#### Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of Diana Lynn Steskal in Support of Landowner Intervenors

State of Nebraska )		
		) ss.
Holt	County	)

- 1 **Q:** Please state your name.
- 2 A: My name is Diana Lynn Steskal.
- Q: Are you an intervener in the Public Service Commission's proceedings
   regarding TransCanada's application for approval of its proposed Keystone
   XL tar sands pipeline across Nebraska?

6 A: Yes, I am.

Q: Do you own land in Nebraska, either directly or through an entity of which
you are an owner that could be affected by the proposed TransCanada
Keystone XL pipeline?

10 A: Yes, I do and it is located at Section 29 – Township 31 – Range 13 in Holt County.

Q: Is Attachment No. 1 to this sworn statement copies of true and accurate aerial
 photo(s) of your land in question here with the area of the proposed KXL
 pipeline depicted?

14 A: Yes.

15 Q: Please describe your property that would be impacted by the potential
 16 TransCanada's Keystone XL Pipeline?

- A: Our 480 acres farm land is located on the northeast edge of the Nebraska
  Sandhills. The farm soil is of highly erodible sandy soil and the Ogallala Aquifer
  runs beneath our land. The route proposed by TransCanada will cut through our
  land diagonally 1.2 miles ~ crossing 3 irrigated quarters; affecting 6 wells ~ 2
  domestic wells; and also crossing the beginning of the north branch of the Eagle
  Creek.
- 7 Q: What do you do for a living?
- 8 A: I am a Registered Cosmetologist working part time and also a sub-contract rural
  9 mail-route carrier.
- 10 Q: If you are you married tell us your spouse's name please?
- 11 A: Yes, Byron Terry Steskal.
- 12 Q: If you have children how many do you have?
- A: Two children, Sarah (31) a High School Teacher) and my late son, Jake (18)
  whom passed in 2008.
- 15 Q: If you have grandchildren how many do you have?
- 16 A: Not yet!
- 17 Q: Is Attachment No. 2 to this sworn statement a copy(ies) of picture(s) of you
  18 and or your family?
- 19 A. Yes.
- Q: For the land that would be affected and impacted by the proposed KXL tar
  sands pipeline give the Commissioners a sense how long the land has been in
  your family and a little history of the land.
- A: We have had this land for over 75 years. Terry's parents Bill and Alda bought this
  property after the "Dust Bowl" years. Both working outside the home throughout
  their years, as well as working the land they purchased to raise a garden, livestock
  and a family. Bill and Alda lived on their property until the time of their passing
  except of a couple of years in the Rest Home. Terry was their primary care giver,
  both living well into their 90's.
- 29 Q: Tell the Commissioners more how important this land is to you.

1 A: This property is important to me because it is our livelihood and also my husband, 2 Terry Steskal's family home. This property holds fond memories of our blended 3 family riding the four-wheeler; snow sledding on an ole' car hood pulled by the 4 four-wheeler; both Sarah and Jake learned to drive an ole' can in our farm 5 pastures, coming back with smiles a mile wide; as well as working maintain the 6 irrigation systems, raising Chinese Ring-necked pheasants and chuckars.

7

#### **Q**: Do you earn any income from this land?

8 A: Yes. We have a contract with a renter to lease the property.

#### 9 **O**: Have you depended on the income from your land to support your livelihood 10 or the livelihood of your family?

11 A: Yes. We do. We raised our family on this land. The land and our family are 12 connected.

#### 13 **O**: Have you ever in the past or have you thought about in the future leasing all 14 or a portion of your land in question here?

- 15 A: Yes, we do lease our property which concerns me. I am concerned that our tenant 16 may try to negotiate a lower price for our land if it had the pipeline on it and all 17 the restrictions and risks and potential negative impacts to farming or ranching 18 operations as opposed to land that did not have those same risks. If I was looking 19 to lease or rent ground I would pay more for comparable non-pipeline land than I 20 would for comparable pipeline land and I think most folks would think the same 21 way. This is another negative economic impact that affects the landowner and the 22 county and the state and will forever and ever should TransCanada's preferred or 23 mainline alternative routes be approved.
- 24

#### Do you have similar concerns about selling the land? **O**:

25 Well I hope not to have to sell the land in my lifetime but times change and you A: 26 never know what is around the corner and yes I am concerned that if another piece 27 of ground similar to mine were for sale and it did not have the pipeline and mine 28 did that I would have a lower selling price. I think this would be true for pipeline 29 ground on both the preferred and mainline alternative routes.

1	Q:	What is your intent with your land after you die?
2	A:	I hope that it will stay in the family for years by passing it on to my daughter
3		Sarah and her family.
4	Q:	Are you aware that the preferred route of TransCanada's Keystone XL
5		Pipeline would cross the land described above and owned by you?
6	A:	Yes.
7	Q:	Were you or an entity for which you are a member, shareholder, or director
8		previously sued by TransCanada Keystone Pipeline, LP?
9	A:	Yes, we were in 2015. TransCanada Keystone Pipeline LP sued us by filing a
10		petition for condemnation against our land so it could place its proposed pipeline
11		within an easement that it wanted to take from us on our land.
12	Q:	Did you defend yourself and your land in that condemnation action?
13	A:	Yes, we did. We hired lawyers to defend and protect us and we incurred legal fees
14		and expenses in our resistance of TransCanada's lawsuit against us.
15	Q:	Has TransCanada reimbursed you for any of your expenses or costs for fees
16		incurred?
17	A:	No, they have not.
18	Q:	In its lawsuit against you, did TransCanada identify the amount of your
19		property that it wanted to take for its proposed pipeline?
20	A:	The lawsuit against us stated they would take the amount of property that is
21		reasonably necessary to lay, relay, operate, and maintain the pipeline and the plant
22		and equipment reasonably necessary to operate the pipeline.
23	Q:	Did TransCanada define what they meant by "property that is reasonably
24		necessary"?
25	A:	No, they did not.
26	Q:	Did TransCanada in its lawsuit against you, identify the eminent domain
27		property portion of your land?
28	A:	Yes, they did.

### Q: Did TransCanada describe what rights it proposed to take related to the eminent domain property on your land?

3 A: Yes, they did.

#### 4 Q: What rights that they proposed to take did they describe?

5 TransCanada stated that the eminent domain property will be used to "lay, relay, A: 6 operate, and maintain the pipeline and the plant and equipment reasonably 7 necessary to operate the pipeline, specifically including surveying, laying, 8 constructing, inspecting, maintaining, operating, repairing, replacing, altering, 9 reconstructing, removing and abandoning one pipeline, together with all fittings, cathodic protection equipment, pipeline markers, and all their equipment and 10 11 appurtenances thereto, for the transportation of oil, natural gas, hydrocarbon, petroleum products, and all by-products thereof." 12

## Q: Prior to filing an eminent domain lawsuit to take your land that TransCanada identified, do you believe they attempted to negotiate in good faith with you?

A: No, I do not. TransCanada's surveying crew trespassed onto our land when it was
posted and we did not sign any easement agreement.

### 18 Q: Did TransCanada at any time approach you with or deliver to you their 19 proposed easement and right-of-way agreement?

20 A: Yes, they did.

Q: At the time you reviewed TransCanada's easement and right-of-way
agreement, did you understand that they would be purchasing a fee title
interest in your property or that they were taking something else?

A: I understood that they proposed to have the power to take both a temporary construction easement that could last for a certain period of time and then also a permanent easement which they described to be 50 feet across or in width, and that would run the entire portion of my property from where a proposed pipeline would enter my property until where it would exit the property. 1Q:Is the document included with your testimony here as Attachment No. 3, a2true and accurate copy of TransCanada's proposed Easement and Right-of-3Way agreement that they included with their condemnation lawsuit against4you?

5 A: Yes, it is.

6 7 Q: Have you had an opportunity to review TransCanada's proposed Easement and Right-of-Way agreement?

8 A: Yes, I have.

9 Q: What is your understanding of the significance of the Easement and Right-of10 Way agreement as proposed by TransCanada?

11 A: My understanding is that this is the document that will govern all of the rights and 12 obligations and duties as well as the limitations of what I can and cannot do and 13 how I and any future landowner and any person I invite to come onto my property 14 must behave as well as what TransCanada is and is not responsible for and how 15 they can use my land.

## Q: After reviewing TransCanada's proposed Easement and Right-of-Way agreement do you have any concerns about any portions of it or any of the language either included in the document or missing from the proposed document?

A: Yes, I have a number of significant concerns and worries about the document and how the language included and the language not included potentially negatively impacts my land and thereby potentially negatively impacts my community and my state.

# Q: I would like you to walk the Commissioners through each and every one of your concerns about TransCanada's proposed Easement and Right-of-Way agreement so they can develop an understanding of how that language and the terms of that contract, in your opinion, potentially negatively impacts you and your land. So, if you can start at the beginning of that document and let's work our way through it, okay?

A: Yes, I'll be happy to express my concerns about TransCanada's proposed
 Easement and Right-of-Way agreement and how it negatively could affect my
 property rights and my economic interests.

4 Q. Okay, let's start with your first concern please.

5 A: The very first sentence talks about consideration or how much money they will 6 pay to compensate me for all of the known and unknown affects and all of the 7 rights I am giving up and for all the things they get to do to my land and for what 8 they will prevent me from doing on my land and they only will pay me one time at 9 the signing of the easement agreement. That is a huge problem.

#### 10 **Q:** Explain to the Commissioners why that is a problem.

11 A: It is not fair to the landowner, the county, or the State. It is not fair to the 12 landowner because they want to have my land forever for use as they see fit so 13 they can make a daily profit from their customers. If I was to lease ground from 14 my neighbor I would typically pay twice a year every year as long as they granted 15 me the rights to use their land. That only makes sense – that is fair. If I was going 16 to rent a house in town I would typically pay monthly, every month until I gave up 17 my right to use that house. By TransCanada getting out on the cheap and paying 18 once in today's dollars that is monthly, bi-annual, or at least an annual loss in tax 19 revenue collection on the money I would be paid and then pay taxes on and 20 contribute to this state and this country. It is money I would be putting back into 21 my local community both spending and stimulating the local economy and 22 generating more economic activity right here. Instead TransCanada's shareholders 23 keep all that money and it never finds its way to Nebraska.

24 **Q: What** 

#### What is your next concern?

A: The first paragraph goes on to say Grantor, which is me the landowner, "does
hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a
limited partnership..." and I have no idea who that really is. I have no idea who is
forcing this pipeline on us or who the owners of the entities are, or what are the
assets backing this limited partnership, or who the general partner is, or who all

1 the limited partners are, and who makes up the ownership of the these partners or 2 the structure or any of the basic things you would want to know and understand if 3 you would want to do business with such an outfit. According to TransCanada's 4 answer to our Interrogatory No. 28, as of the date I signed this testimony, a limited 5 liability company called TransCanada Keystone Pipeline GP, LLC is the general 6 partner and it only owns 0.02 percent of TransCanada Keystone Pipeline, LP so 7 basically nothing. That is really scary since the general partner has the liability but 8 virtually none of the ownership and who knows if it has any other assets.

9 Q: Do you think it is in the public interest of Nebraska to not be one-hundred
10 percent clear on exactly who could become the owner of over 275 miles of
11 Nebraska land?

12 A: No.

Q: Do you think it is in the public interest of Nebraska to not be one-hundred
 percent clear on exactly who will be operating and responsible for
 approximately 275 miles of tar sands pipeline underneath and through
 Nebraska land?

17 A: No.

### 18 Q: Okay, let's continue please with your concerns of the impacts upon your land 19 and the State of Nebraska of TransCanada's easement terms.

Yes, so the next sentence talks about "...its successors and assigns (hereinafter 20 A: 21 called "Grantee")..." and this concerns me because it would allow my easement to 22 be transferred or sold to someone or some company or country or who knows what 23 that I don't know and who we may not want to do business with. This pipeline 24 would be a huge asset for TransCanada and if they can sell to the highest bidder 25 that could have terrible impacts upon all of Nebraska depending upon who may 26 buy it and I don't know of any safeguards in place for us or the State to veto or 27 have any say so in who may own, operate, or be responsible for this pipeline in the 28 future.

1 2

### Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing our State is in the public interest?

3 A: No, certainly not, in fact, just the opposite.

#### 4 Q: What's next?

A: Then it says "...a perpetual permanent easement and right-of-way..." and this
really concerns me. Why does the easement and right-of-way have to be perpetual
and permanent? That is the question myself and my family want an answer to.
Perpetual to me is like forever and that doesn't make sense.

#### 9 Q: Why doesn't a perpetual Easement and Right-of-Way make sense to you?

10 A: For many reasons but mostly because the tar sands are finite. I am unaware of any 11 data proving there is a perpetual supply of tar sands. I am not aware in 12 TransCanada's application where it proves there is a perpetual necessity for this 13 pipeline. My understanding of energy infrastructure like wind towers is they have 14 a decommission plan and actually take the towers down when they become 15 obsolete or no longer needed. Nothing manmade lasts forever. My land however 16 will, and I want my family or future Nebraska families to have that land as 17 undisturbed as possible and it is not in my interest or the public interest of 18 Nebraska to be forced to give up perpetual and permanent rights in the land for 19 this specific kind of pipeline project.

20

#### Q: Okay, what is your next concern?

A: The easement language includes all these things TransCanada can do and it says "...abandoning in place..." so they can just leave this pipeline under my ground until the end of time just sitting there while they are not using it, but I am still prevented from doing on my land and using my land what I would like. If I owned a gas station I couldn't just leave my underground oil or fuel storage tanks sitting there. It doesn't make sense and it scares me and it is not in my interest or the public interest of Nebraska to allow this.

### Q: Now it looks like we are ready to go to the second page of the Easement is that right?

1 A: Yes.

#### 2 Q: So now on the second page of the Easement what are your concerns?

3 A: Here the Easement identifies a 24-month deadline to complete construction of the 4 pipeline but has caveats that are undefined and ambiguous. The 24-month period 5 starts to run from the moment "actual pipeline installation activities" begin on 6 Landowners property. It appears that TransCanada would define this phrase as 7 needed. It would be wise to explain what types of TransCanada action constitutes 8 "installation activity" For instance, would the placement and storage of an 9 excavator or other equipment on or near the Easement property be an activity or 10 would earth have to be moved before the activity requirement is triggered. This 11 vague phrase is likely to lead to future disputes and litigation that is not in the best 12 interest of the welfare of Nebraska and would not protect property interests. The 13 24-months can also be extended in the case of "force majeure." My understanding 14 is that force majeure is often used to insulate a party to a contract when events 15 occur that are completely out of their control. In TransCanada's easement this is 16 expanded to include "without limitation...availability of labor and materials." 17 Extending this language to labor and materials is problematic because these are 18 two variables that TransCanada does have some or significant control over and to allow extension of the 24-month period over events not truly out of the control of 19 20 TransCanada and without further provision for compensation for the Landowner is 21 not conducive to protection of property rights.

22

#### Q: Okay, what is your next concern?

A: Paragraphs 1.A. and 1.B. deal with the liabilities and responsibilities of
TransCanada and Landowner. In 1.A., the first sentence discusses "commercially
reasonable costs and expenses" will pay for damages caused but then limits
TransCanada's liability to certain circumstances. There is no definition of
"commercially reasonable" and no stated right that the Landowner would get to
determine the amounts of cost or expense that is "commercially reasonable."
TransCanada excepts out from their liability any damages that are caused by

Landowner's negligence or the negligence of anyone ever acting on the behalf of 1 2 Landowner. It is understandable that if the Landowner were to willfully and 3 intentionally cause damages to the pipeline that Landowner should be liable. 4 However, anything short of willful misconduct should be the lability of 5 TransCanada who is subjecting the pipeline on the Landowner and who is making 6 a daily profit from that pipeline. When evaluating the impact on property rights of 7 this provision, you must consider the potentially extremely expensive fight a 8 Landowner would have over this question of whether or not damage was an act of 9 negligence. Putting this kind of potential liability upon the Landowner is 10 incredibly problematic and is detrimental to the protection of property rights. I 11 don't think this unilateral power which I can't do anything about as the landowner 12 is in the best economic interest of the land in question or the State of Nebraska for 13 landowners to be treated that way.

### 14Q:Is there and15concern model

### Is there any specific event or example you are aware of that makes this concern more real for you?

A: Yes, one need not look further than a November 3, 2015 lawsuit filed against
 Nemaha County, Nebraska landowner farmers who accidently struck two
 Magellan Midstream Partners, LP pipelines, one used to transport a mixture of
 gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged
 negligence and sued the Nebraska farmer for \$4,151,148.69. A true and accurate
 copy of the Federal Court Complaint is here as Attachment No. 4

#### 22 Q: What is your next concern with the Easement language?

A: Paragraph 3 states that Landowner can farm on and otherwise use their property as
 they choose unless 1) any Landowner use interferes in any way with
 TransCanada's exercise of any of its rights within the Easement, or 2)
 TransCanada decides to take any action on the property it deems necessary to
 prevent injury, endangerment or interference with anything TransCanada deems
 necessary to do on the property. Landowner is also forbidden from excavating

without prior authorization by TransCanada. So my understanding is that 1 2 TransCanada will unilaterally determine what Landowner can and can't do based 3 upon how TransCanada chooses to define the terms in paragraph 3. TransCanada 4 could also completely deny my request to excavate. Further, TransCanada retains 5 all "privileges necessary or convenient for the full use of the rights" granted to 6 them in the Easement. Again, TransCanada unilaterally can decide to the 7 detriment of the property rights of Landowner what TransCanada believes is 8 necessary or convenient for it. And there is no option for any additional 9 compensation to landowner for any right exercised by TransCanada that leads to 10 the removal of trees or plants or vegetation or buildings or structures or facilities 11 owned by Landowner of any kind. Such undefined and unilateral restrictions and 12 rights without having to compensate Landowner for such further destruction or 13 losses are not conducive to the protection of property rights or economic interest.

14

#### **Q**: What is the next concern you have?

15 A: The Easement also allows some rights for Landowner but restricts them at the 16 same time and again at the sole and unilateral decision making of TransCanada. 17 TransCanada will determine if the actions of Landowner might in anyway 18 endanger or obstruct or interfere with TransCanada's full use of the Easement or 19 any appurtenances thereon to the pipeline itself or to their access to the Easement 20 or within the Easement and TransCanada retains the right at any time, whether 21 during growing season or not, to travel "within and along Easement Area on foot 22 or in vehicle or machinery..." Further at TransCanada's sole discretion it will 23 retain the rights to prevent any landowner activity that it thinks may "unreasonably 24 impair[ed] or interfe[ed] with" TransCanada's use of the Easement Area. Such 25 undefined and unilateral restrictions are not conducive to the protection of property rights or economic interest. 26

27

#### What is the next concern you have with the Easement language? **Q**:

28 A: The Easement allows TransCanada sole discretion to burn or chip or bury under 29 Landowner's land any debris of any kind without any input or power of Landowner to demand an alternative method or location of debris disposal. Such
 unilateral powers would negatively affect Landowners property are not conducive
 to the protection of property rights or economic interest.

4

#### Q: What is the next concern you have with the Easement language?

5 A: Again, undefined terms leave a lot of room for confusion. What does the phrase 6 "where rock is encountered" mean and why does TransCanada solely get to 7 determine whether or not this phrase is triggered. This phrase could be used to 8 justify installing the pipeline 24 inches beneath the surface. The ability to use this 9 provision to minimal locate the pipeline at a depth of 24 inches could negatively 10 affect Landowners property are not conducive to the protection of property rights. 11 A shallow pipeline is much more likely to become a danger and liability in the 12 future given farming operations and buried irrigation lines and other factors common to the current typical agricultural uses of the land in question impacted 13 14 by TransCanada's preferred pipeline route.

15

#### Q: What is the next concern you have with the Easement language?

16 A: There are more vague concepts solely at the determination of TransCanada such as 17 "as nearly as practicable" and "pre-construction position" and "extent reasonably possible." There is nothing here that defines this or provides a mechanism for 18 19 documenting or memorializing "pre-construction position" so as to minimize 20 costly legal battles or wasted Landowner time attempting to recreate the soil 21 condition on their fields or pasture. Such unilateral powers would negatively affect 22 Landowners property are not conducive to the protection of property rights or 23 economic interest.

23 24

#### Q: What is the next concern you have with the Easement language?

A: TransCanada maintains the unilateral right to abandon the pipeline and all appurtenances thereto in place on, under, across, or through Nebraska land at any time it chooses. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral

powers would negatively affect Landowners property are not conducive to the
 protection of property rights or economic interest.

#### 3 Q: What is the next concern you have with the Easement language?

4 A: TransCanada has the power to unilaterally move or modify the location of any 5 Easement area whether permanent or temporary at their sole discretion. 6 Regardless, if Landowner has taken prior steps relative the their property in 7 preparation or planning of TransCanada's taking of the initial easement area(s), 8 the language here does not require TransCanada to compensate the Landowner if 9 they decide to move the easement anywhere on Landowners property. Such 10 unilateral powers would negatively affect Landowners property are not conducive 11 to the protection of property rights or economic interests.

12 Q: What is the next concern you have with the Easement language?

A: The Easement requires that all of the burdens and restrictions upon Landowner to
transfer and be applicable to any future owner of the Land in question without the
ability of the future Landowner to modify or negotiation any of the language in
question to which it will be held to comply.

#### 17 Q: What is the next concern you have with the Easement language?

18 A: The Easement allows TransCanada to assign, transfer, or sell any part of the 19 Easement to any person, company, country, etc. at their sole discretion at anytime 20 to anyone. This also means that any buyer of the easement could do the same to a 21 third buyer and so on forever. There is no change of control or sale provision in 22 place to protect the Landowner or Nebraska or to provide compensation for such 23 change of control or ownership. It is not conducive to the protection of property 24 rights or economic interests to allow unilateral unrestricted sale of the Easement 25 thereby forcing upon the Landowner and our State a new unknown Easement 26 owner.

27 Q: What is the next concern you have with the Easement language?

A: There are many terms in the Easement that are either confusing or undefined terms
that are without context as to whether or not the Landowner would have any say

1	so in determining what these terms mean or if the evaluation is solely in
2	TransCanada's control. Some of these vague undefined terms are as follows:
3	i. "pipeline installation activities"
4	ii. "availability of labor and materials"
5	iii. "commercially reasonable costs and expenses"
6	iv. "reasonably anticipated and foreseeable costs and expenses"
7	v. "yield loss damages"
8	vi. "diminution in the value of the property"
9	vii. "substantially same condition"
10	viii. "an actual or potential hazard"
11	ix. "efficient"
12	x. "convenient"
13	xi. "endangered"
14	xii. "obstructed"
15	xiii. "injured"
16	xiv. "interfered with"
17	xv. "impaired"
18	xvi. "suitable crossings"
19	xvii. "where rock is encountered"
20	xviii. "as nearly as practicable"
21	xix. "pre-construction position"
22	xx. "pre-construction grade"
23	xxi. "various engineering factors"
24	Each one of these above terms and phrases as read in the context of the Easement
25	could be problematic in many ways. Notably, undefined terms tend to only get
26	definition in further legal proceedings after a dispute arises and the way the
27	Easement is drafted, TransCanada has sole power to determine when and if a
28	particular situation conforms with or triggers rights affected by these terms. For
29	instance, "yield loss damages" should be specifically defined and spelled out

1 exactly how the landowner is to be compensated and in what events on the front 2 end. I can't afford to fight over this after the damage has occurred. Unfortunately, 3 the Landowner is without contractual rights to define these terms or determine 4 when rights related to them trigger and what the affects may be. 5 Do you have any other concerns about the Easement language that you can **Q**: 6 think of at this time? 7 A: I reserve the right to discuss any additional concerns that I think of at the time of 8 my live testimony in August. 9 **O**: Based upon what you have shared with the Commission above regarding 10 TransCanada's proposed Easement terms and agreement, do you believe 11 those to be reasonable or just, under the circumstances of the pipeline's 12 impact upon you and your land? 13 A: No, I do not believe those terms to be reasonable or just for the reasons that we 14 discussed previously. 15 **Q**: Did TransCanada ever offer you financial compensation for the rights that 16 they sought to obtain in your land, and for what they sought to prevent you 17 and any future land owner of your property from doing in the future? 18 A: Yes, we received an offer from them. As the owner of the land in question and as the person who knows it better 19 **Q**: 20 than anyone else, do you believe that TransCanada offered you just, or fair, 21 compensation for all of what they proposed to take from you so that their tar 22 sands pipeline could be located across your property? 23 No, I do not. Not at any time has TransCanada, in my opinion, made a fair or just A: 24 offer for all the potential impacts and effects and the rights that I'm giving up, and 25 what we will be prevented from doing in the future and how their pipeline would 26 impact my property for ever and ever. 27 **Q**: Has TransCanada at any time offered to compensate you annually, such as 28 wind farm projects do, for the existence of their potential tar sands pipeline 29 across your property.

- 1 A: No, never.
- 2 **O**: At any time did TransCanada present you with or request that you, as the 3 owner of the land in question, sign and execute a document called, "Advanced 4 **Release of Damage Claims and Indemnity Agreement?"**

5 A: Yes, they did.

6 **Q**: Is Attachment No. 5, to your testimony here, a true and accurate copy of the 7 "Advanced Release of Damage Claims and Indemnity Agreement?

8 A: Yes, it is.

#### 9 0: What was your understanding of that document?

- 10 A: When I read that document in the plain language of that document, it was my 11 understanding that TransCanada was attempting to pay me a very small amount at 12 that time in order for me to agree to give up my rights to be compensated from 13 them in the future related to any damage or impact they may have upon my 14 property "arising out of, in connection with, or alleged to resulted from 15 construction or surveying over, under or on" my land.
- 16 **Q**: Did you think this document is fair to sign?
- 17 A: No.

18 **Q**: Why not?

19 A; Because I do not believe that it is fair or just to try to get me to agree to a small 20 sum of money when I have no idea how bad the impacts or damages that they, or 21 their contractors, or subcontractors, or other agents or employees, may cause on 22 my land at any time in the future that resulted from the construction or surveying 23 or their activities upon my land.

24

#### When you reviewed this document, what did it make you feel? **O**:

25 I felt like it was simply another attempt for TransCanada to try to pay very little to A: 26 shield themselves against known and foreseeable impacts that their pipeline, and 27 the construction of it, would have upon my land. It made me feel that they knew it 28 was in their financial interest to pay me as little as possible to prevent me from 29 ever having the opportunity to seek fair compensation again, and that this must be

1		based upon their experience of unhappy landowners and situations in other places
2		where they have built pipelines.
3	Q:	Has TransCanada ever contacted you and specifically asked you if you
4		thought their proposed location of their proposed pipeline across your land
5		was in your best interest?
6	A:	No, they have not.
7	Q:	Has TransCanada ever contacted you and specifically asked you if you
8		thought their proposed location of their proposed pipeline across your land
9		was in the public interest of the State of Nebraska?
10	A:	No, they have not.
11	Q:	Are you familiar with the Fifth Amendment to the U.S. Constitution and the
12		Takings Clause?
13	A:	Yes, I am.
14	Q:	What is your understanding of the Fifth Amendment as it relates to taking of
15		an American citizens property?
16	A:	My understanding is that, according to the United States Constitution, that if the
17		government is going to take land for public use, then in that case, or by taking for
18		public use, it can only occur if the private land owner is compensated justly, or
19		fairly.
20	Q:	Has TransCanada ever contacted you specially to explain the way in which
21		the public could use its proposed Keystone XL Pipeline?
22	A:	No, they have not.
23	Q:	Can you think of any way in which the public, that is the citizens of the State
24		of Nebraska, can directly use the proposed TransCanada Keystone XL
25		Pipeline, as it dissects the State of Nebraska?
26	A:	No, I cannot. I cannot think of any way to use this pipeline. I do not see how the
27		public benefits from this pipeline in any way, how they can use it any way, or how
28		it's in the public interest in any way. By looking at the map, it is quite clear to me
29		that the only reason it's proposed to come through Nebraska, is that because we

are geographically in the way from between where the privately-owned Tar Sands
 are located to where TransCanada wants to ship the Tar Sands to refineries in
 Houston, Texas. Also a possibility that TransCanada would like to take the
 Ogallala Aquifer water from Nebraska out of Nebraska.

G: Has TransCanada ever contacted you and asked you if you had any tar sands,
crude petroleum, oil and petroleum by-products that you would like to ship in
its pipeline?

8 A: No, it has not.

9 Q: Do you have any tar sands, crude petroleum, or oil and petroleum by10 products that you, at this time or any time in the future, would desire to place
11 for transport within the proposed TransCanada Keystone XL Pipeline?

12 A: No, I do not.

Q: Do you know anyone in the state of Nebraska who would be able to ship any
 Nebraska-based tar sands, crude petroleum, or oil and petroleum by products within the proposed TransCanada Keystone XL Pipeline?

16 A: No, I do not. I've never heard of such a person or company like that.

17 Q: Do you pay property taxes for the land that would be affected and impacted
18 at the proposed TransCanada Keystone XL Pipeline?

19 A: Yes, I do.

20 Q: Why do you pay property taxes on that land?

A: Because that is the law. The law requires us to pay the property taxes as the ownerof that property.

Q: Because you follow the law and pay property taxes, do you believe you
deserve any special consideration or treatment apart from any other person
or company that pays property taxes?

A: Well no, of course not. It's the law to pay property taxes if you own property. It's
just what you do.

Q: Do you believe the fact that you pay property taxes entitles you to special
treatment of any kind, or special rights of any kind?

- 1 A: No, of course not.
- 2 Q: Do you believe the fact that you pay property taxes on your land would be 3 enough to qualify you to have the power of eminent domain to take land of 4 your neighbors or other people in your county, or other people across the 5 state of Nebraska?
- 6 A: Well, of course not. Like I said, paying property taxes is the law, it's nothing that
  7 I expect an award for or any type of special consideration.
- 8 Q: Have you at any time ever employed any person other than yourself?
- 9 A: Well, yes I have.
- 10Q:Do you believe that the fact that you have, at some point in your life,11employed one or more other persons entitle you to any special treatment or12consideration above and beyond any other Nebraskan that has also employed13one or more persons?
- 14 A: No, of course not.
- Q: Do you believe that the fact that you, as a Nebraska land owner and taxpayer
   have at one point employed another person within this state, entitles you to
   preferential treatment or consideration of any kind?
- 18 A: No, of course not. If I choose to employ someone that decision is up to me. I
  19 don't deserve any special treatment or consideration for that fact.
- 20 **O**: At the beginning of your statement, you briefly described your property that 21 would be impacted by the potential Keystone XL Pipeline. I would like you to 22 give the Commissioners a sense of specifically how you believe the proposed 23 Keystone XL Pipeline and its preferred route, which proposes to go across 24 your land, how it would in your opinion based on your knowledge, 25 experience, and background of your land, affect it. So please share with the 26 Commissioners the characteristics of your land that you believe is important 27 for them to understand, while they evaluate TransCanada's application for a 28 route for its proposed pipeline to cross Nebraska and across your land, 29 specifically.

1 A: I am very concerned about TransCanada's land reclamation practices. I have 2 visited two different properties of reclamation in South Dakota. As of today 3 neither one of the landowners are happy with the results of the land reclamation of 4 their properties. Both properties are not of sandy soil. I am not an expert farmers 5 but I have lived in the Nebraska Sandhills all of my life. The knowledge that is 6 gained by everyone growing up in the sandhills is that when you disturb the sandy 7 soils of the Sandhills it takes a lifetime of healing and a big possibility of never 8 healing. This route of the pipeline will affect our natural native grasses on our 9 farm. Also it will affect the crops grown on our 3 irrigated quarters.

## 10Q:Do you have any concerns TransCanada's fitness as an applicant for a major11crude oil pipeline in its preferred location, or ultimate location across the12state of Nebraska?

13 A: Yes, I have significant concerns. I am aware of landowners being treated unfairly 14 or even bullied around and being made to feel scared that they did not have any 15 options but to sign whatever papers TransCanada told them they had to. I am 16 aware of folks being threatened that their land would be taken if they didn't follow what TransCanada was saying. I am aware of tactics to get people to sign 17 18 easements that I don't believe have any place in Nebraska or anywhere such as 19 TransCanada or some outfit associated with it hiring a pastor or priest to pray with 20 landowners and convince them they should sign TransCanada's easement 21 agreements. I am aware of older folks and widows or widowers feeling they had 22 no choice but to sign TransCanada's Easement and they didn't know they could 23 fight or stand up for themselves. TransCanada has not been a good neighbor to us. 24 They have lied to us; used Eminent Domain against us; the surveying crews 25 trespassed onto our posted no trespass land, in which a claim was file with the 26 sheriff's office. TransCanada doesn't have a good reputation as Keystone I had 14 27 leaks in the first year. I believe today that Keystone I is not running to its fullest 28 capacity and if so certainly a new route for a new pipeline for the same products 29 and chemicals is not needed and not in the "public interest". Even though a new

1 map of the Sandhills boundaries was presented TransCanada and in the FEIS, it 2 doesn't matter because our highly erodible sandy soil and the two gravel pits 3 across the road from our farm are still located in the Sandhills. Keystone XL tar 4 sands pipeline contain toxic chemicals is not in the best interest of Nebraska as the 5 preferred proposed pipeline route still crosses the Ogallala Aquifer. I am also 6 worried that according to their answer to our Interrogatory No. 211, TransCanada 7 only owns and operates one (1) major oil pipeline. They simply do not have the 8 experience with this type of pipeline and that scares me. There are others but that 9 is what I can recollect at this time and if I remember more or my recollection is 10 refreshed I will share those with the Commissioners at the Hearing in August.

### Q: Do you believe TransCanada's proposed method of compensation to you as a landowner is reasonable or just?

13 A: No, I do not.

## Q: Do you have any concern about limitations that the construction of this proposed pipeline across your affected land would prevent construction of future structures upon the portion of your land affected by the proposed easement and immediately surrounding areas?

A: Well yes, of course I do. We would not be able to build many, if any, types of structures directly across or touching the easement, and it would be unwise and I would be uncomfortable to build anything near the easement for fear of being blamed in the future should any damage or difficulty result on my property in regards to the pipeline.

23 Q

#### **Q:** Do you think such a restriction would impact you economically?

24 A: Well yes, of course.

#### 25 Q: How do you think such a restriction would impact you economically?

A: The future of this land may not be exactly how it's being used as of this moment,
and having the restrictions and limiting my ability to develop my land in certain
ways presents a huge negative economic impact on myself, my family, and any
potential future owner of the property. You have no idea how I or the future owner

1 may want to use this land in the future or the other land across Nebraska 2 potentially affected by the proposed Keystone XL tar sands pipeline. Fifty years 3 ago it would have been hard to imagine all the advances that we have now or how 4 things change. Because the Easement is forever and TransCanada gets the rights in 5 my land forever we have to think with a very long term view. By placing their 6 pipeline on under across and through my land that prevents future development 7 which greatly negatively impacts future taxes and tax revenue that could have 8 been generated by the County and State but now will not. When you look at the 9 short blip of economic activity that the two years of temporary construction efforts 10 may bring, that is far outweighed by the perpetual and forever loss of opportunity 11 and restrictions TransCanada is forcing upon us and Nebraska.

### 12 Q: Do you have any concerns about the environmental impact of the proposed 13 pipeline?

14 A: Yes, I do.

15 Q: What are some of those concerns?

A: As an affected land owner and Nebraskan, I am concerned that any construction,
operation, and/or maintenance of the proposed Keystone XL Pipeline would have
a detrimental impact upon the environment of my land specifically, as well as the
lands near my land and surrounding the proposed pipeline route.

20 Q: Do you have any other environmental concerns?

A: Yes, of course I am concerned about potential breaches of the pipeline, failures in
construction and/or maintenance and operation. I am concerned about spills and
leaks that TransCanada has had in the past and will have in the future. This could
be catastrophic to my operations or others and to my county and the State.

### Q: Do you have any thoughts regarding if there would be an impact upon the natural resources on or near your property due to the proposed pipeline?

A: Yes, I believe that any construction, operation, and/or maintenance of the
proposed Keystone XL Pipeline would have detrimental impacts upon the natural

resources of my land, and the lands near and surrounding the proposed pipeline
 route.

#### 3

### 3 Q: Do you have any worries about potential impacts from the proposed pipeline 4 to the soil of your land, or land near you?

5 A: Yes, I believe that any construction, operation, and/or maintenance of the 6 proposed Keystone XL Pipeline would have a detrimental impact upon the soil of 7 land, as well as land along and surrounding the proposed pipeline route. This 8 includes, but is not limited to, the reasons that we discussed above of disturbing 9 the soil composition and makeup as it has naturally existed for thousands and 10 millions of years during the construction process, and any future maintenance or 11 removal process. I'm gravely concerned about the fertility and the loss of 12 economic ability of my property to grow the crops, or grow the grasses, or grow 13 whatever it is at that time they exist on my property or that I may want to grow in 14 the future, or that a future owner may want to grow. The land will never be the 15 same from as it exists now undisturbed to after it is trenched up for the proposed 16 pipeline.

### Q: Do you have any concerns about the potential impact of the proposed pipeline upon the groundwater over your land, or surrounding lands?

A: Yes, I'm very concerned that any construction, operation, and/or maintenance of
the proposed Keystone XL Pipeline would have a detrimental impact upon the
groundwater of not only under my land, but also near and surrounding the pipeline
route, and in fact, potentially the entire State of Nebraska. Water is life plain and
simple and it is simply too valuable to our State and the country to put at
unreasonable risk.

### Q: Do you have any concern about the potential impact of the proposed pipeline upon the surface water on, or near or around your land?

A: Yes, I have significant concerns that any construction, operation, and/or
maintenance of the proposed Keystone XL Pipeline would have detrimental
impact upon the surface water of not only within my property boundary, but along

and near and surrounding the pipeline route, and in fact, across the state of
 Nebraska. The north branch of the Eagle Creek begins on our property.

## Q: Do you have any concern about the potential impacts of the proposed pipeline upon the wildlife and plants, other than your growing crops on or near your land?

## A: Yes, I'm very concerned that any construction, operation, and/or maintenance of the proposed Keystone XL Pipeline would have a detrimental impact upon the wildlife and the plants, not only that are located on or can be found upon my land, but also near and along the proposed pipeline route.

### 10 Q: Do you have any concerns about the effects of the proposed pipeline upon the 11 fair market value of your land?

12 A: Yes, I do. I am significantly concerned about how the existence of the proposed 13 pipeline underneath and across and through my property will negatively affect the 14 fair market value at any point in the future, especially at that point in which I 15 would need to sell the property, or someone in my family would need to sell the 16 property. I do not believe, and certainly would not be willing to pay, the same 17 price for land that had the pipeline located on it, versus land that did not. I hope 18 there is never a point where I'm in a position where I have to sell and have to 19 realize as much value as I can out of my land. But because it is my single largest 20 asset, I'm gravely concerned that the existence of the proposed Keystone XL 21 Pipeline upon my land will affect a buyer's willingness to pay as much as they 22 would've paid and as much as I could've received, if the pipeline were not upon 23 my property. There are just too many risks, unknowns, impacts and uncertainties, 24 not to mention all of the rights you give up by the nature of having the pipeline 25 due to having the easement that we have previously discussed, for any reasonable 26 person to think that the existence of the pipeline would not negatively affect my 27 property's value.

### Q: Have you ever seen the document that's marked as Attachment No. 6, to your testimony?

1 A: Yes, I have.

2 Where have you seen that before? **O**: 3 A: That is a map I think I first saw a couple years ago that shows the Keystone XL 4 I-90 corridor alternate route of its proposed pipeline through Nebraska and I believe the portion of the alternative route in Nebraska essentially twins or 5 6 parallels Keystone I. 7 **Q**: Do you believe that TransCanada's preferred route as found on page 5 of its 8 Application, and as found on Attachment No. 7, here to your testimony, is in 9 the public interest of Nebraska? 10 A: No, I do not. 11 **O**: Do you believe that the Keystone mainline alternative route as shown on 12 Attachment No. 7 included with your testimony here is a major oil pipeline 13 route that is in the public interest of Nebraska? 14 A: No, I do not. 15 **Q**: Do you believe the I-90 corridor alternative route, specifically for the portion 16 of the proposed pipeline within Nebraska as found in Attachment No. 6 to 17 your testimony, is in the public interest of Nebraska? 18 A: No, I do not. 19 **Q**: Do you believe there is any potential route for the proposed Keystone XL 20 Pipeline across, within, under, or through the State of Nebraska that is in the 21 public interest of the citizens of Nebraska? 22 A: No, I do not. 23 Why do you hold that belief? **O**: 24 A: Because there simply is no public interest based on all of the factors that I am 25 aware and that I have read and that I have studied that this Commission is to 26 consider that would establish that a for-profit foreign-owned pipeline that simply 27 crosses Nebraska because we are geographically in the way between where tar 28 sands are in Canada to where it wants to ship it to in Texas could ever be in the 29 public interest of Nebraskans. We derive no benefit from this project. It is not for public use. Nebraska is simply in the way and when all considerations are taken in
there is no net benefit of any kind for Nebraska should this project be placed in our
state. Even if there was some arguable "benefit" it is not enough to outweigh all
the negative impacts and concerns.

#### 5 6 7

8

Q: What do you think about the applicant, TransCanada's argument that it's preferred route for its proposed Keystone XL Pipeline is in the public interest of Nebraska because it may bring temporary jobs during the construction phase to Nebraska?

9 A: First of all, not all jobs are created equally. Most jobs that are created, whether 10 temporary or on a permanent basis, don't come with a project that has all the 11 potential and foreseeable negative impacts, many of which we have discussed here 12 and other witnesses throughout the course of this hearing have and will discuss. If I decide to hire and employ someone to help me out in my farming or ranching 13 14 business, I've created a job but I haven't done so at the risk or detrimental impact 15 to my land or my town or my county or my state. And I've hired someone who is 16 working directly for me, a Nebraska landowner, citizen, taxpayer, to help produce 17 and grow a Nebraska product to be sold so that I can pay Nebraska taxes. So, all 18 jobs are not created equal. Additionally, I understand from what I'm familiar with from TransCanada's own statements that the jobs numbers they originally touted 19 20 were determined to be a minute fraction of the permanent jobs that had been 21 projected. According to their answer to our Interrogatory No. 191, TransCanada 22 has created only thirty-four (34) jobs within Nebraska working specifically on 23 behalf of TransCanada and according to their answer to Interrogatory No. 196, as 24 of May 5, 2017 they only employ one (1) temporary working within Nebraska. 25 Further, according to their answer to Interrogatory No. 199, TransCanada would 26 only employ six to ten (6 to 10) new individuals if the proposed Keystone XL was 27 constructed on its Preferred Route or its Mainline Alternative Route.

### Q: Are you opposed to the preferred route of the proposed KXL Pipeline simply because it would cross your land?

A: No, absolutely not. I am opposed to this project because it is not in the public
 interest, neither within my community nor within our state.

### 3 Q: Would you be happier if instead of crossing your land, this proposed pipeline 4 was to cross someone else's land?

5 A: No, absolutely not. I would get no joy in having a fellow citizen of my state have 6 the fear and anxiety and potential foreseeable risks and negative impacts that this 7 type of a project carrying this type of product brings foisted upon anyone in this 8 state or any other state.

### 9 Q: Do you think there is any intelligent route for the proposed Keystone XL 10 Pipeline to cross the state of Nebraska?

- A: I don't believe there is an intelligent route because as I have stated I don't believe
  this project anywhere within Nebraska is within the public interest. Both the
  preferred route and the mainline alternative routes are economic liabilities our
  state cannot risk.
- 15 Q: What do you rely upon to make that statement?
- A: Well, the fact that a pipeline owned and operated by TransCanada, Keystone I,
  already exists in that area is reason enough as it is not in our best interest or the
  public interests to have more major tar sands oil pipelines crisscrossing our state.

### 19 Q: Do you have any other concerns you would like to reiterate or can think of at 20 this time you would like the Commissioners to understand?

A: My main concerns with easement terms are as follows: 1. TransCanada using
bullying tactics (Eminent Domain) to gain part of our family farm for private gain.
2. No Protection for NE landowners from Liability 3. Abandonment of Pipe (pipe
removal) 4. Perpetual ownership ~ easement should end when project ends. 5.
Land Reclamation ~ TransCanada's famous last words: "How they will leave the
land in better shape than they found it."

## Q: Have you fully expressed each and every opinion, concern, or fact you would like the Public Service Commissioners to consider in their review of TransCanada's Application?

1 **A:** No, I have not. I have shared that which I can think of as of the date I signed this 2 document below but other things may come to me or my memory may be 3 refreshed and I will add and address those things at the time of the Hearing in 4 August and address any additional items at that time as is necessary. Additionally, 5 I have not had an adequate amount of time to receive and review all of 6 TransCanada's answers to our discovery and the discovery of others so it was 7 impossible to competently and completely react to that in my testimony here and I 8 reserve the right to also address anything related to discovery that has not yet 9 concluded as of the date I signed this document below. Lastly, certain documents 10 requested have not yet been produced by TransCanada and therefore I may have 11 additional thoughts on those I will also share at the hearing as needed.

## Q: What is it that you are requesting the Public Service Commissioners do in regards to TransCanada's application for the proposed Keystone XL Pipeline across Nebraska?

15 A: I am respectfully and humbly requesting that the Commissioners think far beyond 16 a temporary job spike that this project may bring to a few counties and beyond the 17 relatively small amount of taxes this proposed foreign pipeline would possibly 18 generate. And, instead think about the perpetual and forever impacts of this pipeline as it would have on the landowners specifically, first and foremost, but 19 20 also thereby upon the entire state of Nebraska, and to determine that neither the 21 preferred route nor the Keystone mainline alternative route are in the public 22 interest of the citizens of the state of Nebraska. It simply does not make sense to 23 add yet another major oil pipeline crisscrossing our state. This project is not in the 24 best interest for the state of Nebraska.

## Q: Does Attachment No. 8 here contain other documents you are competent to speak about that you wish to be part of your testimony and to discuss in more detail as needed at the August 2017 Hearing?

28 A: Yes.

Q: Are all of your statements in your testimony provided above true and
 accurate as of the date you signed this document to the best of your
 knowledge?

4 A: Yes, they are.

5 Q: Thank you, I have no further questions at this time and reserve the right to
6 ask you additional questions at the August 2017 Hearing.

Diana Lynn Steskal

Subscribed and Sworn to me before this <u>2.54</u> day of May, 2017.

5. Drorak Notar

A GENERAL NOTARY - State of Nebraska	
KA KA	PEGGY S. DVORAK
	My Comm. Exp. May 18, 2019

Attachment No. 1



May 2017 - XADrawings/50388X KEYSTONE XL\9000\_999949368

#### KXL019136

Attachment No. 2




Attachment No. 3

Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

(Above Space for Recorder's Use Only)

Tract No.: ML-NE-HT-30215.000

#### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration") Byron Terry Steskal, a single person, whose mailing address is 707 E. 2<sup>nd</sup> Street, Stuart, NE 68780 (hereinafter called "Grantor") does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), a perpetual permanent easement and right-of-way (the "Easement") for the purposes of surveying, laying, constructing, inspecting, maintaining, operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other equipment and appurtenances thereto (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines), for the transportation of crude petroleum, oil and petroleum by-products, on, under, across and/or

Grantor's Initials\_\_\_\_

through a strip of land 50 feet in width, as more particularly described in <u>Exhibit A</u>, which is attached hereto and made a part hereof (the "**Easement Area**") located on real property situated in the County of Holt, State of Nebraska owned by Grantor and described as follows:

A tract of land containing 480 acres, more or less, situated in the County of Holt, in the State of Nebraska, being further described as the N1/2 and the SE1/4 of Section 29, Township 31 North, Range 13 West of the 6th P.M., as recorded in Book 178, Page 241 and Book 174, Page 462 in the Deed Records of Holt County, Nebraska; less and except any conveyances heretofore made.

(the "**Property**"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "**Initial Construction Period**"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional Temporary Work Space" and are more particularly described in <u>Exhibit A</u> hereto (the "**Temporary Work Space**"), provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

A. Grantee will pay all commercially reasonable costs and expenses that result from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's crops, pastures, drainage systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property, including but not limited to, any and all tree, crop, plant, timber, harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee harmless in this regard, except to the extent that those claims or legal actions result from the

negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

3. Provided its use of the Property does not in any manner interfere with or prevent the exercise by Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

4. Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee's pipeline is left with the amount of cover originally installed to allow safe operation of the Grantee's pipeline; (v) the Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with.

5. During the Initial Construction Period, Grantee shall also provide suitable crossings on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of all brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil to its original, pre-construction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its pre-construction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period) by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment.

Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including, 13. without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" referring to this instrument and setting forth the modified legal description of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid, Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

14. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of negligence, recklessness, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

15. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

16. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

17. It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

18. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

19. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

20. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

21. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_day of \_\_\_\_\_\_ \_, 20\_\_\_\_\_.

GRANTOR(S):

Byron Terry Steskal

[ACKNOWLEDGMENTS APPEAR ON FOLLOWING PAGE]

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_\_\_day of \_\_\_\_\_20\_\_\_

By Byron Terry Steskal, a single person

Notary Public Signature

Affix Seal Here





Attachment No. 4

#### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 1 of 5 - Page ID # 1

#### IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE	)	CASE NO
COMPANY, a New York Corporation,	)	
	)	
Plaintiff,	)	
	)	COMPLAINT
V.	)	
	)	
RICHARD ANDREW, JANE ANDREW,	)	
LUKE ANDREW, and BRYCE ANDREW,	)	
	)	
Defendants.	)	

**COMES NOW** Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

#### PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

- 2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
- 3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
- 4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
- 5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

#### JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

#### **GENERAL ALLEGATIONS**

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

#### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 3 of 5 - Page ID # 3

law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

#### FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the rightof-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

- 23. Defendants were negligent in the following particulars:
  - a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
  - b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;
  - c. Defendants failed to comply with the statutory requirements of the OCNS;
  - d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
  - e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

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26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

#### SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

#### JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

ZURICH AMERICAN INSURANCE COMPANY, Plaintiff,

By: /s/ Albert M. Engles ENGLES, KETCHAM, OLSON, & KEITH, P.C. 1350 Woodmen Tower 1700 Farnam Street Omaha, Nebraska 68102 (402) 348-0900 (402) 348-0904 (Facsimile) Albert M. Engles, #11194 Dan H. Ketcham, #18930 Michael L. Moran, #24042 James C. Boesen, #24862 Attachment No. 5

#### TRANSCANADA KEYSTONE PIPELINE, LP

#### ADVANCE RELEASE OF DAMAGE CLAIMS AND INDEMNITY AGREEMENT

#### Tract No. : <u>ML-NE-HT-30215.000</u>

I, <u>Byron Terry Steskal, a single person</u>, of <u>Holt</u> County, in the State of <u>Nebraska</u>, (hereinafter "Grantor") acknowledge receipt of:

<u>Ten Thousand One Hundred Sixty Seven Dollars and Forty Cents</u> (\$10,167.40), now paid to Grantor by TransCanada Keystone Pipeline, LP (hereinafter "Company"), in full payment and settlement, in advance, for all damages listed on the Advance Damages Computation Form attached hereto as Appendix A. In consideration of said advance payment, Grantor and Grantor's heirs, executors, administrators and assigns, do hereby release and forever discharge Company from any and all causes of action, suits, debts, claims, expenses, general damages, interest, costs and demands whatsoever, at law and in equity, against Company, which Grantor ever had, has now, or which Grantor's insurers, heirs, executors, administrators, successors or assigns hereafter can, shall or may have in the future, relating to all damage items listed on Appendix A, arising out of, in connection with, or resulting or alleged to have resulted from construction or surveying over, under or on the following lands (hereinafter collectively referred to as the "Lands"):

Situated in the County of Holt, State of Nebraska:

#### N/2 & SE/4

#### Section 29, Township 31, Range 13

Grantor understands and agrees that payment of such consideration is not deemed to be an admission of liability on the part of Company. Grantor agrees to accept said advance payment on behalf of Grantor and Grantor's tenants, if any, and to take full responsibility for compensating any and all of Grantor's tenants for any damage or loss that is owed to said tenants as a result of Company's use of any pipeline easement acquired by Company from Grantor on the Lands. Grantor will indemnify, defend, and hold Company and the Company's officers, agents, and employees harmless from any claim asserted by Grantor's tenants, tenants' successors-in-interest, or tenants' heirs for compensation, restitution, crop loss, consideration, or damage of any kind that Grantor's tenants may be lawfully entitled to as a result of Company's construction or surveying activity within any easement acquired by Company from Grantor on the Lands.

IN WITNESS WHEREOF, I have hereunto set our hands on this \_\_\_\_\_ day of

, 20		
Owner Signature	Owner Signature	
Owner/Owner Representative Name	Owner/Owner Representative Name	

Attachment No. 6





KXL002000

Attachment No. 7



Attachment No. 8

Attachment 8.1

## NEBRASKA AGRICULTURE FACT CARD

#### NEBRASKA'S TOP NATIONAL RANKINGS

- 1<sup>st</sup> Beef and veal exports, 2016 ~ \$1,126,575,000
  Commercial Red Meat Production, 2016 ~ 8,009,800,000 lbs.
  Great Northern Bean Production, 2016 ~ 746,000 cwt.
  All Cattle on feed, Jan. 1, 2017 ~ 2,470,000 head
  Popcorn production, 2012 ~ 353,711,118 lbs.
- 2<sup>nd</sup> All Cattle and Calves, Jan.1, 2017 ~ 6,450,000 head Pinto Beans Production, 2016 ~ 1,687,000 cwt.
- 3<sup>rd</sup> Corn for Grain Production, 2016 ~ 1,699,900,000 bushels Corn Exports, 2015 ~ \$987,200,000 Cash Receipts from all Livestock & Products, 2015 ~\$13,951,023,000 Light Red Kidney Beans Production, 2016 ~ 50,000 cwt.

4<sup>th</sup> All Dry Edible Beans Production, 2016 ~ 2,766,000 cwt.

5<sup>th</sup> Soybean Exports, 2015 ~ 1,395,900,000

## NEBRASKA'S AG FACTS:

Cash Receipts from farm marketing contributed over \$23 billion to Nebraska's economy in 2015.

Every Dollar in agricultural exports generates \$1.22 in economic activities such as transportation, financing, warehousing and production. Nebraska's \$6.4 billion in agricultural exports in 2015 translate into \$7.8 billion in additional economic activity.

In 2015, Nebraska ranked second in ethanol production capacity, with 25 operating plants having production capacity of more than 2 billion gallons. Approximately 31% of the state's 2015 corn crop was utilized in ethanol production. Our local ethanol plant (Atkinson NE) employs 43 full time employees; this amount times 25 = over 1000 full time employees.

1 in 4 jobs in Nebraska is related to agriculture.

## NEBRASKA'S NATURAL RESOURCES

Nebraska's farms and ranches utilize 45.2 million acres ~ 91% of the state's total land area.

Nebraska is fortunate to have aquifers below it. If poured over the surface of the state, the water in those aquifers would have a depth of 37.9 feet. The state has 96,131 registered, active irrigation wells supplying water to over 8.3 million acres of harvested cropland and pasture. Of the total cropland harvested during 2012, 44% was irrigated.

## Attachment 8.2

## TODAY

WE STAND TOGETHER IN SOLIDARITY TO PROTECT OUR LAND & WATER





The pipeline is NOT an asset on the landowner's balance sheet, it is a liability. The landowner should carry absolutely NO risk concerning pipelines or their abandonment. It is unreasonable to expect a landowner to cover these costs. ~ Unknown~

"We do not inherit Mother Earth from our ancestors. We borrow her from our children."

~Crazy Horse~

Diana L. Steskal 707 East 2<sup>nd</sup> Street Stuart Ne 68780 402-924-3186 prairierose@nntc.net

Keystone XL Pipeline Docket # OP-0003 August 2017

Hello, I am Diana Steskal. I am testifying to you to express my concerns about the proposed preferred Keystone XL pipeline route. I would like to state that I am not an expert farmer or photographer, but I have taken the following pictures in this testimony. The following is my testimony pertaining to the impact of this proposed preferred pipeline route to the natural resources of Nebraska. The impact of this pipeline route to the soils of our property and other affected property soils in Holt County. I will comment and show pictures of TransCanada's poor quality of workmanship in land reclamation and speak of the existing corridor.

We (myself, my husband -Byron Steskal along with our children Sarah (Nebraska High School Teacher) and our late son Jake have been life-long residents of Holt County in Nebraska. As owners of 480 acres (350 farmland & 130 grass/hay) in the north central part of Holt County, our property lies in the line of the proposed preferred pipeline route. Our farm which has been in the family for over 70 years lies within the Sandhills. Our land still shows the evidence from the Dust Bowl years ~ fence lines which had packed sand 2-3 ft. high, but is now grassed over. Even though you cannot visually see the rolling Sandhills on our property, the soil is still sandy and high erodible. The proposed preferred route still currently crosses the Sandhills and the Ogallala Aquifer, which lies underneath our farm. It will cross diagonally over our farm affecting 3 irrigated quarters, wet lands, and some grass lands. The pipeline will come within ½ mile of 6 water wells on our farmland and the North Branch of the Eagle Creek begins on our property. The Ogallala Aquifer is our life line to the state of Nebraska, its citizens and Nebraska's future generations.

Attachment 8.3

## Soil Survey Prairie Rose W



# Soil Survey Prairie Rose S



Attachment 8.4

## FARM IRRIGATION SYSTEMS ~ WELLS

#1). Keystone XL Project Affected Pivot Irrigation Map ~ This maps show that during the construction of this proposed preferred route, it would affect all THREE of our irrigation systems. We have 6 irrigation wells and 2 domestic wells that will be affected when this pipeline leaks because of the sandy porous soil.

This project will affected 64 irrigated quarters just in Holt County.

## CROPS PRODUCED IN HOLT COUNTY

#1). FSA Office O'Neill NE ~ Crops Planted in Holt Co. 2011 2013 2015#2). FSA Office O'Neill NE ~ Crops Planted / Harvested in Holt Co. 2016


Nebraska Department of Natural Resources Data Bank Database Through: Aug 28 2008 Processed: 8/28/2008 2:48:14 PM

#### **REGISTERED GROUNDWATER WELLS DATA RETRIEVAL**

Note:

Information on Public Water Supply Wells is not available through this interface. Contact the Department of Natural Resources (Data Bank) at 402-471-2363 for more information. For explanation on use, status and other well information, please see Legend and Notes below.

Legend and Notes

Criteria : FirstName - byron LastName - steskal

7 Stations met this criteria.

Registration# Well ID Permit Number Well Log	Use Status	County Name NRD Name Well Location Footage Latitude Longitude	Completion Date Filing Date Decommissioned Date Times Replaced	Acres Irrig Gallons/Min Static Level Pumping Level	Pump Col Dia Pump Depth Well Depth	Owner's Name and Address Owner ID
G-129728 161883 Other Info Logs View as PDF	S A	Holt Lower Niobrara 31N 13W 29 SWNE 2380S 2610W <u>Map It</u>	7/ <b>22/ 2004</b> 9/13/2004  0		1.25 in 30 ft 43 ft	Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
G-135347 167223 LN-05037 Other Info Logs View as PDF	A	Holt Lower Niobrara 31N 13W 29 SENE 1900S 20W <u>Map It</u>	<b>4/ 19/ 2005</b> 8/24/2005  0	130 acres 650 gpm 35 ft 46 ft	<b>8 in</b> 160 ft 176 ft	Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
G-136704 170698 LN-0554 Other Info Logs View as PDF	A	Holt Lower Niobrara 31N 13W 29 SENE <u>Map It</u> 42° 38' 02.80" 098° 51' 24.00"	9/ 27/ 2005 10/5/2005  0	130 acres 250 gpm 36 ft 100 ft	<b>4 in</b> 100 ft 125 ft	Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
G-106973 126966 LN-00009 Other Info Logs View as PDF	I A	Holt Lower Niobrara 31N 13W 29 NENW 650S 1340E <u>Map It</u>	8/ 9/ 2000 9/6/2000 	<b>5 acres</b> 200 gpm 26 ft 40 ft	<b>3 in</b> 47 ft 60 ft	Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
G-136155 164577 LN-04072 Other Info Logs View as PDF	I I	Holt Lower Niobrara 31N 13W 29 NWNW 1300S 1300E <u>Map It</u>	2/ 23/ 2005 9/22/2005 	130 acres 37 ft 37 ft		Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
G-136154 166278 LN-05024 Other Info Logs View as PDF	I A	Holt Lower Niobrara 31N 13W 29 NWNW 30S 1300E <u>Map It</u>	3/ 9/ 2005 9/22/2005	128 acres 2000 gpm 41 ft 80 ft	3 in 140 ft 150 ft	Byron Terry Steskal Owner ID: 56657 707 East 2nd Street Stuart, NE 68780

#### REGISTERED GROUNDWATER WELLS DATA RETRIEVAL

http://dnrdata.dnr.ne.gov/wellssql/viewsql.asp?firstname=byron&las...

164576 A LN-04071 Other Info Logs	N.	Lower Niobrara 31N 13W 29 SESE 20N 1300W <u>Map It</u>	9/22/2005	800 gpm 38 ft 117 ft	100 ft 121 ft	Owner ID: 56657 707 East 2nd Street Stuart, NE 68780
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Data copy of requested wells as Bar(]) delimited file. Data copy of Geo Logs for requested wells as Bar(]) delimited file.

Data copy of Casing Screen for requested wells as Bar() delimited file. Data copy of Grout Gravel for requested wells as Bar() delimited file. Legend and Notes

Attachment 8.5

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#### Page 1 of 1

### **Soils Inventory Report**

#### **BYRON T STESKAL**

Tra	ct	Land Unit	Map Unit Symbol	Map Unit Name	Acr	esPercent
722			3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes	2.3	9%
722			3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slope	s 6.6	26%
722			3266	O'Neill loamy sand, 0 to 2 percent slopes	16.7	65%
				Total:	25.6	100%
722	1		4499	Dunday loamy sand, 3 to 6 percent slopes	0.7	0%
722	1		3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes	10	4%
722	1		3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes	17.8	7%
722	1		3266	O'Neill loamy sand, 0 to 2 percent slopes	92.4	35%
722	1		3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slope	\$139	5 54%
				Total:	260.4	4 100%
722	2		3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes Total:	561 61	100% 100%
722	4		3270	O'Neill-Meadin fine sandy loams, 11 to 30 percent slopes	1	1%
722	4		3266	O'Neill loamy sand, 0 to 2 percent slopes	12	10%
722	4		6314	Barney silt loam, channeled, frequently flooded	3.8	30%
722	4		8425	Boel-Inavale complex, channeled, frequently flooded	4	3%
722	4		3273	O'Neill-Meadin fine sandy loams, 6 to 11 percent slopes	25.8	21%
722	4		4499	Dunday loamy sand, 3 to 6 percent slopes	26.7	21%
722	4		3271	O'Neill-Meadin fine sandy loams, 2 to 6 percent slopes	62	50%
				Total:	124.5	100%
				T		

Total:

1911

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11 1.1.04

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10

471.5 100%

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NATURAL RESOURCES CONSERVATION SERVICE ~ Neligh Nebraska #1). This report on 07/30/2013 states the amount of high erodible land and wetlands on our property 29-31-13.

#2). Soil Inventory Report and Map ~ Agency: USDA – NRCS 07/30/2013

Key Legends: 3266 ~ 3271 ~ 4499 ~ 3273 ~ 3271

- a). 3266 O'Neill ~ Loamy sand
- b). 3271 O'Neill-Meadin ~ Fine sandy loam
- c). 3273 O'Neill-Meadin ~ Fine sandy loam
- d). 4499 Dunday ~ Loamy sand

Soils Map

Customer(s): BYRON T STESKAL District: UPPER ELKHORN NRD

Legal Description: E1/2 & NW1/4 Sec. 29-31-13

Field Office: NELIGH FIELD OFFICE Agency: USDA - NRCS Assisted By: JESSE HAEN State and County: NE, ANTELOPE



#### **Determination Map**

Customer(s): BYRON T STESKAL District: UPPER ELKHORN NRD Legal Description: E1/2 & NW1/4 Sec. 29-31-13 Field Office: NELIGH FIELD OFFICE Agency: USDA - NRCS Assisted By: JESSE HAEN State and County: NE, ANTELOPE



500



- T722
- ---- Wetland\_Lines
- Wetlands
- plss\_a\_ne089



FARM 17 TRACT 722 E1/2 & NW1/4 SECTION 29-31-13 BYRON T STESKAL (OO)

0 500 1,000 1,500 2,000



Feet

#### SOIL MAPS ~ SOIL SURVEY OF HOLT COUNTY

#1). TransCanada's map of the proposed preferred route through our 3 irrigated quarters.

#2). Soil Map showing where our property is located and the types of soil on the land. We own 3 of the 4 quarters in the section ~ (NW, NE, and SE). The proposed preferred pipeline route goes diagonally all three of the quarter.

Soil Legend ~ Key #6 O'Neill-Meadin-Jansen association ~ Gently sloping to steep, excessively drained and well drained; loamy soils that are moderately deep and shallow over SAND and GRAVEL on uplands.

Located to the east of our property across the road, lies 2 decommissioned gravel pits. (Shown on TC's map exhibit #1)

#3). TransCanada's map Soil Association ~ Mile Post Markers

a). Key #3 ~ Elsmere Ipage Loup Association ~ Deep-nearly level and very gently sloping, moderately well drained to very poorly drained, <u>sandy and loamy soils</u>, on bottom lands, on stream terraces and in sandhill valleys.

b). Key #6 ~ O'Neill-Meadin-Jansen Association ~ Gently sloping to steep excessively drained and well drained loamy soils that are moderately deep and shallow over <u>sand and gravel</u> on uplands.

c). Key #8 ~ Labu-Sanarc-Valentine Association ~ Deep to shallow, moderately steep to very steep excessively drained and well drained, clayey and <u>sandy soils</u> on uplands. d). Key #9 ~ Dunday Pivot Dunn Association ~ Deep nearly level to gently sloping, somewhat excessively drained and moderately well drained <u>sandy soils</u> on tablelands and stream terraces.

e). Key #10 ~ Jansen-O'Neill Association ~ Nearly level well drained, loamy soils that are moderately deep over <u>sand and gravel</u> on tablelands.

f). Key #11 ~ Valentine-Simeon-Dunday Association ~ Deep nearly level to steep excessively drained and somewhat excessively drained; <u>sandy soils</u> on uplands and stream terraces.

g). Key #14 ~ O'Neill-Anselmo-Pivot Association ~ Nearly level to gently sloping somewhat excessively drained and well drained; loamy and <u>sandy soils</u> that are deep and moderately deep over <u>sand and</u> <u>gravel</u> on upland, foot slopes and stream terraces.

TransCanada's Soil Association ~ Mile Posts Marker Map shows that the proposed preferred route is still in the Sandhills. The soil legend map Keys:  $3 \sim 6 \sim 8 \sim 9 \sim 10 \sim 11 \sim 14 - states$  that the associations all have sand, sandy soils and/or gravel from mile post marker 625 to 675.

The Soils north of the Elkhorn River are the same sandy soil as south of the Elkhorn River.









Attachment 8.6

#### THE NEBRASKA SANDHILLS & OGALLALA AQUIFER BY STEWARDS OF THE LAND FEB.2, 2012

#1. On February 2, 2012 a group of Nebraska landowners from Holt County met with Governor Heineman to show him lab results from soil samples taken throughout the Keystone XL reroute (now the preferred route) that the DEQ and TransCanada claimed had been "moved out of the Sandhills". The landowners paid \$600 to have 11 soil samples tested by Midwest Labs of Omaha NE. A Power Point presentation by Amy Boettcher-Schaffer illustrated that soil on the north shore of the Elkhorn River deemed outside the Sandhills by an ecoregion map, was as sandy and porous as soil on the south shore of the river inside the area labeled Sandhills.

#2. Midwest Laboratories Table ~ Comparing soil samples of Byron Steskal's property 29-31-13 ~ north of the Elkhorn River ~ 62.7% of sand and Terry Frisch's property T29N-5-14 ~ south of the Elkhorn River ~ 62% sand. Sand is a porous soil, thus putting the Ogallala Aquifer at more risk in these areas.

#3. Soil Map of Nebraska ~ "snrs.unl.edu" ~ This map states that Region 17 (north of the Elkhorn River) shows soil in all three associations of Jansen; O'Neill; and Meadin are sand and gravel. In Region 12 (north of the Elkhorn River) shows soil in all three associations of Valentine; Elsmere; and Tryon are sandy soils.

#4. Affidavit from Amy Boettcher-Schaffer

#5. Power Point ~ The Nebraska Sandhills & Ogallala Aquifer



Here are the results of eleven samples that we have gathered, some being in the area declared as being in the "Sandhills" by the NDEQ and others that are not. The blue bar graph ranks the samples from the highest to lowest percent sand. As you can see, the third highest percentile of sand is that at the proposed entry point of the Keystone XL pipeline. You can also see that sample F which has been declared as being in the Sandhills by the NDEQ has a much lower percentile of sand. Looking at the green bar graph samples J, H, F, and I are from the areas which have been declared as the "Sandhills." Samples E, A, L, G, B, and C are from areas that the NDEQ declared as not being in the Sandhills. As you can see, the soil samples from area that have not been declared as being in the Sandhills, have just as high and in some cases a higher percentile of sand than the soil from the region that the NDEQ declared as the Sandhills. Again, sand is a porous soil, thus putting the Ogallala Aquifer at more risk in these areas. This is specifically the case at the entry point of the proposed Keystone XL pipeline and 1 mile south of the entry point where the percentile of sand is just as high as areas that the NDEQ declared as the "Sandhills."



Now, let's move on and talk about the third characteristic, soil. This map is showing soil regions, portions of Holt County have been deemed as being in the "Sandhills" by the NDEQ and others have not.

#### Region 12 shows:

Valentine: Deep, nearly level to moderately steep, excessively drained, sandy soils formed in eolian sand on uplands in sandhills; Typic Ustipsamments. Elsmere: Deep, nearly level, somewhat poorly drained, sandy soils formed in alluvium and eolian sand in valleys in sandhills; Aquic Haplustolls, sandy.

Tryon: Deep, nearly level, poorly drained, sandy soils formed in alluvium and eolian sand in valleys in sandhills; Typic Psammaquents.

#### Region 21 shows:

**Elsmere:** Deep, nearly level, somewhat poorly drained, sandy soils formed in alluvium and eolian sand in valleys in sandhills; Aquic Haplustolls, sandy. **Ipage:** Deep, nearly level and very gently sloping, moderately well-drained, sandy soils formed in eolian sand and alluvium in valleys in sandhills; Aquic Ustipsamments. **Loup:** Deep, nearly level, poorly drained, sandy soils formed in alluvium and eolian sand in valleys in sandhills; Typic Haplaquolls, sandy

#### **Regions 17 shows:**

Jansen: Moderately deep over sand and gravel, nearly level to moderately steep, well-drained, loamy soils formed in loamy sediments over sand and gravel on uplands; Typic Argiustolls, fine-loamy over sandy or sandy-skeletal. O'Neill: Moderately deep over sand and gravel, nearly level to moderately steep, well-drained, loamy soils formed in loamy sediments over sand and gravel on uplands; Typic Haplustolls, coarse-loamy over sandy or sandy-skeletal. Meadin: Shallow over sand and gravel, nearly level to moderately steep, excessively drained, sandy soils formed in sandy sediments over sand and gravel on uplands; Entic Haplustolls, sandy.

#### Region 27 shows:

**Thurman:** Deep, nearly level to moderately steep, somewhat excessively drained, sandy soils formed in eolian sand; Udorthentic Haplustolls, sandy **Boelus:** Deep, nearly level to strongly sloping, well-drained, sandy over loamy soils formed in eolian sand over loess on uplands; Udic Haplustolls, sandy over loamy

#### DEFINING THE SANDHILLS

#1. NDEQ Dec. 29, 2011 ~ TransCanada PSC Application 2017 ~ This map depicts the Sandhills stopping abruptly on the southern shore of the Elkhorn River. The region north of the Elkhorn River is classified as Holt Tablelands.

#2. Holt Tablelands, north of the Elkhorn River was split off from the Sandhills because it looks different; it is flat as opposed to rolling and vegetation is different. Crops are grown there. By contrast ~ the Sandhills are the largest area of grass-covered sand dunes in the world and are not suitable for crops. But the Holt Tablelands have been changed by man – "farmers". Fifty to 60 years ago you would not have seen farming there. Farmers have developed it into cropland because of irrigation. The soil is just as porous and gravelly as the Sandhills so water goes through it just as fast. USGS maps confirms beneath the surface of the land, what is not visible to the eye, is that the Ogallala Aquifer underlies both the Sandhills and Holt Tablelands. The soil permeability on both sides of the Elkhorn River is identical ~ water flows through it rapidly.

#3. USGS Map of Soil Permeability ~ High Plains Aquifer – This Table shows that most Holt County lies within the fastest "inch per hour" permeability ~ 10 inches per hour.

#4. The following three maps show different boundaries for the Sandhills region.

a). USGS Ground Water Quality of the Northern High Plains Aquifer ~ shows the Sandhill area extends half way between the Elkhorn River north to the Niobrara River. b). SEIS 2011 ~Figure 3.3.1-3 ~Key Aquifers & Portable Water Wells ~Keystone XL Project ~ This map show the Sandhills area extends half way between the Elkhorn River north to the Niobrara River.

c). FEIS Figure 3.3.2-4 ~Source: Nebraska Dept. of Natural Resources 2012a. Esri 2013 ~ This map show the Sandhills area extends all the way north from the Elkhorn River to the Niobrara River.

#5). DEQ Map and Article ~ Your Environment by Region: 2011 2012 In the 2011 the article, the first sentence states that the <u>Sandhills</u> region is located in the central and north-central Nebraska, is comprised of nearly 20,000 square miles of wind-deposited sand dunes, the largest sand dune formation in the U.S. In 2012 the same article, the first sentence states the North-Central region is comprised of 20,000 square miles of wind-deposited sand dunes, the largest sand dune formation in the U.S. Within one year, magically the <u>Sandhills</u> region has disappeared. The article states that below this 18 county region (including Holt Co.) lie hundreds of feet of gravel and coarse sand, forming one of the largest aquifers in North America. Many of the approximately 2000 square miles of wetlands in this region are formed where the ground's surface dips below the top of the groundwater aquifer.

No matter which map is used ~ Keystone XL propose preferred route is still over the Ogallala Aquifer and in the Sandhills.

**Resources: Holt Tablelands** 

Prairie Fire ~ "The Progressive Voice of the Great Plains" 07/30/13 and quote from Bruce Boettcher Nebrask DEQ ~ Your Environment Region 2011 and 2012

### NDEQ Dec. 29, 2011 TC PSC APPLICATION





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# NORTHWESTERN GLACIATED PLAINS 42.

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## NORTHWESTERN GREAT PLAINS 43.

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Figure 5. Permeability of soils overlying the northern High Plains aquifer.

past the soil horizon to ground water. Application of irrigation water in excess of crop needs further promotes transport of these agricultural chemicals to ground water. Nutrients, particularly nitrogen in the form of commercial fertilizers or manure, are applied to crops to increase yields. The application rates of total nitrogen, by hydrogeologic unit, are shown in table 3 (David Lorenz, U.S. Geological Survey, written commun., 1998). Percentage of cropland, percentage of irrigated cropland, and nitrogen application rates by county are shown in figure 7. Percent cropland, irrigated cropland, and nitrogen application rates are highest over the EAST and

PLAT units. Pesticides are primarily used in the study area to increase crop yields by controlling insects and competing vegetation. Pesticides also are used in smaller quantities around homes and livestock and along roads to control a wide variety of pests. The 10 most commonly applied pesticides in the northern High Plains are generally herbicides used on crops (table 3). Although the estimated application rates do not necessarily represent conditions during the time that water composing the ground-water samples was recharged, they do provide a general idea of the types and relative amounts of pesticides that are applied.

#### Ground-Water Quality of the Northern High Plains Aquifer, 1997, 2002-04



Figure 3. Location of major hydrogeologic units and trace of generalized geologic section A-A' (modified from Gutentag and others, 1984).

and others, 1996). These deposits contain weathering products derived from granite or anorthosite from the Laramic Range in Wyoming as well as some quartzite from the Medicine Bow Mountains (Richmond and others, 1994). Later, glacial processes during the Pleistocene period (0.01 to 2 million years ago) continued to fill valleys with coarse sand and gravel originating from the north (Gosselin and others, 1996). The EAST unit overlies either the OGAL where it is present or Cretaceous-age bedrock. It underlies unsaturated glacial till (a glacially deposited mixture of clay, sand, gravel, and

stones of variable sizes) and loess (wind-deposited silt or clay, typically deposited during glacial periods). The glacial till contains iron sulfide and other minerals that can be sources of iron, manganese, sulfate, and calcium (Engberg and Spalding, 1978). Glacial till and loess can be relatively impermeable. The sand and gravel deposits in paleovalleys provide the primary source of water for high-capacity wells. However, many low-capacity domestic and stock wells obtain water from lenses of perched or semiperched ground water (Gosselin and others, 1996).

6





Sources Nebraska Department of Natural Resources 2012a, Esri 2013

Figure 3.3.2-4

#### Nebraska Water Wells Within 1 Mile of Proposed Pipeline Route

Attachment 8.7

#### Your Environment By Region: Sandhills A Brief Overview of the Sandhills Region (North-Central Nebraska)

The Sandhills region, located in central and north-central Nebraska, is comprised of nearly 20,000 square miles of wind-deposited sand dunes, the largest sand dune formation in the U.S. Below the grass-stabilized sandy surface of this 18 county region lie hundreds of feet of gravel and coarse sand, forming one of the largest aquifers in North America. Many of the approximately 2000 square miles (1.3 million acres) of wetlands in this region are formed where the ground's surface dips below the top of the groundwater aquifer.

This region's abundant grasslands and water make it ideal for ranching and wildlife. Land use is primarily rangeland, with cropland/pasture on the plains and dissected plains of the eastern portion of the region. The predominant land use in the Sandhills region is cottle graving on large



in the Sandhills region is cattle grazing on large ranches. In one recent year, 535,000 beef cows grazed the grasslands of this productive environment.

Much of the Sandhills region is sparsely populated. Cities in this region include O'Neill (pop. 3733), Valentine (2820), Ainsworth (1862), Gordon (1756), and Burwell (1130). Rivers originating in or flowing through the Sandhills region include the Niobrara, Snake, South Loup, North Loup, Middle Loup, Loup, Dismal, Calamus, Elkhorn, and Cedar. Ninety percent of annual stream flow in Sandhills rivers originates from spring-fed groundwater.

Although the Sandhills region is known for high quality water, surface water and groundwater contamination from agricultural chemicals and livestock operations in portions of the region present major challenges in the state's environmental protection efforts. A heavily irrigated area in the eastern portion of the Sandhills region contained significant nitrate contamination of groundwater, and portions of some of the region's rivers are impaired due to recal coliform bacteria. NDEQ's Groundwater Management Area program works cooperatively with the state's Natural Resources Districts to address nitrate contamination issues. Fecal coliform bacteria originating from human and livestock sources (wastewater treatment facilities and animal leeding operations) are regure through the National Pollutant Discharge Elimination System (NPDES) program.

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http://www.deq.state.ne.us/YourEnvi.nsf/Pages/SandhillsOver

12/10/2011

#### Your Environment By Region: North-Central A Brief Overview

The North-Cental region, is comprised of nearly 20,000 square miles of wind-deposited sand dunes, the largest sand dune formation in the U.S. Below the grass-stabilized sandy surface of this 18 county region lie hundreds of feet of gravel and coarse sand, forming one of the largest aquifers in North America. Many of the approximately 2000 square miles (1.3 million acres) of wetlands in this region are formed where the ground's surface dips below the top of the groundwater aquifer.

This region's abundant grasslands and water make it ideal for ranching and wildlife. Land use is primarily rangeland, with cropland/pasture on the plains and dissected plains of the eastern portion of the region. The predominant land use in the region is cattle



grazing on large ranches. In one recent year, 535,000 beef cows grazed the grasslands of this productive environment.

Much of the region is sparsely populated. Cities in this region include O'Neill (pop. 3733), Valentine (2820), Ainsworth (1862), Gordon (1756), and Burwell (1130). Rivers originating in or flowing through the Sandhills region include the Niobrara, Snake, South Loup, North Loup, Middle Loup, Loup, Dismal, Calamus, Elkhorn, and Cedar. Ninety percent of annual stream flow in Sandhills rivers originates from spring-fed groundwater.

Although the region is known for high quality water, surface water and groundwater contamination from agricultural chemicals and livestock operations in portions of the region present major challenges in the state's environmental protection efforts. A heavily irrigated area in the eastern portion of the region contains significant nitrate contamination of groundwater, and portions of some of the region's rivers are impaired due to fecal coliform bacteria. NDEQ's Groundwater Management Area program works cooperatively with the state's Natural Resources Districts to address nitrate contamination issues. Fecal coliform bacteria originating from human and livestock sources (wastewater treatment facilities and animal feeding operations) are regulated through the National Pollutant Discharge Elimination System (NPDES) program.

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Yo. \_nvironment Main Page

Page ,f1

## Your Environment

This portion of NDEQ's web site is designed to provide the public with information about the environment across the state, as well as to more specific information about the region you live in. You can click on any section of the map below to find more specifics about that region. Or, select any of the "Focus on..." topics at left below, to find out more information about Nebraska's air quality, water quality and waste management issues.



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Nebraska Department of Environmental Quality 1200 "N" Street, Suite 400 P.O. Box 98922 Lincoln, Nebraska 68509 (402) 471-2186 Attachment 8.8

#### FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

#1. Chapter 3 Figure 3.1.2-1 ~ Surface Geology of Proposed RouteThis map shows that the proposed preferred route is passes over theOgallala Formation

#2. Chapter 3 Table 3.1-3 Physiographic Characteristics of Ecoregions in Nebraska crossed by pipeline route; 619-698 state Surface Geology is Eolian and alluvial sand and silt; Sandy residuum; and Eolian sand, alluvial sand and gravel, and lacustrine sand and silt.

#3. Chapter 3. 2-5 Nebraska ~ These statements are made:

a). Keya Paha, Boyd, and Holt counties lie within the Dakota-Nebraska Eroded Tableland Resources Area. These soils are generally sandy, very deep and excessively drained to somewhat poorly drained.

b). In northern Nebraska, the proposed Project route from approximately MP 619 to MP 707 in Boyd, Holt, and Antelope counties would enter an area where the soils tend to be highly susceptible to erosion by wind and often exhibit characteristics of the NDEQ-identified Sandhills Region. These soils consists of eolian fine sands, loamy fine sands, or sandy alluvium and are generally deep, well-to-excessively drained, and nearly level to moderately steep on uplands and streams terraces.

c). Where the vegetation cover has been disturbed or removed without restoration, severe wind erosion associated with the prevailing winds may create steep-sided, irregular, or conical depressions referred to as "BLOW OUTS". Two blowouts identified in the vicinity of the proposed preferred project route include a blowout in Keya Paha Co., located

approximately 6.5 miles south the MP 611, and a blowout in Holt Co., located approximately 1.6 miles southwest of MP 634.

d). The proposed preferred route would cross approximately 48 miles of highly wind erodible soils in Nebraska (see Table 3.2-1). In Nebraska, prime farmland soils occupy approximately 64 percent of the pipeline route.

#3. Chapter 3 Figure 3.2-4 Miles of Soils Types Crossed

#4. Chapter 3 Figure 3.2.2-2 ~ Highly Wind Erodible Soils

#5. Final Evaluation Report ~ Nebraska's Keystone XL Pipeline Jan.2013 Appendix E.2

a). Figure E.2-1 ~ Soil Association along the Proposed Preferred Nebraska Reroute ~ This map also states that the soils in the route through Holt County: "Soils are Sandy Loamy soil formed from Eolian Sand.

b). Table E.2-4. Holt County Soil Characteristics ~ This table states that in all three Associations (O'Neill, Meadin, and Jansen) that the sandy and loamy soils are over sand and gravel and all being well-drained to excessively well-drained.



Source USGS 2007

Figure 3.1.2-1 Surface Geology of Proposed Project Route
between MP 820 to MP 847) contain varying amounts of limestone that potentially contain karst formations, causing surface subsidence. However, it is unlikely that karst features would be encountered. The Dakota Group (approximately 35 miles crossed between MP 823 to MP 875) consists of sandstone and shale.

Table 3.1-3	Physiographic Characteristics of Ecoregions Crossed in Nebraska by the
	Proposed Project Route

MP Range	Physiographic Description	Elevation Range (ft amsl)"	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwest	ern Glaciated Plains—South	hern River I	Breaks <sup>b</sup>		
601- 619	Unglaciated dissected hills and canyons; Topography contains slopes of high relief bordering major rivers and alluvial plains	1,250- 2,000	250-700	Cretaceous shale	Pierre Shale
Northweste	ern Great Plains-Keya Pal	a Tableland	ls <sup>b</sup>		200
619- 625	Unglaciated, level to rolling sandy plains; Topography is dissected near streams; contains isolated gravelly buttes	1,900– 2,400	20-400	Eolian and alluvial sand and silt	Ogallala Sandstone
Northweste	ern Great Plains-Niobrara	River Break	ksb		
625–627	Unglaciated, dissected canyons; Contains slopes of high relief adjacent to river	1,700– 2,700	200 600	Sandy residuum	Miocene soft sandstone over Pierre Shale
Northweste	ern Glaciated Plains, Holt T	ablelands <sup>b</sup>			
627698	Unglaciated; Tablelands with directed slopes	1,500- 2,000	50- 475	Eolian sand, alluvial sand and gravel, and lacustrine sand and silt	Ogallala Sandstone.
Western Co	orn Belt Plains, Transitional	Sandy Plain	n <sup>b</sup>	productifie suid and site	:
698-715	Level to rolling plains	1,400- 2,000	5- 150	Alluvial sand, gravel and lacustrine silt and sediments	Ogallala Sandstone
Western Co	orn Belt Plains, Northeastern	n Nebraska	Loess Hills <sup>b</sup>	1	
715- 734	Glaciated; Rolling low hills. Perennial streams	1,100- 1,900	100- 300	Calcareous loess	Ogallala Sandstone
Central Gre	eat Plains—Central Nebras	ca Loess Plai	ins <sup>b</sup>		
734- 762	Kolling dissected plains with deep layer of loess; Contains perennial and intermittent streams	1,600- 3,100	50-275	Calcareous loess, alluvial sand, gravel, and lacustrine sand and silt	Ogallala Sandstone
Central Gre	at Plains-Platte River Val	ley <sup>b</sup>			
762 778	Flat, wide alluvial valley; Contains shallow, interlacing streams on a sandy bed	1,300– 2,900	2–75	Alluvial, sand, silt, clay, and gravel deposits	Quaternary and Tertiary unconsolidated sand and gravel

### 3.2.2.2 South Dakota

The proposed Project route in South Dakota would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). In northwestern South Dakota, soils are shallow to very deep, well-drained, and loamy or clayey. To the southeast through Meade County, soils are shallow to very deep, somewhat excessively drained to moderately welldrained, and loamy or clayey. In southern South Dakota, from Hakkon County to Tripp County, areas of smectitic clays are present that have shrink-swell potential and may cause significant problems for roads and structural foundations. From central Tripp County to the state line, these clayey soils contain thick, dark, organically enriched layers of topsoil. Beginning at approximately MP 572, transitional eolian sandy soils are present that generally consist of eolian sands, sandy alluvium, and lesser amounts of loess and glacial outwash. In southern Tripp County to the state line, soils grade into deep, sandy deposits that are similar in characteristics to the NDEQ-identified Sand Hills Region soils in Nebraska. Figure 3.2.2-1 shows the NDEQidentified Sand Hills Region in Nebraska. In South Dakota, prime farmland soils occupy approximately 35 percent of the proposed pipeline route.

### 3.2.2.3 Nebraska

The proposed Project route in northern Nebraska would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region is characterized by a nearly level to gently rolling fluvial plain. Keya Paha, Boyd, and Holt counties lie within the Dakota-Nebraska Eroded Tableland Resource Area. These soils are generally sandy, very deep, and excessively drained to somewhat poorly drained. Also, within Holt and Boyd counties in the Tableland Resource Area, there are soils types that are silty or sandy loam soils.

In Antelope and Boone counties, the proposed Project route would encompass the Central Feed Grains and Livestock Land Resource Region. This area is further classified as the Loess Uplands Resource Area, with soils consisting of deep loess deposits that are susceptible to erosion if unvegetated. In the northern section of Antelope County, the soils are sandy loams which are frequently layered with very fine-grained ash layers that are susceptible to erosion by rain and wind. In Nance and Merrick counties, the proposed Project route would cross the Central Nebraska Loess Hills and the Central Loess Plains Resource Areas (Central Great Plains Winter Wheat and Range Land Resource Region). These areas feature soils consisting of deep loess with some organic enrichment.

South of the Platte River, the proposed Project route would cross flat to rolling loess-covered plains of the Rainwater Basin Plains, one of the largest concentrations of natural wetlands found in Nebraska. Many of the wetlands were drained for cultivation, with much of the area pivot irrigated to help provide a fertile area for crops. The soils are largely silty loams with fine sands in both flooded and rarely flooded areas. Glacial till is scattered throughout the area south of the Platte River and is encountered along the southern section of the proposed pipeline route.

In northern Nebraska, the proposed Project route from approximately MP 619 to MP 707 in Boyd, Holt, and Antelope counties would enter an area where the soils tend to be highly susceptible to erosion by wind and often exhibit characteristics of the NDEQ-identified Sand Hills Region (i.e., fragile soils [see Figure 3.2.2-2]).

These soils consist of eolian fine sands, loamy fine sands, or sandy alluvium and are generally deep, well-to-excessively drained, and nearly level to moderately steep on uplands and streams

Table 3.2-1	Approxima	te Miles" of S	INITS US LAGIN	LIVITA ILA INI		A CONTRACTOR OF A CONTRACTOR OFTA CONTRACTOR O	rroposed	Project Rou	te
state	Total Miles Affected <sup>b</sup>	Highly Erodible (Wind)	Highly Erodible (Water)	Prime Farmland	Hvdric	Compaction- Prone	Stony/ Rocky	Shallow Boduod:	Drought-
Montana	285.4	6.1	208.1	63.1	6.0	63.1	11.2	A 8	prone
south Dakota	316.3	18.3	162.3	109.9	1.2	150.0	66	0.1	
Vebraska	274.0	48.1	178.0	175.8	47.1	1691	40.5	0.2	1.10
Cansas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	41.0
North Dakota	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0
otal	875	72.5	548.4	348.8	54.3	382.5	53.9	53	120.4
iate	Total Acres Affected	Highly Erodible (Wind)	Highly Erodible (Water)	Prime Farmland	Nudnin	Compaction-	Stony/	Shallow	Drought-
onstruction		()	( 11 acce )	L'ai manu	Hunter	rrone	KOCKY	Bedrock	prone
Aontana	5,462.4	69.1	4,067.5	1.359.9	14.5	1 245 3	306.7	713	260.0
outh Dakota	5,777.8	312.0	2,962.0	2.179.2	24.1	7 735 7	2.000	0.17	0.600
Vebraska	3,984.7	673.4	3,523.0	2,572.0	687.9	2 474 6	578.6	3.2	C./C1.1
ansas	15.2	0.0	1.0	14.0	0.0	152	2.0	6.0	1.000
vorth Dakota	56.1	0.0	56.1	44.9	0.0	0.0	0.0	0.0	00
otal	15,296.2	1,054.4	10,609.5	6,169.6	726.5	6,470.7	914.7	83.7	2.117.0
peration	1 924 0	1 30	20101						
Auth Dabata	1 000 0	4.07	C.74C.1	411.0	3.8	411.3	118.7	29.1	138.9
Jehrsels	1,710.0	2.111	1,016.7	696.9	7.5	934.4	13.1	1.5	422.6
ancac	1,10.9	C.162	1,239.7	1,108.7	297.4	1,063.9	258.6	1.5	271.1
Inth Dabata	2.01	0.0	1.0	14.0	0.0	15.2	2.0	6.0	0.0
otal	E 640 1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rounded to neare	et touth of an acre	1.024	9,999.9	2,236.6	308.7	2,424.8	392.4	38.1	832.6

3.2-4



Source Esn 2013, USDA 2007

Figure 3.2.2-2 Highly V

Highly Wind Erodible Soils





Takel Alter a Sta





#### helt Louis

Soils in most of Holt County are generally very deep and excessively drained to somewhat poorly drained sandy soils. The predominant soil type in Holt County along the proposed Nebraska Reroute is the O'Neill-Meadin-Jansen Association (see Table E.2-4).

Table E.2-4. Holt County Soil Characteristics

O'Neill	Loamy soils	Loamy sediments over sand and gravel	Well-drained	0 to 30 percent
Meadin	Sandy soils	Sandy sediments over sand and gravel on uplands	Excessively well- drained	0 to 35 percent
Jansen	Loamy soils	Loamy sediments over sand and gravel on uplands	Well-drained	0 to 30 percent

Source: NRCS, 2012b

#### STARS (par ) SCOTT

Soils in Antelope County are characterized by well-drained sandy or silty soils in the north and west grading to deep loess deposits to the south and east. The main soil types along the proposed Nebraska Reroute in Antelope County are the Nora-Moody-Crofton and the Valentine-Thurman-Nora-Boelus Associations (see Table E.2-5).

Table E.2-5. Antelope County Soil Characteristics

Nora	Silty soils	Loess on uplands	Well-drained	0 to 30 percent
Moody	Silty soils	Loess on uplands	Well-drained	0 to 17 percent
Crofton	Silty soils	Calcareous loess on uplands	Well-drained	1 to 60 percent
Valentine	Sandy soils	Formed in colian sand	Excessively drained	0 to 80 percent
Thurman	Sandy soils	Formed in colian sand	Somewhat excessively drained	0 to 40 percent
Boelus	Sandy over loamy soils	Eolian sand over loess on uplands	Well-drained	0 to 11 percent

Source: NRCS, 2012b

Although the proposed Nebraska Reroute would be located outside the Sand Hills in Antelope County, the Reroute corridor has areas of fragile, sandy soils with surface features very similar to those of the Sand Hills (such as the Valentine Association; see Figure E.2-1). Valentine soils consist mainly of eolian, well-sorted sands, and sandy alluvium, with a smaller amount of loess.



Attachment 8.9

### PROPERTY OF LONNIE & SANDRA BREINER

Section 15 ~ Township 32 ~ Range 15

#1). Soil Associations ~ TransCanada's Mile Post Markers ~ 625-676 ~
This map show that the proposed preferred pipeline route goes
through theses Soil Legends Associations of 1, 8, and 11.

a). Key #1 ~ Elsmere-Valentine-Ipage ~ Deep nearly level to strongly excessively drained, moderately drained, and somewhat poorly drained <u>sandy soils</u> on uplands and in <u>sandhills valleys</u>.

b). Key #8 ~ Labu-Samarc-Valentine ~ Deep to shallow, moderately steep to very steep excessively drained and well drained clayey and <u>sandy soils</u> in uplands.

c). Key #11 ~ Valentine-Simeon-Dunday ~ Deep nearly level to steep excessively drained and somewhat excessively drained <u>sandy soils</u> on uplands and stream terraces.

All three of these Associations have sandy soils

#2). Pictures of the Lonnie/Sandra Briener Property 2015. (Photos 1-5) Photos #1/#2 are pictures of a sand blow out taken by the Guard Rail Pond on 472 Ave in Holt County; Photos #3-#5 are pictures of the sand dunes and blow outs on 472 Ave in Holt County. This property is within 1 ½ mile of the proposed preferred pipeline route.

#3). Pictures taken of the Lonnie/Sandra Briener Property on 03/19/17 (Photos #1-#14) Photos #1-#6 are pictures of a sandy blow out; "Blow outs" are sandy areas where rapid wind erosion laterally "blow out" a hole in the surface of the landscape. Photos #7-#8 are pictures of the sandy soil with yucca/soapweed plants; Photos #9-#10 are pictures of the sandy soil and blow outs in the surrounding Sandhills area; Photos #11-#13 are pictures of natural springs that are located on the same property as the blow outs. These springs do NOT freeze over during the winter; Photo #14 is a picture of a "Bull Hole" where cattle (Mostly bulls) will find an area, pawing at the ground to throw sand on their belly and back. This property is within one mile of the proposed preferred pipeline route.

#4). Pictures of the Sandy Creek on the 472 Ave in Holt County. 2015
(Photos #1-16) Photos #1-#8 are pictures of the Sandy Creek's sandy river bed taken on 472 Ave in Holt County; Photos #9-#15 are pictures of sandy soils of the river bed taken from the Sandy Creek Bridge located by the Salsness Ranch at the intersection of 472 Ave and 887 Rd in Holt County; This part of the Sandy Creek is south of the Briener property within 3 miles of the proposed preferred pipeline route.

#5). Pictures of sandy soils in Holt County in 2015 (Photos #1-#6) Photos #1-#2 are pictures are of sand dunes on 469<sup>th</sup> Ave north of Stuart NE; This property is within 3 miles of the proposed preferred pipeline route; Photos #3-#6 are pictures of the Bear Creek's river bed consisting of sandy soil, located north of Stuart NE on 890 Road. This property is within 4 miles of the proposed preferred pipeline route, located to the southwest.

#6). Affidavit of Sandra Breiner

Slowl Blowl 11 Jacob A. T. Matsure

2015

-1

Taken by Guard Rail Pond ~ 472 AVE Proposed Repetive crosses within 1/2 miles



2. 1. 472 Ave ~ Sand Dunes & Blow Outs Proposed Depetine Crosses Within 11/2 miles 

12 412 Ave - Sand Runss & Blow Out Proposed Pipeline will cross within 11/2 miles of this picture

2015 1 Sandy Creek ~ Rules Bed ~ 472 Ave p12 Proposed Pipeline runs within 3-4 miles

2015 13 1000 Sandy Creek ~ #4



Sandy Creek ~ 472 Ave north of Stuart & Attinson ME



2015

#7



Sandy Creek ~ 472 Ave



2015 #19 Jandy Creek Salsness Ranch ~ 887 Rdr Looking north Bludger 110 Sandy Creek - 887 Gd ~ Bridge looking sauth





Looking north

#11





Sandy Cuerk



411/2

Sandra Breiner 47224 889<sup>th</sup> RD Stuart NE 68780

To Whom It May Concern,

I, Sandra Breiner met with Diana Steskal on Sunday, March 19<sup>th</sup>, 2017 at our resident of 47224 899<sup>th</sup> RD, Stuart NE 68780. I took her on a tour of our property, which lies in the proposed preferred route of the Keystone XL pipeline route. Diana took photos of the blow outs and the sandy soil on the property, we visited about the concerns of land reclamation.

Dated this the 20 day March 2017

Bremes Signature of Affiant

Sworn to subscribed before me, this 20th day 11 and 2017

GENERAL NOTARY - State of Nebraska MICHELLE L. STOHLMANN My Comm. Exp. Feb. 8, 2019

Blow outs are a big problem when ranching in the sandhills. When the ground cover is disturbed, wind keeps making the blow out worse and it takes a lifetime of work to get it healed up again, if you ever do.

Sander Bremer

Breiner Ranch

Attachment 8.10

# LAND RECLAMATION OF KEYSTONE I

## GALEN HECKENLIABLE

## FREEMAN SD

### LAND RECLAMATION OF TRANSCANADA'S KEYSTONE I

### TARSANDS OIL SPILL BY FREEMAN SD

We, Byron Steskal and myself met with Galen Heckenliable on March 28, 2017 at his home ~ 28615 437<sup>th</sup> Ave. On April 2<sup>nd</sup> 2016, a leak from the TransCanada's Keystone I was discovered and reported. This spill affected land on both sides of 437<sup>th</sup> Ave, to the west is Galen's property and to the east is his neighbors. This leak was not discovered by TransCanada but by a county resident who saw that the snow on the affected property was of a black color. We visited with Galen about his concerns of the actions taken by TransCanada's official personal, construction workers, and the reclamation of his land after cleanup completion. Galen gave me (Diana) permission to take pictures of his property as he was very unhappy with the way he was treated and the outcome of his land reclamation.

On the very first day of the spill, TransCanada's workers would not let Galen enter his property when he was returning home from work; Galen had BIG concerns when he saw the construction workers wearing hazmat suits with breathing apparatuses; Galen was not allow close to the spill site; Galen's drive-way was tore up, TC tried to fix it but Galen still had a hard time getting in and out of his drive-way; and TransCanada used more than the 50ft easement area that was stated in the original contract ~ Galen was told that TC could go anywhere during the spill/cleanup process.

As you will see in the following pictures #1-#18, TransCanada's statement about land reclamation ~ "How they will leave the land in better shape than they found it." Once again has fell short ~ FAILED!!

#1). Photos #1-#18 of Galen Heckenliable's property

a). Photos #1-#4 ~ are pictures of the Galen Heckenliable property at 28615 437<sup>th</sup> Ave.

b). Photos #5-#6 ~ are pictures of the TransCanada's Keystone Pipeline Sign

c). Photos #7-#8 ~ are pictures of the standing water that Galen referred to as his "fishing pond"

d). Photos #9-#14 ~ are pictures of the sparse land reclamation which many bare spots of soil showing on the easement area.

e). Photos #15-#16 ~ are pictures of the mesh used in land reclamation floating in the standing water pond.

f). Photo #17 ~ is a picture taken while standing on 437<sup>th</sup> Ave, looking to the east; the affected property is across the road from Galen's.

g). Photo #18 ~ this picture was taken while standing at the corner of Galen's property; close to HWY 18; looking to the west.

#2. Galen Heckenliable's Affidavit











#6



#9



#10





#13

相时













11/



### Attachment 8.11
# LAND RECLAMATION OF KEYSTONE I

# MIKE AND SUE SIBSON HOWARD SD

2009 -- 2016

#### "KEYSTONE PIPELINE ACROSS THE PRAIRIE" By ALLISON RUSSELL

The "Keystone Pipeline Across the Prairie" video shows the beginning start of construction and the questionable completion of the land reclamation of the Keystone I on the Mike and Sue Sibson's property.

The following pictures are taken from the video:

a). The first three pictures show the combine stuck in the easement area during the Fall Harvest 2010.

b). The next five pictures shows that construction in 2009 continued during the wet rainy weather, causing irreparable damage.

















#### Attachment 8.12

# LAND RECLAMATION of the Bison Pipeline

TRANSCANADA'S BISON PIPELINE T Pictures: Bob Zellar - Billing Gazette Wontana 04/12/2011 Lincola Star Journal A cattleguard damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011



Blowing and blown soil on Robert Rusley's property on the Bison high pressure gas pipeline right of way in southeast Montana. 10/27/2010



sunk in spring on Robert Rusley's property in southeast Montana 04/12/2011 A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline



One sign has fallen while another leans in the soft soil on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011



Janelle Reiger walks on a concrete creek crossing damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011



Janelle Reiger stand in a trench left after the soil over the Bison pipeline sunk this spring on Wade Klauzer's property in southeast Montana 04/12/2011



Wade Kllauzer stands by a trench left after the soil over the Bison pipeline sunk this spring on his property in southeast Montana 04/12/2011



A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline sunk this spring on Robert Rusley's property in southeast Montana 04/12/2011



Water erosion on Wade Klauzer's property on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011



Janelle Reiger walks by a trench left after the soil over the Bison pipeline sunk this spring in southeast Montana 04/12/2011



Attachment 8.13

# SIZE AND THICKNESS OF THE PIPE





#### Attachment 8.14

Deana Meskal

What all landowners and county officials should know before construction of the



# KEYSTONE XL Tar Sands Pipeline:

# Lessons and Recommendations to Improve Safety



# Working together to protect landowners and their property

Rural landowners from Montana to Texas are facing the construction of TransCanada's Keystone XL tar sands pipeline. This 36-inch pipeline will run from the tar sands of Alberta to the Gulf Coast and will pump up to 900,000 barrels of oil per day. TransCanada presented initial right-of-way proposals to landowners, but failed to address many of the landowners' concerns, including safety, liability, and environmental restoration. A significant proportion of people living in the areas of Montana and South Dakota to be crossed by Keystone XL rely on groundwater for domestic and agricultural uses. Preventing groundwater contamination from a pipeline failure is a particularly high priority to landowners.

To address these concerns a group of landowners living in the path of Keystone XL formed the Northern Plains Pipeline Landowners Group of Montana (NPPLG). In doing so, they determined that the best way to protect their safety, rights, land, water, and livelihoods was to come together, share information, and develop a joint agreement with TransCanada regarding the use of their land for the pipeline. NPPLG is a democratically organized group with an elected representative committee. It holds membership meetings and uses a collaborative team approach so all members have a say about their situation. Groups similar in mission and structure to NPPLG have formed in South Dakota to address landowner concerns for Keystone XL and Keystone 1, a tar sands pipeline in the Midwest which was just constructed and will be online in 2010.

In October 2009, landowners along the Keystone XL route in Montana and South Dakota attended the Montana Dakota Pipeline Safety Landowner Exchange Project in Valley City, North Dakota, one of the communities along the Keystone 1 Pipeline route. Keystone 1 crosses North Dakota from north to south eventually ending at a refinery in Illinois. The purpose of the exchange project was to educate a landowner delegation whose members would return and inform their communities about the effects of pipeline construction. This event offered landowners the opportunity to meet with public officials, pipeline company representatives, and five landowners crossed by Keystone 1. The delegation also took a flight over the route. Landowners learned about preventing safety problems, ensuring pipeline safety during construction and operation, and responding to problems that occur.

Numerous topics were covered during the exchange, but the most prevalent included road wear, maintenance and safety, pipe thickness, project oversight, easement restoration, prevention and treatment of noxious weeds, and emergency services. This publication summarizes areas of concern from the perspective of Montana landowners after hearing North Dakota landowners and public officials' testimonies, observations, and recommendations.



# ROADS

andowners and highway department personnel in North Dakota mentioned several road issues that arose from Keystone 1. The roads couldn't handle all of the additional wear and, combined with wet weather, were torn up so badly in some areas that they were no longer drivable. A school bus became stuck on a muddy, torn-up road that was used heavily by contractors. Highway department personnel estimated that Keystone 1 put 10 years of wear on the roads. It is unlikely the county will ever be compensated because there's no visible damage yet. Based on their expertise, though, they believe the useful lives of the roads were significantly shortened because of the many trucks hauling pipe and other equipment. Roads were often damaged where crossed by the pipeline. Counties did secure a cumulative \$250,000 bond for road repair, unfortunately that wasn't enough. One North Dakota county had to spend nearly a year negotiating for payment to repair road damage created when trucks repeatedly violated a no-haul order on one rural road.

Good roads are an important safety issue in rural areas. Roads are necessary for emergency and fire vehicles to reach those in peril. Damaged roads can cause needless increased risk of accidents.

#### Lessons and Recommendations

Based on their experiences with Keystone 1, landowners and the North Dakota highway department had several recommendations to improve and guarantee road safety:

- A \$250,000 bond wasn't enough, two to three times this amount would be needed to guarantee funds to repair and maintain roads;
- Allow counties to maintain control over the bonded money;
- Require all counties to implement a unified haul load agreement;
- Only big trucks were restricted in North Dakota. If the highway department could do it over again they said they would restrict all trucks to specific roads;
- Roads near the pipe yards and equipment yards got the most wear, therefore focus attention on those areas;
- Make sure there are provisions (funding and written agreements) requiring the company to conduct road maintenance during project construction and to fix roads upon completion.

Maintaining road quality, limiting road use, and collaborating with neighboring counties to develop road-use agreements will increase the safety and ease of travel on roads used to construct tar sands pipelines. Roads should be maintained or built – during and after construction – at a level equal to or greater than the road conditions before construction. By requiring this, landowners, emergency personnel, and school buses will be able to travel safely.



## PIPE THICKNESS

n October 10, 2008. TransCanada asked the Pipeline and Hazardous Materials Safety Administration (PHMSA is part of the U.S. Department of Transportation) to waive a standard requirement which says that pipelines transporting oil and other hazardous liquids may not operate at more than 72% of their Maximum Operating Pressure. The practical effect of the special permit TransCanada seeks would be to allow it to use pipe made of thinner steel. An operating pressure of 72% of Maximum Operating Pressure in a thicker pipe will be 80% in a thinner pipe. TransCanada seeks this waiver to be able use a thinner pipe in areas not designated as "high consequence." High-consequence areas have a population of 50,000 or more people or a density of 1,000 people per square mile. About 91% of the Montana Keystone XL route is defined as a "low consequence area," therefore subject to thinner pipe, if the wiaver is granted. A pipe made of thicker steel is designed to withstand higher pressures than a pipe with thinner walls made of the same kind of steel.

Wesley P. James, a retired hydraulics professor at Texas A&M University (who is also a landowner on the Keystone XL route), pointed out in a guest editorial to Montana newspapers that TransCanada has "indicated that the pipeline would be pressure tested to at least 1800 psi prior to operation. This implies that the test pressure will be greater than the yield pressure of the thin-walled pipe. If the pressure in the pipe exceeds the yield pressure, the elastic limit of the steel in the pipeline will have been exceeded and when the test is completed the pipe diameter will be greater than 36 inches and the wall of the pipe will be thinner. This would be considered a pipeline failure. It is like blowing up a balloon until it is about to pop. When the air is released, the balloon will be larger and thinner than it was initially.

"Studies of major Canadian pipeline ruptures have found that during the first 10 years of operation, stress cracking was the most common cause of pipeline ruptures while during the second 10 years of operation, external corrosion was the most common cause of pipeline rupture. Both forms of ruptures occur more frequently as the pipeline ages and will be a major concern with Keystone pipeline. Research has shown that a longitudinal stress crack 16 inches long and just 1/16 inch deep will cause the Keystone pipeline to rupture at the normal operating pressure. To reduce the external corrosion rate of the pipeline, TransCanada will use cathodic protection where a DC voltage will be applied to the pipeline. This will cause buried metal pipes and water well casings on property adjacent to the pipeline to corrode rapidly depending on the distance from the pipeline. A buried water pipe that is within 100 feet of the pipeline will be destroyed in less than a year."

At a pipeline safety conference in New Orleans, an NPPLG member discussed TransCanada's pressure waiver with PHMSA officials. Those officials said that more than 50 additional stipulations would be required if the pressure waiver were granted, in which case, in theory, the pipeline would



be just as safe. However, NPPLG members learned during the North Dakota exchange that there was very little on-ground government oversight of Keystone 1 and numerous contractors broke rules With 50 or more stipulations, more enforcement will be needed, requiring a high level of oversight.

#### Lessons and Recommendations

and the second second

Based on their experiences with Keystone 1, landowners and county officials had several recommendations to improve and guarantee pipeline safety:

- Deny TransCanada its waiver to operate at higher pressure in low consequence areas;
- Make sure there is a liaison who is paid by the company and is available for landowners to contact. The liaison would report to the Public Service Commission;
- Demand effective enforcement of rules and stipulations to maintain pipeline safety before and after construction.

Using thicker-walled pipe, establishing liaisons to deal with landowner concerns, and having a fully-staffed PHSMA fleet on the ground during and after pipeline construction will decrease high risk, unsafe events such as spills caused by cracks or improper procedures. As a consequence of these proactive actions, water quality will be protected and people's livelihoods will be safeguarded.

# EASEMENT RESTORATION AND NOXIOUS WEEDS

andowners and the Valley City, North Dakota, Noxious Weed Department noted many problems with weeds caused by construction of Keystone 1 and the need for proper restoration of disturbed land and necessary treatment of weeds. The county stated that certain easements do have weeds, and that TransCanada is paying to treat those weeds for a couple of years, as required by law. Certain locations, such as spoil piles and routes into work sites, were also noted as being more susceptible to weeds.

Unfortunately, problems are anticipated for many years, in which case the company will not pay any more to control weeds. At that point it's left to county taxpayers. A landowner crossed by the pipeline stated the company laid the pipe through his access road, but didn't restore the road to its original condition. In addition, the company didn't reseed his CRP land, weeds have established themselves on the easement, and his renters couldn't cross the easement (the soil was too wet and loose) to do work.

Another trend was trash, portable outhouses, and metal debris being left behind and fences not being rebuilt on the easement after construction. One landowner said a steel post was left behind that damaged his machinery. He billed TransCanada for it and the company did pay. However it shouldn't have been left behind in the first place.

#### Lessons and Recommendations

Based on their experiences with Keystone 1, landowners and county weed specialists had several recommendations to improve the restoration process, decrease the spread of weeds, and encourage safety:

- Document (with photos and descriptions) land, crops, fences, ditches, roads, etc. before, during, and after construction;
- Have funds reserved and available for more than two years after construction in case weed problems persist;
- Encourage reseeding with native plants.

Restoring the easement to maintain its agricultural value should be a top priority of the company. Reseeding, treating noxious weeds, and cleaning up trash will allow landowners to continue with their work quickly and safely.



# EMERGENCY SERVICES

pipeline companies are not required to submit an emergency response plan for a project until after construction has begun. TransCanada's Keystone 1 pipeline is scheduled to go into operation without the public knowing details of an emergency response plan.

The Keystone XL pipeline is now undergoing environmental analysis and review without any proposed emergency response plan available for public review or consideration. This limits the opportunity for not only government officials but the public, including those most directly affected, to have any input before it is too late. If the U.S. Department of Transportation permits the use of thinner pipe in low consequence areas, there will be increased risk. Yet, because of a lack of an upfront emergency response plan, Montana and South Dakota emergency personnel might not be prepared to access spills, leaks, and assist rural landowners. This poses a health and safety risk to those citizens.

To ensure safety of the pipeline, environment, and citizens the Environmental Impact Statement (EIS) should analyze the adequacy of the applicant's response plans for accidents, spills, and other emergencies. Keystone XL would cross hundreds of miles of remote, often fragile areas. Finding and gaining access to sites of leaks, spills and fire may be difficult or slow along much of the pipeline route, and personnel and equipment needed to deal with these incidents will be scarce. The company should state how it will assist, equip, train, and fund local first-responders to be ready and able to act in the event of accidents threatening the environment or public health. Citizens of Montana, the Dakotas, and Nebraska have as much right to safety standards designed to prevent oil spills and contamination of the land and water as do residents of "high consequence areas" such as Houston or Oklahoma City. Citizens and county personnel also should be able to comment and help develop coherent, logical, and efficient emergency response plans.

#### Lessons and Recommendations

- Require the company to develop an emergency plan prior to construction;
- Secure funds to maintain and improve roads specifically for emergency access;
- Ensure local emergency personnel are educated and trained about pipeline hazards and initial response for such cases.

Developing a plan that empowers county emergency services to confidently and quickly respond to incidents near or around the pipeline will improve the health and safety of citizens. The U.S. Department of State should mandate that the EIS analyze the adequacy of the applicant's plans for response to accidents, spills, and other emergencies. Emergency response plans should be in place before construction begins.



### SUMMARY

Ounties and landowners will face many issues when dealing with tar sands pipelines now an into the future. Well-maintained roads, thick pipe, restored easements, and strong, organize emergency services are are among the lessons learned during the Montana Dakota Pipeline Safety Landowner Exchange Project that would improve safety during any pipeline construction.

Montana landowners in the NPPLG believe that by joining together, landowners can share information and ideas to protect their rights, water, safety, and livelihoods. In the end, the goal is to work together to reach a win-win situation for landowners, the company, and the community.



www.northemplains.org Trafferen . 220 South 27th Street, Suite A . Billings, Montana 59101 . (406) 248-1154 Attachment 8.15

#### FARM SOIL ~ Section29 Township31 Range13

#### #1).Farm pictures taken March 19, 2017 ~ #1-#10

Photo #1). This picture shows the beginning of the North Branch of the Eagle Creek.

Photos #3/#4). Pictures ~ there are certain times of the year when we are not able to cross the wetlands due to surface water. All wetlands are south of the shelterbelt and the proposed preferred route crosses at the west end of the shelterbelt, which will be affected by the easement area.

"Wetlands" ~ are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year including the growing season.

"Shelterbelt" ~ A line of trees or shrubs planted to protect an area, especially a farm field, from strong winds and the erosion they cause.

In 1934 President Franklin D. Roosevelt initiated the Great Plains Shelterbelt in response to the severe dust storms of the Dust Bowl, which resulted in significant soil erosion and drought.

Photo #8). This picture shows the north side of the shelterbelt, showing the sandy soil. Also Byron (Stix) is standing on a small ridge which was form during the Dust Bowl, from the blowing sand into the fence line.

Photos #9/#10). This pictures shows evidence of the sandy soil on our property ~ 29-31-13.

#2). Soil Survey ~ B-Farms Partnership (Renter) of Steskal Property
March 19, 2017

#1 north Branch of Eagle Creek Beginning of #2

Legal - Hatt County - Decture 39 Township 31 Pange 13

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Tilaten 19, 2017

#9



110



March 19,2017







#133

Attachment 8.16

Pictures taken of Gravel Pit located Atkinson Sand and Gravel May 25, 2017 28~31~13

Pictures taken from Steskal Property Located at  $29 \sim 31^{\circ} 13$ May 25, 2017

### Property located at 28 ~31 ~13 $\,^{-13}$



The Atkinson Sand and Gravel Pit (listed on page 9 of the Boyd – Holt County Legal Map Book) is located to the east of the Steskal property.



Side-Dump trucks loaded with sand leaving the gravel pit property.



This property located across the road from the Steskal property is owned by Pat Gentele.



# Side-Dump Trucks loaded with sand



## Boyd – Holt County Plat and Wall Maps 2014



480	Phyllis Real Bolduc LLC 160	280 15 200 ,	Vernon & Betty Albrecht Trustee	1 13 14 1 19 1 19		1 g	William Cahin A A Julia Monica A Julia Schulz	27 S
Coal Co.	Board of Ed. Lands	Vernon Abrecht 320 1 😢	3	- e38.67	tenene Section 160 28	A Villem & Julio & Julio Telke 440	-	8
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479.53	verview.	James Sartori 156.03	GH Co.	636.13	Corkels Inc.	320	Rentaction of Business	8

Side-Dump trucks entering the gravel pit.





Byron Steskal Property – 29

Atkinson Sand & Gravel - 28

Attachment 8.17

### CROPS PLANTED IN HOLT COUNTY

	2011	2013	2015
Corn	190,679 acres	194,543 acres	172,310 acres
Soybeans	71,866 acres	79,068 acres	86,159 acres
Popcorn	12,462 acres	16,387 acres	
Potatoes	4,318 acres	4,893 acres	2,487 acres
Edible Beans	2,390 acres	2,872 acres	3,876 acres
Alfalfa	13,964 acres	16,975 acres	
Oats	2,386 acres	4,599 acres	11,276 acres
Rye	2,146 acres	2,744 acres	7,826 acres
Wheat	4,386 acres	3,911 acres	2,526 acres
Mixed Forage		4,722 acres	7,142 acres
Edible Peas			535 acres
Grass		500,241 acres	896,001 acres
Millet		669 acres	2,555 acres

(Resource: Info from FSA – Farm Service Agency ~ O'Neill NE)

1

Total         Complexation         Complexation         Complexation         Produced         Produced           2017         2016         Holt         Country         Reame         2,597.07         0         0         0         0         2,597.07           2017         2016         Hebraska         Holt         Source $2,597.07$ 0         0         0         0         2,597.07           2017         2016         Hebraska         Holt         Sovbeans $2,597.07$ 0         0         0         0         2,597.07           2017         2016         Nebraska         Holt         Forage $2,030.11$ 0         0         0         2,597.07           2017         2016         Nebraska         Holt         Forage $2,030.11$ 0         0         0         0         2,597.07           2017         2016         Nebraska         Holt         Forage $2,597.07$ 0         0         0         2,597.07           2017         2016         Nebraska         Holt         Forage $2,237.03$ 0         0         0         0         0         0         0         0	1000	Concorr	Belim la la complute	Reference Shine	CIMIS	factors Chambood	Contraction	Called		Total
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Warning this document contains Personal Identifiable Information (PII)

12,39645



United States Department of Agriculture

### HIGHLY ERODIBLE LAND AND WETLAND CONSERVATION DETERMINATION

Name Address:	Byron Steskal 707 E 2nd Street Stuart, NE 68780		Request 4/15/2013 Date:	County: Holt	
Agency or Requesting	Person Determination:	Byron Steskal (CPA-38)	Tract No: 722	FSA Farm No.: 17	

### Section I - Highly Erodible Land

Is a soil survey now available for making a highly erodible land determination?	Yes
Are there highly erodible soil map units on this farm?	Yes

Fields in this section have undergone a determination of whether they are highly erodible land (HEL) or not; fields for which an HEL Determination has not been completed are not listed. In order to be eligible for USDA benefits, a person must be using an approved conservation system on all HEL.

2/4/2013
3/5/2008

The Highly Erodible Land determination was completed in the Office

### Section II - Wetlands

Fields in this section have had wetland determinations completed. See the Definition of Wetland Label Codes for additional information regarding allowable activities under the wetland conservation provisions of the Food Security Act and/or when wetland determinations are necessary to determine USDA program eligibility.

Field(s)	Wetland Label*	Occurrence Year (CW)	Acres	Determination Date	Certification Date
1	NW		248.36	6/2/2005	6/2/2005
2	NW		61.02	4/7/2005	4/7/2005
4	W		13.6	7/30/2013	7/30/2013
4	NW		111.0	7/30/2013	7/30/2013
8	W		0.5	7/30/2013	7/30/2013

The wetland determination was completed in the Field It was Mailed to the person on 7/30/2013

Remarks:

I certify that the above determinations are correct and were conducted in accordance with policies and procedures contained in the National Food Security Act Manual.

Signature Designated Conservationist	Date	
Jusy Har	7/30/2013	

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Assistant Secretary for Civil Rights, 1400 Independence Avenue, S.W., Stop 9410, Washington, DC 20250-9410, or call toll-free at (866) 632-9992 (English) or (800) 877-8339 (TDD) or (866) 377-8642 (English Federal-relay) or (800) 845-6136 (Spanish Federal-relay). USDA is an equal opportunity provider and employer



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Jaken By Valilet Resident ~ Blow Out~ 89075 469# Auer North of Stuart ME



Sand Dune ~ 469ds Ave~



Bear Creek - 890 Rd - Sooking south





Bear Creek - 890 Rd ~ Hooking South

E Bear Creek - 890 Bd - Looking south Mar Siller gesting #6 the and the set of the grant of St. Charles

Gear Creek ~ 890"Rd ~ Looking north

### Attachment 8.18















### **BEFORE THE NEBRASKA PUBLIC SERVICE COMMISSION**

### IN THE MATTER OF THE APPLICATION OF TRANSCANADA KEYSTONE PIPELINE, LP FOR ROUTE APPROVAL OF KEYSTONE XL PIPELINE PROJECT, PURSUANT TO MAJOR OIL PIPELINE SITING ACT

### **APPLICATION NO: OP-003**

### DIRECT TESTIMONY OF EXPERT LORNE STOCKMAN

State of Virginia	)
	) ss.
City of Staunton	)

On Behalf of

Landowner Intervenors

June 6, 2017

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Attachment LS-3	The Future of the Canadian Oil Sands, Oxford Institute for Energy Studies, February 2016		
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#### I. BACKGROUND AND EXPERIENCE

#### 1Q. Please state your name, position, and business address.

 My name is Lorne Stockman. I am the Senior Research Analyst at Oil Change International. My business address is 714 G St. SE #202, Washington, DC 20003.

#### 2Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the Landowner Intervenors.

#### **3Q.** Would you briefly describe your educational and professional background?

- A. For the past twenty years I have performed research and written reports on the petroleum and energy industries and economics, with a particular emphasis on the risks faced by investing in projects related to economically marginal crude oil developments. My research experience includes analysis of climate change and energy, the political economy of oil, transitions in energy markets, energy security, and financial risk. I hold a Master's Degree from King's College London. My qualifications may be found in my Curriculum Vitae, attached to this report as Attachment LS-1.
- 4Q. Are you familiar with the Keystone XL Project (the "Project") and its related application before the Nebraska Public Service Commission ("Commission") pursuant to Neb. 21 Rev. Stat. § 57-1401 *et seq*.?
- A. Yes. I have reviewed the Application. If approved, the Project would allow TransCanada Keystone Pipeline, L.P. ("Keystone") to construct, operate, and maintain a 36-inch diameter crude oil pipeline and ancillary facilities. The Project is designed to transport up to 830,000 barrels per day of crude oil from Hardisty, Alberta, Canada, to Steele City, Nebraska. The possible sources of crude oil that would be transported on the Project include oil extracted in Alberta and in the Williston Basin. There are two "onramps" for the Project: one in Hardisty, Alberta, and the other near Baker City, Montana. Oil from these upstream onramps would be transported to Steele City, at which location the Project would connect to an existing 36-inch diameter pipeline that is owned by Keystone and transports crude oil from Steele City to a Keystone terminal near

Cushing, Oklahoma. Upon arrival in Cushing, the crude oil would be delivered to other pipelines that would transport this crude oil to a number of possible locations, including but not limited to oil refineries in Kansas, Oklahoma, Texas, and Louisiana, and to export facilities on the Gulf of Mexico.

The Project would increase Keystone's capacity to transport crude oil from the Tar Sands Region in northern Alberta and conventional oil fields in western Canada. Most of the crude oil transported by the Project would be diluted bitumen or "dilbit." Bitumen is a heavy petroleum oil that is extracted from the Tar Sands Region of Western Canada by surface mining or by *in situ* extraction using wells into which steam is injected. Since bitumen is too viscous to flow through typical crude oil pipelines, to decrease its viscosity bitumen is mixed with a diluent comprised of lighter petroleum oils. The industry uses a variety of substances, such as natural gas condensate and synthetic crude oil, for diluent.

The Project could also transport light crude oil extracted from the Williston Basin in western North Dakota and eastern Montana. This being said, the construction of the Dakota Access Pipeline ("DAPL") has created excess takeaway capacity from the Williston Basin, such that it is unlikely that significant quantities of Williston Basin crude oil would be transported by the Project.

#### 5Q. What is the purpose of your testimony?

- A. The purpose of my testimony is to provide information with regard to whether the Project is in the "public interest" in accordance with Section 23.07 of the Commission's Major Oil Pipelines permit regulations. Specifically, this testimony contains evidence that Keystone has not committed to construct the Project and the market-related reasons why it is unneeded and unlikely to be built, such that approval of construction of the Project is not in the public interest. In particular, this testimony provides evidence related to the following:
  - the relationship between oil price and the development of additional crude oil supply available for export from western Canada;

- an evaluation of western Canadian crude oil historical supply available for export and supply forecasts showing that future supply for export from western Canada will be limited;
- current Canada to U.S. import pipeline capacity and utilization and the potential impact of other proposed import pipelines;
- the record levels of crude oil supply in storage in Oklahoma and the U.S. Gulf Coast and the implications of this glut on demand for additional oil import capacity into this region;
- the lack of growth in domestic consumer demand for petroleum and the current demand trends that will suppress demand growth in the future, and the growth of U.S. crude oil production; and
- the growth in exports of crude oil and petroleum products from the U.S.

# 6Q. Would you describe your professional experience related to determining need for petroleum infrastructure?

A. I have worked as a research analyst on the oil and gas industry for nearly 20 years and have been specifically focused on the North American industry for over ten years. My primary focus in the last ten years has been the Canadian oil sands sector as well as the shifting trends in U.S. supply and demand.

### II. THE NEED FOR THE PROPOSED KEYSTONE XL PIPELINE DEPENDS ON GROWTH IN WESTERN CANADIAN CRUDE OIL PRODUCTION, WHICH IS UNLIKELY TO INCREASE SUBSTANTIALLY

#### 7Q What is the commercial basis for the Keystone XL Pipeline?

A. The primary commercial basis for the Keystone XL Pipeline is to transport crude oil from Alberta, Canada, to Cushing, Oklahoma, and the U.S. Gulf Coast, and particularly refineries and ports in Texas and Louisiana. It will be needed only if: (a) additional new crude oil supply is available for export in the future; and (b) the capacity of other pipelines and railroads to transport this new supply crude oil supply is insufficient or less economic than the proposed Keystone XL Pipeline. At any given time, there is a limited demand for crude oil transportation services. Building more pipeline capacity than the total crude oil supply available for transport is uneconomic and needlessly increases the cost of petroleum fuels. Conversely, building too little pipeline capacity can result in the use of more expensive transportation options, such as rail.

### 8Q Have you examined any data related to the potential for growth of crude oil supply for export from western Canada?

A. Yes. I have examined the impact of oil price on the rate of development of crude oil extraction projects in western Canada. Specifically, I have reviewed the costs of: (a) developing new extraction operations, (b) transporting western Canadian crude oil to market, (c) refining heavy western Canadian crude oil relative to refining other types of crude oil.

### 9Q What is the relationship between oil price and the rate of growth of western Canadian crude oil supply?

A. With regard to the development of new oil extraction projects in Canada, at a minimum the price paid for the crude oil produced by new projects must be high enough to pay for the cost to extract the crude oil from the ground, prepare it for market, ship it to market, and provide a return on investment that is sufficient to attract investors and financiers. Should the combination of these costs be greater than the market price of the particular grade of crude oil produced by a project, then Canadian oil project developers would need to either: (a) build anyway and plan to sell at a loss; or (b) delay or terminate their project development efforts.

Since late 2014, oil prices have slumped and currently remain well below the average breakeven cost required for new oil sands projects to go forward. The price paid for western Canadian crude oil has been too low relative to the cost of building new projects to attract significant new investment in oil extraction and processing facilities, with the result that the Canadian oil industry has not substantially increased the overall supply of crude oil available for export from Canada for over two years. Most in the industry today believe this is a structural market shift characterized by the flexibility of

U.S. shale oil production and tepid global demand growth and have labeled the current oil price era as "lower for longer."

The main source of western Canadian oil production is in the province of Alberta, which produces:

- conventional light, medium, and heavy crude oil;
- unconventional light hydrofracked crude oil from shale formations in the Williston Basin; and
- unconventional crude oil from the "oil sands" or "tar sands," which is exported in the form of synthetic crude oil ("syncrude") and dilbit.

The petroleum deposit in the tar sands region is comprised of a thick viscous hydrocarbon called bitumen. Attachment LS-2. It is found in generally shallow formations mixed with sand, clay and water. Shallower formations may be exploited via open pit mining, but deeper formations can be accessed only via steam injection technologies. Mined bitumen requires intensive processing to separate the sand and clay from the bitumen. The steamed or "*in situ*" production results in relatively pure bitumen but only after weeks of pumping steam underground to liquefy the bitumen enough to be extracted through production wells. These extraction methods are resource intensive relative to 'conventional' methods, with the result that the vast majority of western Canadian oil production is significantly more expensive to extract than 'conventional" crude oil. Attachment LS-3.

The following charts of Canadian Association of Petroleum Producers ("CAPP") data show different views of the same 2016 forecast of western Canadian crude oil supply available for export by type. The data used to generate these charts is from the CAPP June 2016 report on Crude Oil Forecasts, Markets and Transportation ("2016 CAPP Report"), Appendix B.2 Attachment LS-4. Although I do not agree that dibit extraction will grow to the extent forecast by CAPP, these charts are useful because they show that the industry forecasts that dilbit is the only type of crude oil supply for export that might increase to any significant degree over time.





CAPP updates this report each June. CAPP is a trade association whose member companies produce about 85% of Canada's oil and natural gas. *Id.* In its forecasts, CAPP combines hydrofracked light crude oil with conventional light crude oil.

There is no bright line between conventional and unconventional crude oil, but conventional oil is that which can be extracted using traditional vertical oil wells with limited need for more exotic technologies. In comparison, unconventional oil is that which requires significant commitments of technology, money, and energy to extract. Extraction of oil from the tar sands region requires either open pit mining combined with partial refining (upgrading) of the extracted bitumen, or the use of paired horizontal steam injection and extraction wells. Both mining/upgrading and steam extraction are expensive and energy and labor intensive.

Once the bitumen is extracted there is still much that needs to be done to process it into the petroleum products the market requires, primarily gasoline and diesel. Bitumen is too viscous to transport through pipelines, such that it must either be semi-refined (upgraded) into a product called syncrude, or it must be diluted with lighter hydrocarbons, similar to solvents that essentially liquefy the bitumen to create dilbit.

Syncrude production requires that oil companies invest in and construct upgraders, which are expensive and require substantial time to construct. As a general rule, most syncrude is derived from open pit mining, because the mining process itself does not separate the raw bitumen from the sand, clay, and water with which it is mixed in the ground. Instead, the raw bitumen is separated from these other materials by upgraders that also partially refine it into syncrude, which is classified as a light sweet (low sulfur) crude oil. The equipment needed to perform this upgrading is expensive.

The chart below of data provided by Rystad Energy, an independent commercial provider of global energy data, shows that future oil sands mining projects will need a U.S. (WTI equivalent) oil price of \$108 per barrel – just to breakeven. Attachment LS-5. Generating an adequate return on investment would require that oil prices rise to close to \$120 per barrel, or about a 250% increase over the current price of oil. *Id.* This chart is based on the latest May 2017 data from Rystad Energy and already accounts for the cost

savings realized in the sector as a result of the slowdown in activity and consolidation since the oil price crash. *Id*.



Production of dilbit is also expensive. Dilbit is produced using bitumen extracted by *in situ* production technology. The most common *in situ* technology is called 'steam assisted gravity drainage' or 'SAGD' production. Steam generation requires large amounts of natural gas, which must be transported to the SAGD fields and combusted in steam generators. The produced steam is then forced underground at high pressure to gradually heat the bitumen to the point that it liquefies and flows into an extraction well. The resources needed to extract bitumen by the SAGD method also increase the cost of extracting bitumen to well above the cost of conventional oil production. The chart above shows that future *in situ* projects have a <u>breakeven</u> price of \$77 per barrel (WTI equivalent), well below the current price of crude oil. *Id*.

The USEIA's WTI spot price data shows that the price of this oil has averaged \$51 since the beginning of the year. Attachment LS-6. At this price level, western Canadian oil extraction projects under development today are likely to begin production making a loss, and currently producing projects are operating at little to no profit. The future of oil prices is of course hard to predict but at the time of writing WTI Futures out

to December 2025 are trading within a range of \$40 to \$65, which indicates that oil market professionals do not anticipate a rapid increase in oil price.



In addition to the foregoing costs of extraction, transporting bitumen to market is expensive because Canadian oil companies must blend the bitumen with diluent to make dilbit. Attachment LS-7. On average only 72% of a barrel of dilbit transported in a pipeline is bitumen. *Id.* This means that Canadian oil companies must buy 0.28 barrels of diluent for each 0.72 barrels of bitumen. *Id.* To get a full barrel of bitumen to market, the oil companies must ship 1.43 barrels of dilbit. *Id.* Making dilbit requires that Canadian oil companies purchase diluent, transport the dilute to the production site via pipeline, and blend the diluent and bitumen in mixers. *Id.* This process also increases the cost of producing dilbit relative to the cost of conventional crude oil.

Once a barrel of dilbit arrives at a refinery it requires several additional steps to convert it to useful products, such that only complex refineries can handle it. *Id.* These refineries super-heat the bitumen in expensive refining equipment called "cokers," add hydrogen to liquefy it, and intensively treat the bitumen to remove the high levels of sulfur, heavy metals and other contaminants that cannot be carried through to the finished petroleum products. *Id.* The intensive and expensive processing required to refine bitumen means that refinery companies will pay less for bitumen than they will for lighter and cleaner sources of feedstock that are less expensive to refine. Thus, dilbit is not only

more expensive to produce than other crude oils, but it is also a lower value product that is worth less per barrel than other types of crude oil.

In addition, dilbit is produced only in remote northern Alberta. This means it must be transported very long distances by pipeline or rail to U.S. refineries. The current FERC-approved international joint tariff for transporting dilbit on the Keystone Pipeline from Hardisty, Alberta, to Houston, Texas, is \$7.730 per barrel, though not all shippers are eligible to ship at this discounted price. Attachment LS-8. Similarly, the lowest current FERC tariffs to transport dilbit on Enbridge pipelines (Enbridge Mainline System to Flanagan South to Seaway) between Hardisty and Houston is \$6.7042 per barrel. *Id.* In comparison, the cost of shipping crude oil from west Texas to refineries on the U.S. Gulf Coast is typically about \$2 per barrel or less, depending on the distance (*e.g.*, Magellan Crude Oil Pipeline, L.P., tariff). *Id.* Since refineries base oil purchases on the as-delivered cost of crude oil, U.S. Gulf Coast refineries will buy Canadian crude oil only if its price is discounted so that it can complete with closer crude oil suppliers.

Dilbit's expensive extraction and processing methods, the distance it travels to market, and the lower price it fetches, all mean that global oil prices must be relatively high to make its extraction profitable. As noted above, the current breakeven price is estimated to be \$108 per barrel. In the past, the boom in Canadian tar sands development was caused by historically high oil prices. The relationship between rising oil prices in the first 14 years of this century and investment in oil sands production is very clearly shown chart below of Rystad Energy data showing oil sands investments as of May 2017. Investment amounts include exploration capital expenditures (expex), capital expenditures (capex) and operational expenditures (opex). The WTI price data is from

USEIA. (Attachment LS-9).



The chart of Rystad Energy data below shows oil sands production growing the most between 2010 and 2015 during the steadiest period of high oil prices, although the lag between investment and production and the economic crash in 2009 make for some anomalies over the long term back to 2000. *Id.* As discussed below, in 2016, growth in oil sands supply available for export was minimal.



#### 10Q Have low oil prices actually impacted oil industry investments in western Canada?

A. The oil price slump has slowed the development of new oil sands production to a trickle and has thrown into question the future of the sector. The chart below of Rystad Energy data shows the total capacity of all new oil extraction projects sanctioned by the oil industry in western Canada. Attachment LS-10.



Projects sanctioned before the oil price slump in late 2014 continue to move forward, but since the beginning of 2015 only three minor capacity additions have been sanctioned (a final investment decision by a company). Unless more projects are sanctioned, extraction project construction will peter out before 2020. It is unlikely that new extraction projects will be sanctioned in the foreseeable future.

To understand the state of play with oil sands production growth, one must understand the investment cycle in the sector. Most expansion projects require lengthy construction periods spanning several years. This investment momentum is the key reason production capacity has continued to grow since the oil price collapse. The projects that have come online since late 2014, and those that are still under construction today, were primarily sanctioned before the oil price collapse. The three expansions that have been sanctioned since then are relatively modest incremental expansions of existing projects.

New projects will likely continue to come online through 2020 as remaining under-construction projects are completed, but the exact timing of their production rampup is uncertain. Moreover, the net increase in crude oil available for export from western Canada is uncertain, because the output of these new projects will be offset by declining production from older oil fields. Whether any further significant capacity is added after these currently sanctioned projects come online depends on oil prices rising enough to support new development. That currently appears a long way off. While development costs have been cut from the highs of the pre-2015 boom, nonetheless, the U.S. price of oil must be sustained above approximately \$77 per barrel to justify new SAGD projects, and above approximately \$108 per barrel to justify new surface mining projects. At present, oil market supply and demand fundamentals do not justify such high crude oil prices.

The disparity between the oil price needed to financially justify new oil sands projects on the one hand, and the prevailing oil price and prospects for price recovery on the other, has caused a dearth in investment in the oil sands sector that is today lower than it has been in over a decade. By 2019, investment in new projects in the oil sands is expected to drop to nominal levels. The Rystad Energy data in the chart below shows the

annual capital expenditure (capex) spent on developing new oil sands production capacity since 2000, as well as a forecast of expenditures through 2019. Attachment LS-11.



The projected capex shown in this figure beyond 2016 includes only investments in projects that have already been sanctioned. Thus, the Rystad data shows that capex in new extraction projects will end in 2019, indicating that no oil company has committed to build or expand a SAGD facility or surface mine beyond 2019.

This does not mean capex in the sector ceases completely. The chart below of Rystad Energy data shows the total capex spent in the oil sands including capex spent on maintaining production at ongoing projects. Attachment LS-12. This maintenance capex may be spent on, for example, drilling new wells at *in situ* projects within existing project boundaries (infill) in order to replace spent wells and maintain production. The capex shown after 2019 in this figure therefore would all be spent simply to maintain production levels at already producing projects. Therefore, despite projected capex rising from \$8.2 billion in 2020 to \$12.7 billion in 2030, no new production capacity will result from this level of capex.



But the capex needed to maintain production is, of course, not the only expenditure required to keep production going. Operational expenditure (opex), which pays salaries, fuel and other supplies, processing, maintenance, and transport costs, is the main expense of continued production.

The chart of Rystad Energy data below shows that opex is projected to rise from \$21 billion to \$31.6 billion between 2020 and 2030. Attachment LS-13. This figure also shows that the total cost of maintaining the currently operational and sanctioned production capacity will rise to \$44.8 billion by 2030.



Further, as the chart of Rystad Energy data below shows, despite this investment, production at the currently approved projects will start to decline from the mid-2020s as reserves deplete. Attachment LS-14.



During this same period, conventional oil fields are projected to decline from 933,000 bpd in 2016 to 811,000 bpd in 2030. CAPP 2016 Report, Attachment LS-4. Therefore,

for western Canadian crude oil production to grow, new capacity additions in the Tar Sands Region will need to more than make up for depletion at existing conventional and unconventional projects, even as billions are spent to squeeze more oil out of these projects.

The lack of profit in oil sands project development has also resulted in major oil company pull-outs from western Canada. The table below shows that in the past year, five U.S. and European oil companies have sold their oil sands assets, while two more are thought to be considering sales. The source material for this table is provided in Attachment LS-15.

Date	Seller	Buyer	Reserves	Production	Sale Net
Announced			(million Bbls)	(Capacity	Value
				Kbpd)	(Million USD)
Dec. 2016	Statoil	Athabasca	291	24	443
Apr. 2016	Murphy	Suncor	113	15.6	739
Mar. 2017	Shell	Canadian	3,616	160	7,300
		Natural			
Mar. 2017	Conoco	Cenovus	5,465	280	13,300
Mar. 2017	Marathon	Shell/	1,214	50	2,500
		Canadian			
		Natural			
Apr. 2017	BP	?	1,026	30	?
Apr. 2017	Chevron	?	1,071	50	?
Total			12,796	610	24,282

Since April 2016, over \$24 billion has changed hands as Statoil ASA (Norway), Murphy Oil Corporation (U.S.), Royal Dutch Shell (Netherlands), ConocoPhillips (U.S.) and Marathon Oil Company (U.S.), sold their oil sands assets. *Id.* Shell, at one time a leading oil sands producer, sold all its oil sands assets but then bought a 50% stake in the assets sold by Marathon. *Id.* This left Shell as a 10% owner of the Albian Sands Project, in

which it once owned a 60% stake. *Id.* Also, Shell retained an interest in Canadian Natural (CNRL) by receiving about 98 million CNRL shares in exchange for its direct ownership interests in oil sands projects, but it was reported in late May that Shell was looking to offload these shares in what could become the largest equity sale in Canadian history. *Id.* CNRL shares dipped on the announcement. *Id.* Any further decline in value at CNRL could also serve to limit that company's ability to make further investments.

ConocoPhillips was also one of the biggest players in the oil sands but sold its entire oil sands business along with other Canadian oil and gas assets to its oil sands project partner Cenovus. *Id.* Cenovus investors were not impressed and its stock fell 13% on the announcement. *Id.* This being said, it has recently been reported that ConocoPhillips is also looking to sell the Cenovus shares it received as part of this sale. *Id.* 

Reports in April stated that both BP Global (U.K.) and Chevron Corporation (U.S.) were also considering sales, although these are yet to be officially announced. *Id.* There was some speculation about whether these companies may have missed the boat as the pool of capital available for such sales may have already dried up. *Id.* 

The buyers listed above have essentially bought existing production at a discount, which is a less risky way to grow production at those companies compared to sinking capital into new projects. The sales have therefore reduced the pool of capital available for new projects as the number of companies involved in the sector is reduced and those remaining have spent capital on buying the assets of fleeing companies.

Additionally, the CEO of the largest oil sands company, Suncor Energy, recently told investors that his company had no plans for growth beyond that to which it was already committed. Attachment LS-16. CEO Steve Williams told investors at Suncor's end of year results conference in February 2017 that oil sands mining projects "are coming to an end, not just for Suncor but for the industry", that Suncor has "no plans to be going ahead with major capital investment in either mining or *in situ* in the foreseeable future" and that "(w)e have nothing of any materiality in the pipeline around mergers and acquisitions". In other words, the world's leading oil sands company has no plans for

production growth in the foreseeable future. This is one of the clearest indicators that the future of oil sands production is highly uncertain and cannot constitute a source of oil supply that the United States can rely on.

## 11Q What conclusions do you draw about the future need for oil transportation capacity based on the foregoing information?

A. Unless oil prices rise modestly, many western Canadian oil production facilities will continue to lose money and the oil industry will struggle to make the new investments that are necessary just to maintain production. Absent a dramatic increase in oil price, development of new oil projects in Western Canada has ended, eliminating the need for any major increase in new crude oil pipeline export capacity from Canada.

### III. WESTERN CANADIAN HISTORICAL PRODUCTION AND FORECASTS INDICATE THAT FUTURE INCREASES IN OIL SUPPLY FOR EXPORT WILL BE LIMITED

## 12Q. Please describe your review of data and forecasts related to crude oil production and supply in western Canada.

A. I have reviewed both the historical and forecasts of crude oil production and supply in the Western Canadian Sedimentary Basin (WCSB), including forecasts by the CAPP and the NEB. Production is defined as the total volume of crude oil produced in the WCSB. Supply is defined as the amount of this crude oil that is available to sell to distant customers, after taking account of refinery demand in the WCSB.

With regard to the CAPP data and forecasts, I have reviewed the data and forecasts for 2016. Attachment LS-4. This data includes both historical data of actual production and supply and forecasts of production and supply. Section 1.1 of the 2016 CAPP report states that its supply forecasts are based on a survey of its members and describes this survey as follows:

The oil sands component of the forecast is based on CAPP's 2016 survey of all oil sands producers for the following data:

a) expected production for each project;

b) upgraded light crude oil production; and

c) volumes of upgraded crude oil and condensate used as diluent required to move the volumes to market.

This means that the CAPP forecasts are essentially based on the production plans of CAPP's member companies. The survey encompasses conventional crude oil production, bitumen and synthetic crude oil production, and fracked oil production from the Canadian Bakken Formation.

According to the CAPP reports, "supply" is calculated by first estimating total western Canadian production, which is the gross volume of petroleum produced by mines and wells, and then subtracting western Canadian refinery demand for this oil. Thus, the term "supply" is defined as the amount of petroleum available for transport from producing areas in western Canada to customers outside of this region. It does not necessarily mean the volume of crude oil exported to the U.S. or the volume of Canadian crude oil that is actually refined into finished petroleum products in the U.S.

#### 13Q. What conclusions do you draw from your review of the CAPP supply forecasts?

A. CAPP makes predictions every year concerning the number of barrels that it believes will be available as supply in subsequent years. The most recent report at the time that my testimony is due is the 2016 CAPP Report. The 2017 CAPP Report will be released in June 2017, such that I reserve the right to update my testimony on direct examination. The 2016 CAPP Report estimates that supply will increase from 3,981,000 barrels per day (bpd) in 2015 to 4,569,000 bpd by 2020, which is an increase of 588,000 bpd, and to 4,872,000 bpd by 2025, which is an increase of 891,000 bpd.

Since the CAPP June 2016 forecasts are based on its member companies' production forecasts from the beginning of 2016, which assumed rising oil prices through 2017, the accuracy of the CAPP 2016 forecasts fail to take into account continued low oil prices and are subject to the systemic bias inherent in these member forecasts. It seems

likely that the CAPP member forecasts are biased by a variety of factors, including their need to satisfy shareholders and attract potential investors. Thus, the CAPP member forecasts are likely biased towards an optimistic assessment of future production. CAPP is a trade association formed to advance the interests of its members. Therefore, it is reasonable to expect that its forecasts of crude oil supply in western Canada would tend toward optimism and would generally be biased toward supporting a need for rapid pipeline development.

### 14Q. What conclusions do you draw from your review of the National Energy Board of Canada production and supply forecast?

A. The National Energy Board of Canada ("NEB") data shows that average western Canadian crude oil production in 2016 averaged 34,199 bpd less than in 2015, due in part to the fires in Alberta. Attachment LS-17. The NEB forecasts that <u>average</u> production in 2017 will be 160,344 bpd higher in 2017 than in 2016, on the expectation that there will be no significant disruption in supply, such as the fires. *Id.* This being said, peak production in 2017 is forecast to be less than the peak in 2016. *Id.* In fact, production in December 2017 is projected to be about the same as during the summer of 2015. *Id.* 



Even though the industry expects new production capacity to come online in 2017, the NEB nonetheless forecasts an overall net decline in production during 2017, from 4.04 million bpd in January to 3.88 million bpd in December. Since the NEB's forecast cannot assume that major unexpected disruptions will occur, such as the 2016

wildfires and outage of the Syncrude upgrader, the forecast must instead assume that some other causes, such as operational issues and/or production depletion at existing projects, will reduce oil production in western Canada. The disparity between the industry's plans for new project capacity relative to the NEB's forecast of falling total western Canadian production suggests that maintaining production in Canada may require more investment than currently planned.

### IV. CURRENT AND PROPOSED CANADA TO U.S. IMPORT PIPELINE CAPACITY AND UTILIZATION

# 15Q. Please describe your review of data related to the current pipeline capacity available to Canadian petroleum producers to export crude oil from western Canada.

- A. I have reviewed data on current export pipeline capacity and utilization provided by pipeline companies either online or in filings to the Federal Energy Regulatory Commission ("FERC"). According to Enbridge's 2016 Pipeline System Configuration sheet (Attachment LS-18), the Enbridge Mainline System comprises the following six separate pipelines that cross the border from Canada into the US:
  - Enbridge Line 1 236,500 bpd
  - Enbridge Line 2a/b 442,200 bpd
  - Enbridge Line 3 390,000 bpd
  - Enbridge Line 4 795,700 bpd
  - Enbridge Line 65 185,600 bpd
  - Enbridge Line 67 800,000 bpd

Thus, the total current import capacity of the Mainline System is 2,850,000 bpd. These capacities are the annual nominal capacities of these pipelines, which is the average sustainable transportation rate over a year.

A number of other major pipelines also export crude oil from Canada to the U.S., including:

- Spectra Energy's Express-Platte Pipeline 280,000 bpd into Montana; approximately 145,000 bpd into Wood River, Illinois, on the Platte Pipeline
- Kinder Morgan's Trans Mountain Pipeline 300,000 bpd total, with a connection to the 180,000 bpd Puget Sound Pipeline into Washington State and the balance continuing on to Vancouver; and
- TransCanada's Keystone Pipeline 591,000 bpd.

*Id.* Thus total pipeline capacity from producing areas in western Canada to the U.S. and British Columbia is 4,021,000 bpd, and of this total volume, pipelines can deliver 3,586,000 bpd into the upper Midwest, from where a number of pipelines provide transportation services to Oklahoma and the Gulf Coast. In addition, it is possible that a relatively small amount of crude oil is or could be imported to the U.S. on smaller pipelines from Canada into Montana, including an 85,000 bpd connection in Glacier County, Montana, between the Rangeland Pipeline and the Rocky Mountain Pipeline System, both owned by Plains All American Pipeline, L.P., for import into PADD 4, comprised of one 12-inch and one 8-inch pipeline. *Id*.

## 16Q. Please describe your review of data related to the utilization of pipelines used to import oil from Canada to the U.S.

A. Actual imports of crude oil by pipeline into the U.S. are reported by pipeline companies to the FERC on quarterly Form 6 Reports. I have reviewed data from these reports from the first quarter of 2007 to the fourth quarter of 2016 (the most recent). FERC collects this data as part of the tariff setting process for these pipelines. Full Form 6 reports are available online at www.ferc.gov in the eLibrary. A spreadsheet that compiles this data for each pipeline is included as Attachment LS-19. The data in the spreadsheet is illustrated in the chart, below.



# 17Q. What conclusions do you draw from your review of data related to the utilization of existing pipelines that import oil from Canada to the U.S.?

A. As of the fourth quarter of 2016, existing export pipelines operated at 90% of capacity and had approximately 400,000 bpd of combined unused capacity. *Id.* The pipeline industry generally assumes that operation up to 95% of capacity is within normal operations. This suggests that up to about 200,000 bpd of possible future expansions of supply for export from Canada can be accommodated by existing pipelines. When determining the need for the Keystone XL Pipeline, this unused existing capacity should be taken into account.

#### 18Q. Does underutilization of pipelines have adverse economic impacts?

A. Construction of excess utility infrastructure absolutely has adverse economic impacts. Costs incurred to permit, construct, and build a pipeline impact the costs of the transportation of the crude oil. These costs are typically included by FERC in crude oil pipeline tariffs.

Increased pipeline tariff costs impact the price of crude oil and refined products. While crude oil and refined product pricing is set by indices, these indices are actually established by surveys done of various sellers and buyers of the commodity on a monthly basis. These buyers and sellers are surveyed with regard to the price of their oil at various locations that are used as market centers, such as Cushing, Oklahoma. When purchases are negotiated, there are usually "differentials" taken into account that actually apply to the cost of transporting the oil to the nearest market center. These negotiated prices, with the cost of transportation taken into account, are the prices that are reflected in the surveys and ultimately included in the average price of oil for the month. A similar process exists for refined products. Therefore, an increase in transportation costs also increases the market price for crude oil and refined products, such that the oil industry's cost of doing business is passed on to consumers in the form of fuel price increases.

# **19Q.** Have you reviewed data related to other proposed pipelines that, if built, could transport crude oil from western Canada to other markets?

- A. Yes, I have reviewed information about the following competing pipeline projects:
  - Kinder Morgan Trans Mountain Expansion Project from Alberta to Vancouver, British Columbia – net increase of 590,000 bpd;
  - Enbridge Line 3 Replacement Project from Alberta to Wisconsin net increase of 370,000 bpd, but up to 525,000 bpd with additional pumps;
  - TransCanada Energy East Project from Alberta to St. John, Newfoundland net increase of 1,100,000 bpd.

Attachment LS-20.

## 20Q. What conclusions do you make from your review of information related to these proposed pipelines?

- A. Should any one of these competing projects be constructed, there would be excess capacity indefinitely, because it is unlikely that enough production growth would occur to fill any of these proposed pipelines. This means that construction of a second new pipeline, such as the Keystone XL Pipeline, would be entirely redundant.
- 21Q. Is the Keystone XL Pipeline more or less likely to be built than these other pipelines?
  - 25

A. Statements made by TransCanada senior management in its May 5, 2017, Earnings Call (transcript attached as Attachment LS-21) indicate that TransCanada has put the Keystone XL Project on hold and that the shippers who originally contracted for capacity on the Project are waiting to see if other competing pipelines will be built.

Specifically, Russell Girling, the CEO of TransCanada stated: ""In addition, we are updating our shipping contracts for the project and we anticipate that the core contract shipper group will be modified somewhat and include the introduction of new shippers and the reductions in volume commitments by other shippers." *Id.* This statement indicates that TransCanada's shippers are no longer contractually bound to ship specific volumes of oil on the Project for specific durations in years.

Paul Miller, the Executive Vice-President of TransCanada and President of the Liquids Pipelines subsidiary of TransCanada, stated:

- "The key work streams I guess, there's two primary work streams that being securing the commercial support for Keystone XL and the Nebraska Public Service Commission approval for the route through that state. In regard to the shipping contracts, we're making progress with our existing shipping group, as well as new entrants, as they work through their analysis and the documentation. A lot has changed since we were first denied the permits here in 2015 in regard to crude oil pricing and supply and various competitive alternatives, so they continue to work through that and I anticipate it will take a couple of months yet before we sum up our commercial support."
- "We will work through Nebraska. We will work through our commercial negotiations with the shippers, and once we have certainty on both, in early 2018 I would anticipate we would start staging the project as far as securing what material we still have to secure as well as the contractors, and that exercise will take upwards of six to nine months. So I would not see construction started until Q3 timeframe of 2018, and construction would take probably little over two years."
- "We do anticipate, ultimately, while we are targeting to secure the volume contracted volume we had previously as we move potentially move forward

with Keystone XL, I do anticipate some of the current shippers will increase their commitments. I also anticipate some of the current shippers may decrease their commitments as they look at their total transportation requirement. I would also anticipate that we will introduce new parties into the shipper group. So the net result of this is we do anticipate to have contractual support similar to what we enjoyed previously, albeit amongst the different shipper group.

- [90% of the capacity is] what we'll be targeting. Our goal is to fully contract XL, as you know, we have to set aside some capacity for the spot shippers and we'll certainly do that. And, our total will our total remains competitive, notwithstanding the delay and we will with good CapEx, cost management, Russ talked about, we will keep our total in line."
- *Id.* These statements suggest the following conclusions:
  - That senior management admits that the Project shippers may reduce or transfer capacity commitments to potential new shippers indicates that the Project shippers have the option to terminate their contracts.
  - That senior management does not expect to resolve its shipper commitments until "early 2018" indicates that its shippers are waiting to re-commit to the Project until after there is greater clarity on the future of the Kinder Morgan Trans Mountain Expansion Project and the Enbridge Line 3 Replacement Project. This timing will also allow the shippers to determine if oil prices will have risen as predicted by some industry analysts, to the degree needed to economically justify new investments in western Canadian oil extraction infrastructure.
  - That senior management admits that the Project would not secure remaining material and contractors until early 2018, and would not finish this process until six to nine months later indicates that the construction contracts and remaining procurement contracts for the Project have been terminated.
  - Mr. Miller's self-correction in the following statement is telling: "We do anticipate, ultimately, while we are targeting to secure the volume contracted volume we had previously as we move <u>potentially move forward</u> with Keystone XL...." (emphasis added.) This correction clarifies that TransCanada is not

currently committed to construct the Project but rather this decision will be made in early 2018.

In sum, it appears from the foregoing statements that the Project is on hold until early 2018, by which time TransCanada and its shippers hope to have sufficient information to decide on whether to construct or terminate the Project. Should the construction of either the Trans Mountain Expansion Project or the Line 3 Replacement Project appear likely, there would be no need for the Keystone XL Pipeline. Thus, it appears that western Canadian crude oil shippers are treating the Keystone XL Project as a possible fallback option if other pipelines are not built, but only if market conditions improve enough to support investment in production growth.

### V. KEYSTONE XL WILL EXACERBATE AN ONGOING GLUT OF OIL IN CUSHING AND THE GULF COAST AND IS NOT NEEDED

### 22Q. Please describe your review of data related to crude oil in storage in Cushing, Oklahoma, and the US Gulf Coast.

A. I have reviewed: (a) crude oil storage data provided by the USEIA and (b) US crude oil production forecasts by Rystad. In combination, this data shows that oil supply in storage in the major crude oil trading hub of Cushing, Oklahoma, and in the U.S. Gulf Coast, is at record levels constituting a glut, why this has happened, and why constructing the Keystone XL Pipeline will exacerbate this situation.

## 23Q. Please describe your review of data related to pipeline capacity into and out of Cushing, Oklahoma, and any conclusions you might draw from this review.

A. There are currently 18 pipelines flowing crude oil into Cushing, with a total capacity of 3.6 million bpd. Attachment LS-22. There are however only 15 pipelines with a capacity of nearly 2.7 million bpd carrying crude out of the storage hub. *Id.* Therefore, the net inbound capacity is 841,000 bpd. *Id.* One of the inbound pipelines into Cushing is the existing "Keystone Extension Pipeline," which is a 36" crude oil pipeline from Steele City, Nebraska, to Cushing, Oklahoma, with a maximum capacity of 830,000 bpd (identical to the Project). This pipeline is identified at "Phase 2" on the following map.



The Keystone Extension receives crude oil at Steele City only from TransCanada's existing 591,000 bpd Keystone Pipeline (Base Keystone Pipeline), which is identified as "Phase 1" on the above map. The Base Keystone Pipeline continues to Patoka, Illinois. TransCanada has firm contracts for 375,000 bpd of Base Keystone Pipeline capacity for delivery of crude oil to Illinois, 155,000 bpd of contracted capacity for delivery to Cushing, and the remaining 61,000 bpd of capacity is not contractually committed and instead is reserved for uncommitted shippers, such that it could be used for deliveries to either destination. Attachment LS-23. TransCanada's first open season sold 340,000 bpd of capacity to Wood River, Illinois. *Id.* Next, it announced that it had contracted another 35,000 bpd of capacity through negotiations. *Id.* Following an open season for the Keystone Expansion Project to Cushing, TransCanada announced that it had secured a total of 530,000 bpd of committed capacity on the Keystone System, such that shippers entered into contracts for an additional 155,000 bpd during this open season. *Id.* Therefore, assuming that shippers continue to seek delivery of oil to their original contracted destinations, the maximum amount of crude oil that could currently be

transported to Cushing on the Keystone Extension is 215,000 bpd (155,000 bpd plus 61,000 bpd). *Id.* 

Should the Project be constructed, TransCanada would operate the 30-inch diameter Base Keystone Pipeline separately from its 36-inch pipeline network that would include the Project, the Keystone Extension Pipeline, and its Gulf Coast Pipeline. This means that if the Project is built, TransCanada could deliver up to 830,000 bpd of crude oil into Cushing, a net increase of at least 615,000 bpd over the current available capacity. This means that, if the Project is built, total inbound pipeline capacity to Cushing would be approximately 4.2 million bpd, as compared to total outbound capacity of 2.7 million bpd, leaving a net inbound capacity of approximately 1.45 million bpd. Additional crude oil supply in this region would likely suppress oil prices further, resulting in suppression of petroleum development in the Tar Sands Region, as well as increased storage of unneeded crude oil in Oklahoma, which is discussed below.

# 24Q. Please describe your review of data related to pipeline capacity into and out of the US Gulf Coast region, and any conclusions you might draw from this review.

- **A.** For many years the only major crude oil pipeline that transported crude oil from north to south was the Pegasus Pipeline. In recent years, a number of pipelines have been constructed that also transport crude oil to the south (Attachment LS-24), including:
  - the Seaway and Seaway Twin Pipelines came online starting in 2012 with a maximum capacity of 850,000 bpd;
  - the TransCanada Marketlink (Gulf Coast) Pipeline came online in 2014 with an initial capacity of 400,000 bpd and a maximum capacity of 500,000 bpd; and
  - the recently completed Energy Transfer Crude Oil Pipeline (ETCO Pipeline) from the Patoka Terminal in southern Illinois to Nederland, Texas, which has a capacity that is expandable to 450,000 bpd, is expected to start commercial operations in June 2017.

Thus, in the past five years, the crude oil pipeline industry has constructed at least 1.7 million bpd of new capacity from the Midwest to the Gulf Coast. In addition, a large number of pipelines transport oil from fields in Louisiana, New Mexico, Texas, and

offshore oil locations to US Gulf Coast markets. Further, the US Gulf Coast has the capacity to import crude oil via supertanker from global markets. As a consequence, US Gulf Coast refineries do not need greater access to increased volumes of heavy Canadian crude oil.

- 25Q. Please describe your review of data related to crude oil storage in the Cushing and US Gulf Coast petroleum markets, and any conclusions you draw from this data?
- A. I have reviewed USEIA data related to crude oil storage in the Cushing and Gulf Coast regions. Attachment LS-25. Crude oil in storage has been building steadily in Cushing and the Gulf Coast since 2015, and has consistently set new records. *Id.* At the beginning of April, Cushing and Gulf Coast crude oil storage combined was in excess of 350 million barrels. *Id.* These are historic highs far in excess of anything previously seen. The USEIA data tracks crude oil storage at Cushing back to 2004. Prior to 2009, there was only rarely more than 25 million barrels stored at the hub. Storage levels surpassed 30 million barrels for the first time in January 2009. From 2015 to date, storage levels have remained consistently over 50 million barrels and in recent months have reached record highs of over 65 million barrels. *Id.* At the end of April this had eased only slightly to 66.7 million barrels. *Id.*



On the Gulf Coast, where Keystone XL crude oil would primarily be delivered, storage levels are also at record levels. *Id.* EIA data going back to 1990 shows that until mid-2015, levels fluctuated between 100 and 180 million barrels. *Id.* The 200-million-barrel level was first surpassed in March 2015 and storage levels have remained above that ever since, reaching an all-time high of just under 281 million barrels on March 31, 2017. *Id.* The glut in the Gulf Coast has built even as exports of crude oil have hit record levels. See Section VII, *supra*.



This crude oil storage data indicates that the Cushing and Gulf Coast markets are currently oversupplied with crude oil, such that there is no current need for additional inbound crude oil pipeline capacity into these markets.

- 26Q. What reasons exist for these record amounts of crude oil in storage, and what are the implications of this stored oil on whether or not additional crude oil supplies are likely to be needed in the Cushing and Gulf Coast markets?
- A. The record amounts of oil in storage in the Cushing and Gulf Coast markets are an indicator of a lack of demand for new crude oil supply to this region. The amount of oil in storage has increased because global oil production has exceeded global oil demand. As a result, some of the world's oil has ended up in storage tanks. The fact that supply growth has exceeded demand growth is suppressing oil prices. It is possible that eventually lower oil prices will result in lower oil production and higher oil prices, but so far this has not happened to the degree necessary to increase oil price to a profitable level for Canadian tar sands producers. Instead, the recent marginal increase in oil price has resulted in increased U.S. production from fracked oil fields, which increased production has, in turn, continued the oil glut and kept oil prices too low for increased Canadian

production. Since Canadian oil producers have some of the highest production costs in the world, increased production in Canada cannot happen until other lower cost oil producers are no longer able to increase their production to meet global oil demand. As long as lower cost producers can increase production to meet global demand, they will prevent new Canadian production from coming online.

The Gulf Coast refiners are well positioned to take advantage of oil supply from many of the world's suppliers and have no pressing requirement for additional access to Canadian supply. In fact, a look at projections for where production growth will likely come from in the coming decade suggests that the bulk of new supplies will come from producers in Texas, the Gulf of Mexico and other U.S. producers. Projections from Rystad Energy (Attachment LS-26) suggests that the U.S. will see substantial oil production growth in the coming decade.



The state with the most potential growth is Texas. Other leading areas include the Gulf of Mexico, the states of New Mexico, Oklahoma and Colorado, as well as North Dakota. The ongoing glut of oil in the Gulf Coast is only likely to continue as more U.S. supply dominates the market. Therefore, the potential for production growth from Canada is marginal and most at risk from lower oil prices.
This would indicate that Gulf Coast refiners have access to growing domestic sources of crude oil and that the ongoing glut of oil in this region is only likely to continue. While North Dakota is not a neighboring state, it is now directly connected to the Houston, Port Arthur markets via the Dakota Access and Energy Transfer Crude Oil Pipelines.

As long as the Gulf Coast market, the largest refining market in the U.S. and the world, remains well supplied with domestic and lower-cost overseas imported oil, the prospects of oil prices rising to support production growth in the Tar Sands Region are slim.

# VI. THE KEYSTONE XL PIPELINE IS NOT NEEDED BECAUSE DOMESTIC DEMAND FOR CRUDE OIL AND PETROLEUM PRODUCTS HAS BEEN STABLE AND IS NOT LIKELY TO GROW AND DOMESTIC CRUDE OIL PRODUCTION HAS FAR EXCEEDED ANY DEMAND GROWTH

# 27Q. Please describe your review of data related to consumer demand for refined petroleum products.

A. I have reviewed USEIA data related to consumer demand in Nebraska, the Midwest (PADD 2), the Gulf Coast (PADD 3), and the U.S. as a whole for refined petroleum products. Specifically, I have reviewed both the EIA's "Prime Supplier Sales Volumes" monthly data and the USEIA "product supplied" data, both from January 1983 to March 2017. Attachment LS-27.

The prime supplier data shows wholesale sales of refined petroleum products into local markets. Spreadsheets of data for Nebraska, PADD 2, PADD 3, and the U.S. as a whole and their USEIA explanatory notes for its demand survey are also included in Attachment LS-27. *Id.* The types of products reported in the "prime supplier" data include motor gasoline, aviation gasoline, jet fuel, propane, distillate and kerosene (diesel fuel), and residual fuel oil. PADD 2 states include North Dakota, South Dakota, Minnesota, Nebraska, Kansas, Oklahoma, Missouri, Iowa, Wisconsin, Illinois, Indiana, Michigan, Ohio, Kentucky and Tennessee. PADD 3 includes the states of New Mexico, Texas, Arkansas, Louisiana, Mississippi and Alabama. In addition, I have reviewed the USEIA "product supplied" dataset, which shows total sales of both fuel and non-fuel

petroleum products supplied to US markets. These reports are the basis of my research on recent consumer demand trends.

The EIA defines "prime supplier" as a "firm that produces, imports, or transports selected petroleum products across State boundaries and local marketing areas, and sells the product to local distributors, local retailers, or end users." According to the EIA "Definitions, Sources and Explanatory Notes" webpage for this data, the source for this data is EIA Form EIA-782<u>C</u> survey, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption." The Explanatory Notes for this data clarify that the "C" survey is intended to identify the sale of petroleum products <u>into local markets</u>. According to the EIA "Definitions, Sources and Explanatory Notes" website for the EIA's "product supplied" data, this data is also intended to report on all refinery output and not just sales for domestic consumption in specific regions. The "prime supplier" data focuses on consumer fuel sales and does not include specialty petroleum products, the USEIA product supplied data shows sales of all types of petroleum products, including those such as natural gas liquids that may be refined into fuels or used for other industrial processes.

The USEIA product supplied data shows the total volume of all types of petroleum products supplied to domestic buyers, including petroleum fuels, lubricants, waxes, petroleum coke, asphalt, and natural gas liquids. It is more comprehensive than the USEIA "prime supplier" data, but is not provided for individual states. I have reviewed the product supplied data for the US as a whole as well as data for PADDS 2 and 3. Although this data shows demand by domestic buyers, it is possible that some exported petrochemical products produced by U.S. petrochemical plants, such as materials used in plastics production, are included in this data.

# 28Q. What conclusions do you reach based on your review of data related to consumer demand in Nebraska for refined petroleum fuels?

**A.** Focusing in on the state of Nebraska, EIA data shows that the year with the highest petroleum fuel demand was 1998 at 112,636.5 bpd. *Id.* After reaching the peak, there

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was a decline in total refined petroleum products consumed, and for the past five years petroleum fuel demand in Nebraska has been stable at just under the record set by the historical high. *Id.* The following chart illustrates historical Nebraska demand for refined petroleum products. *Id.* 



There is no indication that sales of petroleum products in Nebraska are currently increasing. Instead, sales of petroleum products to Nebraska consumers have been stable for the past five years and remain below record levels set almost 20 years ago.

# 29Q. What conclusions do you reach based on your review of data related to demand in PADD 2 for petroleum products?

A. Expanding the review of the prime supplier data to PADD 2, the average consumer demand for refined petroleum fuels in the entire region also peaked in 2004 at an annual average sales demand of 4,183,000 bpd. *Id.* Since then it dropped below 4 Mbpd and then rose slightly but has been stable for the past 3 years at approximately 4 Mbpd. *Id.* The total increase in demand in PADD 2 between 2012 and 2016 was about 170,000 bpd,

but this increase occurred before 2014. *Id.* The following chart illustrates PADD 2 demand for refined petroleum products. *Id.* 



The USEIA product supplied data also shows that total petroleum products supplied in PADD 2 has been stable since 2014.



Thus, demand for petroleum fuels in PADD 2 is not growing and is well below historical peaks.

The modest 170,000 bpd increase in petroleum demand in PADD 2 since 2012 should be viewed in the context of crude oil production in this region during this same period (PADD 2 crude oil production data provided in Attachment LS-28. In 2012, average crude oil production in PADD 2 was 1,121,000 bpd, and in 2016 average crude oil production was 1,678,000 bpd, an increase of 557,000 bpd. *Id.* This being said, crude oil production since 2010 has increased by about 1 million bpd. *Id.* Thus, increased crude oil production in PADD has far outstripped the modest increase in demand since 2012.



PADD 2 petroleum demand does not itself justify additional import pipeline capacity from Canada.

# 30Q. What conclusions do you reach based on your review of data related to demand in PADD 3 for petroleum products?

A. The USEIA prime supplier data shows that PADD 3 demand for petroleum fuel increased by about 300,000 bpd between 2012 and 2016. Attachment LS-27. This is an average growth rate during this period of just under 3% per year, but the rate dropped to 1.4% in 2016. *Id*.



The USEIA product supplied data shows a similar trend with total product supplied increasing by about 387,000 bpd from 2012 to 2016, by an average of 1.9% per year, though the volume supplied has been stable since mid-2015. *Id*.



Likely, much of this increased demand is related to fuel demand by the fracking industry in PADD 3. Fracked wells require substantial amounts of fuel during both the fracking process and ongoing operations.

The increase in petroleum demand in PADD 3 should be viewed in the context of crude oil production during this period. In 2012, average crude oil production in PADD 3 was 3,775,917 bpd, and in 2016 average crude oil production was 5,472,500 bpd, an increase of 1,696,583 bpd. Attachment LS-28.



Thus, while PADD 3 refined petroleum fuel consumption increased by a bit over 300,000 bpd between 2012 and 2016, and total product supplied increased by 387,000 bpd during this same period, crude oil production increased by 1,700,000 bpd. It is clear that refineries in PADD 3 did not need Canadian crude oil to meet increased PADD 3 domestic fuel demand.

# 31Q. What conclusions do you reach based on your review of data related to consumer demand in the U.S. as a whole for refined petroleum products?

A. The EIA prime supplier data shows that 2007 was the peak year for average annual wholesale petroleum fuel sales in the U.S. as a whole, at 15,948,542 bpd. Attachment LS-27. In comparison, sales in 2016 averaged 15,137,539.7, which is 5.1% less than the record high. *Id.* Although the volume of petroleum fuel sales increased when oil prices started dropping in late 2014, they have been stable since late 2014. *Id.* Thus, this data shows that US consumer demand for petroleum fuels has not been increasing. The following chart illustrates total U.S. demand for refined petroleum products. *Id.* 



The USEIA's "product supplied" data for the entire U.S. data shows that total U.S. demand for petroleum products peaked in 2005 at 20,799,300 bpd. *Id.* In 2016, US demand for petroleum products averaged 19,631,600 bpd, which is 5.6% below the peak year. *Id.* This data is similar to the trends shown in the prime supplier data. Total product supplied in the U.S. has been stable since mid-2015. Since 2012, total product supplied has increased by about 228,000 bpd, or on average about 60,000 bpd per year, representing an average growth rate of about 0.3%, but all of this increase happened before 2015. *Id.* Thus, total U.S. demand for petroleum products is not increasing.



But, this increase in demand should be viewed in light of the net increase in US crude oil production during this time. The following chart of USEIA crude oil production data shows that total US crude oil production increased by an average of 478,000 bpd each year during this period – even accounting for the drop in production since 2015. Attachment LS-28. This is more than double the growth of total US petroleum product demand during this same time.



## 32Q. Have you reviewed any information related to future petroleum demand?

A. Yes, I am aware of growing evidence that U.S. oil demand will cease to grow in the near future. The following charts shows how USEIA petroleum demand forecasts have changed over the past 14 years. Attachment LS-29.



There is a growing convergence of expert opinion that a peak in global demand for oil is now in sight. An accelerating energy market disruption from electric vehicle technology, rapidly improving vehicle fuel efficiency, regulatory measures to address climate change, and the increased adoption of ridesharing and autonomous vehicle technology, are expected to contribute to a peak and decline in U.S. oil demand. Energy market and auto industry analysts are increasingly predicting a rapid, exponential increase in the uptake of Electric Vehicles (EVs), rather than slow linear growth. The expected pattern of sudden technological disruption has been seen in recent years in the sudden and widespread adoption of smart phones, and more recently in the dramatic fall in the cost of solar photovoltaic (PV) panels. There is now compelling evidence that EV adoption is following a similar pattern as a result of the rapid decline in the cost of batteries as manufacturing economies of scale are reached. The following charts show forecasts of battery manufacturing capacity and costs. Attachment LS-30.



Global battery manufacturing capacity is set to more than double by 2021

Source: Bloomberg New Energy Finance

**Battery Boom** 



A sudden transition in transportation could mean that EVs could overtake internal combustion engines rapidly. Investment Bank UBS predicts that EVs will reach price parity with standard internal combustion models next year, far earlier than had been previously assumed. Attachment LS-31. This is also the finding of a new report from Bloomberg New Energy Finance. Id. Price parity is widely seen as the tipping point at which consumers rapidly shift towards buying EVs over traditional internal combustion engines. An analysis from Carbon Tracker Initiative and Imperial College modelled potential EV penetration using up-to-date cost estimates, with no regulatory change, and projected EVs would account for 55% of global passenger vehicles by 2040. Id.

After years of reluctance, vehicle manufacturers are now announcing aggressive plans for the electrification of their product lines. Id. Driven by growing competition

from Tesla Motors, major U.S. carmakers Ford and GM have both announced new strategies embracing electrification of passenger vehicles. Id. VW plans to sell 1 million EVs by 2025, Volvo has said it will stop developing diesel engines and focus on electric drivetrains, and a number of new electric vehicle manufactures are competing for market share in China. Id. Tesla's Model S is already outselling all other luxury sedans in the U.S. and plans to sell 500,000 of its new Model 3 cars by the end of 2018. Id. Energy consultancy Wood McKenzie estimates that U.S. gasoline demand will reach a peak in 2018 as result of dramatic vehicle efficiency improvements, and continue to improve thereafter due to a shift to hybrid and electric drivetrains. *Id.* The USEIA Annual Energy Outlook 2017 predicts declining U.S. energy use from light-duty vehicles between 2018-2040. Id. Their model forecasts that gasoline consumption from light duty vehicles is expected to drop from 8.7 million barrels per day in 2017 to 7.5 over just the next 8 years. Id. Passenger cars in 2015 averaged 31 miles per gallon (on-road mpg), with improved fleet-wide standards already adopted by the industry, this number is expected to reach 45mpg by 2025. Id. Energy efficiency improvements in vehicles are expected to progress faster than the average increase in miles travelled each year. Id.

Emerging technological and social trends are facilitating rapid uptake of urban car sharing, ride sharing, and a shift towards vehicle automation. These interconnected changes have the potential to further reduce oil demand by reducing private car ownership, facilitating further design efficiency improvements, and improving driver fuel economy performance. These trends are expected to increase the average number of passengers per vehicle, allowing the average per person distance travelled to increase without increasing the absolute distance vehicle travel. Improving the efficiency of passenger vehicles to move people over time.

If oil prices rise to a level needed to re-start the boom in tar sands production (\$77 per barrel for SAGD projects and \$108 per barrel for mining projects), these prices would once again drive down fuel demand, in large part because poorer consumers could not afford to drive as much. Reduced consumer demand would, in turn, once again, force the price of crude oil down to affordable levels, which would be too low to support tar sands production.

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Various energy industry players are debating the projected timing of peak oil demand, but many now acknowledge that it is a question of when, not if it will occur. The uncertainty around timing depends primarily around assumptions on the speed at which EVs replace internal combustion engine technology in vehicles, as well as the degree to which growth occurs in the non-transportation petrochemical industry. Major oil companies now acknowledge an impending end to growth in global oil demand. Royal Dutch Shell and Statoil have predicted that peak global oil demand could come within the next decade. Total SA has said that it now expects a peak in global oil demand by the 2030s, as a result of EVs accounting for a third of new-car sales by the end of the next decade.

As the rate of increase in petroleum demand slows and then falls, the need for new petroleum infrastructure, such as crude oil pipelines, is ending. Investment in the Keystone XL Pipeline is likely to be wasted.

# VII. THE KEYSTONE XL PIPELINE IS NOT NEEDED BY NEBRASKA OR THE U.S., BECAUSE IT WILL BE USED TO INCREASE EXPORTS TO FOREIGN MARKETS

### 33Q. Have you reviewed data related to U.S. exports of all types of petroleum?

A. I have reviewed the USEIA data related to exports of crude oil and petroleum products from the U.S. and PADD 3, and for specific ports on the Gulf Coast. Attachments LS-32 and 33.

### 34Q. What does the USEIA data show?

A. Exports of crude oil and petroleum products from the U.S. have grown by over 5 million bpd since 2006, primarily in the form of finished petroleum products. Attachments LS-32. In February 2017, total exports spiked to 6,443,000 bpd, a month-over-month increase of 752,000 bpd over January 2017, and a year-over-year increase of 1.5 million bpd relative to February 2016. *Id.* About half of this increase was exports of crude oil and most of the rest was of refined petroleum products. *Id.*

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Since crude oil is blended during refining, exported finished petroleum products and the "other liquids" category (partially refined products) are likely produced from a mix of domestic and imported oil. The exported crude oil and natural gas liquids are produced from wells in the U.S. and do not include exports of crude oil transshipped through the U.S. from Canada.

The USEIA divides the United States into five regions for analysis of petroleum industry data. These regions are called Petroleum Administration for Defense Districts or PADDs. PADD 3 comprises Gulf Coast states including Texas, Louisiana, Mississippi, Alabama, as well as Arkansas and New Mexico, and is generally considered as the Gulf Coast region. PADD 3 has the largest refining capacity of all the PADDs, primarily located in Texas and Louisiana, and is in fact one of the largest refining centers in the world, with over 8 % of global refining capacity. In February 2017, exports from the PADD 3 accounted for 78% of total exports from the U.S. *Id.* Of this, PADD 3 exports accounted for 80% of finished petroleum products, 78% of exported crude oil, 73% of exported natural gas liquids, and 79 % of other liquids. *Id.* In 2016, nearly 40 % of PADD 3 refining capacity was dedicated to product export. *Id.* With an annual average

of 3.6 million barrels per day (BPD) of products exported in 2016, the PADD 3 region's exports have grown more than threefold since 2006. *Id.* The export spike in February 2017 is 730 % higher than average exports in 2006. The following chart shows PADD 3 petroleum exports relative to total petroleum exports from the U.S. *Id.* 



The data clearly shows that petroleum product exports from the wider Gulf Coast region have grown over 400 % since 2006, with 2016 average exports being 444 % higher than 2006 average exports. *Id.* The export spike in February 2017 is 730 % higher than average exports in 2006. *Id.* 

However, breaking that data down to the Texas Gulf Coast sub-region reveals that the very region Keystone XL would serve is leading the export drive, with the majority of production exported. Data requested from EIA on exports by Gulf Coast port enables a correlation with EIA website data for refinery production by refinery sub-region. Attachment LS-33. This port-specific data provides a closer look at exports from the ports of Houston/Galveston and Port Arthur, those most relevant for Keystone XL. Keystone XL would deliver crude oil to a terminal in Nederland, Texas. This terminal is located north of Port Arthur, where several large refineries are also located. Nederland is east of Houston, where several refineries are located on the eastern side of the city. TransCanada recently completed a pipeline linking the Nederland Terminal to Houston, with a view to accessing refineries in the Houston and Texas City area. I studied petroleum product export data from the ports of Port Arthur, Houston and Galveston. These last two are presented together in the EIA data and capture exports from Houston, Galveston and Texas City refineries. Petroleum product exports from these ports represent a much higher proportion of the sub-region's refinery production than in the wider PADD 3 region. *Id.* 

The data indicates that many of the refineries in the Port Arthur, Houston, Texas City and Galveston area are exporting most of their production. *Id.* In 2016, exports from these ports accounted for 74 % of Texas Gulf Coast refinery production, up from 51% in 2013. *Id.* 



In 2016, finished gasoline exports accounted for 87% of the finished gasoline produced in the region's refineries. *Id.* Including all gasoline additives and ethanol refined and

Key Products (thousand BPD)	Exports	Production	Percentage Exported
Finished Gasoline	353	407	87%
Finished Gasoline + Blending Agents	491	762	64%
Diesel	578	1,260	46%

blended in the region, exports account for 64% of gasoline related products. *Id.* Diesel exports account for 46% of the diesel produced in the region's refineries. *Id.* 

The high proportion of refinery product exports from this region indicate that Keystone XL would primarily serve a refining market that is focused on exports. These refineries are not serving U.S. energy needs, but rather global markets for petroleum products.

The State of Nebraska would bear the risks of hosting the pipeline without any clear benefit for the state or the nation. The project therefore serves the interests of the companies profiting from the extraction, transportation, refining and export of the crude carried by the project and not the wider American public.

## VIII. THE PUBLIC INTEREST AND PUBLIC BENEFITS OF THE PROPOSED KEYSTONE XL PIPELINE

- 35Q. Based on your review of information about the Project, what conclusions do you draw about whether or not construction of the Keystone XL Pipeline in any route is in the public interest?
- A. A pipeline that is not needed is not in the public interest, regardless of where it is built. The evidence shows that western Canadian oil economics does not currently support expansion of oil extraction facilities in Canada, and therefore also does not support construction of new crude oil pipeline export pipeline capacity from Canada. Moreover, trends in crude oil price and increasingly affordable transportation alternatives to internal combustion engines indicate that the long-term prospects for the oil industry are bleak, particularly for the Canadian tar sands industry because it is the high-cost producer in the

global oil market. Even if there is a short-lived near-term need for increased export 1018 capacity from Canada that cannot be met via existing crude oil transportation capacity, 1019 there is a substantial risk that a different pipeline will be permitted to meet any limited 1020 demand and that such pipeline would not serve stagnant consumer demand in Nebraska 1021 or the U.S., but rather would be used to grow the oil industry's skyrocketing overseas 1022 exports. As such, there is no public benefit to imposing a route for the Keystone XL 1023 Pipeline on landowners in Nebraska, and the Keystone XL Pipeline is not in the public 1024 1025 interest.

1026 **36Q.** Does this conclude your testimony?

1027 A. Yes, subject to updates to account for more recent data that should be available between
1028 the date of this testimony and the date of my testimony at the forthcoming Nebraska
1029 Public Service Commission hearing.

1030

Lorne Stockman

Subscribed and Sworn to before me this day of June, 2017.

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CRYSTAL LYNN LAMOY
NOTARY PUBLIC
Commonwealth of Virginia
Reg. #7695368
My Commission Expires May 31, 2020

[Seal]

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# **ATTACHMENT LS-1**

## LORNE STOCKMAN – CURRICULUM VITAE

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## **KEY SKILLS**

### **Research and Analysis:**

- 20 years' experience of research and analysis for environmental & social justice campaigns;
- 20 years' experience working on energy, oil and gas, climate and social justice issues;
- Ten years researching and analyzing the North American oil and gas industry with a priority focus on the Canadian tar sands sector and related infrastructure;
- Ability to identify core issues and their solutions and formulate strategy to achieve goals;
- Clear communication: strong writing ability for a variety of formats and audiences;
- Ability to package technical information in an accessible format;
- Ability to manage consultants and multiple simultaneous research projects.

Substantive Issues: analysis of a range of environmental and social justice issues particularly:

- Climate change and energy, political economy of oil, transitions in energy markets, energy security, financial risk, extractive industries and development, pipelines and major energy infrastructure projects, addressing the domination of fossil fuels in the energy mix;
- Human rights, social justice and environment & development;
- Political economy of development and trade issues;
- Working knowledge of international environmental policy instruments and institutions.

## EDUCATION

- **MA Environment and Development** Kings College, London and the School of Oriental and African Studies, University of London.
- BSc (Hons.) Social Research and Human Geography University of North London.

## EXPERIENCE

## Research and Analysis:

- Research Director and Senior Analyst at Oil Change International since February 2011.
- Freelance Researcher: research, analysis and publication on a range of issues surrounding tar sands production including: the regulatory, legal and financial risks faced by investors, the macroeconomic threats to tar sands production growth, U.S. energy security, tar sands and pipeline infrastructure, analysis of U.S. refined product export trade, analysis of the carbon intensity of oil company reserves, analysis of the carbon footprint of pipeline infrastructure, chain of custody research. Working with Sierra Club, Natural Resources Defense Council, Greenpeace, Platform, Oil Change International, Corporate Ethics International, Friends of the Earth.
- Research into the role of U.K. and U.S. governments in the ongoing conflict over access to oil resources in the Niger Delta. Platform.
- Research into impacts of World Bank funding for extractives industries. Platform.
- Research and review on UK implementation of the Kimberley Agreement to control the trade in conflict diamonds. UK diamond market research and participant observation in major diamond retail outlets to observe and report on staff reaction to customer enquiries. ActionAid.

- Investigative research into government and industry support for research into deep ocean disposal of CO<sub>2</sub> for Greenpeace International.
- Research into oil industry responses to campaign pressure for Climate Initiative Fund.
- Comprehensive study of water resource issues in Tibet carried out for the Tibetan government-in-exile.
- Preliminary research for report on Environment & Minorities for Minority Rights Group: Investigated potential case studies, authors and review readers.
- Report on impact of war on minority children in Somalia for Minority Rights Group and UNICEF.

## PUBLICATIONS

- Numerous blogs and articles at: http://priceofoil.org/author/lorne/
- Stockman, L. (2017) *Gas Pipeline Climate Methodology: Calculating Greenhouse Gas Emissions for Natural Gas Infrastructure* and series of Gas Pipeline GHG Emissions Briefings. Oil Change International
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# **ATTACHMENT LS-2**



# **OIL SANDS 101: PROCESS OVERVIEW**

OVERVIEW (/TECHNICAL/?CATEGORY=OVERVIEW)

There are two ways to **extract bitumen** from the oil sands: either **mine** the entire deposit and gravity separate the bitumen, or extract the bitumen in-place (or **in-situ**) using steam without disturbing the land. The technique used depends on the depth of the deposit.

About 10% of the world's oil reserves (http://www.oilsandsmagazine.com/energy-statistics/global-oil-supplydemand-reserves#reserves) are located in the **Alberta oil sands**. These deposits are estimated to hold almost 2 trillion barrels of oil, but less than 10% (about 166 billion barrels) are recoverable with current technology. Over 96% of Canada's total oil reserves are contained in the oil sands.

**Oil sands** are a loose sand deposit which contain a very viscous form of petroleum known as **bitumen**. Oil sands are actually found all over the world and are sometimes referred to as **tar sands** or **bituminous sands**.

Alberta's oil sands contain on average about 10% **bitumen**, 5% **water** and 85% **solids**. Most of the solids are coarse silica sand. Oil sands also contain fine solids and clays, typically in the range of 10-30% by weight.

**Bitumen** is a heavy complex hydrocarbon, contained within the oil sands deposit. Bitumen is almost solid at room temperature and has a tar-like consistency. As will all heavy oils in general, Alberta bitumen has a relatively higher concentration of nitrogen, sulphur and heavy metals.



**DID YOU KNOW?** About 80% of the world's oil reserves are **state-owned**. Only 20% are open to private investment, almost 50% of which are located in the Alberta oil sands.

LEARN MORE ABOUT OIL SANDS GEOLOGY AND THE PROPERTIES OF BITUMEN  $\rightarrow$  (HTTP://WWW.OILSANDSMAGAZINE.COM/TECHNICAL/PROPERTIES)

#### PROCESS OVERVIEW OIL SANDS MAGAZINE (/)

Petroleum products are produced from the oil sands through 3 basic steps:

- 1. Extraction of the bitumen from the oil sands, where the solids and water are removed
- 2. Upgrading of the heavy bitumen to a lighter, intermediate crude oil product
- 3. Refining of the crude oil into final products such as gasoline, lubricants and diluents.



Traditionally, a majority of the bitumen produced in Alberta was upgraded into **synthetic crude oil** before being sold to refineries on the open market. However, some bitumen is good enough to send directly to a **high-conversion refinery** that has the ability to process heavy/sour crude. Examples of diluted bitumen sold directly to refineries includes product from in-situ facilities around the Christina Lake and Cold Lake areas, diluted bitumen from Imperial Oil's Kearl Lake Mine and upcoming production from Suncor's Fort Hills project.

Currently about 40% of the bitumen produced in Alberta is upgraded to synthetic crude oil. The remaining 60% is diluted with condensate and sold directly to market, without an intermediary upgrading step.

#### BITUMEN EXTRACTION

The Alberta oil sands hold an estimated 166 billion barrels of recoverable oil, representing over 96% of Canada's total reserves. The method used to extract bitumen from the oil sands depends on the depth of the deposit. If the deposit is near the surface, the oil sands is **mined** and sent to a bitumen processing plant. For deposits that are deep below the surface, bitumen is extracted **in-situ** (or in place). Both facilities produce a relatively clean bitumen product which is mostly free of sand and water.



#### DEEP DEPOSITS:

Steam is injected into the oil sands deposit, reducing the viscosity of the bitumen. The mixture of bitumen and water is pumped to the surface where the water is recovered and recycled.

#### SHALLOW DEPOSITS:

The deposit is mined and trucked to a main processing plant. Hot water is added to the oil sands, producing a pumpable slurry. Bitumen is recovered through a gravity separation process.

#### LEARN MORE ABOUT IN-SITU -

(http://www.oilsandsmagazine.com/technical/in-situ)

LEARN MORE ABOUT MINING → (http://www.oilsandsmagazine.com/technical/mining) About 20% of Alberta's bitumen reserves are close enough to the surface to be mined. The remainder are **OIENSIANDSOMAGAZINE** (Provered in-situ. Although in-situ production traditionally had lower recovery  $\frac{n}{0}$ ) rates, recent advancements in technology have significantly improved bitumen recovery. In-situ extraction is expected to lead the growth (http://www.oilsandsmagazine.com/projects/thermal-in-situ) in bitumen production over the coming decades.

#### PRODUCTS DERIVED FROM THE OIL SANDS

Bitumen naturally contains a large fraction of complex long chain hydrocarbon molecules. The fraction depends on the geology of the reservoir and process used to extract the bitumen.

About 40% of bitumen produced from the oil sands requires an intermediate upgrading step for partial removal of the heavy hydrocarbon fractions and conversion into light synthetic crude oil (SCO). The SCO is then sold to refineries on the open market.



The remaining 60% of bitumen produced is blended with a lighter hydrocarbon (diluent) and sold directly to the open market. Many North American refineries are now designed to accept heavy oil streams, as long as the solids and water content is kept relatively low (less than 0.5%). Non-upgraded bitumen is also sour, containing a relatively high sulphur content.

#### 

(http://www.oilsandsmagazine.com/technical/product-streams)



**BITUMEN UPGRADING** 

Bitumen produced from the oil sands is too heavy to be sent directly to a conventional refinery due to its high asphaltene and sulphur content. Depending on the extraction process used, bitumen can sometimes contains  $\Omega I \ln SANDS MAGAZINEI(/)$ , which does not meet pipeline specifications for long distance transport. This product is therefore upgraded into a light synthetic crude, which is then sold on the open market.

Upgrading is a process by which bitumen is transformed into an lighter and sweeter crude by fractionation and chemical treatment. This improves the quality of the oil, reducing its viscosity and sulphur content. The SCO product is then sent to a downstream refinery for conversion into final product. About 40% of Alberta's bitumen is currently upgraded before being sold to market.

#### LEARN MORE ABOUT BITUMEN UPGRADING -

(http://www.oilsandsmagazine.com/technical/bitumen-upgrading)



#### CRUDE OIL REFINING

Refineries convert crude oil feedstock into value added final products for consumer and industrial use. These refined products include fuels such as gasoline, kerosene and diesel, as well as other consumer products such as oil lubricants and asphalt.

Not all refineries are built the same. Simple refineries can only process light crudes with a low sulphur content (sweet). Complex refineries have the ability to process heavier feedstock with a much higher sulphur content (sour).

Due to the rising production of heavy crude oil from Canada, Venezuela and Mexico, most Gulf Coast refineries have been modified to better handle heavier crude streams, which are generally less expensive than light/sweet crude. These refineries are known as high-conversion refineries and have the ability to accept sour crude oil streams with up to 10% heavy fractions, as long as the water and solids content is kept relatively low.

As more and more refineries around the world convert to heavy oil feedstock, there is less of a demand for stand-alone bitumen upgrading. The economics of upgrading therefore lies in the price differential between heavy diluted bitumen and light crude oil.

PRODUCTS DERIVED FROM A BARREL OF CRUDE OIL SOURCE: CAPP

#### OIL SANDS MAGAZINE (/)

DID YOU KNOW? The world's unconventional heavy off reserves are much biggersthan conventional light oil. That's why more refineries are being built (or reprofined) to process heavy, oour feedstock.

LIGHT FUEL
 PROPANE/BUTANE
 ASPHALT

O OTHER

#### TRANSPORTATION

Crude oil from the Alberta 3.2% and unclusion cluded oitumen) is commonly transported to US and Canadian refineries by pipeline (http://www.oilsands.nee.com/projects/crude-oil-liquids-pipelines). About two-thirds of Alberta's exports to the US (http://www.oilsands.nee.com/projects/crude-oil-liquids-pipelines). About two-thirds imports) are destined for the Midwest area.

Due to constraints in pipeline capacity and routing, crude oil transport by rail

(http://www.oilsandsmagazine.com/energy-statistics/canada-us-crude-by-rail) has become increasingly popular in recent years, climbing from near-zero in 2011 to almost 200,000 bbl/day by the end of 2014. Shipment by rail to the US was mostly destined for the US Gulf Coast. However, expansion of pipeline capacity to Quebec, Ontario and the US Midwest has reduced demand for rail transport. Nonetheless, crude-by-rail remains an important back-up mode of transport if new pipeline capacity does not come online in the next few years.

DID YOU KNOW? By the end of 2016, Canada's crude-by-rail loading capacity will increase to over 775,000 bbl/day.

#### ENVIRONMENTAL FOOTPRINT



#### AIR EMISSIONS

- The oil sands emit about 60 megatonnes of greenhouse gases (GHG) per year, representing 8.5% of Canada's total emissions and 0.13% of global GHG emissions.
- About 80% of the GHGs contained in a barrel of oil are emitted by the end user during combustion. Bitumen extraction, upgrading and refining account for the remaining 20%.
- In-situ bitumen production has a slightly higher carbon footprint due to its heavier reliance on steam production. Bitumen produced from mined oil sands is 2% more GHG intensive than the average barrel of oil processed in the US versus a 5% difference for in-situ bitumen.

LEARN MORE - (http://www.oilsandsmagazine.com/technical/environment/air-emissions)



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#### WATER CONSUMPTION

- Every barrel of bitumen produced from mined oil sands requires about 3 barrels of fresh water, mostly sourced from the Athabasca River. Mine operators account for about 0.5% of Athabasca River flows, far below their allocated water supply.
- In-situ bitumen production requires only 0.3 barrels of water per barrel of bitumen, sourced mostly from ground water aquifers.
- About 85-90% of process water used for bitumen production is recycled.



#### LAND USAGE

- Alberta's oil sands covers a total of 142,000 km<sup>2</sup>, only 3% of which is close enough to the surface to be mined. The remaining 97% can only be extracted in-situ with minimal land disturbance.
- Oil sands mining accounts for about 900 km<sup>2</sup> of land disturbance, representing 0.6% of total oil sands surface area and 0.028% of the entire Canadian boreal forest. That includes both tailings ponds and mine pits.
- Mine operators are legally required to reclaim and remediate disturbed land once the mine is depleted and the tailings pond is no longer in use.

### OIL SANDS MAGAZINE (/)

# **OIL SANDS 101**

How bitumen is extracted from the oil sands and converted into refined products

OIL SANDS MAGAZINE • January 20, 2016



+++ (/TECHNICAL/?AUTHOR=52ABB9B9E4B0CB06A591754B)

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Alberta oil sands, from	data for all commercial	Supply, demand, trade	Daily and monthly
the physical properties	oil sands operations and	data and inventories for	average crude oil,
of bitumen to the	energy infrastructure	Alberta, Canada and the	condensate and gas
production of crude oil.	facilities across Canada.	US as well as global	prices, including ratings
		energy statistics.	& price tagets for large
			cap energy stocks.

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## **ATTACHMENT LS-3**





#### February 2016

# The Future of the Canadian Oil Sands

Growth potential of a unique resource amidst regulation, egress, cost, and price uncertainty



**OIES PAPER: WPM 64** 

J. Peter Findlay



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Most importantly, I owe much gratitude to my wife Stephanie for her patience and support while I worked through the research.

Peter Findlay Calgary, January 2016



## Glossary / Acronyms

AECO	Alberta Electric Company; also used as the index for natural gas prices in Alberta									
AOSP	Alberta Oil Sands Project – a joint venture between Shell, Chevron, & Marathon									
AOSTRA	Alberta Oil Sands Technology and Research Authority (now Alberta Innovates)									
API	American Petroleum Institute – API gravity describes the heaviness of a crude									
BC	British Columbia (the Canadian province of)									
Brownfield	A new project instalment that is an expansion or overhaul of a past installation									
CAGR	Compound Annual Growth Rate									
CAPP	Canadian Association of Petroleum Producers									
CCEMC	Climate Change and Emissions Management Corporation									
CCS	Carbon Capture and Storage									
CERI	Canadian Energy Research Institute									
CHOPS	Cold Heavy Oil Production with Sand									
COGD	Combustion Overhead Gravity Drainage									
CNRL	Canadian Natural Resources Limited									
CSR	Corporate Social Responsibility									
CSS	Cyclic Steam Stimulation									
DILBIT	Diluted Bitumen									
Dilbit	A mixture of two streams of crude oil: approximately 70–75% bitumen and 25–30% condensate									
EOR	Enhanced Oil Recovery									
EORI	Energy Return on Investment									
ESP	Electronical submersible pumps									
ET-DSP	Electro-Thermal Dynamic Stripping Process									
ETF	Exchange Traded Fund: Similar to a mutual fund, but with minimal management oversight; ETFs attempt to average the returns of a particular market or industry									
FOB	Freight on Board									
GCOS	Great Canadian Oil Sands Company (now called Suncor Energy)									
GCOS	Great Canadian Oil Sands									
GHG	Greenhouse Gases									
Greenfield	A new project instalment that is built in a new area, rather than an expansion or rebuild of a past installation									
IEA	International Energy Agency									
In-situ	Separating and producing bitumen from oil sands <i>in-place</i> rather than extracting the oil sands and removing the bitumen afterwards as is done in the mining technique									



LNG	Liquefied Natural Gas
LTO	Light Tight Oil (oil produced from mature shale geology); also called 'shale oil' (not 'oil shale', which describes a different geology)
LWD	Logging while drilling enables drillers to see wireline-quality formation measurements during drilling from the help of well logging tools attached to the bottom-hole assembly
Mining	In this research, mining refers to the process of surface mining of oil sands ore, then separating out the bitumen through a number of process steps (see Appendix: Oil sands primer)
NDP	New Democratic Party: A political party that exists at both provincial and federal levels in Canada and is traditionally the more left-wing of the major parties. In 2015 it was elected to a majority government for the first time in Alberta. It has never been the governing party of Canada.
NEB	National Energy Board
NOC	National Oil Company
OBv	Volume of Overburden Removed
OSv	Volume of Oil Sands Mined
PM	Particulate Matter
R&D	Research and Development
SAGD	Steam Assisted Gravity Drainage
SCO	Synthetic Crude Oil
SGER	Specified Gas Emitters Regulation: Government of Alberta regulation to reduce emissions from oil sands producers and other large industrial emitters
SOR	Steam-to-Oil Ratio
Synbit	A mixture of two streams of crude oil: approximately 50% bitumen and 50% Synthetic Crude Oil (SCO)
TAGD	Thermal Assisted Gravity Drainage
TAN	Total Acid Number
THAI	Toe-to-Heel Air Injection
TSX	Toronto Stock Exchange
TV:BIP	Ratio that describes the total volume of oil sands removed versus the amount of bitumen in-place for that volume
Upgrader	Processes oil sands produced bitumen into a lighter Synthetic Crude Oil (SCO) that can be more easily processed downstream by traditional refineries
USGC	United States Gulf of Mexico Coast
VOC	Volatile Organic Compounds
WCSB	Western Canadian Sedimentary Basin – the large hydrocarbon-rich basin between the Rocky Mountains and Canadian Shield, touching parts of British Columbia, Alberta, Saskatchewan, and Manitoba



#### Preface

This research was conceived with two central objectives: first, to help a global audience comprehend the uniqueness of the massive hydrocarbon resource that is Canada's oil sands. Second, and more importantly, the paper aims to provide insight into which economic factors will drive and constrain oil sands growth in the near term (until 2025) and long term (beyond 2025).

As with all major energy sources, there is undeniable uncertainty on both the supply and demand sides of the oil sands equation. This work attempts to provide perspective on these uncertain factors driving the production growth outlook, with quantitative insights where possible. Though the energy future is indeed difficult to predict, it behoves energy industry leaders, government planners, environmental activists, analysts, and investors alike to recognize the environmental and economic fundamentals underlying Canada's oil sands and how they impact the global energy supply.

With these goals in mind, the paper is separated into five sections:

- **Section 1** highlights the environmental (including climate), political, reputational, and regulatory issues surrounding oil sands production.
- Section 2 addresses market access issues of Western Canadian crude oil that are constraining production growth from the oil sands.
- Section 3 tackles the cost of oil sands production, with a focus on inflation and production technology.
- **Section 4** discusses the economic attractiveness for investors of the oil sands in the near and long term and summarizes what role the resource could play in future global supply.
- The **Appendix** provides a detailed **oil sands primer** as a recommended pre-read for those not closely familiar with Canadian oil sands history, production processes, or current production and marketing volumes. The geological and petrophysical nature of almost 2 trillion barrels of bitumen trapped amid sand makes the resource different to almost any other large producing basin in the world this section highlights some of the more critical, unique elements.



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\*All dollar values (\$) represent US dollars (USD), unless otherwise noted.



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#### **Executive Summary**

The oil sands are among the world's sources of 'difficult oil' (sometimes referred to as 'unconventional', depending on the definition standards) and are comparable in some respects to deep water, ultra-deep water, Arctic, and light tight oil (LTO), production of which is concentrated in North America for now).<sup>1</sup> The fact that bitumen is cumbersome and costly to extract is why recoverable reserves of Canadian oil sands are estimated at 170 billion barrels, much less than the estimated 2 trillion barrels in place. What difficult oil plays have in common are high supply costs (often above \$60 per barrel) and an undeniable dependence on technological advances to remain economically attractive. Though Canada's oil sands, like other unconventional plays, will likely play an increasingly prominent role in meeting future global demand to 2035 and beyond, substantial improvements in production and processing technologies, or a return to sustained high crude prices (or likely both), are required to deliver similar capacity additions as the last decade. The world is estimated to need 10-15 million bpd of additional production in the next 20 years to meet the increasing demand of growing economies and global commercial transport, notwithstanding the need to offset declining production in conventional fields. More than one of these difficult oil sources will play a major role. With such a massive base of reserves to work off, oil sands investors, producers, and the Albertan and Canadian governments hope these bitumen deposits will become a more formidable pillar of global supply than its roughly 2.5 million bpd (2.6 per cent) contribution today.

For energy sources reaching society on a large-scale, an economic turning point occurs when the source crosses a threshold of attractiveness, regulatory and environmental acceptance, large-scale availability, and operational certainty. For North American shale gas, and subsequently LTO, this turning point occurred very rapidly around 2005 with the continuous amelioration of lateral (horizontal) well length, micro-seismic imaging, 3-D mapping, and more advanced, multi-stage hydraulic fracturing. In addition, North America's entrepreneurial culture, a pre-existing road and pipeline infrastructure, an adaptive oilfield services supply chain, and favourable mineral rights laws were also major enablers. These economic, rather than technical or geological, enablers act as central explanations for why this tipping-point threshold has not been reached for shale gas and LTO production in other areas of the world.

For the Canadian oil sands, however, the turning point metaphor seems less apt, at least at this point in its journey. Although overall oil sands production growth has been impressive and robust since 1999, it seems that the more production barrels that come online from the massive heavy oil basin, the more headwinds arise that operators must overcome to deliver a return to increasingly impatient investors who have little to show from their investments in the past decade (even before the oil price rout).

Environmental regulations are becoming more onerous and costly to adhere to as scientists and environmental engineers learn more about the climate and ecological side-effects of the energy intensive extraction processes required to separate bitumen from sand. Environmental pressure groups are becoming better funded and more vocal, though the debate between industry proponents and activists is thankfully starting to become more rational and objective. Operators are working harder and spending more to address water usage sustainability, waste management (primarily 'tailing' ponds from mines), encumbered wildlife habitats, and regional air quality. Greenhouse gas (GHG) emissions from oil sands production are just under 70 Mt (just 0.17 per cent of global emissions). Though the producers are currently taxed rather minimally for their emissions, a carbon pricing scheme has just been announced by the Alberta government to approximate the externalities associated with GHG emissions. The proposed regulation is dramatically less burdensome for oil sands producers than for coal power generators (who produce much less GDP per tonne of emissions). It will add roughly \$0.5–4 per barrel of production cost, and impose a cap of overall emissions of 100 Mt per year, though this cap may be adjusted in the next decade as political parties and emission economics change.

<sup>&</sup>lt;sup>1</sup> Robert Skinner, 'Difficult Oil', *Oxford Institute for Energy Studies*, 2005, http://www.oxfordenergy.org/wpcms/wp-content/uploads/2011/02/Presentation30-DifficultOil-RSkinner-2005.pdf.



Following production growth of nearly 2 million bpd in the past 15 years, access to markets for the oil sands' diluted bitumen (DILBIT) and synthetic crude oil (SCO) will continue to be a major concern in the next decade. Much-needed large pipeline projects, President Obama's rejection of TransCanada's Keystone XL pipeline being the renowned example, have already been delayed by years and may never gain approval without substantial redesigns and political willpower. Rail transport is filling some of the gap, though at a higher cost and with somewhat limited room to scale up. The result is substantial pricing discounts to the North American WTI standard, itself trading below \$50 for much of 2015 and piercing below \$30 in January 2016.

Burdened with a history of neglect, Canada strives to improve the living conditions and representation of its Aboriginal peoples. Oil sands mines can hamper traditional Aboriginal lifestyles. Claims of overly polluted water and air, though at times unsubstantiated, have nonetheless tarnished public perception of oil sands production. Ongoing consultations with Aboriginal groups are needed to maintain trust and enable future growth.

Though less discussed in the media, the most challenging headwind for producers is likely cost escalation – the supply (break-even) cost for greenfield projects in 2014 was three to four times more expensive per barrel than it was in 2003, even after adjusting for inflation. Drastic improvements to operating efficiency, capital effectiveness, supply chain management, and overhead costs are needed to be economically attractive in a lower-price environment.

The challenges mentioned above, added to the strain of what could be a prolonged period of lower oil prices, has caused investors to flee in droves over the past five to ten years. Given the cumbersome and energy-intensive processes that are inherent to extracting bitumen (at least today), there are limits to the savings that operations excellence and cost-cutting initiatives can deliver. Technological advances do have the potential to make more substantial, step-change gains, though their approval and implementation cycles are often measured in decades rather than years. Furthermore, the widespread rollout of these technologies is stifled by the fact that many of these innovations are rather specific to locally unique geological formations within Canada's oil sands.

When compared with nimble LTO projects, oil sands investment decisions are slow, have historically been of much greater magnitude, and require large, well-funded balance sheets managed with longer-term foresight. Scale continues to be a formidable barrier to entry, essentially blocking out the type of enterprising smaller operators that made LTO so successful. That said, many feel that being so unique, oil sands development is still in its infancy and there are many aspects ripe for optimization. In this light, the current low-price environment may be the impetus needed to drive much-needed technological and process breakthroughs. For if operators only could find a way to make supply costs more globally competitive, the reserves are practically inexhaustible. It is this long-term thinking that will likely continue to drive oil sands growth forward in the long term, even though the near-term outlook appears subdued, if not dour, in the current low-price environment.



#### 1.1 How Canada and the world view Alberta's oil sands

Outside of government, academia, and well-financed integrated oil companies, the massive bitumen deposits in northern Alberta flew mostly under the public radar during the twentieth century. This institute did not address the basin in detail until discussions of 'difficult oil' became more prominent with the escalation of global oil prices in the early 2000s.<sup>2</sup> Much of Alberta's citizenry outside the industry had heard little about the oil sands until rapid investment began to flow in.

In the past 10–15 years, the level of public interest has taken a volte-face to where oil sands issues have now come to the forefront of the public forum. Canada's national business newspapers are routinely rife with oil sands market insights and project updates, while federal and provincial elections (even those outside Alberta), often feature hard-line stances on oil sands environmental regulations, Aboriginal claims, and royalty schemes. Since the oil price spike before the 2008 financial crisis, the development of Canada's oil sands as a long-term surety against a dwindling supply of low-cost crude imports from outside North America has been a salient political topic. While US crude supply security has taken a backseat as a political issue due to the arrival of LTO, environmental advocacy has grown in political clout. The oil sands are now discussed in Washington less as an asset of energy security (like they were until 2008) and more of an environmental calamity, regardless whether such renunciation is warranted. Both in the US and Canada, it seems that funds generated for lobbying purposes by environmental activist groups and political donors are overwhelming those generated from the oil & gas industry.<sup>3</sup> These donors have taken as their central mandate a state-imposed moratorium on new oil sands projects and enabling infrastructure, claiming that all bitumen production is 'dirty' and at odds with any global progress on climate change.

FIGURE 1: ACTIVIST BILLBOARD COMPARING OIL SANDS TO THE BP HORIZON OIL SPILL



Note: Erected in four major US cities.

Source: Corporate Ethics International, public photograph.

#### Importance of public perception

Through burdensome regulation and approval delays, environmental and anti-industrial activism has considerably impeded oil sands production growth. Policies in democratic countries are ultimately derived from public opinion, whether in the production-focused region of Alberta, the current transport and refining geographies for the oil sands concentrated in the US, or new potential markets such as in Europe and democratic Asia. Public perception and consumer concern over burning 'dirty oil' products emanating from the oil sands in California and Europe has led to consideration of punitive regulations against Canadian heavy oil imports.<sup>4</sup>

<sup>&</sup>lt;sup>2</sup> Robert Skinner, 'Difficult Oil', *Oxford Institute For Energy Studies*, 2005, http://www.oxfordenergy.org/wpcms/wp-content/uploads/2011/02/Presentation30-DifficultOil-RSkinner-2005.pdf.

<sup>&</sup>lt;sup>3</sup> An example of this is the largest US individual political contributor in 2014, Tom Steyer: Kenneth P. Vogel, 'Blue Billionaires On Top', *Politico*, 2015, http://www.politico.com/story/2015/01/blue-billionaires-on-top-114151.html

<sup>&</sup>lt;sup>4</sup> Yadullah Hussain, 'Oilsands Dodge 'Dirty' Label In European Union After Directive Made Official', *Financial Post*, 2015, http://business.financialpost.com/news/energy/oilsands-crude-will-no-longer-be-singled-out-by-eu-after-directive-made-official.



The dual threat of misinformation and vilification of the oil sands has prompted the provincial government of Alberta to devote substantial resources to international awareness campaigns to ensure investment (and divestment) decisions are based on reliable environmental and economic information. The fundamental 'public square' debate in Alberta and around the world is essentially asking: to what extent should investment and government policy enable oil sands production given the economic growth, energy security, and tax revenue it generates, compared to any and all adverse environmental and community impacts?

#### A call for rationality and open dialogue

#### Myopic environmental activism

The debate often shows itself to be politically partisan, emotional, and polarizing. Oil sands foes who are concerned about increases in Canada's GHG emissions and ecological damage are much more inclined to denounce producers' treatment of Alberta's Aboriginal peoples and decry investor profits during periods of high oil prices. An example of this is the follow-up to a commentary calling for an oil sands pipeline moratorium in Nature, the prominent and highly respected journal of biological sciences.<sup>5</sup> The eight originating scientists recruited 95 other scientists to their cause, self-proclaimed as 'a diverse group of scientists from across North America' citing a specific 'ten reasons for a moratorium' on oil sands projects and related infrastructure, with 'each grounded in science'.<sup>6,7</sup> To be sure, several of their arguments highlight salient and genuinely irrefutable, harmful ecological impacts of oil sands production to Northern Alberta's ecosystem, especially associated with surface mining projects. Others are hardly scientific, but conjectural and rhetorical such as the statement that 'continued expansion of oil sands and similar unconventional fuels in Canada and beyond is incompatible with limiting climate warming to a level that society can handle without widespread harm', and another stating that 'development and transport of oil sands is inconsistent with the title and rights of many Aboriginal Peoples of North America'. These comments obscure the reality that oil sands production today contributes around 0.17 per cent to global emissions, becoming less carbon intensive per barrel each year, deliver a rather high GDP to emissions ratio, and ignore the benefits that oil sands development brings to Aboriginal peoples.8,9

#### The nomenclature battle

Hostility can begin in the first sentence of a debate, with activist groups addressing the basin as the 'tar sands' rather than the now more accepted 'oil sands' nomenclature. In fact, both terms were used interchangeably for much of the basin's controversy-free early years (note that oil sands bitumen was initially used, ineffectively, for roofing and paving tar as far back as 1906). Starting in the 1990s, in the face of environmental opposition, the industry pushed for a consensus on the label 'oil', of which bitumen is a form and the ultimate end product of the production process. Technically speaking, 'oil' is more correct than 'tar' as the oil sands do not contain tar, but are 'tar-like' (actual tar is synthetically produced from coal, wood, petroleum, or peat).<sup>10</sup>

#### Environmental indifference

On the other side of the argument, history is chock-full of politicians and others ignoring the environmental impact of large-scale oil sands production, even when a scientific consensus exists. The past few decades are full of ironies of environmental extremists causing unnecessary environmental damage by blocking certain forms of development while more destructive forms replace them.<sup>11</sup> In a similar irony, however, the numerous Canadian and Albertan political leaders

<sup>&</sup>lt;sup>5</sup> Wendy J. Palen et al., 'Energy: Consider The Global Impacts Of Oil Pipelines', *Nature* 510, no. 7506 (2014): 465-467, doi:10.1038/510465a.

<sup>&</sup>lt;sup>6</sup> 10 Reasons, 'Oil Sands Moratorium Press Release', 2013, http://www.oilsandsmoratorium.org/pr/.

<sup>&</sup>lt;sup>7</sup> Shawn McCarthy, 'Alberta'S Oil Sands Take A Hit As Scientists, Academics Call For Halt To Development', *The Globe And Mail*, 2015.

<sup>&</sup>lt;sup>8</sup> The activist group was less 'diverse' than its claims – of the 103 signatories, 91 were scientists from the biological sciences, environmental and natural resources fields while 9 researched policy and political science – all faculties that have a reputation at North American universities to be less supportive of industry than the mainstream. Only one economist and one engineering professor signed the oil sands moratorium, as well as an archaeologist.<sup>8</sup>

<sup>&</sup>lt;sup>9</sup> Energy.alberta.ca, 'Alberta Energy: Facts And Statistics', 2015, http://www.energy.alberta.ca/oilsands/791.asp.

<sup>&</sup>lt;sup>10</sup> To be even more technically correct, and for better accuracy, one can turn to the French language, which refers to the formation as 'sables bitumineux' (translated to English as 'bituminous sands').

<sup>&</sup>lt;sup>11</sup> The closing of nuclear energy plants in Germany and elsewhere, only to be replaced by coal power is an example of this



who are strong oil sands advocates have arguably hampered growth projects due to their indifference to the impacts of global climate change and ecological preservation.

As Prime Minister of Canada between 2006 and 2015, Stephen Harper altered his public opinion and acknowledged the criticality of climate change as a world issue, claiming that Canada will do its part to contribute to the global effort. However, draconian cutbacks to funding for environmental and biological sciences as well as initiatives to limit how government scientists speak with the media rendered many mainstream Canadian voters cynical.<sup>12</sup> Furthermore, the US review of the Keystone XL pipeline has now been rejected by US president Barack Obama based on concerns of global warming. Harper's reputation as a leader critical of taking action on climate change did little to assuage a sceptical American public. Furthermore, somewhat uninformed statements from politicians, like the below from Joe Oliver in 2013, then Canada's Minister of Natural Resources, further harmed Canada's environmental reputation around the world.

I think that people aren't as worried as they were before about global warming of two degrees...Scientists have recently told us that our fears (on climate change) are exaggerated.<sup>13</sup>

#### Earning a 'social licence to operate'

The challenges of developing the oil sands both profitably and responsibly are complex. Making sound investment decisions and writing effective, unbiased policy requires a broad local and global understanding of energy economics, geology, engineering, ecology, Aboriginal rights, market access, climate science, and politics. Individual experts or sources (not least this paper) are unable to comprehensively grasp all the widespread impacts and influences connected with oil sands decisions. Governmental agencies such as the National Energy Board (NEB), the expert group that regulates interprovincial and offshore energy projects including pipelines, and the past constituents of today's Alberta Energy Regulator (AER), had for decades acted as the impartial regulator that manages the regulation process. More recently, however, the emotional and political nature of environmental activism has pulled decision making into the political circle, laden with exaggeration and misinformation from both camps. Upon the NEB's approval in 2014 of Enbridge's proposed Northern Gateway pipeline (slated to carry oil sands crude to Canada's west coast before being tanked to Asia), major federal opposition party leaders Justin Trudeau and Thomas Muclair immediately vowed to reverse the decision if they were elected, even if the burdensome outstanding conditions were met. They insinuated that Stephen Harper's Conservative government was responsible for the NEB's review, notwithstanding the fact that the board includes acclaimed and objective experts in economics, engineering, Aboriginal law, and biology.<sup>14</sup>

Amidst this partisan environment, the Canadian oil & gas industry is itself making a growing effort to address the public debate rationally and objectively. The producers and midstream operators who have taken major balance sheet stakes in the oil sands have been forced to counteract what they deem to be a populist and distorted campaigns that threaten their ability to operate. Historically, North American operators happily operated under the radar with regards to public perception, so long as they met governmental regulations and were able to get responsibly designed projects approved. This is no longer the case, as larger companies have worked diligently through their own brand and corporate social responsibility (CSR) departments, as well as industry funded collaborations such as the Canadian Association of Petroleum Producers (CAPP), to help educate public opinion and discourse. For example, Suncor and Enbridge have invested hundreds of millions of dollars in renewable energy both to gain a foothold in that growing market and to demonstrate that they think

'Alarmism'', *The Globe And Mail*, 2010, http://www.theglobeandmail.com/news/politics/siding-with-skeptics-tory-mp-decriesclimate-change-alarmism/article4310491/.

http://www.cbc.ca/news/politics/northern-gateway-pipeline-approved-with-209-conditions-1.2678285.

<sup>&</sup>lt;sup>12</sup> Harper built his political standing from ideological roots in Alberta based on free markets and limited government intervention. Though regrettable in hindsight, during Harper's political ascent, suspicion of government overreach caused him to refer to environmental initiatives such as the Kyoto climate change accord as 'a socialist scheme to suck money out of wealthproducing nations' as well as the science that drove it as 'tentative and contradictory.' During the election year of 2006, he further displayed his ignorance around climate change by stating that 'we have difficulties in predicting the weather in one week or even tomorrow. Imagine in a few decades. - Joan Bryden, 'Siding With Skeptics, Tory MP Decries Climate-Change 'Alarmism''. *The Clobe And Mail*. 2010. http://www.theqlabeaadmail.com/news/politics/ciding.with.skeptics.top..mp.decrips-

<sup>&</sup>lt;sup>13</sup> Charles Côté, 'Le Ministre Oliver: Des Sables Bitumineux Sans Limite, Une Menace Climatique «Exagérée»', *La Presse (Translated From French)*, 2015.

<sup>&</sup>lt;sup>14</sup> Laura Payton, 'Northern Gateway Pipeline Approved With 209 Conditions', *Cbc.Ca*, 2015,



progressively about energy trends of the future. Beyond branding and public perception marketing, company-led public 'town hall' meetings are commonly used to promote open dialogue. Professional service firms supporting the industry in the accounting, information, consulting, research, and legal fields are also supporting their clients by contributing to conferences and events that boost public awareness of energy education.<sup>15</sup> In fact, while the federal Conservative government made no effort to quell Canadian climate concerns (an action that might have catalyzed the approval of the Keystone XL pipeline), oil sands anchor producers CNRL, Suncor, Shell, and Cenovus proactively came out in favour of a meaningful carbon tax.<sup>16,17</sup>

As CSR efforts increase to educate the public, producers confront an interesting question: Why are we, as regulation-abiding companies operating in the oil sands, burdened with directing capital to building brand awareness of our otherwise unbranded, commodity product, while simultaneously educating the public to ensure an objective regulatory environment?

Theoretically, having the provincial and federal governments produce environmentally sound policy should generate a favourable reputation for Canada's energy industry while generating economic benefits for the public. Oil sands producers and midstream operators, however, have discovered they also need to be proactive in the public sphere to help earn their 'social licence to operate'. Their challenge is to not allow that oft-quoted term to become grounds for regulatory or activist overreach.

#### 1.2 Environmental impact of the oil sands

Extracting and transforming viscous, bituminous sands into a usable crude product on a large scale is technically complex and energy-intensive – the associated environmental impact is correspondingly troublesome and costly to reduce. Though producers have spent billions to reduce both local pollution and global greenhouse gas impacts with admirable success, oil sands production still creates more land disturbance, uses more water, and emits more greenhouse gases per barrel produced than conventional production of light oil.

As the Canadian constitution grants management responsibility of natural resources to provinces, most oil sands production and upgrading remain within the jurisdiction of the province of Alberta and do not require federal approval.<sup>18</sup> The federal government plays a larger role in pipeline and other interprovincial and international transportation, as well as when a project triggers federal authority such as Parks Canada or Health Canada. The federal government has not yet become involved in regulating GHG emissions and has left it to the provinces to take action, though this could change with the election of Justin Trudeau's Liberal party in October 2015.

#### Local impact

#### Air pollution

As with many industrial processes, bitumen extraction and upgrading produces regional air pollution that can damage terrestrial and aquatic ecosystems if accumulated in large enough concentrations.<sup>19</sup> Furthermore, air pollution can endanger human health, as witnessed in the world's most polluted cities and industrial areas. Oil sands processes emit criteria air contaminants<sup>20</sup> (CAC: SO<sub>X</sub>, NO<sub>X</sub>, Particulate Matter<sup>21</sup>, Volatile Organic Compounds, CO, and NH<sub>3</sub>), heavy metals (lead, cadmium,

 <sup>&</sup>lt;sup>15</sup> Examples of this include IHS's "Oil Sands Dialogue", the JuneWarren Nickle's Energy Group and PwC's "Energy Visions"
 <sup>16</sup> Geoffrey Morgan, 'Canadian Natural Resources Ltd Supports A Carbon Tax — But Only If It Funds New Technology', *Financial Post*, 2015, http://business.financialpost.com/news/energy/cnrl.

<sup>&</sup>lt;sup>17</sup> Geoffrey Morgan, 'Carbon Tax Should Apply To Companies And Consumers, Says Suncor Energy Inc's CEO', *Financial Post*, 2015, http://business.financialpost.com/news/energy/carbon-tax-should-apply-to-companies-and-consumers-says-suncor-energy-incs-ceo.

<sup>&</sup>lt;sup>18</sup> Upgraders are processing plants that reduce the viscosity of bitumen to enable processing in a typical refinery. The output of an upgrader is SCO – synthetic crude oil. See the Appendix: Oil Sands Primer for more information.

<sup>&</sup>lt;sup>19</sup> (Hrudey et al. 2010)

<sup>&</sup>lt;sup>20</sup> 'Criteria air contaminants, or CACs, are the primary constituents of air pollution that lead to the most common, broad-scale air quality issues such as smog and acid rain.' (McWhinney 2014)

<sup>&</sup>lt;sup>21</sup> 'Particulate Matter (PM<sub>x</sub>, where x refers to median particle size in micrometers) refers to a complex range of fine particles including soot, dust, dirt, and secondary acidic and organic aerosols which can remain suspended in air.' 'Total PM (TPM) refers to all suspended particles up to approximately 100 micrometres (0.1 mm) in diameter; PM less than 10 micrometres in diameter (PM10), sometimes referred to as coarse PM when excluding particles less than 2.5 micrometres; and PM less than 2.5 micrometres in diameter (PM2.5), sometimes referred to as fine PM.' (Hrudey et al. 2010)



mercury, and vanadium), polycyclic aromatic hydrocarbons (PAHs) and Total Reduced Sulphur (including  $H_2S$ ). Though the CAC emission levels are substantial, in most cases they make up small percentages of Canada's total (see Table 1).<sup>22</sup>

In Tons (T)	ТРМ	<b>PM</b> 10	PM <sub>2.5</sub>	SOx	NOx	voc	СО	NH₃
Mining	751	372	199	2,885	3,826	18,947	3,461	162
In-Situ	686	671	670	9,433	14,397	1,947	13,498	-
Upgrading	4,379	2,638	1,256	99,545	26,445	24,819	14,201	1,197
O/S Total	5,816	3,681	2,125	111,863	44,668	45,713	31,160	1,359
Can Total	22,731,744	7,081,067	1,368,325	1,287,662	1,861,718	2,026,674	8,254,128	495,522
Oil Sands (% of Can)	0.03%	0.05%	0.16%	8.69%	2.40%	2.26%	0.38%	0.27%

TABLE 1: OIL SANDS CAC EMISSIONS VS CANADIAN TOTAL (2012)

Source: Environment Canada, Pollutant Inventories and Reporting Division, 2014.

Mining emissions, typically higher in VOC, arise from open-face mines, tailing ponds, and evaporation of froth extraction solvents. In-situ production drives air pollution through large-scale combustion of natural gas in the steam generation process. Analogous to a typical oil refinery, upgraders contribute the most air pollution, with their SO<sub>x</sub> emissions being most concerning. Because of specific regulations incentivizing cleaner operations, producers' ability to reduce emissions of CACs has been impressive. Table 2 that demonstrates the improvements made over a seven-year period. <sup>22</sup>

	ТРМ	<b>PM</b> 10	PM2.5	SOx	NOx	VOC	СО	NH <sub>3</sub>
Mining	-19%	-27%	-33%	-44%	-21%	-42%	-74%	-53%
In-Situ	-24%	-32%	-32%	-78%	-49%	-70%	-36%	N/A

#### TABLE 2: CHANGE IN AIR POLLUTION EMISSIONS INTENSITY (2005–2012)

Source: NPRI Facility Report Data; AER ST39/ST53.

Heavy metal and PAH pollution from the oil sands has been shown to be relatively small compared to other industrial activity in Canada, though PAH particles are often wind-blown and deposited in nearby lakes. This can potentially cause ecological damage, though none has been demonstrated todate. Also worrisome is the issue of soil and lake acidification from the acidification of NO<sub>x</sub> and SO<sub>2</sub>. The soils of northern Alberta and the nearby lakes of the contiguous province of Saskatchewan are highly sensitive to acid deposits and have little buffering capability. Improved monitoring and further testing is being conducted to ensure that environmental impact is minimized.<sup>23</sup>

#### Water usage and contamination

Environmentalists and many others unfamiliar with resource conservation economics are appalled when learning that oil sands mines require approximately 13–14 barrels of water (in-situ production requires around three barrels of water) to produce just one barrel of bitumen crude. These facts are somewhat misleading, however, as much of this water is recycled in both production techniques. Furthermore, in-situ production is capable of reducing its freshwater needs by 50 per cent or more by substituting otherwise unusable brackish groundwater. The net effect is that mining projects have a non-recycled freshwater to bitumen produced ratio of 2–3 to 1, while in-situ production requires much less at a ratio of only 0.5 to 1.

Nevertheless, with current mining production alone, notwithstanding new projects, more than 2 million bpd of freshwater is taken from the Athabasca River, the region's most important water source. At some estimated production growth rates, water requirements could triple by 2030, as water usage per barrel for mines has not decreased since 2005.<sup>22</sup> Removing excess water from the river can damage aquatic ecosystems and the Canadian and Albertan governments have accordingly limited water

<sup>&</sup>lt;sup>22</sup> (McWhinney 2014)

<sup>&</sup>lt;sup>23</sup> (Hrudey et al. 2010); (McWhinney 2014)



removals to 5.2 per cent of total river flow. Fortunately for producers, this restriction is at least four or five times greater than recent removal levels, even in low-flow months.<sup>24</sup>

As production growth shifts towards in-situ methods, water availability is less of a concern. SAGD operators have worked to increase recycle rates and brackish water usage to substantially reduce fresh groundwater requirements, though this effort can counterproductively increase the steam-to-oil ratio required, and the corresponding GHG emissions intensity, which is more of a concern than water usage. Longer-term seepage of polluted water into freshwater sources is concerning as the movement is so slow (approximately 1 metre per year).<sup>23</sup> Improved monitoring has been called for by the scientific community and is being becoming embedded into provincial regulations.

#### Land disturbance and tailings

Certainly the most visually recognizable environmental impact of oil sands production is the substantial land disturbance associated with surface mining. Environmental activists, including prominent politicians, musicians, and Hollywood celebrities, who have toured the region by helicopter, have described the area as 'toxic', 'a wasteland', and 'like Hiroshima'.<sup>25</sup> This negative publicity, even if unsubstantiated, hampers governments in developing production-friendly regulation and approving critical egress pipelines to the Pacific Coast and the US.

In fact, further research of land usage in the area paints a different picture. Of the oil sands' overall area of 141,000 km<sup>2</sup> (roughly the size of Florida), only 3 per cent (4,700 km<sup>2</sup>) is mineable, and the rest can only be produced through in-situ methods. Of that mineable area, only 0.6 per cent (835 km<sup>2</sup>) had been disturbed at the end of 2012, amounting to 0.13 per cent of the area of Alberta.<sup>26</sup> With fewer mining projects proposed and reclamation efforts underway, it is unlikely that this area would approach the 4,700 km<sup>2</sup> mineable limit in the next two or three decades. As of 2012, when accounting for both mining and in-situ methods, one finds that the land disturbance due to bitumen production in the oil sands areas is less than one-third that of agriculture and much, much less than that of forestry.<sup>27</sup>

Beyond the striking visual impact, surface mining land disturbance is difficult to reclaim. The process takes decades, and very little (<1 per cent) of the disturbed land from mining to-date is considered 'certified reclaimed'. Wetlands, which cover two-thirds of the oil sands mineable area, and tailing ponds, which take decades to solidify, are especially difficult to reclaim. Suncor's first tailing pond, which started in 1967, has just recently been reclaimed to a solid-state.<sup>28</sup> Given that the public is increasingly sceptical of producers' ability to manage tailings over the long term, mine operators and government regulators could afford to take some lessons from the Canadian forestry industry in developing long-term environmental management techniques that progress towards sustainability.

The undeniable trend towards in-situ production, which disturbs approximately 7–15 per cent of the land of a mining project (just slightly higher than conventional oil production), alleviates concerns over future large-scale disturbances. That said, in-situ methods such as SAGD do require pipelines, roads, and seismic lines. Though these infrastructure elements are somewhat 'one-dimensional' in nature and occupy a small total area of land, there are substantial 'linear disturbances', such as fragmented forests, that impact the habitat of forest animals. Canada's threatened Caribou herds, which have been on a worrisome decline in the area and throughout the world, owe some of their collapse to oil sands production, among other human factors.<sup>29,30</sup>

#### Public health

Health concerns around the impact of oil sands production have centred on the small community of Fort Chipewyan, located on the banks of Lake Athabasca and more than 220 km north of Fort

<sup>26</sup> (IHS CERA: Special Report 2013)

<sup>29</sup> Car bou, also referred to as reindeer, are a species of deer located primarily in Canada. Caribou herds comprise one of the world's great large-animal migrations. http://animals.nationalgeographic.com/animals/mammals/car bou/

<sup>&</sup>lt;sup>24</sup> IHS CERA: Special Report, Critical Questions For The Canadian Oil Sands (Washington DC: IHS, 2013).

<sup>&</sup>lt;sup>25</sup> Gary Mason, 'Hollywood Vs. Oil Sands? Not A Fair Fight', The Globe And Mail, 2013,

http://www.theglobeandmail.com/globe-debate/hollywood-vs-oil-sands-not-a-fair-fight/article14423129/.

<sup>&</sup>lt;sup>27</sup> (McWhinney 2014)

<sup>&</sup>lt;sup>28</sup> Government of A berta, *Oil Sands Reclamation* (Edmonton:

http://oilsands.alberta.ca/FactSheets/Reclamation\_FSht\_Sep\_2013\_Online.pdf, 2013).

<sup>&</sup>lt;sup>30</sup> (McWhinney 2014); IHS CERA: Special Report, Critical Questions For The Canadian Oil Sands (Washington DC: IHS, 2013).



McMurray and downstream from the major mining projects. Considered Alberta's oldest settled community, Fort Chipewyan is today home to a population of approximately 1,000 predominantly Aboriginal residents.<sup>31</sup> Widespread media claims of increased rates of cancer in the community due to oil sands pollution started in 2006 with a non-resident visiting doctor voicing dire warnings.<sup>32</sup> Aboriginal and environmental activists cried foul and wilful neglect. However, several studies have since discredited the claims, including a Royal Society report in 2010, quoted below, and recently a more conclusive report from the Alberta government in 2014:

...there is no credible evidence to support the commonly repeated media accounts of excess cancer in Fort Chipewyan being caused by contaminants released by oil sands operations, notably polycyclic aromatic hydrocarbons (PAH) and arsenic. In particular, common references to PAHs in relation to human cancer risk have been loose and inconsistent with the scientific understanding of human cancer risk from this class of compounds.<sup>33,34</sup>

Most consider the claims to be debunked, though Aboriginal leaders in the area have since funded their own studies which demonstrate some link to carcinogenic pollution.<sup>35</sup>Notwithstanding these claims, there is a general consensus among the scientific community (as quoted below, again from the Royal Society) that a broader understanding of public health impact in these remote communities is needed:

The Environmental Impact Assessment (EIA) process that is relied upon by decision-makers... to make a determination whether proposed projects are in the public interest is seriously deficient in formal health impact assessment (HIA) and quantitative sociological impact assessment (SEIA) as would be required for World Bank projects, for example.<sup>33</sup>

#### Alberta Energy Regulator (AER): World class or industry-influenced?

Despite continued efforts to improve regulatory oversight of production, the Alberta Energy Regulator strives to make Alberta one of the safest, most environmentally responsible, and transparent jurisdictions among the world's oil-producing regions.<sup>36</sup> Comparing levels of regulatory scrutiny in Alberta against those in the US Gulf Coast, Mexico, Russia, and Africa, as well as the National Oil Companies of Southeast Asia, South America, China, and the Middle East, it quickly becomes evident that Alberta is a global leader in driving environmental responsibility and compliance.

Nevertheless, the governments of Alberta and Canada have been consistently castigated by oil sands opponents as being too friendly, not truly at arm's length, to the oil and gas industry. A prime example of this is the proposal from the newly elected New Democratic Party (NDP) in Alberta to repeal the Responsible Energy Development Act of 2012. The initiative worked to combine the previously disparate Energy Resources Conservation Board (ERCB) and the Ministry of Environment into a single organization, the Alberta Energy Regulator (AER), in an effort to make the regulatory process more streamlined and efficient. The intent was to reduce uncertainty and improve competitiveness of oil and gas projects in the province, as well as ensure transparency and consistency of regulatory oversight. Though the effort was lengthy and cumbersome, the result has been lauded by industry and government alike as a giant leap forward in improving clarity, transparency, and approval times. The AER now considers itself one of the most effective regulatory bodies in the world for oil and gas

<sup>&</sup>lt;sup>31</sup> Fort Chipewyan was founded by famous explorer Peter Pond of the North West Trading Company, as a trading post for the fur trade in 1788. It was during the period of 1778-1788 that Pond became familiar with the Athabasca region, and he was the first European settler to recognize the "tar" like substance in the oil sands; Government of A berta, 'Peter Pond - Alberta Energy Heritage', *History.Alberta.Ca*, 2015, http://history.a berta.ca/energyheritage/sands/origins/the-fur-trade-and-a bertas-oil-sands/peter-pond.aspx#page-2.

<sup>&</sup>lt;sup>32</sup> The Pembina Institute, 'Briefing Note: Canadian Aboriginal Concerns With Oil Sands', 2010, https://www.pembina.org/reports/briefingnoteosfntoursep10.pdf.

 <sup>&</sup>lt;sup>33</sup> Steve H. Hrudey, *Environmental And Health Impacts Of Canada's Oil Sands Industry: Executive Summary*, The Royal Society Of Canada Expert Panel, 2010.

<sup>&</sup>lt;sup>34</sup> Alberta Health Services, *Appendix I: Fort Chipewyan Update*, Surveillance & Reporting Cancer Measurement Outcomes Research And Evaluation Cancer Control (Government of A berta, 2014)

<sup>&</sup>lt;sup>35</sup> CBC News, 'Fort Chipewyan Cancer Study Suggesting Oilsands Link To Be Released Today', Cbc.Ca, 2014,

http://www.cbc.ca/news/canada/north/fort-chipewyan-cancer-study-suggesting-oilsands-link-to-be-released-today-1.2698430. <sup>36</sup> The Alberta Energy Regulator (AER) is working with the University of Pennsylvania's Program on Regulation to determine where gaps exist between them and world-class regulators across industries.



production, and it is looking to spread its self-proclaimed best practices around the world's oilproducing basins.

Oil and gas sceptics, including the left-leaning NDP party, decry the creation of the AER as part of what they claim was ongoing excessive influence of the industry on the historically business-friendly PC party, who had been in power in Alberta for 44 years until May 2015. As a result of the NDP win, its rhetoric during the election about re-evaluating regulatory practices creates doubt for the AER's future. Although it is concerning when oil sands producers work too closely with the regulator, there does need to be a certain level of minimum interaction for the appropriate regulations to be set, given the relative immaturity of oil sands processes and technologies (such as tailing reclamation or solvents used in SAGD). After all, over the long term it is in the best interest of producers to demonstrate environmental sustainability in order to maintain its social licence to operate. What is more concerning for the future of oil sands is if the AER becomes politicized, less effective, and more bureaucratic, hampering project economics and increasing risk for investors.

#### Global impact: Greenhouse gas (GHG) emissions

The 'carbon footprint' of bitumen production is likely the most emotive issue in oil sands politics and public debate. Vehement protests in the United States and Canada (and even as far away as Europe) denounce Alberta's oil sands as 'dirty' and representing a step in the wrong direction for global environmental progress. Still, it is clear that meeting global energy demand while maintaining environmental responsibility and economic growth for developed and developing populations alike is a highly complex and nuanced problem that necessitates a comprehensive understanding of environmental costs and economic benefits of multiple energy sources. Taking an informed political stance or writing effective policy on Alberta's oil sands, requires such an understanding. Multiple independent analyses have helped elucidate the public debate, though proselytizing is still widespread.<sup>37</sup>

#### How much GHGs do oil sands projects emit?

The challenge oil sands producers face in reducing GHG emissions (primarily carbon dioxide) comes back to the massive amount of energy needed to 'reverse geology' through the inherent low energy return on investment (EROI) of separating bitumen from sand. Currently, the vast majority of energy inputs to the oil sands are derived from fossil fuel combustion such as the burning of natural gas for heat, diesel fuel for mining trucks, and coal for producing much of the electricity on Alberta's grid. It is no surprise that surface mining emits less than most in-situ SAGD and CSS projects because of their higher EROI values.

Calculating the effective GHG emissions attributed to a certain industrial process is complicated as many estimates and assumptions are required along the process value chain. There is also debate as to how much of the value chain should be analyzed. Because per barrel emissions exceed other production sources on average, oil sands producers complain that the public is not getting the whole story when environmental groups make claims like 'oil sands production emits 3 to 4 times more greenhouse gases than producing conventional crude oil'.<sup>38</sup> Oil sands production emissions are indeed substantially higher than those of conventional light oil from prolific reservoirs. That said, production is only a small proportion of the crude oil well to vehicle wheel value chain (approximately 20–30 per cent), Alberta's oil sands are located relatively close to its large-consuming American neighbour, and other heavy oil sources with higher production emissions are used by US refineries. Oil sands per barrel emissions are therefore closely in-line with the US average and in fact lower than several other sources of US crude, such as those from California's heavy oil fields as seen in Figure 2 (on the following page). That said, California's fields have been in decline for decades, while oil sands production will continue to grow, at least to some extent.

In aggregate, mining, in-situ, and upgrading emissions totalled approximately 62 Mt of GHG emissions in 2013, about 8.5 per cent of Canada's output from all sectors.<sup>39</sup> As a sparsely populated

 <sup>&</sup>lt;sup>37</sup> Jacobs Consultancy, IHS, the Alberta Energy Research Institute, the United States Department of State and Environment Canada have undertaken efforts and debates in calculating and clarifying what are the true emissions from Alberta's oil sands
 <sup>38</sup> Tar Sands Solutions Network, 'Climate - Oil Sands Reality Check', *Oil Sands Reality Check*, 2015,

http://oilsandsrealitycheck.org/factcategory/climate/.

<sup>&</sup>lt;sup>39</sup> It is now estimated to be around 70 Mt per year



country (albeit one with high individual energy consumption), Canada contributes only 1.6 per cent to global GHG emissions and the oil sands contribute roughly 0.17 per cent.<sup>40</sup> Thus it is hardly surprising that the US Department of State concluded in 2014 that the Keystone XL pipeline and its enabling of oil sands growth is unlikely to have a discernible effect on global climate change.<sup>41</sup> When questioned about the impact of carbon emissions from the oil sands in 2014, International Energy Agency chief economist Fatih Birol offered a global perspective for increases in GHG emissions until 2040:

...to be frank, the additional  $CO_2$  emissions coming from the oil sands is extremely low... the emissions of this additional production [increase in annual production from 2015–40] is equal to only 23 hours of emissions of China — not even one day. I hope all these [opponent] reactions are based on scientific facts and sound analysis.<sup>42</sup>

#### FIGURE 2: IHS WELL-TO-WHEELS GHG EMISSIONS OF OIL SANDS VS. OTHER US CRUDES



Source: IHS, © 2015 43

<sup>&</sup>lt;sup>40</sup> Natural Resources Canada, *GHG Emissions*, Oil Sands A Strategic Resource For Canada, North America And The Global Market (Government of Canada, 2015),

https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/eneene/pubpub/pdf/os2015/14-0698-Oil-Sands-GHG-Emissions us access eng.pdf.

<sup>&</sup>lt;sup>41</sup> United States Department of State, *Final Supplemental Environmental Impact Statement For The Keystone XL Project: Applicant For Presidential Permit: Transcanada Keystone Pipeline, LP* (Bureau of Oceans and International Environmental and Scientific Affairs, 2014).

<sup>&</sup>lt;sup>42</sup> Yadullah Hussain, 'New Emissions From Canada's Oil Sands 'Extremely Low,' Says IEA's Chief Economist', *Financial Post*, 2015, http://business.financialpost.com/news/energy/new-emissions-from-canadas-oil-sands-extremely-low-says-ieas-chief-economist.

<sup>&</sup>lt;sup>43</sup> See IHS Energy. *Comparing GHG Intensity of Oil Sands and the Average US Crude Oil*. Oil Sands Dialogue. Calgary, 2014, as well as Birn, Kevin, and Jeff Meyer. *Why the Oil Sands?* Oil Sand Dialogue. IHS Energy, 2015.



What Canadians are concerned about is the *growth* of oil sands emissions when compared with other sectors of the economy where emissions are shrinking. These concerns tend to be somewhat aloof to the GDP generated per produced barrel, versus other emissions sources like coal or even gas power generation.

#### Punitive vs. comprehensive GHG regulations

Binding agreements between nations have been hard to come by with so many disparate economic, geopolitical, and environmental interests involved, and few of the world's major emitters have substantially reduced emissions. Without a meaningful price on carbon emissions, politicians and environmental activists resolved to reducing emissions have resorted to obstructing individual production and midstream projects. An example of this is the environmental movement against Albertan exit pipelines, which by themselves emit very little GHG but do enable oil sands production expansion. The strategy has been described as a 'Whac-a-Mole' approach to emissions reduction: striving to squash new fossil fuel projects wherever they may arise.<sup>44</sup>

Frustrated with inaction on carbon pricing, activist groups call for a complete ban on all oil sands production, irrespective of how individual projects are managing their GHG emissions. Such rulings, if enacted, would be an example of a *punitive regulation* – one that discriminately penalizes one form of pollution over another, irrespective of the magnitude of GHGs emitted. The underlying logic is that the government or environmental groups are able to determine which individual industrial projects are in the best long-term interest of the public.

Despite its reputation as something of an environmental pariah within the confederation, in 2007 Alberta became the first Canadian province (and well ahead of any US state) to enact a carbon pricing mechanism: the 'Specified Gas Emitters Regulation'. The policy essentially charges industrial emitters CAD\$15 per tonne CO<sub>2</sub> for emissions that are beyond a 12 per cent reduction from an established baseline. This penalty is to be increased in 2016 to CAD\$30 per tonne CO<sub>2</sub> on declaration of the newly elected NDP government.<sup>45</sup> The programme is essentially punitive in intent, in that its goal is only to reduce production of large emitters, rather than emissions from other sectors such as transportation and land usage, though the cost burden is quite low – even producers who did not lower their emissions intensity are paying emissions costs of less than CAD\$1 per barrel.



FIGURE 3: ALBERTA'S PROPOSED EMISSIONS TAX: EFFECT ON OIL SANDS PRODUCERS

Source: Government of Alberta Climate Leadership report to Minister, November 2015.

<sup>&</sup>lt;sup>44</sup> 'Whac-a-Mole' is a children's carnival / arcade game where players use a mallet to knock randomly appearing toy moles or gophers back into their holes. Regardless of how quickly a skilled player can supress emerging moles, new moles always arise, seemingly faster as the level of the game increases. This is analogous to attempting to obstruct all new arising oil production projects individually, rather than having widespread regulation that penalizes emissions, leading to an overall reduction.
<sup>45</sup> Industrial emitters are considered those with more than 100,000 tonnes of CO2 emissions per year. Given that oil sands emissions for 2013 were 62 Mt, the regulation encompasses all of Alberta's medium and large oil and gas producers, few of whom have been able to meet the 12 per cent reduction standard without substantial cuts to production.



A recent government review of Alberta's carbon pricing mechanism was completed in late November 2015, and the likely to be followed recommendation is to move to a broad-based tax on emissions such that consumer and industrial polluters alike will be charged \$30 per tonne of GHG emissions. Though this would seem to have a substantial price increase for producers, a free-emission credit for production intensity in the top quartile of energy intensity is recommended, meaning that many producers could pay less than what they are today. Figure 3 summarizes the government panel's recommendations – demonstrating that the majority of production will not have major increases in GHG costs (size of bubbles in the chart represent the magnitude of production of the facilities modelled).

#### **Oil sands emissions economics**

Alberta and the neighbouring province of Saskatchewan (also with substantial oil and gas resources) are the highest-emitting provinces in Canada per capita, each with annual emissions of around 67 tonnes GHG per resident. These values are more than triple the Canadian average of 21 tonnes per capita, and are in fact significantly higher than even the world's most carbon-intensive countries like Qatar and the UAE.<sup>46</sup> Natural resource dominated economies that require large amounts of energy, power grids that run primarily on coal versus hydroelectric power, and sparse population density are the major drivers of this discrepancy. As Canada aims to reduce its overall emissions in accordance with international reduction objectives, serious considerations are needed as to how best to cutback, especially in Alberta.



#### FIGURE 4: CANADA'S GHG EMISSIONS BY SECTOR, 2013

Source: Environment Canada / CAPP.

In the next two years, the provinces of British Columbia, Alberta, Quebec, and Ontario are introducing significant pricing on carbon, in one form or another. Further emissions pressure could come from the federal government following the election of the Liberal Party in October 2015. If Canada was to put a meaningful price on carbon emissions, one potent enough for the country to do its part in limiting global temperature rise to the prescribed maximum 2 degrees Celsius, which sources of emissions from Figure 4 above would be reduced? For example, Canada could enforce an aggressive CAD\$75 per tonne carbon tax – a 150 per cent increase from today's top rate, but less than some European countries like Sweden, where some emissions are taxed as high as CAD\$150 per tonne.

A major portion of Canada's emissions from electricity generation are derived from coal plants in Alberta and Saskatchewan, as the rest of the country's power needs are primarily provided by emission-free nuclear and hydroelectric generation. In the hypothetical CAD\$75 per tonne situation mentioned above, Canadian coal plants, which emit roughly 1 tonne per MWh and sell their generation for an average of roughly CAD\$40–70 per MWh, would have to charge an additional

<sup>&</sup>lt;sup>46</sup> Environment Canada, 'Greenhouse Gas Emissions By Province And Territory - Environmental Indicators - Environment Canada', *Ec.Gc.Ca*, 2015, http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=18F3BB9C-1. Numbers taken from 2013 for emissions and population.



CAD\$70-80 per MWh, doubling or tripling the original price, to maintain the same level of profitability.<sup>47</sup> Certainly, this would promote a shift toward lower-emitting sources like nuclear, renewables, and potentially even coal plants with carbon capture technology.

On the contrary, oil sands production is less sensitive to an elevated carbon tax. Production from a SAGD operation might produce 150 kg of GHG emissions per barrel, and in the above CAD\$75 per tonne scenario this amounts to a total cost per barrel for oil sands producers of around CAD\$8-10 per barrel, a significant operating cost addition for producers indeed, but an unlikely one that itself would stymie projects from starting if oil prices rebound to above, say, \$70 per barrel. Because of relatively manageable cost (even at lower emissions rates), University of Alberta economics professor Andrew Leach, who led the climate recommendation report on behalf of the NDP government, acknowledged, in separate research, that 'the cost of upstream emissions policy is unlikely to have a meaningful impact on oil sands growth in the near term'.<sup>48</sup>

Though Leach's statement was made well before the collapse of the crude oil price, most of Alberta's oil sands producers realize that a carbon tax will not in and of itself hinder their growth unless it is punitively charged on their production alone, rather than across all forms of GHG emissions where consumers (voters) would be unlikely to support an exorbitant rate. Suncor CEO Steve Williams pleads their case in May 2015:

We think climate change is happening. We think a broad-based carbon price is the right answer. If you look at carbon production in a modern economy, about 80 per cent of it is at the point of consumption or the point of use. So targeting fees just on industry does not get to it.<sup>49</sup>

In reality, oil sands producers are well aware of the importance of reducing carbon emissions and already have 'internal carbon prices' that they use when modelling future cash flows on production. Prices used have been seen to vary extensively between CAD\$10 (per tonne) and more than CAD\$100.<sup>50</sup>

#### Can oil sands GHG emission intensity be reduced?

With oil sands operators reducing production-related GHG emissions intensity per barrel in the past 25 years by an estimated 25–40 per cent, many are optimistic about the future.<sup>51</sup> However, many of these past gains were due to producers growing out of their infancy and correspond to basic operating improvements that may be difficult to continue. Extraction from mining, for example, has made few per barrel reductions in the past five to ten years, with notable exceptions being the introduction of cogeneration at Imperial's 'next generation' Kearl mine and Shell's Scotford *Carbon Capture and Storage (CCS)*.

For in-situ production, emissions are primarily derived from making steam using natural gas. Producers who have demonstrated improvements in their steam-to-oil ratio for profitability reasons have also enjoyed the financial benefit of reducing their emissions. Up until the collapse of natural gas prices in 2008, there was talk in Alberta about building nuclear fission reactors to make the massive amounts of steam required for burgeoning SAGD production. This could reduce emissions intensity by 90 per cent or more, though it would create challenging project economics with the cost and lengthy construction timelines of building nuclear plants. Other in-situ production technologies have the potential to make significant, if incremental reductions. Among these, one standout technology is

<sup>&</sup>lt;sup>47</sup> Intergovernmental Panel on Climate Change, *Annex III: Technology-Specific Cost And Performance Parameters.*, Climate Change 2014: Mitigation Of Climate Change. Contribution Of Working Group III To The Fifth Assessment Report Of The Intergovernmental Panel On Climate Change (IPCC, 2014).

<sup>&</sup>lt;sup>48</sup> Boskovic, Branko, and Andrew Leach. *Leave It In The Ground? Oil Sands Extraction in the Carbon Bubble*. Edmonton: University of A berta, 2014. http://www.uwinnipeg.ca/economics/docs/leach-oil-sands.pdf.

<sup>&</sup>lt;sup>49</sup> Geoffrey Morgan, 'Carbon Tax Should Apply To Companies And Consumers, Says Suncor Energy Inc's CEO', *Financial Post*, 2015, http://business.financialpost.com/news/energy/carbon-tax-should-apply-to-companies-and-consumers-says-suncorenergy-incs-ceo.

<sup>&</sup>lt;sup>50</sup> The Canadian Press, 'Companies Accelerate Carbon Pricing Plans To Mitigate Risk', *The Globe And Mail*, 2015.

<sup>&</sup>lt;sup>51</sup> IHS study references an emissions reduction of 26 per cent from Environment Canada from 1990-2013, while the RSC report references a 39 per cent reduction over the period 1990-2010.<sup>33</sup>



the use of solvents, which replace much of the steam required in SAGD, and could reduce in-situ emissions by 25 per cent or more (to be discussed in more detail in subsection 3.3).<sup>52</sup>

Alberta's collected carbon tax goes to the independent, though government overseen, Climate Change and Emissions Management Corporation (CCEMC), which is in charge of distributing more than CAD\$200 million annually of grants and investments to emission reducing technologies. Access to these funds for developing technology is competitive and requires 'skin in the game' – that is, funding commitments from the private sector (above and beyond the carbon taxes collected from the private sector), of which more than CAD\$2 billion has been invested to date.<sup>53</sup>

Further to this, in a collaborative effort to solve some of the oil sands environmental challenges around both local impact and global emissions, producers joined together in 2012 to create Canada's Oil Sands Innovation Alliance (COSIA).<sup>54</sup> The member-funded group aims to lower the cost and development time for innovations in five Environmental Priority Areas: Tailings, Water, Land, Greenhouse Gases, and Monitoring. Although each of these focus areas is needed to reduce comprehensive environmental impact, it is primarily the GHG emissions of extraction and upgrading that have the potential to significantly constrain future production growth. COSIA's stated GHG goals include:

- improving energy efficiency in all aspects of oil sands operations, including the production of steam for in-situ (in place) recovery of bitumen
- recovering waste heat for reuse
- design and operating best practices
- measurement, monitoring, and verification
- reducing flaring, venting, and fugitive emissions
- CCS of CO2 from steam generators and other large oil sands facilities
- producing alternative energy
- exploring regional opportunities to reduce GHG emissions with non-industry parties <sup>55</sup>

Several projects are currently underway that address these goals and have the potential to make significant reductions in GHG emissions.<sup>56</sup> Though these technologies and future innovations could provide the combined incremental reductions needed to make the oil sands at par with, or even less emission intensive than, conventional oil production, they do come at a cost. Without a more substantive price on GHG emissions (the current CAD\$30 per tonne tax will not likely dictate project economics) or a substantial recovery of natural gas prices to pre-2008 levels (doubtful due to the advent of shale gas), it is difficult for producers to justify to their shareholders the increased costs of implementing complex GHG reduction initiatives on a large scale. Indeed, capital and operating costs and complexities in the oil sands are already formidable before adding the burden of reducing emissions. This headwind against reducing GHG intensity is exacerbated by the 2014 crash in global crude prices and resultant smaller operating margins. As discussed later in this paper, it is more likely that the pressures on production cost and the resulting innovative extraction technologies, especially in SAGD, will drive down GHG emissions as a 'nice-to-have' outcome, rather than what COSIA is developing; the production SOR ratio 'dog' wags the GHG intensity 'tail'. The challenge is that

<sup>&</sup>lt;sup>52</sup> 'Imperial Oil developed Liquid Addition to Steam for Enhanced Recovery. Pilot tests of this new technology have demonstrated significant process efficiencies, reducing GHG emissions by 25%' – CAPP

<sup>&</sup>lt;sup>53</sup> Shawn McCarthy and Jeff Lewis, 'The Race To Find Transformative Carbon Strategies Is On', *The Globe And Mail*, 2015, http://www.theglobeandmail.com/report-on-business/the-race-for-transformative-carbon-strategies-is-on/article26231817/.

<sup>&</sup>lt;sup>54</sup> COSIA members comprise more than 90 per cent of production in Canada: BP Canada, Canadian Natural Resources Limited, Cenovus Energy Inc., ConocoPhillips Canada Resources Corp., Devon Canada Corporation, Imperial Oil, Nexen, Shell Canada Energy, Statoil Canada Ltd., Suncor Energy Inc., Syncrude Canada Ltd., Total E&P Canada Ltd., and Teck Resources Limited

<sup>&</sup>lt;sup>55</sup> Cosia.ca, 'Greenhouse Gases - COSIA', 2015, http://www.cosia.ca/initiatives/greenhouse\_gases.

<sup>&</sup>lt;sup>56</sup> CNRL has spearheaded development of an *Algal Bio-refinery* with support from the government of Canada's National Research Council that will be shared with other industry players through COSIA. The project takes CO<sup>2</sup>, wastewater, and waste heat from oil sands production to promote growth of algae that is pressed to produce bio-oil (used as refinery feedstock or as a diluent for bitumen or SCO) and fertilizer. CNRL aims to reduce CO2 emissions by 15 per cent at its Horizon mine and by 30 per cent at its Primrose in-situ site. Other projects such as incorporating gas turbine cogeneration into the steam boiler process, molten carbonate fuel cells, and vacuum insulated SAGD tubing show some promise.



production technologies are understandably proprietary, unshared between producers, and will take longer to develop to a commercial scale (discussed further in section 3).

#### 1.3 Impact of oil sands production on the Aboriginal peoples

#### A history of distrust

Once the Canadian provinces joined into a Confederation back in 1867, the new federal government moved forcefully to assimilate Aboriginal peoples. <sup>57,58</sup> Canada's founding and otherwise venerated Prime Minister Sir John A. MacDonald actively promoted the idea of a *status Indian* (making a clear demarcation from white settlers) and developed the inhumane residential school system. <sup>59</sup> MacDonald described his intent to the Canadian House of Commons in 1883:

Indian children should be withdrawn as much as possible from the parental influence, and the only way to do that would be to put them in central training industrial schools where they will acquire the habits and modes of thought of white men.<sup>60</sup>

In causing widespread family separation, societal destruction, and many deaths from disease and mental illness, these residential schools lasted over 100 years and are considered one of the greatest moral stains on Canada's history. It is amid the legacy of these schools, as well as multiple other forms of bigotry and cultural ignorance, that today many of Canada's Aboriginal peoples are distrustful of provincial and federal governments, as well as private sector investors, even when they are proposing projects with tremendous economic benefits to their often impoverished communities.

#### **Opposition to development**

Canada's Aboriginal population is growing rapidly – an estimated 23,000 Aboriginal people live in the oil sands region in Northern Alberta.<sup>61,62</sup> Many of these residents rely on the boreal forest, the principal land type in the region, for livelihood activities such as fishing, trapping, and hunting. Substantial opposition, including calls for a moratorium on production, to oil sands development exists among some of the Aboriginal groups. Primarily cited concerns are around water removal from the Athabasca River, local water and air pollution from production sites, and adverse impacts on Caribou populations. These groups have felt ignored by government agencies and industry, and have taken their grievances to the courts, claiming a lack of adherence to their treaty rights. However, many of their protests have not been substantiated with verified scientific evidence, as in the case of cancer concerns due to pollution. As a result, the protests have been relatively unsuccessful in stopping oil sands projects to-date, though they do act to delay projects coming online, add unforeseen costs, and subsequently hurt the economic return on investment. The recently elected federal Liberal government (which oversees Aboriginal policies) has promised further engagement and powers for Aboriginal communities with respect to resource development, which could prove challenging for producers.

#### A proactive approach

Seemingly just in the past decade, oil sands companies and government agencies have become more aware of the challenges that Aboriginal peoples face, the past atrocities committed against them

<sup>&</sup>lt;sup>57</sup> Having arrived in over 12,000 years ago in North America, Aboriginal peoples developed numerous cultures and societies in Western Canada that have advanced considerably by the time Europeans first made contact in the 1700s. A multitude of treaties aimed at expropriating land across the vast western territories for European settler commercial interests were imposed, including a concerted British effort to "civilise the Indian" in Canada and throughout its empire.

 <sup>&</sup>lt;sup>58</sup> Aboriginal Affairs & Northern Development Canada, *A History Of Treaty-Making In Canada* (Government of Canada, 2010).
 <sup>59</sup> Timothy J. Stanley, 'John A. Macdonald'S Aryan Canada: Aboriginal Genocide And Chinese Exclusion', *Activehistory.Ca*, 2015, http://activehistory.ca/2015/01/john-a-macdonalds-aryan-canada-aboriginal-genocide-and-chinese-exclusion/.

<sup>&</sup>lt;sup>60</sup> Daniel Schwartz, 'Cultural Genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.com/complexities/cultural Genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal/cultural Genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *Cbc.Ca*, 2015, http://www.ebs.cs.cau.org/au/cohoriginal-genocide Label For Residential Schools Has No Legal Implications, Expert Says', *C* 

http://www.cbc.ca/news/aboriginal/cultural-genocide-label-for-residential-schools-has-no-legal-implications-expert-says-1.3110826.

<sup>&</sup>lt;sup>61</sup> Natural Resources Canada, *Aboriginal Peoples*, Oil Sands: A Strategic Resource For Canada, North America And The Global Market (Government of Canada, 2015),

http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/eneene/pubpub/pdf/12-0655-OS-Aboriginal-eng.pdf. <sup>62</sup> Canada's aboriginal population numbers more than 1.4 million as of 2011 (4.3 per cent of the country's population at that time). First Nations, Métis, and Intuit peoples are all considered aboriginal Canadians. Of the 616 First Nations groups, 45 are in Alberta, and 18 of those are located in the oil sands regions. 6 Métis settlements are also contained within the oil sands.



and their culture, and the opportunities that oil sands development can bring to their communities. In 2012, Aboriginal contractors grossed CAD\$1.8 billion in revenues and Aboriginal employment in the oil sands was over 1,700. All major oil sands operators have developed increasingly comprehensive Aboriginal relations strategies aimed at increasing Aboriginal employment, empowering Aboriginal contractors, and ensuring formal and informal consultations are a critical gate in project planning. Syncrude and Cenovus focus on corporate social responsibility investments in Aboriginal communities, scholarship, and leadership programmes. Cenovus prides itself on its local relationships with local residents and trappers. In general, proactive operators feel that the financial investment in maintaining strong relationships with Aboriginal communities will pay off in the form of an improved local labour force and fewer project delays. As the Royal Society of Canada's oil sands report in 2010 summarized:

Consultations need to achieve meaningful agreements that will allow First Nations and Métis populations affected by developments to participate tangibly in benefits of development, rather than simply having to adapt to negative impacts.<sup>63</sup>

#### 1.4 Economic impact of the oil sands

Oil sands extraction, transport, and processing has become a critical pillar of the Canadian economy, the engine of growth upon which Canada was able to quickly ride out the global financial crisis of 2008–09. Oil sands production requires much more manufactured inputs and labour from across the country than conventional production does. Just taking a glance at the national business news or one of the federal debates preceding the fall 2015 election, one can grasp the oil sands significance to the Albertan and Canadian economies.

In an effort to educate policy makers and the Canadian citizenry, research groups such as CERI, IHS, and the Conference Board of Canada, among others, have developed in-depth calculations to demonstrate the economic value added by oil sands development.<sup>64</sup> Though the estimates vary, annual GDP impact hovers around CAD\$100 billion, though this will drop in 2015 with the depressed prices for crude and reduced capital investment. This amounts to approximately 5 per cent of Canada's GDP. More importantly, the oil sands (as part of the nation's extractive industries) act as a 'leading edge' of economic growth. That is, oil sands development drives a disproportionate amount of growth and balance of trade for the country. Of Canada's largest and most influential companies, it is the energy, mining, and petroleum firms that receive the largest amount of foreign direct investment.<sup>65</sup>

Employee compensation in the oil and gas industry tends to be substantially higher than in other industries. Despite the loss of hundreds of thousands of jobs in lower-paying manufacturing to lower-cost developing countries over the past decade, Canada delivered one of the stronger economic records among its G7 peers following the financial crisis due in no small part to accelerated oil sands development amid robust crude prices.

#### Royalties & taxes: Collecting government revenue vs. incentivizing growth

Unlike the United States, mineral rights are not included with surface rights as a part of land ownership in Canada; they are owned by the provincial governments as part of the Natural Resources Transfer Act of 1930. Today, the province has the subsurface rights to 81 per cent of Alberta's land (97 per cent in the oil sands areas) and distributes producing rights through competitive auctions. In addition to collecting sale revenue from these auctions, the provincial government collects royalties based on producing revenues and provincial corporate tax, applicable to all corporations. In 2012, oil sands production directly accounted for almost one-third of provincial government revenues and 6 per cent of federal revenues.<sup>66</sup> It is clear that both levels of government are dependent on current and future production to maintain spending on social programs for their citizens. Increases to royalty rates and corporate taxation have in recent years formed the platforms of left-leaning political platforms, to

<sup>&</sup>lt;sup>63</sup> Steve H. Hrudey, *Environmental And Health Impacts Of Canada's Oil Sands Industry: Executive Summary*, The Royal Society Of Canada Expert Panel, 2010.

<sup>&</sup>lt;sup>64</sup> (Millington and Murillo 2015), (Burt, Crawford and Arcand 2012), and (Bonakdarpour and Forrest 2014)

<sup>&</sup>lt;sup>65</sup> Foreign Affairs, Trade and Development Canada, 'Foreign Direct Investment Statistics', 2015,

http://www.international.gc.ca/economist-economiste/statistics-statistiques/investments-investissements.aspx?lang=eng. 66 (Bonakdarpour and Forrest 2014)



some extent in an attempt to satisfy populist contempt for wealth within the energy industry. Regardless of whether these sentiments are justified, such increases will limit the amount of investment in new projects and could counterproductively reduce overall government revenues.

## 2 Getting to market: the oil sands price discount

#### 2.1 The WCSB bottleneck

Crude oil refining capacity tends to coalesce around population density, tidewater access, and petroleum-producing geology. Alberta lacks two of these three – the population density of the four Western Canadian provinces is only around 3.8 people per square km, compared with 35 in the US and 270 in the UK. The result is that refining capacity in Western Canada is only about 0.6 million bpd, even slightly less than the region's demand at 0.7 million bpd, and only 17 per cent of the Western Canadian Sedimentary Basin (WCSB) production of 3.5 million bpd in 2014.<sup>67</sup> Remotely located, like many of the world's prolific oil basins, the WCSB has had to build up world-scale pipeline capacity over the decades to get its oil to market. This has been accomplished by sending much of it to the US Midwest with the help of the Enbridge Mainline, in service since 1950. With rapid oil sands production growth since 2000 and a shortage of refinery space able to take heavy crude in the Midwest, producers have been looking to new markets in Eastern Canada, the US Gulf Coast, and Asia, exporting the crude from ports and terminals on Canada's West Coast.





Source: Canadian Association of Petroleum Producers (2015).

in thousand bpd	<b>US Midwest</b>	US Gulf Coast	CAN-US W. Coast	CAN E. Coast	Total Egress				
Current									
Enbridge	2,851	-	-	-	2,851				
TransCanada	591	-	-	-	591				
Kinder Morgan		-	300	-	300				
Spectra	280	-		-	280				
Current Total	3,722	-	300	-	4,022				
Proposed									
Proposed Total	370	830	1,115	1,100	3,415				

#### TABLE 3: WCSB CRUDE OIL EXITING PIPELINE CAPACITY

Sources: CAPP and Enbridge.

Over 3.4 million bpd in exit capacity from Alberta is proposed across four major new-build projects, while further expansion is planned downstream by TransCanada and Enbridge in the US (see Table 3

<sup>&</sup>lt;sup>67</sup> Canadian Fuels Association and Canadian Association of Petroleum Producers (CAPP)



and Figure 5 above). Major WCSB exit proposals include Enbridge's Northern Gateway and Kinder Morgan's Trans Mountain Expansion, both aimed at reaching Asian markets, and two TransCanada projects: the famous Keystone XL to connect to the Gulf of Mexico refinery complex, and the Energy East line to supply crude to Eastern Canadian refineries and European markets.



#### FIGURE 6: WCSB SUPPLY AND BAKKEN MOVEMENTS VS. EGRESS CAPACITY

Source: Canadian Association of Petroleum Producers (2015).

Substantial delays and opposition exist for each project, creating heavy price discounts for Western Canadian heavy crude and uncertainty among upstream operators and investors. This has led to an increase in oil sands crude being shipped by rail transport (shown in Figure 6), reaching an estimated 185 thousand bpd in 2014 (conventional, light tight oil, and oil sands).<sup>68</sup> Rail transport, however, is the most expensive method of shipping and has limits given current infrastructure.

#### 2.2 WCS vs. Global oil

Western Canadian crude oil has suffered from multiple price discounts compared with the globally traded, seaborne Brent oil price. First, the well-known North American West Texas Intermediate (WTI) to global Brent differential, driven primarily by the advent of LTO and the US ban on crude exports to countries other than Canada. Second, the price between light sweet crude at Edmonton and WTI, driven by transport costs and the lack of egress from the WCSB. Third, the oil sands' heavy oil standard grade *Western Canadian Select (WCS)*, a blend of bitumen and diluent, is further discounted due to its sour nature and low API of 20.5.<sup>69</sup>

Accordingly, WCS has at times been the lowest-priced crude oil in the world. Figure 7 shows the extent of the differentials: the gap between WTI and WCS averaged around \$15–20 per barrel over the past decade, while the gap between Brent and WCS has exceeded \$50 per barrel on several occasions in the last five years. On such occasions, the term 'bitumen bubble' was prevalent within the oil industry and Canadian politics. Current discounts between WCS and WTI (as of January 2016)

<sup>&</sup>lt;sup>68</sup> CAPP (2015)

<sup>&</sup>lt;sup>69</sup> WCS was defined in 2004 by CNRL, Cenovus, Suncor and Talisman Energy to consolidate a variety of supply streams and create a price benchmark within North American for heavy oil from the oil sands



have lowered to around \$13–15. And fortunately for Canadian producers, the WTI–Brent differential has mostly disappeared due to the US government now permitting exports of crude oil.





Source: Oil Sands Magazine (2015).

#### The Mexican Maya comparable

Light tight oil coming the Bakken shale play (mostly located in the US but straddling the Canadian border) also suffers from discounted prices due to the extent that WCS does. More telling is that the government price-controlled Mexican Maya crude, the largest direct heavy oil competitor stream that WCS faces in the US Gulf Coast, has historically managed to maintain smaller differentials to WTI and until recently, now that pipelines transport is opening up, has been priced higher than WCS (see Figure 8 for a freight on board comparison).

#### **Retooling for heavy oil**

Starting in the early nineties, out of fear of dwindling domestic light oil supplies and then with projections of rapid growth in Canada's oil sands, US Gulf Coast refineries have spent more than \$85 billion retooling themselves to accept a higher portion of heavy crude (US Midwestern refineries added another \$15 billion).<sup>70</sup> The idea was that their refining spreads would be higher with low-cost, plentiful heavy oil from Canada, Mexico, and Venezuela than ever increasing light and medium crudes imported at Brent prices. Ironically, due to the unforeseen upsurge in US light tight oil, producers of heavy crudes such as Pemex's Maya have been able to charge refiners near WTI prices because of the large refining capacity for heavy crudes. In fact, between 2011 and 2013, Maya heavy commanded a higher price than the lighter and less sour WTI grade by an average of more than \$6 per barrel - the refiners had built up too much heavy capacity. During that same period, oil sands producers 3.000 km to the north grumbled that their bottlenecked Maya crude competitor WCS could only garner a price discounted by an average of \$20 per barrel against WTI (\$26 per barrel versus Maya). These discounts reduced oil sands revenues by roughly CAD\$5-15 billion annually. Fortunately for oil sands producers, improved access to pipeline transport to the Gulf Coast, at least in the US south of Cushing, has lowered the WCS discount to around \$13–15 as of December 2015. The remaining difference in WCS price from Maya crude can now then be attributed to the fact that oil sands heavy crude is of lower quality - with a higher total acid number (TAN) and presence of diluent.

<sup>&</sup>lt;sup>70</sup> Birn, Kevin, and Jeff Meyer. Why the Oil Sands? Oil Sand Dialogue. IHS Energy, 2015.



#### FIGURE 8: FOB WCS VS. MEXICO'S FOB MAYA CRUDE (\$ PER BBL, NOMINAL)



Source: Energy Aspects, Reuters.

#### 2.3 Increasing the value of Canadian crude oil

Three major North American midstream players have proposed four pipeline projects to move WCS and SCO to North American and overseas markets. However, each of these have environmental and political challenges to confront, and many opponents claim that granting approvals is akin to giving oil sands production and its associated carbon emissions a green light. (Recall that current oil sands production constitutes around 0.17 per cent of global emissions.)

#### Keystone XL (TransCanada)

Even with a casual following of international energy news, or US or Canadian politics, in recent years, one will surely have heard mention of the Keystone XL pipeline.<sup>71</sup> The proposed pipeline is the fourth phase of TransCanada's Keystone project, slated to carry 830 thousand bpd of crude from Alberta to the Midwestern state of Nebraska. Though not the first major new pipeline to be announced (that honour belongs to Enbridge's Northern Gateway), it is the best known and was considered the most likely to be completed given the technical review hurdles it had cleared. It is one of the few single pipelines to have multiple books written about it, and its approval will be a key debate topic during the US presidential election of 2016. Though Keystone-related concerns about the danger of spills and sensitive ecosystem protection are at times legitimate, they are mostly overblown with respect to past and ongoing pipeline approvals and acceptable levels of risk among energy sources in modern American society.

Keystone XL was held up for almost the entirety of the Obama presidency by the US approval system, first with environmental and legal reviews, and more recently used as a tool of political leverage.<sup>72</sup> Although it seemed likely that Keystone's fate would be in the hands of the newly elected president, not to be reconsidered until 2017, President Obama decided to respond to TransCanada's request for a delay with a swift rejection of the pipeline, claiming that it hurt the US's global climate

<sup>&</sup>lt;sup>71</sup> Keystone XL has been termed by renowned oil historian Daniel Yergin as 'the most famous pipeline in the history of the world, even without being built yet.' Globe Editorial, 'Premier Redford and the World's Most Famous Unbuilt Pipeline', *The Globe and Mail*, 2013.

<sup>&</sup>lt;sup>72</sup> Despite 63 per cent support for a bill approving construction of the pipeline in both the US Senate and House of Representatives in early 2015, and US government reports stating that Keystone's construction would have a negligible effect on global emissions, President Obama vetoed the bill claiming it interfered with the executive branch's authority. At the time, his administration stated that he would decide on the pipeline with a few weeks following more reviews. In retrospect, it is interesting to note this institute remarked on Obama dodging the issue bowing to political pressure in 2011 and punting his decision to beyond the 2012 election. - Michael D. Shear and Coral Davenport, 'Obama Vetoes Bill Pushing Pipeline Approval', *The New York Times*, 2015, http://www.nytimes.com/2015/02/25/us/politics/as-expected-obama-vetoes-keystone-xl-pipeline-bill.html.



change reputation and was not in the best interest of the country. A rejection on such tenuous environmental grounds contravenes the North American Free Trade Agreement with Canada however, and a legal challenge has come from TransCanada seeking \$15 billion in costs and damages.

The pipeline does have further hope – if the victorious 2016 president-elect is from the Republican Party, the pipeline will likely be approved in early 2017.<sup>73</sup> Since the favoured and most pro-business Democratic presidential candidate Hillary Clinton has declared she will reject the pipeline, Keystone XL's existence hangs for the most part on the outcome of the US presidential race in November 2016.<sup>74</sup>

From a geopolitical perspective, few American leaders historically would target a strategy aimed at blocking trade routes to Canada, a NAFTA free-trade partner and ally. However, this trade distortion is precisely the most impactful outcome of blocking Canadian heavy crude access to the US Gulf Coast, rather than the stated goal of reduced carbon emissions and environmental progressivism, for which a rejection of Keystone XL has little impact. In reality, the resulting increased use of less-efficient rail transport will likely raise emissions.

#### Northern Gateway (Enbridge)

Few pipelines stay in the planning stages for as long as the Northern Gateway. The project was formally launched in 2004 and as of January 2016 seems maybe a decade away from being completed, if ever. The proposal would build twin pipelines between a terminal near Edmonton and the Canadian west coast at Kitimat, British Columbia, also the proposed site of a world-scale LNG terminal. One pipeline would send 525 Mbpd of crude to the coast, to be shipped via tanker to Asia, while the other would return diluent eastward to blend with newly mined bitumen in Alberta.

Enbridge suffered delays in starting the project's review by a Joint Review Panel (JRP), consisting of the National Energy Board (NEB) and the Canadian Environmental Assessment Agency (CEAA) in 2010. Once the JRP process started, Enbridge was confronted publicly about not providing enough detail to the regulators. The contentious element of the Northern Gateway is the increased supertanker traffic into the narrow, windy, wavy, snowy, and wildlife-abundant inlet of Kitimat. Enbridge is aware of these challenges and has designed advanced risk reduction systems that have won the approval of Transport Canada. However, opposition is especially intense given the strong environmental focus of voters and Aboriginal groups in Canada's western province of British Columbia. In total, 45 Aboriginal groups are impacted by the pipeline, and only 26 currently support the initiative.<sup>75,76</sup>

The JRP finally released its report in 2013 and highlighted 209 issues of concern to be addressed, and the federal Conservative government followed suit by approving the pipeline in 2014, subject to Enbridge addressing those concerns. Given the cost and complexity around meeting these conditions that address Aboriginal engagement, marine wildlife, land mammals, pipeline integrity, and rigorous reporting, Enbridge has become rather silent on the project. Public anxiety of having oil tankers sail from the northwest coast, despite evidence showing the risks are acceptable, has led to newly elected Liberal Prime Minister Justin Trudeau banning the practice, effectively halting the Northern Gateway pipeline process until at least 2019, when the next federal elections take place.

#### TransMountain Expansion (Kinder Morgan)

Similar to the Northern Gateway, the more recently proposed TransMountain Expansion would add 590 thousand bpd of pipeline capacity from Edmonton, this time going to the west coast Port of Metro

<sup>&</sup>lt;sup>73</sup> Quicksilver Republican presidential candidate Donald Trump (the leader in polls as of January 2016) is running on a platform of economic nationalism and has claimed he would demand profit from TransCanada before approving the pipeline

<sup>&</sup>lt;sup>74</sup> Anne Gearan and Steven Mufson, 'Hillary Clinton Says She Opposes Keystone Pipeline', *The Washington Post*, 2015.

<sup>&</sup>lt;sup>75</sup> Tracy Johnson, 'Is Northern Gateway Quietly Being Shelved?', *Cbc.Ca*, 2015, http://www.cbc.ca/news/business/is-northern-gateway-quietly-being-shelved-1.2965355.

<sup>&</sup>lt;sup>76</sup> Activists have at times singled out Enbridge because of the company's spilling of diluted bitumen into Michigan's Kalamazoo River in 2010. This was the costliest inland pipeline spill in US history at more than \$1 billion. Though such major incidents are infrequent and a somewhat unfortunate result of probability, as well as the fact that Enbridge has since made major improvements to its integrity management and operating procedures, activist opposition remains ardent. See Steven Mufson, 'NTSB Blames Enbridge, 'Weak' Regulations in Kalamazoo Oil Spill', *The Washington Post*, 2015.



Vancouver in Burnaby. The proposal comprises of the twinning of Kinder Morgan's legacy Edmonton– Vancouver TransMountain pipeline built in 1953 (safely operating with multiple expansions, most recently in 2008) and increasing tanker frequency through the inlet from approximately five to 34 trips per month. The proposal is currently being reviewed by the NEB and, given that new pipeline and marine routes are not needed, is more likely to meet regulator requests than the Northern Gateway.

The challenge in getting the pipeline built will come from municipal and environmental opposition. The port to be used for export is located within Greater Vancouver, picturesquely nestled between the Coast Mountains and a straight leading to the Pacific Ocean, and accordingly one of the world's most desired and expensive cities in which to live. The city is a hub for wealthy Canadians and international real-estate investors, as well as an epicentre of environmental activism.<sup>77</sup> The municipal government prides itself on its efforts to build the world's 'Greenest City' and cites reports that Vancouver's 'green brand' is worth CAD\$31 billion. A vociferous opponent, Vancouver Mayor Gregor Robertson reacted to the results of a study commissioned by his own office in 2015 in no uncertain terms:

Today we heard overwhelming evidence that the Kinder Morgan pipeline proposal and the oil tankers associated with it are incredibly disastrous for Vancouver.<sup>78</sup>

In an effort to plead the case for the expansion, Kinder Morgan's chairman and CEO has highlighted how the protests against the pipeline are politically driven and that it comes down to a decision by the federal government:

I am sure there are legitimate concerns about any mega infrastructure development, but a lot of this is [about] the pipeline as a choke point to get at production of the oil sands, which there are people in Canada and the U.S. who want to strangle that altogether....I believe that Canada, like the U.S., has the rule of law, and I think if you have a valid federal decision to go forward, the project will go forward... I think we will get this permitted. We intend to get it built. And we hope to see it in service in the third quarter of 2018.<sup>79</sup>

This quote came before the announcement from Trudeau's Liberal government in January 2016 that the process would be delayed by four additional months to determine the pipeline's (indirect) effect on Canada's GHG emissions, such that the earliest a Federal approval could come, would be in December 2016. This corresponds to a 2019 on-stream date, barring further delays.

#### Energy East (TransCanada)

Last to the game, but certainly not least in magnitude, the Energy East pipeline proposal, that would transport 1.1 million bpd of WCSB crude to Eastern Canada, was announced publicly by TransCanada in 2013, and is currently being reviewed by the NEB. The proposal would transport oil from Alberta and Saskatchewan over 4,600 km to refineries and terminals in the eastern provinces of Quebec and New Brunswick, where there is port access to the Atlantic Ocean. The benefits include a less environmentally contentious path than the Northern Gateway or TransMountain Expansion, without the need for US governmental approval to which the Keystone XL is beholden. The crude will flow to Canadian refineries and terminals, improving regional and local economies throughout the country.

The pipeline is unique in that support will be required from a multitude of Canadian provinces, with Quebec being the most averse to its construction. Concerns about an export terminal impacting the breeding habits of the Beluga Whale off the coast of Quebec has TransCanada looking for another location to build an export terminal, likely in another maritime province due to opposition from the Quebecois people, who are traditionally more hostile to industrial projects. This hiccup is causing the project to be delayed by over two years, with a completion date being extended until at least 2020.<sup>80</sup>

<sup>&</sup>lt;sup>77</sup> Greenpeace was founded in Vancouver in 1971

<sup>&</sup>lt;sup>78</sup> Laura Kane, 'Trans Mountain Pipeline Expansion 'Disastrous,' Says Mayor Gregor Robertson', CBC.CA, 2015,

http://www.cbc.ca/news/canada/calgary/trans-mountain-pipeline-expansion-disastrous-says-mayor-gregor-robertson-1.3090501.

<sup>&</sup>lt;sup>79</sup> Claudia Cattaneo, 'Transmountain Pipeline 'Will Go Forward' If Approved, Kinder Morgan Inc CEO Says', *The National Post*, 2015.

<sup>&</sup>lt;sup>80</sup> Geoffrey Morgan, 'Transcanada Corp'S Decision To Shelve Quebec Oil Terminal Plans May Delay Energy East Pipeline By Two Years', *The National Post*, 2015.



Further to that, Mayor Denis Coderre of Montreal, a city on the proposed pipeline route, has come out vehemently against the project:

We are against it because it still represents significant environmental threats and too few economic benefits for greater Montreal.<sup>81</sup>

Albertans are becoming frustrated with other provinces restricting export access for their products, while Alberta has historically paid a disproportionately large amount of 'equalization payments' that poorer Canadian provinces receive (Quebec is by far the largest recipient of these payments historically). In January 2016, the Alberta government's political opposition leader vociferously attacked Montreal's environmental record when rejecting the Energy East pipeline:

While Mr. Coderre dumps a billion litres of raw sewage directly into his waterways and benefits from billions in equalization payments [CAD\$9.5 billion in 2015], his opposition to the Energy East pipeline is nothing short of hypocritical.<sup>81,82</sup>

The debate is likely to become more acrimonious in the coming months and years, as the oil sands require the approval of at least one major pipeline in order to grow. Prime Minister Justin Trudeau ran a successful election campaign on the promise that he could help get oil sands oil to tidewater, while guaranteeing any project that is approved must first earn a 'social license'. The ill-defined term is a dangerous one and Trudeau has his work cut out for him. Contentious debates and potentially major delays are ahead for both the Energy East and the TransMountain pipelines; as a result of the Liberal government's newly announced inclusion of climate change impact on the approval of pipelines, Energy East will suffer a further 9 month delay for a total regulatory review period of 27 months. Few countries in the world impose such scrutiny and delays before approving energy infrastructure.

#### Rail

US light tight oil and the Canadian oil sands have together added around 5 million bpd of production in the past five years, but the largely unforeseen nature of this boom means that there is now an unsurprising shortage of pipeline infrastructure across North American continent. For the first time since the late 1800s, when the first crude pipelines in the US came online to avoid the overly unionized and costly railroad companies, rail has re-emerged to become a competitive alternative for shipping crude around Canada and the US. Research firm IHS predicts rail in North America will transport more than 1,400 thousand bpd in 2015, up from 20 thousand bpd in 2009.<sup>83</sup> The biggest users are producers in the light tight oil Bakken formation, centred on the US state of North Dakota. As the largest oil-producing shale basin outside Texas, the Bakken struggles with acute egress challenges, not unlike Canada's oil sands in recent years with the delays of major pipeline proposals. Though safety is a major concern for transport of crude by rail, as those in the town of Lac-Mégantic in Quebec can well attest to, it is less of a concern for diluted bitumen which is much less flammable than the very light oil extracted in the Bakken.<sup>84</sup>

For bitumen producers, rail provides geographic flexibility and frees them from the necessity of adding costly diluent. Because closely located bitumen can be loaded onto railcars without the need for diluent to reduce its viscosity for pipeline transport, some operators are building Diluent Recovery Units (DRUs) that remove excess diluent from the crude ensuring that what is transported by rail is only the bitumen they produced.

Though the price of shipping by rail from the WCSB to the US Gulf Coast is substantially more expensive compared with pipeline transport (IHS estimates this premium to average \$8 per barrel), the WTI–WCS discount has in the past five years justified this expense for surplus barrels that cannot get past the pipeline bottleneck. Over the longer term, however, with oil prices driving down netbacks for producers, rail is unlikely to act as much more than a last resort, or used to ship insignificant

Les. "Montreal's Sewage Dump Plan Reveals Common Misconceptions". *The Globe and Mail*, 2016.

83 (IHS Energy 2014)

<sup>&</sup>lt;sup>81</sup> Cbc.ca,. "Montreal Mayor Denis Coderre Says Energy East Pipeline Too Risky", 2016.

http://www.cbc.ca/news/canada/montreal/montreal-mayor-denis-coderre-energy-east-opposition-1.3413117

<sup>&</sup>lt;sup>82</sup> Montreal has been forced to release toxic sewage into the Saint Lawrence Seaway due to poor planning. See Perreaux,

<sup>&</sup>lt;sup>84</sup> The Lac-Mégantic Rail Disaster occurred on July 6<sup>th</sup>, 2013. Multiple rail cars exploded, killing 47 people and destroying 30 buildings.



volumes to geographical regions that lack pipeline connectivity. Shipping by rail will not itself have a great effect on lowering the WCS discount, though it will continue to protect the discount from getting out of hand.

#### 2.4 The egress problem: A wall or an obstacle?

Though politicians, environmentalists, and industry groups seem to fight many of their battles over the approval of pipelines, egress challenges alone are unlikely to block the growth of oil sands production. The massive increase in rail transport in the past five years is testament to this. With the economic implications at stake, especially during times of higher global crude prices, major pipelines and marine transport pathways for Canadian oil sands crude will be found sooner or later, as long as the profitability incentive to produce is there.

Pipeline opponents concerned about the impact of greenhouse gases from oil sands production who demand that this be taken into consideration before pipeline approval are misguided. Their concerns should be refocused not just on oil sands producers, but other industrial players and consumer endusers alike, and on deciding whether to generate emissions based on economic utility and a government regulated carbon constraint (pricing or otherwise). The onus for oil sands GHG emissions reductions will not, and should not, be on the pipeline operator, who oversees a very small portion of the total well-to-wheels emissions.



#### 3 Can oil sands projects better compete on cost?

#### 3.1 A brief history of oil sands supply cost

In many respects, Canada's oil sands have a reputation similar to deep-water and several other sources of difficult oil – considered slow-moving, complicated, and costly. The cumbersome process of extracting entrapped bitumen from sand in a remote geography while attempting to minimize environmental impact, blending it with premium-priced diluent, and transporting it thousands of kilometres to faraway markets is indeed fraught with complexity and expense. One is left to wonder how the early oil sands endeavours at Syncrude and Suncor stayed afloat, and why Shell, Cenovus and other followers rushed quickly to grow production in the early 2000s, with only modest price increases at the time.

We can gain some insight to this question from Figure 9, which shows past estimates of the supply cost (also called the break-even price) for *greenfield* oil sands production projects against WTI and WCS prices.<sup>85</sup> The supply costs shown estimate the required price of pure bitumen (not SCO or even WCS) required to cover capital costs, operating costs including fuel, working capital, royalties, taxes, regulatory liabilities, and a 12.5 per cent rate of return profit.<sup>86</sup>



# FIGURE 9: REAL OIL SANDS SUPPLY COST OF BITUMEN VS. CRUDE PRICE 2015 USD\$ / BBL

Source: National Energy Board, CERI, Oil Sands Magazine.

Note: Per barrel supply costs, as well as WTI and WCS prices, are shown in 2015 dollars, with an assumption of Alberta's rather high level of inflation used to adjust the historic estimates.

Making the comparison in real currency, an industrial or commercial operation with costs per unit of production that increase only with inflation would show as a flat line. Furthermore, industrial

<sup>&</sup>lt;sup>85</sup> Supply costs shown are those estimated by CERI (2010-2014) and NEB (1997-2006). An additional data point from CERI was made public for 2003: USD\$14 for SAGD and USD\$14 for Mining. This is similar to USD\$13 and USD\$13 from the NEB for that year.

<sup>&</sup>lt;sup>86</sup> 2.5% inflation is assumed by CERI and NEB in making these calculations to give a real rate of return of 10 per cent over a period of 30 years from the 12.5 per cent nominal estimate.


processes that have shown dramatic improvements in efficiency and effectiveness, such as shale gas and LTO extraction in the US, would appear as declining rather rapidly. What is profound about this recent cost history of the oil sands is that despite the massive increase in scale (roughly 2 million bpd of added capacity between 2001 and 2015) and the often touted improvements of processes and technology, the oil sands overall project and production life-cycle has become strikingly less efficient. Certainly, Figure 18 only shows an estimated average supply cost for new projects, and these costs vary significantly among the producers – for example, the most attractive and competitive SAGD project proposals might produce bitumen for as low as \$40-50. However, these are the exceptions. Looking at the average, it almost seems as if the supply cost for new projects is driven solely by market price, affirming marginal supply economics and the basin's reputation as the world's highest price, incremental barrel of oil.<sup>87</sup>

Indeed, there are multiple explanations for this cost increase, such as the fact that Alberta's wages have inflated higher than its overall consumer price index (not dissimilar to producing basins in the rest of the world); labour shortages in the remote producing regions of Fort McMurray and Cold Lake have been especially problematic. Another major challenge, common to all upstream oil producers, is the practice of 'high-grading' – producing the best geologies first. Analysts warn investors that as development continues, the reservoirs produced are decreasingly prolific. That said, one would expect this to be somewhat offset by the substantial decrease in Alberta natural gas price and incremental improvements in mining and SAGD technology.

It is also notable that the supply costs shown in Figure 18 are for bitumen production only, and they do not include the substantial costs of blending and transport.<sup>88</sup> When those full-cycle costs are considered, including the strain of the WTI–WCS discount, most greenfield SAGD projects have supply costs requiring a WTI price of \$70–80 per barrel, while greenfield mining projects will likely need \$85–100 (Table 4). With current pricing of WTI in the \$30-40 range and forward curves to 2023 below \$60, approval of new projects in the near term is unlikely without clear visibility to major cost reductions.

Project	Company	New Production (Mbpd)	WTI Equivalent Supply Cost (USD\$ / Bbl)	Capex per flowing Bbl (CAD\$ / bpd)
Mining			Average = \$91	
Kearl with Debottleneck	Imperial Oil	235	\$85	\$56,915
Horizon Expansion	CNRL	127	\$90	\$91,200
Kearl Expansion	Imperial Oil	110	\$95	\$81,818
Fort Hills	Suncor / Total	164	\$96	\$82,317
CERI Estimate	N/(A (Averaged)		002	
CERIEstimate	N/A (Averaged)		\$90	
In-Situ			Average = \$74	
Christina Lake (F,G)	Cenovus	122	\$68	\$32,000
Foster Creek (F,G, & H)	Cenovus	120	\$73	\$38,000
Jackfish Phase 3	cfish Phase 3 Devon Energy		\$76	\$37,142
Surmount Phase II	ConocoPhillips / Total	125	\$76	\$44,037
Nabiye	Imperial Oil	40	\$70	\$55,000
Kirby North	CNRL	40	\$80	\$40,000
Sunrise	Husky	60	\$82	\$53,333
CERI Estimate	N/A (Averaged)		\$80	

# TABLE 4: SUPPLY COSTS OF NEW OIL SANDS PROJECTS (2015)

Sources: Citi Research; The National Post<sup>89</sup>; CERI (2015).

<sup>&</sup>lt;sup>87</sup> Andrew Leach of the University of Alberta discussed this supply cost following price effect in 2013 (Leach, Andrew. 'Cheap Oil Sands Crude Production?'. *Maclean's*, 2013.)

<sup>&</sup>lt;sup>88</sup> Natural gas in Alberta as of September 2015 is trading around USD\$2.15 per MMbtu, a decrease of 60-80% from the high prices of 2002-2008, even without counting for inflation. Natural gas is used as the primary fuel for oil sands production, especially in-situ operations.

<sup>&</sup>lt;sup>89</sup> Hussain, Yadullah. 2015. 'How High Break-Even Costs Are Challenging New Oilsands Projects'. The National Post.



# 3.2 Examining cost increases across the value chain

With the price collapse that bought WCS from highs of over \$90 in August 2013 to roughly \$15 in January 2016, oil sands producers are confronted with the reality shown in Figure 9 and, for the first time since the late 1990s, forced to truly shift their internal focus from growth to efficiency. Based on CERI analyses, Figure 10 summarizes the cost drivers for the 2014 supply cost against those in 2003, with a 12.5 per cent nominal return for the producer included in the costs. Again, note that this diagram is in real currency and that a process that improves cost efficiency over time, like most manufacturing processes in other industries, should show a decline.



### FIGURE 10: REAL (INFLATION ADJUSTED) GREENFIELD PROJECT SUPPLY COST BUILD-UP

Source: CERI (2015).90

How can it be that in just over a decade the inflation adjusted cost of many of these projects has tripled or quadrupled? Capital and operating costs account for roughly two-thirds of the supply cost, estimated in 2014 at \$33 per barrel for SAGD and \$44 per barrel for mining. This represents a substantial increase from the 2003 inflation-adjusted costs of \$7.50 and \$10.50 for SAGD and mining, respectively. Admittedly, these are rough external estimates, but they are taken as industry averages and the methodology in arriving at them did not change from 2003 to 2014. What, then, is driving these cost increases and how can they be addressed to the oil sands more globally competitive?

<sup>&</sup>lt;sup>90</sup> Millington, Dinara, and Carlos A. Murillo. *CANADIAN OIL SANDS SUPPLY COSTS AND DEVELOPMENT PROJECTS* (2015-2035). Study No. 152, August 2015. Calgary; 2014 US / CAD average exchange rates and an inflation index given Alberta's CPI levels in July of 2014 were used



### High-grading and decreased productivity

#### In-situ

Though oil sands reserves may seem endless (170 billion barrels of estimated recoverable reserves with today's technology and roughly 2 trillion total barrels in place), all oil sands ore that is either at the surface to be mined, or in the subsurface to be heated and flowed, was not created equal. Detailed geological understanding of how in-situ reservoirs produce typically separates profitable projects from those that bleed capital. Reflecting on his early experiences in trying to make in-situ projects profitable, SAGD pioneer and Cenovus Executive Vice-President Harbir Chhina highlighted:

...the lesson I learned was that you don't go around building oil sands projects if you haven't delineated the resource. You have to know what you have and what the quality is before you start spending big dollars and building these plants.<sup>91</sup>

SAGD operations have undoubtedly advanced in the past 20 years, though the technology still requires substantial tailoring for each unique geology. In fact, many operators have shown themselves unable to estimate the necessary steam-to-oil ratios during project planning – even Suncor's otherwise successful and highly prolific Firebag project uses an estimated 40 per cent more steam than it was initially designed for.<sup>92</sup>

Subsurface uncertainty and the need to show attractive economics lead to the common oilfield practice of high-grading, producing the most attractive portions of the reservoir first. The result is that production economics per barrel can become less attractive as producers drill or mine their way through their assets. In SAGD specifically, it means higher steam-to-oil (SOR) ratios as well as higher gathering and piping costs to reach wells that are further from the steam plants. Increased SOR values require not only higher natural gas costs in making steam but also increased capital costs for steam production, while decreasing per-well productivity rates requires additional wells to be drilled just to maintain the same level of production.

# FIGURE 11: HISTORY OF IN-SITU PRODUCTION STEAM-TO-OIL RATIO



Source: BMO Capital Markets Oil Sands Monthly, September 2015.

Figure 11 and Figure 12 show the evolution of in-situ productivity and demonstrate rather clearly why the technology is surpassing the traditional huff-and-puff CSS method. However, there has been only nominal improvement in both average SOR and well rates within the last decade for SAGD, which has underwhelmed investors given it is still touted as a new technology with a bright future. Some of this

<sup>&</sup>lt;sup>91</sup> Harbir Chhina, Oil Sands Oral History Project, interview by Peter McKenzie-Brown (Cenovus Energy, Calgary, 2011).

<sup>&</sup>lt;sup>92</sup> Reference from Dawson, Chester. 'Falling Crude Prices Upend Canada's Oil Sands Projects'. *Wall Street Journal*, 2015, and Peter's & Co. Research Reports



tepid improvement being demonstrated is due to less attractive geologies being drilled by less experienced operators – few of the new players have been able to match the productivity of Cenovus Energy's Christina Lake or Suncor's Firebag plays. MEG Energy's Christina Lake project for example, like most others, has less than half the productivity per well.

#### FIGURE 12: HISTORY OF IN-SITU PRODUCTION PER WELL (BPD)



Source: BMO Capital Markets Oil Sands Monthly, September 2015

Though SAGD technology has added, and will continue to add, incremental productivity and energy efficiency gains, it seems unlikely from recent history that major improvements will be made without fundamental alterations to the extraction technology (further discussed in subsection 3.3).

#### Mining

With recovery rates for oil sands mines already reaching up to 95 per cent, large gains in production for a given amount of ore are unlikely. Economic analysis of mining uses the *TV:BIP* ratio to understand how much mining activity is needed to extract bitumen. The ratio is defined as the 'total volume of oil sands ore removed' (TV), which includes both 'oil sands volume mined' ( $OS_v$ ) and 'overburden volume removed' ( $OB_v$ ), divided by the volume of constituent bitumen within that volume. The calculation also includes the bitumen grade, in per cent, of oil sands ore (G). Using approximate densities for oil sands ore and bitumen, the ratio can be calculated as:

$$TV/BIP = \frac{OB_v/OS_v + 1}{2.1 \times G}$$

The economic incentive of high-grading pushes operators to desire lower TV:BIP ratios as highlighted by Imperial Oil's touting of its proposed Kearl mine back in 2006 (see Figure 13 on the next page). The figure also shows an IHS CERA analysis that demonstrates the increasingly poorer quality of proposed mines. Unlike SAGD, however, high-grading is somewhat limited in mining by government regulation. The province does not want mines with large portions of the bitumen deposits left untapped as this leads to high levels of land disruption – the Alberta Energy Regulator mandates that all areas with a TV:BIP ratio of 12 or less must be mined. Though this restriction is effectively irrelevant with WTI prices around \$100 per barrel (when TV:BIP ratios of 16 or higher can still be attractive to producers), at the current WTI prices of \$30 per barrel, some operators are essentially forced to extract and process unprofitable ore. At the macro-level of the mineable resource, there is less high-grade, lightly overburdened ore to be extracted. This decrease in reservoir quality acts to offset capital delivery and operating efficiency improvements.





FIGURE 13: COMPARISON OF TV:BIP RATIOS WITH % GRADE

Sources: Imperial Oil Corporate Presentation; IHS CERA.

# Capital efficiency and the mega-project

Estimated supply costs are based on future budgeting for capital costs that are far from certain. In fact, many oil sands projects have greatly exceeded budgeted capital costs due to an inability to scale up efficiently, which ironically is intended to lower per unit costs. Capital expenditures have tended to exceed budget more often than not (and by a much larger magnitude); since 2006, oil sands projects have on average delivered a poor return on capital versus what was touted to investors (see Section 4).



### FIGURE 14: LABOUR EFFICIENCY OF OIL & GAS CONSTRUCTION IN ALBERTA

Source: Independent Project Analysis Inc.93

During the boom, many of the rapidly growing Calgary-based companies struggled to establish and maintain human resources, operating excellence and capital efficiency best practices amid a general talent shortage and shareholder growth pressure. Even though majors like ExxonMobil's Imperial Oil, Shell, Chevron, Total, and ConocoPhillips were able to leverage experience from their global heavy

<sup>&</sup>lt;sup>93</sup> Labour efficiency chart shown was part of a presentation delivered by Ed Murrow in 2015 to the Construction Owners Association of Alberta Best Practices Conference.



oil networks, they themselves struggled adapting to northern Alberta's unique challenges and were forced to pay substantial premiums for talented workers, services, and products. Alberta has demonstrated its ability to build projects competitively when proper preparation and planning is done (termed 'Front-End Loading' or FEL by Independent Projects Analysis Inc., a consultancy, in Figure 14). However, oil sands 'mega-projects' have an appalling history of exceeding budgets when FEL was not practised.

The oil sands is at an interesting crossroads in its history with regards to project planning – will producers continue the decades-old trend of building massive, multi-billion dollar growth projects in an attempt to leverage scale against the costs of producing bitumen? Or, will they look to limit risk and increase responsiveness by building smaller, modular growth projects, focusing on 'brownfield' expansions to already operating installations? Recent activity shows the latter trend is more likely – the 'mega-project' approach, almost a requirement to reach scale in mining projects, has been fraught with substantial cost overruns and scheduling delays. Rarely have these projects brought the scale advantages promised and producers are looking to smaller scale projects for return on their capital.

### The push for operational excellence

The uncertainty around geology and technology that is inherent to the oil industry, added to a history of massive swings in commodity prices that continue today, have made oil and gas exploration and production a relatively inefficient industry. Producers focusing on delivering volume rather than value to the market were especially common during the 15-year upswing in global prices from 1999 to 2014. Meanwhile, major operating advances in the automobile and other industries such as 'Six Sigma' and 'Lean Manufacturing' process improvement (including organizational elements such as talent management), 'Just-in-Time' inventory management, and advanced strategic sourcing methodologies, have become standard in manufacturing. These practices have had slow penetration into the upstream oil and gas world, especially beyond the majors. Certainly, the process of producing oil from highly variable rock is different than fabricating consumer goods, especially with so much spend skewed towards capital investment. That said, there is undoubtedly room to improve how projects are constructed and operated in the oil sands given its manufacturing-like operations, and sub \$50 WTI crude is a strong impetus to overcome internal resistance to change.

Because much of the operations and construction efforts are outsourced, oil sands producers essentially take their whole supply chain to market when competing with each other and against other global sources of oil. Therefore, it is this integrated supply chain that must generate savings collaboratively and competitively, and not just the producers who own the assets and mineral rights.

# The SAGD 'manufacturing' of oil sands

SAGD focused operators are increasingly discussing their oil sands production as a 'manufacturing' operation, talking of new plans for 'modularization', where construction of major plant components become repeatable and take place offsite, even as far away as Asia. Pad drilling of many co-located well heads is the standard. The intent is to standardize wells and pads, which can drive cost efficiencies in processing plants and gathering infrastructure. However, processes that are dependent on the local geology, such as optimizing steam-to-oil ratios in SAGD, are more difficult to replicate at scale, and true 'manufacturing' SAGD processes remain aspirational at this point. Survival is a compelling motivator, however, and producers do realize that they need to rapidly improve operating practices or remain uncompetitive for investment.

#### **Mining challenges**

All five large mining producers have shown efficiency improvements in extraction and processing starting decades back with the shift towards hydrotransport from the field and replacing the bucketwheels with large earthmovers (also discussed in the oil sands primer in the Appendix). However, it is unclear how much further these operators can go to reduce costs given they have already been fighting to catch up to the less expensive SAGD projects and are burdened with increasing environmental regulatory costs. Initiatives are being developed to automate and improve efficiencies, such as driverless mining trucks (to replace drivers whom cost operators in the neighbourhood of CAD\$200,000 or more per year) could result in hundreds of millions in annual savings for an operator, though their large-scale implementation is still years away.



### Natural gas fuel prices

Though producers can rightly blame regulatory burden, a lack of cost-efficient transportation, and wage inflation for their ballooning costs, their fuel costs have dropped sharply since 2008. Significantly discounted from Henry Hub prices by roughly \$0.50/per MMbtu, itself one of the cheaper trading points of natural gas in the world due to the advent of economic shale gas, Alberta natural gas prices (AECO, shown inflation-adjusted in Figure 15) are at their lowest level in decades. This boon has allowed many producers (especially those using SAGD) to maintain some level of profitability due to a substantial gap between global crude and Alberta natural gas prices. Since 2008, voices calling for the building of nuclear power plants to generate steam in the oil sands regions have been mostly muted due to this inexpensive gas. Despite the likely addition of one or more world-scale LNG liquefaction plants on Canada's west coast, and a potential, if unlikely, environmentally driven ban of hydraulic fracturing, Western Canadian natural gas prices look set to stay low for the foreseeable future.



#### FIGURE 15: ALBERTA NATURAL GAS PRICE (AECO) VERSUS HENRY HUB AND WTI

Sources: EIA; Bloomberg; and CanadianForex.

#### Cogeneration

With current processes, both in-situ and mining operations require massive amounts of gas-derived heat to separate bitumen from oil sands, either in the subsurface or a surface processing facility. Given that production facilities also have considerable electricity needs, the economics of cogeneration plants that produce both heat and power efficiently, are quite favourable. Their usage is growing among SAGD and mining producers alike, and with the Albertan grid looking to replace end-of-life, high-emission coal power plants, there are calls for oil sands cogeneration units to grow in capacity and sell substantially more electricity back into the grid. This could greatly lower the province's overall carbon footprint.

#### Contractors, talent shortages, and wage inflation

A major contributor to the cost increase has been wage inflation within Alberta in general, and the oil and gas industry more acutely, as depicted in Figure 16. Alberta's 2000–15 economic boom witnessed 2 million bpd of added oil sands production capacity with its complicated extraction methods and processing plants, combined with accelerated investment in natural gas production (at least until 2008), LTO production (more recently), and substantial midstream capacity. Much of this investment was aimed at remote geographies in an already sparsely populated province. Moreover, the oil and gas industry holds less allure for many younger workers due to its perceived environmental reputation (whether deserved or not). The resulting crippling shortage of talented workers is therefore little surprise.



#### Avg. Annual Wage Thousands CAD\$, Nominal 140 - All industries and professions 130 Oil and gas extraction Manufacturing 120 110 100 90 80 70 60 CAGRana = 2 50 40 CAGR = 2.8 30 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2001

#### FIGURE 16: CANADIAN OIL AND GAS WAGES VS. OTHER INDUSTRIES

Source: Statistics Canada.

The oil and gas wage premium has been especially acute for the skilled trades such as welders and pipefitters, who until the recent price crash had been in high demand, commanding annual compensation on the order of CAD\$300–400 thousand per year in remote areas. In addition, producers are forced to pay for costly living allowances and bi-weekly or monthly transportation for many of these workers, as many prefer not to live in remote cities like Fort McMurray where housing, school, and hospital shortages have been dire. Oil field service companies grew to focus on growth and meeting their producing client's timelines and technical expectations rather than controlling costs.



#### FIGURE 17: ALBERTA SAFETY PERFORMANCE - LOST TIME INJURY RATE

Source: Government of Alberta.

As labour shortages became exacerbated, producers and operators began to implement a rather systematic, if unheralded, practice of 'lowering the bar'. Operating positions that might once have been required to have a two-year post-secondary technical degree were filled with workers who only had maybe one year of post-secondary training, or none at all. Capable and reliable contractors (where much of the capital and operating expenses flow) were in high demand and were able to charge substantial annual price increases. Combining less experienced workers with safety standards that are ever more stringent (and justifiably so given producer focus on employee well-being) did little



to allay rising labour costs. Fortunately, working in the oil sands became markedly safer as the boom period progressed, largely thanks to the efforts led by producers and contractors (Figure 17).

It will always be expensive to entice tradespeople to work and live in such a remote area. That said, contractor cost escalation was hardly limited to Northern Alberta – it was pervasive throughout the global upstream industry during the 2000–14commodity price ascension. Wages in Alberta have just been much slower to drop, as Harbir Chhina of Cenovus noted in November 2015:

My way of judging how inflation is going, I just look at welder rates, because everything else is going to be escalated if they are getting paid that much. They vary anywhere between \$800 per day to \$1,800 per day. Last year they were getting \$1,700; today they're still getting \$1,400 per day. We still have to see those costs come down.<sup>94</sup>

Seasoned and knowledgeable professional talent in engineering, geology, and project management was spread thin among the multitude of new projects that arose each year, especially with highly attractive compensation packages aimed at poaching talent from the pioneering producers to new entrants. More senior talent was attracted to early retirement armed with sizeable bonuses and stock option pay-outs.

With the price crash of 2014 now lasting beyond 2015, and likely into the next few years, the flip-side of this inherent oil production boom-and-bust economic cycle on workers, well known to those who have the studied oil industry history since the 1800s, is showing its ugly face once more. Layoffs have spread from contractors, the first to be hit by price slumps, to producers, who find themselves under unfamiliar scrutiny from shareholders. An abundance of under-employed contractors indeed helps lower producer costs in the near term, but will somewhat ironically lead to a shortage of workers for the next growth cycle. Alas, the undeniable inefficiency that arises from the boom-bust cycle looks to continue.

### Overhead and benefits reduction

Generous compensation, benefits, and bonus packages for virtually all levels of employees have become the expectation for oil workers in Calgary, and are justified in periods of high commodity prices as a necessity to attract top talent. With poor financial returns amid recent low commodity prices and an estimated 40–60 thousand direct workers laid off in Alberta since the beginning of the price crash (many more indirect workers), shareholders are now growing sceptical of the level of compensation. Well before the crash, ExxonMobil's Imperial Oil chose to relocate from downtown to the less costly suburbs. Suncor, Shell, Husky, and Cenovus have already cut substantial portions of their workforce, while CNRL, who has the reputation of running rather lean, has chosen to impose a salary reduction of upwards of 10 per cent rather than invoking mass layoffs.

#### Royalties, taxes, and regulatory costs

Royalties are one of the major increases in supply cost since 2003, increasing roughly 1,000 per cent on a real basis for a new project (see the numbers back in Figure 10). With rapidly accelerating global crude prices, and a provincial infrastructure shortage due to rapid population growth (spearheaded primarily by the oil and gas industry), the Alberta government moved in 2008 to change the royalty structure and collect more revenue.

	Before 1 January 2009			After 1 January 2009			
	Pro-Payout	Post-Payout		Dro-Davout	Post-Payout		
WITFICE	Fle-Fayout	Greater of		Fie-Fayout	Greater of		
WTI < \$55	1% x Gross Rev.	Pre- Payout Rates	25% x Net Rev.	1% x Gross Rev.	Pre- Payout Rates	25% x Net Rev.	
\$55 < WTI < \$120	1% x Gross Rev.		25% x Net Rev.	1%+0.123%*(WTI-\$55) *Gross Revenue		25%+0.231%*(WTI-\$55) *Net Revenue	
WTI > \$120	1% x Gross Rev.		25% x Net Rev.	9% x Gross Rev.		40% x Net Rev.	

# TABLE 5: ALBERTA OIL SANDS ROYALTY CALCULATION (2015)

Source: Alberta Oil Sands Royalty Guidelines (October 2012).

<sup>&</sup>lt;sup>94</sup> Deborah, Jaremko. 'Oilsands Versus Light Tight Oil: How Canadian Industry Will Succeed'. *The Daily Oil Bulletin*, 2015.



The nature of the structure (both before and after the change), is that royalties potentially switch to a higher rate once the projects reach 'payout status' – defined as the date when its cumulative revenues first exceed its cumulative costs, including an acceptable interim return. After that date, the project will pay the greater of a royalty calculation based on gross revenues and a royalty calculation based on net revenue (revenues minus costs) as shown in Table 5. Rather ironically, though the Alberta government increased the royalty rate in 2008 to garner some of the windfall profits producers were receiving due to a rapid acceleration of WTI price, capital and operating costs were escalating so rapidly that much of the windfall was eaten away, and the producers were saddled only with the increased royalty and reduced overall earnings.

A new royalty review is currently underway in the Alberta, emanating from a platform promise of the recently elected NDP party to ensure producers were paying their 'fair share'. Given the economic stakes involved, it is most likely that royalties and corporate taxation will remain roughly similar to today's levels in order to both satisfy diminishing public coffers and incentivize investment. That said, royalties are unlikely to decrease, especially at higher prices of WTI or WCS, given the NDP's pronounced willingness to increase government revenue at the expense of corporate profit. For example, adding to the foreboding forecasts of royalty increases, oil sands producers worry about the NDP's increase in corporate provincial tax rate from 10–12 per cent.<sup>95</sup> With the above royalty structure, producers get substantial relief from these low WTI prices in the \$30–50 range (on the order of \$3–5 per barrel) compared to when WTI hovered around \$100 from 2010 to 2013.

### **Exchange rate**

The Canadian-US exchange rate can have profound effects on oil sands profitability. It would seem that producers desire a lower Canadian dollar as they are paid revenue in US dollars (or the Canadian equivalent driven by US markets), while much of their cost base rests with Canadian suppliers and employees. For example, assuming that the cost fundamentals driving CERI's 2014 price estimates remain unchanged, the fall of the Canadian dollar from its 2014 average of USD\$0.91 to the current value of USD\$0.75 effectively cuts the cost to produce bitumen by more than 15 per cent. Although this may seem like a boon to producers, this drop in the Canadian dollar is primarily a result of lower global oil prices. Indeed, the correlation between the Canadian dollar and the oil price is remarkable, as illustrated in Figure 18.



# FIGURE 18: THE STRENGTH OF THE CANADIAN DOLLAR AS A FUNCTION OF CRUDE PRICE

Sources: EIA; CanadianForex.

<sup>&</sup>lt;sup>95</sup> Currently producers only pay \$15 / tonne on emissions beyond a 12% reduction from a 2007 (or later) baseline as part of the *Specified Gas Emitters Regulation*. This fee was set by the NDP to double by 2017. The currently on-going comprehensive review of the province's climate change policy will I kely apply carbon pricing to all emissions in the province, increasing costs for producers and consumers alike in all emitting industries and consumption.



It follows, then, that the exchange rate acts as a buffer for producers, reducing costs in low-price environments to offset losses but accelerating cost inflation at boom times of high-price, curbing profits. Based on the price histories of the past 20 years, changes in crude price typically outweigh the resulting exchange rate effects on cost, and producers naturally prefer high prices, despite the higher dollar. This is antithetical to many of Canada's other exporters, who struggle with high exchange rates for which they have blamed high crude prices and the Canadian energy industry. With roughly twothirds of Canada's population residing in the manufacturing-heavy provinces of Ontario and Quebec, oil and gas producers have reduced political clout and little ability to influence policy at the federal level compared with Canada's more labour-intensive, populist, and trade-protected auto and aerospace industries.

### 3.3 Technology as both a competitive necessity and investor promotion tool

As with any energy source or technology whose adoption takes decades (think, for example, solar energy, small modular nuclear fission reactors, arctic offshore oil, electric cars, or industrial-scale batteries), extracting Canada's oil sands will continue to be an uphill battle, likely requiring almost perpetual technological advancement. Former Syncrude CEO Eric Newell described the challenge optimistically in 2013:

We're not a mature industry. We're still by comparison very young. The advantage to that is that there are technology breakthroughs to be made. It was technology that got us to where we are today. It will be technology that gets us to where we need to be tomorrow.<sup>96</sup>

### SAGD as Oil Sands 2.0

The development of the oil sands mine, which came to commercialization in the late 1960s, is the pioneering method of oil sands production; in-situ production using SAGD technology might be considered 'Oil Sands 2.0'. If defined this way, Oil Sands 2.0 came to life in 1987, with the first successful SAGD well producing at the government sponsored AOSTRA Underground Test Facility, coincidentally the same year the Microsoft Windows 2.0 operating system was released for personal computers. The software analogy ends there, however, as oil sands technology development might seem like a turtle racing a cheetah in comparison. Mining technology took roughly five decades from the defining patent to have it its first commercial project payout, while SAGD took more than three. AOSTRA SAGD pioneer Harbir Chhina at Cenovus likes to use the analogy that if oil sands production, especially in-situ, was a baseball game, 'we've just finished the first inning [of a nine-inning game]'. Given the wide variety of potential technologies to apply and the vastness of the resource, the statement is likely true. It is difficult to ascertain, however, how long the next inning will last, not to mention the rest of the proverbial baseball game. Sales pitches to potential oil sands investors boasting of the 'best thing since sliced bread' in extraction technology have been around for almost 90 years; back in 2011, the OIES promoted a sceptical view:<sup>97</sup>

Any company that claims its technology programme will yield efficiency gains/emissions reductions beyond a modest, few percentage points within ten years – and they have yet to put steel in the ground to test their technologies – is simply naïve or attempting to mislead someone. It can take more than three years just to get regulatory approval, two to build, one to three to ramp up, monitor and measure and perhaps a couple more to analyse – and that is only for a pilot, not a full-scale commercial project: that can take another four to six years to produce initial results. And if the history of piloting is any guide, the analysis often concludes there were insufficient observation wells and measurements of the right parameters to provide conclusive data.<sup>98</sup>

This challenge rings true today, especially given that the stomach-wrenching price crash for investors may lead to less capital available for research and development and make it harder for technologically advanced start-ups to stay afloat. What's more, substantial variation in geological characteristics (such as varying thickness, high water-saturation, and impermeable rock formations) in oil sands

<sup>&</sup>lt;sup>96</sup> Dan Barnes, 'Alberta's Oilsands Epic Stretches Back More Than A Century', *The Edmonton Journal*, 2013.

<sup>&</sup>lt;sup>97</sup> Sliced bread was first produced and sold at commercial scale in the United States in 1928. Robert Fitzsimmons started the International Bitumen Company in 1927 at his Bitumount site, proclaiming a novel method of separating bitumen from oil sands that could change the economics of the petroleum industry.

<sup>&</sup>lt;sup>98</sup> 'Robert Skinner Assesses The Technological Challenge Of Producing Heavy Oil', *The Oxford Energy Forum*, no. 86 (2011): Pages 20-23.



reservoirs often leads to a lack of repeatable applicability for newly developed in-situ production technologies, lessening the motivation to develop them.

#### **Incremental improvements**

Internal combustion, diesel, and gas turbine engines have core designs that have remained fundamentally unchanged for 70 years or more, though have slowly but surely produced efficiency improvements by leveraging mechanical, thermodynamic, and material advancements. In a similar fashion, mining, CSS, and SAGD operations will continue to produce bitumen with increasing efficiency through technological enhancements for at least the next two or three decades. Imperial's modern Kearl oil sands mine may not look a lot like the early Bitumount or Abasands plants of the 1930s, but its extraction and separation processes of oil sands ore follow the same underlying physical principles. Technological advances in field extraction and processing for mining, and steam production, well delivery, and reservoir engineering for in-situ, will continue to improve margins for producers. For example, SAGD well delivery has benefited from advancements in horizontal drilling and 'logging while drilling' (LWD) capabilities. Reservoirs are exploited more effectively with the help of 3D reservoir modelling, 4D seismic monitoring of steam chambers, gas injection after steaming, and 'electrical submersible pumps' (ESPs). Additional competitive patents have arisen, such as Cenovus' 'WedgeWell' arrangement for well spacing, which has helped it maintain a competitive advantage in SOR.

The challenge for current and proposed mining and SAGD projects is to develop technological improvements to a magnitude that meet, and ideally exceed, the detriment of decreasingly prolific rock, a result of high-grading. Judging by the escalating per barrel capital and operating costs in past decade, just meeting this challenge has been very demanding – the combined effect of incremental improvements only typically measures a few dollars per barrel in cost savings.

#### In-situ potential game-changers

Research departments of majors and large independents, pilot projects of a few entrepreneurial startups, and government-funded academic bodies, such as the research consortium *Alberta Innovates*, have engineers and geologists working to bring disruptive in-situ production technologies to commercial feasibility. The following families of in-situ extractive technologies are currently under development, though they are yet to generate material commercial success and are likely at least five years away from doing so. The common underlying theme among them is the shift away from steam heating, where most of the heat remains wastefully in the sands, rather than the bitumen.

**Use of Solvents.** Diluents, typically natural gas liquids, are added to the subsurface reservoir in order to produce bitumen with less energy usage than production with steam. This has the added benefit of providing substantial reductions in GHG intensity. Another bonus is that solvents can even 'upgrade' the bitumen insitu to some extent. The drawback is that these diluents are expensive, trading at substantial price premiums to bitumen (and certainty steam), and recovery rates of both bitumen and the diluent itself need to be high enough to justify their usage. Due to solvent demand just for blending and transporting growing oil sands bitumen production, condensate in Alberta trades at a premium to light, sweet crude, making it even more expensive. Propane however, seems to be more than ample supply in Alberta for the foreseeable future – in 2015 it even traded below zero for a few months. Its usage as a solvent might be increased due to its low cost.

Solvent injection methods include VAPEX (injecting gaseous state solvents), injecting warm liquid solvents, and co-injecting solvents with steam. Most in-situ producers are developing solvent technology to some extent (most commonly co-injection) and tinkering with it to optimize the economics. The start-up *N-Solv* is leading the charge in warm liquid solvents, touting itself as a 'clean-tech' leader in its ability to reduce SAGD GHG emissions by 80 per cent. It is working with Suncor to expand its pilot project that has produced 40,000 barrels as of January 2015.<sup>99</sup>

**Combustion.** The two relevant technologies are Toe-to-Heel Air Injection (THAI) and Combustion Overhead Gravity Drainage (COGD). THAI was developed by Petrobank Energy & Resources (now Touchstone Exploration) and generates downhole combustion and energy release by injecting air in a separate vertical well at the toe of the bitumen-producing well. COGD generates combustion in vertical wells above the

<sup>&</sup>lt;sup>99</sup> See the N-Solv website for more details as https://www.nsolv.ca.



producing horizontal wells such that reduced-viscosity bitumen flows with gravity, similar to SAGD. The idea of combustion to release bitumen is attractive as upgrading can happen in-situ (roughly 5 degrees API anyway) and require much less energy than SAGD or CSS. However, preliminary testing of the technologies has not demonstrated the potential to be economic – THAI has essentially been shelved after years of Petrobank touting its potential.<sup>100, 101</sup> That said, the Canadian government continues to perform more fundamental physical research on bitumen combustion that may lead to commercial technologies.

**Electrical Heating.** Two processes under development leverage thermal heating rather than steam to produce in-situ. Electro-Thermal Dynamic Stripping Process (ET-DSP) leverages a matrix configuration of vertical wellbores with electric current passing through water-saturated reservoirs that work to lower the viscosity of bitumen and produce through vertical wells. Thermal-Assisted Gravity Drainage (TAGD) is similar to SAGD in subsurface geometry, though the thermal conduction of electric resistance heaters replaces the steam injection in the upper well, rendering the process essentially waterless, and eliminating the need for costly steam plants and related infrastructure. TAGD is suited to developing bitumen in the carbonates of the oil sands area which represent almost 500 billion of the approximately 1.8 trillion barrels of bitumen reserves not presently considered recoverable. These plentiful reserves are too deep to mine and too shallow to steam with SAGD.<sup>102</sup>

#### Research and development costs: Who pays?

Costly game-changing technology investments have been a tough sell for producers due to such long development times. This is true in times of high crude prices, when the focus is on capacity building, and in crude's current low-price environment, amid across-the-board cost cutting efforts and layoffs.<sup>103</sup> Producers often tout their large research and development (R&D) budgets – CNRL leads the pack with CAD\$450 million spent in 2014, while Suncor, Syncrude, Imperial Oil, and Cenovus each spend roughly CA\$100–200 million annually.<sup>104</sup> Nevertheless, not unlike other oil and gas producers worldwide including supermajors, the portion of revenue reinvested into R&D for oil sands producers is somewhat paltry – around 0.5–1 per cent.<sup>105</sup> Many of Canada's other major companies spend substantially more – the country's technology, aerospace, and pharmaceutical firms invest roughly 7–20 per cent of annual revenue into R&D. Even Canada's two largest telecommunications firms Rogers and Bell, with a combined annual revenue of roughly CAD\$34 billion, spend around 3 per cent each on R&D.

#### Overstressing the 'D' in R&D

Much of the oil sands stated R&D investment is skewed towards development, rather than the more primary research needed to make long-term major cost reductions. If producers can demonstrate that an element of a new project, even if it is for direct commercial use, is in some way experimental, the associated costs can qualify for federal Scientific Research and Experimental Development (SHRED) tax credits. It is therefore in the producers' best interests to amplify their claim of R&D spend as much as possible. For this reason, stated annual R&D totals are overrepresented with the costs of tweaking established technologies (development), rather than the costs of innovating novel ones (research).

#### Environment takes priority

Viewing regulatory and political obstruction as a potential barrier to growth and even continued operation, producers have been coerced to spend much of their R&D investment on reducing their environmental footprint rather than their break-even costs. Certainly, these goals are not mutually exclusive – a more effective SAGD process that lowers the SOR reduces greenhouse gas usage, after all. Nonetheless, many of the footprint reduction efforts that are primarily advanced collaboratively through COSIA and other research groups have been costly to develop (77 technologies have been shared to-date, totalling roughly CAD\$1 billion) and do not necessarily lower capital and operating costs. If anything, reducing the far from trivial impacts on water, air, land, and

<sup>&</sup>lt;sup>100</sup> Tait, Carrie. 'The Tangled Tale of Petrobank's THAI Extraction Technology'. *The Globe and Mail*, 2013.

 <sup>&</sup>lt;sup>101</sup> Healing, Dan. 'Asset Sales Signal Patience Short For Disappointing THAI Heavy Oil Technology'. *The Calgary Herald*, 2015.
<sup>102</sup> Sebastian Gault, 'An In-Depth Look At How In Situ Oil Sands Development Has Evolved', *Alberta Oil: The Business Of Energy*, 2014.

<sup>&</sup>lt;sup>103</sup> Lewis, Jeff. 'Oil Patch Takes Aim At R&D Spending To Make Way For More Cuts'. The Globe and Mail, 2015.

<sup>&</sup>lt;sup>104</sup> 'Research Infosource', 2014. http://www.researchinfosource.com/top100\_corp.php.

<sup>&</sup>lt;sup>105</sup> CNRL is the standout at roughly 2% of revenues, having almost quadrupled annual spend since 2009. 'Canadian Natural Resources - Advancements in Technology', 2015. http://www.cnrl.com/corporate-respons bility/advancements-in-technology/.



climate that are associated with bitumen production will likely add to supply costs due to the necessary and expensive new technology.

#### Cooperation vs. competition

In an effort to earn and maintain their social licence to operate, oil sands producers have adopted the practice of 'co-opetition', at least to some extent. The co-opetition neologism was born out of economic game theory, and it is defined by two or more competitive entities cooperating in order to grow the market with the fundamental premise that 'the whole is greater than the sum of its parts'. This practice led to collaboration between producers through the form of joint-funding for COSIA and other research groups such as Alberta Innovates and the Institute for Oil Sands Innovation at the University of Alberta, the province's largest university.

#### FIGURE 19: SAGD PATENTS SINCE 1979



Source: McCarthy Tétrault LLP.

The problem is that critical production technologies require major funding efforts, such as SAGD that was first developed and patented by Imperial Oil in the 1970s. A full pilot facility is typically needed, such as the AOSTRA SAGD pilot in the 1980s, and producers, knowing that the patents will likely expire before commercial success arrives, are sceptical about making such major investments. (The gap between SAGD's first seminal patent and first commercial project payout was 30 years, though many smaller patents were granted once commercial production started, as seen in Figure 19.)

As a result, there are many potentially disruptive technologies, especially for in-situ production, developed by university researchers, entrepreneurial inventors, and oilfield service companies that go untested because of lack of access to pilot testing facilities.



#### FIGURE 20: SAGD PATENT APPLICATIONS BY TYPE OF APPLICANT

Source: McCarthy Tétrault LLP.

Consequently, it is the handful of larger producers, particularly majors such as Imperial Oil and Shell, who are financially backed by global assets and downstream diversification and thus capable of



investing the magnitude of research funds necessary to make major breakthroughs. These large producers are unlikely to collaborate on subsurface production technology, because it is so critical to their perceived competitive advantage. Ironically, oil sands producers are seeing their competition arise more from lower-cost global basins (like LTO), than each other. The long timelines that seem inherent to the development of oil sands production technology look likely to continue.

# Oil sands 3.0?

The profound, innovative engineering and technological applications that have followed modern man's landmark scientific discoveries in the twentieth century, such as the information technology revolution or genetic modification in agriculture, typically take decades to come to commercial fruition. In this light, researchers like Steven Bryant at the University of Calgary, who leads the Materials Engineering for Unconventional Oil Reservoirs research group, funded by the federal government through a Canada Excellence Research Chair, are rethinking how production from oil sands can be achieved. The core idea is to reinvent ore separation techniques that have remained fundamentally unchanged for more than 80 years, or the practice of creating process heat for in-situ production by simply boiling water, the same basic process that begot the first steam engines more than 200 years ago.

Researchers are developing radically new ideas in academic environments by leveraging budding applications from nanotechnology and microbiology. The central mission is to overcome oil sands' viscosity and release the massive reservoirs of bituminous chemical energy trapped in sand, with minimum environmental impact. Preliminary research has shown that incorporating micro/nanoparticles such as iron oxide into in-situ methods may act to substantially reduce bitumen viscosity. <sup>106</sup> Suncor is moving forward with a small-scale pilot that leverages electromagnetic microwaves with nanoparticles, in combination with its solvent in-situ technology, to hopefully improve production economics and reduce emissions. Longer-term concepts look to harness the microbiome trapped within the oil sands to reduce bitumen viscosity by breaking down carbon-sulphur or carboncarbon bonds, or removing waste through chemical processes.<sup>107</sup>

Futuristic discussions of converting the chemical energy deposits to electrical energy or hydrogen, rather than following the traditional hydrocarbon value chain of transport, refining and combustion, are also ongoing in academic circles. Research at the University of Calgary looks to leverage nanoparticles and the microbiome to create the following:

- i. Direct conversion of petroleum in an oil sands reservoir to hydrogen or electricity
- ii. Integrated energy systems (oil/gas/power) with ultra-low energy input and emissions (potentially mediated through microbial organisms).<sup>108</sup>

Considering oil sands operators seem hesitant to commit sizeable funds to research for even nearterm production technologies, it is not a surprise that the majority of funding for these Oil Sands 3.0type ideas stems from government research grants.<sup>109</sup> Researchers are lobbying the government for what they deem a 'moonshot' – substantial research funding of at least CAD\$100 million annually for a committed period of ten years or more, with the stated goal of transforming the hydrocarbon resources of the oil sands to produce useful energy for society while leaving the carbon in the ground.<sup>110</sup>

<sup>&</sup>lt;sup>106</sup> Shokrlu, Yousef Hamedi, and Tayfun Babadagli. 'Viscosity Reduction of Heavy Oil/Bitumen Using Micro- And Nano-Metal Particles during Aqueous and Non-Aqueous Thermal Applications'. *Journal Of Petroleum Science And Engineering* 119 (2014): 210-220.

<sup>&</sup>lt;sup>107</sup> A microbiome is composed of trillions of microbial organisms. An example is the microbiome in the human gut whose magnitude (of cell numbers) in the trillions has just recently come to the attention of researchers. Being close to the surface, the microbiome within the oil sands is well developed.

<sup>&</sup>lt;sup>108</sup> From discussions with, and documentation from, the Canada Excellence Research Chair (CERC) in Materials Engineering for Unconventional Oil Reservoirs at the University of Calgary

<sup>&</sup>lt;sup>109</sup> Somewhat of an exception to this is Cenovus' investments in General Fusion (a nuclear fusion technology company) and donations to the Perimeter Institute for Theoretical Physics in Ontario. Though these are not direct investments into production of oil sands chemical energy and could be perceived as corporate social responsibility efforts, technological breakthroughs from these investments could enable game-changing new methods applicable to the oil sands.

<sup>&</sup>lt;sup>110</sup> Moonshot refers here to the US government program Project Apollo in the 1960s, famously announced by President John F. Kennedy with the objective of sending a man to the moon through heavy spending on research without a clear line of sight to success.



The economic importance of the oil sands to Canadians today and in future decades is undeniable. Furthermore, the fact the province already spends roughly CAD\$3 billion annually on research and advanced education, while the federal government annually invests over CAD\$10.3 billion in science and technology, would indicate that such a funding commitment for a 'moonshot' would be a wise investment for the politicians in Edmonton and Ottawa. They could also refer back to how much provincial wealth has been generated out of the relatively meagre government investments made into SAGD in the 1980s. Nevertheless, rationality does not always prevail in democracies, and the public perception of supporting oil sands production with large amounts of government funds may be viewed a political landmine, even if the investment is aimed at removing the associated greenhouse gas emissions. Obstinate opponents of oil sands extraction from British Columbia's west coast to Quebec's east coast would be marching in the streets (likely in larger numbers than today).

# 3.4 Cost competitiveness with LTO

# Shale Gas & LTO: Survival of the Fittest

Just a decade ago, few (if any) experts within the US oil and gas industry anticipated the advent of such cheap shale gas in North America, at least at the volumes now being produced. Ingenuity, entrepreneurial nature, key technological advancements, and engineering iteration all accelerated the shale gas revolution from the early days of George Mitchell's Mitchell Energy (later Devon Energy). This continued through to the competitive landscape of shale producers that we know today, consisting mostly of small and medium players supported by an efficient and adaptable supply chain.



# FIGURE 21: ILLUSTRATION OF LEAN / JIT DRILL PLANNING FOR SHALE GAS / LTO

Source: Author.

Most impressive about the shale gas revolution is not the technology, which has developed rapidly, but the speed and adaptability of the production operations. After the Henry Hub price crash of 2008 ended the party for natural gas producers, many went bankrupt, hobbled along, or were gobbled up by competitors. Through this rather Darwinian process, the producers left standing were more efficient and prolific in their drilling efforts. Rather than 'grid drilling' producing areas for example, operators increased efforts to delineate the subsurface reservoirs though iterative data management and learning to ensure the more productive geologies were targeted.<sup>111</sup> Drilling and completion teams decreased well delivery times and costs through 'Lean Manufacturing' and 'Just-in-Time' (JIT) type drill planning (see Figure 21 above) and further optimized well geometries and completion designs. Substantial reductions in break-even costs occurred for producers able to adapt despite continuing wage inflation and the increased practice of high-grading. This near market death created a highly competitive marketplace that was able to maintain some level of profitability producing gas.

<sup>&</sup>lt;sup>111</sup> Grid drilling involves drilling shale wells a unified grid rather than identifying sweet spots and optimizing productivity per well through reservoir management.



importantly, and detrimental to the oil sands, lessons learned from this shale gas market cycle have shifted into shale drilling for LTO, with a similar level of operating excellence.

#### LTO producers are faster learners

Most disturbing for oil sands executives is the pace at which LTO operators are improving their trade. Year over year, LTO producers are delivering lower drilling costs, longer laterals, and enhanced productivity that are all driving down supply costs. Plotting the WTI equivalent supply cost trends for the oil sands against LTO basins in Figure 22 reveals a stark contrast. The oil sands experienced rapid cost inflation through 2013 (roughly 10 per cent per year), while LTO costs are dropped sharply. The only reduction for oil sands projects came in 2014 (a larger drop will be seen in 2015) due primarily to the fall in the CAD to USD exchange rate. LTO operators in the US do not have the same buffer to protect them from low crude prices, but they have nevertheless managed to lower supply costs.



FIGURE 22: SUPPLY COSTS OF OIL SANDS VS. LTO (WTI IN USD\$, NOMINAL)

Sources: CERI; Oil and Gas Journal, July 2015.



# 4 Economic attractiveness and growth outlook

# 4.1 Fleeing investors

After a bull run on oil sands stocks lasting from the early 2000s until the global financial collapse, oil sands investments have handed investors, on average, a substantial loss over the past nine or ten years. This is shown rather starkly in Figure 23, which compares the IShares Oil Sands Index, a weighted 'exchange traded fund' (ETF) of major producers (excluding conglomerate majors such as Shell and Total) against US (S&P 500) and Canadian (TSX) stock market benchmarks.<sup>112</sup> Investors have been fleeing oil sands stocks since 2011, well before the collapse of crude price in mid-2014. BlackRock Asset Management decided to close the oil sands ETF in August of 2015 in a tell-tale sign of investor disinterest in the commodity markets and the oil sands specifically.

# FIGURE 23: SHARE PRICE PERFORMANCE OF OIL SANDS STOCKS VS. MARKET INDICES



Sources: Bloomberg; IShares Canada, August 2015.

# Who invests in the oil sands?

Markets are evermore interconnected as globalization and the information technology revolution continues relatively unabated – investors have many options of geographies and industries to choose from. One might ask, then, why would investors risk their capital on one of the highest-cost oil-producing basins in the world that sells crude to market for what is often the lowest crude price in the world?

#### The long-game

Oil sands investment is a long-term endeavour. Unlike conventional deposits of crude, increasingly challenging to discover in countries that allow private investment, the reserves of oil sands are well known and massive. The recoverable reserves, especially those to be produced in-situ through SAGD, appear inexhaustible in the minds of even long-term thinking investors, who are thinking decades in advance. This long-term certainty is attractive to large-magnitude sources of investment (often in the tens of billions of dollars) from pension funds who are attracted by dividend paying stocks, majors concerned about long-term reserves, and foreign governments (through their national oil companies) looking for crude oil energy security as their domestic needs grow.<sup>113</sup> In addition, there

<sup>&</sup>lt;sup>112</sup> The IShares Oil Sands Index ETF is made up of 14% Suncor, 12% CNRL, 11% Imperial Oil, 9% Canadian Oil Sands, 9% Cenovus Energy, 8% MEG Energy and portions of smaller players including Blackpearl Resources, Athabasca Oil, Bayex Energy and Husky Energy Canada. Though the IShares index shown is somewhat handicapped by the fact that dividend payments are not included (averaging around 1.6% annually as of 2014), the contrast is nonetheless remarkable. Some individual stocks, such as Suncor, have performed much better than the index.

<sup>&</sup>lt;sup>113</sup> A few oil sands producers and midstream companies, including Canadian Oil Sands (a major shareholder in Syncrude), were able to benefit from the Canadian 'Income Trust' structure until 2011. The structure allowed companies to pass profit directly to shareholders without paying corporate tax.



is the upside promise, whether realistic or not, that technology will change the game for oil sands production and that supply costs will sooner or later drop drastically. In this light, accumulating reserves makes a lot of sense for long-term investors. Even famed investing guru Warren Buffet, the CEO of Berkshire Hathaway who has a well-earned reputation for successful long-term investing strategies, has enlarged his company's ownership of Suncor Energy (now a little under 2 per cent).

#### Domestic vs. foreign

Investors from all over the world are attracted to Canada's political and legal stability, especially when compared to other major crude basins in South and Central America, Russia, Africa, and the Middle East. Canada is one of the least corrupt nations in the world (as judged by Transparency International and highlighted in Figure 24). Outside of Norway's declining North Sea basin, and the US, which will remain a net importer of crude for some time, Canada acts as a stable and ethical 'beacon of hope' for international oil investors looking to export. This reputation attracts investors who are averse to the risks inherent in less stable regions.



#### FIGURE 24: GLOBAL CORRUPTION INDEX, HIGHLIGHTING MAJOR OIL EXPORTERS

Sources: Transparency International; ARC Financial (black labelling).

In an effort to drive public opinion against growth, an oil sands opposition group concerned about protecting Alberta's forests estimated in 2012 that more than 70 per cent of the oil sands production ownership was foreign, though foreign entities only controlled 24 per cent.<sup>114</sup> On the whole, however, much of the production ownership is as how it has traditionally been for decades – mostly split between investors based in Canada and the US (remember that mining pioneer Suncor was once a subsidiary of US energy firm Sun Co.).

Global majors such as Shell, Chevron, ConocoPhillips, and ExxonMobil (through Imperial Oil) began playing a bigger role through their Canadian offices as the projects became more attractive. European majors Total and Statoil jumped on the bandwagon a few years later as the global price of crude rose. Several have made quick exits however – Total, Statoil, and ConocoPhillips have all retreated to some extent in the past few years from their audacious initial plans.

More recently, Asian investors seem more bullish on the oil sands than anyone else. Following the financial crisis and amid uncertainty about global oil supply, Asian NOCs accounted for roughly one-third of acquisitions in 2009 and 2010. Much of this investment is from China, through its NOCs Sinopec, CNPC, and CNOOC. Their government mandates and strong financial backing allows them

<sup>&</sup>lt;sup>114</sup> De Souza, Mike. 'Majority Of Oil Sands Ownership And Profits Are Foreign, Says Analysis'. *The National Post*, 2015.



to suffer through unprofitability for longer than the traditional majors and certainly longer than small capitalized Canadian companies. Worried about relinquishing the geopolitical advantages of its oil sands following CNOOC's CAD\$15 billion acquisition of Nexen in 2012, the Canadian government banned major controlling acquisitions of oil sands operators by foreign state-owned companies, especially those from non-democratic nations. This has caused Asian NOCs to take smaller, non-controlling ownership stakes, purchase a number of smaller operators, and/or build up capacity organically with their own companies.

#### LTO is more attractive to investors

For much of the first decade of the twenty-first century, most major investments in North American oil were either aimed at Canada's oil sands or offshore of the US Gulf Coast, which are both costly and difficult sources of oil. This changed rapidly, however, with the emergence of US light tight oil (LTO). Never before has so much oil been added to global supply so quickly from a new source of oil.<sup>115</sup> During arguably the fastest industrial expansion in Canadian history, the oil sands added roughly 1.5 million bpd over the last 10 years, while in just the last five years, the LTO revolution has added almost 5 million bpd to the US production total. Indeed, the oil sands have a formidable 'new kid on the block' competitor in US light tight oil, which is undoubtedly one of the factors behind the diminishing investor interest in the oil sands since 2011.

The ability to drill and complete wells rapidly (within weeks) and the inherent large production declines after the first year or two of operations, makes LTO production a much shorter term investment compared with long-life (and long construction period) oil sands projects. Producers and their investors have much more certainty in knowing that the bulk of their positive cash flow will arrive in a few months, rather than over the next ten to twenty years. Consequently, drilling into shale geologies has created a much more dynamic and nimble landscape of producers than those operating in the oil sands. This higher of level of competition among LTO producers drives further cost efficiencies and ingenuity. Without rapidly adapting, operators can go out of business very quickly – the efficiency of operations evolves at a much quicker pace for LTO than the oil sands.

#### Risk vs. return

Few other industries burden their investors' capital with as much risk as oil and gas production. A typical project economic analysis must confront the daunting uncertainty in subsurface reservoir characteristics, capital costs, scheduling delays, regulatory changes, and commodity price, each of which can make or break final investment decisions. As a result, investors expect higher rates of return than investing in less risky ventures such as a power plant or pipelines with a guaranteed rate structure and more standardized engineering designs.

Oil sands production endeavours can be even more risky than conventional production. Major mining and SAGD project builds must grapple with sizeable fluctuations in the labour markets, capital project delays and overruns, uncertain regulatory burden, bottleneck-related price discounts, volatile energy input costs (natural gas), and – worst of all – long project lifecycles. For example, predicting the future price of oil is always challenging, but it is certainly easier to forecast for the next 10 years, the most productive and relevant period for an LTO project, than for the next 25 years or more, the relevant lifecycle in an oil sands project. Oil sands projects can take five years or more to just come online, while this is just a few months for LTO. Shell CEO Ben van Beurden called attention to these risks after Shell suspended its 80 thousand bpd Carmon Creek SAGD project in October 2015, despite having already sunk CAD\$2 billion into the project:

[Carmon Creek was subject to] a very, very wide range of outcomes... It was basically a clear, straightforward economical decision. So many things had sort of moved against the project economically and so much uncertainty had crept into it on the financial outcomes, that with a tightening of the cash balances within the company, the more sensible thing was to shelve it.<sup>116</sup>

The question then becomes: even if the oil sands can reduce its supply cost enough to equal that of LTO, its continuously improving competitor (for a prescribed rate of return), why would investors

<sup>&</sup>lt;sup>115</sup> Saudi Arabia rebuilt its production volumes starting in 1985, after massive productions cuts in the early 1980s when it played the role of the world's swing producer

<sup>&</sup>lt;sup>116</sup> Lewis, Jeff. 'Shell Says It Halted Oil Sands Project Over Pipeline Uncertainty'. *The Globe and Mail*, 2015.



choose the energy source with substantially more risk? Unless investors have a predisposed focus on energy security, unlikely in today's oversupplied global crude market, oil sands projects will need to become cheaper than LTO projects to be competitive.

# **Shareholders losing patience**

The current low-price environment for oil and commodities in general is certainly a roadblock for operators throughout the world trying to raise capital and grow production. But even before the global price collapse, shareholders were becoming disenchanted with the performance of the oil and gas industry in Canada. Remember that the estimates of supply costs shown in this paper, as well as in financial research and public newspapers, are typically based on a 12.5 percent nominal rate of return, with the assumption that capital costs come in at the budgeted amount. Cost escalation and overruns are common, however, and this has led to disappointing returns on an industry-wide average.

In an effort to prevent further royalty and regulatory cost burdens on the oil and gas industry, CNRL president Steve Laut presented a version of Table 6 to the newly elected NDP provincial government in the summer of 2015. The poor performance of the oil and gas sector at returning capital is glaring, especially considering the high WTI prices in 2012 and 2013 versus today. The numbers will likely look significantly worse for 2014–15; although considered one of the better performers, CNRL notes that despite having a 10 per cent return on capital in 2014, it is forecasted to drop to negative 1.9 per cent in 2015. Laut made the case that because producers are already laden with high costs, and struggling to return the profits that shareholders expect, Alberta's oil and gas industry (in many ways driven by the oil sands) cannot both bear further costs and continue to be a major driver of job creation and government revenue for the province.

By Industry	2012	2013
Arts, Entertainment & Recreation	39.2%	30.7%
Agencies / Brokers	14.7%	15.3%
Alcohol & Tobacco	10.5%	11.2%
Insurance Companies	12.8%	10.6%
Construction	9.4%	8.9%
Agriculture	8.3%	8.0%
Forestry	7.4%	7.4%
Banking	6.1%	6.1%
Mining	3.3%	2.9%
Pharmaceuticals	4.9%	2.8%
Canada / Alberta Oil and Gas	1.4%	1.0%
(WTI Price, \$USD)	\$94.19	\$98.00
All Canadian Based Industries	6.3%	6.4%

# TABLE 6: RETURN ON CAPITAL ACROSS INDUSTRIES IN THE CANADIAN ECONOMY

Source: Statistics Canada.

Larger operators like Suncor, Husky, and Cenovus have attracted investors with their downstream asset diversification, creating a buffer of refining profits in periods of low oil price and losses on the production side. The recent cost cutting and operational improvement efforts of operators is also applauded by investors, though they cannot seem to come fast enough. Major M&A activity will likely continue such as the initially hostile, but eventually mutually agreeable, takeover of Canadian Oil Sands' interest in Syncrude by Suncor.<sup>117</sup>

### The divestment movement

Newspaper headlines have somewhat exaggerated a growing movement among universities, churches, family trust funds, and other groups to divest from all fossil-fuel investments, especially

<sup>&</sup>lt;sup>117</sup> The finalized takeover bid will give Suncor 49% control of Syncrude (making it by far the largest shareholder), allowing it to better implement its cost cutting and operational improvement capabilities.



those in the oil sands – at times decried as harmful as coal by the activists. The movement has had relatively little effect to date outside independent groups and Hollywood celebrities; major groups to make divestment declarations so far include the University of California, Oxford University and, more notably, the Rockefeller Brothers fund, a family financial legacy from oilman John D. Rockefeller. However, these multibillion-dollar funds had very little of their capital invested in the oil sands in the first place, and though the student activist fervour continues to try to sway the fund managers of major endowments at Harvard, MIT, and the University of Toronto, the movement overall is unlikely to create measurable impact when compared to the underlying economics of oil sands production.

# 4.2 Projects in development

### **Announced projects**

Wanting to demonstrate growth prospects to investors, oil sands producers tend to announce many more projects than they end up building. Figure 25 summarizes the in-situ dominated 5,212 thousand bpd of capacity in projects currently announced (not including those officially cancelled or shelved). Of these announced projects, only 479 thousand bpd are listed as under construction as of November 2015.

# FIGURE 25: OIL SANDS PRODUCTION CAPACITY (NEW AND PROPOSED)



Source: Oilsands Review Datasets (November 2015).

The major additions proposed are from the current major players – CNRL, Cenovus, Suncor, and Imperial, with the notable addition of Brion Energy (owned by Chinese NOC PetroChina) which has high aspirations of SAGD growth. Some of these announcements, though not officially cancelled, have little chance of coming to fruition in the near term.

# **Cancelled and shelved projects**

Major withdrawals have occurred both before and since the 2014 crash of crude prices, though project cancellations and suspensions are becoming more common (see Figure 26). Shell's shelving of Carmon Creek in October 2015 is the most recent example. As well, while 81 per cent of announced project capacity is for in-situ production, only 56 per cent of cancelled and suspended project capacity is – further evidence of how mining is becoming much less attractive in comparison. Many feel that Suncor's Fort Hills mine (of which Total and Teck Resources are partners) could be the



last greenfield oil sands mine, especially if costs go as far over budget as previous mega-project mining endeavours. The future looks even grimmer for new upgraders. Economics for upgrading within Alberta remains highly unfavourable, and there are presently no upgrading project plans with an announced start date.



# FIGURE 26: SUSPENDED OR CANCELLED PRODUCTION PROJECTS (SINCE 2011)

In Situ

Mining

Source: Oilsands Review Datasets (November 2015), Author analysis.

# Fundamental changes are needed

Barring a major oil price recovery to \$80–100 WTI in the next few years, major changes are needed to make many of these announced projects economically attractive enough to pass a final investment decision review:

- 1) Oil sands producers, service companies, and suppliers need to become drastically more cost-efficient in their operations through better processes and lower wages. This will likely arise out of a necessity for survival. Negotiating power needs to shift from contractors and suppliers back to where it sits in most industries with healthy economics: the buyer.
- 2) Technology needs to be developed and used effectively, yet judiciously, to improve reservoir productivity and production processes. An entrepreneurial, venture capital-type approach is needed within large producers and external technology developers to be able to compete with the continuing improvements of LTO projects. Research should be a major focus of both government and industry in dedicating resources to developing both near-term gains and longer-term game-changing technologies.
- 3) Certainty is needed around regulatory costs (royalties, carbon pricing, and other environmental controls) and access to markets through new pipelines. Producers and their shareholders will remain justifiably hesitant to go forward on new projects otherwise.

# 4.3 A cautionary approach to growth predictions

#### Inherent uncertainty

The oil sands future has always been blurry at best. Since the resource was first considered useful and exploitable by early European explorers and geologists, there have been fluctuating periods of high hopes and disappointment, boom and bust, audacity and anxiety. As it is rational to think these fluctuations will continue, the reader should take the production growth forecasts shown here, or elsewhere, with an ounce of scepticism. Each of the fundamental drivers of new production growth – price, cost (including technology), egress, and regulation – are driven by a variety of underlying



factors that can change within just a few months, so much so that evaluating each one more than five years in the future can seem futile.



FIGURE 27: IN-SITU OIL SANDS PRODUCTION FORECAST BY THE NEB IN 2000, 000 B/D

Sources: Alberta Energy Regulator; National Energy Board of Canada (2000).



# FIGURE 28: OIL SANDS PRODUCTION FORECASTS AND ACTUALS, 000 B/D

Sources: Alberta Energy Regulator; CAPP (2006, 2015); IEA (2015).<sup>118</sup>

Humbling examples of analysts' inability to forecast oil sands production are shown in both Figure 27 (an in-situ forecast from the National Energy Board in 2000 assuming oil price was to stay at \$18 per barrel) and Figure 28 (forecasts from CAPP and IEA going forward). For example, just within the past year, forecasts of oil sands production rates in 2030 have fallen by 1 million bpd or more due to the drop in crude prices.

It is interesting to note in Figure 28 that there seems to be a substantial difference between the CAPP and IEA 2015 forecasts: CAPP, like other industry groups or industry-funded consultancies, may have a bias towards a more bullish growth trajectory. It is also clear that the growth of LTO and resulting oversupply has greatly dampened oil sands production projections versus earlier predictions like CAPP's in 2006, for example. Accordingly, the IEA is rather dour on oil sands projects being built just after 2020, when those already under construction are completed. Nonetheless, the agency predicts a return to high growth rates from 2025–2040 when LTO production flattens out and declining global conventional supply needs to be supplemented.

<sup>&</sup>lt;sup>118</sup> Taken from the "New Policies Scenario"



# 4.4 Where will the oil sands fit in the global supply mix?

With the above caveat of uncertainty, this paper will attempt to bring some foresight to oil sands production trends, if somewhat qualitative in nature. The sheer magnitude of the reserves contained in the oil sands is a recurring theme in this research, and this is what has fascinated oil futurists for more than 100 years. This fascination ebbs and flows with concerns about global supply and perceived technological breakthroughs – we are currently at the ebb portion of the analogy; the proverbial receding tide has washed much of the interest for rapid oil sands production growth out to sea. When and how much fervour returns among investors, supermajors, and NOCs to expand oil sands production is uncertain, but to some extent we can use what we have learned over the past 50 years of oil sands growth and, when combined with insights from near and long term economic drivers, make some high-level prognostications.

### FIGURE 29: CURRENT SUPPLY (BREAK-EVEN) COSTS OF NEW SOURCES OF OIL



\*The break-even price is the Brent oil price at which NPV equals zero using a real discount rate of 7.5%. Resources are split into two life cycle categories: producing and non-producing (under development and discoveries). The latter is further split into several supply segment groups. The curve is made up of more than 20,000 unique assets based on each asset's break-even price and remaining liquids resources in 2015.

Sources: Rystad Energy UCube, September 2015.

# The near term (until 2025)

Canada's oil sands are considered currently by many as the highest, large-scale source of global crude production (see Figure 29 for a September 2015 analysis, though costs are likely lower in January of 201 for a September 2015 analysis, though costs are likely lower now in January of 2016). This does not bode well for oil sands growth in the relatively oversupplied world of the next few years. Though there are clear-cut opportunities to substantially bring down production costs, other competing sources are also lowering costs and opening market access – US light tight oil and Iran's muzzled conventional production are two examples. Even costly deepwater projects are reducing their field development times from the traditional seven years down to three, especially in North America.<sup>119</sup>

<sup>&</sup>lt;sup>119</sup> Poruban, Steven. 'OTC: IHS's Fryklund: Deepwater Will Be Vital to Maintaining Global Supply'. Oil & Gas Journal, 2015.



#### Unavoidable retrenchment

Many are predicting, and this author agrees, a marked slowdown in capacity construction until either the global crude price returns to consistent levels at perhaps \$80 or above (forecast by the IEA to occur around 2020) or producers can demonstrate drastic and sustainable reductions to their costs structures. Investors and executives will likely need both given the poor economic performance of many of the projects built in the past decade, not to mention current projects under construction that planned for oil prices above \$80 or \$90. Regulatory and egress uncertainty adds additional burdens to already economically unattractive near-term growth opportunities.

Finding capital for oil sands projects, whether directly from public markets, or at the executive level of supermajors and NOCs, is harder now than just two years ago and much harder than it was 10 years ago during the expansion frenzy. Much of the capital spent on the oil sands in the coming years will be aimed at sustaining current levels of production rather than building new capacity, given that investors are now more acutely aware of uncertainty. Furthermore, the short lead-times for US light tight oil and Iraqi projects (highlighted by the IEA in Figure 30) are able to keep price increases buffered with rapidly responding supply, at least to a certain extent.



FIGURE 30: LEAD TIMES FROM FID AND PRODUCTION OF VARIOUS SOURCES

Source: International Energy Agency (2015).

#### From ebb to flow

However, beyond 2020 it is likely that oil sands production will ramp back up more quickly than the IEA has predicted in its base forecast. Near-term pain borne by producers and suppliers will translate to more competition and efficiency, and much lower costs. Production technologies and processes, especially in SAGD, will have to improve out of necessity for producer survival, though the outlook for mining growth still looks grim with high costs and tailings management challenges. Confronting major deficits and awakening to the economic importance of the oil sands, the Alberta and federal governments will bring regulatory certainty for carbon pricing and royalties. The egress problem will eventually be solved, with evidence-based scientific, engineering, and economic arguments outweighing those of the activists. More importantly, prices will likely begin to rebound as indicated by the IEA's Fatih Birol, who has cautioned over crude energy security:

It would be a grave mistake to index our attention to energy security to changes in the oil price... Now is not the time to relax. Quite the opposite: a period of low oil prices is the moment to reinforce our capacity to deal



with future energy security threats. [The global oil industry needs to invest \$630 billion] just to compensate for declining production at existing fields and to keep future output flat at today's levels.<sup>120</sup>

Most importantly, with price likely to recover (at some point in the next ten years anyways), investors will be more likely to look at new growth projects.

# The long term (beyond 2025)

#### **Price**

Like any energy source, sufficient demand through the form of relatively high prices, say above \$70 in today's dollars, will likely be a major driver of oil sands growth over the long term. Certainly, predicting crude prices for the next two or three decades are beyond the scope of this paper, though there are some fundamental themes underlying most of the published forecasts and analyses that are worth mentioning here.

From a demand standpoint, consumption savings through improved engine technology and a switch to natural gas and electrified transportation looks to be offset by the billions of new consumers joining the middle class, primarily in Asia, but also in Africa. Such a rise of income and global trade will surely require more demand for transportation fuels, not to mention petrochemical by-products. Accordingly, ExxonMobil and BP both estimate an average demand growth rate in the next two decades of around 0.8 per cent, while the IEA is less bullish on oil demand due to changing climate policies, but still has demand grow by 0.5 per cent annually. The emergence of these new Asian middle-class consumers is somewhat offset by the fact that they proportionately use less crude oil in their energy mix than traditional developed markets.

Not only are new sources of supply needed to meet this growing demand but also to offset declining production of the majority of the world's conventional fields. LTO production will likely level off at some point due to a dearth of new sweet spots to drill, and the world will look to heavier sources like the oil sands and more difficult sources like deepwater and the Arctic to fill the void. Barring a drastic and unlikely drop in demand, price increases will trend upwards to incentivize production.

To be sure, meaningful restrictions on greenhouse gas emissions will have a dampening effect on global demand, but given how much more costly and technically complicated it is to switch away from liquid fuel usage for transportation than it is to switch away from coal usage for electricity, demand for oil will likely still grow to some extent (before flattening). And with the majority of emissions arising from combustion at the tailpipe, emissions from oil sands production are only marginally more damaging than those from other producing basins around the world.

# Technology, process, and cost

In addition to those who flocked to the early twentieth century first strike of oil near Calgary, the province of Alberta was settled by hard-working farmers and ranchers. Albertans, and especially those leading the charge in Canada's oil and gas industry in Calgary, have always prided themselves as an industrious, entrepreneurial, and resilient bunch. The Canadian oil industry has known boom and bust times like all global basins, but it is somewhat unique in its ability to re-invent itself – the development of the oil sands through advancements in process and technology is a strong testament to that.

Despite the current sluggish oil prices, there is every indication that producers committed to the oil sands in the long term will return to global competitiveness through operational improvements and technological advancements. The question is: how quickly and to what extent?

The biggest factor driving the long-term oil sands production outlook is likely technology. Both incremental improvements to current technologies, such as the addition of solvents to SAGD, and lower probability, but more disruptive, technologies such as the use of nanotechnology or microbial organisms, could have major impacts. Sustainable reductions to supply costs are indeed much more compelling to investors and decision makers than oil prices staying high for a decade or more, something that history shows us is inevitably fleeting.

<sup>&</sup>lt;sup>120</sup> Hussain, Yadullah. "Grave Mistake' To Be Complacent On Energy Security, International Energy Agency Warns". *The National Post*, 2016.



#### 'Speed limits' to growth

The past 15 years in Northern Alberta has taught us that there exist a number of limiting factors to how quickly Alberta's oil sands can grow production. As seen even with a seemingly efficient new technology like SAGD, cost escalation, egress challenges, and environmental impact can quickly dampen even the most promising growth scenarios. These burdens will continue to weigh down producers during future boom times in the coming decades, especially without collaborative forethought between industry and government into cost control, environmental considerations, and impact on Aboriginal groups. Without such critical planning, Canada continues to limit its ability to be a major global exporter.

#### The ultimate marathon

The magnitude of Canada's oil sands reserves is reiterated here, with the diagram in Figure 31. The acknowledgement that in-situ reserves can be produced through SAGD put Canada on the global radar in the late nineties as a major potential source of future crude production.



### FIGURE 31: OIL SANDS RESERVES AMID GLOBAL RESERVES (BILLIONS BBL)

Source: BP Statistical Review, June 2015.

For domestic and foreign investors alike, Canada represents one of the most politically stable regions to place long-term capital. As technology is tweaked, processes improved, and transportation bottlenecks cleared, SAGD (or other in-situ) projects will slowly become more attractive again over the next decade. Technological breakthroughs, such as TAGD technology that uses thermal conduction heating from electrical resistance to produce in the now 'unrecoverable' oil sands carbonates, could very likely add another few hundred billion or so more reserves to Canada's recoverable tally.

In summary, the oil sands is a long-term bet for patient visionaries whose success depends both on the global crude supply and demand fundamentals, and the ability to improve production capability over time. Suncor's Steve Williams summarized the nature of the resource after taking over the CEO role in 2012:

The oil sands business is the ultimate marathon. It requires fitness, endurance, strategic pacing, and discipline.<sup>121</sup>

<sup>&</sup>lt;sup>121</sup> Cattaneo, Claudia. 2015. 'King Of Pain: Steve Williams Seizes On Price Pangs To Prepare Suncor For Oilsands Dominance'. *The National Post.* 

# Appendix: Oil sands primer

# A.1 What are 'oil sands?'

# **Geologic origins**

The oil constituent of the Canadian oil sands is believed to have been formed through similar processes to conventional oil traps. Research suggests that much of Alberta was covered with an ancient sea from which trillions of microorganisms from the ocean floor decomposed to produce kerogen, buried deeply under high temperatures and pressures.<sup>122</sup> Tens of millions of years after this organic material was initially deposited in the middle Cretaceous age (approximately 115 million years ago), the tectonic activity that arose from the large Pacific Plate, of what is today the most western Canadian province of British Columbia, advanced westward and created the world-famous Rocky Mountains on the western edge of Alberta (the Banff and Jasper regions). The mountain-building process generated enormous subsurface pressures on the Cretaceous kerogen layers, converting the deeply buried organic material into massive deposits of light crude oil and natural gas. As geologic activity continued, the lighter hydrocarbon mixture moved towards the surface hydrostatically, and because of the existing geological structures including sand deposits that existed on the path of surface migration, the oil lost lighter hydrocarbons along the way and massive biodegradation occurred. The now volume-diminished, high-viscosity oil then came in contact with sands from ancient river beds (such as the Athabasca River), rendering an immobilized heavy oil, sand, water, and clay emulsion.<sup>123</sup> The industry has now aligned to describe this emulsion as 'oil sands'. They exist in vast proportions in Alberta across the Peace River, Cold Lake, and Fort McMurray deposits as seen in Figure 32. Although oil sands deposits are known to exist in many countries of the world, by far the two largest reserves are in northern Alberta and the Venezuelan Orinoco Belt, each containing comparable volumes of around two trillion barrels of oil in place.

# FIGURE 32: THE CANADIAN OIL SANDS HIGHLIGHTED IN THE PROVINCE OF ALBERTA



Source: Government of Alberta.

<sup>&</sup>lt;sup>122</sup> M.B. Dusseault, 'Comparing Venezuelan And Canadian Heavy Oil And Tar Sands', in *Proceedings Of Petroleum Society's Canadian International Petroleum Conference*, 2001, 61.

<sup>&</sup>lt;sup>123</sup> Fran Hein, Geology Of The Oil Sands (Association of Professional Engineers and Geoscientists of Alberta, 2013).



# Composition

A visually descriptive representation of oil sand composition can be seen in Figure 33, detailing the water-wet composition of the mixture. Triangular and highly abrasive sand grains composed mostly of quartz are covered with a water envelope containing clay minerals, known as fines. Engulfing this is a film of extra-heavy oil known as bitumen. With an API normally less than 10°, the bitumen that comprises between 1–18 per cent of the volume of oil sands is essentially immobile in the colder reservoirs of northern Alberta (though this is less of an issue in the warmer reservoirs of Venezuela). Increased compositions of fines are associated with more water and less bitumen to produce. However, a minimum concentration of the silt- and clay-based fines (around 3 per cent) is needed to produce commercially, as they act to aid the separation of bitumen and sand.<sup>124</sup> The fundamental challenge with oil sands mining is that given the relatively low composition of bitumen in the sand, it takes an average of 2 tonnes of oil sands to produce approximately 1 barrel of synthetic or 'upgraded' crude oil with an API around 30° (vs. Brent at 38° and WTI at 39°).

#### FIGURE 33: OIL SANDS COMPOSITION



Source: Total Website

#### Surface or subsurface?

All three main oil sands deposits are located within Alberta (revisit Figure 32 on the previous page), though other areas of 'lighter' heavy oil with API levels above 10° can be found within the province and into Saskatchewan, the contiguous province to the east. Well over half of the oil sands are located in the Athabasca deposit, the only portion that contains reserves close enough to surface to be mined – that is, where oil sands constituents are removed en masse and transported to a facility for the bitumen to be separated.

Across the deposits, mineable reserves make up about 20 per cent of the total at the most. Even if all of these reserves were to be produced in the coming decades, only 4,800 km<sup>2</sup> of land would be disturbed (and eventually reclaimed). These near or at-surface reserves are essentially frozen solid in the winter months and soften up substantially in the summer with seasonal variations in air temperatures of up to 70°C.

The remaining 80 per cent of recoverable reserves are at depths varying between 300 and 800 meters (1,000–2,600 feet) that require *in-situ* production – removing the bitumen in the subsurface while the remainder of the oil sand material stays in-place.

# A.2 History and technology: 'The Supergiant of the Future,' since 1906

The anthropological uses of bitumen are thought to go back tens of thousands of years further than that of crude oil, with Neanderthals in what is modern day Syria using the substance as an adhesive

<sup>&</sup>lt;sup>124</sup> The Government of Alberta, Facts About Alberta's Oil Sands And Its Industry (Edmonton, 2009).



for hunting tools.<sup>125</sup> Bitumen used for construction and other purposes continued extensively from ancient to more modern civilisations. In fact, well before crude oil became a major global commodity in the 1800s, oil sands were mined at Pechelbronn in Alsace, France in 1741 where heavy bitumen oil was separated from the surface sands using hot water and distillation.<sup>126</sup>

#### Aboriginal traditions and European encounters

For generations (it is unknown how long exactly), Aboriginal peoples of the Athabasca River region had used surface bitumen to caulk their canoes and to keep pesky mosquitos at bay. These First Nations groups used a basic boiling technique to separate the bitumen from the sands.<sup>127</sup> Bitumen was considered valuable enough to the tribes that in 1719 an Aboriginal leader named Wa-Pa-Su (meaning 'the Swan') offered a sample of oil sand to the Hudson's Bay Company, a fur trading business and at the time the de-facto colonial government of unsettled Canadian territory.<sup>128</sup>

Later assessments of the region by British explorers peaked interest in the vast deposits that could be seen at the surface. Once a critical mass of settlement began in Alberta in the mid to late 1800s, and kerosene (from oil) became known as a valuable commodity for lighting, geological surveys were commissioned to the oil sands with auspicious findings. Renowned Canadian geologist Robert Bell noted in 1884:<sup>129</sup>

The banks of the Athabasca would furnish an in exhaustible supply of fuel... [They] have found it to contain from 12–15 per cent of bitumen. This proportion may appear small, yet the material occurs in such enormous quantities that a profitable means of extracting oil...may be found.

### Early hype and production endeavours

On the heels of the promising results of the geological surveys, a couple of primitive wells were drilled. They were followed by further expeditions at the end of the nineteenth century that led to great expectations:<sup>130</sup>

That this region is stored with a substance of great economic value is beyond all doubt, and, when the hour of development comes, it will, I believe, prove to be one of the wonders of Northern Canada. We were all deeply impressed by this scene of Nature's chemistry, and realized what a vast storehouse of not only hidden but exposed resources we possess in this enormous country. What is unseen can only be conjectured; but what is seen would make any region famous.

The Canadian prairies were being rapidly settled with European immigrants and North American migrants in the early 1900s, attracted by enticing land giveaways from the federal government, and Alberta's population grew from 73,022 in 1901 to 374,943 in 1911. With Canada's federal government proving themselves inept at overseeing the development of domestic oil production, and amidst pressure from the British Empire's growing thirst for global oil supplies from the 'Dominions', lease rights to drill for oil in Alberta were made private. The resulting land boom in Calgary became legendary – in the two or three weeks following the famous strike of conventional oil in nearby Turner Valley, over 500 oil companies were formed. The race was on to make the oil sands commercial through private investment. Many geologists thought that the ground seepages of bitumen were indicative of massive oil pools below the surface. Twenty-four wells were drilled starting in 1906 with great expectations and disillusioning results. Subsequent and equally unsuccessful efforts were made to use the oil sands material in paving, in place of imported asphalt. Despite the failures, interest to

<sup>&</sup>lt;sup>125</sup> S. E. Churchill, 'Hand Morphology, Manipulation, And Tool Use In Neandertals And Early Modern Humans Of The Near East', *Proceedings Of The National Academy Of Sciences* 98, no. 6 (2001): 2953-2955, doi:10.1073/pnas.061032198.

<sup>&</sup>lt;sup>126</sup> Total.com, 'Total Global Homepage', 2015, http://www.total.com.

<sup>&</sup>lt;sup>127</sup> 'First Nations' refers to status and non-status 'Indian' peoples in Canada, as was originally defined by the Federal government. Many communities also use the term "First Nation" in the name of their community. Currently, there are 617 First Nation communities, which represent more than 50 nations or cultural groups and 50 Aboriginal languages. – Aboriginal Affairs and Northern Development Canada

<sup>&</sup>lt;sup>128</sup> The Hudson's Bay Company exists today as a retail department store and holds the claim of North America's oldest company.

<sup>129 (</sup>Selwyn and Bell 1885)

<sup>&</sup>lt;sup>130</sup> (Mair 1908)



develop the resource did not wane due to local entrepreneurial spirit and government interest in growing domestic production.<sup>131</sup>

Farmer turned businessman Robert Fitzsimmons came to Fort McMurray in 1922 to make his fortune from the 'huge pools of oil', raising funds to purchase a site he named 'Bitumount' and drill what turned out (again) to be dry holes. Concurrently, the Albertan government setup a council to research oil sands viability and Dr Karl Clark began developing a process to separate bitumen from the sands through the addition of hot water. The process was patented in 1929 and Mr Fitzsimmons applied the process to his Bitumount site, now focused on mining and extraction of oil sands, rather than traditional drilling. With a primitive hot water separation plant, and extensive labour, Bitumount was soon able to produce 300 barrels per day. Though Fitzsimmons' 'International Bitumen Company' listed over 50 uses for its extra heavy oil product, the majority of it was being used only to waterproof roofs after being shipped to Edmonton.<sup>132</sup>

FIGURE 34: FUTURISTIC ILLUSTRATIVE OF THE OIL SANDS VALUE CHAIN DURING WWII



Source: S.C. Ells.

Concurrently during the 1930s, two American developers started the Abasands Oils Company, which was granted substantial land rights from the federal government, and despite economic hardships through the Great Depression in the1930s, they were able to commence production by 1941. During this period, Canada was importing more than 90 per cent of its oil consumption, and the Second World War led to further global pressure from the Allies' desire for energy security through 'synthetic fuels' (from substances other than conventional crude oil). Many proposed rapid growth of oil sands production to support Canada and the Allied war effort, as depicted in Figure 34, a cartoon drawing by engineer and oil sands proponent Sidney Ells during the Second World War.

<sup>&</sup>lt;sup>131</sup> (Chastko 2004)

<sup>&</sup>lt;sup>132</sup> The Government of Alberta, Facts About Alberta's Oil Sands And Its Industry (Edmonton, 2009).



Despite this impetus to develop production, however, both the Bitumount and Abasands plants remained too uneconomic to continue production given the limited scale and primitive technology. Quarrels between the federal and provincial governments around natural resource development that began at the beginning of the century continued following the Second World War. This impeded proper investment and regulatory structure to enable oil sands growth. A major oil strike of conventional oil at Leduc (just outside Edmonton) further diverted attention, and oil sands production regressed until the 1960s.<sup>133</sup>

### The EROI hump

With such a massive hydrocarbon deposit in place, scientists, engineers, civil servants, and visionary oilmen contemplated a wide variety of technological and operational schemes to reinvigorate an oil sands production push during the period following the Second World War. The challenge they faced remained the same – how can one improve process efficiency? Described more fundamentally, they needed to the raise the Energy Return on Investment (EROI). This somewhat conceptual ratio that undeniably and somewhat arbitrarily varies according to how the energy input denominator is defined, is nevertheless a driver of global energy economics.<sup>134</sup> Economically attractive energy sources such as hydroelectric power, coal, and high-pressured conventional light oil tend to require little energy input for production (EROI >20) while higher cost, more cumbersome energy sources like biofuels and solar thermal (EROI <2) need substantial energy inputs as part of upfront and/or ongoing efforts.

Owing to the prolific Texas oil boom (of very 'conventional' oil), the EROI of US oil production in 1919 was estimated at 100.<sup>135</sup> However, the diminishing discoveries of untapped giants in easy to reach areas has pushed the global EROI of oil production down to an estimated value of 20, as of 2010. The US crude EROI declined even further, with much faster depletion of 'easy oil' resources than global producers Russia, Norway, and Middle Eastern countries. (LTO is likely in the 2–4 range for EROI.) This substantial drop is in spite of the prodigious efficiency and technological advances made in the exploration and production industry over the last 100 years.<sup>134</sup> Oil sands production effectively aims to 'reverse' geology, involving the energy-intensive practices of thermal cracking and re-saturation. Subsequent upgrading or diluting the product to resemble refiner-ready crude requires further energy when compared with conventional production. Geographical isolation and seasonal challenges of Canada's oil sands further exacerbates these challenges. EROI at the first large-scale mining operation in 1970 is estimated at 1.0, while EROI values at earlier, rudimentary production projects Bitumount and Abasands were almost certainly lower.<sup>136</sup>

The challenge of overcoming a poor EROI, viewed in light of the colossal magnitude of the hydrocarbon resource in place, led to some interesting ideas. A rather extreme, yet still intriguing, example of this was 'Project Oilsand' that proposed the detonation of nuclear bombs in the subsurface. The 400m (1,300 feet) deep detonation plan was developed by Richfield Oil of California, already experienced in the heavy oil fields of the San Joaquin Valley. The idea was to use the energy release from approximately 100 atomic (fission) bombs to vaporize oil sand ore and create a cavernous well of less viscous liquid hydrocarbons that could be pumped conventionally. If the energy release from an atomic bomb can be considered 'useful', the detonation process would increase oil sands EROI by several orders of magnitude. Federal and provincial authorities approved a pilot using a single atomic bomb, slightly less forceful than those dropped on Japan in 1945, to be detonated just 64 km from Fort McMurray. The plans to have US-owned bombs detonated on Canadian soil were ultimately thwarted before the pilot testing. Ironically, rather than the obvious safety and

<sup>&</sup>lt;sup>133</sup> Institute for Oilsands Innovation - University of A berta, 'Oil Sands History And Development', accessed 15 September 2015, http://www.iosi.ualberta.ca/en/OilSands.aspx.

<sup>&</sup>lt;sup>134</sup> Charles A.S. Hall, Jessica G. Lambert and Stephen B. Balogh, 'EROI Of Different Fuels And The Implications For Society', *Energy Policy* 64 (2014): 141-152, doi:10.1016/j.enpol.2013.05.049.

<sup>&</sup>lt;sup>135</sup> The famous Spindletop 'gusher' that trigged the Texas Oil Boom in 1901 had an initial production of around 100,000 bpd from the single well. In 1902, this well produced more than 17 million barrels, assuredly with a very high EROI, well into the thousands. Texas Oil and Gas Association (www.txoga.org)

<sup>&</sup>lt;sup>136</sup> Adam R. Brandt, Jacob Englander and Sharad Bharadwaj, 'The Energy Efficiency Of Oil Sands Extraction: Energy Return Ratios From 1970 To 2010', *Energy* 55 (2013): 693-702, doi:10.1016/j.energy.2013.03.080.



environmental concerns, it was Cold War-era fears of Soviet espionage and the nuclear nonproliferation climate of the 1960s that thwarted the proposal.<sup>137</sup>

Numerous oil sands technologies and schemes to reduce energy intensity and improve operating efficiency have reached dead ends over the decades. How then, have engineers and investors had the patience to overcome these tribulations and expand production? Former Suncor CEO Rick George has described the somewhat prophetic vision of exploiting the colossal reserves in the face of often unfavourable economics:

The most appealing feature of the oil sands was the fact that they were there to be taken. Instead of cruising the world in search of oil hidden beneath ground and drilling 10 dry wells for every one that proved successful, why not focus on the largest known source of oil? A lot of minds went to work on the idea over the years. A lot of money was spent to make it happen and a lot of companies invested millions of dollars in the dream.<sup>138</sup>

#### Mining

With some 30 billion barrels of proved oil sands reserves at or near the surface, mining was the commercial extraction method of choice for most of the twentieth century. Despite fickle support from both provincial and federal governments, the dawn of the large-scale oil sands mining age was triggered by an audacious president of the US-based Sun Oil Company, J. Howard Pew. An early oil sands visionary, Pew aggressively lobbied Sun's board to look to northern Alberta for a long-term return and a first-mover advantage.<sup>139</sup> In 1953, his company's backing led to the founding of the Great Canadian Oil Sands (GCOS) consortium, the precursor to Suncor, and eventually the first commercial production, starting in 1967. The GCOS plant was completed for a capital cost of approximately \$220 million at a production capacity of 45,000 bpd.<sup>140</sup> The success of this endeavour and the growing concern over international energy security prompted other players to enter the game, as the Oil and Gas Journal illustrated in 1967:

The start of commercial production of synthetic crude from the Athabasca tar sands has been hailed as the dawn of a new era, the forerunner of vast new supplies of hydrocarbon energy, assurance of hemispheric self-sufficiency in petroleum, and a threat to conventional crude oil. It may turn out to be all of those things, but only time will tell.<sup>141</sup>

Although other large upstream players wanted a stake in the potentially large resource and started to assemble research teams, few were willing to take on the associated risks themselves with the GCOS plant still not demonstrating attractive returns. Syncrude was created as a consortium of investors who came and went during lengthy project approval and financing postponements. Construction of their plant, finally completed in 1978, required federal and provincial government investment to bail out the remaining three private investors: Imperial Oil, Gulf Oil Canada, and Cities Services. The oil price spikes of the 1970s buoyed the GCOS (renamed Suncor in 1979) and Syncrude plants to profitability. Soon after however, the fallout of low oil prices starting in the early to mid-1980s, combined with federal government overreach into the oil industry through the National Energy Program (NEP), rendered oil sands expansion projects economically unattractive for almost two decades. The turn of the millennium brought new investments for mining production growth at the Suncor and Syncrude sites, as well as new players like Shell and Canadian National Resources (CNRL) joining the field.

All oil sands mining projects, from the earliest Bitumount plant in the late 1920s to today's most modern operations, leverage the same basic bitumen separation process patented by Dr Karl Clark back in 1929. Mining is attractive as it recovers almost all of the bitumen present, but it must remove enormous amounts of ore in the process.

<sup>&</sup>lt;sup>137</sup> Aaron Fitzpatrick, 'Project Oilsand', Canadian Institute Of Mining, Metallurgy And Petroleum, 2013,

https://magazine.cim.org/en/2013/August/mining-lore/Project-Oilsand.aspx.

<sup>&</sup>lt;sup>138</sup> (George and Reynolds 2012)

<sup>&</sup>lt;sup>139</sup> (Chastko 2004); Dan Barnes, 'Alberta's Oilsands Epic Stretches Back More Than A Century', *The Edmonton Journal*, 2013.

<sup>&</sup>lt;sup>140</sup> Exchange rate taken in 1967 at \$1 USD = \$1.077 CAD; Suncor.com, 'The Oil Sands Story (1960S, 1970S & 1980S) -

Suncor', 2015, http://www.suncor.com/en/about/744.aspx.

<sup>&</sup>lt;sup>141</sup> 'Editorial', Oil & Gas Journal, 1967.



1. Mining

All oil sands mining is surface mining, otherwise known as open-pit, in which oil sands are removed directly from the surface, or near the surface, rather than by tunnelling through the earth. The technology and efficacy of this process has changed markedly as mining projects have worked to increase efficiency and profitability.

Before oil sands are mined, the removal of overburden (trees, vegetation, muskeg, and layers of soil) is conducted as needed, with the use of bulldozers, backhoes, loaders, water trucks, scrapers, side booms, and graders.<sup>142</sup> Much of this overburden is stored for land reclamation, a long-term process that begins just after the mining process is complete. Images of oil sands production popularized in the media and by environmental groups, will typically show aerial views of the disturbed land with overburden removed. Post-reclamation images are rarely shown, except by producers aiming to improve their public image.

For extraction, the 1967 GCOS plant leveraged a six-story tall, 773-ton bucket wheel excavator that was originally designed for the purpose of building an earthen dam. The excavator would remove the oil sands using its 10 buckets and deposit the ore onto massive conveyer belts to be carried to the processing plant. Syncrude decided to leverage large draglines to remove the oil sands, then smaller bucket wheels to transfer the piled ore to the conveyer belts. Syncrude, Suncor, and new mining ventures began using giant mining shovels (earthmovers) at the turn of the millennium and the world's largest purpose-designed trucks with carrying capacities of hundreds of tons to remove and transport oil sand ore. Suncor's Rick George has spoken about the mechanical complexities of mining:

Bucket wheels, and in particular Suncor bucket wheels, were ideal proof of a rule that every engineer understands instinctively: the more complex a piece of mechanical equipment, the greater the probability of its breaking down... I was convinced that replacing the bucket wheels with a more reliable system would produce an immediate leap in productivity.<sup>143</sup>

A single tire for one of the trucks weighs more than 5 tons, is 4 metres in diameter, and costs more than \$40,000.<sup>144</sup> This technology upgrade led to a better selection of oil sand ore, ensuring higher grades entered the next stage of processing, though the trucks are still expensive, substantial consumers of energy.

2. Conditioning 145

After oil sands ore is extracted, large chunks of material are removed and hot water is added to make a slurry for further processing. This conditioning is the first step in separating the trapped bitumen from the bounded sand, water, and clays. Historically, this was accomplished at the processing plant with a tumbler and hot water, after ore was transferred on a conveyer belt. Research by Syncrude in the 1980s and 90s led to both a crushing and dilution process called hydrotransport that uses colder water that can be leveraged in the field, far from the processing facility. The additional advantage was that pipeline transport performed some separation itself as former Syncrude CEO Eric Newell has noted:

As long as you pump it over a kilometre or more, you get enough mechanical energy put in through the mixing to break the bond (between bitumen and sand), so that you can go into the primary separation vessels. That enabled us to get away from conveyor belts and all that.<sup>146</sup>

These technologies enable the slurry to flow by pipeline. Removing the troublesome conveyor belts, as well as the transition to colder water, reduces energy usage and further lowers mining EROI.

3. Primary Separation <sup>145</sup>

A 'primary separation vessel' (PSV) combines the slurry from the conditioning stage and hot water and settling occurs. The slurry separates naturally within minutes into three layers: a top layer of 'froth', composed mostly of bitumen; a 'middlings' layer of bitumen, sand, clay, and water; and a bottom layer of sand, which is raked out from the bottom to improve separation. The middlings mixture is pumped into large outdoor storage area known as tailing ponds, a process common to the mining industry.

<sup>&</sup>lt;sup>142</sup> The Government of Alberta, Facts About Alberta's Oil Sands And Its Industry (Edmonton, 2009).

<sup>&</sup>lt;sup>143</sup> Dan Barnes, 'Alberta's Oilsands Epic Stretches Back More Than A Century', *The Edmonton Journal*, 2013.

<sup>&</sup>lt;sup>144</sup> Joe Carroll, 'Titan'S Giant Tires Falling Flat In Alberta Oil Sands', *Bloomberg*, 2009,

http://www.bloomberg.com/apps/news?pid=newsarchive&sid=awEFZg9ApIjA.

<sup>&</sup>lt;sup>145</sup> The Government of Alberta, *Facts About Alberta's Oil Sands And Its Industry* (Edmonton, 2009).

<sup>&</sup>lt;sup>146</sup> Dan Barnes, 'Alberta's Oilsands Epic Stretches Back More Than A Century', *The Edmonton Journal*, 2013.



#### 4. Secondary Separation

In the tailing ponds, further separation occurs in flotation tanks through air injection, and allows an additional 2–4 per cent of bitumen to be recovered. The mixture is then sent back to mix with the primary bitumen froth.

5. Froth Treatment 145

Bitumen froth is further heated and de-aerated to ensure air bubbles are removed. The remaining mixture is approximately 30 per cent water and 10 per cent solids (clay minerals or silts) by weight and must be further cleaned. This is either done at a froth treatment plant or through the Counter-Current Decantation Vessels used at Shell's oil sands operations.

At a Froth Treatment plant, the de-aerated bitumen is diluted with a naphtha solvent to improve viscosity. The mixture is then sent through settlers and centrifuges that act to remove the water and solids to generate a solution with less than 5 per cent water and 0.5 per cent minerals. Waste from this process is stripped of remaining naphtha and then is sent to the tailing ponds. If the product is to be upgraded on-site, the resulting diluted bitumen (called 'dilbit') is stripped of naphtha in a Diluent Recovery Unit (DRU) and the nearly pure bitumen remains are sent for upgrading.

The counter-current decantation vessels process is similar, with naphtha being used as a solvent. Advanced separation processes are then used to remove water and solids and produce dilbit.

As the oil sands mining process is complex and relatively new, opportunities exist to improve efficiency and render the endeavour more attractive to investors. This has been shown in recent decades, as estimates for EROI of mining extraction have jumped from around 1 in 1970 to roughly 5–6 in 2010. The efficiency step change, combined with growing crude prices, led to post-2000 expansions at the Suncor and Syncrude sites, as well as new mining projects led by Shell, Canadian Natural Resources (CNRL), and Imperial Oil (majority-owned by ExxonMobil).

#### In-Situ

With more than 80 per cent of oil sands reserves located well below the surface, inaccessible by open-pit mining techniques, many feel the long-term value of Canada's oil sands depends on how operators can separate bitumen from oil sands in the subsurface, or in-situ. Furthermore, the environmental impact at the surface of in-situ production is substantially less than mining and thus more palatable to an environmentally concerned public. Producers focused on in-situ methods are wont to mention this fact, claiming their operations to be 'a different kind of oil sands', versus the somewhat visually disturbing aerial photos of the open-face mines.<sup>147</sup>

Notwithstanding the outlandish nuclear detonation proposal, a multitude of more feasible ideas have been proposed to enable subsurface production. The technical foundation of today's oil sands in-situ commercial methods stems from the heavy oil fields of the San Joaquin Valley in California, based on decades of development into various ways of injecting steam to enhance production.<sup>148</sup> Most techniques leverage the high temperature of steam to coerce the viscous bitumen to flow and are often simply denoted as 'thermal' methods. Because vast amounts of energy are required to generate the necessary heat (through steam or otherwise), in-situ production growth has historically lagged behind mining. This trend changed at the turn of the millennium and in-situ production is starting to now pull away from mining in annual production. This inflection point was primarily due to improved in-situ production technology that led to higher recovery rates, lower capital costs, and a substantial reduction in energy costs. Low natural gas prices in North America, and especially Western Canada since 2008, have been a boon for most in-situ producers. Thermal producers tend to live and die by their steam-to-oil ratio (SOR) – a clear measure of how effectively they can recover bitumen from the subsurface while minimizing energy and water consumption. In-situ oil sands production has been driven by the following commercial extraction processes (next generation technologies are discussed in subsection 3.3):

• Primary & Non-Thermal Enhanced Oil Recovery (EOR)

<sup>&</sup>lt;sup>147</sup> Cenovus.com, 'Cenovus Advertising - A Different Oil Sands', 2015, http://www.cenovus.com/news/a-different-oil-sands.html.

<sup>&</sup>lt;sup>148</sup> Harbir Chhina, Oil Sands Oral History Project, interview by Peter McKenzie-Brown (Cenovus Energy, Calgary, 2011).


Primary and non-thermal EOR methods are used to produce the lighter, less-bituminous, heavy oil found within the demarcated oil sands areas. There are some areas of geology that are favourable to economic production with these more conventional production methods, though are certainly not ubiquitous. Examples of EOR methods that are used to produce heavy oil include water flooding, gas injection, and polymer/chemical flooding.<sup>149</sup> These methods typically have much lower capital and operating costs, though they recover only 5–10 per cent of the heavy oil in place.<sup>150</sup> A quasi-primary, 'Made-in-Canada' method for extracting cold heavy crude at more than 10 per cent recovery is Cold Heavy Oil Production with Sand (CHOPS). Rather than filtering sand out of hydrocarbon production, CHOPS deliberately initiates sand influx during completion, produces sand with the oil, and separates it from the oil at the surface.<sup>151</sup>

• Cyclic Steam Stimulation (CSS)

Like many great discoveries, CSS (informally referred to as 'Huff-and-Puff') was discovered by accident in the heavy oil fields of Venezuela in 1959, when a steam injector well that was aimed at allowing steam flooding into a nearby producing well, began to actually produce oil itself after a blowout.<sup>152</sup> The process injects wet steam directly into the producing well and is comprised of three stages: 1) Wet Steam Injection (Huff), lasting a few weeks; 2) Soaking, where the well is shut down for a few days; and 3) Production (Puff) where heavy oil is produced, typically for several months. The completion of all three stages represents one cycle, and producing wells go through many cycles over their lifetime. CSS operations do not function well in shallower oil sands reservoirs above a few hundred metres, and they require a shale cap to produce. Mostly through trial-and-error in the field, rather than structured laboratory research, CSS has advanced substantially since the late 1960s, when it was first used by Exxon's Imperial Oil at the Cold Lake Deposit, and the mid-1980s, when the first commercial production began.<sup>153</sup> Recovery factors and SOR ratios have improved by increasing the number of CSS cycles over the lifetime of a well (many wells now have >20 cycles), shifting to horizontal wells to increase reservoir access (though these must deal differently with the steam's gravitational effects), and raising the steam's injection pressures and temperatures to match the reservoir while increasing the water content of the wet injected steam.<sup>152</sup> In the oil sands, these improvements have helped CSS projects reach 25-30 per cent in oil recovery in recent years. CSS production growth has been steady, if less pronounced than mining and SAGD, reaching 277 Mbpd in 2014.<sup>154</sup>

• Steam Assisted Gravity Drainage (SAGD)

Also borne out of the thermal EOR practices of the California heavy oil fields in the 1960s was the idea that during steam flooding (also called stream drives) of vertical wells, when steam is transferred from a injector well to a producing well, it is the gravity rather than the steam itself that incites oil production.<sup>155</sup> Imperial Oil's Dr Roger Butler was well aware of this fact in the late 1960s, when he developed an in-situ extraction method using steam injection wells that generate a subsurface 'steam chamber' leading to reduced viscosity of the bitumen in such a way that it drains to a lower, horizontal well, where it can be produced. This process known as Steam Assisted Gravity Drainage (SAGD) was piloted by Imperial in 1978, patented in 1982, and has now become the most important technology in oil sands production, with the standard practice utilizing two parallel wells horizontal wells approximately 4–6m apart (see Figure 35).<sup>156</sup>

Continued development through corporate and provincially funded consortium research led to several commercial endeavours starting in the late 1990s, with Cenovus Energy leading the charge with the first commercial SAGD project in 2001 at Foster Creek in the Cold Lake deposit (subsequently the first SAGD endeavour to reach project profitability in 2010). Advances in 4D seismic modelling, horizontal well drilling, and operational effectiveness played a big part in making the technology attractive, and in 2002 the *Oil* &

<sup>&</sup>lt;sup>149</sup> Christopher Holly, Martin Mader and Jesse Toor, *Oil Sands Production Profile (2002-2010)* (Edmonton: Alberta Department of Energy, 2012).

<sup>&</sup>lt;sup>150</sup> Alberta Energy Regulator, Alberta's Energy Reserves 2013 & Outlook 2014–2023, ST98-2014 (Calgary, 2014).

<sup>&</sup>lt;sup>151</sup> (Dusseault 2002)

<sup>&</sup>lt;sup>152</sup> Johannes Alvarez and Sungyun Han, 'Current Overview Of Cyclic Steam Injection Process', *Journal Of Petroleum Science Research* 2, no. 3 (2013): 116-127.

<sup>&</sup>lt;sup>153</sup> E.L. Lui, 'Imperial Oil – A Leader In Thermal In-Situ Production', 2006.

<sup>&</sup>lt;sup>154</sup> Alberta Energy Regulator, *Alberta'S Energy Reserves 2013 And Supply/Demand Outlook 2014–2023*, ST98-2014 (Calgary, 2014).

 <sup>&</sup>lt;sup>155</sup> Harbir Chhina, Oil Sands Oral History Project, Peter McKenzie-Browninterview by , radio (Cenovus Energy, Calgary, 2011).
 <sup>156</sup> Imperial Oil Website, 'Aspen - A SAGD Development: Project Overview', 2014, http://www.imperialoil.ca/Canada-English/Files/aspen\_project\_summary.pdf.



*Gas Journal* increased Canada's petroleum reserves from 4.9 to 180 billion barrels accordingly.<sup>157</sup> Since Foster Creek, SAGD growth has eclipsed other in-situ and even large commercial mining extraction methods.



#### FIGURE 35: ILLUSTRATION OF THE SAGD METHOD

Source: The Geological Society (Petroleum Geological Conference Series).

SAGD yields considerable advantages over CSS and the more conventional heavy-oil EOR methods – the most striking is the recovery factor (up to 60 per cent with current commercialized technology) and the partially correlated measure of production per well that can be as almost 10 times higher than CSS (Figure 36). The downside is that each individual SAGD producing well has much higher energy, cost, and complexity with the need for better-quality steam and a second (non-producing) injecting well. Moreover, SAGD is only effective in higher-quality bitumen reservoirs, whereas CSS can be applied to geologies with a wider range of bitumen saturation.

Despite burgeoning production growth since 2001, all in-situ projects still suffer from the challenging energy economics that accompanies a relatively low EROI (SAGD projects are in the 3–4 range at best). Substantial operational and technological efforts, especially since the price crash of 2014, have aimed at lowering the steam required for production (SOR), lowering the cost and greenhouse gas (GHG) emissions of producing the steam, and delivering scale capital and operational cost savings through a 'lean manufacturing' approach to production (discussed further in section 3.2).

<sup>&</sup>lt;sup>157</sup> Sebastian Gault, 'An In-Depth Look At How In Situ Oil Sands Development Has Evolved', *Alberta Oil: The Business Of Energy*, 2014.





FIGURE 36: WELL PRODUCTIVITY AND # IN PRODUCTION, BY IN-SITU METHOD (2013)

Source: Alberta Energy Regulator.

#### **Marketing bitumen**

#### Upgrading

Oil sands marketing has come a long way since the early Bitumount days, when separated bitumen product was barged and railed from the plant near Fort McMurray to the Edmonton markets and sold mostly as a final product for weatherproofing roofs.<sup>158</sup> By economic imperative, GCOS's large-scale mining development in the 1960s brought with it substantial improvements in refining technology. Even with the energy intensive and costly separation process that occurs after mining, bitumen is still at least a thousand times more viscous than light crude oil. More challenging was that, until recent years, few refiners were able to process bitumen on its own, as it had to be 'upgraded' first into a lighter crude. Starting with GCOS (Suncor) in 1967 and until just recently, all mining projects have included an 'Upgrader' unit that can transform viscous bitumen (API gravity of 8–10°) into a more marketable 'Synthetic Crude Oil' (SCO) with an API greater than 32°. Vacuum distillation, cracking (thermal or catalytic), and desulfurization processes are used in various upgrading configurations to separate out lighter hydrocarbon streams, purify the heavier crude, and remove the asphalt. The upgrading process also removes impurities such as sulphur, nitrogen, and trace metals in the lighter streams through hydro-treating before blending the final output streams to generate SCO to be transported by pipeline.

#### Dilbit & Synbit: The shift away from upgrading

Before the recent advent of large-scale light tight oil production in the US shale basins, there was a marked shift towards refiners looking at heavier crude feedstock, shifting from an average API of 32.5° in 1985 to 30.3° in 2008, with a corresponding increase in average sulphur content.<sup>159</sup> The fact that this was happening while traditionally large US imports of heavy oil volumes from Venezuela and Mexico were declining, due to under investment and mismanagement in those countries, is a testament to the growing prominence of oil sands heavy crude. Accordingly many large US refineries in the Midwest and on the Gulf of Mexico spent billions of dollars retooling their refineries with upfront coking (cracking) and other processing units to manage the heavy feedstock. Meanwhile, most oil sands producers, especially those producing in-situ, were focused on improving recovery and lowering extraction costs rather than improving upgrader economics, for which the central lever is increasing scale. Most in-situ producers, and more recently mining producers, have found that it made sense to avoid upgrading bitumen, and simply transport the diluted bitumen mixture (without removing

<sup>&</sup>lt;sup>158</sup> The Government of Alberta, Facts About Alberta's Oil Sands And Its Industry (Edmonton, 2009).

<sup>&</sup>lt;sup>159</sup> American Petroleum Institute, Canadian Oil Sands Primer: Enhancing America's Energy Security (Washington, 2011).



the diluent as is done before upgrading) to refineries downstream of the Edmonton and Hardisty crude hubs in Alberta.<sup>160</sup>

The diluted bitumen mixture can either be dilbit, a mixture of 25–30 per cent natural gas condensate with 70–75 per cent bitumen, or synbit, an approximately 50/50 mix of SCO from an upgrader and produced bitumen.

#### A.3 The oil sands today

#### **Bitumen production**

Major production capacity in the oil sands arrived in somewhat discrete chunks with only a handful of players coming on-stream on a commercial scale until the turn of the millennium (Figure 37). After the Suncor and Syncrude mining projects struggled with profitability (apart from the oil price crisis years of the late 1970s), no new mining projects would be built before Shell's Muskeg River operations came online in 2002.





Source: Oilsands Review Datasets (2015).

The rapid upswing in global oil prices, the commercial implementation of SAGD technology, and mining process efficiency improvements spurred an investment boom starting around 1999. Shell and CNRL built large 'greenfield' mining projects while Syncrude and Suncor made sizeable 'brownfield' additions to their current mining operations. The most salient growth story is the upsurge of SAGD as the production method of choice, as demonstrated in Figure 38. Patented by Imperial Oil and accelerated into large-scale commercial production by Cenovus Energy, the technology has attracted many other players to look at oil sands investments.

The SAGD trend continues. More than 80 per cent of announced new capacity (excluding projects that have been officially suspended or cancelled) is from in-situ plays (Figure 25). While early oil sands production consisted of only two committed players willing to burden the massive costs of infrastructure (upgrading and foundational pipelines) and mining equipment, the trend towards lower

<sup>&</sup>lt;sup>160</sup> This trend away from upgraders has expanded from the smaller volume in-situ projects to mining production, where new proposals are looking to remove on-site upgrading from project plans. ExxonMobil's Imperial Oil is calling this the 'Next Generation of oil sands mining".



upfront capital and smaller-scale for SAGD projects has attracted many more players to game, both large and small.



FIGURE 38: OIL SANDS PRODUCTION HISTORY, BY PRODUCTION METHOD

Source: Alberta Energy Regulator.

#### Upgrading

Historically, upgrader capacity has grown in-sync with mining projects, approaching 1.4 million bpd of on-stream capacity as of 2015. Whereas in-situ produced bitumen typically contains less impurities and can be more easily transported by pipeline after dilution (with SCO or condensate), bitumen from the mines has required on-site upgrading facilities. This thinking began to change with the building of the Scotford Upgrader, just outside of Edmonton, by the Shell-led Alberta Oil Sands Project (AOSP) in 2002 to process bitumen from their newly on-stream Muskeg River mine north of Fort McMurray, almost 500km away.<sup>161</sup> AOSP chose to locate their upgrader beside Shell's already operating Scotford refinery and chemicals facility, and closer to a population centre rather than the higher labour cost and rather remote production location near Fort McMurray (where most other upgraders are located). This generated a strong enough business case to bring to life the first new mining project in 25 years, despite WTI prices in the \$20 range during concept and construction phases.

In the past five to ten years, as US refineries have retooled to accept more heavy crude primarily from the oil sands, price spreads between bitumen and SCO have become smaller, rendering upgrading projects less attractive. Rather than look at building their own costly upgrader, Canadian producers like Cenovus and Husky looked to US-based refiners ConocoPhillips and BP, respectively, to ensure processing capacity south of the border. Upgrader economic attractiveness has decreased so substantially that with CAD\$3.5 billion in sunk cost into its CAD\$11.6 billion Voyageur upgrader, Suncor decided to mothball the project (with partner Total in tow) and invest the unspent capital in bitumen production expansion instead.<sup>162</sup> Imperial's new Kearl mine project, whose first phase at 110 Mbpd went online in 2013, is the first of its kind to use no upgrader at all thanks to a proprietary bitumen froth treatment technology. With almost twice as much upgrader capacity cancelled or postponed as announced in recent years, new upgraders are unlikely in the near future. There have been calls from left-leaning politicians nonetheless, in a populist effort to generate jobs for Albertans and Canadians, for subsidization of local, if unprofitable, upgraders, refineries, and petrochemical

<sup>&</sup>lt;sup>161</sup> The AOSP is a joint venture with the ownership split as 60 per cent by Shell, 20 per cent by Chevron, and 20% by Marathon. <sup>162</sup> Brent Jang, 'Suncor Cancels Voyageur Project, Takes Hit To Profit', *The Globe And Mail*, 2013.



facilities. The North West Upgrader, whose construction is to be completed shortly, is a prime example of this.<sup>163</sup>



#### FIGURE 39: OIL SANDS UPGRADING CAPACITY (BITUMEN INTAKE)

Source: Oilsands Review Database (2015).

#### Markets

#### North American Refinery Capacity

Production growth of 'difficult oil' has profoundly altered the North American oil supply landscape – first with growing oil sands production since 2000, and more recently, with the explosion of light tight oil. Among the world's top five crude exporters (including Saudi Arabia, Russia, Nigeria, and the UAE), Canada is somewhat unique in that it still imports almost 600 thousand bpd of crude oil to its domestic refineries, indicative of the lag of adequate pipeline infrastructure to Eastern Canada (see Figure 40).<sup>164</sup> These refineries have long been fed by foreign imports from the Atlantic Ocean, and have only recently consumed significant volumes of Western Canadian and US light tight oil crude, much of which is transported at a higher cost by rail.

Even before oil sands expansion, Western Canadian producers long relied on the refinery capacity of its high-consuming and trade-friendly US neighbour, mostly in the Midwest, to process their production. This trend has continued with the refineries in US PAD II processing 1.9 of Canada's 2.7 million bpd of exported crude in 2014.<sup>165</sup> Furthermore, recent retooling of Midwestern refineries to handle the increase in bituminous feedstock (essentially upgrading on-site of the refinery) has led to PADD II processing 1.3 million bpd of heavy oil. Most of this crude is of Western Canadian origin, predominantly from the oil sands, which averaged 2.2 million bpd in bitumen production in 2014.<sup>164</sup>

The largest opportunity for oil sands export to the US lies in the massive 8.3 million bpd demand of the Gulf Coast, whose refineries have also retooled for feedstock of lower API gravity, currently processing more than 2 million bpd of imported heavy crude. With Mexican and Venezuelan heavy oil sources declining markedly in recently years, it is somewhat surprising that Gulf Coast refineries currently only handle roughly 235 Mbpd of Canadian heavy supply. Lack of inbound transportation capacity is indeed a limiting factor.<sup>164</sup>

<sup>&</sup>lt;sup>163</sup> Darcy Henton, 'North West Upgrader Morphed Into 'An Economic Boondoggle,' Says Former PC Finance Minister', *The Calgary Herald*, 2015.

<sup>&</sup>lt;sup>164</sup> (Natural Resources Canada 2015); (Canadian Association of Petroleum Producers (CAPP) 2015)

<sup>&</sup>lt;sup>165</sup> See Figure 40 on the following page for a map of US oil marketing regions





#### FIGURE 40: NORTH AMERICAN REFINERY DEMAND (2014, MBPD)

Sources: CAPP; CA Energy Commission; EIA; Statistics Canada.

#### **Transportation**

For decades, oil sands SCO production from Suncor and Syncrude upgraders was easily handled by Edmonton refineries, or sent down Enbridge's mainline along with conventional Western Canadian crude to US markets. More recently, rapid growth in oil sands production since 2001 and light tight oil production in the Bakken shale basin of the northern US since 2007 has put regional pressures on midstream infrastructure downstream of the Edmonton hub, and producers have faced substantial discounts on their crude products – both from the oil sands and the Bakken. More than 1.6 million bpd of oil sands bitumen production growth was added between 1999 and 2014, with another 0.7–1.0 million bpd predicted by 2020 with projects under construction that are unlikely to stop.

Without large-capacity pipeline access to tidewater, save for the Pacific and Gulf Coasts of the US, which currently prohibits crude exports, Western Canadian crude has been, and will continue to be, mostly landlocked. Pipeline infrastructure to the Pacific or Atlantic coasts will be needed, along with exporting terminals for trans-oceanic tankers, if oil sands production is to grow substantially over the coming decades. With Asian demand estimated to grow by 15 million bpd in the next two decades and OECD demand indicating a trend of decline, Canada's oil sands will need increased access to both the Gulf Coast and international markets to make major production growth projects attractive.<sup>166</sup> Critical egress challenges for getting oil sands crude out of the Western Canadian Sedimentary Basin will continue to have a dampening effect on oil sands growth – this is discussed further in Section 2.

February 2016 – The Future of the Canadian Oil Sands: Growth potential of a unique resource amidst regulation, egress, cost, and price uncertainty

<sup>166 (</sup>BP plc 2015)



#### Units

\$	US dollars
CAD\$	Canadian dollars
Bbl	Barrels of liquid
bpd	Barrels per day
Mbpd	Thousand barrels per day
MMbpd	Million barrels per day
Ma.	Million years (geology)
km <sup>2</sup>	Square kilometres
t	Metric tonne (1000 kg)
Mt	Million tonnes
MWh	Megawatt-hour

#### **Conversion Factors**

3.28 feet
1.34 (as of 30 November 2015 – unless noted, all dollar figures in USD)
1.056 GJ
0.972 Mcf natural gas



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#### **About the Author**

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Peter lives in Calgary and enjoys skiing, mountain biking, and discussing the past and (eventual) future greatness of the Edmonton Oilers hockey team.

## **ATTACHMENT LS-4**

# Crude Oil FORECAST, MARKETS AND TRANSPORTATION









CANADA'S OIL & NATURAL GAS PRODUCERS

**JUNE 2016** 

# **Executive Summary**

The oil industry is in the midst of the most severe downturn in recent history. Lower earnings have led to cost cutting and reduced capital investments in exploration and production. The Canadian oil industry must not only contend with a lower oil price environment but in the near term will have to recover from the damage caused by the recent wildfires in Fort McMurray. As the industry adjusts to these challenges, the prospect for long term supply growth can be fostered through better market access.

CAPP's annual *Crude Oil Forecast, Markets and Transportation* report provides the association's latest long term outlook for Canadian crude oil supply in combination with an update on oil markets and transportation infrastructure developments.

Key observations from this year's report are:

- Total oil supply continues to grow but at a slower pace than seen in recent years.
- Western Canadian supply grows from 4.0 million b/d in 2015 to 5.5 million b/d in 2030.
- Future growth is driven primarily by the oil sands production in Western Canada.
- 2016 oil sands production is severely impacted by the Fort McMurray wildfires.
- Oil sands projects currently under construction are expected to continue to proceed as planned and contribute to additional production to 2020.
- Oil sands projects further out in the outlook face greater uncertainty, which is reflected by deferred startup timings.
- Both conventional and oil sands production have notable upside potential above and beyond that reflected in this outlook.
- Access to tidewater is needed to diversify markets beyond regional U.S. markets.
- Canada's future success in the global oil market relies on the existence of transportation infrastructure to provide market access for growing supplies. New extensions to the regulatory process have resulted in delays and uncertainty to in service dates for the proposed pipeline projects.

ON THE COVER

Top: Workers at Shell Scotford; photo courtesy of Shell. Bottom Right: Christina Lake *in situ* project; photo courtesy of Cenovus.

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#### Western Canadian Crude Oil Supply

7 Actual **Forecast** June 2015 Forecast 6 5 4 **Oil Sands Heavy \*** 3 2 **Upgraded Light** 1 **Conventional Heavy Conventional Light** 0 2012 2014 2016 2018 2020 2022 2024 2026 2028 2030 2006 2008 2010

million barrels per day

\* Oil Sands Heavy includes some volumes of upgraded heavy sour crude oil and bitumen blended with diluent or ugpraded crude oil. Note: Supply volumes include imported diluent.

#### Canadian Crude Oil Supply

million b/d	2015	2020	2025	2030
Eastern Canada	0.18	0.24	0.17	0.09
Western Canada				
Light	1.44	1.36	1.39	1.46
Heavy	2.54	3.21	3.48	3.99
Western Canada	3.98	4.57	4.87	5.45
TOTAL CANADA	4.16	4.81	5.04	5.54

\*Totals may not add up due to rounding.



# Western Canada crude oil supply growing by 1.5 million barrels per day

## **Crude Oil Production and Supply**

Total production continues to grow but at a slower pace than seen in recent years. Conventional crude oil production is expected to exhibit a downward trend in the near term but forecasted oil sands growth exceeds the declines in conventional and Eastern Canada production (except in 2016). Total Canadian crude oil production grows to 4.9 million b/d in 2030.

Although there is uncertainty around timing, a recovery from the current low oil price within the outlook period is anticipated. Future project economics are expected to improve so as to allow the oil sands projects further out in the outlook period to proceed.

Crude oil supplies delivered to refining markets are greater than the original production volumes because of the addition of imported diluent for blending with heavy crude oil and bitumen volumes to enable pipeline transportation. Total crude oil supplies from Western Canada are forecast to grow by 1.5 million b/d by 2030.

This supply outlook could be higher as both the conventional and oil sands have notable upside potential. The conventional outlook is a reflection of current views but could possibly be higher if investment returns quicker than anticipated. Growth in oil sands production could also be higher than forecast if *in situ* operators are able to respond with greater cost efficiencies. The production capacity for *in situ* oil sands projects that have been approved but are not currently operating or in construction total 1.8 million b/d. These projects could provide additional production that may result in output greater than that reflected in this forecast or further growth beyond 2030.

#### **Canadian Crude Oil Production**

million b/d	2015	2020	2025	2030
Eastern Canada	0.18	0.24	0.17	0.09
Western Canada				
Conventional				
(including C5+/	1.31	1.09	1.11	1.17
condensate)				
Oil Sands	2.37	3.06	3.28	3.67
Western Canada	3.68	4.15	4.39	4.83
TOTAL CANADA	3.85	4.39	<b>4.56</b>	4.93

\*Totals may not add up due to rounding.

#### **Conventional Oil**

Conventional production in Western Canada is currently 1.3 million b/d . It is expected to decline to 1.1 million b/d by 2018 and then remain relatively stable to the end of the outlook period. Of these volumes, condensate and pentanes production on average, comprise 260,000 b/d. In 2015, despite declines in other conventional sources, condensate and pentanes production increased 20 per cent and are expected to continue to moderate overall conventional production declines throughout the outlook.

#### Oil Sands

Oil sands production is forecast to increase by 1.3 million b/d from 2.4 million b/d in 2015 to reach 3.7 million b/d in 2030. Although the Fort McMurray wildfires are expected to have a severe impact in 2016, an average annual growth of 128,000 b/d is forecast for oil sands production from 2016 through to 2021, after which the rate of growth slows to less than half this rate, or 59,000 b/d. The majority of future growth is expected to come from *in situ* projects, which are smaller in scale than mining projects.

In 2015, oil sands mining projects produced over 1.0 million b/d while over 1.3 million b/d came from *in situ* projects. Looking ahead to 2030, mining production is forecast to reach 1.5 million b/d and *in situ* production is forecast to reach 2.1 million b/d.

#### Eastern Canada

In 2015, Eastern Canada contributed 5 per cent of total Canadian crude oil production. By 2030, production is forecast to gradually decline to around 93,000 b/d from 176,000 b/d in 2015. Eastern Canada's production is primarily sourced from projects located offshore of Newfoundland and Labrador. The next major project, Hebron, is expected to provide a boost to production when it is scheduled to start operations in late 2017.

## **Crude Oil Markets**

While the U.S. will remain Canada's most important export market, Canada's growing crude oil supplies need to be able to compete in the global market. Access to multiple customers that lie beyond regional U.S. markets is critical for such competition to occur.

The need for market diversity and attendant transportation capacity are repeating themes in this outlook. Almost all crude oil supplies from Western Canada are exported to refining markets in North America. Growing supplies by 2020 could be absorbed in Eastern Canada, U.S. West Coast and the U.S. Gulf Coast but additional infrastructure is still needed. This market demand outlook is based on CAPP's 2016 refinery survey for receipts of western Canadian crude oil.



2015 Canada and U.S. Crude Oil Demand by Market Region

Growing supplies of western Canadian production will need to compete to displace other foreign imports to these markets. In order to obtain maximum value for these resources, access to tidewater is essential to reach international markets and to reduce dependence on the U.S. market.

#### Eastern Canada

In 2015, refineries in Québec and Atlantic Canada imported 566,000 b/d of foreign-sourced crude oil to fulfull their feedstock needs. These refineries typically process light crude oil. Since late 2015, infrastructure has been in place, with the startup of the reversed Enbridge Line 9 pipeline, to enable the delivery of western Canadan crude oil all the way to Montréal. Refineries in Ontario already source their crude oil feedstock needs mainly from Western Canada.

#### **United States**

Refineries in the U.S. Gulf Coast processed 8.5 million b/d of crude oil in 2015, including 2.2 million b/d of foreign heavy oil imports. Canadian producers are displacing more of these imported volumes and could supply at least 608,000 b/d to this market by 2020.

The U.S. Midwest is expected to remain Canada's largest export market. In 2015, almost 1.9 million b/d of western Canadian crude oil was delivered to this market. According to CAPP's 2016 Refiner Survey, almost 2.2 million b/d could be absorbed by this region in 2020. Receipts into PADD II could be delivered to refineries or into storage and then distributed later to other locations, including refineries in PADD III.

Refineries in Washington and California need to replace their declining traditional sources of supply from Alaska. These refineries are expected to increase their demand for western Canadian crude oil from 225,000 b/d currently to 369,000 b/d by 2020.



#### Canadian & U.S. Crude Oil Pipelines and Proposals

#### World

Growth in global crude oil demand is concentrated in Asian markets. In order to compete in the global market place, and serve those markets with growing crude oil requirements, Canada must build connections to world markets that lie beyond the United States. Currently crude oil from Western Canada has limited access to tidewater and hence to other global crude oil markets. Deliveries of limited shipments of Canadian crude oil to countries in both Europe and Asia have been reported. These volumes will increase as transportation options are developed.

According to the IEA's *World Energy Outlook* 2015, combined demand from China and India will increase by 10.8 million b/d by 2040. This is equal to almost 84 per cent of total world oil demand increase in 2040 from 2014.

### **Crude Oil Transportation**

Extensions to the regulatory process are creating uncertainty for the in service dates of potential pipeline projects to both the East Coast and West Coast. Pipeline projects to coastal waters are needed to provide market diversification for western Canadian producers.

Canadian crude oil supplies are forecast to grow by 1.5 million b/d in 2030. Pipelines are the preferred mode of transportation to move this product but unexpected extensions in the regulatory processes for proposed projects have created new uncertainty around project timing. However, it remains clear that better tidewater access will be needed to reach growing global market outlets and capture full value for western Canadian supplies.



WCSB Pipeline Takeaway Capacity vs. Supply Forecast

Capacity shown can be reduced by temporary operating and physical constraints. Enbridge capacity reduced by volumes of US Bakken transported in 2015

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# 1. Introduction

CAPP's Crude Oil Forecast, Markets and Transportation report contains the association's latest 15-year outlook for total Canadian crude oil production and western Canadian crude oil supply. Also, Canadian and regional U.S. refining market demand for this supply is examined along with an update on the transportation projects that could deliver this supply to both new and traditional markets.

The 2016 edition of this publication examines the impact of current oil prices on production and reports the latest regulatory delays in the pipeline approval process as well as other pertinent developments.

The 2014 average spot price for WTI crude oil was US\$93 per barrel. Since September of that year, the price has declined dramatically and as of May 2016, is averaging around US\$50 per barrel, down by almost 50 per cent. CAPP estimates 2016 producer capital spending in the oil sands to be C\$17 billion, which is down from the estimated expenditure of C\$23 billion in 2015 and only half of the C\$34 billion expenditures in 2014.

This period of low oil prices is extending longer than many had anticipated however CAPP still forecasts additional Canadian crude oil production growth of 1.1 million b/d by 2030. This translates into over 1.5 million b/d of additional crude oil supplies to be transported to markets There are a number of pipeline projects proposed that could serve new and traditional markets but all are facing a number of challenges and regulatory delays.

Canada needs to diversify its crude oil exports to destinations beyond the U.S. to earn full value for these resources and reap the resulting benefits of economic growth and job creation. Industry continues to pursue market access in a variety of directions with a range of proposed transportation alternatives being considered to serve markets in Canada, the U.S., Europe and growing markets in Asia.

## 1.1 Production & Supply Forecast Methodology

The crude oil forecast is comprised of three main production areas: Eastern Canada with production primarily from offshore projects; conventional production in Western Canada; and production from oil sands projects.

Both the Western Canada conventional and Eastern Canada production forecasts are developed through CAPP's internal analysis of historical trends, expected drilling activity, company announcements, as well as discussions with industry stakeholders and government agencies.

The oil sands component of the forecast is based on CAPP's 2016 survey of all oil sands producers for the following data:

- a) expected production for each project;
- b) upgraded light crude oil production; and
- volumes of upgraded crude oil and condensate used as diluent required to move the volumes to market.

Crude oil supplies that are delivered to the refining market are greater than production volumes because they include imported diluent volumes. CAPP does not forecast crude oil prices. Producers responded to the survey using their own internal view of the oil price for the outlook. The survey results are then adjusted or "risked" based on each project's stage of development. Any company's past performance for previous phases of projects is also taken into consideration. The reasonableness of the overall forecast is assessed in a context against historical trends during final review. No direct constraints are put on the forecast due to availability of condensate for blending purposes or lack of transportation infrastructure although company assessments on this matter could have an impact on individual company survey responses.

## 1.2 Market Outlook Methodology

CAPP surveyed refiners in Canada and the U.S. for their expected demand for western Canadian crude oil from 2015 to 2020. No adjustments were made to the submitted data beyond checking for potential errors. However, EIA company imports data and market judgement were used to supplement the survey data for each region in the U.S., while Statistics Canada and NEB data was used to supplement survey responses from Canadian refineries.

The CAPP Refiner survey focuses on the refining demand for western Canadian crude oil. The types of western Canadian crude oil are categorized as follows:

- Conventional Light Sweet (greater than 27° API and less than or equal to 0.5% sulphur) including condensates and pentanes plus
- Heavy (equal to or less than 27° API) including conventional heavy, synthetic sour and crude oil blends such as DilBit, SynBit and DilSynBit
- Conventional Medium Sour (greater than 27° API and greater than 0.5% sulphur)
- 4. Light Sweet Synthetic (Upgraded Light)

The actual 2015 U.S. imports by source, shown in the pie charts in Chapter 3 of the report is based on EIA data. The following crude types and definitions are applied to the data:

- Sweet: crude oil with a sulphur content of less than or equal to 0.5%
- Sour: crude oil with a sulphur content of greater than 0.5%
- Light: crude oil with an API of at least 30°
- Medium: crude oil with an API of greater than 27° but less than 30°
- Heavy: crude oil with an API of 27° or less

No differentiation is made between sweet and sour crude oil that falls into the heavy category because heavy crude oil is generally assumed to be sour.

## 1.3 Transportation Outlook Methodology

In this publication, CAPP reports the timing of the proposed pipeline and rail projects based on information released by the project proponents. However, the actual review time within the regulatory process can be lengthier than originally anticipated and represents a significant factor that impacts the final in-service date of these projects.

CAPP's production forecast is not directly constrained by a lack of any transportation infrastructure. However, the report does compare the supply outlook against the current pipeline projects to show the gap that needs to be filled from the selection of transportation infrastructure projects discussed in Chapter 4 of the report.

## 2. Crude Oil Production & Supply Forecast

Crude oil is one of the most important commodities in the world. Not only is it the dominant source of transportation energy now and for the foreseeable future, it has many other uses. It is a crucial raw material for the chemical industry, and in the production of plastics, which makes possible almost every item in our daily lives. CAPP is forecasting Western Canada crude oil production to grow by over 1.1 million b/d by 2030. After blending and including imported diluent volumes, this means over 1.5 million b/d of crude oil supplies need to be transported to refining markets .

In its December 2015 issue, the *Oil & Gas Journal* reported that Canada holds 171 billion barrels of oil reserves. These are the world's third largest reserves after Venezuela and Saudi Arabia. With such large resources Canada can be a vital source of energy to world markets.

The development of these resources is an important driver for the Canadian economy. The ripple effect from the current downturn faced by the industry is continuing to be felt through Canada. At its peak in 2014, the oil and gas industry provided employment for 550,000 Canadians. As of the end of April 2016, CAPP estimates that 110,000 of these jobs have been lost. Oil and gas companies, government and all stakeholders have important roles to play considering the major challenges currently faced by the industry.

## 2.1 Canadian Production

In 2015, Canadian crude oil production increased by three per cent over 2014 levels to reach 3.8 million b/d. Most of the production was sourced from Western Canada while 176,000 b/d originated from Eastern Canada. With the exception of 2016, production is expected to continue to grow throughout the forecast period although the projected pace of growth exhibited in recent years, slows in the longer-term. In 2015, Canada was displaced by Iraq and fell from the 5<sup>th</sup> to the 6<sup>th</sup> largest producer of crude oil despite continued growth in Canadian production.

#### Table 2.1 Canadian Crude Oil Production

million b/d	2015	2020	2025	2030
Eastern Canada	0.18	0.24	0.17	0.09
Western Canada	3.68	4.15	4.39	4.83
Total Canada*	3.85	4.39	4.56	4.93

\*Totals may not add up due to rounding.

The total Canadian production forecast is shown in Figure 2.1. Western Canada, but more specifically the oil sands, is driving the overall growth in production from 3.9 million b/d in 2015 by over 1 million b/d to 4.9 million b/d by 2030. In contrast, production from Eastern Canada is expected to decline steadily while conventional production declines before remaining flat for most of the outlook.

Western Canada oil production grows through the outlook period, except in 2016, which was impacted by the wildfires. The overall pace of growth has slightly slowed compared to last year's forecast. There could also be significant variability in the long term depending on the length of time before oil prices stabilize at a level that improves project economics allowing approved but yet to be constructed oil sands projects to proceed.

#### Figure 2.1 Canadian Oil Sands & Conventional Production

million barrels per day



### 2.2 Eastern Canada Production

Overall, there is little change in the outlook for Eastern Canada production compared to CAPP's 2015 forecast. Eastern Canadian crude oil represents five per cent of Canada's total production. This production is primarily sourced from projects located offshore of Newfoundland and Labrador although small volumes are also produced in Ontario and New Brunswick. The three producing offshore oil fields are: Hibernia, Terra Nova and White Rose (including North Amethyst).

In 2015, production decreased by 20 per cent from 220,000 b/d to 176,000 b/d with reported declines at all three producing fields. The decrease was a result of scheduled maintenance work. In 2016, a 28-day maintenance shutdown is scheduled at Terra Nova for the second quarter. At the White Rose project a 20-day turnaround is planned on the Floating Production Storage and Offloading Vessel (FPSO) in the third quarter. However, a recovery in production at Hibernia is expected to more than offset the decline from the other two projects, resulting in an overall increase in 2016 versus 2015.

Increased reserves from associated satellite pools have extended the life of these projects. Drilling and production from the associated satellite pools has slowed the overall rate of decline from these fields. When Hibernia was originally proposed for development, its proponents estimated that it contained 520 million barrels in two separate reservoirs named, Hibernia and Avalon. Since then estimated recoverable reserves have increased more than three-fold to over 1.6 billion barrels. The life of the main White Rose field has also been extended through development of satellite fields and extensions, most recently with production coming on from the South White Rose Extension in 2015.

A fourth major project, Hebron, received official sanction in December 2012 with first oil expected in late 2017 and has been included in CAPP's longterm forecast. The project will utilize a Gravity Based Structure (GBS) that is similar but on a smaller scale to the one used at Hibernia. The GBS is designed for a production rate of 150,000 b/d.

In December 2014, the proponents of the West White Rose Extension project announced a deferral of their final investment decision by one year and have yet to make a decision. The potential production from this project remains outside of CAPP's forecast period. As well, potential production from recent discoveries has yet to be incorporated due to the early stage of evaluation.

Table 2.2 lists Atlantic Canada's producing, proposed, and recently discovered fields.

#### Table 2.2 Atlantic Canada Projects and Recent Discoveries

Field	First Oil	Cumulative Production to December 31, 2015 (million barrels)	Estimated Recoverable Reserves (million barrels)
Hibernia	Nov 1997	952	1,644
Terra Nova	Jan 2002	379	506
White Rose (including North Amethyst)	Nov 2005	254	479
Hebron	Late 2017	n/a	707
Recent Discoveries	Discover	y Announced	Estimated Recoverable Reserves (million barrels)
Mizzen		2009	102
Harpoon	Ju	ın 2013	Under evaluation
Bay du Nord	Αι	ıg 2013	300 to 600

## 2.3 Western Canada Production

In 2015, western Canadian crude oil production consisted of 36 per cent from conventional and 64 per cent from oil sands sources. Future growth is driven by oil sands projects (Figure 2.2). Western Canada production is forecast to increase by over 1.1 million b/d from 2015 production of 3.7 million b/d to 4.8 million b/d in 2030. The annual growth in Western Canada production is forecast to average 77,000 b/d year over year.

Compared to CAPP's 2015 report, western Canadian production is anticipated to be lower than previously forecasted by 400,000 b/d in

#### Figure 2.2 Western Canada Crude Oil Production

2030. For the first half of the forecast period, the difference in the forecasts can be attributed to lower production forecast from conventional wells. Note however, that in 2016 the Fort McMurray wildfires also contributed to lower oil sands production for the year. For the latter period, lower production from both oil sands and conventional is contributing to the difference. In terms of the oil sands, the timing for the startup of oil sands projects in the future have been deferred in consideration of the weaker oil price environment and uncertainty around the timing of recovery. Conventional production is fairly sensitive to oil prices so production could return more quickly if prices rebound strongly.



million barrels per day

#### Table 2.3Western Canada Crude Oil Production

million b/d	2015	2020	2025	2030
Conventional				
(including pentanes/	1.31	1.09	1.11	1.17
condensate)				
Oil sands	2.37	3.06	3.28	3.67
(bitumen & upgraded)				
Total Western Canada	3.68	4.15	4.39	4.83

\*Totals may not add up due to rounding.

## 2.3.1 Conventional

While most of the conventional production is sourced from Alberta and Saskatchewan, the provinces of British Columbia, Manitoba and the Northwest Territories also have production. Figure 2.3 shows the Western Canada conventional production forecast by province.

In 2015, conventional production declined slightly to 1.3 million b/d. This production was comprised of 29 per cent heavy crude oil, 54 per cent light & medium crude oil, and 17 per cent pentanes and condensate. Notably, while both conventional and heavy components reported declines from 2014, pentanes and condensate production increased 20 per cent or 37,000 b/d thereby offsetting some of the decline from other conventional sources. Total conventional production is currently 1.3 million b/d and is expected to decline in the short-term and will average around 1.1 million b/d through the outlook period. Compared to CAPP's 2015 conventional production forecast, this outlook is 114,000 b/d lower in 2030. This forecast may be conservative and is a reflection of current views but could possibly be higher if investment returns quicker than anticipated.

#### Alberta

The Alberta Energy Regulator (AER), reports at year-end 2015, that Alberta holds remaining established conventional crude oil reserves of 281 million barrels. Alberta produces almost half (49 per cent) of the total conventional light and heavy crude oil and 84 per cent of the condensate. In 2015 versus 2014, Alberta's conventional crude oil production (excluding condensates) decreased by 59,000 b/d (10 per cent) to 530,000 b/d. Condensate and pentanes production increased by 31,000 b/d (20 per cent) to 184,000 b/d. Overall Alberta conventional production decreased by 28,000 b/d (4 per cent) to 715,000 b/d.

Production from new wells drilled are not expected to offset the natural decline in existing production for crude oil (excluding condensates). This will result in a steady decline from 2016 though 2019 before stabilizing for the remainder of the outlook.



#### Figure 2.3 Western Canada Conventional Production

#### Saskatchewan

In 2015, Saskatchewan accounted for 37 per cent of total conventional production. The province produced 486,000 b/d of crude oil comprised of almost equal parts light and heavy conventional and negligible volumes of condensate. This was 27,000 b/d less than production in 2014 (six per cent decline). On average, Saskatchewan production is expected to contribute 428,000 b/d during the outlook.

#### Manitoba, British Columbia, NWT

Manitoba accounts for three per cent of total conventional production from Western Canada. Current production of 46,000 b/d is expected to decline gradually to 29,000 b/d by 2030. British Columbia produced 55,000 b/d of conventional production in 2015, of which 34,000 b/d was condensate. British Columbia is the second largest provincial source of condensate after Alberta.

Little production currently comes from the Northwest Territories (NWT). The National Energy Board (NEB) assessed conventional petroleum resources in the NWT at 1.2 billion barrels of crude oil. In May 2015, the NEB also released an assessment of the unconventional oil-in-place resources for the Bluefish Shale and Canol Shale and stated that if only one per cent of the oilin-place assessed for the Canol Shale could be recovered, it would represent a marketable resource of 1.45 billion barrels. However, the current oil price environment has essentially halted further exploratory development in this region.

## 2.3.2 Oil Sands

In this forecast, oil sands production is forecast to increase by 1.3 million b/d to 3.7 million b/d in 2030 (Table 2.4). Compared to last year's forecast, the outlook is essentially unchanged up until 2021 but lower by 285,000 b/d by 2030.

#### Table 2.4Oil Sands Production

million b/d	2015	2020	2025	2030
Mining	1.02	1.38	1.41	1.53
In situ	1.34	1.69	1.87	2.14
Total*	2.36	3.07	3.28	3.67

\*Total may not add up due to rounding.

Three designated oil sands areas in Northern Alberta have been established in order to separate the extra heavy crude oil produced from these regions, termed bitumen, from conventional crude oil production. These regions, referred to as the Athabasca, Cold Lake and Peace River deposits are depicted in Figure 2.4. The AER estimated at year-end 2015, that these areas contain remaining established reserves of 165 billion barrels, of which 32 billion barrels, or 19 per cent is considered recoverable by mining and 133 billion barrels, or 81 per cent can be recovered using *in situ* techniques.

#### Figure 2.4 Oil Sands Regions



Surface or open pit mining can be used to recover bitumen that occurs near the surface. At greater depths, *in situ* (Latin for "in place") techniques are used. In this report, the term is used in reference to both primary development, which uses methods similar to conventional crude oil production, and enhanced recovery techniques – the main methods being cyclic steam stimulation (CSS) and steamassisted gravity drainage (SAGD). As such, the resources are accessed via a combination of steam injection wells, to reduce the viscosity of the bitumen, and recovery or production wells.

#### Figure 2.5 Western Canada Oil Sands Production

million barrels per day



In 2015, oil sands production almost totaled 2.4 million b/d. Of these volumes, 1.3 million b/d were recovered by *in situ* techniques and 1.0 million b/d from mining.

CAPP's latest oil sands forecast is shown in Figure 2.5. From 2016 to 2021, oil sands production is forecast to grow by 128,000 b/d on average each year, after which the rate of growth slows down to 59,000 b/d from 2022 to 2030 of the outlook. Mining production is forecast to rise to 1.5 million b/d by 2030. Most of the future growth is expected from *in situ* production, which is forecast to reach 2.1 million b/d by the end of the outlook period.

Production volumes from oil sands include upgraded crude oil volumes from integrated projects. The yield losses associated with upgraded bitumen volumes from non-integrated producers have been accounted for in the supply volumes that are discussed in the following section of this report. Currently, Nexen's Long Lake project is the only *in situ* project coupled with upgrading facilities. All mined bitumen projects, with the exception of Imperial's Kearl mining project, have an affiliated upgrader that processes the mined bitumen into upgraded light crude oil. The Kearl project delivers diluted bitumen to the market. Some in situ volumes from Suncor's Firebag and MacKay River projects are upgraded at the Suncor upgrader.

Refer to Appendix B.1 for detailed production data.

Existing integrated mining and upgrading projects are listed below:

- Athabasca Oil Sands Project (AOSP) and Shell Jackpine Mine;
- Canadian Natural Horizon Project;
- Suncor Steepbank and Millennium Mine; and
- Syncrude Mildred Lake Mine and Aurora Mine.

Growth in oil sands production could be higher than forecast if long-term crude oil prices return to previous high levels or if in situ operators are able to respond to a lower price environment with greater cost efficiencies. The oil sands industry has a history of such innovation. It is also important to note that growth is expected to extend beyond 2030. To provide some perspective for future potential growth, note that the production capacity for in situ oil sands projects that have been approved total 1.8 million b/d. This would be growth in addition to production from projects that are operating or are currently in the construction phase. Projects in the proposed and application phases could also contribute growth beyond this level. Refer to Appendix A for a list of the these projects.

## 2.4 Western Canada Supply

Crude oil supplies are ultimately delivered to the end-use market and therefore are most relevant to market observers. These volumes are greater than the production reported in the previous section due to the higher effect of imported diluent volumes added to the mix. Both conventional heavy crude oil production and oil sands bitumen are either upgraded or blended in order to be transported by pipeline or to meet optimal refinery specification.

CAPP forecasts a growth of 1.5 million b/d of crude oil supplies by 2030 (Figure 2.6). Compared to the 2015 forecast, the Upgraded Light crude oil supply outlook is unchanged. Conventional supplies decline by 154,000 b/d from 1.0 million b/d to 856,000 b/d in 2030. Oil Sands Heavy supply is forecast to increase from 2.2 million b/d in 2015 by almost 1.6 million b/d to 3.8 million b/d in 2030.

In this report, CAPP categorizes the various crude oil types that comprise western Canadian crude oil supply into the following main categories: Conventional Light; Conventional Heavy; Upgraded Light; and Oil Sands Heavy. Oil sands heavy includes upgraded heavy sour crude oil, bitumen diluted with upgraded light crude oil (also known as "SynBit") and bitumen diluted with condensate (also known as "DilBit"). Blending for DilBit requires approximately a 70:30 bitumen to condensate ratio while the blending for SynBit is approximately 50:50. Bitumen volumes transported by rail are currently relatively small. These railed volumes may be transported as raw bitumen or could use less diluent for blending (also known as "RailBit") versus moving by pipeline.

The upgraded light crude oil supply includes the light crude oil volumes produced from:

- upgraders that process conventional heavy oil;
- integrated mining and upgrading projects;
- integrated *in situ* projects; and
- off site upgraders.

In 2015, about 1.2 million b/d or 48 per cent of the total bitumen produced in Canada was upgraded, including volumes of bitumen that were processed at the Suncor refinery in Edmonton. This refinery intake was included because it was designed to process oil sands feedstock exclusively. Upgraded volumes are forecast to rise to 1.5 million b/d by 2030.

#### Figure 2.6Western Canada Oil Sands & Conventional Supply





\* Oil Sands Heavy includes some volumes of upgraded heavy sour crude oil and bitumen blended with diluent or ugpraded crude oil. Note: Supply volumes include imported diluent. Canada's upgrading capacity is not expected to rise commensurately with bitumen production growth due to a number of economic challenges. It is difficult for a new upgrader to compete with the option of transporting heavy crude oil to the refineries already located throughout North America that have spare coking capacity, and hence the ability to refine the heavy crude oil slates produced in Western Canada.

If it is not upgraded, bitumen is so viscous at its production stage that it needs to be diluted with a lighter hydrocarbon or diluent to create a type of crude oil that meets pipeline specifications for density and viscosity. Unblended bitumen generally cannot be moved by pipeline. Less diluent could be used when bitumen is moved by rail if it is transported in heated rail cars as the heat lowers the viscosity of the bitumen. The main source of diluent is pentanes (also referred to as condensate) that are recovered from processing natural gas in Western Canada. The gap between the available supply of this blending source and the blending demand is expected to widen with growing bitumen production.

In 2015, over 400,000 b/d in total of imported condensates, upgraded crude oil, as well as quantities of butane were needed to supplement the condensate supply from indigenous natural gas wells in Western Canada. CAPP's forecast is not constrained by the availability of condensate imports as new sources of condensate are assumed to be available to meet market requirements. Refer to Section 4.6 for details on existing and proposed diluent pipeline projects.

The potential for bitumen to travel by rail with reduced diluent requirement is not factored into the analysis of condensate demand. It is difficult to assess what volumes could potentially move by rail as long term commitments are not required given the lower capital investment for loading terminals compared to pipelines.

#### Table 2.5 Western Canada Crude Oil Supply

million b/d	2015	2020	2025	2030
Light	1.44	1.36	1.39	1.46
Heavy	2.54	3.21	3.48	3.99
Total Supply*	3.98	4.57	4.87	5.45

\*Total may not add up due to rounding.

Table 2.5 shows the projections for total western Canadian crude oil supply. Refer to Appendix B.2 for expanded data. Light crude oil supply is projected around 1.4 million b/d through the outlook. Heavy crude oil supply is projected to increase by 1.5 million b/d from 2.5 million b/d in 2015 and reach 4.0 million b/d by 2030.

## 2.5 Crude Oil Production & Supply Summary

Over one million b/d of incremental Canadian crude oil production is being forecast over the outlook period increasing from 3.9 million b/d in 2015 to 4.9 million b/d in 2030. The outlook for Eastern Canada is relatively unchanged and is expected to contribute 93,000 b/d in 2030. Western Canada is the primary source of supplies and future production growth.

- Western Canada conventional production is expected to decline for the next few years but stabilizes around and average of 1.1 million b/d from 2019 to 2030.
- Western Canada oil sands production grows by 1.3 million b/d to 3.7 million b/d in 2030, with the majority of the future growth coming from in situ projects.
- Western Canada crude oil supply is forecast to grow by almost 1.5 million b/d by 2030. Supply that is delivered to refining markets is greater than production volumes due to the addition of imported diluent.
- The current Western Canada crude oil supply outlook could be understated and closer to the level of the 2015 forecast given two main uncertainties.

1) conventional production reflects current views but could be higher if investment returns more quickly than anticipated.

2) oil sands production could be higher if *in situ* producers are able to respond to the price environment with greater cost efficiences.

If higher production levels were realized, the cumulative supply growth would be even higher from the additional imported diluent required.

# 3. Crude Oil Markets

Crude oil is a vital commodity that is converted into a number of end products for consumption, including gasoline, diesel and jet fuel at refineries. Almost all crude oil production from Western Canada goes to refining markets in North America. Figure 3.1 shows the sources of crude oil being supplied to the main markets in Canada and the U.S. The red and orange areas illustrate the share of a given market served by Canadian crude oil.



Figure 3.1 Canada and U.S.: 2015 Total Crude Oil Receipts by Source

Sources: CAPP, CA Energy Commission, EIA, Statistics Canada



#### Figure 3.2 Western Canadian Crude Oil Demand: Actual 2015 and 2020

Sources: CAPP, EIA, NEB, Statistics Canada

Note: 2015 demand does not equal available supply due to factors including inventory adjustment, timing differences, and the potential for U.S. production transiting in Canada before being refined in the U.S. being reported as Canadian exports

Based on the CAPP 2016 refinery survey, domestic refineries and markets in PADD II, PADD III and PADD V could potentially absorb the forecasted growth in western Canadian supply by 2020 (Figure 3.2). However, additional transportation capacity exiting Western Canada will be needed in order to satisfy these or new offshore markets.

Most notable potential markets are the domestic market in Eastern Canada and the coastal regions of the U.S. There is also significant heavy oil processing capacity located in the U.S. Gulf Coast that would be well-suited for processing the growing supplies of western Canadian heavy oil. Canadian producers will need access to tidewater in order to serve global markets beyond North America such as Asia and Europe.

In 2015, Canadian refineries comprised 27 per cent (1.1 million b/d) of total demand for western Canadian crude oil while the remaining 73 per cent (2.9 million b/d) was essentially all exported to the U.S.

## 3.1 Canada

There is 1.9 million b/d of processing capacity in refineries located in Canada. In 2015, these refineries processed 1.7 million b/d, of which twothirds was sourced from domestic production. As Canadian refineries located east of Ontario gain additional access to western Canadian crude oil supplies, this share is expected to increase.

## 3.1.1 Western Canada

The eight refineries located in Western Canada have a combined crude oil processing capacity of 681,000 b/d. In 2015, these refineries processed 573,000 b/d of crude oil that was sourced exclusively from Western Canada. Western Canadian crude oil receipts are expected to increase by 98,000 b/d to 671,000 b/d in 2020 (Figure 3.3).



#### Figure 3.3 Western Canada: Crude Oil Receipts From Western Canada

Source: 2016 CAPP Refinery Survey

These additional crude oil receipts are related to a debottleneck project at the Moose Jaw plant, expansion plans at the Co-op refinery and upgrader complex, which are both located in Saskatchewan, and the startup of the North West Redwater Partnership's refinery located in Sturgeon County (north of Edmonton, Alberta).

The \$8.5 billion Sturgeon refinery is designed to process 50,000 b/d of raw bitumen feedstock under 30 year fee-for-service processing agreements. The Alberta Petroleum Marketing Commission, under the jurisdiction of the provincial government, will supply 75 per cent of the feedstock and Canadian Natural Resources will supply the remainder. The project broke ground on September 20, 2013 and is reported to be on track to begin operations as scheduled in 2017.

There are three export refinery concepts that are based in British Columbia (BC) being proposed. Two of the proposals seek feedstock to be delivered to the refinery by rail where bitumen would be converted into refined products for export to Asia. Kitimat Clean Ltd. proposes to build a heavy oil refinery near Kitimat that would process 400,000 b/d of bitumen into gasoline, jet fuel and diesel, primarily for export at a cost of \$22 billion. Pacific Future Energy Corp. is proposing to build a bitumen refinery in northwest BC working closely with local First Nations. This refinery is estimated to cost between US\$9 billion and US\$11 billion and would have a 200,000 b/d processing capacity. A third proposal, by Eagle Spirit Energy, envisages upgrading bitumen either in northern Alberta or northeastern BC before sending the light upgraded crude oil through a pipeline for export from Grassy Point, located north of Prince Rupert.

## 3.1.2 Eastern Canada

There are eight refineries in Eastern Canada, located in Ontario, Québec and Atlantic Canada. These refineries primarily process light crude oil and provide a combined crude oil refining capacity of 1.2 million b/d.

In 2015, 490,000 b/d or 45 per cent of total demand was fulfilled by western Canadian crude oil supplies. Domestic crude supplies almost all of the feedstock requirements for refineries in Ontario, however, imports make up over three quarters of the feedstock requirements for refineries located in Québec and Atlantic Canada. By 2020, overall demand for western Canadian crude oil is expected to increase by 143,000 b/d (Figure 3.4).

#### Figure 3.4 Eastern Canada: Crude Oil Receipts from Western Canada



#### **Ontario**

The four refineries in Ontario have a combined crude oil refining capacity of 392,000 b/d. In 2015, these refineries processed 354,000 b/d of crude oil, which was essentially made up of all domestic Canadian crude oil supplies. The Bowman Centre is developing a concept for a new \$10 billion refinery to be built in the Sarnia-Lambton area. The project is called the Sarnia-Lambton Advanced Bitumen Energy Refinery (SABER).

#### **Québec & Atlantic Provinces**

There are a total of four refineries in Québec and the Atlantic provinces that have a combined 782,000 b/d of crude oil processing capacity. Domestic crude oil sources supply about 22 per cent of total feedstock demand. Of the 566,000 b/d of foreign imports, 75 per cent or 422,000 b/d was sourced from the U.S. The large U.S. share of this market has been driven by the growing availability of tight oil production from North Dakota, Texas, New Mexico and Colorado. After the U.S., the top 5 sources for Canadian imports are Saudi Arabia, Norway, Nigeria, Algeria and Angola.

Enbridge's Line 9 reversal project that has been operating since late 2015, can deliver western Canadian crude oil all the way to Montréal (see section 4.5.1). With additional transportation infrastructure, these refineries will have increased access to receive western Canadian crude oil, and producers will have a greater opportunity to compete against foreign crude oil suppliers.

## 3.2 United States

Since 2004, Canada has been the top foreign supplier of crude oil to the U.S. Canada is likely to remain in this pole position for the foreseeable future given that in 2015, imports from Canada exceeded imports from Saudi Arabia, the second largest supplier, by over 2 million b/d. Most of the growth in western Canadian crude oil supplies in 2015 was absorbed by the U.S. market as almost all Canadian exports of crude oil totaling 3.0 million b/d, were exported to the U.S.

U.S. imports from Canada have been increasing year over year for the past five years despite a decrease in total imports over the same period. Imports of Canadian crude oil have been displacing other foreign imports of heavy crude oil and the projected growth in western Canadian crude oil supplies could further displace other heavy crude oil imports in the U.S. Gulf Coast and in other U.S. regions. U.S. production has risen rapidly in recent years, resulting in the displacement of light crude oil imports with U.S. domestic production. The EIA projects further U.S. production growth beyond 2016 although the pace and duration is uncertain. Of note, in December 2015 the U.S. ban on crude oil exports was lifted, which could have an impact on future flows of crude oil but these impacts will be moderated in the near-term if there remains a small differential between U.S. and international crude oil prices.

The U.S. Department of Energy divides the 50 states into five market regions termed Petroleum Administration of Defense Districts or PADDs. These PADDs were originally created during World War II to help allocate fuels derived from petroleum products. Today, this delineation continues to be used when reporting data to describe the U.S. crude oil market regions.

## 3.2.1 PADD I (East Coast)

The U.S. East Coast market consists of nine refineries with a combined capacity of 1.3 million b/d. In 2015, these refineries processed 1.1 million b/d of primarily light crude oil, and 661,000 b/d or 59 per cent was sourced from foreign sources (Figure 3.5). PADD I refineries imported 257,000 b/d of crude oil from Canada, of which 125,000 b/d was sourced from Western Canada. Most of these refineries have the ability to receive crude oil supplies by rail (Table 3.1).

## Figure 3.5 2015 PADD I: Foreign Sourced Supply by Type and Domestic Crude Oil



\* Includes small volumes of Medium Sweet Source: EIA

#### Table 3.1 Rail Offloading Terminals in Eastern Canada and PADD I

		Capacity	Scheduled	
Operator	Location	(thousand b/d)	In-Service	Description
Eastern Canada				
Imperial (refinery)	Nanticoke, ON	20	Operating since 2013	
Irving (refinery)	Saint John, NB	145	Expansion op since 2014	
Valero (refinery)	Québec City, QC	60	Operating since Aug 2013	
Eastern Canada Tota	I Existing Capacity	225,000 b/d		
PADD I				
PBF Energy (refinery)	Delaware City, DE	170 (130 light/40 heavy)	Operating since Feb 2013; expanded Aug 2014	Both light and heavy crude oil unloading capacity. Light oil double loop track for two 100-car unit trains.
Axeon Specialty Partners (refinery)	Savannah, GA	9* *16 tank cars per day of heavy crude; expandable up to 32)	Operating since Jan 2014	Crude oil that is shipped by rail to Savannah could move to Paulsboro via backhauls on waterborne vessels.
Westville	Eagle Point (near Paulsboro), NJ	44* *66 cars / day	Operating since Jan 2012	Can unload 66 cars/day using 22 offload spots or a unit train every 2 days.
Axeon Specialty	Paulsboro, NJ	small volumes	Operating	Unit train capability is being contemplated.
Partners (refinery)		Unit train capable	2014	
Buckeye Partners, L.P.	Perth Amboy, NJ	60-80 104-car unit train/day	Operating since Q3 2014	Light crude; possibly handle heavy in the future.
Buckeye Partners, L.P.	Albany, NY	135	Operating since Nov 2012	Multi-year agreement with Irving refinery.
Global Partners	Albany, NY	160 (estimated to be operating at 100)	Operating since 2011	Light crude oil receipts; seeking permit for facility to heat crude oil. Phillips 66 has a 5 year contract for 50,000 b/d.
Eddystone Rail Company (Enbridge JV)	Philadelphia, PA	80* *one 118-car unit train; expandable to 2 unit trains (160,000+ b/d)	Operating since April 2014	A crude-by-rail-to-barge facility. First train received on May 3, 2014. Exclusive long- term contract with Bridger Logistics for existing capacity. Transport Bakken crude.
Philadelphia Energy Solutions (refinery)	Philadelphia, PA	280 four 104-car unit trains / day	Operating since Oct 2013; expanded Oct 2014	A crude-by-rail-to-barge facility. Terminal started operation on October 23, 2013 and was expanded from 2 unit trains to 4 on October 28, 2014.
Plains All American Pipeline (PAAP)	Yorktown, VA	60	Operating since Dec 2013	First 98-car unit train received on Dec. 30, 2013. Up to 800 trains per year can be unloaded with up to 104 rail cars per train.
PADD I Total Existing	g Capacity	998,000 b/d		

## 3.2.2 PADD II (Midwest)

The Midwest accounts for 22 per cent of the total U.S. crude oil refining capacity and this market plays a significant role in determining crude oil prices because the largest commercial tank farm in the U.S., with an estimated 73 million barrels of working storage capacity is located in Cushing, Oklahoma. Cushing is the main trading hub for U.S. oil and is also the delivery point for New York Mercantile Exchange (NYMEX) traded futures contracts.

Almost four million b/d of refining capacity is located in PADD II. In 2015, these refineries imported 2.1 million b/d of crude oil sourced from Western Canada, the majority of which was heavy crude oil (Figure 3.6).

#### Figure 3.6 2015 PADD II: Foreign Sourced Supply by Type and Domestic Crude Oil



The Midwest region is currently Canada's largest market due to its close proximity, large size and established pipeline network. This traditional market is becoming saturated, however, deliveries from Western Canada are expected to increase by 294,000 b/d from 2015 levels by 2020 (Figure 3.7). The EIA reports receipts into PADD II in excess of those attributable to refineries in the region. These volumes could be delivered into storage and then distributed later to untracked locations, including refineries in PADD III.

#### Figure 3.7 PADD II: Crude Oil Receipts from Western Canada



PADD II can be further divided into the Northern, Eastern, and Southern PADD II states. The primary market hubs within PADD II are located at Clearbrook, Minnesota for the Northern PADD II states; Wood River-Patoka, Illinois area for the Eastern PADD II states; and Cushing, Oklahoma for the Southern PADD II states.

#### Eastern PADD II

There are 14 refineries with almost 2.6 million b/d of refining capacity located in Eastern PADD II. Husky has plans to modify its Lima, Ohio refinery to allow the processing of up to 40,000 b/d of heavy crude oil from Western Canada (Table 3.2).

### Northern and Southern PADD II

There are five refineries located in Northern PADD II, representing 575,800 b/d of processing capacity. In response to growing U.S. domestic light supply, a number of simple topping refineries (Tesoro expansion, Calumet Specialty Products/ MDU Resources, Thunder Butte Petroleum Services (2016), Dakota Oil Processing (planned), Quantum Energy are being assessed. The 20,000 b/d capacity Dakota Prairie refinery project, which was completed in April 2015, is the first new U.S. refinery since 1976.

The seven refineries in Southern PADD II provide 819,000 b/d of crude processing capacity. These refineries are either located in Kansas or Oklahoma.
#### Table 3.2 Proposed Refinery Upgrade Projects in PADD II

Operator	Location	Current Capacity (thousand b/d)	Scheduled In-Service	Estimated Cost (\$ million)	Description
Eastern PAC	id II				
Husky	Lima, OH	160	2019 (originally 2017)	300	Modifications to coker and other processing units to increase ability to process heavy crude oil by up to 40,000 b/d.
Northern &	Southern PADD II				
Dakota Prairie LLC	Dickinson, ND	20	Completed May 2015	400	New refinery processing Bakken crude oil to produce primarily diesel.
CHS	McPherson, KS	100	Completed Feb 2016	555	Expanded capacity to 100,000 b/d from 85,000 b/d and increased heavy crude oil processing capacity to 50% with installation of new delayed coker.

#### 3.2.3 PADD III (Gulf Coast)

There are 50 refineries located in the Gulf Coast market that have a combined crude oil processing capacity of 9.3 million b/d, which represents more than half of the total refining capacity in the U.S. The vast majority of this capacity is located in two states: Louisiana and Texas.

In 2015, foreign imports of crude oil totaled 3.2 million b/d, of which only small volumes were comprised of light crude oil (Figure 3.8). Venezuela, Saudi Arabia and Mexico are by far the top three suppliers of foreign sourced crude oil to PADD III. Each of these countries supplied in excess of 600,000 b/d and combined accounted for 64 per cent of imports into the region. Western Canada follows in a distant fourth place; supplying 390,500 b/d.

Growing supplies from Western Canada could gain a larger share in this market in the near future through the displacement of other heavy crude oil imports. According to CAPP's 2016 refinery survey, imports from Western Canada could reach 608,000 b/d by 2020. Some refinery upgrades have been announced that would increase the size of this market's ability to process heavy crude oil in the near future (Table 3.3). The supplemental use of rail and new pipeline infrastructure, including the TransCanada Gulf Coast pipeline, has enabled a steady rise of western Canadian crude oil supplied into this market since 2014.



\* Includes small volumes of Medium Sweet Source: EIA

#### Figure 3.8 2015 PADD III: Foreign Sourced Supply by Type and Domestic Crude Oil

#### Table 3.3 Recent and Proposed Refinery Upgrades in PADD III

		Current Capacity	Scheduled	
Operator	Location	(thousand b/d)	In-Service	Description
Delek	Tyler, TX	75	Completed Mar 2015	Expansion from 60,000 b/d capacity.
ExxonMobil	Beaumont, TX	345	on Hold	Crude unit expansion to double capacity
Marathon	Garyville, LA	522	2018+ (2015 decision deferred)	Installation of hydrotreating, hydrocracking, & desulphurization equipment.
Valero	McKee, TX	170	Completed 2014	Increased capacity by 25,000 b/d. Expansion will process WTI and locally produced crude oil.

### 3.2.4 PADD IV (Rockies)

There are 14 refineries in PADD IV with a combined capacity of 659,800 b/d. Over half of this market processes U.S. domestic crude oil supplies. All foreign imports originate from Western Canada (Figure 3.9).





\* Includes small volumes of Medium Sweet Source: EIA

In 2015, PADD IV refineries processed 278,000 b/d of Canadian crude oil, representing 46 per cent of total feedstock requirements. Receipts of western Canadian crude oil supplies are expected to remain relatively flat through to 2020 (Figure 3.10).

# Figure 3.10 PADD IV: Crude Oil Receipts from Western Canada



Source: 2016 CAPP Refinery Survey

#### Table 3.4 Proposed Refinery Upgrade Projects in PADD IV

Operator	Location	Current Capacity (thousand b/d)	Scheduled In-Service	Estimated Cost (\$ million)	Description
Calumet Montana Refining	Great Falls, MT	20	Feb 2016	400	Installation of new crude unit, mild pressure hydrocracker and tankage. Capacity increased from 10 kb/d
HollyFrontier	Woods Cross, UT	45 (originally 31)	May 2016	420	Increased capacity. Includes new refining facilities + rail loading

### 3.2.5 PADD V (West Coast)

The Rocky Mountains divide PADD V from the rest of the U.S. and this geographic isolation has affected the development of crude supply sources to the region. The states in PADD V that have refineries are Alaska, California, Hawaii, and Washington. The refineries receive production from California and Alaska and also have good access to crude global crude oil through tanker deliveries.

Almost 2.9 million b/d of crude oil processing capacity is located in the region. Foreign imports typically account for just under half of the crude oil feedstock demand (Figure 3.11). This share could grow to replace the declining production from Alaska.

#### Figure 3.11 2015 PADD V: Foreign Sourced Supply by Type and Domestic Crude Oil



Source: EIA

The following discussion focuses only on Washington and California as the demand from refineries located in these two states account for the main future prospects for western Canadian crude oil in this region. Based on CAPP's 2016 refinery survey, western Canadian receipts into these two states could increase from 225,000 b/d in 2015 by 144,000 b/d to 369,000 b/d in 2020 (Figure 3.12).

#### Figure 3.12 PADD V (WA & CA): Crude Oil Receipts from Western Canada



#### Washington

There are five refineries located in Washington that provide a combined crude oil processing capacity of 634,000 b/d. Most of the crude feedstock arrives by tanker from Alaska and elsewhere. From its peak at around 2 million b/d in 1988, Alaskan production has declined to less than a quarter of that level to 482,800 b/d in 2015. Washington refineries will continue to become increasingly dependent on foreign imports although, rail provides some access to North Dakota's crude oil production. The Trans Mountain pipeline delivers western Canadian crude oil to this market.

#### California

California dominates PADD V in both oil production and refining capacity. There are 16 refineries located in California that contribute a combined crude oil refining capacity of 1.9 million b/d. Almost all of the refineries are located near the coast in the Los Angeles and the San Francisco Bay areas. There is no direct pipeline to California from producing areas outside of the state. Therefore, as Alaskan crude oil declines an opportunity arises to process more crude oil from North Dakota and potentially from Canada. Refer to Section 4.4 for pipeline proposal projects connecting western Canadian crude oil to the west coast where the crude oil could then be loaded on to tankers to serve these refineries. Table 3.5 lists the rail offloading terminals for markets on the West Coast.

#### Table 3.5 Rail Offloading Terminals in Western Canada & PADD V

Company	Location	Current Capacity (thousand b/d)	Scheduled In-Service	Description	
Western Canada					
Chevron (refinery)	Burnaby, BC	8	Operating since 2013		
Western Canada capac	ity subtotal	8,000 b/d			
Washington					
Shell (refinery)	Anacortes, WA	+50	TBD	Applied for permits	
Tesoro (refinery)	Anacortes, WA	50	Operating since 2012		
BP (refinery)	Cherry Point/Blaine, WA	60	Operating since Dec 2013		
Phillips 66 (refinery)	Ferndale, WA	30	Expansion operating since Dec 2014	Currently receiving manifest trains; applied for permits for expansion	
US Oil (refinery)	Tacoma, WA	30	Operating since 2012	Unit train capable	
US Development Group	Grays Harbour, WA	-	Gave up option on land lease Apr 2016	Applied for permits	
Westway	Grays Harbour, WA	+27	TBD	Applied for permits	
Tesoro/Savage	Port of Vancouver, WA	+120 (expandable to 280)	Late 2017	Applied for permits	
Global Partners of Massachusetts	Port Westward/ Calskanie, WA	65 (expandable to 130)	Operating since Q4 2012	24 trains per month; expandable to 50	
Washington capacity s	ubtotal	235,000 b/d; potential	for additional 197,000 b/d		
California					
Alon USA	Bakersfield, CA	manifest; +Expansion to 150	Operating 2016	Heavy and light crude oil capacity	
Plains All American	Bakersfield, CA	65	Operating since Dec 2014		
Valero (refinery)	Benicia, CA	+ 70	2016	western Cdn crude + US	
Phillips 66 (refinery)	Santa Maria, CA	+ 41	2016		
California capacity sub	total	70,0000 b/d; potential	for additional 326,000 b/d		
TOTAL		153,000 b/d; potential for additional 663,000 b/d			

#### 3.3 International

Despite the anticipated growing role of renewables and other sources, oil will be needed and expected to remain a signficant source of energy into the foreseeable future. According to the International Energy Agency's (IEA), *World Energy Outlook 2015* report, global oil demand will grow by 14 per cent by 2040 from 2014 levels. Oil will represent over a quarter of total world energy demand in 2040.

It is important for Canada to be able to supply growing global demand for crude oil that lies beyond the United States. Countries in both Europe and Asia are considering Canada to meet their demands. In 2015, Statistics Canada reported some limited shipments of Canadian crude oil destined for the United Kingdom, Spain, China, Italy and the Netherlands.

Growth in global demand is concentrated in Asian markets. Table 3.6 shows forecasted oil demand in major Asian markets. Combined growth from China and India of 10.8 million b/d is equal to almost 84 per cent of the world demand increase in 2040 from 2014.

#### Table 3.6 Total Oil Demand in Major Asian Countries

million b/d	2014	2020	2030	2040
China	10.5	12.5	14.7	15.3
India	3.8	4.8	7.0	9.8
Japan	4.1	3.4	2.8	2.3
World	90.6	95.9	99.9	103.5

Source: IEA World Energy Outlook 2015, New Policies Scenario

According to the IEA, China will become the world's largest importer of crude oil by 2020 with India coming in second by 2035. Figure 3.13 shows the changing global net import needs. While declines in the crude oil import needs for other major importing countries or regions are forecast, global oil demand will remain large.

#### Figure 3.13 Global Net Oil Imports: 2014 to 2040



IEA World Energy Outlook 2015, New Policies Scenario

### 3.4 Markets Summary

While the U.S. Gulf Coast market represents a large opportunity given its overall size and most refineries' ability in the region to process the type of heavy crude oil produced in Western Canada, the need for market diversity and associated transportation capacity is a key observation in this outlook.

Eastern Canada, California and Washington, represent opportunities for expanded markets in North America for Canadian crude oil by 2020. PADD II is essentially saturated with western Canadian and domestic U.S. supplies however, deliveries to this market remain significant as the largest U.S. tank farm is located in Cushing, Oklahoma. Infrastructure must be built to enable large volumes to be transported to tidewater in order to reach international markets.

# 4. Transportation

Canada's western crude oil supply base is landlocked and separated from the majority of its refining markets by large distances. Most of these supplies are moved by pipelines, which are the most efficient method for transporting large volumes to marketplaces throughout North America. Rail, trucks and marine tankers have also emerged to play a role in moving discrete shipments when pipelines are at capacity or unavailable. Figure 4.1 shows the existing pipeline projects and the proposals for projects that could provide part of the needed additional capacity out of Western Canada as crude oil supplies grow.



Figure 4.1 Existing and Proposed Canadian & U.S. Crude Oil Pipelines

### 4.1 Existing Crude Oil Pipelines Exiting Western Canada

There are four major pipelines that transport crude oil production out of Western Canada. Together, the Enbridge Mainline, Kinder Morgan Trans Mountain, Spectra Express, and TransCanada Keystone pipelines provide over four million b/d of capacity exiting western Canada. In addition, a number of proposals have been announced that could increase this capacity during the next five years (Table 4.1). Pipeline capacity is currently tight and operational constraints can and have at times, reduced the available capacity to below nameplate capacity. The growing Western Canada crude oil supply volumes forecast until 2020 require increased pipeline capacity if these supplies are to access markets.

## Table 4.1Major Existing & Proposed Crude Oil<br/>Pipelines Exiting the WCSB

Pipeline	In Service	Capacity (thousand b/d)
Enbridge Mainline	Operating since 1950	2,851
Enbridge Line 3 Restored	2019	+370
Kinder Morgan Trans Mountain	Operating since 1953	300
Trans Mountain Expansion	Late 2019	+590
Spectra Express	Operating since 1997	280
TransCanada Keystone	Operating since 2010	591
TransCanada Keystone XL	denied	+830
Enbridge Northern Gateway	timing uncertain	+525
TransCanada Energy East	Late 2020	+1,100
Total Existing Capacity		4,022
Total Proposed Additional Capa	city	+3,415

The next sections provide additional details on the four major existing pipelines, followed by the proposed and existing pipelines sections categorized by their destination market. Stated capacities reported in this section could be impacted by operational pressure restrictions or physical constraints at terminals. Some of these pipelines will also transport U.S. supplies.

### 4.1.1 Enbridge Mainline

The Enbridge Mainline is a multi-pipeline system that delivers light crude, heavy crude and refined products from Western Canada, Montana, and North Dakota to markets in Western Canada, the U.S. Midwest, and Ontario. The Mainline connects to several pipelines: Line 9 at Sarnia, Ontario; the Minnesota Pipeline at Clearbrook, Minnesota; Spearhead South and Flanagan South at Flanagan, Illinois; Chicap at Patoka, Illinois; Mustang at Chicago, Illinois and Toledo at Stockbridge, Michigan.

#### Enbridge North Dakota System

Enbridge's North Dakota system, including the Bakken Expansion pipeline gathers light crude oil from Western Canada, Montana and North Dakota for delivery to the Berthold Rail Project and the Enbridge Mainline. The U.S. production volumes entering the system reduces the capacity available to transport western Canadian crude oil production.

Enbridge is proposing the Sandpiper Pipeline project, which includes a new 24-inch diameter pipeline from Beaver Lodge Station, south of Tioga, North Dakota to a terminal in Clearbrook, Minnesota. A 30-inch diameter pipeline would then connect from Clearbrook to Superior, Wisconsin. The existing pipelines terminate in Clearbrook so a larger diameter pipeline is needed beyond Clearbrook. Sandpiper is targeted for completion in 2019 and will provide an incremental capacity of 230,000 b/d when completed.

#### **Enbridge Mainline Expansion Projects**

The portion of the Enbridge Mainline which is located between Edmonton, Alberta and Superior, Wisconsin represents the capacity of the system exiting Western Canada. This total existing system capacity of 2.85 million b/d is comprised of a number of pipelines (Table 4.2). The recent new capacity on the Alberta Clipper pipeline was provided through the addition of new pumps and station upgrades.

Enbridge is also proposing a Line 3 Replacement project for completion in 2019. At an estimated cost of \$7.5 billion, the project would restore the Line 3 pipeline to its original capacity of 760,000 b/d, thereby increasing the current operating capacity of 390,000 b/d by 370,000 b/d. On April 25, 2016, the NEB issued a report wherein it recommended that the Governor in Council (GIC) approve the project. The federal government indicated that it will be making a final determination on whether the project is in Canada's best interest in the fall of 2016

## Table 4.2Enbridge Mainline System:Upstream Superior

Enbridge Pipeline	In Service	Capacity (thousand b/d)
Line 1	Operating	237
Line 2	Operating	442
Line 3	Operating	390
Line 3 Replacement	2019	+370
Line 4	Operating	796
Line 65	Operating	186
Alberta Clipper	Operating	800
Original	Op. since 2010	450
Phase 1 Expansion	Op. since 2014	120
Phase 2 Expansion	Op. since 2015	230
Total Existing Capacity		2,851

Past Superior, the Enbridge Mainline has a capacity of 2.45 million b/d provided by Line 5, Line 6, Line 14 and the Southern Access Pipeline. These pipelines connect to a number of other pipelines that serve as market extensions of the Enbridge Mainline system.

### 4.1.2 Kinder Morgan Trans Mountain

The Trans Mountain system is currently the only crude oil pipeline serving Canada's west coast. It originates near Edmonton, Alberta and transports multiple products, including crude oil and refined products to destinations in British Columbia (BC), Washington and the Westridge marine terminal in Burnaby, BC. In Burnaby crude oil can be loaded onto vessels for offshore exports to California, the U.S. Gulf Coast and Asia.

The current capacity on the pipeline system is 300,000 b/d (assuming 20 per cent of the volumes being transported are heavy crude oil). Of this capacity, 221,000 b/d is allocated to refineries with connections in BC and Washington State and the remaining 79,000 b/d is allocated to the Westridge terminal for marine exports. With respect to the capacity designated for the marine terminal, 54,000 b/d or 68 per cent is underpinned by firm contracts. Nominations for service on this pipeline have been in apportionment since 2010, and demand for access to this pipeline is expected to grow. See Section 4.4.2 for details on the Trans Mountain Expansion Project.

#### 4.1.3 Spectra Express-Platte

Spectra purchased the Express-Platte pipeline system, which is comprised of both the Express and Platte crude oil pipelines, from Kinder Morgan in 2013. The Express Pipeline originates at Hardisty, Alberta and terminates at Casper, Wyoming where it interconnects with the Platte Pipeline. The design capacity on Express is 280,000 b/d. The Platte Pipeline transports up to 164,000 b/d from Casper to Guernsey, Wyoming and 145,000 b/d from Guernsey to Wood River, Illinois.

The Express Enhancement project is expected to be in-service during the second half of 2016 and will increase system capacity by 21,000 b/d. Facilities include the addition of tank storage at Hardisty, AB and Buffalo, MT and additional pumps at Buffalo, MT.

### 4.1.4 TransCanada Keystone

The Keystone pipeline system originates at Hardisty, Alberta and extends to Steele City, Nebraska. From this juncture, crude oil can be transported east to terminals in Wood River and Patoka, Illinois or south to Cushing, Oklahoma. The pipeline system can deliver a total of 590,000 b/d to either destination. The pipeline system began operating in July 2010 initially serving the Wood River/Patoka markets with only 435,000 b/d capacity. The system's capacity subsequently expanded to its current capacity in February 2011 when the Cushing extension came online.

Between July 10, 2015 and September 2, 2015, TransCanada held a successful Open Season for an additional 15,000 b/d of contract capacity. These contracts would extend for 20 years with the volumes destined for the U.S. Gulf Coast markets. Prior to the 2015 open season, contracted space on the pipeline was 530,000 b/d for an average of 18 years.

#### 4.2 Oil Pipelines to the U.S. Midwest

The U.S. Midwest is the largest market for western Canadian crude oil. The key market hubs in this region are located at Wood River and Patoka in Illinois and at Cushing, Oklahoma. Table 4.3 summarizes the pipelines which deliver Canadian crude oil to the Midwest.

#### 4.2.1 Spectra Express-Platte

See Section 4.1.3.

#### 4.2.2 TransCanada Keystone

See Section 4.1.4.

### 4.2.3 Enbridge Mainline Market Extensions

Enbridge has recently completed a number of system segment projects that have expanded its market reach to a number of Midwest markets. These include Flanagan South, the Southern Access Extension, Spearhead North twin line (Table 4.3). Together, these pipelines have added almost 1.5 million b/d segments of new capacity.

### 4.2.4 Minnesota Pipeline System

The Minnesota Pipe Line (MPL) system transports crude oil originating in Canada and North Dakota through pipeline connections at Clearbook, Minnesota to the Twin Cities. The MPL system is owned by Minnesota Pipe Line Company and operated by Koch Pipeline Company. It is the primary pipeline system that supplies crude oil to Minnesota's two refineries.

The MPL system is comprised of four pipelines that together, can transport about 465,000 b/d. The first pipeline in the MPL system was built in 1954; the second was built in the 1970s; the third in the 1980s; and the last pipeline, MPL Line 4, formerly known as MinnCan, was constructed in 2008. MPL Line 4 can currently transport about 165,000 b/d. The Minnesota Pipe Line Company has proposed a project to increase capacity of the pipeline by 185.000 b/d to reach 350.000 b/d when needed through the addition of six pump stations and upgrading two existing stations. At an estimated cost of \$125 million, this project is intended to give MPL the flexibility to shift volumes to its newest pipeline in the event of an outage on other segments of the pipeline system. The construction is targeted to be completed in Q4 2017.

### 4.2.5 Plains All American Diamond Pipeline

Plains All American has plans to build a new 200,000 b/d crude oil pipeline from Cushing, Oklahoma to Valero's refinery in Memphis, Tennessee. Engineering plans have been finalized and all the required permits and rights-of-way acquisitions were completed in late 2015. Construction is expected to be completed in early 2017. Valero has also exercised its option to purchase 50 per cent interest in the pipeline.

#### Table 4.3 Summary of Crude Oil Pipelines to the U.S. Midwest

Pipeline	Originating Point	Destination	Status	Capacity (thousand b/d)
Enbridge Mainline	Superior, WI	various delivery points	Operating	1,525
- Line 5				540
- Line 6				667
- LIIIe 14/04	O	Elementer II		310
Enbridge Mainline - Southern Access	Superior, wi	Flanagan, IL	Operating	935
- Original Phase 1 Expansion			Operating	400
- Phase 2 Expansion			Op. Since Aug 2014	275
- Phase 3 Expansion			Proposed - 2019	+265
Enhridge Spearhead North	Flanagan II	Chicano II	Onerating	235
Enbridge Spearhead North Twin	Flanagan, IL	Chicago, II	Op. since Nov 2015	570
Enbridge Spearhead South	Flanagan, IL	Cushing, OK	Operating	193
Enbridge Flanagan South	Flanagan, IL	Cushing, OK	Op. since Dec 2014	585
Enbridge Southern Access Ext.	Flanagan, IL	Patoka, IL	0p. since Jan 2016	300
Enbridge Mustang	Lockport, IL	Patoka, IL	Operating	100
Koch Minnesota Pipeline	Clearbrook, MN	Minnesota refineries	Operating	465
Spectra Express-Platte	Guernsey, WY	Wood River, IL	Operating	280/145
TransCanada Keystone	Hardisty, AB to Steel	east to Patoka, IL /		591
	City, NE	Wood River, IL or	P1 op. since Jul 2010	
		south to Cushing, OK	P2 op. since Feb 2011	
PAAP Diamond	Cushing, OK	Memphis, TX	Proposed - Q4 2016	+200

### 4.3 Oil Pipelines to the U.S. Gulf Coast

The Gulf Coast represents the most significant opportunity for market growth for heavy Canadian crude oil supplies to markets in North America. Refineries in the region currently rely on imports primarily from Mexico, Saudi Arabia and Venezuela for heavy crude oil supplies. Most supplies of western Canadian crude oil traditionally moved to the U.S. Midwest but with the recent startup of Seaway Twin and the TransCanada Gulf Coast Extension of the Keystone pipeline, more than 1.2 million b/d of transport capacity was opened up from the U.S. Midwest to the U.S. Gulf Coast.

#### 4.3.1 Enbridge/Enterprise Seaway

The Seaway Pipeline system is jointly owned by Enbridge Inc. and Enterprise Products Partners L.P. and is comprised of two parallel pipelines (Seaway and Seaway Twin). The total system capacity is 850,000 b/d with 400,000 b/d contributed by the Seaway pipeline between Cushing, Oklahoma and the Freeport, Texas area and 450,000 b/d contributed by the Seaway Twin pipeline.

U.S. Gulf Coast market access for western Canadian crude oil has only started to emerge in recent years. The direction of flow on the Seaway pipeline was reversed on May 17, 2012 in order to allow crude oil to be transported from the bottlenecked Cushing, Oklahoma hub to the Gulf Coast refineries near Houston. The original capacity of the reversed pipeline was 150,000 b/d but was increased in January 2013 to 400,000 b/d through pump station modifications and additions. Seaway Twin was brought into service on December 1, 2014.

#### Table 4.4 Summary of Crude Oil Pipelines to the U.S. Gulf Coast

Pipeline	Originating Point	Destination	Status	Capacity (thousand b/d)
Seaway	Cushing, OK	Freeport, TX	Expansion op. since Jan 2013	400
Seaway Twin Line			Op. since Dec 2014	450
TransCanada Keystone XL	Hardisty, AB	Steele City, NE	Denied	+830
Cushing extension of Keystone	Steele City, NE	Cushing, OK	Op. since Feb 2011 (Segment 1)	-
Gulf Coast extension of Keystone	Cushing, OK	Nederland, TX	Op. since Jan 2014 (Segment 2)	700
Capline Reversal	Patoka,IL	St. James, LA	Proposed	+1,200

### 4.3.2 TransCanada Keystone XL

The Keystone XL Pipeline is a proposed crude oil pipeline project that originates in Hardisty, Alberta and extends south to Steele City, Nebraska. The project was originally proposed by TransCanada in 2005. TransCanada applied for a Presidential Permit with the U.S. Department of State to build this cross-border pipeline in September 2008. On November 6, 2015 U.S. President Obama issued a Formal Presidential Statement rejecting the Keystone XL Pipeline Project. TransCanada has taken legal action challenging the decision. Trans Canada will review options that could include potentially filing a new application.

### 4.3.3 TransCanada Gulf Coast Extension of the Keystone Pipeline System

TransCanada's Gulf Coast extension of its Keystone pipeline system started delivering crude oil on January 22, 2014. The pipeline is part of the Keystone Pipeline system and provides capacity from Cushing, Oklahoma to Port Arthur, Texas. Construction is continuing on the Houston Lateral pipeline, which will extend the system to Houston, Texas and is expected to be completed in the second quarter 2016.

### 4.3.4 Capline Reversal

The Capline pipeline currently transports crude oil northbound from St. James, Louisiana to Patoka, Illinois. It is a pipeline system with 1.2 million b/d capacity. If reversed, the pipeline could move western Canadian crude oil to refineries in Louisiana but infrastructure upstream of the origination point would be required to connect to sources of supply. Marathon operates the pipeline while Plains All American Pipeline is the majority owner; the other part owner is BP. The owners have indicated that they would consider connecting Capline to the Diamond pipeline (Section 4.2.5).

### 4.4 Oil Pipelines to the West Coast of Canada

The Kinder Morgan Trans Mountain pipeline is currently the only pipeline transporting crude oil from Alberta to the West Coast. There is significant interest in building new pipeline capacity to the West Coast where it can be offloaded onto crude carriers to reach many markets including California, Washington, the U.S. Gulf Coast and Asia. Table 4.5 lists the existing pipeline and proposed projects to the West Coast.

### 4.4.1 Enbridge Northern Gateway

The Northern Gateway pipeline is a proposed pipeline project with an initial capacity of 525,000 b/d that extends from Bruderheim, Alberta to Kitimat, British Columbia (BC). In June 2014, the project was approved by the Governor in Council subject to 209 conditions and mandated further discussion with Aboriginal communities. One of the conditions was that the certificate would expire on December 31. 2016 unless construction has begun by then. On May 6, 2016, Northern Gateway Pipelines Inc. and Aboriginal Equity Partners (AEP) filed a request to extend this deadline by three years. Reasons iustifying the extension include: delay in obtaining approvals from other regulators; judicial challenges to required approvals; and changes in market conditions affecting commercial arrangements. The NEB will make a decision after considering the reply, due on July 18, 2016, to public comments.

The original targeted in-service date of this pipeline was 2019, which will be deferred given the above noted development but no new timing has been provided by the proponents of the project.

### 4.4.2 Kinder Morgan Trans Mountain Expansion

If approved and constructed, the expanded system would be comprised of two parallel pipelines. Line 1 would consist of existing pipeline segments and could transport 350,000 b/d of refined petroleum products and light crude oil or potentially heavy crude oil depending on demand. The proposed Line 2 would have a capacity of 540,000 b/d and would be allocated to the transportation of heavy crude oil. This new pipeline and reconfiguration would, in effect, add 590,000 b/d of capacity over the existing system for a total capacity of 890,000 b/d. The estimated capital cost of the project is \$6.8 billion. The expansion is underpinned by contracts totaling 707,500 b/d under 15 and 20-year commitments from 13 shippers. The preliminary capital cost for Trans Mountain's expansion has jumped 25 per centfrom \$5.4 billion to \$6.8 billion. The earliest startup that the expanded pipeline could be operational is estimated to be at the end of 2019.

On May 17, 2016, a Ministerial panel was assigned to engage communities, including indigenous communities potentially affected by the project, to seek their views and report back to the Minister of Natural Resources by November.

On May 19, 2016, the NEB issued a report that concluded that Kinder Morgan's proposal to expand its existing Trans Mountain pipeline was in Canada's public interest and recommended that the Governor in Council (GIC) approve the project. The recommendation came subject to 157 conditions. Environment and Climate Change Canada also released a report on its review of upstream greenhouse gas (GHG) emissions that would be associated with the project. The GIC will make the final decision on the project by December 20, 2016. This is a four month extension from the original timing contemplated in order to allow for consideration of the the additional Aboriginal consultation and the assessment of upstream GHG emissions, which were new elements added to the government's decision-making process in January 2016.

### 4.5 Oil Pipelines to Eastern Canada

In 2015, refineries in Eastern Canada processed almost 1.1 million b/d of crude oil, of which 567,000 b/d originated from foreign sources. This is a potential market for western Canadian producers. Table 4.6 lists the pipeline proposals that could provide a conduit to this market.

#### Table 4.5 Summary of Crude Oil Pipelines to the West Coast of Canada

Pipeline	Originating Point	Destination	Status	Capacity (thousand b/d)
Kinder Morgan Trans Mountain	Edmonton , AB	Burnaby, BC	Operating	300
Kinder Morgan Trans Mountain Expansion			Proposed - Late 2019	+590
Enbridge Northern Gateway	Bruderheim, AB	Kitimat, BC	Proposed - uncertain start	+525

### 4.5.1 Enbridge Line 9 Reversal

The Enbridge Line 9 Reversal project does not add new capacity from Western Canada but does extend the Enbridge Mainline's reach. It is a pipeline that transports crude oil from Sarnia, Ontario to Montréal, Québec. In August, 2013, the 9A portion started flowing crude oil from Sarnia, Ontario to North Westover, Ontario with a capacity of 152,000 b/d. Line 9B, from North Westover, Ontario to Montréal, Québec started flowing oil in December 2015. The completed now line has a capacity of 300,000 b/d.

### 4.5.2 TransCanada Energy East

TransCanada Energy East is a proposed pipeline system that is intended to enable the transportation of about 1.1 million b/d of crude oil from Hardisty, Alberta and a tank terminal in Moosim, Saskatchewan to delivery points in Eastern Canada. The project will provide western Canadian crude oil access to markets in Eastern Canada, U.S. East Coast, U.S. Gulf Coast and other international destinatations via the marine terminal. About 995,000 b/d is underpinned by firm contracts for an average term of 19 years.

In TransCanada's original application to the NEB filed on October 30, 2014, the project included delivery points to three refineries and two marine terminals – one at Gros Cacouna, Québec and one at Saint John, New Brunswick. The revised application filed on December 17, 2015 includes the delivery points to the three refineries in Eastern Canada and one marine terminal (Canaport Energy East Marine Terminal), near Saint John, New Brunswick.

The major components of the project includes the conversion of a natural gas pipeline to oil service and constructing new pipeline segments in Alberta, Saskatchewan, Manitoba, Eastern Ontario, Québec and New Brunswick. Construction of associated facilities, pump stations and tank terminals, including a marine facility would also be required.

The cost of the 4,500 km long pipeline has been revised to an estimate of \$15.7 billion due to changes in the project schedule and scope, compared to the original estimate of \$12 billion. This cost is exclusive of the transfer of Canadian Mainline natural gas assets into oil service. The targeted in-service date for the project has been delayed to Q4 2021. On April 26, 2016, the NEB released its preliminary schedule for review of the project wherein its recommendations to the Governor in Council (GIC) will be released in March 2018. The timeline reflects an extended time limit of 21 months for the regulatory process as directed by the Minister of Natural Resources in order to allow for greater consultation with Aboriginal groups and an assessment of the direct and upstream greenhouse gas emissions linked to the project. The legislated time for the GIC review has also been extended from three months to six months, so based on the current schedule, the federal government would make a final decision by September 2018.

### 4.6 Diluent Pipelines

Table 4.7 provides a summary of projects which aim to bring diluent supply in order to satisfy the blending component needed to transport the growing supply of heavy crude oil produced in Western Canada by pipelines.

### 4.6.1 Enbridge Southern Lights

The Southern Lights pipeline runs from Manhattan, Illinois to Edmonton, Alberta and has been operating since July 2010. The capacity of the pipeline is 180,000 b/d, of which 162,000 b/d is secured by long-term contracts. If required, the capacity of the pipeline could be expanded.

#### Table 4.6 Summary of Crude Oil Pipelines to Eastern Canada

Pipeline	Originating Point	Destination	Status	Capacity (thousand b/d)
Enbridge Line 9 Reversal 9A 9B	Sarnia, ON Sarnia, ON North Westover, ON	Montréal, QC North Westover, ON Montréal, QC	Operating Op. since Aug 2013	300
TransCanada Energy East	Hardisty, AB	Québec City, QC / St. John, NB	Proposed - Q4 2021	+1,100

#### Table 4.7 Summary of Diluent Pipelines

Pipeline	Originating Point	Destination	Status	Capacity (thousand b/d)
Enbridge Southern Lights	Flanagan, IL	Edmonton, AB	Operating	180
Enbridge Northern Gateway	Kitimat, BC	Bruderheim, AB	Proposed - uncertain start	+193
Kinder Morgan Cochin Conversion	Kankakee County, IL	Fort Saskatchewan, AB	Operating since July 2014	95
TransCanada Grand Rapids	Heartland, AB	Fort McMurray, AB	Proposed - 2017	+330

### 4.6.2 Enbridge Northern Gateway Diluent

As part of its Northern Gateway Project, Enbridge is proposing a diluent pipeline that would run from Kitimat, British Columbia to Bruderheim, Alberta. The proposed capacity of the pipeline is 193,000 b/d. The last reported target in service date is 2019 although this is likely to be deferred as timing of this project is linked to the Northern Gateway project (section 4.4.1).

### 4.6.3 TransCanada Grand Rapids Diluent

TransCanada plans to build a new diluent line from the Heartland region to Fort McMurray, Alberta. The diluent pipeline would have a capacity of 330,000 b/d and is expected to be operating in 2017.

Keyera Corp. has agreed to acquire a 50 per cent interest in the southernmost portion of the 20inch diameter Grand Rapids diluent pipeline. The 45-kilometre pipeline will be constructed by Grand Rapids Pipeline Limited Partnership, an affiliate of TransCanada PipeLines Limited and Brion Energy Corporation. The pipeline will extend from Keyera's Edmonton Terminal (KET) to TransCanada's Heartland Terminal near Fort Saskatchewan as part of TransCanada's previously announced Grand Rapids pipeline project. In connection with this agreement, Keyera will be constructing a pump station at KET where the pipeline will connect. Based on current estimates, Keyera expects its total contribution to the joint venture will be approximately \$140 million.

### 4.6.4 Kinder Morgan Cochin Reversal Project

Kinder Morgan's Cochin system is a multi-product pipeline. In April 2014, the pipeline was removed from ethane-propane service. Since July 2014, the pipeline has been shipping condensate from Kankakee County, Illinois to Fort Saskatchewan, Alberta. The pipeline's estimated capacity is 95,000 b/d.

### 4.7 Crude Oil by Rail

Rail is an alternative mode of transportation to pipeline. The number of rail car loadings of crude oil and petroleum products declined in 2015 by 24 per cent compared to 2014 loadings. There was also a great variation in monthly loadings ranging between 9,809 car loads and 15,237 carloads throughout the year (Figure 4.2).

In 2015, industry data indicated that about 140,000 b/d of western Canadian crude oil was transported to market by rail, which was 23 per cent less than in 2014.



2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 Source: Statistics Canada





The current rail loading capacity originating in Western Canada is 754,000 b/d. Figure 4.3 shows all the major existing rail terminals for uploading crude in Western Canada. Plans for previously announced future expansions to facilities are currently on hold.

#### Major\* Announced Rail Uploading Terminals in Western Canada

Operator	Location	Capacity** (thousand b/d)	Scheduled Startup				
	ALBERTA						
Keyera/Enbridge	Cheecham	32	Operating since Oct 2013				
Cenovus (Ex Canexus)	Bruderheim (near Edmonton)	70	Expansion operating since Sep 2014; expandable				
Gibson	Edmonton	20	Operating since Q3 2015				
Keyera/Kinder Morgan	Edmonton	40	Operating since Sep 2014				
Gibson/USDG	Hardisty	120	Operating since Jul 2014				
Altex	Lynton (Ft. McMurray)	15	Operating				
Kinder Morgan/Imperial	Sherwood Park (Strathcona County)	210	Operating since Apr 2015; can be expanded to 250				
	SASKATCHEWAN						
TORQ Transloading	Bromhead	20	Operating				
Plains	Kerrobert	(70)	Startup Nov 2015. As of May 2016, operations temporarily closed				
Altex	Lashburn	60	Expansion operating				
TORQ Transloading	Lloydminster	25	Operating;				
Crescent Point	Stoughton	45	Operating since Feb 2012				
Altex	Unity	15	Operating				
TORQ Transloading	Unity	22	Operating				
	MANITOBA						
Tundra	Cromer	60	Expansion operating since Q4 2014				
ΤΟΤΑ	L 754,000 b	/d + potential expansions					

\*Facilities with less than 15,000 b/d are not shown

\*\*Estimated capacities based on assumptions for operating hours, available car spots, type of crude oil transported, and contracts in place (if known).

#### **Rail Quick Facts**

- Rail tank car capacity carrying light oil: 600 to 700 bbls
- Rail tank car capacity carrying heavy oil: 500 to 525 bbls
- Manifest trains are mixed cargo trains delivering to different destinations
- Unit trains are used to carry one type of cargo from one location to another
- Unit train: 70 to 120 cars carrying only crude oil
- Economics for transport by rail improves with unit trains

#### 4.8 Transportation Summary

Canadian crude oil supplies are forecast to grow by 1.5 million b/d in 2030. Pipelines are the preferred mode of transportation to move this product but unexpected extensions in the regulatory process for proposed projects have created new uncertainty around project timing. However, it remains clear that better tidewater access will be needed to reach growing global market outlets and capture full value for western Canadian supplies.

Either the Trans Mountain Expansion or Northern Gateway projects would provide valuable access to the West Coast in order to reach Asian and California markets. TransCanada Energy East could provide access to the East Coast and European markets. Keystone XL has been denied but could be revitalized at a later time to provide access to the U.S. Gulf Coast.



#### Figure 4.4 Existing WCSB Takeaway Capacity vs. Supply Forecast

Capacity shown can be reduced by temporary operating and physical constraints. Enbridge capacity reduced by volumes of US Bakken transported in 2015

# GLOSSARY

Asphalt plant	A facility that processes crude oil into various types and grades of asphalt, ranging from dust-abatement road oils to highway-grade asphalt, to roofing tar.
API Gravity	A specific gravity scale developed by the American Petroleum Institute (API) for measuring the relative density or viscosity of various petroleum liquids.
Barrel	A standard oil barrel is approximately equal to 35 Imperial gallons (42 U.S. gallons) or approximately 159 litres.
Bitumen	A heavy, viscous oil that must be processed extensively to convert it into a crude oil before it can be used by refineries to produce gasoline and other petroleum products.
Coker	The processing unit in which bitumen is cracked into lighter fractions and withdrawn to start the conversion of bitumen into upgraded crude oil.
Condensate	A mixture of mainly pentanes and heavier hydrocarbons. U.S. condensate is divided into two broad categories. The first is lease condensate produced at or near the wellhead (either natural gas or crude oil). The second category is plant condensate, also known as NGLs, natural gasoline, pentanes plus or C5+, that remain suspended in natural gas at the wellhead and is removed at a gas processing plant. For purposes of this report, both categories are included in the term "condensate". Both categories of condensate are substantially similar in composition but the U.S. EIA arbitrarily defines lease condensate as crude oil and plant condensate as an NGL (pentanes plus). Furthermore, Department of Commerce - Bureau of Industry and Security (BIS) regulations also define lease condensate as crude oil.
Crude oil (Conventional)	A mixture of pentanes and heavier hydrocarbons that is recovered or is recoverable at a well from an underground reservoir. It is liquid at the conditions under which its volumes is measured or estimated and includes all other hydrocarbon mixtures so recovered or recoverable except raw gas, condensate, or bitumen.
Crude oil (heavy)	Crude oil is deemed, in this report, to be heavy crude oil if it has an API of 27° or less. No differentiation is made between sweet and sour crude oil that falls in the heavy category because heavy crude oil is generally sour.
Crude oil (medium)	Crude oil is deemed, in this report, to be medium crude oil if it has an API greater than 27° but less than 30°. No differentiation is made between sweet and sour crude oil that falls in the medium category because medium crude oil is generally sour.
Crude oil (synthetic)	A mixture of hydrocarbons, similar to crude oil, derived by upgrading bitumen from the oil sands.
Density	The mass of matter per unit volume.
DilBit	Bitumen that has been reduced in viscosity through addition of a diluent (or solvent) such as condensate or naphtha.
Diluent	Lighter viscosity petroleum products that are used to dilute bitumen for transportation in pipelines.
Extraction	A process unique to the oil sands industry, in which bitumen is separated from their source (oil sands).

Feedstock	In this report, feedstock refers to the raw material supplied to a refinery or oil sands upgrader.
Integrated mining project	A combined mining and upgrading operation where oil sands are mined from open pits. The bitumen is then separated from the sand and upgraded by a refining process.
In situ <b>recovery</b>	The process of recovering crude bitumen from oil sands by drilling.
Merchant upgrader	Processing facilities that are not linked to any specific extraction project but is designed to accept raw bitumen on a contract basis from producers.
Oil	Condensate, crude oil, or a constituent of raw gas, condensate, or crude oil that is recovered in processing and is liquid at the conditions under which its volume is measured or estimated.
Oil sands	Refers to a mixture of sand and other rock materials containing crude bitumen or the crude bitumen contained in those sands.
Oil Sands Deposit	A natural reservoir containing or appearing to contain an accumulation of oil sands separated or appearing to be separated from any other such accumulation. The AER has designated three areas in Alberta as oil sands areas.
Oil Sands Heavy	In this report, Oil Sands Heavy includes upgraded heavy sour crude oil, and bitumen to which light oil fractions (i.e. diluent or upgraded crude oil) have been added in order to reduce its viscosity and density to meet pipeline specifications.
Open Season	A period of time designated by a pipeline company to determine shipper interest on a proposed project. Potential customers can indicate their interest/support by signing a transportation services agreement for capacity on the pipeline.
Pentanes Plus	A mixture mainly of pentanes and heavier hydrocarbons that ordinarily may contain some butanes and is obtained from the processing of raw gas, condensate or crude oil.
PADD	Petroleum Administration for Defense District that defines a market area for crude oil in the U.S.
Refined Petroleum Products	End products in the refining process (e.g., gasoline).
Specification	Defined properties of a crude oil or refined petroleum product.
SynBit	A blend of bitumen and synthetic crude oil that has similar properties to medium sour crude oil.
Train (Manifest)	Manifest trains carry multiple cargoes and make multiple stops. These are small group or single car load.
Train (Unit)	Unit trains carry a single cargo and deliver a single shipment to one destination, lowering the cost and shortening the trip.
Upgrading	The process that converts bitumen or heavy crude oil into a product with a lower density and viscosity.
West Texas Intermediate	WTI is a light sweet crude oil, produced in the United States, which is the benchmark grade of crude oil for North American price quotations.

# **APPENDIX A.1** Approved Oil Sands *In Situ* Projects

Company	Project Name	Technology	Capacity (b/d)
Athabasca Oil Corp	Dover West Carbonates Phase 1 Demonstration	TAGD	6,000
BP (75%) / Value Creation (25%)	Terre de Grace Pilot	SAGD	10,000
Brion	Dover North Phase 1	SAGD	50,000
Brion	Dover North Phase 2	SAGD	50,000
Brion	Dover South Phase 3	SAGD	50,000
Brion	Dover South Phase 4	SAGD	50,000
Brion	Dover South Phase 5	SAGD	50,000
Brion	Mackay River Phase 2	SAGD	40,000
Brion	Mackay River Phase 3	SAGD	40,000
Brion	Mackay River Phase 4	SAGD	35,000
Cenovus	Telephone Lake Phase A	SAGD	45,000
Cenovus	Telephone Lake Phase B	SAGD	45,000
Husky	Sunrise 2A	SAGD	35,000
Husky	Sunrise 2B	SAGD	35,000
Husky	Sunrise Additional Future Phases	SAGD	70,000
Suncor	Firebag Stage 5	SAGD	62,500
Suncor	Firebag Stage 6	SAGD	62,500
Suncor	Firebag Phases 3-6 debottleneck	SAGD	23,300
Suncor	MacKay River Phase 2	SAGD	20,000
Sunshine Oilsands Ltd.	Thickwood Phase A1	SAGD	10,000
Sunshine Oilsands Ltd.	West Ells Phase A2	SAGD	5,000
Canadian Natural Resources	Kirby North Phase 1	SAGD	40,000
Canadian Natural Resources	Kirby North Phase 2	SAGD	60,000
Cavalier Energy Inc	Hoole Phase 1	SAGD	10,000
Cenovus	Christina Lake Phase G	SAGD	50,000
Cenovus	Foster Creek Phase H	SAGD	30,000
Cenovus	Foster Creek Phase J	SAGD	50,000
Cenovus	Pelican Upper Grand Rapids Phase A	SAP-SAGD	10,000
Cenovus	Pelican Upper Grand Rapids Phase B	SAP-SAGD	32,000
Cenovus	Pelican Upper Grand Rapids Phase C	SAP-SAGD	29,000
Cenovus	Pelican Upper Grand Rapids Phase D	SAP-SAGD	2,900
Cenovus	Narrows Lake Phase A	SAP-SAGD	45,000
Cenovus	Narrows Lake Phase B	SAP-SAGD	45,000
Cenovus	Narrows Lake Phase C	SAP-SAGD	40,000

# **APPENDIX A.1 cont.**

Company	Project Name	Technology	Capacity (b/d)
CNOOC Limited	Kinosis (K1B)	SAGD	37,500
Connacher	Connacher Great Divide Pod 3A	SAGD	12,000
Connacher	Connacher Great Divide Pod 3B	SAGD	12,000
Devon	Pike Phase 1A	SAGD	35,000
Devon	Pike Phase 1B	SAGD	35,000
Grizzly Oil Sands ULC	Algar Lake Phase 2	SAGD	6,000
Harvest Operations	BlackGold Phase 2	SAGD	20,000
Koch	Muskwa Pilot	SAGD	10,000
MEG Energy	Christina Lake Phase 3A	SAGD	50,000
MEG Energy	Christina Lake Phase 3B	SAGD	50,000
MEG Energy	Christina Lake Phase 3C	SAGD	50,000
Statoil	Leismer Expansion	SAGD	20,000
Statoil	Corner	SAGD	40,000
Baytex	Gemini Commercial project	SAGD	5,000
Devon	Walleye Phase 1	SAGD	9,000
Husky	Caribou Demo	SAGD	10,000
OSUM	Orion Phase 2	SAGD	10,000
OSUM	Taiga Phase 1	CSS & SAGD	12,500
OSUM	Taiga Phase 2	CSS & SAGD	12,500
OSUM	Taiga Phase 3	CSS & SAGD	20,000
Pengrowth	Lindbergh Phase 2 Expansion	SAGD	34,000
		Total	1,834,800

## **APPENDIX A.2** Approved Oil Sands Mining Projects

Company	Project Name	Technology	Capacity (b/d)
Imperial	Kearl Phase 3	Mining	80,000
Imperial	Kearl Phase 4 Debottleneck	Mining	45,000
Shell Albian Sands	Jackpine Phase 1B	Mining	100,000
Shell Albian Sands	Jackpine Phase Expansion after 1B	Mining	100,000
Shell Albian Sands	Muskeg River Expansion & Debottlenecking	Mining	115,000
Syncrude Canada	Aurora South Train 1	Mining	100,000
Syncrude Canada	Aurora South Train 2	Mining	100,000
Total E&P Canada	Joslyn Mine Phase 1	Mining	100,000
		Total	740,000

# **APPENDIX B.1** CAPP Canadian Crude Oil Production Forecast 2016 – 2030

housand barrels per day	Actual	Forecas	st													
EASTERN CANADA	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Ontario	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Atlantic Provinces <sup>1</sup>	175	185	206	264	274	240	222	214	193	192	169	143	133	118	99	92
E. CANADA CONVENTIONAL	176	186	207	265	275	241	223	215	194	193	170	144	134	119	100	93
WESTERN CANADA CONVENTIONAL	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Light & Medium																
Alberta	393	355	312	281	264	258	258	262	268	275	280	284	290	296	303	310
British Columbia	21	21	20	19	18	17	16	15	15	14	13	13	12	11	11	10
Saskatchewan <sup>1,2</sup>	238	226	213	209	209	209	210	212	216	221	226	232	238	244	250	257
Manitoba	46	41	39	37	36	35	35	34	33	32	32	31	31	30	29	29
Northwest Territories.	10	10	9	9	8	8	7	7	7	6	6	6	6	5	5	5
Light & Medium	707	653	593	554	535	527	526	531	539	548	557	566	576	586	599	611
Heavy																
Alberta	137	130	123	121	118	113	107	102	96	92	87	83	79	75	71	67
Saskatchewan <sup>2,</sup>	248	233	211	199	190	183	184	188	191	195	198	203	207	212	217	222
Heavy	385	363	334	320	308	296	291	290	288	286	286	285	286	287	288	290
PENTANES/CONDENSATE	219	230	243	252	263	263	264	264	265	265	266	266	266	265	266	266
W. CANADA CONVENTIONAL (incl. condensates)	1,311	1,245	1,170	1,126	1,106	1,086	1,081	1,085	1,092	1,099	1,108	1,117	1,127	1,138	1,152	1,167

Notes:

- 1. Atlantic Canada production includes Newfoundland & Labrador production and negligible volumes from New Brunswick. Condensates/pentanes from Nova Scotia and New Brunswick are also added.
- 2. CAPP allocates Saskatchewan Area III Medium crude as heavy crude. Also 17% of Area IV is > 900 kg/m<sup>3</sup>.

WESTERN CANADA																
OIL SANDS (BITUMEN & UPGRADED CRUDE OIL)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mining	1,023	991	1,130	1,326	1,350	1,376	1,394	1,401	1,404	1,407	1,409	1,412	1,415	1,419	1,472	1,526
In situ	1,342	1,401	1,525	1,590	1,642	1,689	1,739	1,775	1,819	1,847	1,872	1,922	1,967	2,039	2,094	2,141
TOTAL OIL SANDS	2,365	2,393	2,655	2,915	2,992	3,065	3,133	3,177	3,223	3,254	3,281	3,334	3,383	3,458	3,565	3,668
W. Canada Oil Production	3,676	3,638	3,825	4,041	4,098	4,151	4,214	4,261	4,315	4,352	4,389	4,451	4,510	4,596	4,718	4,834
E. Canada Oil Production	176	186	207	265	275	241	223	215	194	193	170	144	134	119	100	93
TOTAL CANADIAN OIL Production	3,852	3,824	4,032	4,307	4,373	4,392	4,437	4,476	4,509	4,546	4,559	4,595	4,644	4,715	4,818	4,928
OIL SANDS RAW BITUMEN**	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mining	1,162	1,122	1,281	1,489	1,516	1,544	1,565	1,576	1,579	1,582	1,586	1,589	1,593	1,598	1,651	1,707
In situ	1,365	1,434	1,552	1,617	1,669	1,716	1,766	1,803	1,847	1,881	1,914	1,965	2,011	2,082	2,150	2,211
TOTAL OIL SANDS RAW BITUMEN	2,527	2,556	2,834	3,106	3,185	3,261	3,331	3,379	3,426	3,463	3,499	3,554	3,604	3,680	3,801	3,917

Totals may not add up due to rounding.

Notes:

\*\* Raw bitumen numbers are provided at the bottom of the table and do not reflect upgrading. The oil sands production numbers at the top of the table (as historically published) are a combination of upgraded crude oil and bitumen and therefore incorporate yield losses from integrated upgrader projects. Production from off-site upgrading projects are included in the production numbers as bitumen.

Blended Supply to Trunk Pipelines and Markets thousand barrels per day

	Actual	Forecas	t													
CONVENTIONAL	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Light and Medium	703	649	589	550	531	523	522	527	535	544	553	562	572	582	595	607
Net Heavy to Market	314	284	253	237	224	210	205	203	201	199	199	198	199	200	201	203
TOTAL CONVENTIONAL	1,018	933	842	787	755	733	726	730	736	743	751	760	771	782	796	811
OIL SANDS																
Upgraded Light (Synthetic) <sup>1</sup>	735	725	771	802	794	834	843	846	842	840	835	830	834	840	845	856
Oil Sands Heavy <sup>2</sup>	2,229	2,267	2,543	2,839	2,944	3,002	3,084	3,140	3,208	3,249	3,285	3,356	3,415	3,506	3,649	3,788
TOTAL OIL SANDS AND UPGRADERS	2,963	2,992	3,314	3,641	3,739	3,836	3,927	3,986	4,049	4,090	4,121	4,186	4,249	4,346	4,495	4,644
Total Light Supply	1,438	1,374	1,360	1,351	1,325	1,357	1,365	1,373	1,377	1,384	1,388	1,392	1,406	1,422	1,440	1,464
Total Heavy Supply	2,543	2,552	2,796	3,076	3,169	3,212	3,288	3,343	3,409	3,449	3,484	3,554	3,614	3,706	3,851	3,991
WESTERN CANADA OIL Supply	3,981	3,925	4,156	4,427	4,494	4,569	4,653	4,715	4,786	4,833	4,872	4,946	5,020	5,128	5,291	5,455

Notes:

1. Includes upgraded conventional.

2. Includes: a) imported condensate b) manufactured diluent from upgraders and c) upgraded heavy volumes coming from upgraders.

# **APPENDIX C** Acronyms, Abbreviations, Units and Conversion Factors

#### Acronyms

API	American Petroleum Institute
AER	Alberta Energy Regulator
CAPP	Canadian Association of Petroleum Producers
EIA	Energy Information Administration
FERC	Federal Energy Regulatory Commission
IEA	International Energy Agency
NEB	National Energy Board
OECD	Organization for Economic Co-operation and Development
PADD	Petroleum Administration for Defense District
U.S.	United States
WCSB	Western Canada Sedimentary Basin
WTI	West Texas Intermediate

#### **U.S. State Abbreviations**

#### **Canadian Provincial Abbreviations**

AB	Alberta
BC	British Columbia
MB	Manitoba
NB	New Brunswick
NL	Newfoundland & Labrador
NWT	Northwest Territories
ON	Ontario
QC	Québec
SK	Saskatchewan

#### Units

b/d barrels per day

#### **Conversion Factor**

1 cubic metre = 6.293 barrels (oil)

AL	Alabama	ME	Maine	OK	Oklahoma
AK	Alaska	MD	Maryland	OR	Oregon
AZ	Arizona	MA	Massachusetts	PA	Pennsylvania
AR	Arkansas	MI	Michigan	SC	South Carolina
CA	California	MN	Minnesota	SD	South Dakota
CO	Colorado	MS	Mississippi	TN	Tennessee
СТ	Connecticut	MO	Missouri	ТХ	Texas
DE	Delaware	MT	Montana	UT	Utah
FL	Florida	NE	Nebraska	VT	Vermont
GA	Georgia	NV	Nevada	VA	Virginia
ID	Idaho	NH	New Hampshire	VI	Virgin Islands
IL	Illinois	NJ	New Jersey	WA	Washington
IN	Indiana	NM	New Mexico	WV	West Virginia
IA	Iowa	NY	New York	WI	Wisconsin
KS	Kansas	NC	North Carolina	WY	Wyoming
KY	Kentucky	ND	North Dakota		
LA	Louisiana	OH	Ohio		

# **APPENDIX D**

### **Crude Oil Pipelines and Refineries**





THE CANADIAN ASSOCIATION OF **PETROLEUM PRODUCERS (CAPP) REPRESENTS COMPANIES, LARGE** AND SMALL, THAT EXPLORE FOR, **DEVELOP AND PRODUCE NATURAL GAS AND CRUDE OIL THROUGHOUT CANADA. CAPP'S MEMBER COMPANIES PRODUCE ABOUT 85 PER CENT OF CANADA'S NATURAL GAS AND CRUDE OIL. CAPP'S ASSOCIATE** MEMBERS PROVIDE A WIDE RANGE **OF SERVICES THAT SUPPORT** THE UPSTREAM CRUDE OIL AND NATURAL GAS INDUSTRY. TOGETHER CAPP'S MEMBERS AND ASSOCIATE MEMBERS ARE AN IMPORTANT PART **OF A NATIONAL INDUSTRY WITH REVENUES FROM OIL AND NATURAL** GAS PRODUCTION OF ABOUT \$120 BILLION A YEAR.

CANADA'S OIL & NATURAL GAS PRODUCERS

#### CALGARY

2100, 350 - 7 Avenue SW Calgary, Alberta, Canada T2P 3N9

#### OTTAWA

1000, 275 Slater Street Ottawa, Ontario, Canada K1P 5H9

#### ST.JOHN'S

1004, 235 Water Street St. John's, Newfoundland and Labrador, Canada A1C 1B6

#### VICTORIA

360B Harbour Road Victoria, British Columbia, Canada V9A 3S1

#### capp.ca

2016 - 0007

### **ATTACHMENT LS-5**



	Min	ing	In Situ		
Producing	\$	47	\$	48	
Under Construction	\$	58	\$	54	
Undeveloped	\$	108	\$	77	



### **ATTACHMENT LS-6**



1-Mar	\$ 54
2-Mar	\$ 53
3-Mar	\$ 53
6-Mar	\$ 53
7-Mar	\$ 53
8-Mar	\$ 50
9-Mar	\$ 49
10-Mar	\$ 48
13-Mar	\$ 48
14-Mar	\$ 48
15-Mar	\$ 49
16-Mar	\$ 49
17-Mar	\$ 49
20-Mar	\$ 48
21-Mar	\$ 47
22-Mar	\$ 48
23-Mar	\$ 48
24-Mar	\$ 48
27-Mar	\$ 48
28-Mar	\$ 48
29-Mar	\$ 50
30-Mar	\$ 50
31-Mar	\$ 51
3-Apr	\$ 50
4-Apr	\$ 51
5-Apr	\$ 51
6-Apr	\$ 52
7-Apr	\$ 52
10-Apr	\$ 53
11-Apr	\$ 53
12-Apr	\$ 53
13-Apr	\$ 53
17-Apr	\$ 53
18-Apr	\$ 52
19-Apr	\$ 50
20-Apr	\$ 50
21-Apr	\$ 50
24-Apr	\$ 49
25-Apr	\$ 50
26-Apr	\$ 50

27-Apr	\$ 49
28-Apr	\$ 49
1-May	\$ 49
2-May	\$ 48
3-May	\$ 48
4-May	\$ 46
5-May	\$ 46
8-May	\$ 46
9-May	\$ 46
10-May	\$ 47
11-May	\$ 48
12-May	\$ 48
15-May	\$ 49
16-May	\$ 49
	\$ 51

#### **Crude Oil Futures Quotes View Another Product** Globex Time & Sales Quotes Settlements **Contract Specs** Volume Margins Calendar Globex Globex Auto Refresh Is ON **Futures** Options Market data is delayed by at least 10 minutes. All market data contained within the CME Group website should be considered as a reference only and should not be used as validation against, nor as a complement to, real-time market data feeds. Settlement prices on instruments without open interest or volume are provided for web users only and are not published on Market Data Platform (MDP). These prices are not based on market activity. Prior Hi / Low Month Options Charts Last Change Settle Open High Low Volume Limit Updated 58.32/ 10:58:04 CT OPT . 542,793 JUL 2017 49.03 +0.71 48.32 48.63 49.17 48.19 38.32 01 Jun 2017

AUG 2017	OPT	al	49.26	+0.70	48.56	48.84	49.40	48.42	97,570	58.56 / 38.56	10:58:02 CT 01 Jun 2017
SEP 2017	OPT	al	49.43	+0.69	48.74	49.02	49.57	48.61	46,314	58.74 / 38.74	10:57:58 CT 01 Jun 2017
OCT 2017	OPT	al	49.56	+0.69	48.87	49.16	49.70	48.75	21,027	58.87 / 38.87	10:57:49 CT 01 Jun 2017
NOV 2017	OPT	al	49.71	+0.70	49.01	49.35	49.84	48.90	16,234	59.01 / 39.01	10:57:49 CT 01 Jun 2017
DEC 2017	OPT	al	49.83	+0.71	49.12	49.44	49.95	49.01	57,962	59.12 / 39.12	10:57:50 CT 01 Jun 2017
JAN 2018	OPT	al	49.93	+0.72	49.21	49.64	50.01	49.22	5,315	59.21 / 39.21	10:57:58 CT 01 Jun 2017
FEB 2018	OPT	al	49.95	+0.70	49.25	49.61	50.03	49.20	2,966	59.25 / 39.25	10:57:53 CT 01 Jun 2017
MAR 2018	OPT	al	50.05	+0.79	49.26	49.86	50.05	49.25	6,446	59.26 / 39.26	10:57:53 CT 01 Jun 2017
APR 2018	OPT	al	49.93	+0.70	49.23	49.56	49.93	49.22	2,470	59.23 / 39.23	10:54:14 CT 01 Jun 2017
MAY 2018	OPT	al	49.40	+0.21	49.19	49.40	49.40	49.19	3,639	59.19 / 39.19	10:57:30 CT 01 Jun 2017

Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	<b>Hi / Low</b> Limit	Updated
JUN 2018	OPT	al	49.83	+0.70	49.13	49.57	49.83	49.07	15,310	59.13 / 39.13	10:57:50 CT 01 Jun 2017
JUL 2018	OPT	al	-	-	49.06	-	-	-	1,099	59.06 / 39.06	10:54:44 CT 01 Jun 2017
AUG 2018	OPT	al	-	-	49.01	-	-	-	809	59.01 / 39.01	10:54:44 CT 01 Jun 2017
SEP 2018	OPT	al	-	-	48.97	-	-	-	1,402	58.97 / 38.97	10:57:32 CT 01 Jun 2017
OCT 2018	OPT	al	-	-	48.94	-	-	-	244	58.94 / 38.94	10:54:25 CT 01 Jun 2017
NOV 2018	OPT	al	-	-	48.93	-	-	-	134	58.93 / 38.93	10:57:47 CT 01 Jun 2017
DEC 2018	OPT	al	49.55	+0.62	48.93	49.36	49.61	48.85	21,950	58.93 / 38.93	10:57:40 CT 01 Jun 2017
JAN 2019	OPT	al	-	-	48.90	-	-	-	1	58.90 / 38.90	10:54:17 CT 01 Jun 2017
FEB 2019	OPT	al	-	-	48.87	-	-	-	16	58.87 / 38.87	10:54:17 CT 01 Jun 2017
MAR 2019	OPT	al	-	-	48.84	-	-	-	93	58.84 / 38.84	10:54:17 CT 01 Jun 2017
APR 2019	OPT	al	-	-	48.83	-	-	-	73	58.83 / 38.83	10:54:18 CT 01 Jun 2017
MAY 2019	OPT	al	-	-	48.83	-	-	-	25	58.83 / 38.83	10:36:04 CT 01 Jun 2017
JUN 2019	OPT	al	49.02	+0.18	48.84	49.11	49.31	48.94	678	58.84 / 38.84	10:57:31 CT 01 Jun 2017
JUL 2019	OPT	al	-	-	48.82	-	-	-	0	58.82 / 38.82	10:01:01 CT 01 Jun 2017
AUG 2019	OPT	al	-	-	48.84	-	-	-	0	58.84 / 38.84	10:01:01 CT 01 Jun 2017
SEP 2019	OPT	al	-	-	48.86	-	-	-	0	58.86 / 38.86	10:01:01 CT 01 Jun 2017
OCT 2019	OPT	al	-	-	48.90	-	-	-	0	58.90 / 38.90	10:01:01 CT 01 Jun 2017
NOV 2019	OPT	al	-	-	48.96	-	-	-	10	58.96 / 38.96	10:01:01 CT 01 Jun 2017
DEC 2019	OPT	al	49.40	+0.37	49.03	49.38	49.59	49.06	2,632	59.03 / 39.03	10:57:31 CT 01 Jun 2017
JAN 2020	OPT	al	-	-	49.04	-	-	-	0	59.04 / 39.04	10:01:01 CT 01 Jun 2017

Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	<b>Hi / Low</b> Limit	Updated
FEB 2020	OPT	al	-	-	49.06	-	-	-	0	59.06 / 39.06	10:01:01 CT 01 Jun 2017
MAR 2020	OPT	-1	-	-	49.09	-	-	-	0	59.09 / 39.09	10:01:01 CT 01 Jun 2017
APR 2020	OPT	al	-	-	49.13	-	-	-	0	59.13 / 39.13	10:01:01 CT 01 Jun 2017
MAY 2020	OPT	al	-	-	49.17	-	-	-	0	59.17 / 39.17	10:01:01 CT 01 Jun 2017
JUN 2020	OPT	al	-	-	49.23	-	-	-	1	59.23 / 39.23	10:01:01 CT 01 Jun 2017
JUL 2020	OPT	al	-	-	49.22	-	-	-	0	59.22 / 39.22	10:01:01 CT 01 Jun 2017
AUG 2020	OPT	al	-	-	49.25	-	-	-	0	59.25 / 39.25	10:01:01 CT 01 Jun 2017
SEP 2020	OPT	al	-	-	49.31	-	-	-	0	59.31 / 39.31	10:01:01 CT 01 Jun 2017
OCT 2020	OPT	al	-	-	49.39	-	-	-	0	59.39 / 39.39	10:01:01 CT 01 Jun 2017
NOV 2020	OPT	al	-	-	49.49	-	-	-	0	59.49 / 39.49	10:01:01 CT 01 Jun 2017
DEC 2020	OPT	al	49.97	+0.35	49.62	49.91	49.97	49.76	200	59.62 / 39.62	10:54:18 CT 01 Jun 2017
JAN 2021	OPT	al	-	-	49.65	-	-	-	0	59.65 / 39.65	10:01:01 CT 01 Jun 2017
FEB 2021	OPT	al	-	-	49.70	-	-	-	0	59.70 / 39.70	10:01:01 CT 01 Jun 2017
MAR 2021	OPT	al	-	-	49.77	-	-	-	0	59.77 / 39.77	10:01:01 CT 01 Jun 2017
APR 2021	OPT	al	-	-	49.86	-	-	-	0	59.86 / 39.86	10:01:01 CT 01 Jun 2017
MAY 2021	OPT	al	-	-	49.97	-	-	-	0	59.97 / 39.97	10:01:01 CT 01 Jun 2017
JUN 2021	OPT	al	-	-	50.10	-	-	-	0	60.10 / 40.10	10:01:01 CT 01 Jun 2017
JUL 2021	OPT		-	-	50.13	-	-	-	0	60.13 / 40.13	10:01:01 CT 01 Jun 2017
AUG 2021	OPT	al	-	-	50.18	-	-	-	0	60.18 / 40.18	10:01:01 CT 01 Jun 2017
SEP 2021	OPT	al	-	-	50.26	-	-	-	0	60.26 / 40.26	10:01:01 CT 01 Jun 2017
Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	<b>Hi / Low</b> Limit	Updated
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OCT 2021	OPT	al	-	-	50.37	-	-	-	0	60.37 / 40.37	10:01:01 CT 01 Jun 2017
NOV 2021	OPT	•1	-	-	50.50	-	-	-	0	60.50 / 40.50	10:01:01 CT 01 Jun 2017
DEC 2021	OPT	al	-	-	50.65	-	-	-	8	60.65 / 40.65	10:30:04 CT 01 Jun 2017
JAN 2022	OPT	al	-	-	50.70	-	-	-	0	60.70 / 40.70	10:01:01 CT 01 Jun 2017
FEB 2022	OPT	al	-	-	50.76	-	-	-	0	60.76 / 40.76	10:01:01 CT 01 Jun 2017
MAR 2022	OPT	al	-	-	50.84	-	-	-	0	60.84 / 40.84	10:01:01 CT 01 Jun 2017
APR 2022	OPT	al	-	-	50.93	-	-	-	0	60.93 / 40.93	10:01:01 CT 01 Jun 2017
MAY 2022	OPT	al	-	-	51.04	-	-	-	0	61.04 / 41.04	10:01:01 CT 01 Jun 2017
JUN 2022	OPT	al	-	-	51.18	-	-	-	0	61.18 / 41.18	10:01:01 CT 01 Jun 2017
JUL 2022	OPT	al	-	-	51.21	-	-	-	0	61.21 / 41.21	10:01:01 CT 01 Jun 2017
AUG 2022	OPT	al	-	-	51.27	-	-	-	0	61.27 / 41.27	10:01:01 CT 01 Jun 2017
SEP 2022	OPT	al	-	-	51.36	-	-	-	0	61.36 / 41.36	10:01:01 CT 01 Jun 2017
OCT 2022	OPT	al	-	-	51.47	-	-	-	0	61.47 / 41.47	10:01:01 CT 01 Jun 2017
NOV 2022	OPT	al	-	-	51.60	-	-	-	0	61.60 / 41.60	10:01:01 CT 01 Jun 2017
DEC 2022	OPT	al	51.99	+0.23	51.76	52.26	52.26	51.93	20	61.76 / 41.76	10:10:47 CT 01 Jun 2017
JUN 2023	OPT	al	-	-	52.26	-	-	-	0	62.26 / 42.26	10:01:01 CT 01 Jun 2017
DEC 2023	OPT	al	-	-	52.77	-	-	-	0	62.77 / 42.77	10:55:37 CT 01 Jun 2017
JUN 2024	OPT	al	-	-	53.16	-	-	-	0	63.16 / 43.16	10:01:01 CT 01 Jun 2017
DEC 2024	OPT	al	-	-	53.56	-	-	-	0	63.56 / 43.56	10:01:01 CT 01 Jun 2017
JUN 2025	OPT	al	-	-	53.78	-	-	-	0	63.78 / 43.78	10:01:01 CT 01 Jun 2017

Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	<b>Hi / Low</b> Limit	Updated
DEC 2025	OPT	al	-	-	54.01	-	-	-	0	64.01 / 44.01	10:01:01 CT 01 Jun 2017
Legend: OF	<b>PT</b> Options	II Price	e Chart							<b>?</b> A	bout This Repor

# **ATTACHMENT LS-7**



# **Understanding Bitumen Pricing**

#### Home » Understanding Bitumen Pricing



A question that we often hear at GLJ is,

#### "What is your forecast price for bitumen?"

In general, stakeholders want to know the value of the bitumen at the wellhead to inform project economic forecasts.

The short answer to the above question is, **"It depends."** 

The price that an oil sands producer will receive for their bitumen at the wellhead requires answers to many questions, including:

What market is the bitumen sold to?
What are the components of the produced bitumen?
What is the actual product? Dil-bit or raw bitumen?
How much diluent is in the blended product?
What is the cost of diluent?
What is the cost of transporting the diluent to the field?

• What is the cost of transporting the final product to market?

Each of these factors has an effect on the ultimate value of the raw product. Transporting by rail to the Gulf of Mexico, for instance, was a popular option just a few years ago, but has fallen out of favor with tightening differentials between WTI and Brent and lower commodity prices in general. For this reason, it would be disingenuous to present a bitumen price forecast without understanding the specifics of the individual circumstances. The basics of bitumen marketing can be modeled relatively simply, allowing for straightforward evaluation of different pricing options and/or changing price forecasts.

The easiest way to illustrate how one might calculate a wellhead bitumen price for a particular project is through examples. Below are two typical marketing options a company might have at their disposal. The benchmark prices used in the examples are the Q2-Q4 2016 prices from the April 1, 2016 GLJ price forecast. Blend ratios, differentials and transportation costs are for demonstration purposes only.

#### Example 1:

Let's imagine an in-situ bitumen producer whose main customers are refiners in the Midwest. In order to transport the bitumen by pipeline, it is blended with diluent on-site and shipped and sold as diluted bitumen (dil-bit). The process to get the final product to market would be:

- 1. Acquire the diluent
- 2. Transport the diluent to the field
- 3. Blend the bitumen and diluent
- 4. Transport the dil-bit to the sales point
- 5. Sell the dil-bit at sales point

Let's work our way backwards through the scenario. For simplicity, we won't worry about the specifics of the Midwest refining economics and we'll instead set the final sales point closer to the project. The GLJ benchmark price for Western Canadian Select (WCS) is used as a reasonable benchmark for dil-bit sold at Hardisty, AB. Let's say that WCS is currently priced at 42.46 CAD/bbl. The dil-bit will typically be sold at the WCS price level, minus some small differential dictated by the specifics of the product. For this example, let's assume that the differential is around -4.00 CAD/bbl. At this point, the producer is fetching 42.46 -4.00 = 38.46 CAD/bbl for their dil-bit.

Prior to that, the dil-bit was transported from the field to Hardisty. This could have occurred by pipeline (cheaper), or by a more expensive option like truck or rail. In this instance, let's assume that the project is tied-in to a sales pipeline and that the tariff for dil-bit is 3.00 CAD/bbl. At this point, the dil-bit price is 38.46 - 3.00 = 35.46 CAD/bbl at the field level.

This gives us the value of the blended product at the field level. However, there was a cost in adding that diluent to create the dil-bit. We'll estimate the diluent price using the GLJ Edmonton pentanes plus (condensate) benchmark forecast. Similar to the dil-bit, the cost of the diluent can be estimated as the benchmark price, plus any postings premiums, plus the cost to transport it to the field. Let's assume, for this example, that the operator is trucking in condensate at a cost of 5.00 CAD/bbl and is paying the Edmonton condensate price plus 0.50 CAD/bbl. Using a condensate price of 56.40 CAD/bbl, a postings premium of 0.50 CAD/bbl and a transportation cost of 5.00 CAD/bbl, we calculate that diluent at the field costs 56.40 + 0.50 + 5.00 = 61.90 CAD/bbl.

The amount of diluent required per barrel of dil-bit is a function of the specific properties of the produced bitumen, as well as the pipeline specifications at the ultimate sales terminal. A typical value for Athabasca bitumen is 30% diluent by volume. This means that in every barrel of dil-bit, there are 0.3 barrels of diluent and 0.7 barrels of bitumen. (The blend ratio may alternatively be expressed as 0.3 / 0.7 or 0.429 bbl diluent per bbl bitumen.) So, in this example, every barrel of dil-bit has 0.3 x 61.90 = 18.57 CAD/bbl in diluent costs. Of the 35.46 CAD/bbl received for the dil-bit, the amount associated with the actual bitumen is 35.46 - 18.57 = 16.89 CAD for 0.7 barrels of bitumen, or 24.13 CAD per barrel of bitumen.

#### Example 2:

 $\equiv$ 

A second option that exists for selling bitumen is via rail to the Gulf of Mexico. This scenario has potential advantages and disadvantages compared to the previous example. On the positive side, the price benchmark for the sales would be based on a world heavy oil price, such as Mexican Mayan crude (sometimes just called "Maya"). Selling at this price was particularly advantageous in past years due to the large price difference between WTI and Brent. In addition, bitumen transported by rail doesn't need as much blended diluent as it does when transported by pipeline, reducing diluent costs. Diluent can also be purchased at the Gulf of Mexico and transported back in the same rail cars, potentially providing further savings on diluent costs. The downside to crude-by-rail is the high transportation cost when compared to pipeline.

For simplicity, let's assume the same diluent costs as in Example 1. The dil-bit fetches Maya less 4.00 CAD/bbl and only needs to be composed of 20% diluent instead of the 30% required in the pipeline scenario. Transportation costs, however, are much higher at 20 CAD/bbl. The forecast Maya price is 49.91 CAD/bbl.

The netback price for bitumen under this scenario is:

[(49.91 - 4.00) - 20.00 - (61.90 x 0.2)] / 0.8 = 16.91 CAD/bbl bitumen. In this case, the rail scenario currently loses to the WCS sales example by just over \$7/bbl, but under certain circumstances, rail transportation can be the better option.

The generalized form of the netback pricing equation is:

$$P_{wh} = (P_1 + D_1 - T_1)(1 + B) - (P_2 + D_2 + T_2)B$$

Where:

- Pwh: Wellhead bitumen price
- P1: Benchmark price for final sales product
- D<sub>1</sub>: Differential to benchmark price
- T<sub>1</sub>: Transportation cost of final sales product to sales point
- P2: Benchmark price for diluent

D<sub>2</sub>: Differential to diluent benchmark price

- T<sub>2</sub>: Cost to transport diluent to field
- B Blend ratio (bbl diluent per bbl bitumen)

Using the above formula, combined with specific marketing assumptions, we can calculate the impact of different pricing scenarios and changes to the benchmark price forecasts.

#### Posted by Bill Spackman on May 18, 2016



AUTHOR BIOGRAPHY - Bill holds the position of Senior Reservoir Engineer at GLJ and has a wide breadth of experience including domestic and international reserve evaluations; conventional, unconventional and enhanced oil recovery. Bill one of the leading experts in the evaluation reserves and resources for in-situ oilsands projects and has a concentrated focus on the evaluation of in-situ projects in Alberta and Saskatchewan's oil sands; including the application of various technologies in multiple formations, both clastic and carbonate. In addition to evaluations work, Bill is responsible for overseeing the development of GLJ's proprietary in-situ oil sands evaluation software.

Tags: Bitumen Pricing

#### Previous

Next 🕨

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#### ABOUT US

Company Profile Our Team Partners Clients Community Involvement

#### EVALUATIONS

Reserves & Resources Asset Transactions Scoping Analysis

#### SPECIALIZED CONSULTING

Technical Studies Risk & Sensitivity Analysis Expert Witness Technical Training

#### COMMODITY PRICE FORECASTS

Price Charts Forecasts **ATTACHMENT LS-8** 



450 - 1st Street SW Calgary, Alberta, Canada T2P 5H1 Tel: (403) 920-2918 Fax: (403) 920-2285 E-mail: julie\_kemp@transcanada.com

October 21, 2016

**Oil Pipeline Filing** 

Ms. Kimberly D. Bose Secretary Federal Energy Regulatory Commission 888 First Street NE Washington, DC 20426

**Filed Electronically** 

# Re: TransCanada Keystone Pipeline, LP, by its general partner, TransCanada Keystone Pipeline GP, LLC (TransCanada Keystone) FERC No. 7.3.0 Rate Tariff

Dear Ms. Bose:

In accordance with the requirements of the Interstate Commerce Act (ICA), 49 U.S.C § 1 et seq. and the Rules and Regulations of the Federal Energy Regulatory Commission (FERC), 18 C.F.R. Part 341, TransCanada Keystone submits for filing FERC No. 7.3.0, issued on October 21, 2016, to be effective November 10, 2016, upon 19 days' notice. FERC No. 7.3.0 cancels FERC No. 7.2.0 (Docket No. IS16-539-000).

TransCanada Keystone is establishing a new rate for Shippers to tender volumes to the new Sour Lake interconnect facility. TransCanada Keystone is concurrently filing this rate in its local tariff, FERC No. 6.27.0 which is supported by an affidavit that accords with the requirements of 18 C.F.R. § 342.2(b) in that filing.

There are no changes being made to TransCanada Keystone's rules and regulations as a result of these proposed changes. All rates remain unchanged. In accordance with the Commission's policy, the International Joint Tariff (IJT) rates set forth in FERC No. 7.3.0 are less than the sum of the local tariff rates for the component movements on Keystone Canada Pipeline System and the Pipeline System.

This IJT is concurrently filed with the National Energy Board in Canada as NEB Tariff No. 24.

TransCanada Keystone requests special permission pursuant to 18 C.F.R. § 341.14 to file this tariff on 19 days' notice and respectfully requests a waiver of Section 6 (3) of the ICA. TransCanada Keystone submits that good cause exists for such waiver in that it will provide the new rate to all Shippers at the earliest possible date. TransCanada Keystone understands that FERC No. 7.3.0 is conditionally accepted, subject to refund, pending a 30 day review.

Ms. Kimberly D. Bose October 21, 2016 Page 2 of 2

In accordance with 18 C.F.R. § 341.2(c)(2), I hereby certify that this filing has been sent on this day to each subscriber of TransCanada Keystone's tariff publication and applicable shippers by first-class mail or by email.

Pursuant to 18 C.F.R. § 343.3(a), TransCanada Keystone respectfully requests that any protests directed to the enclosed tariff filings be faxed to Tracy S. Penn at (403) 920-2285.

If you have any questions concerning this tariff filing, please contact me by phone at (403) 920-2918 or by email at julie\_kemp@transcanada.com.

Sincerely, TransCanada Keystone Pipeline, LP

Julie Kemp Liquids Pipelines Regulatory

Attachments

cc: Mr. Aaron Kahn, FERC

National Energy Board Tariff No. 24 FERC No. 7.3.0 Cancels F.E.R.C. No. 7.2.0 FERC ICA Oil Tariff

# TransCanada Keystone Pipeline GP Ltd.

as general partner on behalf of TransCanada Keystone Pipeline Limited Partnership

In Connection with

# TransCanada Keystone Pipeline, LP

by its general partner TransCanada Keystone Pipeline GP, LLC

International Joint Rate Tariff Containing Rates Applying to the Transportation of Petroleum

# From Hardisty, Alberta To Port Arthur and Houston, Texas

The transportation rates listed in this tariff are subject to the Rules and Regulations published by:

TransCanada Keystone Pipeline GP Ltd., National Energy Board (NEB) Tariff No. **[W]2123** and supplements thereto and reissues thereof, for transportation within Canada; and TransCanada Keystone Pipeline, LP's, F.E.R.C. No. 5. **[W]45**.0, and supplements thereto and reissues thereof; for transportation within the United States.

For the purpose of this tariff, capitalized terms used herein and not otherwise defined have the meanings set out in such Rules and Regulations.

# [N] <u>Issued on 19 days' notice under authority of 18 CFR § 341.14. This tariff publication is</u> conditionally accepted subject to refund pending a 30 day review period.

The provisions published herein will, if effective, not result in an effect on the quality of the human environment.

### Issued: October 21, 2016

Issued by:

Trudy Eisele TransCanada Keystone Pipeline GP Ltd. 450 – 1<sup>st</sup> Street SW Calgary, Alberta T2P 5H1 Canada

# Effective: November 10, 2016

**Compiled by:** Julie Kemp TransCanada Keystone Pipeline GP Ltd. 450 – 1<sup>st</sup> Street SW Calgary, Alberta T2P 5H1, Canada (403) 920-2918 (403) 920-2285 (fax) julie\_kemp@transcanada.com

website: http://www.transcanada.com/keystone-shipper-information.html

# NEB Tariff No. 24

# Page 2 of 2

FERC No. 7.3.0

#### **International Joint Uncommitted Rates**

(Rates in United States dollars per Barrel)

Origin	Destination	Light Crude	Heavy Crude
	Port Arthur, Texas	[U]7.113	[U]7.730
Haldisty, Alberta	Houston, Texas	[U]7.113	[U]7.730

#### Notes:

- 1) The international joint rates herein are applicable to a Non-Term Shipper who specifies the international joint service via a Notice of Shipment and to a Term Shipper for volumes Tendered in excess of the Contract Volume in accordance with Term Shipper's Contract.
- Volumes Tendered at the Lucas interconnect facility will be charged an additional [U] US\$0.629/m<sup>3</sup> ([U] US\$0.10/bbl) for volumes Delivered at such facility.
- 3) Volumes Tendered at the Beaumont interconnect facility will be charged an additional [U] US\$0.818/m<sup>3</sup> ([U] US\$0.13/bbl) for volumes Delivered at such facility.
- [N]<u>4) Volumes Tendered at the Sour Lake interconnect facility will be charged an additional US\$5.629/m<sup>3</sup> (US\$0.895/bbl) for volumes Delivered at such facility.</u>
- [W]45) There will be an Abandonment Surcharge of [U] CAD\$0.369/m<sup>3</sup> ([U] CAD\$0.06/bbl) applicable to all Shippers in accordance with the determination of the Abandonment Charge as set forth in NEB Tariff No. 21.

### Joint Routing:

TransCanada Keystone Pipeline GP Ltd. - Hardisty, Alberta to International Boundary at or near Haskett, Manitoba connecting to;

TransCanada Keystone Pipeline, LP - International Boundary at or near Haskett, Manitoba to Port Arthur and Houston, Texas.

### **Exceptions:**

 Exception to F.E.R.C. No. 5. [W]4<u>5</u>.0, Item 9, Payment of Tariff Rates and Other Charges and Lien for Unpaid Charges: For the purposes of this international joint tariff, NEB Tariff No. [W]2<u>123</u>, Article 9, will apply.

Explanation of reference marks:

[N] New, [U] Unchanged Rate, [W] Change in Wording.

FERC rendition of the electronically filed tariff records in Docket No. IS17-00014-000 Filing Data: CID: C001060 Filing Title: TransCanada Keystone FERC 7.3.0 Company Filing Identifier: 85 Type of Filing Code: 830 Associated Filing Identifier: Tariff Title: Oil Pipeline Tariffs Tariff ID: 15 Payment Confirmation: Suspension Motion:

Tariff Record Data: Record Content Description, Tariff Record Title, Record Version Number, Option Code: Tariff, F.E.R.C. No. 7.3.0, 7.3.0, A Record Narative Name: Tariff Record ID: 7 Tariff Record Collation Value: 838860800 Tariff Record Parent Identifier: 0 Proposed Date: 2016-10-21 Priority Order: 100000000 Record Change Type: CHANGE Record Content Type: 2 Associated Filing Identifier:

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Document Content(s)
FERC 7.3.0 Keystone Transmittal Letter.PDF
FERC No. 7.3.0_ Clean.PDF
FERC GENERATED TARIFF FILING.RTF



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#### Enbridge Pipelines Inc. 200, 425 – 1<sup>st</sup> Street SW Calgary, Alberta T2P 3L8 Canada

**ENBRIDGE PIPELINES (FSP) L.L.C.** 

August 19, 2016

E-FILED

**Oil Pipeline Tariff Filing** 

Kimberly D. Bose, Secretary Federal Energy Regulatory Commission Room 1A, Dockets 888 First Street, N.E. Washington, DC 20426 USA

Dear Ms. Bose:

Re: FERC Tariff No. 3.12.0

Enclosed for filing, pursuant to the Interstate Commerce Act and the Federal Energy Regulatory Commission's (FERC or the Commission) regulations, is the following tariff issued by Enbridge Pipelines (FSP) L.L.C. (Enbridge FSP) on behalf of itself, Enbridge Pipelines Inc. (EPI) and Enbridge Energy, Limited Partnership (Enbridge Energy):

 FERC Tariff No. 3.12.0 (International Joint Tariff), canceling FERC Tariff No. 3.11.0 (Docket No. IS16-612)

This tariff bears an issuance date of August 19, 2016 and an effective date of October 1, 2016.

### **Explanation of Tariff Filing**

FERC Tariff No. 3.12.0 is being filed to provide a discount to the rates currently charged for committed volumes of medium crude petroleum. FERC Tariff No. 3.12.0 also cancels the language on page 2 of the tariff that specifies committed volumes having a density greater than light crude petroleum will be charged the rate for heavy crude petroleum. In addition, the tariff number referenced for EPI's receipt tankage tariff has been updated.

Under the current International Joint Tariff (IJT) (FERC Tariff No. 3.11.0), committed volumes of medium crude petroleum are charged the rate for heavy crude petroleum. The proposed medium committed rates follow the methodology used for determining both the

underlying local rates and the uncommitted IJT rate for the same movement. It is Enbridge FSP's intention that medium crude petroleum volumes shipped at the discounted committed rate will be deemed to satisfy shipper volume commitments under the existing Transportation Services Agreements (TSAs) with Enbridge FSP as if those volumes had been shipped at the current committed rate for heavy crude petroleum.

### FSP International Joint Tariff Rate

The IJT Rates for committed shipments on Enbridge FSP, EPI and Enbridge Energy were established in accordance with TSAs entered into between Enbridge FSP and its shippers.

The TSAs were executed during the course of two widely publicized open seasons; the first commencing on October 3, 2011 and concluding on November 2, 2011 and the second commencing on January 4, 2012 and concluding on February 17, 2012 (the Open Seasons).

Separate rates for light, medium and heavy crude petroleum are standard on the Enbridge Mainline system. However, many other pipeline systems do not differentiate between medium and heavy crude petroleum, including the Seaway Pipeline from which Enbridge FSP leases a portion of its pipeline capacity. At the time of the Open Seasons, no interested party had expressed an interest in transporting medium crude petroleum on the Flanagan South Pipeline (FSP). Consistent with the practice on Seaway, Enbridge FSP did not offer a separate rate for medium crude petroleum in the TSAs.<sup>1</sup> Instead, the TSAs specified rates for light crude petroleum and heavy crude petroleum (without defining the specific break point between light and heavy crude petroleum).

When FSP went into commercial service on December 1, 2014, IJT rates for light and heavy crude petroleum were posted, but no medium crude petroleum rates were posted. Shortly after FSP went into service, shippers began requesting the ability to transport medium crude petroleum. In response, Enbridge FSP filed FERC Tariff No. 3.2.0 which stipulated that any committed volumes with a density greater than 876 k/m<sup>3</sup> (crude petroleum with a density greater than 11ght crude petroleum) would be charged the heavy crude petroleum rate. FERC Tariff No. 3.2.0 also established uncommitted IJT rates for medium crude petroleum.

In early 2016, committed shippers asked Enbridge FSP to reduce the committed rate for medium crude petroleum, in recognition of the fact that the tariff rates for uncommitted medium crude petroleum shipments were lower than the tariff rates for uncommitted heavy

<sup>&</sup>lt;sup>1</sup> FERC Tariff No. 3.1.0

crude petroleum shipments. Through this tariff filing Enbridge FSP seeks to respond to this request with committed IJT rates for medium crude petroleum that approximate the rates it would have offered during the Open Seasons if any prospective shipper had shown an interest in transporting medium crude petroleum at that time.

### Proposed Medium Crude Petroleum Committed Rate

Under the current IJT (FERC Tariff No. 3.11.0), committed volumes of medium crude petroleum are charged the committed rate for heavy crude petroleum. The proposed medium committed IJT rate provides a discount from the heavy committed IJT rate.

Although Enbridge FSP did not offer a separate medium crude petroleum tariff rate during the Open Seasons, there is no indication that any interested party's decision not to sign a TSA during the Open Seasons was affected by the absence of a separate tariff rate for medium crude petroleum. In fact, at the time of the Open Seasons, no interested party suggested to Enbridge FSP any intent to transport medium crude petroleum, nor did any party request a separate rate for doing so. The interest in moving medium crude petroleum on FSP did not materialize until after the pipeline was already in service. At that time, it was no longer feasible to offer the separate medium crude petroleum rate through a new open season, because Enbridge FSP had accepted volume commitments equal to 90 percent of its overall capacity in the original Open Seasons. As a result, offering additional committed capacity to new parties would have conflicted with Commission policy requiring at least 10 percent of the pipeline's capacity to be available for uncommitted movements.

Given these circumstances, it should not be necessary, nor is it possible, to offer a separate committed rate for medium crude petroleum through a new open season. Any shipper that desired to transport medium crude at the time of the original Open Seasons could have requested a separate rate for such movements, and none did. The ability to transport medium crude petroleum was implicitly part of the TSAs that were offered in the original Open Seasons, since those TSAs did not specifically define different types of crude petroleum and therefore did not exclude medium crude petroleum. The new element here is not the service of transporting medium crude petroleum, but only the rate applicable to such movements. Since the medium crude petroleum rate is within the range of rates that were offered in the Open Seasons (that is, it falls between the light and heavy crude petroleum rates that were set forth in the TSAs), it is difficult to believe that an interested party that wanted to transport medium crude petroleum on FSP actually refrained from signing a TSA during the Open Seasons without even inquiring about a separate medium crude petroleum rate. Thus, the essential function of an open season was fulfilled here, in that the availability of the service was publicized (along with the range of rates for different types of crude petroleum) and no interested parties sought specific rates for medium crude petroleum service at the time.

Despite the fact that the proposed medium crude petroleum committed IJT cannot currently be offered through an open season, it is nonetheless a reasonable and non-discriminatory response to the request of a committed shipper to establish a reduced committed IJT rate for medium crude petroleum. Currently, uncommitted shippers can transport medium crude petroleum at a rate that is less than the uncommitted rate to transport heavy crude petroleum. The proposed medium crude petroleum committed rate in the IJT merely extends that same privilege to committed shippers. Furthermore, the proposed rates follow the same convention of commodity differentiation that underlies the uncommitted IJT rate. which is based on the local tariffs of the carriers comprising the joint transportation movement. The EPI and Enbridge Energy local tariffs provide separate rates for light, medium and heavy crude petroleum where the rate for medium crude petroleum is approximately 8 percent higher than the rate for light crude petroleum and the rate for heavy crude petroleum is approximately 22 percent higher than the rate for light crude petroleum. The FSP local tariff does not provide differentiated rates based on crude type. Accordingly, the proposed medium committed IJT rate reflects a discount from the heavy committed rate for the portions of the IJT attributable to EPI and Enbridge Energy but not to the portion of the IJT attributable to FSP.

Under the unique circumstances of this case, the proposed rates are both just and reasonable and not unjustly discriminatory. They do not substantially deviate from the existing TSA rate structure and terms of service and they are within the specified ranges of the rates that were publicly offered through the two separate open season processes. Furthermore, as Appendix A demonstrates, the international joint rates set forth in FERC Tariff No. 3.12.0 are each equal to or less than the sum of the local rates for the component movements on EPI<sup>2</sup>, Enbridge Energy, and Enbridge FSP comprising the international through service addressed in FERC Tariff No. 3.12.0.

### Notification

I hereby certify that Enbridge FSP has, on or before this date, provided copies of the above tariff to each person on the Enbridge FSP tariff subscriber list, Enbridge Energy tariff

<sup>&</sup>lt;sup>2</sup> The local rates for EPI are filed with and approved by the National Energy Board (NEB) in Canada which performs a similar statutory role as that of the Commission to ensure that rates in effect are just and reasonable (*Express Pipeline*, *LLC*, 104 FERC ¶ 61,207 (2003)).

subscriber list and EPI tariff subscriber list by electronic means or by other means agreed upon.

Pursuant to 18 C.F.R. 343.3 of the Commission's regulations, it is requested that any protest related to this tariff filing be sent via email to Enbridge-Tariffs@enbridge.com.

If you have any questions concerning this filing, please contact the undersigned at (403) 231-5940.

Yours truly,

Feisal Gazie Senior Manager Regulatory Strategy and Compliance

Enclosures

cc: Enbridge FSP Tariff Subscribers Enbridge Energy Tariff Subscribers EPI Tariff Subscribers **NEB No. 405** Replaces NEB No. 404 **FERC No. 3.12.0** Cancels FERC No. 3.11.0



#### ENBRIDGE PIPELINES (FSP) L.L.C. (FLANAGAN SOUTH PIPELINE SYSTEM)

#### IN CONNECTION WITH

#### **ENBRIDGE PIPELINES INC.**

AND

#### **ENBRIDGE ENERGY, LIMITED PARTNERSHIP**

#### INTERNATIONAL JOINT RATE TARIFF

#### FROM POINTS IN THE PROVINCES OF ALBERTA, SASKATCHEWAN AND MANITOBA

TO

#### POINTS IN THE STATE OF TEXAS

The rates listed in this tariff are subject to the Rules and Regulations published by:

Enbridge Pipelines Inc. NEB Tariff No. 388, or successive issues thereof, for transportation within Canada;

Enbridge Energy, Limited Partnership FERC Tariff No. 41.12.0, or successive issues thereof, for transportation within the United States; and

Enbridge Pipelines (FSP) L.L.C. FERC Tariff No. 1.3.0, or successive issues thereof, for transportation within the United States.

The provisions published herein will, if effective, not result in an effect on the quality of the human environment.

#### **ISSUED:** August 19, 2016

#### **ISSUED BY:**

Dave Wudrick Senior Director Strategic Planning, Regulatory and Analysis Enbridge Pipelines Inc. 200, Fifth Avenue Place 425 – 1<sup>st</sup> Street S.W. Calgary, AB Canada T2P 3L8

#### **EFFECTIVE: October 1, 2016**

#### **COMPILED BY:**

David Parker Regulatory Strategy and Compliance Enbridge Pipelines Inc. (403) 767-3711

E-mail: Enbridge-Tariffs@enbridge.com

The rates listed in this tariff are payable in United States currency and are applicable on the international movement of Crude Petroleum tendered to Enbridge Pipelines Inc. at established receiving points in Canada for the purpose of transportation on the Flanagan South Pipeline System in the United States.

#### **RATES:**

Rates set forth apply to transportation from the receipt point to the delivery point for a given volume tier. The Joint Committed Rate for Committed Volumes payable by a shipper at any time shall be based on its then current Committed Volume.

Commodities shall be classified on the basis of the density and viscosity of such commodities at the time of receipt by Enbridge Pipelines Inc. and assessed a transportation rate as listed in the transportation rate tables below. Density shall be based on  $15^{\circ}$ C. Viscosity shall be based on Enbridge Pipelines Inc.'s reference line temperature at the time of receipt. Where the density of a commodity falls within the density range of one commodity classification and the viscosity of the commodity falls within the viscosity range of another commodity classification, then the commodity shall be deemed to be in the commodity classification with the higher transportation rate.

[C] Any committed volumes of crude petroleum moving on the Flanagan South Pipeline that have a density greater than 876k/m<sup>3</sup>, will be charged the heavy crude petroleum rate for that movement.

LIGHT CRUDE PETROLEUM (LIGHT) – A commodity having a density from 800 kg/m<sup>3</sup> up to but not including 876 kg/m<sup>3</sup> and a viscosity from 2 mm<sup>2</sup>/s up to but not including 20 mm<sup>2</sup>/s will be classified as Light Crude Petroleum.

MEDIUM CRUDE PETROLEUM (MEDIUM) – A commodity having a density from 876 kg/m<sup>3</sup> up to but not including 904 kg/m<sup>3</sup> and a viscosity from 20 mm<sup>2</sup>/s up to but not including 100 mm<sup>2</sup>/s will be classified as Medium Crude Petroleum.

HEAVY CRUDE PETROLEUM (HEAVY) – A commodity having a density from 904 kg/m<sup>3</sup> to 940 kg/m<sup>3</sup> inclusive and a viscosity from 100 up to and including 350 mm<sup>2</sup>/s will be classified as Heavy Crude Petroleum.

TANKAGE: Tankage charges incurred on Enbridge Pipelines Inc. or Enbridge Energy, Limited Partnership are included in the committed joint rates. For the applicable Tankage charges for the uncommitted rates in Canada and the United States, refer to Enbridge Pipelines Inc.'s NEB Tariff No. 401, Enbridge Pipelines Inc.'s NEB RT Tariff No. [W] <u>16-4</u> <del>16-3</del>, and Enbridge Energy, Limited Partnership's FERC Tariff No. 43.21.0, and successive issues thereof.

LOSS ALLOWANCE: Enbridge Pipelines Inc. shall deduct 1/20<sup>th</sup> of 1% of the volumes of Crude Petroleum received into its facilities to cover loss due to shrinkage and evaporation incident to transportation on the Carrier's facilities. Enbridge Energy, Limited Partnership and Enbridge Pipelines (FSP) L.L.C. will deduct loss allowance according to their respective Rules and Regulations.

#### NOTES:

The transportation rates include abandonment surcharges pursuant to NEB MH-001-2013 Reasons for Decision and Order MO-030-2014.

#### **JOINT ROUTING:**

Receipt points in the provinces of Alberta, Saskatchewan and Manitoba to delivery points in the state of Texas.

Enbridge Pipelines Inc. – Edmonton or Hardisty, Alberta; Kerrobert or Regina, Saskatchewan; Cromer, Manitoba to the International Border near Gretna, Manitoba, connecting to;

Enbridge Energy, Limited Partnership – International Border near Neche, North Dakota to Flanagan, Illinois, connecting to;

Flanagan South Pipeline System – Flanagan, Illinois to ECHO Terminal (Harris County), Texas; Seaway Freeport (Brazoria County), Texas; Phillips 66 Refinery Sweeny (Brazoria County), Texas; or Beaumont/Port Arthur, Texas.

# JOINT TRANSPORTATION RATES FOR ENBRIDGE PIPELINES INC., ENBRIDGE ENERGY, LIMITED PARTNERSHIP AND FLANAGAN SOUTH PIPELINE SYSTEM

# [U] All rates in the following table are unchanged.

	1 <sup>st</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup>								
LIGHT CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>									
From									
Term	Volume (barrels per day)	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba			
10 Years	99,999 or less	\$6.3441	\$6.1059	\$5.9994	\$5.7866	\$5.5259			
15 Years	49,999 or less	\$6.0906	\$5.8523	\$5.7459	\$5.5331	\$5.2723			
15 Years	50,000 +	\$5.8877	\$5.8877 \$5.6495 \$5.5431 \$5.3302 \$5.0695						

# [N] All rates in the following table are new.

1 <sup>st</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup> MEDIUM CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>								
	From							
Term Volume (barrels per day)		Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba		
10 Years	99,999 or less	\$7.0598	\$6.8028	N/A	N/A	\$6.0802		
15 Years	49,999 or less	\$6.8063	\$6.5493	N/A	N/A	\$5.8267		
15 Years	50,000 +	\$6.6034 \$6.3464 N/A N/A \$5.6238						

# [U] All rates in the following table are unchanged.

	1 <sup>st</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup>							
HEAVY CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>								
From								
Term	Volume (barrels per day)	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba		
10 Years	99,999 or less	\$7.4496	\$7.1606	\$7.0745	\$6.6284	\$6.1952		
15 Years	49,999 or less	\$7.1961	\$6.9071	\$6.8210	\$6.3748	\$5.9417		
15 Years	50,000 +	\$6.9932	\$6.7042	\$6.6181	\$6.1720	\$5.7388		

# [U] All rates in the following table are unchanged.

2 <sup>nd</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup> LIGHT CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>								
	From							
Term	Volume (barrels per day)	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba		
10 Years	49,999 or less	\$6.9425	\$6.7042	\$6.5978	\$6.3850	\$6.1242		
10 Years	50,000 - 99,999	\$6.7701	\$6.5318	\$6.4254	\$6.2126	\$5.9518		
15 Years	49,999 or less	\$6.5774	\$6.3391	\$6.2327	\$6.0199	\$5.7591		
15 Years	50,000 - 99,999	\$6.2731	\$6.0349	\$5.9285	\$5.7156	\$5.4549		
20 Years	50,000 - 99,999	\$6.0196	\$5.7813	\$5.6749	\$5.4621	\$5.2013		

# [N] All rates in the following table below are new.

	2 <sup>nd</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup> MEDIUM CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>								
	From								
Term	Volume (barrels per day)	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba			
10 Years	49,999 or less	\$7.5845	\$7.3285	N/A	N/A	\$6.5107			
10 Years	50,000 - 99,999	\$7.4121	\$7.1561	N/A	N/A	\$6.3383			
15 Years	49,999 or less	\$7.2194	\$6.9634	N/A	N/A	\$6.1456			
15 Years	50,000 - 99,999	\$6.8847	\$6.6287	N/A	N/A	\$5.8211			
20 Years	50,000 - 99,999	\$6.6616	\$6.4056	N/A	N/A	\$5.5878			

# [U] All rates in the following table are unchanged.

2 <sup>nd</sup> OPEN SEASON COMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup> HEAVY CRUDE PETROLEUM TO ALL DELIVERY POINTS <sup>2</sup>								
	From							
Term	Volume (barrels per day)	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba		
10 Years	49,999 or less	\$8.0480	\$7.7590	\$7.6729	\$7.2268	\$6.7936		
10 Years	50,000 - 99,999	\$7.8756	\$7.5866	\$7.5005	\$7.0544	\$6.6212		
15 Years	49,999 or less	\$7.6829	\$7.3939	\$7.3078	\$6.8617	\$6.4285		
15 Years	50,000 - 99,999	\$7.3482	\$7.0592	\$6.9731	\$6.5270	\$6.1040		
20 Years	50,000 - 99,999	\$7.1251	\$6.8361	\$6.7500	\$6.3039	\$5.8707		

#### [U] All rates on this page are unchanged.

UNCOMMITTED JOINT RATES IN U.S. DOLLARS PER BARREL <sup>1</sup> TO ALL DELIVERY POINTS <sup>2</sup>							
	From						
Crude Type	Edmonton, Alberta	Hardisty, Alberta	Kerrobert, Saskatchewan	Regina, Saskatchewan	Cromer, Manitoba		
Light Crude	\$8.3783	\$7.8866	\$7.6424	\$7.1525	\$6.7986		
Medium Crude	\$8.6457	\$8.1349	N/A	N/A	\$6.9617		
Heavy Crude	\$9.1141	\$8.5700	\$8.2731	\$7.6777	\$7.2476		

<sup>1</sup>In addition to the rates set forth in all tables above, a separate charge of \$0.2220 per barrel will be assessed for power on Enbridge Pipelines (FSP) L.L.C. The power charge will be recalculated annually, on a forward-looking basis, to true-up for the actual power costs and throughputs in the previous year and to reflect the projected power costs and throughputs for the current year.

<sup>2</sup> Delivery points:

ECHO Terminal (Harris County), Texas; Seaway Freeport (Brazoria County), Texas; Phillips 66 Refinery Sweeny (Brazoria County), Texas; Beaumont/Port Arthur, Texas

#### **EXCEPTIONS:**

For exceptions to Enbridge Pipelines Inc. Rules and Regulations, Enbridge Energy, Limited Partnership Rules and Regulations, and Enbridge Pipelines (FSP) L.L.C. Rules and Regulations, see the following:

- 1) Exception to Enbridge Pipelines Inc. Rules and Regulations NEB No. 388, or successive issues thereof, Rule 7 and Enbridge Energy, Limited Partnership Rules and Regulations FERC No. 41.12.0, or successive issues thereof, Item 7 (a). For the purposes of this international joint tariff, Enbridge Pipelines (FSP) L.L.C. shall charge a Shipper the rate for the transportation of Crude Petroleum that is in effect on the date of receipt at the designated Receipt Point on Enbridge Pipelines (FSP) L.L.C. for such Crude Petroleum.
- 2) Exception to Enbridge Pipelines (FSP) L.L.C. Rules and Regulations No. 1.3.0, or successive issues thereof, Rule 4(a)(iv). For the purposes of this international joint tariff, volume that has been accepted for transportation on Enbridge Pipelines Inc. or Enbridge Energy, Limited Partnership will be deemed to have met the Observed Viscosity specification on Enbridge Pipelines (FSP) L.L.C.
- 3) Exception to Enbridge Pipelines (FSP) L.L.C. Rules and Regulations No. 1.3.0, or successive issues thereof, Rule 17(d). A Shipper's Binding Nomination will be reduced by any volume that Shipper demonstrates, directly and solely as a result of apportionment on either Enbridge Pipelines Inc. or Enbridge Energy, Limited Partnership, was not delivered to Flanagan, Illinois.

- Symbols: [C] Cancel [N] New

- [U] Unchanged Rate [W] Change in wording only

# Justification for Joint Transportation Rates Between ENBRIDGE PIPELINES INC., ENBRIDGE ENERGY, LIMITED PARTNERSHIP and ENBRIDGE PIPELINES (FSP) L.L.C.

# Medium Crude Petroleum Rates are in U.S. dollars per barrel unless otherwise specified

To demonstrate the sum of the local tolls/rates from Enbridge Pipelines Inc. NEB No. 401, Enbridge Energy, Limited Partnership FERC No. 43.21.0, and Enbridge Pipelines (FSP) L.L.C. FERC No. 2.4.0, the local tolls from Enbridge Pipelines Inc. NEB No. 401, Enbridge Energy, Limited Partnership FERC No. 43.21.0, and Enbridge Pipelines (FSP) L.L.C. FERC No. 2.4.0, the local tolls from Enbridge Pipelines Inc. NEB No. 401 need to be converted from \$CAD/m<sup>3</sup> to \$US/bbl and the rates in FERC No. 43.21.0 need to be converted from \$US/m<sup>3</sup> to \$US/bbl.

# Conversion from M<sup>3</sup> to BBL

**Step 1:** Convert Enbridge Pipelines Inc. local tolls contained in NEB No. 401 and Enbridge Energy, Limited Partnership local rates contained in FERC No. 43.21.0 from \$CAD/m<sup>3</sup> to \$CAD/bbl and \$US/m<sup>3</sup> to \$US/bbl, respectively, by dividing the cubic meter rate by 6.289811.

ENBRIDGE PIPELINES INC.				
Local Tolls Tariff - I	NEB No. 401			
(\$CAD/m	1 <sup>3</sup> )			
Delivery to International Border near Gretna,				
Manitoba				
	(A)			
Dessint Deint	Medium Crude			
<u>Receipt Point</u>	(\$CAD/m <sup>3</sup> )			
Edmonton	\$21.7160			
Hardisty	\$17.4570			
Cromer \$7.2040				

(B)		
<b>Conversion Factor</b>		
(m <sup>3</sup> ) to (bbl)		
6.289811		
6.289811		
6.289811		

Local Tolls Tariff - NEB No. 401 (\$CAD/bbl) Delivery to International Border near <u>Gretna, Manitoba</u> (A) / (B) = (C) Medium Crude
(\$CAD/bbl) <u>Delivery to International Border near</u> <u>Gretna, Manitoba</u> (A) / (B) = (C) Medium Crude
Delivery to International Border near Gretna, Manitoba (A) / (B) = (C) Medium Crude
<u>Gretna, Manitoba</u> (A) / (B) = (C) Medium Crude
(A) / (B) = (C) Medium Crude
Medium Crude
(ŞCAD/DDI)
\$3.4526
\$2.7754
\$1.1453

Rates are in U.S. dollars per barrel unless otherwise specified

ENBRIDGE ENERGY, LIMITED PARTNERSHIP				
Local Rates Tariff - FERC No. 43.21.0				
(\$US/m³)				
<u>To Flanagan, Illinois</u>				
	(D)			
Receipt Point	Medium Crude			
	(\$US/m³)			
International Border near Neche, North Dakota	\$14.4737			

(B)
<b>Conversion Factor</b>
(m <sup>3</sup> ) to (bbl)
6.289811

ENBRIDGE ENERGY, LIMITED PARTNERSHIP				
Local Rates Tariff - FERC No. 43.21.0				
(\$US/bbl)				
To Flanagan, Illinois				
	(D) / (B) = (E)			
Receipt Point	Medium Crude			
	(\$US/bbl)			
nternational Border near Neche, North Dakota	\$2.3011			

# Enbridge Pipelines Inc. Local Tolls - Conversion from CAD to US Dollars

Step 2: Convert Enbridge Pipelines Inc. local tolls contained in NEB No. 401 from \$CAD/bbl to \$US/bbl by using a conversion rate of 0.7692 US dollar to 1.00 CAD dollar.

ENBRIDGE PIPELINES INC.			
Local Tolls Tariff - NEB No. 401			
(\$CAD/bbl)			
Delivery to International Border near Gretna,			
Manitoba			
(C)			
Pocoint Point	Medium Crude		
(\$CAD/bbl)			
Edmonton	\$3.4526		
Hardisty	\$2.7754		
Cromer	\$1.1453		

(F)			
Conversion Factor			
(\$CAD/bbl) to (\$US/bbl)			
\$0.7692			
\$0.7692			
\$0.7692			

ENBRIDGE PIPELINES INC.
Local Tolls Tariff - NEB No. 401
(\$US/bbl)
Delivery to International Border near
<u>Gretna, Manitoba</u>
(C) * (F) = (G)
Medium Crude
(\$US/bbl)
\$2.6557
\$2.1348
\$0.8810

Rates are in U.S. dollars per barrel unless otherwise specified

# Sum of Local Rates

Step 3: Calculate the sum of the local tolls/rates by summing the Enbridge Pipelines Inc. local tolls from NEB No. 401, the Enbridge Energy, Limited Partnership local rates from FERC No. 43.21.0, and the Enbridge Pipelines (FSP) L.L.C. local rate from FERC No. 2.4.0.

ENBRIDGE PIPEL	INES INC.	ENBRIDGE ENERGY, LIMITED PARTNERSHIP	ENBRIDGE PIPELINES (FSP) L.L.C.		
Local Tolls Tariff - N	NEB No. 401	Local Rates Tariff - FERC No. 43.21.0	Local Rate Tariff - FERC No. 2.4.0		Sum of the Local Medium Crude Rates
	(G)	(E)	(H) (I)		(G) + (E) + (H) + (I) = (J)
Delivery to International B	order near Gretna,	From the International Border near Nech, North	From Flanagan Illinois to		
<u>Manitob</u>	<u>a</u>	Dakota to Flanagan, Illinois	Power Charge		Medium Crude
Peccint Point	Medium Crude	Medium Crude	Delivery Points		
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)
Edmonton	\$2.6557	\$2.3011	\$4.4434	\$0.2220	\$9.6222
Hardisty	\$2.1348	\$2.3011	\$4.4434	\$0.2220	\$9.1013
Cromer	\$0.8810	\$2.3011	\$4.4434	\$0.2220	\$7.8475

#### <sup>1</sup> Delivery points include the following locations:

ECHO Terminal (Harris County), Texas;

Seaway Freeport (Brazoria County), Texas;

Phillips 66 Refinery Sweeny (Brazoria County), Texas;

Beaumont/Port Arthur, Texas

Rates are in U.S. dollars per barrel unless otherwise specified

# Open Season # 1

Step 4: Compare the sum of the local tolls/rates calculated in Step 3 to the IJT rates contained in Enbridge Pipelines (FSP) L.L.C. FERC No. 3.12.0 to compute the discount resulting from the joint tolls/rates.

Sum of the Local Rates		ENBRIDGE PIPE IJT Joint Rates per NEB 10 Year Commitment and	ENBRIDGE PIPELINES (FSP) L.L.C. IJT Joint Rates per NEB No. 405 & FERC No. 3.12.0 10 Year Commitment and 99,999 barrels per day or less		
	(L)	(К)	(1)	(J) - (K) - (I) = (L)	
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude	
	Medium Crude				
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	
Edmonton	\$9.6222	\$7.0598	\$0.2220	\$2.3404	
Hardisty	\$9.1013	\$6.8028	\$0.2220	\$2.0765	
Cromer	\$7.8475	\$6.0802	\$0.2220	\$1.5453	

ENBRI Sum of the Local Rates IJT Joint Rates 15 Year Commitm		ENBRIDGE P IJT Joint Rates per NE 15 Year Commitment an	IPELINES (FSP) L.L.C. B No. 405 & FERC No. 3.12.0 Id 49,999 barrels per day or less	Discount Resulting from Jo
	(L)	(M)	(1)	(J) - (M) - (I) = (N)
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude
	Medium Crude	Mediani Ciude		
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)
Edmonton	\$9.6222	\$6.8063	\$0.2220	\$2.5939
Hardisty	\$9.1013	\$6.5493	\$0.2220	\$2.3300
Cromer	\$7.8475	\$5.8267	\$0.2220	\$1.7988

### <sup>1</sup> Delivery points include the following locations:

ECHO Terminal (Harris County), Texas;

Seaway Freeport (Brazoria County), Texas;

Phillips 66 Refinery Sweeny (Brazoria County), Texas;

Beaumont/Port Arthur, Texas

# oint Rates

Rates are in U.S. dollars per barrel unless otherwise specified

# **Open Season # 1 (Continued)**

Sum of the Local Rates		ENBRIDGE PI IJT Joint Rates per NEI 15 Year Commitment and !	Discount Resulting from Joint Rates	
	(L)	(0)	(1)	(J) - (O) - (I) = (P)
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude
	Medium Crude			
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)
Edmonton	\$9.6222	\$6.6034	\$0.2220	\$2.7968
Hardisty	\$9.1013	\$6.3464	\$0.2220	\$2.5329
Cromer	\$7.8475	\$5.6238	\$0.2220	\$2.0017

# Open Season # 2

Sum of the Local Rates		ENBRIDGE PIF IJT Joint Rates per NEE 10 Year Commitment and	Discount Resulting from Joint Rates	
	(L)	(Q)	(1)	(J) - (Q) - (I) = (R)
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude
	Medium Crude	Median crade	i ower enarge	
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)
Edmonton	\$9.6222	\$7.5845	\$0.2220	\$1.8157
Hardisty	\$9.1013	\$7.3285	\$0.2220	\$1.5508
Cromer	\$7.8475	\$6.5107	\$0.2220	\$1.1148

<sup>1</sup> Delivery points include the following locations:

ECHO Terminal (Harris County), Texas;

Seaway Freeport (Brazoria County), Texas;

Phillips 66 Refinery Sweeny (Brazoria County), Texas;

Beaumont/Port Arthur, Texas

Rates are in U.S. dollars per barrel unless otherwise specified

# **Open Season # 2 (Continued)**

		ENBRIDGE PIPE	ENBRIDGE PIPELINES (FSP) L.L.C.		
Sum of the Local Rates		IJT Joint Rates per NEB	IJT Joint Rates per NEB No. 405 & FERC No. 3.12.0		
		10 Year Commitment and 5	10 Year Commitment and 50,000 - 99,999 barrels per day		
	(L)	(S)	(1)	(J) - (S) - (I) = (T)	
<b>Bassint Doint</b>	To Delivery Points	Madium Crudo	Power Charge	Medium Crude	
Receipt Point	Medium Crude				
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	
Edmonton	\$9.6222	\$7.4121	\$0.2220	\$1.9881	
Hardisty	\$9.1013	\$7.1561	\$0.2220	\$1.7232	
Cromer	\$7.8475	\$6.3383	\$0.2220	\$1.2872	
		ENBRIDGE PIPE	LINES (FSP) L.L.C.		
Sum of the Local Rates		IJT Joint Rates per NEB	IJT Joint Rates per NEB No. 405 & FERC No. 3.12.0		
		15 Year Commitment and	15 Year Commitment and 49,999 barrels per day or less		
	(L)	(U)	(1)	(J) - (U) - (I) = (V)	
	To Delivery Points <sup>1</sup>				

	Sum of the Local Rates	ENBRIDGE PIF IJT Joint Rates per NEE 15 Year Commitment and	Discount Resulting from Joint Rate		
	(L)	(U)	(1)	(J) - (U) - (I) = (V)	
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude	
	Medium Crude	Wediani Clade	Fower charge	Mediam crude	
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	
Edmonton	\$9.6222	\$7.2194	\$0.2220	\$2.1808	
Hardisty	\$9.1013	\$6.9634	\$0.2220	\$1.9159	
Cromer	\$7.8475	\$6.1456	\$0.2220	\$1.4799	

<sup>1</sup> Delivery points include the following locations:

ECHO Terminal (Harris County), Texas;

Seaway Freeport (Brazoria County), Texas;

Phillips 66 Refinery Sweeny (Brazoria County), Texas;

Beaumont/Port Arthur, Texas

Rates are in U.S. dollars per barrel unless otherwise specified

# **Open Season #2 (Continued)**

Sum of the Local Rates		ENBRIDGE PIP IJT Joint Rates per NEB 15 Year Commitment and	ENBRIDGE PIPELINES (FSP) L.L.C. IJT Joint Rates per NEB No. 405 & FERC No. 3.12.0 15 Year Commitment and 50,000 - 99,999 barrels per day		
	(L)	(W)	(1)	(J) - (W) - (I) = (X)	
Receint Point	To Delivery Points <sup>1</sup>	Medium Crude	Power Charge	Medium Crude	
Receipt Foint	Medium Crude	Mediani erade	l ower enarge	inculum crude	
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	
Edmonton	\$9.6222	\$6.8847	\$0.2220	\$2.5155	
Hardisty	\$9.1013	\$6.6287	\$0.2220	\$2.2506	
Cromer	\$7.8475	\$5.8211	\$0.2220	\$1.8044	

	Sum of the Local Rates	ENBRIDGE PIP IJT Joint Rates per NEB 20 Year Commitment and S	Discount Resulting from Joint Rate	
	(L)	(Y)	(1)	(J) - (Y) - (I) = (Z)
Receipt Point	To Delivery Points <sup>1</sup>	Medium Crude	Bower Charge	Medium Crude
	Medium Crude		rower charge	
	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)	(\$US/bbl)
Edmonton	\$9.6222	\$6.6616	\$0.2220	\$2.7386
Hardisty	\$9.1013	\$6.4056	\$0.2220	\$2.4737
Cromer	\$7.8475	\$5.5878	\$0.2220	\$2.0377

# <sup>1</sup> Delivery points include the following locations:

ECHO Terminal (Harris County), Texas;

Seaway Freeport (Brazoria County), Texas;

Phillips 66 Refinery Sweeny (Brazoria County), Texas;

Beaumont/Port Arthur, Texas

Numbers may not sum up exactly due to rounding.

FERC rendition of the electronically filed tariff records in Docket No. IS16-00658-000 Filing Data: CID: C004601 Filing Title: Committed Medium Rates Company Filing Identifier: 52 Type of Filing Code: 830 Associated Filing Identifier: Tariff Title: Oil Pipeline Tariffs Tariff ID: 30 Payment Confirmation: Suspension Motion:

Tariff Record Data: Record Content Description, Tariff Record Title, Record Version Number, Option Code: IJT Rates, FERC 3.12.0, 3.12.0, A Record Narative Name: Tariff Record ID: 22 Tariff Record Collation Value: 176160768 Tariff Record Parent Identifier: 0 Proposed Date: 2016-10-01 Priority Order: 100000000 Record Change Type: CHANGE Record Content Type: 2 Associated Filing Identifier:

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20160819-5156 FERC PDF (Unofficial) 8/19/2016 12:43:09 PM
Document Content(s)
FERC No. 3.12.0 TL.PDF1-5
Clean Tariff.PDF6-13
Appendix A.PDF
FERC GENERATED TARIFF FILING.RTF21-21




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FROM (Incentive Origin)	TO (Incentive Destinations)	75,000 bpd Incentive Rate (cents per barrel)
	Magellan East Houston Terminal	<b>[U]</b> 209.07
Crane, TX Barnhart, TX <sup>[Note 1]</sup>	Houston Ship Channel Area MCOP's Speed Junction Houston Valero Refinery Houston Refining's Refinery Pasadena Refining System, Inc's Refinery Shell Deer Park Refinery	<b>[U]</b> 209.07
	[N] <u>Houston Fuel Oil Terminal Company Jct.</u> <u>Pasadena, TX</u>	[N] <u>220.44</u>
	Genoa Junction	[U] 221.22
	Galveston Bay – Marathon Refinery Texas City – Valero Refinery Texas City – Marathon Refinery	<b>[U]</b> 240.68
	Magellan East Houston Terminal	[U] 245.54
	Houston Ship Channel Area MCOP's Speed Junction Houston Valero Refinery Houston Refining's Refinery Pasadena Refining System, Inc's Refinery Shell Deer Park Refinery	<b>[U]</b> 245.54
Midland, TX	[N] Houston Fuel Oil Terminal Company Jct Pasadena, TX	[N] <u>256.91</u>
	Genoa Junction	<b>[U]</b> 257.69
	Galveston Bay – Marathon Refinery Texas City – Valero Refinery Texas City – Marathon Refinery	<b>[U]</b> 277.14

6

- 7. Adjustment of the Incentive Rates and Minimum Quarterly Payments will be in accordance with the Commitment Agreement.
- 8. Payments for transportation of all volumes to which the Participating Shipper holds title in its name and ships from the Incentive Origin for delivery to the applicable Incentive Destinations and for which Participating Shipper pays the Incentive Rate will apply toward the Minimum Quarterly Payment.
- Carrier will invoice the Participating Shipper at the rates set out in Paragraph 6 of this Item, as such rates may be adjusted pursuant to the Commitment Agreement. Shipper will bear all other applicable charges in the applicable rules and regulations in MCOP's R.C.T. No. 1.0.0 and any supplements thereto and reissues thereof.
- 10. In the event that a Deficiency Payment is made, the Participating Shipper will be credited for prepaid transportation, on a dollar for dollar basis, toward the Participating Shipper's payment obligations for its deliveries made under this incentive program during the twelve (12) Contract Quarters immediately following the Contract Quarter with respect to which the Deficiency Payment was paid. Such prepaid transportation credits will only apply to transportation fees in excess of the Minimum Quarterly Payment in the applicable Contract Quarter. At the scheduled expiration of the Commitment Agreement, including the two extensions thereof if exercised by the Participating Shipper, Participating Shipper will have the immediately-following twelve month period to apply any remaining prepaid transportation as a credit against transportation charges for movement from the Incentive Origin to the Incentive Destinations during such period. Any remaining prepaid transportation that is not applied within the allotted time period will expire and be of no further use or effect thereafter. Shipper will have no Minimum Quarterly Payment obligation with respect to the period for which the term is extended, if any, for the sole purpose of permitting Shipper to utilize any unused and unexpired credits.



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[Note 1] For Barnhart, TX origination, shipper must arrange facilities for injection and Carrier must confirm nomination.

[U] Unchanged rate. [N] New. [C] Cancel.

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	Production	WTI	
1990	442.2168		24.5
1991	431.8177	-10.3991	21.5
1992	441.855	10.0373	20.58
1993	465.9063	24.0513	18.48
1994	491.7196	25.8133	17.19
1995	515.2747	23.5551	18.4
1996	542.4185	27.1438	22.03
1997	670.4587	128.0402	20.61
1998	722.613	52.1543	14.4
1999	734.406	11.793	19.3
2000	705.0593	-29.3467	30.26
2001	770.7827	65.7234	25.95
2002	761.6411	-9.1416	26.15
2003	883.6956	122.0545	30.99
2004	1007.546	123.8504	41.47
2005	987.088	-20.458	56.7
2006	1095.919	108.831	66.25
2007	1139.055	43.136	72.41
2008	1014.938	-124.117	99.75
2009	1152.669	137.731	62.09
2010	1272.256	119.587	79.61
2011	1394.714	122.458	95.11
2012	1551.89	157.176	94.15
2013	1653.53	101.64	98.05
2014	1843.232	189.702	92.91
2015	2050.519	207.287	48.79

	Production \	NTI Oil Price
2000	-29.3467	30.26
2001	65.7234	25.95
2002	-9.1416	26.15
2003	122.0545	30.99
2004	123.8504	41.47
2005	-20.458	56.7
2006	108.831	66.25
2007	43.136	72.41
2008	-124.117	99.75
2009	137.731	62.09
2010	119.587	79.61
2011	122.458	95.11
2012	157.176	94.15
2013	101.64	98.05
2014	189.702	92.91
2015	207.287	48.79





	Investment WTI	
2000	189	30
2001	1773	26
2002	1864	26
2003	3722	31
2004	7283	41
2005	11747	57
2006	15317	66
2007	16630	72
2008	16882	100
2009	13610	62
2010	19701	80
2011	22127	95
2012	30117	94
2013	35424	98
2014	35953	93
2015	23982	49
2016	17905	43
2017	18237	52





	Start-up Year				
	Year	2015	2016	2017	
	[Data Values]	Production	Production	Production	
Approval Year	Asset				
	Surmont Phase 2, CA	0.493151	45.33031	93.15069	
	Black Gold Phase 1, CA				
	2010 Sunrise Phase 1, CA	6.4	24.92839	41.91781	
	2011 Kearl Phase 2, CA	41.09589	59.0137	102.4485	
	Cold Lake Phases 14-16: Nabiye, CA	11.9726	25.13835	36.91781	
	Hangingstone JACOS Expansion, CA				
	West Ells Phase A1, CA	0	0.09589	1.39726	
	Long Lake Phase 2 (Kinosis 1A), CA	2.739726	1.358904	4.109589	
	Hangingstone AOSC Phase 1, CA	1.973	7.358	12	
	MacKay River Phase 1_Petrochina, CA				
	2012 Narrows Lake Phase A, CA				
	Horizon Phase 3, CA				
	Horizon Phase 2B, CA				
	Foster Creek Phase H, CA				
	Foster Creek Phase G, CA				
	Christina Lake Cenovus Energy ConocoPhillips Phase 1F, CA				
	West Ells Phase A2, CA				
	Fort Hills Phase 1, CA				
	2013 Lindbergh Phase 1_Pengrowth, CA	9.421128	11.24658	11.24	
	2014 Kirby North CNR Phase 1, CA				
	2015 Christina Lake Cenovus Energy ConocoPhillips Optimization (Phases C,D,E), CA	11.15	21.70802	21.77795	
	Lindbergh Phase 1 Optimization_Pengrowth, CA				
	2016 Christina Lake Cenovus Energy ConocoPhilips Phase G (North), CA				
Sum		85.24549	196.1781	324.9596	

							2015					
2018	2019	2020	2021	2022	2023	2024	2025	2015	2016	2017	2018	2019
Production												
109.2775	117.8082	117.8082	117.8082	117.8082	117.8082	117.8082	117.8082					
50.9589	58.98105	60	60	60	60	60	60					
110	110	110	110	110	110	110	110					
49.31506	49.31506	49.31507	49.31506	49.31507	49.31507	49.31507	49.31507					
2.69863	3.38114	4	4	4	4	4	4					
4.109589	19.17808	19.17808	19.17808	19.17808	19.17808	19.17808	19.17808					
12	12	12	12	12	12	12	12					
								0	0.647466	9.285099	17.92273	26.56036
								-				
								0	2.971132	6.475943	9.980753	13.48557
								0	0.232069	6.860058	13.48805	20.11603
11.24	11.20921	11.24	11.24	11.24	11.24	11.24	11.24					
21.84788	21.82576	21.91781	21.91781	21.91781	21.91781	17.22636	11.84645					
371.4476	403.6985	405.4592	405.4592	405.4592	405.4592	400.7677	395.3878	0	3.850666	22.6211	41.39153	60.16196

					2016							
2020	2021	2022	2023	2024	2025	2016	2017	2018	2019	2020	2021	2022
Production	Production	Production	Production	Production	Production I	Production						
						0	2.067178	12.23438	16	16	16	16
						0	0.684734	7.513553	14.34237	21.17118	25.51917	28
35.19799	40.43796	43.83561	43.83562	43.83562	43.83561	0	2.600863	44.42335	72	72	72	72
16.99038 26.74402	20.49519 33.37201	22.55633 37.00315	24 40	24 40	24 40							
						0	0.026419	85.62965	128.0794	171.2329	171.2329	171.2329
						0	0.298838	1.365893	2.432945	3.257353	3.5	3.5
78.93239	94.30516	103.3951	107.8356	107.8356	107.8356	0	5.678032	151.1668	232.8547	283.6614	288.252	290.7329

		2017									2018	
2023	2024	2025	2017	2018	2019	2020	2021	2022	2023	2024	2025	2018
Production F	Production Pro	duction Pro	oduction P	Production Pro	oduction							
			0	0.147345	2.764896	5.38245	6.948989	8	8	8	7.999999	
16	16	16										
28	28	28										
72	72	72										
												0
171.2329	171.2329	171.2329										
3.5	3.5	3.5										
290.7329	290.7328	290.7329	0	0.147345	2.764896	5.38245	6.948989	8	8	8	7.999999	0

						2019						
2019	2020	2021	2022	2023	2024	2025	2019	2020	2021	2022	2023	2024
Production Pr	oduction											

0 2.766057 11.07454 19.38303 27.69151 34.27002

0.353225 6.258069 12.16292 18.06776 21.58543 23.9726 23.9726

0 0.961397 2.010794 3.060192 4.078206 4.109589

0 6.814953 13.67286 20.53077 27.38867 34.22778

03.85929311.5805819.3018727.0231734.744460.3532256.25806912.1629218.0677621.5854323.972623.9726014.401738.3387862.2758686.18156107.3519

2020 2025 Production (kbbl/d)

36

4.109589

34.24657

41.24939 115.6056

Project Phase	Approval Y(Sta	rt-Up Year	Installed Capacity		
Sunrise Phase 1	2010	2015	60,000		
Surmont Phase 2	2010	2015	118,000		
Black Gold Phase 1	2010	2018	10,000		
Kearl Phase 2	2011	2015	110,000		
Cold Lake Phases 14-16: Nabiye	2012	2015	40,000		
Hangingstone AOSC Phase 1	2012	2015	12,000		
Long Lake Phase 2 (Kinosis 1A)	2012	2015	20,000		
Hangingstone JACOS Expansion	2012	2017	20,000		
MacKay River Phase 1_Petrochina	2012	2017	35,000		
Narrows Lake Phase A	2012	2020	45,000		2015-2016
West Ells Phase A1	2012	2020	5,000		475,000
Lindbergh Phase 1_Pengrowth	2013	2015	11,240		
Christina Lake Cenovus Energy ConocoPhillips Phase 1F	2013	2016	50,000		
Foster Creek Phase G	2013	2016	30,000		
Horizon Phase 2B	2013	2016	45,000		
Fort Hills Phase 1	2013	2017	160,000		
Horizon Phase 3	2013	2017	80,000		
Foster Creek Phase H	2013	2020	30,000		
West Ells Phase A2	2013	2020	5,000		
Kirby North CNR Phase 1	2014	2020	40,000	926,240	
Christina Lake Cenovus Energy ConocoPhillips Optimization (Phases CDE	2015	2015	25,000		
Lindbergh Phase 1 Optimization_Pengrowth	2016	2017	3,500		
Christina Lake Cenovus Energy ConocoPhilips Phase G (North)	2016	2019	40,000	68,500	
				994,740	93%

Installed Capacity from Government of Alberta AOSID Quarterly Update Spring 2017. http://www.albertacanada.com/business/statistics/oil-sands-qu

2015-2017 771,240

296,240

arterly.aspx

Approval Y	Capacity
2010	188,000
2011	110,000
2012	177,000
2013	411,240
2014	40,000
2015	25,000
2016	43,500
2017	-



Economics Grc Capex Exploration Cape: Sum

[Data Values] Economics Economics (MUSI Economics (MUSD) Year

2000	5180.954	2.411492	5183.365
2001	6509.903	0	6509.903
2002	1535.381	0.833333	1536.214
2003	3514.476	4.673116	3519.149
2004	6918.313	2.511938	6920.825
2005	11032.98	13.3611	11046.34
2006	12125.17	0.666667	12125.84
2007	14131.32	1.507119	14132.83
2008	10029.95	0	10029.95
2009	6918.324	5.838116	6924.162
2010	7994.171	16.45993	8010.631
2011	8131.173	9.143416	8140.317
2012	12575.13	1.940462	12577.07
2013	16155.92	0.291626	16156.21
2014	16339.82	6.146043	16345.97
2015	6616.415	0	6616.415
2016	4398.116	0.256708	4398.373
2017	3812.771	0	3812.771
2018	1189.914		1189.914
2019	746.3686		746.3686
	155856.5	66.04106	155922.6

Sum

CUBESCRIPT(UCube) Report S() F(Unconventional Category:Oil sands;Country:Canada;Life Cycle Category TS:Under development;Asset;Approval Year:1911-2017) C(Economics Group:Capex,Exploration Capex;Data Values) R(Year:2000-2020) V(Economics:MUSD)

	CAP	EX MUSD
2000	\$	5,183
2001	\$	6,510
2002	\$	1,536
2003	\$	3,519
2004	\$	6,921
2005	\$	11,046
2006	\$	12,126
2007	\$	14,133
2008	\$	10,030
2009	\$	6,924
2010	\$	8,011
2011	\$	8,140
2012	\$	12,577
2013	\$	16,156
2014	\$	16,346
2015	\$	6,616
2016	\$	4,398
2017	\$	3,813
2018	\$	1,190
2019	\$	746



Economics Capex Exploratior Sum [Data Valu Economics Economics (MUSD) Year

	2000	5797.528	25.44418	5822.972
	2001	7417.107	18.52162	7435.629
	2002	4789.879	28.79491	4818.674
	2003	5114.761	39.09817	5153.859
	2004	8575.161	37.56353	8612.725
	2005	14334.61	27.43122	14362.04
	2006	18822.2	13.40086	18835.6
	2007	19330.85	10.75035	19341.6
	2008	18265.33	43.73982	18309.07
	2009	13770.4	57.19819	13827.6
	2010	18112.02	70.38743	18182.41
	2011	19840.04	22.95112	19862.99
	2012	26597.68	9.687866	26607.37
	2013	30581.08	4.887168	30585.97
	2014	27936.67	11.61239	27948.29
	2015	15782.99	0.378456	15783.37
	2016	9881.334	0.323661	9881.657
	2017	8939.595	0	8939.595
	2018	9585.735		9585.735
	2019	7555.202		7555.202
	2020	8156.794		8156.794
	2021	9462.929		9462.929
	2022	10101.3		10101.3
	2023	10700.19		10700.19
	2024	11001.24		11001.24
	2025	11227.96		11227.96
	2026	11479.27		11479.27
	2027	11766.25		11766.25
	2028	12057.77		12057.77
	2029	12368.27		12368.27
	2030	12699.63		12699.63
Sum		412051.8	422.171	412474

CUBESCRIPT(UCube) Report

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F(Unconventional Category:Oil sands;Country:Canada;Asset;Approval Year:1911-2017;!Life Cycle Category TS:Seasonal (Other liquids),Undiscovered,Unknown) C(Economics Group:Capex,Exploration Capex;Data Values) R(Year:2000-2030)

	То	tal Capex MUSD
2000	\$	5,823
2001	\$	7,436
2002	\$	4,819
2003	\$	5,154
2004	\$	8,613
2005	\$	14,362
2006	\$	18,836
2007	\$	19,342
2008	\$	18,309
2009	\$	13,828
2010	\$	18,182
2011	\$	19,863
2012	\$	26,607
2013	\$	30,586
2014	\$	27,948
2015	\$	15,783
2016	\$	9,882
2017	\$	8,940
2018	\$	9,586
2019	\$	7,555
2020	\$	8,157
2021	\$	9,463
2022	\$	10,101
2023	\$	10,700
2024	\$	11,001
2025	\$	11,228
2026	\$	11,479
2027	\$	11,766
2028	\$	12,058
2029	\$	12,368
2030	\$	12,700

Total Oil Sands Capex


## **ATTACHMENT LS-13**

Economics Group Capex Opex Sum [Data Values] Economics Economics Economics (MUSD) Year

2020	8156.794	21033.2	29190
2021	9462.929	24245.38	33708.3
2022	10101.3	26120.59	36221.89
2023	10700.19	27482.78	38182.97
2024	11001.24	28282.58	39283.81
2025	11227.96	28989.13	40217.1
2026	11479.27	29701.89	41181.16
2027	11766.25	30362.99	42129.24
2028	12057.77	31024.46	43082.24
2029	12368.27	31623.81	43992.08
2030	12699.63	32090.61	44790.24
	121021.6	310957.4	431979.1

CUBESCRIPT(UCube) Report

S()

Sum

F(Unconventional Category:Oil

sands;Country:Canada;Asset;Approval Year:1911-

2017;!Life Cycle Category TS:Seasonal (Other

liquids), Undiscovered, Unknown)

C(!Economics Group:Free Cash Flow,Government

Take;Data Values)

R(Year:2020-2030)

V(Economics:MUSD)

	Cape	х	Opex		Sum
2020	\$	8,157	\$	21,033	29190
2021	\$	9,463	\$	24,245	33708.3
2022	\$	10,101	\$	26,121	36221.89
2023	\$	10,700	\$	27,483	38182.97
2024	\$	11,001	\$	28,283	39283.81
2025	\$	11,228	\$	28,988	40215.58
2026	\$	11,479	\$	29,678	41157.45
2027	\$	11,766	\$	30,363	42129.24
2028	\$	12,058	\$	31,019	43076.98
2029	\$	12,368	\$	31,603	43970.82
2030	\$	12,700	\$	32,091	44790.24



## **ATTACHMENT LS-14**

[Data Values] Production (kbbl/d)

Year

2017	2350.725
2018	2610.463
2019	2750.052
2020	2843.263
2021	2892.633
2022	2933.698
2023	2964.54
2024	2981.216
2025	2982.552
2026	2978.926
2027	2973.74
2028	2965.926
2029	2948.217
2030	2919.374

### CUBESCRIPT(UCube) Report

S()

F(Unconventional Category:Oil sands;Country:Canada;!Approv al

Year:2018,2019,2020,2021,202 2,2023,2024,2025,2026,2027,2 028,2029,2030,2031,2032,2033 ,2034,2035,2036,2037,2038,20 39,2040,2041,2042,2043,2044, 2045,2045,2047,2048,2040,205

	Production at Approved Projects
2017	2350.725
2018	2610.463
2019	2750.052
2020	2843.263
2021	2892.633
2022	2933.698
2023	2964.54
2024	2981.216
2025	2982.552
2026	2978.926
2027	2973.74
2028	2965.926
2029	2948.217
2030	2919.374



2													
Z	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

## **ATTACHMENT LS-15**

					Sale Net
			Reserves	Production	Value
			(million	(Capacity	(Million
Date Announced	Seller	Buyer	Bbls)	Kbpd)	USD)
Dec. 2016	Statoil	Athabasca	291	24	443
Apr. 2016	Murphy	Suncor	113	15.6	739
Mar. 2017	Shell	Canadian Natural	3616	160	7300
Mar. 2017	Conoco	Cenovus	5465	280	13300
Mar. 2017	Marathon	Shell/Canadian Natural	1214	50	2500
Apr. 2017	BP	?	1026	30	?
Apr. 2017	Chevron	?	1071	50	?
			12,796	610	24,282

Sources Rystad Ucube (Reserves) ThinkProgress https://insideclimatenews.org/n ews/13042017/canadian-oilsands-tar-sands-climate-changeconocophillips-exxon and http://www.reuters.com/article /us-bp-canada-divestitureidUSKBN17M2D0 and Government of Alberta CompanyBP1266.723Shell3616.558Chevron1071.648ConocoPhi5465.246Marathon1214.728Sum12634.9

### DEALS | Thu Apr 20, 2017 | 2:45pm EDT

## BP mulls sale of stakes in Canadian oil sands assets: sources



A BP logo is seen at a petrol station in London, Britain January 15, 2015. REUTERS/Luke MacGregor/File Photo

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### By John Tilak and Nia Williams | TORONTO/CALGARY

BP Plc is considering the sale of its stakes in three Canadian oil sands projects, people familiar with the matter told Reuters this week, as part of the British oil company's strategy of retreating from noncore businesses.

BP's 50 percent stake in the Sunrise project near Fort McMurray in Alberta, where Husky Energy Inc owns the rest and is the operator, is the most valuable of the three assets. BP'S Sunrise stake is valued at about \$810 million, based on recent transactions in the sector.

It also owns a 50 percent stake in Pike, operated by Devon Energy Corp, which is still awaiting a final investment decision, and is majority-owner of the Terre de Grace oil sands pilot project.

A BP spokesman declined to comment. Sources declined to be named as the information is confidential.

The three projects are located in northeastern Alberta.

BP has discussed with advisers the possibility of selling the stakes, though no final decision has been made, the people added.

If the sale proceeds, BP would deploy capital in more attractive regions, such as the Permian basin in the United States, where the rate of return tends to be higher, one of the people said.

BP's planned move comes after other global energy majors, including ConocoPhillips and Royal Dutch Shell have cut their exposure to Canada's oil sands operations, which are among the world's most expensive oil plays to develop.

### PICTURES

Faced with a lower oil price environment and challenging economics, which include high cost operations and carbon taxes, global players are increasingly put off by the oil sands.

Reuters reported last week that U.S. oil producer Chevron Corp was exploring the sale of its 20 percent stake in Canada's Athabasca Oil Sands project, which could fetch about \$2.5 billion.

BP is focusing its operations in Egypt, Azerbaijan, the Gulf of Mexico, the North Sea and Trinidad in the coming years.

Husky said in February that current production at the Sunrise project is about 36,000 barrels of oil per day. It is in the process of ramping up the project to full capacity of 60,000 bpd but progress has been slower than expected and the company is drilling extra wells to try to speed up production. Husky lowered the 2017 production forecast to 40,000-44,000 bpd from 60,000 bpd.

### ALSO IN DEALS

How PPG lost its \$29.5 billion <sup>i</sup> bet on Dulux paint

While Husky is not keen to increase its exposure to the oil sands, it may consider buying BP's stake if the price is attractive, two sources said.

U.S. meal kit service Blue Apron files for IPO

Husky spokesman Mel Duvall declined to comment on whether the company had discussed buying BP's stake in Sunrise.

"We take a look at everything, but we have a number of organic growth opportunities," he added.

(\$1 = 1.3475 Canadian dollars)

(Reporting by John Tilak in Toronto and Nia Williams in Calgary; Additional reporting by Ron Bousso in London, Ethan Lou in Calgary, Alberta; and David French in New York; Editing by Denny Thomas and Matthew Lewis)

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Linde, Praxair agree \$73 billion merger to create global gases leader



Deere to buy German road construction firm for about \$5 billion

n firm

Deere & Co said on Thursday it would buy privately held German company Wirtgen Group for about \$4.88 billion to expand its road construction operations as it looks to cut down its dependence on its slowing farm business.

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FRANKFURT/MUNICH The boards of Linde and

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DEALS | Fri Apr 21, 2017 | 3:04pm EDT

## Canada's oil sands acquisition pool dwindles as global firms flee

By Nia Williams and John Tilak | CALGARY, ALBERTA/TORONTO

As international energy companies retreat from the Canadian oil sands sector because of depressed oil prices, a fast-shrinking universe of potential buyers may leave some stranded in the high-cost, capital-intensive sector.

Global producers are bailing on their oil sands investments due to higher development costs, limited export pipeline capacity to get crude to market and concerns about high carbon emissions in the sector.

International companies once drawn by the long-life assets that can produce for up to 50 years during the oil sector boom are discovering the economics do not work as well in a low-price environment.

But to get out, they have to overcome a simple equation: there are more sellers than buyers for the oil sands.

The three biggest domestic producers - Suncor Energy, Canadian Natural Resources Ltd and Cenovus Energy - are digesting multi-billion dollar deals, and have little room for more acquisitions, industry participants say. Global companies like ConocoPhillips and Marathon Oil Corp prefer to pile into cheaper U.S. shale plays such as the Permian basin instead.

"The market is pretty thin for oil sands buyers," said Janan Paskaran, an M&A lawyer at Torys LLP who advises domestic and international energy companies.

"There are three or four buyers out there that have said they are interested in increasing exposure to oil sands, but they've already done their shopping," he added. "I don't see any new entrants."

BP Plc has joined Chevron Corp in weighing the sale of its oil sands stakes, Reuters has reported. This follows decisions by Royal Dutch Shell, ConocoPhillips and Marathon to dump about \$22.5 billion worth of largely oil sands assets this year.

### **BIG LOSSES**

Companies that planned further divestitures from oil sands will either have to patiently sit on their assets or, as in the case of Statoil ASA and Marathon, accept a loss on their investments.

### ALSO IN DEALS

PPG walks away from battle to buy Akzo Nobel "There's not enough financial wherewithal in Canada to snap up all of the foreign investment that might be exiting right now," said Rafi Tahmazian, portfolio manager at Canoe Financial, referring to the domestic Canadian energy industry.

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PICTURES

Deere to buy German road construction firm for about \$5 billion

"You end up having to decide as a foreign company, am I willing to get rid of this cheap or do I hang on to it?"

Statoil booked an impairment charge of \$500-\$550

million, when it sold its oil sands assets to Athabasca Oil Corp. Similarly, Marathon sold its stake in the Athasbasca Oil Sands Project for \$2.5 billion, having paid \$6.2 billion to get into the region in 2007. While some Canadian companies have stepped forward to take their place, their resources are limited. Cenovus' share price tumbled after it loaded up on debt to buy ConocoPhillips assets. Suncor and Canadian Natural are in better shape financially but may have limited appetite for further deals after major acquisitions in the last 15 months. Sources said Husky Energy, BP's joint venture partner in the Sunrise project, is not keen to increase its exposure to the oil sands but may consider buying BP's stake if the price is attractive.

"The prices will adjust to the supply of buyers and likely move downward," said John Stephenson, president of Stephenson & Co Capital Management, which owns shares in Cenovus and Canadian Natural.

(Reporting by Nia Williams and John Tilak; Editing by Denny Thomas and Bernard Orr)

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### NEXT IN DEALS

### Intelsat expects \$14 billion OneWeb merger deal to fail



Satellite operator Intelsat SA said it expected its \$14 billion merger with peer OneWeb Ltd, which is backed by Japan's SoftBank Group Corp , to fall through as it failed to get enough of its creditors to back the deal.

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# Cenovus Energy shares drop most in company's history as investors snub \$17.7 billion oilsands deal



ALEX NUSSBAUM, KEVIN ORLAND AND ROBERT TUTTLE, BLOOMBERG NEWS | March 30, 2017 | Last Updated: Mar 30 12:39 PM ET More from Bloomberg News



Cenovus Energy Inc. and Canadian Natural Resources Ltd. are betting they can exploit new technologies and their deeper understanding of Canadian-specific issues, such as environmental rules and relations with native communities, to profit from one of the world's biggest hydrocarbon reserves without their former partners

Cenovus Energy Inc. fell more than 10 per cent, the most since its 2009 debut, after saying it will buy Canadian oil assets from ConocoPhillips for \$17.7 billion in a deal partly financed with shares.

The agreement, announced after the close of trading Wednesday, will double the Calgary-based producer's reserves and production in the latest sale of energy assets in Canada by international companies stung by falling oil prices. While Cenovus shares fell, Houston-based Conoco was having its best day in four months, rising 6 per cent to US\$48.69 in New York.

Conoco is set to get 208 million shares in the deal, which it said Wednesday it will liquidate within six months. Additionally, Cenovus said it is selling 187.5 million shares at \$16 each, or 8.3 per cent below the Wednesday close, to raise \$3 billion. Cenovus acquires Conoco's half interest in a joint venture with Cenovus in Canada's oil sands and most of Conoco's Deep Basin conventional assets in Alberta and British Columbia.

"This is an easy fit," said Michael Kay, an analyst at Bloomberg Intelligence in New York. "ConocoPhillips is focused elsewhere, and Cenovus has made it a priority to expand in the oil sands. It's mostly a domestic industry now." The pros and cons of Cenovus Energy's massive acquisition



Analysts weigh in on deal that gives a Canadian company full control of its oilsands assets, but takes on a lot of debt doing so. Find out more



Combined, the holdings in the agreement can produce 298,000 barrels of oil equivalent a day in 2017. The transaction, expected to close in the second quarter, will make Conoco into Cenovus's largest shareholder, with about a 25 per cent stake.

The sale comes two weeks after Canadian Natural Resources Ltd. agreed to spend \$12.7 billion to buy assets in Alberta from Royal Dutch Shell Plc and Marathon Oil Corp. It follows by a month Conoco's announcement that its reserves fell to a 15-year low after removing oilsands barrels that were uneconomic as crude prices sat below US\$50 a barrel.

The acquisition allows Cenovus "to take full control of our best-in-class oilsands projects and to add a second growth platform across the prolific Deep Basin that provides complementary short-cycle development opportunities," said Brian Ferguson, Cenovus chief executive officer.

With about 440,000 barrels a day of capacity after the acquisitions, Cenovus will be the third largest oil-sands producer by the end of the decade, behind Suncor Energy Inc. and Canadian Natural, according to company statements.

### **Deal Details**

Along with the share sales, Cenovus has a \$10.5 billion bridge loan in place with Royal Bank of Canada and JPMorgan Chase & Co., the company said in a statement announcing the acquisition after the close of trading on Wednesday. Cenovus will also make contingency payments to Houston-based Conoco over five years, if oil prices rise above \$52 a barrel.

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In a separate statement, Conoco said it would use the proceeds to reduce debt to \$20 billion in 2017, and to double a share repurchase program to \$6 billion. The company plans to triple its buybacks this year to \$3 billion, with the remaining \$3 billion spent in the next two years.

Conoco doesn't plan to remain a shareholder in Cenovus for the long-term, Chief Financial Officer Don Wallette Jr. told analysts on a conference call Wednesday. After a six month pause mandated by the deal, "we will liquidate our position over time and do it in an orderly way."

### **Maximizing Value**

"We were just looking for the maximum value that we could get for the assets, and that happened to come from a combination of cash and equity and the contingent payment," he said.

The transaction will be Cenovus's biggest since it was separated from Encana Corp. in 2009. In that split, Encana retained most of the previous company's natural gas assets, while Cenovus held the oil assets. The current deal is the largest in the Canadian oil patch since CNOOC Corp. bought Nexen Energy for \$17 billion in 2012.

The industry has long been hampered by a lack of adequate transport options to move its crude to market. A series of proposed pipelines — and renewed support in the U.S. for the Keystone XL project — may help to ease a bottleneck that has kept Western Canadian oil prices below global benchmarks.

Canadian Natural, Cenovus and MEG Energy Corp. have announced expansion projects in the past five months that will add a total of 110,000 barrels a day of capacity when completed in 2019.

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## Exodus From Canada's Oil Sands Continues as Energy Giants Shed Assets

Over the past year, five multinational energy companies have sold off nearly \$25 billion worth of their Canadian assets to domestic companies.

BY NICHOLAS KUSNETZ Follow @nkus

APR 14, 2017

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Aerial view of the Suncor oil sands extraction facility. Several multinational energy companies have sold their tar sands holdings to Canadian companies as oil prices remain low and pressure builds to rein in global warming emissions. Credit: Mark Ralston/AFP/Getty Images

When ConocoPhillips signed a **\$13.3 billion deal** last month to shed many of its Canadian assets, it became the latest in a growing list of foreign firms to sell tar sands holdings to a Canadian company.



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U.S. Renewable Energy Jobs Employ 800,000+ People and Rising: in Charts A series of recent deals have signaled that multinational energy giants are diverting their money to cheaper and less-polluting resources. But while the message about their investment priorities is clear, the implications for future tar sands production—and **climate change**—are less so.

All told, five American and European companies have sold nearly \$25 billion worth of Canadian oil and gas projects over the past 12 months, the vast majority of them in the tar sands. This week, Reuters reported that **Chevron is exploring a sale** of its major oil sands stake.



Tar sands projects are among the most expensive sources of oil, and the extraction produces more greenhouse gas emissions than most conventional drilling. With oil prices remaining low, multinationals are shifting investment to higher-return projects like shale in the United States. When **Marathon Oil announced the sale** of its tar sands projects for \$2.5 billion in March, for example, it also highlighted a \$1.1 billion purchase in the Permian Basin of New Mexico and Texas. While economics is the leading factor in the sales, some advocates argue that climate change is playing a role, too.

Energy companies—European ones in particular—are facing increasing pressure to lower their carbon footprints, and are doing so by shifting away from heavier fuels like the tar sands and toward more natural gas and renewables. Just as Shell announced the sale of nearly all of its tar sands operations last month, for example, it also **disclosed details of a new policy** to tie executive bonuses to emissions reductions. Days after it **sold its oil sands assets** in

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December, Norway's Statoil announced a \$42.5 million **winning bid to lease acreage for a wind farm** off the coast of New York. This year, the company presented a climate roadmap in which it **outlined a path to lower emissions** and declared that oil sands and extra heavy oil will not have a place in our future strategy.

With the completion of the five recent sales, about two-thirds of **oil sands production** will be concentrated in the hands of Canadian companies, according to data compiled by JWN Energy. (JWN's analysis cites a higher figure, but includes production by Imperial Oil, a Canadian company in which ExxonMobil holds a controlling interest.) That means investment likely will shrink, said Jennifer Winter, an energy economist at the University of Calgary's School of Public Policy.

If there are fewer investors in the oil sands, or there's more concentration with the exit of these multinationals, it means that unless the companies operating in the oil sands are able to attract significant amounts of outside capital, it's probably going to be slower growth than if Shell or ConocoPhillips stayed, she said. The oil sands are going to continue to be one of the marginal production areas for the near future.

The long-term outlook is murkier. There are two factors that determine whether a project is profitable: the price of oil and production costs. While producers can't control the global oil market, they can drive down costs, and by consolidating bigger projects in fewer hands, the Canadian companies may be able do just that, said Michael Dunn, an analyst with GMP FirstEnergy. It's their bread and butter, Dunn said of the buyers of these projects, which include oil sands giants Suncor and Canadian Natural Resources Limited.

Several of the projects had been joint ventures between the buyers and sellers, which tended to duplicate roles. Having fewer companies in the game will also allow them to negotiate better prices with contractors and suppliers. And with the buyers focused primarily on oil sands, Dunn said, some of these assets that the sellers were not committed to growing will be in the hands of entities that will be committed to long-term growth.

There is one notable exception to the trend: ExxonMobil. The company has been a leader in exploiting the tar sands for half a century, largely through its Canadian affiliate Imperial Oil. Even before the sales, it pumped more oil from Alberta than any foreign company. And despite Exxon's recent announcement that it had wiped off its books all **3.5 billion barrels** of reserves at one of its tar sands projects —a move forced by financial reporting rules—the company has said it remains committed to the resource. That position is now looking increasingly isolated.

PUBLISHED UNDER: OIL/TAR SANDS CLIMATE CHANGE

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Nicholas Kusnetz is a reporter for InsideClimate News. Before joining ICN, he ran the Center for Public Integrity's State Integrity Investigation, which won a New York Press Club Award for Political Coverage. He also covered fracking as a reporting fellow at ProPublica and was a 2011 Middlebury Fellow in Environmental Journalism. His work has appeared in more than a dozen publications, including Slate, The Washington Post, Businessweek, Mother Jones, The Nation, Fast Company and The New York Times.

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## THE GLOBE AND MAIL\*

## Shell to sell \$4.1-billion stake in Canadian Natural

### John Tilak And David French

TORONTO and NEW YORK — Reuters Published Tuesday, May 23, 2017 2:50PM EDT Last updated Wednesday, May 24, 2017 5:10AM EDT

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Royal Dutch Shell Plc has decided to offload a roughly \$4.1-billion stake in Canadian Natural Resources Ltd (CNRL) that it acquired as part of a deal to retreat from Canada's oil sands earlier this year, people familiar with the situation told Reuters.

The energy company has been interviewing investment banks to hire a financial adviser for the share sale, four people said in the past week, declining to be named as the discussions are confidential.

The deal could be one of the biggest-ever equity sales in Canada. The largest Canadian equity deal so far was TransCanada Corp's \$4.4-billion offering last year.

Shell and Canadian Natural declined to comment. Canadian Natural shares fell about 1 per cent after the Reuters report and were trading down 2.1 per cent at \$41.12 on Tuesday afternoon.

In March, Shell agreed to sell most of its Canadian oil sands assets for \$8.5-billion, in a major strategic pullback from the capital-intensive business. As part of the transaction, Shell acquired about 98 million Canadian Natural shares, or about 8.8 per cent of CNRL's outstanding shares, which are currently valued at about \$4.1-billion.

In a deal that saw another global player pulling back from the oil sands, ConocoPhillips in March agreed to sell some of its Canadian assets to Cenovus Energy Inc. As part of the transaction, ConocoPhillips acquired

208 million Cenovus shares, and Conoco now owns 16.9 per cent of issued and outstanding Cenovus common shares.

Shell plans to use the proceeds to help pay down the debt it assumed with the acquisition of British rival BG Group, the people said. The company is weighing whether to sell its Canadian Natural stake in one block or phase it out, the people said.

Shell has sold or agreed to sell more than \$20-billion in assets over the past two years to help finance the \$54-billion BG acquisition last year. It plans to divest at least \$10-billion more by 2018.

The Anglo-Dutch company's sale of its Canadian oil sand assets was also seen as part of a drive to pull out of some of the most energy-intensive operations as the world switches to cleaner fossil fuel.

While Shell wants to sell the stake as soon as it is able to, no decision has been made about the timing of the sale, the people said. Shell would have to wait until a lockup period for the stake sale expires before it began the process, the people said.

Canadian banks such as Royal Bank of Canada, Toronto-Dominion Bank, Bank of Montreal, Scotiabank and CIBC are among those vying for the mandate, the people said. Global players such as Goldman Sachs Group Inc have also pitched, the people said.

RBC and TD declined to comment. BMO, CIBC, Scotiabank and Goldman did not immediately respond to requests for comment.

Shell is trying to assess if it would take a hit by selling the stake in a chunk, and if so, how much of a hit, one of the people said. The other option is to sell it down gradually, and Shell is figuring out how long that process would take, that person added.

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## **ATTACHMENT LS-16**



OILSANDS & HEAVY OIL OIL & GAS MARKETS & INVESTMENT U.S. & INTERNATIONAL

# Five statements from Suncor CEO Steve Williams about the future of the oilsands











Image: Suncor Energy

Suncor Energy president and CEO Steve Williams laid out some of his views on the future of the oilsands during his 2016 year-end address to shareholders.

He painted a picture of a company putting major expansion plans on hold awaiting better markets.

Here's some of what Williams had to say.

On future mining development

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"Mining investments are coming to an end, not just for Suncor but for the industry, I believe, for a considerable period, probably in excess of 10 years."

On future in situ development

"I want to be equally clear: we have no plans to be going ahead with major capital investment in either mining or in situ in the foreseeable future."

On mergers and acquisitions

"We have nothing of any materiality in the pipeline around mergers and acquisitions."





"First indications are very strong. There's a lot of support for the oil and gas industry. There's a lot of expertise in the government with Rex Tillerson as the Secretary of State. He is clearly saying that he believes oil and gas is an important part of the U.S. future."

On potential U.S trade sanctions

"My view is that, overall, Canada is not at the top of the list for the U.S. in terms of the trade concerns. The trade, I think it's a very healthy balance and a very healthy symbiotic relationship between Canada and the U.S., so I think the probability of a border taxes we're currently thinking about it is very low."

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Five statements from Suncor CEO Steve Williams about the future of the oilsands



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## **ATTACHMENT LS-17**



National Energy Office national Board de l'énergie

03/14/17

### 2017 ESTIMATED PRODUCTION OF CANADIAN CRUDE OIL AND EQUIVALENT (m³/d) PRODUCTION ESTIMATIVE DE PÉTROLE BRUT ET D'ÉQUIVALENTS AU CANADA EN 2017 (M³/J)

													2017
	Jan/janv.	Feb/fév.	Mar/mars	Apr/avr.	May/mai	June/juin	July/juil.	Aug/août	Sep/sept.	Oct/oct.	Nov/nov.	Dec/déc.	Avg/moyenne
ONV. LIGHT CRUDE OIL/													
PÉTROLE BRUT LÉGER CLASS.													
AB	51169	51725	52639	53206	53031	52593	<b>52363</b>	52427	52760	53181	53645	54126	52739
BC	3240	3576	3220	3316	3197	3292	3081	3072	3165	3054	3147	3038	3200
SK	28782	28816	29824	31383	30394	29049	28647	28566	29185	29406	30353	31061	29622
MB	6096	6105	6130	6095	6026	5979	5969	5990	6028	6068	6094	6105	6057
NWT/NT	1427	1414	1051	833	688	614	541	469	398	329	261	194	685
NF/NL	40195	35526	32901	30639	30653	27758	28532	29255	30635	27974	34999	35654	32060
ON	122	130	112	132	126	125	127	135	129	104	116	120	123
SUB TOTAL/SOUS-TOTAL	131030	127292	125876	125604	124115	119410	119260	119914	122300	120116	128616	130297	124486
B UPGRADED BITUMEN/ BITUME													
/ALORISÉ-AB <sup>1</sup>													
SUB TOTAL/SOUS-TOTAL	168149	171203	153987	124985	154910	170222	168975	169475	171738	170476	172749	171476	164029
5+ / CONDENSATE/C <sub>5+</sub> /CONDENSATS													
AB	36136	36485	36830	37261	37744	38258	37185	37737	38328	38867	39378	39857	37839
BC	5922	6032	5959	6177	6279	6119	6247	6172	6096	5928	6171	6250	6113
SK <sup>2</sup>	116	115	113	112	111	109	108	106	105	104	102	101	109
NS	363	382	397	382	358	364	353	352	362	322	331	317	357
SUB TOTAL/SOUS-TOTAL	42538	43014	43300	43933	44492	44850	43893	44367	44891	45221	45982	46526	44417
OTAL LIGHT/LEGER	341718	341509	323163	294522	323517	334482	332128	333757	338930	335812	347347	348299	332932
IEAVY CRUDE OIL/ PETROLE BRUT LO	OURD												
AB CONV./CLASSAB	18254	18276	18311	18304	18265	18275	18347	18464	18564	18659	18755	18949	18452
AB NON-UPGRADED BITUMEN / BITUME NON	222000	246652	229054	246526	240206	240202	242220	244569	252504	246296	254424	247244	245257
	252900	240000	230031	240000	240390	249303	243320	244000	20004	240300	204121	247341	240207
AB SUB IUTAL/SUUS-IUTAL -AB	47201	204530	200000	47067	47674	180/1	49369	203032 19579	49193	49253	48604	48323	203700
OTAL HEAVY/LOURD	298356	311483	302880	311907	306335	316518	311035	312610	321261	314202	321479	314614	311202
OTAL PRODUCTION	640073	652992	626043	606429	629852	650999	643162	646367	660191	650110	668826	662913	644830

Canada

### ESTIMATED PRODUCTION BY REGION

### Canada

### WESTERN CANADA/OUEST CANADIEN

CONV. LIGHT/LÉGER CLASS.	90714	91636	92863	94834	93337	91527	90601	90524	91537	92038	93500	94523	92303
	168149	171203	153987	124985	154910	170222	168975	169475	171738	170476	172749	171476	164029
PENTANES PLUS	42175	42632	42903	43550	44134	44486	43540	44016	44529	44899	45651	46209	44060
TOTAL LIGHT/LÉGER	301038	305471	289753	263369	292380	306235	303116	304015	307804	307413	311900	312208	300392
CONV. HEAVY/LOURD CLASS. AB NUN-UPGRADED BITUMEN / BITUME NUN	65455	64830	64829	65371	65939	67215	67715	68043	67758	67912	67359	67273	66641
VALORISÉ-AB <sup>3</sup>	232900	246653	238051	246536	240396	249303	243320	244568	253504	246386	254121	247341	245257
TOTAL HEAVY/LOURD	298356	311483	302880	311907	306335	316518	311035	312610	321261	314298	321479	314614	311898
TOTAL WESTERN CANADA/ OUEST													
CANADIEN	599393	616954	592634	575277	598715	622753	614151	616625	629065	621710	633380	626822	612290
TOTAL EASTERN CANADA/													
EST CANADIEN	40680	36038	33410	31153	31137	28247	29012	29742	31126	28399	35446	36091	32540
TOTAL CANADA	640073	652992	626043	606429	629852	650999	643162	646367	660191	650110	668826	662913	644830

NOTES:

Figures in black print are actual production data from reporting agencies.

Figures in blue print are NEB projected estimates of production.

<sup>1</sup> As per ERCB -ST3, includes in situ bitumen that is upgraded to SCO

<sup>2</sup>Saskatchewan pentanes plus production is estimated to be 100 m<sup>3</sup>/d as no other data is available

<sup>3</sup> As per ERCB -ST3, excludes in situ produced bitumen that is upgraded to SCO

Les chiffres en noir représentent les données de production réelles obtenues auprès d'organismes présentant des rapports. Les données en bleu représentent les prévisions estimatives de l'ONÉ à l'égard de la production.

<sup>1</sup> Comprend la production de pétrole brut synthétique et de distillats de Suncor, Syncrude, AOSP, Horizon et Long Lake.

<sup>2</sup> Faute de données réelles, la

<sup>°</sup> Bitume in situ, sauf les quantités transformées en pétrole brut synthétique par valorisation.






#### https://www.neb-one.gc.ca/nrg/stistc/crdindptrimprdcl/sti/stmtdprdcin-eng.html 2017 ESTIMATED PRODUCTION OF CANADIAN CRUDE OIL AND EQUIVALENT (b/d) PRODUCTION ESTIMATIVE DE PÉTROLE BRUT ET D'ÉQUIVALENTS AU CANADA EN 2017 (b/J)

													2017
	Jan/janv.	Feb/fév.	Mar/mars	Apr/avr.	May/mai	June/juin	July/juil.	Aug/août	Sep/sept.	Oct/oct.	Nov/nov.	Dec/déc.	Avg/moyenne
CONV. LIGHT CRUDE OIL/	•			•		•		•					
PÉTROLE BRUT LÉGER CLASS.													
AB	321844	325339	331087	334653	333553	330800	329355	329756	331853	334499	337417	340441	331716
BC	20381	22490	20251	20856	20109	20707	19379	19322	19908	19210	19795	19106	20126
SK	181032	181250	187585	197395	191175	182715	180185	179676	183566	184957	190914	195370	186318
MB	38340	38402	38559	38339	37902	37607	37544	37675	37915	38167	38333	38397	38098
NWT/NT	8976	8895	6611	5241	4328	3861	3401	2949	2505	2069	1640	1219	4308
NF/NL	252818	223449	206943	192713	192801	174591	179458	184010	192688	175949	220138	224257	201651
ON	764	815	702	827	792	784	797	850	810	655	730	755	774
SUB TOTAL/SOUS TOTAL	824155	800639	791738	790025	780661	751064	750118	754237	769245	755505	808966	819544	782991
AB UPGRADED BITUMEN/ BITUME													
VALORISÉ-AB <sup>1</sup>													
SUB TOTAL/SOUS TOTAL	1057625	1076835	968546	786132	974350	1070660	1062818	1065965	1080199	1072258	1086557	1078552	1031708
C5+ / CONDENSATE/C5 /CONDENSATS													
AB	227288	229481	231655	234365	237404	240633	233888	237357	241078	244466	247679	250693	237999
BC	37249	37940	37481	38854	39494	38486	39293	38824	38341	37287	38812	39313	38448
SK <sup>2</sup>	732	723	714	704	696	687	678	669	661	652	644	636	683
NS	2285	2406	2496	2403	2251	2292	2222	2211	2277	2023	2083	1995	2245
SUB TOTAL/SOUS TOTAL	267555	270550	272346	276327	279844	282098	276080	279061	282357	284428	289218	292638	279375
TOTAL LIGHT/LÉGER	2149335	2148023	2032630	1852484	2034856	2103822	2089017	2099263	2131800	2112191	2184742	2190733	2094075
HEAVY CRUDE OIL/ PETROLE BRUT LO	URD												
AB CONV./CLASS. AB	114813	114955	115174	115130	114881	114944	115397	116136	116765	117361	117963	119188	116059
AB NON UPGRADED BITUMEN / BITUME NON VALORISÉ AB <sup>3</sup>	1464897	1551300	1407206	1550662	1512045	1568063	1530433	1538281	1504488	1540718	1508367	1555726	1542615
	1579710	1666354	1612470	1665701	1626026	1683007	1645831	1654417	1711253	1667079	1716330	167/013	1658673
AD SUD TOTAL/SUUS TOTAL AB	206227	202811	202588	206044	200861	307827	310516	311939	309/17	309790	305709	303045	303403
TOTAL HEAVY/LOURD	1876597	1050165	1005058	1061835	1026787	1000834	1056346	1066255	2020670	1076860	2022030	1078858	1961776
	4025022	4407499	2027699	2044240	2064642	1004656	4045262	1000200	4452470	4090060	4206794	4460604	4055954
	4020932	410/100	333/000	3014319	3501642	4034030	4040303	4000010	4152470	4009060	4200/01	4109591	4000001

WESTERN CANADA/OUEST CANADIEN					L	ESTIMATED P	RODUCTION	BY REGION				Car	nadä
CONV. LIGHT/LÉGER CLASS. AB UPGRADED BITUMEN/ BITUME VALORISE AB	570573	576375	584093	596484	587068	575689	569863	569377	575747	578901	588099	594532	580567
1	1057625	1076835	968546	786132	974350	1070660	1062818	1065965	1080199	1072258	1086557	1078552	1031708
PENTANES PLUS	265270	268144	269850	273924	277593	279806	273859	276850	280080	282405	287135	290642	277130
TOTAL LIGHT/LÉGER	1893467	1921354	1822489	1656540	1839011	1926155	1906540	1912191	1936025	1933565	1961791	1963727	1889405
CONV. HEAVY/LOURD CLASS.	411700	407765	407762	411173	414742	422770	425913	427974	426182	427151	423672	423132	419161
AB NON UPGRADED BITUMEN / BITUME NON VALORISÉ AB <sup>3</sup>	1464897	1551399	1497296	1550662	1512045	1568063	1530433	1538281	1594488	1549718	1598367	1555726	1542615
TOTAL HEAVY/LOURD	1876597	1959165	1905058	1961835	1926787	1990834	1956346	1966255	2020670	1976869	2022039	1978858	1961776
TOTAL WESTERN CANADA/ OUEST													
CANADIEN	3,770,064	3,880,518	3,727,547	3,618,375	3,765,798	3,916,989	3,862,886	3,878,446	3,956,695	3,910,434	3,983,831	3,942,585	3,851,181
TOTAL EASTERN CANADA/ EST CANADIEN	255868	226670	210141	195944	195844	177667	182477	187072	195775	178626	222950	227007	204670
TOTAL CANADA	4025932	4107188	3937688	3814319	3961642	4094656	4045363	4065518	4152470	4089060	4206781	4169591	4055851

2017 TOTAL WESTERN CANADA/	
OUEST CANADIEN (Updated May 12,	
2017)	4,042,343

2017)	4,042,343	3,957,082	3,686,615	3,490,997	3,672,902	3,822,914	3,827,242	3,826,729	3,882,366	3,841,010	3,907,612	3,880,525	3,819,861
Difference 3/14 minus 5/12 forecast s	-272,279	-76,564	40,932	127,377	92,896	94,075	35,644	51,717	74,329	69,424	76,219	62,060	31,319
<b>2016</b> TOTAL WESTERN CANADA/ OUEST CANADIEN	3,838,405	3,921,493	3,750,408	3,408,999	2,781,977	3,136,626	3,683,102	3,791,573	3,786,739	3,818,526	4,076,426	3,919,930	3,659,517

3,747,338 3,858,532 3,787,237 3,490,275 3,264,835 3,492,379 3,836,999 3,963,270 3,487,918 3,695,149 3,821,430 3,879,228

2015 TOTAL WESTERN CANADA/

OUEST CANADIEN

72,467

172521

3,693,716

#### 2014 TOTAL WESTERN CANADA/

 OUEST CANADIEN
 3,460,318
 3,450,156
 3,562,745
 3,503,878
 3,358,897
 3,452,304
 3,505,911
 3,536,114
 3,520,551
 3,698,779
 3,620,607
 3,723,591
 3,532,821

 2013 TOTAL WESTERN CANADA/

OUEST CANADIEN

2012 TOTAL WESTERN CANADA/ OUEST CANADIEN

#### NOTES:

Figures in black print are actual production data from reporting agencies. Figures in blue print are NEB projected estimates of production. <sup>1</sup>As per ERCB -ST3, includes in situ bitumen that is upgraded to SCO <sup>4</sup>Saskatchewan pentanes plus production is estimated to be 100 m³/d as no other data is available <sup>5</sup> As per ERCB -ST3, excludes in situ produced bitumen that is upgraded to SCO

Les chiffres en noir représentent les données de production réelles obtenues auprès d'organismes présenta Les données en bieu représentent les prévisions estimatives de l'ONE à l'égard de la production. <sup>1</sup> Comprend la production de pétrole brut synthétique et de distillats de Suncor, Syncrude, AOSP, Horizon et <sup>2</sup> Faute de données réelles, la

production de pentanes plus de la

Saskatchewan est estimée à 100 m3/j.

° Bitume in situ, sauf les quantités transformées en pétrole brut synthétique par valorisation.



		Estimated
	Actual Production	Production
Jan-15	3,747,338	
Feb-15	3,858,532	
Mar-15	3,787,237	
Apr-15	3,490,275	
May-15	3,264,835	
Jun-15	3,492,379	
Jul-15	3,836,999	
Aug-15	3,963,270	
Sep-15	3,487,918	
Oct-15	3,695,149	
Nov-15	3,821,430	
Dec-15	3,879,228	
Jan-16	3,838,405	
Feb-16	3,921,493	
Mar-16	3,750,408	
Apr-16	3,408,999	
May-16	2,781,977	
Jun-16	3,136,626	
Jul-16	3,683,102	
Aug-16	3,791,573	
Sep-16	3,786,739	
Oct-16	3,818,526	
Nov-16	4,076,426	
Dec-16	3,919,930	
Jan-17	4,042,343	
Feb-17	3,957,082	3,957,082
Mar-17	3,686,615	3,686,615
Apr-17	3,490,997	3,490,997
May-17	3,672,902	3,672,902
Jun-17	3,822,914	3,822,914
Jul-17	3,827,242	3,827,242
Aug-17	3,826,729	3,826,729
Sep-17	3,882,366	3,882,366
Oct-17	3,841,010	3,841,010
Nov-17	3,907,612	3,907,612
Dec-17	3,880,525	3,880,525



01/15-01-1<sup>°</sup>01/15-12/17 295,005 133,187





## **ATTACHMENT LS-18**

### Pipeline System Configuration

Q1, 2016



#### Line 1

37,600 m<sup>3</sup>/d (237 kbpd) 18"/20" - 1098 miles - NGL - Refined Products - Light

#### Line 2A

70,300 m<sup>3</sup>/d (442 kbpd) 24" - 596 miles - Condensates - Light

#### Line 2B

70,300 m³/d (442 kbpd) 24"/26" - 502 miles - Light

#### Line 3

62,000 m<sup>3</sup>/d (390 kbpd) 34" - 1098 miles - Condensates (Edmonton to Hardisty) - Light

#### Line 4

126,500 m<sup>3</sup>/d (796 kbpd) 36"/48" - 1098 miles - Heavy

- Medium (Ex-Clearbrook)
- Light (Ex-Clearbrook)

#### .....

Line 5 85,900 m³/d (540 kbpd) 30" - 645 miles - NGL

- Light

#### Line 6

106,000 m³/d (667 kbpd) 34" - 467 miles

- Light - Medium
- Iviediun - Heavy

#### Line 7

28,600 m³/d (180 kbpd) 20" - 120 miles - Light

- Medium
- Heavy

#### Line 78

79,500 m³/d (500 kbpd) 30"/36" - 373 miles - Light

- Medium
- Heavy

#### Line 65

29,500 m<sup>3</sup>/d (186 kbpd) 20" - 313 miles - Light - Medium Line 10

#### 11,800 m<sup>3</sup>/d (74 kbpd) 12"/20" - 91 miles - Liaht

- Medium
- Heavy

#### Line 11

18,600 m<sup>3</sup>/d (117 kbpd) 16"/20" - 47 miles

- Condensates
- Light
- Medium
- Heavy

#### Line 62

37,400 m³/d (235 kbpd) 22" - 75 miles - Heavy

#### Line 14/64

50,500 m³/d (318 kbpd) 24" - 467 miles - Light

- Medium

#### Line 61

148,000 m³/d (931 kbpd) 42" - 454 miles - Light - Medium

- Heavy

#### Line 67

127,200 m³/d (800 kbpd) 36" - 1112 miles - Heavy

#### Not part of the Enbridge Mainline System

#### ••••

Line 9 47,700 m<sup>3</sup>/d (300 kbpd) 30" - 517 miles - Light

-Heavy

#### . . . . .

Line 17

16,000 m³/d (100 kbpd) 16" - 88 miles - Heavy

#### • • • • •

#### Line 55

30,700 m<sup>3</sup>/d (193 kbpd) 22"/24" - 583 miles - Light

- Medium
- Heavy

#### . . . . .

#### Line 59

93,000 m³/d (585 kbpd) 36" - 593 miles - Light

- Heavy
- . . . . .

#### Line 79

12,700 m<sup>3</sup>/d (80.0 kbpd) 20"/16" - 61 miles - Heavy

#### • • • • •

Line 63 47,700 m³/d (300 kbpd) 24" - 168 miles - Light - Heavy



do not include current restrictions.

NOTE: Capacities provided are Annual Capacities and



## Spectra Energy Corp Headquarters

5400 Westheimer Court Houston, TX 77056-5310 (713) 627-5400

## **Crude Oil Transportation**

### Express-Platte



Express System Facts

- Length: 785 miles (1263 km)
- Diameter: 24 inch
- Transportation Capacity: approximately 280,000 bpd (44,800 m3/d)
- Transit time: Approximately 12 days
- Pump stations: 19
- Ownership interest: 100 percent Spectra Energy Partners, LP
- Regulator: National Energy Board (Canadian segment), and U.S. Department of Transportation Office of Pipeline Safety and the Federal Energy Regulator Commission (U.S. segment)

### **Platte System Facts**

- Length: 932 miles (1500 km)
- Diameter: 20 inch
- Transportation Capacity: Approximately 164,000 bpd (26,000 m3/d) from Casper to Guernsey, and approximately 145,000 bpd (23,000 m3/d) from Guernsey to Wood River
- Transit time: Approximately 15 days
- Pump stations: 19
- Ownership interest: 100 percent Spectra Energy Partners, LP
- Regulator: U.S. Department of Transportation Office of Pipeline Safety, Federal Energy Regulatory Commission and Wyoming Public Service Commission.

The Express-Platte Pipeline System is one of three critical pipelines that

Fact Sheet

• Express-Platte Facts (PDF 309 KB)

**Customer Tools** 

• Express-Platte Shipper Interface

transport crude oil from Western Canada to the United States. Express-Platte is comprised of the Express and the Platte crude oil pipelines. This 1,700- mile (2,700-km) integrated oil transportation network connects Canadian and U.S. producers to refiners in the Rocky Mountain and Midwest regions of the United States. In addition, the system includes 44 storage tanks with a total capacity of 4.8 million barrels (MMBbls), and 38 pump stations to boost the flow of oil.

### **Express Pipeline**

The Express pipeline receives a variety of light, medium and heavy crude oil produced in Western Canada at Hardisty, Alberta, a rapidly growing Canadian oil hub, and transports it to refiners in the U.S. Rocky Mountain states. The Express pipeline interconnects with the Platte pipeline at Casper, Wyoming. Accompanying facilities include 10 storage tanks (1.4 MMBbls total capacity) that provide flexibility on shipment timing and product mix. Flow through the pipeline is boosted by 19 pump stations with 156,000 horsepower.

### **Platte Pipeline**

The 932-mile Platte pipeline transports up to 164,000 barrels per day (bpd) of crude oil from Casper, Wyoming, to Guernsey, Wyoming, and 145,000 bpd from Guernsey to Wood River, Illinois. The pipeline brings crude oil predominantly from the Bakken and Western Canada to refiners in the Midwest, and is accompanied by 34 storage tanks (3.4 MMBbls total capacity) that provide flexibility on shipment timing and product mix. Flow through the pipeline is boosted by 19 pump stations with 64,000 horsepower.

> Operations > Crude Oil Transportation > Express-Platte



Kinder Morgan in Canada Pipeline Business in Canada 🔻

- Pipeline Systems >

#### - Trans Mountain

- TMX Anchor Loop Project
- Trans Mountain Jet Fuel
- Puget Sound
- Cochin
- Shipper Services > - Pipeline Safety Tolls & tariffs > Terminal Business in Canada

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#### Trans Mountain Pipeline System

In operation since 1953, the Trans Mountain pipeline system (TMPL) is the only pipeline system in North America that transports both crude oil and refined products to the west coast. TMPL moves product from Edmonton, Alberta, to marketing terminals and refineries in the central British Columbia region, the Greater Vancouver area and the Puget Sound area in Washington state, as well as to other markets such as California, the U.S. Gulf Coast and overseas through the Westridge marine terminal located in Burnaby, British Columbia. Only crude oil and condensates are shipped into the United States.



**Historical Highlights** 

System Facts Length: 1150 km (715 miles) Diameter: 827 km (514 mile) of 610 mm (24-inch) pipe, 150 km (93.4 mile) of 914 mm (36-inch) pipe and 72 km (30-inch) pipe Current capacity: 48 000 m3/d (300.000 bpd) (approx.) Pump stations: 24 Pump stations: 24 Regulated by National Energy Board (NEB)

#### For information on the

proposed TMPL expansion, visit www.transmountain.com or contact info@transmountain.com.

Edmonton Terminal The TMPL mainline originates at the Edmonton terminal, located in Sherwood Park, Alberta. The terminal has 20 incoming feeder lines from throughout Alberta It contains 19 storage tanks with an overall volume of 390 000 m3 (2.5 million bbl). The main control centre located at the Edmonton terminal remotely monitors all aspects of pipeline operations with a sophisticated Supervisory Control and Data Acquisition (SCADA) system.

#### Kamloops Terminal

Refined products from Edmonton are routed to Kamloops for local distribution. Kamloops is also a receiving site for products from northeastern British Columbia that are bound for the west coast. The site contains two storage tanks with an overall volume of 23 000 m3 (144,000 bbl).

#### Sumas Pump Station and Terminal

The Sumas pump station and the Sumas terminal are located in Abbotsford. British Columbia. Both facilities route crude oil from the TMPL mainline into Washington State via KMC's Puget Sound pipeline system. The terminal contains six storage tanks with an overall volume of 103 000 m3 (650,000 bbl).

#### **Burnaby Terminal**

The Burnaby terminal is the terminus of the TMPL mainline. It receives both crude oil and refined products for temporary storage and distribution through separate pipelines to local terminals, a refinery and the Westridge marine terminal. The Burnaby terminal has 13 storage tanks with an overall volume of 250 000 m3 (1.6 million bbl).

#### Westridge Marine Terminal

The Westridge marine terminal is located within Port Metro Vancouver in Vancouver. British Columbia. Built in 1953, it can accommodate ships up to approximately 120 000 dead weight tons and barges. In addition to shipping crude oil, the facility also receives jet fuel, which is delivered to the Vancouver International Airport through the Jet Fuel pipeline system. The Westridge marine terminal is regulated by Transport Canada and the National Energy Board. Three storage tanks have an overall volume of 46 000 m3 (290,000 bbl).

#### Products in the Pipeline

TMPL transports crude oil, refined and semi-refined products together in the same line. This process, known as "batching," means that a series of products can follow one another through the pipeline in a "batch train."

A typical batch train in the mainline is made up of a variety of materials being transported for different shippers. Products next to each other in the pipeline can mix. This mixing - or product interface - is kept to a minimum by putting the products in a specific sequence. Any products that do mix are re-refined for use.



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### Oil

TransCanada is meeting the growing demand for energy across North America — and maximizing our pipeline infrastructure — through innovative and strategic pipeline solutions that will transport Canadian crude oil, as well as U.S. domestic crude oil to key U.S. markets in the Midwest and U.S. Gulf Coast.

### **Keystone Pipeline**

The Keystone Pipeline is a 2,150-mile (3,460-kilometre) pipeline that transports crude oil from Hardisty, Alta., to markets in the American Midwest at Wood River and Patoka in Illinois, and at Cushing, Okla.. The Canadian portion of the pipeline runs from Hardisty east into Manitoba where it turns south and crosses the border into North Dakota. From North Dakota, the pipeline runs south through South Dakota and Nebraska. At Steele City, Neb., one arm of the pipeline runs east through Missouri for deliveries into Wood River and Patoka, Illinois; another arm runs south through Oklahoma for deliveries into Cushing.

Deliveries to Wood River and Patoka began in the summer of 2010, and deliveries to Cushing began in February of 2011. The pipeline system currently has the capacity to deliver up to 590,000 barrels per day (bbl/d) of Canadian crude oil into these important North American refining markets.

For more information on becoming a Keystone customer, please see the Keystone Shipper Information.

#### **Gulf Coast Pipeline Project**

The Gulf Coast Pipeline Project is an approximate 485-mile (780 kilometre), 36-inch crude oil pipeline beginning in Cushing, Okla., and extending south to Nederland, Texas, to serve the Gulf Coast marketplace.

Construction of the Gulf Coast Pipeline began in August 2012 with an anticipated in service date of mid-to-late 2013. The Gulf Coast Pipeline will have the initial capacity to transport 700,000 barrels per day (bbl/d) with the potential to transport 830,000 bbl/d to Gulf Coast refineries.

For more information on becoming a Gulf Coast Pipeline customer, please see the Keystone Shipper Information.

#### **Cushing Marketlink Project**

The Cushing Marketlink Project provides receipt facilities to transport U.S. crude oil production from Cushing, Okla., to the U.S. Gulf Coast using facilities that make up part of the Gulf Coast Pipeline Project.

For more information on becoming a Marketlink customer, please see the Marketlink Shipper Information.

Page Updated: 2013-12-03 09:23:36h CT TransCanada Corporation Home » Our Businesses » Pipelines » Oil

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### **Energy East Pipeline Project**

#### A pipeline from West to East

Called the Energy East Pipeline, the 4,500-kilometre pipeline will carry 1.1-million barrels of crude oil per day from Alberta and Saskatchewan to refineries in Eastern Canada.

Currently, the project has the following major components:

- · Converting an existing natural gas pipeline to an oil transportation pipeline
- Constructing new pipelines in Alberta, Saskatchewan, Manitoba, Eastern Ontario, Québec and New Brunswick to link up with the converted pipe
- Constructing the associated facilities, pump stations and tank terminals required to move crude oil from Alberta to Québec and New Brunswick, including marine facilities that enable access to other markets by ship

While the exact route will only be determined after public and regulatory review, the planned starting point is a new tank terminal in Hardisty, Alta. Three other new terminals will be built along the pipeline's route: One in Saskatchewan, one in the Québec City area and another in the Saint John, N.B., area. The terminals in the Québec City and Saint John areas will include facilities for marine tanker loading. The project will also deliver oil to existing Québec refineries in Montréal, near Québec City and in Saint John. New pipeline will be built in Alberta, Saskatchewan, Manitoba, Eastern Ontario, Québec and New Brunswick.

The Energy East Pipeline Project involves three major components: pipeline conversion, the construction of new pipeline and the construction of new pipeline facilities. Energy East will convert an existing natural gas pipeline to oil service between Burstall, Saskatchewan and Cornwall, Ontario. New sections of pipe will also need to be constructed in Alberta, Saskatchewan, Manitoba, Eastern Ontario, Québec and New Brunswick to link up with the newly converted pipe. Lastly, associated facilities like pump stations, tank terminals and marine facilities will be constructed in order to successfully move the crude oil from Alberta to New Brunswick.

Learn more at EnergyEastPipeline.com

Page Updated: 2013-09-06 13:37:45h CT TransCanada Corporation Home » Key Projects » Oil Pipelines » Energy East Pipeline Project

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### Project Overview | Trans Mountain

**Project Overview** 

Projected Power

Environmental and Socio-Economic Assessment Aboriginal Peoples Engaging Communities Landowner Information Current Pipeline Operations Industry Safety & Regulations

Requirements Regulatory Process

Timeline

Jobs Procurement Benefits Proposed Pipeline Corridor Marine Plans

**Commercial Support** 

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FACILI Learn more	TIES APPL about our Facilities	ICATION	TRANS MOU Find information on th	JNTAIN the Trans Mour	PIPELINE tain Pipeline.	<b>CON</b> We want to	TACT US		
<sup>0.0</sup> Home	1.0 Proposed Expansion	<sup>2.0</sup> Current Pipeline Operations	3.0 Industry Safety & Regulations	<sup>4.0</sup> News	5.0 Resources & Publications	<sup>6.0</sup> About Us	<sup>7.0</sup> Contact Us	<sup>8.0</sup> Med	ia Centre
Pipeline / I	Proposed Expansio	on / Project Overview							
Propose	d Expansion	PROJ	ECT OVERVIE	N					

Trans Mountain is proposing an expansion of its current 1,150-kilometre pipeline between Strathcona County (near Edmonton), Alberta and Burnaby, BC. The proposed expansion, if approved, would create a twinned pipeline that would increase the nominal capacity of the system from 300,000 barrels per day, to 890,000 barrels per day.

#### SOME QUICK FACTS INCLUDE:

Projected capital cost: approximately \$5.5 billion
Approximately 994 km of new pipeline
Reactivation of 193 km of reactivated pipeline
12 new pump stations to be built
20 new tanks to be added to existing storage terminals in Burnaby (14), Sumas (1), and Edmonton (5)
Westridge Marine Terminal in Burnaby to be expanded with 3 new berths
Existing line to carry refined products, synthetic crude oils, light crude oils with capability for heavy crude oils
Proposed new line to carry heavier oils with capability for transporting light crude oils
This is not the first time the Trans Mountain line has been expanded. In fact, since operation began in 1953,
the capacity of the pipeline system has been increased numerous times, with the initial expansion in 1957.
The most recent expansion project took place between 2006 and 2008 with the construction of 13 new pump
stations and modifications to existing stations. Also during this time, the Anchor Loop project added 160

The most recent expansion project took place between 2006 and 2008 with the construction of 13 new pump stations and modifications to existing stations. Also during this time, the Anchor Loop project added 160 kilometres of new pipe through Jasper National Park and Mount Robson Provincial Park between Hinton, Alberta and Hargreaves, BC.

At present, the Westridge Marine Terminal handles approximately five tankers per month. Should the proposed expansion be approved, the number of tankers loaded at the Westridge Marine Terminal could increase to approximately 34 per month.

#### DID YOU KNOW

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> PLASTICS, MANY PHARMACEUTICALS, CHEMICALS, AND OILS AND LUBRICANTS START OUT AS PETROLEUM. (SOURCE: CEPA)

See All

http://www.transmountain.com/project-overview

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1.866.514.6700 <u>info@transmountain.com</u> 2844 Bainbridge Ave	RT <u>@LexaHobenshield</u> : <u>@transmtn</u> Ian Anderson "if you have not been contacted by us, you are not in either corridor"	RT <u>@ieffnaael</u> : 16 Lower Mainland cities among munis, RDs applying for <u>#NEB</u> hearings into <u>#KinderMorgan</u> 's <u>@TransMtn</u> twinning:	
PO Box 84028 Bainbridge Burnaby, BC V5A 4T9	<u>http://t.co/kEPRdEFCUh</u> v 8 hours aga Follow <u>@TransMtn</u>	http://t.co/ja 11 hours ago	<u>Visit Channel</u>

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# **ROCKY MOUNTAIN PIPELINE SYSTEM LLC**

LOCAL AND PROPORTIONAL TARIFF APPLYING ON CRUDE PETROLEUM

#### CONTAINING BASE AND AGGREGATE VOLUME RATES

Subject to rules and regulations named herein.

TABLE 1 OF BASE RATES						
ORIGIN	DESTINATION	Base Rates in Cents per Barrel of 42 United States Gallons				
International Boundary	Casper, Wyoming	<b>[U]</b> 234.24				
Glacier County, Montana (Rangeland Crude) (Subject to Note A)	Billings, Montana	<b>[U]</b> 191.67				
Cut Bank Station Glacier County, Montana	Guernsey, Wyoming	<b>[I]</b> 248.44				
(Bow River Crude) (Subject to Notes A and B)	Ft. Laramie, Wyoming	<b>[U]</b> 248.44				
International Boundary Glacier County, Montana (Rangeland Crude)	Cut Bank Station, Montana	<b>[U]</b> 53.26 (1)				

#### Route:

-Intl. Boundary/Cut Bank, Montana to Billings, Montana (Glacier System)

-Billings, Montana to Elk Basin, Wyoming (Beartooth System)

-Elk Basin, Wyoming to Casper/Guernsey, Wyoming (Big Horn System)

This tariff publication is filed in accordance with indexing and tariff ceiling provisions of 18 CFR 342.3.

### ISSUED: July 29, 2013

### EFFECTIVE: September 1, 2013

The provisions published herein will, if effective, not result in an effect on the quality of the human environment.

Issued By: [W] Mark Gorman Executive Vice President Harry N. Pefanis President & Chief Operating Officer Rocky Mountain Pipeline System LLC P.O. Box 4648 Houston, Texas 77210-4648

### Explanation of Reference Marks:

- [I] Increase
- [U] Unchanged rate
- [W] Change in wording only

Compiled By: Teresa Bratcher Tariff Manager Rocky Mountain Pipeline System LLC P.O. Box 4648

Houston, Texas 77210-4648

(713) 646-4568

(1) EXCEPTION TO ITEM 35 (b) DETERMINATION OF VOLUMES AND DEDUCTIONS:

In lieu of the provisions stated in Item No. 35 (b), of the rules and regulations contained herein, the following will apply: A deduction of one-tenth of one percent (0.1%) will be made to cover shrinkage and evaporation incident to pipeline transportation.

**Note A**: Unless otherwise specified in this tariff, a viscosity surcharge will be assessed as follows: Crude Petroleum having a viscosity from 20 up to but not including 100 square millimeters per second (mm2/s or centistokes (cs)) will be assessed a 10% surcharge on the tariff rate. Crude Petroleum having a viscosity from 100 to 200 square millimeters per second (mm2/s or centistokes (cs)) will be assessed a 17% surcharge on the tariff rate. Crude Petroleum having a viscosity greater than 200 square millimeters per second (mm2/s or centistokes (cs)) will be assessed a 17% surcharge on the tariff rate. Crude Petroleum having a viscosity greater than 200 square millimeters per second (mm2/s or centistokes (cs)) will be measured at pumping temperature as the Crude Petroleum is pumped into Carrier's pipeline at Cut Bank, MT.

**Note B:** Receipts from Cut Bank, MT (Bow River Crude) to Casper will be accepted on a segregated basis only, and Carrier reserves the right to limit nominations subject to operational constraints in properly handling and segregating such volumes. Carrier will offer this segregated service for 12 months, after which time Carrier reserves its rights to review the service and make appropriate changes, including canceling the segregation.

## Rules and Regulations

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	RULES A	AND REGULATIONS
ITEM NO.	SUBJECT	RULES AND REGULATIONS
5	ABBREVIATIONS AND DEFINITIONS	As used in these rules and regulations, the following terms have the following meanings: "a.m." means a time of day after midnight and before noon. "Barrel" means forty-two United States gallons. "F.E.R.C." means Federal Energy Regulatory Commission. "No." means number. "Line Fill" means Crude Petroleum in transit in the pipeline system between origin and destination including the Crude Petroleum in tankage at origin and en route to destination. "p.m." means a time of day after noon and before midnight. "Tender" means an offer by a Shipper to the Carrier of a stated quantity of Crude Petroleum for transportation from a specified origin or origins to a specified destination or destinations in accordance with these rules and regulations. "API" means American Petroleum Institute. "Carrier" means Rocky Mountain Pipeline System LLC. "Shipper" means the party who contracts the Carrier for transportation of Crude Petroleum. as defines herein and under the terms and conditions acceptable to the Carrier and this tariff. "Consignee" means the party to whom a Shipper has ordered the delivery of Crude Petroleum. "Common Stream" means Crude Petroleum moved through the Carrier's pipeline and pipeline facilities, which is commingled or intermixed with other Crude Petroleum. "Crude Petroleum" dike quality and characteristics. Carrier's Common Streams and the characteristics are determined in accordance with Item No. 25 below. "Crude Petroleum" facilities or (i) a liquid phase in underground reservoirs and remains liquid at atmospheric pressure after passing through sufface separating facilities or (ii) a liquid phase in underground reservoires and synchica re or (ii) a liquid static pressure after passing through sufface separating facilities or (ii) a liquid phase in underground reservoires and remains liquid at atmospheric pressure after passing through sufface separating facilities or (ii) a liquid phase in underground reservoires and remains liquid at atmospheric pressure after passing through sufface separat

ITEM NO.	SUBJECT	RULES AND REGULATIONS
5	ABBREVIATIONS AND DEFINITIONS (Continued)	"Force Majeure" will be defined as acts of God, strikes, lockouts or other industrial disturbances, acts of war or public disturbance, landslides, earthquakes, fires, floods, washouts, order or action from any Federal or state government or any other governmental authority having jurisdiction that would prohibit a party's performance hereunder, explosions, breakage, accidents or repairs to machinery or lines of pipe or other facilities excluding scheduled maintenance, inability to obtain or unavoidable delay in obtaining material and equipment, failure of a co- owner of the Western Corridor Pipeline to operate any segment of the Western Corridor Pipeline which it has agreed to operate, and any other causes, whether of the kind herein enumerated or otherwise, not reasonably within Carrier's control.
10	Commodity	The Carrier is engaged in the transportation of Crude Petroleum by pipeline and will not accept any other commodity for transportation.
15	TENDERS	<ul> <li>a) Crude Petroleum will be transported only under a Tender accepted by the Carrier, from origin to destination when a tariff covering the movement is lawfully in effect and on file with the Federal Energy Regulatory Commission.</li> <li>b) Any Shipper desiring to Tender Crude Petroleum for transportation shall make such Tender to the Carrier in writing on or before the twenty-fifth day of the month preceding the month during which the transportation under the Tariff is to begin. When the twenty-fifth day of the month falls on a weekend, nominations will be required on the previous workday. When the twenty-fifty of the month falls on a holiday, nominations will be required two days prior to the holiday. Unless such notification is made, the Carrier will be under no obligation to accept Crude Petroleum for transportation. However, operating conditions permit and at the sole discretior of the Carrier, Tenders for Crude Petroleum may be accepted for transportation after the 25<sup>th</sup> day of the month preceding the month during which the transportation under the Tender is to begin.</li> </ul>
20	QUANTITIES	<ul> <li>a) A Tender will be accepted only when the total quantity covered by such will be made available for transportation within the month when the Tender is to begin.</li> <li>b) Any quantity of Crude Petroleum will be accepted from facilities to which the carrier is connected, if such quantity can be so consolidated with other Crude Petroleum that Carrier can make a single delivery of not less than 25 thousand barrels, and Carrier will not be obligated to make any single delivery of less than 25 thousand barrels. The term "single delivery" as used herein means a delivery of Crude Petroleum in one continuous operation to one or more "Consignees into a single facility, furnished by Consignee or Consignees, to which Carrier is connected.</li> </ul>

	RULES A	ND REGULATIONS
ITEM NO.	SUBJECT	RULES AND REGULATIONS
25	SEGREGATION AND VARIATIONS IN QUALITY AND GRAVITY	<ul> <li>a) Only Crude Petroleum, as defined in Item 5 above, will be accepted for transportation.</li> <li>b) Carrier is not liable for variations in gravity or quality of Crude Petroleum occurring while in its custody, and is under no obligation to deliver the identical Crude Petroleum received, but may make delivery out of a Common Stream</li> <li>c) No Crude Petroleum will be accepted for transportation as part of Common Stream except good merchantable Crude Petroleum of acceptable character readily susceptible of transportation through Carrier's existing facilities, and which will not materially affect the quality of Crude Petroleum being transported, or cause a disadvantage to any other Shipper.</li> <li>d) Where it is feas ble to segregate particular Crude Petroleum or particular mixtures of Crude Petroleum through the Carrier's pipeline system without increasing investment or operating costs, the Carrier will endeavor to handle, segregated streams of mixed Crude Petroleum or individual Crude Petroleum, but the number of such segregated stream will not be increased if an added stream would require and increase in investment or in operating costs.</li> <li>f) The acceptance of Crude Petroleum for transportation shall be on the condition that such Crude Petroleum in the Carrier's pipeline and tanks.</li> <li>g) The Carrier shall have no respons bility in, nor for, any revaluations nor settlements deemed appropriate by Shippers and Consignees because of mixing of component parts of Crude Petroleum streams by the Carrier, other than to furnish a volume and gravity data on the Crude Petroleum received into and delivered out of the respective streams.</li> </ul>
30	DESTINATION FACILITIES	No duty to transport will arise until evidence satisfactory to the Carrier has been furnished that Consignee has provided necessary facilities to which Carrier is connected and has made necessary arrangements for accepting delivery off shipment promptly on arrival at destination, as provided in these rules and regulations.

ITEM	SUBJECT	RULES AND REGULATIONS				
NO. 35	DETERMINATION OF VOLUME AND DEDUCTIONS	<ul> <li>a) Quantities for receiving, delivering, assessing charges and all other purposes will be corrected to a temperature of sixty degrees Fahrenheit by the use of factors derived from the American Petroleum Institute Manual of Petroleum Measurement, after deduction of impurities shown by tests made by the carrier prior to receipt and upon deliver. A representative of the Carrier shall have the right to enter upon the premises where Crude Petroleum is received and delivered and have access to all tanks, storage receptacles or meters for the purpose of metering and testing and to make any examination, inspection, measurement or test reasonably necessary to insure the accuracy of all volume and quality measurements and adjustments. Quantities may be computed from tank table compiled or accepted by the Carrier, if metering fails.</li> <li>b) Three-tenths of one percent (0.30%) will be deducted from all Crude Petroleum received for transportation at point of origin and retained buy Carrier to cover losses due to shrinkage and evaporation incident to pipeline transportation. This loss allowance adjustment will be made from Shipper's inventory.</li> <li>c) After consideration of all factors set forth in this Item in paragraphs (a) and (b), a net balance will be determined as the quantity deliverable by Carrier and transportation charges will be assessed on this net balance upon delivery at destination.</li> </ul>				
40	STORAGE IN TRANSIT	<ul> <li>a) The Carrier has working tanks required in the process of transporting Crude Petroleum, but has no other tankage and, therefore, does not have facilities for rendering, nor does it offer, a storage service.</li> <li>b) Each Shipper will be required to furnish Crude Petroleum into inventory for their proportionate share of the line fill in such amount as deemed necessary by Carrier</li> </ul>				
45	DELIVERY AND DEMURRAGE	<ul> <li>a) Subject to Item 60, Carrier will transport and deliver Crude Petroleum with reasonable diligence and dispatch, but will accept no Crude Petroleum to be transported in time for any particular market.</li> <li>b) After any shipment has had time to arrive at destination, and on twenty-four hour notice to Consignee, Carrier may begin delivery at its current rate of pumping.</li> <li>c) Commencing after the first seven o'clock a.m. after expiration of said notice, a demurrage charge of [U]1.14¢ per barrel per day of twenty-four hours shall accrue on any part of said shipment offered for delivery and not taken as prescribed in paragraph (b) of this item. If Shipper or Consignees is unable or refuses to receive said Crude Petroleum as it arrives at destination, the Carrier reserves the right to make whatever arrangements for disposition of the Crude Petroleum it deems appropriate to clear its pipeline. Any additional expense, cost or loss, incurred by Carrier in making such arrangements shall be borne by the Shipper.</li> </ul>				
50	RATES APPLICABLE	Crude petroleum transported shall be subject to the rates in effect on date such Crude Petroleum is received by the Carrier irrespective of date of Tender.				

	F.E.R.C. No. 183.5.0			
	RULES A	ND REGULATIONS		
ITEM NO.	SUBJECT	RULES AND REGULATIONS		
55	PAYMENT OF CHARGES	The Shipper shall be responsible for payment of transportation and all other charges applicable to the shipment, and if required, shall prepay such charges or furnish guaranty of Payment satisfactory to the Carrier. The Carrier will have a lien on all Crude Petroleum accepted for transportation to secure the payment of all charges, including demurrage charges, and may refuse to deliver Crude Petroleum until all charge have been paid. If said charges or any part thereof shall remain unpaid five days, computed from the first seven o'clock a.m. after written notice is mailed to shipper of intention to enforce Carrier's lien as herein provided, or when there shall be failure to take the Crude Petroleum at the point of destination as provided in Item 45 within five days, computed from the first seven o'clock a.m. after expiration of the notice therein provided, the carrier shall have the right through an agent to sell said Crude Petroleum at public auction for cash between the hours of ten o'clock a.m. and four o'clock p.m. on any day not a legal holiday and not less than twenty-four hours after notice of the time and place of such sale and quantity , general description and location of the Crude Petroleum to be sold has been published in a daily newspaper of general circulation published in the town or city where the sale is to be held, and sent by telegraph to Shipper. The Carrier may be a bidder and purchaser at such sale. Out of the proceeds of said sale Carrier may pay itself all transportation, demurrage, and other lawful charges, expense of notice, advertisement, sale, and other necessary expense and of caring for and maintaining the Crude Petroleum, and the balance shall be held for whomsoever may be lawfully entitled thereto.		
60	LIABILITY OF CARRIER	<ul> <li>a) The Carrier, while in the possession of any Crude Petroleum will not be liable for any loss thereof, or damage thereto, or delay in deliver, caused by an act of God, the public enemy, quarantine, the authority of law, or of public authority, str kes, riots, insurrection inherent nature of the goods, or the act or default of the Shipper or Consignee, or resulting form any other cause not due to the negligence of Carrier where similar or dissimilar to the causes herein enumerated.</li> <li>b) Any losses of crude petroleum (other than inherent losses covered by Item 35, will be charge proportionately to each Shipper in the ratio that his Crude Petroleum, or portion thereof, received and undelivered at the time the loss occurs, bears to the total of all Crude Petroleum then in the custody of the Carrier for transportation via the lines or other facilities in which the loss occurs; and the Carrier will be obligated to deliver only that portion of such Crude Petroleum remaining after deducting Shipper's proportion of such loss determined as aforesaid. Transportation charges will be assessed only on the quantity delivered.</li> </ul>		
65	TITLE	A Tender of Crude Petroleum shall be deemed a warranty of title by the warranty tendering, but acceptance shall not be deemed a representation by the Carrier as to title. The Carrier may in the absence of adequate security decline to receive any Crude Petroleum, which is in litigation, or as to which a dispute over title may exist, or which is encumbered lien of which the Carrier has notice.		

F.E.R.C. No. 183.5.0

RULES AND REGULATIONS						
ITEM NO.	SUBJECT	RULES AND REGULATIONS				
70	TIME LIMITATION ON CLAIMS	As a condition precedent to recovery for loss, damage, or delay to shipments, claims must be filed in writing with the Carrier within in nine months and one day after delivery of the property, or in any case of failure to make delivery then within nine months and one day after reasonable time for delivery, based on capital Carrier's normal operations, has elapsed; and suits shall be instituted against the Carrier only within two years and one day from the day when notice in writing is given by the Carrier to the claimant that the Carrier has disallowed the claim or any part or parts thereof specified in the notice. Where claims are not filed or suits are not instituted thereon in accordance with foregoing provisions, no Carrier hereunder will be liable, and such claims will not be paid.				
75	RECONSIGNMENT	Crude Petroleum in transport may be reconsigned without an additional charge to another capital shipper at point of destination, provided such reconsignment is made in writing by the tendering Shipper prior to delivery at original destination. This will be allowed subject to rates, rules and regulations applicable from point for origin to points of final destination. Reconsignment shall not affect the liability of the tendering Shipper for all charges under Item No. 55.				
80	PRORATION PROCEDURES	<ul> <li>When there shall be tendered to the Carrier Rocky Mountain Pipeline System LLC for transportation on the Carrier's pipeline system or any part thereof under applicable tariffs, more crude petroleum than can be currently transported, the transportation furnished by the Carrier shall be apportioned among shippers in a fair and equitable manner so as to avoid discrimination among shippers and so as not to adversely affect the reasonable operations of the Carrier's facilities.</li> <li>Because of the extensive and varied line capacities and types of Products transported over different segments of the Carrier's pipeline system, individual proration procedures as identified below, will be utilized to effectively handle proration on the affected line segment.</li> <li>Western Corridor* - refer to Proration Policy effective March 1, 2003 available upon request.</li> <li>(*Defined as: Rocky Mountain Pipeline System's space originating at the International Boundary to Billings, MT (Glacier System); then Billings, MT to Elk Basin, WY, (Beartooth System); then Elk Basin, WY to Casper, WY (Bighorn System) with destinations at Casper, WY and Guernsey, WY.</li> </ul>				



Check appropriate box:

An Initial (Original) Submission

Resubmission No.

Form 6 Approved OMB No. 1902-0022 (Expires 6/30/2013) Form 6-Q Approved OMB No. 1902-0206 (Expires 6/30/2013)



# FERC Financial Report FERC Form No. 6: ANNUAL REPORT OF OIL PIPELINE COMPANIES and Supplemental Form 6-Q: Quarterly Financial Report

(Formerly ICC Form P)

These reports are mandatory under the Interstate Commerce Act, Sections 20 and 18 CFR Parts 357.2 and 357.4. Failure to report may result in criminal fines, civil penalties and other sanctions as provided by law. The Federal Energy Regulatory Commission does not consider this report to be of a confidential nature.

Exact Legal Name of Respondent (Company)

Rocky Mountain Pipeline System LLC

 Year/Period of Report

 End of
 2012/Q4

Nam	e of Respondent		This F	Report Is:		D	ate of Report	Year	Period of Report
Roc	ky Mountain Pipeline System	LLC	(1) (2)			(1)	04/18/2013	End o	f <u>2012/Q4</u>
		Miles	( <sup>2</sup> )		d of Year ((	conti	nued)		
1)	Give particulars (details) calle	d for by State and ter	mini c	concerning the miles of	of all ninelin		erated and size of	each line at end	l of vear
acco	rding to the classifications giv	en.	min, o	oncerning the miles t		c opc			i or year,
2.)	Report miles of pipeline opera	ated to the nearest wh	ole mi	le adjusted to footing	s, i.e.: count	t ½ m	nile and over as a v	vhole mile disre	garding any
fracti	on less than ½ mile. Report fr	actional size line in th	e next	smaller whole size, e	e.g.: report 2	2 1/2"	and 6 5/8" lines as	s 2" and 6" lines	s, respectively.
Size	of line is defined as inside dia	imeter.						n a na niho i alla san in	
3.)	Report under (A), the lines will Report under (B), the total million	nolly owned and opera	in undi	respondent, includin	g wholly ow	nea r d by i	ninor facilities tem	porarily idle or if	n standby service.
<i>)</i>	Name of Company and State			TERMINI					OP AT END OF YB
	(a)	From -		TO -	YR	. 01	GATHERING LINES	YR	TRUNK LINES
	()	(b)		(C)	GATHERI	NG	Size of Line	TRUNK LINES	FOR CRUDE OIL
Line				.,	LINES		(in inches)	FOR CRUDE OIL	Size of Lines
No.					Miles		(e)	Miles	(in inches)
					(d)			(f)	(g)
		(B) OWNED II				OPE	RATED BY RESP	ONDENT	
1		BILLINGS		BASIN 12"				69	12
2	Beartooth-WY	BILLINGS	ELK	BASIN 12"				6	12
3		CASPER	GUI	ERNSEY JCT 12				104	12
4		CASPER						6	12
5		ELK BASIN	CAS	SPER 12"				231	12
6		LARCO JCT	SIN	CLAIR REFIN"				2	8
40	Subtotal							418	
	Olasian MT					ND O	PERATED BY OTH	HERS	10
1	Glacier-MI	CANADIAN BORDER	BILI					333	12
2		CANADIAN BORDER						/	8
3								234	8
4								50	12
5	Quilitated	ROUNDUP STA	BLK	CVLV G10-0 B				53	10
40	Subtotal	(D)					PESDONDENT	677	
1	Sidney Products Pineline-NF					ום ט	RESPONDENT		
2	Sidney Products Pipeline-WY	CHEVENNE FRONTR	СН	EVENNE 8"					
3	Sidney Products Pipeline-WY	CHEVENNE FRONTR	SID	NFY 6"					
40	Subtotal		0.2						
	GRAND TOTAL					287		1,639	
L									

## **ATTACHMENT LS-19**

## US Imports by Pipeline From Canada - FERC Form 6 Data

Average Barrels per Day

		% Utilization			
		Based on		% Utilization	
		Nominal Capacity		Based on	
		at Specific Time		Nominal Capacity	
Quarter	Enbridge	(see formula)	Express	of 280,000 bpd	Puget Sound
2007 Q1	1,534,098	77%	212,091	76%	91,062
2007 Q2	1,444,037	72%	215,854	77%	109,804
2007 Q3	1,512,779	76%	233,725	83%	119,987
2007 Q4	1,568,540	78%	192,193	69%	110,409
2008 Q1	1,600,353	80%	212,148	76%	108,548
2008 Q2	1,486,172	74%	199,218	71%	110,784
2008 Q3	1,575,558	79%	189,319	68%	121,981
2008 Q4	1,711,028	86%	182,219	65%	124,115
2009 Q1	1,570,332	79%	208,265	74%	73,940
2009 Q2	1,603,890	80%	201,076	72%	79,257
2009 Q3	1,678,639	84%	216,051	77%	139,394
2009 Q4	1,654,608	83%	209,795	75%	125,681
2010 Q1	1,557,044	78%	188,671	67%	120,718
2010 Q2	1,707,770	85%	200,458	72%	114,549
2010 Q3	1,531,995	61%	207,468	74%	128,853
2010 Q4	1,621,725	65%	197,142	70%	165,830
2011 Q1	1,609,052	64%	174,486	62%	154,507
2011 Q2	1,531,453	61%	182,626	65%	133,176
2011 Q3	1,464,649	59%	173,837	62%	128,970
2011 Q4	1,624,709	65%	169,696	61%	138,954
2012 Q1	1,658,084	66%	195,221	70%	130,855
2012 Q2	1,662,726	67%	245,204	88%	134,116
2012 Q3	1,614,130	65%	135,486	48%	144,110
2012 Q4	1,665,833	67%	193,245	69%	136,164
2013 Q1	1,737,435	69%	205,054	73%	140,003
2013 Q2	1,595,762	64%	199,239	71%	162,907
2013 Q3	1,777,685	71%	205,285	73%	117,910
2013 Q4	1,859,413	74%	215,423	77%	118,074
2014 Q1	1,884,398	75%	190,455	68%	128,366
2014 Q2	1,945,030	78%	155,405	56%	148,242
2014 Q3	2,054,950	82%	208,183	74%	150,383
2014 Q4	2,085,885	83%	227,984	81%	146,859
2015 Q1	2,182,380	77%	234,786	84%	159,770
2015 Q2	2,048,917	72%	212,327	76%	170,273
2015 Q3	2,242,787	79%	213,777	76%	196,643
2015 Q4	2,305,292	81%	219,455	78%	180,975
2016 Q1	2,514,381	88%	197,991	71%	188,825
2016 Q2	2.250.031	79%	193.472	69%	212.008
2016 Q3	2.386.522	84%	226.991	81%	204.772
2016 Q4	2.507.908	88%	251.724	90%	159.213
2017 Q1	_, , , , , , , , , , , , , , , ,				

2017 Q2

2017 Q3
2017 Q4
2018 Q1
2018 Q2
2018 Q3
2018 Q4
2019 Q1
2019 Q2
2019 Q3
2019 Q4
2020 Q1
2020 Q2
2020 Q3
2020 Q4

maximum	2,514,381	1	251,724	1	212,008
Ave 2007	1,514,863		213,466		107,816
Ave 2008	1,593,278		195,726		116,357
Ave 2009	1,626,867		208,797		104,568
Ave 2010	1,604,633		198,435		132,488
Ave 2011	1,557,466		175,161		138,902
Ave 2012	1,650,193		192,289		136,311
Ave 2013	1,742,574		206,250		134,724
Ave 2014	1,992,566		195,507		143,463
Ave 2015	2,194,844	77%	220,086	79%	176,915
Change 2014 to 2015	202,278	77%	24,579	79%	33,453

	Maximum		
Pipeline	Capacity (bpd)	Less AC	
TransMountain (Puget			
Sound) Pipeline System	180,000		Enbridge Line 1
			Enbridge Line
Express Pipeline	280,000		2a/b
Keystone Pipeline	591,000		Enbridge Line 3
Enbridge Line 1	236,500		Enbridge Line 4
Enbridge Line 2a/b	442,200		Enbridge Line 65
Enbridge Line 3	390,000		Enbridge Line 67
Enbridge Line 4	795,700		
			TransMountain
			(Puget Sound)
Enbridge Line 65	185,600		Pipeline System
Enbridge Line 67	450,000		Express Pipeline

Total Pre K1 and 67	2,324,400		Rangeland Pipeline
Total Current No Line 67			
Expansions	3,551,000	3,201,000	Keystone Pipeline
Total + Line 67 at Max	3,901,000		
Line 67 Phase I and II			TransMountain to
Expansion	350,000		Vancouver
Enbridge total current			
capacity	2,850,000		Total Pipeline expc
Milk River Pipeline	118,000		
Rangeland Pipeline	85,000		

% Utilization		% Utilization		%Utilization	
Based on		Based on		Based on	Annual Average
Nominal Capacity	Glacier/	Nominal Capacity		<b>Nominal Capacity</b>	Daily Pipeline
of 180,000 bpd	Rangeland	of 85,000 bpd	Keystone 1	of 591,000 bpd	Imports bpd
51%					1,837,251
61%					1,769,695
67%					1,866,491
61%					1,871,142
60%	2,479	3%			1,923,528
62%	4,025	5%			1,800,199
68%	7,824	9%			1,894,682
69%	5,469	6%			2,022,830
41%	6,205	7%			1,858,742
44%	3,753	4%			1,887,976
77%	3,275	4%			2,037,359
70%	3,626	4%			1,993,710
67%	3,569	4%			1,870,001
64%	3,477	4%			2,026,254
72%	4,340	5%	116,017	20%	1,988,674
92%	4,697	6%	187,372	32%	2,176,766
86%	8,252	10%	339,790	57%	2,286,088
74%	4,902	6%	330,216	56%	2,182,373
72%	7,787	9%	434,367	73%	2,209,611
77%	4,920	6%	494,042	84%	2,432,322
73%	7,760	9%	533,131	90%	2,525,052
75%	3,719	4%	502,169	85%	2,547,933
80%	3,899	5%	489,333	83%	2,386,957
76%	5,839	7%	481,272	81%	2,482,353
78%	7,322	9%	534,825	90%	2,624,641
91%	5,658	7%	497,712	84%	2,461,278
66%	1,731	2%	483,655	82%	2,586,266
66%	3,580	4%	518,312	88%	2,714,802
71%	3,315	4%	546,948	93%	2,753,481
82%	5,746	7%	498,852	84%	2,753,276
84%	3,638	4%	522,597	88%	2,939,752
82%	7,778	9%	582,075	98%	3,050,581
89%			559,149	95%	3,136,084
95%			544,021	92%	2,975,538
109%			584,488	99%	3,237,694
101%			533,275	90%	3,238,998
105%			569,956	96%	3,471,154
118%			399,813	68%	3,055,324
114%			540,542	91%	3,358,826
88%			579,753	98%	3,498,598

1	8,252	0	584,488	1	3,498,598
	#DIV/0!		#DIV/0!		1,836,145
	4,949		#DIV/0!		1,910,310
	4,215		#DIV/0!		1,944,447
	4,021		151,694		2,015,424
	6,466		399,604		2,277,598
	5,304		501,476		2,485,574
	4,573		508,626		2,596,747
			537,618		2,874,273
98%			555,233	94%	3,147,079
98%			17,615	1	272,806

236500						
442200 390000 795700						
185600						
449700 2499700						
180000						
Net Increase/	Pipeline					
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decrease in	Capacity AC at	Pipeline	Pipeline Capacity	Total Export	Excess Import	
imports	Max	<b>Capacity Existing</b>	AC at Max +KXL Pipeline Capacity		<b>Pipeline Capacity</b>	
		2,324,400	2,324,400		487,149	
(67 <i>,</i> 556)		2,324,400		2,324,400	554,705	
96,796		2,324,400		2,324,400	457,909	
4,651		2,324,400		2,324,400	453,258	
52,386		2,324,400		2,324,400	400,872	
(123,330)		2,324,400		2,324,400	524,201	
94,483		2,324,400		2,324,400	429,718	
128,148		2,324,400		2,324,400	301,570	
(164,087)		2,324,400		2,324,400	465,658	
29,234		2,324,400		2,324,400	436,424	
149,383		2,324,400		2,324,400	287,041	
(43,649)		2,324,400		2,324,400	330,690	
(123,709)		2,324,400		2,324,400	454,399	
156,253		2,324,400		2,324,400	298,146	
(37,581)		3,551,000		3,551,000	1,562,326	
188,092		3,551,000		3,551,000	1,374,234	
109,322		3,551,000		3,551,000	1,264,912	
(103,715)		3,551,000		3,551,000	1,368,627	
27,238		3,551,000		3,551,000	1,341,389	
222,711		3,551,000		3,551,000	1,118,678	
92,730		3,551,000		3,551,000	1,025,948	
22,881		3,551,000		3,551,000	1,003,067	
(160,976)		3,551,000		3,551,000	1,164,043	
95,396		3,551,000		3,551,000	1,068,647	
142,287		3,551,000		3,551,000	926,359	
(163,362)		3,551,000		3,551,000	1,089,722	
124,988		3,551,000		3,551,000	964,734	
128,536		3,551,000		3,551,000	836,198	
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# **ATTACHMENT LS-20**



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is an important choice before us all. That choice is about where we get the oil we need and how we choose to transport it. Energy East makes sense and this is why the majority of Canadians support the project. community: https://t.co/wndnqZgXiz https://t.co/YQLbexuYNA

Our booth is up @fairmontlaurier,glad to be part of the @ConfBoardofCda discussion on Canada's energy future in Ott... https://t.co/1UR9cejfLS

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							Key project info	rmation is avai	lable in 6 la	inguages.
ŀ	Home	Expansion Project	Current Pipeline Operations	Talk Trans Mountain	Blog	News & Resources	Media Centre	About Us	Conta	ct Us

### **EXPANSION PROJECT**

On November 29, 2016, the Government of Canada granted approval for the Trans Mountain Expansion Project (the Project). Earlier on May 19, 2016, following a 29-month review, the NEB concluded the Project is in the Canadian public interest and recommended the Federal Governor in Council approve the expansion. These approvals will allow the Project to proceed with 157 conditions.

The original Trans Mountain Pipeline was built in 1953 and <u>continues to operate safely</u> today. The expansion is of this existing 1,150-kilometre pipeline between Strathcona County (near Edmonton), Alberta and Burnaby, BC. The expansion will create a twinned pipeline increasing the nominal capacity of the system from 300,000 barrels per day to 890,000 barrels per day.

Some quick facts about the proposed expansion include:

Projected capital cost is approximately \$7.4\* billion

Project will create <u>benefits</u> including new <u>jobs</u> in the short and long term, job-related <u>training opportunities</u> and increases in taxes collected through all three levels of government

Approximately 980 km of new pipeline

73% of the <u>route</u> would use the existing right-of-way, 16% would follow other linear infrastructure such as TELUS, Hydro or highways and 11% would be new right-of-way

Reactivation of 193 km of reactivated pipeline

12 new pump stations to be built

19 new tanks to be added to existing storage terminals in Burnaby (14), and Edmonton (5)

Westridge Marine Terminal in Burnaby to be expanded with three new berths

Existing line to carry refined products, synthetic crude oils, light crude oils with capability for heavy crude oils

Combined government revenue impact for construction and the first 20 years of expanded operations is \$46.7 billion, including federal and provincial that can be used for public services such as health care and education – British Columbia receives \$5.7 billion and Alberta receives \$19.4 billion

During construction, the equivalent of 15,000 people will be working on the pipeline expansion. The expansion will also create the equivalent of 37,000 direct, indirect and induced jobs per year during operations.

New line to carry heavier oils with capability for transporting light crude oils

Trans Mountain plans to begin construction in September 2017 and go into service in late 2019

Engagement with communities, <u>landowners</u>, stakeholders and <u>Aboriginal</u> <u>communities</u> have been ongoing since 2012 and will continue through to operation

Environmental protection plans have been developed along the entire route.

Why Expand? **Regulatory Filings** Maps Construction Timeline **Project Benefits** Jobs & Training Procurement Marine Plans Emergency Response **Environmental Protection Engaging Communities** Aboriginal Peoples Landowner Information Support **Current Pipeline Operations** Talk Trans Mountain Blog News & Resources Media Centre About Us Contact Us

**Expansion Project** 

#### DID YOU KNOW

REFINERIES ARE PROCESSING PLANTS THAT CHANGE CRUDE OIL INTO PRODUCTS LIKE GASOLINE FOR CARS, AIRPLANE FUEL AND TRUCK DIESEL FUEL. PETROLEUM IS A BUILDING BLOCK FOR MANY GOODS THAT WE USE EVERY DAY – MEDICINE, SHAMPOO, DETERGENT, CLOTHING, EVEN OUR DEBIT AND CREDIT CARDS.

See All

<u>Volume 5</u> and <u>Volume 6</u> of the Facilities Application cover the environmental assessment and protection planning. <u>Field studies</u>, as required, continue to be conducted along the route.

Download the project benefits overview <u>here</u>.

#### **Previous Expansion**

This is not the first time the Trans Mountain line has been expanded. In fact, since operation began in 1953, the capacity of the pipeline system has been increased numerous times, with the initial expansion in 1957. The most recent expansion project took place between 2006 and 2008 with the construction of 13 new pump stations and modifications to existing stations. Also during this time, the <u>Anchor Loop project</u> added 160 kilometres of new pipe through Jasper National Park and Mount Robson Provincial Park between Hinton, Alberta and Hargreaves, BC.

#### Marine Terminal

At present, the <u>Westridge Marine Terminal</u> handles approximately five tankers per month., Once the new berths are completed and in service, the number of tankers loaded at the Westridge Marine Terminal could increase to approximately <u>34 per month</u>.

#### **Pipeline Alternatives**

Pipelines are proven to be the safest and most efficient method to move petroleum products over great distances on land. Petroleum products can also be shipped by tanker trucks or railcars.



Based on existing capacity of 300,000 barrels

Every day, member companies of the <u>Canadian Energy Pipeline Association</u> (CEPA) move enough crude oil and petroleum products through pipelines to fill 15,000 tanker truckloads and 4,200 railcars. The existing Trans Mountain pipeline system moves the equivalent of about 1,400 tanker truckloads or 441 tanker railcars daily.

While rail plays an increasing role in petroleum exports from Western Canada and other regions in North America, we're focused on the safe, efficient and economic expansion of our pipeline operations serving our customers in British Columbia, Washington State and offshore.

\*Actual project costs may change.

We want to hear from you:	Stay Informed
1.866.514.6700	Email Address*:
info@transmountain.com 2844 Bainbridge Ave PO Box 84028 Bainbridge	I want to stay in touch by receiving the Trans Mountain weekly eNewsletter.
Burnaby, BC V5A 4T9	I would also like to receive updates on: Engagement Opportunities Job Updates
	I consent to receiving email from Trans Mountain. At anytime you may withdraw your consent by clicking 'unsubscribe' found at the bottom of <b>Reset Sign Up</b> our emails.
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## 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.

- <u>Full Design Capacity</u>: 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.
- <u>Annual Capacity or Nameplate Capacity</u>: 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

# **ATTACHMENT LS-21**

TransCanada (TRP) Q1 2017 Results - Earnings Call Transcript

May 5, 2017 10:13 PM ET

TransCanada Corp. (NYSE:TRP)

Q1 2017 Earnings Call

May 05, 2017 2:30 pm ET

Executives

David Moneta - TransCanada Corp.

Russell K. Girling - TransCanada Corp.

Donald R. Marchand - TransCanada Corp.

Paul Miller - TransCanada Corp.

Karl Johannson - TransCanada Corp.

Analysts

Robert C. Hope - Scotiabank

Linda Ezergailis - TD Securities, Inc.

Praneeth Satish - Wells Fargo Securities LLC

Ben Pham - BMO Capital Markets (Canada)

Robert Kwan - RBC Capital Markets

Robert Catellier - CIBC World Markets, Inc.

Patrick Kenny - National Bank Financial, Inc.

Nick S. Raza - Citigroup Global Markets, Inc.

Operator

All participants, please stand by, your conference is ready to begin. Good day, ladies and gentlemen. Welcome to the TransCanada Corporation 2017 First Quarter Financial Results Conference Call.

I would now like to turn the meeting over to Mr. David Moneta, Vice President-Investor Relations. Please go ahead, Mr. Moneta.

David Moneta - TransCanada Corp.

Thanks very much and good afternoon, everyone I'd like to welcome you to TransCanada's first quarter 2017 financial results conference call.

With me today are Russ Girling, President and Chief Executive Officer; Don Marchand, Executive Vice President and Chief Financial Officer; Karl Johannson, Executive Vice President and President, Canada and Mexico Natural Gas Pipelines and Energy; Paul Miller, Executive Vice President and President, Liquids Pipelines; Glenn Menuz, Vice President and Controller; Stan Chapman, who is recently appointed Executive Vice President and President U.S. Natural Gas Pipelines, couldn't join us today, but will participate in all future calls.

Russ and Don will begin today with some opening comments on our financial results and certain other company developments. Please note that a slide presentation will accompany their remarks. A copy of the presentation is available on our website at transcanada.com. It can be found in the Investors section, under the heading Events & Presentations.

Following Russ and Don's remarks, we will turn the call over to the conference coordinator for questions from the investment community. If you are a member of the media, please contact Mark Cooper or James Millar following this call and they would be happy to address your questions.

In order to provide everyone from the investment community with an equal opportunity to participate, we ask that you limit yourself to two questions. If you have additional questions, please reenter the queue. Also, we ask that you focus your questions on our industry, our corporate strategy, recent developments and key elements of our financial performance. If you have detailed questions relating to some of our smaller operations for your detailed financial models, Stuart and I would be pleased to discuss them with you following the call.

Before, Russ, begins, I'd like to remind you that our remarks today will include forward-looking statements that are subject to important risks and uncertainties. For more information on these risks and uncertainties, please see the reports filed by TransCanada with Canadian securities regulators and with the U.S. Securities Exchange Commission.

And finally, during this presentation, we'll refer to measures such as comparable earnings, comparable earnings per share, comparable earnings before interest, taxes, depreciation and amortization or EBITDA, comparable funds generated from operations and comparable distributable cash flow. These and certain other comparable measures do not have any standardized meaning under GAAP and are therefore considered to be non-GAAP measures.

As a result, they may not be comparable to similar measures presented by other entities. They are measures used to provide you with additional information on our operating performance, liquidity and our ability to generate funds to finance our operations. A reconciliation to the nearest GAAP measures is included in the appendix.

With that, I'll turn the call over to Russ.

Russell K. Girling - TransCanada Corp

Thanks, David, and good afternoon, everyone. And thank you very much for joining us on a Friday afternoon.

As I've highlighted in the past and again earlier today at our Annual Meeting, Trans 2016 was truly a transformational year for TransCanada. Our portfolio of high-quality energy infrastructure assets performed very well and our long-term strategy, financial discipline enabled us to undertake unprecedented growth that will reward our shareholders for many years to come.

We continue to build on those accomplishments here early in 2017, evidence of that can be seen in our first quarter record financial results, which support our board of directors' decision in February to increase our quarterly common share dividend to \$0.625 per share, that equates to \$2.50 per share on an annual basis and represents a 10.6% increase over the dividend in 2016.

During the first quarter, we also continued to advance our \$23 billion near-term capital program, spending approximately \$1.8 billion. In aggregate, this portfolio of commercially secured and rate regulated projects remains on time and on budget.

In addition, we completed the US\$920 million acquisition of Columbia Pipeline Partners. To help fund our capital program, we completed \$2.6 billion of external financing across the capital spectrum on very compelling terms and initiated a US\$765 million drop down to our U.S. MLP.

And finally, we continued to advance a number of other strategic initiatives that will enhance our competitiveness and position us for additional long-term growth. I'll touch on each of these developments in the next few slides, beginning with a brief review of our first quarter financial results.

Excluding certain specific items, comparable earnings for the first quarter of 2017 were \$698 million or \$0.81 per share, an increase of \$204 million or \$0.11 per share over the same period last year. That equates to a 16% increase on a per share basis and reflects the strong performance across the Natural Gas Pipeline business, including Columbia, which we acquired in mid-2016.

Comparable EBITDA also increased \$475 million to approximately \$2 billion, while comparable funds generated from operations of \$1.5 billion was \$259 million higher than the first quarter of 2016. Don will provide more detail on those financial results in just a few minutes. Before he does, I'd like to offer few comments on some of the recent developments in each of our businesses beginning with our natural gas business.

Starting with the U.S. and Columbia, which I'm happy to report was essentially fully integrated here early in April, when we added our new employees to an enterprise-wide SAP information system, effectively giving the entire organization the ability to share information and to use similar processes to carry out their work. This was the final major step in our integration process. We are on track to realize majority of the targeted \$250 million in annual synergies in 2017 with the remainder showing up in 2018.

On the growth side, we continued to advance Columbia's \$7.1 billion of near-term capital by commencing construction on the US\$1.4 billion Leach XPress project and the US\$400 million Rayne XPress project. Both of those are expected to be in service by November of this year. We also continued

to advance the WB XPress, Mountaineer XPress, and Gulf XPress projects through the various stages of regulatory approval and expect all to be in service in 2018.

Turning to Canadian Natural Gas Pipeline business, where we filed an application with the National Energy Board for variance to the existing approvals for NGTL's \$1.4 billion North Montney pipeline project, to remove the condition that the project could only proceed once a positive final investment decision was made on the Pacific Northwest LNG project. North Montney is now under 10 by 20-year contracts with a broader group of shippers and is not dependent upon, but still could accommodate the LNG project.

On the Canadian Mainline, we announced the successful conclusion of the long-term fixed price open season for service from Empress to Dawn. The open season resulted in binding long-term contracts with Western Canadian producers to transport 1.5 PJs per day for a term of 10 years at a total of \$0.77 per gigajoule.

An application was filed with the NEB on April 26 for approval of the service, including our request to have it implemented starting November 1, 2017. These developments on NGTL and the Canadian Mainline support our belief that Western Canada shale plays particularly in the areas of Montney, Duvernay, and the Deep Basin, are among the lowest cost source of supply in North America.

We believe the Western Canadian Sedimentary Basin gas continues to play an important role in meeting North American demand, which could lead to further growth on NGTL System, as facilities will be needed to increase access to the main export delivery points in the province.

In Mexico, we continue to advance the Tula, Villa de Reyes project and the Sur de Texas projects that will see us invest a total of \$2.5 billion in three projects with approximately \$900 million have been spent to-date on those projects.

Finally, in the Natural Gas Pipeline business, during the fourth quarter, we continued to advance our MLP strategies. First, we completed the acquisition of all the outstanding publicly-held common units of Columbia Pipeline Partners for approximately US\$920 million. This provides us with 100% ownership of Columbia's core assets and simplifies our corporate structure leaving us with a single MLP, which is TC PipeLines, LP.

And secondly, in February, we offered to sell the interest in Iroquois and PNGTS to TC PipeLines and yesterday, we announced that we'd agreed to a sale for those pipelines for a US\$765 million, that transaction is expected to closed in mid-2017, subject to closing conditions.

Turning now to Liquids, where we continue to advance construction of the Grand Rapids, Northern Courier pipeline projects, which will see us invest a total of \$1.9 billion. Today, we've spent \$1.7 billion on these projects with both expected to enter service before the end of the year.

Also in Liquids, we began to once again advance the Keystone XL project. On March 24, we received the Presidential Permit, which as you know is a significant and long-awaited milestone for this project. In February, we also filed an application with the Nebraska Public Service Commission seeking approval for

the pipeline route through that State of Nebraska. Hearing on that application is scheduled in August and a final decision is expected by the end of November 2017.

In addition, we are updating our shipping contracts for the project and we anticipate that the core contract shipper group will be modified somewhat and include the introduction of new shippers and the reductions in volume commitments by other shippers.

In Energy, we continue to advance construction of the Napanee gas-fired power generation facility in Ontario. That plant is expected to be completed in 2018 and is underpinned by a 20-year contract with the Ontario Independent Electric System Operator (sic) [Ontario Independent Electricity System Operator] or the IESO.

Bruce Power is a long-term refurbishment program also continues to progress with work on the asset management program advancing as planned in preparation the first major component replacement, which is scheduled to commence in 2020.

Finally, in Energy, we continue to advance the sale of our U.S. Northeast power assets. We completed the sale of the hydro assets for US\$1.065 billion in April. The sale of Ravenswood, Ironwood, Ocean State and Kibby Wind is expected to close in the second quarter of 2017. Proceeds from those transactions will be used to retire the remainder of the Columbia acquisition bridge facilities.

So, in summary, during the first quarter, our high-quality portfolio of energy infrastructure assets continue to produce very strong results. We continue to advance our \$23 billion near-term capital program on time and on budget.

In total, we invested \$1.8 billion during the quarter, principally in expansions of the NGTL and Columbia system, but as well on our Mexican Natural Gas Pipeline projects, regional pipelines projects in Alberta and the Napanee and Bruce Power projects.

Bringing the cumulative investment to-date in the \$23 billion program to approximately \$7.5 billion. The remaining \$15 billion required to complete these projects will largely be spent through the end of 2019, and we remain well-positioned to fund the rest of that capital program.

To remind you, each of these projects is underpinned by long-term contracts or cost of service regulation, giving us good visibility to growth in earnings and cash flow as they enter service between now and the end of the decade.

As a result, we expect to continue to grow the dividend at the upper end of the 8% to 10% range through 2020, supported by growth in both earnings and cash flow. And as a result, we also expect to maintain very strong coverage ratios.

Finally, before I pass it on to Don. I'd like to make a few brief comments on our leadership team changes. First, I'd like to thank Alex Pourbaix, our Chief Operating Officer for his contribution to the company, he will officially retire from TransCanada on May 31.

As a result of Alex's retirement and the natural evolution of our business, I'm pleased to announce Stan Chapman, our Columbia employee who joined TransCanada in a senior role as part of the acquisition has been promoted to Executive Vice President and President of U.S. Natural Gas Pipelines. Stan has 30 years of experience in the Natural Gas Pipeline business, and we are very pleased to have him join our executive team.

Karl Johannson will continue as President of Canada and Mexico Natural Gas Pipelines, and now has additional responsibility for the Energy business in place of Bill Taylor, who left the organization to pursue other opportunities.

That concludes my remarks, and I will now turn it back to Don for some additional comments on our first quarter results. Don?

Donald R. Marchand - TransCanada Corp

Okay. Thanks, Russ, and good afternoon, everyone. As outlined in our quarterly report to shareholders issued earlier today, we reported net income attributable to common shares in the first quarter of \$643 million or \$0.74 per share, compared to net income of \$252 million or \$0.36 per share for the same period in 2016. Per share amounts include the dilutive effect of issuing 161 million common shares in 2016, plus additional shares issued through the dividend reinvestment program in the first quarter.

Our results include a \$24 million after-tax charge for integration-related costs associated with the Columbia acquisition, a \$10 million after-tax charge for the costs related to the monetization of our U.S. Northeast power business, a \$7 million after-tax charge for maintenance of Keystone XL assets, and a \$7 million income tax recovery related to the realized loss on a third-party sale of Keystone XL assets.

First quarter 2016 results included \$176 million after-tax impairment charge on the carrying value of our Alberta PPAs, a \$26 million after-tax charge related to costs associated with the acquisition of Columbia, a \$6 million after-tax charge related to Keystone XL costs for the maintenance and liquidation of project assets and a \$3 million after-tax loss in the sale of TC Offshore, which closed in March 2016.

Excluding these items and specific risk management activities, comparable earnings for first quarter 2017 rose by \$204 million to \$698 million or \$0.81 per share compared to \$494 million or \$0.70 per share for the same period last year, a 16% increase on a per share basis.

Turning to our business segment results on slide 13, in the first quarter comparable EBITDA from our five business segments was approximately \$2 billion, \$475 million higher than the same period in 2016. The increase was largely driven by the following factors: Canadian Natural Gas Pipelines EBITDA of \$504 million rose \$16 million. As outlined in the quarterly report, net income for the NGTL System increased \$9 million in the first quarter, compared to the same period last year, mainly due to a higher investment base and incentive earnings on O&M costs, while net income for the Canadian Mainline increased \$2 million due to higher incentive earnings, partially offset by a lower investment base.

U.S. Natural Gas Pipelines EBITDA of \$720 million increased by C\$382 million or US\$292 million, mainly due to the acquisition of Columbia on July 1, 2016 and higher ANR transportation revenues resulting from higher rates that went into effect on August 1, 2016 as part of its rate settlement.

Mexico Natural Gas Pipelines EBITDA of \$140 million increased C\$87 million or US\$67 million, primarily due to incremental earnings from Topolobampo and Mazatlán, which began collecting revenue in July and December 2016, respectively.

Liquids Pipelines EBITDA rose by \$16 million to \$312 million, primarily as a result of a higher contribution from Liquids marketing, partially offset by higher business development costs to advance the Keystone XL project.

These positives were partially offset by a \$23 million decrease in Energy EBITDA to \$305 million. This is primarily a result of lower earnings from Bruce Power, mainly due to lower gains from contracting activities and higher interest expense and a lower contribution from U.S. Power largely due to lower realized capacity prices in New York and higher fuel costs and lower generation volumes at our New York and New England facilities. These negative Energy variances were partially offset by a higher contribution from Western Power due to the termination of the Alberta PPAs in first quarter 2016, as well as higher earnings from natural gas storage, due to an increase in the realized gas storage price spreads.

Note that first quarter 2017 Energy EBITDA includes C\$72 million or US\$54 million contribution from our U.S. Northeast power assets. As assets held for sale, the generating facilities will continue to contribute to comparable earnings and funds generate from operations, through to the date that their sales are completed.

Now turning to the other income statement items on slide 14. Depreciation and amortization of \$510 million in the first quarter increased by \$56 million, largely due to the acquisition of Columbia, as well as new assets placed into service. This was partially offset by the discontinuation of depreciation expense, effective November 1, 2016 on our U.S. Northeast power assets upon their classification as held for sale.

Interest expense of \$500 million increased by \$80 million compared to the same period in 2016, mainly due to debt assumed as part of the Columbia acquisition, along with new long-term debt issuances, including amounts outstanding on the acquisition bridge facilities, partially offset by Canadian and U.S. dollar denominated debt maturities. Allowance for funds used during construction, or AFUDC, was unchanged year-over-year.

Comparable interest income and other decreased by \$42 million in the first quarter compared to the same period in 2016, due to the net effect of realized losses in 2017 compared to realized gains in 2016 on derivatives used to manage our net exposure to foreign exchange rate fluctuations on U.S. dollar denominated income and the impact of currency fluctuations on the translation of foreign currency denominated working capital.

With respect to sensitivity to foreign exchange rates, our U.S. dollar denominated assets, including our interest in Mexico, are predominantly hedged with U.S. dollar denominated debt and the associated interest expense. We actively manage the residual exposure on a rolling one year forward basis.

Comparable income tax expense of \$244 million in first quarter 2017 was \$64 million higher than last year. The increase was mainly as a result of higher pre-tax earnings in 2017 compared to 2016 and changes in the proportion of income earned between Canadian and foreign jurisdictions.

Net income attributable to non-controlling interests increased by \$10 million for the three months ended March 31, 2017 compared to the same period in 2016, primarily due to the acquisition of Columbia, which included a non-controlling interest in CPPL. As Russ noted, on February 17, 2017, we acquired all outstanding publicly held common units of CPPL for US\$921 million.

And finally, preferred share dividends increased by \$19 million for the three months ended March 31, 2017, compared to the same period in 2016, primarily due to the issuance of Series 13 and Series 15 preferred shares in April and November 2016, respectively.

Now, moving to cash flow and distributable cash flow coverage ratios on slide 15. Comparable funds generated from operations of approximately \$1.5 billion in the first quarter increased by \$259 million compared to the same period in 2016, primarily due to the increase in comparable earnings.

For the first quarter, comparable distributable cash flow was \$1.2 billion or \$1.41 per common share, compared to just under \$1 billion or \$1.39 per common share in 2016. Again, note that comparable distributable cash flow per share in 2017 included the dilutive effect of issuing 161 million common shares in 2016 as well as DRiP participation in Q1 2017.

Maintenance capital expenditures were \$167 million in the first quarter or \$23 million less than the level of spend last year. This amount includes \$49 million related to our Canadian regulated Natural Gas Pipelines, which is largely consistent with first quarter 2016 and as reflected in the NGTL and Canadian Mainline rate basis, which positively impacts net income.

Maintenance capital of \$70 million on our U.S Natural Gas Pipelines was similar year-over-year. A reminder that ANR maintenance capital is expected to be at elevated levels through the balance of 2017, and we will earn a return on and off capital per last year's rate settlement.

While our first quarter DCF coverage ratio of 2.3 times was very robust, looking forward, we expect our maintenance capital spend to increase over the coming quarters, primarily in our regulated natural gas pipelines in both Canada and the U.S. As a result, we continue to expect our full year 2017 distributable cash flow coverage ratio to be in line with our outlook provided on the fourth quarter call in February.

Finally, a few words on the progress we have made in financing our \$23 billion capital program. We believe our funding needs are manageable and will be met through our predictable and growing internally generated cash flow, as well as a variety of financing levers available to us across the capital spectrum.

As I mentioned, comparable funds generated from operations continues to grow. In the first quarter, we generated \$1.5 billion of FGFO and exited the period with approximately \$900 million of cash on hand. We also completed a significant amount of external financing on compelling terms.

In March, we raised US\$1.5 billion through an offering of 60-year junior subordinated notes. These notes have a fixed interest rate of 5.3% for their first 10 years, converting to a floating rate thereafter. Interest expense on these notes is fully deductible and they are accorded 50% equity credit in the calculation of our key credit metrics.

Also in the quarter, Bruce Power issued 7-year and 10-year senior unsecured notes and subsequently distributed \$362 million from this financing activity to us. As highlighted in previous calls, TC PipeLines, LP remains a core element of TransCanada strategy and future dropdowns of stable mature assets are expected to play a role in meeting our consolidated financing needs.

Consistent with this, in February, we made an offer to sell our 49.3% interest in Iroquois and our remaining 11.8% interest in the PNGTS System to TC PipeLines, LP. Yesterday, we announced that we reached agreements to sell these interests for a total transaction value of US\$765 million and expect to close mid-year 2017.

Proceeds, net of proportionate debt assumed, are expected to be US\$597 million. As Russ indicated, subsequent to quarter-end, we closed the sale of our U.S. Northeast Hydro assets for US\$1.065 billion. Proceeds were applied to the Columbia acquisition bridge facilities. The remaining balance on these lines of approximately US\$2.1 billion will be retired once we close the sale of the remainder of the U.S. Northeast Power Thermal and Wind assets, which is expected to be completed in the second quarter.

Our dividend reinvestment plan also continues to provide incremental subordinated capital in support of our growth and credit metrics. We are currently seeing approximately 40% of common dividends being reinvested into common shares under the program.

Looking forward, we expect to continue to access the senior debt, hybrid and preferred share markets in a manner that is consistent with achieving targeted A grade credit metrics in 2018. We also continue to assess the potential introduction of an at-the-market equity program.

Use of an ATM would allow us to opportunistically issue common shares in a very cost effective, efficient manner, and as necessary, provide additional bespoke subordinated capital to support an A grade credit rating and our capital expenditure program over the next two years.

We have successfully used an ATM at TC PipeLines, LP since 2014 and in the first quarter raised an additional US\$69 million at that entity. Use of an ATM program will be shaped by our spending profile as well as the availability and relative cost of the other funding mechanisms discussed.

So in summary, while our external funding needs are sizable, they are viewed as eminently achievable given the clear, accretive and credit supportive use of proceeds. With the dividend reinvestment plan, access to preferred share and hybrid security markets, LP dropdowns and the potential selective use of

an ATM program, we do not foresee the need for additional discrete equity to finance our current \$23 billion portfolio of near-term growth projects.

Turning now to slide 17, in closing, I would offer the following comments. Our positive financial and operational performance in the first quarter continued to build upon our transformational 2016. Today, we are advancing a \$23 billion near-term capital program and have five distinct platforms for future growth in Canadian, U.S. and Mexico natural gas pipelines, liquids pipelines and energy. Our overall financial position remains strong, supported by our A grade credit ratings and a simple understandable corporate structure.

We remain well-positioned to fund our near-term capital program through resilience and growing internally generated cash flow and strong access to capital markets on compelling terms. Our suite of critical energy infrastructure projects is poised to generate significant growth in high quality earnings and cash flow for our shareholders. That is expected to support annual dividend growth at the upper end of an 8% to 10% range through 2020. Success in adding to our growth portfolio in the coming years could augment or extend the company's dividend growth outlook through 2020 and beyond.

That's the end of my prepared remarks. I'll now turn the call back over to David for the Q&A.

David Moneta - TransCanada Corp.

Thanks, Don. Just a reminder, before I turn it over to the conference coordinator for questions from the investment community, we ask that you limit yourself to two questions and if you have additional questions, please reenter the queue.

With that, I'll turn it back to the conference coordinator.

Question-and-Answer Session

Operator

Thank you. We will now take questions from the telephone lines. The first question is from Rob Hope of Scotiabank. Please go ahead.

## Robert C. Hope - Scotiabank

So, good afternoon. Thank you for taking my calls. I was hoping – or my questions. I was hoping we could first touch on Keystone XL. Could you provide an update on the key work streams there and how your discussions have been going with potential shippers there, especially in the light of an uncertain D.C. election?

Paul Miller - TransCanada Corp.

Rob, it's Paul Miller here. The key work streams I guess, there's two primary work streams that being securing the commercial support for Keystone XL and the Nebraska Public Service Commission approval for the route through that state. In regard to the shipping contracts, we're making progress with our

existing shipping group, as well as new entrants, as they work through their analysis and the documentation. A lot has changed since we were first denied the permits here in 2015 in regard to crude oil pricing and supply and various competitive alternatives, so they continue to work through that and I anticipate it will take a couple of months yet before we sum up our commercial support.

On the Nebraska Public Service Commission, we filed our application back in February. We are going to various open houses, one most recent here was on Wednesday of this past week. I was very encouraged by the format and structure, and the organization of the process by the Public Service Commission. We saw participants from both sides respectfully convey their positions, so I think it will be a very robust exercise. I would anticipate a second open house here in the next month or so, and finally we would see the hearings conducted in early August in Nebraska with the decision received by the end of November.

### Robert C. Hope - Scotiabank

All right. That's helpful. And then I believe the messaging on the Q4 call was that even with a Nebraska decision late in 2017, the project may not necessarily start construction until well into 2018. Is that still the expected timeline there or could you move that forward or backwards?

Paul Miller - TransCanada Corp.

No, that continues to be the timeline. We will work through Nebraska. We will work through our commercial negotiations with the shippers, and once we have certainty on both, in early 2018 I would anticipate we would start staging the project as far as securing what material we still have to secure as well as the contractors, and that exercise will take upwards of six to nine months. So I would not see construction started until Q3 timeframe of 2018, and construction would take probably little over two years.

Robert C. Hope - Scotiabank

All right. That's helpful. Thank you.

Paul Miller - TransCanada Corp.

Thank you.

Operator

Thank you. The following question is from Linda Ezergailis of TD Securities. Please go ahead.

Linda Ezergailis - TD Securities, Inc.

Thank you. Just wanted to maybe shift focus a little bit on some of the elements of your financing strategy. With respect to your U.S. Power Marketing business, will that be sold in Q2 as well and if not, how might we see it to run down over time as it's still about a \$400 million of value that will be kind of realized over the next couple of years?

Donald R Marchand - TransCanada Corp.

Hi, Linda. It's Don here. Yes. It's under a couple of times, here, we continue to actively look at the sale process as well as full monetization over time, it's a dual path here. We expect to realize proceeds, as we'd indicated before in that \$400 million range and that will crystallize over time. We've seen a little bit of that come through now, that has been applied to the bridge loan. But generally, really no change from what we indicated earlier. But we don't have definitive line of sight to whether that will be a monetization over time or a single point sale.

Linda Ezergailis - TD Securities, Inc.

Okay. Thank you. And maybe just a question on the \$23 billion of projects; for some of the larger initiatives, what would be kind of some of the key potential bottlenecks? And I guess, I'm specifically thinking of, with some of the changes going on at FERC, how long can that drag on before that starts to affect the timeline of the projects?

Karl Johannson - TransCanada Corp.

Yeah, Linda, it's Karl. I think, we talked about this on the previous call that, with the lack of quorum there, and I see they lost another board member, so the lack of quorum is not getting better. We have three – what I call, three significant projects in the queue, they are going through the regulatory process right now. Our expectation – we're expecting earlier to get those – the FERC approvals by the end of June. Realistically, if we can get them by the end of summer, I think, we are in pretty good shape, but quite frankly if they can't get a quorum or we can't get them by the end of summer, we're going to have to start revisiting the in-service dates on those, but we still have several months yet to get them, so we are still optimistic, we'll be able to get them by the end of summer here.

Linda Ezergailis - TD Securities, Inc.

Great. Thank you.

Russell K. Girling - TransCanada Corp.

Thanks, Linda.

Operator

Thank you. The following question is from Praneeth Satish of Wells Fargo. Please go ahead.

Praneeth Satish - Wells Fargo Securities LLC

Thanks. Just one quick question for me. So, can you just remind us, again, your ability to recover development costs for the West Coast LNG projects? I think in the past, you talked about \$900 million in total, and I guess, just given recent announcements, would you expect to collect this and if so, what's the timing?

Karl Johannson - TransCanada Corp.

Hi. Yeah, this is Karl, again. Yeah, we have provisions in our agreements with the sponsors of those projects, that we can collect all of those monies. There are certain dates, in which we can call them back from the companies, which we haven't done at this time, but we are quite confident that we can get those, those monies back in due course.

Now, having said that, I would just say that, both of our sponsors are still quite optimistic that they will ultimately provide an FID, and we still are doing a little bit of work on the projects, but the work has slowed down quite a bit, and your number of \$900 million is approximately right.

Praneeth Satish - Wells Fargo Securities LLC

Okay. Great. Thank you.

Russell K. Girling - TransCanada Corp.

Thanks.

Operator

Thank you. The following question is from Ben Pham of BMO. Please go ahead.

Ben Pham - BMO Capital Markets (Canada)

Okay. Thanks. Good afternoon. Actually, this question is for Russ. Just thinking about some of your comments about organizational structure, you've had some pretty dramatic changes, the VP director level last year and more recent – the senior levels more recently. I'm just curious as you've gone through that process and seeing Alex leave here and more curious about how you got to the decision of not needing a replacement for him. And is this – can it be now, that structure, that position, you're pretty comfortable with that for over a next few years?

Russell K. Girling - TransCanada Corp.

I guess, maybe I'll start with. Yes, I'm very comfortable with the structure of the organization. All of these things are natural evolutions at a company that's grown as considerably as we have over the last number of years. Today, as I mentioned in my prepared remarks, we have five significant platforms for growth. These are all sizeable businesses that produce \$1 billion to \$2 billion each of EBITDA. Each of those has a president in-charge of it that has now responsibility for all aspects of its business. We reorganized and decentralized here over the last 24 months. So they're responsible for operations in all of their embedded services, as well as capital projects.

So, a bit different sort of approach than we've taken in the past. As the company's grown, we've decentralized to put decision rights and accountability in the hands of folks that are closer to the action and can make better and more efficient decisions. So, the changes that have been made or what I call natural evolution, we have a very, very strong bench and depth in our organization.

And so we will continue to evolve our organization as our business changes, but as I look at it today, the change that we announced here most recently with Stan Chapman being promoted to Executive Vice President and President of U.S. Gas is just the reflection of the size of that business.

Half of our employees are now in the U.S., half of our EBITDA, half of our revenues. It's natural that we need a person based in Houston that is part of our executive leadership team. Stan, as I said, has got 30 years of experience, so deep bench and natural evolution of management.

And, I guess, in terms of looking forward, you can expect this to continue to evolve our management team to meet our business. And as I said, I'm very proud of the accomplishments of the folks that have left, but equally proud of the bench that we have and the strength of our team to evolve with our business.

Ben Pham - BMO Capital Markets (Canada)

Okay, great. And maybe this question is for Don and some of the commentary on the TC Pipes and the strategy there. And I'm just wondering beyond the \$1 billion target you've highlighted, just curious about some other things that you look at when considering drops going forward? Is it looking at accretion to the TRAP or can that be liquids, rather than just gas drops? Maybe just share what else that you look at when considering drops to TCP.

Donald R. Marchand - TransCanada Corp.

Yeah. The inventory is pretty deep, when you look at what's left of the legacy TransCanada assets that are qualifying assets, including the balance of Great Lakes, some of the stuff that's come in with Columbia such as Millennium, the Columbia portfolio itself as it is built out. So the inventory of gas assets is very large. Liquids Pipes are a qualifying asset for MLPs. That said, I'm not sure they would be fully described as mature assets, given the opportunity to potentially build out XL here.

So, we don't have any specific color coding of what sequencing or when this might happen, but the first point I'd make is that there is a huge inventory of stuff that could ultimately go into TC Pipe LP. Our thought process as to when and what goes in, there's a number of factors that go into that. Firstly, it's driven by our financing needs at big TransCanada. It is a financing vehicle. I'll speak about other growth possibilities for it in a second here, but the financing needs at the parent company are a pretty important component of this.

In terms of the price at which we set these drops, it is a balancing act that we don't want to be transferring value from one shareholder base to the other at any point in time. So it is always a balancing act.

In terms of moving forward on that, the Pipe LP drops, what we do is we compare them to other forms of capital that we can raise and things in that camp would be, say, preferred shares here in Canada, probably something in the mid-4s after tax right now.

Hybrid securities, which is a very attractive vehicle right now for us, probably something in the 5% area pre-tax, high 3% area after-tax, additional portfolio management and the like. So, the MLP dropdown would be weighed against those factors. Other key things in that would be what is the unit price for the LP and what is the capacity of the LP.

So probably a long-winded way of saying, there's a whole lot of moving parts here. We do see it as an important vehicle going forward from a financing perspective. As well, we would like to grow the LP through high-quality but smaller scale acquisitions if we could going forward. We will do that on a disciplined basis, but stuff that may not move the dial at the parent company that might be a real good fit for the LP is what we'd be focused on there.

Ben Pham - BMO Capital Markets (Canada)

Okay. Can I follow-up? You're always looking at accretion at the TCP level, but then when you bring it back to corporate side, maybe on paper, it's neutral to EPS, but then when you factor in opportunity cost of financing, it is accretive to you overall?

Donald R. Marchand - TransCanada Corp.

Yeah, it's a fair comment. We are always looking at share count at the parent company, so if the LP issues third-party equity, that is treated as dollar for dollar equity in calculating our credit metrics at the parent company. So it's avoided cost of equity and avoided share count increase at the parents. So that's a pretty important factor here.

Russell K. Girling - TransCanada Corp.

I think as well, Ben, if you – as Don said, I mean, those are our criteria, but all the transactions that we've done to date have been accretive to the parent TRAP. And the other piece that you have to take into consideration is the distribution splits at the LP level in calculating the accretion of the dropdown to TRAP. So, overall, we look for accretion. But as Don said, primarily driven off of our financing needs and how that cost of capital compares to other cost of capital. But to-date, we've been pretty fortunate that everything that we've done, in our view, has been accretive.

Ben Pham - BMO Capital Markets (Canada)

Okay. All right. Thanks, Russ. Thanks, Don.

David Moneta - TransCanada Corp.

Thanks, Ben.

Operator

Thank you. The following question is from Robert Kwan of RBC Capital Markets. Please go ahead.

Robert Kwan - RBC Capital Markets

Good afternoon. If I can just ask about some potential on the NGTL expansion. First, whether there's some color you can give on the Westpath, open season, but as well as it relates to the Mainline LTFP deal, what do you see in terms of additional investment as you think about expansion for delivery service as well as expansion of upstream James River.

Karl Johannson - TransCanada Corp.

Robert, it's Karl. Yeah, as you've obviously noticed that this week we put out a new open season for our Westpath deliveries, up to 400 million a day. We'll see how that open season comes, but we do have two things, we've got customers asking for more delivery service which this open season has meant to take care of them. We have a queue of customers looking for a receipt services, which is still up in – upstream in the Montney area in the oil or the gas – I think in the gas shale area.

So, we will assess the response to the open season we put out, and we will assess the amount of receipt services that we need to put in and we will be back to the market shortly thereafter with our plans. I can say, it's probably if we have success on this particular open season, and with the resulting new receipt service that brings on, it will be a \$1 billion-plus type of expansion starting – construction starting in probably late 2018, early 2019.

Robert Kwan - RBC Capital Markets

Okay. And then – Karl, was that just for the Westpath, or did that include the Upstream James River as well if any delivery expansion you might need into Empress?

Karl Johannson - TransCanada Corp.

Yeah. No, that would include the Westpath in any resulting new receipt services that comes along for the Westpath. So that would not be an expansion to the East Gate at this time.

Robert Kwan - RBC Capital Markets

Okay. And did you need anything on the East Gate to serve the LTFP deal?

Karl Johannson - TransCanada Corp.

No, not at this time. We have capacity for the East Gate. Our volumes aren't growing large enough that I would expect, at some point in the future, we might need some extra compression support for the East Gate, but we certainly have enough right now for the long-term fixed pricing, and some future growth of East Gate deliveries beyond that.

### Robert Kwan - RBC Capital Markets

Got it. Okay. And if I can just finish here with Keystone XL. The commentary about substantially similar customer support. I'm just wondering is that both volumes and toll, and then on – as for cost, Russ, you mentioned at the AGM, that the cost can actually be a little bit lower. I'm just wondering was that statement around the gross cost or is that net inclusive of the write-down?

Russell K. Girling - TransCanada Corp.

I'll start with the first one is, it will be beyond the gross cost, and certainly my job is to push our team to make this as economic as possible for our shippers and, certainly, that's the directive that I've given to Paul and his team and they are working hard to make that happen. I'm optimistic it can occur. With respect to the contract, maybe I'll turn it over to Paul, and he can talk about where we're at on the contract.

Paul Miller - TransCanada Corp.

Sure, Robert. We do anticipate, ultimately, while we are targeting to secure the volume – contracted volume we had previously as we move – potentially move forward with Keystone XL, I do anticipate some of the current shippers will increase their commitments. I also anticipate some of the current shippers may decrease their commitments as they look at their total transportation requirement. I would also anticipate that we will introduce new parties into the shipper group. So the net result of this is we do anticipate to have contractual support similar to what we enjoyed previously, albeit amongst the different shipper group.

Robert Kwan - RBC Capital Markets

Okay. So just to be clear, roughly speaking, 90% of the capacity, a very similar total to what you had prior?

Paul Miller - TransCanada Corp.

That's what we'll be targeting. Our goal is to fully contract XL, as you know, we have to set aside some capacity for the spot shippers and we'll certainly do that. And, our total will – our total remains competitive, notwithstanding the delay and we will with good CapEx, cost management, Russ talked about, we will keep our total in line.

Robert Kwan - RBC Capital Markets

That's great. Thank you very much.

David Moneta - TransCanada Corp.

Thanks, Robert.

Operator

Thank you. The following question is from Robert Catellier of CIBC World Markets. Please go ahead.

Robert Catellier - CIBC World Markets, Inc.

Hi. I was just hoping to get a little bit of follow-up on West Coast LNG and let's start with the North Montney request for variance. Do you see anything getting in the way there and what are sort of milestones when you expect an outcome there? And then, just secondly with respect to the success of Canadian LNG projects, can you comment on that both in an environment with an NEB government and without – so in other words, what's really holding these projects back, is it simply a question of proponents getting comfortable with the market?

Karl Johannson - TransCanada Corp.

Hi. This is Karl, again. So maybe I'll start with the North Montney. And we have put in our application for a variance review. What we are trying to do is ask the board to release a condition on our – approval we have already received for it and that condition is that the LNG goes ahead. We now have – we recently submitted that application for approval, we had one shipper in that, gas was fairly – was deem to go into the LNG terminals. Today, we have 11 shippers, one of which is the LNG proponent. We have 11 shippers that want to move gas into the markets right now, and they've also in very long-term agreement. So, we believe – the circumstances have change enough that this facility is not necessarily dedicated to any LNG facility, and we would – we're asking the NEB to recognize that and to lift that condition.

The process for it right now is NEB has came out and ask for comments on the process to looking at it. That process can be another hearing or it can be just the NEB opining on it by themselves as to whether they want to accept the variance or not. They have suggested that they've – that through May and the first half of June, interested parties can submit their questions and concerns and positions, and that the board should respond as to what the process will be by the end of June. So, that's about as much as we know about the process, right now.

On Canadian LNG projects with government – whatever government that is, I would remind you that both of these LNG projects have very, very strong support from both the aboriginal communities and local communities that they are in right now, and they're both fully permitted. So, I think they're both relying on FID decisions for the sponsors. I'm not – it's really difficult for me to comment on what a sitting government of any particular party would want to do with those approvals, but it strikes me that this is more of an economic situation right now that the proponents you're looking for and not a political one.

Robert Catellier - CIBC World Markets, Inc.

Okay. Thanks for that answer.

David Moneta - TransCanada Corp.

Thanks, Rob.

Operator

Thank you. The following question is from Patrick Kenny of National Bank Financial. Please go ahead.

Patrick Kenny - National Bank Financial, Inc.

Yeah. Good afternoon, guys. A quick question for Karl here on the gas storage margins. Now three relatively strong quarters in a row, just wondering if you can remind us of some of the positive market dynamics that are at play right now, helping out contributions, and then maybe to the extent you can, how you see the market for storage and the spreads through the summer and into next winter?

Karl Johannson - TransCanada Corp.

Yeah. So a couple things happening. We have had some good quarters of storage margins both in Alberta and down in the U.S. So I would say that this warm winter probably hasn't – it hasn't helped them a lot. We have quite a lot to fill in Alberta, for example. We have a lot of gas – leading Alberta with the long-term fixed price still to come in the fall. So, we may not get that storage filled up again.

So, I would suggest that, what we have seen is probably what we're going to get maybe not better, but – it's not going to be a lot worse, but we do have some little bit of headwinds on that just because of the warm winter and the extra gas which we're taking out of Alberta would be a long-term fixed price.

In the U.S., a bit of a different situation, although that the storage in the U.S. is highly contracted with LDCs, it tends to be a little bit more consistent. Certainly, on the ex-Columbia assets, it's very, very full with LDC contracts, and even on the old TransCanada assets, ANR specifically still one of the LDC contractor. So, probably less volatility there, less price sensitive storage there.

So, the fundamentals of, I think, about storage right now is the surplus gas production. As the production does go up, you do need more storage, you do need – there is more need to manage volume swings, volumetric swings because, the gas is coming at you every day. So, we're still pretty satisfied with the storage business in TransCanada. We still think there is a need for storage. And then with the increasing gas price, we see the utility storage staying the same, if not getting better in the long-term.

Patrick Kenny - National Bank Financial, Inc.

All right. Thanks for those comments. And then just maybe a cleanup question on Columbia. I know Russ you mentioned that synergies are on track here as expected, but are you at the full \$125 million run rate coming out of Q1 or you still need a couple of quarters to get there?

Donald R. Marchand - TransCanada Corp.

Patrick, it's Don here. We're not at the full \$125 million right now, but we've got a healthy chunk of that in the first half of this year. So it will still be a ramp-up through the rest of the year, but we're on track for \$125 million for the year, but not at a full run rate yet.

Patrick Kenny - National Bank Financial, Inc.

Got it. Thank you very much.

David Moneta - TransCanada Corp.

Thanks, Pat.

### Operator

Thank you. The following question is from Nick Raza of Citi. Please go ahead.

Nick S. Raza - Citigroup Global Markets, Inc.

Thank you, guys. Just a couple of quick follow-up questions. The Great Lakes Rate Case, how will be the rate case go with TransCanada contracting what's essentially a fairly large chunk of capacity on the system, do you sort of have any views on that?

Karl Johannson - TransCanada Corp.

Well, so a couple of – this is Karl, again couple of things on that. First of all, as you've obviously seen, we have filed with the NEB that we have completed a contract with Great Lakes to move approximately half of the volumes from the LTFP to Great Lakes. We did that, because the Northern going to – taking that volume over the Northern part of our Mainline system, and into the Triangle could not accommodate all of that volume going into Dawn through the Triangle, so that's why we have done that.

Both the Mainline and Great Lakes are in rate cases right now. The Mainline, obviously, has to go get approval for the volumes – for the service that we're offering, and as part of that service, the board will be interested in the prudence of how we're splitting the volumes between our Mainline and Great Lakes.

Great Lakes will be – is in a rate case, a regular five-year rate case, as we speak, right now. So it's very difficult for us to say, right now, A, what those approvals will ultimately look like, and what the rate cases on Great Lakes or the settlements on Great Lakes will look like as well. So, it's a little premature to start speculating on how we're going to come out of both of those rate cases. So, again, we'll have to wait and see as both of those rate cases gets settled or litigated.

Nick S. Raza - Citigroup Global Markets, Inc.

Okay. Thank you, guys. And then just one final question. In terms of expansions for Iroquois and Portland Natural Gas, are there any sort of plans to do anything as now the assets are completely sort of in TC PipeLines?

Karl Johannson - TransCanada Corp.

It's Karl again. I think the short answer is, yes. I don't think the fact that they're in TC PipeLines has any bearing on whether there's plans on expanding them or not, but certainly if there is a demand for extra capacity to go down those facilities, us and TC PipeLines will be anxious to fill that demand. I can't tell you we have been in the market with PNGTS with the Portland system, marketing some capacity there, some increased capacity there for when the contracts roll of in 2018 and we have gotten significant interest. Not enough yet to get contracts signed and announce anything, but there is significant issue there. And of course once we sell PNGTS, then we will see we will need more capacity going down the Mainline and TQM and Eastern Triangle of the Mainline. So I think it's pretty much business as usual

there. If we can't find more capacity, more customers willing to ship on our systems, we will accommodate them.

Nick S. Raza - Citigroup Global Markets, Inc.

That's all I have. Thank you, guys.

Operator

Thank you. There are no further questions registered at this time. I'd like to turn the meeting back over to Mr. Moneta.

David Moneta - TransCanada Corp.

Great. Thanks very much. And thanks to all of you. We very much appreciate your interest in TransCanada and we look forward to speaking to you again soon. Have a great weekend. Bye for now.

Operator

Thank you. The conference has now ended. Please disconnect your lines at this time. We thank you for your participation

# **ATTACHMENT LS-22**



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# Keystone XL, Dakota Access Could Cause Bottlenecks at U.S. Mid-Continent Storage Hubs, Shift Crude Prices

**Events** 

## Hillary Stevenson & Dylan White, Oil Market Analysts February 14, 2017



Presidential Executive Orders touting the construction of Energy Transfer Partner's Dakota Access and TransCanada's Keystone XL pipelines recently advanced the controversial projects that together would move more than one million bpd of crude to Midwest storage hubs. But, the new flow routes could create a takeaway

bottleneck, which would have price implications for U.S. and Canadian crudes. While the price of West Texas Intermediate (WTI) at Cushing, OK, could fall due to additional supply, North Dakota Bakken and Alberta, Canada, heavy crude differential should strengthen due to added demand.

Cushing, OK, stocks reached historical highs in 2012 due to increased incoming pipeline flows spurred by domestic and Canadian production and limited outgoing pipeline capacity. In November 2012, WTI was depressed as much as \$22/bbl below Brent crude as inventories in Cushing rose.

Drilling under Lake Oahe in southern North Dakota for Energy Transfer Partner's Bakken-to-Patoka, IL, Dakota Access (DAPL) crude pipeline began immediately upon receiving an easement from the U.S. Army Corps of Engineers on February 8, according to a company spokeswoman. It is expected to take 83 days for construction and linefill, she added. This action comes on the tailwind of a January 24 Presidential Memorandum directing U.S. Federal agencies to expedite approvals and reviews for remaining portions of Dakota Access, according to a statement issued by The White House Office of the Press Secretary.



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The January 24 memo also put a deadline on the government's review of TransCanada's proposed 830,000 bpd Keystone XL pipeline, which would enable more Canadian crude to reach U.S. Mid-Continent and Gulf Coast refiners with the possibility of re-export.



Keystone XL and Dakota Access pipeline supply chain connections. Click to enlarge

### **A Cushing Crunch**

The Keystone XL pipeline will be able to carry up to 830,000 bpd from Hardisty, AB, to Steele City, NB. Upon completion of the XL line, the Keystone system will be able to flow to Cushing and Patoka, IL, simultaneously. Preexisting infrastructure will provide connectivity from Steele City to both destinations. Once Keystone XL is completed, crude flows on the legacy line will flow to Patoka, leaving the Keystone XL line to feed Cushing directly. Currently, the legacy line can only feed one of the spurs leaving Steele City at any given time, limiting the pipeline capacity utilization to Cushing and Patoka.

Increased flows into Cushing due to the addition of Keystone XL could lead to a bottleneck of inventories at the hub, which would put downward pressure on crude prices.

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At the beginning of February, there were 18 pipelines carrying crude into Cushing, totaling 3.6 million bpd of capacity, compared to 15 pipelines with nearly 2.7 million bpd of capacity carrying crude out of the hub. Inflow capacity is currently outpacing outflow capacity, with a net capacity of 841,000 bpd. The imbalance is actually 221,000 bpd greater than in 2012 when Cushing bottlenecked. However, no bottleneck has occurred in the past year because of a difference in capacity utilization for pipes moving in and out of Cushing.



Imbalances in pipeline capacity netflow could lead to increased storage inventories at Cushing should incoming flows increase. Click to enlarge

Incoming pipeline capacity utilization has averaged 51 percent thus far in 2017. Outgoing pipelines were operating at higher utilization rates during the same time, averaging 67 percent. The difference in utilization rates has led to a relative balance of netflow at Cushing. Should incoming pipeline utilization increase by 24 percent, existing outgoing pipeline capacity would become saturated, stranding barrels in Cushing. If outgoing capacity cannot keep up with incoming flows, WTI prices are likely to be depressed.

Keystone XL could increase total inflow into Cushing by about 475,000 bpd to 2.2 million bpd, a 14 percent increase in incoming pipeline utilization, based on average flows so far in 2017.

Currently, only one pipeline is planned to help mitigate the imbalance in Cushing– connected pipeline capacity. Plains All American and Valero are planning the 200,000 bpd Diamond Pipeline, which will increase pipeline capacity out of Cushing. The new line will connect to Valero's 195,000 bpd Memphis, TN, refinery, and is expected online by the end of 2017, according to the company's website.

As of February 3, crude inventories at Cushing have averaged 67.5 million bbls in 2017, and capacity utilization rates at the hub have remained above 70 percent since November 2016. Sixteen owners operate facilities at Cushing, totaling more than 90 million bbls of available capacity: Blueknight, Enbridge, Magellan, Plains All American, and Rose Rock Midstream each operate more than seven million bbls of capacity, and two companies, TransCanada and Barcas, have plans to expand their storage facilities, according to regulatory documents submitted to the Oklahoma Department of Environmental Quality. Upon completion, the construction projects will add an additional 30 tanks, or 8.1 million bbls of capacity, at Cushing.

Outgoing pipes from Cushing carry barrels directly to more than 1.6 million bpd of refining capacity in the U.S. Mid-Continent, but Cushing also has connectivity to the U.S. Gulf Coast, where more than eight million bpd of refining capacity is located.

TransCanada also has several tanks under construction in Hardisty, the origin of the Keystone pipeline system. The company began building eight tanks in 2013, totaling 2.7 million bbls. Construction on the tanks was nearly completed, but they never became operational after Keystone XL plans were halted in the legislative process, and these tanks have sat idle for years. It is possible that TransCanada will finally bring the new section of their Hardisty terminal online as the Keystone XL project is revitalized.



Tanks at TransCanada's Hardisty terminal have remained under construction for years as Keystone XL was postponed (top: February 2015; bottom: February 2017). Click to enlarge

### **Pipelines to Patoka**

Keystone XL will also allow more Canadian crude to reach the Patoka storage hub, which is connected to nearly 2.25 million bpd of Mid-Continent refining capacity.

The Patoka storage hub consists of nearly 17 million bbls of operational tank capacity operated by seven different companies. Plains, Marathon, and Capline operated more than 80 percent of the operational capacity in February. As of February 3, 540,000 bbls of capacity were under construction and another 1.8 million bbls of capacity were in

maintenance, while a total of 2.5 million bbls of incoming pipeline capacity and 1.3 million bpd of outgoing pipeline capacity were operational in February.

Tank storage utilization at the hub has been fairly consistent between 2016 and 2017; it has averaged 52 percent so far in 2017 compared to 53 percent in 2016, according to Genscape. However, that utilization may increase as the Keystone XL pipeline will allow barrels to flow to Patoka directly without having to share delivery with Cushing.

Assuming that the legacy Keystone pipeline was able to flow at capacity to Patoka, leaving Keystone XL volumes to supply the Cushing hub, incoming pipeline flow would increase by about 336,000 bpd to 1.1 million bpd, using 2017 average flows on Genscape monitored pipelines (Genscape monitors 83 percent of incoming pipeline capacity at Cushing).

The potential increase in Keystone deliveries would elevate incoming flow to nearly the existing outgoing pipeline capacity. Unmonitored flows on the Enbridge-operated 100,000 bpd Mustang and Marathon-operated 315,000 bpd Woodpat pipelines could push total incoming flow over outgoing pipeline capacity and cause barrels to pool in Patoka or back up at the origin destinations. Granted, Keystone flow is partially diverted to Phillips 66's 306,000 bpd Wood River, IL, refinery, reducing crude reaching Patoka.

Incoming flow from the Dakota Access pipeline would further contribute to the net pipeline capacity imbalance. Once complete, the pipeline will cause incoming pipeline capacity to exceed outgoing pipeline capacity by nearly three million bpd.

However, Energy Transfer Partners also plans to add 470,000 bpd of new outgoing pipeline capacity, reversing the increase in net capacity gained by DAPL. The Energy Transfer Crude Oil Pipeline (ETCOP) project includes converting a natural gas pipeline to deliver crude to Nederland, TX.

Additional incoming barrels due to the completion of DAPL and/or Keystone XL would benefit refiners connected to the hub, including Marathon, BP, Husky, Citgo, Exxon and Phillips 66, which can source crude from Patoka for their Mid-Continent refineries.

Should pipeline supply exceed refinery demand at Patoka, additional outgoing pipeline capacity would be needed. There are several ways this might be addressed, including the possibility to reverse the 1.2 million bpd Marathon-operated Capline pipeline. The reversal is not likely to happen before new connectivity to Memphis, via the Diamond pipeline, is completed at the end of the year.

Data from Genscape's Cushing Crude Oil and Patoka Crude Oil Storage reports advised the storage trends in this blog. Genscape's storage data is collected using Infrared cameras, aerial diagnostics, and other proprietary measurement techniques. This approach translates into highly accurate, advance notice of the actual oil storage levels. Genscape's Mid-Continent Pipeline Service, which includes the Keystone pipeline system, also advised the pipeline information contained in this report. Updates on pipeline flows for 42 pipelines every 30 minutes with downloadable historical data, custom alerting, and intelligence reporting are included in the Mid-Continent pipeline service. To learn more or request a free trial of any of Genscape's Oil Market Services, please click here.

### This entry was posted in: Oil

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### Eric Smith • 4 months ago

One of our concerns in Louisiana is to gain pipeline access to Canadian heavy crude. Unlike Texas, Louisiana lacks direct access as there is no West to East pipeline available to deliver heavy Canadian crude to the Louisiana complex refineries. As a result Louisiana, the second larges refining state, is sourcing much of its heavy crude from Venezuela while Texas has access to both Canada via pipeline and Mexico via blue water ships. Reversing Capline could help, but don't know if that is in the cards.

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GregS → Eric Smith • 3 months ago

Eric: Capline might have a better chance of being reversed after the Diamond P/L is built, which will then supply the Memphis refinery from Cushing. Once that is done I don't think there is enough volume going North on Capline to keep it economically effective.



Eric Smith → GregS • 3 months ago
That's a great idea. I'll certainly check it out.
∧ | ∨ • Share >



Hillary Stevenson → Eric Smith • 3 months ago

For more information about the Diamond pipeline and possible Capline reversal, check out our blog!: http://www.genscape.com/blo...

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**Eric Smith** → Hillary Stevenson • 3 months ago

I did read your earlier blog and found it helpful. However, it only discusses volume for one of the equity partners. As you point out Marathon seems interested in a reversal. However, BP's U.S. Crude Pipeline & Storage Impacts of DAPL & Keystone XL | Genscapehttp://www.genscape.com/blog/keystone-xl-dakota-access-could-cause-bo...

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## **ATTACHMENT LS-23**



TransCanada Home 🎍 Nowe 🎍 2007 News Releases 🕨 TransCanada Markets Keystone Pipeline

### **Keystone Pipeline Expansion and Cushing**

nuary 30, 2007 – TransCanada Corporation (TSX, ada) today announced the start of a binding Open on and extension of the proposed Keystone Oil

p. . . . . .

The purpose of the Open Season is to obtain binding commitments to support the expansion of the proposed Keystone Pipeline from a nominal capacity of approximately 435,000 barrels per day to 590,000 barrels per day and the construction of a 468-kilometre (291-mile) extension of the U.S. portion of the pipeline from the Nebraska/Kansas border to the refining and terminal hub near Cushing, Oklahoma. The US\$700 million expansion and extension project is targeted to be in-service in the fourth quarter of 2010.

The Keystone Pipeline is a proposed 2,965-kilometre (1,842-mile) pipeline with a nominal capacity to transport approximately 435,000 barrels per day of crude oil from Hardisty, Alberta, to U.S. Midwest markets at Wood River and Patoka, Illinois. It is an innovative and cost-competitive proposal to transport a significant amount of new Canadian crude oil to key U.S. markets commencing in late 2009.

The Keystone Pipeline is underpinned by long-term transportation commitments from producers totaling 340,000 barrels per day with an average contract duration of 18 years as a result of a previous binding open season process.

Regulatory applications have been filed to construct and operate the pipeline in Canada and the U.S., with decisions anticipated to be received by the end of 2007. The Keystone Pipeline is on schedule to meet an in-service date in the fourth quarter of 2009.

During the Open Season period, which will expire at noon MDT on March 14, 2007, interested parties may submit binding bids for firm capacity transportation of crude oil from Hardisty, Alberta to Cushing, Oklahoma or to Wood River and Patoka, Illinois. Parties are invited to contact David Diakow, Manager, Oil Business Development at 403.920.6019 or Marty Heeg, Director, Oil Business Development at 403.920.2101 for more information. The Keystone website (www.transcanada.com/keystone) provides additional information about the Keystone Pipeline and the Open Season.

TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas pipelines and storage facilities, and power generation. For 50 years, TransCanada has transported the majority of Western Canada's natural gas production to key Canadian and U.S. markets. On closing of the acquisition of the ANR Pipeline Company and ANR Storage Company announced December 22, 2006, TransCanada's network of wholly owned pipelines will extend more than 59,000 kilometres (36,500 miles), tapping into virtually all major gas supply basins in North America. TransCanada will also become one of the continent's largest providers of gas storage and related services with approximately 360 billion cubic feet of storage capacity. A growing independent power producer, TransCanada owns, or has interests in, approximately 7,700 megawatts of power generation in Canada and the United States. TransCanada's common shares trade on the Toronto and New York stock exchanges under the symbol TRP.

#### FORWARD-LOOKING INFORMATION

Certain information in this news release is forward-looking and is subject to important risks and uncertainties. The results or events predicted in this information may differ from actual results or events. Factors which could cause actual results or events to differ materially from current expectations include, among other things, the ability of TransCanada to successfully implement its strategic initiatives and whether such strategic initiatives will yield the expected benefits, the availability and price of energy commodities, regulatory decisions, competitive factors in the pipeline and power industry sectors, and the current economic conditions in North America. For additional information on these and other factors, see the reports filed by TransCanada with Canadian securities regulators and with the United States Securities and Exchange Commission. TransCanada disclaims any intention or obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

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David Moneta/Myles Dougan (403) 920-7911



TransCanada Home 🕨 News 🕨 2008 News Releases 🕨 Keystone Pipeline to expand to serve the U.S. Gulf Coast

#### Keystone Pipeline to expand to serve the U.S. Gulf Coast

CALGARY, July 16, 2008 – TransCanada Corporation (TransCanada) (TSX, NYSE: TRP), on behalf of the Keystone Pipeline partnerships (Keystone) between TransCanada and ConocoPhillips (NYSE: COP), today announced plans to expand the Keystone crude oil pipeline system and provide additional capacity of 500,000 barrels per day from Western Canada to the U.S. Gulf Coast in 2012. The expansion is expected to cost approximately US\$7.0 billion. When completed, the expansion will increase the commercial design of the Keystone Pipeline system from 590,000 barrels per day to approximately 1.1 million barrels per day and result in a total capital investment of approximately US\$12.2 billion.

Plans to expand to the U.S. Gulf Coast follow successful negotiations with several prospective shippers who have agreed, subject to regulatory approvals, to make shipping commitments of approximately 300,000 barrels per day to the U.S. Gulf Coast for an average term of 18 years during a binding open season which begins today. In addition, prospective shippers have also agreed to commit another 35,000 barrels per day to Wood River and Patoka, Illinois during a future open season expected in the third or fourth quarter of 2008. With these commitments Keystone has now secured long-term commitments for approximately 830,000 barrels per day for an average term of 18 years. These commitments represent approximately 75 per cent of the commercial design of the system.

"The Keystone expansion will be the first direct pipeline to connect a growing and reliable supply of Canadian crude oil with the largest refining market in North America," says Hal Kvisle, TransCanada president and chief executive officer. "The Keystone Pipeline will be constructed and operated as an integrated system with delivery points in the U.S. Midwest and U.S. Gulf Coast."

The Keystone expansion includes an approximate 3,200-kilometre (1,980-mile), 36inch crude oil pipeline starting at Hardisty, Alberta and extending south to a delivery point near existing terminals in Port Arthur, Texas and, subject to shipper support, will include an additional approximate 80-kilometre (50-mile) pipeline lateral to the Houston, Texas area. With the addition of incremental pumping facilities, the Keystone Pipeline system could be further expanded from 1.1 million barrels per day to 1.5 million barrels per day.

During the binding open season Keystone will seek additional shipping commitments from interested parties. Once Keystone completes the open season process it will proceed expeditiously with the necessary regulatory applications in Canada and the U.S. for approvals to construct and operate the proposed facilities. Construction of the facilities is anticipated to commence in 2010 following the receipt of the necessary regulatory approvals. As a result, the majority of the US\$7.0 billion in additional capital investment required to expand Keystone to the U.S. Gulf Coast is expected to be made between 2010 and 2012.

Certain parties who have agreed to make volume commitments to the Keystone expansion have an option to acquire up to a combined 15 per cent equity ownership in the Keystone partnerships.

http://www.transcanada.com/news/2008 news/20080716.html

IransCanada is responsible for developing, constructing and operating the Keystone pipeline and has initiated outreach activities with key stakeholders including local communities and landowners along the expansion route. It is expected that deliveries to Wood River and Patoka, Illinois will commence in late 2009. Deliveries to Cushing, Oklahoma are expected to commence in late 2010 and deliveries to the U.S. Gulf Coast are expected to begin in 2012.

During the binding open season period, which expires at noon (Mountain Time) on September 4, 2008, TransCanada, on behalf of Keystone, will accept binding bids from parties for firm transportation capacity for transportation of crude oil from Hardisty, Alberta to Port Arthur or Houston, Texas. Interested parties are invited to contact Marty Heeg at 403.920.2101 or David Diakow at 403.920.6019 for more information. The Keystone expansion project web page [www.transcanada.com/keystone/kxl.html] provides additional information about the project including a summary of the open season documents and a map of the proposed pipeline corridor.

With more than 50 years' experience, TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas pipelines, power generation, gas storage facilities, and projects related to oil pipelines and LNG facilities. TransCanada's network of wholly owned pipelines extends more than 59,000 kilometres (36,500 miles), tapping into virtually all major gas supply basins in North America. TransCanada is one of the continent's largest providers of gas storage and related services with approximately 355 billion cubic feet of storage capacity. A growing independent power producer, TransCanada owns, controls or is developing approximately 8,300 megawatts of power generation. TransCanada's common shares trade on the Toronto and New York stock exchanges under the symbol TRP.

Note: All financial figures are in Canadian dollars unless noted otherwise.

#### FORWARD-LOOKING INFORMATION

This news release may contain certain information that is forward looking and is subject to important risks and uncertainties. The words "anticipate", "expect", "may", "should", "estimate", "project", "outlook", "forecast" or other similar words are used to identify such forward looking information. All forward-looking statements reflect TransCanada's beliefs and assumptions based on information available at the time the statements were made. Actual results or events may differ from those predicted in these forward-looking statements. Factors which could cause actual results or events to differ materially from current expectations include, among other things, the ability of TransCanada to successfully implement its strategic initiatives and whether such strategic initiatives will yield the expected benefits, the operating performance of the Company's pipeline and energy assets, the availability and price of energy commodities, regulatory processes and decisions, changes in environmental and other laws and regulations, competitive factors in the pipeline and energy industry sectors, construction and completion of capital projects, labour, equipment and material costs, access to capital markets, interest and currency exchange rates, technological developments and the current economic conditions in North America. By its nature, such forward-looking information is subject to various risks and uncertainties, which could cause TransCanada's actual results and experience to differ materially from the anticipated results or expectations expressed. Additional information on these and other factors is available in the reports filed by TransCanada with Canadian securities regulators and with the U.S. Securities and Exchange Commission. Readers are cautioned not to place undue reliance on this forward-looking information, which is given as of the date it is expressed in this news release or otherwise, and to not use future-oriented information or financial outlooks for anything other than their intended purpose. TransCanada undertakes no obligation to update publicly or revise any forward-looking information. whether as a result of new information. future events or

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otherwise, except as required by law.

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David Moneta/Myles Dougan/Terry Hook (403) 920-7911 (800) 361-6522 Date of Release: 2009-12-15

# **TransCanada Keystone Pipeline, LP**

# DBRS Confirms TransCanada Keystone at R-1 (low), Stable Trend

DBRS has today confirmed the R-1 (low) rating of the Canadian-based Commercial Paper (CP) of TransCanada Keystone Pipeline, LP (Keystone USA or the Partnership) with a Stable trend based on the strength of the guarantee of TransCanada PipeLines Limited (TCPL rated "A" and R-1 (low) with Stable trends, see separate report), its 100% parent. Furthermore, TCPL's wholly-owned U.S. subsidiary, TransCanada PipeLine USA Ltd., is also a guarantor. The CP program issues U.S. or Canadian dollar paper up to the equivalent of US\$1 billion and is supported by a US\$1 billion 364-day credit facility with a one-year term-out option. The proceeds from Canadian CP are swapped into U.S. dollars and a forward foreign currency contract entered into to settle on the maturity date of the CP to minimize foreign exchange risk. Keystone USA was initially financed with a capital structure consisting of approximately 50% to 60% debt (compared with TCPL's debt-to-capital of 56% as of September 30, 2009) prior to its becoming a wholly-owned subsidiary on August 14, 2009. DBRS expects the final capital structure to be in line with TCPL's financial profile and within the parameters of the current rating based on long-term contractual arrangements.

The Partnership represents the U.S. portion of the pipeline, which, together with the Canadian portion (Keystone Canada), forms an integral part of the base Keystone Pipeline System (collectively, Base Keystone). On June 16, 2009, DBRS confirmed TCPL's ratings, following its concurrent announcements of its underwritten equity issuance and its agreement to acquire from its original 50% joint venture partner and a major shipper, ConocoPhillips (COP - rated "A" with a Stable trend), the remaining 20% equity interest in the Keystone pipeline partnerships it did not already own, for US\$750 million upfront (effectively at book value) including assumed debt, plus \$1.7 billion of capex to 2012. The transaction closed on August 14, 2009. In addition to the TCPL guarantee, the rating also reflects the following Keystone USA strengths:

(1) Upon full completion in late 2010, Base Keystone will be supported by long-term take-or-pay shipper contracts with an average term of 18 years, mostly with strong investment-grade counterparties (about 80% based on DBRS ratings). These commitments will cover about 90% (or 530,000 barrels per day (b/d)) of the pipeline's design capacity of 590,000 b/d. A capital cost sharing

mechanism on a 50/50 basis with shippers should mitigate in part the potential cost overruns often associated with mega-projects. In addition, part of Base Keystone is composed of converted portions of TCPL's existing gas pipelines, reducing construction risk to some extent. The project is largely on time and on budget to date.

(2) The pipeline's tolling structure includes: (a) a fixed toll that recovers fixed costs (including fixed financing costs), effectively eliminating almost all of the throughput risk, since 90% of Base Keystone capacity has been committed, and (b) a variable toll that covers operating, maintenance and administration expenses on a cost-of-service basis, effectively eliminating operating cost risk. The capital portion of the project is recovered through pre-established fixed tolls adjusted for capital variances shared on a 50/50 basis with shippers due to cost overruns as mentioned above.

(3) Competitive tolling arrangements as expected on completion should ensure the viability of Keystone USA beyond the contract terms. DBRS estimates that a significant portion of the construction costs would have been recovered through depreciation charges during the average 18-year contract term, increasing the competitiveness of future tolls.

(4) TCPL, the operator of Keystone USA, is among the largest pipeline operators in North America, with extensive experience in building and operating pipelines.

(5) Bitumen reserves are abundant in the oil sands sector, with new projects coming on stream during 2008 and 2009 and a couple of major projects commencing production, after Base Keystone is in full service in 2010.

The Partnership faces several challenges, which are considered manageable. (1) The previous concerns of potential project cost overruns and delays which could affect the economics and competitiveness of Keystone USA are now largely mitigated as the project is over 90% complete with the first phase of Base Keystone being commissioned for in-service expected in Q1 2010 (potentially only a couple of months delay from its original schedule). Any minor cost overruns will likely be covered by contingencies and included in the fixed portion of the tolls. A substantial portion of project costs (approximately 60%) has been committed through materials and construction contracts awarded. (2) Should a shipper default prior to or after pipeline completion, Keystone USA would have to bear its portion of the fixed capital cost until a substitute shipper is found, although Keystone USA retains the right to sue for damages for any shipper defaults. (3) For Base Keystone, approximately 20% of the contracted volumes are with non-investment-grade shippers, which presents an element of uncertainty, although financial assurances in the form of parental guarantees or letters of credit are required and have been obtained for certain shippers. (4) The aftermaths of the global financial crisis, the economic slowdown and environmental concerns could lead to more delays

in oil sands developments, limiting the supply source. While some major projects are still being deferred, certain projects of lesser scale are proceeding. The continued postponement of two major upgrader projects could enhance the value of heavy crude pipelines, such as Base Keystone, which ships heavy crude oil to the U.S. Midwest markets and ultimately to the Gulf Coast through expansions and extensions (Keystone XL), where refineries are better equipped to handle heavier crude. The improving crude oil prices from Q2 2009 to the mid-to-high \$70s per barrel level should suffice to support most oil sands projects, going forward. (5) Refinancing risk exists, following pipeline completion, although this is partly mitigated by the value of Keystone USA's pipeline capacity, underpinned by the strong take-or-pay long-term transportation contracts as well as the substantial equity component (currently estimated at more than 40%) in the project. With a 100% ownership interest, TCPL will likely refinance the CP outstandings using its balance sheet capacity.

Base Keystone (a 3,456-kilometre (2,148-mile) 30- and 36-inch pipeline), when completed, will extend from Hardisty, Alberta, to U.S. Midwest markets at Wood River and Patoka, Illinois, and Cushing, Oklahoma. Phased start-up is expected in Q1 2010, with an initial nominal capacity of 435,000 b/d, which will be expanded to 590,000 b/d in Q1 2011. The construction of the pipeline began in May 2008. Keystone XL (3,200-kilometre (1,900-mile) 36-inch pipeline), the proposed extension and expansion project, would increase the capacity to 1.09 million b/d from Hardisty to Port Arthur, Texas, and other U.S. Midwest markets, with in-service expected in Q4 2012 or early 2013. The pipeline system is further expandable to 1.5 million b/d at relatively low cost, enhancing future growth opportunities.

The capital cost for Base Keystone is estimated at approximately \$6.1 billion (equivalent) and at approximately \$13.4 billion, including Keystone XL (collectively Keystone), which are close to original estimates of approximately US\$12 billion. The capital cost sharing mechanism for any project cost overruns between Keystone and the shippers is 50/50 for Base Keystone and 75/25 for Keystone XL.

### Note:

The Commercial Paper is guaranteed by TransCanada PipeLines Limited and TransCanada PipeLine USA Ltd.

All figures are in Canadian dollars unless otherwise noted.

The applicable methodology is Rating Utilities (Electric, Pipelines & Gas Distribution), which can be found on our website under Methodologies.

This is a Corporate (Energy) rating.

The full report providing additional analytical detail is available by clicking on the link below or by contacting us at info@dbrs.com.

## **Related Research**

- TransCanada Keystone Pipeline, LP
- <u>Rating Utilities (Electric, Pipelines & Gas Distribution)</u>

## **Related Issuers**

• <u>TransCanada Keystone Pipeline, LP</u>

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# Ratings

Issuer	Debt Rated	Rating	Rating	Trend	Notes	Published
		Action				
TransCanada Keystone Pipeline,	Commercial	Confirmed	R-1	Stb		15 Dec
<u>LP</u>	Paper		(low)			2009

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## **ATTACHMENT LS-24**

### 144 FERC ¶ 61,086 UNITED STATES OF AMERICA FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Jon Wellinghoff, Chairman; Philip D. Moeller, John R. Norris, Cheryl A. LaFleur, and Tony Clark.

Marketlink, LLC

Docket No. OR13-18-000

### ORDER ON PETITION FOR DECLARATORY ORDER

(Issued July 31, 2013)

1. On April 26, 2013, Marketlink, LLC (Marketlink) filed a Petition for a Declaratory Order (Petition) requesting approval of the rate structure, cost of service calculation, rate principles underlying the uncommitted rates, the methodology to calculate the uncommitted rates and the proposed proration policy for the proposed Cushing Marketlink System Project. Marketlink contends that the Project will provide additional capacity needed to transport crude oil from Cushing, Oklahoma (Cushing) to refinery centers along the Gulf Coast. The Petition is unopposed, and Marketlink requests that the Petition be granted by July 31, 2013, so that Marketlink may prepare tariffs with an expected filing date of November 1, 2013 and an expected in-service date of December 1, 2013. As discussed below, the Commission grants the Petition.

### **Background and Details of the Project**

2. Marketlink is a new common carrier pipeline that will provide crude oil transportation from Cushing to the Texas Gulf Coast. Marketlink states that the Project will address the need for transportation capacity for the current glut of oil in Cushing. According to Marketlink, it will lease its capacity from TransCanada Keystone,<sup>1</sup> and will construct ancillary interconnecting facilities at Cushing, including tanks and metering facilities, allowing shippers an opportunity to ship crude oil from Cushing to the Gulf Coast. Marketlink anticipates commencing operations in December 2013, and plans to offer approximately 400,000 barrels per day of capacity in its first phase.

3. Unique to the Marketlink project, the amount of capacity available to all shippers will be reduced to 150,000 barrels per day (bpd) after the initial service period as

<sup>&</sup>lt;sup>1</sup> See TransCanada Keystone, L.P., "Petition for Declaratory Order," Docket No. OR13-17-000 (filed concurrently with the instant Petition). Marketlink is a wholly owned affiliate of TransCanada Keystone Pipeline, L.P.

TransCanada Keystone's committed shippers come on-line. Marketlink states that all prospective shippers on Marketlink were notified of this reduction as part of the open season. This reduction will take place upon the earlier of three years after the in-service date of Marketlink or the in-service date of the Keystone XL Pipeline.

4. Marketlink will provide transportation service to both committed shippers and uncommitted shippers. Committed shippers have executed binding commitments for ship-or-pay term contracts to delivery points at Houston and Port Authur, Texas. Committed shippers will be subject to prorationing, as their transportation service agreements (TSAs) do not guarantee firm service. Uncommitted shippers will pay rates for transportation service from Cushing to the Gulf Coast that will be greater than the rates paid by committed shippers.

## **Requested Rulings**

5. Marketlink is requesting approval of the rate structure, cost of service calculation, rate principles underlying the uncommitted rates, the methodology to calculate the uncommitted rates, and the proposed proration policy, as set forth below.

## Committed and Uncommitted Rate Structure

6. Marketlink's committed shippers executed binding ship-or-pay commitments in exchange for discounted transportation rates as part of the open season. Committed shippers will not receive firm service and will be subject to Marketlink's proration policy. Uncommitted shippers will have the ability to nominate any level of transportation in any month and in exchange will pay an uncommitted rate that is higher than the rates paid by committed shippers. The committed rates will be subject to the Commission's indexing policy, but should the index be negative the rates cannot be reduced below the initial rates at the time Marketlink goes into service.

### Cost of Service

7. Marketlink's cost of service will include Marketlink's cost of leasing pipeline capacity from its affiliate TransCanada Keystone Pipeline, L.P. as well as the cost of service of the Marketlink-owned facilities.<sup>2</sup> The lease payments for Marketlink's capacity will be calculated based on Marketlink's proportional share of the total capacity of TransCanada Keystone's Gulf Coast leg. The cost of providing service will be calculated on a stand-alone basis and then allocated to Marketlink based on the amount of capacity leased on the Gulf Coast leg.

<sup>&</sup>lt;sup>2</sup> For example, tankage and metering facilities.

## **Revenue Crediting Mechanism**

8. Marketlink's uncommitted rates will incorporate a revenue crediting mechanism. Marketlink proposes identifying the cost of service underlying the uncommitted rates by taking the total cost of service of the lease for the TransCanada Keystone pipeline capacity and subtracting revenues received by committed shippers. The difference will be divided by the pipeline capacity available to uncommitted shippers to derive the uncommitted rates.

## **Uncommitted Rate Calculation Methodology**

9. Marketlink's uncommitted rate will be calculated in a multiple step process. First, as stated above, Marketlink will take the total cost of service of the pipeline portion then subtract the total revenues attributable to committed shippers. Marketlink will then divide that number by the uncommitted capacity to derive a stand-alone uncommitted rate. Next, Marketlink will calculate the unit cost for Marketlink Facilities by taking the total cost of service of the Marketlink Facilities and dividing it by Marketlink's leased capacity, resulting in a "Marketlink Facilities Unit Cost." The final step will be to add together the stand-alone Uncommitted rate for transportation from Cushing to the Gulf Coast.

## Prorationing Policy

10. Marketlink also requests approval of its prorationing policy. This policy will employ a historical shipment allocation methodology using an 18 month representative period for qualification as a Historical Shipper and a 12 month representative period for calculating shipping histories; deem new shippers who have tendered volumes in 12 months during the last 18 months to be Historical Shippers; deem committed shippers to be Historical Shippers as of the in-service date; and allow a split of 90 percent of the capacity for Historical Shippers and 10 percent of the capacity for new shippers during periods of prorationing.

## Notice and Interventions

11. Notice of the Petition was issued April 30, 2013. Interventions and protests were due May 20, 2013. Pursuant to Rule 214 of the Commission's regulations,<sup>3</sup> all timely filed motions to intervene and any unopposed motion to intervene out-of-time filed before the issuance date of this order are granted. Granting late intervention at this stage of the proceeding will not disrupt the proceeding or place additional burdens on existing

<sup>3</sup> 18 C.F.R. § 385.214 (2013).

parties. Nexen Energy Marketing filed a letter in support of Marketlink's petition. There were no filings in opposition.

### **Discussion**

12. Having considered the Petition, the Commission finds it may approve the requested use of a committed and uncommitted rate structure; the calculation of the Project's cost of service using lease payments plus the cost of service of facilities; the use of a revenue crediting mechanism; the methodology to calculate the total uncommitted rate; and Marketlink's proposed prorationing policy for transportation of crude between Cushing and Texas when the project goes into service and Marketlink files the appropriate tariffs to implement service. The Commission's granting of this Petition is consistent with its approval of similar petitions undergirding oil pipeline infrastructure projects, and it will provide regulatory certainty for the commercial underpinnings of another much-needed infrastructure project.

13. The Commission approves Marketlink's proposed use of committed and uncommitted rates, pursuant to which committed shippers execute binding commitments in exchange for discounted rates. Uncommitted shippers exchange the flexibility in nominations for rates higher than the committed rates. The Commission finds that such committed and uncommitted shippers are not similarly situated, and that such differing rates are therefore not unduly discriminatory or preferential.

14. The Commission confirms that Marketlink is appropriately using a revenue crediting mechanism. The revenue crediting mechanism recognizes that committed shippers who have assumed the risk associated with term and throughput commitments in order to enable the construction of a project are not similarly situated to uncommitted shippers.<sup>4</sup> The use of such a revenue crediting mechanism is consistent with Commission precedent, and is hereby approved.

15. The Commission confirms Marketlink's proposed uncommitted rate calculation methodology will be approved when the project goes into service and Marketlink files rates to initiate transportation service from Cushing to points in Texas. The proposed calculation methodology ensures that both the cost of Marketlink's lease of the TransCanada Keystone pipeline capacity, as well as Marketlink-owned facilities are appropriately allocated to shippers in a non-discriminatory manner. The calculation uses capacity that uncommitted shippers would use, and then derives the uncommitted incremental unit cost. The Commission finds that this methodology ensures no shipper or

<sup>&</sup>lt;sup>4</sup> See, e.g., Laclede Pipeline Co., 114 FERC ¶ 61,335 (2006), reh'g denied, 119 FERC ¶ 61,236 (2007); and *TransCanada Keystone Pipeline LP*, 125 FERC ¶ 61,025 (2008).

group of shippers cross subsidizes any other shipper. Finally, when Marketlink files to implement its initial rates, if the initial uncommitted rate is protested, the Commission will require Marketlink to comply with section 342.2(b)<sup>5</sup> of the regulations and support its uncommitted rate by filing cost, revenue, and throughput data supporting such rate in accordance with Part 346 of the Commission's regulations.<sup>6</sup>

16. The Commission confirms Marketlink's proposed prorationing policy will be approved and utilized when the project goes into service and Marketlink files its tariff(s). The prorationing policy allocates up to 90 percent of the capacity to Historical Shippers and 10 percent to new shippers, and is consistent with Commission precedent.<sup>7</sup> Additionally, giving committed shippers' Historical Shipper status upon the in-service date of the project is also consistent with Commission precedent as is using an 18 month qualification period for allocation. Finally, the Commission finds it to be reasonable to reset shippers' history at the time that Marketlink's total available capacity declines from 400,000 bpd to 150,000 bpd.

### The Commission orders:

The Petition is granted, as discussed in the body of this order.

By the Commission.

(SEAL)

Kimberly D. Bose, Secretary.

<sup>5</sup> 18 C.F.R. § 342.2(b) (2013).

<sup>6</sup> 18 C.F.R. § 346.2 (2013).

<sup>7</sup> See, e.g., ConocoPhillips Transp. Alaska, Inc., 112 FERC ¶ 61,213 (2005); and Platte Pipe Line Co., 117 FERC ¶ 61,296, at P 56 (2006).

## **ABOUT SEAWAY**

Seaway Crude Pipeline Company LLC (Seaway) is a 50/50 joint venture between Enterprise Products Partners L.P., the operator, and Enbr dge Inc., wh ch purchased its ownership interest from ConocoPhillips on November 16, 2011. The Seaway system includes a 500-mile, 30-inch diameter pipeline between Cushing, Oklahoma and the Freeport, Texas area, and a terminal and distribution crude oil network originating in Texas City, Texas that serves all of the refineries in the Greater Houston area.

On May 17, 2012 Enterprise and Enbr dge completed a project to reverse the flow direction of the Seaway Pipeline, allowing it to transport crude oil from the Cushing, Oklahoma hub to the vast refinery complex along the Gulf Coast near Houston. The first volumes arrived at the Jones Creek terminal, just north of Freeport, on June 6, 2012. In reversed service the line had an initial capac ty of 150,000 barrels per day (BPD). Following pump station additions and modificat ons, wh ch were completed in January 2013, the capacity of the reversed Seaway Pipeline increased to approximately 400,000 BPD of crude oil.



Download a PDF version of the map.

During a binding open comm tment period held January 4, 2012 to February 10, 2012, shippers

executed long-term, crude oil transportation agreements that provided the support necessary to move forward with construct on of a loop (twin) of the Seaway Pipeline. The new pipeline, which is designed to parallel the existing right-of-way from Cushing to the Gulf Coast, more than doubled Seaway's capacity to 850,000 BPD following complet on in July, 2014.

The Seaway reversal and expansion projects, have given shippers access to Enterprise's ECHO crude oil storage facility in southeast Houston and the Port Arthur/Beaumont refining complex.

Prov ding southbound capacity to the Gulf Coast from the Cushing hub facilitates the development of crude oil from growing North American basins, reduces the need for imported supplies and promotes domestic energy security. Expansion of the Seaway system and its ongoing operat on has generated more than 3,000 jobs. Other benefits include increased use of local goods and services and add tional tax revenue for the states and communities in which the infrastructure is located.

 $\circledast$  2012 Seaway Crude Pipeline Company, L.L.C. All rights reserved.

Enterprise Products Partners, L.P. Enbridge Inc.



(http://twitter.com/RustyBraziel) (http://www.facebook.com/pages/RBN-Energy-LLC/279891862070250) (http://www.linkedin.com/company/2456872)

## **Energy Transfer Crude Oil Pipeline Project (Trunkline)**

<b>Operator:</b> Energy Transfer Partners	In Service Date: Q2/2017
<b>Commodity:</b> Crude Oil	Diameter: 30 inches
<b>Stage:</b> Under Construction	Length: 744 miles
<b>Project Type:</b> Combination	Est Capital Cost: \$ 1,000 Million
Expansion Capacity: 450 Mb/d Total Capacity: 450 Mb/d	Origin: Patoka, IL United States PADD 2 Destination: Nederland, TX United States PADD 3

### http://www.energytransfer.com/documents/ETCOP\_FactSheet10.pdf(http: //www.energytransfer.com/documents/ETCOP\_FactSheet10.pdf)



1 of 2

Expandable to 570 Mb/d, P66 25% JVP Will be the southern transport leg of the Dakota Access Pipeline (DAPL). Start up date pushed back to 2Q 2017 to accommodate DAPL delay.

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## **ATTACHMENT LS-25**

## Workbook Contents

## Weekly Cushing, OK Ending Stocks excluding SPR of Crude Oil (Thousand Barr

Click worksheet name or tab at bottom for data

Worksheet Name	Description
Data 1	Weekly Cushing, OK Ending Stocks excluding SPR of Crude Oil (Thou
Release Date:	4/26/2017
Next Release Date:	5/3/2017
Excel File Name:	w_epc0_sax_ycuok_mbblw.xls
Available from Web Page:	http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPC(
Source:	Energy Information Administration
For Help, Contact:	infoctr@eia.doe.gov
	(202) 586-8800

els)

# Of Series	Frequency	Latest Data for
1	Weekly	4/21/2017

) SAX YCUOK MBBL&f=W

Back to Contents	Data 1: Weekly	Cushing, OK Ending Stocks excluding SPR of Crude
	W_EPC0_SAX_YC	
Sourcekey	UOK_MBBL	
	Weekly Cushing,	
	OK Ending	
	Stocks excluding	
	SPR of Crude Oil	
Date	(Thousand	
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Apr-04	12512	
Apr-04	12905	
Apr-04	12731	
May-04	13631	
May-04	14358	
May-04	15378	
May-04	15971	
Jun-04	16521	
Jun-04	15494	
Jun-04	13709	
Jun-04	11810	
Jul-04	15297	
Jul-04	16361	
Jul-04	15949	
Jul-04	16577	
Jul-04	15236	
Aug-04	14767	
Aug-04	14215	
Aug-04	14512	
Aug-04	14395	
Sep-04	15896	
Sep-04	14266	
Sep-04	13968	
Sep-04	14094	
Oct-04	13981	
Oct-04	14148	
Oct-04	14561	
Oct-04	151/6	
Oct-04	14626	
Nov-04	16281	
Nov-04	13013	
Nov-04	16038	
Nov-04	16079	
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Dec-04	16356	
Dec-04	16596	
Dec-04	16644	
Dec-04	16698	
Jan-05	15925	
Jan-05	16548	
Jan-05	16912	
Jan-05	1/480	
Feb-05	17460	

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Feb-05	17811
Feb-05	18186
Mar-05	19042
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Mar-05	20234
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Apr-05	22780
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May-05	21952
May-05	22047
May-05	20540
May-05	20010
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Jun-05	201/1
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	19290
	10000
	10040
	10000
Jui-05	10700
Jui-05	19334
Aug-05	18024
Aug-05	18/61
Aug-05	17836
Aug-05	17984
Sep-05	16640
Sep-05	16087
Sep-05	16064
Sep-05	17222
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Oct-05	14700
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Dec-05	17734
Dec-05	21355
Dec-05	21242
Dec-05	22116
Dec-05	21894
Jan-06	21635
Jan-06	21759
Jan-06	21386
Jan-06	21118
Feb-06	21087

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Feb-06	22244
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Mar-06	24022
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Mar-06	25300
Mar 06	20000
Apr 06	24943
Apr-00	24472
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Apr-06	24999
May-06	25121
May-06	24429
May-06	23157
May-06	22569
Jun-06	23236
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Jun-06	23642
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Sep-06	22564
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Oct 06	22740
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Nov 06	23220
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Apr-13	50070
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May 13	50508
May 12	50000
lup 12	40265
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Jun-13	49200
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JUI-13	46083
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Jan-15	36783
Jan-15	38868

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Feb-15	48680
Feb-15	49216
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Mar-15	54403
Mar-15	56314
Mar-15	58943
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Apr-15	61462
Apr-15	62200
Apr-15	61686
May-15	61674
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May-15	60010
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Jun-15	58115
Jun-15	56245
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Jul-15	56667
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Jul-15	57918
Jul-15	57706
Jul_15	57164
Aug 15	57113
Aug 15	57/30
Aug 15	57605
Aug-15	57095
Aug-15	57307
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Dec-15	60056
Dec-15	62101
Dec-15	62993
Jan-16	63910
Jan-16	64007
Jan-16	64198
Jan-16	63427

Jan-16 64174	
Feb-16 64697	
Feb-16 64733	
Feb-16 65066	
Feb-16 66256	
Mar-16 66946	
Mar-16 67491	
Mar-16 66233	
Mar-16 65961	
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Apr-16 64551	
Apr-16 64303	
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Apr-16 66292	
May-16 67812	
Mav-16 68273	
May-16 67624	
May-16 66920	
Jun-16 65557	
Jun-16 66461	
Jun-16 65181	
Jun-16 64230	
Jul-16 64148	
Jul-16 63916	
Jul-16 64105	
Jul-16 65215	
Jul-16 64092	
Aug-16 65255	
Aug-16 64531	
Aug-16 64906	
Aug-16 63867	
Sep-16 63433	Crude Oil Stocks - Cushing Oklaho
Sep-16 62188	
Sep-16 62714	v 80
Sep-16 62083	April 07, 20
Sep-16 62652	E 70
Oct-16 61334	
Oct-16 59699	
Oct-16 58362	50
Oct-16 58451	
Nov-16 58479	40
Nov-16 59170	
Nov-16 59083	30
Nov-16 61502	
Dec-16 65285	20
Dec-16 66508	
Dec-16 66263	10
Dec-16 66435	0
Dec-16 67509	
Jan-17 66930	bet structure of structure of structure of the structure
Jan-17 65656	t to to to to to to to to to
Jan-17 65372	

64127
65270
64568
63040
63535
64402
66532
67951
67731
69144
69420
68642
67439

Oil (Thousand Barrels)



## Workbook Contents

## Weekly Gulf Coast (PADD 3) Ending Stocks excluding SPR of Crude Oil (Thousa

Click worksheet name or tab at bottom for data

Worksheet Name	Description
Data 1	Weekly Gulf Coast (PADD 3) Ending Stocks excluding SPR of Crude O
Release Date: Next Release Date: Excel File Name: Available from Web Page: Source: For Help, Contact:	4/26/2017 5/3/2017 wcestp31w.xls http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCESTF Energy Information Administration infoctr@eia.doe.gov
	(202) 586-8800

nd Barrels)

# Of Series	Frequency	Latest Data for
1	Weekly	4/21/2017

<u> 231&f=W</u>

## Back to Contents Sourcekey

## Data 1: Weekly Gulf Coast (PADD 3) Ending Stocks excluding SPR of Crude Oil (Thousand Barrels)

ourcekey	WCESTPST Weekiv Guit Coast (PADD
	3) Ending Stocks
	excluding SPR of Crude
Data	Oil (Thousand Barrols)
Jan 00	
Jan 90	140494
Jan 90	151730
Jan-90	152360
Jan-90	152103
Feb-90	157359
Feb-90	157055
Feb-90	155995
Feb-90	150501
Mar-90	150319
Mar-90	153 191
Mar-90	151179
Mar-90	156099
Mar-90	161278
Apr-90	166329
Apr-90	163904
Apr-90	162273
Apr-90	162755
May-90	162004
May-90	163853
May-90	165400
May-90	168053
Jun-90	168882
Jun-90	171421
Jun-90	169997
Jun-90	171922
Jun-90	168440
Jul-90	169203
Jul-90	169065
Jul-90	169020
Jul-90	171921
Aug-90	165830
Aug-90	161947
Aug-90	165396
Aug-90	169943
Aug-90	167799
Sep-90	172021
Sep-90	170341
Sep-90	167620
Sep-90	166109
Oct-90	162889
Oct-90	158383
Oct-90	154583
Oct-90	152086
Nov-90	153628
Nov-90	152569
Nov-90	150239
Nov-90	153547
Nov-90	151102
Dec-90	147881
Dec-90	149281
Dec-90	146449
Dec-90	142026
Jan-91	136644
.lan-91	138550
.lan-91	139772
.lan-91	140751
Fah_01	136573
Fah_01	1/2027
Fah_01	142007
Fob 01	144000
Len-al	142000

Mar-91	143991
Mar-91	144097
Mar-91	146921
Mar-01	1/5236
Mar 01	143200
Mar-91	147254
Apr-91	147289
Apr-91	149350
Apr-91	147006
Δpr-91	148676
May 01	140070
Iviay-91	143120
May-91	145306
May-91	150366
May-91	149612
May-91	152471
Jun-91	157037
lun-91	156845
	150045
Jun-91	159641
Jun-91	159285
Jul-91	158987
Jul-91	159369
Jul-91	155756
Jul-91	150343
Aug_01	152360
Aug-91	152500
Aug-91	154468
Aug-91	155162
Aug-91	156969
Aug-91	157683
Sep-91	154029
Sen-91	151011
Sop 01	150435
Sep-91	150455
Sep-91	153249
Oct-91	152544
Oct-91	152763
Oct-91	156732
Oct-91	157754
Nov-91	156048
Nov 01	156007
Nov-91	150037
NOV-91	158059
Nov-91	153836
Nov-91	153032
Dec-91	153927
Dec-91	151541
Dec-91	140888
Dec 01	14000
Dec-91	144900
Jan-92	140752
Jan-92	145680
Jan-92	145164
Jan-92	148251
Jan-92	148307
Feb-92	147037
Fob 02	146600
Feb-92	140000
Feb-92	149929
Feb-92	150310
Mar-92	155241
Mar-92	149361
Mar-92	150619
Mar-92	145857
Δnr-92	1/6700
Apr 02	140703
Apr-92	150854
Apr-92	1513/1
Apr-92	152713
May-92	154666
May-92	155562
May-92	156017
May-92	155751
May 02	150101
ividy-92	104020

h	454000
Jun-92	154602
Jun-92	154913
Jun-92	150100
lup_02	1/5/01
	140000
Jul-92	142022
Jul-92	146637
Jul-92	144523
	1//538
Jul-92	144000
Jul-92	147349
Aug-92	147495
Aug-92	150814
Aug-92	152083
Aug-92	132303
Aug-92	146612
Sep-92	149655
Sep-92	147871
Sep-92	151075
0ep-92	101010
Sep-92	149139
Oct-92	145743
Oct-92	148381
Oct 02	1/0222
001-92	149232
Oct-92	147946
Oct-92	149451
Nov-92	141708
Nov 02	138/01
N00-92	130491
Nov-92	143525
Nov-92	145056
Dec-92	144884
Dec-92	1/0820
Dec-52	140020
Dec-92	148216
Dec-92	137920
Jan-93	137897
lan-93	130743
	100740
Jan-93	145772
Jan-93	144736
Jan-93	146376
Feb-93	148272
Teb 02	150070
Feb-95	150276
Feb-93	145926
Feb-93	142832
Mar-93	146305
Mar 02	1/2050
Ivial-95	146950
Mar-93	143064
Mar-93	146375
Apr-93	150191
Apr 03	150204
Api-93	159204
Apr-93	152866
Apr-93	154342
Apr-93	156084
May-93	150322
May-00	100022
May-93	100100
May-93	158703
Mav-93	160055
lun-93	156459
lun 02	100400
Jun-93	154585
Jun-93	157859
Jun-93	160948
1.1.93	158018
	100010
Jul-93	159558
Jul-93	163473
Jul-93	161024
.lul-93	160357
	460040
Aug-93	158910
Aug-93	160642
Aug-93	155399
Aug-93	155013
Aug-30	100010
сер-93	154132

Sep-93	155214
Sep-93	153191
Sen-93	148978
Oct 02	140000
001-93	140909
Oct-93	149708
Oct-93	151999
Oct-93	153458
Oct-93	151193
Nov 03	1/0/02
NUV-93	149492
NOV-93	154670
Nov-93	149181
Nov-93	152331
Dec-93	154457
Dec-93	156713
Dec 02	150242
Dec-93	150242
Dec-93	155039
Dec-93	150833
Jan-94	146816
Jan-94	142680
lan_04	136010
Jan 04	124004
Jan-94	134004
Feb-94	142984
Feb-94	136540
Feb-94	140500
Feb-94	138199
Mar-Q/	130003
Mar 04	109900
Mar-94	139876
Mar-94	145801
Mar-94	145728
Apr-94	147029
Anr-94	150085
Apr 04	140902
Apr-94	149003
Apr-94	152324
Apr-94	148069
May-94	150588
May-94	151239
May-04	151173
May 04	101173
May-94	148747
Jun-94	148261
Jun-94	141886
Jun-94	146643
lun-94	147686
	152102
Jul-94	100120
Jul-94	152167
Jul-94	153363
Jul-94	155331
Jul-94	154476
Aug-94	149426
Aug-04	150247
Aug-94	150347
Aug-94	149558
Aug-94	150292
Sep-94	147850
Sen-94	150604
Sop 04	151560
Sep-94	151509
Sep-94	153160
Sep-94	154221
Oct-94	157640
Oct-94	157392
Oct-94	155022
Oct 04	100900
001-94	162574
Nov-94	158240
Nov-94	153105
Nov-94	151894
Nov-94	154847
	104047
Dec-94	103000
Dec-94	151503

Dec-94	152394
Dec-94	150271
	1/5010
Dec-94	140010
Jan-95	143030
Jan-95	138966
Jan-95	133659
Jan-95	134377
Ech 05	137/96
Teb-95	107400
Feb-95	130033
Feb-95	132634
Feb-95	135385
Mar-95	136582
Mar-95	140077
Mar-95	138175
Mar-95	137558
Mar 05	142605
10121-95	143005
Apr-95	141623
Apr-95	144304
Apr-95	145445
Apr-95	140259
May-95	140761
May-95	13707/
May OF	101014
May-95	130430
May-95	137422
Jun-95	137141
Jun-95	136748
Jun-95	137029
lun-95	134462
lun-95	130831
	1393031
Jul-95	130709
Jul-95	140848
Jul-95	136231
Jul-95	139234
Aug-95	132906
Aug-95	137906
Aug-95	134463
	124106
Aug-95	134100
Sep-95	141677
Sep-95	141063
Sep-95	141166
Sep-95	138906
Sep-95	134987
Oct-95	129621
Oct 95	121000
001-95	101099
Oct-95	129551
Oct-95	127317
Nov-95	125036
Nov-95	128697
Nov-95	135654
Nov-95	135302
Dec-95	134530
	104000
Dec-95	131740
Dec-95	132789
Dec-95	129352
Dec-95	124933
Jan-96	124864
Jan-96	128116
Jan-96	133561
lan 06	100116
Jai1-30	129110
Len-20	131/01
Feb-96	129642
Feb-96	130006
Feb-96	129113
Mar-96	123923
Mar-96	128911
Mar-96	126480
indi oo	120403

Mar-96	122847
Mar-96	120781
Apr 06	125102
Apr-90	120192
Apr-96	126386
Apr-96	124677
Apr-96	126370
May 00	120070
Ivlay-96	128195
May-96	128620
May-96	127483
May-96	130284
May 06	125690
Ivlay-96	135089
Jun-96	133373
Jun-96	132145
lun-96	133073
	126104
Jun-96	130104
Jul-96	140087
Jul-96	134200
Jul-96	131637
	125011
Jul-96	135011
Aug-96	135070
Aug-96	131941
Aug-96	132833
	120651
Aug-96	100001
Aug-96	134706
Sep-96	129600
Sen-96	131238
Cop 00	101200
Sep-96	131290
Sep-96	131765
Oct-96	129126
Oct-96	127745
Oct-00	121140
Uci-96	130998
Oct-96	131430
Nov-96	138098
Nov-96	140817
Nev 06	140074
N0V-90	140074
Nov-96	133856
Nov-96	134023
Dec-96	135583
Dec 00	101517
Dec-96	131517
Dec-96	129308
Dec-96	128692
lan-97	121582
lan 07	125004
Jan-97	125204
Jan-97	123399
Jan-97	126660
lan_97	127024
	127024
Feb-97	132473
Feb-97	140078
Feb-97	137484
Feb-97	132834
Nor 07	102004
Mar-97	135302
Mar-97	139057
Mar-97	138535
Mar-97	141457
Amr 07	400770
Apr-97	139770
Apr-97	141342
Apr-97	140412
Apr-97	1/1025
May 07	400000
iviay-97	130889
May-97	140914
May-97	139076
May-97	139664
May 07	44000
iviay-97	140905
Jun-97	143163
Jun-97	142831
lun_07	1/1000
Juil-97	141200

1 07	100070
Jun-97	139870
Jul-97	144000
Jul-97	144791
Jul-97	142107
	125000
Jui-97	135060
Aug-97	134992
Aug-97	143275
Aug-97	143266
	120662
Aug-97	139002
Aug-97	139063
Sep-97	135702
Sep-97	138549
Sen_97	135//0
0 ep - 97	100440
Sep-97	133430
Oct-97	136608
Oct-97	135480
Oct-97	131327
Oct 07	122206
001-97	10000
Oct-97	136451
Nov-97	135856
Nov-97	138380
Nov-97	142387
New 07	142507
NOV-97	142507
Dec-97	139824
Dec-97	140131
Dec-97	139206
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Dec-97	133040
Jan-98	131884
Jan-98	130046
Jan-98	135934
lan_08	130644
	100044
Jan-98	141462
Feb-98	142653
Feb-98	146007
Feb-98	149744
Eeb-08	1/6605
1 60-90	140035
Mar-98	145206
Mar-98	141846
Mar-98	146116
Mar-98	148957
Apr 09	140704
Api-96	149704
Apr-98	152540
Apr-98	159399
Apr-98	157561
May-08	150880
May-90	159009
May-98	158108
May-98	163828
May-98	162810
May-98	160445
lup 08	150621
Juli-90	159021
Jun-98	159074
Jun-98	156000
Jun-98	158867
101-98	157023
	157320
Jul-98	100110
Jul-98	161730
Jul-98	164430
Jul-98	165823
	16657/
Aug-90	1000/4
Aug-98	164411
Aug-98	162921
Aug-98	162929
Sen-98	156386
Cop-30	100000
Зер-98	153140
Sep-98	146893
Sep-98	153344

Oct-98	157633
Oct-98	159534
Oct-98	164166
Oct-00	162627
001-96	103027
Oct-98	165281
Nov-98	165787
Nov-98	165395
Nov-98	168753
Nov 08	164254
NUV-90	104204
Dec-98	162398
Dec-98	165629
Dec-98	165371
Dec-98	165357
Jan-99	155501
lan_00	1575/1
	162200
Jan-99	103309
Jan-99	160665
Jan-99	159677
Feb-99	159156
Feb-99	157948
Feb-99	159563
Feb-00	161338
Mar 00	162225
Mai-99	103333
Mar-99	162144
Mar-99	164355
Mar-99	163315
Apr-99	160125
Apr-99	164302
Apr 00	165501
Api-99	100091
Apr-99	163019
Apr-99	162026
May-99	158806
May-99	157127
Mav-99	156718
May-99	157889
lun-00	153770
Jun 00	155775
Juli-99	156209
Jun-99	156554
Jun-99	154260
Jul-99	153747
Jul-99	153885
lul-99	155906
	155012
Jul-99	155915
Jui-99	154202
Aug-99	155453
Aug-99	152742
Aug-99	150185
Aug-99	152301
Sen-99	148718
Sop 00	147004
Sep-99	147004
Sep-99	150294
Sep-99	145960
Oct-99	146253
Oct-99	138291
Oct-99	143745
Oct-99	1/1811
Oct-99	129600
001-99	138009
NOV-99	141846
Nov-99	141948
Nov-99	137757
Nov-99	136872
Dec-99	136603
Dec-00	122570
	1000/0
Dec-99	131/18
Dec-99	131244
Dec-99	130414

Jan-00	138078
lan 00	136909
Jan-00	150000
Jan-00	136032
lan-00	128437
	120-107
Feb-00	129427
Feb-00	131969
Tab 00	101510
Feb-00	131310
Feb-00	128619
Mar-00	131687
	101007
Mar-00	131118
Mar-00	130998
Mar 00	120060
Mai-00	130000
Mar-00	133687
Apr-00	132825
A	102020
Apr-00	136301
Apr-00	142649
Apr-00	139297
	100207
May-00	144016
May-00	146816
May-00	1/3505
May-00	140000
May-00	140161
Jun-00	138328
lup 00	136451
Juli-00	130431
Jun-00	132710
Jun-00	134018
lup 00	122600
Juli-00	133000
Jul-00	139156
.lul-00	136132
	100102
Jui-00	136359
Jul-00	130916
Aug-00	127588
/ tug 00	121000
Aug-00	131130
Aug-00	129901
00-00	133879
Aug-00	100010
Sep-00	134703
Sep-00	137678
Sen-00	1325/11
	102041
Sep-00	133636
Sep-00	131208
Oct-00	132/09
000	132409
Oct-00	128092
Oct-00	129920
Oct 00	122200
001-00	132309
Nov-00	134198
Nov-00	130292
New 00	100202
NOV-UU	132251
Nov-00	133246
Dec-00	134373
Dec 00	104010
Dec-00	130116
Dec-00	131577
Dec-00	132367
Dec-00	102007
Dec-00	132186
Jan-01	130326
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5an-01	150100
Jan-01	130978
Jan-01	127303
Feb-01	120/52
	129402
Feb-01	130387
Feb-01	120977
Eeb_01	122059
	120000
iviar-01	119723
Mar-01	128947
Mar-01	12/502
	104020
Mar-01	141377
Mar-01	140297
Apr-01	1/0701
	142191

Apr-01	148679
Apr-01	145593
Apr-01	148880
Api-01	140000
May-01	149264
May-01	152376
May-01	154477
May-01	151474
lun-01	152071
	142069
Jun-01	143900
Jun-01	144878
Jun-01	145653
Jun-01	142236
Jul-01	141148
Jul-01	150841
lul-01	151096
	149200
	140290
Aug-01	146486
Aug-01	143489
Aug-01	143501
Aug-01	144923
Aug-01	146455
Sep-01	145658
Sep 01	145050
Sep-01	140401
Sep-01	148999
Sep-01	148189
Oct-01	148279
Oct-01	147504
Oct-01	146093
Oct 01	1/9375
New 01	140373
NOV-U I	153720
Nov-01	149953
Nov-01	148460
Nov-01	143015
Nov-01	148349
Dec-01	144829
Dec 01	1/5313
	140010
Dec-01	148118
Dec-01	146651
Jan-02	145499
Jan-02	147254
Jan-02	149789
.lan-02	149288
Ech 02	150774
	150774
Feb-02	153427
Feb-02	151242
Feb-02	149942
Mar-02	150236
Mar-02	148073
Mar-02	150039
Mar 02	145620
Mar 00	140029
Mar-02	151974
Apr-02	151018
Apr-02	147285
Apr-02	152137
Apr-02	156189
May_02	156525
May 02	150525
iviay-UZ	15/144
May-02	15/319
May-02	156660
May-02	160024
Jun-02	159657
Jun-02	159226
lun-02	158100
lun 02	150103
	15/480
Jul-02	154865
Jul-02	152627

Jul-02	149140
.lul-02	148281
Aug 02	140201
Aug-02	146767
Aug-02	142732
Aug-02	144455
	1/5/00
Aug-02	140400
Aug-02	144728
Sep-02	142763
Sep-02	141702
Sep-02	141861
Sep-02	191001
Sep-02	134602
Oct-02	126601
Oct-02	138067
Oct-02	141018
Oct-02	141010
Uci-02	142898
Nov-02	146011
Nov-02	141707
Nov-02	144048
Nov-02	140005
Nov-U2	142965
Nov-02	146390
Dec-02	147455
Dec-02	143384
Dec-02	140055
Dec-02	140355
Dec-02	131702
Jan-03	133541
lan_03	12850/
Jan-05	120394
Jan-03	130844
Jan-03	130831
.lan-03	129327
Ech 02	12/626
Feb-03	124030
Feb-03	133130
Feb-03	130140
Feb-03	131836
Mor 02	101000
Mai-03	125060
Mar-03	127399
Mar-03	131509
Mar-03	136385
Apr 02	124404
Apr-03	134404
Apr-03	130936
Apr-03	134873
Apr-03	136304
May 02	126111
iviay-03	130111
May-03	134313
May-03	132853
May-03	132256
May 02	102200
May-03	134340
Jun-03	131882
Jun-03	133322
.lun-03	130526
lup 02	120050
Jun-03	132232
Jul-03	134247
Jul-03	132664
lul-03	130284
	100204
Jui-03	131524
Aug-03	131168
Aug-03	130563
Aug-03	130078
Aug 00	400070
Aug-03	132373
Aug-03	130406
Sep-03	129088
Sen-03	121/06
00p-00	101480
Sep-U3	130975
Sep-03	127719
Oct-03	131246
Oct 03	1001//
	153144
Oct-03	133816

O =t 02	100540
001-03	139543
Oct-03	137304
Nov-03	139653
Nov 03	130266
100-03	139200
Nov-03	137390
Nov-03	133328
Dec-03	130828
Dec-00	100020
Dec-03	128738
Dec-03	127160
Dec-03	125438
	120100
Jan-04	122211
Jan-04	118395
Jan-04	118913
lan_04	120067
Jan-04	120007
Jan-04	124019
Feb-04	123217
Feb-04	124102
Fab 04	105412
Feb-04	125415
Feb-04	127110
Mar-04	130640
Mar 04	121211
Mar 04	101011
Mar-04	139486
Mar-04	141363
Apr-04	139975
Apr 04	140504
Api-04	140304
Apr-04	137115
Apr-04	142515
$\Delta pr_{-}04$	141850
Api-04	140454
May-04	140454
May-04	142678
May-04	141674
May 04	1/1955
Nay-04	141000
Jun-04	139611
Jun-04	141669
Jun-04	143214
lup 04	1// 917
Juli-04	144017
Jul-04	147476
Jul-04	146326
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Aug-04	140300
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Aug-04	135866
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Sep-04	124876
Sep-04	128371
Oct-04	131869
Oct 04	133600
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Oct-04	133920
Oct-04	134655
Oct-04	138741
Nev 04	140262
N0V-04	140303
Nov-04	142112
Nov-04	139769
Nov-04	140087
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Dec-04	142025
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Dec-04	142143
Dec-04	130876
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Dec-04	13/004
Jan-05	133866
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lan-05	1/0260
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1em 05	444740
Jan-05	141748
Feb-05	144179
Feb-05	143471
Teb 05	141400
Feb-05	141429
Feb-05	142267
Mar-05	144599
Mar 05	1/5550
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Mar-05	146764
Mar-05	151510
Apr-05	152609
Apr 00	455774
Apr-05	155774
Apr-05	157136
Apr-05	159931
Apr 05	150654
Api-05	139034
May-05	161877
May-05	164573
May-05	162006
May 00	102000
May-05	164901
Jun-05	162310
Jun-05	161653
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Jul-05	161062
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Aug-05	160454
Aug-05	161696
Aug-05	162344
Sop 05	161124
Sep-05	101134
Sep-05	153136
Sep-05	152835
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Sep 05	151100
Sep-05	151102
Oct-05	152654
Oct-05	157130
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Nev 05	450440
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Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Dec-05	159419 156644 158934 159087 158372 161008 160240
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Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526
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Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06 Mar-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077 173041
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06 Mar-06 Mar-06 Apr-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077 173041 174479
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06 Mar-06 Apr-06 Apr-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077 173041 174479 172953
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06 Mar-06 Mar-06 Apr-06 Apr-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077 173041 174479 172953 172920
Nov-05 Dec-05 Dec-05 Dec-05 Dec-05 Jan-06 Jan-06 Jan-06 Jan-06 Feb-06 Feb-06 Feb-06 Feb-06 Feb-06 Mar-06 Mar-06 Mar-06 Mar-06 Apr-06 Apr-06 Apr-06	159419 156644 158934 159087 158372 161008 160240 156804 160123 158979 159296 162583 164319 165092 164608 166644 170174 169526 173077 173041 174479 172953 173389

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Jun-06	173340
Jun-06	174902
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Juli-00	172175
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Jun-06	166930
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Jui-06	104200
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Mar-08	150989
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Jui-08	130081
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Aug-08	145539
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Mar-09	172770
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Oct-10	173838
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Dec-10	157123
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Jan-11	144003
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Mar-11	155880
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May-11	164677
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Jun-11	166352
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Aug-11	157842
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Sep-11	146475
Oct-11	147053
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Oct-11	150494
Oct-11	149660
Nov-11	147087
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Dec-11	138933
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Dec-11	136273
Dec-11	137190
Jan-12	142791
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Jan-12	141527
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Feb-12	142602
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May-12	170702
May-12	169627
May-12	170531
Jun-12	170373
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Juli-12	170248
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Nov-12 Nov-12	162254
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Feb-13	154285
Feb-13	155370
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Mar-13	167027
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May-13	172740
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Dec-13	156261
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Jan 14	143707
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Apr-14	185977
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Mar 15	206665
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Apr-15	215038
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Apr 15	227201
Api-15	222519
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Mav-15	220615
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Jul 15	206687
Jui-15	200087
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Aug-15	204390
Sep-15	207088
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Sep-15	209393
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Oct-15	221878
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NUV-15	231379
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Nov-15	227813
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Dec-15	222017
Dec-15	223130
Dec-13	223139
Jan-16	218752
Jan-16	215883
Jan-16	221089
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Jan-16	228042
Jan-16	232260
Feb-16	231002
Feb-16	230619
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Feb-16	243748
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Mar-16	250489
Mar-16	259453
Mar-16	261334
Apr 16	256071
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Apr-16	263963
Apr-16	263904
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Apr 16	200012
Api-io	202087
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Mav-16	261661
May-16	251001
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Jun-16	253633
Jun-16	253609



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$\Delta nr_17$	
Api-17	



## **ATTACHMENT LS-26**

US State	Alabama	Alaska	Arkansas	California	Colorado	Kansas	Louisiana	Mississippi	Montana	New Mexic	North Dakc	Gulf of Me
2016	22.64384	490.873	14.71906	524.1478	329.8067	101.3178	158.6685	58.11297	70.72231	456.9738	1037.792	1719.336
2017	20.86438	453.4026	13.72487	494.6391	378.8382	93.16655	145.7381	54.96389	63.82341	498.42	1065.684	1807.989
2018	18.46408	430.185	12.77368	464.5642	481.5053	86.09577	137.1406	53.27673	62.39124	601.0037	1210.647	1825.517
2019	16.68897	417.7295	11.89413	442.2007	554.5325	81.4368	131.736	54.14992	69.58139	736.6503	1358.216	1816.313
2020	15.37966	410.1534	11.07199	424.8174	624.9176	78.94035	127.183	56.36109	79.40958	891.5584	1506.666	1734.497
2021	14.18517	403.1061	10.31084	411.1406	677.171	78.51688	123.8262	59.57582	89.92793	1056.69	1645.39	1667.564
2022	13.09179	398.9707	9.591084	401.5385	762.348	77.47215	117.9131	61.5268	93.71941	1237.509	1743.236	1636.525
2023	12.08848	384.7312	8.91908	379.9086	790.2601	73.01449	108.6144	58.9842	87.20172	1367.191	1762.136	1734.76
2024	11.16756	388.8374	8.294399	361.6519	812.6561	70.24339	103.7047	57.76072	86.1287	1490.933	1771.454	1853.4
2025	10.32047	409.215	7.709906	346.2639	801.0412	67.64344	100.6763	56.83167	85.80035	1580.031	1758.143	1932.403
2026	9.542521	432.7108	7.165091	333.6627	778.9058	65.28725	98.34077	56.17415	85.68392	1649.406	1711.802	2206.558
2027	8.823288	436.1677	6.655613	323.5603	746.3721	63.07012	96.35526	54.32415	84.14296	1658.265	1649.309	2338.374
2028	8.165575	435.5696	6.17911	315.1954	713.2516	60.88088	93.81007	50.20935	80.63829	1647.707	1568.254	2349.244
2029	7.560616	426.7128	5.731855	307.798	678.6338	61.46967	90.96085	47.44668	77.40963	1629.869	1501.54	2246.783
2030	7.003554	416.5827	5.31431	301.5989	647.7628	63.45544	88.21812	45.08826	75.8482	1605.863	1440.389	2110.201





Ohio	Oklahoma	Pennsylvan	South Dakc	Texas	Utah	West Virgir	Wyoming
67.62428	421.6056	20.00644	3.926027	3232.672	83.15068	22.06027	203.761
53.02855	455.5024	22.99814	3.948474	3494.03	100.3793	20.48953	188.035
70.40656	496.1118	31.92978	3.750206	4022.824	107.8823	21.37001	189.7171
86.7067	549.7712	35.33094	3.553962	4697.884	115.8514	21.97101	219.8891
93.88692	614.8749	39.40536	3.362022	5369.388	123.1368	23.38084	259.7867
109.9462	672.3521	46.8026	3.139063	6028.841	127.8531	26.06614	304.1079
129.5248	683.0243	51.39116	2.936855	6515.301	132.7328	29.30958	343.0271
142.6799	661.9947	54.69865	2.748118	6541.834	135.5398	31.684	342.188
153.212	653.3668	58.01757	2.573449	6604.355	139.4247	33.68097	352.7054
164.9428	642.1306	61.18661	2.402471	6610.077	143.8036	35.31982	365.2356
181.4317	630.5208	64.62368	2.242893	6540.471	149.9191	36.91389	382.5412
191.25	617.923	67.91039	2.090975	6419.271	155.2382	38.32739	398.3555
200.8123	607.8342	71.19131	1.948271	6273.121	148.211	38.9175	411.7652
217.2057	595.7067	73.30211	1.807482	6089.531	136.6806	38.78096	425.9045
243.0163	578.6244	74.85866	1.675964	5911.144	127.8998	38.29282	445.0537

## **ATTACHMENT LS-27**

## Back to Contents Data 1: Motor Gas Data 3: Other Products

 Sourcekey
 C100020311
 C400020311
 C500020311
 C900020311

	Nebraska Total	Nebraska Aviation	Nebraska Kerosene-	
	Gasoline All	Gasoline All	Type Jet Fuel All	Nebraska Propane
	Sales/Deliveries by	Sales/Deliveries by	Sales/Deliveries by	All Sales/Deliveries
	Prime Supplier	Prime Supplier	Prime Supplier	by Prime Supplier
	(Thousand Gallons	(Thousand Gallons	(Thousand Gallons	(Thousand Gallons
Date	per Dav)	per Dav)	per Day)	per Dav)
Jan-1983	1795.9	8.9	50.4	498.6
Feb-1983	1665 1	7	48.6	468 1
Mar-1983	2255 1		55.5	384.2
Apr-1983	1981 7	30.8	51.4	335.2
May-1983	2020.5	13	58.5	159.1
Jun-1983	2263.6	18.6	53 7	137.4
Jul-1983	2085.9	22.5	57.7	423.1
Aug-1983	2187	23.1	61.2	354 1
Sep-1983	2145.5	.31.4	74.4	479.5
Oct-1983	1954 7	10.7	70.2	346.9
Nov-1983	1881.4	88	69.1	305
Dec-1983	2033	8	83.4	712.5
Jan-1984	1804 9	75	69.2	524.7
Feb-1984	1665.7	9.6	59.4	.342
Mar-1984	1924 4	0.0	70.2	321.2
Apr-1984	1991.6	9.6	69	247 1
May-1984	2135.4	14.8	64 6	149.5
.lun-1984	2118.5	16.7	56.9	145
Jul-1984	2291 7	19.5	63.6	438.4
Aug-1984	2201.2	16.6	66.5	526.3
Sep-1984	1948.9	12	57.2	381.8
Oct-1984	2077.6	10.1	58	844.2
Nov-1984	1997.2	11.2	57.2	555.9
Dec-1984	1783.7	8.4	66.9	375.7
Jan-1985	1693.2	7.8	48.4	497
Feb-1985	1862	6.8	56.4	389.3
Mar-1985	1883.9	11.2	52.6	271.1
Apr-1985	1913.4	12.4	50.8	156
May-1985	2064.5	13.2	64.6	92.5
Jun-1985	2128.8	12	56.7	187.3
Jul-1985	2012.5	14.9	58.2	460.1
Aua-1985	1864.8	13.6	58.2	250.8
Sep-1985	1682	9.7	55.4	355.8
Oct-1985	2230	8.6	62.3	784.9
Nov-1985	1955.5	7.7	64	707.9
Dec-1985	1788.8	6.4	70.4	522.8
Jan-1986	1725.3	7.9	59.2	292.9
Feb-1986	1710.1	5.8	57.8	300.7
Mar-1986	2046.5	9.3	53.9	287.8
Apr-1986	2053.2	8.9	47.5	141.2
May-1986	2222	17.9	48.8	143.3
Jun-1986	2149.6	15.9	53.5	189.7
Jul-1986	2047.5	15.5	60.6	303.6
Aug-1986	2178.4	11.2	63.7	273.3
Sep-1986	1698.3	9.2	51.7	270
Oct-1986	2244.5	8.8	51.2	522.4
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Nov-1986	1954.5	7.6	47.9	548.5
Dec-1986	2138.6	7.1	46.1	369.7
Jan-1987	1603.3	6.8	44.7	291
Feb-1987	1665.4	7.2	46.8	237.9
Mar-1987	1852.4	6.4	53	209.4
Apr-1987	2003.5	12.9	42.5	183.2
May-1987	2021.3	9.3	45	75
Jun-1987	2119.2	15.4	51.9	241.6
Jul-1987	2415.5	15.4	56.8	419.1
Aua-1987	2062.5	13.6	61.2	257.5
Sep-1987	2139.9	10.3	66.2	341.7
Oct-1987	2250.1	9.3	58.7	600.6
Nov-1987	1851.6	9.6	56.2	257.3
Dec-1987	2091.3	7.6	60.9	411.6
Jan-1988	1835.2	7.4	61	556.3
Feb-1988	1944.8	6.5	67.5	444.7
Mar-1988	2073	8.9	68	300.7
Apr-1988	2057 5	10.5	59.9	167.4
May-1988	2032.9	10	57	130.8
lun-1988	2490 7	13.2	63 3	419
Jul-1988	2154 5	14.5	73.5	/12.6
Δug-1988	2704.0	13.4	60.0	412.0
Aug-1900	2243.0	9.6	62.4	434.9
Oct 1000	2207	0.0	02.4 52.2	400.7
Nov 1000	2227.9	0.0	00.0	402.0
NUV-1900	2000.5	7.9	03.7	320.7
Dec-1988	2005.5	8.2	00.3	406.4
Jan-1989	1746.4	7.4	64.1	400
Feb-1989	2025.6	6	63.4	521.8
Mar-1989	2168.6	8.2	73.5	324.4
Apr-1989	1997	8.2	64.1	160.3
May-1989	2016	10.3	69.4	139.7
Jun-1989	2435.2	11	58.6	192.6
Jul-1989	1910.7	12.5	71.2	392.1
Aug-1989	2285.1	13	62.6	473.6
Sep-1989	2048.1	9.6	48.6	319.3
Oct-1989	2071.6	8.8	60.3	401.2
Nov-1989	2008.6	10.6	63	290.1
Dec-1989	2096.1	8	79.3	600.7
Jan-1990	1636.3	6	86.3	255.6
Feb-1990	1811.2	6.3	86.6	361.4
Mar-1990	2045.8	9.3	79.5	243.1
Apr-1990	1922.7	9.8	80.9	136.6
May-1990	2082.7	11.2	79	140.5
Jun-1990	2056.9	10.7	77.3	134.3
Jul-1990	2255.5	12.2	75.3	497.4
Aug-1990	2222.3	15	87.4	367.9
Sep-1990	1919.4	8.3	82.2	307.9
Oct-1990	2093.9	8.3	79.5	396.6
Nov-1990	2089.1	7.9	86.1	274
Dec-1990	2070.9	7.5	82.8	441.9
Jan-1991	1650.5	6.7	69	473.6
Feb-1991	1773.1	7.1	71.5	256.3
Mar-1991	1804.7	7.4	68.2	183.5

Apr-1991	2004.3	6.6	66.5	116.5
May-1991	2049.7	9.8	72.7	77.3
Jun-1991	2118.8	14.5	67.5	232.2
Jul-1991	2260.5	18.9	79.2	610.2
Aug-1991	2116.9	12.7	70.6	404
Sep-1991	2111.1	8.9	74.5	370.2
Oct-1991	2137.9	8.5	77.6	224.8
Nov-1991	1809.1	4.4	60.3	311.3
Dec-1991	1957.5	8.1	69.8	312.3
Jan-1992	1783.2	6.2	67.7	321.5
Feb-1992	1792.5	6.4	57.7	244.8
Mar-1992	1837.7	7.2	64.1	177.6
Apr-1992	2099.8	9.3	59.5	132.7
May-1992	2008.4	6.5	59.6	103
Jun-1992	2176.8	8.4	71.8	129.6
Jul-1992	2108.8	13.1	74.8	204.3
Aug-1992	2101.6	10.1	71.2	217.1
Sep-1992	2025.1	7.5	68.7	239.7
Oct-1992	2136.9	7.7	74.4	435.6
Nov-1992	2030.1	5.9	65.6	693.9
Dec-1992	2111.8	4.6	86.9	530.4
Jan-1993	1746.8	4.8	70.3	418.5
Feb-1993	1845.2	4.9	70.2	415.9
Mar-1993	1907.8	6.6	80.3	282
Apr-1993	2028.6	6.7	76.4	159.1
May-1993	2019.3	8.3	66.9	75.5
Jun-1993	2287.1	9.1	79	86.9
Jul-1993	2206.3	10.4	67	92.5
Aug-1993	2233.1	13.5	75.7	236.4
Sep-1993	2161.4	5.9	71.3	272.7
Oct-1993	2062.5	7.3	64.3	442.1
Nov-1993	2128.9	6.1	65.8	442.7
Dec-1993	2295.4	3.3	72.4	321.9
Jan-1994	1859.1	4.7	77.1	647.6
Feb-1994	1913.4	4.4	91.5	622.5
Mar-1994	2024.5	6.5	83.7	315.5
Apr-1994	2204.6	6	78.3	182.3
May-1994	2221.7	6.5	83.3	149.6
Jun-1994	2434.1	9.1	92.1	287.9
Jul-1994	2319.8	13.8	91.5	234.3
Aug-1994	2312.9	9	106	370.5
Sep-1994	2382.6	7.4	101	431.9
Oct-1994	2208	6	97.1	579.8
Nov-1994	2146.8	5.5	101.9	337.6
Dec-1994	2209.6	4.2	93.3	475.9
Jan-1995	1917 7	4.5	87	552
Feb-1995	1987 6		92.9	460.5
Mar-1995	2094 2	54	89.5	336.5
Apr-1995	2005.2	11.6	121 5	215.9
May-1995	2156.3	8.6	102.1	143.2
Jun-1995	2499.6	10.5	95.8	192.6
Jul-1995	23097	11.5	115 1	611 1
Aug-1995	2360.4	16.5	106.8	596.8
Sep-1995	2263.3	87	94.3	<u>44</u> 0 7
	2200.0	0.1	01.0	++0.7

Oct-1995	2303.4	8.3	111.7	453.9
Nov-1995	2181	6.2	99.4	410.8
Dec-1995	2128.6	6.7	97.2	485.2
Jan-1996	2059.5	3.9	104.4	696
Feb-1996	2217.7	5.9	102.2	559.8
Mar-1996	1995 1	7	95	379.6
Apr-1996	2225.2	86	105.8	224
May-1996	2226.8	83	95.2	119.9
Jun-1996	2420.9	10.8	98.9	165.3
Jul-1996	2475.6	14.3	94 5	607.4
Δμα-1996	2300.4	13.6	107.1	315.4
Son-1996	2300.4	69	113	/16 5
Oct-1006	2200.7	83	118 /	953 A
Nov-1996	2317.5	5.7	104 7	621 5
Dec 1006	2105.5	5.7	104.7	502 T.J
Dec-1990	2102.7		114.1	7/1 0
Jan-1997	2073.5		110.0	741.0 515.0
Feb-1997	1977.9		114.0	210.9
Mar 1997	2145.5		111.9	337.0
Apr-1997	2157.7		104.1	238.2
May-1997	2223.9		99	179.2
Jun-1997	2372.7		112.8	167.4
Jul-1997	2514.4		115.5	635.8
Aug-1997	2265.9		114.2	410.3
Sep-1997	2209.7		114.7	391.5
Oct-1997	2321.1		110.7	526.8
Nov-1997	2193.3		102.9	506.9
Dec-1997	2248.1		123.2	550.1
Jan-1998	2082.1		110.7	590.3
Feb-1998	2006.7		113.8	445
Mar-1998	2025.3		107.5	463.8
Apr-1998	2299.4		107.5	183.2
May-1998	2253		109.1	109.2
Jun-1998	2566.7		123.9	186.8
Jul-1998	2533.7		113	418.5
Aug-1998	2401.1		111.4	291.6
Sep-1998	2418.5		114.2	474.3
Oct-1998	2350.2		107.3	434.6
Nov-1998	2174.9		105.6	371.8
Dec-1998	2212.2		110.9	610.9
Jan-1999	2014.5		155.9	708.9
Feb-1999	2040.6		153.6	434.1
Mar-1999	2234.8		174.2	386.8
Apr-1999	2217.4		148.7	187.3
Mav-1999	2383.1		149.1	106.7
Jun-1999	2563.9		168	126.8
Jul-1999	2469		169.2	426.1
Aug-1999	2334.5		199.5	328.1
Sep-1999	2311.3		158.9	485.8
Oct-1999	2381 7		144 8	401 4
Nov-1999	2289.4		125.1	255 3
Dec-1999	2200.4		126.9	566 6
Jan-2000	1034 2		119 5	506.2
Feb-2000	20/5 5		100	500.0
Mar-2000	204J.J 21Q1 2		122	000.0 000.0
mai-2000	2104.0		123.1	232.3

Apr-2000	2227.4		114.3	161.1
May-2000	2327.1		118.5	145.9
Jun-2000	2373.3		121.9	289.7
Jul-2000	2493.5		112	343.1
Aug-2000	2566.9	9.6	119	564
Sep-2000	2345.9	6.4	118.3	378.4
Oct-2000	2269.5	4.9	123.7	263.5
Nov-2000	2341.5	5.3	115.9	409.4
Dec-2000	2351.2	3.6	113.4	807.7
Jan-2001	2020.1		116.3	611.5
Feb-2001	2151.9	5.7	115	633.9
Mar-2001	2258.6	4.2	113.1	387.8
Apr-2001	2336.9	8.9	103.4	177.5
May-2001	2231.5	7.2	110.2	303.9
Jun-2001	2563.9	5.6	102.8	261.7
Jul-2001	2444.2	11.4	108.3	557.7
Aug-2001	2428.5	10.4	113.6	592.9
Sep-2001	2334		85.4	347.9
Oct-2001	2325.6	4.5	95.6	421.5
Nov-2001	2158.6	6.6	117.7	251.5
Dec-2001	2133.5	4.6	166.8	482.9
Jan-2002	1949.3		168.2	547
Feb-2002	2015.8		133.7	442.1
Mar-2002	1942.3	5.5	149.1	390.7
Apr-2002	2125.7		169.7	160.9
May-2002	2219.2		143.4	115.2
Jun-2002	2284	6.1	154.9	208.3
Jul-2002	2332.1	14.6	192.9	545.6
Aug-2002	2348.7	8.7	167.9	366.5
Sep-2002	2156.5		142	290
Oct-2002	2151.6	4	140.1	458.6
Nov-2002	2119.7	4.1	134.2	398.8
Dec-2002	2135.8	4.7	143.7	469.3
Jan-2003	2001.5	3.1	130	615.5
Feb-2003	1921.8	4.4	156.2	561.6
Mar-2003	1923	2.9	138.8	302.4
Apr-2003	1974.4	4.9	115.4	158.3
May-2003	2184.1	5.9	107.4	92.1
Jun-2003	2245.7	7.8	103.2	121.9
Jul-2003	2291.6	10.5	109.8	498.9
Aug-2003	2232.5	9	117.2	536.7
Sep-2003	2252.7	5.4	98.6	372.7
Oct-2003	2205.9	7	108.6	405.7
Nov-2003	2154.5	5.5	99.4	369.9
Dec-2003	2269.8	4.6	98.8	598.6
Jan-2004	2060.3	3.3	99.4	645.9
Feb-2004	1986.2	2.6	105.3	660.6
Mar-2004	2187.7	5.9	107.2	289.2
Apr-2004	2266.6	6.9	111.1	130.5
May-2004	2187.3	6.5	93.8	97.5
Jun-2004	2366.4	6.6	100.9	153
Jul-2004	2378.8		90.4	266.8
Aug-2004	2316.6	9.4	85.9	423.3
Sep-2004	2279.6	7.8	63.5	291

Oct-2004	2248		68	478.5
Nov-2004	2250.7	5.3	65.2	417.8
Dec-2004	2393.7	4.3	68.2	586.5
Jan-2005	1969.7	1.4	61.2	687.9
Feb-2005	2004 8		63 7	452
Mar-2005	2173.8	ΔΔ	64.8	289.1
Apr-2005	2106.0	5.8	101.9	116.5
May-2005	2130.2	6.8	108.1	105.1
lup_2005	2012.4	8.5	03.5	87.8
Jul 2005	2401.5	8.5	107.2	07.00 A 0 9 0 1
Jui-2005	2391.5		107.2	400.9
Aug-2005	2452.4	0.0	106.2	323.0
Sep-2005	2124.0	5.2	100.3	211.1
Oct-2005	2165.2	4.9	100.9	254
Nov-2005	2286.9		97.5	274.2
Dec-2005	2298.1	2.9	105.5	582
Jan-2006	1994.4		101.8	369
Feb-2006	2154		104	444.1
Mar-2006	2025.8	3.5	100	321.7
Apr-2006	2118.3	3.6	102	101.1
May-2006	2210.9	3.5	101.7	170.7
Jun-2006	2374		110.8	168.9
Jul-2006	2196.6	6.2	107.7	320.5
Aug-2006	2260.1	4.8	101.7	231.7
Sep-2006	2183.2		108.7	280.8
Oct-2006	2154.3	3.3	110.7	373.7
Nov-2006	2146.5	2	96.7	375.2
Dec-2006	2048.4		89.5	472.7
Jan-2007	2072.2		99.3	560.4
Feb-2007	2077.5		95.5	617.6
Mar-2007	2051.2		104.5	267.3
Apr-2007	2200.5		102.6	123.5
Mav-2007	2198	5.8	104.1	69.4
Jun-2007	2367.7	6.8	106.9	126.9
.lul-2007	2274 7	10 1	99.5	295.6
Aug-2007	2283.9	78	98.7	143.3
Sep-2007	2198.8	5.2	83.5	272.7
Oct-2007	2180.0	2	90.7	305.8
Nov-2007	2008.3	L	83.7	304.6
Dec-2007	1975 9	2.5	86.5	568 /
Jan-2008	1030.3	2.5	90.7	610
Jan-2000	1959.5	2.2	90.7	561.1
Feb-2008	1990.0	2.3	90.3	274
Mai-2006	1910	2.0	07	2/4
Apr-2008	2016.2	4.5	87	155.1
May-2008	2054.9	4.5	92.1	170.1
Jun-2008	2131.1	5.3		89.9
Jul-2008	2184.9	9.9	95.7	181.6
Aug-2008	2165.6	9.2	104.9	258.5
Sep-2008	2056.6	4.2	82.8	319.2
Oct-2008	2089.1	2.9	82.7	423.6
Nov-2008	2015.9		79.1	427
Dec-2008	2187.5	2.4	85.2	646.5
Jan-2009	1947.3		71.1	556.6
Feb-2009	2009.2	3	74.5	404.8
Mar-2009	2010.1		85.1	338.8

Apr-2009	2069.9	2.1	78	179.6
May-2009	2176.4	2.8	82.4	89.9
Jun-2009	2285	5.1	78.4	94.2
Jul-2009	2290.6	9.2	86.9	267.5
Aug-2009	2133.1	5.4	83.3	227.8
Sep-2009	2172.8	2.9	70.8	267.2
Oct-2009	2027.2		70.3	585.4
Nov-2009	1998.2	1.5	67.9	873.2
Dec-2009	1986.9		62.8	674.8
Jan-2010	1782.8	1.4	57.1	605.2
Feb-2010	1995.5	2.2	64.6	468.9
Mar-2010	2085.4		70.7	303.1
Apr-2010	2176.3		75.2	289.9
May-2010	2182.8	4	80.5	91.2
Jun-2010	2378.9	3.9	103.4	91.4
Jul-2010	2409.7		115.5	220.1
Aua-2010	2310.9	5.1	106.1	239.2
Sep-2010	2341.6	3.2	88.1	285.2
Oct-2010	2187.7	-	92.3	207.2
Nov-2010	2232.1		98.9	236.2
Dec-2010	2159.2		87.4	546.8
Jan-2011	1894.3		83.1	538.5
Feb-2011	1979 9		92.6	472.9
Mar-2011	2038.2		113	273.4
Apr-2011	2034.8		119.4	115.1
May-2011	2095 1		95 4	78.1
lun-2011	2030.1		03 03	99.6
Jul-2011	2200.4	74.8	95 3	149.4
Δμα-2011	2244.0	67.1	55.5	237 4
Sep-2011	2041.4	07.1		237.3
$O_{ct-2011}$	2180 5			207.8
Nov-2011	2178.0			237.0
Dec-2011	2170.3		15 7	273.7 171 1
Jon 2012	1060.5		45.7	471.4
Jan-2012	1900.5		95.1	204 0
Feb-2012	1937.2		00.1	394.9
Apr 2012	1907.3		90.7 96 F	91.0
Api-2012	2147.4		00.0	01.9
May-2012	2330.1		84.8	93.4
Jun-2012	2207.0	40.0	100.9	100.1
Jui-2012	2279.6	42.2	110.8	350.3
Aug-2012	2250.7	39.9	111.1	307.7
Sep-2012	2084.2	47	97.2	210.1
Oct-2012	2197.7	4.7	113.2	217.4
Nov-2012	2127.3	2.7	101.5	251.7
Dec-2012	2002.2	2.2	103.6	352.9
Jan-2013	1990.6	3.2	97.9	503.4
Feb-2013	1981.3		106	420.3
Mar-2013	2017.8	3.1	106.2	300.5
Apr-2013	2203.9	2.9	108.9	191.1
May-2013	2249.9	3.4	112.4	102.9
Jun-2013	2295.4		113.2	130.6
Jul-2013	2321.5	8.2	137.1	295.4
Aug-2013	2257.6	5.5	147.7	252.3
Sep-2013	2073.7	4.5	113.4	298.5

Oct-2013	1965.1	4	113.8	580.9
Nov-2013	1943.9	3	112.2	484.8
Dec-2013	2037.9	3.8	109.3	617.3
Jan-2014	1894.4	2.3	105.8	582.2
Feb-2014	1885.7	2.9	116.3	403.8
Mar-2014	1858.9	3.6	115	379.5
Apr-2014	1929	1.8	110	186
May-2014	2100.9	3.6	130.2	127.8
Jun-2014	2026	5.1	129.9	120.8
Jul-2014	2227.3	8.4	112.6	231.9
Aug-2014	2116.7	6.4	111.6	230.8
Sep-2014	2125.5	3.8	109.1	383.1
Oct-2014	2021.6	4.4	119.1	465.8
Nov-2014	2054.9		107	407.8
Dec-2014	2001.3	3.8	103.8	474.2
Jan-2015	1886.7	2.3	111.3	570.5
Feb-2015	2052	4	111.6	491.7
Mar-2015	1949.8	3.7	126.8	296.8
Apr-2015	2106	3.1	107.8	149.7
May-2015	2076.7	4.1	122.5	97.2
Jun-2015	2249.7	5.3	126.3	108.2
Jul-2015	2247.9	7.1	126	205.7
Aug-2015	2202.4	6.2	129	239.3
Sep-2015	2166.5	4.4	106	295.6
Oct-2015	2072.4	4.2	124.9	313.1
Nov-2015	2022	2.4	123.6	232.3
Dec-2015	1991.6	2.7	121.8	425.6
Jan-2016	1901.3	3.5	102.1	577.3
Feb-2016	2001.8	2.8	121.3	390.8
Mar-2016	2067.5	5.2	124.9	213.1
Apr-2016	2144.4	3.3	125.9	120.7
May-2016	2227.6	4.2	146.5	82.9
Jun-2016	2399.9	5	151.1	160.4
Jul-2016	2298.5	7.6	149.6	174.9
Aug-2016	2316.9	4.7	150.3	221.3
Sep-2016	2260.8	4.1	130.1	249.5
Oct-2016	2116.1	3.2	121	283.1
Nov-2016	2170.3	2.9	111.1	175
Dec-2016	2215.5	3.2	130.7	524
Jan-2017	1878.4	2	117.7	528.4
Feb-2017	2012.6	3.8	125.5	249.3



Nebraska Total   Nebraska Residu   Total   Average     Distillate plus   Fuel Oil All   Petroleum   Petroleum   Total   Annual     Sales/Deliveries by   Prime Supplier   Prime Supplier   Prime Supplier   Petroleum	C290020311	C300020311				
Distillate plus   Nebraska Residual   Total   Annual   Average     Kerosene All   Sales/Deliveries by   Sales/Deliveries by   Fuel Sales   Fuel Sales   Petroleum   Fuel Sales   Petroleum   Fuel Sales   Petroleum   Fuel Sales   Petroleum   Fuel Sales	Nebraska Total			Average		
Kerosene All Sales/Deliveries by Prime Supplier (Thousand Gallons)   Fuel Sales Fuel Sales   Petroleum Fuel Sales   Total Petroleum Fuel Sales   Petroleum Fuel Sales   Fuel Sales   (Barrels per Day)     789.2   3143   74,833   74,833   04	Distillate plus	Nebraska Residual	Total	Annual		Average
Sales/Deliveries by Prime Supplier (Thousand Gallons (Thousand Gallons per Day)   Fuel Sales (Thousand Gallons per Day)   Petroleum Fuel Sales (Barrels per Day)   Petroleum Fuel Sales (Barrels per Day)   Petroleum Fuel Sales (Barrels per Day)     789.2   3143   74,83   74,83     744.3   2933.1   69,836   69,836     1224.1   3625.2   86,267     1222.2   3473.3   82,698     1233.4   3766.7   89,683     1283.4   3766.7   89,683     1737.4   4362.8   101,610     1737.4   3238.5   77,107     1741.7   3282.5   86,267     1737.4   4362.8   98,62     1747.4   3238.5   77,107     1741.5   3369.7   80,231     1748.1   3805.4   90,605     1547.7   3912   93,43     1648.1   3805.4   90,605     1547.7   3912   93,724     1648.1   3226.7   77,064     1711.9   4525.1   107,740     1645.1 </th <th>Kerosene All</th> <th>Fuel Oil All</th> <th>Petroleum</th> <th>Petroleum</th> <th>Total</th> <th>Annual</th>	Kerosene All	Fuel Oil All	Petroleum	Petroleum	Total	Annual
Prime Supplier (Thousand Gallons per Day)   Priel Supplier (Thousand Gallons per Day)   Chousand Gallons per Callons per Day)   Fuel Sales (Barrels per Day)   Fuel Sales (Barrels per Day)     789.2   3143   74.33   69.836     744.3   2933.1   69.836     961.1   3655.9   87.045     1222.2   3473.3   82.698     1223.4   3626.7   89.683     1678.4   4267.6   103.876     1737.4   4362.8   98.162     1086.9   4422.8   98.162     1086.9   3369.7   80.231     700.8   2807.5   66.845     1029.2   3345   77.107     1218.7   4055.6   3.676.0   96.652     1029.2   3345   79.643     1029.2   3364   91.762     1711.9   4525.1   107.740     1488.1   3805.4   91.762     1711.9   32267   77.064     1450.8   3440.7   105.731     1460.8   3440.7   105.731	Sales/Deliveries by	Sales/Deliveries by	Fuel Sales	Fuel Sales	Petroleum	Petroleum
(Thousand Gallons per Day)Gallons per Day)Gallons per Day)(Barrels per<	Prime Supplier	Prime Supplier	(Thousand	(Thousand	Fuel Sales	Fuel Sales
per Day)per Day)Day)Day)Day)Day)Day)789.2314374.833744.32933.168.8361224.13655.987.0451224.23473.382.6981222.23473.382.6981233.43766.789.6831678.44267.6101.6101737.44362.8103.87613824122.898.1621086.93468.482.605974.23236.577.1071218.74055.63.676.0963.43969.796.231730.82807.566.8451029.2334599.7431541.54352.1107.7401541.54352.1107.7401541.5335493.724985.332203778.376.66789.958.3866.43112.877.1041314.93936.433.724985.33220323.7861336.4351983.7861336.4351983.7861336.4351983.7861336.4328.577.1071328.73516.183.7171335.53740.389.05513328.73516.183.71713329.84064.996.783102333411.73.668.0102333411.73.668.0102333411.73.668.01046.33120.774.3021046.33120.774.3021046.3 <th>(Thousand Gallons</th> <th>(Thousand Gallons</th> <th>Gallons per</th> <th>Gallons per</th> <th>(Barrels per</th> <th>(Barrels per</th>	(Thousand Gallons	(Thousand Gallons	Gallons per	Gallons per	(Barrels per	(Barrels per
789.2 3143 74,833   744.3 2933.1 69,836   961.1 3655.9 87,045   1224.1 3623.2 86,267   1222.2 3473.3 82,698   1233.4 3766.7 89,683   1678.4 4267.6 101,610   1737.4 4362.8 103,876   1392 4122.8 98,162   1086.9 3469.4 82,605   974.2 3238.5 77,107   1218.7 4055.6 3,676.0 96,562 87,523.6   963.4 3369.7 80,231 86,43   1029.2 3345 79,643 102,21 3,143   1516.9 3854 91,762 107,740   1541.5 4352.1 103,621 134,43   1541.5 4352.1 103,621 134,43   1541.5 4352.1 105,731 131,49   3986.4 3,774.3 76,667 89,958.3   866.4 3112.8 74,114 922.2 3236.7 77,064   1356.5 3740.3	per Day)	per Day)	Day)	Day)	Day)	Day)
744.32933.169,836961.13655.987,0451224.13623.286,2671222.23473.382,6981293.43766.789,6831678.44267.6101,6101737.44362.898,1621086.93469.482,605974.23238.577,1071218.74055.63,676.096,562963.43369.780,231730.82807.566,8451029.2334579,6431488.13805.490,6051547.7391293,1431516.9385491,7621711.94525.1107,7401541.54352.1107,7401541.54352.1107,7401541.53236.777,0641450.84440.7105,7311314.93936.493,724985.332203,778.376,66789,958.3866.43112.874,114922.23236.777,0641386.4351983,7861386.4351983,7861386.4351989,0551698.44244.1101,0501328.73516.183,7171335.63236.577,1071494.14579.9109,0451328.73516.183,7171335.63236.577,1071494.14579.9109,0451329.84064.996,7831023.33411.73,668.0 </th <th>789.2</th> <th></th> <th>3143</th> <th></th> <th>74,833</th> <th></th>	789.2		3143		74,833	
961.13655.987,0451224.13623.286,2671222.23473.382,6981293.43766.789,6831678.44267.6101,6101737.44362.8103,87613924122.898,1621086.93469.482,605974.22328.577,1071218.74055.63,676.096,56287,523.6963.43369.766,8451029.2334579,643128.73905.491,7621711.94525.1107,7401516.9385491,7621711.94525.1103,6211371.23771.189,7881450.84440.7105,7311314.93936.493,724985.332203,778.376,66789,8763369.783,7861386.4351983,7861386.4351983,7861386.4351983,7861386.4351983,7661328.73516.183,717135.53740.389,0551698.44244.1101,0501328.73516.183,7171335.63228.577,1071494.14579.9109,0451329.84064.996,7831023.33411.73,668.01329.83040.272,3861046.33120.774,3021062.13996.695,2291332.13582.985,307 <td>744.3</td> <td></td> <td>2933.1</td> <td></td> <td>69,836</td> <td></td>	744.3		2933.1		69,836	
1224.1 $3623.2$ $86,267$ 1222.2 $3473.3$ $82,698$ 1293.4 $3766.7$ $89,683$ 1678.4 $4267.6$ $101,610$ 1737.4 $4362.8$ $103,876$ 1392 $4122.8$ $98,162$ 1086.9 $3469.4$ $82,605$ $974.2$ $3238.5$ $77,107$ 1218.7 $4055.6$ $3,676.0$ $963.4$ $3369.7$ $80,231$ $730.8$ $2807.5$ $79,643$ $1029.2$ $3345$ $79,643$ $1488.1$ $3805.4$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $107,740$ $1541.5$ $33220$ $3,778.3$ $76,667$ $89,958.3$ $3220$ $3,778.3$ $76,667$ $89,955.3$ $3220$ $3,778.3$ $76,667$ $89,955.3$ $3220$ $3,778.3$ $76,667$ $89,955.3$ $3220$ $3,778.3$ $76,667$ $89,955.3$ $3220$ $3,778.3$ $79,643$ $136.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,786$ $1386.4$ $3259$ $90,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1329.8$ $4064.9$ <td>961.1</td> <td></td> <td>3655.9</td> <td></td> <td>87,045</td> <td></td>	961.1		3655.9		87,045	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1224.1		3623.2		86,267	
12934 $3766.7$ $89,683$ $1678.4$ $4267.6$ $101,610$ $1737.4$ $4362.8$ $103,876$ $1392$ $4122.8$ $98,162$ $1086.9$ $3469.4$ $82,605$ $974.2$ $3238.5$ $77,107$ $1218.7$ $4055.6$ $3,676.0$ $96,562$ $963.4$ $3369.7$ $80,231$ $730.8$ $2807.5$ $66,845$ $1029.2$ $3345$ $79,643$ $1488.1$ $3805.4$ $90,605$ $1547.7$ $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $1314.9$ $3936.4$ $93,724$ $985.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $1366.4$ $3112.8$ $77,064$ $1556$ $3774.8$ $89,876$ $1386.4$ $3519$ $83,786$ $1342$ $3576.8$ $85,162$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1328.8$ $4064.9$ $6,783$ $1023.3$ $3411.7$ $3,668.0$ $1023.3$ $3411.7$ $3,668.0$ $1023.1$ $3562.9$ $85,307$	1222.2		3473.3		82,698	
1678.4 $4267.6$ $101,610$ $1737.4$ $4362.8$ $103,876$ $1392$ $4122.8$ $98,162$ $1086.9$ $3469.4$ $82,605$ $974.2$ $3238.5$ $77,107$ $1218.7$ $4055.6$ $3,676.0$ $96,562$ $87,523.6$ $963.4$ $3369.7$ $80,231$ $730.8$ $2807.5$ $66,845$ $1029.2$ $3345$ $79,643$ $1488.1$ $3805.4$ $90,605$ $1547.7$ $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $985.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1556$ $3774.8$ $89,876$ $1342$ $3576.8$ $85,162$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1494.1$ $4579.9$ $909,045$ $1023.3$ $411.7$ $3,668.0$ $81.231$ $87,332.5$ $954.9$ $3040.2$ $72,386$ $1046.3$ $3120.7$ $74,302$ $1046.3$ $3120.7$ $74,302$ $1062.1$ $399.6$ $95,229$ $1332.1$ $3582.9$ $85,307$	1293.4		3766.7		89,683	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1678.4		4267.6		101,610	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1737.4		4362.8		103,876	
1086.9 $3469.4$ $82,605$ $974.2$ $3238.5$ $77,107$ $1218.7$ $4055.6$ $3,676.0$ $96,562$ $87,523.6$ $963.4$ $3369.7$ $80,231$ $730.8$ $2807.5$ $66,845$ $1029.2$ $3345$ $79,643$ $79,643$ $1488.1$ $3805.4$ $90,605$ $91,762$ $1547.7$ $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1485.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $3220$ $3,778.4$ $89,958.3$ $136.4$ $3519$ $83,766$ $1386.4$ $3519$ $83,766$ $1386.4$ $3274.3$ $89,055$ $1386.4$ $3256.5$ $77,107$ $1498.4$ $424.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1135.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $1322.1$ $3582.9$ $85,307$	1392		4122.8		98,162	
974.2 $3238.5$ $77,107$ $1218.7$ $4055.6$ $3,676.0$ $96,562$ $87,523.6$ $963.4$ $3369.7$ $80,231$ $730.8$ $2807.5$ $66,845$ $1029.2$ $3345$ $79,643$ $1488.1$ $3805.4$ $90,605$ $1547.7$ $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $985.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $85,162$ $1328.7$ $3516.1$ $83,717$ $1328.7$ $3516.1$ $83,717$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $81,231$ $87,332.5$ $954.9$ $3040.2$ $72,386$ $1046.3$ $3120.7$ $74,302$ $1062.1$ $3999.6$ $95,229$ $1332.1$ $3582.9$ $85,307$	1086.9		3469.4		82,605	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	974.2		3238.5		77,107	
963.43369.7 $80,231$ 730.82807.5 $66,845$ 1029.2 $3345$ $79,643$ 1488.13805.4 $90,605$ 1547.7 $3912$ $93,143$ 1516.9 $3854$ $91,762$ 1711.9 $4525.1$ $107,740$ 1541.5 $4352.1$ $103,621$ 1371.2 $3771.1$ $89,788$ 1450.8 $4440.7$ $105,731$ 985.3 $3220$ $3,778.3$ 76,667 $89,958.3$ 866.4 $3112.8$ $74,114$ 922.2 $3236.7$ $77,064$ 1556 $3774.8$ $89,876$ 1386.4 $3519$ $83,786$ 1386.4 $3519$ $83,786$ 1386.4 $3516.1$ $83,717$ 1328.7 $3516.1$ $83,717$ 1328.7 $3516.1$ $83,717$ 1494.1 $4579.9$ $109,045$ 1329.8 $4064.9$ $96,783$ 1023.3 $3411.7$ $3,668.0$ 81,231 $87,332.5$ 954.9 $3040.2$ $72,386$ 1046.3 $3120.7$ $74,302$ 1002.1 $3999.6$ $95,229$ 1332.1 $3582.9$ $85,307$	1218.7		4055.6	3,676.0	96,562	87,523.6
730.8 $2807.5$ $66,845$ $1029.2$ $3345$ $79,643$ $1488.1$ $3805.4$ $90,605$ $1547.7$ $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $1314.9$ $3936.4$ $93,724$ $985.3$ $3220$ $3,778.3$ $76,667$ $89,958.3$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1556$ $3774.8$ $89,876$ $1386.4$ $3519$ $83,786$ $1342$ $3576.8$ $85,162$ $1328.7$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $132.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $123.3$ $3120.7$ $74,302$ $1046.3$ $3120.7$ $74,302$ $1046.3$ $3120.7$ $74,302$ $1046.3$ $3120.7$ $74,302$ $1045.3$ $3120.7$ $74,302$ $1045.3$ $3120.7$ $74,302$ $1332.1$ $3582.9$ $85,307$	963.4		3369.7		80,231	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	730.8		2807.5		66,845	
1488.13805.490,6051547.7391293,1431516.9385491,7621711.94525.1107,7401541.54352.1103,6211371.23771.189,7881450.84440.7105,7311314.93936.493,724985.332203,778.376,66789,958.3866.4312.874,114922.23236.777,06415563774.889,8761386.4351983,78613423576.885,1621355.53740.389,0551698.44244.1101,0501328.73516.183,7171135.63238.577,1071494.14579.9109,0451329.84064.996,7831023.33411.73,668.081,23187,332.5954.93040.272,3861046.33120.774,3021032.13582.985,307	1029.2		3345		79,643	
1547.7 $3912$ $93,143$ $1516.9$ $3854$ $91,762$ $1711.9$ $4525.1$ $107,740$ $1541.5$ $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $1314.9$ $3936.4$ $93,724$ $985.3$ $3220$ $3,778.3$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,786$ $1386.4$ $3519$ $83,717$ $132.7$ $3516.1$ $83,717$ $132.7$ $3516.1$ $83,717$ $1135.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $123.3$ $3120.7$ $74,302$ $1046.3$ $3120.7$ $74,302$ $1042.1$ $399.6$ $5,229$ $1332.1$ $3582.9$ $85,307$	1488.1		3805.4		90,605	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1547.7		3912		93,143	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1516.9		3854		91,762	
1541.5 $4352.1$ $103,621$ $1371.2$ $3771.1$ $89,788$ $1450.8$ $4440.7$ $105,731$ $1314.9$ $3936.4$ $93,724$ $985.3$ $3220$ $3,778.3$ $76,667$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1556$ $3774.8$ $89,876$ $1386.4$ $3519$ $83,786$ $1342$ $3576.8$ $85,162$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1135.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $81,231$ $87,332.5$ $954.9$ $3040.2$ $72,386$ $1046.3$ $3120.7$ $74,302$ $1602.1$ $3999.6$ $95,229$ $1332.1$ $3582.9$ $85,307$	1711.9		4525.1		107,740	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1541.5		4352.1		103,621	
1450.8 $4440.7$ $105,731$ $1314.9$ $3936.4$ $93,724$ $985.3$ $3220$ $3,778.3$ $76,667$ $985.3$ $3220$ $3,778.3$ $76,667$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1556$ $3774.8$ $89,876$ $1386.4$ $3519$ $83,786$ $1342$ $3576.8$ $85,162$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1135.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $81,231$ $87,332.5$ $954.9$ $3040.2$ $72,386$ $1046.3$ $3120.7$ $74,302$ $1602.1$ $3999.6$ $95,229$ $1332.1$ $3582.9$ $85,307$	13/1.2		3771.1		89,788	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1450.8		4440.7		105,731	
985.3 $3220$ $3,778.3$ $76,667$ $89,958.3$ $866.4$ $3112.8$ $74,114$ $922.2$ $3236.7$ $77,064$ $1556$ $3774.8$ $89,876$ $1386.4$ $3519$ $83,786$ $1342$ $3576.8$ $85,162$ $1355.5$ $3740.3$ $89,055$ $1698.4$ $4244.1$ $101,050$ $1328.7$ $3516.1$ $83,717$ $1135.6$ $3238.5$ $77,107$ $1494.1$ $4579.9$ $109,045$ $1329.8$ $4064.9$ $96,783$ $1023.3$ $3411.7$ $3,668.0$ $81,231$ $87,332.5$ $954.9$ $3040.2$ $72,386$ $1046.3$ $3120.7$ $74,302$ $1602.1$ $3999.6$ $95,229$ $1332.1$ $3582.9$ $85,307$	1314.9		3936.4	0 770 0	93,724	00 050 0
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	985.3		3220	3,778.3	76,667	89,958.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	866.4		3112.8		74,114	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	922.2		3230.7		77,064	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1000		3774.8		89,876	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1000.4		2576 9		00,700	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1342		3370.0		00,102 80.055	
1030.44244.1101,0301328.73516.183,7171135.63238.577,1071494.14579.9109,0451329.84064.996,7831023.33411.73,668.081,231954.93040.272,3861046.33120.774,3021602.13999.695,2291332.13582.985,307	1609.4		3740.3		101.050	
1320.7 3310.1 5310.1 5370.17   1135.6 3238.5 77,107   1494.1 4579.9 109,045   1329.8 4064.9 96,783   1023.3 3411.7 3,668.0 81,231 87,332.5   954.9 3040.2 72,386   1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	1328.7		4244.1		83 717	
1133.0 3230.3 177,107   1494.1 4579.9 109,045   1329.8 4064.9 96,783   1023.3 3411.7 3,668.0 81,231 87,332.5   954.9 3040.2 72,386   1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	1135.6		3238.5		77 107	
1329.8 4064.9 96,783   1023.3 3411.7 3,668.0 81,231 87,332.5   954.9 3040.2 72,386   1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	1/0/ 1		1570 Q		109 045	
1023.3 3411.7 3,668.0 81,231 87,332.5   954.9 3040.2 72,386   1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	1320.8		4064.9		96 783	
954.9 3040.2 72,386   1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	1023.0		3411 7	3 668 0	81 231	87 332 5
1046.3 3120.7 74,302   1602.1 3999.6 95,229   1332.1 3582.9 85,307	954.9		3040.2	0,000.0	72 386	07,002.0
1602.1 3999.6 95,229   1332.1 3582.9 85,307	1046 3		3120.7		74 302	
1332.1 3582.9 85,307	1602 1		3999 6		95 229	
	1332.1		3582 9		85 307	
1497.6 3929.6 93.562	1497 6		3929 6		93,562	
1596.3 4005 95.357	1596.3		4005		95,357	
1743.6 4170.8 99.305	1743 6		4170.8		99.305	
1603.4 4130 98.333	1603.4		4130		98.333	
1131.1 3160.3 75.245	1131.1		3160.3		75.245	

1438.1	4265		101.548	
1320.2	3878.7		92.350	
1158.1	3719.6	3.750.2	88.562	89.290.5
999.8	2945.6	-,	70,133	,
994 7	2952		70,286	
1121 9	3243 1		77 217	
1392 9	3635		86 548	
1367 3	3517.9		83 760	
1541 1	3969.2		94 505	
1963 3	4870 1		115 955	
1358 3	3753 1		80.360	
1/00 0	4049		09,000	
1700.2	4049		110 199	
056.9	4027.9		74 560	
900.0 1075 7	3131.3	2 605 1	74,500	97 070 0
1075.7	3047.1	3,095.1	00,030	07,979.2
1120.6	3580.5		85,250	
1265.5	3729		88,786	
1910.7	4361.3		103,840	
1225.7	3521		83,833	
1281.7	3512.4		83,629	
1989.6	4975.8		118,471	
1780.4	4435.5		105,607	
1665.5	4418.3		105,198	
1469	4215.7		100,374	
1591.5	4344.3		103,436	
1407	3871.8		92,186	
1176.7	3662.1	4,052.3	87,193	96,483.5
1035.1	3253		77,452	
1181.1	3797.9		90,426	
1623.8	4198.5		99,964	
1526.9	3756.5		89,440	
1589.3	3824.7		91,064	
1683.4	4380.8		104,305	
1756.6	4143.1		98,645	
1805	4639.3		110,460	
1325.9	3751.5		89,321	
1501.8	4043.7		96,279	
1243.1	3615.4		86,081	
1248.5	4032.6	3,953.1	96,014	94,121.0
792	2776.2		66,100	
1143.5	3409		81,167	
1236	3613.7		86,040	
1579.7	3729.7		88,802	
1438.8	3752.2		89,338	
1568.6	3847.8		91,614	
2002.4	4842.8		115.305	
1714.6	4407.2		104,933	
1432.5	3750.3		89.293	
1371.4	3949 7		94,040	
1189.2	3646 3		86 817	
1201 5	3804 6	3 794 1	90,586	90 336 3
1131 5	3331 3	0,104.1	79 317	00,000.0
931 1	30301.0		72 360	
1258 7	2222 E		70 107	
1200.1	3322.3		19,107	

1515 /	2700.2		99 217	
135/ 1	3563.6		84 848	
1606.2	4120.2		09.211	
2177 1	4129.2 5145 0		100,514	
1602	1207.2		102 214	
1095	4297.2		09 517	
1575	4137.7		90,017	
1404.4	3913.2		93,171	
1134.9	3320	0 700 0	79,048	00 404 5
1199.8	3547.5	3,788.0	84,464	90,191.5
1047.5	3226.1		76,812	
1381.9	3483.3		82,936	
1380.1	3466.7		82,540	
1618.9	3920.2		93,338	
1641.9	3819.4		90,938	
1491.8	3878.4		92,343	
1382.6	3783.6		90,086	
1292.7	3692.7		87,921	
1428.4	3769.4		89,748	
1492	4146.6		98,729	
1262.7	4058.2		96,624	
1354.5	4088.2	3,777.7	97,338	89,946.0
1046.7	3287.1		78,264	
1038.9	3375.1		80,360	
1090.8	3367.5		80,179	
1470.3	3741.1		89,074	
1386.6	3556.6		84,681	
1514	3976.1		94,669	
1337.4	3713.6		88,419	
1462.9	4021.6		95,752	
1192.4	3703.7		88,183	
1474.5	4050.7		96,445	
1441.1	4084.6		97.252	
1475.4	4168.4	3,753.8	99,248	89,377.2
1073.6	3662.1	,	87.193	,
1017	3648.8		86.876	
1330.6	3760.8		89.543	
1462.1	3933.3		93,650	
1576.5	4037 6		96 133	
1656.3	4479.5		106 655	
1426	4085.4		97 271	
1471 4	4269.8		101 662	
1558 6	4200.0		106 702	
1608.7	4401.0		107 133	
1338 6	3930.4		93 581	
12/13 5	4026 5	4 067 9	95,869	06 855 8
1004 7	3655 0	4,007.3	93,009 87.045	30,033.0
1004.7	38383		07,045	
1232.3	4066		91,500	
1402 7	2946.0		90,010	
1432.7	3040.9		91,090	
13/9.0 1754 C	3190		9U,230	
1/04.0 0100.1	4003.1		108,407	
	5147.5		122,560	
1//4.1	4854.6		115,586	
1513.1	4320.1		102,860	

1700.8	4578.1		109,002	
1402.7	4100.1		97,621	
1283.8	4001.5	4,229.3	95,274	100,698.6
1232	4095.8		97,519	
1180.6	4066.2		96,814	
1514.4	3991.1		95,026	
1867.3	4430.9		105,498	
1597.5	4047.7		96,374	
1808.3	4504.2		107,243	
2280.8	5472.6		130,300	
1885.2	4621.7		110,040	
1594.6	4331.7		103,136	
2141.3	5438.9		129,498	
1710.9	4628.1		110,193	
1473	4342.5	4,497.6	103,393	107,086.1
1634.1	4566		108,714	
1431.2	4039.5		96,179	
1882.3	4477.5		106,607	
1871	4371		104,071	
2390.8	4892.9		116,498	
2029.9	4682.8		111,495	
2185.1	5450.8		129,781	
1848.6	4639		110,452	
1635.5	4351.4		103,605	
2203.3	5161.9		122,902	
1620	4423.1		105,312	
1708	4629.4	4,640.4	110,224	110,486.7
1644.3	4427.4		105,414	
1683.9	4249.4		101,176	
1666.4	4263		101,500	
2099.1	4689.2		111,648	
2001.7	4473		106,500	
2138.8	5016.2		119,433	
2280	5345.2		127,267	
2048.3	4852.4		115,533	
2138.2	5145.2		122,505	
2171.9	5064		120,571	
1769.6	4421.9		105,283	
1887.9	4821.9	4,730.7	114,807	112,636.5
1579.9	4459.2		106,171	
1501	4129.3		98,317	
1945.1	4740.9		112,879	
1832.7	4386.1		104,431	
2007.5	4646.4		110,629	
1981.7	4840.4		115,248	
2168.8	5233.1		124,598	
2107.3	4969.4		118,319	
2019.5	4975.5		118,464	
2130.9	5058.8		120,448	
1977.7	4647.5		110,655	
1273.2	4379.2	4,705.5	104,267	112,035.3
974.5	3535		84,167	
997.8	3671.9		87,426	
1432.7	3979.2		94,743	

1418.6		3921.4		93,367	
1566.9		4158.4		99,010	
1850.2		4635.1		110,360	
1558.8		4507.4		107,319	
2068.4		5327.9		126,855	
1620.1		4469.1		106,407	
1552.6		4214.2		100,338	
1264.7		4136.8		98,495	
1294.4		4570.3	4,260.6	108,817	101,441.9
1119.7		3867.6		92,086	
1139.7		4046.2		96,338	
1478.2		4241.9		100,998	
1812.4		4439.1		105,693	
1687.3		4340.1		103,336	
1865.8		4799.8		114,281	
1998.1		5119.7		121,898	
1980		5125.4		122,033	
1655		4422.3		105,293	
1850.3		4697.5		111,845	
1470.9		4005.3		95,364	
1366.9		4154.7	4,438.3	98,921	105,673.8
1371.8		4036.3		96,102	
1226.4		3818		90,905	
1303.7		3791.3		90,269	
1636.4		4092.7		97,445	
1531.1		4008.9		95,450	
1701.1		4354.4		103,676	
2551.4		5636.6		134,205	
2065.2		4957		118,024	
1648.9		4237.4		100,890	
1647		4401.3		104,793	
1470		4126.8		98,257	
1131.6		3885.1	4,278.8	92,502	101,876.6
1177.9		3928		93,524	
1046.2		3690.2		87,862	
1112.5		3479.6		82,848	
1294.5		3547.5		84,464	
1560.8		3950.3		94,055	
1658.7		4137.3		98,507	
2409.1		5319.9		126,664	
2135.2		5030.6		119,776	
1813.4		4542.8		108,162	
1782.8		4510		107,381	
1350.9		3980.2		94,767	
1285.2		4257	4,197.8	101,357	99,947.2
1038.2	6.7	3853.8		91,757	
1180.6		3935.3		93,698	
1557.7		4147.7		98,755	
1840.3		4355.4		103,700	
1724		4109.1		97,836	
1911.9		4538.8		108,067	
1959.3		4695.3		111,793	
2116.1		4951.3		117,888	
1710.2		4352.1		103,621	

	4440			
1645.5	4440		105,714	
1527.9	4266.9	4 005 0	101,593	400 007 0
1328.4	4381.1	4,335.6	104,312	103,227.8
1020.3	3740.5		89,060	
1155.6	3676.1		87,526	
1477.8	4009.9		95,474	
1660.4	4080.8		97,162	
1864.3	4456.7		106,112	
1775.9	4367.2		103,981	
2375.9	5290.5		125,964	
2166.8	5063		120,548	
1807.6	4321.4		102,890	
1594.7	4119.7		98,088	
1577.1	4235.7		100,850	
1318.6	4307.1	4,305.7	102,550	102,517.1
1533.4	3998.6		95,205	
1590.3	4292.4		102,200	
1681	4132		98,381	
2041.6	4366.6		103,967	
1941.9	4428.7		105,445	
2110.6	4764.3		113,436	
2181.9	4812.9		114,593	
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1558.5	4131.2		98,362	
1756.4	4398.4		104,724	
1601.5	4221.9		100,521	
1329.1	3939.7	4,310.8	93,802	102,638.3
2335.6	5067.5		120,655	
1694.3	4484.9		106,783	
2007.4	4430.4		105,486	
2012.2	4438.8		105,686	
2064.8	4442.1		105,764	
1983	4591.3		109,317	
2359.4	5039.3		119,983	
1903.5	4437.2		105,648	
1893.1	4453.3		106.031	
2309.1	4891.8		116,471	
2090.5	4577.1		108,979	
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1472.5	4121.5	.,	98.131	,
1219.5	3871.8		92 186	
1513 7	3706.3		88 245	
1673.6	3931.9		93 617	
1788 5	4110.1		97 860	
1805 1	4031.4		95 986	
2053	4525 1		107 740	
2001 5	4539.7		108 088	
1789 5	4050.1 4252 R		101 245	
1700 5	4202.0 1208 R		102 352	
1592 3	- <u>-</u> 200.0 Δ11Λ 2		97 960	
1700 9	1600 5	4 177 1	110 060	00 155 Q
1277 9	7022.J 2852 Q	7,177.1	91 736	55,455.0
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1200 7	3003.Z 2701 7		80 602	
1230.1	3124.1		00,000	

1456 7	3786.3		90 150	
1498 6	3850 1		91 669	
1356.3	3819		90,929	
1768 1	4422.3		105 293	
1788 1	4237 7		100,898	
1788 8	4302.5		102 440	
1660.3	4343.2		103 410	
1698.3	4639.1		110 455	
1417 5	4142	4 065 3	98 619	96 791 7
1243.6	3690 1	4,000.0	87 860	50,751.7
1675 5	4206 7		100 160	
1723 0	4183 1		99 598	
2080 1	4621 5		110 036	
10/0 7	4021.0		102 362	
1340.7	2577.6		61 371	
	2377.0		65 364	
2215 1	2743.3 4876 4		116 105	
2210.1	4070.4		119,103	
2200.1	4970.2		110,529	
2004	4021.2		114,790	
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1094.1	4407.5	4,163.5	100,040	99,606.0
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1788.9	4334.3		103,198	
1860.7	4285.3		102,031	
1877.9	4147.2		98,743	
1935.6	4204.2		100,100	
1924.6	4356.6		103,729	
2039.6	4603.9		109,617	
2295.9	4941.8		117,662	
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2421.1	4908.4		116,867	
2150.6	4603.2	4 400 0	109,600	400.000.0
1877.9	4582.7	4,486.8	109,112	106,829.0
1790.6	4211.1		100,264	
1665.7	4082.9		97,212	
1841.3	4085.4		97,271	
1762.1	4077.9		97,093	
2013.8	4522.1		107,669	
2430.1	49/1.7		118,374	
2816.6	5605.5		133,464	
2609.4	5318.8		126,638	
2217.4	4608.9		109,736	
2278.6	4811.6		114,562	
1927.3	4410.5	4 557 0	105,012	400 540 0
1526.4	3987.3	4,557.8	94,936	108,519.2
1622.9	4218		100,429	
1614.8	4122.4		98,152	
1725.1	4152.7		98,874	
1948.9	4455.7		106,088	
2016	4484.6		106,776	
19/2./	4511.9		107,426	
2494.2	5256.4		125,152	
1968.2	4631.3		110,269	
1830.6	4320.7		102,874	

2494.8	5158.6		122,824	
1992.8	4536.7		108,017	
1808.7	4577	4,535.5	108,976	107,988.1
1665.8	4250.5		101,202	
1289.2	3697.9		88,045	
1970.9	4327.9		103,045	
2100.7	4327.5		103,036	
2061.6	4424.1		105,336	
2127.2	4409		104,976	
2573	5153.2		122,695	
1961.1	4426.6		105,395	
2128.9	4750.4		113,105	
2580.6	5191.5		123,607	
2096.2	4665.9		111,093	
2073.3	4656.4	4,523.4	110,867	107,700.2
1925.6	4496.4		107,057	
1988.1	4647.4		110,652	
2041.7	4418.8		105,210	
2075.8	4442.4		105,771	
1802.4	4102.9		97,688	
2088	4577.5		108,988	
2302	4888.7		116,398	
2325.7	4902.6		116,729	
2158.8	4731.3		112,650	
2505	5019.6		119,514	
2067.4	4447.7		105,898	
1852.7	4394.4	4,589.1	104,629	109,265.3
1632.8	4217		100,405	
1698.5	4215.2		100,362	
2000.2	4410.9		105,021	
1999.8	4394.1		104,621	
1896.8	4358		103,762	
2400	5116.4		121,819	
2261.7	4892.3		116,483	
2307.4	5000.6		119,062	
2218.7	4863.2		115,790	
2381.5	4904.9		116,783	
2060.7	4520		107,619	
1856.8	4730.2	4,635.2	112,624	110,362.7
1645	4171.5		99,321	
1735.7	4126.9		98,260	



## Back to Contents Data 1: Motor Gas Data 3: Other Products

Sourcekey

C100020001

C400020001

C910020001

C500020001

C900020001

			Midwest		
		Midwest (PADD	(PADD 2) Jet	Midwost (PADD	Midwost (PADD
		Gasoline All		2) Kerosene-	2) Propane All
	Midwest (PADD 2)	Sales/Deliveries	Sales/Deliveri	Type Jet Fuel All	Sales/Deliverie
	Total Gasoline All	by Prime	es by Prime	Sales/Deliveries	s by Prime
	Sales/Deliveries by	Supplier	Supplier	by Prime	Supplier
	Prime Supplier	(Thousand	(Thousand	Supplier	(Thousand
	(Thousand Gallons	Gallons per	Gallons per	(Thousand	Gallons per
Date	per Day)	Day)	Day)	Gallons per Day)	Day)
Jan-1983	78463.3			4887.5	15432.6
Feb-1983	75773	153.1	1152.3		14056.3
Mar-1983	92565.5			5021.5	11732.8
Apr-1983	86743.9		1574.8		10704.8
May-1983	86403.3		1739.9		6508.7
Jun-1983	94733		1592.9	5188.7	6285.9
Jul-1983	88681.8		1654.6		6253.6
Aug-1983	91770.5		1522.3	5583.5	6/9/.6
Oct 1983	00421.0		1040.4	5196.1	10925.5
Nov-1983	00074.2 86278 2		1024.1	5250.2	10400.1
Dec-1983	890233		1474.0	5618.4	18348.8
Jan-1984	84213.6		1471 4	5793.3	18152 6
Feb-1984	82937.5		1320.5	6491.9	12198.9
Mar-1984	88345.5		1382.5	6138.2	11742.3
Apr-1984	86006.5		1385.4	5914.8	9759.6
May-1984	92862.4		1393.8	6467.1	7786.2
Jun-1984	93293.3		1560.9	6399.9	7015.3
Jul-1984	92386.7		1685.3	6209.1	7881.7
Aug-1984	97688.5		1635	6569.4	10467.8
Sep-1984	88027		1557.9	6198.9	11218
Oct-1984	91923		1414.5	6084.9	18153.9
Nov-1984	91979.3		1694	6013	17331.8
Dec-1984	88770.4		1300.8	6265.3	15064.7
Jan-1985	84948.9		1172.8	6471.4	15813.6
Feb-1985	89124.8	191.2	1080.9	6094.1	16027.7
Mar-1985	89101.7	005	897.2	6781.4	11/9/.6
Apr-1985	92855.1	265	1216.8	6386.4	9638.8
Iviay-1965	97294.9		1449.0	6261.8	7002 6
Jul-1985	95552.4		1338.0	7184 1	8992.0
Aug-1985	94056.9	315.8	1252.5	7216.7	10214.3
Sep-1985	86980.8	010.0	1255.4	7014 4	10707.3
Oct-1985	98084.2		1424.2	6925.3	17507.1
Nov-1985	89874.8	202.6	785.9	7593.3	17539.2
Dec-1985	90514.5		815	7399	18465.3
Jan-1986	82795.9	212.9	815.6	7858.9	15258.6
Feb-1986	81552.4		742.7	7585.7	13408.5

Mar-1986	92450.1	216.4	768.5		10638.1
Apr-1986	96763.6	264.7	489.9	7301.6	8564.2
May-1986	98582.3	277.7	669.8		8251.7
Jun-1986	94063	315.3	594.3	7857.3	7139.1
Jul-1986	97765.2	352.4	507.3		7527.1
Aug-1986	96744.9		628.7	7937.5	9717.8
Sep-1986	88522	255.9	583	7798.3	10569.9
Oct-1986	95848.8	240.2	709.3	7410.3	14048.9
Nov-1986	89047.5	223.7	719	7424	15970.7
Dec-1986	94690.8		726.5	8134.4	14324.8
Jan-1987	78744.7	181.1	522.4	7879.1	14119.7
Feb-1987	81836.8	215.3	527.1	7974.2	11359
Mar-1987	86959.1	227.8	428.5	7430.8	9536.4
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May-1987	91806.1	265.9	558.1	7437.2	4718
Jun-1987	96074.6	321.7	652.6	7491	6074.7
Jul-1987	96535.9	320.8	475.1	7431.2	6813.7
Aug-1987	91420.5	312.1	628.7	7489.7	7365.6
Sep-1987	93107.1	280.6	781.2	7386.4	10456.8
Oct-1987	95094	267	765.5	7273	13097.9
Nov-1987	85766	226.9	727	7049.3	10329.2
Dec-1987	91892.7	174.7	769.5	7729.4	15190
Jan-1988	83346.2	144.7	647.6	6001.4	17649.8
Feb-1988	85891.4	162.8	783.8	6143.9	15130.4
Mar-1988	90479.6	200	731.8	6042	11107.3
Apr-1988	92723.1	257.1	959.2	7278.5	6815.1
May-1988	92609.3	288.9	1029.4	7003	5847.8
Jun-1988	101940.3	357.7	1026.8	7060.3	6233.2
Jul-1988	97034.6	335.5	766.6	6909.1	6150.5
Aug-1988	98454.5	341.8	1042.9	7565.9	7575.7
Sep-1988	94316.3	288.1	1125.7	7186.2	11125.6
Oct-1988	95455.9	263.6	1108.2	6931.6	12741.3
Nov-1988	92953.3	230.8	1052.5	6898.3	12850.1
Dec-1988	95853	212.6	874.3	7389.5	16066.5
Jan-1989	84670.4	160.5	1206.3	7080.3	16011.2
Feb-1989	89955.1	173.9	1117.7	7119	17518.7
Mar-1989	95679.5	210.4	1191.2	7243.6	13213.1
Apr-1989	91966.2	250.8	1369.8	6733.1	7333.1
May-1989	96805.9	241.5	1375.4	7192.2	5829.2
Jun-1989	103018.8	302.3	1369.5	7541.4	6469.8
Jul-1989	96392.9	253.9	1121.5	7518.1	5920.9
Aug-1989	101956.2	288.6	1272.1	8058.9	8568
Sep-1989	95346.2	250.9	1209.8	7623.9	10453.6
Oct-1989	96345.5	243.6	1223.3	7575.6	14442.1
Nov-1989	96767.3	207.3	1062.9	7173.5	13825.9
Dec-1989	98273.5	153.9	921.1	7331.2	20417.3
Jan-1990	85439.4	167	916.5	7164.9	13386.8
Feb-1990	89384.3	187.5	877.9	7472	13370.2
Mar-1990	93565.9	215.1	884.8	7447.2	10584.9
Apr-1990	93464.3	229.4	854.8	6828.3	7798.4
May-1990	98446.8	280.4	1036.6	6932	5821
Jun-1990	101663.3	303.4	1059.3	7160	6355.4
Jul-1990	100555.3	317.1	933.7	7333.1	6968.1
Aug-1990	101293.9	340.6	870.7	7602.1	9784

Sep-1990	90891.5	250.9	974 8	7783 8	9395
Oct-1990	93979 4	234.4	723.5	8535.5	13683.3
Nov-1990	93467 1	206.2	942.6	7374 7	12592.4
Dec-1990	89688 9	154.8	1028.2	7370.4	14761 9
lan-1991	85065.6	163.5	849 7	7238	18102.8
Eph-1001	86498 9	155 1	1063.6	71/7 /	12823.7
Mor-1001	88030 3	182.3	1000.0	7160.7	0586 /
Apr 1001	04022.0	102.3	1020.4	7756.2	7024.1
Api-1991 May 1001	94022.9	233	1020.0	7700.0	7024.1 5000.4
May-1991	97234.3	240.0	1029.0	7437.1	5023.4
Jun-1991	97109	302.1	1289.1	7938	5863.5
Jul-1991	97851.7	325.4	1400.2	8245.6	7840.1
Aug-1991	97237.3	295.1	1433	8607.7	8418.8
Sep-1991	92009.3	236.6	1562.4	81/7	11169.3
Oct-1991	93852.9	244.5	1360.5	8138.7	11284
Nov-1991	90070.1	155	1001.5	7514.8	12532
Dec-1991	90951.3	151.9	1137.1	7557.5	13718.6
Jan-1992	85905.7	150.3	1001	7623.5	15265.6
Feb-1992	89277.4	164.7	1058.3	7956.6	13037
Mar-1992	90696.3	186.5	1176.2	8087.8	10178.1
Apr-1992	94637.7	208.8	1324.4	7825.9	8345.6
May-1992	95931.9	244.8	1171.2	7784.4	6541.8
Jun-1992	97634	271.8	1125.1	8534.3	6902.8
Jul-1992	99130.7	281.7	1208.6	9109.7	8415.2
Aug-1992	97230	257.6	1221.9	9591.5	8924
Sep-1992	95196.7	241	1090.9	9365.9	10974.3
Oct-1992	98662.7	218.8	820.7	9066.4	15304.6
Nov-1992	94279.4	160.6	870.5	9042.7	19685.9
Dec-1992	99044.4	167.7	825.9	8887.3	19600.1
Jan-1993	84498.4	136.4	745.9	8495	15972.5
Feb-1993	88956.1	151.7	776.8	8534.9	16809
Mar-1993	89819.4	187.5	949.4	8588.5	13185.9
Apr-1993	92662.5	203	930.9	8734.5	8304.4
Mav-1993	93928.9	234.3	1081.7	9003.5	5840.8
Jun-1993	98726.7	257.6	1134.7	9011.4	7288.6
Jul-1993	99595.7	276.8	978.2	8730	7837.6
Aug-1993	98583.4	266.1	959.4	9192.8	8946.1
Sep-1993	95428.2	229 7	988.1	8423	11238.5
Oct-1993	94292	256.4	846 1	9310.6	14327 4
Nov-1993	95233 5	175 9	801 3	9207.5	16400.4
Dec-1993	96689 6	148 5	774 9	8897.4	15666 1
lan-100/	86503.0	125 5	614.0	8615.1	10000.1
5an-1994 Fob-1994	90802.2	120.0	717.6	8896 5	18060 5
Mor 1004	90802.2	205.7	770.5	0090.0	10009.5
Apr 1004	92400.0	200.7	626.2	9311	7729.1
Api-1994	95515.5	200.0	722.4	9794.0	6214.2
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Jun-1994	101003.7	204.1	723.0	9700.1	0739.0
Jui-1994	98822.9	288.8	585.Z	9450.7	7041.6
Aug-1994	99331.2	291.9	672.7	10095.1	9516.4
Sep-1994	97485.6	257.1	444.8	9575.3	10412.5
Uct-1994	96889.4	246.4	341.9	9793.3	15310.8
NOV-1994	95816.8	204.8	357	10024	13662
Dec-1994	97348.2	184.4	267.4	10205.4	15953.4
Jan-1995	88137.1	136.5	361.2	9033.4	18557.1
Feb-1995	92412	163.1	336.3	9579.5	18945.7

Mar-1995	95449.3	191.6	422.3	9674.1	12069.5
Apr-1995	95509.8	191.6	288	9356.7	9110.5
Mav-1995	99532.7	235.7	322.7	9606	7275.4
Jun-1995	106210.9	245.9	257.8	9967.6	7301.8
Jul-1995	102298.4	264.3	471	10030.5	7979.4
Aug-1995	105494.8	294.5	416	9986.3	9972.4
Sep-1995	99397.4	247.5	429.9	10029	13002
Oct-1995	100243 7	229.6	229.5	9943 5	13929
Nov-1995	99424	177.3	22010	9863.4	16717.8
Dec-1995	97712.6	154.9		9409.1	21813.5
Jan-1996	90734	129.7		9399.6	22623.5
Feb-1996	94133.5	144.3		9925.9	21214
Mar-1996	94680.5	169.8		9469.8	14655.8
Apr-1996	98527.5	206.8		9864.6	10688
May-1996	101884.6	220.5	303 7	9333.4	7355.8
Jun-1996	102762 7	255.8	277.2	9738 1	7041.2
Jul-1996	104611.2	308.5	315.4	9986.2	8759.6
Aug-1996	104624	294.8	306.2	10086.2	10854.6
Sep-1996	97775.6	234 7	000.2	10084 4	12975.2
Oct-1996	100902 1	216	267	9490 1	18038 7
Nov-1996	100142.4	159.6	96.5	9928 7	21508.4
Dec-1996	97499.8	139.6	249 7	10301 7	21261.9
Jan-1997	91596 7	137.6	164 7	9324	22912 7
Feb-1997	93770 9	151.9	274 7	9922	17809.3
Mar-1997	96338 1	177.5	256.5	9846 7	12266 7
Apr-1997	100019.8	208.9	200.0	10709.6	9681
May-1997	102150	230.7		9885.1	7339.1
Jun-1997	104139.5	292.9		10088.2	7022.4
.lul-1997	108199.3	341 1		9964.3	8993 7
Aug-1997	104577.8	310.9		9729 7	10604.4
Sep-1997	100757.8	273.8		9977 1	12355.2
Oct-1997	104298.8	266.3		9736.6	16743 1
Nov-1997	98755.4	183.1		9304.9	17715 1
Dec-1997	100981.3	172.6		9849	19418.5
Jan-1998	93335.8	133.5		9164 1	18144 8
Feb-1998	95042 7	181.9		9518.6	14517.5
Mar-1998	97800.8	161.8		9837.5	13557.3
Apr-1998	101601 1	233.4		9648.3	8170.5
May-1998	103674 5	247.9		9868.6	5635.9
Jun-1998	108427 7	269.4		10514 4	6537 7
Jul-1998	108480.5	313.4	142	10021.8	7517.2
Aug-1998	105706 7	283.1	112	10261.9	8192
Sep-1998	103304 1	281.6		9334	11227 6
Oct-1998	103910 1	259.2		10262	14579.3
Nov-1998	100438.8	185.4		10532.9	13525.1
Dec-1998	103068 7	202.8		10740 7	17606.9
Jan-1999	91871	179.3		10346.5	23037.7
Feb-1999	98490.4	232		11212.6	15380.1
Mar-1999	100821 1	231.6		11730 4	14856.6
Apr-1999	104309.2	243		11102.3	8902.5
May-1999	106738.4	269.6		12335.2	6128.5
Jun-1999	111830.6	356.9		12108.6	5928.7
Jul-1999	111428.8	314.8		11553.6	6708.6
Aug-1999	108402	350.6		11735.3	8441
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Sep-1999	105307.8	310.9	11240.7	11388.5
Oct-1999	106064	280.8	11422.1	11521.6
Nov-1999	104374.9	202.6	12057.6	11036.3
Dec-1999	110269.9	170	12424.3	17904.2
Jan-2000	91354.7	110.7	10069.9	19480.1
Feb-2000	98782.2	147.5	10720.3	16626.3
Mar-2000	100878.5	194.5	10536.3	8827.3
Apr-2000	102444.2	204.3	11155.7	6278.4
May-2000	107877.8	249.7	10281.2	5026.7
Jun-2000	108734 7	251.1	12320.8	5864 7
Jul-2000	108555.8	271.3	12256.2	5913.8
Aug-2000	111192.6	265	11911 7	10043.5
Sep-2000	104305.8	212.1	12655.4	10372 1
Oct-2000	104558 7	207.1	10985 3	10836.2
Nov-2000	104670 /	1/0	11082.0	13456 1
Dec-2000	105315 1	105 3	10808	23040 5
Jan-2001	0/871 6	103.0	10781 3	21822.6
5an-2001 Eab-2001	94071.0	103.9	1171/ 8	17262.0
Mar 2001	101/26 2	121.7	11200.2	17202.1
Nai-2001	101430.3	100.2	11209.2	6540.9
Apr-2001	103930.0	100.3	11121.2	6040.2 5005 9
Way-2001	104724.9	190.3	11/62.9	5095.0 5550.2
Jun-2001	110100.1		11402.0	0000.0
JUI-2001	107331.0	254.7	11763	6832.9
Aug-2001	109299.1	243.5	11685.3	8874.0
Sep-2001	102657.4	137.7	9935.8	9798.3
Oct-2001	106336.7	178.6	10119.1	13691.6
Nov-2001	103687	203.3	10540.8	11986.3
Dec-2001	101977.1	151.5	9884	13661.9
Jan-2002	96823.9	101.6	9944	1/69/.8
Feb-2002	100647.2	120.9	9912.7	13497.6
Mar-2002	99205.1	122.7	9720.8	12504.6
Apr-2002	104367.3	169.4	10648.7	7955.4
May-2002	107777.5	387.9	10152.2	5950.5
Jun-2002	108919.4	158.1	10395.5	5808.4
Jul-2002	110243.9	269.6	10958.3	6737.4
Aug-2002	110467.3	383.9	10209.1	7810
Sep-2002	102330.7	191.3	10530.9	8121.6
Oct-2002	105756.2	215.1	10804.2	14119.7
Nov-2002	103746.4	170	10503.5	14093.4
Dec-2002	101625.7	144	10338.1	17341.4
Jan-2003	97267.5	90.3	9591.3	20458.3
Feb-2003	97207.1	131	9691.5	18404.1
Mar-2003	97037.2	195	9341.8	10413.4
Apr-2003	101647.1	159.3	9088.5	6636.8
May-2003	106900.3	137.3	9270.5	5087.5
Jun-2003	107959.1	342.5	9297.3	5685.6
Jul-2003	110413.7	265.3	9336.8	7180
Aug-2003	111478.2	260.1	9599.5	8538.8
Sep-2003	108871.8	217.4	9325.2	10010.4
Oct-2003	110039.5	159	9569.5	12796.3
Nov-2003	104783.4	162.7	8942.5	11962.8
Dec-2003	106590.7	141.4	9983.4	17461.3
Jan-2004	99394.3	128.9	10010.4	21109.5
Feb-2004	99773	121.7	9801.9	18676.4

Mar-2004	103795.8	200.2	10011.9	10688.6
Apr-2004	107802.3	226	12252.5	6643.8
May-2004	106386.3	177	9952.6	5522.1
Jun-2004	112433.5	181.9	10925.2	6361.8
Jul-2004	110848.5	216.2	10397.5	7600.8
Aug-2004	109691.1	217.3	10633.5	8840.7
Sep-2004	107607.1	237.6	10118.2	9374.2
Oct-2004	104844 6	208.2	10270 1	14158 4
Nov-2004	103855.2	161.2	10328.3	14674.9
Dec-2004	108629.9	142.6	9766	18760.2
Jan-2005	95493 1	102.4	11053.2	19718.2
Feb-2005	100619.5	121 7	12445.2	15440.3
Mar-2005	102214.3	177 1	12512.8	13086 1
Apr-2005	103529.3	172.3	12754 9	6546.4
May-2005	107452 5	193.4	12423 5	5907 5
Jun-2005	110092.6	279.7	12736	5866.8
Jul-2005	108227 7	27 3.7	13321 9	6815 5
Aug-2005	111832 7	240.3	13537 5	8679 5
Sen-2005	100538.3	240.0	12965 7	9017.6
Oct-2005	101958	165.6	11885.9	12143.8
Nov-2005	101550	149.6	12592.3	12145.6
Dec-2005	102720.0	140.0	11126.2	20562
Jan-2006	04707 6	107.1	10196	11118 8
5an-2000 Fob-2006	100521.5	107.1	10685.8	17273 8
Mar-2006	00624	1/5 /	1085.0	1218/ 3
Apr 2006	102291 7	145.4	10075.9	7040.0
Apr-2006	102201.7	170.4	10837	6226.1
lup_2006	104759.5	211.8	11074.3	6367.5
Jul 2006	109200.9	211.0	11074.3	6550 /
Jui-2000	103030.1	210.1	11902 6	7916.2
Aug-2006	107002.0	200	11003.0	0251 5
Oct 2006	103045	179.3	10917.9	12540.2
Nov 2006	104300.1	140.7	10746 4	13049.2
Doc 2006	102041	111.2	11106 7	15450.4
Dec-2000	07509.1	111.2	10671.2	10400.0
Jan-2007	100070 0	04	10071.2	21619 /
Feb-2007	100079.9	94 120 5	10904.3	21010.4
Apr 2007	100202.1	129.0	10072	7212.1
Apr-2007	102170.0	110.0	11101 0	731Z.1 52/1 2
lup 2007	105552.7	145.0	11505.3	5620.1
Jul 2007	100000.0	100.4	11595.5	5050.T
Jui-2007	103000.2	170.0	11600.0	7265 /
Aug-2007	100100.4	100.7	11090.9	7200.4
Sep-2007	102204.0	123.3	11242 6	0942.0
Nov 2007	100070.7	101.0	11042.0	11192.2
NOV-2007	102790.0	101.2	11277.4	12093.0
Dec-2007	99473 06266 2	07.1 75.7	10122.0	10207.0
Jan-2006	90200.3	/ 5./	10122.9	19030.2
Feb-2000	90040.2	90.0	10209.0	10002.9
1VIAI-2008	9/031.4	93.4	10/12.5	11529.8
Api-2008	100399.2	1/1.4	113/1.1	1053.1
Iviay-2008	990Z1.9	101.4	10815.2	54/9./
JULI-2008	99403.5	1/6.4	11683.7	5319.1
Jui-2008	100044.1	189.9	11241.5	0508.8
Aug-2008	99823.7	1/4.8	11453	6572.2

Sep-2008	96996.6	106.6	10893.9	7929.6
Oct-2008	101065.5	142.3	9895.4	13560.1
Nov-2008	97932.2	103.7	9709.8	15010.5
Dec-2008	99852.2	86.3	10063	18723.2
Jan-2009	93271.5	63.4	9709.4	19510.1
Feb-2009	96204.3	83.6	10945.1	14764.5
Mar-2009	95216.2	99.8	10407.5	9534.2
Apr-2009	98564.1	129	10547.7	6760.9
May-2009	99666.3	142.2	10713.3	4887.1
Jun-2009	103209.9	132.2	11288.4	5587.2
Jul-2009	102408.4	154.2	11411.6	6111.6
Aug-2009	100336.2	173.1	10559	6163.7
Sep-2009	99401.2	169	10715.3	7684.9
Oct-2009	97263.2	102.1	10456.1	13869.5
Nov-2009	95458.7	90.9	9974.2	20831.5
Dec-2009	97533.8	72.2	10628.9	20022.4
Jan-2010	88225.9	56.5	9450.1	18229
Feb-2010	93636.4	65.1	9648.1	15973.9
Mar-2010	95594.7	97.3	10661.3	9408.2
Apr-2010	99286.1	130.8	10109	5112.6
May-2010	99355	103	10770.5	4482.6
Jun-2010	103036.8	140.3	11107	5019.2
Jul-2010	103416	169.8	11294.7	5504.3
Aug-2010	102532.8	152.2	11001.5	6546.5
Sep-2010	100707.4	138.7	11286.8	8823.4
Oct-2010	99104.5	267.3	10541.8	8317.2
Nov-2010	98091.1	245.4	10365.8	10228.8
Dec-2010	98671.8	206.5	9991.9	17578.3
Jan-2011	90211.7	183.3	9940.9	18275
Feb-2011	91716.2	198	9983	15247.3
Mar-2011	94380.4	224.5	10355.2	9677.6
Apr-2011	93574.5	222.4	10280.5	5650
May-2011	95163.2	239.1	10756	4247.2
Jun-2011	100067.5	283.7	11080.2	4804.4
Jul-2011	98207	325.6	10949.7	4831.8
Aug-2011	101267.5	312	11188.9	6591
Sep-2011	96975.7	281.1	10738.4	9336.8
Oct-2011	95616.7	254.8	10606.6	10152.5
Nov-2011	96496.2	226.8	10138.1	11147.3
Dec-2011	95962.5	208.2	10250.2	13145.3
Jan-2012	88374	205.1	9267.7	13726.8
Feb-2012	92766.7	244	9975.9	12328.9
Mar-2012	91727.2	240.5	10576.5	6403.5
Apr-2012	95121.1	249	10439	4120.4
May-2012	99148.4	261.9	10613.5	3802.9
Jun-2012	102090.9	265.3	11052.1	4560.3
Jul-2012	98403.9	288.2	11281.8	5140.3
Aug-2012	99592.8	267.7	11316.6	6294.2
Sep-2012	93035.4	216	9984.1	7674.8
Oct-2012	97600.3	127.9	9918.6	8856.5
Nov-2012	95422.7	114.3	10137	10291.7
Dec-2012	93317.3	71.5	9943.8	12380.4
Jan-2013	91771.7	88.2	10308.8	16576.4
Feb-2013	93749.5	75.1	9311.7	14387.6

Mar-2013 Apr-2013 May-2013	94135.8 97530.8 100870.5	93.7 90 115.8		9149.7 10668.5 10007.3	10979.5 6929.7 4213
Jun-2013 Jul-2013	100329.1 100473.7	118.9 143.4		10438.5 10568.6	4313.6 5407.3
Aug-2013 Sep-2013	100600.9 95888.8	157.8 131.1		10464.4 10131.5	6970.2 7890.1
Oct-2013 Nov-2013	96138.3 96586.4	128.2 78.1		9983 9851.8	15026.2 14859.1
Dec-2013 Jan-2014	95448.8 88985.5	73.9 65.7		9704.1 8937.8	18392.7 18554
Feb-2014	92812.3 92422 9	60.6 76 1		9516	14707.7
Apr-2014	95026	84.5		10351.2	6650.2 5165 7
Jun-2014	99731.8 98907.6 100669	00.9 109.5 150.3		10063	5426.2 6795 1
Aug-2014	98706	126.9		9881.5	7369
Oct-2014	97137.1 99068.6 97651.1	120.4		10281.6	14159
Dec-2014	97888	83.4		10966.4	14961.3
Feb-2015	92635 96466.8 94913 1	68.5 74.4		9005.5 9786.4 9970 3	17145.0
Apr-2015	99656.1 100730 9	90 89.8		10193.2	5759.1
Jun-2015	103614	109.4 144		10960.8	5316.6
Aug-2015	101836.4	124.5		10914.1	5969.2
Oct-2015	101300.3	104.8		9994 10802 6	9966 8234 9
Dec-2015	98234.2	77 58 1		10490.4	11332.7
Feb-2016 Mar-2016	98258.8 97860.8	74.3 79.9		9748.3 9898.2	13511.3 7933.7
Apr-2016 May-2016	101825.3 103316.7	90.7 91.3		10056.5 10219.5	5526.2 4244
Jun-2016 Jul-2016	107308.7 105475	117.1 137.5		10848.3 10727.5	4459.9 4258.5
Aug-2016 Sep-2016 Oct-2016	106134.3 104800 102996 9	134.2 104.8 101 7		11260.7 10027.4 9972	5725.2 6648.8 9502 1
Nov-2016 Dec-2016	102655.2 101556.1	97.9 59.1		9972 10064.5 9782.9	8216 15051.8
Jan-2017 Feb-2017	93609 97117.9	52 70.7		9106.7 9989.8	14827.5 10294.2
Maximum Date of Max	112,433.5	387.9	1,845.4	13,537.5	23,040.5



Midwest (PADD				
2) Total				
Distillate plus	Midwest (PADD	Total		
Kerosene All	2) Residual Fuel	Petroleum		
Sales/Deliverie	Oil All	Fuel		
s by Prime	Sales/Deliveries	Wholesale	Total	
Supplier	by Prime	Sales in PADD	Petroleum Fuel	Average Annual
(Thousand	Supplier	2 (Thousand	Wholesale	Petroleum Fuel
Gallons per	(Thousand	Gallons per	Sales in PADD	Wholesale Sales
Day)	Gallons per Day)	Day)	2 (bpd)	(bpd)
28924.8	2802	130,510.2	3,107,385.7	
25316.8		116,451.5	2,772,654.8	
34812.4	3116.4	147,248.6	3,505,919.0	
32861.4	2672.5	134,557.4	3,203,747.6	
30186.3	2527.6	127,365.8	3,032,519.0	
32702	2449	142,951.5	3,403,607.1	
29872.8	2033.9	128,496.7	3,059,445.2	
33337.8	2574	141,585.7	3,371,088.1	
34071.1	2405	142,866.5	3,401,583.3	
32502.7		127,867.1	3,044,454.8	
34575.3	2162.2	141,120.2	3,360,004.8	
41475.5	2077.6	156,543.6	3,727,228.6	3,249,136.5
39472.8	2910.9	152,014.6	3,619,395.2	
31685.4	2076.7	136,710.9	3,255,021.4	
36615.3	1950.6	146,174.4	3,480,342.9	
36226.4	1376.6	140,669.3	3,349,269.0	
39106.6	1360.4	148,976.5	3,547,059.5	
35187.6	1265.6	144,722.6	3,445,776.2	
32332.6	1226.8	141,722.2	3,374,338.1	
33791.8	1154.1	151,306.6	3,602,538.1	
36682.7	1368.6	145,053.1	3,453,645.2	
3/636	1021.6	156,233.9	3,719,854.8	
39727.7	1598.7	158,344.5	3,770,107.1	2 542 250 5
30902.3	1400	140,703.7	3,341,734.0	3,313,236.5
38139.3	1020.7	148,191.9	3,528,378.0	
30031.1	1010.0	100,000.4	3,392,333.3	
3/3/0.0	1004.1	147,210.0	3,303,204.0	
30401	1010.3	149,031.4	3,507,414.3	
3107/ 6	088 3	149,100.0	3 380 121 /	
33507.2	1162 9	148 199 9	3 528 569 0	
35996 5	1277 7	150 330 4	3 579 295 2	
33619.8	1041 4	140 619 1	3.348 073 8	
41112 8	1127 5	166 181 1	3,956,692,9	
37899.5	913.2	154,808 5	3.685.916.7	
38559.4	1496.8	157.250.0	3,744,047,6	3,580,641.3
37027.6		143.969.5	3,427.845.2	2,000,0110
36129.2		139,418.5	3,319,488.1	

42195.2	1600.1	147,868.4	3,520,676.2	
36783.2	1372.7	151,539.9	3,608,092.9	
37552.1	1406	146,739.6	3,493,800.0	
34657.5	1442.8	146,069.3	3,477,840.5	
34123.1	1767.6	142,042.7	3,381,969.0	
36464.1	1951.6	153,444.6	3,653,442.9	
32774.9	1442.3	141,946.3	3,379,673.8	
39504.3	1561	159,322.8	3,793,400.0	
37454.3	1812.7	152.651.9	3.634.569.0	
39250.2	1845.4	158,972.1	3,785,050.0	3.539.654.0
32874.5	1649.5	135,971.0	3.237.404.8	-,
31712.6	1279	134,904.0	3.212.000.0	
33927.6	1500.4	140.010.6	3.333.585.7	
35706.8	1747.4	144.615.9	3.443.235.7	
32613.5	1418.3	138 817 1	3 305 169 0	
33289.6	1517	145 421 2	3 462 409 5	
32135.1	1422	145 133 8	3 455 566 7	
30183.9	1005 7	138 406 2	3 295 385 7	
37372 1	1271	150,400.2	3 587 028 6	
10018	1226.6	158 642 0	3,777,100,5	
32044 7	1623.0	137 767 0	3 280 166 7	
35837 5	1867 5	153 /61 3	3,200,100.7	3 120 218 6
26711.2	1645.6	146 146 5	3,033,040.3	3,420,240.0
27/09 2	1643.0	140,140.5	3,479,070.0	
37400.3	1013.1	147,133.7	3,505,105.5	
43400.3	1210.4	100,107.4	3,047,319.0	
32373.4	1210.0	141,023.0	3,370,730.1	
32231.3	1234.7	140,204.4	3,339,020.0	
34091.3	904.0	102,214.2	3,024,147.0	
32200.1	1041.0	140,010.2	3,432,014.3	
33867	1899.7	150,747.5	3,589,226.2	
30027.4	1828.5	151,497.8	3,607,090.5	
39925.3	1413.5	157,839.4	3,758,081.0	
37994.6	1875.3	153,854.9	3,663,211.9	0 574 400 0
36819.2	2937.8	160,152.9	3,813,164.3	3,571,190.3
34339.1	1696.1	145,163.9	3,456,283.3	
38281.9	1561.1	155,727.4	3,707,795.2	
40136.7	1583.5	159,258.0	3,791,857.1	
35925.8	15/1.2	145,150.0	3,455,952.4	
35881.4	1532.2	148,857.8	3,544,233.3	
37060.5	1/18.8	157,481.1	3,749,550.0	
32902.1	1340.8	145,450.2	3,463,100.0	
38037.4	1//1.5	159,952.7	3,808,397.6	
37369.9	1387	153,641.3	3,658,126.2	
41964	1533	163,327.1	3,888,740.5	
40420.1	1967.1	161,424.1	3,843,431.0	
43440.3	2443.6	172,980.9	4,118,592.9	3,707,171.6
33013.4	1753.5	141,841.5	3,377,178.6	
38529.4	1707.3	151,528.6	3,607,823.8	
37060.2	1454.9	151,213.0	3,600,309.5	
37731.9	1062.7	147,969.8	3,523,090.5	
37376.6	1570.7	151,464.1	3,606,288.1	
38598.7	1459.1	156,599.2	3,728,552.4	
37494.2	1707.3	155,308.8	3,697,828.6	
40167.1	1310	161,368.4	3,842,104.8	

38106	1236.9	148,638.9	3,539,021.4	
39832.8	1305.1	158,294.0	3,768,904.8	
37178.1	1473.7	153,234.8	3,648,447.6	
34463.2	913.1	148,380.5	3,532,869.0	3,622,701.6
39163.2	726.8	151,309.6	3,602,609.5	
33043.4	732.8	141,464.9	3,368,211.9	
34295.2	661.8	141,837.1	3,377,073.8	
35846	694.7	146,703.8	3,492,947.6	
36673.2	598.1	149,036.7	3,548,492.9	
36221.1	956.8	149,679.6	3,563,800.0	
36030.7	848.9	152,542.6	3.631.966.7	
35653.7	1012.5	152,658,1	3.634.716.7	
38237.6	787.5	152,179,7	3.623.326.2	
41285.5	1023.4	157,189.5	3.742.607.1	
35302.2	1082.6	147.658.2	3.515.671.4	
34628	924.1	149.068.5	3.549.250.0	3.554.222.8
37516	713.8	148,175.9	3.527.997.6	0,000,000
34857.1	596.1	146.947.2	3.498.742.9	
36328.5	650.9	147 304 3	3 507 245 2	
37365.2	775	150 482 6	3 582 919 0	
37688 7	849	150 211 8	3 576 471 4	
36531.6	568.8	151 568 4	3 608 771 4	
35765 1	703	154 614 0	3 681 285 7	
36590 3	929 1	154 744 4	3 684 390 5	
40159.6	976 5	158 004 9	3 762 021 4	
128/1 8	082.8	167 807 8	3 007 566 7	
38644 1	902.0 905 /	163 588 6	3,897,500.7	
12115 3	1130 /	171 801 1	1 000 502 1	3 701 073 /
42143.3	718	1/7 803 7	3 510 135 7	3,701,073.4
39096 1	610	147,003.7	3,519,155.7	
37700 7	626.4	151,524.0	3,004,071.4	
3703/ 1	610.7	1/0 380 1	3,556,660,0	
37957 7	657	149,300.1	3,550,009.0	
29707.2	570.6	140,703.9	3,340,309.0	
3560/ 1	842	153,090.0	3,665,581,0	
29755 2	910 2	157,512 /	3,005,501.0	
40000 8	10/1 1	157,513.4	3,750,319.0	
40099.0	726 /	162 776 0	3,740,771.4	
43000	066	164 237 0	3,07,0,040.3	
41452.4	300 702 0	165 /29 0	3,910,404.0	2 706 /19 5
42559.2	004 7	105,450.9	3,939,021.4	3,700,410.5
40313	994.7	157,299.7	3,745,231.0	
39477.4 40242.4	900.4 700 G	159,103.0	2,700,100.7	
40243.1	702.0 615.7	154,750.2	3,004,242.9	
40101.9	659.7	154,590.0	3,000,720.0	
40249.3	000.7	100,941.9	3,003,∠03.3 2,925,200,5	
41333.2	072.5	100,003.0	3,023,309.5	
33301.7 44270 F	000.7 670.0	102,371.0	3,027,093.Z	
41319.3	019.9 770 0	101,900.7	3,000,000.U	
42099.0		101,044.0	3,040,304.0	
44010	000.Z	107,000.0	3,330,013.0 2 002 F72 0	
42200	140.0	103,000.1	3,00∠,313.8 2,000,047.6	2 702 006 0
40400.7	000.9 EE1 E	100,020.4	3,323,241.0 3 600 060 0	3,733,330.0
3031Z.1 40472	004.0 4400 7	100,002.0	3,030,003.U 3 994 940 E	
40472	1120.1	103,037.3	3,001,040.3	

40427.6	348.8	158,583.2	3,775,790.5	
38232.9	392.9	153,082.4	3,644,819.0	
39027.3	468.2	156,468.0	3,725,428.6	
42454.5	360.4	166,798.9	3,971,402.4	
37831	322.8	159,197.4	3,790,414.3	
42352.7	292.9	168,809.6	4,019,276.2	
42988.5	320.8	166,415,1	3,962,264,3	
46097.1	519.8	171,192,2	4.076.004.8	
42965.7	494.2	169.642.4	4.039.104.8	
40863.1	623.9	170.577.1	4.061.359.5	3.887.214.5
41550.8	707.3	165 144 9	3 932 021 4	0,001,21110
42535.3	729.6	168 682 6	4 016 252 4	
40808.4	599.7	160,384.0	3 818 666 7	
43510.3	423.7	163 220 9	3 886 211 9	
41422.2	471	160,220.0	3 833 123 8	
41363 7	434 1	161 872 8	3 854 114 3	
40724 9	688.2	165 394 0	3 937 952 4	
41664 4	580.4	168 410 6	4 009 776 2	
43010.2	607.7	164 777 8	3 023 281 0	
43010.2	337.3	176 602 3	1 206 959 5	
47441.1	007.0	176,092.3	4,200,959.5	
43043.7	023.0	170,505.1	4,202,454.0	2 072 007 /
40427.0	1206 4	169 221 0	4,007,154.0	3,973,997.4
42709.0	1390.4	100,321.9	4,007,004.3	
39019.0	4/0	102,220.0	3,002,330.1	
40973.0	000.0	160,512.9	3,021,733.7	
44704.8	704.3	166,028.4	3,953,057.1	
43605.5	000.4	163,765.9	3,899,188.1	
41733.7	332.4	163,609.1	3,895,454.8	
42916.8	451.4	170,866.6	4,068,252.4	
41420.4	489.7	167,132.9	3,979,354.8	
45446	430.5	169,240.4	4,029,533.3	
49929.2	537.7	181,511.7	4,321,707.1	
41644.6	529.6	168,132.7	4,003,159.5	
41/65.6	/12.9	172,899.9	4,116,664.3	3,996,525.8
42114.6	483.4	163,376.2	3,889,909.5	
41784.3	588.4	161,633.4	3,848,414.3	
42212.3	579.4	164,149.1	3,908,311.9	
42872	620.3	163,145.6	3,884,419.0	
41897.8	469.6	161,794.3	3,852,245.2	
44716.4	477.2	170,942.8	4,070,066.7	
41882.7	468.9	168,826.5	4,019,678.6	
42577.2	580	167,600.9	3,990,497.6	
46841.7	355.1	171,344.1	4,079,621.4	
48158.7	392.6	177,561.9	4,227,664.3	
43506.8	510.6	168,699.6	4,016,657.1	
44171.1	671.8	176,462.0	4,201,476.2	3,999,080.2
42455.5	773.2	168,663.2	4,015,790.5	
42648	481.4	168,444.5	4,010,583.3	
45902.7	659.3	174,201.7	4,147,659.5	
44123.1	315.3	168,995.4	4,023,700.0	
44010.6	476.1	169,958.4	4,046,628.6	
46516.6	524	177,265.4	4,220,604.8	
44774.2	361.6	175,141.6	4,170,038.1	
46451.3	601.3	175,981.5	4,190,035.7	

48054.5	515	176,817.4	4,209,938.1	
50413.3	511.3	180,213.1	4,290,788.1	
47725	578.7	175,975.1	4,189,883.3	
46069.7	534.3	187,372.4	4,461,247.6	4,164,741.5
40483.3	428.3	161,927.0	3,855,404.8	
42018.3	573.2	168,867.8	4,020,661.9	
43526.3	341.6	164,304.5	3,912,011.9	
43674.4	435.1	164,192.1	3,909,335.7	
47302.5	442.4	171,180.3	4,075,721.4	
45550.4	549.6	173,271.3	4,125,507.1	
41764.5	426	169,187.6	4,028,276.2	
48634.7	547.2	182,594.7	4,347,492.9	
47588.5	608.6	175,742.5	4,184,345.2	
50481.7	463.1	177,532.1	4,226,954.8	
46774	507.6	177,540.0	4,227,142.9	
46572.6	711.3	186,552.8	4,441,733.3	4,112,882.3
47392.1		174,971.5	4,165,988.1	
45088.9	1338.7	175,516.7	4,178,969.0	
48379	872.8	174,417.9	4,152,807.1	
47487.8	908.7	170,169.0	4,051,642.9	
47015	869.9	169,073.6	4,025,561.9	
46202.1	941.5	174,528.8	4,155,447.6	
44179	588.3	170,949.5	4,070,226.2	
48165	660.1	178,927.6	4,260,181.0	
47002.3	537.3	170,068.8	4,049,257.1	
52372.1	436.5	183,134.6	4,360,347.6	
47126.9	544.7	174,089.0	4,144,976.2	
41108.5	477.4	167,260.4	3,982,390.5	4,133,149.6
43109.5	460.4	168,137.2	4,003,266.7	
42607.1	444.5	167,230.0	3,981,666.7	
41939.2	546.3	164,038.7	3,905,683.3	
45936.8	473.7	169,551.3	4,036,935.7	
45621.6	478.5	170,368.2	4,056,385.7	
45850.9	488.2	171,620.5	4,086,202.4	
45416.5	570.2	174,195.9	4,147,521.4	
46157.8	430.7	175,458.8	4,177,590.5	
46432.6	554	168,161.1	4,003,835.7	
49903.2	472.1	181,270.5	4,315,964.3	
44655.7	559.1	173,728.1	4,136,383.3	
40777.3	747	170,973.5	4,070,797.6	4,076,852.8
42649.5	676.7	170,733.6	4,065,085.7	
42730.6	520.1	168,684.4	4,016,295.2	
41134.2	733.8	158,855.4	3,782,271.4	
45013.3	645	163,190.0	3,885,476.2	
44950.4	648.4	166,994.4	3,976,057.1	
44672.2	630	168,586.7	4,013,969.0	
46357.9	858.8	174,412.5	4,152,678.6	
45046.6	729.2	175,652.4	4,182,200.0	
49117.5	619	178,161.3	4,241,935.7	
52246.6	766.5	185,577.4	4,418,509.5	
44032	948.2	170,831.6	4,067,419.0	
42073.8	815.1	177,065.7	4,215,850.0	4,084,812.3
42774.6	784	174,201.7	4,147,659.5	
42493.7	677.5	171,544.2	4,084,385.7	

45368.6	729.6	170,794.7	4,066,540.5	
48435.7	886.6	176,246.9	4,196,354.8	
43846.3	743.6	166,627.9	3,967,331.0	
47979.8	897.3	178,779.5	4,256,654.8	
44959.4	863.3	174,885.7	4,163,945.2	
47045.6	752.6	177,180.8	4,218,590.5	
50122.5	617.4	178.077.0	4,239,928,6	
49624.8	866.2	179.972.3	4.285.054.8	
46946	774.8	176,740,4	4.208.104.8	
44558.9	979.5	182.837.1	4.353.264.3	4,182,317,9
40789 1	845.8	168 001 8	4 000 042 9	.,,
42332	783.4	171 742 1	4 089 097 6	
47062.8	938.4	175 991 5	4 190 273 8	
46265.2	837.3	170 105 4	4 050 128 6	
46616.6	619.1	173 212 6	4 124 109 5	
48567.8	1251 5	178 794 4	4 257 009 5	
40007.0 44474 8	983.1	174 050 1	4 144 050 0	
50065 5	903.1 904 7	185 260 2	4,144,000.0 1 / 10 057 1	
10361 5	1205 7	173 310 7	4,410,357.1	
49304.5	1200.7	175,319.7	4,120,009.0	
47740.0	1062.7	175,247.1	4,172,000.0	
4/400.4	052.7	191 707 9	4,200,790.5	1 171 515 7
44011.0	900.2	101,797.0	4,520,519.0	4,174,515.7
44910.4	011 6	100,010.7	3,940,921.4	
40002.4	911.0	170,371.8	4,199,328.6	
47453.8	1034.3	172,317.7	4,102,802.4	
48422.6	1046.9	169,904.5	4,045,345.2	
48662.3	959.1	171,501.0	4,083,357.1	
49203.7	/3/.1	176,855.3	4,210,840.5	
45751.6	850.8	170,290.0	4,054,523.8	
48670.1	1018.5	177,379.0	4,223,309.5	
47307.9	652.6	171,687.4	4,087,795.2	
52009.8	588.5	181,417.1	4,319,454.8	
48008.5	1015.1	176,186.0	4,194,904.8	
42373.8	884.8	172,013.2	4,095,552.4	4,129,844.6
45943.9	847.4	172,718.2	4,112,338.1	
47917.5	832.1	181,446.2	4,320,147.6	
47113.4	865	170,476.7	4,058,969.0	
48393.3	831.1	169,806.8	4,043,019.0	
50122.5	897.1	171,122.1	4,074,335.7	
49326.3	784.9	173,050.8	4,120,257.1	
46568.6	806.6	169,087.1	4,025,883.3	
49951.7	745.4	175,980.5	4,190,011.9	
49337.8	844.7	172,684.9	4,111,545.2	
56453.9	709.8	185,506.7	4,416,826.2	
52438.8	934.7	179,644.1	4,277,240.5	
44951.5	846.2	172,186.4	4,099,676.2	4,154,187.5
48221.5	714.1	174,438.7	4,153,302.4	
47767.8	685.3	176,017.6	4,190,895.2	
48071.2	665.6	168,703.9	4,016,759.5	
51150.1	829.3	170,974.2	4,070,814.3	
51179.8	826.6	168,090.6	4,002,157.1	
49839.8	761.4	167,243.9	3,981,997.6	
49171.6	716.3	167,872.2	3,996,957.1	
48240	640.9	166,904.6	3,973,919.0	

49732.7	686.5	166,345.9	3,960,616.7	
52545	532.2	177,740.5	4,231,916.7	
47503	414.5	170,673.7	4,063,659.5	
47011	579.6	176,315.3	4,197,983.3	4,070,081.5
43702.8	533.6	166,790.8	3,971,209.5	
42617.2	428.9	165,043.6	3,929,609.5	
42446.2	311.7	158,015.6	3,762,276.2	
42873.1	377.2	159,252.0	3.791.714.3	
42323.4	320.8	158,053,1	3,763,169,0	
44397.2	380.4	164,995,3	3.928.459.5	
43470.4	362.7	163,918,9	3.902.831.0	
42327.5	366.3	159.925.8	3.807.757.1	
45968.5	288	164.226.9	3.910.164.3	
45730.7	296.7	167,718.3	3,993,292,9	
46216.6	259.5	172 831 4	4 115 033 3	
43628.6	348.1	172.234.0	4,100,809.5	3,914,693,8
392197	263.1	155 444 3	3 701 054 8	0,011,00010
43168 1	194 4	162 686 0	3 873 476 2	
46492 1	260.5	162,50010	3 869 383 3	
49501.8	290.9	164 431 2	3 915 028 6	
45654 1	319.1	160 684 3	3 825 816 7	
48937 8	378.1	168 619 2	4 014 742 9	
46550 7	403.4	167 338 9	3 984 259 5	
48866	378.7	169 477 7	4 035 183 3	
52222 4	354.9	173 533 6	4,000,100.0	
52876 6	230 5	170,000.0	4,101,702.4	
49134 2	302	168 367 3	4,073,475.2	
46578	343 5	173 370 0	4 127 857 1	3 963 897 8
40070	209.9	163 019 4	3 881 414 3	0,000,007.0
46288	101 4	163 623 9	3 895 807 1	
40200	163.5	162 172 2	3 861 242 9	
45326 3	206.1	155 259 8	3 696 661 9	
46656 2	249.6	157 311 3	3 745 507 1	
40508.2	240.0	166 096 9	3 954 688 1	
45727 1	223 7	160,000.0	3 815 831 0	
51617.8	333.0	171 311 1	4 078 835 7	
51234 7	308.3	168 965 0	4,070,000.7	
54156	244 3	171 030 9	4,022,070.2	
50777 8	244.0	169 028 4	4 024 485 7	
46373 3	212.2	166 152 6	3 956 014 3	3 917 135 7
45943 4	150.6	157 667 6	3 753 990 5	0,017,100.7
47354 9	173.1	162 843 5	3 877 226 2	
45697 5	213.3	154 858 5	3 687 107 1	
48646 9	195.2	158 771 6	3 780 276 2	
40040.5	275.2	164 024 3	3 905 340 5	
40721 2	269.7	167 969 6	3 999 276 2	
47796 1	205.7	163 206 2	3 885 861 9	
51312.2	200.0	169 052 5	4 025 059 5	
49060 6	203	160 187 7	3 813 992 9	
53338 2	270.0	170 070 6	4 049 300 0	
48907	215 3	165 088 0	3 930 666 7	
42792 2	210.0	158 706 4	3 778 723 8	3 873 001 8
46771 5	159 7	165 676 3	3 944 673 8	0,010,001.0
45608 1	262.8	163 394 8	3,890 352 4	
			0,000,000	

45505.5 48509.1	209.5 252.5	160,073.7 163,980.6	3,811,278.6 3,904.300.0	
49931.7	181.6	165.319.9	3.936.188.1	
48091 2	191.8	163 483 1	3 892 454 8	
50117 1	218.9	166 929 0	3 974 500 0	
49693 2	241.1	168 127 6	4 003 038 1	
49128 2	166.7	163 336 4	3 888 961 9	
56194 6	185.2	177 655 5	4 220 802 0	
50610.2	127.1	172 112 7	4,223,032.5	
46800 1	120.5	170 540 1	4 060 478 6	3 969 503 4
48270 7	88.2	164 901 9	3 926 235 7	0,000,000.1
48612 5	122.3	165 831 4	3 948 366 7	
47557.6	118.4	161 175 5	3 837 511 9	
51112.8	161.9	163 386 6	3 890 157 1	
52161 5	142 7	167 353 6	3 984 609 5	
51450.5	186.3	166 384 9	3 961 545 2	
52308 8	190.4	170 365 3	4 056 316 7	
48899 1	199.7	165 182 2	3 932 909 5	
53694 5	100.1	171 107 7	4 076 135 7	
58814.8		182 444 4	4,070,100.7	
52433.9		174 154 3	4 146 531 0	
50348 9		174,104.0	4 148 761 9	4 021 082 9
48526.9	67.9	167 701 7	3 992 897 6	4,021,002.0
51100 2	07.5	174 538 3	4 155 673 8	
178/0 1		163 203 0	3 887 928 6	
51303 7		167 002 1	3,007,320.0	
18483		16/ /23 0	3,970,240.3	
50806 7		170 807 5	1 068 088 1	
10065 2		170,037.3	4,000,300.1	
50009 2		168 853 /	4,037,731.0	
55066		174 220 6	4,020,319.0	
57089 9	139.4	178 173 2	4 242 219 0	
48631 1	100.4	166 865 4	3 972 985 7	
47887 7		168 022 0	4 000 523 8	4 039 872 6
4/809 9		164 076 2	3 906 576 2	4,000,072.0
46275.8		167 868 5	3 996 869 0	
46251 0		162 024 5	3,857,726,2	
40201.9		165 023 4	3,007,720.2	
47049 5		164 921 0	3 926 690 5	
50871 1		173 605 1	3,320,030.3 1 1 3 3 1 5 1 8	
46018.8		166 617 3	3 967 078 6	
50603.8		173 858 2	<i>3,307,070.0</i> <i>1</i> 139 <i>1</i> 81 0	
52178 0		173,050.2	4,133,401.0	
55/20.8		178,759.9	4,137,140.5	
52020 7		172,054.2	4,230,134.0	
17005 0		17/ //5 Q	4,141,703.0 1 152 171 1	1 012 061 7
47995.9		162 275 0	2 962 711 0	4,043,901.7
44000.7		102,273.9	2,003,711.9	
407 13.9		104,100.5	3,909,230.0	
58,814.8	3,116.4	187,372.4	4,461,247.6	4,182,317.9
			Dec-99	Jan-00

2012 average	3,873,901.8
2016 average	4,043,961.7
Increase 2012 to	170,059.9



Back to Contents	Data 1: Motor Gas	Data 3: Other Proc	lucts		
Sourcekey	C100030001	C400030001	C910030001	C500030001	C900030001
	Gulf Coast (PADD 3)	Gulf Coast (PADD 3)	Gulf Coast (PADD 3) Jet Fuel Naphtha All Sales/Deliveries	Gulf Coast (PADD 3) Kerosene- Type Jet Fuel All Sales/Deliverie	Gulf Coast (PADD 3) Propane All Sales/Deliverie
	Total Gasoline All	Aviation Gasoline All	by Prime	s by Prime	s by Prime
	Sales/Deliveries by	Sales/Deliveries by	Supplier	Supplier	Supplier
	Prime Supplier	Prime Supplier	(Thousand	(Thousand	(Thousand
Date	(I nousand Gallons	(Inousand Gallons	Gallons per	Gallons per	Gallons per
Jan-1983	43639.9	143.5	3242.5	6145.5	14964.4
Feb-1983	43521.2	190.8	3296.5	6498.9	14892.3
Mar-1983	48468.7	191	3628.4	7392.5	14006.4
Apr-1983	48648.7	242.8	3968.6	6722.3	12362.5
May-1983	46763.3	186.1	3937.9	6189.6	10774.5
Jun-1983	49604.9	239	4186.5	7180.8	9650.9
Jul-1983	48122.5	212.9	3170.8	6589.3	10468.3
Aug-1983	51690.4	225.2	2995.6	8/62.4	10287.2
Oct-1983	49034.0	200.4	3667.4	8210.1	11986 7
Nov-1983	46531.6	161.6	3924.2	8932.3	14086.8
Dec-1983	48032.1	121.1	3632.8	8471.3	13836.7
Jan-1984	45248.5	166.1	1961.7	7699.6	15315.7
Feb-1984	47529.7	169.2	3524.2		12126.5
Mar-1984	47320.5	180.2	4178.1		11210
Apr-1984	46193.2	192.8	3729		11376.7
May-1984	48972.7	211.7	3900.9	70/1 0	11108.7
Jul-1964	49303.0	232.2	3927.9 4082.4	8601.6	12217 7
Aug-1984	50139	243.4	4489.4	0001.0	12072.1
Sep-1984	46045	196.7	3909	8835.2	12205.4
Oct-1984	49227.8	172.7	4364.1		10999
Nov-1984	50919.1	209.4	3558.4	9268	11485.3
Dec-1984	46601.8	141.8	3066.8	9555.3	13065.5
Jan-1985	45838.5	142.7	3272.4	9454.3	15721.4
Feb-1985	49102.2	242.0	3400.6	9986.1	16326.8
Mar-1985	51209	242.8	2801.3	10409.2	13995.0
May-1985	54143.8	217.2	3545.2	9152 5	12030.0
Jun-1985	52455.1	257.1	4002.1	9028.2	10556.7
Jul-1985	54375.9	230.5	3662.9	9545.4	11167.2
Aug-1985	53964.9		2479.9	8550.2	10976.9
Sep-1985	52881.1	171.9	3069.1	11506.8	11179
Oct-1985	54153	157.9	3171	10592.1	12206.5
Nov-1985	55775.2	175	4438.5	11370.7	12930.6
Dec-1985	56075.4	261.6	4004.6	12409.5	15373.6
Jan-1900 Feb-1986	56099.5	144 1	3739.9	10956.5	13779.8
Mar-1986	54379	137.5	3249.4	10565.4	10662.1
Apr-1986	57331.2	180.1	3377.9	9408.7	10533.8
May-1986	62459.2	163.2	3236.4	10436.2	10359.1
Jun-1986	58273.6	235.1	3315.4	9658.3	8825.8
Jul-1986	56870.4	247.5	3254	9990.3	9718.3
Aug-1986	57359.5	209.9	2859.8	10720.3	8306.7
Sep-1986	56208.3	204.6	3462.5	11174.3	11136.8
UCT-1986	50051.5	1/6	3737.4	11544.9	10300.8
Dec-1986	59143.2	119.2	3002.9	13223	14391 4
Jan-1987	51757.3	135	3188.3	10959.6	14718.8
Feb-1987	52687.5	118.9	3362	11415.1	14733.1
Mar-1987	57642.3	192.9	3175.5	12008.1	12644
Apr-1987	57955.7	210.9	3636.5	10505.3	12524.7
May-1987	57114.6	190	2561	10955.6	9405.7
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Jun-1987	57696.9	178.8	3673.6	10653.8	9060.6
Jul-1987	59257 4	220.9	3446	10714 4	10343 9
Δug-1987	55491	255.3	3594	11768 5	10896 3
Sop-1087	54148.2	200.0	3886.3	12101	12208.0
Oct 1097	52127 6	209	2526	11022 6	14200.9
Nov 1097	53127.0	223.0	2014.2	11052.0	14200.0
NOV-1967	52479.9	104.4	3914.2	11004.7	12190.4
Dec-1987	50637.4	132.3	3226.9	12249.8	15/80.4
Jan-1988	48706.7	102.7	3227.8	11496	1/16/.2
Feb-1988	54450.4	1/3.6	3315.9	13500.7	14658.3
Mar-1988	60555.2	165.1	3378.8	11237	13324
Apr-1988	60366.4	147.8	3231.2	11547.9	11151.7
May-1988	58699.9	156.7	3101.3	12889.1	11660.2
Jun-1988	63013.5	176.7	3305.6	12519.9	11021.8
Jul-1988	59480.1	220.2	2930.4	13314.8	11620.7
Aug-1988	60100	184.5	2583.8	11689.4	12382.9
Sep-1988	57368.2	173	3188.9	13492.2	11667.5
Oct-1988	56345.4	142.7	3150.1	13346.3	12563
Nov-1988	56026.1	132.9	2726.9	11402.6	11452.9
Dec-1988	57193.2	123.3	3149.3	10982.8	14514.9
Jan-1989	51108.8	94.5	2634.5	11210.8	12906.8
Feb-1989	49979.6	92.1	2954.6	10572	14743.2
Mar-1989	58625.5	150.7	3380.2	10907.5	12774.4
Apr-1989	55500.4	152.6	4076	11503	10545.6
May-1989	58499.5	149.2	3759.7	13787	9635.9
Jun-1989	55722.7	194.9	3271.3	13051.6	8770.1
Jul-1989	54451.8	177.6	3264.7	12957.3	9342.1
Aug-1989	55892.1	184.3	3069.4	12109.3	9926.9
Sep-1989	55860.8	148.1	2686.5	12957.7	9197.7
Oct-1989	53804.3	139.4	4006	12884.7	11514.6
Nov-1989	52048.6	119.5	2953.7	11599.8	11991.6
Dec-1989	52974.7	92.2	4074.3	10490.7	15467.3
Jan-1990	50806.2	118	3009.6	12359.5	14806.9
Feb-1990	53462.9	117.3	3192.7	12883.8	12615.2
Mar-1990	55308.6	142.8	3073.5	12933.6	10731.6
Apr-1990	54921	183.1	3064.4	11125.4	10103.7
May-1990	59164.4	153.6	3068.5	12694.5	9017.5
Jun-1990	59717.8	207.2	3322.6	12061.2	8616.5
Jul-1990	56664	225.4	2613.5	12479	10176.7
Aug-1990	61467.3	190.1	3348.7	11998.7	11529.1
Sep-1990	56100.4	138.2	3910.5	14239.5	10545
Oct-1990	55107.9	125.9	3312.8	13622.5	10198.7
Nov-1990	56398.1	114	2751.7	14467.9	10684.7
Dec-1990	55139.2	79.8	2992.5	11708.4	11520.8
Jan-1991	54633	93.5	3359	12366.4	12797.2
Feb-1991	54310.9	102.4	3697.5	13172	13116.2
Mar-1991	56360.2	119.4	2512.9	12195	10098
Apr-1991	57304.7	121.2	2804.2	13212.4	10185.2
May-1991	57005.6	135.6	3221.5	13997.5	9170.2
Jun-1991	54033.9	169.4	2530.7	12596.9	8924
Jul-1991	54784.5	176.2	2720.8	12966.5	10106.5
Aug-1991	54360.7	169.2	2977.9	13849	9086.2
Sep-1991	51048.7	141.3	2777.2	13554.6	9215.2
Oct-1991	52098.9	144	2972.6	13025.4	10365.5
Nov-1991	51214.3	105.3	3651.2	13368.8	10541.2
Dec-1991	53460.8	95.6	2931.3	13050	12096.5
Jan-1992	51367.6	97	2733.9	11670.2	15548.4
Feb-1992	54553.7	121.5	3054.5	13523	12483.3
Mar-1992	55116	137.4	2737.4	12487.3	11219.4
Apr-1992	59283.5	146.8	2851.8	12567	9446.2
May-1992	55847.2	150	3113.5	13514.8	9229.2
Jun-1992	54122.8	177.7	2813	14098.3	10240
Jul-1992	54925.4	202.5	2279.1	12589.9	11760.2
Aug-1992	51994.4	176.1	2365.8	11948.7	11766.4
Sep-1992	52545.5	155.6	2728.2	12516.3	11185.4
Oct-1992	54919.8	155.8	3350.6	13803.6	10251.6

Dec-1992     55346.9     101     2386     11992.4     14207.3       Fab-1993     46276.5     129     2500.9     11141.9     14744.6       Mar-1993     47790.3     146.9     2049.8     12216.7     1068.5       Apr-1993     47790.3     146.9     2049.8     12267.2     11431       Jul-1993     49406.1     182.2     2823.3     12267.2     11431       Jul-1993     48473.4     196.9     2638.9     12216.7     1092.8       Aug-1933     48282.8     196.4     2460.6     12483.3     11538.8       Oct-1933     48172.5     1367.1     1362.8     1198.4     12007.6       Sep-1934     48262.8     166.1     174.8     1374.7     1368.8     1969.4       Nov-1933     9477.1.4     121.4     1781     12376.4     1224.4     15007.6       Feb-1994     45067.8     105.1     1352.8     11724.4     15007.6       Jan-1994     48672.6     160.1     974.9     1382.8     11692.5	Nov-1992	53460.1	102.1	2272.9	13929.1	12059.8
Jan-1933     42350.4     B4     1907.     11068.5     13722.1       Mar-1933     47311.9     131.6     3026.6     1142.2     13136.2       Mar-1933     47790.3     146.9     2049.8     1226.7     10454.4       May-1933     47628.8     139.4     2335.4     1226.7     11431.1       Jul-1933     49496.1     182.2     2223.3     1226.7     11431.1       Jul-1933     48473.4     196.9     2838.9     12311.6     10002.8       Sep-1933     48282.8     160.4     2406.6     12483.3     11538.8       Nov-1933     4977.4     121.4     1781     12302.8     13883.8       Nov-1933     4977.4     121.8     131.5     10466.4     13924.3       Nar-1944     4805.5     122.6     501.3     1343.2     19866       Nar-1944     4805.5     174.8     517.8     1347.6     1982.3       Jun-1944     49365.9     152.6     513.3     1343.2     19866       May-1944     49365.7	Dec-1992	55346.9	101	2386	11992.4	14207.3
Feb-1933     46276.5     129     2500.9     1141.9     14744.6       Mar-1933     47790.3     146.9     2049.8     12216.7     10454.4       May-1933     47628.8     139.4     2335.4     12586     29250.1       Jun-1933     49496.1     182.2     2823.3     12267.2     11431       Jun-1933     49496.1     182.2     2823.3     12267.2     11431       Jun-1933     48275.3     185.6     2006.4     11982.9     10007.5       Sep-1903     48275.3     185.6     2006.4     11982.9     10007.5       Sep-1903     48275.4     105.1     1352.8     11724.4     15007.6       Sep-1904     47537.4     121.8     831.5     10468.4     1392.3     14629.5       Jun-1994     48665.5     174.8     517.8     1374.7     9987.1     1342.9     1966.4       Jun-1994     49657.8     220.9     572.6     13847.1     11756.2     12469.3     12309.3     130303.3     124989.5     1256.5     1278.7     <	Jan-1993	42350.4	84	1990.7	11068.5	13972.1
Mar-1993     47731.9     131.6     3026.6     11422     13136.2       May-1993     47628.8     139.4     233.4     1226.7     10454.4       May-1993     47628.8     139.4     233.4     1226.7     11431       Jul-1993     48473.4     196.9     283.9     1226.7     11431       Jul-1993     48275.3     183.6     2064.6     12483.3     11538.8       Oct-1993     48275.3     185.6     2095.4     11982.9     12366.8       Nov-1983     4317.7.3     136.7     1481.4     10664.2     12286.8       Nov-1983     4377.4     121.8     1345.5     10468.4     13924.3       Mar-1994     45057.6     160.1     974.9     11382.8     11692.5       Apr-1994     43665.9     152.6     501.3     13432     9896       May-1994     48665.5     174.8     517.8     1326.7     12780.1       Jun-1994     49065.9     162.6     501.3     13432.9     9806       May-1994     48075.8	Feb-1993	46276.5	129	2500.9	11441.9	14744.6
Apr-1933     47790.3     146.9     2049.8     12216.7     10454.4       May-1933     49496.1     182.2     223.3     12267.2     11431       Jun-1933     48475.3     183.6     2095.4     11982.9     10407.5       Sep-1933     48272.8     169.4     2060.6     12311.6     10022.8       Nov-1993     49771.4     121.4     1781     12392.8     1383.8       Nov-1993     50348.8     124.6     101.5     13012.8     11692.5       Nov-1993     49771.4     121.4     1781     12392.8     13883.8       Dec-1993     50348.8     124.6     101.5     13012.8     11692.5       Apr-1994     45037.8     105.1     1322.8     11724.4     15007.6       Apr-1994     48665.5     174.8     517.8     13432.9     966       Ayr-1994     48665.5     174.8     517.8     13476.7     9987.1       Jun-1994     48665.5     174.8     517.8     13343.7     12789.1       Aug-1994     50211.7 <td>Mar-1993</td> <td>47311.9</td> <td>131.6</td> <td>3026.6</td> <td>11622</td> <td>13136.2</td>	Mar-1993	47311.9	131.6	3026.6	11622	13136.2
May-1993     47628.8     139.4     2235.4     12298     9250.1       Jul-1993     48473.4     196.9     2838.9     12287.2     11431       Jul-1993     48275.3     183.6     2095.4     11982.9     10007.5       Spp-1993     48275.3     183.6     2095.4     11982.9     10007.5       Sov-1993     49771.4     121.4     1781     12289.8     1388.8       Dec-1993     50348.8     124.6     2101.5     13012.8     14669.1       Jan-1994     45047.8     105.1     1352.8     11724.4     1500.5       Apr-1994     48665.5     174.8     831.5     10468.4     13924.3       May-1994     48665.5     174.8     517.8     1343.2     9896       May-1994     48665.5     174.8     517.8     1342.5     12990     10681.6       Jun-1994     49067.1     166.1     103.5     13849.3     1300.3     1320.5     1299.0     10681.6     120.5     1282.5     1282.5     1282.5     1289.6     1330.2 <td>Apr-1993</td> <td>47790.3</td> <td>146.9</td> <td>2049.8</td> <td>12216.7</td> <td>10454.4</td>	Apr-1993	47790.3	146.9	2049.8	12216.7	10454.4
Jun-1993     49496.1     192.2     2823.3     12267.2     11431       Jul-1993     48275.3     183.6     2095.4     11982.9     10407.5       Sep-1993     48282.8     160.4     2460.6     12483.3     11538.8       Oct-1993     4917.3     138.7     1481.4     10864.2     12266.8       Nov-1993     4977.14     121.4     1781.8     1301.28     14666.1       Jan-1994     45047.8     105.1     1352.8     11724.4     15007.6       Jan-1994     450357.4     121.8     831.5     10466.4     13924.3       Mar-1994     46865.9     174.8     617.3     13476.7     987.1       Jul-1994     40865.7     220.9     672.6     13847.1     11766.2       Jul-1994     40887.2     100.1     108.8     212.05.7     12789.1       Sep-1994     50211.7     160.1     103.5     13989.3     1309.3       Sep-1994     40762.1     180.8     223.2     13365.7     12789.1       Sep-1994     407	May-1993	47628.8	139.4	2335.4	12598	9250.1
Jul-1993 48473.4 196.9 2638.9 12311.6 10022.8 Aug-1993 48227.5 3 183.6 2095.4 1982.9 10407.5 Sep-1993 4827.8 160.4 2460.6 12483.3 11538.8 Nov-1993 49771.4 121.4 1781 12392.8 13883.8 Nov-1993 49771.4 121.4 1781 12392.8 13883.8 Dec-1994 4007.8 105.1 1352.8 11722.4 15007. Feb-1994 47537.4 121.8 831.5 10468.4 13924.3 Mar-1994 48365.9 152.6 501.3 13428.8 11692.5 Apr-1994 48365.9 152.6 501.3 13428.8 11692.5 Apr-1994 49865.7 124.8 517.8 13476.7 9897.1 Jun-1994 50381.6 204.8 613.2 12990 10681.6 Jul-1994 49865.7 219.1 588.2 13255.7 12789.1 Sep-1994 50381.6 204.8 613.2 12990 10681.6 Jul-1994 50381.6 204.8 613.2 12990 110581.6 Jul-1994 49605.7 219.1 588.2 13255.7 12789.1 Sep-1984 50211.7 166.1 103.5 13969.3 1309.3 Oct:1984 4001.3 134.1 130.2 12532.9 12605.7 Nov-1994 49762.1 180.8 223.2 13356.7 12789.1 Sep-1994 50385.4 10.6 120.3 12765.2 16166 Jan-1995 40305.5 101 211.8 12875.2 16166 Jan-1995 40305.4 110.5 198.4 14151.8 12875.2 16166 Jan-1995 50286.4 136.2 187.8 12581.4 1156.9 1267.7 May-1995 51312.6 160.7 150.2 12634.8 12267.1 12760.3 Jun-1995 5132.4 1406. 120.3 12706.9 12767.7 May-1995 5133.4 196.8 131 12081.7 13206.4 12374.2 12470.3 Jun-1995 5133.4 196.8 131 12081.7 13206.4 12374.2 12470.3 Jun-1995 5133.4 196.8 131 12081.7 13206.4 12374.2 12470.3 Jun-1995 5133.4 196.8 131 12081.7 13205.4 12374.2 12470.3 Jun-1995 5133.4 196.8 131 12081.7 13205.4 12374.2 13497.5 Feb-1995 40336.9 107.2 142.7 171.2 13722.2 13377.7 Oct-1995 5023.4 135.8 182.5 13720.4 13575.5 17742.5 Feb-1995 40336.9 107.2 142.7 12745.6 15873.3 Jun-1996 5053.9 111 160.5 14375.5 17742.8 Mar-1996 40502.5 111 160.6 14375.5 17742.8 Mar-1996 4092.4 115.3 152.1 4454.7 17749.8 Mar-1996 5053.5 164.6 95.5 44734.2 1566.5 May-1997 5363.5 163.6 126.2 1500.3 14486.5 Oct-1996 5053.5 164.6 95.5 44734.2 1566.5 May-1997 51376.8 119.5 121.9 14245.1 1594.4 12687.5 Nov-1997 51376.8 119.5 121.9 14245.1 1575.5 17742.8 Mar-1996 51595.3 163.1 11.7 7.4 13473.8 16200.4 Sep-1997 51376.8 119.5 121.9 14245.1 15045.1 16464.4 Apr-1997 51376.8 125.2	Jun-1993	49496.1	182.2	2823.3	12267.2	11431
Aug-1993   44275.3   183.6   2095.4   11982.9   1047.5     Sep-1993   44282.8   166.4   2460.6   12483.3   11538.8     Oct-1993   4977.14   121.4   1781   1292.8   13938.8     Dec-1993   50348.8   124.6   2101.5   13012.8   14666.1     Jan-1994   45047.8   105.1   1352.8   11724.4   1392.4     Mar-1994   48365.9   152.6   501.3   13432   9896     May-1994   48365.9   174.8   617.3   13476.7   987.1     Jul-1994   40365.7   220.9   672.6   13847.1   110681.6     Jul-1994   50081.6   204.8   613.2   12900   10681.6     Sep-1994   50013.1   134.1   103.5   13898.3   1300.3     Oct-1994   40762.1   180.8   223.2   1358.7   12889.9     Dec-1994   50382.5   101   218.4   1451.8   1772.5     Feb-1995   43760.8   110.5   198.4   14615.8   1772.5     Feb-1996   4393	Jul-1993	48473.4	196.9	2638.9	12311.6	10092.8
Sep-1993     44282.8     169.4     2460.6     12483.3     11538.8       Nov-1993     49771.4     121.4     1781     12926.8     12868.8       Nov-1993     50348.8     124.6     2101.5     13012.8     14680.4       Jan-1994     45047.8     105.1     1352.8     11724.4     15007.6       Feb-1994     47537.4     121.8     831.5     10468.4     11922.5       Apr-1994     48985.5     174.8     517.8     1376.7     9887.1       Jun-1994     40567.8     220.9     572.6     13847.1     11762.5       Aug-1994     40567.8     220.9     572.6     13847.1     11765.5       Aug-1994     40081.3     134.1     130.2     1252.9     12605.7       Nov-1984     49762.1     180.8     223.2     12605.7     101.21.8     12376.2     16165       Jan-1995     50286.4     136.2     187.8     1267.7     1288.9     1265.7     12168.6     1297.5     16165     1372.6     16165     1372.6     161	Aug-1993	48275.3	183.6	2095.4	11982.9	10407.5
Oct-1993     49117.3     136.7     1481.4     10864.2     12266.8       Nov-1993     50348.8     124.6     2101.5     13012.8     14869.1       Jan-1994     45047.8     105.1     1352.8     11724.4     15007.6       Feb-1994     47537.4     121.8     831.5     10468.4     1392.3       Mar-1994     48872.6     160.1     974.9     11382.8     11892.5       May-1994     48869.5     174.8     617.3     13476.7     9987.1       Jul-1994     50381.6     204.8     613.2     12900     10681.6       Aug-1994     50281.7     12981     103.5     13989.3     13309.3       Oct-1994     50211.7     169.1     103.5     13989.3     13309.3       Oct-1994     5032.5     101     211.8     1267.8     1228.9     1256.7       Jul-1995     45039.2.5     101     211.8     1267.8     1276.2     1286.7       Jun-1995     50286.4     136.2     137.4     1288.7     1288.7	Sep-1993	48282.8	169.4	2460.6	12483.3	11538.8
Nov.1993     49771.4     121.4     1781     12392.8     13883.8       Dec.1993     50348.8     124.6     2101.5     13012.8     14669.1       Jan.1994     48572.6     160.1     1352.8     11724.4     1502.8       Apr.1994     48572.6     160.1     974.9     11382.8     11692.5       Apr.1994     4866.5     174.8     517.8     13476.7     9987.1       Jun.1994     50381.6     204.8     613.2     12990     10681.6       Jul.1994     49657.8     220.9     572.6     13847.1     117756.2       Aug-1994     50381.6     204.8     613.2     13285.7     12789.1       Soct:1994     50028.5     101     211.8     12287.2     16165.1       Jan.1995     50286.4     136.2     187.8     1328.1     1772.5       Jan.1995     51393.4     196.8     131     12061.7     1302.8       Jan.1995     51393.4     196.8     131     1208.1     1276.9       Mar-1995     51393.4	Oct-1993	48117.3	136.7	1481.4	10864.2	12266.8
Dec.1993     50348.8     124.6     2101.5     13012.8     14668.1       Jan-1994     4507.8     105.1     1352.8     11724.4     15007.6       Feb-1994     47537.4     121.8     831.5     10468.4     13924.3       Mar-1994     48365.5     152.6     501.3     13432     9896       May-1994     48365.5     174.8     517.8     13476.7     9987.1       Jul-1994     50381.6     220.9     572.6     13847.1     17756.2       Aug-1994     50021.7     166.1     103.5     13989.3     13309.3       Sep-1994     5021.7     166.1     103.5     13989.3     132605.7       Nov-1994     48762.1     180.8     223.2     13358.7     12898.9       Dec-1994     5032.5     101     211.8     12752.2     16165       Mar-1995     50286.4     136.2     187.8     12581.4     15400       Apr-1995     51383.4     196.8     131     12081.7     13108       Jul-1995     51393.4	Nov-1993	49771.4	121.4	1781	12392.8	13883.8
Jan. 1994     45047.8     105.1     1352.8     11724.4     1507.4       Mar. 1994     4872.6     160.1     974.9     11382.8     11692.5       Apr. 1994     48869.5     152.6     501.3     13432     9896       Mar. 1994     48869.5     174.8     517.8     13476.7     9987.1       Jun. 1994     50381.6     204.8     613.2     12990     10681.6       Spe. 1994     50081.7     160.1     103.5     13989.3     13309.3       Oct.1994     48091.3     134.1     130.2     12532.9     12605.7       Nov.1994     49762.1     180.8     223.2     1338.7     12889.3       Dec. 1994     4092.2     131.9     291     11185.6     19267.8       Mar. 1995     50286.4     136.2     187.8     12681.4     12700.3       Jun. 1995     5132.6     160.7     150.2     12634.8     12700.3       Jun. 1995     51393.4     196.8     131     12081.7     1314.6       Jun. 1995     51393.4 <td>Dec-1993</td> <td>50348.8</td> <td>124.6</td> <td>2101.5</td> <td>13012.8</td> <td>14669.1</td>	Dec-1993	50348.8	124.6	2101.5	13012.8	14669.1
Feb-1994     47537.4     121.8     831.5     10488.4     13924.3       Mar-1994     48869.5     152.6     501.3     13432     9866       May-1994     48869.5     174.8     517.8     13476.7     9867.1       Jul-1994     50381.6     204.8     613.2     12990     10681.6       Jul-1994     50088.7     219.1     588.2     13255.7     12789.1       Sep-1994     50011.7     160.1     103.5     13989.3     13309.3       Oct-1994     48091.3     134.1     130.2     12532.9     12605.7       Nov-1894     49762.1     180.8     223.2     1338.7     12898.9       Dec-1994     50392.5     101     211.8     17725.2     16165       Mar-1995     50286.4     136.2     187.8     12561.4     15490       Apr-1995     4395.4     140.6     120.3     12706.9     1276.7       May-1995     51312.6     160.7     150.2     12631.4     15490       Apr-1995     49395.4 <td< td=""><td>Jan-1994</td><td>45047.8</td><td>105.1</td><td>1352.8</td><td>11724.4</td><td>15007.6</td></td<>	Jan-1994	45047.8	105.1	1352.8	11724.4	15007.6
Mar-1994   48872.6   160.1   974.9   1138.2   11692.5     May-1994   48869.5   174.8   517.8   1343.2   9896     May-1994   48869.5   174.8   517.8   1347.7   9987.1     Jun-1994   50381.6   204.8   613.2   1299.0   10681.6     Jul-1994   49557.8   220.9   572.6   13347.1   1175.2     Aug-1994   50287.7   12789.1   588.2   1325.7   12789.1     Nov-1994   40076.1   180.8   223.2   1336.7   12889.9     Dec-1994   50392.5   101   211.8   12875.2   16165     Jan-1995   43760.8   110.5   198.4   14151.8   17725.2     Apr-1995   50395.4   140.6   120.3   12706.9   12576.7     May-1995   51393.4   196.8   131   12081.7   13106.8     Jun-1995   51393.4   196.8   131   12081.7   1316.8     Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jun-1995   50239.4 </td <td>Feb-1994</td> <td>47537.4</td> <td>121.8</td> <td>831.5</td> <td>10468.4</td> <td>13924.3</td>	Feb-1994	47537.4	121.8	831.5	10468.4	13924.3
Apr.1994     49365.9     152.6     501.3     13476.7     9987.1       Jun.1994     50381.6     204.8     613.2     12990     10681.6       Jul.1994     40557.8     220.9     572.6     13847.1     11756.2       Aug-1994     51088.7     219.1     588.2     13255.7     12789.1       Sep-1994     50211.7     168.1     103.5     13989.3     13309.3       Oct-1994     40762.1     180.8     223.2     13367.7     12889.9       Dec-1994     50392.5     101     211.8     12875.2     16165       Jan-1995     45760.8     110.5     198.4     14151.8     17725.2       Feb-1995     49385.4     140.6     120.3     12706.3     12706.3       Apr.1995     51312.6     160.7     150.2     12634.8     12700.3       Jun-1995     51393.4     196.8     131     12081.7     13106.8       Jun-1995     51393.4     196.8     1331     1208.1     1306.8       Jun-1996     50239.4	Mar-1994	48872.6	160.1	974.9	11382.8	11692.5
May-1994   48809.5   174.8   517.8   13476.7   9987.1     Jul-1994   49557.8   220.9   572.6   13847.1   11756.2     Aug-1994   51088.7   219.1   588.2   13255.7   12789.3     Sep-1994   50211.7   169.1   103.5   13989.3   13309.3     Oct-1994   48091.3   134.1   130.2   12838.7   12889.9     Dec-1994   50392.5   101   211.8   12875.2   16165     Jan-1995   43760.8   110.5   198.4   14151.8   17725.2     Pio1995   43965.4   140.6   120.3   12706.9   12576.7     May-1995   51312.6   160.7   150.2   12834.8   12700.3     Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   51393.4   196.8   131   12081.7   13106.8     Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   50239.4   135.8   162.5   1372.0   13427.5     Sep-1996   49	Apr-1994	49365.9	152.6	501.3	13432	9896
Jun.1994     50381.6     204.8     613.2     1299     10681.6       Aug.1994     51086.7     219.1     586.2     13255.7     12789.1       Sep.1994     50081.7     169.1     103.5     13889.3     13309.3       Oct.1994     4001.3     134.1     130.2     12532.9     12605.7       Nov.1994     40762.1     180.8     223.2     13358.7     12889.9       Dec.1994     50392.5     101     211.8     12875.2     16165       Jan-1995     45760.8     110.5     198.4     14151.8     17725.2       Feb-1995     49395.4     140.6     120.3     12706.9     12576.7       May-1995     51312.6     160.7     150.2     12634.8     12700.3       Jun-1995     5132.6     160.7     150.2     12634.8     12706.3       Jun-1995     5132.6     160.7     150.2     12634.8     12706.3       Jun-1995     50239.4     173     205.4     12372.2     13327.7       Oct.1995     50239.4	May-1994	48869.5	174.8	517.8	13476.7	9987.1
Jul-1994   49557.8   220.9   572.6   13847.1   11756.2     Sep-1994   51088.7   219.1   588.2   13255.7   12789.1     Sep-1994   50211.7   169.1   103.5   13989.3   13309.3     Oct-1994   40091.3   134.1   130.2   1252.9   1288.9     Dec-1994   50392.5   101   211.8   12875.2   16165     Jan-1995   45760.8   110.5   198.4   14151.8   17725.2     Feb-1995   48402.2   131.9   291   11185.6   19267.8     Mar-1995   50286.4   136.2   187.8   12514.4   15490     Apr-1995   51312.6   160.7   150.2   12634.8   12700.3     Jun-1995   51393.4   196.8   131   12081.7   1310.8     Jul-1995   5939.4   173   205.4   12374.2   1247.5     Ct-1995   50291.1   134.3   176.1   12372.2   13327.7     Oct-1995   50291.1   134.3   176.1   12376.5   17742.5     Feb-1996   48042.4	Jun-1994	50381.6	204.8	613.2	12990	10681.6
Aug-1994   51088.7   219.1   588.2   1325.7   12789.1     Sop-1994   50211.7   166.1   103.5   13398.3   13309.3     Oct-1994   48091.3   134.1   130.2   12532.9   12605.7     Nov-1994   50392.5   101   211.8   12875.2   16165     Jan-1995   45760.8   110.5   198.4   14151.8   17725.2     Feb-1995   48402.2   131.9   291   11185.6   19267.8     Mar-1995   50286.4   136.2   187.8   12581.4   1540.9     Ayr-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   50239.4   178.8   153.6   12252.2   1347.5     Sop-1995   4920.6   142.7   171.2   13722.2   1337.7     Oct-1995   50239.4   135.8   182.5   13724.6   16823.9     Jon-1996   47550   111   160.5   1742.5   1266.6   16873.3     Jon-1996 <td>Jul-1994</td> <td>49557.8</td> <td>220.9</td> <td>572.6</td> <td>13847.1</td> <td>11756.2</td>	Jul-1994	49557.8	220.9	572.6	13847.1	11756.2
Sep-1994     50211.7     169.1     103.5     1398.3     13309.3       Oct-1994     46091.3     134.1     130.2     12532.9     12605.7       Nov-1994     49762.1     180.8     223.2     13358.7     12898.9       Dec-1994     50392.5     101     211.8     12875.2     16165       Jan-1995     45760.8     110.5     198.4     14151.8     17275.2       Feb-1995     48402.2     131.9     291     11185.6     19267.8       Mar-1995     50286.4     136.2     187.8     1251.4     15490.       Apr-1995     51393.4     196.8     131     12017.7     12644.8     12700.3       Jun-1995     49389.1     173     205.4     12374.2     12447.5       Sep-1995     50239.4     135.8     182.5     13720.4     13675.5       Nov-1995     50211.1     134.3     176.1     13226.6     15873.3       Dec-1995     4936.9     107.2     142.7     17745.6     16823.9       Jun-1996	Aug-1994	51088.7	219.1	588.2	13255.7	12789.1
Oct-1994     48091.3     134.1     130.2     1252.9     12605.7       Nov-1994     49762.1     180.8     223.2     13388.7     12888.9       Dec-1994     50392.5     101     211.8     12875.2     16165       Jan-1995     45760.8     110.5     198.4     14151.8     17725.2       Feb-1995     50286.4     136.2     187.8     12581.4     15490       Apr-1995     51393.4     196.8     131     12081.7     1310.6       Jun-1995     51393.4     196.8     131     12081.7     1310.6       Jul-1995     5029.6     142.7     171.2     13720.4     1387.7       Oct-1995     5023.9.4     135.8     182.5     13720.4     1387.8       Nov-1995     50211.1     134.3     176.1     13216.6     1587.3       Dec-1996     4936.9     107.2     142.7     12745.6     1682.39       Jan-1996     47550     1111     160.5     14375.5     17742.5       Feb-1996     49343.1	Sep-1994	50211.7	169.1	103.5	13989.3	13309.3
Nov-1994     49762.1     180.8     223.2     1338.7     12888.9       Dec-1994     50392.5     101     211.8     12875.2     16165       Jan-1995     45760.8     110.5     198.4     14151.8     17725.2       Feb-1995     49402.2     131.9     291     11185.6     19267.8       Mar-1995     50266.4     136.2     187.8     12581.4     15490       Apr-1995     49395.4     140.6     120.3     12706.9     12576.7       May-1995     51332.4     196.8     131     12081.7     13106.8       Jul-1995     49389.1     173     205.4     12374.2     12447.5       Sep-1995     49920.6     142.7     171.2     13722.2     13327.7       Oct-1995     50231.1     134.3     176.1     13216.6     15873.3       Dec-1995     49336.9     107.2     142.7     12745.6     16823.9       Jan-1996     47550     111     160.5     14375.5     17742.5       Feb-1996     50980.7     <	Oct-1994	48091.3	134.1	130.2	12532.9	12605.7
Dec.1994     50392.5     101     211.8     1275.2     16165       Jan.1995     45760.8     110.5     198.4     14151.8     17725.2       Mar.1995     50286.4     136.2     187.8     1281.4     1540.9       Mar.1995     51312.6     160.7     150.2     12634.8     12700.3       Jun.1995     51312.6     160.7     150.2     12634.8     12703.3       Jun.1995     51393.4     196.8     131     12081.7     13106.8       Jul.1995     49383.1     173     205.4     12374.2     12442       Aug.1995     51499.4     178.8     153.6     12252.2     13497.5       Sep.1995     49920.6     142.7     171.2     13720.4     13678.5       Nov.1995     50211.1     134.3     176.1     13216.6     15873.3       Dec.1995     49336.9     107.2     142.7     12745.6     16823.9       Jan-1996     47550     1111     160.5     14375.5     17742.5       Feb-1996     48042.4	Nov-1994	49762.1	180.8	223.2	13358.7	12898.9
Jan-1995   45760.8   110.5   198.4   14151.8   17225.2     Mar-1995   50286.4   136.2   187.8   12581.4   15490     Apr-1995   49395.4   140.6   120.3   12706.9   12576.7     May-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   50239.4   135.8   153.6   12252.2   13497.5     Sep-1995   49920.6   142.7   171.2   13720.4   13678.3     Nov-1995   50231.1   134.3   176.1   13216.6   15873.3     Dec-1995   4936.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   1111   160.5   14375.5   17742.5     Mar-1996   50980.7   133.3   113.1   1550.2   13134.6     May-1996   5248	Dec-1994	50392.5	101	211.8	12875.2	16165
Feb-1995   48402.2   131.9   291   11185.6   19267.8     Mar-1995   50286.4   136.2   187.8   12581.4   15490     Apr-1995   51312.6   160.7   150.2   12634.8   12700.9   12776.7     May-1995   51312.6   160.7   150.2   12634.8   12700.3   12706.9   12774.2   12442     Aug-1995   51393.4   196.8   131   12081.7   13106.8   12372.2   13327.7     Oct-1995   50239.4   135.8   182.5   13720.4   13678.5   107.2   142.7   12745.6   16823.9     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9   111   160.5   14375.5   17742.5   16823.9   133.3   113.1   15500.2   1313.4     Mar-1996   49343.1   133.8   120.7   14958.5   14094.1   4475.5   17742.5   1682.9   131.4   15500.2   13134.6   May-1996   52485.8   160.6   104.2   15822.8   11334.6   May-1996   51595.3   163   111   14792.6   12287	Jan-1995	45760.8	110.5	198.4	14151.8	17725.2
Mar-1995   50286.4   136.2   187.8   12581.4   1549.4     Apr-1995   49395.4   140.6   120.3   12706.9   12576.7     May-1995   51312.6   160.7   150.2   12634.8   12700.3     Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   51499.4   173   205.4   12374.2   12442     Aug-1995   50439.4   178.8   153.6   12252.2   13497.5     Sep-1995   49920.6   142.7   171.2   13722.4   1367.5     Nov-1995   50211.1   134.3   176.1   13216.6   15873.3     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   111   160.5   14375.5   17742.5     Peb-1996   48042.4   115.3   152.1   1451.7   17749.8     Mar-1996   5080.7   133.3   113.1   1500.2   1313.4     May-1996   52485.8   160.6   104.2   1582.8   1193.9     Jun-1996   51595.3	Feb-1995	48402.2	131.9	291	11185.6	19267.8
Apr.1995   49395.4   140.6   120.3   12706.9   12576.7     May-1995   51312.6   160.7   150.2   12634.8   1270.3     Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   49389.1   173   205.4   12374.2   12442     Aug-1995   51499.4   178.8   153.6   12252.2   13497.5     Sep-1995   49920.6   142.7   171.2   13722.2   13327.7     Oct-1995   50211.1   134.3   176.1   13216.6   15873.3     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   1111   160.5   14375.5   17742.5     Feb-1996   48042.4   115.3   152.1   14514.7   17749.8     Mar-1996   49343.1   133.8   120.7   14985.5   14994.1     Apr-1996   5080.7   133.3   113.1   1550.2   13134.6     Apr-1996   5080.7   133.3   113.1   14792.6   12287     Jul-1996   5159	Mar-1995	50286.4	136.2	187.8	12581.4	15490
May-199551312.6160.7150.212634.812700.3Jun-199551393.4196.813112081.713106.8Jul-199549389.1173205.412252.213497.5Sep-199549920.6142.7171.213722.213327.7Oct-199550239.4135.8182.513720.413678.5Nov-199550211.1134.3176.113216.615873.3Dec-199549336.9107.2142.712745.616823.9Jan-199647550111160.514375.517742.5Feb-199648042.4115.3152.114514.717749.8Mar-199643343.1133.8120.714958.514094.1Apr-199650980.7133.3113.115500.213134.6May-199652485.8160.6104.215822.811934.9Jun-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614849.9Oct-19965157.5116.514734.217596Jan-19974997.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-19974998.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.1Jun-19975134.8	Apr-1995	49395.4	140.6	120.3	12706.9	12576.7
Jun-1995   51393.4   196.8   131   12081.7   13106.8     Jul-1995   49389.1   173   205.4   12374.2   12442     Aug-1995   51499.4   178.8   153.6   12252.2   13327.7     Oct-1995   50239.4   135.8   182.5   13720.4   13678.5     Nov-1995   50211.1   134.3   176.1   13216.6   15873.3     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   111   160.5   14375.5   17742.5     Feb-1996   48042.4   115.3   152.1   14514.7   17749.8     Mar-1996   49333.1   133.3   113.1   15500.2   13134.6     Mar-1996   50980.7   133.3   113.1   15500.2   13134.6     May-1996   51595.3   163   111   14792.6   12827     Jul-1996   51595.3   163   111   14792.6   12827     Jul-1996   51595.3   166.2   126.2   1506.3   14484.9     Oct-1996   51531.5	May-1995	51312.6	160.7	150.2	12634.8	12700.3
Jul-1995   49389.1   173   205.4   12374.2   12442     Aug-1995   51499.4   178.8   153.6   12252.2   13497.5     Sep-1995   49920.6   142.7   171.2   13722.2   13327.7     Oct-1995   50239.4   135.8   182.5   13720.4   13678.5     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   111   160.5   14375.5   17742.5     Feb-1996   48042.4   115.3   152.1   14514.7   1774.9     Mar-1996   50880.7   133.3   113.1   1550.2   13134.6     May-1996   51282.8   160.6   104.2   15822.8   11934.9     Jul-1996   52282.9   178.7   128.4   14952.5   11875.2     Aug-1996   51572.3   165.2   126.2   1506.3   14482.6     Sep-1996   49175.4   150.8   126.8   15149.6   1488.4     Oct-1996   51531.5   149.6   118.8   1562.6   16076.3   14482.6     Dec	Jun-1995	51393.4	196.8	131	12081.7	13106.8
Aug-1995   51499.4   178.8   153.6   12252.2   13497.5     Sep-1995   49920.6   142.7   171.2   13722.2   13327.7     Oct-1995   50239.4   135.8   182.5   13720.4   13678.5     Nov-1995   50211.1   134.3   176.1   13216.6   1587.3     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   111   160.5   14375.5   17742.5     Feb-1996   48042.4   115.3   152.1   14514.7   17749.8     Mar-1996   50980.7   133.3   113.1   15500.2   13134.6     May-1996   52485.8   160.6   104.2   1582.8   11934.9     Jun-1996   51595.3   163   111   14792.6   12287     Jul-1996   51592.3   165.2   126.2   15006.3   14482.9     Oct-1996   51572.3   165.2   126.2   15006.3   14482.9     Oct-1996   51531.5   149.6   118.8   13626.1   15044.5     Nov-1996   4	Jul-1995	49389.1	173	205.4	12374.2	12442
Sep-1995   49920.6   142.7   171.2   13722.2   13327.7     Oct-1995   50239.4   135.8   182.5   13720.4   13678.5     Nov-1995   50211.1   134.3   176.1   13216.6   15873.3     Dec-1995   49336.9   107.2   142.7   12745.6   16823.9     Jan-1996   47550   111   160.5   14375.5   17742.5     Feb-1996   48042.4   115.3   152.1   14514.7   17749.8     Mar-1996   49343.1   133.8   120.7   14958.5   14094.1     Apr-1996   50980.7   133.3   113.1   15500.2   13134.6     May-1996   51595.3   163   111   14792.6   12287     Jul-1996   52928.9   178.7   128.4   14952.5   11875.2     Aug-1996   51572.3   165.2   126.2   15006.3   14482.6     Sep-1996   49175.4   150.8   126.8   15149.6   14884.9     Oct-1996   51531.5   104.6   95.5   14734.2   17596     Jan-1997   40	Aug-1995	51499.4	178.8	153.6	12252.2	13497.5
Oct-1995     50239.4     135.8     182.5     13720.4     13678.5       Nov-1995     50211.1     134.3     176.1     13216.6     15873.3       Dec-1995     49336.9     107.2     142.7     12745.6     16823.9       Jan-1996     47550     111     160.5     14375.5     17742.5       Feb-1996     48042.4     115.3     152.1     14514.7     17749.8       Mar-1996     50980.7     133.3     113.1     15500.2     13134.6       May-1996     52485.8     160.6     104.2     15822.8     11934.9       Jun-1996     52928.9     178.7     128.4     14952.5     11875.2       Jul-1996     51572.3     165.2     126.2     15006.3     14482.6       Sep-1996     49175.4     150.8     126.8     15149.6     14884.9       Oct-1996     51531.5     149.6     118.8     13626.1     15044.5       Nov-1996     49972.5     111.9     103.3     14143.4     15806.2       Dec-1996     51053.5 </td <td>Sep-1995</td> <td>49920.6</td> <td>142.7</td> <td>171.2</td> <td>13722.2</td> <td>13327.7</td>	Sep-1995	49920.6	142.7	171.2	13722.2	13327.7
Nov-1995     50211.1     134.3     176.1     13216.6     1587.3       Dec-1995     49336.9     107.2     142.7     12745.6     16823.9       Jan-1996     47550     111     160.5     14375.5     17742.5       Feb-1996     48042.4     115.3     152.1     14514.7     17749.8       Mar-1996     50980.7     133.3     113.1     15500.2     13134.6       May-1996     52485.8     160.6     104.2     15822.8     11934.9       Jun-1996     51595.3     163     111     14792.6     12287       Jul-1996     52928.9     178.7     128.4     14952.5     11875.2       Aug-1996     51531.5     149.6     118.8     13626.1     15044.5       Nov-1996     49175.4     150.8     126.8     15149.6     14884.9       Oct-1996     51531.5     149.6     118.8     13626.1     15044.5       Nov-1996     49972.5     111.9     103.3     14143.4     15806.2       Dec-1996     51053.5	Oct-1995	50239.4	135.8	182.5	13720.4	13678.5
Dec-199549336.9107.2127.45.616823.9Jan-199647550111160.514375.517742.5Feb-199648042.4115.3152.114514.717749.8Mar-199649343.1133.8120.714958.514094.1Apr-199652485.8160.6104.215822.811934.9Jun-199651595.316311114792.612287Jul-199652928.9178.7128.414952.511875.2Aug-199651595.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-19975180.882.916277.618887.4Jun-199849702.984.315205.416601.8Feb-199850250.2114.11500616195.3A	Nov-1995	50211.1	134.3	176.1	13216.6	15873.3
Jan-199647550111160.514375.517742.5Feb-199648042.4115.3152.114514.717749.8Mar-199649343.1133.8120.714958.514094.1Apr-199650980.7133.3113.115500.213134.6May-199652485.8160.6104.215822.811934.9Jun-199652928.9178.7128.414952.511875.2Aug-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-19965153.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412864.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-19975249.4168.516610.712315.2Jun497Jun-199752631.5157.21709612460.3Sep-19975058.2126.216076.511842Aug-199751818.7143.7112.714895.512944.6Jun-199752631.5157.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-19974976.492.716205.913371.7<	Dec-1995	49336.9	107.2	142.7	12745.6	16823.9
Feb-199648042.4115.3152.114514.717/49.8Mar-199649343.1133.8120.714958.514094.1Apr-199650980.7133.3113.115500.213134.6May-199652485.8160.6104.215822.811934.9Jun-199651595.316311114792.612287Jul-199652928.9178.7128.414952.511875.2Aug-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314485.51294.4Jun-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516675.511842Aug-199752631.5157.21709612460.3Jul-199752631.5157.21709612460.3Jun-199750958.2126.216076.513630.3Oct-19975180.882.916277.61887.4Jan-199847702.984.315205.416601.8 <td< td=""><td>Jan-1996</td><td>47550</td><td>111</td><td>160.5</td><td>14375.5</td><td>17742.5</td></td<>	Jan-1996	47550	111	160.5	14375.5	17742.5
Mar-1996   49343.1   133.8   120.7   14958.5   14094.1     Apr-1996   50980.7   133.3   113.1   15500.2   13134.6     May-1996   52485.8   160.6   104.2   15822.8   11934.9     Jun-1996   52928.9   178.7   128.4   14952.5   11875.2     Aug-1996   51595.3   165.2   126.2   15006.3   14482.6     Sep-1996   49175.4   150.8   126.8   15149.6   1488.49     Oct-1996   51531.5   149.6   118.8   13626.1   15044.5     Nov-1996   49972.5   111.9   103.3   14143.4   15806.2     Dec-1996   51053.5   104.6   95.5   14734.2   17596     Jan-1997   46938.3   101.1   77.4   13473.8   16290.4     Feb-1997   50054   110.7   123   14485.5   16319.1     Mar-1997   51818.7   143.7   112.7   14895.5   12248     Apr-1997   51818.7   143.7   112.7   14895.5   12944.6     Jun-1997 <td< td=""><td>Feb-1996</td><td>48042.4</td><td>115.3</td><td>152.1</td><td>14514.7</td><td>17749.8</td></td<>	Feb-1996	48042.4	115.3	152.1	14514.7	17749.8
Apr-199650980.7133.3113.115500.213134.6May-199652485.8160.6104.215822.811934.9Jun-199651595.316311114792.612287Jul-199652928.9178.7128.414952.511875.2Aug-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314485.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jul-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-1998 </td <td>Mar-1996</td> <td>49343.1</td> <td>133.8</td> <td>120.7</td> <td>14958.5</td> <td>14094.1</td>	Mar-1996	49343.1	133.8	120.7	14958.5	14094.1
May-199652485.8160.6104.213822.811934.9Jun-199651595.316311114792.612287Jul-199652928.9178.7128.414952.511875.2Aug-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816620.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751376.8119.5121.914215.312228May-199752631.5157.216675.511842Jul-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-19975130.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8	Apr-1996	50980.7	133.3	113.1	15500.2	13134.6
Jul-199651595.316311114792.612287Jul-199652928.9178.7128.414952.511875.2Aug-199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516510.712315.2Jul-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.61887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-19985288.1168.6 <td>May-1996</td> <td>52485.8</td> <td>100.0</td> <td>104.2</td> <td>15822.8</td> <td>11934.9</td>	May-1996	52485.8	100.0	104.2	15822.8	11934.9
Jul:199652928.9178.7128.414952.511875.2Aug:199651572.3165.2126.215006.314482.6Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-19985288.1168.614967.214378.2	Jun-1996	51595.3	103	111	14792.6	12287
Aug-199651572.3165.2126.215006.314482.0Sep-199649175.4150.8126.815149.614884.9Oct-199651531.5149.6118.813626.115044.5Nov-199649972.5111.9103.314143.415806.2Dec-199651053.5104.695.514734.217596Jan-199746938.3101.177.413473.816290.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-19985288.1168.614967.214378.2	Jui-1996	52928.9	1/8./	128.4	14952.5	11875.2
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Jahl 199740930.3101.111.413473.810230.4Feb-199750054110.712314488.516319.1Mar-199749472.311787.514289.412686.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516510.712315.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-19985288.1168.614967.214378.2	Jon-1007	46038.3	104.0	95.5 77 A	14734.2	16200 4
Nar-199749472.3110.112.514400.310013.1Mar-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516510.712315.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	5an-1997	40930.3 50054	101.1	17.4	1//88 5	16290.4
Mar-199751376.811767.514209.412000.4Apr-199751376.8119.5121.914215.312228May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516510.712315.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Mor-1007	40472.3	117	12J 97 5	14400.0	12686 4
May-199751818.7143.7112.714895.512944.6Jun-199752149.4168.516510.712315.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Δnr-1997	51376.8	119.5	121.9	14205.4	12000.4
Indy 153751610.7143.7112.111403.512344.0Jun-199752149.4168.516510.712315.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	May-1997	51818 7	143.7	1127.5	14215.5	12044 6
Jul-199752142.4100.510010.712213.2Jul-199753342.8182.516675.511842Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	lun-1007	521/0 /	168.5	112.7	16510.7	12344.0
Aug-199752631.5157.21709612460.3Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Jul-1997	53342.8	182.5		16675 5	11842
Sep-199750958.2126.216076.513630.3Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Aug-1997	52631.5	157.2		17096	12460 3
Oct-199751303.5125.316112.814391.1Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Sep-1997	50958 2	126.2		16076 5	13630 3
Nov-199749756.492.716205.915371.7Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Oct-1997	51303.5	125.3		16112.8	14391 1
Dec-199751880.882.916277.618887.4Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Nov-1997	49756.4	92.7		16205.9	15371 7
Jan-199847702.984.315205.416601.8Feb-199850250.2114.115076.118461.4Mar-199851696.8193.61500616195.3Apr-199852888.1168.614967.214378.2	Dec-1997	51880.8	82.9		16277.6	18887 4
Feb-1998     50250.2     114.1     15076.1     18461.4       Mar-1998     51696.8     193.6     15006     16195.3       Apr-1998     52888.1     168.6     14967.2     14378.2	Jan-1998	47702.9	84.3		15205.4	16601.8
Mar-1998     51696.8     193.6     15006     16195.3       Apr-1998     52888.1     168.6     14967.2     14378.2	Feb-1998	50250.2	114.1		15076.1	18461.4
Apr-1998 52888.1 168.6 14967.2 14378.2	Mar-1998	51696.8	193.6		15006	16195.3
	Apr-1998	52888.1	168.6		14967.2	14378.2

May-1998	53900.6	144.7	16164.2	12755.2
Jun-1998	55810.3	173.1	15889.8	14498.3
Jul-1998	55245.5	172.3	16447.1	12335.1
Aug-1998	53317.9	157.9	16534.8	12999.2
Sep-1998	52804.6	141.9	14541.3	13877.9
Oct-1998	53984.5	126.5	16733.6	14253.3
Nov-1998	52144.2	107.5	15601.9	14855.3
Dec-1998	54019.1	96.7	15581.2	19604.4
Jan-1999	49166.5	99.1	13416	17316.7
Feb-1999	52832.6	132.4	14418.4	16533
Mar-1999	54788.2	132.5	13938.5	16078.5
Apr-1999	56362.1	137.3	15839.8	14482.1
May-1999	55266.2	138.1	16184.6	13702.5
Jun-1999	56714	154	16761.8	15135.3
Jul-1999	55612.7	152.5	17707	15461.2
Aug-1999	55010.6	152.6	17022.9	16992.9
Sep-1999	53621.2	173.4	16199	16715.8
Oct-1999	52933	141.2	16113.9	15842.3
Nov-1999	53628	129.5	15808.8	18010
Dec-1999	56990.8	115.1	15679.2	20285.9
Jan-2000	47057.2	107.3	13263.1	17484.6
Feb-2000	52543.8	110.2	14851.4	18190.8
Mar-2000	51944.5	108	14241.3	16336.5
Apr-2000	51707.2	114.5	15080	14843.7
May-2000	54597 1	138	15749 5	10814 7
Jun-2000	54227 9	122.8	16379 1	12842.4
Jul-2000	52972.2	125.7	15920	13003 5
Aug-2000	54614 7	184.8	15991 5	14978
Sep-2000	52059 2	112.8	15872 6	15129 5
Oct-2000	51556 7	134.3	15012.0	17508.4
Nov-2000	51055 3	94.6	14974 5	17601.5
Dec-2000	52836.4	76 5	15222 7	20209.1
Jan-2001	49430.3	87.7	15250 7	20373
Feb-2001	52265.6	98	14303.3	15581.6
Mar-2001	52592.6	111.6	15780 7	17794 8
Apr-2001	53377 5	127.1	15191 7	13362.7
May-2001	54813.6	123.7	17211 4	14484.9
Jun-2001	55713.8	133.4	16931.6	14535.9
Jul-2001	55340 5	132.7	17943	15344.8
Aug-2001	56259 9	125.4	18113 1	16189.2
Sep-2001	52927.2	93.7	14533.4	17800.9
Oct-2001	54249 5	123.3	16568 6	18759 7
Nov-2001	54229.6	103.2	16518 5	19658 7
Dec-2001	54246 1	84.8	17908	23011.6
Jan-2002	52055 1	95.5	16295 9	19766 9
Feb-2002	54103.6	89.2	17482 7	16483.6
Mar-2002	54278 5	137.7	18801.5	15932.8
Apr-2002	56499.4	101.1	17054 1	15408.6
May-2002	58320 1	107.7	16418.5	14387.2
Jun-2002	57397 4	124.8	16803.2	16824.4
Jul-2002	57401.8	137.2	17024.2	13162 5
Aug-2002	58107.6	144.5	16745.3	13907.4
Sen-2002	53522 4	126.5	17144 8	14196 5
Oct-2002	54740 3	83.8	16292	15167.8
Nov-2002	54926.6	95.0	15219.1	16370
Dec-2002	53929 7	64 1	15154.2	18941 1
Jan-2003	51610 4	81.1	14722 4	18277.2
Feb-2003	52430 3	73.3	14492.2	16301.8
Mar-2003	5/108 7	4 J.J 95	14786 /	13/72 5
Anr-2003	55527 1	9J 1/2	14700.4	12282
May-2003	570/0 8	06.7	15205.2	10378 5
lun_2003	57050 1	110 /	1/1071 2	10/10/
Jul-2003	57832	110.4	1407 1.2 17370 7	1∠404.4 10221 1
Δug-2003	57000 5	00.7	14070.7	11795 1
5003 Sen-2003	51922.5	99.7 115.0	14201.3	1/20/ /
Oct-2003	57627 5	116	13030	14024.4
201 2000	51051.5	110	10004.7	10210.2

Nov-2003	55214.7	77.4	15318	15090.2
Dec-2003	55637	88.9	14025.3	18383.4
Jan-2004	52617.4	75.2	13756.7	20084.5
Feb-2004	53656.3	77.6	14095.2	16238.8
Mar-2004	56314.7	106.4	13861	15633.2
Apr-2004	56310.9	109.6	13504	13459.9
May-2004	56411.1	90.8	13048.4	12129
.lun-2004	57164 4	108	12834.6	14160.2
Jul-2004	58201 7	122.6	12863.6	13323 5
Aug-2004	58656 3	109.5	13723 5	12142 1
Sen-2004	57069.4	100.0	13328 4	13031 3
Oct-2004	56800 7	03.2	12150 7	1/208 0
Nov-2004	563/3	83.3	12130.7	17/56
Doc 2004	57051 /	101.2	11007.0	20575 5
Dec-2004	57951.4	71.1	1007.0	20070.0
Jan-2005	50107.0	71.1	10734.0	16040.0
Feb-2005	50197.0	71.0	11020.3	10907.0
Mar-2005	59422.6	84.1	11752.3	13860.5
Apr-2005	60915.9	102.4	13144.7	13624.1
May-2005	59957.5	92.2	13115.8	12037.9
Jun-2005	59434.8	134.8	14997.7	13085
Jul-2005	59137	100.7	12373.6	12432.4
Aug-2005	59991.1	104.5	12711.4	13478.2
Sep-2005	57441.8	113	11122.7	13928.8
Oct-2005	58429	87.4	11011.4	13507.1
Nov-2005	58923.4	92.2	10087.4	12895.9
Dec-2005	59400.4	72.1	12314.4	15403.9
Jan-2006	54254	78.3	11247.1	18931.8
Feb-2006	57622.5	78.4	11857.8	19188.2
Mar-2006	57702.6	89.7	12645.6	15538.1
Apr-2006	59168.5	90.3	11348	15901.7
May-2006	59246.6	104.1	11312.1	12841.9
Jun-2006	59964	107.8	12906.7	14551
Jul-2006	57614.5	91.7	11096.2	14188.2
Aug-2006	59633.8	99.3	11499.2	14670.1
Sep-2006	57891.9	99.6	10859.9	14581
Oct-2006	57083.5	108.4	11245.7	14678.2
Nov-2006	58339.4	92.2	10333.5	16686.5
Dec-2006	58043.1	67.1	10706.6	16636.5
Jan-2007	54070.3	77.3	10482.3	17453.7
Feb-2007	58003.8	81.2	11324	18082.2
Mar-2007	59948.3	91.5	10449.9	15872.1
Apr-2007	58127.5	96.5	10573.2	18860.3
May-2007	62240.4	80.4	10396.5	15364.2
Jun-2007	61834.1	92.8	11781 2	13521.3
Jul-2007	60152.7	93.6	10129.5	15861.0
Aug-2007	62329.7	111	11101 6	17446 1
Sen-2007	60625.4	112.3	9933	16602.2
Oct-2007	61638	112.5	11732.8	17075.2
Nov-2007	50568 /	02.7	10780.2	16063.3
Doc-2007	58211.2	52.1 75 A	0046.3	15065.0
Dec-2007	56/66	70.2	9940.3	10900.9
Jan-2000 Eab 2009	50400	70.3	10410.3	16063.2
Feb-2006	00000 7	91.0	10204.7	10019.1
Mar-2008	60320.7	60.0 00.0	10077.4	15545.0
Apr-2008	62346.6	80.0	9743.6	14024.6
May-2008	60812.5	91.4	9658.5	13383.8
Jun-2008	60816.1	99.5	11403.5	14063.1
Jul-2008	58259.1	87.9	10987	13925.5
Aug-2008	59635.2	83.8	10945.3	12334
Sep-2008	56166.7	85.9	9011.9	10471.5
Oct-2008	60936.7	92	11035.3	10963.7
Nov-2008	58377.2	84.5	9527.9	11148.2
Dec-2008	57680.6	64.5	9586.3	13877
Jan-2009	55468.9	81.9	10183.4	12347.1
Feb-2009	58603.7	102.1	9801.7	14773.3
Mar-2009	58864	87.3	9658.7	12614.2
Apr-2009	60141.5	69	9607.2	10010.7

Mav-2009	60095.2	73	8786	9660.5
Jun-2009	61594.7	110.8	9768.8	13071.9
Jul-2009	60403.2	105.2	9055.5	12618.8
Aug-2009	59904.2	86.4	9185.2	12377.3
Sep-2009	59288	98.9	9565	13740.8
Oct-2009	58001 1	74.8	8721 7	10692.9
Nov-2009	58910 7	76.7	9251.2	12731.2
Dec-2009	59654 1	67.4	9810.9	15978 1
lan-2010	56089.9	53.2	8794 7	14513
5an-2010 Feb-2010	50013.2	72.8	9//5 8	13706.6
Mor-2010	60814.2	12.0	10144 8	13056 1
Apr 2010	62062.1	116.2	0925.9	11020.1
Api-2010	61905.0	10.5	9033.0	11920.1
lup 2010	01095.0	103.3	10302	9030.2
Jun-2010	64053	128.3	9589.4	11541.1
Jui-2010	02000.2	97.3	10513	8501.9
Aug-2010	64758.9	85.3	10502.1	10072.4
Sep-2010	62701.8	100.2	9588.5	9682.4
Oct-2010	62040.2	157.8	9479.5	10309.6
Nov-2010	59812.4	147.5	9483	10852.4
Dec-2010	59210.9	126.5	9821.4	12074.3
Jan-2011	53565.7	127.9	9552.3	14009.3
Feb-2011	55489.8	131.7	9627.9	11585.9
Mar-2011	58190.1	164.2	10232.1	9434.9
Apr-2011	58977.6	144.2	10143.3	9784.5
May-2011	56938.8	137.6	9631.4	12529.3
Jun-2011	58003.2	153.7	9986.9	11516
Jul-2011	56046.1	153.4	8775	9872.6
Aug-2011	59337.6	157.7	9133.1	10527.5
Sep-2011	58573.1	149.9	10080.4	8826.5
Oct-2011	57728.6	131.9	8454.8	12512.2
Nov-2011	57404.6	132.9	8662.2	10952.9
Dec-2011	57600.5	103.5	8755.5	12720.5
Jan-2012	54886.2	139.3	8219.1	12930.9
Feb-2012	57271.9	152.2	8604.4	14050.2
Mar-2012	57476.1	163.5	9452.5	11910
Apr-2012	57669.8	160.1	9324.9	10624.8
May-2012	58383.6	157.9	10046.8	12435.4
Jun-2012	59919.2	173.6	9808.3	12047.3
Jul-2012	56893.1	174	10296.8	11506.6
Aug-2012	58743	162.4	11292.5	13720.8
Sep-2012	56098.6	125.1	10375.6	12683.6
Oct-2012	58460.8	124	10864.5	15621.6
Nov-2012	58021.4	131.9	10591.5	14096.3
Dec-2012	56491.4	84.3	9483	16452.2
Jan-2013	56042.7	86.2	11551 5	17536.5
Eeb-2013	58562.8	93.8	10628.7	16110
Mar-2013	59543.4	112.5	11497 1	15309.6
Apr-2013	59594 6	109.1	11143.4	14642 5
May-2013	60/77 2	113.5	1135/	13376 5
lup_2013	60182.3	170.0	10627.6	13868.0
Jul-2013	58448 5	112.4	11027.0	10000.9
Jui-2013	50640.0	113.0	11900.3	12373.3
Aug-2013	59110.7	107.2	11203.2	12020 2
Sep-2013	50110.1 50600 5	101.3	11424.2	10000.0
Nev 2013	59699.5 50560.4	00.0	11210.7	120/0.4
NOV-2013	59560.1	0/	11002.7	13009.7
Dec-2013	57430.3	78.2	10798.5	14614.5
Jan-2014	56018.2	99.5	10927	16585.8
reb-2014	58668.9	80.3	11036	13654.5
Mar-2014	60246.9	68.8	10536.5	11038.7
Apr-2014	60660.5	81.4	11517	11745.7
May-2014	59793.5	82.3	11153.5	11929
Jun-2014	60165.2	79.3	11922.9	9667.8
Jul-2014	60250.8	84.7	12751.5	9192.8
Aug-2014	61228.4	78	12319.4	9762.2
Sep-2014	59608.8	75.9	11734.3	10579.3
Oct-2014	63389.6	96.2	12496.6	10919.1

Nov-2014	61645.1	75.7	13223	9793
Dec-2014	61235.2	71.4	13132.2	11611.6
Jan-2015	58429.5	56.6	11351.4	14023.1
Feb-2015	60798.1	65.9	13096.4	13544.2
Mar-2015	62055.7	48	11977.2	10419.7
Apr-2015	62867.3	74.6	13560.7	10045.8
May-2015	61815.3	70.1	12834	10476.6
Jun-2015	64061.9	71.9	14119.1	13261.6
Jul-2015	64073.4	82.5	15132	12494.4
Aug-2015	63672.2	76.2	13432.2	12620.5
Sep-2015	62945.4	76.2	13360.4	11095.5
Oct-2015	62758.8	89.4	13956.2	8834.7
Nov-2015	62010.3	62.3	13526.2	11689.8
Dec-2015	61744.5	62.3	13182.9	12089.6
Jan-2016	60264.8	65.5	12979.7	16127.9
Feb-2016	62907	71	11868.3	14524.2
Mar-2016	65568.9	74.1	14180.7	11632.8
Apr-2016	64183.4	71.3	14108.4	12110.6
May-2016	64855.4	71.6	13943.4	11085.7
Jun-2016	68241.7	75.1	14256.4	10945.9
Jul-2016	66718.2	73.6	12959.5	8469.7
Aug-2016	65197.1	77.9	12815.9	12504.1
Sep-2016	64887.8	77.4	13321.2	12448.3
Oct-2016	65762.5	80.4	13464.4	12353.2
Nov-2016	64599.4	84.5	14011.2	13825.3
Dec-2016	64197.8	57.5	13400.9	13906.8
Jan-2017	61550.9	64	12434.4	14562.9
Feb-2017	66043.3	63.6	12429.8	13207.2



Gulf Coast (PADD 3) Total Distillate plus	Gulf Coast (PADD			
Sales/Deliveries		Total Petroleum		
by Prime Supplier	Sales/Deliveries	Fuel Wholesale Sales in PADD 3	Total Petroleum Fuel Wholesale	Annual Petroleum Fuel
(Thousand	(Thousand	(Thousand	Sales in PADD 3	Wholesale Sales
Gallons per Dav)	Gallons per Day)	Gallons per Day)	(bpd)	(bpd)
21115.3	8930	98.181.1	2.337.645.2	(
19920.7	12051.4	100.371.8	2,389,804,8	
22374.9		96.061.9	2,287,188,1	
19976.1		91.921.0	2.188.595.2	
18821.1		86.672.5	2.063.631.0	
24464	10374.2	105,700.3	2,516,673.8	
23394.9	8498.5	100,457.2	2,391,838.1	
25305.6		99,266.4	2,363,485.7	
21376.1		93,333.7	2,222,231.0	
21988.1		94,161.8	2,241,947.6	
22686.6	9647.8	105,970.9	2,523,116.7	
24434.6	10389	108,917.6	2,593,276.2	2,343,286.1
24512.2	7220.2	102,124.0	2,431,523.8	
24708.7	10379.6	98,437.9	2,343,759.5	
25124.8	10376.7	98,390.3	2,342,626.2	
22723.2	6882.5	91,097.4	2,168,985.7	
24442.1	8966.4	97,602.5	2,323,869.0	
24810.2	7758.9	105,596.4	2,514,200.0	
24846.5	8422.2	105,169.7	2,504,040.5	
24985.5	8/0/.3	100,636.7	2,390,111.9	
24000.4	9402.4 11265 2	100,039.1	2,300,073.0	
24949.0	11200.2	100,970.3	2,404,245.2	
20320.0	11562 3	110,430.7	2,724,751.0	2 441 660 7
20732.3	11502.5	100,700.0	2,007,701.9	2,441,000.7
24374	8912.6	112 102 3	2,669,102.4	
25630.8	00.2.0	104.288.7	2,483.064.3	
26058.1		107,203.4	2,552,461.9	
23979.8	8565.5	110,334.4	2,627,009.5	
24158.6	9151.1	109,608.9	2,609,735.7	
25617.5	6600.4	111,199.8	2,647,614.3	
25857.7		101,829.6	2,424,514.3	
26258.7		105,066.6	2,501,585.7	
27965.5		108,246.0	2,577,285.7	
30205		114,895.0	2,735,595.2	
31024.2		119,148.9	2,836,878.6	2,587,948.0
27078.6	8092.8	117,224.2	2,791,052.4	
30147.2	7646.5	121,920.6	2,902,871.4	
26622.1	6785.8	112,401.3	2,676,221.4	
24038.9	0912.4	112,383.0	2,075,785.7	
27440	9394.2	123,490.3	2,940,300.1	
23300.9		103,009.1	2,519,204.3	
20370		100,450.5	2,502,545.2	
28793.2	8658 4	119,638,1	2,848,526,2	
30663 7	6994 5	121,468,8	2,892 114 3	
27416	7881.4	117.225.7	2,791.088.1	
29663.8	12052.4	131,832.2	3,138,861.9	2,776,551.0
27310.4	8711.7	116,781.1	2,780,502.4	. ,
25434.8	8320.1	116,071.5	2,763,607.1	
27432.5	6683.6	119,778.9	2,851,878.6	
25851.2	7065.8	117,750.1	2,803,573.8	

25326.7	5982.5	111.536.1	2.655.621.4	
26057.8	8713.4	116,034.9	2,762,735.7	
25462	7745.2	117,189.8	2.790.233.3	
25181.3	6776.6	113,963.0	2,713,404.8	
26161.3	9987.9	119,792.6	2,852,204,8	
29731.7	6589.3	118,441.6	2.820.038.1	
29307.9	7272.5	117,160.0	2,789,523,8	
300267	10034 4	128 087 9	3 049 711 9	2 802 753 0
30982.5	8850.8	120,533.7	2 869 850 0	2,002,100.0
34116.4	9110.2	129,325,5	3 079 178 6	
31539 7	9784 5	129 984 3	3 094 864 3	
28060 7	9305.5	123,804.0	2 947 885 7	
27929.2	9982.2	124 418 6	2 962 347 6	
26902.6	10293 7	127 233 8	3 029 376 2	
20302.0	10434 7	125 271 9	2 982 664 3	
29376.6	10333	126,650,2	3 015 481 0	
27688 9	10143.9	123,722.6	2 945 776 2	
28041 6	9407.6	122,722.0	2,040,770.2	
20041.0	9127 3	120,006,6	2,320,432.0	
2076/ 8	10567 4	126,000.0	3 007 040 5	2 076 688 1
28099 3	9020	115 074 7	2 730 873 8	2,570,000.1
20033.3	0127 7	11/ 003 0	2,735,785,7	
27433.0	9121.1	122 017 0	2,735,705.7	
27320.9	9030.7	125,017.9	2,920,997.0	
20201.0	0/9/.1	100.154.4	2,750,571.4	
24923.3	11399.3	122,104.1	2,900,431.0	
20100.7	00Z1 10052.6	112,003.3	2,730,173.0	
23027.2	10052.0	113,073.3	2,711,209.0	
29612.9	8415.5	119,210.4	2,838,342.9	
27241.2	7815.8	115,907.8	2,759,709.5	
28480.2	8942.7	119,771.9	2,851,711.9	
28079.2	9829.7	116,622.1	2,776,716.7	0.000.400.0
29136.8	10737	122,973.0	2,927,928.6	2,806,126.0
2/05/.2	8896.5	117,653.9	2,801,283.3	
24502.8	11820.5	118,595.2	2,823,695.2	
24697.4	8474.4	115,361.9	2,746,711.9	
24081.8	9495	112,974.4	2,689,866.7	
25192.6	8201.6	117,492.7	2,797,445.2	
30043.7	8979.8	122,948.8	2,927,352.4	
26475.1	/811.1	116,444.8	2,772,495.2	
29697.9	11397.3	129,629.1	3,086,407.1	
28106.7	11321.2	124,361.5	2,960,988.1	
30078	8250.2	120,696.0	2,873,714.3	
28608.1	8964.4	121,988.9	2,904,497.6	
26726.6	9965.4	118,132.7	2,812,683.3	2,849,761.7
28514.1	9544.3	121,307.5	2,888,273.8	
29299.2	10791.9	124,490.1	2,964,050.0	
26169.5	11072	118,527.0	2,822,071.4	
25786.3	10929.8	120,343.8	2,865,328.6	
26108.1	10879.5	120,518.0	2,869,476.2	
26557.8	11285.9	116,098.6	2,764,252.4	
26168.1	11126.4	118,049.0	2,810,690.5	
28638.8	10515.3	119,597.1	2,847,550.0	
27147.8	11181.6	115,066.4	2,739,676.2	
27841.7	10520.4	116,968.5	2,784,964.3	
25253.5	10311.3	114,445.6	2,724,895.2	
28503.4	12993.5	123,131.1	2,931,692.9	2,834,410.1
25808.3	11982.4	119,207.8	2,838,281.0	
27448.4	11096.2	122,280.6	2,911,442.9	
24180.4	12974.9	118,852.8	2,829,828.6	
25466.8	13488.9	123,251.0	2,934,547.6	
24045.8	12105.4	118,005.9	2,809,664.3	
25785.9	12891.9	120,129.6	2,860,228.6	
24832.2	12470.2	119,059.5	2,834,750.0	
24392.2	8339.5	110,983.1	2,642,454.8	
25435.6	11766	116,332.6	2,769,823.8	
25077.7	9899.9	117,459.0	2,796,642.9	

25527.7	8023.1	115,374.8	2,747,019.0	
24920.2	8458	117,411.8	2,795,519.0	2,814,183.5
18143.3	7176.5	94,785.5	2,256,797.6	
19598.5	8024.3	102,715.7	2,445,611.9	
19786.5	6266.7	101,281.5	2,411,464.3	
19963.2	6803.1	99,424.4	2,367,247.6	
19309.8	6521.7	97,783.2	2,328,171.4	
21053.5	6499.2	103,752.5	2,470,297.6	
21403.5	6390.1	101,507.2	2,416,838.1	
20167.9	5885.8	98,998.4	2,357,104.8	
20890.7	7659.6	103,485.2	2,463,933.3	
22637.8	5775.9	101,280.1	2,411,431.0	
21637.9	5859.6	105,447.9	2,510,664.3	
21472.5	7820.9	109,550.2	2,608,338.1	2,420,658.3
18906	5255.7	97,399.4	2,319,033.3	
20144.9	3930.9	96,959.2	2,308,552.4	
21627.8	6059	100,769.7	2,399,278.6	
21190.1	4760.2	99,298.1	2,364,240.5	
20616.8	4030.4	97,673.1	2,325,550.0	
23217.2	5885.5	103,973.9	2,475,569.0	
21080.9	5071.9	102,107.4	2,431,128.6	
22542	4261	104,743.8	2,493,900.0	
22348.2	5389.3	105,520.4	2,512,390.5	
20768.9	4218.1	98,481.2	2,344,790.5	
21214.8	4827.3	102,465.8	2,439,661.9	
19864.4	4928.3	104,538.2	2,489,004.8	2,408,591.7
19762.5	5569	103,278.2	2,459,004.8	
20485.4	5717.3	105,481.2	2,511,457.1	
22445.4	4927.6	106,054.8	2,525,114.3	
21443.3	4549.8	100,933.0	2,403,166.7	
21859.1	3163.6	101,981.3	2,428,126.2	
23346.8	3117.2	103,373.7	2,461,278.6	
21477.9	3845.4	99,907.0	2,378,738.1	
22888.5	4087.3	104,557.3	2,489,459.5	
22720.1	3762.5	103,767.0	2,470,642.9	
23293.5	3630.4	104,880.5	2,497,154.8	
21983.7	4042.9	105,638.0	2,515,190.5	
19999.3	4428.4	103,584.0	2,466,285.7	2,467,134.9
20984.5	4030.5	104,954.5	2,498,916.7	
22133.2	4789.4	107,496.9	2,559,450.0	
21709.1	5423.5	105,782.8	2,518,638.1	
23296.2	5222	108,380.1	2,580,478.6	
23755.3	5221.9	109,485.5	2,606,797.6	
23586.5	4392.7	106,928.1	2,545,907.1	
23502.4	4831.8	108,397.9	2,580,902.4	
23711.5	5282.1	110,346.2	2,627,290.5	
22401.6	5187.2	107,076.3	2,549,435.7	
24502.7	5/66.1	110,739.3	2,030,050.0	
22020.0	3964.7	100,942.5	2,595,009.0	0 504 000 0
21308.3	7504.5	112,440.0	2,677,300.0	2,581,303.0
21421.1	0007.Z	104,909.3	2,499,745.2	
22100.4	7409 5	105 952 5	2,019,911.9	
21791.4	7400.0	100,002.0	2,520,297.0	
23030.3	5700 7	100,021.3	2,571,955.7	
23734.1	5678.2	109,440.0	2,003,714.3	
23650 1	66/0	112 3/1 0	2,032,107.1	
23/52 6	6054.9	111 852 5	2,017,001.1	
20+02.0	6394.6	111 738 0	2,000,104.0	
24578 5	7020 1	113 540 3	2 703 340 5	
27/38 0	7809 3	111 674 0	2,100,040.0	
22641 6	7782.2	117 552 5	2 798 869 0	2 634 105 0
21801 2	6611.2	108 006 8	2 571 590 5	2,007,100.0
23211.3	6651 5	113 764 6	2 708 681 0	
25053.6	6960.8	115,106 1	2,740,621.4	
24831.4	7516.6	114,750.1	2,732,145.2	
	-	,		

25132.4	8406.4	116.503.5	2.773.892.9	
26323.6	7120.9	119,816.0	2,852,761.9	
25671 1	8255 9	118 127 0	2 812 547 6	
25025 1	5418 3	113 453 2	2 701 266 7	
23017 5	8268 7	113 551 9	2 703 616 7	
25305 /	75/3 6	118,036.0	2,700,010.7	
23333.4	7040.0	114 952 2	2,010,402.4	
24923.7	7220.0	120.092.0	2,134,000.0	2 751 000 2
24403.3	7190.2	120,902.9	2,000,040.2	2,751,009.5
22904.0	7000.4 0250 5	110,049.2	2,039,200.7	
24047.4	6300.0	110,022.3	2,701,403.3	
20304.4	521.2	110,000.0	2,775,310.7	
24049.4	5249 4740 7	110,919.7	2,703,002.4	
24000.0	4/10./	114,095.0	2,735,609.5	
25060.9	5464.5	119,890.5	2,854,535.7	
20074.4	50704	119,000.9	2,047,031.0	
20303.7	5126.6	121,330.0	2,009,447.0	
20110	0.00	110,024.0	2,024,301.0	
20703.4	4066.9	119,012.0	2,002,000.7	
20200.4	4900.0	120,023.5	2,070,750.0	0.040.074.0
20330.2	5042.4 4288.2	124,443.0	2,962,942.9	2,818,671.0
22939	4300.2	105,259.4	2,300,170.2	
20210	4073.3		2,775,845.2	
27361.6	5036.2	115,028.1	2,738,764.3	
25511.4	5751.4	113,008.2	2,690,671.4	
27595.9	5326.9	114,222.1	2,719,573.8	
29096.3	4738.1	117,406.6	2,795,395.2	
2//6/.1	5087.5	114,876.0	2,735,142.9	
29171.4	5389	120,329.4	2,864,985.7	
26955.6	5083.1	115,212.8	2,743,161.9	
27235.3	5748.9	117,201.0	2,790,500.0	
25193.5	4623.9	113,543.3	2,703,411.9	
26189.3	5967.5	120,501.5	2,869,083.3	2,744,392.7
28615.8	5801.2	119,558.7	2,846,635.7	
26191.1	5104.6	113,544.2	2,703,433.3	
26857.9	4849.5	117,987.1	2,809,216.7	
27624.3	5065.4	114,748.7	2,732,111.9	
28104.6	6408.8	121,147.0	2,884,452.4	
27281	4969.8	119,565.5	2,846,797.6	
27359.9	5247.3	121,368.2	2,889,719.0	
29115.7	5269.3	125,072.6	2,977,919.0	
27676.3	4259.2	117,290.7	2,792,635.7	
28668.3	4353.3	122,722.7	2,921,969.0	
27442.1	4891.5	122,843.6	2,924,847.6	
25193.8	5302.8	125,747.1	2,993,978.6	2,860,309.7
26364.1	3262.3	117,839.8	2,805,709.5	
26410.7	3783.3	118,353.1	2,817,931.0	
24955.9	2930.9	117,037.3	2,786,602.4	
27184.1	3013.9	119,261.2	2,839,552.4	
27988.5	3593.6	120,815.6	2,876,561.9	
27572.1	3988.4	122,710.3	2,921,673.8	
27376.6	3477.9	118,580.2	2,823,338.1	
27657	4109.3	120,671.1	2,873,121.4	
26331.2	2970.1	114,291.5	2,721,226.2	
27773.5	3477.7	117,535.1	2,798,454.8	
27488.4	3967.4	118,076.2	2,811,338.1	
24640.1	4081.5	116,810.7	2,781,207.1	2,821,393.1
26439	3449.6	114,579.7	2,728,088.1	
26381.5	3310.9	112,990.0	2,690,238.1	
28743.7	3818.9	115,115.2	2,740,838.1	
29153.5	3190.6	116,724.4	2,779,152.4	
28872.7	4256.1	115,958.9	2,760,926.2	
28378.2	5289.9	118,384.2	2,818,671.4	
27713.1	3848.3	116,216.2	2,767,052.4	
27376.3	3625.1	115,070.2	2,739,766.7	
28194.8	3848.2	118,643.0	2,824,833.3	
29903.6	2642.4	119,510.4	2,845,485.7	

26344.6	2465.1	114,510.0	2,726,428.6	
25542.2	3479.9	117,156.7	2,789,445.2	2,767,577.2
24144.1	3679.1	114,357.0	2,722,785.7	
24407.1	3156.1	111,631.1	2,657,883.3	
28328.1	3429.8	117,673.2	2,801,742.9	
29493.2	3270.1	116,147.7	2,765,421.4	
28396.8	3798.6	113,874.7	2,711,302.4	
29326.4	3742.9	117,336.5	2,793,726.2	
29017.9	3435.6	116,964.9	2,784,878.6	
28601.6	4005.8	117,238.8	2,791,400.0	
29437.3	3261.3	117,140.8	2,789,066.7	
28214.2	3712.7	115,279.4	2,744,747.6	
26285.1	3247.2	115,505.0	2,750,119.0	
27096.7	3652.5	121,265.1	2,887,264.3	2,766,694.8
26108.8	3412.5	113,456.1	2,701,335.7	, ,
27309.9	2808.1	116,981.5	2,785,273.8	
29336.3	3325.9	117,781.7	2,804,326.2	
29888.3	3022.7	120,698.1	2,873,764.3	
31024.6	3132.8	119,360.8	2,841,923.8	
30464.9	2734.2	120,851.4	2,877,414.3	
29204.3	2636.7	115,884.7	2,759,159.5	
31039.4	3129.5	120,454.1	2,867,954.8	
30120	3340.1	116,066.4	2,763,485.7	
29360.7	3430.2	115,825.8	2,757,757.1	
28209.2	3107.9	113,316.0	2,698,000.0	
27556.7	3193.3	117,940.8	2,808,114.3	2,794,875.8
28119.6	3440.6	116,071.4	2,763,604.8	
29197.6	2859.2	120,803.7	2,876,278.6	
31609.5	3245	120,830.5	2,876,916.7	
31737.4	2892.9	121,138.8	2,884,257.1	
31899.7	3343.7	118,748.1	2,827,335.7	
31909.4	3673.6	123,112.5	2,931,250.0	
32130.3	2722.8	117,843.7	2,805,802.4	
34693.7	2634.8	123,230.9	2,934,069.0	
33053.4	2715.1	119,200.9	2,838,116.7	
33026.2	3076.4	119,218.4	2,838,533.3	
32436.1	2803.6	120,691.3	2,873,602.4	
30512.6	2423.5	118,389.4	2,818,795.2	2,855,713.5
30878.3	3783.7	116,745.6	2,779,657.1	
33812.6	3215	124,518.8	2,964,733.3	
36236.5	3283.4	125,881.7	2,997,183.3	
33985.6	2983	124,626.1	2,967,288.1	
34835.9	2955.1	125,872.5	2,996,964.3	
34671.8	2679.8	124,581.0	2,966,214.3	
32829.6	3266.7	122,334.0	2,912,714.3	
38293.9	3190.4	132,472.7	3,154,111.9	
35113.6	2998.4	125,384.9	2,985,354.8	
38106.5	3352.2	132,024.4	3,143,438.1	
36698	2847.2	126,958.8	3,022,828.6	
33478.7	3099.9	120,777.5	2,875,654.8	2,980,511.9
34108.5	3545.9	123,190.2	2,933,100.0	
33289.1	3200.3	122,143.0	2,908,166.7	
33583.7	3539.2	123,153.1	2,932,216.7	
37923.2	3415.6	127,540.2	3,036,671.4	
35361.8	2632.5	121,940.5	2,903,345.2	
33900.8	3341.9	123,624.9	2,943,450.0	
32922.6	3210.4	119,392.5	2,842,678.6	
32037	2829.4	117,864.7	2,806,302.4	
30252	2856	108,844.0	2,591,523.8	
33223	3120.3	119,371.0	2,842,166.7	
29420.6	3007	111,565.4	2,656,319.0	
29342.1	3353.2	113,903.7	2,711,992.9	2,842,327.8
29344.4	3138.6	110,564.3	2,632,483.3	
29969.1	2425.2	115,675.1	2,754,169.0	
28565.1	2760.1	112,549.4	2,679,747.6	
29408.1	2791.5	112,028.0	2,667,333.3	

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31841.3	2603.5	116,627.5	2,776,845.2	
31473 5	2640.2	115 666 8	2 753 971 4	
22152.2	2506.2	117,000.0	2,700,045.0	
32133.3	2090.0	117,442.5	2,790,245.2	
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30400.4	2740.2	114,110.4	2,716,914.3	
29346.8	3056.4	117.913.7	2.807.469.0	2.727.516.9
31807 3	2761.8	114 019 9	2 714 759 5	_, ,
22054	2602.6	110,010.0	2,714,700.0	
32954	3023.0	119,710.0	2,000,001.0	
34883.8	3097.1	122,094.2	2,907,004.8	
34323.5	2855.9	122,014.7	2,905,111.9	
34114	2879.6	119,191.1	2,837,883.3	
34742 3	2616.9	122 671 0	2 920 738 1	
25225 1	2511.0	110 704 0	2,020,100.1	
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36029.9	2234.1	123,682.7	2,944,826.2	
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32229.5	2037.1	116,253.7	2,767,945.2	
31257.9	1918.8	113,472.0	2,701,714,3	
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30310.5	2818.1	110,383.8	2,628,185.7	
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33404.1	1587.2	114,147.2	2,717,790.5	
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33990.6	1725.2	114 543 3	2 727 221 4	
36037.0	1775.6	11/ 066 1	2 727 288 1	
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32302.0	2290.2	114,039.0	2,715,214.3	2,091,204.3
34036	2130.5	112,342.0	2,674,809.5	
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33889.7	2720.1	114,389.4	2,723,557.1	
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22550 0	2007.1	120,020.1	2,004,704.0	
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31083	2/88 3	110,688.2	2 8/0 710 0	2,700,727.1
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22760 6	1009 4	117 502 0	2,000,240.2	
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33863.4	2166.4	118,951,3	2,832,173,8	2,877,371,8
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36472.7	2684.4	122,115.4	2,907,509.5	
36967.9	2180.7	120,983.8	2,880.566.7	
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20502 2	1070 /	100 564 0	2 044 020 0	
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40372.1	3471.5	130,745.1	3,112,978.6	

37205.6	3130.1	125,072.5	2,977,916.7	
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37939.5	2673.1	124,473.2	2,963,647.6	
37057.9	2258.7	126,821.2	3,019,552.4	
36701.5	2104.8	123,306.9	2,935,878.6	
39079.7	3172.1	128,800.2	3,066,671.4	
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40235.9	3293.2	135,043.6	3,215,323.8	
39116.5	2161.9	133,060.7	3,168,111.9	
38999.8	3567.1	132,368.0	3,151,619.0	
39087.6	3264.3	129,829.4	3,091,176.2	
38830.7	2951.3	127,421.1	3,033,835.7	
36038.5	3715.7	127,042.8	3,024,828.6	
36209.4	3676.3	126,965.0	3,022,976.2	3,053,559.9
34700.2	3867.5	128,005.6	3,047,752.4	
36982.6	3576.4	129,929.5	3,093,559.5	
35577	4765.1	131,798.6	3,138,061.9	
36354.1	3346	130,173.8	3,099,376.2	
36274.1	3492.5	129,722.7	3,088,635.7	
35422.4	3213.1	132,154.6	3,146,538.1	
34980.4	2616.7	125,818.1	2,995,669.0	
36792.1	2642.6	130,029.7	3,095,945.2	
38129	2490.1	131,353.8	3,127,471.4	
38373.7	2542.6	132,576.8	3,156,590.5	
36281.3	2472.2	131,273.9	3,125,569.0	
33856.7	2402.5	127,822.2	3,043,385.7	3,096,546.2
35599.5	2058.2	126,269.9	3,006,426.2	
36496.1	2892.6	131,132.6	3,122,204.8	

135,043.6	3,215,323.8	3,096,546.2
	36,495.0	36,526.0

2,345,112.4

310,818.85 62,163.77

## Back to Contents Data 1: Motor Data 3: Other Products

Sourcekey C10000001 C40000001 C91000001 C50000001 C90000001

				U.S. Kerosene-	
	U.S. Total	U.S. Aviation	U.S. Jet Fuel	Type Jet Fuel	
	Gasoline All	Gasoline All	Naphtha All	All	U.S. Propane All
	Sales/Deliveries	Sales/Deliveries	Sales/Deliveries	Sales/Deliveries	Sales/Deliveries
	by Prime				
	Supplier	Supplier	Supplier	Supplier	Supplier
	(Thousand	(Thousand	(Thousand	(Thousand	(Thousand
	Gallons per				
Date	Day)	Day)	Day)	Day)	Day)
Jan-1983	257881.5	727.4	7202.3	30535.1	40603.3
Feb-1983	258959.7	842.4	7404.4	30940.1	38782.2
Mar-1983	300458.2	943.4	7526.2	32226.7	34331.1
Apr-1983	289966.9	1071.4	8780.1	31285.4	30375.6
May-1983	286608.4	1040.2	9009	31316.6	22839.1
Jun-1983	309199.3	1230.7	8785.9	35094.3	21972
Jul-1983	290507.3	1358.7	8389.7	34341.8	22012.2
Aug-1983	304307.1	1310.5	7471.4	38682.8	23466.2
Sep-1983	290911.7	1336.8	7969.5	36482.4	28462.4
Oct-1983	279682.8	1059.8	7485	36025.1	29326.8
Nov-1983	284509.6	912.3	8622.1	38256.8	33609.8
Dec-1983	290638.5	722.2	8630.8	37565.5	42045.7
Jan-1984	272775.5	782.3	6631.1	36327.6	46218.7
Feb-1984	279630	879.5	8123.9	37749.9	32881.5
Mar-1984	291849.6	963.6	8435.1	37907.1	30729.5
Apr-1984	286842.7	994.1	7930.3	36742.9	27747.8
May-1984	298240.8	1129.5	8973.7	39682.2	24778.3
Jun-1984	299896.7	1257	8846.7	39339.8	24371.4
Jul-1984	295443.5	1318	9451.4	39219.9	25588.8
Aug-1984	314533.6	1351.9	11352.2	42331.5	29568.5
Sep-1984	283966.1	1102.7	9163.8	40257.9	30206.4
Oct-1984	299499.7	997.4	8634.4	40136	37525.2
Nov-1984	299797.7	964.9	9083.1	38367.3	37694.4
Dec-1984	290740.9	739.7	7820.3	42026.2	37430.8
Jan-1985	282919	735.1	7864.1	40140	44690.1
Feb-1985	298124.4	759.7	8776.9	40972.7	45033.5
Mar-1985	303912.8	984.8	7295.7	42775.2	33995.2
Apr-1985	316665.7	1050.5	9298	40084.9	30083.1
May-1985	318817.3	1144.1	8778.4	40599.1	24158.5
Jun-1985	311279.5	1240.8	9110.7	39332.9	24938.4
Jul-1985	321709.3	1387.8	8181.3	42979	26751.2
Aug-1985	320373.3	1378.3	7908	42692.3	29092.3
Sep-1985	301929.8	1002.1	8106.5	44451.6	30296.6
Oct-1985	320287.5	992.9	7945.5	43419.8	38750.1
Nov-1985	308707.3	837.4	8573.9	45960.8	39372.4
Dec-1985	309690.2	837.6	8063.1	47899.8	46133.2
Jan-1986	281734.1	848.4	7720.7	45391.1	43179.3
Feb-1986	286128.1	742.8	6973.6	42511.4	37895.1
Mar-1986	305346.8	895.8	7033.1	41681.3	29758.9
Apr-1986	320484.8	1002.3	6140.2	41429	26487

May-1986	332225.2	1049.9	8252.6	42396.3	25780.4
Jun-1986	322838.8	1302.1	7478	43082.3	22083
Jul-1986	328108.1	1292.6	7731.4	43405.2	23326.3
Aua-1986	330274.1	1213.3	6988.1	44787.4	24514.4
Sep-1986	309861.4	1027.7	7736.2	45595.2	29659.9
Oct-1986	324726.4	961.4	7024.3	44811	32346.2
Nov-1986	305777.2	766	7677.3	43718.3	36536.6
Dec-1986	323647.8	756 1	7065.4	48636 1	38872.6
Jan-1987	288578 5	707.3	6471 7	45346.2	40896.5
Feb-1987	295464 7	776.9	6927.6	46373 6	36706.9
Mar-1987	312171.5	894.2	6432.4	45917	31182.8
Apr-1987	320244 4	1096.2	7429.2	44735.6	27313.2
May-1987	322449 9	1017 7	6309 3	45388	19506 3
Jun-1987	335228.8	1168 7	8004.7	46427 3	20945 1
lul-1087	330051 6	1200.7	7276.0	46578.0	20040.1
Δμα-1987	323785 7	1203.7	7578.6	48253 3	24680.4
Sen-1087	321780.2	1002.8	7837.0	40200.0	30673 /
Oct-1987	322700.2	1032.0	7756	47552.0	36171 3
Nov-1987	305738 1	81/1 3	8208.8	44051.0	31003 4
Doc 1097	221240.9	706 1	6022.4	44400.9	41092 A
Jop 1099	201292 5	700.1 593 5	7126.9	40092.0	41902.4
Jan-1900	291303.0	303.3	7120.0	45220.5	40090.1
Feb-1900	203920.9		7402.0	43695.1	41307.4
Mar-1988	32/31/.0	828.0	7506.3	44607.7	33473.0
Apr-1988	330756.8	917.1	7000.0	47400.7	24585.2
May-1988	329060.3	1001.1	7741.4	47625	23304.1
Jun-1988	353648.2	1215.7	7887.9	48426.3	23103
Jul-1988	343320.7	1224	7598.3	49870.7	23493
Aug-1988	348466.4	1387.1	7429	49366.8	27220
Sep-1988	331812.7	1114	8201.9	48979.5	30876.5
Oct-1988	327800.3	916.5	7661.8	48305.9	34441
Nov-1988	328227.4	851.3	7554.7	46210	33954.7
Dec-1988	335040.2	792.2	8361.8	47802.5	42818.3
Jan-1989	303925.3	664.6	/166.5	47418.8	40433.4
Feb-1989	313726.9	682.4	/9//.3	48521.3	43522.6
Mar-1989	337503.4	929.4	8335.3	46449	35476.5
Apr-1989	323919.2	1040	8584.3	46106.9	24565.6
May-1989	337184	1014.3	8184.4	47585.3	21213.7
Jun-1989	349145.9	1182.3	8360.8	49963.6	20789
Jul-1989	335303.5	1142	8053.2	50393.8	20733.6
Aug-1989	347409.9	1169.9	7895.1	50184.4	25827.5
Sep-1989	333118.2	1008	7742.6	50653.6	27342
Oct-1989	331325.1	877	8603.5	49931.9	33921.8
Nov-1989	332290.2	780.1	7564.8	48784.5	34683.4
Dec-1989	337236.5	622	8174.7	47320.5	48546
Jan-1990	304916.8	678.6	6349.7	48661.3	40483.1
Feb-1990	322955	788.2	7317.1	49656.4	35363.2
Mar-1990	335280.4	874.7	7045.9	51639.5	29265.9
Apr-1990	332826.3	971.5	7482.8	48156.9	25011.1
May-1990	348291.4	1020.7	6812.9	48957.9	20754.9
Jun-1990	356128.7	1269	6820.2	49158	21245.1
Jul-1990	352120.4	1231.2	5010	50155.3	23537.2
Aug-1990	361497.7	1250.4	6786.7	52329.2	28549.2
Sep-1990	329230.6	995	7831.2	52742.2	27399.5
Oct-1990	331873.4	843	6601.4	52675.5	32139.1

Nov-1000	332440 5	766.0	6727 6	51/2/ 3	32465 3
Dec-1990	321256 5	574 7	5813.1	18050.8	36001 3
Jan-1001	308274 1	6/3 6	6327.7	40039.0	30991.3 44141 Q
5an-1991 Eob 1001	2152026	659.9	7026 /	40110.2	26741.6
Feb-1991 Mar 1001	224206 1	710.0	7020.4 5446 7	40332	20741.0
Apr 1001	324390.1 242074 F	110.3	0440.7 6462 F	40010	20010.0
Apr-1991	342071.3	000.7	0103.5	40303	24020.0
May-1991	345390	900.0 4004.0	0402.0	40990.3	21303.0
Jun-1991	339167.2	1064.9	6442.9	49198.7	20745.8
Jul-1991	346159.8	1134.3	6316.7	50506.4	24841.5
Aug-1991	345090.4	1091.4	7170.1	51901.7	25003.2
Sep-1991	322272.8	959.7	6960.4	49464.1	28421.9
Oct-1991	328589.1	856.8	6370.5	48009.3	30166.5
Nov-1991	320431.8	650.6	6758.3	48197.8	32831.7
Dec-1991	323425.5	617.9	6154.2	48890.9	36918.9
Jan-1992	309436.2	630.2	6000	45906.4	43540.1
Feb-1992	316640.6	680	6080.5	48600.6	36995.9
Mar-1992	323606.2	842.7	5922.3	48031.8	30363.7
Apr-1992	337042.7	856.5	6433.8	48272.6	25643.3
May-1992	334208.8	964.1	6938.1	47872	22056.5
Jun-1992	338291.5	1035.8	6130.5	51896.7	23683.3
Jul-1992	340888.3	1155.4	6599.6	51823.7	27261
Aug-1992	330858.3	1077.3	5989.6	51453.4	28455.1
Sep-1992	327672.8	943.7	5443.3	51358.1	31170.3
Oct-1992	333957.2	845.8	5963.8	50910.2	34598.4
Nov-1992	321867.3	656.5	4825.5	50828.4	41573.2
Dec-1992	332800.2	629.5	4940.4	49262.2	47382
Jan-1993	292206.7	517.6	4397.9	47041.8	42579.8
Feb-1993	311617.3	650.3	5154.1	47619.4	45279.6
Mar-1993	314819.7	747.6	5632.9	47792.8	38827.7
Apr-1993	324876.6	814	4900.7	48912.8	27011.3
May-1993	323118.8	914.9	4848	49899.5	21063.8
Jun-1993	335721.3	1035.1	5798.2	50384.4	25757.9
Jul-1993	336371.2	1083.4	5435.2	51271.4	24793.5
Aug-1993	334404.4	1036.7	4133.5	52007.5	27050.8
Sep-1993	326018.2	923.9	4319.4	51813.2	32169.2
Oct-1993	322287.8	872.7	3073.8	50711.4	36030.5
Nov-1993	325399.9	706.3	3334.5	52370.3	41454.2
Dec-1993	328422.6	635.6	3364.4	52149.5	43763.8
Jan-1994	299392	569.4	2509	49334.7	50468.7
Feb-1994	314953.6	654.1	1964	49026.6	46939.8
Mar-1994	324234	826	2321.8	51650 5	33355.3
Apr-1994	330060.6	845 1	1826.5	54930.6	25372.3
May-1994	330510.6	1011 2	2053 1	54048	23204.4
Jun-1994	342276.6	1101.8	2078.3	55197.9	25401.5
lul_1004	336288.9	1162.4	19024	56035	26111.7
Δμα-1994	343779 9	1174 5	1872 1	57697 6	31219.5
Sen-1994	333013 4	1052.8	1134	56872	34005 7
Oct-1994	330/63 6	8/2 6	863	5/77/ 0	37770 /
Nov-1994	320420.5	772	1168.0	56060	37878 1
Dec-100/	323423.3 33/072 5	632 7	006 8	56103 /	15028 2
lan-1005	305012.0	561 9	300.0 1112 Q	5/765 /	40900.Z
5an-1990 Eab-1005	200343.0	504.0 669 <i>1</i>	1110.0	51874 7	52225 4
Mor 1005	JZZ421.1 201106 1	760 5	1103.1	520/4.7	202220.1
Nat 1005	331120.4 220027 7	009.0 000.0	G. 1001	54252 0	3043Z.9
Ahi-1992	529021.1	0U2.0	911.4	04000.Z	30210.7

May-1995	341311.1	973.7	1080.8	55284.8	27798.1
Jun-1995	353167.9	1000.6	991.1	56209.3	28204.2
Jul-1995	343697.5	1063.8	1300.5	56468.8	27811.1
Aug-1995	354811.1	1098.5	1188.9	57758.7	32654.7
Sep-1995	337234.6	942.5	1200.6	56416.1	35501.6
Oct-1995	338400.5	803.9	782.5	56699.9	36762.4
Nov-1995	337841	690.2	708	56896.4	44632.5
Dec-1995	333498.6	571.5	700.4	55724.2	53945.3
Jan-1996	311386.5	541.8	706.1	57805.1	57186.2
Feb-1996	326881.1	603.8	735.2	58810.1	55734.5
Mar-1996	331178.9	693.1	675.6	59143.7	40326.8
Apr-1996	342258.7	816.1	567.3	60408.7	33387.8
May-1996	345818.8	925.8	799.7	60325.7	26854.4
Jun-1996	348403.5	950.1	877.4	61257.3	26771.1
Jul-1996	353754.4	1030.3	884.1	61401.8	28838.3
Aug-1996	355688.7	1059.8	881.6	61710.5	34944.4
Sep-1996	335198.3	865.3	825.2	61629.7	37751.7
Oct-1996	344902.4	822.5	687.9	58196.2	43378.2
Nov-1996	340286.4	621	490	58008.9	49289.9
Dec-1996	337018.8	532.7	622.7	59646.5	53479.3
Jan-1997	317585	571.7	588.5	56673.6	54346.7
Feb-1997	329821.2	834.8	890.3	57750.3	47277.7
Mar-1997	335799.6	731.6	757	58791.1	34964
Apr-1997	344051.8	766.9	730.9	60322.2	31714.4
May-1997	348075.6	897.1	789.7	59572.1	28454.2
Jun-1997	351113.5	940.7	714.1	62704.7	27177.7
Jul-1997	363440	1088.6	710.3	62496.7	28647.8
Aug-1997	358387.5	1028.5	837.4	62747.5	31743.2
Sep-1997	343092.7	883.6	673.1	62188.8	36170.4
Oct-1997	351432.4	809.2	571.1	60719.2	41354.3
Nov-1997	337550.4	607.2	485	62031.9	44337.4
Dec-1997	348581.1	589.6	480.8	61683.9	53463.2
Jan-1998	323496	502.8	385.7	58044	48358.2
Feb-1998	335167.1	629	650.9	59719.5	45994.4
Mar-1998	343963.5	796.3	413.9	59427.8	42029
Apr-1998	351645.5	835.1	524.6	60353	31203.5
May-1998	355069.1	872.4	516.6	61346.7	25617.6
Jun-1998	368321.4	977.4	456	63303.1	28544.5
Jul-1998	370309.5	1077	617	62669.9	27183.8
Aug-1998	363216.5	933.2	619.7	63074.4	29392.4
Sep-1998	355466.6	938.1	517.1	58267.6	34517.4
Oct-1998	359486.6	851.8	568.2	62884.4	39072.4
Nov-1998	347231.3	647	446.7	60199.6	39283.7
Dec-1998	356435.4	636.9	389.6	62109.6	51185.9
Jan-1999	323265.9	549.9	360.4	53964.4	56229.1
Feb-1999	347337.8	720.1	408.9	58380.6	45375.7
Mar-1999	357105.4	762.8	428.2	58830.5	44851
Apr-1999	359659.2	834.5	508.1	60466.2	32459.9
May-1999	360674.8	858.1	337.8	62512.2	26872.3
Jun-1999	373982	1040.7	327.6	64213.4	28568.5
Jul-1999	373161.5	1039	319.2	63912.5	29377.1
Aug-1999	368014.3	1022.6	361.1	63905	34095.8
Sep-1999	357659.4	1011.2	378.7	61712.1	37650.5
Oct-1999	357262.6	832.9	219.3	59981.7	36645.4

Nov-1999	354350.4	706.8	205.9	61272.5	39608.6
Dec-1999	375695.1	630.6	252.5	63333.9	53004.9
Jan-2000	311407.7	473.6		54849	52418.4
Feb-2000	345228 4	584 7		58071.5	51102.3
Mar-2000	347882.2	695.7		59419.9	35832.9
Apr-2000	349434 7	701		59610 1	28755.2
May-2000	365731.5	878 7		60314.5	23214.1
Jun-2000	371614 6	893 7		64658.3	26225.6
Jul-2000	362793.6	894.8		64050 7	25608.6
Aug-2000	372249.6	1079.2		63585 3	33608.5
Sep-2000	354559 1	862.7		63839.2	35340.7
Oct-2000	35/187/1 6	733.0		60842.2	38152 5
Nov-2000	353150.8	630.9		61608.0	13//1 8
Dec-2000	357733	500.2		61688.3	50035.2
Jan-2001	222211 2	520.7		50626.0	50803 1
Jan-2001 Eob 2001	2/225/1.3	520.7	10.4	60722.3	47051 9
Mar 2001	340234.2	672.0	19.4	61606.3	47051.0
Apr 2001	260512.2	722.1	14.7	60276	42147.0
Apr-2001	300313.3	132.1	14.7	64204.9	20400.9
Way-2001	303009.1	007.7	13.1	04294.0	27213.3
Jun-2001	374951.2	872.1	40.4	64043.1	20885.3
Jui-2001	372348.0	938.7	10.1	00020.0	29601.3
Aug-2001	381999.3	943.5	11.9	67291.5	33259.7
Sep-2001	356021.6	660.6	14.6	55120.6	36017.6
Oct-2001	367685.3	709.5	11.5	54452.6	41819
Nov-2001	362764.8	636.1	8.8	60010.8	41567.2
Dec-2001	361098.1	498.3	13.5	58272.5	48489.7
Jan-2002	345610.1	477.2	7.6	54987.3	51832.8
Feb-2002	360267.8	499.2	17.8	58373.9	42756.4
Mar-2002	361490.8	648.8	7.8	60893.1	39255.9
Apr-2002	372778.4	759.3	12.3	60038.7	30712
May-2002	380735.8	958.2	11.2	58146.3	27140.1
Jun-2002	382719.3	684.3	7.8	60425.6	28908.2
Jul-2002	384409	887.4	6.4	62899.5	26581.1
Aug-2002	389738	1120.3		60851.3	28921.3
Sep-2002	362285.1	748.9		60369	30285.2
Oct-2002	374162.4	671.6		60446.5	38883
Nov-2002	366073.6	516		58897.3	41605.5
Dec-2002	362595.5	445.9		57349.1	51891.9
Jan-2003	347064.9	393.4		53933.7	56114.9
Feb-2003	351393.3	543.9		55966.8	50128.2
Mar-2003	354496.3	629.5		54353.7	35029
Apr-2003	364468.4	671.1		52837.9	29051.6
May-2003	377611.2	653.2		53186	22303.1
Jun-2003	380903.5	931.7		54755.9	25010.3
Jul-2003	389831.3	807.7		55886.6	26980.3
Aug-2003	390542.3	783.9		56467.4	28104.8
Sep-2003	375971.4	745.4		56967.2	33545.5
Oct-2003	382446.5	629.9		54457.6	38005.1
Nov-2003	364938.8	523.8		55047.7	37327.8
Dec-2003	369796.2	501.2		56169.7	51746.6
Jan-2004	347495.3	461.7		55540.7	58509.6
Feb-2004	354176.8	498.1		56899.7	51063.6
Mar-2004	368985.9	704.3		57638.3	37743.8
Apr-2004	375386.6	730		60633.2	28846.2

May-2004	373860.7	688.3	55130.1	23929.7
Jun-2004	383443.8	771.4	58884	27470.5
Jul-2004	385513.2	805	57031.6	28061.7
Aug-2004	384187.7	800.4	59308	28932
Sep-2004	375697.2	756.8	57825.5	32547.8
Oct-2004	370616	653.4	56489.1	37565.5
Nov-2004	368125.1	565.6	56261.5	43069.4
Dec-2004	379501.7	529	55909.5	54813.5
Jan-2005	350388.6	427.7	56124.4	54221.5
Feb-2005	369812.3	529.1	61015.6	48605.6
Mar-2005	378044 4	622.4	61570.3	40872 6
Apr-2005	380809.4	666.5	63701.8	28717.5
May-2005	388167.8	681.8	62361.5	25146
Jun-2005	395341.8	925.5	65283 1	26578
Jul-2005	390661.6	778	62719 7	25925 5
Aug-2005	399133.6	870.6	65988 5	30361.2
Sep-2005	368882 3	783.9	62032.8	32584.3
Oct-2005	368895 1	586 1	58033.0	34836.0
Nov-2005	373805.8	507.7	57999 1	36523.5
Dec-2005	373003.0	J97.7 A5A A	59546.6	52717.6
Dec-2005	3/0/00.1	404.4	55180.8	J2717.0
5an-2000 Fob-2006	370808 1	400.0 51/ 0	56670	49 <u>5</u> 20.5
Mar 2006	376000.1	501 1	50079	12951.0
Apr 2006	370166 5	647.1	59075	43031.9
Apr-2000	321520.6	766.2	57067 7	27470.0
lup 2006	201007	700.3	60145.2	21419.9
Jun-2006	391007	702.2	60145.2 58602 7	29074.2
Jui-2006	2024012.7	193.3	50095.7 60904 F	20000.1
Aug-2006	392402.4	000 601 5	60001.5 E8446.0	31000.0
Sep-2006	377309	091.0	50410.9	34230.4
Oct-2006	378303.4	642.7	56974.7	39632
NOV-2006	377075.1	362.9 455 7	55477.5	43971.8
Dec-2006	373940.3	455.7	57235.2	48068.5
Jan-2007	359050.7	458.4	56296.5	53280.1
Feb-2007	372551.8	456.2	58869.4	60543.3
Mar-2007	376284.7	541.7	57775.2	40851.9
Apr-2007	374146.1	540.3	58969.8	36765.2
May-2007	385243.6	606.8	58505.7	28972.5
Jun-2007	390003.8	670.6	62124.1	26872.2
Jui-2007	381336.7	688.3	60293.9	29562.4
Aug-2007	391683.3	714.5	61900	32990.1
Sep-2007	375442.7	605.5	58410.4	34901.9
Oct-2007	380390.6	580.8	59576.1	38721.7
Nov-2007	370591.4	515.7	57962.9	42089.8
Dec-2007	362633.1	366.6	56430.3	48869.9
Jan-2008	352153.3	382.2	56294.1	56199.6
Feb-2008	364644.3	442.5	5/311	50203.4
Mar-2008	364816.2	453.7	57026.3	39883.9
Apr-2008	3/1623.2	584.3	58367.2	30844.3
May-2008	368957.4	587.8	58245.5	26376.8
Jun-2008	367346.2	647.5	61190.4	25925
Jul-2008	363029.5	631.9	61670.1	26782.3
Aug-2008	367087.6	598	59060.5	25840.9
Sep-2008	350425.3	508.9	54739.6	27111.3
Oct-2008	367401	515.4	54131.3	34680.1

Nov-2008	356401.8	424.9	52718.8	37543.7
Dec-2008	361649.4	352.2	52319	48573.9
Jan-2009	342062.7	373	52431.9	49912.9
Feb-2009	355341.5	425.1	52935.1	45839.9
Mar-2009	355900.8	454.4	54803.4	34513.1
Apr-2009	366179.9	470.9	55959.1	26157.4
Mav-2009	369845.6	497.3	54838.7	20685.4
Jun-2009	377793.5	608.1	58406.5	25020
Jul-2009	375451.2	653	57992	25112.4
Aug-2009	371446.3	600.6	57002.4	25028.2
Sep-2009	365338.3	601.8	56218.3	29934 8
Oct-2009	360349.5	470	54037 5	34818.3
Nov-2009	352940.3	413.5	55020.9	43900 5
Dec-2009	360567.2	350	55679 7	52302.9
Jan-2010	335329 3	326.8	50520 5	50703.9
Feb-2010	351848 4	367.2	52052.8	46707.6
Mar-2010	362671 7	476.8	55690.6	34824 9
Apr-2010	371490 6	552 3	54528.8	25244.2
May-2010	372032.8	527.2	55854 1	20244.2
lup_2010	370036	620.3	57684	20723.4
Jul-2010	380748 1	604.9	59140.6	20068 5
Jui-2010	370138 6	580.8	50252	20000.5
Aug-2010	260442.2	509.0	59252	23022.0
Sep-2010	303443.Z	570.0 702.9	54005.2	27002.3
Nov 2010	302003.0	702.0	53741.0	27000.9
NOV-2010	357911.7	043	53033.8	32775.1
Dec-2010	309033.9	518.3	52933.7	47620.4
Jan-2011	3332/8./	497.5	52124.9	50172.7
Feb-2011	347283.1	604.6	51657.7	42370.9
Mar-2011	352630.5	639	55161.5	31074.4
Apr-2011	353211.1	656.3	55363.7	23664.4
May-2011	353234.7	700.5	54743	23144
Jun-2011	363300.9	/9/.4	55882.5	22595.1
Jui-2011	359158.6	838.5	54638.5	20471.5
Aug-2011	370095.5	831.5	55542.9	24327
Sep-2011	359636.8	808.5	54212.1	26809.7
Oct-2011	355416	662.7	50138.9	31918.7
Nov-2011	355103.6	603.7	50906	33361
Dec-2011	356700.6	531	51042.1	39207.3
Jan-2012	326206.9	661.4	50686.3	40717.2
Feb-2012	343471.6	742.5	51662.6	39174.9
Mar-2012	344305.4	775.2	53755.7	27975.3
Apr-2012	346056	764.6	54788.4	21797.5
May-2012	353967.2	840.6	54953.7	22320.9
Jun-2012	362301	873.1	59833.2	22536.2
Jul-2012	353467	935.8	59490.2	23144.8
Aug-2012	360886.1	911.7	58343.6	26836.7
Sep-2012	341115.6	707.7	52548.7	28336.2
Oct-2012	351417.5	622.4	52464	34028.4
Nov-2012	344150.9	581.4	52967.2	36349
Dec-2012	339377.3	378.9	52673.7	42058.9
Jan-2013	332833.7	474	54584.1	50979.8
Feb-2013	341507.9	470.1	54380.1	46231.3
Mar-2013	345879.9	508.9	55382.7	39184.1
Apr-2013	351699.1	458.8	58386.8	30891.1

May-2013	357563.7	519.7	57380.8	24136.5
Jun-2013	359454.4	648	57511.7	24131.8
Jul-2013	355964.6	671.9	61022.4	24383.4
Aug-2013	360621.2	624.3	59252	28245.1
Sep-2013	344753.3	528.1	55062.2	30711.8
Oct-2013	347905.1	517.1	53861	38009.2
Nov-2013	345431.1	473.4	54173.9	40789.2
Dec-2013	339797.8	371.8	53411.6	49315.5
Jan-2014	322546.8	386.7	51820	54043.8
Feb-2014	334997.9	353.1	52890.6	45922.3
Mar-2014	340445.2	383.6	53741.5	36412.8
Apr-2014	346400	441.1	57167.8	27602.4
May-2014	354700	532.6	56096.6	23999.1
Jun-2014	353345.7	460.6	59012.7	22000.1
Jul-2014	356085.8	651.9	58830	23418
Aug-2014	355024.7	496.8	59446.6	25134.1
Sep-2014	345832.2	441.8	57417.6	30019.7
Oct-2014	354962.2	482.8	57891.2	35142
Nov-2014	347193.7	353.7	57788.2	36976.1
Dec-2014	348016	440.8	59197.1	42261.9
Jan-2015	336514	321.7	53636.6	49531.2
Feb-2015	350723.3	376.4	56530.6	49778.2
Mar-2015	353325	344.2	58574.9	35163.4
Apr-2015	363960.8	519.8	60428.1	24971.2
May-2015	363206.7	470.6	59520.8	22108.1
Jun-2015	373640.6	478.3	61808.6	25704.3
Jul-2015	374628.1	636.5	64611.6	25044.8
Aug-2015	371183	509.5	61876.6	25612.8
Sep-2015	365649	495.3	59251	27309.3
Oct-2015	364053	558.5	57919.6	28546.5
Nov-2015	357796.9	361	58355.5	30625.4
Dec-2015	357455.7	343.4	58987.8	36654.7
Jan-2016	342192.8	303.5	54943.8	48967.2
Feb-2016	360546.8	390.9	53752.6	44708.6
Mar-2016	366846.1	405	56557.2	31072.4
Apr-2016	370840.6	535.4	56993.6	26138.7
May-2016	373972.4	415.8	56938.4	22698.3
Jun-2016	389669.5	485.7	60850.8	22635.8
Jul-2016	385165.4	499.8	60690	19105
Aug-2016	384718.7	628.9	62722.8	25924.1
Sep-2016	375497.9	448.2	58898.6	27905
Oct-2016	373717.8	405.1	57690.9	31164.1
Nov-2016	369832.5	423.7	59103.3	33644.3
Dec-2016	367595.8	427.1	58370.7	45753.2
Jan-2017	343474.5	281.4	55505.5	46766.8
Feb-2017	359533.3	339.4	56873.7	38278.7

U.S. Total				
Distillate plus	U.S. Residual			
Kerosene All	Fuel Oil All			
Sales/Deliveries	Sales/Deliveries	<b>Total Petroleum</b>		
by Prime	by Prime	Fuels Sold by		
Supplier	Supplier	Prime Suppliers	<b>Total Petroleum</b>	
(Thousand	(Thousand	(Thousand	Fuels Sold by	
Gallons per	Gallons per	Gallons per	Prime Suppliers	Annual Average
Day)	Day)	Day)	(bpd)	(bpd)
132511	64569.5	534,030.1	12,715,002.4	
127907	72030.1	536,865.9	12,782,521.4	
131963.9	64213.8	571,663.3	13,611,031.0	
122106.2	61906.4	545,492.0	12,987,904.8	
98592.6	57123.2	506,529.1	12,060,216.7	
109788.3	56605.4	542,675.9	12,920,854.8	
100179.8	55004.7	511,794.2	12,185,576.2	
114581.4	56383.6	546,203.0	13,004,833.3	
109214.3	52154.3	526,531.4	12,536,461.9	
109759.5	52101.5	515,440.5	12,272,392.9	
127742.4	53347.6	547,000.6	13,023,823.8	
159240	59939.5	598,782.2	14,256,719.0	12,863,111.5
171550	71706.8	605,992.0	14,428,381.0	
139804.2	71179.2	570,248.2	13,577,338.1	
149881.1	63353.5	583,119.5	13,883,797.6	
130208.2	48592.2	539,058.2	12,834,719.0	
125439.4	50283	548,526.9	13,060,164.3	
113180.2	51437.6	538,329.4	12,817,366.7	
110675.4	46538.2	528,235.2	12,577,028.6	
120028.1	52783.8	571,949.6	13,617,847.6	
121139	51599.8	537,435.7	12,796,088.1	
122456.9	50119.1	559,368.7	13,318,302.4	
139326.6	50395	575,629.0	13,705,452.4	
146015	58982.6	583,755.5	13,898,940.5	13,376,285.5
167695.1	60160.8	604,204.2	14,385,814.3	
157029.4	60737.1	611,433.7	14,557,945.2	
142744.2	51170.3	582,878.2	13,878,052.4	
129578.3	42151.2	568,911.7	13,545,516.7	
113540.8	41476.6	548,514.8	13,059,876.2	
106041.4	42847.9	534,791.6	12,733,133.3	
111182.4	39061.3	551,252.3	13,125,054.8	
121472.9	42392.1	565,309.2	13,459,742.9	
120935.6	39280.5	546,002.7	13,000,064.3	
136639.7	42549.8	590,585.3	14,061,554.8	
136042.7	48283.4	587,777.9	13,994,711.9	40 704 404 0
160166.1	5/545.4	630,335.4	15,007,985.7	13,734,121.0
150381.1	51134.6	580,389.3	13,818,792.9	
159857.4	58018	592,126.4	14,098,247.6	
140002.1	51241.0 40000 0	501,519.0	10,040,/04.8	
12/055	49098.8	5/1,09/.1	13,011,033./	

123235.5	47678.7	580,618.6	13,824,252.4	
115055.7	49875	561,714.9	13,374,164.3	
117388.8	51940	573,192.4	13,647,438.1	
127387.4	52025.9	587,190.6	13,980,728.6	
121037.1	49753.3	564,670.8	13,444,542.9	
137296.6	42176.5	589,342.4	14,031,961.9	
137560	49452.4	581,487.8	13,844,947.6	
158972.3	60837.7	638,788.0	15,209,238,1	13.894.321.2
156450	56575	595,025.2	14,167,266.7	- , , -
149707.4	57015.5	592,972.6	14,118,395.2	
143621.7	45918.4	586,138.0	13,955,666,7	
128116.9	44588.3	573.523.8	13.655.328.6	
115484.9	39537.3	549,693.4	13,087,938.1	
119444.2	47313.4	578.532.2	13.774.576.2	
118325.9	48773.5	585.312.2	13,936,004.8	
110845.8	48122.7	564.509.8	13.440.709.5	
124532.2	44891	578,360.1	13,770,478.6	
143200.5	41291.4	596.210.9	14,195,497.6	
135181.2	47348	572,747.7	13.636.850.0	
155944.4	62218.9	637,208.6	15,171,633.3	13,909,195.4
176152.3	60859	627,427.5	14,938,750.0	, ,
177354	58700.9	641,517.8	15,274,233.3	
166594.8	52942.2	633,270.8	15,077,876.2	
130818.4	49690	591,834.8	14,091,304.8	
124189.3	45073.1	577,994.3	13,761,769.0	
124786.2	47625.7	606,693.0	14,445,071.4	
122416.7	50119.1	598,042.5	14,239,107.1	
129896.7	53291.9	617,057.9	14,691,854.8	
128188.9	48120.3	597,293.8	14,221,281.0	
144760	55291	619,176.5	14,742,297.6	
151608.8	59465.9	627,872.8	14,949,352.4	
170355.4	72650.5	677,820.9	16,138,592.9	14,714,290.9
164381.1	68083.2	632,072.9	15,049,354.8	
167848.1	62492	644,770.6	15,351,681.0	
161642.5	64750.1	655,086.2	15,597,290.5	
134176	59311.4	597,703.4	14,231,033.3	
125869.7	53956.9	595,008.3	14,166,864.3	
128176.1	49817.2	607,434.9	14,462,735.7	
117198.7	53663.4	586,488.2	13,964,004.8	
136870.4	47255.5	616,612.7	14,681,254.8	
132428	44845.5	597,137.9	14,217,569.0	
144499	48503.9	617,662.2	14,706,242.9	
153329.1	53387.2	630,819.3	15,019,507.1	
191152.6	67522.9	700,575.2	16,680,361.9	14,843,991.7
157129.7	69708.2	627,927.4	14,950,652.4	
161678.4	60722	638,480.3	15,201,911.9	
147366	50911.1	622,383.5	14,818,654.8	
137466.6	49876.2	601,791.4	14,328,366.7	
129776.2	46388.9	602,002.9	14,333,402.4	
131891.7	47638.4	614,151.1	14,622,645.2	
126787.5	53366.8	612,208.4	14,576,390.5	
143618.1	55138.9	649,170.2	15,456,433.3	
135975.5	46917	601,091.0	14,311,690.5	
139242.2	43120.2	606,494.8	14,440,352.4	

143363.7	44157.3	611,345.6	14,555,847.6	
143747.4	46498.4	602,941.2	14,355,742.9	14,662,674.2
168347.9	49723.4	625,576.8	14,894,685.7	
147642.4	49118.1	605,411.9	14,414,569.0	
140207.2	47208.3	593,107.2	14,121,600.0	
132143.1	48462	602,590.1	14,347,383.3	
124733.6	48171.3	596,125.8	14,193,471.4	
121377.7	52906.2	590,903,4	14.069.128.6	
122699.6	49244.1	600,902.4	14,307,200.0	
128082.1	51422.5	609,761,4	14.518.128.6	
128614.8	50244	586,937,7	13.974.707.1	
142231.9	40627.7	596.851.8	14.210.757.1	
137278.5	43866.2	590.014.9	14.047.973.8	
149550.4	56062.8	621,620,6	14.800,490.5	14.325.007.9
162996.8	54795.9	623.305.6	14.840.609.5	,,
149318.8	52109	610.425.4	14.533.938.1	
144582.4	50898.2	604.247.3	14.386.840.5	
139433.2	49362.3	607.044.4	14.453.438.1	
122597.5	41553.4	576,190,4	13.718.819.0	
124092.5	43922.2	589.052.5	14.025.059.5	
122434.1	43485.7	593.647.8	14,134,471,4	
122210.4	34432.6	574,476,7	13.678.016.7	
135122.6	38180.9	589 891 7	14 045 040 5	
142302.3	40225 7	608 803 4	14 495 319 0	
140257 6	41282.2	601 290 7	14 316 445 2	
160038.3	43608 1	638 660 7	15 206 207 1	14 319 517 1
142679.8	37108	566 531 6	13 488 847 6	1,010,017.1
155716.6	35742	601 779 3	14 328 078 6	
150618.2	37875.9	596 314 8	14 197 971 4	
129204 2	37038.9	572 758 5	13 637 107 1	
116162 1	30991	546 998 1	13 023 764 3	
121610.8	34708	575 015 7	13 690 850 0	
115644 8	36662 1	571 261 6	13 601 466 7	
119180 4	35596.2	573 409 5	13 652 607 1	
127733 5	40601.8	583 579 2	13 894 742 9	
135400.3	37429 1	585 805 6	13 947 752 4	
140851	36540.4	600,656,6	14 301 347 6	
157489 1	45213.9	631 038 9	15 024 735 7	13 899 106 0
166254	45524.5	614 052 3	14 620 292 9	10,000,10010
161667	51665.3	626 870 4	14 925 485 7	
151008 7	44020 4	607 416 7	14 462 302 4	
129530.2	33657 4	576 222 7	13 719 588 1	
124439.5	32821.5	568 088 3	13 525 911 9	
128439	35511	590,006,1	14 047 764 3	
114011 8	32696.3	568 208 5	13 528 773 8	
129422	32498.6	597.664.2	14.230.100.0	
133451	29323.4	588.852.3	14.020.292.9	
135778	24120 1	584 612 6	13 919 347 6	
135869.3	27369.9	588,556 7	14.013.254 8	
146791.7	31236.2	616.581 5	14.680.511.9	14,141,135,5
145231 2	30586.3	588,679.8	14,016 185 7	,,
157925.9	33450 3	620 774 6	14,780,347.6	
144957 9	28391 3	598,706.8	14,254 923 8	
129138.2	23515	568.765.0	13,542.023.8	
		,	-,,	

126441.7	22835.6	575,725.8	13,707,757.1	
130479.9	23151.9	593,204.9	14,123,926.2	
118004.1	23153.4	571,499.2	13,607,123.8	
132489.2	26323.5	606,324.6	14,436,300.0	
133003.5	25325.1	589,624.0	14,038,666.7	
139418.6	22061.5	594,929.3	14,164,983.3	
147569.7	26087.5	614,425.3	14,629,173.8	
156104.4	31934.6	632,479.0	15.059.023.8	14.196.703.0
165833.6	37293.4	630,752.7	15,017,921.4	, ,
167599.4	34235.5	644,599.6	15,347,609.5	
149268.5	32061.7	613,348,3	14.603.531.0	
144402.3	27369.1	609,210.0	14,505,000.0	
132808.8	23110.5	590,643.7	14,062,945.2	
130359	26396.8	595,015.2	14,167,028.6	
128573.1	27205.4	601,687,4	14.325.890.5	
134056.5	27735.8	616,077.3	14,668,507.1	
135061.1	23955	595,286.3	14,173,483.3	
151257.7	26073	625,317.9	14,888,521.4	
150732.2	29722.8	629,151.2	14,979,790.5	
151440.7	33697.5	636,438.2	15,153,290.5	14,657,793.3
164331.1	33137.1	627,233.7	14,934,135.7	, ,
154622.5	33003.4	624,200.2	14,861,909.5	
146488.3	27840.2	605,371.8	14,413,614.3	
146373.9	24977.7	608,937.8	14,498,519.0	
136341.6	24156.5	598,286.8	14,244,923.8	
131456.3	25131.1	599,238.1	14,267,573.8	
133968.1	27232.8	617,584.3	14,704,388.1	
131843.4	26980.7	613,568.2	14,608,766.7	
143124.6	26772.8	612,906.0	14,593,000.0	
152255.9	30503.4	637,645.5	15,182,035.7	
143339.9	33407.7	621,759.5	14,803,797.6	
156725	35002	656,525.6	15,631,561.9	14,728,685.5
152927.6	32472.2	616,186.5	14,671,107.1	
153087.9	29412.6	624,661.4	14,872,890.5	
154173.8	31315.3	632,119.6	15,050,466.7	
141558.9	31794.6	617,915.2	14,712,266.7	
134271.8	29308.6	607,002.8	14,452,447.6	
144189.9	29000.9	634,793.2	15,114,123.8	
138842.6	35098.5	635,798.3	15,138,054.8	
137215.7	33015.1	627,467.0	14,939,690.5	
143171.5	29978.1	622,856.4	14,829,914.3	
151762.5	32492	647,117.9	15,407,569.0	
148500	29431.5	625,739.8	14,898,566.7	
154255	34804.1	659,816.5	15,709,916.7	14,983,084.5
158613.8	36690.9	629,674.4	14,992,247.6	
161037.2	34817.7	648,078.0	15,430,428.6	
165870.3	32682.1	660,530.3	15,726,911.9	
143252.5	27204.2	624,384.6	14,866,300.0	
136961.1	25509.5	613,725.8	14,612,519.0	
143253.5	24543	635,928.7	15,141,159.5	
138294.6	27262.7	633,366.6	15,080,157.1	
143740.7	26813.5	637,953.0	15,189,357.1	
148759.5	26047.2	633,218.6	15,076,633.3	
158038.7	25056.9	638,037.5	15,191,369.0	

158694	25887.7	640,725.9	15,255,378.6	
167236.7	25118.6	685,272.3	16,316,007.1	15,239,872.4
155769.5	25048.2	599,966.4	14,284,914.3	
165749	28179.8	648,915.7	15,450,373.8	
154950.2	24109	622,889.9	14,830,711.9	
145774.8	23133	607,408.8	14,462,114.3	
150944.5	22809.8	623,893.1	14,854,597.6	
151409.2	26240.9	641,042.3	15,262,911.9	
138614.4	27449.3	619,411.4	14,747,890.5	
155694.7	26344.6	652,561.9	15,537,188.1	
151764.5	26257.3	632,623,5	15.062.464.3	
158637.8	28295.8	641,536,8	15.274.685.7	
157148.6	26058.9	642.039.9	15.286.664.3	
173416.6	36004	689.277.3	16.411.364.3	15.122.156.7
186912	38813.3	678.077.3	16.144.697.6	-, ,
173011.8	33751.8	663,344,6	15.793.919.0	
171411.5	31492.8	662,500,5	15.773.821.4	
159507	30120.5	639,714,5	15.231.297.6	
151723.7	32040.8	641,782,7	15.280.540.5	
147487.5	28053.3	642.292.5	15.292.678.6	
144109.3	26283.7	639.018.2	15.214.719.0	
154016.4	26462.5	663.984.8	15.809.161.9	
150998.2	24145.6	622.978.8	14.832.828.6	
163925.9	20813.8	649.417.6	15.462.323.8	
158158	21966.9	645 112 6	15 359 823 8	
151367 7	24473	644 212 8	15,338,400,0	15 461 184 3
164208	22212.8	639 335 8	15 222 281 0	10,101,101.0
159795.9	22618.3	644.329.3	15.341.173.8	
150787	21003.8	634.087.2	15.097.314.3	
153307.9	22005.6	639 614 2	15 228 909 5	
149525 8	22466.6	638 984 0	15 213 904 8	
144018.3	21187 1	637,950,6	15 189 300 0	
144387.2	20042.6	639.213.2	15.219.361.9	
148340.3	22982 1	651 953 3	15 522 697 6	
145878.8	20694.6	620.261.6	14,768,133,3	
161905 6	21858.5	657 927 6	15 664 942 9	
157457 5	25016	649 565 9	15 465 854 8	
160627.2	29392	662.301.6	15.769.085.7	15.308.580.0
178986.3	28628.7	665.121.9	15.836.235.7	,,
175866	28103.8	662 002 0	15 761 952 4	
160141.8	30661.2	635.311.5	15,126,464.3	
156422.4	27305.1	630,756,5	15.018.011.9	
147829.7	27150.3	628,733.5	14,969,845,2	
147354 4	26675.5	635 631 3	15 134 078 6	
149638 8	27765 4	650,910,1	15 497 859 5	
146053.5	24178.5	646,130,4	15.384.057.1	
157234 8	24770.3	649 234 6	15 457 966 7	
167968 8	23054.2	666 562 1	15 870 526 2	
151367.5	21877 5	631.083 1	15.025.788 1	
164514.7	27254 4	669,982 8	15.951.971.4	15,419,563 1
176951 8	29445 4	668,404 5	15,914,392,9	,,
169867 1	32983.6	665,488,9	15.844.973.8	
167415.2	25996.8	658,484,3	15.678.197.6	
162953.5	23982.1	652.531.6	15,536.466.7	
		,	, ,	

146646.5	23050.5	623,305.8	14,840,614.3	
155607	24638.5	650,815.2	15,495,600.0	
148401.9	24709.8	644,523.2	15,345,790.5	
152289.1	21248.6	646,765.8	15,399,185.7	
159681.4	19832.8	646,341.5	15,389,083.3	
160116.5	22239.8	647,680.3	15,420,959.5	
159970.1	24084.9	652,076.6	15,525,633.3	
169134.3	25690.3	685,578.3	16,323,292.9	15,559,515.9
167116.1	26431.8	654,710.1	15,588,335.7	
170973.1	26575.8	677,511.5	16,131,226.2	
174996.8	23516.8	679,623.3	16,181,507.1	
157328.2	20298	651,521.4	15,512,414.3	
157420.7	18246	652,023.8	15,524,376.2	
160657.9	21888.8	670,675.1	15,968,454.8	
149939.3	21550.7	651,574.8	15,513,685.7	
166063	24927	687,343.9	16,365,331.0	
162904	25398.1	652,585.4	15,537,747.6	
160052.7	24454.2	647,758.9	15,422,831.0	
167629.2	26612.3	663,167.6	15,789,704.8	
174402.1	28342.9	692,523.7	16,488,659.5	15,835,356.2
171680.1	26630.5	652,968.8	15,546,876.2	
177259.2	22519.3	680,982.2	16,213,861.9	
177457.4	20030.6	677,028.1	16,119,716.7	
162901.7	18674.4	651,694.9	15,516,545.2	
164609	20175.6	651,638.1	15,515,192.9	
164851.2	19939.6	665,772.0	15,851,714.3	
156553.3	22022.8	651,213.9	15,505,092.9	
167595.4	23431.9	676,699.7	16,111,897.6	
161365	20692.9	652,785.7	15,542,516.7	
172638.5	20848.5	669,099.8	15,930,947.6	
170185.4	21293.9	668,566.6	15,918,252.4	
160822.1	21519.5	662,647.3	15,777,316.7	15,795,827.6
176070.6	25107.4	670,263.7	15,958,659.5	
191570.1	26042.9	710,033.7	16,905,564.3	
179443.6	23529.5	678,426.6	16,153,014.3	
169272.2	24139.1	663,832.7	15,805,540.5	
169183.6	23296.8	665,809.0	15,852,595.2	
164172.5	20867.5	664,710.7	15,826,445.2	
156698.4	21619.9	650,199.6	15,480,942.9	
170416.1	21952.4	679,656.4	16,182,295.2	
162378.8	20500.5	652,239.8	15,529,519.0	
180626.5	19618.9	679,514.6	16,178,919.0	
176072.5	20854.6	668,086.9	15,906,831.0	
166812	20179.3	655,291.2	15,602,171.4	15,948,541.5
176105.8	21520.3	662,655.3	15,777,507.1	
174396	19939.5	666,936.7	15,879,445.2	
166864.3	17542.3	646,586.7	15,394,921.4	
170711	18535.8	650,665.8	15,492,042.9	
161359.8	17359.5	632,886.8	15,068,733.3	
158834.3	17879.3	631,822.7	15,043,397.6	
156068.9	16461.5	624,644.2	14,872,481.0	
153957.9	15687.8	622,232.7	14,815,064.3	
156506.5	15299.7	604,591.3	14,395,031.0	
16/575.1	15166.5	639,469.4	15,225,461.9	

162273.521046.3646.214.315.386.054.815.171,408.9164090.722649.1 $631.520.3$ 15.036.197.616048.820138.7 $635.149.1$ 15.122.597.615048.817741.1 $614.261.6$ $14.625.276.2$ 145099.816281.2 $610.148.3$ $14.527.340.5$ 13909.315604.1 $600.564.7$ $14.299.159.5$ 14457.4.614919.5 $621.322.2$ $14.793.385.7$ 14457.4.614919.5 $614.221.4$ $14.625.088.1$ 139866.515027.2 $608.971.2$ $14.695.888.1$ 139866.515027.2 $608.971.2$ $14.695.888.1$ 150037.614705.5 $614.421.4$ $14.629.081.0$ 146777.516446.3 $615.499.0$ $14.654.738.1$ 15509.115551.6 $639.142.1$ $15.025.100.0$ 158290.215556.9 $628.111.1$ $14.955.026.2$ 154634.7 $14694.2$ $621.144.8$ $14.730.910.1$ 15529716445.0 $624.270.6$ $14.863.565.7$ 152061.314475 $631.774.0$ $15.042.238.1$ 149077.614630.9 $624.270.6$ $14.863.565.7$ 152066.613657.6 $628.867.2$ $14.973.028.6$ 157840.113880.4 $615.895.6$ $14.664.181.0$ 15348.916093.6 $629.60.0$ $14.635.371.4$ 149077.614630.9 $624.270.6$ $14.635.371.4$ 158298.912687.9 $595.073.3$ $14.164.33.3$ 14,484.701.215172.5 $620.99.0$ $14.764.247.$	154590.6	16004.4	617,684.2	14,706,766.7	
164090.722649.1631,520.315,036,197.6160468.820138.7635,149.115,122,597.6150848.817741.1614,261.614,625,276.2145099.816281.2610,148.314,527,340.5139093.615604.1600,564.714,299,159.5144574.614919.5621,322.214,793,385.7141619.616399.1617,227.314,650,888.1139866.515027.2608,971.214,499,314.3140881.815166.5616,151.514,670,273.8150037.614708.5614,421.414,624,081.0153691.316551639,142.115,227,00.0154842.4608,719.914,433,331.0154842.716526.9628,111.1154834.714694.2621,144.814427.915190.1612,726.5156011.314475631,774.0152006.613657.6628,867.2157440.113880.4615,895.6156041.314475631,774.0152006.613657.6628,867.2157440.113880.4615,895.6158451.913944.4152405.915247.6154834.816093.4640,148.615241,633.314,846,701.2157450.115380.2160386.813993.9626,266.014,973,98.1163348.916093.4640,148.615241,633.314,846,701.2157450.115475.715463.813305.2164683.81	162273.5	21046.3	646,214.3	15,386,054.8	15,171,408.9
160488.820138.7635,149.115,122,597.6150848.817741.1614,261.614,625,276.2130903.615604.1600,564.714,299,159.5144574.614919.5621,322.214,793,385.7144574.614919.5621,322.214,793,385.7144574.614919.5621,322.214,499,314.3139866.515027.2608,971.214,499,314.3148891.815166.5616,151.514,670,273.8150037.614708.5614,421.414,529,081.0146777.516446.3615,499.014,654,738.1153691.316551639,142.115,217,669.014,730,910.115529716564.2608,719.914,493,331.0161464.818613.4631,054.215,025,100.0158890.215566.9628,111.114,955,026.2154634.714694.2621,144.814,789,161.914427.915190.1612,761.514,583,585.7152606.613657.6628,867.214,973,028.6160386.813993.9626,266.014,911,095.2157840.113880.4613,723.914,612,473.816348.916093.4640,148.615,241,633.314,846,701.2161982.916325.5611,332.514,624,473.816348.916093.4640,148.615,241,633.314,846,701.2161982.916325.5612,744.914,555,271.416310.215172.5620,199.014,766,642.916305.21567.9 <td< td=""><td>164090.7</td><td>22649.1</td><td>631,520.3</td><td>15,036,197.6</td><td></td></td<>	164090.7	22649.1	631,520.3	15,036,197.6	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	160468.8	20138.7	635,149.1	15,122,597.6	
$\begin{split} 145099.8 & 16281.2 & 610.148.3 & 14.527.340.5 \\ 139093.6 & 15604.1 & 600.564.7 & 14.299.159.5 \\ 144574.6 & 14919.5 & 621.322.2 & 14.793.385.7 \\ 141619.6 & 16399.1 & 617.227.3 & 14.695.888.1 \\ 139866.5 & 15027.2 & 608.971.2 & 14.499.314.3 \\ 148891.8 & 15166.5 & 614.421.4 & 14.629.081.0 \\ 146777.5 & 16446.3 & 615.499.0 & 14.654.738.1 \\ 153691.3 & 16551 & 639.142.1 & 15.217.669.0 & 14.730.910.1 \\ 155297 & 16542.4 & 608.719.9 & 14.493.331.0 \\ 161464.8 & 18613.4 & 631.054.2 & 15.025.100.0 \\ 158890.2 & 15556.9 & 628.111.1 & 14.955.026.2 \\ 154634.7 & 14694.2 & 621.144.8 & 14.789.161.9 \\ 148427.9 & 15190.1 & 612.761.5 & 14.589.559.5 \\ 156011.3 & 14475 & 631.774.0 & 15.042.288.1 \\ 149077.6 & 14630.9 & 624.270.6 & 14.863.585.7 \\ 15206.6 & 13657.6 & 628.667.2 & 14.973.028.6 \\ 160386.8 & 13993.9 & 626.266.0 & 14.911.095.2 \\ 157840.1 & 13880.4 & 615.895.6 & 14.664.181.0 \\ 155415.9 & 13944.4 & 613.723.9 & 14.612.473.8 \\ 160386.8 & 13993.9 & 626.266.0 & 14.911.095.2 \\ 157840.1 & 13880.4 & 613.895.6 & 14.664.181.0 \\ 155415.9 & 13944.4 & 613.723.9 & 14.612.473.8 \\ 160386.8 & 13993.9 & 626.276.0 & 14.766.642.9 \\ 160592. & 15121 & 614.685.6 & 14.663.33 & 14.846,701.2 \\ 1618348.9 & 16093.4 & 640.148.6 & 15.241.633.3 & 14.846,701.2 \\ 161842.9 & 16325.5 & 614.382.2 & 14.628.147.6 \\ 163110.2 & 15172.5 & 620.199.0 & 14.766.642.9 \\ 160592. & 15121 & 614.852.6 & 14.652.5 \\ 14.628.147.6 & 14.655.271.4 \\ 149589.9 & 12587.9 & 595.073.3 & 14.168.411.9 \\ 147071.2 & 12273.4 & 591.166.8 & 14.075.400.0 \\ 154663.8 & 13305.2 & 610.744.9 & 14.552.71.4 \\ 1557643.2 & 12211.1 & 611.321.4 & 14.552.71.4 \\ 1569451.6 & 9842.4 & 617.600.9 & 14.704.783.3 \\ 15743.2 & 12211.1 & 611.321.4 & 14.455.271.4 \\ 149589.9 & 12587.3 & 591.366.4 & 14.005.152.4 \\ 149408.8 & 592.723.8 & 14.712.471.4 \\ 157516.1 & 14145.7 & 606.71.3 & 14.455.271.4 \\ 149584.1 & 13408 & 582.723.9 & 13.951.735.7 \\ 152755.3 & 11976.2 & 598.871.9 & 13.951.735.7 \\ 152755.3 & 11976.2 & 598.871.9 & 13.951.735.7 \\ 152755.3 & 11976.2 & 598.871.9 & 13.951.735.7 \\ 155963 & 13910.3 & 612.799.9 & 14$	150848.8	17741.1	614,261.6	14,625,276.2	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	145099.8	16281.2	610,148.3	14,527,340.5	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	139093.6	15604.1	600,564.7	14,299,159.5	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	144574.6	14919.5	621,322.2	14,793,385.7	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	141619.6	16399.1	617,227.3	14,695,888.1	
148891.815166.5616,151.514,670,273.8150037.614708.5614,421.414,629,081.0146777.516446.3615,499.014,654,738.1153691.316551639,142.115,217,669.014,730,910.115529716542.4608,719.914,493,331.0146474.8161464.818613.4631,054.215,025,100.0158890.215556.915689.215556.9628,111.114,955,026.214,8427.915190.1163643.714694.2621,144.814,789,161.914,863,585.7156011.314475631,774.015,042,238.1149077.614630.9624,270.614,863,585.7152606.613657.6628,867.214,973,028.6160386.813993.9626,266.014,911,095.2157840.113880.4615,895.614,664,181.0155415.913944.4613,723.914,612,473.8163348.916093.4640,148.615,241,633.314,958,99.11587.5620,199.014,766,642.9160059.215121614,685.614,635,371.414958.912587.9595,073.314,168,411.9147071.212273.4591,166.814,075,400.0154863.813305.2610,744.914,541,545.2143794.811601.6590,503.514,059,607.1156961.69842.4617,600.914,770,783.315745.114558.7619,164.814,742,019.014,5718.313103.1612,799.9 <t< td=""><td>139866.5</td><td>15027.2</td><td>608,971.2</td><td>14,499,314.3</td><td></td></t<>	139866.5	15027.2	608,971.2	14,499,314.3	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	148891.8	15166.5	616,151.5	14,670,273.8	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	150037.6	14708.5	614,421.4	14,629,081.0	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	146777.5	16446.3	615,499.0	14,654,738.1	
155297 $16542.4$ $608,719.9$ $14,493,331.0$ $161464.8$ $18613.4$ $631,054.2$ $15,025,100.0$ $158890.2$ $15556.9$ $628,111.1$ $14,955,026.2$ $154634.7$ $14694.2$ $621,144.8$ $14,789,161.9$ $148427.9$ $15190.1$ $612,761.5$ $14,589,559.5$ $156011.3$ $14475$ $631,774.0$ $15,042,238.1$ $149077.6$ $14630.9$ $624,270.6$ $14,863,585.7$ $152606.6$ $13657.6$ $628,867.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,574,52.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $618,228.5$ $14,624,345.2$ $1648038$ $13429.9$ $618,208.0$ $1$	153691.3	16551	639,142.1	15,217,669.0	14,730,910.1
161464.818613.4631,054.215,025,100.0158890.215556.9628,111.114,955,026.2154634.714694.2621,144.814,789,161.9148427.915190.1612,761.514,589,559.5156011.314475631,774.015,042,238.1149077.614630.9624,270.614,863,585.7152606.613657.6628,867.214,973,028.6160386.813993.9626,266.014,911,095.2157840.11380.4615,895.614,664,181.0155415.913944.4613,723.914,612,473.8163348.916093.4640,148.615,241,633.314,846,701.2161982.916325.5614,382.214,628,147.6163310.215172.5620,199.014,766,642.9160059.215121614,685.614,635,371.4149584.912587.9595,073.314,168,411.9147071.212273.4591,166.814,075,400.0154863.813305.2610,744.914,541,545.2143794.811601.6590,503.514,059,607.1156961.69842.4617,600.914,704,783.3157643.212211.1611,321.414,555.71.416380.813429.9618,208.014,719,238.1157125.114558.7619,164.814,742,019.014,518,398.6159471.214980.8559,72.913,951,735.7152755.311976.2596,813.914,209,854.8154153.31303.1612,799.914	155297	16542.4	608,719.9	14,493,331.0	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	161464.8	18613.4	631,054.2	15,025,100.0	
154634.7 $14694.2$ $621,144.8$ $14,789,161.9$ $148427.9$ $15190.1$ $612,761.5$ $14,589,559.5$ $156011.3$ $14475$ $631,774.0$ $15,042,238.1$ $149077.6$ $14630.9$ $624,270.6$ $14,863,585.7$ $152606.6$ $13657.6$ $628,867.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $160384.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $1512.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $14707.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $1456861.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $15745.1$ $14455.7$ $606,713.4$ $14,408,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,009,152.4$ $14990.8$ $592,723.8$ $14,129,471.4$ $157516.1$ $14145.7$ $606,775.4$ $14,208,864.8$	158890.2	15556.9	628,111.1	14,955,026.2	
148427.9 $15190.1$ $612,761.5$ $14,589,559.5$ $156011.3$ $14475$ $631,774.0$ $15,042,238.1$ $149077.6$ $14630.9$ $624,270.6$ $14,863,585.7$ $152606.6$ $13657.6$ $622,867.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,555,271.4$ $142394.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14455.5$ $591,366.4$ $14,009,152.4$ $159471.2$ $14980.8$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,613.9$ $14,209,854.8$ $15425.3$ $591,366.4$ $14,209,854.8$ <td>154634.7</td> <td>14694.2</td> <td>621,144.8</td> <td>14,789,161.9</td> <td></td>	154634.7	14694.2	621,144.8	14,789,161.9	
156011.3 $14475$ $631,774.0$ $15,042,238.1$ $149077.6$ $14630.9$ $624,270.6$ $14,863,585.7$ $152606.6$ $13657.6$ $628,67.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $160059.2$ $1512.1$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,755,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,020,152.4$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149129.5$ $15425.3$ $591,366.4$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $13,550,77.3$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,66$	148427.9	15190.1	612,761.5	14,589,559.5	
149077.6 $14630.9$ $624,270.6$ $14,863,585.7$ $152606.6$ $13657.6$ $628,867.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,774,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12023$ $615,763.4$ $14,661,033.3$ $148027.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$	156011.3	14475	631,774.0	15,042,238.1	
152606.6 $13657.6$ $628,867.2$ $14,973,028.6$ $160386.8$ $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $959,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,659,472.9$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $598,672.6$ $14,254,109.5$ $154523.3$ $12003$ $615,763.4$ $14,661,033.3$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ <td< td=""><td>149077.6</td><td>14630.9</td><td>624,270.6</td><td>14,863,585.7</td><td></td></td<>	149077.6	14630.9	624,270.6	14,863,585.7	
160386.8 $13993.9$ $626,266.0$ $14,911,095.2$ $157840.1$ $13880.4$ $615,895.6$ $14,664,181.0$ $155415.9$ $13944.4$ $613,723.9$ $14,612,473.8$ $163348.9$ $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $155661.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,600,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148027.8$ $13627$ $598,672.6$ $14,2254,109.5$ $1565823$ $12203$ $615,763.4$ $1$	152606.6	13657.6	628,867.2	14,973,028.6	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	160386.8	13993.9	626,266.0	14,911,095.2	
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163348.9 $16093.4$ $640,148.6$ $15,241,633.3$ $14,846,701.2$ $161982.9$ $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,480,152.4$ $149129.5$ $15425.3$ $591,366.4$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $1157.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $122159.5$ $594,415.4$	155415.9	13944.4	613,723.9	14,612,473.8	
161982.9 $16325.5$ $614,382.2$ $14,628,147.6$ $163110.2$ $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,408,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,580,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $15936.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12595.5$ $594,415.4$ <t< td=""><td>163348.9</td><td>16093.4</td><td>640,148.6</td><td>15,241,633.3</td><td>14,846,701.2</td></t<>	163348.9	16093.4	640,148.6	15,241,633.3	14,846,701.2
163110.2 $15172.5$ $620,199.0$ $14,766,642.9$ $160059.2$ $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,425,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148007.8$ $13527$ $594,415.4$ $14,398,985.7$ $14767.1$ $1259.5$ $594,415.4$ $14,52,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14428.9$ $618$	161982.9	16325.5	614,382.2	14,628,147.6	
160059.2 $15121$ $614,685.6$ $14,635,371.4$ $149589.9$ $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,4080,152.4$ $149129.5$ $15425.3$ $591,366.4$ $14,009,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $14802.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $16328.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	163110.2	15172.5	620,199.0	14,766,642.9	
149589.9 $12587.9$ $595,073.3$ $14,168,411.9$ $147071.2$ $12273.4$ $591,166.8$ $14,075,400.0$ $154863.8$ $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,4080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $14802.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $15936.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$	160059.2	15121	614,685.6	14,635,371.4	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	149589.9	12587.9	595,073.3	14,168,411.9	
154863.8 $13305.2$ $610,744.9$ $14,541,545.2$ $143794.8$ $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$	147071.2	12273.4	591,166.8	14,075,400.0	
143794.8 $11601.6$ $590,503.5$ $14,059,607.1$ $156961.6$ $9842.4$ $617,600.9$ $14,704,783.3$ $157643.2$ $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	154863.8	13305.2	610,744.9	14,541,545.2	
156961.69842.4617,600.914,704,783.3157643.212211.1611,321.414,555,271.416238013706.2614,222.514,624,345.2164803.813429.9618,208.014,719,238.1157125.114558.7619,164.814,742,019.014,518,398.6159471.214980.8592,723.814,112,471.4157516.114145.7606,713.414,445,557.1149129.515425.3591,366.414,080,152.4149158.413408585,972.913,951,735.7152755.311976.2596,813.914,209,854.8154153.313103.1612,799.914,590,473.8148007.813627598,672.614,254,109.5156582.312203615,763.414,661,033.3148022.211580.8582,311.213,864,552.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	143794.8	11601.6	590,503.5	14,059,607.1	
157643.2 $12211.1$ $611,321.4$ $14,555,271.4$ $162380$ $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	156961.6	9842.4	617,600.9	14,704,783.3	
162380 $13706.2$ $614,222.5$ $14,624,345.2$ $164803.8$ $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	15/643.2	12211.1	611,321.4	14,555,271.4	
164803.8 $13429.9$ $618,208.0$ $14,719,238.1$ $157125.1$ $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	162380	13706.2	614,222.5	14,624,345.2	
157125.1 $14558.7$ $619,164.8$ $14,742,019.0$ $14,518,398.6$ $159471.2$ $14980.8$ $592,723.8$ $14,112,471.4$ $157516.1$ $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	164803.8	13429.9	618,208.0	14,719,238.1	
159471.214980.8592,723.814,112,471.4157516.114145.7606,713.414,445,557.1149129.515425.3591,366.414,080,152.4149158.413408585,972.913,951,735.7152755.311976.2596,813.914,209,854.8154153.313103.1612,799.914,590,473.8148007.813627598,672.614,254,109.5156582.312203615,763.414,661,033.3148022.211580.8582,311.213,864,552.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	15/125.1	14558.7	619,164.8	14,742,019.0	14,518,398.6
157516.1 $14145.7$ $606,713.4$ $14,445,557.1$ $149129.5$ $15425.3$ $591,366.4$ $14,080,152.4$ $149158.4$ $13408$ $585,972.9$ $13,951,735.7$ $152755.3$ $11976.2$ $596,813.9$ $14,209,854.8$ $154153.3$ $13103.1$ $612,799.9$ $14,590,473.8$ $148007.8$ $13627$ $598,672.6$ $14,254,109.5$ $156582.3$ $12203$ $615,763.4$ $14,661,033.3$ $148022.2$ $11580.8$ $582,311.2$ $13,864,552.4$ $163015.7$ $11059.9$ $612,607.9$ $14,585,902.4$ $159136.8$ $11572.1$ $604,757.4$ $14,398,985.7$ $147767.1$ $12159.5$ $594,415.4$ $14,152,747.6$ $14,275,631.3$ $162243.5$ $13413.1$ $614,528.2$ $14,631,623.8$ $161596.5$ $14128.9$ $618,314.8$ $14,721,781.0$ $155863$ $13910.7$ $610,729.3$ $14,541,173.8$ $158110.5$ $11901$ $611,447.3$ $14,558,269.0$	159471.2	14980.8	592,723.8	14,112,471.4	
149129.515425.3591,366.414,080,152.4149158.413408585,972.913,951,735.7152755.311976.2596,813.914,209,854.8154153.313103.1612,799.914,590,473.8148007.813627598,672.614,254,109.5156582.312203615,763.414,661,033.3148022.211580.8582,311.213,864,552.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	157516.1	14145.7	606,713.4	14,445,557.1	
149136.413408585,972.913,951,735.7152755.311976.2596,813.914,209,854.8154153.313103.1612,799.914,590,473.8148007.813627598,672.614,254,109.5156582.312203615,763.414,661,033.3148022.211580.8582,311.213,864,552.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	149129.0	10420.0	591,300.4	14,060,152.4	
152735.3   11976.2   596,813.9   14,209,854.8     154153.3   13103.1   612,799.9   14,590,473.8     148007.8   13627   598,672.6   14,254,109.5     156582.3   12203   615,763.4   14,661,033.3     148022.2   11580.8   582,311.2   13,864,552.4     163015.7   11059.9   612,607.9   14,585,902.4     159136.8   11572.1   604,757.4   14,398,985.7     147767.1   12159.5   594,415.4   14,152,747.6   14,275,631.3     162243.5   13413.1   614,528.2   14,631,623.8     161596.5   14128.9   618,314.8   14,721,781.0     155863   13910.7   610,729.3   14,541,173.8     158110.5   11901   611,447.3   14,558,269.0	149100.4	13400	505,972.9	13,951,735.7	
134133.3   13103.1   612,799.9   14,590,473.8     148007.8   13627   598,672.6   14,254,109.5     156582.3   12203   615,763.4   14,661,033.3     148022.2   11580.8   582,311.2   13,864,552.4     163015.7   11059.9   612,607.9   14,585,902.4     159136.8   11572.1   604,757.4   14,398,985.7     147767.1   12159.5   594,415.4   14,152,747.6   14,275,631.3     162243.5   13413.1   614,528.2   14,631,623.8     161596.5   14128.9   618,314.8   14,721,781.0     155863   13910.7   610,729.3   14,541,173.8     158110.5   11901   611,447.3   14,558,269.0	102/00.0	12102 1	590,013.9	14,209,004.0	
148007.813027598,072.014,234,109.5156582.312203615,763.414,661,033.3148022.211580.8582,311.213,864,552.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	1/2007 2	12627	508 672 6	14,590,475.0	
148022.2   11580.8   582,311.2   13,864,552.4     163015.7   11059.9   612,607.9   14,585,902.4     159136.8   11572.1   604,757.4   14,398,985.7     147767.1   12159.5   594,415.4   14,152,747.6   14,275,631.3     162243.5   13413.1   614,528.2   14,631,623.8     161596.5   14128.9   618,314.8   14,721,781.0     155863   13910.7   610,729.3   14,541,173.8     158110.5   11901   611,447.3   14,558,269.0	140007.0	12203	615 763 A	14,254,109.5	
143012.211300.0302,311.213,804,332.4163015.711059.9612,607.914,585,902.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	1/18022.2	11580.8	582 311 2	13 864 552 4	
103013.711033.3012,007.314,303,302.4159136.811572.1604,757.414,398,985.7147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	140022.2	11050.0	612 607 9	17,004,002.4	
147767.112159.5594,415.414,152,747.614,275,631.3162243.513413.1614,528.214,631,623.8161596.514128.9618,314.814,721,781.015586313910.7610,729.314,541,173.8158110.511901611,447.314,558,269.0	150136.8	11572 1	604 757 4	14,303,302.4	
162243.5   13413.1   614,528.2   14,631,623.8     161596.5   14128.9   618,314.8   14,721,781.0     155863   13910.7   610,729.3   14,541,173.8     158110.5   11901   611,447.3   14,558,269.0	147767 1	12159 5	594 415 4	14 152 747 6	14 275 631 3
161596.5     14128.9     618,314.8     14,721,781.0       155863     13910.7     610,729.3     14,541,173.8       158110.5     11901     611,447.3     14,558,269.0	162243 5	13413 1	614 528 2	14 631 623 8	1,2,0,001.0
155863 13910.7 610,729.3 14,541,173.8   158110.5 11901 611,447.3 14,558,269.0	161596 5	14128.9	618,314.8	14,721 781 0	
158110.5 11901 611,447.3 14,558,269.0	155863	13910.7	610.729.3	14,541,173.8	
	158110.5	11901	611,447.3	14,558,269.0	

153279.5	11523.5	604,403.7	14,390,564.3	
150543.5	11301.1	603,590.5	14,371,202.4	
150826	11963.4	604,831.7	14,400,754.8	
154151.9	13631.1	616,525.6	14,679,181.0	
150875.6	10665.9	592,596.9	14,109,450.0	
167713.8	11003.2	619,009.4	14,738,319.0	
160329.9	10492.4	611,689.9	14,564,045.2	
158313.7	11782.3	612,992.7	14,595,064.3	14,525,119.0
168892	11275.3	608,964.6	14,499,157.1	
167145.9	12726.2	614,036.0	14,619,904.8	
163407.6	12238.5	606,629.2	14,443,552.4	
165289.2	10244.8	607,145.3	14,455,840.5	
160452.1	11074.1	606,854.5	14,448,916.7	
159105.6	10679.4	604,604.1	14,395,335.7	
162416	10602.6	612,004.3	14,571,531.0	
159400.8	10945.6	610,448.6	14,534,490.5	
167498.4	10686.8	611,896.5	14,568,964.3	
177166.9	12334.3	637,979.4	15,189,985.7	
166650	13489.9	622,451.6	14,820,276.2	
167905.6	12444.5	630,265.9	15,006,331.0	14,629,523.8
173210.4	11254.5	624,468.4	14,868,295.2	
182638.8	11430.8	651,478.1	15,511,383.3	
166504.8	11247.8	625,160.1	14,884,764.3	
166819.1	12413.6	629,112.6	14,978,871.4	
155452.3	11764.9	612,523.4	14,583,890.5	
164811.5	12273.1	638,716.4	15,207,533.3	
161263.6	11127.5	637,312.1	15,174,097.6	
161511.8	12618.8	633,312.5	15,078,869.0	
169757.7	11666.3	634,128.6	15,098,300.0	
173043.6	12381	636,502.2	15,154,814.3	
158219.8	12598.5	617,957.1	14,713,264.3	
161019.5	11684.7	626,145.8	14,908,233.3	15,013,526.4
160908.1	13462.6	620,778.0	14,780,428.6	
167834.6	14161.1	641,394.6	15,271,300.0	
160802.3	13870.3	629,553.3	14,989,364.3	
159153.7	12276.1	625,938.1	14,903,288.1	
155878.8	11677.1	621,580.8	14,799,542.9	
160269.7	11697.3	645,608.8	15,371,638.1	
150723.7	10172.3	626,356.2	14,913,242.9	
163378.9	11474.5	648,847.9	15,448,759.5	
165098.9	10641.1	638,489.7	15,202,135.7	
168800.9	11356.8	643,135.6	15,312,752.4	
166708	11284.9	640,996.7	15,261,826.2	
163282.6	11210.9	646,640.3	15,396,197.6	15,137,539.7
160368.9	10964.5	617,361.6	14,699,085.7	
164375.4	11492.9	630,893.4	15,021,271.4	

16,905,564.3 15,948,541.5

-5.1%



## Data 1: U.S. Product Supplied for Crude Oil and Petroleum **Products** Back to Contents MTTUPUS2

Sourcekey

Date	U.S. Product Supplied of Crude Oil and Petroleum Products (Thousand Barrels per Day)	Annual Average U.S. Product Supplied of Crude Oil and Petroleum Products (Thousand Barrels per Day)
Jan-1936		
Feb-1936		
Mar-1936		
Apr-1936		
May-1936		
Jun-1936		
Jul-1936		
Aug-1936		
Sep-1936		
Oct-1936		
Nov-1936		
Dec-1936		
Jan-1937		
Feb-1937		
Mar-1937		
Apr-1937		
May-1937		
Jun-1937		
Jul-1937		
Aug-1937		
Sep-1937		
Oct-1937		
Nov-1937		
Dec-1937		
Jan-1938		
Feb-1938		
Mar-1938		
Apr-1938		
May-1938		
Jun-1938		
Jul-1938		
Aug-1938		
Sep-1938		
Oct-1938		
Nov-1938		
Dec-1938		
Jan-1939		
Feb-1939		

Mar-1	939
Apr-1	939
May-1	939
Jun-1	939
Jul-1	939
Aua-1	939
Sep-1	939
Oct-1	939
Nov-1	939
Dec-1	939
lan-1	0/0
Ech-1	040
Mar-1	040
Δpr-1	040
Api-i Mov 1	940
Iviay-1	940
Jun-1	940
Jui-1	940
Aug-1	940
Sep-1	940
Oct-1	940
Nov-1	940
Dec-1	940
Jan-1	941
Feb-1	941
Mar-1	941
Apr-1	941
May-1	941
Jun-1	941
Jul-1	941
Aua-1	941
Sep-1	941
Oct-1	941
Nov-1	941
Dec-1	941
Jan-1	942
Feb-1	942
Mar-1	942
Δnr-1	942
May_1	0/2
lun_1	0/2
	0/2
	0/2
Son 1	042
Oct 1	342
Nov 1	942
	942
Dec-1	942
Jan-1	943
Feb-1	943
Mar-1	943
Apr-1	943
May-1	943
Jun-1	943
Jul-1	943
Aug-1	943
Sep-1	943
Oct-1	943
Nov-1	943

Dec-1	943
Jan-1	944
Feb-1	944
Mar-1	944
Apr-1	944
Mav-1	944
Jun-1	944
Jul-1	944
Aug-1	944
Sep-1	944
Oct-1	944
Nov-1	944
Dec-1	944
Jan-1	945
Feb-1	945
Mar-1	945
Δnr-1	945
Mav-1	045
lup_1	015
	045
	045
Aug-1	940
Sep-1	940
Nov 1	940
Doc 1	940
Dec-1	945
Jan-1	940
Feb-1	946
N/10r 1	
	946
Apr-1	946
Apr-1 May-1	946 946 946
Apr-1 May-1 Jun-1	946 946 946 946
Apr-1 May-1 Jun-1 Jul-1	946 946 946 946 946
Apr-1 May-1 Jun-1 Jul-1 Aug-1	946 946 946 946 946 946
Apr-1 Apr-1 Jun-1 Jul-1 Aug-1 Sep-1	946 946 946 946 946 946
Apr-1 Apr-1 Jun-1 Jul-1 Aug-1 Sep-1 Oct-1	946 946 946 946 946 946 946 946
Apr-1 Apr-1 Jun-1 Jul-1 Aug-1 Sep-1 Oct-1 Nov-1	946 946 946 946 946 946 946 946 946
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Feb-2009	18822	
Mar-2009	18719	
Apr-2009	18672	
May-2009	18211	
Jun-2009	18828	
Jul-2009	18626	
Aug-2009	18949	
Sep-2009	18594	
Oct-2009	18803	
Nov-2009	18753	
Dec-2009	19237	18,771.2
Jan-2010	18652	-,
Feb-2010	18850	
Mar-2010	19099	
Apr-2010	19044	
May-2010	18866	

Jun-2010	19537	
Jul-2010	19319	
Aug-2010	19662	
Sep-2010	19438	
Oct-2010	18974	
Nov-2010	18977	
Dec-2010	19722	19,178.3
Jan-2011	18911	
Feb-2011	18809	
Mar-2011	19234	
Apr-2011	18588	
May-2011	18420	
Jun-2011	19182	
Jul-2011	18705	
Aug-2011	19349	
Sep-2011	18848	
Oct-2011	18796	
Nov-2011	19019	
Dec-2011	18721	18,881.8
Jan-2012	18304	
Feb-2012	18643	
Mar-2012	18164	
Apr-2012	18211	
May-2012	18589	
Jun-2012	18857	
Jul-2012	18515	
Aug-2012	19156	
Sep-2012	18092	
Oct-2012	18705	
Nov-2012	18528	
Dec-2012	18120	18,490.3
Jan-2013	18749	
Feb-2013	18643	
Mar-2013	18531	
Apr-2013	18584	
May-2013	18779	
Jun-2013	18806	
Jul-2013	19257	
Aug-2013	19125	
Sep-2013	19252	
Oct-2013	19312	
Nov-2013	19491	10.050.0
Dec-2013	18983	18,959.3
Jan-2014	19102	
Feb-2014	18908	
Mar-2014	18464	
Apr-2014	18849	
May-2014	18585	
Jun-2014	18890	
Jul-2014	19283	
Aug-2014	19400	
Sep-2014	19246	
UCT-2014	19691	
NOV-2014	19370	40,400,0
Dec-2014	19457	19,103.8
Jan-2015	19218	
Feb-2015	19677	

Mar-2015	19352	
Apr-2015	19263	
May-2015	19301	
Jun-2015	19841	
Jul-2015	20126	
Aug-2015	19930	
Sep-2015	19418	
Oct-2015	19500	
Nov-2015	19144	
Dec-2015	19600	19,530.8
Jan-2016	19055	
Feb-2016	19680	
Mar-2016	19616	
Apr-2016	19264	
May-2016	19202	
Jun-2016	19799	
Jul-2016	19712	
Aug-2016	20131	
Sep-2016	19864	
Oct-2016	19622	
Nov-2016	19655	
Dec-2016	19979	19,631.6
Jan-2017	19234	
Feb-2017	19188	
	21666	20,799.3
	Growth rate 2014-1	2.24%
	Growth rate 2015-1	0.52%
		-5.6%
	206 - 2012	1,141.3
		228.3



# Data 1: Midwest (PADD2) Product Supplied for<br/>Crude Oil andBack to Contents<br/>SourcekeyMTTUPP22

Midwest (PADD 2) Product Supplied of Crude Oil and **Petroleum Products** Date (Thousand Barrels per Day) Jan-1981 4627 4390 Feb-1981 4179 Mar-1981 Apr-1981 4057 May-1981 4137 Jun-1981 4337 Jul-1981 4132 Aug-1981 3956 Sep-1981 4320 Oct-1981 4382 Nov-1981 4294 Dec-1981 4412 Jan-1982 4110 Feb-1982 4120 Mar-1982 3999 Apr-1982 4290 May-1982 4080 Jun-1982 4075 Jul-1982 4075 Aug-1982 3950 Sep-1982 4162 Oct-1982 4224 Nov-1982 4154 Dec-1982 4145 Jan-1983 3742 Feb-1983 3788 Mar-1983 4033 Apr-1983 3840 May-1983 3883 Jun-1983 4215 Jul-1983 4195 Aug-1983 4241 Sep-1983 4291 Oct-1983 4051 Nov-1983 4186 Dec-1983 4526 Jan-1984 4197 Feb-1984 3881

4142

Mar-1984

Apr-1984	4037
May-1984	4342
Jun-1984	4356
Jul-1984	4340
Aug-1984	4353
Sep-1984	4242
Oct-1984	4427
Nov-1984	4357
Dec-1984	4035
Jan-1985	4233
Feb-1985	4195
Mar-1985	3973
Apr-1985	4117
Mav-1985	4215
Jun-1985	4174
Jul-1985	4190
Aug-1985	4377
Sen-1985	4282
Oct-1985	4603
Nov-1985	4300
Dec-1985	4300
Jan-1986	3056
San-1986	3803
Mor 1086	4006
Apr 1086	4090
Api-1960 May 1086	4092
1900	4142
Jun-1980	4080
Jul-1986	4387
Aug-1986	4388
Sep-1986	4128
Oct-1986	4420
NOV-1986	4146
Dec-1986	4129
Jan-1987	3816
Feb-1987	3782
Mar-1987	3905
Apr-1987	3999
May-1987	4022
Jun-1987	4352
Jul-1987	4177
Aug-1987	4084
Sep-1987	4323
Oct-1987	4523
Nov-1987	3964
Dec-1987	4133
Jan-1988	4106
Feb-1988	4208
Mar-1988	4278
Apr-1988	4019
May-1988	4096
Jun-1988	4382
Jul-1988	4090
Aug-1988	4365
Sep-1988	4372
Oct-1988	4447

Nov-1988	4403
Dec-1988	4345
Jan-1989	3978
Feb-1989	4395
Mar-1989	4396
Apr-1989	4020
May 1080	4020
lup 1090	4172
	4303
Jui-1989	4000
Aug-1989	4392
Sep-1989	4177
Oct-1989	4385
Nov-1989	4308
Dec-1989	4553
Jan-1990	3785
Feb-1990	4016
Mar-1990	4127
Apr-1990	4148
May-1990	4262
Jun-1990	4441
Jul-1990	4420
Aug-1990	4644
Sep-1990	4187
Oct-1990	4494
Nov-1990	4223
Dec-1990	4025
Jan-1991	4131
Feb-1991	3931
Mar-1991	3825
Apr-1991	3977
May-1991	4141
lun-1001	4200
Jul-1001	4255
Aug 1001	4301
Sop 1001	4203
Oct 1001	4411
Oct-1991	4472
NOV-1991	4112
Dec-1991	4124
Jan-1992	4175
Feb-1992	4036
Mar-1992	4036
Apr-1992	4054
May-1992	4266
Jun-1992	4391
Jul-1992	4420
Aug-1992	4519
Sep-1992	4503
Oct-1992	4719
Nov-1992	4455
Dec-1992	4628
Jan-1993	4080
Feb-1993	4307
Mar-1993	4363
Apr-1993	4301
May-1993	4403
-	

Jun-1993	4683
Jul-1993	4596
Aug-1993	4713
Sep-1993	4692
Oct-1993	4817
Nov-1993	4762
Dec-1993	4690
Jan-1994	4506
Feb-1994	4646
Mar-1994	4488
Apr-1994	4493
May-1994	4554
Jun-1994	4718
Jul-1994	4555
Aug-1994	4830
Sen-1994	4647
Oct-1994	4813
Nov-1994	4010
Dec-1994	4764
lan-1005	4704
Feb-1995	4615
Mar-1995	4013
Apr 1005	4320
Api-1995 May 1995	4552
lup 1005	4310
Jul 1005	4///
Jul-1995	4097
Aug-1995	4010
Sep-1995	4750
Oct-1995	4000
NOV-1995	4743
Dec-1995	4/51
Jan-1996	4583
Feb-1996	4596
Mar-1996	4586
Apr-1996	4520
May-1996	4642
Jun-1996	4665
Jul-1996	4695
Aug-1996	4954
Sep-1996	4705
Oct-1996	5163
Nov-1996	4916
Dec-1996	4757
Jan-1997	4673
Feb-1997	4516
Mar-1997	4363
Apr-1997	4664
May-1997	4719
Jun-1997	4834
Jul-1997	5090
Aug-1997	4936
Sep-1997	4957
Oct-1997	5231
Nov-1997	4824
Dec-1997	5067

4736
4493
4624
4665
4822
4904
4890
4950
4908
5143
4702
4973
4716
4678
4699
4792
4846
5109
5196
5155
5060
5343
4983
5334
4881
4001
4736
47.00
4708
4044
4921
4900
5310
5105
5005
5007
5Z33
5027
4902
4907
4819
4750
4978
5030
4991
4/33
5120
4853
4783
4803
4789
4710
4797
4914
5083
5128

Aug-2002	5139
Sep-2002	5090
Oct-2002	5276
Nov-2002	5113
Dec-2002	5011
Jan-2003	4923
Feb-2003	5102
Mar-2003	4648
Apr-2003	4830
Mav-2003	4931
Jun-2003	5065
Jul-2003	5095
Aug-2003	5245
Sep-2003	5138
Oct-2003	5304
Nov-2003	5020
Dec-2003	5115
Jan-2004	5000
5an-2004 Feb-2004	5007
Mar-2004	1018
Apr-2004	512/
Api-2004 May 2004	5004
lup 2004	5004
Juli-2004	5220
Jui-2004	5210
Aug-2004	5205
Sep-2004	5Z00
Oct-2004	0490 5016
N0V-2004	5010
Dec-2004	5297
Jan-2005	5152
Feb-2005	5140
Mar-2005	5121
Apr-2005	5010
May-2005	5219
Jun-2005	5470
Jul-2005	5264
Aug-2005	5453
Sep-2005	5427
Oct-2005	5260
Nov-2005	5375
Dec-2005	5508
Jan-2006	5022
Feb-2006	5205
Mar-2006	5076
Apr-2006	5037
May-2006	5113
Jun-2006	5332
Jul-2006	5162
Aug-2006	5355
Sep-2006	5330
Oct-2006	5405
Nov-2006	5369
Dec-2006	5169
Jan-2007	5036
Feb-2007	5245

Mar-2007	5089
Apr-2007	5027
May-2007	4993
Jun-2007	5164
Jul-2007	5115
Aug-2007	5176
Sep-2007	5132
Oct-2007	5272
Nov-2007	5158
Dec-2007	5150
Jan-2008	5016
Feb-2008	4991
Mar-2008	4924
Apr-2008	4910
May-2008	4910
lun-2008	4000
	4901
Jui-2008	4922
Aug-2008	4910
Sep-2006	4000
Uct-2008	5204 4077
NOV-2008	4977
Dec-2008	5073
Jan-2009	4750
Feb-2009	4782
Mar-2009	4795
Apr-2009	4534
May-2009	4590
Jun-2009	4755
Jul-2009	4843
Aug-2009	4739
Sep-2009	4768
Oct-2009	4829
Nov-2009	5038
Dec-2009	4963
Jan-2010	4527
Feb-2010	4789
Mar-2010	4739
Apr-2010	4765
May-2010	4788
Jun-2010	4929
Jul-2010	4928
Aug-2010	5013
Sep-2010	4973
Oct-2010	4963
Nov-2010	4864
Dec-2010	5008
Jan-2011	4630
Feb-2011	4776
Mar-2011	4631
Apr-2011	4507
May-2011	4637
lun_2011	4007
Jul_2011	4020
Δμα-2011	4113
Son 2011	4900 1000
Sep-2011	4000

Oct-2011	4984
Nov-2011	4929
Dec-2011	4772
Jan-2012	4517
Feb-2012	4793
Mar-2012	4498
Apr-2012	4695
May-2012	4854
Jun-2012	4846
Jul-2012	4819
Aug-2012	4978
Sep-2012	4710
Oct-2012	5035
Nov-2012	4740
Dec-2012	4495
Jan-2013	4828
Feb-2013	4664
Mar-2013	4801
Apr-2013	4533
May 2013	4333
lup 2013	47.52
Jul 2012	4923
Jui-2013	4000
Aug-2013	4884
Sep-2013	4892
Oct-2013	5253
Nov-2013	5059
Dec-2013	4839
Jan-2014	4767
Feb-2014	4819
Mar-2014	4758
Apr-2014	4726
May-2014	4812
Jun-2014	4983
Jul-2014	5005
Aug-2014	4948
Sep-2014	5102
Oct-2014	5261
Nov-2014	5064
Dec-2014	5064
Jan-2015	4896
Feb-2015	5039
Mar-2015	4807
Apr-2015	4863
May-2015	4951
Jun-2015	5014
Jul-2015	5187
Aug-2015	5026
Sep-2015	5016
Oct-2015	5132
Nov-2015	/210
Dec-2015	1012
lan-2016	4340
Jaii-2010 Eab 2016	4912
rep-2016	4905
	4853
Apr-2016	4879

4813
5183
5037
5180
5073
5176
4943
5225
4984
5000



	Data 1: Gulf	
	Coast (PADD 3)	
	Droduct Supplied	
	Froduct Supplied	
	for Crude Oil and	
	Petroleum	
Back to Contents	Products	
Sourcekey	MTTUPP32	
	Gulf Coast (PADD 3)	
	Product Supplied of	
	Crude Oil and	
	Petroleum Products	
	(Thousand Barrels	
Date	per Day)	
Jan-1981	3668	
Feb-1981	3515	
Mar-1981	3481	
Apr-1981	3691	
May-1981	3719	
Jun-1981	3766	
Jul-1981	3639	
Aug-1981	3507	
Sep-1981	3684	
Oct-1981	3469	
NOV-1981	3409	
Dec-1981	3487	
Jan-1982 Eab 1092	3140	
Feb-1962 Mar 1082	3330 2420	
Wai-1902	3430 2627	
Api-1902 May-1082	3037	
lun-1982	3574	
lul_1982	3386	
Aug-1982	3521	
Sen-1982	3438	
Oct-1982	3321	
Nov-1982	3376	
Dec-1982	3463	
Jan-1983	3201	
Feb-1983	3088	
Mar-1983	3425	
Apr-1983	3437	
May-1983	3511	
Jun-1983	3452	
Jul-1983	3431	
Aug-1983	3336	
Sep-1983	3722	
Oct-1983	3529	
Nov-1983	3706	

Dec-1983	3641
Jan-1984	3798
Feb-1984	3776
Mar-1984	3622
Apr-1984	3921
Mav-1984	3753
Jun-1984	3705
Jul-1984	3929
Aug-1984	3865
Sep-1984	3587
Oct-1984	3576
Nov-1984	3430
Dec-1984	3506
Jan-1985	3295
Feb-1985	3638
Mar-1985	3637
Apr-1985	3673
May-1985	3849
Jun-1985	3913
Jul-1985	3801
Aug-1985	3767
Sen-1985	3496
Oct-1985	3696
Nov-1985	3681
Dec-1985	3863
Jan-1986	3520
5an-1986	3782
Mar-1986	2021
Apr-1986	2712
Apr-1900 May 1096	3712
lup 1096	3900
Jul 1096	2015
Jui-1900	2704
Aug-1900	2021
Oct 1096	3921
Uci-1900	3949
NOV-1900	4002
Dec-1900	4209
Jan-1907	4042
FeD-1967	3999
Mar-1987	3979
Apr-1987	4240
May-1987	4090
Jun-1987	4210
Jul-1987	4493
Aug-1987	4083
Sep-1987	4168
Uct-1987	4036
NOV-1987	3981
Dec-1987	4228
Jan-1988	3963
Feb-1988	4126
Mar-1988	4252

Apr-1988	4312
May-1988	4171
Jun-1988	4332
Jul-1988	4429
Aug-1988	4414
Sep-1988	4391
Oct-1988	4407
Nov-1988	4396
Dec-1988	4325
Jan-1989	4282
Feb-1989	4025
Mar-1989	4523
Apr-1989	4422
May-1989	4352
Jun-1989	4518
Jul-1989	4297
Aug-1989	4293
Sep-1989	4475
Oct-1989	4493
Nov-1989	4260
Dec-1989	4321
Jan-1990	4280
Feb-1990	4106
Mar-1990	4325
Apr-1990	4378
May-1990	4070
Jun-1990	4464
Jul-1990	4461
Δμα-1990	4630
Sen-1990	4030
Oct-1990	4365
Nov-1990	4303
Dec-1990	4314
Jon-1001	4379
Eob-1001	4307
Mor-1991	4314
Apr-1991	4447
Api-1991 May-1991	4237
lup 1001	4242
	4470
Jui-1991	4404
Aug-1991	4027
Sep-1991	4602
Oct-1991	4590
NOV-1991	4482
Dec-1991	4535
Jan-1992	4206
Feb-1992	4408
Mar-1992	4561
Apr-1992	4573
May-1992	4595
Jun-1992	4567
Jul-1992	4700

Aug-1992	4519
Sep-1992	4370
Oct-1992	4656
Nov-1992	4541
Dec-1992	4456
Jan-1993	4240
Feb-1993	4200
Mar-1993	4582
Apr-1993	4163
May-1993	4584
Jun-1993	4624
.lul-1993	4744
Aug-1993	4308
Sen-1993	4640
Oct-1003	4040
Nov-1003	4404
Doc 1002	4047
lan-100/	4413
Jan-1994 Eob 1004	4310
rep-1994	4010
Mai-1994	4388
Apr-1994	4868
May-1994	4581
Jun-1994	4749
Jul-1994	4905
Aug-1994	4774
Sep-1994	4609
Oct-1994	4890
Nov-1994	4658
Dec-1994	4814
Jan-1995	4320
Feb-1995	4515
Mar-1995	4367
Apr-1995	4493
May-1995	4388
Jun-1995	4908
Jul-1995	4325
Aug-1995	4688
Sep-1995	4708
Oct-1995	4598
Nov-1995	4421
Dec-1995	4534
Jan-1996	4443
Feb-1996	4680
Mar-1996	4565
Apr-1996	4572
May-1996	4869
Jun-1996	4717
Jul-1996	5006
Aug-1996	4828
Sep-1996	4504
Oct-1996	5032
Nov-1996	4671
	-

Dec-1996	4713
Jan-1997	4720
Feb-1997	4854
Mar-1997	4843
Apr-1997	5078
May-1997	4820
Jun-1997	5003
Jul-1997	4994
Aug-1997	4767
Sep-1997	4986
Oct-1997	4902
Nov-1997	4862
Dec-1997	4796
Jan-1998	4584
Feb-1998	4532
Mar-1998	5005
Apr-1998	5150
May-1998	4803
.lun-1998	4953
Jul-1998	4975
Aug-1998	5030
Sen-1998	4821
Oct-1998	4802
Nov-1998	51002
Dec-1998	5069
lan-1990	4780
Foh-1000	5026
Mor-1000	5162
Mar-1999	5103
Api-1999 May 1000	4905
lup 1000	4090
Jul 1000	5312
Jui-1999	5249
Aug-1999	5556
Oct 1000	5459
Oct-1999	5522
NOV-1999	5274
Dec-1999	5376
Jan-2000	5120
Feb-2000	5282
Mar-2000	5142
Apr-2000	5254
May-2000	5447
Jun-2000	5299
Jul-2000	5429
Aug-2000	5381
Sep-2000	5368
Oct-2000	5335
Nov-2000	4929
Dec-2000	5459
Jan-2001	4733
Feb-2001	4898
Mar-2001	5096

Apr-2001	5579
May-2001	5185
Jun-2001	5191
Jul-2001	5286
Aua-2001	5170
Sep-2001	5304
Oct-2001	5413
Nov-2001	5302
Dec-2001	5105
lan-2002	5072
Feb-2002	5205
Mar-2002	5/20
Δpr-2002	5254
May-2002	5/20
lun-2002	5242
Jul-2002	5383
Jui-2002	5350
Aug-2002	5025
Oct 2002	5025 4767
Nov 2002	5200
N0V-2002	5200
Dec-2002	3019
Jan-2003	4740
rep-2003	4690
Mai-2003	5220
Apr-2003	5238
May-2003	4873
Jun-2003	4819
Jul-2003	5114
Aug-2003	5199
Sep-2003	5083
Oct-2003	4816
Nov-2003	5239
Dec-2003	5248
Jan-2004	4984
Feb-2004	5228
Mar-2004	5193
Apr-2004	5223
May-2004	5482
Jun-2004	5384
Jul-2004	5449
Aug-2004	5662
Sep-2004	5171
Oct-2004	5459
Nov-2004	5247
Dec-2004	5535
Jan-2005	5119
Feb-2005	5167
Mar-2005	5371
Apr-2005	5214
May-2005	5394
Jun-2005	5486
Jul-2005	5281

Aug-2005	5468
Sep-2005	4501
Oct-2005	4788
Nov-2005	5064
Dec-2005	5136
Jan-2006	5379
Feb-2006	5118
Mar-2006	5205
Apr-2006	5216
May-2006	5382
Jun-2006	5488
Jul-2006	5300
Aug-2006	5656
Sep-2006	5253
Oct-2006	5331
Nov-2006	5273
Dec-2006	5585
Jan-2007	5167
Feb-2007	5109
Mar-2007	5357
Apr-2007	5264
May-2007	5508
Jun-2007	5385
Jul-2007	5485
Aug-2007	5538
Sep-2007	5432
Oct-2007	5204
Nov-2007	5331
Dec-2007	5747
Jan-2008	5032
Feb-2008	5019
Mar-2008	5042
Apr-2008	5208
May-2008	5258
Jun-2008	5146
Jul-2008	5108
Aug-2008	5080
Sep-2008	3670
Oct-2008	5081
Nov-2008	4889
Dec-2008	4689
Jan-2009	4568
Feb-2009	4639
Mar-2009	4039 4779
Δpr-2009	5086
Mav-2000	<u>⊿</u> 712
Jun-2009	1021
Jul-2000	4331
Διια-2000	5207
Sen-2009	10201
Oct-2009	-939 5048
Nov-2009	1003
1000 2000	4000

Dec-2009	5028
Jan-2010	5067
Feb-2010	4644
Mar-2010	5154
Apr-2010	5181
May-2010	5207
Jun-2010	5221
Jul-2010	5179
Aug-2010	5452
Sep-2010	5327
Oct-2010	5043
Nov-2010	5197
Dec-2010	5111
Jan-2011	5084
Feb-2011	4890
Mar-2011	5276
Apr-2011	5139
May-2011	5258
Jun-2011	5392
.lul-2011	5134
Aug-2011	5383
Sen-2011	5073
Oct-2011	5061
Nov-2011	5063
Dec-2011	5126
lan-2012	4948
Feb-2012	5042
Mar-2012	5018
Δpr-2012	4043
May-2012	5000
lup_2012	5116
Jul-2012	5028
Jui-2012	5020
Aug-2012 Son-2012	JZZ7 4070
Oct 2012	4979
Nov 2012	5169
NOV-2012	5000
Dec-2012	5000
Jan-2013	5153
rep-2013	5022
Mar-2013	4919
Apr-2013	5354
May-2013	5249
Jun-2013	5163
JUI-2013	5430
Aug-2013	5336
Sep-2013	5473
Oct-2013	5241
Nov-2013	5687
Dec-2013	5253
Jan-2014	5120
Feb-2014	4982
Mar-2014	4818

Apr-2014	5196
May-2014	4980
Jun-2014	5065
Jul-2014	5306
Aug-2014	5447
Sep-2014	5388
Oct-2014	5198
Nov-2014	5363
Dec-2014	5178
Jan-2015	5084
Feb-2015	4957
Mar-2015	5185
Apr-2015	5298
May-2015	5337
Jun-2015	5613
Jul-2015	5626
Aug-2015	5523
Sep-2015	5350
Oct-2015	5135
Nov-2015	5509
Dec-2015	5400
Jan-2016	5433
Feb-2016	5272
Mar-2016	5502
Apr-2016	5370
May-2016	5373
Jun-2016	5308
Jul-2016	5537
Aug-2016	5387
Sep-2016	5621
Oct-2016	5408
Nov-2016	5668
Dec-2016	5601
Jan-2017	5410
Feb-2017	5208

2012 average	5,070
2013 average	5,273
2014 average	5,170
2015 average	5,335
2016 average	5,457
2016-2012	387
Increase 206 over	
2012	7.6%
	1.9%



# The EIA-782 survey

## Background

The EIA-782 surveys were implemented in 1983 to fulfill the data requirements necessary to meet U.S. Energy Information Administration (EIA) legislative mandates and user community data needs. The requirements include petroleum product price, market distribution, demand (or sales), and product supply data, which are needed for a complete evaluation of petroleum market performance. The EIA-782 series includes the Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report"; Form EIA-782B, "Resellers'/Retailers' Monthly Petroleum Product Sales Report"; and Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption."

The Form EIA-782A collects refiner and gas plant operator monthly price and volume data at a state level on 14 petroleum products for various retail and wholesale marketing categories. The Form EIA-782B collects reseller/retailer monthly price and volume data at a state level for gasoline, No. 2 distillate, propane, and residual fuel. The Form EIA-782C collects prime supplier monthly volume data on 14 petroleum products. Beginning March 1984, gasoline and residual fuel were added to the EIA-782B. The EIA-782 forms were modified in October 1993 to reflect the changes in refined petroleum products arising out of the requirements of the Clean Air Act Amendments of 1990 (CAAA). The CAAA require that oxygenated gasoline be sold during the winter months in carbon monoxide nonattainment areas beginning October 1, 1992. They require that reformulated gasoline be sold in ozone nonattainment areas beginning January 1, 1995. Beginning October 1, 1993, diesel fuel sold for on-highway use must be low-sulfur diesel fuel (i.e., diesel fuel containing less than or equal to 0.05% sulfur). As a result of these environmental regulations, gasoline data collected on the EIA-782 forms were divided into conventional, oxygenated, and reformulated categories. Diesel fuel sales were separated into low-and high-sulfur categories. The wholesale gasoline categories on the EIA-782A and EIA-782B forms were also modified to include dealer tank wagon, rack, and bulk sales. The retail category for propane on the EIA-782 was expanded to include residential, commercial/institutional, industrial, sales through company-operated retail outlets, petrochemical, and other end user sales. Propane was added to the EIA-782B corresponding to the EIA-782A propane categories. Beginning with January 2004, the collection of naphtha-type jet fuel on the EIA-782C was eliminated due to declining sales. To accommodate changes in the industry as a result of the Environmental Protection Agency's mandate to lower sulfur content in diesel fuel, the EIA-782 forms were modified beginning with January 2007 data to separate low sulfur diesel into ultra-low and low sulfur diesel. In addition, the collection of oxygenated gasoline as a separate category was eliminated and combined with conventional gasoline. Publication tables were modified to incorporate these changes.

## Discussion of sample design

The Form EIA-782A is sent to a census of refiners and gas plant operators. Respondents are selected with certainty due to their small number and because of the relative size of their sales volume.

The Form EIA-782B is sent to a scientifically selected sample of motor gasoline, distillate, propane, and residual fuel oil resellers and retailers. The Form EIA-863, "Petroleum Product Sales Identification Survey," served as the basis of the sampling frame of dealers. Information obtained from the Form EIA-

863 was supplemented with information from the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." The sales volumes obtained from these surveys were used to assign measures of size for sampling. Dealers comprising 5% or more of sales in a state were selected with certainty. The remaining units on the frame were each assigned a probability of selection. In this design, the probability was based on the size of the company, as determined by their sales volume, relative to the total for all companies for each geographic area and type-of-sale classification relevant for that company. In addition, a random number between 0 and 1 was assigned to each company. The companies were then ordered by the ratio of the random number minus the random number times the probability to the probability minus the random number times the probability (r-rp)/(p-rp). The first 2,200 companies in this ordering were then selected for the sample. The noncertainty companies were then post-stratified within each geographic/type-of-sale category by their volume. The sample weights, the inverse of the probabilities, were multiplied by the sample expectation adjustment which was the ratio of the sum of the probabilities of selection for all frame units in the stratum to the actual sample size of the stratum.

The geographic areas were defined as (a) the 24 states in which No. 2 distillate was a significant heating source and 50 states and the District of Columbia for residual and motor gasoline, (b) the 25 states in which propane was a significant energy source, or as (c) the PAD Districts for districts where not all state estimates are provided. The type-of-sale classifications were retail and resale for motor gasoline and residual fuel oil, and residential and nonresidential retail and wholesale for distillate and propane. Four volume-of-sales strata (certainty, zero, low, and high) were defined with volume boundaries differing by state, sales type, and product.

The design of the EIA-782B sample was based on ten target variables: total retail motor gasoline, total wholesale motor gasoline, residential No. 2 fuel oil, other retail No. 2 fuel oil, total wholesale No. 2 fuel oil, residential propane, total other retail propane, wholesale propane, total retail residual fuel oil, and total wholesale residual fuel oil. A sample size of 2,200 was expected to yield a median level of accuracy for each target variable of volume coefficients of variation (CV) of 15% for No. 2 distillate and 10% for the other products, determined at the publishable state level (24 states for distillate, 25 for propane, 50 states and the District of Columbia for motor gasoline and residual). Studies on the relationship of volume CV to price CV have shown that this will produce price CVs of less than 1%. The reliability of current month estimates will vary from these goals due to the deterioration of the frame over time and the changing distributions of price and volume.

Prior to March 1997, the sample design was a linked stratified sample. Within each product, sales type, and geographic area, companies were stratified by the size of the company as determined by their sales volumes. The samples resulting from the separate stratification schemes were combined by means of joint linked selection to yield a sample size of approximately 3,500 companies. Prior to October of 1993, the sample design, the survey sample, and the survey form did not include propane. As of the March, 2011 reference month, data collection on the EIA-782B survey was suspended.

The Form EIA-782C was sent to all prime suppliers of any of the selected products on the EIA-782C. A prime supplier is a firm that produces, imports, or transports any of the selected petroleum products across state boundaries and local marketing areas and sells the product to local distributors, local retailers, or end users. They were selected with certainty due to their small number and the relative size of their sales volumes.

### Discussion of the sampling frame

The EIA-782A survey consists of a census of respondents who either directly or indirectly control a refinery or gas plant facility. The EIA-782A form collects sales data on 14 refined petroleum products. Currently, about 98 companies respond to the EIA-782A survey.

The EIA-863 data base provided the sampling frame for the EIA-782B survey. The Form EIA-863, "Petroleum Product Sales Identification Survey," was mailed to approximately 27,000 companies in January 2003, in order to collect 2002 state-level sales volume data for No. 2 distillate, residual, and motor gasoline. The No. 2 distillate data were further identified by residential/nonresidential end-use and nonend-use sales, while the residual and motor gasoline data were identified by end-use and nonend-use sales. The mailing list for the EIA-863 survey was constructed by merging and unduplicating the previous master frame file and approximately 59 state and commercial lists.

Data from the 2002 EIA-821, "Annual Fuel Oil and Kerosene Sales Report" survey were merged with data from the EIA-863 survey to yield a combined file. A transformed and edited version of this file was created to form the sample file used to design and select the EIA-782B sample.

NOTE: Service stations and smaller truck stops selling No. 2 diesel fuel were specifically included in this frame update. Therefore, the EIA-782B end-use category, "sales through company outlets," does incorporate all sales of No. 2 distillate.

The EIA-782C survey consists of a census of suppliers who produce, import, or transport any of the 14 refined petroleum products listed on the form across state boundaries and local marketing areas, and who sell the product to local distributors, local retailers, or end users. Currently, about 201 firms respond to the EIA-782C survey.

#### Reliability of data

There are two types of errors possible in an estimate based on a sample survey: sampling and nonsampling. Sampling errors occur because observations are made only on a sample, not on the entire population. Nonsampling errors can be attributed to many sources in the collection and processing of data. The accuracy of survey results is determined by the joint effects of sampling and nonsampling errors.

#### Measures of sampling variability

For data prior to March 2011, tables 12 through 15, 28 through 30, and 34 through 38 utilize a sample of nonrefiners and, therefore, have sampling error. The remainder of the tables published are based on census data; therefore, there is no error due to sampling. The particular sample used for the EIA-782B is one of a large number of all possible samples that could have been selected using the same design. Estimates derived from the different samples would differ from each other. The average of these estimates would be close to the estimate derived from a complete enumeration of the population (a census), assuming that a complete enumeration has the same nonsampling errors as the sample survey.

The sampling error, or standard error of the estimate, is a measure of the variability among the estimates from all possible samples of the same size and design and, thus, is a measure of the precision with which an estimate from a particular sample approximates the results of a complete enumeration.

#### Nonsampling errors

Nonsampling errors can be attributed to many sources: (1) inability to obtain complete information about all cases in the sample (i.e., nonresponse), (2) response errors, (3) definitional difficulties, (4) differences in the interpretation of questions, (5) mistakes in recording or coding the data obtained, and (6) other errors of collection, response, coverage, and estimation for missing data. These nonsampling errors also occur in complete censuses.

Although no direct measurement of the biases due to nonsampling errors can be obtained, precautionary steps were taken in all phases of the frame development and data collection, processing, and tabulation processes, in an effort to minimize their influence. In addition, the close cooperative consultation between EIA and the EIA-782 survey respondents and data users results in a more accurate information gathering and reporting process.

#### Imputation and estimation

Survey data gathered from the respondents invariably contain incomplete reporting, nonresponse, and values that fail editing. These missing data are estimated, or imputed for, as follows. First, for all survey units, the previous month's reported value and the previous month's predicted value are weighted together to yield a predicted value for the current month. The sum of the weighted, predicted values for nonrespondents in the current month is then multiplied by a chain link multiplier (the ratio of the sum of the weighted, reported values for respondents in the current month). The resulting estimate for nonreported values is then added to the reported values. That is,

$$\widehat{V}_t = \sum_{R,h} W_{i,h} V_{i,h,t} + \sum_{NR,h} W_{j,h} V'_{j,h,t}$$

and similarly

$$\hat{Q}_{t} = \sum_{R,h} W_{i,h} V_{i,h,t} P_{i,h,t} + \sum_{NR,h} W_{j,h} V'_{j,h,t} P'_{j,h,t}$$

where

$$V'_{j,h,t} = \frac{\sum_{R,h,PADD} W_{i,h} V_{i,h,t}}{\sum_{R,h,PADD} W_{i,h} \tilde{V}_{i,h,t}} \tilde{V}_{j,h,t}$$

$$P'_{j,h,t} = \frac{\sum_{R,h,PADD} P_{i,h,t}}{\sum_{R,h,PADD} \tilde{P}_{i,h,t}} \tilde{P}_{j,h,t}$$

and,

$$W^*_{i,h} = \frac{\sum^{Nh\frac{l}{W_{i,h}}} (W_{i,h})}{n_h}$$

 $W_{i,h}$  = the weight for company i in stratum h. For resellers/retailers responding to EIA-782B,  $W_{i,h}$  is inversely proportional to the probability of inclusion. For all certainty units  $W_{i,h}$  = 1. The certainty units
are all respondents to the EIA-782A, the EIA-782C, and the units selected with certainty for the EIA-782B.

Nh = total number of population units in stratum h,

*nh* = number of sampled units in stratum *h*,

 $\sum_{R,h}$  =summation across current month respondents *i*, all strata

 $\sum_{NR,h}$  =summation across current month nonrespondents *j*, all strata

 $V_{i,h,t}$  = current month (t) reported volume for company *i*, in stratum *h* 

*Pi*,*h*,*t* = current month (*t*) reported price for company *i*, in stratum *h* 

 $\widehat{V'}_t$  = current month (t) estimated total volume,

 $\hat{Q}_t$  = current month (*t*) estimated total revenue,

 $\widehat{V}'_{i,t}$  = current month (t) predicted volume for company *i*, respondent,

 $\tilde{P}_{i,t}$  = current month (t) predicted price for company *i*, respondent,

$$V_{i,t} = \alpha V'_{i,t-1} + (1-\alpha)V_{i,t-1}$$
$$P_{i,t} = \alpha P'_{i,t-1} + (1-\alpha)P_{i,t-1}$$

where

 $V_{it-1}$  = previous month (*t*-1) reported volume for company *i*,

 $P_{it-1}$  = previous month (*t*-1) reported price for company *i*,

 $\alpha$ = constant between 0 and 1, set by form, product, type of sale and price or volume,

and

$$\widehat{\mathbf{P}}_{\mathsf{t}} = \frac{\widehat{Q}_t}{\widehat{V'}_t}$$

the resulting estimate of price at the published level for month t.

Multiple product data collection and linked sample selection yield two types of respondents: basic and supplemental. Both types are used for imputation, estimation, and standard errors.

The variance estimate is:

$$VAR(\hat{P}_{t}) = \frac{1}{\hat{V}_{t}^{2}} \sum_{k} N_{k}^{2} n_{k} (1 - f_{k}) \frac{M_{k}}{(\sum_{i} W_{lk})^{2}}$$

where

 $N_k$  = the number of population units in group k,

nk = the number of basic and volunteer respondents in group k,

 $W_{ik}$  = the sampling weight for respondent *i* in group *k*,

$$f_k = \frac{n_k}{N_k}$$

and  $\hat{P}_t$  and  $\hat{V}_t$  are previously defined.

The term  $M_t$  is computed as follows:

$$M_k = \frac{\sum_i (M_{lk})^2}{n_k - 1}$$

where

$$M_{lk} = W_{lk}V_{lk}D_{lk} - \frac{W_{lk}}{(\sum_{i} W_{lk})} x \sum_{l} (W_{lk}V_{lk}D_{lk})$$

and

$$D_{ik} = P_{ik} - \hat{P}_t$$

 $V_{ik}$  = reported volume for respondent *i* in group *k* 

 $P_{ik}$  = reported price for respondent *i* in group *k*.

#### Data continuity

When the EIA-782 series was implemented in 1983, it replaced prior surveys that had been used to meet the U.S. Energy Information Administration's data requirements. The Form EIA-782A replaced the refiner and gas plant operator portions of the Form EIA-460, "Petroleum Industry Monthly Report for Product Prices"; and Form EIA-9A, "No. 2 Distillate Price Monitoring Report"; the Form EIA-782B replaced the nonrefiner portions of the Form EIA-460 and Form EIA-9A; and the Form EIA-782C replaced Form EIA-25, "Prime Supplier's Monthly Report."

Since the transition from the EIA-460, the EIA-9A, and the EIA-25 to the EIA-782 took place over a period of 4 months, rather than occurring at one time, it was possible to compare data from the predecessor surveys with data from the new survey during the transition period for some data elements. This comparative analysis yielded adjustment factors which reflected the estimated overall effect of the changes.

These adjustment factors were applied to the appropriate predecessor survey prices to yield a backcast estimate. A complete description of the estimation of historical data prior to January 1983 is contained in the feature article of the December 1983(3) issue of the *Petroleum Marketing Monthly* (PMM).

The backcast price estimation employed the predecessor survey published price as the initial approximation. The initial approximation, however, frequently represented less aggregated product categories and more aggregated seller/sales categories. Therefore, more comparable product categories were formed by volume weighting the disaggregated predecessor survey product prices. For the EIA-9A, comparable categories were formed by subtracting from the price the average taxes reported. Comparable seller/sales categories were formed by multiplying the predecessor price by the ratio of the

EIA-782 price for the category to be estimated divided by the volume weighted prices for the aggregate of the EIA-782 categories most comparable to the predecessor category. That is,

$$\widehat{\widehat{P}}_{460,i} = \ \widehat{P}_{460,j} \frac{\widehat{\widehat{P}}_{782,i}}{\widehat{\widehat{P}}_{782,j}}$$

where i represents the EIA-782 category to be back-cast and j represents the most similar category on the predecessor survey.

The backcast price series were estimated by multiplying the estimate for the previous time period from the predecessor survey by an adjustment factor:

$$\hat{P}_{782,i,t} = \hat{P}_{Predecessor,i,t} \times (Adjustment Factor)$$

where t = reference month.

Adjustment factors were computed by dividing the EIA-782 December price by the derived December predecessor price for comparable categories:

Adjustment Factor = 
$$\frac{\hat{P}_{782,i,December}}{\hat{P}_{Predecessor,i,December}}$$

The EIA-782 December 1982 price for all respondents had to be estimated since not all of the EIA-782 respondents were reporting in December. This estimate was based on the average of the ratios of the prices for the December respondents to the prices for all respondents in January, February, and March of 1982. That is,

$$\hat{P}_{782,i,December} = \hat{P}_{782,i,r,December} \frac{\sum_{m} \frac{\hat{P}_{782,i,r,m}}{P_{782,i,m}}}{3}$$

where r = respondents who reported in the December reference month and m = the months of January, February, and March.

Starting with the September 1990 final estimates, prices published are derived using the sample described under "Discussion of Sample Design." Prices published for January 1984 through August 1990 were derived using different samples and slightly different designs (refer to the 1987 PMA for a further description). Also, the monthly price estimates from January through December 1983 were derived using another sample design (see the December 1983(3) issue of the PMM). Therefore, there may be some minor discontinuity in price estimates between August 1988 and September 1988 and between December 1983 and January 1984.

#### **Collection methods**

Survey data are collected every month, by mail, fax, email or the PC Electronic Data Reporting Option (PEDRO) software. It is mandatory for each respondent to submit completed forms to EIA within the specified time allotted. For the EIA-782A, completed forms must be submitted no later than 30 calendar days after the close of each reference month. For the EIA-782C, completed forms must be submitted no later than 20 calendar days after the close of the reference month. Telephone follow-up calls to non-

respondents begin the day after the established due date in order to collect all outstanding data. Late submissions and resubmissions are processed when received.

#### Data processing

As EIA-782 forms are received, they are logged into an automated Survey Control File which maintains monthly status codes for each company. The data are reviewed manually and then entered into the computer files. The EIA-782A and EIA-782C are transitioning to Electronic Data Extraction System (EDES) forms that will securely capture respondents' excel spreadsheet submissions without manual keying. They are then processed through an automated edit program which detects missing data, inconsistent prices, volumes and prices that significantly differ from those previously reported by the company, and outlying values that will affect published estimates. Data that fail the edits are resolved by contacting the data reporters, and corrections and verification codes are entered into the computer files. Statistical reports, including publication tables, are then generated using only acceptable and verified data.

#### Nondisclosure

The data contained in this publication are subject to statistical nondisclosure procedures. The objective of the disclosure-avoidance procedures, as stated in the Office of Management and Budget <u>Standard</u> <u>7.2, Data Protection and Disclosure Avoidance for Dissemination</u>, is to ensure that confidential, company-identifiable data are not disclosed in tables where "company specific responses may be proprietary and prohibited from public disclosure by 18 U.S.C. 1905." Statistics representing data aggregated from fewer than three companies or that are dominated by input from one or two companies are withheld. EIA identifies cells that are sensitive according to these criteria by applying a statistical formula to the data contained in each cell to determine if a few companies "dominate" the cell.

If a cell is sensitive, the data in that cell are suppressed and a "W" is placed in the publication cell. Also, since many tables include row or column totals, some nonsensitive data cells have been suppressed to prevent the reader from calculating the suppressed numbers by simply subtracting the published numbers from the total. In conjunction with the 2007 survey changes, the Total columns in certain publication tables have been eliminated to help ensure that sensitive data reported to EIA by individual survey respondents may not be closely estimated using the aggregates published by EIA.

#### Table EN1. Federal and state motor fuels taxes<sup>1</sup> (see updated rates)

cents per gallon

	Motor gasoline	Diesel fuel	Gasohol		Motor gasoline	Diesel fuel	Gasohol
Federal[2]	18.40	24.40	18.40	Mississippi[4]	18.40	18.40	18.40
Average state tax	24.12	24.90	24.08	Missouri[4]	17.30	17.30	17.30
				Montana[4]	27.75	28.50	27.75
Alabama[4]	19.00	20.75	19.00	Nebraska	27.30	26.70	27.30
Alaska[5]	8.00	8.00	8.00	Nevada[4]	23.81	27.75	23.81
Arizona	19.00	19.00	19.00	New Hampshire	19.63	19.63	19.63
Arkansas	21.80	22.80	21.80	New Jersey[3]	10.55	13.55	10.55
California[3][4]	37.56	12.56	37.56	New Mexico	18.88	22.88	18.88
Colorado	22.01	20.51	22.01	New York[3][4]	26.74	24.94	26.74
Connecticut[3]	25.00	54.90	25.00	North Carolina	36.75	36.75	36.75
Delaware	23.00	22.00	23.00	North Dakota	23.03	23.03	23.03
District of Columbia	23.50	23.50	23.50	Ohio	28.00	28.00	28.00
Florida[4]	19.29	33.37	19.29	Oklahoma	17.00	14.00	17.00
Georgia[3][4]	8.00	8.00	8.00	Oregon[4]	30.00	30.00	30.00
Hawaii[3][4]	19.50	19.50	19.50	Pennsylvania	41.80	52.10	41.80
Idaho	26.00	26.00	26.00	Rhode Island	33.12	33.12	33.12
Illinois[3][4]	21.10	22.60	20.10	South Carolina[4]	16.75	16.75	16.75
Indiana[3]	19.00	17.00	19.00	South Dakota	24.00	24.00	24.00
lowa[3]	22.00	23.50	20.00	Tennessee	21.40	18.40	21.40
Kansas	25.03	27.03	25.03	Texas	20.00	20.00	20.00
Kentucky	32.50	29.50	32.50	Utah	25.00	25.00	25.00
Louisiana	20.13	20.13	20.13	Vermont[3]	32.95	32.00	32.95
Maine	31.40	32.60	31.40	Virginia[3]	11.70	20.80	11.70
Maryland	27.59	28.34	27.59	Washington[4]	37.51	37.51	37.51
Massachusetts	24.02	24.02	24.02	West Virginia	35.70	35.70	35.70
Michigan[3]	19.88	15.88	19.88	Wisconsin	32.90	32.90	32.90
Minnesota	30.60	30.60	30.60	Wyoming	24.00	24.00	24.00

1 This figure lists rates of general application (including, but not limited to, excise taxes, environmental taxes, special taxes, and inspection fees), exclusive of county and local taxes. Rates are also exclusive of any State taxes based on gross or net receipts. The State rates are in effect as of July 1, 2014. (see <u>updated rates</u>)

2 The Federal tax on motor gasoline and diesel fuel increased to 18.4 and 24.4 cents, respectively, on October 1, 1997. The Federal tax on gasohol increased to 18.4 cents on January 1, 2003.

3 Additional State taxes are levied as follows: California: 2.25 percent sales tax on gasoline, 9.25 percent sales tax on diesel fuel in addition to local sales taxes; Connecticut: 7.0 percent gross earnings tax; Georgia: 4 percent Prepaid State Tax; Hawaii: 4 percent gross income tax, Illinois: 6.25 percent sales tax (suspended for the period beginning July 1, 2000, and ending December 31, 2000); Indiana: 7 percent sales tax (suspended for the period between July 1, 2000 and September 15, 2000); Michigan: 6 percent sales tax; New Jersey: gross receipts tax of 4 cents per gallon for on-highway use fuels; New York: 8.0 cents per gallon state sales tax in addition to local sales taxes; Vermont: Motor Fuels Transportation Infrastructure Assessment Fee (subject to change on a quarterly basis for gasoline and 3.0 cents per gallon on diesel fuel) and the Motor Fuel Tax Assessment on gasoline; Virginia: 2.1 percent Wholesales Sales Tax in certain jurisdictions.

4 Local option taxes (LOTS) are allowed. Florida: the State assesses a State Comprehensive Enhanced Transportation System (SCETS) tax on gasoline which is two-thirds of each county's rate. In addition, the State collects a "ninth cent tax" and a second local tax. These taxes add an unweighted average of 15.8 cents to the gasoline State tax. Georgia: a Transportation Local Option Sales Tax (TSPLOST) may apply. Hawaii LOTS are as follows: Honolulu: 16.5 cents per gallon; Maui: 16.0 cents per gallon; Hawaii: 8.8 cents per gallon; Kauai: 17.0 cents per gallon. Nevada: additional county taxes on gasoline range from 5 to 10 cents per gallon.

5 The State of Alaska suspended its motor fuels taxes on all fuel types and uses for a period of one year beginning September 1, 2008 and ending August 31, 2009.

#### Table EN2. U.S. postal two-letter state abbreviations

State		State		State	
code	State	code	State	code	State
AL	Alabama	KY	Kentucky	ND	North Dakota
AK	Alaska	LA	Louisiana	ОН	Ohio
AZ	Arizona	ME	Maine	ОК	Oklahoma
AR	Arkansas	MD	Maryland	OR	Oregon
CA	California	MA	Massachusetts	PA	Pennsylvania
со	Colorado	MI	Michigan	RI	Rhode Island
СТ	Connecticut	MN	Minnesota	SC	South Carolina
DE	Delaware	MS	Mississippi	SD	South Dakota
DC	District of Columbia	MO	Missouri	ΤN	Tennessee
FL	Florida	MT	Montana	ТΧ	Texas
GA	Georgia	NE	Nebraska	UT	Utah
HI	Hawaii	NV	Nevada	VT	Vermont
ID	Idaho	NH	New Hampshire	VA	Virginia
IL	Illinois	NJ	New Jersey	WA	Washington
IN	Indiana	NM	New Mexico	WI	Wisconsin
IA	lowa	NY	New York	WV	West Virginia
KS	Kansas	NC	North Carolina	WY	Wyoming

#### Relationship of refiner and prime supplier sales volumes

The refiner sales volumes collected on the EIA-782A are related to the prime supplier sales volumes collected on the EIA-782C, but conceptual differences exist that cause variations between these data. In general, EIA-782A volumes are intended to reflect refiner sales of petroleum products into all secondary and tertiary markets, while EIA-782C volumes are designed to measure prime supplier sales into only the local markets of final consumption. Specifically:

The reporting universe for the EIA-782C survey is significantly larger than that of the EIA-782A. While nearly all refiners and gas plant operators report on both surveys (a small number do not qualify as prime suppliers), some large, interstate distributors and retailers, as well as some importers, report only on the EIA-782C.

EIA-782A respondents are asked only to exclude sales to other refiners (that is, other respondents that comprise the primary market), while EIA-782C respondents are asked to exclude sales to any company that is not a local distributor, local retailer, or end user (DRE). Therefore, EIA-782C respondents are asked not only to exclude sales to refiners, but also to most large interstate resellers, importers, traders, and retailers who transport products across state boundaries.

The EIA-782A is designed to gather data on the sales of selected petroleum products made in each state, regardless of where the products are physically located or will be consumed. In contrast, the EIA-782C is designed to collect data reflecting only delivered sales of selected petroleum products into those states where the products are expected to be locally consumed.

Consequently, EIA-782A and EIA-782C volumetric data generally vary at national, regional, and state levels. In particular, differences are expected in states and regions in which major supply origination, pipeline distribution, or transfer points are located. In these states, large volumes of products may change hands many times, often for eventual shipment outside the state. Since the EIA-782C is intended to measure only those sales into the final local markets of consumption (sales to DREs), all preceding

sales are excluded. Furthermore, sales by EIA-782C respondents are reported wherever the product was delivered, which may differ from the state where title transferred. In contrast, the EIA-782A reflects all sales made to secondary resellers, wherever title transfers.

Additionally, the EIA-782C reflects imports by firms that are neither refiners nor gas plant operators, that would not be measured on the EIA-782A unless they were transferred to a distribution chain. This mostly affects regions with a high level of product imports, such as the New England or Mid-Atlantic states.

Therefore, states with major refining areas, such as Texas or California, generally show higher volumes on the EIA-782A survey than the EIA-782C survey, since some of the volumes reported on the EIA-782A are excluded on the EIA-782C or are reported in different states. Conversely, net consuming states (e.g., most PAD District 1 and PAD District 2 states) may show larger prime supplier sales on the EIA-782C due to interstate movements or imports by resellers and/or differences in state of delivery versus title transfer. However, this may be partially or entirely offset by some refiners reporting larger sales volumes on the EIA-782A than on the EIA-782C (due to fewer exclusions taken on the EIA-782A).

In summary, caution should be exercised when comparing sales volumes between refiners and prime suppliers. Whereas EIA-782A data reflect the marketing of products by refiners to non-refiners where the sale occurs, EIA-782C data reflect prime supplier sales to local distributors, local retailers, and end users where the product is delivered. Therefore, the EIA-782A and EIA-782C surveys differ by the respondents reporting (refiners versus prime suppliers), the types of sales reported (sales to non-refiners versus sales to DREs), and the location of the reported sales (point of title transfer versus destination of the sale).

#### Table EN3. Revision error in selected 2016 U.S. refiner average price data

_	Re sale	gular gaso es to end u	line sers	No sale	<ol> <li>2 distillation</li> <li>2 to end us</li> </ol>	e sers	Re: sale	sidual fuel o s to end use	oil ers
Date	РММ	Final	Difference	PMM	Final	Difference	РММ	Final	Difference
January	1.426	1.426	0.000	1.200	1.201	0.001	0.710	0.710	0.000
February	1.257	1.256	-0.000	1.188	1.187	-0.001	0.633	0.632	-0.001
March	1.485	1.485	0.000	1.318	1.318	0.000	0.693	0.693	0.000
April	1.656	1.656	0.000	1.386	1.388	0.002	0.759	0.782	0.023
May	1.805	1.806	0.001	1.554	1.555	0.001	0.922	0.922	0.000
June	1.900	1.900	0.000	1.666	1.662	-0.004	0.983	0.983	0.000
July	1.729	1.729	0.000	1.577	1.578	0.001	1.043	1.030	-0.013
August	1.687	1.687	0.000	1.578	1.578	0.000	0.990	0.990	0.000
September	1.716	1.716	0.000	1.603	1.602	-0.001	1.074	1.076	0.002
October	1.748	1.748	0.000	1.708	1.708	0.000	1.115	1.115	0.000
November	1.684	1.684	0.000	1.604	1.601	-0.003	1.061	1.106	0.045
December	1.782	1.783	0.001	1.719	1.721	0.002	1.229	1.230	0.001

dollars per gallon excluding taxes

Sources: Data are from Tables 2 and 6 of the Petroleum Marketing Monthly.

#### Table EN4. Revision error in selected 2016 U.S. refiner sales volume data

million gallons per day

	Me sal	otor gasolin les for resal	e e	No. 2 distillate sales for resale		Residual fuel oil sales to end users			
			Percent			Percent			Percent
Date	PMM	Final	change	PMM	Final	change	PMM	Final	change
January	284.9	285.3	0.1%	142.7	142.8	0.1%	4.1	4.1	0.0%
February	294.9	295.0	0.0%	145.7	145.7	0.0%	4.1	3.9	-5.1%
March	304.2	303.8	-0.1%	146.2	146.2	0.0%	4.1	4.1	0.0%
April	302.5	302.5	0.0%	145.1	145.1	0.0%	4.0	4.2	4.8%
May	305.8	305.8	0.0%	143.1	144.3	0.8%	3.9	3.9	0.0%
June	314.9	314.9	0.0%	143.3	143.4	0.1%	3.8	3.8	0.0%
July	315.7	315.9	0.1%	136.5	136.3	-0.1%	4.1	4.3	4.7%
August	314.7	314.8	0.0%	146.2	146.1	-0.1%	4.4	4.4	0.0%
September	307.8	307.8	0.0%	148.3	148.8	0.3%	4.8	4.7	-2.1%
October	301.9	301.9	0.0%	152.4	152.4	0.0%	4.4	4.4	0.0%
November	300.0	299.6	-0.1%	151.5	151.9	0.3%	3.5	4.0	12.5%
December	298.3	298.5	0.1%	155.5	155.4	-0.1%	4.3	4.2	2.4%

Sources: Data are from Tables 3 and 5 of the Petroleum Marketing Monthly.

#### Table EN5. Revision error in selected volumes of 2016 U.S. prime supplier sales data

million gallons per day

	Total	motor gase	oline	Total no	. 2 distillate	sales	Total re	sidual fuel	oil
			Percent			Percent			Percent
Date	PMM	Final	change	PMM	Final	change	PMM	Final	change
January	341.8	342.2	0.1%	155.9	155.9	0.0%	13.4	13.5	0.7%
February	361.0	360.5	-0.1%	163.8	163.8	0.0%	14.2	14.2	0.0%
March	366.9	366.8	0.0%	160.3	159.0	-0.8%	13.9	13.9	0.0%
April	371.6	370.8	-0.2%	157.6	157.6	0.0%	12.1	12.3	1.6%
May	373.6	374.0	0.1%	154.3	154.9	0.4%	11.7	11.7	0.0%
June	387.1	389.7	0.7%	159.5	159.4	-0.1%	11.7	11.7	0.0%
July	384.7	385.2	0.1%	149.3	149.8	0.3%	10.2	10.2	0.0%
August	387.5	384.7	-0.7%	163.6	162.2	-0.9%	11.5	11.5	0.0%
September	376.3	375.5	-0.2%	163.8	163.7	-0.1%	10.6	10.6	0.0%
October	373.7	373.7	0.0%	166.5	166.5	0.0%	11.4	11.4	0.0%
November	370.6	369.8	-0.2%	163.7	163.6	-0.1%	11.3	11.3	0.0%
December	367.7	367.6	0.0%	157.8	157.9	0.1%	11.3	11.2	-0.9%

Sources: Data are from Tables 45, 46, and 47 of the Petroleum Marketing Monthly.

#### **Revision error**

The petroleum product price and volume data shown for the current month are preliminary. These numbers may be revised in the next month's publication based on data received late or revisions to previously submitted data. For example, if the latest data shown are for the month of February, the February data are preliminary and the January data may have been revised due to the receipt of late or revised data. The data are final upon publication in the April issue of the *Petroleum Marketing Monthly* (PMM). In the above example, the difference between the preliminary January data is called the revision error. The amount of revision error for some selected EIA-782 data series is shown in Tables EN3 -EN5.

## The crude oil price surveys

#### Background

#### Form EIA-182: "Domestic Crude Oil First Purchase Report"

Each month, the Form EIA-182 collects data from first purchase buyers of domestic crude oil. A "first purchase" constitutes a transfer of ownership of crude oil during or immediately after the physical removal of the crude oil from a production property for the first time. Transactions between affiliated companies are reported as if they were arms-length transactions. The primary objective is to calculate an average first purchase price at various levels of aggregation. A company's monthly average first purchase prices are volume weighted across given geographical areas for selected crude streams and gravity bands. Prices are computed from the following reported data elements:

**Area of production**. The producing state or non-state production "area" (i.e., Alaska North Slope, Alaska South, and Federal Offshore Gulf—about one-fifth off the coastline of Texas and the remainder off Louisiana).

**Average cost**. Reported at the lease boundary and based on the actual purchase expenditures, including any taxes, discounts or premiums paid.

**Total volume purchased**. The amount of crude bought and paid for as it is measured at the lease boundary (usually at a lease automatic custody transfer unit—a LACT unit), adjusted for basic sediment and water (BS&W) and temperature.

Prices published from data collected on Form EIA-182 are calculated by dividing the sum of the total volume weighted average costs paid by the sum of the total volumes purchased.

Beginning with January 2004 data, EIA deleted selected crude streams and began collecting and publishing relevant crude oil stream price information to provide for better analysis of crude oil markets. Changes to the following states and areas are described below:

- California: Deleted the crude streams for Huntington Beach, San Ardo, and Ventura and began collecting for Coalinga, Cymric, and Lost Hills.
- Gulf Coast: Deleted the crude streams for Texas Gulf Refugio and Louisiana South Mix and began collecting for Heavy Louisiana Sweet (HLS), Louisiana Light Sweet (LLS), Mars Blend, Eugene Island, HOOPS Blend, and High Island.
- Oklahoma: Deleted the crude streams Cement and Garber and began collecting for Sweet.
- Texas: Deleted the crude stream for Hawkins and began collecting for Panhandle, North Texas Sweet, South Texas Sweet, and West Central Texas.

#### Form EIA-856: "Monthly Foreign Crude Oil Acquisition Report"

The Form EIA-856 collects monthly price and volume data for about 90% of all crude oil imported into the United states. It also collects classification data that enable EIA to determine the terms of an acquisition. The data are reported for the parent company and all the affiliates controlled by the parent.

Under this definition, the acquisition price reported for each cargo is the one paid to an unaffiliated seller, in principle an "arms-length" price, which is consistent with use of the data to represent market trends, rather than monitoring internal company transfer pricing policies.

Each month, respondents report the following for cargos acquired for U.S. importation:

**Offshore inventories**. Crude oil owned by the respondent that is intended for importation into the United States. These inventories include oil in tankers enroute to the United States and floating or on-land storage outside the United States.

**Crude type**. Includes the country of origin of the cargo of crude, the stream or type of crude oil (e.g., Saudi Light), and the API gravity.

**Volume acquired**. The number of 42 U.S. gallon barrels in the cargo.

Dates. The date of loading/acquisition and the expected date of landing.

Transportation. Ports of loading and landing and the name of the vessel.

**Prices**. Acquisition cost, landed cost, and other costs such as demurrage, agent's fees, import tariffs and fees, etc. (all costs are reported in dollars per barrel).

**Day's credit**. The number of day's credit is extended to the purchaser by the seller. This information is optional.

**Purchase classifying information**. Type of transaction (e.g., purchase from host government), terms of transaction (spot or contract), and point of transaction (f.o.b. (free on board), country of origin or CIF (cost, insurance, and freight), U.S. port of entry).

Published prices are calculated by first multiplying the purchase volume by a price to obtain a total cost, then the sums of the total costs are divided by the sums of the purchase volumes.

The prices associated with data collected on Form EIA-856 are aggregated within the month of acquisition, which can be the month of loading, the month of landing, or sometime between those events. By design, the prices are not aggregated for the month in which they are determined, unless the acquisition and price determination month are the same. EIA-856 data reflect types of trades occurring over the entire spectrum of international crude oil markets, ranging from continuing supply agreements to spot market purchases. Prices can be determined at time of loading or at time of landing. Prices can be negotiated between the parties involved or tied to spot or futures market price levels. The methodology chosen for the EIA-856 provides a consistent historical series even though its prices may not always agree with measures of prices from other sources.

International crude oil markets are complex and dynamic. For example, a cargo of Saudi Arabian crude oil could be acquired in June at a loading port in Saudi Arabia. The cargo may land in the United States in August. The price for the crude oil could be determined by spot crude oil prices in effect during the 5 days before and after landing. For the PMM, the price for this cargo will be aggregated in the month of June, when it was acquired. Conversely, a cargo of Brent crude may be acquired in June, but its price may have been determined in the forward Brent market in April. This cargo's price will also be aggregated in June, when the purchaser took title to the crude.

In the early 1980's, most crude oil prices were set by the country selling the crude. Gradually, as the supply of crude oil became more abundant, markets became more competitive. A robust spot market for crude evolved, in which prices for crude oil were determined by demand and supply. Frequently, the official sales price set by the selling government was considerably different than spot market assessments. As buyers began to purchase more crude oil on the spot market, the control that sellers had theretofore exercised eroded.

In order to protect their market share, crude oil producing governments began to tie prices for their crude to market-related prices. When these market-related pricing formulas came into prominence in late 1985, many crude oil prices were tied to a "netback realization," wherein a crude oil's value was determined by volume weighted spot market prices of products derivable from that crude. The weights essentially reflected the relative yield of selected products from a given crude stream. These netback-based formulas gradually gave way to formulas based on spot crude oil assessments.

The formulas and terms used by sellers of crude oil continue to change. Since the EIA-856 prices are aggregated by month of acquisition—not necessarily the same as month of price determination—they may not always show the same pattern as a series from another source (e.g., trade-press publications). During periods of dramatic change in crude oil prices, aggregate prices derived from EIA-856 data will tend to "lead" the market. That is, these prices will show the emerging trend earlier, reach the inflection point sooner, and then return to the underlying trend. When averaged over longer periods of time, however, EIA-856 prices show the same relative price movements as exogenous sources.

#### Form EIA-14: "Refiners' Monthly Cost Report"

The EIA-14 is a monthly census of all U.S. refiners. It collects the net acquisition costs and volumes of crude oil, both domestic and imported, on a corporate regional basis (i.e., not for individual refineries). Prior to 2004, the EIA-14 was collected at the national level only.

Included in the costs are all charges associated with the acquisition, transportation, and storage of crude incurred by respondents up to the time the oil is booked into their refineries. PAD District costs and volumes reflect the PAD District in which the crude oil is intended to be refined. See Glossary for PAD District definition.

Each month, refiners report the volume (in thousands of barrels) and costs (in thousands of dollars) for:

Domestic crude oil. Oil produced in the United States or from its outer continental shelf.

**Imported crude oil**. Oil produced outside the United States and brought into the United States for domestic processing.

**Composite crude oil cost**. The average amount that refiners pay for all the crude oil they refine, both domestic and imported. It is calculated by dividing the sum of the domestic and imported costs by the sum of the domestic and imported volumes.

**Initial price estimates**. Each month an initial price estimate is published for the domestic, imported, and composite refiner acquisition cost of crude oil. For example, if the published data is for January 2014, EIA will also publish an initial estimate for February 2014 that is a forecast of what the published February 2014 will be. In January 2012, EIA updated the methodology used to calculate the initial price estimates for refiner acquisition costs of crude oil. The price estimate for domestic crude oil comes from a regression model based on West Texas Intermediate (WTI) crude oil spot market prices. The price estimate for imported crude oil comes from a regression model that uses a basket of world crude oil prices. When WTI crude oil spot market prices or world crude oil prices are not available other methods are used. The composite price estimate is a weighted average of the domestic and imported prices based on refinery receipts data found in the *Petroleum Supply Annual*.

Initial price estimates for the November 1998 report period first appeared in the January 1999 *Petroleum Marketing Monthly*. The first initial estimates were forecasted using autoregressive

integrated moving average (ARIMA) transfer function models. Transfer function models are ARIMA models which use input data series as predictors. The initial estimates are calculated based on their own past values and present and past values of other related time series.

#### **Respondent frame**

#### Form EIA-182:

All firms that buy domestic crude oil at the lease boundary, acquiring ownership of the crude in a first purchase transaction. The list initially was compiled from the 1974 Federal Energy Administration (FEA) Oil and Gas Survey of Producers and Operators. Collection of data from first purchasers began in February 1976. By 1978, the frame consisted of 340 respondents. Of these, 198 purchased more than 150,000 barrels per year and together represented 99.9 % of the total reported volume.

Adjustments to the frame have mostly been "deaths," with relatively few "births." Following decontrol in January 1981, there was a major contraction of the list of active first purchasers. Many small firms went out of business or were absorbed by larger companies. Currently, the EIA-182 survey collects data from 108 active respondents.

#### Form EIA-856:

All companies that were reporting data on the ERA51, "Transfer Pricing Report," as of June 1982, regardless of the total volumes of crude oil that are imported. In addition, all other companies that acquire more than 500,000 barrels of foreign crude oil in the report month for importation into the United States are required to prepare and submit an EIA-856 for that month.

#### Form EIA-14:

All refiners of crude oil in the United States, including its territories and possessions. There are currently 69 respondents on the EIA-14.

The list of respondents to the EIA-14 is updated periodically by supplementation from the EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report," and the EIA-810, "Monthly Refinery Report."

#### Data collection processing

All three crude oil data collection systems are operated independently. Each performs similar data collection and processing functions that are outlined below.

Survey data are collected every month by mail, fax, email, or the PEDRO software. It is mandatory for each respondent to submit completed forms to EIA no later than 30 calendar days after the close of each reference month. Telephone follow-up calls to nonrespondents begin two days after the established due date in order to collect all outstanding data. Late submissions and resubmissions are processed when received.

The forms are manually logged and the data are entered onto computer files. The EIA-14 and EIA-182 are transitioning to Electronic Data Extraction System (EDES) forms that will securely capture respondents' excel spreadsheet submissions without manual keying. The files are then processed through an automated edit program which detects missing data, inconsistent prices, and outlying values that affect published estimates. Data that fail the edits are resolved through telephone calls to data reporters, and corrections and verification codes are entered onto computer files. Statistical reports, including publication tables, are then generated using only acceptable and verified data. Response rates

are normally 100% by the time final statistics are calculated.

#### Nondisclosure

The data contained in this publication are subject to statistical nondisclosure procedures. The objective of the disclosure-avoidance procedures, as stated in the Office of Management and Budget <u>Standard</u> 7.2, <u>Data Protection and Disclosure Avoidance for Dissemination</u>, is to ensure that confidential, company-identifiable data are not disclosed in tables where "company specific responses may be proprietary and prohibited from public disclosure by 18 U.S.C. 1905." Statistics representing data aggregated from fewer than three companies or that are dominated by input from one or two companies are withheld. EIA identifies cells that are sensitive according to these criteria by applying a statistical formula to the data contained in each cell to determine if a few companies "dominate" the cell.

If a cell is sensitive, the data in that cell are suppressed and a "W" is placed in the publication cell. Also, since many tables include row or column totals, some nonsensitive data cells have been suppressed to prevent the reader from calculating the suppressed numbers by simply subtracting the published numbers from the total.

#### Data Continuity

Some of the crude oil statistics published in the *Petroleum Marketing Monthly* (PMM) are republished in the *Monthly Energy Review* (MER). For a number of years before the PMM, these statistics had been published in the MER and *Annual Energy Review* (AER). The data currently collected through the crude oil surveys are compatible with data used to derive statistics for the historical series. The definitions, respondents, and processing have not changed substantially over the years the data have been collected. The target populations and the computational algorithms have remained virtually unchanged.

**Refiner acquisition costs** 

#### Table EN6. Revision error in 2016 U.S. refiner acquisition cost data

dollars per barrels

	Domestic			Imported			Composite		
Date	PMM	Final	Difference	РММ	Final	Difference	РММ	Final	Difference
January	32.22	32.17	-0.05	27.47	27.48	0.01	30.01	29.99	-0.02
February	30.34	30.28	-0.06	26.67	26.66	-0.01	28.57	28.53	-0.04
March	35.28	35.29	0.01	32.25	32.24	-0.01	33.82	33.82	0.00
April	39.34	39.30	-0.04	35.90	35.90	0.00	37.73	37.71	-0.02
May	44.70	44.77	0.07	41.00	40.88	-0.12	42.91	42.88	-0.03
June	47.55	47.57	0.02	44.13	44.13	0.00	45.95	45.96	0.01
July	44.87	44.88	0.01	41.58	41.48	-0.10	43.31	43.26	-0.05
August	44.18	44.18	0.00	41.21	41.21	0.00	42.70	42.70	0.00
September	44.54	44.47	-0.07	40.82	40.86	0.04	42.74	42.73	-0.01
October	48.63	48.66	0.03	44.76	44.76	0.00	46.82	46.85	0.03
November	46.10	46.10	0.00	41.80	41.80	0.00	44.06	44.06	0.00
December	50.38	50.45	0.07	46.72	46.72	0.00	48.62	48.66	0.04

Sources: PMM data are the first publication of EIA-14, "Refiners' Monthly Cost Report," survey data from Table 1 of the *Petroleum Marketing Monthly*. Final data include revisions to monthly data that are published in the June *Petroleum Marketing Monthly*.

#### Table EN7. Revision error in 2016 U.S. domestic first purchase price data

dollars per barrels

Date	РММ	Final	Difference
January	27.11	27.02	-0.09
February	25.51	25.52	0.01
March	31.87	31.87	0.00
April	35.59	35.59	0.00
Мау	41.02	41.02	0.00
June	43.96	43.96	0.00
July	40.70	40.71	0.01
August	40.46	40.46	0.00
September	40.54	40.55	0.01
October	45.00	45.00	0.00
November	41.65	41.65	0.00
December	47.12	47.12	0.00

Sources: PMM data are the first publication of EIA-182, "Domestic Crude Oil First Purchase Report," survey data from Table 1 of the *Petroleum Marketing Monthly*. Final data are revisions to monthly data that are published in the June *Petroleum Marketing Monthly*.

#### Table EN8. Revision error in 2016 U.S. foreign crude oil acquisition cost data

dollars per barrel

-	FOB	cost of im	ports	Lande	d cost of i	mports	
Date	РММ	Final	Difference	РММ	Final	Difference	
January	23.73	23.67	-0.06	26.84	27.36	0.52	
February	24.28	24.68	0.40	25.95	27.04	1.09	
March	29.73	29.74	0.01	31.16	32.06	0.90	
April	33.14	32.73	-0.41	34.94	35.43	0.49	
May	38.54	38.31	-0.23	40.26	40.73	0.47	
June	42.56	41.92	-0.64	43.87	43.55	-0.32	
July	39.51	38.76	-0.75	41.02	41.05	0.03	
August	38.28	38.26	-0.02	39.89	40.40	0.51	
September	38.18	38.28	0.10	39.99	40.81	0.82	
October	42.58	42.36	-0.22	43.86	43.97	0.11	
November	39.60	40.12	0.52	41.34	42.59	1.25	
December	44.83	44.52	-0.31	46.12	46.74	0.62	

Sources: PMM data is the first publication of EIA-856, "Monthly Foreign Crude Oil Acquisition Report," survey data from Table 1 of the *Petroleum Marketing Monthly*. Final data include revisions to monthly data that are published in the June *Petroleum Marketing Monthly*.

#### Reliability of data

There are two types of errors possible in an estimate based on a sample survey: sampling and nonsampling. Sampling errors occur because observations are made only on a sample, not on the entire population. Since the crude oil surveys are based on a census of the population, these surveys contain no sampling error.

Nonsampling errors can be attributed to many sources: (1) inability to obtain complete information from all respondents in the survey (i.e., nonresponse), (2) response errors, (3) definitional difficulties, (4) differences in the interpretation of questions, (5) mistakes in recording or coding the data obtained, and (6) other errors of collection, response, coverage, and estimation for missing data.

Although no direct measurement of the biases due to nonsampling errors can be obtained, precautionary steps were taken in all phases of the frame development and data collection, processing, and tabulation processes, in an effort to minimize their influence. In addition, the close cooperative consultation between EIA and the survey respondents and data users results in a more accurate information gathering and reporting process.

#### Imputation

Since the response rates for the crude oil survey are virtually 100%, there are no imputation procedures in the PMM data for nonresponse to these surveys. Imputation is performed, however, on EIA-182 volume data used in estimating crude oil production published in the *Petroleum Supply Monthly* (PSM). Since production estimates for the PSM are required on an expedited schedule, some responses are imputed for the PSM. However, all responses are received prior to the publication of the PMM, thus no imputation is required for the price data published in the PMM. See Note 4 in the Explanatory Notes in the PSM for additional information on the use of EIA-182 data in estimating domestic crude oil production.

#### **Revision error**

The values shown for Domestic First Purchase Prices and the Refiner Acquisition Cost (RAC) prices for the current month and the Average Landed Costs for the most recent two months are preliminary. These numbers are revised in the month after the preliminary month(s) based on data received late or revisions to previously submitted data. For example, the February RAC data are preliminary and the January RAC data may have been revised due to receipt of late or revised data.

The data can be revised again and are final upon publication in the June issue of the *Petroleum Marketing Monthly* (PMM). In the above example, the difference between the February preliminary RAC data and when it is made final in the June PMM is the revision error. The amount of the revision error for some selected crude oil data series is shown in Tables EN6 through EN8.

# **ATTACHMENT LS-28**

	Midwest (PADD 2) Field Production of Crude Oil (Thousand	Annual Average Gulf Coast (PADD 3) Field Production of Crude Oil
Date	Barrels per Day)	(Barrels per Day)
Jan-2010	570	
Feb-2010	627	
Mar-2010	648	
Apr-2010	661	
May-2010	662	
Jun-2010	699	
Jul-2010	702	
Aug-2010	703	
Sep-2010	727	
Oct-2010	720	
Nov-2010	746	
Dec-2010	746	
Jan-2011	725	
Feb-2011	701	
Mar-2011	773	
Apr-2011	751	
May-2011	766	
Jun-2011	798	
Jul-2011	831	
Aug-2011	850	
Sep-2011	854	
Oct-2011	886	
Nov-2011	902	
Dec-2011	962	
Jan-2012	974	
Feb-2012	1011	
Mar-2012	978	
Apr-2012	1005	
May-2012	1071	
Jun-2012	1135	
Jul-2012	1155	
Aug-2012	1221	
Sep-2012	1189	
Oct-2012	1245	
Nov-2012	1209	
Dec-2012	1258	1,121
Jan-2013	1267	
Feb-2013	1261	
Mar-2013	1326	
Apr-2013	1370	
May-2013	1351	
Jun-2013	1378	
Jul-2013	1390	
Aug-2013	1499	
Sep-2013	1469	

Oct-2013	1518	
Nov-2013	1534	
Dec-2013	1512	1,406
Jan-2014	1524	
Feb-2014	1526	
Mar-2014	1570	
Apr-2014	1684	
May-2014	1653	
Jun-2014	1714	
Jul-2014	1771	
Aug-2014	1768	
Sep-2014	1867	
Oct-2014	1901	
Nov-2014	1906	
Dec-2014	1899	1,732
Jan-2015	1900	
Feb-2015	1892	
Mar-2015	1919	
Apr-2015	1895	
May-2015	1913	
Jun-2015	1913	
Jul-2015	1893	
Aug-2015	1868	
Sep-2015	1834	
Oct-2015	1848	
Nov-2015	1825	
Dec-2015	1808	1,876
Jan-2016	1769	
Feb-2016	1798	
Mar-2016	1791	
Apr-2016	1694	
May-2016	1697	
Jun-2016	1679	
Jul-2016	1662	
Aug-2016	1614	
Sep-2016	1583	
Oct-2016	1657	
Nov-2016	1640	
Dec-2016	1548	1,678
Jan-2017	1568	
Feb-2017	1641	



			Annual Average
	Gulf Coast (PADD 3)	Gulf Coast (PADD	Gulf Coast (PADD
	Field Production of	3) Field Production	3) Field Production
	Crude Oil (Thousand	of Crude Oil	of Crude Oil
Date	Barrels per Day)	(Barrels per Day)	(Barrels per Dav)
Jan-2010	3197	3 197 000	(
Feb-2010	3292	3 292 000	
Mar-2010	3202	3 202 000	
Apr-2010	3075	3 075 000	
May-2010	3145	3 145 000	
lun-2010	31/1	3 1/1 000	
Jul-2010	3052	3 052 000	
Δυα-2010	3180	3 189 000	
Son 2010	2047	3,103,000	
Oct 2010	3247	3,247,000	
Nov 2010	3200	3,203,000	
Nov-2010	3204	3,204,000	
Dec-2010	3243	3,245,000	
Jan-2011	3320	3,320,000	
Feb-2011	3090	3,090,000	
Mar-2011	3210	3,210,000	
Apr-2011	3178	3,178,000	
May-2011	3249	3,249,000	
Jun-2011	3207	3,207,000	
Jui-2011	3133	3,133,000	
Aug-2011	3252	3,252,000	
Sep-2011	3115	3,115,000	
Oct-2011	3387	3,387,000	
Nov-2011	3451	3,451,000	
Dec-2011	3456	3,456,000	
Jan-2012	3544	3,544,000	
Feb-2012	3609	3,609,000	
Mar-2012	3692	3,692,000	
Apr-2012	3656	3,656,000	
May-2012	3633	3,633,000	
Jun-2012	3587	3,587,000	
Jul-2012	3786	3,786,000	
Aug-2012	3666	3,666,000	
Sep-2012	3784	3,784,000	
Oct-2012	4037	4,037,000	
Nov-2012	4148	4,148,000	
Dec-2012	4169	4,169,000	3,775,917
Jan-2013	4161	4,161,000	
Feb-2013	4214	4,214,000	
Mar-2013	4198	4,198,000	
Apr-2013	4341	4,341,000	
May-2013	4281	4,281,000	
Jun-2013	4244	4,244,000	
Jul-2013	4409	4,409,000	
Aug-2013	4398	4,398,000	
Sep-2013	4586	4,586,000	

Oct-2013	4458	4,458,000	
Nov-2013	4580	4,580,000	
Dec-2013	4666	4,666,000	4,378,000
Jan-2014	4742	4,742,000	
Feb-2014	4849	4,849,000	
Mar-2014	4910	4,910,000	
Apr-2014	5106	5,106,000	
May-2014	5122	5,122,000	
Jun-2014	5194	5,194,000	
Jul-2014	5287	5,287,000	
Aug-2014	5349	5,349,000	
Sep-2014	5332	5,332,000	
Oct-2014	5440	5,440,000	
Nov-2014	5496	5,496,000	
Dec-2014	5671	5,671,000	5,208,167
Jan-2015	5545	5,545,000	
Feb-2015	5687	5,687,000	
Mar-2015	5690	5,690,000	
Apr-2015	5774	5,774,000	
May-2015	5644	5,644,000	
Jun-2015	5569	5,569,000	
Jul-2015	5698	5,698,000	
Aug-2015	5730	5,730,000	
Sep-2015	5768	5,768,000	
Oct-2015	5661	5,661,000	
Nov-2015	5616	5,616,000	
Dec-2015	5575	5,575,000	5,663,083
Jan-2016	5610	5,610,000	
Feb-2016	5559	5,559,000	
Mar-2016	5599	5,599,000	
Apr-2016	5507	5,507,000	
May-2016	5447	5,447,000	
Jun-2016	5364	5,364,000	
Jul-2016	5358	5,358,000	
Aug-2016	5456	5,456,000	
Sep-2016	5309	5,309,000	
Oct-2016	5417	5,417,000	
Nov-2016	5506	5,506,000	
Dec-2016	5538	5,538,000	5,472,500
Jan-2017	5589	5,589,000	
Feb-2017	5711	5,711,000	

Difference 2016-2012

1,696,583



## Back to Contents Data 1: Crude Oil Production

Sourcekey MCRFPUS2

	U.S. Field Production of Crude Oil	ı	
	(Thousand Barrels		
Date	per Day)	Average	
Jan-2010	539	0	
Feb-2010	554	5	
Mar-2010	5502	2	
Apr-2010	538	1	
May-2010	538	3	
Jun-2010	537	7	
Jul-2010	529	7	
Aug-2010	543	9	
Sep-2010	560	8	
Oct-2010	561	9	
Nov-2010	556	6	
Dec-2010	5599	9	5,475.9
Jan-2011	5488	8	
Feb-2011	5393	3	
Mar-2011	560	5	
Apr-2011	554	8	
May-2011	560	9	
Jun-2011	557	5	
Jul-2011	542	7	
Aug-2011	564	1	
Sep-2011	556	9	
Oct-2011	586	2	
Nov-2011	597	5	
Dec-2011	603	7	5,644.1
Jan-2012	614	4	,
Feb-2012	624	C	
Mar-2012	625	3	
Apr-2012	624	6	
May-2012	6304	4	
Jun-2012	626	5	
Jul-2012	642	C	
Aug-2012	6363	3	
Sep-2012	655	6	
Oct-2012	693	6	
Nov-2012	7024	4	
Dec-2012	707	9	6,485.8
Jan-2013	707	C	
Feb-2013	712	8	
Mar-2013	719	7	
Apr-2013	737	3	
May-2013	729	9	
Jun-2013	7264	4	
Jul-2013	746	7	
Aug-2013	752	1	
Sep-2013	774	5	
Oct-2013	771	C	
Nov-2013	788	5	
Dec-2013	792	3	7,466.0
Jan-2014	803	3	

Feb-2014	8127	
Mar-2014	8262	
Apr-2014	8605	
May-2014	8604	
Jun-2014	8718	
Jul-2014	8815	
Aug-2014	8876	
Sep-2014	9047	
Oct-2014	9233	
Nov-2014	9307	
Dec-2014	9496	8,760.3
Jan-2015	9379	
Feb-2015	9517	
Mar-2015	9566	
Apr-2015	9627	
May-2015	9472	
Jun-2015	9320	
Jul-2015	9418	
Aug-2015	9384	
Sep-2015	9423	
Oct-2015	9358	
Nov-2015	9304	
Dec-2015	9225	9,416.1
Jan-2016	9194	
Feb-2016	9147	
Mar-2016	9174	
Apr-2016	8947	
May-2016	8882	
Jun-2016	8711	
Jul-2016	8691	
Aug-2016	8759	
Sep-2016	8567	
Oct-2016	8785	
Nov-2016	8863	
Dec-2016	8780	8,875.0
Jan-2017	8838	
Feb-2017	9031	

2,389.17

477.83



# **ATTACHMENT LS-29**



Home / Energy / Oil Prices

# There Is No Such Thing As Peak Oil Demand

By <u>Dwayne Purvis</u> - Mar 28, 2017, 4:00 PM CDT



Notwithstanding that oil demand has increased for over 150 years, it will eventually stop increasing. If oil demand were to reach an actual peak, then the top might be easier to predict. As it stands, the forecast models of demand are likely predicting peak demand far later than it will be.

The so-called balance of supply and demand has always been a moving target, a race to the top in which the two run neck and neck. Imbalances result from out-of-step growth rates and not from movements away from a stationary balance. Perversely, imbalances breed further imbalances as the supply and demand components are provoked in opposite directions but with different timing, magnitudes and inertias. Without sufficient damping, the market has often overcompensated. Of course, there are also exogenous events like political turmoil, policy shifts, technological innovations and demographic changes which can unexpectedly and significantly alter not just the immediate balance but fundamentally shift the way supply and demand curves respond to price movements. The trends are plagued by inherent and irreducible irregularities.

Such a structural change has recently occurred. High prices persisted long enough for the industry in the U.S. to build a larger fleet of modern rigs and to learn how effectively to hydraulically fracture shale wells. It also persisted long enough for new efficiencies to incubate towards maturity, and the Paris accords promised to further reduce carbon emissions through policy changes. By the time that Saudi Arabia finally <u>acted to protect</u> not only its place among suppliers but also, and more importantly, the role of oil in the world economy. The backbone of shale supply in the U.S. was strong, and the seeds of lesser use were established. After these fundamental shifts, the rest of the world realized what Saudi Oil Minister Al-Naimi argued long ago and what Shell Oil has more recently asserted, namely that peak demand will occur long before peak supply.

## **Related: Dakota Access Pipeline Loaded And Ready For Business**

To understand the trajectory of demand growth, we turn to econometric models like those published by the EIA and IEA. The central problem with long term supply and demand models is that they require assumptions about the many and interrelated responses to today's prices. Though modeled responses may be tuned with low precision to relatively recent events and new realities, the actual response curves are poorly constrained and continue to evolve, in some cases at an accelerating pace. As the aphorism goes, all models are wrong, but some are useful. The EIA, IEA and other public econometric models call for global oil demand to continue growing through 2040, and the EIA even calls for renewed growth in the U.S. and OECD demand. The forecasts of growth in global demand rely upon increased use by developing countries, most importantly China and India. On the other hand, the United States has already seen demand decline for about 13 years. In fact it was the second to last of the world's seven major developed countries to enter demand decline, and the entire OECD group of countries has, as a whole, seen shrinking demand since 2007. EIA data shows that 35 countries in all have already reached and descended from maximum oil demand. The experience of projected versus actual peak oil demand in the U.S. and OECD countries provides an empirical test and thus context to evaluate the current forecasts of growth and delayed maximum.

The following chart compares actual oil demand in the U.S. to several relevant demand forecasts of the EIA, all data coming from the EIA itself. U.S. demand reached a plateau for four years ending in 2007. Before, during, and even after the actual maximum demand, the models predicted decades of growth.



# (Click to enlarge)

The next chart shows the same kind of comparison for the IEA's models of OECD oil demand. Actual demand gently achieved its maximum in 2005. Even the alternative policy (lower demand) case in 2006 failed to capture the impending decline, but the reference cases adapted to the reality of declining demand much more quickly than did the EIA. Still the IEA over predicted the actual demand. Though not shown in charts, the EIA's model of OECD demand growth and the IEA's model of U.S. demand growth follow the same patterns. In short, these deeply technical and widely used referenced models missed badly the pivot point, the watershed of the object of analysis. For truly exculpatory reasons, the second and third order dynamics of reality were not captured by the models.



(Click to enlarge)

## **Related: Oil Companies Bet Big On This Mature Oil Play**

Rather than the theoretical calculation by such models, empirical observation of history is likely more informative when it comes to anticipating the timing of maximum demand. The graph below normalizes annual oil demand from the G7 countries with the U.S. shown in black, each normalized to its own year and volume of maximum demand. The scales show a 15 year window around the maximum annual consumption, and the pattern of the G7 is repeated in the OECD total and in most all of the 28 other countries.



(Click to enlarge)

The same data viewed on the scale of generations may resemble an alpine peak, but from the experience of living through it, demand does not peak. It sputters, surges and stalls as it rolls over from a slow incline into a slow decline. It is less a peak and more a crest of demand.

Sequential global demand forecasts over the last decade have projected slower growth, mostly now forecast at less than 1 percent, and sensitivity cases now allow for the possibility of substantial demand decline by 2040. Unfortunately, experience demonstrates that the crest will likely occur unexpectedly and sooner than predicted. And then our industry enters a whole new world as the moving balance of supply and demand turns into a race to the bottom.

By Dwayne Purvis for Oilprice.com

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The author of this report may be dead-on right about oil consumption regarding OECD countries, but the far bigger issue is the developing countries, especially India and China, where 2 billion people are moving quickly towards the modernized world. That population is nearly 10 times larger than the U. S. Do we expect electric vehicles to outpace demand for gas driven vehicles in those parts of the world more rapidly than the 1% decline in demand for the OECD countries? I know where I would place that bet!



@brett inghambeing an indian i will tell you wats happening in india-

-13 % of total crude oil is used in agriculture mainly for water pumpsets and tractors. of 10 million diesel pupmsets already 1 lak pumpsets r converted to solar pumpsets, its happening so fastly trust me in next 5-10 years no one will use diesel pump sets. My bet is 3-4% crude oil demand will be off in next 3-5 years.

- 25% of total crude oil is used in public transport vehicles like buses and heavy trucks. Govt is planning to convert 1.5 lak diesel buses into electric buses in next 3-5 years and its already started pilot projects. For heavy trucks and lorries, govt is planning for a electric highway from Delhi-Mumbai but this is still in thought process . my bet is 3-4% crude oil demand will off

-35% of crude oil is used in mainly 2 wheeler and 4 wheeler vehicles, i still didnt see any major impact on this sector except private taxi services like ola and uber and popular Autos convert from electric from diesel (reason is economics and more profits). but god.. indians are buying 2.5 million diesel/petrol cars so this will increase the oil demand to 2-3 % of oil every year

Reminaing 27% for other industrial purposes, only this sector will increase the crude oil demand to 1-2% every year.

My assessment is in next 3-5 years the crude demand will fall to 2% then what it is today. And top of that India planning to develop oil fields and i guess india will be importing 3% less oil from outside world



The price of oil based fuels will have to go up quite a bit to make battery powered transport cheaper than oil based fuels.

And people have to be rich enough to purchase expensive battery powered cars.

The developing world contains billions of people who would just LOVE their own car or truck. As they get richer, many will try to buy one. That will increase the demand for gasoline and diesel.

Jet travel will continue to increase, as the poor countries gradually get richer. Cruise ships are increasing. They consume vast quantities of oil. Oil is used for thousands of plastics and for paving roads. The chemical industry uses some oil and a lot of natural gas. Should reusable rockets prove

feasible in lowering the cost of space access a lot, rockets could consume a lot of kerosene. Some will be fueled by methane from natural gas, but many might burn kerosene in the first stage, due to its high energy content. It won't take thousands of rockets to consume a lot of kerosene, since getting to orbit requires a lot of energy.

I would be shocked if the global demand for oil peaks within the next 30 years, unless some new source of cheaper energy, like possibly nuclear fusion, is invented. Worrying about having too much oil is like worrying about having too much gold. Maybe that is one reason why they call it, 'black gold'.



# Josh Gregner on March 29 2017 said:

The key difference between today and the past decades is, that we have alternatives to oil now. They may not have arrived in every single country just yet, and they may take a year or two to unfold but I think it is clear that the move off oil and coal is inevitable.

The old way of thinking is: "rich countries can invest in energy saving, as they can afford modern ICE vehicles and other power saving measures - developing countries need to increase oil and coal consumption first, then they can start to spend money on saving energy and CO2".

I think this way of thinking is outdated. I had a Danish Minister for Energy and Environment complain to us that developing countries are in a great position as they don't need to keep their coal power plants alive to pacify angry voters. He was jealous of developing countries being able to invest in wind / solar without inner-political backlash.

So today, smart countries invest in solar and wind from the getgo. And that's what we are seeing all over the world.

The impact this will have on oil will depend on the speed of adoption of renewable energy alternatives. But outside the transport sector (where I'm not yet fully convinced), I don't really see any real and meaningful growth for coal, oil or natural gas demand in developing countries, either.

# John Smith on March 29 2017 said:

Peak supply and peak demand will occur at exactly the same time. Supply = Demand, always, regulated by price.



The revolution in energy consumption will be likened to that of communication. Developing countries skipped investing into landline phones and invested in mobile phones from the start when the technology was developed. The solar and wind is getting cheaper and investing in carbon energy might

be skipped. The other point which is often omitted is that people like to live in non polluted areas, so high carbon emission might be banned anyway.

**ATTACHMENT LS-30** 

# Move Over Tesla, Europe's Building Its Own Battery Gigafactories

by Anna Hirtenstein May 22, 2017, 12:00 AM EDT From

- Global battery capacity set to double by 2021 and slash costs
- Daimler joins Tesla in investing in battery factory capacity

Battery-making gigafactories are about to arrive in Europe, challenging a lead Tesla Inc. <a href="https://www.bloomberg.com/quote/TSLA:US">https://www.bloomberg.com/quote/TSLA:US</a> is building at a plant in Nevada and opening the way for a quicker shift toward green power for both cars and utilities.

German Chancellor Angela Merkel on Monday is scheduled to break ground at a 500 million-euro (\$543 million) plant to assemble lithium-ion energy-storage units for Daimler AG <a href="https://www.bloomberg.com/quote/DAI:GY">https://www.bloomberg.com/quote/DAI:GY</a> , which produces Mercedes-Benz and Maybach luxury cars.

The facility 130 kilometers (81 miles) south of Berlin highlights a push by both major automakers and power companies into energy storage. The technology is crucial to drive the next generation of green vehicles and to hold electricity from wind and solar farms for when it's needed most. With two dominant industries moving in the same direction, the cost of batteries is likely to plunge quickly, according to Bloomberg New Energy Finance.

"As battery costs fall and their energy density increases, we could see cheaper battery-electric cars than their fuel-burning equivalents by 2030," said Nikolas Soulopoulos, an analyst with the London-based research arm of Bloomberg LP.



**Battery Boom** 

Global battery manufacturing capacity is set to more than double by 2021

Global battery-making capacity is set to more than double by 2021, reaching 278 gigawatt-hours, up from about 103 gigawatt-hours now, according to BNEF. Europe's market share is expected to almost double over that time from 2.5 percent.
Large-scale factories planned in Sweden, Hungary and Poland, as well as Daimler's battery assembly plant in Germany, are expected to feed demand from automakers such as <u>Volkswagen AG <https://www.bloomberg.com/quote/VOW3:GY></u> and <u>Renault SA</u> <<u>https://www.bloomberg.com/quote/RNO:FP></u>. That will cut the cost of lithium-ion packs by 43 percent and make electric cars a mainstream reality, the researcher estimates.

For a note from BNEF on when electric cars will rival regular ones on price, click here.

For the utilities, cheaper batteries reduce the cost of storage units that smooth the variable flows of electric power to the grid from renewables. At <u>Enel SpA <https://www.bloomberg.com/quote/ENEL:IM></u>, the biggest distributor in Italy, pairing a battery with a wind farm helped grid managers improve forecasts for electricity output from the plant by as much as 30 percent.

"Batteries are clearly a key enabler for renewables penetration," said Riccardo Amoroso, the head of innovation at Enel. "We have seen impressive results in our pilot industrial scale projects, especially in terms of increased programming and reduced intermittency."

### **Greener Power**

Finland's Fortum Oyj <a href="https://www.bloomberg.com/quote/FORTUM:FH>">https://www.bloomberg.com/quote/FORTUM:FH>">https://www.bloomberg.com/quote/FORTUM:FH></a> is similarly testing batteries for its gigawatt-sized \_\_\_\_\_ plan for solar and wind projects, according to Chief Financial Officer Markus Rauramo.

Used since the early 1990s <https://www.bloomberg.com/news/articles/2017-03-14/google-ceo-schmidt-flags-promise-of-new-goodenoughbattery> in consumer electronics such as computers and phones, lithium-ion batteries have made a leap into the transport and power industries. But because of their cost, their application on the grid and in cars is only now starting to spread. The battery boom will be most evident to consumers in electric vehicles, with most major automakers planning plug-in models by the middle of the next decade.

# Electric-Car Boom Models by style and range available through 2020





Source: Bloomberg New Energy Finance

Currently, electronics makers in Asia control the battery business. South Korea's LG Ltd. and <u>Samsung SDI Co.</u> <<u>https://www.bloomberg.com/quote/006400:KS></u> are among the top vendors, according to BNEF. Asia is expected to maintain its lead with an additional eight factories being constructed in China alone.

Automakers are moving quickly to secure battery capacity. Daimler's factory would be the biggest yet in Europe, responding to Tesla's \$5 billion Gigafactory venture with Panasonic Corp. At Daimler, batteries will feed both its cars and a venture Mercedes-Benz entered with rooftop-solar installer Vivint Solar Inc. <a href="https://www.bloomberg.com/quote/VSLR:US">https://www.bloomberg.com/quote/VSLR:US</a> to produce home energy storage systems.

"Looking a few years out, as we have a stronger penetration of EVs in the market, you'll have more demand on the grid, which may need to be supported by storage," said Boris von Bormann, chief executive officer of Mercedes-Benz Energy Americas.

Tesla's plant was about a third complete in January and will give it access to 35 gigawatts a year of capacity when finished, enough for its planned production rate of 500,000 cars a year. This would place the carmaker based in Palo Alto, California, as the No. 2 supplier behind <u>LG</u> Chem Ltd. <a href="https://www.bloomberg.com/quote/051910:KS">https://www.bloomberg.com/quote/051910:KS</a> Tesla is also planning to build additional gigafactories.

"Later this year, we expect to finalize locations for Gigafactories 3, 4 and possibly 5 (Gigafactory 2 is the Tesla solar plant in New York)," the company wrote in its fourth quarter letter to shareholders.

The scale of Daimler's investment is smaller, and the company hasn't disclosed its capacity goal. Volkswagen is in talks with battery makers over possible ventures and plans a prototype assembly plant in Germany to develop its own expertise. A Stockholm-based startup run by a former Tesla executive, NorthVolt AB, has also announced plans for a <u>4 billion-euro <https://www.bloomberg.com/news/articles/2017-03-13/to-</u>take-on-tesla-sweden-s-northvolt-seeks-1-billion-next-year> battery factory in Sweden by 2023.

Higher production of lithium-ion units for cars will help slash costs of batteries for all applications, making storage more affordable in homes and on the grid.





The result may make electric cars competitive with ones fueled by gasoline or diesel sometime in the next decade. The battery pack is the most expensive part of a plug-in, making up about a third of the total cost. Lithium-ion packs are projected to be 43 percent cheaper by 2021, dropping to \$156 a kilowatt-hour from \$273 today.



To be sure, the wider use of lithium-ion batteries is still in its early days and there are potentially <u>competing technologies</u> <<u>https://www.bloomberg.com/news/articles/2017-03-14/google-ceo-schmidt-flags-promise-of-new-goodenough-battery></u>. It remains an open question whether storage can ever be profitable for consumers or utilities at a big scale.

"You still need a crystal ball to operate a system on batteries," said Bridgit Hartland-Johnson, head of energy storage at <u>Siemens Energy</u> <u>Management <https://www.bloomberg.com/quote/0329242D:SP></u>U.K., a maker of wind turbines and power systems. "There are still some unanswered questions."

Even so, the battery factories are being built by automakers looking toward an electric future. Plug-ins could make up a fifth of new auto sales, or 21 million units, by 2030, according to BNEF. Merkel's visit to the Daimler plant underscores her government's target <a href="http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf>">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf">http://nationale-plattform-elektromobilitaet.de/fileadmin/user\_upload/Redaktion/NPE\_AG2\_Roadmap\_Zellfertigung\_final\_bf.pdf">http://nationale-plattf

# **Electric Cruising**

Plug-in vehicles are projected to make up a fifth of new car sales by 2030

35%	
30	
25	
0u	



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# **Tesla's Battery Revolution Just Reached Critical Mass**

### Three new plants in California show how lithium-ion storage is ready to power the grid.

by **Tom Randall** January 30, 2017, 6:45 AM EST

Tesla Motors Inc. is making a huge bet that millions of small batteries can be strung together to help kick fossil fuels off the grid. The idea is a powerful one—one that's been used to help justify the company's <u>\$5 billion factory <https://www.bloomberg.com/news/articles/2017-01-04/tesla-flips-the-switch-on-the-gigafactory></u> near Reno, Nev.—but batteries have so far only appeared in a handful of true, grid-scale pilot projects.

That changes this week.

Three massive battery storage plants—built by <u>Tesla <https://www.bloomberg.com/news/articles/2016-09-15/tesla-wins-utility-contract-to-supply-grid-scale-battery-storage-after-porter-ranch-gas-leak></u>, <u>AES Corp. <http://aesenergystorage.com/2016/08/18/aes-to-deploy-37-5-mw-of-advancion-energy-storage-arrays-for-sdge/></u>, and <u>Altagas Ltd. <http://altagas.mwnewsroom.com/press-releases/altagas-celebrates-opening-of-north-america-s-largest-battery-storage-facility-tsx-ala-201701271084127001></u>—are all officially going live in southern California at about the same time. Any one of these projects would have been the largest battery storage facility ever built. Combined, they amount to 15 percent of the battery storage installed planet-wide last year.

Ribbons will be cut and executives will take their bows. But this is a revolution that's just getting started, Tesla Chief Technology Officer J.B. Straubel said in an interview on Friday. "It's sort of hard to comprehend sometimes the speed all this is going at," he said. "Our storage is growing as fast as we can humanly scale it."





Tesla built the world's biggest battery power plant in just three months. Source: Tesla

## **A Fossil-Fuel Disaster**

The new battery projects were commissioned in response to a fossil-fuel disaster—the natural gas leak at Aliso Canyon, near the Los Angeles neighborhood of Porter Ranch. It released thousands of tons of methane into the air before it was sealed last February.

In its wake, Southern California Edison (SCE) rushed to deploy energy storage deals to alleviate the risk of winter blackouts. There wasn't any time to waste: All of the projects rolling out this week were completed within 6 months, an unprecedented feat. Tesla moved particularly nimbly, completing in just three months a project that in the past would have taken years.





During construction Tesla's Powerpack 2 modules were lowered into place. Southern California Edison and Tesla grid storage project

"There were teams working out there 24 hours a day, living in construction trailers and doing the commissioning work at two in the morning," Straubel said. "It feels like the kind of pace that we need to change the world."

## **A Question of Price**

The battery storage industry—a key part of the plan if wind and solar power are to ever dominate the grid—is less than a decade old and still relatively small. Until recently, batteries were many times more expensive than natural gas "peaker" plants that fire up to meet surging demand in the evening and morning hours.

But prices for lithium-ion batteries have fallen fast—by almost half just since 2014. Electric cars are largely responsible, increasing demand and requiring a new scale of manufacturing for the same battery cells used in grid storage. California is mandating that its utilities begin testing batteries by adding more than 1.32 gigawatts <a href="http://www.nrel.gov/docs/fy16osti/65061.pdf">http://www.nrel.gov/docs/fy16osti/65061.pdf</a>> by 2020. For context, consider this: In 2016, the global market for storage was less than a gigawatt.

California's goal is considerable, but it's dwarfed by Tesla's ambition to single-handedly deliver 15 gigawatt hours 1 of battery storage a year by the 2020s—enough to provide several nuclear power plants–worth of electricity to the grid during peak hours of demand. Not everyone, however, is that optimistic.

"I'm not convinced," said Yayoi Sekine, a Bloomberg New Energy Finance analyst who covers battery technology. The market is "moving faster than ever, but it's not on the gigawatt scale yet."



# Battery Prices Are Falling Fast



Battery surveys include electric vehicles. Source: Bloomberg New Energy Finance

Battery costs and profitability for utilities are difficult to evaluate. Companies are reluctant to give up their pricing data, and the expense is highly variable. Nevertheless, battery plants take up a much smaller footprint than gas-powered plants, they don't pollute, and their instant response can provide valuable services better than any other technology. In a small but increasing number of scenarios, batteries are already the most economical option.

But for the most part, according to a BNEF analysis, the costs of new projects would need to drop by half in order to be profitable on a wider scale in California, and that's not likely to happen for another decade. The total installed cost of a battery plant would need to fall to about \$275 per kilowatt hour. While Tesla declined to provide its pricing data, the similarly sized Altagas project was expected to cost at least <u>\$40 million</u> <<u>http://www.marketwired.com/press-release/altagas-awarded-10-year-contract-to-provide-battery-storage-at-pomona-tsx-ala-2151054.htm></u>, or \$500 per kilowatt hour. It's possible that with the remarkable scope of Tesla's Reno operations, the company will be able to establish new floors for pricing, forcing the industry to follow, BNEF's Sekine said.





Telsa and Southern California Edison Powerpack 2 power battery storage plant. Photographer: Dana Hull

It's still early days, even with this week's announcements. It will probably be a few years before Tesla's battery-storage sales are material enough to break out separately from automotive sales on quarterly filings, Straubel said.

## The End of the Gas Peaker

But the battery's day is coming, while those of natural gas peaker plants are numbered. That's the prediction of John Zahurancik, AES's president of battery storage. Zahurancik is one of the pioneers of energy storage, having cobbled together profitable edge-case storage projects since 2008, when battery prices were 10 times higher than they are today.

AES has completed installation and is doing final testing of a 30 megawatt/120 megawatt hour plant that's even bigger than Tesla's 20 MW/80 MWh. AES is also working on a longer-term project that will be five times the size of Tesla's project when complete by 2021. That's a scale that would have been unimaginable a decade ago.

"This is my fifth time doing the largest project in the world for energy storage, and each time people tell me, 'well this is the test, this is really the test'" Zahurancik said in an interview Friday. "The next big test is how do we scale this up broadly."

The biggest thing that sets Tesla and AES apart is that Tesla is building the components of its storage units itself at the company's <u>Gigafactory</u> in Reno <<u>https://www.bloomberg.com/news/articles/2017-01-04/tesla-flips-the-switch-on-the-gigafactory</u>, including battery cells with partner Panasonic, modules, and inverters. Tesla says this vertical integration will help reduce costs and make a seamless system. AES says that dealing with a diverse supply chain allows it to seek the cheapest price and the best technology on the market. It's the same debate going on in the electric-car business, where Tesla is manufacturing an unprecedented percentage of its own parts in-house.

For now, gas peaker plants still win out on price for projects that aren't constrained by space, emissions, or urgency, said Ron Nichols, President of SCE, the California utility responsible for most of the biggest battery storage contracts. But that may change in the next five years, he said.

"Long term, will large amounts of batteries be able to take over?" Nichols asked. "We'll need to get some hours under our belts to know for sure."

-With assistance from Dana Hull.

### Watch Next: Tesla's Grand Unification

# **ATTACHMENT LS-31**

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# ♠ > Business Electric vehicles to cost the same as conventional cars by 2018



The cost of owning an electric car will fall to the same level as petrol-powered vehicles next year, according to bold new analysis from UBS which will send shockwaves through the automobile industry.

Experts from the investment bank's "evidence lab" made the prediction after tearing apart one of the current generation of electric cars to examine the economics of electric vehicles (EVs).

They found that costs of producing EVs were far lower than previously thought but there is still great potential to make further savings, driving down the price of electric cars.

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Electric cars are currently more expensive to own than conventionally-fuelled vehicles CREDIT: KAI-UWE KNOTH

As a result, UBS forecasts that the "total cost of consumer ownership can reach parity with combustion engines from 2018", with this likely to happen in Europe first.

"This will create an inflexion point for demand," the analysts said. "We raise our 2025 forecast for EV sales by ~50pc to 14.2m - 14pc of global car sales."

First affordable electric car from Tesla unveiled



If the prediction comes to pass, traditional car industry giants could face ruin. Germany's Volkswagen Group - the world's biggest car company - is racing to catch up with rivals' investment levels in electric drivetrains, the components which deliver the power into the wheels, having largely ignored the technology in the past.

UBS's research was to help understand what it called the "most disruptive car category since the Model T Ford". The findings are based on its deconstruction of a Chevy Bolt, which it considered to be "the world's first mass-market EV, with a range of more than 200 miles".



UBS's analysts deconstructed the Chevy Bolt CREDIT: UBS

The 2017 car - which cost \$37,000 - was taken apart piece by piece and the parts analysed. UBS said that the Bolt's electric drive was \$4,600 cheaper to produce than thought, "with much cost reduction potential left".

"We estimate that GM (which produces the Bolt) loses \$7,400 in earnings before interest, and tax on every Bolt sold today, mainly due to a lack of scale."

Tesla's highly anticipated Model 3 - another small electric vehicle - is expected to lose billionaire Elon Musk's company \$2,800 per car for the base version, according to UBS, but Tesla will break even at an average selling price of \$41,000.

The bank predicts this will be achieved as customers opt for higher specification vehicles, making electric cars a viable business proposition, with upmarket EVs likely to be more profitable than mid-range versions.

"Once total cost of ownership parity is reached, mass-brand EVs should also turn profitable," UBS said.

Tesla's Model 3 is the company's first 'mass market' car

Although the costs of EVs and current cars will be the same for motorists by 2018, manufacturers will not reach parity until 2023, when they will make 5pc margins on EVs - about equal to the profit on current vehicles.

EVs matching the cost of conventionally fuelled cars sooner than expected will send a seismic shock throughout the sector, from manufacturers right down through their supply chains, with UBS warning "the 'time to get ready' and win in the space shrinks".

It also warns that the aftermarket for replacement parts could be radically disrupted because electric drivetrains suffer less wear than traditional engines.

"Our detailed analysis of moving and wearing parts has shown that the highly lucrative spare parts business should shrink by ~60pc in the end-game of a 100pc EV world, which is decades away," UBS said.

Electric cars are the most disruptive thing to happen to the industry since Henry Ford's Model T CREDIT: AFP

It also forecast tech companies grabbing a bigger slice of the industry, with the deconstruction of the Bolt revealing that its electronics content was \$4,000 higher than in an internal combustion engines, excluding the battery.

Professor David Bailey, car industry expert at Aston University, said: "If this really is the moment that the car industry reaches parity then the inflexion point is far earlier than anyone was expecting."

Ian Fletcher, principal automotive analyst at IHS Markit, added: "We are not going to see the death of diesel or petrol anytime soon but manufacturers are weighing up the investment cost of traditional engines against electric, as well as the levies they face over the emissions of their fleets."



# Today in Energy

### May 23, 2017

## Fuel economy improvements are projected to reduce future gasoline use



Anticipated changes in energy consumption by light-duty vehicles in the United States are based on two factors: the amount of travel and the fuel economy of the vehicles used. The Annual Energy Outlook 2017 (AEO2017) Reference case projects a decline in light-duty vehicle energy use between 2018 and 2040 as improvements in fuel economy more than offset increases in light-duty vehicle miles.

The number of vehicle-miles traveled in the United States by light-duty vehicles set a record at 2.84 trillion miles in 2016. As the number of miles driven per vehicle has remained relatively steady at about 12,000 miles per vehicle, the recent increase in vehicle-miles traveled is more attributable to an increase in the number of vehicles in use. Light-duty vehicle-miles traveled per year are expected to continue to increase, ultimately reaching 3.33 trillion miles traveled in 2040.

The fuel economy of the light-duty vehicle stock is also expected to increase because of market developments and increases in fuel economy standards for new vehicles. Although sales of new vehicles make up a relatively small portion of the total light-duty vehicle fleet in any year and existing vehicles can remain on the road for many years, fuel economy standards for new vehicles and the mix of vehicles purchased have long-term implications for fuel consumption.

Light-duty vehicles are generally divided into two categories: passenger cars and light trucks. Fuel economy and greenhouse gas (GHG) standards are set for the two categories by the National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA). The standards applied by NHTSA and EPA are more stringent for passenger cars than for light trucks, and they are determined based on the vehicle footprint, or the area of the rectangle defined by the points of contact between the four wheels and the ground.

For model year 2015, the required fuel economy standards averaged about 35 miles per gallon (mpg) for passenger cars and about 27 mpg for light trucks after taking into account the footprint mix of vehicles sold within each category. The standards for each category are currently required to increase over time so that the standards for model year 2025 vehicles are expected to reach about 53 mpg and 38 mpg, respectively.

Because compliance fuel economy is based on a specific test procedure that applies certain credits, compliance fuel economy generally exceeds on-road fuel economy. On-road fuel economy is more relevant for estimating and forecasting energy consumption because it

reflects how the vehicle is actually used. For model year 2015, new vehicle on-road fuel economies averaged about 31 mpg for passenger cars and about 21 mpg for light trucks.

EIA's AEO2017 projections reflect both the changes in the vehicle sales mix and the fuel economy standards that are applied separately to new passenger cars and light trucks. Despite an increasing share of vehicles classified as light trucks, the AEO2017 Reference case projects improved fuel economy of new light-duty vehicles and the in-use vehicle fleet through 2025 and beyond.

Based on the more stringent fuel economy standards covering model years through 2025 that have already been established, new onroad vehicle fuel economy for passenger cars is projected to increase 43% between 2015 and 2025, from 31 mpg in 2015 to 45 mpg. New on-road light truck fuel economy is projected to increase 46% over the same period, from 21 mpg to 31 mpg. Fuel economy of the overall vehicle stock rises more slowly, given the slower turnover of light-duty vehicles.

Because light trucks are projected to make up a growing share of the total light-duty vehicle fleet, the weighted-average fuel economy is expected to be closer to that of light trucks. In the AEO2017 Reference case, on-road fuel economy of new light-duty vehicles increases from about 25 mpg in 2015 to 36 mpg in 2025.



Source: U.S. Energy Information Administration, Annual Energy Outlook 2017

The net effect of these fuel economy trends is that light-duty vehicle energy consumption is projected to decrease 12%, from 16.1 quadrillion British thermal units (Btu) in 2017 to 14.2 quadrillion Btu in 2025 in the AEO2017 Reference case, despite projected growth in vehicle-miles traveled of 5% over the same period. Nearly all of this energy consumption is gasoline, with gasoline consumption by light-duty vehicles projected to fall from 8.7 million barrels per day in 2017 to 7.5 million barrels per day in 2025.

Principal contributors: David Stone, Mason Hamilton

EDITION: UNITED STATES

Peak gasoline demand looms with engine efficiency gains

### BUSINESS NEWS | Fri Mar 3, 2017 | 4:34am EST

# Peak gasoline demand looms with engine efficiency gains



A car is filled with gasoline at a gas station pump in Carlsbad, California August 4, 2015. REUTERS/Mike Blake

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### By Ron Bousso

(This story published on March 2 corrects paragraph 5 to show bpd, not tonnes)

By Ron Bousso

ADVERTISING



Demand for gasoline in the United States, which accounts for a tenth of global oil consumption, is expected to peak next year as engines become more efficient, WoodMackenzie analysts said.

Peak gasoline demand looms with engine efficiency gains venicle fleet, according to the Edinburgh-based consultancy.

A rise in the number of hybrid and electric cars such as the Nissan Leaf, Toyota Prius and Tesla as well as tighter fuel standards in Europe and the United States will contribute to a historic shift in consumption.

The United States saw spectacular growth in gasoline demand following the collapse in oil prices in 2014 and as its economy recovered from the 2008 financial crisis, reaching a record high of 9.326 million barrels per day (bpd) last year.

Gasoline demand is expected to grow to peak of around 9.45 million bpd in 2017 and remain largely unchanged in 2018 before slipping to 9.28 million bpd in the following year, according to WoodMac.

"We expect gasoline engine efficiency to continue to improve through better deployment of batteries in hybrid vehicles," WoodMac analyst Alan Gelder said.

An expected recovery in oil prices in coming years is also expected to curtail demand growth, he added.

At its peak, global gasoline demand is expected to reach 25.89 million barrels per day (bpd) in 2021, accounting for roughly a quarter of oil demand.

The decline in U.S. and European gasoline consumption will mask a steady expansion in demand in Asia, where most of the global increase in the vehicle fleet will take place.

While engine efficiencies increase, the global gasoline car fleet is expected to grow by more than 10 percent by 2025 to above 1 billion vehicles, according to WoodMac.

Vitol, the world's top oil trader, last month said it expected global demand for gasoline and diesel to peak in 2027-2028.

### NO PEAK

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Big oil, small U.S. towns see new reward in old production technique The question of when oil demand will reach its apex has been one of the most central and divisive for the industry, which faces the prospect of a world almost free of fossil fuels by the end of the century if a U.N.backed plan to stem global warming is enforced.

Some companies, including Royal Dutch Shell, the world's second-largest oil and gas company, say oil demand could peak in the 2030s. The International Energy Agency, the West's energy watchdog, expects oil consumption to grow in the foreseeable future,

albeit at much slower rates.

"We still see global oil demand growing but the role of transportation shrinks," Gelder said.

Growth will be driven by the petrochemical sector, which uses oil feedstocks to produce plastics, as well as demand for diesel and gasoil from the commercial transportation sector, particularly buses, ships and planes, he added.

The world's car fleet, including diesel cars and trucks, is set to grow by some 20 percent to 1.32 billion by 2025, according to WoodMac.

But the pace is expected to drop sharply compared to historic rates.

"Traditionally we had (annual) oil demand growth north of 1 million barrels per day. We are transitioning over the next decade to growth of around 500,000 bpd a year," Gelder

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TOKYO Apple Inc and Amazon.com Inc will join Foxconn's bid for Toshiba Corp's semiconductor business, the Nikkei business daily quoted Foxconn Chairman Terry Gou as saying on Monday.

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# **ATTACHMENT LS-32**

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Total Crude Oil + Products

Sourcekey MTTEXUS2 MCREXUS MNGEXUS2 MOLEXUS2 MTPEXUS2

	U.S. Exports			U.S. Exports of		
	of Crude Oil		U.S.	Natural Gas	U.S.	U.S. Exports
	and		Exports	Liquids and	Exports of	of Finished
	Petroleum		of Crude	Liquid Refinery	Other	Petroleum
	Products		Oil	Gases	Liquids	Products
	(Thousand		(Thousan	(Thousand	(Thousand	(Thousand
	Barrels per	Annual	d Barrels	Barrels per	Barrels	Barrels per
Date	Day)	Average	per Day)	Day)	per Day)	Day)
Jan-2000	1,006		176	103	34	693
Feb-2000	870		30	83	29	728
Mar-2000	1,159		144	116	45	855
Apr-2000	1,131		124	83	50	875
May-2000	856		34	45	59	717
Jun-2000	925		9	70	63	783
Jul-2000	900		15	63	60	762
Aug-2000	1,073		17	76	36	943
Sep-2000	1,059		23	63	44	929
Oct-2000	1,292		9	73	67	1,143
Nov-2000	1,108		2	73	49	984
Dec-2000	1,095	1,040	16	85	51	943
Jan-2001	954		18	77	37	823
Feb-2001	1,004		24	60	37	883
Mar-2001	938		37	34	36	831
Apr-2001	942		5	36	27	875
May-2001	1,069		64	31	53	920
Jun-2001	976		15	60	39	861
Jul-2001	879		11	53	49	765
Aug-2001	1,048		28	37	44	939
Sep-2001	825		8	36	28	753
Oct-2001	946		11	38	25	873
Nov-2001	960		9	37	40	874
Dec-2001	1,109	971	12	44	29	1,024
Jan-2002	861		11	52	42	755
Feb-2002	1,175		4	96	50	1,024
Mar-2002	853		8	64	42	739
Apr-2002	890		8	32	74	776
May-2002	910		7	68	66	769
Jun-2002	880		5	33	35	807
Jul-2002	839		33	33	57	/16
Aug-2002	1,138		9	46	70	1,013
Sep-2002	1,015		7	67	111	829
Oct-2002	962		4	85	81	792
Nov-2002	1,026	<b>2</b> 2-	10	98	97	821
Dec-2002	1,272	985	2	131	63	1,076
Jan-2003	1,212		10	116	57	1,028

Feb-2003	1,067		5	130	44	888
Mar-2003	1,051		10	51	55	936
Apr-2003	1,053		12	51	57	932
May-2003	1.097		15	71	60	952
Jun-2003	1.065		45	45	57	918
Jul-2003	976		7	47	52	870
Aug-2003	947		4	54	37	852
Sep-2003	960		3	29	75	851
Oct-2003	970		14	25	76	857
Nov-2003	933		21	20	56	824
Dec-2003	990	1 027	4	56	78	852
lan-2004	748	1,027	6	59	70 41	643
Feb-2004	1 046		8	58	58	922
Mar-2004	1 024		19	35	56	922 91 <i>4</i>
Apr-2004	1,024		55	40	56	004
Apr-2004 May 2004	1,155		26	49	50	994
lup 2004	1,052		20	55	68	924
Jul 2004	1,070		40	50	106	901
Jui-2004	1,060		10	50	106	907
Aug-2004	1,091		10	40	57	901
Sep-2004	901		30	40	40 50	032
Oct-2004	1,078		25	32	52	969
NOV-2004	992	1.0.10	42	33	62	855
Dec-2004	1,284	1,048	30	59	80	1,115
Jan-2005	917		40	35	61	780
Feb-2005	1,256		19	61	40	1,136
Mar-2005	1,308		36	56	81	1,135
Apr-2005	1,330		45	63	95	1,127
May-2005	1,380		55	66	/1	1,189
Jun-2005	1,477		21	63	75	1,318
Jul-2005	1,259		34	79	60	1,086
Aug-2005	1,295		17	80	73	1,125
Sep-2005	844		24	48	55	716
Oct-2005	854		17	56	47	734
Nov-2005	961		48	52	49	811
Dec-2005	1,106	1,166	24	55	57	970
Jan-2006	1,059		27	72	50	910
Feb-2006	1,276		15	121	42	1,098
Mar-2006	1,170		29	82	58	1,001
Apr-2006	1,398		26	89	116	1,166
May-2006	1,350		27	51	80	1,191
Jun-2006	1,334		33	63	104	1,134
Jul-2006	1,387		13	49	107	1,218
Aug-2006	1,255		15	55	121	1,064
Sep-2006	1,554		21	45	83	1,406
Oct-2006	1,506		37	62	72	1,335
Nov-2006	1,353		24	60	54	1,216
Dec-2006	1,164	1,317	27	69	68	1,001
Jan-2007	1,446		9	94	54	1,288
Feb-2007	1,350		25	76	84	1,164
Mar-2007	1,274		34	72	97	1,071
Apr-2007	1,360		19	50	69	1,221

May-2007	1,441		36	68	124	1,213
Jun-2007	1,331		52	69	69	1,141
Jul-2007	1,506		27	86	83	1,311
Aug-2007	1.483		42	50	111	1.279
Sep-2007	1,361		34	44	87	1,196
Oct-2007	1 325		11	36	94	1 184
Nov-2007	1 767		20	119	91	1,536
Dec-2007	1 542	1 432	20	77	89	1 356
Jan-2008	1,620	1,402	12	151	80	1,000
Eeb-2008	1,020		20	156	71	1,077
Mar-2008	1,040		20	146	72	1,001
Mar-2000	1,007		1/	140	50	1,553
May 2008	1,739		14	102	59	1,501
May-2000	1,795		19	123	50	1,592
Jul 2008	2,140		22	70	00	1,974
Jui-2006	2,051		29	70	04	1,000
Aug-2008	2,053		40	60	85	1,868
Sep-2008	1,323		39	58	35	1,191
Oct-2008	1,658		43	101	74	1,440
Nov-2008	1,720		31	65	67	1,558
Dec-2008	1,856	1,801	46	/4	38	1,698
Jan-2009	1,922		36	135	58	1,692
Feb-2009	1,808		30	171	54	1,553
Mar-2009	1,838		30	135	77	1,596
Apr-2009	1,900		27	132	53	1,689
May-2009	2,015		53	97	69	1,797
Jun-2009	1,963		57	104	71	1,730
Jul-2009	2,348		31	119	63	2,134
Aug-2009	2,119		35	156	77	1,850
Sep-2009	2,105		42	126	82	1,856
Oct-2009	2,223		72	165	69	1,917
Nov-2009	2,029		46	156	46	1,782
Dec-2009	1,996	2,022	65	173	57	1,701
Jan-2010	1,897		33	194	75	1,595
Feb-2010	2,034		58	157	94	1,725
Mar-2010	2,149		45	155	98	1,851
Apr-2010	2,432		37	176	158	2,063
May-2010	2,399		36	176	110	2,077
Jun-2010	2,304		31	125	122	2,026
Jul-2010	2,516		69	170	130	2,148
Aug-2010	2,410		36	132	154	2,089
Sep-2010	2,345		61	155	118	2,010
Oct-2010	2,480		23	172	115	2,169
Nov-2010	2,598		32	164	130	2.272
Dec-2010	2.644	2,351	40	190	160	2.254
Jan-2011	2,750	_,	72	213	168	2,298
Feb-2011	2 634		30	192	143	2 269
Mar-2011	2,001		36	270	215	2 211
Apr-2011	3 071		41	348	232	2,211
May-2011	2 735		37	292	154	2,401
.lun-2011	2,700		36	276	147	2,202
Jul_2011	2,710		73	210	102	2,201
	5,055		15	202	100	2,024

Aug-2011	3,002		34	253	169	2,546
Sep-2011	3,174		35	256	169	2,714
Oct-2011	3,107		51	168	203	2,686
Nov-2011	3,159		64	217	213	2,664
Dec-2011	3,667	2,983	53	242	225	3,147
Jan-2012	2,870		78	268	199	2,324
Feb-2012	2,994		73	316	216	2,389
Mar-2012	3,116		71	297	209	2,539
Apr-2012	3,272		41	326	204	2,701
May-2012	3,207		83	270	207	2,648
Jun-2012	3,216		46	325	198	2,647
Jul-2012	3,237		77	321	225	2,615
Aug-2012	3,081		60	290	241	2,490
Sep-2012	3,164		68	327	221	2,548
Oct-2012	3,255		67	331	203	2,654
Nov-2012	3.404		73	379	199	2,752
Dec-2012	3.636	3.204	71	326	246	2.994
Jan-2013	2.881	-, -	109	278	316	2.179
Feb-2013	3.280		132	389	371	2.388
Mar-2013	3.111		107	431	308	2.266
Apr-2013	3.235		138	415	368	2.313
May-2013	3.472		130	471	271	2,599
Jun-2013	3.594		124	351	319	2.800
Jul-2013	3.851		104	555	334	2,858
Aug-2013	3,725		71	504	235	2,915
Sep-2013	3 632		105	426	378	2 722
Oct-2013	4 074		119	672	383	2,722
Nov-2013	3,967		253	496	435	2 782
Dec-2013	4 602	3 619	220	619	589	3 173
Jan-2014	3 911	0,010	248	597	522	2 545
Feb-2014	3 658		247	550	360	2,500
Mar-2014	3,993		251	590	338	2 814
Apr-2014	3 974		282	672	323	2 697
May-2014	4 113		309	722	343	2,007
Jun-2014	4 155		394	672	360	2 728
Jul-2014	4 464		421	768	428	2 847
Aug-2014	4 457		391	742	400	2 923
Sep-2014	3 947		349	762	339	2,020
Oct-2014	4 134		376	825	416	2 517
Nov-2014	4 353		521	702	454	2 676
Dec-2014	4 892	4 171	421	819	559	3 093
Jan-2015	4 567	1,171	491	809	534	2 733
Feb-2015	4 699		428	1 020	462	2 789
Mar-2015	4 120		417	748	472	2 482
Apr-2015	4 943		586	909	575	2,102
May-2015	4 874		531	953	570	2,870
Jun-2015	4 668		431	933	562	2 742
Jul-2015	4 967		526	1 021	452	2 968
Aug-2015	4,564		461	991	464	2,648
Sep-2015	4,884		409	1,136	509	2.829
Oct-2015	4,628		500	970	466	2 692
20.20.0	.,0_0			0.0		_,

Nov-2015	4,817		320	1,058	552	2,887
Dec-2015	5,275	4,751	392	1,067	683	3,132
Jan-2016	4,878		364	1,246	571	2,697
Feb-2016	4,948		374	1,245	546	2,782
Mar-2016	5,002		508	1,079	515	2,901
Apr-2016	5,154		591	1,147	490	2,926
May-2016	5,658		662	1,367	549	3,080
Jun-2016	5,240		383	1,144	450	3,263
Jul-2016	5,209		474	1,164	483	3,088
Aug-2016	5,114		657	1,059	461	2,937
Sep-2016	5,250		692	1,022	464	3,072
Oct-2016	4,942		491	1,217	530	2,704
Nov-2016	5,392		597	1,261	511	3,022
Dec-2016	5,460	5,187	442	1,449	381	3,188
Jan-2017	5,691		746	1,402	525	3,019
Feb-2017	6,443		1,116	1,388	579	3,359
MOM Increase / Dec	450	-	106	44	(19)	318
Maximum	5,691		692	1,367	683	3,263
Max Less Current	-	-	95	106	172	241
increase from Jan 2(	752	-	370	(14)	54	340
% of total	100.0%	0.0%	49.2%	-1.9%	7.2%	45.2%
month yoy	1,495	-	742	143	33	577
% of total	100.0%	0.0%	49.6%	9.6%	2.2%	38.6%

%



SourcekeyMTTEXP32MCREXP32MNGEXP32MOLEXP32MOLEXP32MTTEXP32ProductsNatural Gas LiquidsNatural Gas LiquidsPetroleum ProductsPetroleum ProductsMTTEXUS2Gulf Coast (PADD 3) Exports of Crude Oil and Petroleum ProductsGulf Coast (PADD 3) Exports of Crude Oil and Petroleum ProductsGulf Coast (PADD 3) Exports of Crude Oil and Petroleum Products (ThousandGulf Coast (PADD 3) Exports of DateGulf Coast (PADD 3) Exports of Crude Oil and Petroleum Products (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of DateGulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of DateGulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Marels per Day Barrels per Day)Gulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Gulf Coast (PADD 3) Exports of (Thousand Barrels per Day)Marels per Day Barrels per DayMarels per Day Bar	Back to Contents	Data 1: Gulf Coast (PADD 3) Exports of Crude Oil and Petroleum Products					Data 1: U.S. Exports of Crude Oil and Petroleum Products Total Crude Oil +
Natural Gas LiquidsPetroleum ProductsPetroleum ProductsMTEXUS2Gulf Coast (PADD 3) Sports of Crude Oil and Petroleum ProductsGulf Coast (PAD Si Exports of Si Exports of Crude Oil and Petroleum ProductsGulf Coast (PAD Si Exports of Si Exports of Crude Oil and Barels per Dei Barrels per Dei 	Sourcekey	MTTEXP32	MCREXP32	MNGEXP32	MOLEXP32	MTPEXP32	Products
Crude OilLiquidsOther LiquidsProductsМТТЕХUS2Gulf Coast (PADD 3) Exports of Crude Oil and PetroleumGulf Coast (PAD) 3) Exports of Crude Oil and 3) Exports of (ThousandGulf Coast (PAD) 3) Exports of Liquids and 3) Exports of Crude Oil 1quid RefineryGulf Coast (PAD) 3) Exports of Crude Oil and 3) Exports of Crude Oil 1quid RefineryGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of Direct Quid Refinery Barrels per DayGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of Thousand ThousandGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of Thousand ThousandGulf Coast (PAD) 3) Exports of ThousandGulf Coast (PAD) 3) Exports of 3) Exports of 3) Exports of 3) Export of<				Natural Gas		Petroleum	
Gulf Coast (PADD 3) Exports of Crude Oil and Petroleum (ThousandGulf Coast (PAD) Supports of Crude Oil and Petroleum (ThousandGulf Coast (PAD) Supports of Crude Oil and Barels per DayGulf Coast (PAD) Supports of Crude Oil and (ThousandGulf Coast (PAD) Supports of Crude Oil and (ThousandGulf Coast (PAD) Supports of Crude Oil and (ThousandGulf Coast (PAD) Supports of Crude OilSupports of Supports of Oil and (ThousandGulf Coast (PAD) Supports of Oil and (ThousandSupports of Supports of Oil and Oil an			Crude Oil	Liquids	Other Liquids	Products	MTTEXUS2
DateBarrels per Day)Barrels per Day)Barrels per Day)Barrels per Day)Barrels per Day)Barrels per Day)Jan-2000617093294951,006Feb-200057405825491870Mar-2000671074355611,159Apr-2000702-1742478856Jun-200057403456484925Jul-200055501947489900Aug-200072504890048900	Data	Gulf Coast (PADD 3) Exports of Crude Oil and Petroleum Products (Thousand	Gulf Coast (PADD 3) Exports of Crude Oil (Thousand	Gulf Coast (PADD 3) Exports of Natural Gas Liquids and Liquid Refinery Gases (Thousand	Gulf Coast (PADD 3) Exports of Other Liquids (Thousand	Gulf Coast (PADD 3) Exports of Finished Petroleum Products (Thousand	U.S. Exports of Crude Oil and Petroleum Products (Thousand
Jan-2000       617       0       93       29       495       1,006         Feb-2000       574       0       58       25       491       870         Mar-2000       671       0       74       35       561       1,159         Apr-2000       702       55       46       602       1,131         May-2000       537       17       42       478       856         Jun-2000       574       0       34       56       484       925         Jul-2000       555       0       19       47       489       900         Aug-2000       735       0       48       20       657       1.032	Date	Barreis per Day)	Barrels per Day)	Barrels per Day)	Barrels per Day)	Barrels per Day)	Barreis per Day)
Nar-2000       574       0       58       25       491       870         Mar-2000       671       0       74       35       561       1,159         Apr-2000       702       55       46       602       1,131         May-2000       537       17       42       478       856         Jun-2000       574       0       34       56       484       925         Jul-2000       555       0       19       47       489       900         Aug-2000       735       0       48       20       657       1.073	Jan-2000 Eab 2000	617	0	93	29	495	1,006
Mai-2000       671       0       74       35       561       1,159         Apr-2000       702       55       46       602       1,131         May-2000       537       17       42       478       856         Jun-2000       574       0       34       56       484       925         Jul-2000       555       0       19       47       489       900         Aug-2000       735       0       48       20       657       1 073	Feb-2000 Mar 2000	574	0	58	25	491	870
Apr 2000       702       702       33       40       602       1,131         May-2000       537       17       42       478       856         Jun-2000       574       0       34       56       484       925         Jul-2000       555       0       19       47       489       900         Aug-2000       735       0       48       20       657       1.073	Apr-2000	702	0	74	35	501	1,109
Jun-2000     574     0     34     56     484     925       Jul-2000     555     0     19     47     489     900       Aug-2000     735     0     48     20     657     1 073	May-2000	702 537		17	40	002 //78	856
Jul-2000     555     0     19     47     489     900       Aug-2000     725     0     48     20     657     1.073	Jun-2000	574	0	34	42	478	925
Aug-2000 725 0 48 20 657 1.072	Jul-2000	555	0	19	47	484	900
Aug-2000 755 0 46 29 657 1,075	Aug-2000	735	0	48	29	657	1,073

Sep-2000	740	0	40	30	669	1,059
Oct-2000	868	0	41	35	791	1,292
Nov-2000	787	0	52	36	699	1,108
Dec-2000	784	0	62	48	674	1,095
Jan-2001	647	0	49	22	577	954
Feb-2001	641	0	42	30	569	1,004
Mar-2001	614	0	18	23	573	938
Apr-2001	624		21	21	583	942
May-2001	620		14	39	567	1,069
Jun-2001	646		37	31	579	976
Jul-2001	600		37	34	530	879
Aug-2001	663		23	34	606	1,048
Sep-2001	492		23	24	446	825
Oct-2001	621		20	21	580	946
Nov-2001	618	0	25	29	565	960
Dec-2001	767		32	25	710	1,109
Jan-2002	576	2	33	32	509	861
Feb-2002	814	0	80	30	703	1,175
Mar-2002	530	0	51	26	453	853
Apr-2002	558		17	61	480	890
May-2002	586		44	49	494	910
Jun-2002	576		17	18	540	880
Jul-2002	530	0	16	44	469	839
Aug-2002	695	0	22	58	614	1,138
Sep-2002	679		50	89	540	1,015
Oct-2002	586		71	55	460	962
Nov-2002	757	0	82	81	593	1,026
Dec-2002	947	0	120	55	772	1,272
Jan-2003	851	0	97	47	708	1,212
Feb-2003	780		115	33	632	1,067
Mar-2003	776	0	28	37	712	1,051

Apr-2003	658	0	14	39	606	1,053
May-2003	678		13	31	633	1,097
Jun-2003	687	0	24	36	628	1,065
Jul-2003	627	0	11	36	580	976
Aug-2003	605	0	16	32	558	947
Sep-2003	664		12	45	607	960
Oct-2003	650		12	57	581	970
Nov-2003	579		19	50	510	933
Dec-2003	675		41	60	573	990
Jan-2004	502		42	35	425	748
Feb-2004	681		46	39	597	1,046
Mar-2004	659		12	40	607	1,024
Apr-2004	665	0	11	46	608	1,153
May-2004	756		10	54	691	1,052
Jun-2004	698		17	61	620	1,070
Jul-2004	720		13	91	617	1,080
Aug-2004	710		21	50	639	1,091
Sep-2004	654		19	42	594	961
Oct-2004	692		17	45	630	1,078
Nov-2004	622		17	52	553	992
Dec-2004	883		21	72	790	1,284
Jan-2005	558		16	49	494	917
Feb-2005	838		23	31	783	1,256
Mar-2005	868		16	70	782	1,308
Apr-2005	979		23	73	883	1,330
May-2005	890		23	41	826	1,380
Jun-2005	1031		23	62	947	1,477
Jul-2005	885		25	52	807	1,259
Aug-2005	866		25	63	777	1,295
Sep-2005	556		16	47	493	844
Oct-2005	545		30	38	476	854

Nov-2005	550	10	16	34	490	961
Dec-2005	765	9	26	47	683	1,106
Jan-2006	697		38	41	618	1,059
Feb-2006	774		86	31	657	1,276
Mar-2006	817	6	47	48	715	1,170
Apr-2006	939		39	99	801	1,398
May-2006	947		19	70	858	1,350
Jun-2006	835		17	90	729	1,334
Jul-2006	877	0	18	97	762	1,387
Aug-2006	878		20	110	747	1,255
Sep-2006	1025	1	16	72	936	1,554
Oct-2006	1048		30	63	955	1,506
Nov-2006	924	0	36	43	845	1,353
Dec-2006	835		38	57	739	1,164
Jan-2007	1013		69	40	903	1,446
Feb-2007	978		50	71	858	1,350
Mar-2007	897		42	84	770	1,274
Apr-2007	983		14	56	912	1,360
May-2007	924		20	92	812	1,441
Jun-2007	807		14	56	736	1,331
Jul-2007	992	0	27	63	902	1,506
Aug-2007	1024		16	82	926	1,483
Sep-2007	893		13	67	813	1,361
Oct-2007	936		11	73	851	1,325
Nov-2007	1227		79	75	1073	1,767
Dec-2007	1108		37	72	998	1,542
Jan-2008	1108		86	49	973	1,620
Feb-2008	1165		97	67	1002	1,848
Mar-2008	1163		67	71	1025	1,807
Apr-2008	1202		35	52	1115	1,739
May-2008	1140		47	57	1036	1,793

Jun-2008	1518		14	60	1445	2,146
Jul-2008	1323		12	62	1249	2,051
Aug-2008	1341		12	83	1246	2,053
Sep-2008	712		14	33	665	1,323
Oct-2008	1031		53	71	907	1,658
Nov-2008	1103		12	66	1026	1,720
Dec-2008	1256		30	37	1188	1,856
Jan-2009	1343		81	55	1207	1,922
Feb-2009	1223		112	51	1059	1,808
Mar-2009	1324		82	73	1169	1,838
Apr-2009	1330		65	50	1215	1,900
May-2009	1498	17	34	68	1379	2,015
Jun-2009	1371		45	70	1257	1,963
Jul-2009	1567		54	61	1452	2,348
Aug-2009	1471		105	77	1289	2,119
Sep-2009	1462		78	81	1303	2,105
Oct-2009	1628		124	65	1439	2,223
Nov-2009	1461		111	45	1305	2,029
Dec-2009	1471		125	54	1292	1,996
Jan-2010	1357		129	59	1169	1,897
Feb-2010	1521		89	77	1354	2,034
Mar-2010	1618		93	71	1453	2,149
Apr-2010	1846		86	127	1633	2,432
May-2010	1765		116	89	1560	2,399
Jun-2010	1802		81	112	1608	2,304
Jul-2010	1941	31	103	112	1695	2,516
Aug-2010	1806		89	134	1583	2,410
Sep-2010	1737		109	98	1530	2,345
Oct-2010	1859		125	94	1639	2,480
Nov-2010	2100		120	104	1877	2,598
Dec-2010	2134		153	133	1847	2,644

Jan-2011	2143	29	123	125	1866	2,750
Feb-2011	1903		96	102	1705	2,634
Mar-2011	2009		155	178	1677	2,733
Apr-2011	2265		170	200	1896	3,071
May-2011	1897		140	104	1653	2,735
Jun-2011	1902		119	92	1691	2,716
Jul-2011	2051	11	97	128	1815	3,053
Aug-2011	2121		115	124	1882	3,002
Sep-2011	2216		126	119	1971	3,174
Oct-2011	2234		49	156	2029	3,107
Nov-2011	2406		110	156	2140	3,159
Dec-2011	2802		108	153	2542	3,667
Jan-2012	2142		150	157	1835	2,870
Feb-2012	2187		138	183	1866	2,994
Mar-2012	2321	20	148	175	1979	3,116
Apr-2012	2313		187	137	1990	3,272
May-2012	2351	22	139	154	2037	3,207
Jun-2012	2292		151	126	2015	3,216
Jul-2012	2259	0	171	172	1916	3,237
Aug-2012	2166		155	182	1830	3,081
Sep-2012	2268		148	169	1951	3,164
Oct-2012	2367		182	171	2014	3,255
Nov-2012	2711		238	165	2309	3,404
Dec-2012	2864	0	215	202	2447	3,636
Jan-2013	2099	10	156	266	1667	2,881
Feb-2013	2419	14	182	322	1901	3,280
Mar-2013	2391	11	280	268	1831	3,111
Apr-2013	2413	47	271	323	1772	3,235
May-2013	2511	34	304	214	1959	3,472
Jun-2013	2636	17	264	256	2100	3,594
Jul-2013	2666	21	286	288	2071	3,851

Aug-2013	2792	23	304	171	2295	3,725
Sep-2013	2745	20	332	304	2088	3,632
Oct-2013	3047	46	398	309	2295	4,074
Nov-2013	3133	144	398	369	2222	3,967
Dec-2013	3449	61	399	506	2482	4,602
Jan-2014	2972	144	395	437	1995	3,911
Feb-2014	2698	75	349	271	2003	3,658
Mar-2014	3026	176	368	262	2221	3,993
Apr-2014	2952	144	413	268	2126	3,974
May-2014	3097	226	444	273	2154	4,113
Jun-2014	2984	252	377	275	2079	4,155
Jul-2014	3315	274	459	352	2230	4,464
Aug-2014	3227	200	414	342	2271	4,457
Sep-2014	2889	139	492	245	2014	3,947
Oct-2014	3054	202	540	349	1962	4,134
Nov-2014	3103	212	435	378	2078	4,353
Dec-2014	3692	245	543	476	2429	4,892
Jan-2015	3481	270	508	461	2242	4,567
Feb-2015	3464	237	655	341	2232	4,699
Mar-2015	3116	268	481	361	2005	4,120
Apr-2015	3755	333	616	504	2303	4,943
May-2015	3713	309	582	477	2344	4,874
Jun-2015	3593	262	580	518	2232	4,668
Jul-2015	3782	316	620	390	2456	4,967
Aug-2015	3468	289	609	413	2157	4,564
Sep-2015	3690	268	764	439	2219	4,884
Oct-2015	3643	408	632	398	2205	4,628
Nov-2015	3795	243	732	465	2356	4,817
Dec-2015	4144	292	739	597	2516	5,275
Jan-2016	3741	184	878	485	2194	4,878
Feb-2016	3807	180	869	459	2300	4,948

Mar-2016	3670	276	699	408	2288	5,002
Apr-2016	3918	338	744	402	2434	5,154
May-2016	4274	362	915	435	2562	5,658
Jun-2016	3792	150	715	324	2604	5,240
Jul-2016	3761	118	724	368	2551	5,209
Aug-2016	3823	410	658	339	2416	5,114
Sep-2016	3998	470	632	351	2545	5,250
Oct-2016	3758	245	893	368	2252	4,942
Nov-2016	4270	357	920	411	2582	5,392
Dec-2016	4283	268	1110	269	2636	5,460
Jan-2017	4408	476	1074	366	2491	5,691
Feb-2017	5034	872	1012	457	2693	6,443
Tatal U.O. Even anta						
Feb 2017	6112	1116	1200	570	2250	
1002011	0443	1110	1300	575	5535	
PADD 3 as % of						
Total US Exports	78.1%	78.1%	72.9%	78.9%	80.2%	
Average 2006	883					
% increase Feb						
2017 over 2016	7200/					
Ave Average 2016	730%					
% increase 2016	3,925					
average over						
2006 average	444%					




# **ATTACHMENT LS-33**

PRODUCTS	PADD 3 PORT DISTRICTS	201301	201302
ASPHALT & ROAD OIL	HOUSTON-GAL, TX	4	7
ASPHALT & ROAD OIL	PORT ARTHUR, TX		
BIOMASS-BASED DIESEL FUEL	HOUSTON-GAL, TX	0	0
BIOMASS-BASED DIESEL FUEL	PORT ARTHUR, TX		
COKE, MARKETABLE	HOUSTON-GAL, TX	82	132
COKE, MARKETABLE	PORT ARTHUR, TX	78	109
DIST DOM < 15 PPM	HOUSTON-GAL, TX	247	251
DIST DOM < 15 PPM	PORT ARTHUR, TX	55	94
DIST DOM > 500 PPM	HOUSTON-GAL, TX	37	46
DIST DOM > 500 PPM	PORT ARTHUR, TX	13	
DIST DOM 15 - 500 PPM	HOUSTON-GAL, TX	13	16
DIST DOM 15 - 500 PPM	PORT ARTHUR, TX		
FIN MOGAS - CONV - OTHER	HOUSTON-GAL, TX	214	227
FIN MOGAS - CONV - OTHER	PORT ARTHUR, TX	60	58
JET - KEROSENE	HOUSTON-GAL, TX	63	8
JET - KEROSENE	PORT ARTHUR, TX	25	
KEROSENE	HOUSTON-GAL, TX	0	0
KEROSENE	PORT ARTHUR, TX	13	17
LUBES, TOTAL	HOUSTON-GAL, TX	25	44
LUBES, TOTAL	PORT ARTHUR, TX	3	3
MISC PRODUCTS	HOUSTON-GAL, TX	0	0
NGL - PENTANES PLUS	HOUSTON-GAL, TX	1	1
NORMAL BUTANE/BUTYLENE	HOUSTON-GAL, TX	9	11
PETROCHEM FEED - NAPHTHA	HOUSTON-GAL, TX		
PROPANE/PROPYLENE	HOUSTON-GAL, TX	142	167
RESIDUAL FUEL, TOTAL	HOUSTON-GAL, TX	91	121
RESIDUAL FUEL, TOTAL	PORT ARTHUR, TX		
SPECIAL NAPHTHAS	HOUSTON-GAL, TX		
SPECIAL NAPHTHAS	PORT ARTHUR, TX		
UFO - KEROSENE & LGO	HOUSTON-GAL, TX		
UFO - NAPHTHA & LIGHTER	HOUSTON-GAL, TX	91	43
UFO - NAPHTHA & LIGHTER	PORT ARTHUR, TX		
WAX	HOUSTON-GAL, TX	0	0
Total		1,267	1,356

201303	201304	201305	201306	201307	201308	201309	201310	201311
7	5	3	5	3	7	5	6	4
	0							
0	1	0	0	5	5	7	7	7
	5	5	5					
80	116	106	90	134	88	149	129	98
91	91	110	140	88	114	87	129	80
206	219	308	346	337	348	390	426	398
117	68	129	109	187	172	150	174	200
19	22	30	43	22	30	19	37	15
			2	17	9			
10	10	7	35	33	54	22	25	53
9		1				11	24	
149	113	146	141	184	269	185	246	270
66	20	24	44	32	29	20	32	35
14	29	39	40	27	41	13	21	44
31		1		7	27	29	18	20
0	0	0	0		0		0	0
		4	1	6			9	10
25	31	45	31	36	36	36	37	28
3	4	2	2	4	2	7	6	4
0	0	0	0	0	0	0	0	0
1	1	1	1	0	1	1	2	1
13	4	12	12	28	26	17	8	8
264	262	288	248	252	274	311	384	385
150	165	222	164	128	175	93	110	128
37	87	44	89	101	46	65	76	121
		9			9	16	29	17
0	0	1	0	0	0	1	0	1
1,292	1,254	1,540	1,550	1,632	1,762	1,636	1,935	1,926

- 2,101 1,604

PRODUCTS	PADD 3 PORT DISTRICTS	201401	201402
ASPHALT & ROAD OIL	HOUSTON-GAL, TX	5	9
ASPHALT & ROAD OIL	PORT ARTHUR, TX		
BIOMASS-BASED DIESEL FUEL	HOUSTON-GAL, TX	4	5
BIOMASS-BASED DIESEL FUEL	PORT ARTHUR, TX		
COKE, MARKETABLE	HOUSTON-GAL, TX	114	151
COKE, MARKETABLE	PORT ARTHUR, TX	74	56
DIST DOM < 15 PPM	HOUSTON-GAL, TX	351	234
DIST DOM < 15 PPM	PORT ARTHUR, TX	186	168
DIST DOM > 500 PPM	HOUSTON-GAL, TX	12	3
DIST DOM > 500 PPM	PORT ARTHUR, TX		
DIST DOM 15 - 500 PPM	HOUSTON-GAL, TX	24	7
DIST DOM 15 - 500 PPM	PORT ARTHUR, TX		11
FIN MOGAS - CONV - OTHER	HOUSTON-GAL, TX	282	196
FIN MOGAS - CONV - OTHER	PORT ARTHUR, TX	50	45
JET - KEROSENE	HOUSTON-GAL, TX	34	29
JET - KEROSENE	PORT ARTHUR, TX	9	21
KEROSENE	HOUSTON-GAL, TX	10	7
KEROSENE	PORT ARTHUR, TX		10
LUBES, TOTAL	HOUSTON-GAL, TX	28	31
LUBES, TOTAL	PORT ARTHUR, TX	2	7
MISC PRODUCTS	HOUSTON-GAL, TX	0	0
NGL - PENTANES PLUS	HOUSTON-GAL, TX	3	34
NORMAL BUTANE/BUTYLENE	HOUSTON-GAL, TX	52	19
PETROCHEM FEED - NAPHTHA	HOUSTON-GAL, TX		18
PROPANE/PROPYLENE	HOUSTON-GAL, TX	330	320
RESIDUAL FUEL, TOTAL	HOUSTON-GAL, TX	152	144
RESIDUAL FUEL, TOTAL	PORT ARTHUR, TX		
SPECIAL NAPHTHAS	HOUSTON-GAL, TX	110	0
SPECIAL NAPHTHAS	PORT ARTHUR, TX	30	
UFO - KEROSENE & LGO	HOUSTON-GAL, TX		
UFO - NAPHTHA & LIGHTER	HOUSTON-GAL, TX		26
UFO - NAPHTHA & LIGHTER	PORT ARTHUR, TX		
WAX	HOUSTON-GAL, TX	1	0
Total		1,861	1,552

201403 20	1404	201405	201406	201407	201408	201409	201410	201411
8	1	0	1	1	5	2	2	2
		1					1	
0	0		0	0		0	0	0
164	145	81	130	176	103	94	111	137
151	127	124	88	61	97	82	115	68
244	297	291	294	297	391	293	237	227
177	188	196	179	246	169	179	126	137
20	19	33	24	37	37	39	9	23
							4	
37	10	15	23	10	26	8	35	44
		13		10	8		10	4
201	181	264	212	217	253	133	134	233
37	30	26	18	56	53	30	27	45
26	24	20	30	55	31	12	26	31
14	16	31	33	20	32		9	11
0	0	0	0	0	0	0	0	0
7	3	6	4		12		10	10
38	38	33	30	33	31	35	27	28
7	2	7	1	2	6	8	4	2
0	0	0	0	0	0		0	0
0	0	1	0	1	1	0	1	1
45	43	27	25	59	48	79	55	35
10	10	7						
309	367	412	347	398	361	406	479	394
145	111	138	114	119	117	146	131	116
33	52	63						
	6	7						
	0	,		13	23	10	13	20
8	58	87	132	176	196	81	132	103
-	20	10		30	31	24	12	
0	1	0	1	0	1	1		0
1,682	1,732	1,892	1,687	2,018	2,031	1,662	1,708	1,673

2,090 1,799

PRODUCT	Port Districts	201501	201502
ASPHALT & ROAD OIL	HOUSTON-GAL, TX	2	1
ASPHALT & ROAD OIL	PORT ARTHUR, TX		
BIOMASS-BASED DIESEL FUEL	HOUSTON-GAL, TX		
BIOMASS-BASED DIESEL FUEL	PORT ARTHUR, TX		
COKE, MARKETABLE	HOUSTON-GAL, TX	133	159
DIST DOM < 15 PPM	HOUSTON-GAL, TX	309	268
DIST DOM > 500 PPM (EXCEPT 814)	HOUSTON-GAL, TX	73	24
DIST DOM 15 - 500 PPM	HOUSTON-GAL, TX	26	4
FIN MOGAS - CONV - OTHER	HOUSTON-GAL, TX	322	281
JET - KEROSENE	HOUSTON-GAL, TX	34	38
COKE, MARKETABLE	PORT ARTHUR, TX	85	133
DIST DOM < 15 PPM	PORT ARTHUR, TX	143	149
ETHANE -NGPL	HOUSTON-GAL, TX		
DIST DOM > 500 PPM (EXCEPT 814)	PORT ARTHUR, TX	19	10
DIST DOM 15 - 500 PPM	PORT ARTHUR, TX	4	
ISOBUTANE - NGPL	HOUSTON-GAL, TX	4	6
FIN MOGAS - CONV - OTHER	PORT ARTHUR, TX	53	62
JET - KEROSENE	PORT ARTHUR, TX	40	24
KEROSENE	HOUSTON-GAL, TX	0	0
KEROSENE	PORT ARTHUR, TX	4	17
LUBES, TOTAL	HOUSTON-GAL, TX	25	31
LUBES, TOTAL	PORT ARTHUR, TX	3	3
MISC PRODUCTS	HOUSTON-GAL, TX	0	0
NGL - PENTANES PLUS	HOUSTON-GAL, TX	1	0
NORMAL BUTANE - NGPL	HOUSTON-GAL, TX	25	32
NORMAL BUTANE - NGPL	PORT ARTHUR, TX		
PROPANE - NGPL	HOUSTON-GAL, TX	472	468
PROPANE - NGPL	PORT ARTHUR, TX		142
RESIDUAL FUEL, TOTAL	HOUSTON-GAL, TX	110	143
RESIDUAL FUEL, TOTAL	PORT ARTHUR, TX	3	18
UFO - KEROSENE & LGO	HOUSTON-GAL, TX	82	46
UFO - NAPHTHA & LIGHTER	HOUSTON-GAL, TX	114	101
UFO - NAPHTHA & LIGHTER	PORT ARTHUR, TX	6	18
WAX	HOUSTON-GAL, TX	0	0
Total		2,090	2,180

201503	201504	201505	201506	201507	201508	201509	201510	201511
2	2 1	2	2	0	2	1	3	8
							2	
C	)	0	0	0		0	0	0
135	5 132	97	115	147	119	140	129	121
275	5 359	351	335	371	273	343	340	295
30	) 28	32	30	66	53	44	18	23
12	2 18	34	22	17	11	35	27	31
211	. 183	263	185	263	238	172	256	266
22	2 50	8	39	45	24	32	29	42
102	2 114	71	95	89	134	97	90	120
184	182	187	172	212	166	215	225	262
11								
	8	8	7	7				
4	4	9	8	6	9	5	9	7
39	43	19	40	39	48	42	42	16
4	26	21	18	19	30	12	5	7
C	)	0	9	0	0	10	0	0
				3	9	2	20	10
26	5 26	39	33	35	28	34	36	27
2	2 1	10	3	3	3	3	3	1
C	) 0	0	0	0	0	0	0	0
1	. 1	0	1	1	1	1	1	1
48	32	46	68	64	51	75	55	78
		21	43	20	17	22	31	14
306	6 423	400	377	430	415	506	401	467
116	5 150	99	78	93	112	150	127	158
109	) 197	207	130	135	157	109	87	83
29	) 17		2		7		7	
66	5 113	97	132	45	58	46	25	70
127	' 140	121	113	101	147	138	100	95
8	3 20	20	47	29	28		35	29
C	) 0	0	0	0	0	0	0	0
1,870	2,268	2,166	2,103	2,240	2,139	2,231	2,103	2,233

- 2,511 2,178

PRODUCT	Port Districts	201601	201602
ASPHALT & ROAD OIL	HOUSTON-GAL, TX	4	1
ASPHALT & ROAD OIL	PORT ARTHUR, TX		
BIOMASS-BASED DIESEL FUEL	HOUSTON-GAL, TX	0	1
BIOMASS-BASED DIESEL FUEL	PORT ARTHUR, TX		
COKE, MARKETABLE	HOUSTON-GAL, TX	123	105
DIST DOM < 15 PPM	HOUSTON-GAL, TX	277	242
DIST DOM > 500 PPM (EXCEPT 814)	HOUSTON-GAL, TX	14	25
DIST DOM 15 - 500 PPM	HOUSTON-GAL, TX	19	49
FIN MOGAS - CONV - OTHER	HOUSTON-GAL, TX	273	280
JET - KEROSENE	HOUSTON-GAL, TX	40	46
COKE, MARKETABLE	PORT ARTHUR, TX	130	114
DIST DOM < 15 PPM	PORT ARTHUR, TX	146	151
ETHANE -NGPL	HOUSTON-GAL, TX		
DIST DOM > 500 PPM (EXCEPT 814)	PORT ARTHUR, TX		
DIST DOM 15 - 500 PPM	PORT ARTHUR, TX	16	8
ISOBUTANE - NGPL	HOUSTON-GAL, TX	5	5
FIN MOGAS - CONV - OTHER	PORT ARTHUR, TX	69	63
JET - KEROSENE	PORT ARTHUR, TX	31	12
KEROSENE	HOUSTON-GAL, TX	16	2
KEROSENE	PORT ARTHUR, TX	16	11
LUBES, TOTAL	HOUSTON-GAL, TX	28	32
LUBES, TOTAL	PORT ARTHUR, TX	3	2
MISC PRODUCTS	HOUSTON-GAL, TX	0	6
NGL - PENTANES PLUS	HOUSTON-GAL, TX	1	0
NORMAL BUTANE - NGPL	HOUSTON-GAL, TX	49	28
NORMAL BUTANE - NGPL	PORT ARTHUR, TX	28	10
PROPANE - NGPL	HOUSTON-GAL, TX	665	646
PROPANE - NGPL	PORT ARTHUR, TX	123	162
RESIDUAL FUEL, TOTAL	HOUSTON-GAL, TX	81	129
RESIDUAL FUEL, TOTAL	PORT ARTHUR, TX		
UFO - KEROSENE & LGO	HOUSTON-GAL, TX	34	72
UFO - NAPHTHA & LIGHTER	HOUSTON-GAL, TX	141	143
UFO - NAPHTHA & LIGHTER	PORT ARTHUR, TX	14	10
WAX	HOUSTON-GAL, TX	0	0
Total		2,345	2,354

201603	201604	201605	201606	201607	201608	201609	201610	201611
2	. 1	2	0	3	3	1	0	2
					1		1	
C	0	0	0	0	0	1	1	1
		3		0	0			
109	181	137	223	161	115	136	154	98
344	345	360	457	413	426	411	335	419
13	41	2	27	4	29	9	40	11
17	47	30	5	9	10	41	25	23
273	266	239	238	257	214	303	336	430
44	. 37	65	48	38	67	35	35	34
113	84	117	75	120	66	117	83	124
190	195	199	228	209	133	110	51	107
						17	5	
16	8	8	3		25	12	11	6
5	7	2	5	6	7	7	8	2
49	47	48	70	57	48	39	55	70
13	28	13	26	10	30	27	2	13
2	0	0	0	0	0	0	0	0
	9				10		9	7
29	42	38	29	32	30	32	37	28
3	1	13	2	1	2	2	4	1
C	0	0	0	0	0	0		0
1	. 1	1	1	2	1	1	1	1
45	67	57	48	26	27	63	56	118
41	. 30	54	17	16	8	1	43	17
495	544	709	515	493	474	417	587	589
96	72	65	107	160	112	95	168	159
111	. 81	155	100	90	118	129	90	122
80	64	88	13	49	14	36	25	16
72	90	73	60	72	74	103	105	132
	10	40	19	19	10	19	16	30
C	0	0	1	0	0	0	0	1
2,162	2,298	2,519	2,318	2,248	2,055	2,168	2,284	2,561

- 2,585 2,325

	Refining District	Refining District			
	Texas Gulf Coast	Texas Gulf Coast	Refining District	Refining District	Refining District
	Refinery Net	Refinery Net	Texas Gulf Coast	Texas Gulf Coast	Texas Gulf Coast
	Production of Crude	Production of	Refinery Net	Refinery Net	Refinery Net
	Oil and Petroleum	Liquified Petroleum	Production of Ethane-	Production of Ethane	Production of
	Products (Thousand	Gases (Thousand	Ethylene (Thousand	(Thousand Barrels	Ethylene (Thousand
Date	Barrels per Day)	Barrels per Day)	Barrels per Day)	per Day)	Barrels per Day)
Jan-2013	2859	152	7	7	0
Feb-2013	2889	174	7	6	6 0
Mar-2013	2815	217	5	5	б О
Apr-2013	2917	267	7	7	· 0
May-2013	3200	283	5	5	5 O
Jun-2013	3290	278	6	6	6 O
Jul-2013	3440	276	7	7	0
Aug-2013	3181	269	7	7	0
Sep-2013	3222	209	8	8	6 0
Oct-2013	3187	151	8	8	з О
Nov-2013	3331	134	7	7	0
Dec-2013	3328	154	6	5	<b>0</b>
Jan-2014	3119	154	5	5	<b>0</b>
Feb-2014	3099	181	4	4	0
Mar-2014	3173	239	5	4	0
Apr-2014	3337	280	5	5	<b>0</b>
May-2014	3247	262	5	4	0
Jun-2014	3176	275	2	2	2 0
Jul-2014	3451	287	5	5	5 O
Aug-2014	3310	278	7	6	6 O
Sep-2014	2922	167	5	5	6 O
Oct-2014	2699	125	4	4	0
Nov-2014	3164	150	4	3	6 0
Dec-2014	3417	154	4	4	0
Jan-2015	3223	150	4	3	6 0
Feb-2015	3209	167	6	6	б О
Mar-2015	3254	220	5	5	б О
Apr-2015	3287	267	4	4	0

May-2015	3198	267	5	5	0
Jun-2015	3312	263	5	4	0
Jul-2015	3385	264	6	5	0
Aug-2015	3285	273	4	3	0
Sep-2015	3212	196	4	4	0
Oct-2015	3192	154	5	4	0
Nov-2015	3322	145	6	5	0
Dec-2015	3355	128	6	5	0
Jan-2016	2876	129	4	4	0
Feb-2016	2834	149	3	3	0
Mar-2016	3275	252	4	3	0
Apr-2016	3118	266	4	4	0
May-2016	3130	286	5	4	0
Jun-2016	3254	273	0	0	0
Jul-2016	3407	285	2	2	0
Aug-2016	3284	264	5	5	0
Sep-2016	3097	204	4	3	0
Oct-2016	2956	163	4	3	0
Nov-2016	3223	153	4	3	0
Dec-2016	3333	154	3	2	0
Jan-2017	3194	162	2	1	0

Refining District			Refining District		
Texas Gulf Coast	Refining District	Refining District	Texas Gulf Coast	Refining District	Refining District
Refinery Net	Texas Gulf Coast	Texas Gulf Coast	Refinery Net	Texas Gulf Coast	Texas Gulf Coast
Production of	Refinery Net	Refinery Net	Production of Normal	Refinery Net	Refinery Net
Propane and	Production of	Production of	Butane-Butylene	Production of Normal	Production of Normal
Propylene (Thousand	Propane (Thousand	Propylene (Thousand	(Thousand Barrels	Butane (Thousand	Butylene (Thousand
Barrels per Day)	Barrels per Day)	Barrels per Day)	per Day)	Barrels per Day)	Barrels per Day)
171	77	94	-24	-14	-10
165	67	98	-3	3	-5
182	82	101	32	41	-9
187	80	108	81	91	-10
194	87	107	93	102	-10
194	84	110	83	93	-9
188	84	104	87	98	-12
192	84	108	80	95	-15
196	89	106	21	33	-12
190	82	108	-33	-21	-12
193	83	111	-54	-38	-16
194	91	103	-31	-14	-18
192	87	104	-27	-19	-8
191	87	104	-4	5	-10
201	91	110	49	58	-9
205	97	108	84	99	-16
198	92	107	82	95	-13
203	95	108	88	98	-10
208	96	112	89	104	-15
192	87	104	89	103	-14
146	72	75	26	44	-18
152	68	84	-16	1	-17
204	87	116	-40	-24	-16
205	89	116	-36	-24	-13
189	83	106	-26	-11	-15
182	79	103	-12	1	-13
182	81	101	46	57	-12
194	84	110	85	89	-4

185	83	102	97	105	-8
180	80	100	98	93	6
195	85	110	85	98	-13
192	77	115	89	98	-9
174	76	98	28	30	-2
169	74	94	-9	-1	-8
182	76	106	-34	-20	-14
196	82	114	-60	-43	-17
186	72	113	-42	-43	2
188	75	113	-27	-27	0
207	86	121	55	51	4
193	81	113	80	86	-6
200	81	119	93	98	-5
194	85	109	94	101	-6
197	88	109	98	108	-11
184	81	104	87	92	-5
182	77	105	33	39	-6
183	78	105	-12	-10	-2
200	82	117	-36	-32	-4
203	86	117	-41	-38	-3
193	81	112	-21	-26	4

Refining District					
Texas Gulf Coast		Refining District	Refining District	Refining District	Refining District
Refinery Net	Refining District	Texas Gulf Coast	Texas Gulf Coast	Texas Gulf Coast	Texas Gulf Coast
Production of	Texas Gulf Coast	Refinery Net	Refinery Net	Refinery Net	Refinery Net
Isobutane-	Refinery Net	Production of	Production of	Production of	Production of
Isobutylene	Production of	Isobutylene	Finished Motor	<b>Reformulated Motor</b>	<b>Conventional Motor</b>
(Thousand Barrels	Isobutane (Thousand	(Thousand Barrels	Gasoline (Thousand	Gasoline (Thousand	Gasoline (Thousand
per Day)	Barrels per Day)	per Day)	Barrels per Day)	Barrels per Day)	Barrels per Day)
-2	-1	0	443		443
5	6	0	461		461
-3	-2	0	405		405
-8	-8	0	325		325
-9	-8	-1	340		340
-6	-6	-1	404		404
-6	-6	-1	439		439
-9	-9	0	356		356
-16	-15	0	437		437
-15	-14	0	425		425
-13	-12	-1	471		471
-14	-14	0	507		507
-15	-15	0	453		453
-10	-9	0	498		498
-15	-15	-1	420		420
-13	-13	-1	440		440
-23	-22	-1	459		459
-18		-	407		407
-10	- 14	-1	400		400
-9 10	-0	-1	394		394
-10	-9	-1	313		313
-13 -17	-14	-1	458		458
-20	_10	-1 _1	400 504		400 594
-20	-16	-1	520		520
_9	-8	-1	511		511
-13	-13	-1	511		511
-17	-16	-1	476		476

-20	-19	-1	417	417
-21	-20	_1	424	474
-22	-20 -21	-1	454	454
-12	-12	-1	475	475
-12	_9	-1	485	475
-10	-9	-1	403	403
-10	-9	-1	479 550	479
-0	-0	- 1	550	550
-14	-13	-1	549	549
-19	-18	-1	483	483
-15	-14	-1	421	421
-14	-13	-1	449	449
-11	-11	-1	348	348
-12	-11	-1	314	314
-15	-14	-1	370	370
-11	-11	-1	391	391
-13	-11	-2	369	369
-14	-14	-1	365	365
-12	-11	-1	440	440
-13	-13	-1	454	454
-11	-10	0	484	484
-11	-11	-1	458	458

Refining District	Ref District Texas				Refining District
Texas Gulf Coast	Gulf Coast Refinery	Refining District	Refining District	Refining District	Texas Gulf Coast
Refinery Net	Production of Motor	Texas Gulf Coast	Texas Gulf Coast	Texas Gulf Coast	Refinery Net
Production of	Gasoline, Finished,	Refinery Net	Refinery Net	Refinery Net	Production of
<b>Conventional Motor</b>	Conventional, Ed55	Production of Other	Production of	Production of	Commercial
Gasoline with Fuel	and Lower	<b>Conventional Motor</b>	Aviation Gasoline	Kerosene-Type Jet	Kerosene-Type Jet
Ethanol (Thousand	(Thousand Barrels	Gasoline (Thousand	(Thousand Barrels	Fuel (Thousand	Fuel (Thousand
Barrels per Day)	per Day)	Barrels per Day)	per Day)	Barrels per Day)	Barrels per Day)
14	. 14	429	4	. 313	278
16	16	445	2	354	317
16	5 16	389	2	350	334
16	5 16	310	4	. 389	359
16	5 16	324	2	345	291
17	· 17	387	5	347	310
17	' 17	422	3	362	314
17	17	339	3	363	312
17	′	420	3	379	338
16	16	409	4	357	335
16	16	455	3	389	354
16	16	491		364	327
16	16	438	2	336	298
16	16	482	4	352	315
16	16	404	2	352	308
16	16	424	4	381	347
16	16	442	4	313	286
17	17	390	3	325	294
17	17	448	4	389	352
17	17	3//	3	303	338
16		327	2	316	297
17	17	297	2	294	252
10	) IO	442	0	374	347
14	. 14	5/9	4	· 390	· 357
	) [] 3   4 A	507	4	353	· 323
14	· 14	497	3	312	. 333
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14	. 14	402	ļ	3/0	J 34 I

14	14	403	2	415	389
14	14	410	2	431	388
15	15	439	1	422	389
15	15	460	3	352	346
14	14	470	3	345	316
15	15	465	4	378	341
14	14	535	4	392	362
14	14	535	2	432	398
13	13	470	2	350	313
16	16	406	0	364	342
16	16	434	3	389	349
15	15	333	3	412	380
16	16	299	3	402	361
16	16	354	2	417	376
17	17	374	2	452	423
16	16	352	2	452	405
15	15	350	2	417	396
15	15	426	3	379	336
14	14	440	2	439	399
14	14	470	3	424	392
14	14	444	2	374	339

Refining District Texas Gulf Coast Refinery Net Production of Military Kerosene-Type Jet Fuel (Thousand Barrels per Day)	Refining District Texas Gulf Coast Refinery Net Production of Kerosene (Thousand Barrels per Day)	Refining District Texas Gulf Coast Refinery Net Production of Distillate Fuel Oil (Thousand Barrels per Day)	Refining District Texas Gulf Coast Refinery Net Production of Distillate Fuel Oil, 0 to 15 ppm Sulfur (Thousand Barrels per Day)	Refining District Texas Gulf Coast Refinery Net Production of Distillate Fuel Oil, Greater than 15 to 500 ppm Sulfur (Thousand Barrels per Day)	Refining District Texas Gulf Coast Refinery Net Production of Distillate Fuel Oil, Greater Than 500 ppm Sulfur (Thousand Barrels per Day)
34		1129	1065	29	35
37		1097	1089	-5	13
16		1037	997	18	22
30		1043	1014	11	18
54		1285	1242	1	42
37		1318	1244	34	40
48		1386	1306	35	44
50		1295	1210	23	62
41		1294	1234	21	39
22		1373	1296	27	50
35		1412	1330	32	50
38	~	1383	1320	30	33
38	2	2 1207	1215	25	27
37	1	1227	100	30	20
44		12/0	1217	40	21
30 27	2	1000 12/10	12/0	აი იე	17
21		1340	1203	23	42
31	-4	1299	1240	9	4J 50
25	1	1367	1010	20	60
10	-1	1252	1181	10	62
42	-1	1153	1037	34	82
	ſ	) 1319	1235	20	64
38	C C	) 1432	1358	30	44
30	C C	1332	1231	36	65
40		1284	1208	28	48
27		1338	1273	42	22
37		1327	1261	41	25

26		1261	1172	27	62
43		1342	1268	20	54
33		1400	1336	20	44
6		1337	1264	27	46
29		1334	1258	37	39
36	0	1331	1257	33	41
30		1390	1322	27	41
34	0	1374	1321	24	29
37		1159	1110	17	32
22		1121	1056	27	38
40		1319	1277	10	32
32	0	1210	1171	12	27
41	0	1262	1216	22	24
41	0	1326	1277	4	44
29	2	1347	1305	7	35
47	0	1315	1263	8	44
21	1	1234	1160	21	53
44	4	1145	1035	27	83
40	0	1291	1221	15	56
32		1396	1334	17	45
36	0	1353	1301	20	32

Refining District Texas Gulf Coast Refinery NetRefining District Texas Gulf Coast Refinery NetTexas Gulf Coast Refinery Net <t< th=""></t<>
Refining District Texas Gulf Coast Refinery NetTexas Gulf Coast Refinery Net<
Texas Gulf Coast Refinery Net Production of Residual Fuel Oil Residual Fuel Oil per Day)Refinery Net Production of Residual Fuel Oil, Less than 0.31% Sulfur (Thousand Barrels per Day)Refinery Net Production of Residual Fuel Oil, Less than 0.31% Sulfur (Thousand Barrels per Day)Refinery Net Production of Residual Fuel Oil, Less than 0.31% Sulfur (Thousand Barrels per Day)Refinery Net Production of Residual Fuel Oil, ORefinery Net Production of Residual Fuel Oil, Greater Than 1% Sulfur (Thousand Barrels per Day)Refinery Net Production of Residual Fuel Oil, ORefinery Net Production of Residual Fuel Oil, Greater Than 1% Sulfur (Thousand Barrels per Day)Refinery Net Production of Petrochemical FeedstocksProduction of Naphtha for Petrochemical Feedstocks720135919214910601392183146140012127141108141165015132193141147015132193141189015742031529801583211152680115718813680970180137711259174135
Refinery Net Production of Residual Fuel Oil (Thousand Barrels per Day)Production of Residual Fuel Oil Less than 0.31% Sulfur (Thousand Barrels per Day)Production of Residual Fuel Oil, Less than 0.31% Sulfur (Thousand Barrels per Day)Production of Residual Fuel Oil, 0.31 to 1.00% Sulfur (Thousand Barrels per Day)Production of Residual Fuel Oil, Greater Than 1% Sulfur (Thousand Barrels per Day)Naphtha for Petrochemical Feedstocks (Thousand Barrels per Day)7201359192149106013921831461400121271411081411650151321931411470151321931411890157420315298015832111529801583211152680115718813680970180137711259174135
Production of Residual Fuel Oil (Thousand BarrelsResidual Fuel Oil, Less than 0.31%Residual Fuel Oil, 0.31 to 1.00% Sulfur (Thousand BarrelsResidual Fuel Oil, 0.31 to 1.00% Sulfur (Thousand BarrelsResidual Fuel Oil, 0.31 to 1.00% Sulfur (Thousand BarrelsPetrochemical FeedstockPetrochemical Feedstock72013591921491060139218314614001212714110816501513219314114701513219314189015742031529801583211152680115718813680970180137711259174135
Residual Fuel Oil (Thousand BarrelsLess than 0.31% Sulfur (Thousand Barrels per Day)0.31 to 1.00% Sulfur (Thousand Barrels per Day)Greater Than 1% Sulfur (Thousand Barrels per Day)Feedstocks (Thousand Barrels per Day)Feedstock Use (Thousand Barrels per Day)7201359192149106013921831461400121271411081650151501561171470151321931418901574203152980115718813680970180137711259174135
(Thousand Barrels per Day)Sulfur (Thousand Barrels per Day)(Thousand Barrels per Day)Sulfur (Thousand Barrels per Day)(Thousand Barrels per Day)(Thousand Barrels) per Day)(Thousand Barrels) (Thousand Barrels)(Thousand Barrels) (Thousand Barrels)(Thousand Barrels) (Thousand Barrels)(Thousand B
per Day)Barrels per Day)per Day)Barrels per Day)per Day)per Day)72013591921491060139218314614001212714110816501515015611714701513219314189015742031529801583211152680115718813680970180137711259174135
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71 12 59 174 135
88 12 76 191 148
90 0 9 81 216 137
1179108205146
88 0 7 80 200 135
102 9 93 186 133
71 0 10 61 175 114
69 0 10 59 162 97
85 0 10 75 168 100
58 9 50 195 125
57 5 52 177 123
51 8 43 1/5 138 66 11 55 195 135
50 11 30 100 130 50 11 20 106 150
70 12 12 67 206 153
12   01   200   103   07   105   135   1
08 3 95 185 172
96 5 92 167 112

91		9	82	174	105
98		8	90	161	100
64		7	57	156	92
57	-4	7	54	176	121
82		8	75	188	131
54		7	47	194	144
42		7	36	184	138
47		5	42	197	144
22		6	16	183	132
46		7	38	178	118
79		7	72	181	125
119		8	112	192	140
88		7	82	177	140
61		4	57	182	131
93		4	89	190	141
67		6	60	190	130
74		4	71	189	127
82		6	76	180	113
101		5	96	172	120
79		5	74	183	128
62		3	59	178	127

<b>Refining District</b>						
Texas Gulf Coast			Refining District			
Refinery Net		Refining District	Texas Gulf Coast	Refining District		
Production of Other	Refining District	Texas Gulf Coast	Refinery Net	Texas Gulf Coast	Refining District	
Oils for	Texas Gulf Coast	Refinery Net	Production of	Refinery Net	Texas Gulf Coast	
Petrochemical	Refinery Net	Production of	Naphthenic	Production of	Refinery Net	
Feedstock Use	Production of Special	Lubricants	Lubricants	Paraffinic Lubricants	Production of Waxes	
(Thousand Barrels	Naphthas (Thousand	(Thousand Barrels	(Thousand Barrels	(Thousand Barrels	(Thousand Barrels	
per Day)	Barrels per Day)	per Day)	per Day)	per Day)	per Day)	
44	26	55	5 2	2 53	3 5	<i>;</i>
37	21	52	2 1	5	1 5	<i>;</i>
33	24	48	3 2	2 46	6 4	ł
40	27	50	) 2	2 48	3 5	<i>;</i>
52	25	70	) 2	2 68	3 5	<i>;</i>
51	30	58	3 2	2 56	6 3	3
59	26	64	1 2	2 62	2 5	<i>;</i>
52	25	62	2 2	2 6'	1 5	5
43	19	65	5 2	2 63	3 4	ł
40	28	55	5 2	2 54	4 4	ł
43	28	59	9 2	2 57	7 4	ł
79	25	51	1 2	2 49	9 1	l
59	26	49	) 2	2 47	7 4	ł
66	26	45	5 2	2 43	3 4	ł
52	27	56	6 2	2 54	4 3	5
61	25	61	1 2	2 59	9 4	ł
65	29	58	3 2	2 56	6 3	5
69	29	39	)	38	3 3	3
69	28	62	2 2	2 60	) 4	ł
58	26	67	7 2	2 65	5 5	<i>;</i>
54	23	61	1 2	2 60	) 4	ł
37	26	48	3 (	) 48	3 4	ł
49	24	47	7	46	6 3	3
43	25	34	4 2	2 32	2 1	I
53	25	38	3 1	37	7 1	l
47	26	51	1 2	2 49	9 1	
63	20	47	7 3	3 44	4 1	l
55	20	59	9 2	2 57	7 2	2

69	22	61	2	59	1
61	23	59	2	57	1
63	24	64	2	62	1
55	26	66	2	65	2
57	23	62	2	60	1
50	21	66	2	64	2
46	24	61	2	59	1
54	18	61	2	59	1
51	27	32	2	30	2
61	25	27	2	26	1
56	25	45	1	44	1
52	25	56	1	55	1
37	17	60	2	58	2
52	19	60	2	58	1
48	19	63	2	61	1
60	22	61	2	59	1
62	22	58	1	57	1
67	24	61	1	60	1
52	19	61	2	58	1
55	21	59	2	57	1
51	21	55	2	54	2

	Refining District				Refining District
Refining District	Texas Gulf Coast	Refining District	Refining District		Texas Gulf Coast
Texas Gulf Coast	Refinery Net	Texas Gulf Coast	Texas Gulf Coast	Refining District	Refinery Net
Refinery Net	Production of	Refinery Net	Refinery Net	Texas Gulf Coast	Production of
Production of	Petroleum Coke	Production of	Production of	Refinery Net	Miscellaneous
Petroleum Coke	Marketable	Petroleum Coke	Asphalt and Road Oil	Production of Still	Petroleum Products
(Thousand Barrels	(Thousand Barrels	Catalyst (Thousand	(Thousand Barrels	Gas (Thousand	(Thousand Barrels
per Day)	per Day)	Barrels per Day)	per Day)	Barrels per Day)	per Day)
239	180	59	9	195	25
221	168	53	8	181	24
229	163	65	10	184	25
255	187	68	11	193	26
267	200	67	11	196	28
296	228	69	11	219	30
306	237	69	10	223	31
288	220	68	13	216	29
293	224	69	15	215	29
291	223	69	7	215	31
292	224	68	10	218	33
284	217	67	8	211	32
267	201	66	12	196	29
251	180	05	11	183	28
271	204	07 70	10	196	29
311	241	70	9	207	33
209	219	70	11	203	<b>১</b> । ১০
203	209	74	10	217	JZ 22
302 297	220	70	11	217	
207	217 210	53	10	220	
203	210	50	14	213	20
207 201	200	75	10	201	20
290	215	75	12	203	30
200	210	65	8	195	34
279	217	61	16	180	33
284	218	66	14	183	33
256	191	65	13	193	31

268	207	61	10	177	31
281	219	62	9	184	34
296	226	70	13	192	34
278	209	69	12	195	32
264	198	67	14	183	31
279	219	60	13	185	32
290	226	65	13	193	34
297	228	69	9	202	37
271	207	64	6	177	33
273	208	65	14	184	31
292	226	66	13	193	33
255	188	66	8	191	32
277	210	67	10	199	33
293	226	67	11	208	31
307	239	69	14	208	33
291	226	66	17	200	32
286	220	66	10	199	32
257	192	65	10	177	28
300	232	68	10	188	33
293	226	67	9	192	35
294	227	66	9	189	35

Refining District Texas Gulf Coast Refinery Net Production of Miscellaneous Petroleum Products for Fuel Use (Thousand Barrels	Refining District Texas Gulf Coast Refinery Net Production of Miscellaneous Petroleum Products for Nonfuel Use (Thousand Barrels	Refining District Texas Gulf Coast Refinery Processing Gain (Thousand
per Day)	per Day)	Barrels per Day)
	25	-321
	24	-275
	25	-303
	26	-325
	28	-331
	30	-354
	31	-344
	29	-362
	29	-359
	31	-351
	33	-372
	32	-359
	29	-322
	28	-317
	29	-288
	33	-335
	31	-291
	32	-355
	33	-344
	32	-347
	28	-238
	26	-274
	30	-342
	30	-280
	34	-336
	33	-322
	33	-320
	31	-343

31	-324
34	-297
34	-334
32	-337
31	-302
32	-329
34	-327
37	-335
33	-302
31	-309
33	-331
32	-345
33	-362
31	-362
33	-373
32	-341
32	-353
28	-315
33	-350
35	-355
35	-355

	2013	2014	2015	2016
Exports	1,604	1,799	2,178	2,325
Production	3,138	3,176	3,270	3,149
Percentage	51%	51% 57%		74%
	2013	2014	2015	2016
Not Exported	1,534	1,377	1,092	824
Exported	1,604	1,799	2,178	2,325













## Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of Expert Joseph P. Suntum in Support of Landowner Intervenors

State of Maryland		)
		) ss.
Montgomery County	)	

1	Q:	Please state your name.
2	A:	My name is Joseph P. Suntum.
3	Q:	Mr. Suntum is Attachment No. 1 to this sworn statement a true and accurate copy of
4		your most recent CV or Resume?
5	A:	Yes it is.
6	Q:	Does your CV describe your educational background and relevant professional
7		experiences?
8	A:	Yes.
9	Q:	Is Attachment No. 2 to this sworn statement a copy of your Expert Report in this
10		matter?"
11	A:	Yes it is.
12	Q:	What were you asked to do?
13	А.	I was asked to review TransCanada's proposed Easement and Right of Way Agreements that
14		were provided to the Landowner Intervenors in this matter and to review them for any
15		language, terms, or provisions that may be problematic for the Landowner, and/or the local
16		and state government of Nebraska. My understanding is that the Public Service Commission
17		is reviewing an Application for Permit of a preferred route for the proposed Keystone XL
18		pipeline across Nebraska and that TransCanada must prove their proposed preferred route is
19		in the public interest of Nebraska. Because an Easement and Right of Way Agreement is the
20		controlling contract between a condemnor, here TransCanada, and the Landowner and
1		because it governs the rights, responsibilities, and restrictions of both parties, I was asked to
----	-----------	--
2		evaluate the form Agreement proposed to be used by TransCanada in terms of its impacts on
3		property rights, economic interests, and the public interest.
4	Q:	How many years have you been a licensed lawyer?
5	A:	35 years.
6	Q:	In those years have you had the opportunity to review many contracts and agreements.
7	A:	Yes.
8	Q:	Would you say you have reviewed hundreds of contracts and agreements?
9	A:	Yes, certainly.
10	Q:	What type of law, if any, do you specialize in?
11	A:	I focus my practice on Eminent domain and condemnation.
12	Q:	Can you briefly explain what condemnation and eminent domain is please?
13	A:	Eminent Domain is the power of the sovereign to take privately owned property for a public
14		use. Both the United States' constitution and the constitution of most, if not all, States require
15		the payment of just compensation to the property owner for the property rights being taken
16		and the damage caused, if any, to the remainder of the landowner's property. The limitation
17		on the government's use of eminent domain in our federal constitution is in the Fifth
18		Amendment in a clause commonly known as the "takings clause." The exact language of the
19		takings clause is "nor shall private property be taken for public use, without just
20		compensation."
21	Q:	Is that language from the takings clause of the federal constitution also found in state
22		constitutions?
23	A:	In my experience the language found in state constitutions is often identical or very close to
24		the federal language.
25	Q:	Did you familiarize yourself for the relevant language within the Nebraska state
26		constitution?
27	A:	Yes I did.
28	Q:	And what is that language?
29	<b>A:</b>	Article 1 Section 21 of the Nebraska Constitution states "The property of no person shall be
30		taken or damaged for public use without just compensation therefor."
31	Q:	Okay, and so what is condemnation then?
32	A:	Condemnation is the process of the exercise of the power of eminent domain. This is the
33		process where the property in question is condemned or taken. Typically there is an effort to

1 negotiate a voluntary purchase of the needed property rights from the landowner. If the 2 Landowner and the Condemnor cannot reach agreement, the condemnor may file a 3 condemnation action in which the compensation to be paid to the landowner will be 4 determined.

5

### Q: Will the court review the condemnor's right to take the property in question?

6 A: The decision whether to condemn—and whether the subject property is necessary for a 7 public use—is a legislative decision, which the courts generally will not overrule, unless the 8 decision is arbitrary or capricious, or failed to meet applicable legislative prerequisites. 9 Consequently, once the legislature has authorized the exercise of eminent domain the 10 landowner's sole remedy is limited to receiving just compensation for the taking. The court 11 will not modify the terms of an approved easement agreement. Consequently, the scope and 12 terms of any easement to be condemned by TransCanada must be set by the PSC.

13 Q: What is the Easement and Right-of-Way Agreement in the context of condemnation?

- A: An Easement and Right of Way Agreement is the document which states the rights and
   obligations of both the Grantee (the condemning authority or entity) and the Grantor
   (landowner). An easement should clearly spell out all the rights and obligations of both
   parties with respect to the use of the subject property.
- Q: If you were to estimate the number of easements you have reviewed or negotiated in
   your professional role as a lawyer working in condemnation over the length of your
   career would that be hundreds?
- 21 A: Yes, hundreds of easements and right of way agreements.
- Q: In Attachment No. 2 to your sworn testimony, your Expert Report, did you come to any
   professional opinions about TransCanada's proposed Easement and Right-of-Way
   Agreement language?

25 A: Yes, I did.

- Q: Are those opinions held by you with a reasonable degree of professional certainty based
   upon your education, background, training, and relevant work experiences?
- A: Yes they are, and I incorporate my Report and the opinions therein into my testimony as
  though set forth fully herein.
- 30

Joseph P. Suntum

Subscribed and Sworn to before me this \_\_\_\_\_ day of June, 2017.

STATE OF MARYLAND )	
COUNTY OF Montgomen ) to	o wit:
I HEREBY CERTIFY that on this	day of <u>une</u> , before me, the
subscriber, a Notary Public, in and for the	State and County aforesaid, personally appeared ledged that he has executed the foregoing for the
purposes therein contained as his act and deed	SUSAN M. JECKO
WITNESS my hand and Notarial Seal.	PUBLIC PUBLIC Wy Commission Expires October 18, 2017
a) al a	Smerring m & al
My Commission Expires: 10 18 2011	Notary Public

Attachment No. 1

### **Current Practice 1988-Present**

Miller, Miller & Canby, Chtd., 200-B Monroe Street, Rockville, Maryland

- Managing Shareholder (1997 2007)
- Principal, Litigation Department

AV Preeminent Rating with Martindale Hubbell – <u>www.Martindale.com</u> Selected to Maryland Super Lawyers 2007 – <u>www.SuperLawyers.com</u> *Successfully* tried both murder cases and multi-million dollar civil actions

Personal practice focuses on civil trial and appellate work concerning real estate, and focused primarily on eminent domain and condemnation.

### **Previous Professional Experience**

Office of the Public Defender, Montgomery County, Maryland, 1983-1988 Circuit Court for Baltimore City, Maryland, 1982-1983 - Law Clerk to the Honorable Elsbeth Levy Bothe

## **Educational Background**

University of Maryland School of Law - J.D., 1982 University of Maryland B.S., 1979 University of Montana 1975-1977

### Associations

Maryland Attorney Member of the Owners Counsel of America

### **Bar Association Memberships/Activities/Positions**

Character Committee of the Court of Appeals for the 6<sup>th</sup> Judicial Circuit (1992-1997)
Bar Association for Montgomery County, Maryland (Secretary 1996-1997; Executive Committee 1997-1999; Legal Services Task Force 1998; Long-Range Planning Committee 1995, 1997, 2007)
Montgomery County Bar Foundation (Board of Directors 2005-2009)
Maryland State Bar Association (Cost of Litigation Task Force 1999-2000)
Alan J. Goldstein Inn of Court (Master; Treasurer, 1997-1998; Secretary, 1998-2000)
Montgomery Inns of Court (Barrister, early 1990s)

### **Reported Cases:**

Montgomery County v. Phillips, 445 Md. 55 (2015) Boland v. Boland, 423 Md. 296 (2011); Boland v. Boland, 194 Md. App. 477 (2010) cert. granted 417 Md. 500 (2011); Lasater v. Guttmann, 194 Md. App. 431 (2010); Circuit City Stores, Inc. v. Rockville Pike Joint Venture Ltd. Partnership, 376 Md. 331 (2003); 8621 Ltd. Partnership v. LDG, Inc., 169 Md. App. 214 (2006); Golub v. Cohen, 138 Md. App. 508 (2001); Buxton v. Buxton, 363 Md. 634 (2001); Schochet v. State, 320 Md. 714 (1990); State v. Calhoun, 306 Md. 692 (1986); State v. Tichnell, 306 Md. 428 (1986). Attachment No. 2

### Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP For Route Approval of Keystone XL Pipeline Project, Pursuant to *MOPSA* 

### **Intervenors:**

Susan Dunavan and William Dunavan, **Bartels Farms. Inc.** Johnnie Bialas and Maxine Bialas, **Bonnie Brauer.** James Carlson and Christine Carlson, **Timothy Choat, Gary Choat Farms LLC,** and Shirley Choat Farms, LLC, CRC, Inc., Daniel A. Graves and Joyce K. Graves, Patricia A. Grosserode a/k/a Patricia A. Knust. Terri Harrington, Donald C. Loseke and Wanda G. Loseke, Arla Naber and Bryce Naber, Mary Jane Nyberg, Kenneth Prososki and Karen Prososki, **Edythe Sayer**, Dan Shotkoski and Clifford Shotkoski, Leonard Skoglund and Joyce Skoglund, John F. Small and Ginette M. Small, Deborah Ann Stieren and Mary Lou Robak, Jim Tarnick, Terry J. Van Housen and Rebecca Lynn Van Housen. Donald D. Widga, Byron Terry "Stix" Steskal and Diana Steskal, Allpress Brothers, LLC, Germaine G. Berry, Karen G. Berry, Cheri G. Blocher and Michael J. Blocher, L.A. Breiner and Sandra K. Breiner,

**Application No: OP-003** (Filed by Applicant on 2/16/17)

Report of Joseph P. Suntum Expert Witness In Support of Landowner Intervenors Jerry Carpenter and Charlayne Carpenter, CHP 4 Farms, LLC, Larry D. Cleary, Jeanne Crumly and Ronald C. Crumly, Ken Dittrich. Lloyd Z. Hipke and Vencille M. Hipke. **R.** Wynn Hipke and Jill Hipke, **Richard Kilmurry and Bonnie Kilmurry, Rosemary Kilmurry**, **Beverly Krutz and Robert Krutz,** LJM Farm, LLC, **Carol Manganaro**, Frankie Maughan and Sandra Maughan, **Beverly Miller and Earl Miller,** Edna Miller and Glen Miller, Milliron Ranch, LLC, Frank C. Morrison and Lynn H. Morrison, Larry D. Mudloff, J.D. Mudloff, and Lori Mudloff, Constance Myers a/k/a Constance Ramold, Nicholas Family Limited Partnership, Ann A. Pongratz and Richard J. Pongratz, **Donald Rech**, Schultz Brothers Farms, Inc., **Connie Smith and Verdon Smith,** Joshua R. Stelling, **Richard Stelling and Darlene Stelling**, Todd Stelling and Lisa Stelling, Arthur R. Tanderup and Helen J. Tanderup, TMAG Ranch, LLC, Tree Corners Farm, LLC, **Dave Troester and Sharyn Troester,** and **Gregory Walmer and Joanne Walmer,** 

Intervenors,

# **Credentials & Representative Cases**

 My name is Joseph P. Suntum. I am a lawyer practicing law with the law firm Miller, Miller, and Canby, Chartered in Rockville, Maryland. I was admitted to the Maryland Bar in 1982. I have been with the firm of Miller, Miller & Canby since 1988. The firm is based in Rockville, Maryland, although my eminent domain practice is State-wide. I am a principal in the firm and the Eminent Domain Practice Group Leader. My first year of practice was spent clerking for The Honorable Elsbeth Levy Bothe of the Circuit Court for Baltimore City, Maryland. I then served four years as an Assistant Public Defender for the State of Maryland in the Montgomery County, Maryland office. My area of practice since 1988 has been in litigation handling matters in a wide variety of subject areas, but primarily in real estate related disputes and eminent domain. For the last dozen years or so I have focused my practice primarily in the field of eminent domain, principally representing property owners and defending their property rights and entitlement to full just compensation when their property is taken. I am the Owners' Counsel of America member attorney for the State of Maryland. The Owners' Counsel of America is a national network of experienced condemnation attorneys who represent property owners against federal, state and local governments, as well as other entities granted eminent domain authority. Membership in the Owners' Counsel of America is selective and restricted to one member attorney per state.

- 2. Through my work in the field of eminent domain, as well as in general real estate litigation matters, I have reviewed many dozens of easements in real property. An easement is the controlling document which establishes the rights and responsibilities of the grantee and the landowner, including how the grantee may use the owner's property, and the limitations imposed upon the owner's use of the property once the easement is given, or, in the case of eminent domain, taken. A full and complete understanding of the terms of an easement is required to evaluate the impact of the easement on the owner's property rights and the value of the property.
- 3. A true and accurate copy of my current CV or Resume is attached as Exhibit 1 to this Report.

# Overview

4. On February 16, 2017, TransCanada Keystone Pipeline, LP, ("TransCanada") submitted to the Nebraska Public Service Commission ("PSC") an Application for approval of its preferred crude oil pipeline route across Nebraska.<sup>1</sup> This submission was made pursuant to Nebraska's Major Oil Pipeline Siting Act ("MOPSA")<sup>2</sup>. TransCanada is requesting that the PSC find that TransCanada's proposed crude oil pipeline route is in the public interest of Nebraska and

<sup>&</sup>lt;sup>1</sup><u>http://www.psc.nebraska.gov/natgas/Keystone/20170216%20KXL%20PSC%20Application%20with%2</u> <u>0attachments.pdf</u>

<sup>&</sup>lt;sup>2</sup> Nebraska Revised Statutes Sections <u>57-1401</u> to <u>57-1413</u>

Nebraskans and that, therefore, TransCanada should be able to act under *Neb. Rev. Stat.* § 57-1101 and exercise the statutorily-specified power of eminent domain against the owners of land along its preferred route.

- 5. According to the provisions of MOPSA, one of the purposes of the Act is to "Ensure the welfare of Nebraskans, including protection of property rights, aesthetic values, and economic interests."<sup>3</sup>
- 6. When addressing the question of "protection of property rights" in a context where PSC approval of TransCanada's Application would trigger TransCanada's ability to exercise eminent domain powers over the land of private citizens of Nebraska, the PSC should carefully analyze the proposed Easement and Right of Way Agreement that would define the rights and responsibilities of TransCanada in regards to the Nebraska land it would place its pipeline on, under, across, and through.
- 7. This Report is designed to assist the PSC with their evaluation of whether or not TransCanada's proposed Easement and Right of Way Agreement in fact "ensures the welfare of Nebraskans, including protection of property rights..." and therefore, whether or not approval of TransCanada's preferred route is in the public interest. This report and opinion does not address the amount of just compensation that will be due to the landowner for any property rights taken.
- 8. My ultimate conclusion is that TransCanada's proposed Easement and Right of Way Agreement does not protect the property rights of Nebraska citizens, here primarily the Landowner Intervenors whose property rights would be directly affected should TransCanada's preferred route application be approved, and, consequently approval of the proposed route is not in the public interest of Nebraska or Nebraskans.
- 9. In the event that the PSC votes to approve TransCanada's application, the specific terms of the easement to be taken should be determined by the PSC and TransCanada should be prohibited from using its granted authority of eminent domain to solicit greater or more disadvantageous terms from Nebraska landowners.
- 10. I reserve the right to amend or modify this Report should information or facts become known to me that were not known as of the date this report was prepared.

<sup>&</sup>lt;sup>3</sup> <u>http://nebraskalegislature.gov/laws/statutes.php?statute=57-1402</u> (1)(a)

# Documents, Data, and/or Evidence Referenced or Reviewed

- 11. In preparation of this Report and my opinions expressed herein, I have reviewed the following:
  - a. Portions of TransCanada's February 16, 2017 Application to the PSC<sup>4</sup>
  - b. The Major Oil Pipeline Siting Act<sup>5</sup>
  - c. *Neb. Rev. Stat.* § 57-1101<sup>6</sup>
  - d. The Oil Pipeline Reclamation  $Act^7$
  - e. Neb. Rev. Stat. §§ 76-701 thru 76-726 Eminent Domain
  - f. Pertinent Nebraska case law and constitutional provisions
  - g. An exemplar of Nebraska County Court files for the Condemnation lawsuits filed against Nebraska landowners by TransCanada on or about January 20<sup>th</sup>, 2015.
  - h. An exemplar Easement and Right of Way Agreement proposed by TransCanada to be used for easements across Nebraska land (Attached as Exhibit 2)
  - TransCanada's Keystone XL Project Map Figure 2.2-2 and Figure 4.3.3-B I-90 Corridor Alternative A and B Key Aquifers and Potable Water Wells within 2-mile Corridor (Attached as Exhibit 3)

# My Assignment

12. I was contacted by Brian Jorde, lawyer for Landowner Intervenors. I was asked to review an exemplar Easement and Right of Way Agreement as drafted by TransCanada and attached to their Condemnation Petition in its 2015 lawsuits against each of the Nebraska Landowner Intervenors to determine what the impact on the landowners' property rights the proposed easement would have based on applicable real estate law and the proposed easement's language, terms, and provisions. My analysis and opinions herein focus on the question of protection of landowner property rights and their entitlement to just compensation should the proposed easements be condemned.

<sup>&</sup>lt;sup>4</sup>http://www.psc.nebraska.gov/natgas/Keystone/20170216%20KXL%20PSC%20Application%20with%2 <u>0attachments.pdf</u>

<sup>&</sup>lt;sup>5</sup> Nebraska Revised Statutes Sections <u>57-1401</u> to <u>57-1413</u>

<sup>&</sup>lt;sup>6</sup> <u>http://nebraskalegislature.gov/laws/statutes.php?statute=57-1101</u>

<sup>&</sup>lt;sup>7</sup> Nebraska Revised Statutes Sections <u>76-3301</u> to <u>76-3308</u>

# **Foundational Concepts**

- 13. Eminent Domain as set forth in *Thompson v. Heineman*, 289 Neb. 798, 857 N.W.2d 731 (2015):
  - a. A citizen's property may not be taken against his or her will, except through the sovereign powers of taxation and eminent domain, both of which must be for a public purpose.
  - b. Eminent domain is the State's inherent power to take private property for a public use.
  - c. The State's eminent domain power resides in the Legislature and exists independently of the Nebraska Constitution. But the constitution has limited the power of eminent domain, and the Legislature can limit its use further through statutory enactments.
  - d. Under *Neb. Const. art. I, § 21*, the State can take private property only for a public use and only if it pays just compensation.
  - e. Only the Legislature can authorize a private or public entity to exercise the State's power of eminent domain.
  - f. Under the Nebraska Constitution's limitation on the power of eminent domain, pipeline carriers can take private property only for a public use. That minimally means that a pipeline carrier must be providing a public service by offering to transport the commodities of others who could use its service, even if they are limited in number.

Importantly, *Neb. Rev. Stat.* § 57-1101, provides that only "so much of any lot, land, real estate, right-of-way, or other property *as may be reasonably necessary for the laying, relaying, operation, and maintenance of any such pipeline or the location of any plant or equipment necessary to operate such pipeline, shall have the right to acquire the same for such purpose through the exercise of the power of eminent domain...." (Emphasis added). Thus, to the extent TransCanada's proposed Easement and Right of Way Agreement seeks to acquire broader rights in Nebraskan landowners' property than is reasonably necessary to lay, operate or maintain the subject pipeline, its easement and proposed route for the pipeline violate Nebraska law and are not in the public interest of Nebraska or Nebraskans.* 

- 14. Condemnation Village of Memphis v. Frahm, 287 Neb. 427, 843 N.W.2d 608 (2014):
  - a. "A condemnation proceeding is 'the exercise of eminent domain by a governmental entity." *Pinnacle Enters. v. City of Papillion*, 286 Neb. 322, 332–33, 836 N.W.2d 588, 596 (2013).
  - b. The legislature controls the authority to exercise the power of eminent domain. The power may be delegated. The Nebraska legislature, with *Neb. Rev. Stat.* § 57-1101, delegated specified, limited eminent domain authority to companies such as TransCanada that engage in transporting crude oil in interstate commerce through or across the State of Nebraska or intrastate within the State. But the delegation is restricted, as noted above, and it is in the public interest of Nebraska and Nebraskans that the exercise of this power by a foreign, for-profit corporation over the citizens of Nebraska be strictly controlled by the PSC.

# 15. Easement

An easement conveys a property interest in real property and sets forth the rights of the Grantor (fee simple owner) and Grantee (easement owner). The owner of fee simple title to the property is the servient tenant, as its ownership is subject to the superior rights of the easement owner. The easement owner is the dominant tenant, as its rights to use the property as authorized by the easement is superior to that of the fee simple property owner. For example, an easement for ingress and egress will prohibit the fee simple owner from doing anything with the subject property that would interfere with the easement owner's use of the property for ingress or egress. Thus, the grant—or taking by eminent domain—of an easement in otherwise freely held real property will necessarily, significantly and negatively affect the fee owner's property rights in the subject land.

Kovanda v. Vavra, 10 Neb. App. 486 633, N.W.2d 576 (2001):

- a. An easement is usually defined as a right in the owner of one parcel of land, by reason of such ownership, to use the land of another for a special purpose not inconsistent with the general property right of the owner.... The owner of the easement may make use of it only for the special purpose that gave rise to the easement itself. (Citation omitted.) *Paloucek v. Adams*, 153 Neb. 744, 747, 45 N.W.2d 895, 897 (1951).
- b. "The servient owner of land subject to an easement may make such use of it as he sees fit, subject only to the right of the dominant owner of

the easement to use it for the purposes out of which the right arose." *Jurgensen v. Ainscow*, 155 Neb. 701, 710, 53 N.W.2d 196, 201 (1952) (involving prescriptive easement).

c. "The servient owner may make any use of it that he cares to make so long as he does not interfere with the rights of the dominant owner of the easement." *Paloucek*, 153 Neb. at 747, 45 N.W.2d at 897.

## TransCanada's Proposed Easement and Right of Way Agreement

An exemplar copy of the form Easement and Right of Way Agreement proffered by TransCanada to Nebraska landowners in its 2015 litigation is attached as Exhibit 2 ("TransCanada's Form Easement"). As discussed below, approval of TransCanada's Form Easement is not in the public interest of the landowners, Nebraskans, or the State of Nebraska.

Initially, TransCanada's Form Easement provides that it is perpetual and permanent.<sup>8</sup> A permanent easement exceeds the grant of eminent domain authority and is not in the interest of Nebraska or the affected landowners. As noted above, *Neb. Rev. Stat.* § 57-1101 grants eminent domain authority to companies engaged in the business of transporting or conveying crude oil, petroleum, gases or other products either intrastate or interstate through or across the State of Nebraska. Further, *Neb. Rev. Stat.* § 57-1101 provides that only "so much of any lot, land, real estate, right-of-way, or other property as may be reasonably necessary for the laying, relaying, operation, and maintenance of any *such* pipeline or the location of any plant or equipment necessary to operate *such* pipeline," may be taken by eminent domain. At a minimum, any easement taken by TransCanada should be only for so long as it is used for the purpose for which eminent domain authority was granted. The easement should, by its express terms, terminate automatically when such use ceases.

TransCanada's Form Easement states affirmatively that it is for "the purposes of surveying, laying, constructing, inspecting, maintaining, operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline..." and provides for the express exclusion of just one specified non-permitted use, namely, the right to construct or operate above-ground high voltage electrical transmission lines. The implication that one specified use is prohibited implies that other unstated, but

<sup>&</sup>lt;sup>8</sup> TransCanada's Form Easement, opening paragraph.

unauthorized, uses may be permitted. The easement should expressly state that it may be used *solely* for the purpose authorized.

TransCanada's Form Easement provides<sup>9</sup> that TransCanada, or its successors and assigns, may abandon the pipeline in place when its use ceases. This right exceeds TransCanada's limited right of eminent domain and should be excluded. Obviously, TransCanada inserted this "right" into its form easement to avoid the cost of restoring Nebraska landowners' property to its pre-existing condition when its use of the easement—and the easement itself—terminates. The grant of eminent authority from the legislature to TransCanada did not authorize the passing of this cost to Nebraska landowners and it is not in the interest of Nebraska or Nebraskans. At a minimum, if the PSC determines that TransCanada's authority extends this distance, the easement should expressly provide that just compensation to the landowners should be calculated based upon the assumption that the pipeline will be abandoned in place and that Nebraska landowners should be compensated for the impact such abandonment will have on the value of their property and the damages that will result, or the costs to avoid that damage should be paid by TransCanada to the landowners as an element of just compensation.

TransCanada's Form Easement<sup>10</sup> initially sets a limited period of 24 months to occupy property outside the described easement area as "Temporary Work Space" to construct and install the pipeline. But the easement continues to provide caveats to that time limitation, which renders the actual time that the landowners' property will be occupied and disturbed by TransCanada unknown. The just compensation to be paid for the use of the landowners' property for construction activities is tied to the duration of such activities. TransCanada's obligation to pay the landowners their constitutional right to just compensation requires that if a longer period of use of the property is necessitated—for whatever reason—TransCanada should be required to pay the landowner additional compensation for that extended period. The right of eminent domain does not give the condemnor the right to use private property without just compensation even if the need to use the property results from "force majeure."

TransCanada's Form Easement<sup>11</sup> limits TransCanada's liability for all costs and expenses that result from its, or anyone acting on its behalf, use of the Easement Area or Temporary Work Space. It also seeks to impose liability on Nebraska landowners. Neither of these efforts are authorized by Nebraska's grant of eminent domain authority to TransCanada. Further, if TransCanada seeks to impose liability for negligence upon

<sup>&</sup>lt;sup>9</sup> Id.

<sup>&</sup>lt;sup>10</sup> Id. In first paragraph following the legal description of the subject property.

<sup>&</sup>lt;sup>11</sup> TransCanada's Form Easement at ¶ 1.

Nebraska landowners—an insurable risk—the cost to insure against that risk for the duration of the easement should be an element of just compensation paid to Nebraska landowners.<sup>12</sup>

TransCanada's Form Easement<sup>13</sup> provides broad discretion to TransCanada concerning its maintenance of the easement area and its authority to prohibit use of the easement area by the landowner. In order for the landowner to receive full just compensation for the property rights taken by TransCanada, including, but not limited to such discretionary rights in the future, the grant of approval by the PSC, if given, should require that just compensation be determined assuming TransCanada's exercise of all its discretion to the fullest extent against the landowners' interest. Otherwise, TransCanada would be permitted to take actions in the future for which the landowner never received just compensation.

TransCanada's Form Easement<sup>14</sup> permits TransCanada to install its pipeline, if necessary, less than 48" below the surface, but it does not require TransCanada in such event, to otherwise support and protect the pipeline sufficiently to allow the landowners' surface use of the property to continue without disturbance. In other words, the minimum depth of 48" is presumed to be sufficient to permit the landowner to farm, drive and otherwise use the property over the pipeline after the pipeline is installed. If for any reason the pipeline is installed at a depth less than 48" the landowners' use of the property—and thus its value—will be diminished without the receipt of just compensation. The easement should require TransCanada to support any pipeline installed to a depth of less than 48" to provide as much support as otherwise would be provided by a 48" depth.

TransCanada's Form Easement<sup>15</sup> states that the easement area depicted on the attached exhibit is merely approximate. The taking of an interest in real property and the consequent impact on the title to the property and its use demands precision. The exhibits attached to any easement should describe the burdened land with specificity and be surveyed, in order that the land records and the Nebraska landowners' title to, and use of, the remaining property not be impacted. Further, once the easement area is established

<sup>&</sup>lt;sup>12</sup> This risk is not unjustified. One need not look further than a November 3, 2015 lawsuit filed against Nemaha County, Nebraska landowner farmers who accidently struck two Magellan Midstream Partners, LP pipelines, one used to transport a mixture of gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged negligence and sued the Nebraska farmer for \$4,151,148.69. (A true and accurate copy of the Federal Court Complaint is here as Exhibit 4)

<sup>&</sup>lt;sup>13</sup> See, e.g. ¶ 3 TransCanada's Form Easement.

<sup>&</sup>lt;sup>14</sup>¶ 7 TransCanada's Form Easement.

<sup>&</sup>lt;sup>15</sup> ¶ 13 TransCanada's Form Easement.

and just compensation based on that established location is determined, TransCanada must not be permitted to relocate the easement area at its discretion without a corresponding obligation to pay additional compensation. The proposed easement seeks to limit the landowners' right to just compensation as a result of a relocated easement to "only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location." But the impact of an easement on the fair market value of the landowners' property may be affected by more than just the size of the easement area. It may be substantially affected by its location—even if the size in comparison to the original easement is the same. TransCanada's attempt to limit the landowners' rights to just compensation should not be permitted.

TransCanada's Form Easement provides for the exercise of discretion with respect to numerous issues that may occur in the future. Such vagueness and discretion, albeit unavoidable, puts the landowner at a great economic disadvantage vis-à-vis TransCanada with respect to any dispute that may arise between the parties. The easement should provide for the recovery by the landowner of the landowners' costs and expenses, including attorneys' fees, in the event the landowner prevails in any dispute with TransCanada, or its successors and assigns, concerning the parties' respective rights under the easement.

The first sentence of the Easement discusses amount of compensation that the Landowner is to receive in consideration for property rights being taken. The specific terms of the easement agreement will impact the landowner's rights in the property and, therefore, the amount of just compensation due to the landowner. Consequently, the PSC should review all the terms of the proposed Easement and Right-of-Way Agreement to understand how the Easement will affect the land burdened by the easement, as well as adjacent property through which the easement runs, in order to protect the property rights of the landowner to the extent possible. The PSC should also limit the scope of the easement to those rights needed by TransCanada to install and maintain the subject pipeline.

### **Unequal Bargaining Power**

The power of eminent domain is an awesome power. Delegation of such power to a foreign, for-profit company to be exercised against the citizens of Nebraska should not be undertaken lightly. And the delegation should be strictly limited to that expressly authorized by the legislature. A condemnor is obligated to negotiate with an owner prior to filing an action to condemn the required property rights. It is critical for the PSC to recognize that the parties do not have equal bargaining power. An owner does not have the right to refuse the grant of the desired property rights. Rather, the condemnor has the authority to condemn the required property rights if the owner refuses to convey them voluntarily.

Government condemnors are answerable to the electorate. A foreign, for-profit company such as TransCanada is not. Rather, the only limitations placed upon its exercise of the power of eminent domain delegated to it is that imposed by the grant— and the PSC. It is my experience—confirmed in discussions with other eminent domain attorneys—that such companies regularly present owners with easements containing provisions and rights far beyond those authorized by the legislature. Many unwitting owners reasonably believe that resisting such easements will be futile because the company will sue them and take the easement by eminent domain if they refuse. It is incumbent upon the legislature—and here the PSC—to protect the property rights of Nebraska landowners by conditioning any approval of any pipeline route on the use of an easement only on terms that have been approved by the Commission. And any easement previously granted with terms contrary to those approved by the PSC should be void as obtained by abuse of the granted eminent domain authority.

Following is a redlined copy of TransCanada's Form Easement, which represents the minimum the PSC should require be used in the event of any approval by the PSC of any pipeline route for the KXL pipeline and the exercise by TransCanada of eminent domain. Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

(Above Space for Recorder's Use Only)

Tract No.: ML-NE-HT-40380.000 ML-NE-HT-40420.000 ML-NE-HT-40440.000

### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration") [LANDOWNER], (hereinafter called "Grantor") whose mailing address is does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), an perpetual permanent easement and right-of-way (the "Easement") for the sole purposes of surveying, laying, constructing, inspecting, maintaining, operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other equipment and appurtenances thereto described herein (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines or any use other than as set forth herein), for the transportation of crude petroleum, oil and petroleum by-products, on, under, across and/or through a strip of land 50 feet in width, as more particularly described in Exhibit A, which is attached hereto and made a part hereof (the "Easement Area") located on real property situated in the County of Holt, State of Nebraska owned by Grantor and described as follows:

# [Legal Description of Entire Property]

(the "Property"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "Initial Construction Period"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional

Temporary Work Space" and are more particularly described in <u>Exhibit A</u> hereto (the "Temporary Work Space")., provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

Grantee will pay all commercially reasonable costs and expenses that result Α. from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's property, crops, pastures, drainage. systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the gross negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the maximum use of Grantee's rights hereunder reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property and the Grantee's use thereof, including but not limited to, any and all tree, crop, plant, timber, harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the <u>gross</u> negligence, <u>recklessness</u>, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction

or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. <u>In such event</u>, <u>Grantee will install</u> temporary fencing outside the easement area, as requested by <u>Grantor</u>, at <u>Grantee's expense</u>, <u>until the original fencing is</u> <u>replaced as required above</u>, in <u>order to prevent cattle</u>, horses and/or other <u>livestock located on the Property from straying</u>. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

Provided its use of the Property does not in any manner interfere with or prevent the 3. exercise by Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right 4. to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee shall not be prevented from traveling within and along Easement Area on foot or in vehicle or machinery; (iv) Grantee's pipeline is left with the amount of cover originally installed to allow safe operation of the Grantee's pipeline; (v) the Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with. With respect to fencing, it is agreed that installation of gates to provide Grantee access to the easement area shall not constitute an interference with Grantee's pipeline or its easement rights.

5. During the Initial Construction Period, Grantee shall also provide suitable crossings

on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of *all* brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground. In the event the pipeline is installed to a depth less than 48" below current grade level, Grantee shall support and stabilize the pipeline and its installation to provide equal or greater support as would be provided by 48" depth.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil, or equivalent grade topsoil, to its original, preconstruction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its preconstruction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment and compensate Grantor for any diminution in value to the Property or damage that such abandonment will cause.

13. Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including, without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the

ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" referring to this instrument and setting forth the modified legal description of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid, Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

13. If Grantee authorization or approval is required herein for any action of Grantor, such authorization or approval may not be unreasonably withheld.

14. Should Grantor prevail in any litigation brought to enforce its rights under this Agreement, Grantee shall pay all costs and expenses, including reasonable attorneys' fees, incurred by Grantor in such effort.

1<u>5</u>4. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of <u>gross</u> negligence, <u>recklessness</u>, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

1<u>6</u>5. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

1<u>76</u>. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

 $1\underline{87}$ . It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

198. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

<u>2019</u>. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

2<u>1</u><del>0</del>. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

2<u>2</u>4. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_\_\_

**GRANTOR**:

### **Conclusion and Opinions**

For all of the foregoing reasons discussed above it is my opinion that TransCanada's proposed Easement and Right-of-Way Agreement is not in the public interest of Nebraska or Nebraskans and therefore does not promote the welfare of Nebraska or protect Nebraskan landowners' property rights. All of my opinions expressed in this Report are held by me with a reasonable degree of professional certainty based upon my education, background, training, and decades of relevant work experiences dealing with easement language and contractual terms and provisions.

June 6, 2017

Joseph P. Suntum

# EXHIBIT #1

### **Current Practice 1988-Present**

Miller, Miller & Canby, Chtd., 200-B Monroe Street, Rockville, Maryland

- Managing Shareholder (1997 2007)
- Principal, Litigation Department

AV Preeminent Rating with Martindale Hubbell – <u>www.Martindale.com</u> Selected to Maryland Super Lawyers 2007 – <u>www.SuperLawyers.com</u> *Successfully* tried both murder cases and multi-million dollar civil actions

Personal practice focuses on civil trial and appellate work concerning real estate, and focused primarily on eminent domain and condemnation.

### **Previous Professional Experience**

Office of the Public Defender, Montgomery County, Maryland, 1983-1988 Circuit Court for Baltimore City, Maryland, 1982-1983 - Law Clerk to the Honorable Elsbeth Levy Bothe

## **Educational Background**

University of Maryland School of Law - J.D., 1982 University of Maryland B.S., 1979 University of Montana 1975-1977

### Associations

Maryland Attorney Member of the Owners Counsel of America

### **Bar Association Memberships/Activities/Positions**

Character Committee of the Court of Appeals for the 6<sup>th</sup> Judicial Circuit (1992-1997)
Bar Association for Montgomery County, Maryland (Secretary 1996-1997; Executive Committee 1997-1999; Legal Services Task Force 1998; Long-Range Planning Committee 1995, 1997, 2007)
Montgomery County Bar Foundation (Board of Directors 2005-2009)
Maryland State Bar Association (Cost of Litigation Task Force 1999-2000)
Alan J. Goldstein Inn of Court (Master; Treasurer, 1997-1998; Secretary, 1998-2000)
Montgomery Inns of Court (Barrister, early 1990s)

### **Reported Cases:**

Montgomery County v. Phillips, 445 Md. 55 (2015) Boland v. Boland, 423 Md. 296 (2011); Boland v. Boland, 194 Md. App. 477 (2010) cert. granted 417 Md. 500 (2011); Lasater v. Guttmann, 194 Md. App. 431 (2010); Circuit City Stores, Inc. v. Rockville Pike Joint Venture Ltd. Partnership, 376 Md. 331 (2003); 8621 Ltd. Partnership v. LDG, Inc., 169 Md. App. 214 (2006); Golub v. Cohen, 138 Md. App. 508 (2001); Buxton v. Buxton, 363 Md. 634 (2001); Schochet v. State, 320 Md. 714 (1990); State v. Calhoun, 306 Md. 692 (1986); State v. Tichnell, 306 Md. 428 (1986).

### **Current Practice 1988-Present**

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Bar Association for Montgomery County, Maryland (Secretary 1996-1997; Executive Committee 1997-1999; Legal Services Task Force 1998; Long-Range Planning Committee 1995, 1997, 2007)
Montgomery County Bar Foundation (Board of Directors 2005-2009)
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Montgomery Inns of Court (Barrister, early 1990s)

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Montgomery County v. Phillips, 445 Md. 55 (2015) Boland v. Boland, 423 Md. 296 (2011); Boland v. Boland, 194 Md. App. 477 (2010) cert. granted 417 Md. 500 (2011); Lasater v. Guttmann, 194 Md. App. 431 (2010); Circuit City Stores, Inc. v. Rockville Pike Joint Venture Ltd. Partnership, 376 Md. 331 (2003); 8621 Ltd. Partnership v. LDG, Inc., 169 Md. App. 214 (2006); Golub v. Cohen, 138 Md. App. 508 (2001); Buxton v. Buxton, 363 Md. 634 (2001); Schochet v. State, 320 Md. 714 (1990); State v. Calhoun, 306 Md. 692 (1986); State v. Tichnell, 306 Md. 428 (1986).

# EXHIBIT #2

Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

#### (Above Space for Recorder's Use Only)

Tract No.: ML-NE-HT-40380.000 ML-NE-HT-40420.000 ML-NE-HT-40440.000

#### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration") TMAG Ranch, LLC, whose mailing address is 916 S. 181<sup>st</sup> Street, Elkhorn, NE 68022 (hereinafter called "Grantor") does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), a perpetual permanent easement and right-of-way (the "Easement") for the purposes of surveying, laying, constructing, inspecting, maintaining, operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other

Grantor's Initials

ML-NE-HT-40380.000 ML-NE-HT-40420.000 ML-NE-HT-40440.000 equipment and appurtenances thereto (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines), for the transportation of crude petroleum, oil and petroleum by-products, on, under, across and/or through a strip of land 50 feet in width, as more particularly described in <u>Exhibit A</u>, which is attached hereto and made a part hereof (the "Easement Area") located on real property situated in the County of Holt, State of Nebraska owned by Grantor and described as follows:

A tract of land containing 362 acres, more or less, situated in the County of Holt, in the State of Nebraska, being further described as the NE1/4, NW1/4 of the SE1/4, and SW1/4 of Section 18, Township 33 North, Range 15 West of the 6th P.M., as recorded in Book 198, Page 543 in the Deed Records of Holt County, Nebraska; less and except any conveyances heretofore made.

A tract of land containing 72.03 acres, more or less, situated in the County of Holt, in the State of Nebraska, being further described as Lot 7 of Section 7, Township 33 North, Range 15 West of the 6th P.M., as recorded in Book 198, Page 543 in the Deed Records of Holt County, Nebraska; less and except any conveyances heretofore made.

A tract of land containing 160 acres, more or less, situated in the County of Holt, in the State of Nebraska, being further described as the NW1/4 of Section 17, Township 33 North, Range 15 West of the 6th P.M., as recorded in Book 198, Page 543 in the Deed Records of Holt County, Nebraska; less and except any conveyances heretofore made.

(the "**Property**"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "**Initial Construction Period**"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional Temporary Work Space" and are more particularly described in <u>Exhibit A</u> hereto (the "**Temporary Work Space**"), provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

A. Grantee will pay all commercially reasonable costs and expenses that result from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's crops, pastures, drainage systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property, including but not limited to, any and all tree, crop, plant, timber,

Grantor's Initials

harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

Provided its use of the Property does not in any manner interfere with or prevent the exercise by 3. Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

4. Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee shall not be prevented from traveling within and along Easement Area on foot or in vehicle or machinery; (iv) Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with.

Grantor's Initials

ML-NE-HT-40380.000 ML-NE-HT-40420.000 ML-NE-HT-40440.000 5. During the Initial Construction Period, Grantee shall also provide suitable crossings on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of all brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil to its original, pre-construction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its pre-construction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period) by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment.

13. Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including, without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid,

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Grantor's Initials
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Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

14. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of negligence, recklessness, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

15. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

16. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

17. It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

18. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

19. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

20. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

21. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_day of \_\_\_\_\_

GRANTOR(S):

TMAG Ranch, LLC

By:

Its:

# [ACKNOWLEDGMENTS APPEAR ON FOLLOWING PAGE]

Grantor's Initials\_\_\_\_\_

.

.

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STATE OF \_\_\_\_\_

•

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COUNTY OF \_\_\_\_\_

The foregoing instrument was acknowledged before me this	day of	20
Ву		of

TMAG Ranch, LLC, on behalf of the corporation.

Notary Public Signature

Affix Seal Here

Grantor's Initials\_\_\_\_\_












# EXHIBIT #3





KXL002000

# EXHIBIT #4

#### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 1 of 5 - Page ID # 1

#### IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE	)	CASE NO
COMPANY, a New York Corporation,	)	
	)	
Plaintiff,	)	
	)	COMPLAINT
V.	)	
	)	
RICHARD ANDREW, JANE ANDREW,	)	
LUKE ANDREW, and BRYCE ANDREW,	)	
	)	
Defendants.	)	

**COMES NOW** Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

#### PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

- 2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
- 3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
- 4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
- 5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

#### JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

#### **GENERAL ALLEGATIONS**

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

#### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 3 of 5 - Page ID # 3

law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

#### FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the rightof-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

- 23. Defendants were negligent in the following particulars:
  - a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
  - b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;
  - c. Defendants failed to comply with the statutory requirements of the OCNS;
  - d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
  - e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

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26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

#### SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

#### JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

ZURICH AMERICAN INSURANCE COMPANY, Plaintiff,

By: /s/ Albert M. Engles ENGLES, KETCHAM, OLSON, & KEITH, P.C. 1350 Woodmen Tower 1700 Farnam Street Omaha, Nebraska 68102 (402) 348-0900 (402) 348-0904 (Facsimile) Albert M. Engles, #11194 Dan H. Ketcham, #18930 Michael L. Moran, #24042 James C. Boesen, #24862

#### Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of Expert Shaun "Sean" Sweeney

State of New York	)
	) ss.
New York County	)

- 1 **Q:** Please state your name.
- 2 A: My name is Shaun "Sean" Sweeney.
- 3 Q: Mr. Sweeney is Attachment No. 1 to this sworn statement a true and accurate
  4 copy of your most recent CV or Resume?
- 5 A: Yes it is.
- 6 Q: Briefly describe for the Commissioners please your educational background
  7 starting with your undergraduate work and all degrees and any relevant
  8 certifications earned or held by you.
- 9 A: I have a Bachelor of Arts in Sociology and Industrial Relations (1985) and a Ph.D.
  10 in the same area, also from the University of Bath, awarded 1991
- 11 Q: Tell the Commissioners about your relevant work experience over that past
  12 ten (10) years and about your current employment.
- A: For almost 8 of the last 10 years I was Senior Extension Faculty at Cornell
   University's School of Industrial and Labor Relations. I founded and co-directed
   the Cornell Global Labor Institute for most of that time. In early 2015 I started the
   International Program for Labor, Climate and Environment at the Murphy

1		Institute, City University of New York. I have done policy-related work for unions
2		from a number of different countries on energy, transportation, and environmental
3		issues, including green jobs. I have also worked with the UN's Environment
4		Program (UNEP)
5	Q:	Is Attachment No. 2 to this sworn statement a copy of a Report entitled "Pipe
6		Dreams? Jobs Gained, Jobs Lost by the Construction of Keystone XL?"
7	A:	Yes it is.
8	Q:	Are you the author or co-author of this Report?
9	A.	Yes I am. I am a co-author
10	Q:	Are the contents and the findings of this Report true and accurate to the best
11		of your knowledge?
12	A:	Yes they are.
13	Q:	Does this Report include an analysis of potential jobs, both permanent and
14		temporary, likely created by the proposed Keystone XL pipeline?
15	A:	Yes it does.
16	Q:	Is this Report published by Cornell Universities ILR School Global Labor
17		Institute?
18	A:	Yes it is.
19	Q:	What exactly is the ILR School Global Labor Institute and what type of work
20		does it do?
21	A:	The ILR School Global Labor Institute was established in 2005 to help unions deal
22		with the challenges posed by changes in the political economy and their impact on
23		worker's rights and protections. It also attempted to develop trade union policy on
24		alternatives to what some call neoliberalism.
25	Q:	Are you competent to testify as to the contents of the attached Report and all
26		of the source material and data that forms the basis of this Report?
27	A:	Yes.

1	Q:	Although you completed this Report in approximately September 2011, have
2		you become aware since that time of any data or facts that would suggest
3		your Report's findings or ultimate conclusions are incorrect?
4	A:	No.
5	Q:	Have you reviewed TransCanada's answers or responses to the Landowner
6		Intervenors' discovery requests related to jobs and employment some of
7		which are included here in Attachment No. 3?
8	A:	Yes, they support our findings and I will incorporate those responses into my
9		testimony at the Hearing as needed.
10	Q:	Is Attachment No. 4 to this sworn statement a copy of a Report entitled "The
11		Impact of Tar Sands Pipeline Spills on Employment and the Economy?"
12	A:	Yes it is.
13	Q:	Are you the author or co-author of this Report?
14	A.	Yes I am. I am a co-author
15	Q:	Are the contents and the findings of this Report true and accurate to the best
16		of your knowledge?
17	A:	Yes they are.
18	Q:	Although you completed this Report in approximately March 2012, have you
19		become aware since that time of any data or facts that would suggest your
20		Report's findings or ultimate conclusions are incorrect?
21	A:	No.
22	Q:	As of today's date, do you stand by your findings and conclusion as detailed
23		in in your Reports?
24	A:	Yes I do and I incorporate the Reports into my testimony.
25	Q:	Thank you, I have no further questions at this time and reserve the right to
26		ask you additional questions at the August 2017 Hearing.

Storens 7

Shaun "Sean" Sweeney

Subscribed and Sworn to before me this  $2^{nd}$  day of  $_{une}$ , 2017.

Ha Notary Public

Stacey Neuman Commissioner of Deeds City of New York No. 2-13210 Kings County Commission Expires 12/1/20(7) Attachment No. 1

#### Sean Sweeney, Ph.D. 64 Church Avenue, 4D Brooklyn, NY, 11218

917 886 1418 sean.sweeney@cuny.edu

Abbreviated vita

Professional History	
Feb 2015 – present	<b>Director, International Program for Labor, Climate &amp;</b> <b>Environment,</b> Center for Labor and Policy Studies, Murphy Institute, City University of New York
Jan 2006 – Jan 2015	<b>Director, Cornell Global Labor Institute</b> , Cornell School of Industrial and Labor Relations, Extension Division, New York City.
July 1999 – Jan 2006	<b>Director, Labor Studies Certificate Program</b> . Cornell School of Industrial and Labor Relations, Extension Division, New York City. Responsible for curriculum development, hiring instructional staff, negotiating institutional partnerships, and promoting the program. Teaching 2-3 sections per year in labor history and globalization.
	<b>Director, Cornell Global Labor Institute</b> . Established September 2004. www.ilr.cornell.edu/globallaborinstitute
July 1995 – July 1999	<b>Director, Queens College Worker Education Extension</b> <b>Center, CUNY</b> . Responsible for hiring and training instructional staff, overseeing all administration and enrollment operations, student counseling and academic advisement. Secured grants and additional funding.
Sept. 1992 – July 1995	Labor Studies faculty, Queens College Worker Education Extension Center. Full teaching load, curriculum development, student advisement. Worked closely with adjunct faculty, assisted director in all aspects of the program's operations.

Page 2/Sweeney		
August 1988 – 1991		Special Asst. Professor (full time), Institute of Applied Social Science, Hofstra University, District 65/UAW. Coordinator of Trade Union Administration concentration. Full teaching load, curriculum development, student
Education		advisement.
Laucation		
	Ph.D.	University of Bath, England. August 1990. Dept. of Sociology and Industrial Relations. Dissertation: U.S.

Labor & Globalization

B.A. University of Bath, England, 1985. (First Class with Honors). Sociology with Industrial Relations. Cotgrove Prize for most outstanding student in social sciences.

#### Recent Publications (authored and co-authored)\_\_\_\_\_

2017: Chapter contribution to Energy Democracy: Advancing Equity in Clean Energy Solutions (Fairchild and Weinrub, eds. Island Press)

(Forthcoming) Contested Futures

2017: Energy Transition: Are We Winning? With John Treat, Murphy Institute, CUNY and Rosa Luxembourg Stiftung, TUED Working Paper 6

2016: An Illness to One is the Concern of All: The Health Impacts of Fossil Fuels and Climate Change. With Svati Shah, Murphy Institute, CUNY and Rosa Luxembourg Stiftung, TUED Working Paper 6

2016: Carbon Markets After Paris: Trading in Trouble Murphy Institute, CUNY and Rosa Luxembourg Stiftung, TUED Working Paper 6 2015: The Hard Truths About Coal: Why Unions Should Reconsider Their Support for Carbon Capture and Storage, Murphy Institute, CUNY and Rosa Luxembourg Stiftung, TUED Working Paper 6

2015: Mapping the Possible: Union Perspectives on Energy Democracy, Cornell GLI and Rosa Luxembourg Stiftung, TUED Working Paper 5

2015: Building Energy Democracy in Greece: Syriza's Program and the Planned Transition to Renewable Power, TUED Working Paper 4

2014: Towards Energy Democracy, Chapter in State of the World Report 2014, Worldwatch Institute

2014: Nurses and the Challenge of Fossil Fuel Expansion and Climate Change

2014: Global Shale Gas and the Anti-Fracking Movement: Developing Trade Union Policies and Perspectives, Cornell GLI and Rosa Luxembourg Stiftung

2012: Unions and the Challenge of 'Extreme Energy' Chapter in book, Trade Unions and the Environment, Nora Rathzel (ed.) Routledge Press

2012: Resist, Reclaim, Restructure: Unions and the Struggle for Energy Democracy, TUED Working Paper 1, Cornell GLI and Rosa Luxembourg Stiftung

2012: The Impact of Tar Sands Pipeline Spills on Employment and the Economy <u>http://www.ilr.cornell.edu/globallaborinstitute/research/upl</u> <u>oad/GLI\_Impact-of-Tar-Sands-Pipeline-Spills.pdf</u> Released by Natural Resources Defense Council

2011: Pipe Dreams: Jobs Gained, Jobs Lost in the Construction of the Keystone XL Pipeline, Cornell GLI Research Paper

2010: Transport Workers and Climate Change, document for the World Congress of the International Transport Workers Federation, Mexico City 2008: United Nations Environment Program, "Green Jobs: Toward Decent Work in a Sustainable, Low-Carbon World," With ILO/ITUC/IOE, September 2008

European Industrial Relations Observatory, 2002-2007 Annual Reviews for the United States. http://www.eiro.eurofound.eu.int/2003/11/feature/us031110 1f.html

#### Recent Presentations \_\_\_\_\_

With UN Special Envoy, Mary Robinson, former President of the Republic of Ireland, A Global Climate Treaty – Why the U.S. Must Lead Presentation Panel, Society for Ethical Culture, New York

A Europe in Crisis, A Europe Without Jobs, European United Left/Nordic Green Left (GUE/NGL) In cooperation with Trade Unionist Network Europe (TUNE) European Parliament, Brussels, April 10-11, 2014

Unions and Renewable Energy Policy, National Union of Metalworkers of South Africa (NUMSA), Johannesburg

European Trade Union Confederation Youth Conference, Brussels, "Extending Solidarity to the Ecosystems" Attachment No. 2

## **PIPE DREAMS?** JOBS GAINED, JOBS LOST BY THE CONSTRUCTION OF KEYSTONE XL

A REPORT BY CORNELL UNIVERSITY GLOBAL LABOR INSTITUTE



Cornell University ILR School Global Labor Institute

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- 35 Conclusion: Employment Potential from KXL is Little to None; Decision should be based on other factors

Technical assistance provided by Ian Goodman and Brigid Rowan, The Goodman Group, Ltd. www.thegoodman.com

SEPTEMBER 2011

## INTRODUCTION

The purpose of this briefing paper is to examine claims made by TransCanada Corporation and the American Petroleum Institute that, if constructed, TransCanada's proposed Keystone XL (KXL) pipeline will generate enough employment to kick-start important sections of the US economy through the creation of tens of thousands—perhaps even hundreds of thousands—of good, well-paying jobs for American workers.

This briefing paper raises a number of questions regarding the jobs claims promoted by the industry, questions that are serious enough to generate a high level of skepticism regarding the value of KXL as an important source of American jobs. With national unemployment levels presently (September 2011) around 9%, and the real unemployment figures considerably higher, jobs are desperately needed both to sustain families and to help the broader economy. However, it is our assessment—based on the publicly available data—that the construction of KXL will create far fewer jobs in the US than its proponents have claimed and may actually destroy more jobs than it generates.

The results presented below should also cast doubt on the recent claim made by American Petroleum Institute that the oil industry could create more than a million jobs over the next decade—if the US government would open public lands, beaches, oceans, to unlimited oil drilling. If the industry's jobs estimates made in the context of KXL are any indication, then this broader claim should be scrutinized very carefully indeed.

## **MAIN FINDINGS**

#### The main points in this briefing paper can be summarized as follows:

- » The industry's US jobs claims are linked to a \$7 billion KXL project budget. However, the budget for KXL that will have a bearing on US jobs figures is dramatically lower—only around \$3 to \$4 billion. A lower project budget means fewer jobs.
- » The project will create no more than 2,500-4,650 temporary direct construction jobs for two years, according to TransCanada's own data supplied to the State Department.
- » The company's claim that KXL will create 20,000 direct construction and manufacturing jobs in the U.S is not substantiated.
- » There is strong evidence to suggest that a large portion of the primary material input for KXL—steel pipe—will not even be produced in the United States. A substantial amount of pipe has already been manufactured in advance of pipeline permit issuance.
- » The industry's claim that KXL will create 119,000 total jobs (direct, indirect, and induced) is based on a flawed and poorly documented study commissioned by TransCanada (The Perryman Group study). Perryman wrongly includes over \$1 billion in spending and over 10,000 person-years of employment for a section of the Keystone project in Kansas and Oklahoma that is not part of KXL and has already been built.
- » KXL will not be a major source of US jobs, nor will it play any substantial role at all in putting Americans back to work. Even if the Perryman figures were accurate, and all of the workers for the next phase of the project were hired immediately, the US seasonally adjusted unemployment rate would remain at 9.1%—exactly where it is now.
- » KXL will divert Tar Sands oil now supplying Midwest refineries, so it can be sold at higher prices to the Gulf Coast and export markets. As a result, consumers in the Midwest could be paying 10 to 20 cents more per gallon for gasoline and diesel fuel. These additional costs (estimated to total \$2–4 billion) will suppress other spending and will therefore cost jobs.

- » Pipeline spills incur costs and therefore kill jobs. Clean-up operations and permanent pipeline spill damage will divert public and private funds away from productive economic activity. In 2010 US pipeline spills and explosions killed 22 people, released over 170,000 barrels of petroleum into the environment, and caused \$1 billion dollars worth of damage in the United States.
- » Rising carbon emissions and other pollutants from the heavy crude transported by Keystone XL will also incur increased health care costs. Emissions also increase both the risk and costs of further climate instability.
- » By helping to lock in US dependence on fossil fuels, Keystone XL will impede progress toward green and sustainable economic renewal and will have a chilling effect on green investments and green jobs creation. The green economy has already generated 2.7 million jobs in the US and could generate many more.

## A NOTE ON ENERGY INDEPENDENCE AND "ETHICAL OIL"

This paper is primarily concerned about jobs, but the findings below also shine light on another claim made by the industry—that KXL will get the US further on the road to energy independence. The idea of energy independence clearly resonates with the American public, and the paid advertisements depicting Canadian Tar Sands as the source of "ethical oil" (and therefore a better option than oil from dictatorships like Saudi Arabia) plays to that sentiment. But KXL is a global project driven by global oil interests. Tar Sands development has attracted investment capital from oil multinationals—with Chinese corporations' stake getting bigger all the time.<sup>1</sup> If approved, KXL will be almost certainly be constructed by temporary labor working with steel made in Canada and India. Much of the Tar Sands oil will be refined in Port Arthur, Texas, where the refinery is half-owned by Saudi Aramco, the state-owned oil company of Saudi Arabia.<sup>2</sup> And a good portion of the oil that will gush down the KXL will, according to some studies, probably end up being finally consumed beyond the territorial United States.<sup>3</sup> Indeed, the oil industry is also trying to build another pipeline, Enbridge's proposed Northern Gateway, to carry Tar Sands oil across British Columbia for export to Asian markets, although this pipeline also faces serious public opposition. Clearly, Tar Sands oil and energy independence really do not belong in the same sentence.

- 1 Dlouhy, Jennifer. "China Invests Billions in Canada Oil Sands,"Houston Chronicle, September 19, 2011. <u>http://</u> www.chron.com/business/article/China-invests-billions-in-oil-sands-2176114.php
- 2 Harder, Amy. "US Oil Giants Poised to Gain on Keystone Pipeline," National Journal, August 5, 2011. <u>http://</u> www.nationaljournal.com/energy/u-s-oil-giants-poised-to-gain-on-keystone-pipeline-20110804
- 3 Droitsch, Danielle. "The Link between Keystone XL and Canadian Oilsands Production," Pembina Institute, April 2011.

## TRANSCANADA WILL SPEND \$3 TO \$4 BILLION IN THE US, NOT \$7 BILLION AS CLAIMED

A serious question surrounds the exact size of the KXL project in monetary terms. The industry's US jobs estimates refer to the **total** \$7 billion budget—so there is a clear association between this number and the jobs a \$7 billion project might produce. The State Department's FEIS job and tax revenue projections are also based on \$7 billion in expenditures.' However, the part of the budget for KXL that will have a bearing on US jobs figures is much lower—only around \$3 to \$4 billion. A lower budget means fewer jobs.

The Keystone Project Budget Analysis Chart provides a graphic illustration of how the Keystone budget is broken down and how the KXL US budget is revised from TransCanada's \$7 billion claim to the more relevant \$3 to \$4 billion.

In its Presidential Permit Application for KXL, TransCanada stated that, "The capital cost of the US portion of the Project, from the US-Canada border to the Gulf Coast is estimated to be US \$5.443 billion."<sup>2</sup> KXL US (the portion of the KXL project within the US) is **not** a \$7 billion project. Rather, KXL US plus KXL Canada (the portion within Canada) are *together* a \$7 billion project.

As shown on the Budget Analysis Chart, KXL Canada costs \$1.6 billion.<sup>3</sup> Therefore, approximately 23% of KXL's \$7 billion total cost is for the Canadian portion of the pipeline. Within the US, the KXL project budget is \$5.4 billion, not \$7 billion.<sup>4</sup> Therefore approximately 23% of the \$7 billion total cost of KXL is for the Canadian portion of the pipeline.

Moreover, all of the above figures are estimates of costs from project start to finish. So all these figures also substantially overestimate how much now remains to be spent. Construction has not yet started on KXL, but there have already been several years of activities preparing for possible construction. According to TransCanada's interim financial statement released on July 28, 2011, the capital cost of the larger Keystone project (made up of the segments already completed and KXL) is \$13 billion. Of this \$13 billion, \$7.9 billion had

4 As discussed in footnote 1, the State Department's FEIS estimates US property tax revenues for KXL based on an assumed \$7 billion project cost. So in effect, the FEIS is assuming that KXL will be paying US property taxes for the entire project, including the portion in Canada. Even those evaluating the KXL project for the US Federal Government do not seem to be have ready access to accurate cost estimates for the US portion of the project.

<sup>1</sup> US State Department's Final Environmental Impact Statement (FEIS), Socioeconomics, pp. 3.10–58, 3.10–91. <u>http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open</u>

<sup>2</sup> Letter from TransCanada to the US Department of State regarding the Keystone XL Application, September 19, 2008. <u>http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf/presidentialpermitapplication.</u> pdf?OpenFileResource

In its Canadian NEB Application for KXL, TransCanada states, "The capital cost of the Project is currently estimated to be approximately \$1.7 billion". TransCanada Keystone Pipeline GP Ltd., Keystone XL Pipeline Section 52 Application, submitted on February 27, 2009, p. 1. <u>https://www.neb.gc.ca/ll-eng/livelink.exe?func=ll&objld=549164&objAction=Open</u> The above cost estimate is in Canadian dollars. The exchange rate between US and Canadian currencies has fluctuated throughout the Keystone project and is currently near parity. For the purposes of this Budget Analysis, the above KXL Canada cost estimate (CAD\$1.7 billion) has been converted to US \$1.6 billion, which together with the cost of KXL US (\$5.4 billion) equals \$7 billion (the cost for KXL reported by TransCanada). It should be understood that this Budget Analysis is based on the information made public by TransCanada and may thus be somewhat approximate.

#### **KEYSTONE PROJECT BUDGET ANALYSIS**



already been invested by June 30, 2011. Of the \$7.9 already invested, US \$1.7 billion is related to KXL.<sup>5</sup> So prior to any actual construction, about 25% of the KXL budget has already been expended for activities including design, permitting, and materials procurement.<sup>6</sup>

In other words, for the entire \$13 billion Keystone project, \$6.2 billion has already been spent to complete earlier phases of the project that are now in service. The entire budget for just the KXL project is \$7 billion, but \$1.7 billion of this has already been spent as of mid-year 2011. So remaining KXL spending (as of mid-year 2011) was only \$5.3 billion in both US and Canada.

The Budget Analysis assumes ongoing spending, so a total of \$1.8 billion has now been expended; remaining KXL spending is \$5.2 billion. And as explained above, only 77% of the KXL project costs are within the US. Thus, the remaining KXL spending within the US is now \$4 billion.

Moreover, TransCanada's financial statements also reveal that it has already made commitments to spend (or has already spent) almost 40% of the total KXL budget as of year-end 2010. At that time, the remaining budget (not already committed) was only

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<sup>5</sup> TransCanada, Second Quarterly Report, July 28, 2011, p. 31 (PDF p. 39) <u>http://www.transcanada.com/docs/Investor\_Centre/2011\_q2\_english\_corp.pdf</u>

<sup>6</sup> The accounting for KXL costs already incurred presumably includes a wide range of activities in support of permitting, such as the Perryman Group study.

\$4.4 billion for the entire KXL project and could now be as low as \$3.9 billion.<sup>7</sup> And for the approximately 77% of project costs within the US, the remaining budget (not already committed) could now be as low as \$3 billion. Thus, the incremental spending within the US that is actually associated with building KXL may be less than half of the industry's \$7 billion figure.

These figures essentially mean that TransCanada's claim that KXL is a \$7 billion stimulus to the US economy is misleading on three levels. First, \$1.6 billion will be spent on the Canadian portion of the pipeline, drawing largely on Canadian material and labor inputs. Second, at least \$1.8 billion of the \$7 billion has already been spent, mostly on design, permitting, and material inputs. Third, in addition to the \$1.8 billion already spent, another \$1.3 billion of KXL costs may already be committed. These committed costs may be incurred regardless of whether the project is actually constructed.

Therefore, we calculate that the actual spending relevant to the US economy, and the figure from which US new job creation projections should be calculated, is around \$3 to \$4 billion, not \$7 billion.<sup>8</sup> Once again, see the Keystone Project Budget Analysis Chart for a step-by-step illustration of how the \$3 to \$4 billion KXL US budget is derived from TransCanada's original and misleading \$7 billion claim.

Money already spent in the past few years, plus money budgeted for the Canadian part of KXL, should not be presented as though it were part of future US-related spending pending the approval of the project. The money is gone and the work has been done (or soon will be). This spending will lead to few if any new jobs in the US. Likewise, some (and possibly all) of the money committed, but not yet spent, will be spent even if KXL is not built and should therefore not be considered in the analysis of the incremental spending that will occur should the project be approved.

<sup>7</sup> As of year-end 2010, TransCanada had already spent \$1.4 billion and was committed to spend another \$1.2 billion on KXL. TransCanada, 2010 Annual Report, p. 33 http://www.transcanada.com/docs/Investor\_Centre/2010\_TCC\_AR\_Eng. pdf. By mid-year 2011, costs already spent had risen by \$0.3 billion (to \$1.7 billion) for KXL. See footnote

<sup>8</sup> Calculation based on the data provided above: \$7 billion total KXL project cost, \$1.6 billion for Canadian portion of KXL, \$1.8 billion now already expended, and \$.3 billion already committed as of now. So US share of KXL costs is 77% = ((\$7.0-\$1.6)/\$7.0). It follows then that the US share of not yet expended KXL costs = (\$7.0 - \$1.6) \* .77%. And US share of KXL costs not yet expended or committed = (\$7.0 - \$1.8 - \$1.3) \* .77%.

## **KXL WILL GENERATE 2,500-4,650 CONSTRUCTION JOBS**

A calculation of the direct jobs that might be created by KXL can begin with an examination of the jobs on-site to build and inspect the pipeline. The project will create no more than 2,500-4,650 temporary direct construction jobs for two years, according to TransCanada's own data supplied to the State Department.<sup>9</sup>

The State Department's FEIS considers each component of construction labor, and provides jobs data for the construction spreads, pump stations, and tank farms:

- » Construction of the pipeline is planned to occur in 17 construction spreads or completed lengths (Table 3.10.1-13). Ten spreads are planned along the proposed Steele City Segment, six spreads along the proposed Gulf Coast Segment, and one spread along the proposed Houston Lateral. Final spread configurations and construction schedules could result in shorter spreads.
- » Approximately 500 to 600 construction and inspection personnel would work on each spread, except for the proposed Houston Lateral which would require approximately 250 workers. Each spread would require 6 to 9 months to complete. Construction of new pump stations would require 20 to 30 additional workers at each site. Construction of all pump stations would be completed in 18 to 24 months. Tank farm construction would require approximately 30 to 40 construction personnel over a period of 15 to 18 months.<sup>10</sup>

Based on jobs information provided by TransCanada for the FEIS, KXL US on-site construction and inspection creates only 5,060-9,250 person-years of employment (1 person-year = 1 person working full time for 1 year). This is equivalent to 2,500-4,650 jobs per year over two years.

On-site construction labor thus accounts for only a small share (about 5-10%) of overall KXL US project costs.<sup>11</sup> Stated another way, KXL US on-site employment is only about 1-2 person-years per \$1 million project cost.<sup>12</sup>

<sup>9</sup> US State Department's Final Environmental Impact Statement (FEIS), Socioeconomics, Section. 3.10-53, 54. <u>http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open</u>. Calculation based on jobs information provided by TransCanada for the FEIS.

<sup>10</sup> FEIS, Socioeconomics, op.cit. Section 3.10-53, 54.

<sup>&</sup>lt;sup>11</sup> For the low end of the range, assumptions are 5,060 person-years of employment and an average cost of \$50,000 per person-year; labor cost totals \$253 million, which is 4.7% of KXL US project cost (\$5.4 billion). For the high end of the range, assumptions are 9,250 person-years of employment and an average cost of \$60,000 per person-year; labor cost totals \$555 million, which is 10.3% of KXL US project cost. The FEIS (Socioeconomics, op.cit. Section 3.10-57) estimated KXL labor cost of \$349–419 million, which is within the range calculated above.

<sup>12 5,040</sup> person-years /\$5,400 million = 0.93 person-years per \$1 million; 9,250 person-years/\$5,400 million = 1.71 person-years per \$1 million.

## MOST JOBS CREATED WILL BE TEMPORARY AND NON-LOCAL

The number of jobs that could be created by the construction of KXL is by no means insignificant. But the overall impact of these jobs should not be overstated. TransCanada's submission to Canada's National Energy Board (NEB) led to the Board stating:

The Board finds that the socio-economic impacts of the Keystone XL Project will be of a **temporary nature and limited to the relatively short duration of pipeline construction without significant long term effect on the surrounding communities.**<sup>13</sup> (Emphasis added)

In its application to the NEB, TransCanada stated:

Total direct and indirect construction employment that will amount to about 5310 person- months of employment and an estimated \$58 million in wages and salaries. This includes the Hardisty B terminal, pipeline and eight pump stations and their associated power lines... **Construction is short term, workers' families are not expected to move into the area** and area medical facilities are adequate to deal with any on-the-job injuries.<sup>14</sup> (Emphasis added)

In the US, construction jobs will be created in the 6 states along the pipeline's route. Based on the FEIS estimates, there would also be between 3 and 7 person-years of construction labor per mile of new pipeline construction in 5 states—Montana, South Dakota, Nebraska, Oklahoma and Texas. There would also be about 60-120 person-years of construction labor to upgrade the existing Keystone pipeline in Kansas.<sup>15</sup>

The State Department's FEIS states that "the proposed Project has the potential to generate substantial direct and indirect economic benefits for local and regional economies along the pipeline route." However, the report also estimates that just 500 to 900 workers are expected to be hired locally—roughly 10-15% of the total workers hired.<sup>16</sup> In some states, this could mean that the number of local workers hired for the project could be fewer than 100.

Based on data provided by TransCanada to the State Department, only between 506 and 1,387 workers would be hired locally.<sup>17</sup> A state-by-state breakdown indicates that KXL

<sup>13</sup> National Energy Board (NEB), "Reasons for Decision," March 2010, p.77.

<sup>14</sup> TransCanada Keystone Pipeline GP Ltd., "Keystone XL Pipeline Section 52 Application, Section 14: Environmental and Socio-Economic," pp.25-6.

<sup>15</sup> The Keystone project has already built a 36-inch pipeline through Kansas. The KXL project will make use of this existing segment (commissioned in February 2011) from Steele City, Nebraska, to Cushing, Oklahoma. There will be no new pipeline added within Kansas, but the KXL project does include adding two new pump stations along the existing pipeline in Kansas.

<sup>16</sup> FEIS, Socioeconomics, op.cit. Section 310-57.

<sup>17</sup> For the purposes of this calculation, it is assumed that the average duration of employment is one year. So number of person-years equals number of workers.

will create between 93 and 257 jobs for residents in Montana; 121-333 jobs in South Dakota; 90-248 jobs in Nebraska; 6-18 jobs in Kansas; 41-113 jobs in Oklahoma; and 156-470 jobs in Texas.<sup>18</sup>

Information provided by TransCanada regarding the construction of Keystone Phase 1 further indicates that KXL is likely to provide only a limited number of jobs to residents along the pipeline's route. Responding to an inquiry made to TransCanada by the South Dakota Public Utilities Commission, TransCanada officially reported that during the construction of Keystone Phase 1 it employed a total of 2,580 workers in South Dakota, but only 282 workers (11%) of the workers were residents of the state. This included 20 workers in supervision, 3 welders, 32 truck drivers, 27 equipment operators, 110 laborers, and 90 construction managers, surveyors or inspectors.<sup>19</sup>.

Building KXL US would require only a modest amount of on-site construction and inspection workers and for only a short period. Moreover, local hiring would be tiny, because it is only a small proportion (10-15%) of a small number of total jobs.

So to the extent that the KXL US project could have significant employment impacts, these jobs would have to be off-site. Thus, it is important to also consider the labor requirements associated with the materials and supplies which are inputs to the KXL US project.

<sup>18</sup> Similar results were calculated by National Wildlife Foundation based on information provided by TransCanada to the DEIS. Factsheet: <u>http://www.nwf.org/~/media/PDFs/Global%20Warming/Tar-Sands/Keystone\_XL\_Jobs\_11-09-10.ashx</u>

<sup>19</sup> TransCanada Keystone Pipeline, LP's Objections and Responses to Dakota Rural Action's First Set of Interrogatories and Request for Documents, Case #: HP09-001, August 24, 2009. <u>http://www.puc.sd.gov/commission/dockets/</u> <u>hydrocarbonpipeline/2009/hp09-001/091809aff.pdf</u>


# **KXL STEEL MANUFACTURED OUTSIDE THE UNITED STATES**

TransCanada claims that "**The \$7 billion (KXL) pipeline project is expected to directly create more than 20,000 high-wage manufacturing jobs and construction jobs in 2011-2012 across the US, stimulating significant additional economic activity**."<sup>20</sup> This claim is misleading and erroneous on a number of levels.

First, as discussed above, the budget for KXL US that relates to incremental US employment is \$3 to \$4 billion and not the \$7 billion claimed by the proponents. Second, TransCanada and other KXL proponents are giving the impression that KXL will create a high number of manufacturing jobs. This is simply not true. The main manufacturing activity related to pipeline construction is the manufacture of the steel pipe. The 36-inch steel pipe is the largest single materials input for KXL. This is literally the pipe in the pipeline. In general, pipeline construction is not a manufacturing-intensive activity even if the steel itself is also being manufactured onshore.

This section will present strong evidence that:

- (a) almost half (and perhaps more) of the primary material input for KXL—steel pipe—will not even be produced in the United States;
- (b) based on the experience of Phases 1 and 2, the final processing work for KXL will probably be performed in the US with most of the steel and pipe sourced from oustide of the US (notably India and South Korea).<sup>21</sup>

In making a case for the thousands of manufacturing jobs offered by KXL, TransCanada provides the assurances that "approximately 75% of the pipe for the US portion of the proposed Project would be purchased from North American pipe manufacturing facilities and that regardless of the country of origin, it would purchase pipe only from qualified pipe suppliers and trading houses."<sup>22</sup> However, there is strong evidence to suggest that almost half of the primary material input for KXL—steel pipe—will not even be produced in the United States.

<sup>20</sup> TransCanada's website (viewed Sept. 19, 2011). http://www.transcanada.com/economic\_benefits.html
21 Beyond the evidence discussed below regarding the off-shoring of the steel pipe manufacturing, we note that the Perryman study does not substantiate the claim that KXL will result in a high level of manufacturing jobs. This finding is consistent with other recent studies of employment impacts associated with major pipeline projects. The Perryman study estimates large employment impacts for KXL construction, but only a small portion of these added jobs are in manufacturing industries. Perryman Group, The Impact of Developing the Keystone XL Pipeline Project on Business Activity in the US, June 2010, pp. 44-51. http://www.transcanada.com/economic\_benefits.html. A study projected that 4,000 manufacturing jobs will be created in Canada for a similar-sized pipeline construction project (the proposed Northern Gateway Project), assuming the steel is made in Canada. Enbridge Northern Gateway Project (Volume 6C: Environmental and Socio-Economic Assessment (ES)-Human Environment, Section 4: Socio Economic Condition, pp.4-7, 4-12 to 4-19. https://www.transcanada.com/econo/go464/go552/384192/620327/624798/620129/ B3-16.-. Vol. 6C.-... Gateway Application\_-\_Human\_Environment\_ESA\_(Part\_1\_of\_3).-. A1ToG6\_...

<sup>22</sup> FEIS, op.cit. Volume 1, Project Description, Page 2-26. <u>http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open</u>

KXL will require over 800,000 tons of carbon steel pipe.<sup>23</sup> TransCanada has contracted with an Indian multi-national company, the Mumbai-based Welspun Corp Limited, and a Russian company, Evraz, to manufacture steel pipe for KXL.<sup>24</sup>. In fact, a significant portion of the \$1.7 billion already invested in KXL by TransCanada has likely been used towards the manufacture and import of the pipe. Clearly, this is an investment that is for the most part generating economic activity and job creation *outside* of the US. TransCanada's claims that US manufacturing would reap considerable benefits from the project need to be viewed in the light of these data.

Of this writing, TransCanada has not received the Presidential Permit that is required to construct the KXL pipeline, but has already signed contracts for almost 50% of the steel pipe for the project.<sup>25</sup> The Russian company, Evraz, will manufacture about 40% of KXL pipe in its Camrose and Regina mills in Canada. This information is based on Evraz's own contract announcements and their contracts with Bredero Shaw, the company coating the KXL pipes.<sup>26</sup>

The Indian company, Welspun, is likely to be manufacturing the rest of the pipe for the KXL project. To date, Welspun has manufactured and imported almost 10% of the pipe for KXL. Shipping and customs records show that TransCanada imported over 70,000 tons of carbon steel pipe from Welspun through the Port of New Orleans since April 2011.27 The pipe TransCanada has imported from Welspun since April 2011 meets the specifications for KXL (36 inch diameter) and has been imported after the completion of Keystone Phase 2, which also used 36 inch pipe. It therefore seems likely that the rest of the pipe needed for KXL will probably be manufactured in Welspun's Indian plants and then shipped to the U.S for final processing (double jointing and coating) or manufactured in Welspun's Arkansas plant, which imports raw coiled steel and other production inputs (notably from India and South Korea.)<sup>28</sup> These arrangements allow TransCanada to state that "approximately 75% of the pipe for the US portion of the proposed project would be purchased from North American pipe manufacturing facilities."<sup>29</sup> This claim is misleading on two levels. Firstly, it is possible to purchase from a North American facility, but this does not necessarily mean that the steel was produced in those facilities. Secondly, the jobs created in Canada-while important to the Canadian economy-should not then be pitched as "American jobs" to the media and the American public.<sup>30</sup>

<sup>23</sup> KXL would require about 830,000 tons of pipe based on engineering calculations for KXL characteristics (length, pipe specifications, and prevalence of zones requiring heavier pipe). KXL requirements of 880,000 tons have been reported in industry publications. AMM Keystone XL Pipeline Doubts Mount, Metal Bulletin, April 13, 2011. <u>http://www.metalbulletin.com/Article/2807225/AMM-Keystone-XL-pipeline-doubts-mount,html</u>

<sup>24</sup> Evraz News, September 24, 2009. http://www.evraz.com/press/?ID=10351&PAGEN\_1=9. For Welspun, data pertaining to TransCanada's Keystone imports were obtained through industry tracking of US imports and export by consignee, product, and origin, etc.

<sup>25</sup> Since 2011, TransCanada has imported 70,000 tons of carbon steel pipe from Welspun. This is approximately 8.5 percent of pipe needed for Keystone XL. In addition, Evraz will manufacture 40%.

<sup>26</sup> Metal Bulletin,op cit; Bredero Shaw, Pipe Coating Solutions, Volume 2, 2010. <u>http://www.brederoshaw.com/</u> literature/newsletter/PipeCoatingSolutions\_NA\_2010\_2.pdf

<sup>27</sup> Data pertaining to TransCanada's Keystone imports were obtained through industry tracking of US imports and export by consignee, product, and origin, etc.

<sup>28</sup> Customs Data show raw steel imports of hot rolled steel coils, mild steel, and other production inputs from India, South Korea and other countries.

<sup>29</sup> FEIS, Project Description, Section 2-26., op. cit.

<sup>30</sup> The work in Canada may yield some employment benefits to the US if US-based suppliers are involved-but the numbers are likely to be small.

TransCanada's decision to contract steel pipe for KXL from outside of the US is consistent with past practice. TransCanada imported almost all of the steel pipe needed for the US portion of Keystone Phase 1 (Hardesty, Alberta to Patoka, Illinois) from Welspun's plants in India.<sup>31</sup> In fact, when Welspun was sued by Kinder Morgan for producing substandard steel that led to pipeline leaks and spills: the Indian company that supplied the steel, ArcelorMittal, was also sued.<sup>32</sup> The rest of the pipe for Phase 1 was manufactured by Evraz in its Canadian mills and by Berg Steel Corporation, which has pipe mills both within and outside of North America.<sup>33</sup> TransCanada has and continues to import pipe components(such as valves) from various multi-national corporations like Orion Spa, Valvitalia and subsidiaries of Welspun.<sup>34</sup>

Regarding issues of the quality of the steel used for KXL (see section on oil spills, below), in 2011 TransCanada agreed to 57 new pipe safety specifications demanded by the US Pipeline and Hazardous Materials Safety Administration (PHMSA). The company was responding to the leaks and spills that had occurred following the construction of TransCanada's Phase 1 and Phase 2 pipelines. It is unclear how TransCanada plans to meet these new specifications for KXL US. Nor is it clear if and how the State Department is monitoring where TransCanada is producing the pipe for KXL US or whether the pipe meets PHMSA's specifications. Import records show that TransCanada had already imported close to 10% of the pipe for KXL in early 2011.<sup>35</sup> It is likely that much of the steel pipe for KXL has already been manufactured; the pipe has to be produced substantially before major construction activity begins in order to allow time for double jointing, pipe coating and transport to the construction location.

All in all, the claims made by KXL proponents that the project will generate thousands of manufacturing jobs are unsubstantiated and misleading. If a significant proportion of the pipe is fabricated outside the US, this further decreases positive US employment impacts. Even the steel pipe fabricated within the US is made from imported steel, which further decreases positive US employment impacts. Furthermore, the evidence also suggests that only final processing work is likely to be done in the US, and that other pipe components are also being imported. This further reduces any potential US manufacturing jobs impacts.

Finally, there is evidence to suggest that TransCanada could be offshoring safety concerns, as well as jobs. The fact that the steel and steel pipe are being imported from outside the US has a safety impact in an area that has already been prone to catastrophic accidents. As indicated above, the KXL project will be subject to more stringent safety specifications.

<sup>1</sup> In an interview with World Pipelines Magazine, Welspun explains that one of its main advantages is its global capacity to produce pipe: "Welspun used its global capacity to produce the pipe and related services to meet the demanding schedule required for the project [Keystone]. One of Welspun's greatest strengths is its global capacity, in India and the US. Multiple helically spiral welded pipe mills in India produced the bare pipe for the Keystone project and over 20 ocean going vessels supplied by Thorsten Shipping transported the bare pipe from the India port of Mundra to the US through the Ports of New Orleans and Houston." (http://www.welspunpipes.us.com/userfiles/file/Editonal%20-%20Worldpipeline%20 Magazine%20-%20Aug%2009.pdf; Welspun Annual Report FY 2007-08, p. 10 http://welspunpipes.us.com/userfiles/file/ WGSRL%20Annual%20Report%202007-08.pdf

<sup>32</sup> http://plainsjustice.org/files/Keystone\_XL/Steel/Letter\_re\_TransCanada\_Use\_of\_Substandard\_Steel\_2010-06-28, pdf; http://plainsjustice.org/files/SubstandardSteelReport.pdf) Kinder Morgan Louisiana Pipeline LLC v. Welspun Gujarat Stahl Rohren Ltd., 752 F. Supp. 2d 772 (S.D. Tex. 2010).

<sup>33</sup> Berg Spiral Pipe Corp website <u>http://www.bergpipe.com/130-1-Project-List.html</u>; Bredero Shaw Pearland, op. cit.

<sup>34</sup> Data pertaining to TransCanada's Keystone imports were obtained through industry tracking of US imports and export by consignee, product, and origin, etc. See Excel table in appendix.

<sup>35</sup> See footnote 28.

However, it is unclear how TransCanada will meet these new specifications or how they will be monitored by US authorities, particularly if a major portion of the manufacturing is off-shore (and a significant amount of the pipe has already been produced). Moreover, the Indian company, Welspun, which is likely to be the largest steel pipe manufacturer for the project, is currently being sued for the sales of defective pipelines and has been repeatedly found to produce substandard steel. These safety concerns will be discussed in more detail in the "Oil Spills" section below.

# CONSTRUCTION SERVICES: ENGINEERING/DESIGN/TECHNICAL/ SUPPORT

The study by the Perryman Group (discussed in more detail below) includes KXL pipeline construction jobs created from direct expenditures as well as a broader range of spin off jobs (direct jobs off-site, plus indirect and induced) from those expenditures.<sup>36</sup> Perryman's numbers include jobs in the 6 states along the pipeline's route as well as the job impact to the rest of the United States. Perryman anticipates that just over 40% of the total US employment would occur in Texas. On its face, this is not surprising. Over a quarter of the KXL US pipeline route is within Texas, and the Gulf Coast is a global center for a broad range of activities relating to the oil industry. The highly populous and industrialized Gulf Coast region (notably Texas) could provide a substantial amount of the overall construction labor and other inputs for KXL construction. Data from the Perryman study also suggests that the other 5 states along the pipeline's route would account for roughly one third of total national US employment impacts from KXL construction.<sup>37</sup>

The Perryman study is based on expenditure and sourcing data provided by TransCanada, and none of that information has been disclosed or subject to independent review. The Perryman results (notably the high number of jobs estimated overall, and especially in Texas) are a strong indication that the Perryman study is assuming a high level of US content for KXL project sourcing. Put more simply, TransCanada and Perryman are claiming that materials, supplies, and services for KXL construction will in large part be provided by suppliers in Texas and elsewhere in the US, and that these KXL suppliers will in turn rely in large part on other US suppliers.

The previous section of this paper addressed the sourcing of the 36-inch steel pipe that is the largest single materials input for KXL—literally the pipe in the pipeline. But it should also be emphasized that a project like KXL includes very substantial expenditures for a wide variety of engineering, design, and other technical and support services. The US (and especially Texas) has traditionally been a global center for oil and gas industry support activities, including both materials and services.

But with the growth of the Tar Sands and related activities, Canada (and especially Alberta) has emerged as another global center for the oil and gas industry. And as would be expected, TransCanada (which is based in Calgary, Alberta) has very extensive and strong relationships with Canadian suppliers of pipeline materials and services. And Canadian suppliers have played a large role in all phases of the Keystone project.

<sup>36</sup> Perryman Keystone XL, 2010, op. cit.

Perryman Keystone XL, 2010, op. cit. pp. 44-51. The remaining jobs would be in the rest of US outside of the 6 pipeline states.

Moreover, it should be emphasized that logistics are a major consideration in pipeline construction and operations. Put simply, much of the KXL pipeline route (including the portion within the northern US, as well as in Canada) is closer to Alberta than to Texas.

The Perryman analysis assumes that KXL construction will have large impacts within the US and especially within Texas. But in reality, KXL sourcing will have a large component of suppliers from Canada as well as from outside North America.

# PERRYMAN STUDY DEEPLY FLAWED AND PROVIDES NO SOUND BASIS FOR JOBS CLAIMS

The industry's claim that Keystone XL will create a total of 119,000 jobs is based on a deeply flawed and poorly documented study commissioned by TransCanada (The Perryman Group study). The Perryman study includes jobs from KXL construction (and possibly operations) in its calculation of overall employment impacts, estimated at close to 119,000 person years.<sup>38</sup> The Perryman study jobs estimates are claimed to incorporate a broad range of economic spin-offs (direct, indirect, and induced jobs).<sup>39</sup>

At the outset, the Perryman study lays out how this type of job study should be conducted:

There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated.<sup>40</sup>

#### [...]

the estimated costs of the pipeline and supporting facilities were provided by TransCanada and are consistent with available market information. The estimates are fully adjusted for both (1) the construction materials likely to be acquired from foreign sources and (2) the aspects of construction within individual states which do not reflect spending in the local areas.<sup>41</sup>

### [...]

an important first step in quantifying the total economic impact of the pipeline expansion project is estimation of the direct outlays. As noted, approximate mileage and costs in various areas was provided by the developer, as well as the location and costs associated with collateral infrastructure. The Perryman Group used these estimates to define the direct activity associated with the project in the US and in each state along the route, which includes direct expenditures in construction and development of the pipeline as well as the corresponding multiplier effects associated with those expenditures. <sup>42</sup>

### [...]

The second step is the simulation of the input-output system to measure overall economic effects. In the case of a prospective evaluation, it is necessary to first calculate reasonable estimates of the direct activity.<sup>43</sup>

<sup>38</sup> Perryman Keystone XL, 2010, op. cit.

<sup>39</sup> Perryman Keystone XL, 2010, op. cit. pp. 38-39.

<sup>40</sup> Perryman Keystone XL, 2010, op. cit. p. 37.

<sup>41</sup> Perryman Keystone XL, 2010, op. cit. pp. 21-22.

<sup>42</sup> Perryman Keystone XL, 2010, op. cit. p. 22

<sup>43</sup> Perryman Keystone XL, 2010, op. cit. p. 37.

However, by Perryman's own standards for conducting a quality job study, as cited above, the Perryman report fails on three major counts:

- (a) Most importantly, Perryman fails to define the project that is being analyzed.
- (b) Secondly, Perryman fails to properly define the overall cost of the project, as well as project-related spending.
- (c) Related to point (b), Perryman provides no input data from TransCanada.

Regarding the last point (c), Perryman states that he received this data from TransCanada, but nowhere in the report does he provide the TransCanada input data (for construction expenditures and sourcing of inputs). Perryman does not even present summary detail as to the essentials regarding inputs (such as a breakdown of expenditures into major categories and assumptions regarding whether major inputs such as steel pipe are imported or sourced domestically or imported). Nor does the Perryman report provide adequate detail as to the nature of the job impacts estimated (such as a breakdown between direct, indirect, and induced). In fact, the lack of adequate data and detail render the report so opaque as to make meaningful review impossible.

Regarding points (a) and (b), the Perryman study's failure to be transparent, and to meet the standards of a quality jobs study, extends to even the most fundamental aspects. As a starting point, any jobs study for a proposed project must clearly define the project being analyzed and how much it is assumed to cost.

Despite its official title, the Perryman study results are not restricted to the Impact of the Proposed Keystone Expansion ("Keystone XL") Pipeline Project. Instead, in addition to the costs of the KXL segments, the project budget analyzed in the Perryman study also includes over \$1 billion in costs for portions of the Keystone pipeline that are already constructed and operating. Specifically, the Perryman study redefines the KXL project to include Keystone Phase 2, a 298 mile 36-inch pipeline from Steele City, Nebraska to Cushing, Oklahoma that was built in 2010 and fully in-service as of February 2011. <sup>44</sup>

The Perryman study was issued in June 2010 when Keystone Phase 2 was already under construction and would soon be completed. Jobs relating to building Phase 2 are not relevant to the current review of the KXL project and in any event have now already been created. Moreover, Phase 2 is not part of the KXL project as defined in the Presidential Permit application submitted in September 2008 and under review by Department of State throughout the period of the Perryman study and currently.<sup>45</sup> So it is simply misleading for TransCanada to claim that the Perryman study is based on the impacts of the now proposed KXL project. Instead, the Perryman study is based on a substantially larger project. And this helps to explain why the estimated job impacts are so high and so hard to reconcile with the other available information regarding likely job impacts for the KXL project that is being analyzed. The project reviewed in the Perryman study is not the same as the project that is being reviewed for the Presidential Permit Process.

<sup>44</sup> Perryman Keystone XL, 2010, op. cit. pp. 10-11.

<sup>45</sup> Phase 2 is part of the original Keystone project that was subject to a separate Department of State review, culminating in the issuance of a Presidential Permit in 2008. As explained in footnote 15, the KXL project does include the addition of two pump stations in Kansas along the existing Phase 2 pipeline.

Likewise, with respect to point (b), the Perryman study fails to be transparent about the cost of the project being analyzed, as well as the details of project-related spending. In analyses of employment impacts, it is standard practice to provide results in terms of multipliers. In particular, a useful summary metric is jobs per dollar (person-years of employment per \$1 million of project-related spending). Multipliers facilitate comparison of results within and across studies. With results expressed in terms of multipliers, projects (and other activities) with differing levels of spending can be compared to determine relative intensity of impacts. Projects with higher jobs per dollar are more labor-intensive.

The Perryman study does not present any of its results in terms of multipliers, and as a result it is difficult to compare the Perryman results with those of other studies. But the more basic problem is that the Perryman study fails to provide the amount of project-related spending being assumed. To calculate jobs per dollar, data must be provided for both jobs and dollars (the numerator and the denominator). The Perryman study does provide many results for jobs, but never makes clear what amount of dollars are being assumed in determining the job impacts. So in mathematical terms, the Perryman study provides lots of numbers for the numerator, but is notably silent as to the associated denominator. Again, according to the citations above from the Perryman study, it recognizes (at least in theory) the importance of defining multipliers for a quality job study.<sup>46</sup> In practice, however, no multiplier data have been reported in the study.

The only KXL cost data from TransCanada provided in the Perryman report is a single mention of the oft-cited \$7 billion figure.<sup>47</sup> By itself, this utter paucity of cost data is highly unusual for a study estimating job impacts. Typically, cost data are front and center in such a study. Job impacts for a project can only be meaningfully considered in the context of project-related expenditures. The mention of the \$7 billion figure (which includes costs within Canada) raises concerns as to whether the Perryman study is properly differentiating between KXL project costs in the US and Canada. The Perryman report does not provide documentation as to the amount of project costs being assumed, so it cannot be determined if costs within Canada are estimated to have jobs impacts within the US

Finally, given that the Perryman report provided no cost data, the only way to gain some insight into the Perryman study project cost assumptions was via review of the state-level reports accompanying (but not acknowledged within) the main Perryman study. Through the addition of project cost data that are chopped up into each of the state-level reports, it was revealed that Perryman wrongly includes over \$1 billion in spending for a section of the Keystone project in Kansas and Oklahoma that is not part of KXL, and has already been built. These reports demonstrate that the project costs assumed for KXL in each of

- 46 See footnote 42.
- 47 Perryman Keystone XL, 2010, op. cit. p. 1.

the 6 states along the combined KXL/Keystone Phase 2 route total \$6.6 billion.<sup>48</sup> So the project costs assumed in the Perryman study exceed the costs now estimated for the KXL project in the US (\$5.4 billion) by over \$1 billion. Put another way, the project analyzed in the Perryman study is at least 20% larger (more costly) than the actual KXL project.

So even if the Perryman study does not include the cost of KXL in Canada, it still assumes total costs near the \$7 billion figure. The Perryman study manages to achieve this result by adding in the already built Keystone Phase 2 pipeline to be part of an analysis which (on its face) purports to quantify solely the impacts of the Keystone XL project (not yet built).

A review of the state-level reports reveals that the Perryman study assumes substantial expenditures in every county along the entire Keystone Phase 2 route through Nebraska, Kansas, and Oklahoma.<sup>49</sup> As a result, the Perryman study assumes \$1 billion in capital costs and 6,721 person-years of employment in Kansas,<sup>50</sup> where all pipeline construction has already been completed.<sup>51</sup> Likewise, the Perryman study assumes \$0.845 billion in capital costs and 14,440 person-years of employment in Oklahoma, based on almost 240 pipeline miles for the combined XL and Phase 2 routing.<sup>52</sup> Phase 2 accounts for over a third of this total, so about a third of the impacts estimated by Perryman for Oklahoma are for Phase 2 and not KXL. Thus, the inclusion of Phase 2 has increased the Perryman estimates of project costs by over \$1 billion and the employment estimates for Kansas and Oklahoma by more than 10,000 person-years.

Moreover, the Perryman results include the impacts in each state from pipeline expenditures in other states. In particular, the very large impacts estimated for Texas likely reflect an assumption that this state will provide substantial amounts of inputs for the pipeline construction in other states. Thus, by including Phase 2 and increasing overall project costs by more than 20%, the Perryman study has also increased the employment estimated in Texas and all other states.

A reasonable estimate would be that the Perryman study results are in the order of 20% higher owing to the inclusion of Phase 2 costs. And this helps to explain why the Perryman results are so high relative to what would reasonably be expected for a pipeline project with the costs and characteristics of KXL.

48 Capital costs assumed in Perryman analysis (\$6.5615 billion): Montana \$1.0 billion, South Dakota \$0.8165 billion, Nebraska \$1.3 billion, Kansas \$1.0 billion, Oklahoma \$0.845, Texas \$1.6 billion (p. 1, all cites below) http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_montana\_report.pdf

http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_nontana\_report.pdf

http://www.transcanada.com/docs/Key\_Projects/Perryman\_Group\_Nebraska\_Report.pdf http://www.transcanada.com/

http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_texas\_report.pdf

docs/Key\_Projects/perryman\_group\_kansas\_report.pdf

http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_oklahoma\_report.pdf

<sup>49</sup> http://www.transcanada.com/docs/Key\_Projects/Perryman\_Group\_Nebraska\_Report.pdf, pp. 4, 9; http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_kansas\_report.pdf, p. 4, 8; http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_oklahoma\_report.pdf, p. 4, 9

<sup>50</sup> Perryman Keystone XL, 2010, op. cit. pp. 10-11, 24.

As explained in footnote 46, the KXL project does include the addition of two pump stations in Kansas along the existing Phase 2 pipeline. Given the paucity of documentation in the Perryman study, it is not possible to determine how these two pump stations have been accounted for. But in any event, the cost of these two pump stations would be small relative to the \$1.0 billion in capital costs assumed by the Perryman study for Kansas.

<sup>52</sup> Perryman Keystone XL, 2010, op. cit. pp. 10-11, 24.

In conclusion, the industry's claim that KXL will create 119,000 total jobs (direct, indirect, and induced) jobs is based on a flawed and poorly documented study, which fails to apply its own standards for conducting a quality job study. Most notably, Perryman wrongly includes over \$1 billion in spending and over 10,000 person-years of employment for a section of the Keystone project in Kansas and Oklahoma that is not part of KXL and has already been built.

# TOTAL (DIRECT, INDIRECT, AND INDUCED) JOBS FROM KEYSTONE XL

As discussed above, the state-level reports accompanying the main Perryman study indicate that the Perryman study assumes total project capital costs of \$6.6 billion.<sup>53</sup> On this basis, the Perryman results can be now be expressed as a multiplier. The Perryman study total employment impacts for project construction and development (119,000 person-years) are equivalent to 18.1 person-years of employment per \$1 million of project capital cost.<sup>54</sup>

The Keystone XL Job Analysis Chart-Higher Estimate: Perryman Multiplier provides a graphic illustration of how the Perryman Muliplier (18 person-years per \$1 million) is applied to Keystone US budgets ranging from \$6.6 billon (Phase 2 + KXL) to the more relevant \$3 to \$4 billion.

It cannot be ruled out that a pipeline construction project could result in total job impacts approaching 18 person-years per \$1 million. But given the nature of pipeline projects in general, and the specific characteristics of the KXL project, a lower multiplier should be assumed for evaluating the KXL project employment impacts. In the context of the current briefing paper, it is not practical to undertake a full independent analysis of KXL job impacts.

Fortunately, the job projections submitted by developers of other major pipeline projects provide a useful guide for estimating potential impacts for KXL.<sup>55</sup> On this basis, for the purposes of estimating total employment impacts, it is reasonable to assume a multiplier of approximately 11 person-years per \$1 million pipeline project capital costs. So for the KXL total US capital costs (\$5.4 billion), total employment impacts would be in the order of 59,000 person-years, or roughly half of the results estimated by the Perryman study.

The Keystone XL Job Analysis Chart-Lower Estimate: Independent Assessment Multiplier provides a graphic illustration of how the Independent Assessment Multiplier is applied to KXL US budgets ranging from \$5.4 billion (KXL) to the more relevant \$3 to \$4 billion.

This independent estimate of potential job impacts for KXL is lower than that estimated by Perryman for two major reasons. First, the KXL project spending assumed is \$5.4 billion (the actual budget for the project in the US), rather than the \$6.6 billion figure assumed

<sup>53</sup> See footnote 49.

<sup>54</sup> Monetary results in the Perryman study are typically expressed in terms of constant 2009 dollars. Given the paucity of documentation, it is unclear whether the project capital cost data presented in the Perryman study state-level reports are also in terms of constant 2009 dollars. Given the approximate nature of this analysis and currently very low inflation rates, a reasonable working assumption is that these cost data (and the resulting multiplier) are in 2009 dollars.

<sup>55</sup> For example, see the analysis submitted for the Enbridge Northern Gateway Project (Volume 6C: Environmental and Socio-Economic Assessment (ES)-Human Environment, Section 4: Socio Economic Condition. <u>https://www.neb.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624798/620129/B3-16 - Vol\_6C - Gateway Application - Human Environment\_ESA (Part 1 of 3) - A1TOG6\_pdf?nodeid=620083&vernum=0</u>

### **KEYSTONE XL JOB ANALYSIS: HIGHER ESTIMATE** PERRYMAN MULTIPLIER (18 PERSON-YEARS PER \$1 MILLION)



in the Perryman study (with Keystone Phase 2 added in). Second, in this independent estimate, the multiplier assumed is approximately 11 person-years per \$1 million capital costs, rather than the approximately 18 person-years per \$1 million estimated by the Perryman study. Given the opaque nature of the Perryman model and the absence of any disclosure regarding the TransCanada expenditure and sourcing data utilized by Perryman, it is impossible to determine why the Perryman results are so high.<sup>56</sup> By contrast, analyses based on higher quality studies and standard economic models estimate multipliers substantially lower than those assumed by Perryman. Hence, an alternative approach (i.e., using an independent assessment multiplier), yielding lower job estimates, is a much more reliable guide for evaluation and policymaking in regard to the KXL project.

The Perryman study's findings cannot be relied upon because there is no way of knowing how they were arrived at. The Perryman study is based on a proprietary economic analysis model.<sup>57</sup> There is basically no disclosure of the data that were input into the model, nor a useful level of detail as to how the outputs were determined. This does not allow for any meaningful independent review or validation of the Perryman findings. The results from the Perryman study do not usefully inform serious public debate concerning the KXL project and should be disregarded.

With the proper context now provided, it is possible to present estimates of job impacts that are relevant for the actual decisions that need to be made concerning the KXL

<sup>56</sup> One possibility is that the Perryman results for project construction also include impacts relating to project operations. The Perryman study is so opaque that it cannot be readily determined what types and amount of project expenditures were assumed in calculating the overall results. In particular, the Perryman study estimates a substantial amount of overall employments impacts (118,925 person-years) associated with project construction and development. But it cannot be determined what these results are based on in terms of project construction and operations. This failure to clearly distinguish between project constructions and operations was also noted in the review of the Perryman study as part of the FEIS (Socioeconomics, op.cit. Section 3.10-80-3.10-81).

<sup>57</sup> The Perryman model, christened the US Multi-Regional Impact Assessment System (USMRIAS), is opaque. Perryman claims that the model "was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility. In addition, the model has been in operation and continually updated for over two decades." The Perryman Group. The Economic and Fiscal Effects of Expanding Alcoholic Beverage Sales in the City of Dallas, July 2010. http://www.scribd.com/doc/34378516/The-Economic-and-Fiscal-Effects-of-Expanding-Alcoholic-Beverage-Sales-in-the-City-of-Dallas This is not a verifiable claim.

### KEYSTONE XL JOB ANALYSIS: LOWER ESTIMATE

INDEPENDENT ASSESSMENT MULTIPLIER (11 PERSON-YEARS PER \$1 MILLION)



project. The job estimate developed above (approximately 59,000 person-years of total employment impacts) is based on the KXL total US capital costs (\$5.4 billion). But as discussed above (in the KXL Budget section), a very substantial part of the KXL budget is already spent, and another major portion is already committed.

So in evaluating the impacts of KXL construction, it is now relevant to evaluate only the uncommitted jobs associated with building KXL. Money already spent is sunk costs and any associated jobs have already happened (or soon will happen) regardless of whether KXL is built. Likewise, to the extent KXL costs are already committed and not avoidable, the jobs associated with these costs will occur in any event.<sup>58</sup>

Thus, the incremental US spending associated with KXL project construction is only about \$3 to \$4 billion. Given a multiplier of 11 person-years per \$1 million, this translates into total employment impacts of 33,000 to 44,000 person-years.<sup>59</sup> So a reasonable estimate of the total incremental US jobs from KXL construction is about one-third of the figure estimated in the Perryman study and used by industry to advocate for the construction of KXL.

Moreover, any job impacts associated with KXL construction would be spread over 2 and more likely 3 years.<sup>60</sup> So the annual impacts are at most about 22,000 person-years of employment per year, for two years.<sup>61</sup> But the annual impacts could also be as low as 11,000 person-years per year, for three years.<sup>62</sup>

62 See footnote 59.

<sup>&</sup>lt;sup>58</sup> In practice, there would be a variety of considerations in determining the job impacts associated with project costs that are committed, but not yet spent. If in fact the committed expense will be incurred regardless of whether the project is constructed, then it might be fully appropriate to consider any job impacts from the committed expense as a constant that need not be taken into account. Put more simply, if the jobs will happen in any event, they should not be a factor in evaluating whether to proceed with construction. On the other hand, in the event that KXL is not constructed, TransCanada would presumably seek to minimize costs by attempting to renegotiate commitments, as well as by reusing or reselling whatever was being obtained via the commitments. So it is conceivable that some material intended for use in KXL would then be repurposed for other projects and that would serve to reduce future procurement and associated jobs.

<sup>59</sup> Approximately \$3 to \$4 billion x 11 person-years per \$1 million = 33,000-44,000.

<sup>60</sup> The construction period for KXL would be at least 2 years and possibly longer. Moreover, there will be some time lags for effects to ripple through the economy. And much of the total employment impacts being estimated are for these ripple effects (indirect and induced jobs), as opposed to the direct on-site construction labor whose timing is tied to the actual construction. So even if KXL construction proceeds on a highly accelerated and compressed schedule, associated employment impacts will be spread over at least 2 years. And a scenario where job impacts are spread over at least 3 years is more realistic.

<sup>61</sup> See footnote 59.

Either way, the potential job impacts associated with KXL construction are quite small, both absolutely and certainly relative to the employment levels estimated by the Perryman study. In comparing these results with those from the Perryman study, it is useful to keep in mind that even results based on the Perryman study would be much lower, once they are adjusted for more realistic project cost assumptions.

Starting with the Perryman study total employment estimated for project construction (119,000 person-years), the Perryman results can be adjusted for more realistic project cost assumptions. Also starting with the \$6.6 billion in project costs assumed by Perryman,<sup>63</sup> and adjusting for the \$5.4 billion project cost for KXL in the US, the adjusted Perryman result is about 97,000 person-years. Next, instead of assuming a \$4 billion KXL US project cost not yet spent, the adjusted Perryman result drops to about 72,000 person-years. And finally, assuming a \$3 billion KXL US cost not yet spent or committed, the adjusted Perryman results drops again to 54,000 person-years.

So even if it is assumed the Perryman study provides a reasonable estimate of job impacts per dollar spent on pipeline construction (i.e. 18 person-years per \$1 million), total job impact will be much lower than the Perryman results once a more realistic budget is assumed for project construction. And whatever is estimated for total employment impacts, it must be spread over the relevant period in order to meaningfully estimate annual impacts. For KXL construction, the relevant period is at least two and perhaps more likely three years.<sup>64</sup>

In this context, it is also important to consider that almost all of the jobs (direct, indirect and induced) associated with Keystone XL will, of course, also be temporary. The operating costs for KXL are very minimal, and based on the figures provided by TransCanada for the Canadian section of the pipeline, the new permanent US pipeline jobs in the US number as few as 50.65 The other operating expenditures (for materials, supplies, services, electric power, property taxes, etc.) would comprise the bulk of operating expenses and would also have some job impacts. So considering a broad range of spin-offs, operating expenditures would have job impacts in the order of around 1,000 per year.<sup>66</sup>

It is unfortunate that the numbers generated by TransCanada, the industry, and the Perryman study have been subject to so little scrutiny, because they clearly inflate the projections for the numbers of direct, indirect, and long-term induced jobs that KXL might expect to create. What is being offered by the proponents is advocacy to build support for KXL, rather than serious research aimed to inform public debate and responsible decision making. By repeating inflated numbers, the supporters of KXL approval are doing an injustice to the American public in that expectations are raised for jobs that simply cannot be met. These numbers—hundreds of thousands of jobs!—then get packaged as if KXL were a major jobs program capable of registering some kind of significant impact on unemployment levels and the overall economy. This is plainly untrue.

65 Calculated based on information provided by TransCanada that approximately 864 km pipeline would create 17 permanent jobs in Canada. Source: National Energy Board's Hearing with TransCanada on April 8, 2008, p.96, line 961.

66 Pipeline operating costs, such as electric power supply for pump stations, generally have relatively small job impacts. Operating costs include property and other taxes. Depending upon the amount of taxes assumed and the modeling of impacts associated with taxes, job impacts for pipeline operating expenditures could be somewhat higher or lower than the estimate provided. As discussed in the remainder of this paper, the adverse impacts associated with KXL could be very sizable and more than offset any benefits in terms of tax revenues.

<sup>63</sup> See footnote 48.

<sup>64</sup> See footnote 60.

# KXL WILL HAVE MINOR IMPACT ON UNEMPLOYMENT LEVELS

When the direct, indirect and induced jobs created by KXL are examined in the light of the US economy as a whole, claims that Keystone XL will be both a major source of jobs and play an important role in putting unemployed Americans back to work are misleading. According to Perryman, the lion's share of state-by-state employment estimated for KXL will go to Texas (over 40%) and the other states will gain small numbers of construction jobs.<sup>67</sup> Based on the current unemployment rates for the pipeline states, these jobs could have a small impact on local unemployment levels. Using Perryman's own numbers, we calculate an average reduction in the levels of pipeline state unemployment of under 0.2%—a very modest reduction indeed.

None of this alters the fact that, even if Perryman's total job figures (119,000) were correct, and all the workers expected to be hired in the next phase of the project were hired tomorrow (so roughly 40,000 for three years), the US unemployment would remain where it is today—at 9.1 per cent.<sup>68</sup> The US economy needs to create more than 90,000 jobs per month just to keep up with the growing labor force.<sup>69</sup> It needs to generate 8 million jobs in order the get the US unemployment down to where it was at the onset of the recession.<sup>70</sup> And while it is true that construction and manufacturing have been hit hard by the 2008 recession, these are areas of the economy that have reduced unemployment substantially over the past 12 months. In August 2011 the unemployment level for construction workers was 13.5%, down from 17.0% a year ago. Manufacturing unemployment had also fallen to 8.9%, slightly below the 9.1% average for the workforce as a whole.<sup>71</sup> In an economy that has lost millions of jobs since the onset of the recession in 2008, KXL jobs amount to a tiny drop in a very deep bucket.

<sup>67</sup> Perryman, op. cit, p. 24. Also see: <u>http://www.transcanada.com/docs/Key\_Projects/perryman\_group\_texas\_report.</u> pdf, p.2.

<sup>68</sup> Bureau of Labor Statistics (BLS), The Employment Situation, August 2011. <u>http://www.bls.gov/news.release/pdf/empsit.pdf</u>

<sup>69</sup> Baker, Dean. "Zero Job Growth in August, as Unemployment Rate Remains Stable," Center for Economic and Policy Research, September 2, 2011. <u>http://www.cepr.net/index.php/data-bytes/jobs-bytes/zero-job-growth-in-august-as-unemployment-rate-remains-stable</u>

<sup>70</sup> Fieldhouse, Andrew and Irons, John. "More Economic Support is Desperately Needed, Economic Policy Institute," June 23, 2011. <u>http://www.epi.org/publication/more\_economic\_support\_is\_desperately\_needed/;</u> calculated using BLS data from November 2007 and August 2011.

<sup>71</sup> BLS, op.cit.

# FOUR WAYS KEYSTONE XL COULD BE A JOB KILLER

The industry-generated jobs data are highly questionable and ultimately misleading. But this is only part of the problem. These industry-generated data attempt only to tell the positive side of the KXL jobs story. There is evidence to suggest that the effects of KXL construction could very well lead to more jobs being lost than are created. In this section, we show four ways that jobs can be destroyed or prevented by KXL—higher petroleum prices, environmental damage such as spills, the impact of emissions on health and climate instability, and the chilling effect KXL approval could have on the emerging green economy.

### **HIGHER FUEL PRICES IN 15 STATES**

According to TransCanada, KXL will increase the price of heavy crude oil in the Midwest by almost \$2 to \$4 billion annually, and escalating for several years.<sup>72</sup> It will do this by diverting major volumes of Tar Sands oil now supplying the Midwest refineries, so it can be sold at higher prices to the Gulf Coast and export markets. As a result, consumers in the Midwest could be paying 10 to 20 cents more per gallon for gasoline and diesel fuel, adding up to \$5 billion to the annual US fuel bill.<sup>73</sup> Further, the KXL pipeline will do nothing to insulate the US from oil price volatility.<sup>74</sup>

**Even one year of fuel price increases as a result of KXL could cancel out some or all of the jobs created by KXL, based on the (more accurate) \$3 to 4 billion budget for KXL (the remaining cost to build within the US).** Higher fuel prices due to KXL would have broad adverse impacts. Gasoline is a significant cost for most Americans, and especially for those with lower incomes and/or residing in rural areas. Moreover, refined oil products (notably gasoline and diesel) are very widely used throughout the economy (especially in agriculture and commercial transportation). So higher fuel prices due to KXL would ripple through the economy and impact a very broad range of people and businesses.

The benefits of KXL construction and operations would be narrowly concentrated. A relatively small number of workers and businesses would be directly involved in providing labor and other inputs to pipeline construction and operations. Likewise, the other potential costs and benefits from KXL would not be shared equally across US regions and states. In particular, the Midwest region could be a loser due to KXL, while the Gulf Coast (and particularly Texas) could be a winner.

<sup>72</sup> National Energy Board (Canada), Reasons for Decision, TransCanada Keystone Pipeline GP Ltd, OH-1-2009, March 2010 <u>https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objld=604441&objAction=browse</u> pp. 21-22; Verleger, Phil. "If gas prices go up further, blame Canada," Star Tribune. May 13, 2011. <u>http://www.startribune.com/opinion/</u> <u>otherviews/117832183,html?source=error</u>

<sup>73</sup> Verleger, Phil, op cit.

<sup>74</sup> Verleger, Phil, op cit.

The impact of higher Midwest fuel prices due to KXL would be concentrated in that region. But there will certainly be some spillover of effects to other regions, especially since the Midwest is a large region with strong economic linkages to other areas of the US. KXL would deliver Tar Sands output (and other crude oil) to the Gulf Coast. In contrast to potential impacts in the Midwest oil market, KXL is less likely to increase Gulf Coast fuel prices and could even lead to somewhat lower prices. Overall, the potential costs and benefits from KXL would not be shared equally. Higher fuel prices due to KXL would result in a broad set of losers, while KXL construction and operations would mainly benefit a much narrower group of winners.

### JOBS LOST THROUGH ENVIRONMENTAL DAMAGE

The industry has ignored or dismissed fears that the KXL pipeline will have a serious impact on our environment through inland spills or spills into fresh water supplies (principally the Ogallala Aquifer) or through increases in greenhouse gas emissions (GHGs) and other forms of pollution. In so doing, it has no need to acknowledge that environmental damage is invariably a job killer. Cleaning up spills and other environmental damage may create some jobs, but only at the expense of jobs in other parts of the economy.

### THE COST OF OIL SPILLS

The economic and non-economic damage caused by oil spills are given scant attention by TransCanada or supporters of KXL. But they need to be considered as part of the hefty price our economy and our environment would have to pay if KXL is constructed. In 2010, pipeline spills and explosions in the US killed 22 people, released more than 170,000 barrels of petroleum, and caused \$1 billion dollars in damage.<sup>75</sup> The history of other pipelines indicates that spills from KXL are inevitable. Over thirty spills have occurred with the Keystone pipeline (Phase 1 and 2) in its first year of operation in Canada and the United States.<sup>76</sup> According to the State Department's FEIS, Keystone has experienced 14 leaks on US territory in just its first year of operation.<sup>77</sup> This is despite the fact that the Keystone pipeline was described as meeting or exceeding "world-class safety and environmental standards."<sup>78</sup> In Canada, 19 spills had been reported from Keystone as of June 2011.

Concerns generated by the actual spill history of Keystone and similar pipelines are further reinforced by an independent study conducted by Dr. John S. Stansbury of the University of Nebraska. Stansbury's study examined the likely frequency, magnitude and consequences of spills from KXL. It concluded that TranCanada's claim that spills would be rare—just 11 significant spills over a 50 year period—was not consistent with the available

<sup>75</sup> PHMSA Pipeline Safety Program website (viewed 9.27.11) http://primis.phmsa.dot.gov/comm/reports/safety/PSI.html

<sup>76 &</sup>lt;u>http://primis.phmsa.dot.gov/comm/reports/safety/PSI.html</u>, Natural Resources Defense Council, Sierra Club, Oil Change, International, Dakota Resource Council, September 2011, "The Keystone XL Tar Sands Pipeline Is Not in the National Interest."

<sup>77</sup> FEIS, Section 3.01-103. See also US Department of Transportation, Pipeline and Hazardous Materials Safety Administration. Corrective Action Order, CPF No. 3-2011-5006H. June 3, 2011. <u>http://blog.nwf.org/wildlifepromise/</u> files/2011/06/320115006H\_CAO\_06032011.pdf

<sup>78</sup> Think Progress, "After 12 Oil Spills in One Year, TransCanada Says Proposed Keystone XL Pipeline will be Safest in US," August 17, 2011 citing http://thinkprogress.org/romm/2011/08/17/297576/oil-spills-transcanadakeystone-xl-pipeline/. See also: Natural Resources Defense Council, Sierra Club, Oil Change,International, Dakota Resource Council September 2011, "The Keystone XL Tar Sands Pipeline Is Not in the National Interest"

historical data pertaining to pipeline spills (which point to a much higher spill rate). Moreover:

(A) more realistic assessment of expected frequency of significant spills is 0.00109 spills per year per mile (from the historical data (PHMSA, 2009)) resulting in 91 major spills over a 50 year design life of the pipeline.<sup>79</sup>

Concerns regarding spills could be even further heightened by the fact that TransCanada is contracting with a company (Welspun) that has been found to produce substandard steel.<sup>80</sup> TransCanada used imported Welspun steel for Phase 1 of the Keystone project and, as noted above, the pipeline has had 14 spills in its first year of operation. Prior to building Phase 1, TransCanada assured landowners and government officials that a spill would only occur once every 20 years. The latest leaks in Keystone Phase 1 spurred the PHMSA to order a shut down of the pipeline until a "corrective action order" was addressed. PHMSA ordered this "corrective action order" due to pipe expansions it had detected. Pipe expansions occur when low strength, low integrity, or poor quality steel is used. Under normal circumstances, it takes about 46 years of use before pipe expansions occur. <sup>81</sup>

Welspun's use of substandard steel has also been an issue in other pipeline projects. Welspun is currently being sued by two Kinder Morgan Energy Partner subsidiaries for fraudulent sales practices and the sale of defective steel pipe.<sup>82</sup> PHMSA has ordered Boardwalk Pipeline Partners and Kinder Morgan Energy Partner to replace hundreds of pipe joints along their pipelines after an investigation revealed numerous "expansion anomalies" indicating the use of low quality steel. Approximately 80 percent of the steel Boardwalk Pipeline Partners and Kinder Morgan Energy Partner used in their pipelines was purchased from Welspun.<sup>83</sup>

Certainly, the environmental damage of a "worst case scenario" spill from KXL would be very extensive, particularly affecting Midwest residents' livelihoods in agriculture, tourism, and many other economic sectors. Stansbury's study notes, "(T)he benzene released by a Keystone XL worst-case spill to groundwater in the Sandhills region of Nebraska would be sufficient to contaminate 4.9 billion gallons of water at concentrations exceeding the safe drinking water levels." Such a spill "would pose serious health risks to people using that groundwater for drinking water and irrigation." <sup>84</sup>

Pipeline spills are also known to carry with them a hefty price tag. Cleaning up spills creates jobs, but few would maintain that this is a good way to fight unemployment. Moreover, the costs to the companies and to the public purse will simply divert money from other parts of the economy. For example, the costs of an 800,000 gallon oil spill (July 2010) into the Kalamazoo River from the Enbridge pipeline are expected to exceed

<sup>79</sup> Analysis of Frequency, Magnitude and Consequence of Worst Case Spills From the Proposed Keystone XL Pipeline John Stansbury, Ph.D., P.E. <u>http://watercenter.unl.edu/downloads/2011-Worst-case-Keystone-spills-report.pdf</u>

<sup>80</sup> Plains Justice. Request for Investigation of Possible Use Of Substandard Steel in the Keystone Pipeline, June 28, 2010 Via Email. <u>http://plainsjustice.org/files/Keystone\_XL/Steel/Letter\_re\_TransCanada\_Use\_of\_Substandard\_</u> <u>Steel\_2010-06-28.pdf</u>.

<sup>81</sup> Lefebvre, Ben. "US Tightens Scrutiny on TransCanada's Keystone Pipeline. Dow Jones Newswires," June 7, 2011. http://www.smartmoney.com/news/ON/?story=ON-20110607-000362&cid=1127

<sup>82 11</sup>th Judicial District Court of Harris County, Texas. No.2009–54103.

<sup>83</sup> Stansbury, op cit, p. 2

<sup>84</sup> Stansbury, op cit, p. 2

\$500 million, excluding the costs of insurance payments and compensation.<sup>85</sup> And the clean-up operation itself has yet to be completed.<sup>86</sup> At the height of the Kalamazoo clean-up effort, more than 2,500 EPA, state, local and Enbridge personnel and contractors worked on cleanup efforts along 35 miles of impacted river and shoreline. Over one year later the EPA has more than 500 people deployed on cleanup efforts in the area.<sup>87</sup> In addition to the spill into the Kalamazoo, Enbridge spent an additional \$45 million on costs related to a spill in Romeoville, Illinois, in September 2010. Enbridge's 2010 annual report states that the company lost \$16 million in revenue from the transfer of oil while the pipelines were shut down. Both spill cleanups and pipeline repairs contributed to an overall operating loss of \$24.7 million, according to the company's 2010 Annual Report.<sup>88</sup> According to the EPA, the July 2011 rupture at ExxonMobil's Silvertip oil pipeline spilled at least 1,000 barrels of crude oil into the Yellowstone River. More than 1,000 people were involved in cleaning up the spill, an effort that is estimated to cost \$42.6 million.<sup>89</sup>

# ECONOMIC COSTS RELATED TO AIR POLLUTION AND CARBON EMISSIONS

It is a well known fact that if emissions rise, air quality deteriorates, and health problems increase. Respiratory and other illnesses reduce both labor productivity and labor market participation, as well as the educational performance of those exposed to airborne particulates. The American Lung Association has documented how the health impacts from oil-generated NOx, SOx, Hg and other air toxics are a serious drain on the US economy.<sup>90</sup> People who are sick underperform as workers and suffer economically. These negatives also ripple through the economy in the form of increased costs for health care and rehabilitation.

If constructed, KXL will clearly add to these health-related costs and social problems. KXL is part of an industry plan to make Port Arthur into an international refining hub, where heavy sour crude from tar sands is processed for export. The processing of tar sands crude emits more toxic chemicals than processing of conventional sweet crude, and this will take place in an area where residents are already exposed to high levels of pollution. High rates of asthma and cancer and other illnesses in the Port Arthur area act as a drain on the economy and cause suffering for thousands of residents.

Aside from the human and economic costs of increased emissions related to poor air quality, it is now widely accepted that rising emissions lead to climate instability and this, in turn, results in an increase in economy-damaging, extreme weather events. As the Stern

<sup>85</sup> Zoe, Clark. "Oil Spill Cost Enbridge Energy 550 Million," Michigan Radio online. <u>http://michiganradio.org/post/oil-spill-cost-enbridge-energy-550-million-2010</u>

<sup>86</sup> US Environmental Protection Agency website, EPA's Response to the Enbridge Oil Spill (Viewed 9.21.11). <u>http://www.epa.gov/enbridgespill/index.html</u>. According to the EPA, "After a year of extensive cleanup work in the Kalamazoo River system, the (EPA) has identified pockets of submerged oil in three areas covering approximately 200 acres that require cleanup."

<sup>87</sup> US Environmental Protection Agency website, One Year Later: More Work Necessary to Clean Up Submerged Oil in Michigan's Kalamazoo River System (Viewed 9.21.11). <u>http://epa.gov/enbridgespill/</u>

<sup>88</sup> Enbridge Corporation, Annual Report 2010, pp. 78, 92, 160-1. <u>http://ar.enbridge.com/ar2010/assets/</u> <u>Downloads/2010\_Enbridge-Inc-Annual-Report.pdf</u>. Killian, Chris. "Enbridge plans 'accelerated' pipeline inspection process in 2011," mlive.com, April 6, 2011. <u>http://www.mlive.com/news/kalamazoo/index.ssf/2011/04/enbridge\_plans\_accelerated\_pip.html</u>

<sup>89</sup> National Geographic, op.cit.

<sup>90</sup> American Lung Association, http://www.lungassoc.org



Review<sup>91</sup> made clear five years ago, if emissions continue to rise according to a "business as usual" scenario, climate change is likely to have an impact on the global economy equivalent to the combined effect of the two World Wars of the 20<sup>th</sup> Century and the Great Depression. According to Stern, as much as 20 percent of global GDP could be wiped out.

Extreme weather events are already having a serious impact on jobs and livelihoods in many parts of the world. In 2011, killer tornados, droughts and forest fires, record-breaking temperatures and rainfall have wreaked havoc across the US. There are those who believe that these events have nothing to do with GHG emissions, but no one can deny that climate scientists have warned that rising emissions will lead to climate disruption, and climate disruption is today increasingly obvious. The damage caused by just one event—Hurricane Irene—has been estimated to exceed \$7 billion.<sup>92</sup> The drought in Texas—the worst one-year drought in the history of the state—has inflicted damage thus far totaling \$5.2 billion.<sup>93</sup>

<sup>91</sup> Stern, Nicholas. (2006). "Stern Review on The Economics of Climate Change (pre-publication edition). Executive Summary". HM Treasury, London. Archived from the original on 2010-01-31. <u>http://www.webcitation.org/5nCeyEYJr.</u> <u>Retrieved 2010-01</u>

<sup>92</sup> Williams Walsh, Mary. "Irene Adds to a Bad Year for Insurance Industry," August 28, 2011. <u>http://www.nytimes.</u> com/2011/08/29/business/irene-damage-may-hit-7-billion-adding-to-insurer-woes.html?pagewanted=all

<sup>93</sup> Fernandez, Manny. "Sacrifices and Restrictions as Central Texas Town Copes With Drought," New York Times, September 6, 2011.<u>http://www.nytimes.com/2011/09/07/us/07drought.html?\_r=3&scp=4&sq=cost%200f%20texas%20</u> <u>fires&st=cse</u>

How will KXL increase the level of GHG emissions? Firstly, KXL is an important part of an industry plan to expand the oil industry's exploitation of dirty, unconventional high carbon fuels. This planned expansion will have a very serious impact on emissions levels. Indisputably, the energy used in the Tar Sands extraction process has already made a huge contribution to Canada's CO<sub>2</sub> emissions. Producing one barrel of oil from the Tar Sands produces three times the amount of GHGs produced from conventional oil, making the overall GHG lifecycle of a barrel of tar sands oil considerably higher than conventional oil.<sup>94</sup> KXL will connect the Tar Sands to heavy crude refineries in the Gulf and open the Tar Sands to more extraction to meet the rising global demand for oil. This will lead to more "upstream" GHG emissions in Alberta. Furthermore, emissions generated from the manufacture of more than 800,000 tons of steel for the KXL pipeline are also significant. As a rule of thumb, one ton of steel produces one ton of CO<sub>3</sub>, which adds up to more than 800,000 tons of CO<sub>2</sub>—more than the annual national emissions levels of scores of smaller countries.95 And because Tar Sands oil is difficult to upgrade and refine, it will generate more emissions from refineries than regular crude oil. Lastly, if fully utilized, the KXL pipeline would add an additional 27 million metric tons of carbon dioxide equivalent (MMTCO2e) annually to emissions from average U.S crude.<sup>96</sup>

It is important to note that KXL is being proposed at a time when, given the scientific evidence, the public discourse should be about how to reduce emissions substantially. Slowing down the levels at which GHGs are being released into the atmosphere is simply not enough. US transport emissions presently total around 27 percent of national  $CO_2$  emissions, and emissions from transport are growing faster than emissions from any other economic sector (this is true both globally and nationally).<sup>97</sup> The US will never be able to make the kind of emissions reductions that the scientific evidence suggest are necessary without aggressively tackling the rising levels of emissions from its transportation sector. If US transport emissions were viewed as a separate country, emissions from this sector would rank number four—behind China, the US and Russia.<sup>98</sup>

However, there are alternatives for transport and the economy as a whole. The President's own *Blueprint for a Clean Energy Future* describes how the US can reduce oil use by about 3.7 million barrels a day by 2025.<sup>99</sup> From the perspective of both job creation and environmental protection, this is a far better choice and consistent with the national interests of the US

<sup>94</sup> Weber, Bob. "Alberta's Oilsands: Well-managed Necessity or Ecological Disaster?" Moose Jaw Times Herald- Canada, December 2009. <u>http://www.mjtimes.sk.ca/Canada---World/Business/2009-12-10/article-243834/Albertas-oilsands:-</u>well-managed-necessity-or-ecological-disaster%3F/1

<sup>95</sup> Dume, Belle, "Steel by-product could sequester carbon dioxide," Environmental Research Web, December 5, 2008. <u>http://environmentalresearchweb.org/cws/article/news/36966</u>. Rogers, Simon and Evans, Lisa."World carbon dioxide emissions data by country: China speeds ahead of the rest," The Guardian, January 31, 2011.<u>http://www.guardian.co.uk/</u> <u>news/datablog/2011/jan/31/world-carbon-dioxide-emissions-country-data-co2</u>

<sup>96</sup> Environmental Protection Agency. Comments on Draft Environmental Impact Statement. July 16, 2010. http://yosemite.epa.gov/oeca/webeis.nsf/%28PDFView%29/20100126/\$file/20100126.PDF?OpenElement

<sup>97</sup> Environmental Protection Agency, Greenhouse Gas Emissions from Transportation <u>http://www.epa.gov/oms/climate/basicinfo.htm</u>

<sup>98</sup> Union of Concerned Scientists, "Each Country's Share of CO2 Emissions. Information from EIA 2008. <u>http://www.ucsusa.org/global\_warming/science\_and\_impacts/science/each-countrys-share-of-co2.html</u>

<sup>99</sup> White House, Blueprint for a Secure Energy Future, March 2011.

http://www.whitehouse.gov/sites/default/files/blueprint\_secure\_energy\_future.pdf

### KEYSTONE XL'S IMPACT ON THE GREEN ECONOMY AND GREEN JOBS

It is also important to consider the jobs that may not be created as a result of KXL. Many believe its approval will likely have a chilling effect on those in the private sector and in public policy who have positioned themselves on the cutting edge of the green economy. Small business organizations such as the Green Chamber of Commerce and the Green Business Network (representing more than 5,000 enterprises) agree that KXL will impede progress toward green and sustainable economic renewal.<sup>100</sup> The level of green investments is also influenced by the degree of political will to reduce global warming pollution. The approval of KXL and an acceleration in the use of Tar Sands oil sends a clear and disturbing message: not only is Canada not serious about reaching its (already unachievable) Kyoto targets, but the US Administration is reneging on its stated commitment to provide leadership in the global effort to combat climate change.

The possibility of KXL construction amounts to a sword hanging over the prospects of a vibrant green economy and green jobs. The approval of the project will send a clear signal that North America will build its economic future economy on dirty fuel, and not on clean energy. The negative impact on jobs is potentially enormous. A string of studies have been released that point to the growth and future potential of green jobs and other economic and social dividends resulting from climate and environmental protection policies.<sup>101</sup> However, the prospect of green businesses flourishing in the future is to a large extent contingent upon how private investors and public officials interpret which way the economic winds are blowing. If the world's largest economy locks in a long-term dependence on fossil fuels—and exceptionally dirty fuels at that—then green investments (and therefore green jobs) will surely suffer.

Moreover, a recent study conducted by Political Economy Research Institute (PERI) at the University of Massachusetts concludes that oil generates barely one fourth of the number of jobs created by green investments for the same amount of investment.<sup>102</sup> Green infrastructure programs create more jobs per dollar spent because they are less capital intensive, are more labor intensive, and stimulate domestic industries and services. A post-recession study conducted by the Brookings Institute, *Sizing the Clean Economy: A National and Regional Green Jobs Assessment*,<sup>103</sup> details how today the clean economy employs 2.7 million American workers across a diverse group of industries. This figure is already greater than the number of people employed by the entire fossil fuel sector. In the past year clean-tech has outperformed the national rate of job creation by some distance. The clean economy also offers more opportunities and better pay (13 percent higher) for low- and middle-skilled workers than the national economy as a whole.<sup>104</sup>

104 Muro op.cit

<sup>100</sup> Letter from Green Chamber of Commerce to president Obama <a href="http://greenchamberofcommerce.net/2011/09/01/small-businesse-urge-president-to-reject-keystone-xl-pipeline">http://greenchamberofcommerce.net/2011/09/01/small-businesse-urge-president-to-reject-keystone-xl-pipeline</a>. See also Green Business Network <a href="http://greenbusinessnetwork.org/news/announcements/item/394-tell-president-obama-stop-the-tar-sands-oil-pipeline.html">http://greenbusinessnetwork.org/news/announcements/item/394-tell-president-obama-stop-the-tar-sands-oil-pipeline.html</a>

<sup>101</sup> United Nations Environment Program, Green Jobs: Towards Decent Work in a Sustainable Low Carbon World, September 2008. <u>http://www.unep.org/labour\_environment/features/greenjobs-report.asp</u>. See also: EPI—Blue Green Alliance, Rebuilding Green: The American Recovery and Reinvestment Act and the Green Economy, 2011

<sup>102</sup> Robert Pollin, Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy, University of Massachusetts Amherst PERI, September 2008. <u>http://www.peri.umass.edu/green\_recovery/</u>

<sup>103</sup> Muro, Mark et al. Sizing the Clean Economy: A National and Regional Green Jobs Assessment, 2011. <u>http://www.brookings.edu/reports/2011/0713\_clean\_economy.aspx</u>

### **JOBS LOST IN CANADA**

We have identified four ways by which KXL can threaten existing jobs or prevent the creation of new ones. However, there has been little discussion at all with regard to the impact KXL might have on Canadian jobs. The extraction of Tar Sands oil has generated 75,000 jobs in Alberta.<sup>1</sup> While these jobs are not all good jobs by any means, and they have brought with them a number of social problems and costs, the Tars Sands remains a large employer. Increased production from the Tar Sands will generate more jobs, but even here the picture is complicated by the fact that KXL will allow the upgrading and refining of Tar Sands oil to be "offshored" to the US and, in principle, even beyond the border of US

As recently as 2008, a dozen new or expansion "upgrader" projects were planned for the Fort McMurray and Industrial Heartland areas (just outside of Edmonton) of Alberta. The Industrial Heartland Association calculated that the 8 upgraders would create approximately 22,000 construction and 12,000 permanent jobs in the region.<sup>2</sup> These upgraders would not only provide much needed jobs in the region, but also lay the foundation for Alberta to manufacture refined petroleum products such as gasoline, diesel and petrochemicals, and thus retain much of the value added from Tar Sands production. While a few of these upgrader projects have gone forward, the vast majority of them were postponed or cancelled due to the global recession. The current and proposed pipelines to the US further reduce the likelihood that these upgraders will be built, as companies will now look to exporting Tar Sands oil to US upgraders and refineries. According to the Alberta Federation of Labour, "The size and number of these US refineries and American-bound pipelines is significant because it means that US oil refiners will have the capacity to absorb all expected increases in Alberta's oil sands production over the next 10 years."<sup>3</sup> Keystone XL will further eliminate the need for upgrading facilities in Alberta, thus ending the possibility of diversifying Alberta's energy economy and the thousands of potential construction and permanent jobs in those facilities.

1 Canadian Association of Petroleum Producers, Oil Sands Fact Book, June 2011. <u>http://issuu.com/capp/</u> docs/oilsands-factbook?mode=embed&layout=http%3A%2F%2Fskin.issuu.com%2Fv%2Flight%2Flayout.xml& showFlipBtn=true&autoFlip=true&autoFlipTime=6000

2 Alberta's Industrial Heartland Association, Presentation: Alberta's Industrial Heartland Oilsands 101 Update, June 23, 2007, p. 15-18; 31.

3 Alberta Federation of Labour, Lost Down the Pipeline, March 2009.

# CONCLUSION: EMPLOYMENT POTENTIAL

Of this writing, TransCanada, the American Petroleum Institute, and other proponents of KXL are touting the job-creation potential of the pipeline. Jobs have thus become an important part of the case for Presidential approval of KXL. The data presented in this briefing paper should put this issue to rest. The industry's capacity to frame the KXL decision as a jobs issue has been amply demonstrated in recent months, but decisionmakers should be absolutely clear that the industry's job numbers are not based on reliable research; not informed by past experience; and completely fail to consider the large number of jobs that could be endangered by the construction of KXL.

#### To highlight some of the main points made in this paper:

- » The construction of KXL will create far fewer jobs in the US than its proponents have claimed and may actually destroy more jobs than it generates.
- » The industry's US job claims, and even the State Department's analysis, are linked to a \$7 billion KXL project budget. However, the budget for KXL that will have a bearing on US jobs figures is dramatically lower—only around \$3 to \$4 billion.
- » The claim that KXL will create 20,000 direct construction and manufacturing jobs in the US is unsubstantiated. There is strong evidence to suggest that a large portion of the primary material input for KXL—steel pipe—will not even be produced in the US
- » The industry's job projections fail to consider the large number of jobs that could be lost by construction of KXL. This includes jobs lost due to consumers in the Midwest paying 10 to 20 cents more per gallon of gasoline and diesel fuel. These additional costs (\$2 to \$4 billion) will suppress other spending and cost jobs. Furthermore, pipeline spills, pollution and increased greenhouse gas emissions incur significant human health and economic costs, thus eliminating jobs.

Put simply, KXL's job creation potential is relatively small, and could be completely outweighed by the project's potential to destroy jobs through rising fuel costs, spill damage and clean up operations, air pollution and increased GHG emissions.

As noted above, it is unfortunate that the numbers generated by TransCanada, the industry, and the Perryman study have been subject to so little scrutiny, because they clearly inflate the projections for the numbers of direct, indirect, and long-term induced jobs that KXL might expect to create. What is being offered by the proponents is advocacy to build support for KXL, rather than serious research aimed to inform public debate and responsible decision making. By repeating inflated job numbers, the supporters of KXL

approval are doing an injustice to the American public in that expectations are raised for jobs that simply cannot be met. These numbers—hundreds of thousands of jobs—then get packaged as if KXL were a major jobs program capable of registering some kind of significant impact on unemployment levels and the overall economy. This is plainly untrue.



Cornell University ILR School Global Labor Institute

### About the GLI

The GLI is part of Cornell University's School for Industrial and Labor Relations (ILR), the leading U.S. university program specializing in labor relations. Through research, education and training and policy development, the GLI works with trade unions in the U.S. and internationally to develop solutions to major social, economic and environmental challenges. The goal of the Institute is to help union officers, staff and activists gain a deeper understanding of the policies and institutions that shape today's world, assist in bringing unionists based in different countries into contact with each other for meaningful discussion on strategy and policy, and facilitate dialogue between unions, civil society organizations and movements committed to global justice.



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### Attachment No. 3

Interrogatory No. 191: How many permanent jobs located within the state of Nebraska have you created?

**Answer:** Keystone has created 34 jobs within Nebraska working specifically on behalf of Keystone. However, as Dr. Goss explains on page 27 of Appendix H, the number of permanent jobs created by economic activity from direct, indirect, and induced economic impacts exceeds that number of employees acting on behalf of Keystone.

Interrogatory No. 192: As of May 5, 2017 how many people do you employ on a permanent basis within the state of Nebraska?

**Answer:** Presently, Keystone has 34 employees in the TransCanada Omaha office working on behalf of the applicant, and there are 7 full-time TransCanada field technicians in Nebraska working on behalf of Keystone.

Interrogatory No. 195: How many temporary jobs located within the state of Nebraska have you created?

Answer: Keystone has created 70 jobs for contractors within Nebraska working specifically on behalf of Keystone during the period of 2008 to 2016. For the construction of the Keystone Mainline in 2009 and 2010, on each spread there approximately 700 construction personnel, 15 surveyors, and 40 inspectors. There were two spreads in Nebraska totaling approximately 1,510 employees.

For completion of surveys (environmental, cultural, civil, geotechnical, etc.) in Nebraska for the Keystone Mainline and Keystone XL Project over the past 11 years, 30-60 and 120-150 employees, respectively, were used (second number represents peak employees).

However, as Dr. Goss explains on page 27 of Appendix H, the number of temporary jobs (e.g., construction) created by economic activity from direct, indirect, and induced economic impacts will greatly exceed that number of employees currently acting on behalf of Keystone.

Interrogatory No. 196: As of May 5, 2017 how many people do you employ on a temporary basis within the state of Nebraska?

Answer: Keystone currently employs one temporary worker in the State of Nebraska.

Interrogatory No. 199: If your proposed preferred Route for your proposed Keystone XL pipeline was constructed, how many new people, above and beyond those already employed by you in Nebraska, would you employ on a permanent basis within the state of Nebraska?

**Answer:** Keystone anticipates it would employ approximately 6-10 new individuals in the State of Nebraska if Keystone XL was constructed on the Preferred Route.

<u>Interrogatory No. 200</u>: If your proposed Mainline Alternative Route for your proposed Keystone XL pipeline was constructed, how many new people, above and beyond those already employed by you in Nebraska, would you employ on a permanent basis within the state of Nebraska?

**Answer:** Keystone anticipates it would employ approximately 6-10 new individuals in the State of Nebraska if Keystone XL was constructed on the Mainline Alternative Route.

Interrogatory No. 270: When you constructed your currently existing Keystone I pipeline, how many Nebraska residents were employed on a temporary basis during its

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construction either through direct employment by you or through employment by any contractor that you hired? For each separate category of employment list the number.

Answer: Keystone objects to this Interrogatory because it is overbroad, unduly burdensome and seeks information that is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving these objections, as provided in the Department of State's Final Environmental Impact Statement for Keystone I Pipeline, a workforce of approximately 500 to 600 construction personnel per spread was required with an additional 20 to 30 workers for construction of each pump station. There were three spreads in Nebraska and five pump stations. Taking into account the number and length of each spread within Nebraska, the number of pump stations, and considering that ten to fifteen percent of hires were local, Keystone estimates it hired approximately 125 temporary Nebraska residents.

Attachment No. 4

# THE IMPACT OF TAR SANDS PIPELINE SPILLS ON EMPLOYMENT AND THE ECONOMY

A REPORT BY CORNELL UNIVERSITY GLOBAL LABOR INSTITUTE

LARA SKINNER, PH.D AND SEAN SWEENEY, PH.D CORNELL UNIVERSITY GLOBAL LABOR INSTITUTE



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Cornell University ILR School Global Labor Institute

#### **MARCH 2012**

Lara Skinner, Ph.D. and Sean Sweeney, Ph.D Research support: Jill Kubit

In debates over proposed tar sands pipelines such as the TransCanada corporation's Keystone XL, little attention has been given to the potentially negative impacts of pipeline spills on employment and the economy. Tar sands oil is different than conventional oil. It has many different properties that may increase the frequency of pipeline spills, Recent experience has demonstrated that tar sands spills also pose additional dangers to the public and present special challenges in terms of clean up. An independent analysis of historical spill data concluded that Keystone XL could, over a 50-year period, generate up to 91 major spills. The proposed route for the 1,700-mile pipeline cuts through America's agricultural heartland, where farming, ranching, and tourism are major employers and economic engines. Ground or surface water contamination from a tar sands oil spill in this region could inflict significant economic damage, causing workers to lose jobs, businesses to close, and residents to relocate. Such a spill could negatively impact the health of residents and their communities.

### ABOUT THIS REPORT

This report examines the potentially negative impacts of tar sands oil spills on employment and the economy. It draws attention to economic sectors at risk from a tar sands pipeline spill, particularly in the six states along Keystone XL's proposed route—Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. This report also shows how Michigan's Kalamazoo River spill in 2010—to date the largest tar sands oil spill in the U.S.—caused significant economic damage and negatively impacted the quality of life of local communities.

The information was collected from employment and economic data in the pipeline states, as well as from interviews with businesspeople, landowners, farmers, and ranchers who live and work along the proposed route for the Keystone XL or near the Kalamazoo River oil spill.

### **MAIN FINDINGS**

- > The negative impacts on employment and the economy of tar sands pipelines have largely been ignored. To date, a comprehensive spills risk assessment for the proposed Keystone XL pipeline has not been conducted. Such an assessment would provide an independent review of both the risk of spills and their economic consequences.
- The Keystone XL pipeline would cut through America's breadbasket. Agricultural land and rangeland comprise 79 percent of the land that would be affected by the proposed Keystone XL pipeline. It would cross more than 1,700 bodies of water, including the Missouri and Yellowstone rivers and the Ogallala and Carrizo-Wilcox aquifers. The Ogallala Aquifer alone supplies 30 percent of the groundwater used for irrigation in the U.S. It also supplies two million people with drinking water.
- Farming, ranching, and tourism are major sources of employment along the Keystone XL pipeline's proposed route. Water contamination resulting from a Keystone XL spill, or the cumulative effect of spills over the lifetime of the pipeline, would have significant economic costs and could result in job loss in these sectors. Approximately 571,000 workers are directly employed in the agricultural sector in the six states along the Keystone XL corridor. Total agricultural output for these states is about \$76 billion annually.
- > Many of the land areas and bodies of water that Keystone XL will cross provide recreational opportunities vital to the tourism industry. Keystone XL would traverse 90.5 miles of recreation and special interest areas, including federal public lands, state parks and forests, and national historic trails. About 780,000 workers are employed in the tourism sector in the states along the Keystone XL pipeline. Tourism spending in these states totaled more than \$67 billion in 2009.

BETWEEN 2007 AND 2010, PIPELINES TRANSPORTING TAR SANDS OIL IN THE NORTHERN MIDWEST HAVE SPILLED THREE TIMES MORE OIL PER MILE THAN THE U.S. NATIONAL AVERAGE FOR CONVENTIONAL CRUDE.

> SINCE THE FIRST KEYSTONE PIPELINE BEGAN OPERATION IN JUNE 2010, AT LEAST 35 SPILLS HAVE OCCURRED IN THE UNITED STATES AND CANADA. IN ITS FIRST YEAR, THE SPILL FREQUENCY FOR KEYSTONE'S U.S. SEGMENT WAS 100 TIMES HIGHER THAN TRANSCANADA FORECAST.

- There is strong evidence that tar sands pipeline spills occur more frequently than spills from pipelines carrying conventional crude oil because of the diluted bitumen's toxic, corrosive, and heavy composition. Tar sands oil spills have the potential to be more damaging than conventional crude oil spills because they are more difficult and more costly to clean up, and because they have the potential to pose more serious health risks. Therefore both the frequency and particular nature of the spills have negative economic implications.
- The largest tar sands oil spill in the U.S. occurred on the Kalamazoo River in Michigan in 2010. This spill affected the health of hundreds of residents, displaced residents, hurt businesses, and caused a loss of jobs. The Kalamazoo spill is the most expensive tar sands pipeline oil spill in U.S. history, with overall costs estimated at \$725 million.
- » According to the U.S. State Department, the six states along the pipeline route are expected to gain a total of 20 permanent pipeline operation jobs. Meanwhile, the agricultural and tourism sectors are already a major employer in these states. Potential job losses to these sectors resulting from one or more spills from Keystone XL could be considerable.
- » Renewable energy provides a safer route to creating new jobs and a sustainable environment. The U.S. is leading the world in renewable energy investments, and employment in this sector has expanded in recent years.
### 

Tar sands oil is transported through pipelines as diluted bitumen, a mixture of bitumen (raw tar sands) and light natural gas liquids or other volatile petroleum products. Spills from pipelines transporting diluted bitumen, conventional oil, and other hazardous liquids happen frequently—but their impact on workers, businesses, and communities is not widely recognized. Between 2002 and 2011, there were more than 3,700 pipeline spills in the U.S.<sup>1</sup> In 2010 alone, U.S. pipeline spills and explosions released more than 173,000 barrels of hazardous liquids into the environment and caused \$1.1 billion in damage.<sup>2</sup>

Over the past decade, the amount of diluted bitumen passing through U.S. pipelines has rapidly increased. In 1999, the U.S. on average imported 165,000 barrels of tar sands oil per day from Canada.<sup>3</sup> By 2010, that number had risen to about 600,000 barrels per day.<sup>4</sup> In 2019, the Alberta Energy Resources Conservation Board expects as many as 1.5 million barrels of diluted bitumen oil will be imported by the U.S. every day.<sup>5</sup>

There is evidence that pipelines transporting diluted bitumen tar sands oil have a higher frequency of spills than pipelines carrying conventional crude. Between 2007 and 2010, pipelines transporting diluted bitumen tar sands oil in the northern Midwest spilled three times more oil per mile than the national average for conventional crude oil.<sup>6</sup> The relatively high spill record of pipelines transporting diluted bitumen has raised concerns about the spill potential of Keystone XL and other proposed tar sands pipelines.<sup>7</sup> Diluted bitumen is heavier, more corrosive, and contains more toxic chemicals and compounds than conventional crude oil. There is also evidence that tar sands pipeline spills inflict more damage than spills from conventional crude pipelines. Tar sands oil spills are more difficult to clean up, and the diluted bitumen's toxic and corrosive qualities may increase the overall negative impacts to the economy and public health.

### TRANSCANADA'S KEYSTONE XL PIPELINE

TransCanada is the Canadian oil pipeline company that in 2008 applied for a permit from the U.S. government to construct the Keystone XL tar sands pipeline. This proposal has attracted a high level of public attention and sparked a sharp debate about the economic and environmental implications of transporting additional tar sands into the U.S. If constructed, Keystone XL will transport more than 830,000 barrels of tar sands oil per day from Alberta, Canada, to heavy crude oil refineries in Texas. The 1,700-mile pipeline will pass through six U.S. states—Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. The pipeline will also cross 1,748 bodies of water, including the Missouri and Yellowstone rivers, and the Ogallala and Carrizo-Wilcox aquifers.<sup>8</sup> While TransCanada's application to build Keystone XL has been denied, the company announced on February 27, 2012, that it expects to reapply for a presidential permit.9

TransCanada has claimed that Keystone XL will be the "safest pipeline in the U.S."<sup>10</sup> However, since the initial Keystone 1 pipeline began operation in June 2010, at least 35 spills have occurred in the U.S. and Canada.<sup>11</sup> In its first year, the U.S. section of Keystone 1 had a spill frequency 100 times greater than TransCanada forecast.<sup>12</sup> In June 2011, federal pipeline safety regulators determined Keystone 1 was a hazard to public safety and issued TransCanada a Corrective Action Order.<sup>13</sup>



## THE POTENTIAL IMPACT OF TAR SANDS SPILLS ON JOBS AND THE ECONOMY

In the debates on tar sands pipelines taking place in the U.S. and Canada, little attention has been given either to the risk of pipeline spills or to their economic impact. In the case of Keystone XL, discussion has mostly focused on the pipeline's potential to create jobs. Scant attention has been given to how *existing* jobs and economic sectors would be impacted from Keystone XL leaks and spills. A comprehensive and independent spill risk assessment for the Keystone XL pipeline has yet to be conducted. Such an assessment is needed in order to thoroughly consider both the risk of spills and their economic consequences, including negative impacts on employment.<sup>14</sup>

Major sources of employment along the proposed pipeline route—particularly farming, ranching, and tourism—depend on a clean supply of water. Contamination resulting from a Keystone XL spill, or the cumulative effects of spills over the lifetime of the pipeline, would generate significant economic costs and could result in job loss in these sectors. About 571,000 workers are directly employed in the agricultural sector in the six states along the Keystone XL corridor. The total agricultural output for these states is \$76.3 billion.<sup>15</sup> Moreover, tourism spending totaled more than \$67 billion in 2009 and tourism employed about 780,000 people.<sup>16</sup>

## TRANSCANADA INFLATES KEYSTONE XL JOB NUMBERS

TransCanada has stated that pipeline construction would create 20,000 direct construction and manufacturing jobs in the U.S.<sup>17</sup> The Cornell Global Labor Institute (GLI) examined data TransCanada submitted to the State Department. GLI estimated between 2,500 to 4,650 temporary, direct jobs would be created per year by pipeline construction over a two-year span.<sup>18</sup> The State Department's evaluation of Keystone XL's job-creation potential produced similar results.<sup>19</sup>

TransCanada's claim that 7,000 U.S. manufacturing jobs would be created by the construction of the pipeline is unsubstantiated. The project's main material input is steel pipe, and as of September 2011 TransCanada had manufactured approximately 50 percent of the pipe in India and Canada.<sup>20</sup> TransCanada also states that Keystone XL would generate 119,000 "person years" of employment, which includes direct, indirect, and induced jobs.<sup>21</sup> GLI estimates that construction of Keystone XL would create between 33,000 and 44,000 person years of employment. This is between 30 and 40 percent of the job numbers estimated by TransCanada.<sup>22</sup> The State Department's Report to Congress in January 2012 following the presidential denial of the permit also concluded that TransCanada's numbers were inflated.<sup>23</sup>

#### THE POTENTIAL IMPACT OF SPILLS ON AGRICULTURE AND TOURISM

A preliminary analysis of the major employers and the economic profiles of the six states along the proposed pipeline route suggests that significant leaks or spills from Keystone XL could negatively impact employment and the economy—particularly in the agriculture and tourism sectors. The 2010 Enbridge pipeline tar sands spill into the Kalamazoo River incurred significant economic costs and degraded the quality of life in surrounding communities. There appears to be a considerable risk of similar spills with Keystone XL and other tar sands pipelines.

#### KEYSTONE XL CROSSES 1,748 BODIES OF WATER, FOUR MAJOR RIVERS AND OGALLALA AQUIFER IN NEBRASKA AND CARRIZO-WILCOX AQUIFER IN TEXAS

A leak or a spill into a body of water close to the proposed Keystone XL could contaminate drinking water for residents and livestock, and it could also contaminate irrigation water for farmers' crops. TransCanada's proposed route for Keystone XL had the pipeline crossing a section of the Ogallala Aquifer, which alone supplies 30 percent of U.S. groundwater used for irrigation. The aquifer also supplies two million people with drinking water.<sup>24</sup>

A study conducted by Dr. John Stansbury at the University of Nebraska estimated that 91 significant Keystone XL spills can be expected over 50 years.<sup>25</sup> The study also considered the potential damage caused by a worst-case scenario spill into the aquifer:

#### "...[T]he benzene released by a Keystone XL worst-case spill to groundwater in the Sandhills region of Nebraska would be sufficient to contaminate 4.9 billion gallons of water at concentrations exceeding the safe drinking water levels. [The spill] would pose serious health risks to people using that groundwater for drinking water and irrigation."<sup>26</sup>

A major spill from Keystone XL could extend hundreds of miles into major rivers, impacting drinking water intakes, aquatic wildlife, and recreation areas for hundreds of thousands of people, with the potential to affect cities like Omaha, Nebraska, and Kansas City, Missouri.<sup>27</sup>

#### **AGRICULTURE IS A MAJOR EMPLOYER IN THE PIPELINE STATES**

Contamination from a Keystone XL spill could have a negative effect on individuals and businesses that depend on farming and ranching. Agricultural land (4,656 acres) and rangeland (11,122 acres) comprise 79 percent of the land area affected by the proposed Keystone XL pipeline.<sup>28</sup> The farms and ranches along this corridor depend on clean water. Concerns about water contamination from a pipeline spill prompted the National Farmers Union and its affiliates in Nebraska, Montana, South Dakota, and Kansas to oppose the Keystone XL pipeline.<sup>29</sup> In 2011, ExxonMobil's oil pipeline ruptured and spilled into the Yellowstone River in Montana, contaminating 3,200 acres, much of which was farmland and ranchland.<sup>30</sup> Property owners in the spill area have filed a class-action suit for damage to their land and businesses.<sup>31</sup>

In Nebraska, 93 percent of the total land area affected by the pipeline is utilized for farming. The Keystone XL pipeline would carve a 255-mile strip through dozens of Nebraska farms.<sup>32</sup> The Keystone XL pipeline would also cross numerous waterways, including two rivers, the Niobrara and the Elkhorn, that are sources

Despite TransCanada's assurances, we know there will be leaks and spills. All pipelines have some sort of leak during their operating lifetimes. It is not a matter of if, it is a matter of when, how often, and how much leakage there will be...When a leak happens, it will be [the farmers'] drinking water, their livestock water supply, and their irrigation supply that will be contaminated. Their economic well-being is directly impacted by spills and leaks...<sup>33</sup> [In addition], 'temporary' loss of agricultural productivity of the land is acknowledged. At issue are topsoil degradation, soil compaction, and introduction of rock.<sup>34</sup>

> –JOHN K. HANSEN, PRESIDENT, NEBRASKA FARMERS UNION

> > "We are landowners along the proposed Keystone XL pipeline route and downstream from the Missouri and Yellowstone river crossings who are concerned about the impact that another spill would have on our families' health, water quality, and ability to make a living on the land in Montana."355

> > > -REPRESENTATIVES OF THE NORTHERN PLAINS PIPELINES LANDOWNERS GROUP

Tourism is the second-largest industry in South Dakota. In 2006, travelers spent nearly \$865 million across the state... The state also has a strong agricultural base. It is the largest industry in the state. South Dakota routinely ranks among the top 10 states for the production of hay, sunflowers, rye, honey, soybeans, corn, wheat, and cattle.<sup>37</sup>

-SOUTH DAKOTA DEPARTMENT OF TOURISM

"My family farms and ranches organically on 1000 acres of land, most all of which is just downhill and downstream of the proposed pipeline. We have a lot of surface water that runs through our property, down to the Cedar River. So if a leak or spill were to happen at the point where the pipe crosses our farm, it would affect us very badly. I have 5 grandchildren on my farm that I would like to be able to work here, farming and agritourism, but if something happens with this pipeline, they won't have that opportunity."<sup>36</sup>

> —JIM KNOPIK, ORGANIC FARMER, NEBRASKA

of drinking water for people and for livestock, and used for crop irrigation.<sup>38</sup> Both of these rivers eventually join the Missouri River, also a major resource for communities, farmers, ranchers, and the tourism industry. According to the U.S. State Department, the states along the pipeline corridor are expected to gain a total of 20 permanent pipeline operation jobs from Keystone XL.<sup>39</sup> Meanwhile, the agricultural sector is already a major employer and an economic engine in these states. The extent of the potential damage to this sector resulting from one or more spills from Keystone XL would of course depend on the size and location of any given spill. But if a major source of water was to become contaminated, or became inaccessible due to clean-up operations, the damage could be considerable.

#### THE CONSTRUCTION PHASE OF THE KEYSTONE XL PIPELINE WOULD DISRUPT FARMERS AND RANCHERS

Pipeline construction would bring its own disruptions to farmers and ranchers along the proposed route.<sup>40</sup> Bulldozers and backhoes would be deployed to scrape and flatten the land, and then dig a trench to lay the pipe. This process would take weeks. It would disrupt farms that produce soybeans, wheat, and other crops.<sup>41</sup> Once the pipe is laid, farmers would have to begin restoring the land in order to replant and harvest crops in the affected area. The process of laying the pipe is particularly worrisome for organic farmers who risk losing their organic certification if chemicals, such as those from machinery fuel, contaminate their soil.<sup>42</sup> Moreover, after their land is disturbed and compacted by heavy machinery, organic farmers cannot use chemicals to restore their cropland.<sup>43</sup> To maintain their organic certification, these farmers can only use natural methods to return a healthy mix of nutrients to their soil.<sup>44</sup>

#### **KEYSTONE XL WILL CROSS LAND AND BODIES OF WATER THAT SUSTAIN THE RECREATIONAL TOURISM INDUSTRY**

Many of the bodies of water that Keystone XL is expected to cross provide recreational activities that are important to the tourism industry. Land and waterways can be inaccessible for months or years following a spill. For example, 35 miles of the Kalamazoo River remain closed more than 18 months after the 2010 spill.<sup>45</sup> Fishing, canoeing, kayaking, and other recreational activities have ceased on the contaminated section of river.

Keystone XL will cross approximately 90.5 miles of recreational and special interest areas in Montana, South Dakota, Nebraska, Oklahoma, and Texas.<sup>46</sup> These areas include state and federal public lands, recreational waters, state parks and forests, national historic trails, wildlife refuges, and wildlife management areas.<sup>47</sup> Keystone XL will also cross six historic trails (including Lewis and Clark, Pony Express, Oregon, and El Camino Real de los Tejas) and two scenic byways that draw tourists from around the world (Big Sky Back Country Byway and Historic Route 66).<sup>48</sup>

# In the six states along the pipeline route, travel expenditures by visitors totaled \$67 billion in 2010, and approximately 780,000 workers are employed in the tourism sector.49

### AGRICULTURE IN THE PIPELINE STATES

TEXAS IS RANKED NO. 2 IN THE U.S. FOR AGRICULTURAL SALES<sup>50</sup>

# 570,921 WORKERS

ARE DIRECTLY EMPLOYED IN THE AGRICULTURAL SECTOR IN THE SIX PIPELINE STATES<sup>51</sup>

# MORE THAN **75,000**

KANSANS ARE DIRECTLY EMPLOYED IN THE AGRICULTURAL SECTOR<sup>52</sup>

THERE ARE 507,900 FARMS IN THE PIPELINE STATES<sup>53</sup>

**IN NEBRASKA**,

EXPORTS

**EVERY \$1** IN AGRICULTURAL

GENERATES

**IN ADDITIONAL** 

ECONOMIC ACTIVITIES<sup>57</sup>

### **ONE IN EVERY THREE** NEBRASKA JOBS IS RELATED TO

IS RELATED TO AGRICULTURE<sup>54</sup>

#### NEBRASKA'S LARGEST INDUSTRY IS AGRICULTURE<sup>55</sup>

TOTAL AGRICULTURAL OUTPUT OF THE PIPELINE STATES IS

**\$76.3** BILLION<sup>6</sup>

> IN KANSAS IN 2010, TOTAL AGRICULTURAL OUTPUT WAS MORE THAN **\$15 MILLION**<sup>58</sup>

# WHEN A SPILL HAPPENS: SOCIAL AND ECONOMIC DISRUPTION ALONG THE KALAMAZOO RIVER

The largest-ever U.S. tar sands oil spill occurred on July 25, 2010. The Enbridge corporation's Lakehead Pipeline System 6B ruptured about one mile from the town of Marshall, Michigan.<sup>59</sup> Despite multiple alarms and warning signals, operators did not shut down the 30 inch diameter pipeline until almost 12 hours after the spill began.<sup>60</sup> It took an additional six hours to identify the spill's location.<sup>61</sup> During this time more than one million gallons leaked from a 6.5 foot gash, the cause of which remains unknown.<sup>62</sup> The spill originated in an open field, but the oil flowed into Talmadge Creek and eventually traveled about 40 miles downstream along the Kalamazoo River to Morrow Lake.

The Kalamazoo spill has been especially difficult and expensive to clean up because it consisted of diluted bitumen. Conventional oil spill response techniques rely on containing oil on the surface of bodies of water. In the case of the Kalamazoo spill, as the diluted bitumen flowed down the Kalamazoo, the two main tar sands oil materials—bitumen and diluents—separated, leaving the heavier bitumen to sink.<sup>63</sup> As of February 2012, tar sands oil remains submerged in multiple locations. The cleanup, which was originally projected by Enbridge to cost between \$300 million and \$400 million, is now projected to cost \$725 million.<sup>64</sup> The river remains closed and the cleanup is expected to continue through 2012. Officials have acknowledged that some bitumen will remain on the riverbed indefinitely.<sup>65</sup>

#### **RESIDENTS SUFFER HEALTH PROBLEMS**

Immediately following the spill, people living near Talmadge Creek and the Kalamazoo River started reporting "strong, noxious odors and associated health symptoms" to their local public health departments.<sup>66</sup> Air-quality monitoring found elevated levels of benzene at multiple locations along the river during the first week after the spill.<sup>67</sup> For several weeks residents were not informed that the oil spilled was actually diluted bitumen.<sup>68</sup>

According to a 2010 report by the Michigan Department of Community Health, between July 26 and September 4, health care providers identified 145 patients who had reported illness or symptoms associated with exposure to the oil spill.<sup>69</sup> One patient exhibited eight related symptoms and was classified by medical personnel as having "major" effects (defined here as symptoms that can cause disability or are lifethreatening).<sup>70</sup> In addition, the Michigan Department of Community Health and the Calhoun County Public Health Department conducted a door-to-door survey, which included 550 people from four communities and one workplace along the river. Fifty-eight percent of the people included in the survey reported adverse health effects.<sup>71</sup> The most common symptoms reported in the surveys and in hospital visits included headaches, respiratory problems, and nausea.<sup>72</sup> Local and state health departments, together with Enbridge and the Environmental Protection Agency, continue to monitor the air, water, and soil quality along impacted areas.<sup>73</sup> However, there are currently no plans to study or monitor the spill's long-term health impacts. Similarly, there are no plans to calculate the economic costs related to residents' health problems.



"With all our regrets, we are sad to inform you that Shady Bend Campground is Permanently Closed [d]ue to the Oil Spill, July 27, 2010. We would like to thank all of you who have camped, canoe[d] or tub[ed] with us the past 22 seasons...It was a very difficult decision for us to make but not knowing when we could open again our choice was to sell our home, liquidate Shady Bend and move on to the next chapter of our lives."<sup>74</sup>

#### **DISRUPTIONS TO RESIDENTS AND BUSINESSES**

Following the spill, Enbridge developed a home buyout program for residents living directly along Talmadge Creek and the Kalamazoo River. The home purchasing program was offered to people whose properties were located in an area identified as the "red zone," or within 200 feet of the affected waterways. About 200 homes were identified for this program, which expired one year after the spill.<sup>75</sup> Enbridge purchased at least 130 homes, 114 homes in Calhoun County and 16 in Kalamazoo County.<sup>76</sup> However, the majority of homes in those two communities are located more than 200 feet from the river and generally these homes were not included in the home buyout program. Unless they also served as a residence, commercial and industrial properties along the river were also excluded.<sup>77</sup>

Some residents have expressed concerns regarding how both the spill itself and the home buyout program will impact property values.<sup>78</sup> As of February 2012, only one property has been resold, so the long-term impact on the real estate market remains unclear.<sup>79</sup> The long-term quality of life impact on a small community with a relatively large number of displaced residents is also unknown.

The impact of the Kalamazoo spill on businesses was not severe because most of the affected properties were residences. Had the spill occurred closer to commercial properties, the damage to businesses would likely have been more serious. However, the spill caused some business closures and job losses. A local campsite was forced to close, as was a daycare center. The daycare center employed about 12 people; the campsite was family-owned.

Debra Miller is a Ceresco resident whose small business survived the spill but suffered negative impacts. Her family-run carpet store, which opened in 1989, is less than four miles from the source of the spill, and close to a dam on the Kalamazoo River that served as an oil collection site. Miller estimates that

## RISKS OF TAR SANDS OIL PIPELINE SPILLS

Unlike the more viscous and free-flowing conventional crude oil, the tar sands oil that Keystone XL will carry is a rougher mixture of raw tar sands plus natural gas liquids or other volatile petroleum products. Diluted bitumen contains higher concentrations of hazardous materials and toxins than are found in conventional crude oil, and it is also more abrasive and corrosive.<sup>80</sup> Tar sands pipelines also transport oil under high pressure and at high temperatures. This means a small rupture can produce a large spill and cause significant damage. Once exposed to oxygen, the highly flammable volatile chemicals used to dilute bitumen increase the risk of explosion.<sup>81</sup>

Diluted bitumen tar sands pipeline leaks are more difficult to detect than conventional oil leaks. As diluted bitumen flows through a pipeline, pressure changes within the pipeline can result in the formation of gas bubbles that can impede the oil's flow. Sometimes these gas bubbles send faulty signals to detection systems. Because of this phenomenon, real leaks may go unnoticed by operators if they assume the leaks are gas bubbles.<sup>82</sup> Moreover, if a spill occurs in a remote area, it could take a long time for the necessary equipment to be transported to the site of the spill.<sup>83</sup>

Diluted bitumen's viscosity presents unique challenges. In the case of conventional oil spills, the crude oil floats on water and can be skimmed from the surface of rivers and streams. Diluted bitumen is similarly lighter than water, but when exposed to the air the diluents quickly evaporate, leaving heavy bitumen that then sinks beneath the surface. This was the case with the Kalamazoo River spill.<sup>84</sup>



"Enbridge compensated us for the initial shutdown of our business, but we are concerned about the long-term impact that the spill has had on our business... One-and-a-half years later our business is still suffering financially and dealing with the problems created by the spill is taking a serious toll on my available time. The area is still a construction zone, which deters customers. I also suspect that some customers feel that the smell and toxins from the spill somehow affected the carpets, even though it hasn't. All I know is this is the worst year we've ever had."<sup>85</sup>

-DEBRA MILLER, CARPET STORE OWNER

because of the spill her business profits are 35 percent lower than their pre-spill levels. In the months immediately following the spill, workers required regular access of Miller's property in order to conduct cleanup operations. Miller said that more than 100 cleanup workers came onto her property with trucks and equipment, blocking the roads and preventing public access to both her office and her warehouse. The business was also closed for 13 weeks to facilitate cleanup efforts.<sup>86</sup>

The experience of Kalamazoo residents and businesses provides an insight into some of the ways a community can be affected by a tar sands pipeline spill. Pipeline spills are not just an environmental concern. Pipeline spills can also result in significant economic and employment costs, although the systematic tracking of the social, health, and economic impacts of pipeline spills is not required by law. Leaks and spills from Keystone XL and other tar sands and conventional crude pipelines could put existing jobs at risk. In order to determine the full economic, employment, and social impacts of the proposed Keystone XL pipeline and similar pipelines, both the risks and their potential economic and social impacts should be given careful consideration.

"Many people in my community did not want to sell their homes, but felt they had no choice since the spill was negatively impacting the health of their families and they were worried about the decrease in property value...There are many streets that now have five or six empty homes on the side of the road near the river, while the people on the other side are still living there, as they were not offered the buyout program."<sup>87</sup>

-SUSAN CONNOLLY, RESIDENT OF MARSHALL, MICHIGAN

### ALTERNATE ROUTE—RENEWABLE ENERGY AND THE CLEAN ECONOMY

#### **AMERICA LEADS THE RENEWABLES REVOLUTION**

In 2011, the U.S. eclipsed China to become the world's leading investor in renewable energy. The U.S. now leads the world in wind power generation. In the last four years, more than a third of the nation's new power capacity has come from wind. Solar power has also grown—by nearly 50 percent annually since 2005. This includes a 70 percent growth rate in the first half of 2011, despite the sluggish economy.88 Nine in ten Americans say developing clean and renewable energy sources should be a priority for the President and Congress.<sup>89</sup>

Investing in renewable and clean energy creates jobs. For every

\$1 million invested, 16.7 jobs are created. By contrast, \$1 million invested in fossil fuels generates 5.3 jobs.<sup>90</sup> A \$150 billion investment in the fossil fuel industry would create about 788,000 jobs. That same investment in clean energy would create more than 2.5 million jobs.<sup>91</sup>

The jobs advantage renewable energy has over fossil fuels is demonstrated by a comparison between the coal and wind industries. Coal currently provides 49 percent of the nation's electricity, and it employs about 80,000 people in mining.<sup>92</sup> Wind currently CLEAN ENERGY JOBS PAY ABOUT **13 PERCENT MORE** THAN JOBS IN THE BROADER ECONOMY<sup>93</sup>

generates 1 percent of the nation's electricity, and it already employs about 85,000 people. Today more than 400 facilities in the U.S. manufacture wind turbine components.<sup>94</sup>



#### A CLEAN ENERGY ECONOMY TRANSLATES TO MORE JOBS

The renewable energy industry is growing at twice the rate of the overall economy. Today the clean energy economy employs 2.7 million workers overall.<sup>95</sup> Between 2003 and 2010—a time when many industries were cutting jobs—clean energy economy employers added 500,000 jobs.<sup>96</sup> In contrast, the top five oil companies generated \$546 billion in profits between 2005 and 2010, but reduced their combined U.S. workforce by 11,200.<sup>97</sup>

Renewable energy's job creation potential has barely been tapped. Realizing this potential will require proper policy decisions. IN THE U.S., WIND CURRENTLY EMPLOYS 85,000 WORKERS, AND SOLAR EMPLOYS 100,000°<sup>8</sup>

For example, extending the Treasury Grant Program under the American Reinvestment and Recovery Act would create an additional 55,000 jobs in wind and 45,000 in solar.<sup>99</sup>

Other countries have demonstrated the economic effects on the energy sector when clean energy is encouraged. Germany is one example. In 2010, more than 370,000 people were employed in renewable energy in Germany. That almost equals the number of jobs in the country's largest manufacturing industry (automobiles).<sup>100</sup>

A major commitment to clean and renewable energy in the U.S. would lead to a cleaner environment and job growth.

### **NORTHERN GATEWAY**

Keystone XL is one of several tar sands pipelines that has the potential to put at risk both public health and jobs in agriculture and tourism. In Canada, pipeline company Enbridge has proposed the 730-mile Northern Gateway tar sands pipeline, which would transport an average of 525,000 barrels of tar sands oil per day from Alberta to the Pacific Coast.<sup>101</sup> The pipeline would cross more than 750 rivers and streams and pass through the headwaters of three of the continent's most important watersheds—the Mackenzie, the Fraser, and the Skeena.<sup>102</sup> The pipeline would follow the Morice River to the Coast Mountains, cross the headwaters of the Zymoetz River, and then follow the Kitimat River down to the coastal town of Kitimat. At Kitimat, a tank farm at the edge of the water would facilitate the transfer of oil to holding tanks and then into large oil supertankers. These supertankers would then traverse 100 miles of inner-coastal waters. Although not discussed in detail in this report, the Northern Gateway pipeline crosses numerous rivers and water bodies that are the source for the multi-billion dollar Pacific Northwest fishing industry. A tar sands oil pipeline spill could contaminate these waters, negatively impacting one of the region's largest industries, and the many jobs and livelihoods linked to this industry.

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- 3. National Energy Board, Canada's Oil Sands: A Supply and Market Outlook to 2015, October 2000, p.68. (Accessed March 5, 2012), see: <a href="http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrpt/lsnd/lsndsspplymrkt20152000-eng.pdf">http://www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrpt/lsnd/lsndsspplymrkt20152000-eng.pdf</a>
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- 5. Energy Resources Conservation Board, Alberta's Energy Reserves 2009 and Supply/Demand Outlook 2010-2019: http://www.ercb.ca/docs/products/STs/st98\_2010.pdf. Based on estimates of blended bitumen removals from Alberta on Table 2.21 on page 2-34.
- 6. North Dakota, Minnesota, Wisconsin, and Michigan have approximately 5,475 miles of crude pipeline, or about 10.9 percent of the U.S. total. PHMSA. State Mileage by Commodity Statistics. 2011. primis.phmsa.dot.gov/comm/reports/safety/Ml\_detail1.html?nocache=8335#\_OuterPanel\_tab\_4. Bureau of Transportation Statistics. Table 1-10: U.S. Oil and Gas Pipeline Mileage. 2009. www.bts.gov/publications/national\_transportation\_statistics/html/table\_01\_10.html. Meanwhile, between 2007 and 2010 crude pipelines in North Dakota, Minnesota, Wisconsin, and Michigan spilled 38,220 barrels of crude, or 30.3% of the 125,862 barrels of crude spilled in the United States.
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#### **ABOUT THE GLI**

The GLI is part of Cornell University's School for Industrial and Labor Relations (ILR), the leading U.S. university program specializing in labor relations. Through research, education and training and policy development, the GLI works with trade unions in the U.S. and internationally to develop solutions to major social, economic and environmental challenges. The goal of the Institute is to help union officers, staff and activists gain a deeper understanding of the policies and institutions that shape today's world, assist in bringing unionists based in different countries into contact with each other for meaningful discussion on strategy and policy, and facilitate dialogue between unions, civil society organizations and movements committed to global justice.



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#### Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of Arthur Tanderup in Support of Landowner Intervenors

State of Nebraska ) ) ss. Antelope County )

- 1 **Q:** Please state your name.
- 2 A: My name is Arthur Tanderup.
- Q: Are you an intervener in the Public Service Commission's proceedings
   regarding TransCanada's application for approval of its proposed Keystone
   XL tar sands pipeline across Nebraska?

6 A: Yes, I am.

Q: Do you own land in Nebraska, either directly or through an entity of which
you are an owner that could be affected by the proposed TransCanada
Keystone XL pipeline?

- 10 A: Yes, I do and it is located in Antelope County.
- Q: Is Attachment No. 1 to this sworn statement copies of true and accurate aerial
   photo(s) of your land in question here with the area of the proposed KXL
   pipeline depicted?

14 A: Yes.

- 15 Q: If you are you married tell us your spouse's name please?
- 16 A: Helen Tanderup.

Q: Is Attachment No. 2 to this sworn statement a copy(ies) of picture(s) of you
 and or your family?

3 A. Yes.

- 4 Q: How long the land has been in your family?
- 5 A: The farm has been in my wife's family for over 100 years.
- 6 Q: Do you earn any income from this land?
- 7 A: Yes.

# 8 Q: Have you depended on the income from your land to support your livelihood 9 or the livelihood of your family?

10 A: Yes.

# 11 Q: Have you ever in the past or have you thought about in the future leasing all 12 or a portion of your land in question here?

- 13 A: Yes, I have thought of it and that concerns me. I am concerned that a prospective 14 tenant may try to negotiate a lower price for my land if it had the pipeline on it and 15 all the restrictions and risks and potential negative impacts to farming or ranching 16 operations as opposed to land that did not have those same risks. If I was looking 17 to lease or rent ground I would pay more for comparable non-pipeline land than I 18 would for comparable pipeline land and I think most folks would think the same 19 way. This is another negative economic impact that affects the landowner and the 20 county and the state and will forever and ever should TransCanada's preferred or 21 mainline alternative routes be approved. If they were to twin or closely parallel to 22 Keystone I the vast majority of landowners would be those that already have a 23 pipeline so there would be considerable less new incremental negative impacts.
- 24

#### Q: Do you have similar concerns about selling the land?

A: Well I hope not to have to sell the land in my lifetime but times change and you
never know what is around the corner and yes I am concerned that if another piece
of ground similar to mine were for sale and it did not have the pipeline and mine
did that I would have a lower selling price. I think this would be true for pipeline
ground on both the preferred and mainline alternative routes.

1	Q:	What is your intent with your land after you die?
2	A:	Like I said I hope not to have to sell and I hope that it stays in the family for years
3		to come but I have thought about getting out if this pipeline were to come through.
4	Q:	Are you aware that the preferred route of TransCanada's Keystone XL
5		Pipeline would cross the land described above and owned by you?
6	A:	Yes.
7	Q:	Were you or an entity for which you are a member, shareholder, or director
8		previously sued by TransCanada Keystone Pipeline, LP?
9	A:	Yes, we were in 2015. TransCanada Keystone Pipeline LP sued us by filing a
10		petition for condemnation against our land so it could place its proposed pipeline
11		within an easement that it wanted to take from us on our land.
12	Q:	Did you defend yourself and your land in that condemnation action?
13	A:	Yes, we did. We hired lawyers to defend and protect us and we incurred legal fees
14		and expenses in our resistance of TransCanada's lawsuit against us.
15	Q:	Has TransCanada reimbursed you for any of your expenses or costs for fees
16		incurred?
17	A:	No, they have not.
18	Q:	In its lawsuit against you, did TransCanada identify the amount of your
19		property that it wanted to take for its proposed pipeline?
20	A:	The lawsuit against us stated they would take the amount of property that is
21		reasonably necessary to lay, relay, operate, and maintain the pipeline and the plant
22		and equipment reasonably necessary to operate the pipeline.
23	Q:	Did TransCanada define what they meant by "property that is reasonably
24		necessary"?
25	A:	No, they did not.
26	Q:	Did TransCanada in its lawsuit against you, identify the eminent domain
27		property portion of your land?
28	A:	Yes, they did.

# Q: Did TransCanada describe what rights it proposed to take related to the eminent domain property on your land?

3 A: Yes, they did.

#### 4 Q: What rights that they proposed to take did they describe?

5 TransCanada stated that the eminent domain property will be used to "lay, relay, A: 6 operate, and maintain the pipeline and the plant and equipment reasonably 7 necessary to operate the pipeline, specifically including surveying, laying, 8 constructing, inspecting, maintaining, operating, repairing, replacing, altering, 9 reconstructing, removing and abandoning one pipeline, together with all fittings, 10 cathodic protection equipment, pipeline markers, and all their equipment and 11 appurtenances thereto, for the transportation of oil, natural gas, hydrocarbon, petroleum products, and all by-products thereof." 12

Q: Prior to filing an eminent domain lawsuit to take your land that
 TransCanada identified, do you believe they attempted to negotiate in good
 faith with you?

16 A: No, I do not.

17 Q: Did TransCanada at any time approach you with or deliver to you their
 18 proposed easement and right-of-way agreement?

19 A: Yes, they did.

20Q: At the time you reviewed TransCanada's easement and right-of-way21agreement, did you understand that they would be purchasing a fee title22interest in your property or that they were taking something else?

- A: I understood that they proposed to have the power to take both a temporary
   construction easement that could last for a certain period of time and then also a
   permanent easement which they described to be 50 feet across or in width, and
   that would run the entire portion of my property from where a proposed pipeline
   would enter my property until where it would exit the property.
- Q: Is the document included with your testimony here as Attachment No. 3, a
   true and accurate copy of TransCanada's proposed Easement and Right-of-

1 Way agreement that they included with their condemnation lawsuit against 2 vou?

3 A: Yes, it is.

4 Q: Have you had an opportunity to review TransCanada's proposed Easement
5 and Right-of-Way agreement?

6 A: Yes, I have.

- Q: What is your understanding of the significance of the Easement and Right-of8 Way agreement as proposed by TransCanada?
- 9 A: My understanding is that this is the document that will govern all of the rights and 10 obligations and duties as well as the limitations of what I can and cannot do and 11 how I and any future landowner and any person I invite to come onto my property 12 must behave as well as what TransCanada is and is not responsible for and how 13 they can use my land.

# 14Q:After reviewing TransCanada's proposed Easement and Right-of-Way15agreement do you have any concerns about any portions of it or any of the16language either included in the document or missing from the proposed17document?

- A: Yes, I have a number of significant concerns and worries about the document and
   how the language included and the language not included potentially negatively
   impacts my land and thereby potentially negatively impacts my community and
   my state.
- Q: I would like you to walk the Commissioners through each and every one of
  your concerns about TransCanada's proposed Easement and Right-of-Way
  agreement so they can develop an understanding of how that language and
  the terms of that contract, in your opinion, potentially negatively impacts you
  and your land. So, if you can start at the beginning of that document and
  let's work our way through it, okay?

1 A: Yes, I'll be happy to express my concerns about TransCanada's proposed 2 Easement and Right-of-Way agreement and how it negatively could affect my 3 property rights and my economic interests.

Okay, let's start with your first concern please. 4 Q.

5 A: The very first sentence talks about consideration or how much money they will 6 pay to compensate me for all of the known and unknown affects and all of the 7 rights I am giving up and for all the things they get to do to my land and for what 8 they will prevent me from doing on my land and they only will pay me one time at 9 the signing of the easement agreement. That is a huge problem.

#### 10 **O**: Explain to the Commissioners why that is a problem.

11 A: It is not fair to the landowner, the county, or the State. It is not fair to the 12 landowner because they want to have my land forever for use as they see fit so 13 they can make a daily profit from their customers. If I was to lease ground from 14 my neighbor I would typically pay twice a year every year as long as they granted 15 me the rights to use their land. That only makes sense – that is fair. If I was going 16 to rent a house in town I would typically pay monthly, every month until I gave up 17 my right to use that house. By TransCanada getting out on the cheap and paying 18 once in today's dollars that is monthly, bi-annual, or at least an annual loss in tax 19 revenue collection on the money I would be paid and then pay taxes on and 20 contribute to this state and this country. It is money I would be putting back into 21 my local community both spending and stimulating the local economy and 22 generating more economic activity right here. Instead TransCanada's shareholders 23 keep all that money and it never finds its way to Nebraska.

24 **O**:

#### What is your next concern?

25 A: The first paragraph goes on to say Grantor, which is me the landowner, "does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a 26 27 limited partnership..." and I have no idea who that really is. I have no idea who is 28 forcing this pipeline on us or who the owners of the entities are, or what are the 29 assets backing this limited partnership, or who the general partner is, or who all

1 the limited partners are, and who makes up the ownership of the these partners or 2 the structure or any of the basic things you would want to know and understand if 3 you would want to do business with such an outfit. According to TransCanada's 4 answer to our Interrogatory No. 28, as of the date I signed this testimony, a limited 5 liability company called TransCanada Keystone Pipeline GP, LLC is the general 6 partner and it only owns 0.02 percent of TransCanada Keystone Pipeline, LP so 7 basically nothing. That is really scary since the general partner has the liability but 8 virtually none of the ownership and who knows if it has any other assets.

9 Q: Do you think it is in the public interest of Nebraska to not be one-hundred
10 percent clear on exactly who could become the owner of about 275 miles of
11 Nebraska land?

12 A: No.

Q: Do you think it is in the public interest of Nebraska to not be one-hundred
 percent clear on exactly who will be operating and responsible for
 approximately 275 miles of tar sands pipeline underneath and through
 Nebraska land?

17 A: No.

# 18 Q: Okay, let's continue please with your concerns of the impacts upon your land 19 and the State of Nebraska of TransCanada's easement terms.

Yes, so the next sentence talks about "...its successors and assigns (hereinafter 20 A: 21 called "Grantee")..." and this concerns me because it would allow their easement 22 to be transferred or sold to someone or some company or country or who knows 23 what that I don't know and who we may not want to do business with. This 24 pipeline would be a huge asset for TransCanada and if they can sell to the highest 25 bidder that could have terrible impacts upon all of Nebraska depending upon who 26 may buy it and I don't know of any safeguards in place for us or the State to veto 27 or have any say so in who may own, operate, or be responsible for this pipeline in 28 the future.

1 2

# Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing our State is in the public interest?

3 A: No, certainly not, in fact, just the opposite.

#### 4 Q: What's next?

A: Then it says "...a perpetual permanent easement and right-of-way..." and this
really concerns me. Why does the easement and right-of-way have to be perpetual
and permanent? That is the question myself and my family want an answer to.
Perpetual to me is like forever and that doesn't make sense.

#### 9 Q: Why doesn't a perpetual Easement and Right-of-Way make sense to you?

10 A: For many reasons but mostly because the tar sands are finite. I am unaware of any 11 data proving there is a perpetual supply of tar sands. I am not aware in 12 TransCanada's application where it proves there is a perpetual necessity for this 13 pipeline. My understanding of energy infrastructure like wind towers is they have 14 a decommission plan and actually take the towers down when they become 15 obsolete or no longer needed. Nothing manmade lasts forever. My land however 16 will, and I want my family or future Nebraska families to have that land as 17 undisturbed as possible and it is not in my interest or the public interest of 18 Nebraska to be forced to give up perpetual and permanent rights in the land for 19 this specific kind of pipeline project.

20

#### Q: Okay, what is your next concern?

A: The easement language includes all these things TransCanada can do and it says "...abandoning in place..." so they can just leave this pipeline under my ground until the end of time just sitting there while they are not using it, but I am still prevented from doing on my land and using my land what I would like. If I owned a gas station I couldn't just leave my underground oil or fuel storage tanks sitting there. It doesn't make sense and it scares me and it is not in my interest or the public interest of Nebraska to allow this.

# Q: Now it looks like we are ready to go to the second page of the Easement is that right?

1 A: Yes.

#### 2 Q: So now on the second page of the Easement what are your concerns?

3 A: Here the Easement identifies a 24-month deadline to complete construction of the 4 pipeline but has caveats that are undefined and ambiguous. The 24-month period 5 starts to run from the moment "actual pipeline installation activities" begin on 6 Landowners property. It appears that TransCanada would define this phrase as 7 needed. It would be wise to explain what types of TransCanada action constitutes 8 "installation activity" For instance, would the placement and storage of an 9 excavator or other equipment on or near the Easement property be an activity or 10 would earth have to be moved before the activity requirement is triggered. This 11 vague phrase is likely to lead to future disputes and litigation that is not in the best 12 interest of the welfare of Nebraska and would not protect property interests. The 13 24-months can also be extended in the case of "force majeure." My understanding 14 is that force majeure is often used to insulate a party to a contract when events 15 occur that are completely out of their control. In TransCanada's easement this is 16 expanded to include "without limitation...availability of labor and materials." 17 Extending this language to labor and materials is problematic because these are 18 two variables that TransCanada does have some or significant control over and to allow extension of the 24-month period over events not truly out of the control of 19 20 TransCanada and without further provision for compensation for the Landowner is 21 not conducive to protection of property rights.

22

#### Q: Okay, what is your next concern?

A: Paragraphs 1.A. and 1.B. deal with the liabilities and responsibilities of
TransCanada and Landowner. In 1.A., the first sentence discusses "commercially
reasonable costs and expenses" will pay for damages caused but then limits
TransCanada's liability to certain circumstances. There is no definition of
"commercially reasonable" and no stated right that the Landowner would get to
determine the amounts of cost or expense that is "commercially reasonable."
TransCanada excepts out from their liability any damages that are caused by

Landowner's negligence or the negligence of anyone ever acting on the behalf of 1 2 Landowner. It is understandable that if the Landowner were to willfully and 3 intentionally cause damages to the pipeline that Landowner should be liable. 4 However, anything short of willful misconduct should be the lability of 5 TransCanada who is subjecting the pipeline on the Landowner and who is making 6 a daily profit from that pipeline. When evaluating the impact on property rights of 7 this provision, you must consider the potentially extremely expensive fight a 8 Landowner would have over this question of whether or not damage was an act of 9 negligence. Putting this kind of potential liability upon the Landowner is 10 incredibly problematic and is detrimental to the protection of property rights. I 11 don't think this unilateral power which I can't do anything about as the landowner 12 is in the best economic interest of the land in question or the State of Nebraska for 13 landowners to be treated that way.

# 14 Q: Is there any specific event or example you are aware of that makes this 15 concern more real for you?

A: Yes, one need not look further than a November 3, 2015 lawsuit filed against
 Nemaha County, Nebraska landowner farmers who accidently struck two
 Magellan Midstream Partners, LP pipelines, one used to transport a mixture of
 gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged
 negligence and sued the Nebraska farmer for \$4,151,148.69. A true and accurate
 copy of the Federal Court Complaint is here as Attachment No. 4.

#### 22 Q: What is your next concern with the Easement language?

A: Paragraph 3 states that Landowner can farm on and otherwise use their property as
they choose unless 1) any Landowner use interferes in any way with
TransCanada's exercise of any of its rights within the Easement, or 2)
TransCanada decides to take any action on the property it deems necessary to
prevent injury, endangerment or interference with anything TransCanada deems
necessary to do on the property. Landowner is also forbidden from excavating
without prior authorization by TransCanada. So my understanding is that

1 TransCanada will unilaterally determine what Landowner can and can't do based 2 upon how TransCanada chooses to define the terms in paragraph 3. TransCanada 3 could also completely deny my request to excavate. Further, TransCanada retains 4 all "privileges necessary or convenient for the full use of the rights" granted to 5 them in the Easement. Again, TransCanada unilaterally can decide to the 6 detriment of the property rights of Landowner what TransCanada believes is 7 necessary or convenient for it. And there is no option for any additional 8 compensation to landowner for any right exercised by TransCanada that leads to 9 the removal of trees or plants or vegetation or buildings or structures or facilities 10 owned by Landowner of any kind. Such undefined and unilateral restrictions and 11 rights without having to compensate Landowner for such further destruction or 12 losses are not conducive to the protection of property rights or economic interest.

13

#### **Q:** What is the next concern you have?

14 A: The Easement also allows some rights for Landowner but restricts them at the 15 same time and again at the sole and unilateral decision making of TransCanada. 16 TransCanada will determine if the actions of Landowner might in anyway 17 endanger or obstruct or interfere with TransCanada's full use of the Easement or 18 any appurtenances thereon to the pipeline itself or to their access to the Easement 19 or within the Easement and TransCanada retains the right at any time, whether 20 during growing season or not, to travel "within and along Easement Area on foot 21 or in vehicle or machinery..." Further at TransCanada's sole discretion it will 22 retain the rights to prevent any landowner activity that it thinks may "unreasonably 23 impair[ed] or interfe[ed] with" TransCanada's use of the Easement Area. Such 24 undefined and unilateral restrictions are not conducive to the protection of 25 property rights or economic interest.

26

#### **Q:** What is the next concern you have with the Easement language?

A: The Easement allows TransCanada sole discretion to burn or chip or bury under
Landowner's land any debris of any kind without any input or power of
Landowner to demand an alternative method or location of debris disposal. Such

unilateral powers would negatively affect Landowners property are not conducive
 to the protection of property rights or economic interest.

#### 3 Q: What is the next concern you have with the Easement language?

4 A: Again, undefined terms leave a lot of room for confusion. What does the phrase 5 "where rock is encountered" mean and why does TransCanada solely get to 6 determine whether or not this phrase is triggered. This phrase could be used to 7 justify installing the pipeline 24 inches beneath the surface. The ability to use this 8 provision to minimal locate the pipeline at a depth of 24 inches could negatively 9 affect Landowners property are not conducive to the protection of property rights. 10 A shallow pipeline is much more likely to become a danger and liability in the 11 future given farming operations and buried irrigation lines and other factors 12 common to the current typical agricultural uses of the land in question impacted 13 by TransCanada's preferred pipeline route.

#### 14 Q: What is the next concern you have with the Easement language?

15 A: There are more vague concepts solely at the determination of TransCanada such as 16 "as nearly as practicable" and "pre-construction position" and "extent reasonably 17 possible." There is nothing here that defines this or provides a mechanism for 18 documenting or memorializing "pre-construction position" so as to minimize 19 costly legal battles or wasted Landowner time attempting to recreate the soil 20 condition on their fields or pasture. Such unilateral powers would negatively affect 21 Landowners property are not conducive to the protection of property rights or 22 economic interest.

#### 23 Q: What are some of the reasons why this is concerning to you?

A: Our farm is in the eastern Sandhills and directly over the Ogallala Aquifer. The soil where the pipeline would run is all in the Thurman fine sand family. These are fine sands that are very porous. According to the Soil Survey of Antelope County Nebraska, the sand turns into a sand/gravel mixture and then all gravel before hitting a shale layer. Our house well is 70 feet deep and our irrigation well is 120 feet deep. The irrigation well is at the shale layer. When dug in the 90's, it

test pumped over 1500 gallons per minute. There is a massive amount of water in
that sandy gravel sponge. High permeability with a high water table would be
rapidly contaminated by a chemical and tar sands spill. This is the water we drink,
the livestock drinks and irrigate our crops and garden with.

5

#### Q: What is the next concern you have with the Easement language?

A: TransCanada maintains the unilateral right to abandon the pipeline and all appurtenances thereto in place on, under, across, or through Nebraska land at any time it chooses. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral powers would negatively affect Landowners property are not conducive to the protection of property rights or economic interest.

#### 12 Q: What is the next concern you have with the Easement language?

TransCanada has the power to unilaterally move or modify the location of any 13 A: 14 Easement area whether permanent or temporary at their sole discretion. 15 Regardless, if Landowner has taken prior steps relative the their property in 16 preparation or planning of TransCanada's taking of the initial easement area(s), 17 the language here does not require TransCanada to compensate the Landowner if 18 they decide to move the easement anywhere on Landowners property. Such 19 unilateral powers would negatively affect Landowners property are not conducive 20 to the protection of property rights or economic interests.

#### 21 Q: What is the next concern you have with the Easement language?

A: The Easement requires that all of the burdens and restrictions upon Landowner to
transfer and be applicable to any future owner of the Land in question without the
ability of the future Landowner to modify or negotiate any of the language in
question to which it will be held to comply.

#### 26 Q: What is the next concern you have with the Easement language?

A: The Easement allows TransCanada to assign, transfer, or sell any part of the
Easement to any person, company, country, etc. at their sole discretion at any time
to anyone. This also means that any buyer of the easement could do the same to a

1 third buyer and so on forever. There is no change of control or sale provision in 2 place to protect the Landowner or Nebraska or to provide compensation for such 3 change of control or ownership. It is not conducive to the protection of property 4 rights or economic interests to allow unilateral unrestricted sale of the Easement 5 thereby forcing upon the Landowner and our State a new unknown Easement 6 owner.

7

18

#### **Q**: What is the next concern you have with the Easement language?

8 A: There are many terms in the Easement that are either confusing or undefined terms 9 that are without context as to whether or not the Landowner would have any say 10 so in determining what these terms mean or if the evaluation is solely in 11 TransCanada's control. Some of these vague undefined terms are as follows:

- 12 i. "pipeline installation activities" 13
  - ii. "availability of labor and materials"
- 14 iii. "commercially reasonable costs and expenses"
- 15 iv. "reasonably anticipated and foreseeable costs and expenses"
- 16 v. "yield loss damages"
- 17 vi. "diminution in the value of the property"
  - vii. "substantially same condition"
- 19 viii. "an actual or potential hazard"
- 20 ix. "efficient"
- 21 x. "convenient"
- 22 xi. "endangered"
- 23 xii. "obstructed"
- 24 xiii. "injured"
- 25 xiv. "interfered with"
- 26 xv. "impaired"
- xvi. "suitable crossings" 27
- xvii. "where rock is encountered" 28
- 29 xviii. "as nearly as practicable"

1

3

- xix. "pre-construction position"
- 2
- xx. "pre-construction grade"
- xxi. "various engineering factors"

4 Each one of these above terms and phrases as read in the context of the Easement 5 could be problematic in many ways. Notably, undefined terms tend to only get 6 definition in further legal proceedings after a dispute arises and the way the 7 Easement is drafted, TransCanada has sole power to determine when and if a 8 particular situation conforms with or triggers rights affected by these terms. For 9 instance, "yield loss damages" should be specifically defined and spelled out 10 exactly how the landowner is to be compensated and in what events on the front 11 end. I can't afford to fight over this after the damage has occurred. Unfortunately, 12 the Landowner is without contractual rights to define these terms or determine when rights related to them trigger and what the affects may be. 13

- 14 Q: Do you have any other concerns about the Easement language that you can
  15 think of at this time?
- 16 A: I reserve the right to discuss any additional concerns that I think of at the time of17 my live testimony in August.

Q: Based upon what you have shared with the Commission above regarding
 TransCanada's proposed Easement terms and agreement, do you believe
 those to be reasonable or just, under the circumstances of the pipeline's
 impact upon you and your land?

- A: No, I do not believe those terms to be reasonable or just for the reasons that wediscussed previously.
- Q: Did TransCanada ever offer you financial compensation for the rights that
   they sought to obtain in your land, and for what they sought to prevent you
   and any future land owner of your property from doing in the future?
- A: Yes, we received an offer from them.

Q: As the owner of the land in question and as the person who knows it better
than anyone else, do you believe that TransCanada offered you just, or fair,

compensation for all of what they proposed to take from you so that their tar 1 2 sands pipeline could be located across your property? 3 A: No, I do not. Not at any time has TransCanada, in my opinion, made a fair or just 4 offer for all the potential impacts and effects and the rights that I'm giving up, and 5 what we will be prevented from doing in the future and how their pipeline would 6 impact my property for ever and ever. 7 **Q**: Has TransCanada at any time offered to compensate you annually, such as 8 wind farm projects do, for the existence of their potential tar sands pipeline 9 across your property. 10 A: No, never. 11 **O**: At any time did TransCanada present you with or request that you, as the 12 owner of the land in question, sign and execute a document called, "Advanced 13 **Release of Damage Claims and Indemnity Agreement?"** 14 A: Yes, they did and it was included in the County Court lawsuit against us. 15 **Q**: Is Attachment No. 5, to your testimony here, a true and accurate copy of the "Advanced Release of Damage Claims and Indemnity Agreement? 16 17 A: Yes, it is. 18 **Q**: What was your understanding of that document? 19 A: When I read that document in the plain language of that document, it was my 20 understanding that TransCanada was attempting to pay me a very small amount at 21 that time in order for me to agree to give up my rights to be compensated from 22 them in the future related to any damage or impact they may have upon my 23 property "arising out of, in connection with, or alleged to resulted from 24 construction or surveying over, under or on" my land. 25 Did you ever sign that document? **Q**: 26 No, I did not. A: 27 Why not? **Q**: 28 A: Because I do not believe that it is fair or just to try to get me to agree to a small 29 sum of money when I have no idea how bad the impacts or damages that they, or their contractors, or subcontractors, or other agents or employees, may cause on
 my land at any time in the future that resulted from the construction or surveying
 or their activities upon my land.

4 Q: When you reviewed this document, what did it make you feel?

5 A: I felt like it was simply another attempt for TransCanada to try to pay very little to 6 shield themselves against known and foreseeable impacts that their pipeline, and 7 the construction of it, would have upon my land. It made me feel that they knew it 8 was in their financial interest to pay me as little as possible to prevent me from 9 ever having the opportunity to seek fair compensation again, and that this must be 10 based upon their experience of unhappy landowners and situations in other places 11 where they have built pipelines.

# Q: Has TransCanada ever contacted you and specifically asked you if you thought their proposed location of their proposed pipeline across your land was in your best interest?

15 A: No, they have not.

Q: Has TransCanada ever contacted you and specifically asked you if you
 thought their proposed location of their proposed pipeline across your land
 was in the public interest of the State of Nebraska?

19 A: No, they have not.

20 Q: Are you familiar with the Fifth Amendment to the U.S. Constitution and the
21 Takings Clause?

22 A: Yes, I am.

Q: What is your understanding of the Fifth Amendment as it relates to taking of
an American citizens property?

A: My understanding is that, according to the United States Constitution, that if the government is going to take land for public use, then in that case, or by taking for public use, it can only occur if the private land owner is compensated justly, or fairly.
Q: Has TransCanada ever contacted you specially to explain the way in which
 the public could use its proposed Keystone XL Pipeline?

3 A: No, they have not.

4 Q: Can you think of any way in which the public, that is the citizens of the State
5 of Nebraska, can directly use the proposed TransCanada Keystone XL
6 Pipeline, as it dissects the State of Nebraska?

- A: No, I cannot. I cannot think of any way to use this pipeline. I do not see how the
  public benefits from this pipeline in any way, how they can use it any way, or how
  it's in the public interest in any way. By looking at the map, it is quite clear to me
  that the only reason it's proposed to come through Nebraska, is that because we
  are geographically in the way from between where the privately-owned Tar Sands
  are located to where TransCanada wants to ship the Tar Sands to refineries in
  Houston, Texas.
- Q: Has TransCanada ever contacted you and asked you if you had any tar sands,
   crude petroleum, or oil and petroleum by-products that you would like to
   ship in its pipeline?

17 A: No, it has not.

Q: Do you have any tar sands, crude petroleum, or oil and petroleum by products that you, at this time or any time in the future, would desire to place
 for transport within the proposed TransCanada Keystone XL Pipeline?

A: No, I do not.

- Q: Do you know anyone in the state of Nebraska who would be able to ship any
   Nebraska-based tar sands, crude petroleum, or oil and petroleum by products within the proposed TransCanada Keystone XL Pipeline?
- 25 A: No, I do not. I've never heard of such a person or company like that.
- Q: Do you pay property taxes for the land that would be affected and impacted
  at the proposed TransCanada Keystone XL Pipeline?

28 A: Yes, I do.

29 Q: Why do you pay property taxes on that land?

- A: Because that is the law. The law requires us to pay the property taxes as the owner
   of that property.
- 3 Q: Because you follow the law and pay property taxes, do you believe you
  4 deserve any special consideration or treatment apart from any other person
  5 or company that pays property taxes?
- 6 A: Well no, of course not. It's the law to pay property taxes if you own property. It's
  7 just what you do.
- 8 Q: Do you believe the fact that you pay property taxes entitles you to special
  9 treatment of any kind, or special rights of any kind?

10 A: No, of course not.

- 11 Q: Do you believe the fact that you pay property taxes on your land would be 12 enough to qualify you to have the power of eminent domain to take land of 13 your neighbors or other people in your county, or other people across the 14 state of Nebraska?
- A: Well, of course not. Like I said, paying property taxes is the law, it's nothing that
  I expect an award for or any type of special consideration.
- 17 Q: Have you at any time ever employed any person other than yourself?
- 18 A: Well, yes I have.
- Q: Do you believe that the fact that you have, at some point in your life,
   employed one or more other persons entitle you to any special treatment or
   consideration above and beyond any other Nebraskan that has also employed
   one or more persons?

23 A: No, of course not.

- Q: Do you believe that the fact that you, as a Nebraska land owner and taxpayer
   have at one point employed another person within this state, entitles you to
   preferential treatment or consideration of any kind?
- A: No, of course not. If I choose to employ someone that decision is up to me. I
  don't deserve any special treatment or consideration for that fact.

1Q:At the beginning of your statement, you briefly described your property that2would be impacted by the potential Keystone XL Pipeline. I would like you to3give the Commissioners a sense of specifically how you believe the proposed4Keystone XL Pipeline and its preferred route, which proposes to go across5your land, how it would in your opinion based on your knowledge,6experience, and background of your land, affect it.

7 A: The KXL pipeline poses a significant threat to our farming practices. We have 8 been utilizing no-till conservation practices for the past 13 years. We also plant 9 cover crops to enhance these practices. This improves soil structure, builds 10 microorganisms and organic matter to create healthy soil. Plant root structure goes 11 down to over five feet deep. These conservation practices also prevent soil erosion 12 from wind and weather. When not protected, our sand will drift like snow, creating "blowouts" while destroying productivity. Destroying the earth for pipeline 13 14 construction would require years of reclamation to bring back to current levels. 15 The heat from the pipe will destroy root structure, causing poor growth and yields. 16 The warm soil will harbor insects and diseases over winter. A buried pipeline will 17 continue to settle the dirt around it, creating potential cave-ins. Irrigation water 18 will wash into the trench area. Pivot tires can become stuck in such a trench line. 19 These trenches also create potential for equipment to fall into. Significant damage 20 can occur to that equipment. If the pipe happens to get damaged from such an 21 accident, it becomes our responsibility. Future farming technologies may be 22 forbidden or severely restricted. Our farm has a large number of trees that protect 23 the land from wind erosion. Many old and newer trees will have to be removed 24 and cannot be replaced. The property value of our farm will be significantly 25 decreased with this pipeline and permanent easement. Land with KXL easements 26 has already sold for less than comparable market value.

## Q: Do you have any concerns TransCanada's fitness as an applicant for a major crude oil pipeline in its preferred location, or ultimate location across the state of Nebraska?

1 Yes, I have significant concerns. I am aware of landowners being treated unfairly A: 2 or even bullied around and being made to feel scared that they did not have any 3 options but to sign whatever papers TransCanada told them they had to. I am 4 aware of folks being threatened that their land would be taken if they didn't follow 5 what TransCanada was saying. I am aware of tactics to get people to sign 6 easements that I don't believe have any place in Nebraska or anywhere such as 7 TransCanada or some outfit associated with it hiring a pastor or priest to pray with 8 landowners and convince them they should sign TransCanada's easement 9 agreements. I am aware of older folks and widows or widowers feeling they had 10 no choice but to sign TransCanada's Easement and they didn't know they could 11 fight or stand up for themselves. From a more practical standpoint, I am worried 12 that according to their answer to our Interrogatory No. 211, TransCanada only 13 owns and operates one (1) major oil pipeline. They simply do not have the 14 experience with this type of pipeline and that scares me. There are others but that 15 is what I can recollect at this time and if I remember more or my recollection is 16 refreshed I will share those with the Commissioners at the Hearing in August.

## 17 Q: Do you believe TransCanada's proposed method of compensation to you as a 18 landowner is reasonable or just?

19 A: No, I do not.

20 **Q:** Do you have any concern about limitations that the construction of this 21 proposed pipeline across your affected land would prevent construction of 22 future structures upon the portion of your land affected by the proposed 23 easement and immediately surrounding areas?

A: Well yes, of course I do. We would not be able to build many, if any, types of structures directly across or touching the easement, and it would be unwise and I would be uncomfortable to build anything near the easement for fear of being blamed in the future should any damage or difficulty result on my property in regards to the pipeline.

29 Q: Do you think such a restriction would impact you economically?

1 A: Well yes, of course.

### 2 Q: How do you think such a restriction would impact you economically?

3 A: The future of this land may not be exactly how it's being used as of this moment, 4 and having the restrictions and limiting my ability to develop my land in certain 5 ways presents a huge negative economic impact on myself, my family, and any 6 potential future owner of the property. You have no idea how I or the future owner 7 may want to use this land in the future or the other land across Nebraska 8 potentially affected by the proposed Keystone XL tar sands pipeline. Fifty years 9 ago it would have been hard to imagine all the advances that we have now or how 10 things change. Because the Easement is forever and TransCanada gets the rights in 11 my land forever we have to think with a very long term view. By placing their 12 pipeline on under across and through my land that prevents future development which greatly negatively impacts future taxes and tax revenue that could have 13 14 been generated by the County and State but now will not. When you look at the 15 short blip of economic activity that the two years of temporary construction efforts 16 may bring, that is far outweighed by the perpetual and forever loss of opportunity 17 and restrictions TransCanada is forcing upon us and Nebraska.

## 18 Q: Do you have any concerns about the environmental impact of the proposed 19 pipeline?

20 A: Yes, I do.

21 Q: What are some of those concerns?

A: As an affected land owner and Nebraskan, I am concerned that any construction,
 operation, and/or maintenance of the proposed Keystone XL Pipeline would have
 a detrimental impact upon the environment of my land specifically, as well as the
 lands near my land and surrounding the proposed pipeline route.

26 Q: Do you have any other environmental concerns?

A: Yes, of course I am concerned about potential breaches of the pipeline, failures in
construction and/or maintenance and operation. I am concerned about spills and

leaks that TransCanada has had in the past and will have in the future. This could be catastrophic to my operations or others and to my county and the State.

## 3 Q: Do you have any thoughts regarding if there would be an impact upon the 4 natural resources on or near your property due to the proposed pipeline?

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5 A: Yes, I believe that any construction, operation, and/or maintenance of the 6 proposed Keystone XL Pipeline would have detrimental impacts upon the natural 7 resources of my land, and the lands near and surrounding the proposed pipeline 8 route.

## 9 Q: Do you have any worries about potential impacts from the proposed pipeline 10 to the soil of your land, or land near you?

11 A: Yes, I believe that any construction, operation, and/or maintenance of the 12 proposed Keystone XL Pipeline would have a detrimental impact upon the soil of 13 land, as well as land along and surrounding the proposed pipeline route. This 14 includes, but is not limited to, the reasons that we discussed above of disturbing 15 the soil composition and makeup as it has naturally existed for thousands and 16 millions of years during the construction process, and any future maintenance or 17 removal process. I'm gravely concerned about the fertility and the loss of 18 economic ability of my property to grow the crops, or grow the grasses, or grow whatever it is at that time they exist on my property or that I may want to grow in 19 20 the future, or that a future owner may want to grow. The land will never be the 21 same from as it exists now undisturbed to after it is trenched up for the proposed 22 pipeline.

### Q: Do you have any concerns about the potential impact of the proposed pipeline upon the groundwater over your land, or surrounding lands?

A: Yes, I'm very concerned that any construction, operation, and/or maintenance of
the proposed Keystone XL Pipeline would have a detrimental impact upon the
groundwater of not only under my land, but also near and surrounding the pipeline
route, and in fact, potentially the entire State of Nebraska. Water is life plain and

simple and it is simply too valuable to our State and the country to put at
 unreasonable risk.

### 3 Q: Do you have any concern about the potential impact of the proposed pipeline 4 upon the surface water on, or near or around your land?

A: Yes, I have significant concerns that any construction, operation, and/or
maintenance of the proposed Keystone XL Pipeline would have detrimental
impact upon the surface water of not only within my property boundary, but along
and near and surrounding the pipeline route, and in fact, across the state of
Nebraska.

## Q: Do you have any concern about the potential impacts of the proposed pipeline upon the wildlife and plants, other than your growing crops on or near your land?

A: Yes, I'm very concerned that any construction, operation, and/or maintenance of
the proposed Keystone XL Pipeline would have a detrimental impact upon the
wildlife and the plants, not only that are located on or can be found upon my land,
but also near and along the proposed pipeline route.

## 17 Q: Do you have any concerns about the effects of the proposed pipeline upon the 18 fair market value of your land?

19 A: Yes, I do. I am significantly concerned about how the existence of the proposed 20 pipeline underneath and across and through my property will negatively affect the 21 fair market value at any point in the future, especially at that point in which I 22 would need to sell the property, or someone in my family would need to sell the 23 property. I do not believe, and certainly would not be willing to pay, the same 24 price for land that had the pipeline located on it, versus land that did not. I hope 25 there is never a point where I'm in a position where I have to sell and have to 26 realize as much value as I can out of my land. But because it is my single largest 27 asset, I'm gravely concerned that the existence of the proposed Keystone XL 28 Pipeline upon my land will affect a buyer's willingness to pay as much as they 29 would've paid and as much as I could've received, if the pipeline were not upon 1 my property. There are just too many risks, unknowns, impacts and uncertainties, 2 not to mention all of the rights you give up by the nature of having the pipeline 3 due to having the easement that we have previously discussed, for any reasonable 4 person to think that the existence of the pipeline would not negatively affect my 5 property's value.

### 6 Q: Have you ever seen the document that's marked as Attachment No. 6, to your 7 testimony?

8 A: Yes, I have.

9 Q: Where have you seen that before?

# A: That is a map I think I first saw a couple years ago that shows the Keystone XL I-90 corridor alternate route of its proposed pipeline through Nebraska and I believe the portion of the alternative route in Nebraska essentially twins or parallels Keystone I.

14Q:Do you believe the portion of the proposed pipeline within Nebraska as found15in Attachment No. 6 to your testimony, is in the public interest of Nebraska?

16 A: No, I do not.

Q: Do you believe that TransCanada's preferred route as found on page 5 of its
Application, and as found on Attachment No. 7, here to your testimony, is in
the public interest of Nebraska?

20 A: No, I do not.

## Q: Do you believe that the Keystone mainline alternative route as shown on Attachment No. 7 included with your testimony here is a major oil pipeline route that is in the public interest of Nebraska?

A: No, I do not.

Q: Do you believe there is any potential route for the proposed Keystone XL
 Pipeline across, within, under, or through the State of Nebraska that is in the
 public interest of the citizens of Nebraska?

A: No, I do not.

29 Q: Why do you hold that belief?

1 A: Because there simply is no public interest based on all of the factors that I am 2 aware and that I have read and that I have studied that this Commission is to 3 consider that would establish that a for-profit foreign-owned pipeline that simply 4 crosses Nebraska because we are geographically in the way between where tar 5 sands are in Canada to where it wants to ship it to in Texas could ever be in the 6 public interest of Nebraskans. We derive no benefit from this project. It is not for 7 public use. Nebraska is simply in the way and when all considerations are taken in 8 there is no net benefit of any kind for Nebraska should this project be placed in our 9 state. Even if there was some arguable "benefit" it is not enough to outweigh all 10 the negative impacts and concerns.

# Q: What do you think about the applicant, TransCanada's argument that it's preferred route for its proposed Keystone XL Pipeline is in the public interest of Nebraska because it may bring temporary jobs during the construction phase to Nebraska?

15 A: First of all, not all jobs are created equally. Most jobs that are created, whether 16 temporary or on a permanent basis, don't come with a project that has all the 17 potential and foreseeable negative impacts, many of which we have discussed here 18 and other witnesses throughout the course of this hearing have and will discuss. If 19 I decide to hire and employ someone to help me out in my farming or ranching 20 business, I've created a job but I haven't done so at the risk or detrimental impact 21 to my land or my town or my county or my state. And I've hired someone who is 22 working directly for me, a Nebraska landowner, citizen, taxpayer, to help produce 23 and grow a Nebraska product to be sold so that I can pay Nebraska taxes. So, all 24 jobs are not created equal. Additionally, I understand from what I'm familiar with 25 from TransCanada's own statements that the jobs numbers they originally touted 26 were determined to be a minute fraction of the permanent jobs that had been 27 projected. According to their answer to our Interrogatory No. 191, TransCanada 28 has created only thirty-four (34) jobs within Nebraska working specifically on 29 behalf of TransCanada and according to their answer to Interrogatory No. 196, as

of May 5, 2017 they only employ one (1) temporary working within Nebraska.
 Further, according to their answer to Interrogatory No. 199, TransCanada would
 only employ six to ten (6 to 10) new individuals if the proposed Keystone XL was
 constructed on its Preferred Route or its Mainline Alternative Route.

5 6

### Q: Are you opposed to the preferred route of the proposed KXL Pipeline simply because it would cross your land?

A: No, absolutely not. I am opposed to this project because it is not in the public
interest, neither within my community nor within our state.

### 9 Q: Would you be happier if instead of crossing your land, this proposed pipeline 10 was to cross someone else's land?

A: No, absolutely not. I would get no joy in having a fellow citizen of my state have
the fear and anxiety and potential foreseeable risks and negative impacts that this
type of a project carrying this type of product brings foisted upon anyone in this
state or any other state.

## 15 Q: Do you think there is any intelligent route for the proposed Keystone XL 16 Pipeline to cross the state of Nebraska?

A: I don't believe there is an intelligent route because as I have stated I don't believe
this project anywhere within Nebraska is within the public interest. However, if
you are presenting a hypothetical that if this proposed KXL Pipeline absolutely
had to go somewhere in the state of Nebraska, the only intelligent route I believe
would be to twin or closely parallel the existing Keystone I Pipeline. Both the
preferred route and the mainline alternative routes are economic liabilities our
state cannot risk.

### 24 Q: What do you rely upon to make that statement?

A: Well, the fact that a pipeline owned and operated by TransCanada, Keystone I, already exists in that area is reason enough as it is not in our best interest or the public interests to have more major oil pipelines crisscrossing our state. Second, they have all the infrastructure already there in terms of relationships with the counties and local officials and first responders along that route. Third, they have already obtained easements from all the landowners along that route and have
relationships with them. Fourth, that route avoids our most sensitive soils, the
sandier lighter soils. Fifth, that route for all practical purposes avoids the Ogallala
Aquifer. Sixth, they have already studied that route and previously offered it as an
alternative. Seventh, it just makes the most sense that as a state we would have
some intelligent policy of energy corridors and co-locating this type of
infrastructure near each other.

8 9

### Q: Do you have any other concerns you would like to reiterate or can think of at this time you would like the Commissioners to understand?

10 A: Yes. TransCanada refuses to agree to remove this pipeline after its usefulness has 11 expired. They will be leaving a continuous toxic waste dump across Nebraska. 12 The pipe will be significantly deteriorated by then. In other words, this is a disaster 13 waiting to happen. Property rights ensure that private corporations cannot take 14 land via eminent domain unless it is in the public interest. There is no public 15 benefit from this pipeline to the citizens of Nebraska. This is a situation of 16 granting a foreign corporation the right to take land from American citizens. The 17 whole purpose is for corporate gain and greed. TransCanada wants to use eminent 18 domain as a means of "hostile business acquisition." That is not in the public 19 interest. The non-negotiable terms of TransCanada's easement violate good 20 business practices. They provide a one-time payment for a lifetime of risks. The 21 easement takes control of a portion of land down the middle of the farm. It is not 22 like a road or highway where the land is generally at the edge of the property. By 23 putting it through the middle of a property, the landowner provides more security 24 from vandalism or terrorism. The farmer also deals with all the reclamation and 25 productivity issues. In the cases of most spills, it has been a landowner or tenant 26 who has discovered leaks. The company knows that the farmers will be over the 27 easement on a regular basis to observe potential problems. For all the risks and 28 extra work, annual payments should be made to the landowner. Wind energy 29 easements make annual payments to the landowner. No wise businessman would

- sign TransCanada's easement that offers a lot of risk and no reward. If anything
   TransCanada should offer a lease not a one-time payment.
- 3 Q: Does Attachment No. 8 here contain other documents you are competent to
  4 speak about that you wish to be part of your testimony and to discuss in more
  5 detail as needed at the August 2017 Hearing?
- 6 A: Yes.

## Q: Have you fully expressed each and every opinion, concern, or fact you would like the Public Service Commissioners to consider in their review of TransCanada's Application?

10 A: No, I have not. I have shared that which I can think of as of the date I signed this 11 document below but other things may come to me or my memory may be 12 refreshed and I will add and address those things at the time of the Hearing in August and address any additional items at that time as is necessary. Additionally, 13 14 I have not had an adequate amount of time to receive and review all of 15 TransCanada's answers to our discovery and the discovery of others so it was 16 impossible to competently and completely react to that in my testimony here and I 17 reserve the right to also address anything related to discovery that has not yet 18 concluded as of the date I signed this document below. Lastly, certain documents 19 requested have not yet been produced by TransCanada and therefore I may have 20 additional thoughts on those I will also share at the hearing as needed.

## Q: What is it that you are requesting the Public Service Commissioners do in regards to TransCanada's application for the proposed Keystone XL Pipeline across Nebraska?

A: I am respectfully and humbly requesting that the Commissioners think far beyond a temporary job spike that this project may bring to a few counties and beyond the relatively small amount of taxes this proposed foreign pipeline would possibly generate. And, instead think about the perpetual and forever impacts of this pipeline as it would have on the landowners specifically, first and foremost, but also thereby upon the entire state of Nebraska, and to determine that neither the

1 preferred route nor the Keystone mainline alternative route are in the public 2 interest of the citizens of the state of Nebraska. And if the Commissioners were 3 inclined to modify TransCanada's proposed routes and were to be inclined to grant 4 an application for a route in Nebraska, that the only potential route that would 5 make any intelligent sense whatsoever would be twinning or near paralleling of 6 the proposed KXL with the existing Keystone I pipeline. It simply does not make 7 sense to add yet another major oil pipeline crisscrossing our state creating new 8 pumping stations, creating new impacts on additional counties and communities 9 and going through all of the court processes with myself and other landowners like 10 me when this applicant already has relationships with the landowners, the towns 11 and the communities along Keystone I, and that Keystone I is firmly outside of the 12 sand hills and a significantly further portion away from the heart of the Ogallala 13 Aguifer than the preferred route or the Keystone mainline alternative route.

## 14 Q: Are all of your statements in your testimony provided above true and 15 accurate as of the date you signed this document to the best of your 16 knowledge?

17 A: Yes, they are.

18 Q: Thank you, I have no further questions at this time and reserve the right to
19 ask you additional questions at the August 2017 Hearing.

Arthur Tanderup Subscribed and Sworn to me before this 2017. day of Mary .2017. + atrica Warith State of Nebraska - General Notary PATRICIA M. SMITH My Contraission Expines January 21, 2019

Attachment No. 1



May 2017 - XADrawings/50388X KEYSTONE XL\9000\_9999/9358

Attachment No. 2





Attachment No. 3

Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

(Above Space for Recorder's Use Only)

Tract No.: ML-NE-AT-30255.000

#### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration") Helen J. Tanderup and Arthur R. Tanderup, wife and husband, as joint tenants, whose mailing address is 52343 857 Road, Neligh, NE 68756 (hereinafter called "Grantor") does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), a perpetual permanent easement and operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other equipment and appurtenances thereto (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines), for the transportation of crude

Grantor's Initials\_\_\_\_\_

petroleum, oil and petroleum by-products, on, under, across and/or through a strip of land 50 feet in width, as more particularly described in <u>Exhibit A</u>, which is attached hereto and made a part hereof (the **"Easement Area**") located on real property situated in the County of Antelope, State of Nebraska owned by Grantor and described as follows:

A tract of land containing 160.29 acres, more or less, situated in the County of Antelope, in the State of Nebraska, being further described as the SW1/4 of Section 5, Township 26 North, Range 6 West of the 6th P.M., as recorded in Book 116, Page 168 in the Deed Records of Antelope County, Nebraska; less and except any conveyances heretofore made.

(the "**Property**"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "**Initial Construction Period**"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional Temporary Work Space" and are more particularly described in <u>Exhibit A</u> hereto (the "**Temporary Work Space**"), provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

A. Grantee will pay all commercially reasonable costs and expenses that result from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's crops, pastures, drainage systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property, including but not limited to, any and all tree, crop, plant, timber, harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee

Grantor's Initials

harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

3. Provided its use of the Property does not in any manner interfere with or prevent the exercise by Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

4. Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee shall not be prevented from traveling within and along Easement Area on foot or in vehicle or machinery; (iv) Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with.

5. During the Initial Construction Period, Grantee shall also provide suitable crossings on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of all brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil to its original, pre-construction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its pre-construction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period) by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment.

Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including, 13. without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" referring to this instrument and setting forth the modified legal description of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid, Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

14. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of negligence, recklessness, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

15. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

16. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

17. It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

18. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

19. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

20. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

21. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_day of \_\_\_\_\_

GRANTOR(S):

Helen J. Tanderup

Arthur R. Tanderup

### [ACKNOWLEDGMENTS APPEAR ON FOLLOWING PAGE]

STATE OF		
COUNTY OF		
The foregoing instrument was acknowledged before me this	day of	20
By Helen J. Tanderup		
Notary Publi	ic Signature	
Affix Seal Here		
STATE OF		
COUNTY OF		
The foregoing instrument was acknowledged before me this	day of	20
By Arthur R. Tanderup		

Notary Public Signature

Affix Seal Here

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Attachment No. 4

### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 1 of 5 - Page ID # 1

### IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE	)	CASE NO
COMPANY, a New York Corporation,	)	
	)	
Plaintiff,	)	
	)	COMPLAINT
V.	)	
	)	
RICHARD ANDREW, JANE ANDREW,	)	
LUKE ANDREW, and BRYCE ANDREW,	)	
	)	
Defendants.	)	

**COMES NOW** Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

### PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

- 2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
- 3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
- 4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
- 5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

### JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

#### **GENERAL ALLEGATIONS**

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

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law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

#### FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the rightof-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

- 23. Defendants were negligent in the following particulars:
  - a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
  - b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;
  - c. Defendants failed to comply with the statutory requirements of the OCNS;
  - d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
  - e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

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26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

#### SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

#### JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

ZURICH AMERICAN INSURANCE COMPANY, Plaintiff,

By: /s/ Albert M. Engles ENGLES, KETCHAM, OLSON, & KEITH, P.C. 1350 Woodmen Tower 1700 Farnam Street Omaha, Nebraska 68102 (402) 348-0900 (402) 348-0904 (Facsimile) Albert M. Engles, #11194 Dan H. Ketcham, #18930 Michael L. Moran, #24042 James C. Boesen, #24862 Attachment No. 5

### TRANSCANADA KEYSTONE PIPELINE, LP

### ADVANCE RELEASE OF DAMAGE CLAIMS AND INDEMNITY AGREEMENT

### Tract No. : ML-NE-AT-30255.000

We, <u>Helen J. Tanderup and Arthur R. Tanderup, wife and husband, as joint tenants</u>, of <u>Antelope</u> County, in the State of <u>Nebraska</u>, (hereinafter "Grantor") acknowledge receipt of:

<u>Five Thousand Seven Hundred Sixty Dollars and No Cents</u> (\$5,760.00), now paid to Grantor by TransCanada Keystone Pipeline, LP (hereinafter "Company"), in full payment and settlement, in advance, for all damages listed on the Advance Damages Computation Form attached hereto as Appendix A. In consideration of said advance payment, Grantor and Grantor's heirs, executors, administrators and assigns, do hereby release and forever discharge Company from any and all causes of action, suits, debts, claims, expenses, general damages, interest, costs and demands whatsoever, at law and in equity, against Company, which Grantor ever had, has now, or which Grantor's insurers, heirs, executors, administrators, successors or assigns hereafter can, shall or may have in the future, relating to all damage items listed on Appendix A, arising out of, in connection with, or resulting or alleged to have resulted from construction or surveying over, under or on the following lands (hereinafter collectively referred to as the "Lands"):

Situated in the County of Antelope, State of Nebraska:

#### SW/4

### Section 5, Township 26N, Range 6W

Grantor understands and agrees that payment of such consideration is not deemed to be an admission of liability on the part of Company. Grantor agrees to accept said advance payment on behalf of Grantor and Grantor's tenants, if any, and to take full responsibility for compensating any and all of Grantor's tenants for any damage or loss that is owed to said tenants as a result of Company's use of any pipeline easement acquired by Company from Grantor on the Lands. Grantor will indemnify, defend, and hold Company and the Company's officers, agents, and employees harmless from any claim asserted by Grantor's tenants, tenants' successors-in-interest, or tenants' heirs for compensation, restitution, crop loss, consideration, or damage of any kind that Grantor's tenants may be lawfully entitled to as a result of Company's construction or surveying activity within any easement acquired by Company from Grantor on the Lands.

IN WITNESS WHEREOF, we have hereunto set our hands on this \_\_\_\_\_\_ day of

\_\_\_\_\_\_, 20\_\_\_\_.
Owner Signature
Owner Signature
Owner/Owner Representative Name
Owner/Owner Representative Name

Attachment No. 6




KXL002000

Attachment No. 7



Attachment No. 8

Attachment 8.1



## Attachment 8.2

### Soils Inventory Report

### ARTHUR TANDERUP

Tract	Land Unit	Map Unit Symbol	Map Unit Name	Acres	Percent
1322		6700	Thurman loamy fine sand, 0 to 2 percent slopes	0	0%
1322		3164	Doger loamy fine sand, 0 to 2 percent slopes	0	0%
1322		6635	Boelus fine sand, 0 to 6 percent slopes	0.2	1%
1322		4786	Valentine fine sand, 0 to 6 percent slopes	0.3	2%
1322		6798	Loretto sandy loam, 0 to 3 percent slopes	1.5	9%
1322		6724	Thurman fine sand, 2 to 6 percent slopes	1.9	12%
1322		3163	Doger fine sand, 0 to 6 percent slopes	2	12%
1322		6636	Boelus loamy fine sand, 0 to 3 percent slopes	2.9	18%
1322		6723	Thurman fine sand, 0 to 2 percent slopes	3.5	21%
1322		6637	Boelus loamy fine sand, 2 to 6 percent slopes	4	25%
			Total:	16.3	
1322	1	6700	Thurman loamy fine sand, 0 to 2 percent slopes	0	0%
1322	1	6635	Boelus fine sand, 0 to 6 percent slopes	0.3	0%
1322	1	6792	Loretto loarn, 2 to 6 percent slopes	0.5	0%
1322	1	3164	Doger loamy fine sand, 0 to 2 percent slopes	0.9	1%
1322	1	4786	Valentine fine sand, 0 to 6 percent slopes	1	1%
1322	1	6798	Loretto sandy loam, 0 to 3 percent slopes	5.2	4%
1322	1	6637	Boelus loamy fine sand, 2 to 6 percent slopes	7.7	6%
1322	1	6753	Nora silt loam, 2 to 6 percent slopes	8.1	6%
1322	1	3163	Doger fine sand, 0 to 6 percent slopes	17.8	13%
1322	1	6724	Thurman fine sand, 2 to 6 percent slopes	20.6	15%
1322	1	6723	Thurman fine sand, 0 to 2 percent slopes	32.7	24%
1322	1	6636	Boelus loamy fine sand, 0 to 3 percent slopes	42.5	31%
			Total:	137.3	

### Attachment 8.3

### Map Unit Description

### Antelope County, Nebraska

Map unit: 6792 - Loretto Ioam, 2 to 6 percent slopes

Component: Loretto (100%)

The Loretto component makes up 100 percent of the map unit. Slopes are 2 to 6 percent. This component is on hillslopes on uplands. The parent material consists of loamy eolian deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY058NE Loarny ecological site. Nonimigeted land capability classification is 2e. Irrigated land capability classification is 3e. This soll does not meet hydric criteria. 1 .....

Map unit: 6798 - Loretto sandy loam, 0 to 3 percent slopes

Component: Loretto (100%)

The Loretto component makes up 100 percent of the map unit. Slopes are 0 to 3 percent. This component is on hillslopes on uplands. The parent material consists of loamy ealian deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72. Inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sandy ecological site. Nonirrigated land capability classification is 2a. Irrigated land capability classification is 2a. This soll does not meet hydric criteria.

### Map Unit Description

### Antelope County, Nebraska

Map unit: 6637 - Boelus loamy fine sand, 2 to 6 percent slopes

#### Component: Boelus (100%)

The Boelus component makes up 100 percent of the map unit. Slopes are 3 to 6 percent. This component is on hillslopes on uplands. The parent meterial consists of explant sands over silty collan deposits. Depth to a root restrictive layer is greater than 60 inches. The netural dreinege class is well dreined. Weter movement in the most restrictive layer is moderately high. Available weter to a depth of 60 inches is high. Shrink-swell poteritial is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sendy ecological site. Nanimigated land capability classification is 3e. Imgated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 6700 - Thurman loamy fine sand, 0 to 2 percent slopes

Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 0 to 3 percent. This component is on hummooks on uplands. The parent material consists of sendy epilan deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained: Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll flooded is a bout 2 percent. This component is in the R1020Y064NE Sendy ecological site. Nonirigated land capability classification is 38. Irrigated land capability classification is 36. This soll does not meet hydric criteria.

Map unit: 6723 - Thurman fine sand, 0 to 2 percent slopes

#### Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 0 to 3 percent. This component is on hummocks on uplands. The parent material consists of sandy collan deposits. Depth to a root restrictive layer is greater than 60 inches. The netural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CV054NE Sandy ecological site. NonIrrigated land capability classification is 4a. Irrigated land capability classification is 4a. This soll does not meet hydric criteria

Map unit: 6724 - Thurman fine sand, 2 to 6 percent slopes

Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 3 to 6 percent. This component is on ridges on uplands. The parent material consists of sandy ealien deposits. Depth to a root restrictive layer is greater then 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within e depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sandy ecological site. Nonirrigeted land capability classification is 48. Irrigated land capability classification is 48. This soll does not meet hydric criteria.

Map unit: 6753 - Nora silt loam, 2 to 6 percent slopes

Component: Nora (100%)

The Nora component makes up 100 percent of the map unit. Slopes are 2 to 6 percent. This component is on hillslopes on uplands. The parent material consists of fine-slity calcareous losss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic metter content in the surface horizon is about 3 percent. This component is in the R102CY058NE Loamy ecological site. Nonirrigeted land capability classification is 2a. Irrigated land capability classification is 3a. This soll does not meet hydric criteria. The celcium carbonete equivalent within 40 inches; typically, does not exceed 10 percent.



SDA Natural Resources **Conscrvation Service** 

1:1.

Survey Area Version: 7 Survey Area Version Date: 10/29/2009

### Map Unit Description

### Antelope County, Nebraska

### [Minor map unit components are excluded from this report]

Map unit: 3163 - Doger fine sand, 0 to 6 percent slopes

Component: Doger (100%)

The Dogencomponent makes up 100 percent of the map unit. Slopes are 0 to 6 percent. This component is on hillslopes on oplands. The parent meterial consists of eclien early. Depth to a rost restrictive layer is directer than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of wells, saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This companient is in the R065XY056NE Sends 22/25 P.z. ecological sigen of maner women in the soliday nonzen is about a percent, this companent is in the robust robust control of the solid ces not meet hydric chiefte.

Map unit: 3164 - Doger learny fine sand, 0 to 2 percent slopes

### Component: Doger (100%)

The Doger component mekes up 100 percent of the map-unit. Slopes are 0 to 3 percent, This component is on hillslopes on uplends. The parent material consists of sollar sands. Depth to a root restrictive layer is greater than 50 inches. The netural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to e depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded, it is not pended. There is no zone of water seturation within eldepth of 72 inches. Organic matter centent in the surface horizon is about 2 percent. This component is in the RD65XY054NE Sandy 22±25" P.2. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydrid criteria.

Map unit: 4766 - Valentine fine sand, 0 to 6 percent slopes

### Component: Valentine (98%)

The Velentine component makes up 98 percent of the map unit. Slopes are 6 to 6 percent This component is on ridges on sendirille. The Velentine component makes up 98 percent of the map unit. Slopes are 0, to 6 percent 4nts component is on noges on sentifille, duries on sentifillis. The parent material consists of sollar sends. Depth to a postrestructive layer is greater than 60 inches. The natural drainage classifier accessively diatried. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shink-swell potential is low. This soll is not noted at the potent. This is not zone of water saturation within a depth of 72-low. Shink-swell potential is low. This soll is not not as about 7 percent. This component is in the R065XY055NE Sands 22-25" P.z. Inches. Organic matter content in the surface holdow is bout 7 percent. This component is in the R065XY055NE Sands 22-25" P.z. ecological site. Noningeted land capability classification is 60. Indigated and capability classification is 4e. This solf does not meet hydric ecological site. Noningeted land capability classification is 60. Indigated and capability classification is 4e. This solf does not meet hydric

criteria.

Map unit: 6635 - Boelus fine sand, 0 to 6 percent slopes

### Component: Boelus (100%)

The Boelus component makes up 100 percent of the map unit. Slopes are 0 to 6 percent. This component is on hillstopes on uplends. The parent meterial consists of collan sends over sliby collan deposits. Depth to a root restrictive lever is greater than 60 inches. The ne parent meternal consists of commen series over entry comments, wepting, and realizes involve layer is grader and your and series and over the neuronal drainage class is well drainad. Weter movement in the most restrictive layer is moderately high. Available water to a depth of 60. Inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 persent. This component is in the R102CY054NE Sendy ecological site. Nonimigeted land cepeblility classification is 4e. Imigeted land capability classification is 4e. This soil does not meet hydric criteria. The celcium cerbonate equivalent within 40 inches, typically, does not exceed 6 percent.

Mep unit: 8636 - Boolus loamy fine sand, 0 to 3 percent slopes

#### Boelus (99%) Component:

The Boolus component makes up 99 percent of the map unit. Slopes are 0 to 9 percent. This component is on knolls on utilands. The r ne coeius component makes up se percent or me mep ant, slopes are u to a percent, this component aron, shore on aparters the parent meterial consists of eolien sends over ally collen deposits. Deprinto e root restrictive leveris greater, men counters. The netural drainage class is well drained. Water movement in the most restrictive leveris moderably high. Available water to a depity of coincides areinage class is well areined, water movement in the most restrictive layer is moderately high. Available water to a depth of 60 mones Is high. Shrink-swell potential is moderate. This soil is not fiboded. It is not ponded. Fibre is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface honzon is about 2 percent. This component is in the RTD2CY064VE Sandy ecological site. Nonimigated land capability classification is 3e. Imigated land capability dissification is 3e. This soil does not meet hydric criteria. The calcium carbonete equivalent within 40 inches, typically, does not exceed 3 percent.



SDA Natural Resources **Conservation Service** 

Survey Area Version: 7 Survey Area Version Date: 10/29/2009

### Attachment 8.4

### SARGENT PUMP DESIGN WORK SHEET

SARGENT IRRIGATION CO.

### MEL ICH NE.

JOB NAME :Art Tanderup LOCATION :SW 1/4-5-26-6 Antelope Co PUMP BRAND: WESTERN LAND ROLLERPOWERED BY: POWER UNITPUMP SIZE: 8 X 2 X 1.25PUMP SET FT: 120 PUMP RPM : 1760 AGING FACTOR : 1.1 IRRIG TYPE : PIVOT PIVOT PSI : 55 850 GPM FROM : 93.5 FT PUMP LOSS : 3.2 FT CHECK VALVE LOSS : 1.39 FT HOOK-UP LOSS : .22 FT ELEVATION PIVOT LOSS : O FT : 14.66 FT 55 PSI X 2.31 : 127.05 FT -----TOTAL HEAD : 240.02 FT BOWL BRAND : Western Land Roller 5 STAGE 12CH BOWL A. 1 -H 1/4C & 4 -H 3/4C H. P. FACTOR : 100 % AMOUNT OFF :-1.08 THRUST Lbs : 3542 REQUIRED LATERAL: 2842867 HEAD FACTOR : 100 % ACTUAL HEAD : 238.94 BOWL HP : 65.76 BOWL LATERAL : .563 SHAFT STRETCH: .117 BOWL ADJUSTMENT : 1.91 TURNS SHAFT LOSS : 1 BOWL EFFIC : 77.99 % GEAR DRIVE LOSS : 2.78 : 77.99 % PUMP EFFICIENCY : 73.75 % MOTOR TYPE : DIESEL GEAR RATIO : 1 - 1 MOTOR RPM : 1760 FUEL COST :\$ .75 ANNUAL FUEL : 4190 ANNUAL COST :\$ 3142 MOTOR HP : 69.55 HP PER / GAL : 16.6 FUEL PER / HR: 4.19 ANNUAL HOURS : 1000 :\$ 3142.17 \*\*BOWL ADJUSTMENT IS RELATIVE SHAFT STRETCH PLUS .060 In .\*\* MOTOR POWER AND ANNUAL COST ARE FOR PUMP POWER ONLY AND DOES NOT I UDE COOLING FAN OR PIVOT DRIVE POWER REQUIREMENTS ENGINEER :Dennis Francis DATE :10-15-1994

### Attachment 8.5

Home News Who Killed the Finest Soybean Soil?

# Who Killed the Finest Soybean Soil?

APRIL 22, 2017 02:31 AM

Like 10 Share Tweet



A breached sediment barrier at the mouth of a terrace is a violation of Georgia's Soil and Water Commission's Green Book.

© Randy Dowdy



By **Chris Bennett** Farm Journal Technology and Issues Editor

### Randy Dowdy says he'll face major yield loss from natural gas pipeline project

As he walked along muddy turnrows under pounding January rains, Randy Dowdy knew part of the topsoil from the farm that birthed the highest soybean yields in world history was gone. His 171.7 bu. soybeans and 521 bu. corn from fall harvest faded far into the past.

Email

Today the topsoil on more than 40 acres has been stripped or flipped and replaced or mixed with fresh dirt. In agriculture, dirt is death and soil is life. Compounding the topsoil loss, 100 acres of wetlands caught much of the fertilizer-heavy slurry as it spilled off Dowdy's Brooks County land in southern Georgia. The reconstruction bill is expected to top \$1 million.

Dowdy signed an easement in 2015 giving Spectra Energy right of way across a mile of his land for the Sabal Trail natural gas pipeline, a 515-mile project running through Alabama, Georgia and Florida. The section of the project on Dowdy's land began after fall harvest and was slated for completion the first week of 2017.

On Dec. 6, Dowdy contacted Sabal Trail management, expressing concern about erosion and emphasizing the sensitivity of his ground. According to Dowdy, he continued to contact management and was assured construction would be done on schedule.

"I texted again Jan. 9 and nothing was done," Dowdy says. "No rebuilt terraces, cover crops or restoration."

The third week of January, the skies opened. Construction was ongoing and Dowdy's unprotected topsoil was exposed to heavy rains. Across a 180-acre farm, two-thirds of the runoff was headed directly for the terraces. Sabal Trail's sediment barriers at the mouth of each terrace acted like corks, backing up water into the fields until the watershed surrendered to gravity, escaping across barriers, over terraces and into a creek. Dowdy's meticulously crafted elixir of protozoa, microbials and organic matter was whisked away. Bon voyage to soil health.

Who is to blame? Dowdy points to Sabal Trail and alleges regulatory violations. Sabal Trail declined interview requests citing privacy concerns. Parent company Spectra Energy didn't respond to phone or email questions.

When Dowdy signed the easement, the agreement included a stipulation: Sabal Trail would return all land to its preconstruction condition, both in fertility

### and soil deposition.

Dowdy's ground runs at a steep 10% to 12% grade. Cover crops and terraces control water runoff and slow the flow to a 1% grade equivalency. The gas line runs mainly north to south, and Dowdy's terraces run east to west. The gas line breaks through every terrace.

Dowdy says the topsoil disaster was a direct result of Sabal Trail negligence in following the Georgia Soil and Water Commission's Green Book (Manual for Erosion and Sediment Control in Georgia) regulations. "Sediment barriers in concentrated flows of water; no straw covers; no safety sediment fences; and many more violations," Dowdy contends.

At Sabal Trail's request, he provided three restoration estimates. One: costs of topsoil purchase, extraction, hauling, grading, soil health applications and terrace reconstruction. Two: estimation of damage to wetlands. Three: long-term yield loss projections. According to



"It's one thing to rebuild terraces, haul in topsoil and straw, plant cover crops and spread chicken litter. It's another thing to gain soil life from dead dirt." - Randy Dowdy, Brooks County, Georgia

Dowdy, Sabal Trail agreed to pay for topsoil restoration and allowed him to begin the process.

He hauled in eight to 18 trucks of lower grade topsoil per day and used one excavator, one motor grader, two bulldozers, two tractors and hay blowing equipment for a \$25,000 price tag per day. Before Sabal Trail would write a check, Dowdy was required to sign a release waiving compensation for future yield loss and wetlands damage. "They knew I would spend \$700,000-plus and were squeezing me, but there was no way I would sign," he explains.

In March, Dowdy filed a complaint with the Environmental Protection Division (EPD) of Page 3 of 5

Georgia. EPD enforces Green Book regulations but only monitors potential construction project violations on a complaint basis: One representative in south Georgia covers nine counties. "We rely on people letting us know about issues. However, we investigate every single complaint we get," says Burt Langley, EPD's director of compliance.

Joe Freeman, environmental compliance officer with EPD, visited the site on March 10 and didn't see any best management practices violations. "Mr. Dowdy has already undertaken the re-terracing of his fields, and the evidence is effectively covered. It may have been different if I'd seen things in December," Freeman says.



While repairing an irrigation line, Randy Dowdy found jumbled soil deposition. "Even the soil that was saved and put back on my land wasn't segregated."

"The only people involved in reviewing compliance with permitting standards are on Sabal Trail's payroll," Dowdy responds. "Isn't that the fox guarding the henhouse? What's the point of having an agency that issues permits if they don't personally police for compliance?"

On March 11, while fixing an irrigation line leak, Dowdy found jumbled soil deposition—a violation of Sabal Trail's agreement. Rance Harrod, irrigation manager at Nashville Tractor, ran an excavator: "I pushed off a couple inches of topsoil and hit at least a 6" layer of a hard clay and blackish dirt mix. The excavator was struggling, and the ground was coming up in chunks."

In succession, Harrod scraped off 2" of topsoil, 6" of hard clay and 10" to 15" of various mixtures before digging into the

expected bright orange Georgia clay. "How do other landowners know this hasn't been done on their land?" Dowdy asks. "Farmers and landowners are just supposed to sign a release and the story is over?"

Dewey Lee, University of Georgia agronomist, says the ramifications of soil disturbance and erosion on Dowdy's ground are incalculable. "It's impossible to replace the positive effects of Randy's management on his soils in a short period of time. Just in the disturbance, you lose aggregation, organic matter, fertility and nutrients," Lee says. "The negative effects are immediate, but of far more concern, the longterm effects could last decades."

Dowdy believes he's facing a lifetime of yield loss on the affected ground due to the negligence of Sabal Trail. He's hauled in more than 1,000 loads of new dirt and expects he needs at least 800 more. In part, the breadbasket topsoil of the world's record soybean yield and some of the highest corn yields is being replaced by a forced substitute.

Back to news

### Comments

No comments have been posted to this News Article

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### Attachment 8.6

YOUR COMMUNICATION SOURCE

# Re: Sand Dune & Blow Outs

Art Tanderup <atanderu@gmail.com>

Diana Terry Steskal <prairierose@nntc.net> 10/06/2015 11:50

Hi Diana,

My experience with blow outs:

1. Fence them off.

2. Cover with hay that has seeds in it, If manure is available, spread that as well.

3. Allow to recover for several years.

4. Repeat cover procedure as needed, at least yearly and sometimes multi-yearly. Several years will be required.

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TTET I L.

You might be able to return the blow out to its natural vegetation. My experience has shown about a 50% recovery rate.

Generally, blow outs are in smaller areas. Opening a pipeline trench creates the potential for lengthy blowouts that would be much more difficult to control. Having to fence both sides through the middle of a pasture would create other challenges for the rancher. Art

On Oct 6, 2015, at 10:42 AM, prairierose@nntc.net wrote:

Hi, I am doing a small project on the sandhills' sand dunes and blow outs. If you have time, could you send me a small paragraph of your thoughts on these questions?

How do you heal a blow out? How long does it take to heal? If never? Thoughts on disturbing the sand soil during pipeline construction, how's going to blow away?

Do this only if you have time, thanks ~ Diana

### Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of Helen Tanderup in Support of Landowner Intervenors

State of Nebraska)) ss.Antelope County)

- 1 Q: Please state your name.
- 2 A: My name is Helen Tanderup.
- Q: Are you an intervener in the Public Service Commission's proceedings
   regarding TransCanada's application for approval of its proposed Keystone
   XL tar sands pipeline across Nebraska?

6 A: Yes, I am.

Q: Do you own land in Nebraska, either directly or through an entity of which
you are an owner that could be affected by the proposed TransCanada
Keystone XL pipeline?

- 10 A: Yes, I do and it is located in Antelope County.
- Q: Is Attachment No. 1 to this sworn statement copies of true and accurate aerial
   photo(s) of your land in question here with the area of the proposed KXL
   pipeline depicted?
- 14 A: Yes.
- 15 Q: If you are you married tell us your spouse's name please?
- 16 A: Art Tanderup.

Q: Is Attachment No. 2 to this sworn statement a copy(ies) of picture(s) of you
 and or your family?

3 A. Yes.

- 4 Q: How long the land has been in your family?
- 5 A: The farm has been in my family for over 100 years.
- 6 Q: Do you earn any income from this land?
- 7 A: Yes.

# 8 Q: Have you depended on the income from your land to support your livelihood 9 or the livelihood of your family?

10 A: Yes.

# 11 Q: Have you ever in the past or have you thought about in the future leasing all 12 or a portion of your land in question here?

- 13 A: Yes, I have thought of it and that concerns me. I am concerned that a prospective 14 tenant may try to negotiate a lower price for my land if it had the pipeline on it and 15 all the restrictions and risks and potential negative impacts to farming or ranching 16 operations as opposed to land that did not have those same risks. If I was looking 17 to lease or rent ground I would pay more for comparable non-pipeline land than I 18 would for comparable pipeline land and I think most folks would think the same 19 way. This is another negative economic impact that affects the landowner and the 20 county and the state and will forever and ever should TransCanada's preferred or 21 mainline alternative routes be approved. If they were to twin or closely parallel to 22 Keystone I the vast majority of landowners would be those that already have a 23 pipeline so there would be considerable less new incremental negative impacts.
- 24

### Q: Do you have similar concerns about selling the land?

A: Well I hope not to have to sell the land in my lifetime but times change and you
never know what is around the corner and yes I am concerned that if another piece
of ground similar to mine were for sale and it did not have the pipeline and mine
did that I would have a lower selling price. I think this would be true for pipeline
ground on both the preferred and mainline alternative routes.

1	Q:	What is your intent with your land after you die?
2	A:	Like I said I hope not to have to sell and I hope that it stays in the family for years
3		to come but I have thought about getting out if this pipeline were to come through.
4	Q:	Are you aware that the preferred route of TransCanada's Keystone XL
5		Pipeline would cross the land described above and owned by you?
6	A:	Yes.
7	Q:	Were you or an entity for which you are a member, shareholder, or director
8		previously sued by TransCanada Keystone Pipeline, LP?
9	A:	Yes, we were in 2015. TransCanada Keystone Pipeline LP sued us by filing a
10		petition for condemnation against our land so it could place its proposed pipeline
11		within an easement that it wanted to take from us on our land.
12	Q:	Did you defend yourself and your land in that condemnation action?
13	A:	Yes, we did. We hired lawyers to defend and protect us and we incurred legal fees
14		and expenses in our resistance of TransCanada's lawsuit against us.
15	Q:	Has TransCanada reimbursed you for any of your expenses or costs for fees
16		incurred?
17	A:	No, they have not.
18	Q:	In its lawsuit against you, did TransCanada identify the amount of your
19		property that it wanted to take for its proposed pipeline?
20	A:	The lawsuit against us stated they would take the amount of property that is
21		reasonably necessary to lay, relay, operate, and maintain the pipeline and the plant
22		and equipment reasonably necessary to operate the pipeline.
23	Q:	Did TransCanada define what they meant by "property that is reasonably
24		necessary"?
25	A:	No, they did not.
26	Q:	Did TransCanada in its lawsuit against you, identify the eminent domain
27		property portion of your land?
28	A:	Yes, they did.

# Q: Did TransCanada describe what rights it proposed to take related to the eminent domain property on your land?

3 A: Yes, they did.

### 4 Q: What rights that they proposed to take did they describe?

5 TransCanada stated that the eminent domain property will be used to "lay, relay, A: 6 operate, and maintain the pipeline and the plant and equipment reasonably 7 necessary to operate the pipeline, specifically including surveying, laying, 8 constructing, inspecting, maintaining, operating, repairing, replacing, altering, 9 reconstructing, removing and abandoning one pipeline, together with all fittings, 10 cathodic protection equipment, pipeline markers, and all their equipment and 11 appurtenances thereto, for the transportation of oil, natural gas, hydrocarbon, petroleum products, and all by-products thereof." 12

Q: Prior to filing an eminent domain lawsuit to take your land that
 TransCanada identified, do you believe they attempted to negotiate in good
 faith with you?

16 A: No, I do not.

17 Q: Did TransCanada at any time approach you with or deliver to you their
 18 proposed easement and right-of-way agreement?

19 A: Yes, they did.

20Q: At the time you reviewed TransCanada's easement and right-of-way21agreement, did you understand that they would be purchasing a fee title22interest in your property or that they were taking something else?

- A: I understood that they proposed to have the power to take both a temporary
   construction easement that could last for a certain period of time and then also a
   permanent easement which they described to be 50 feet across or in width, and
   that would run the entire portion of my property from where a proposed pipeline
   would enter my property until where it would exit the property.
- Q: Is the document included with your testimony here as Attachment No. 3, a
   true and accurate copy of TransCanada's proposed Easement and Right-of-

1 Way agreement that they included with their condemnation lawsuit against 2 vou?

3 A: Yes, it is.

4 Q: Have you had an opportunity to review TransCanada's proposed Easement
5 and Right-of-Way agreement?

6 A: Yes, I have.

- Q: What is your understanding of the significance of the Easement and Right-of8 Way agreement as proposed by TransCanada?
- 9 A: My understanding is that this is the document that will govern all of the rights and 10 obligations and duties as well as the limitations of what I can and cannot do and 11 how I and any future landowner and any person I invite to come onto my property 12 must behave as well as what TransCanada is and is not responsible for and how 13 they can use my land.

# 14Q:After reviewing TransCanada's proposed Easement and Right-of-Way15agreement do you have any concerns about any portions of it or any of the16language either included in the document or missing from the proposed17document?

- A: Yes, I have a number of significant concerns and worries about the document and
   how the language included and the language not included potentially negatively
   impacts my land and thereby potentially negatively impacts my community and
   my state.
- Q: I would like you to walk the Commissioners through each and every one of
  your concerns about TransCanada's proposed Easement and Right-of-Way
  agreement so they can develop an understanding of how that language and
  the terms of that contract, in your opinion, potentially negatively impacts you
  and your land. So, if you can start at the beginning of that document and
  let's work our way through it, okay?

1 A: Yes, I'll be happy to express my concerns about TransCanada's proposed 2 Easement and Right-of-Way agreement and how it negatively could affect my 3 property rights and my economic interests.

Okay, let's start with your first concern please. 4 Q.

5 A: The very first sentence talks about consideration or how much money they will 6 pay to compensate me for all of the known and unknown affects and all of the 7 rights I am giving up and for all the things they get to do to my land and for what 8 they will prevent me from doing on my land and they only will pay me one time at 9 the signing of the easement agreement. That is a huge problem.

#### 10 **O**: Explain to the Commissioners why that is a problem.

11 A: It is not fair to the landowner, the county, or the State. It is not fair to the 12 landowner because they want to have my land forever for use as they see fit so 13 they can make a daily profit from their customers. If I was to lease ground from 14 my neighbor I would typically pay twice a year every year as long as they granted 15 me the rights to use their land. That only makes sense – that is fair. If I was going 16 to rent a house in town I would typically pay monthly, every month until I gave up 17 my right to use that house. By TransCanada getting out on the cheap and paying 18 once in today's dollars that is monthly, bi-annual, or at least an annual loss in tax 19 revenue collection on the money I would be paid and then pay taxes on and 20 contribute to this state and this country. It is money I would be putting back into 21 my local community both spending and stimulating the local economy and 22 generating more economic activity right here. Instead TransCanada's shareholders 23 keep all that money and it never finds its way to Nebraska.

24 **O**:

### What is your next concern?

25 A: The first paragraph goes on to say Grantor, which is me the landowner, "does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a 26 27 limited partnership..." and I have no idea who that really is. I have no idea who is 28 forcing this pipeline on us or who the owners of the entities are, or what are the 29 assets backing this limited partnership, or who the general partner is, or who all

1 the limited partners are, and who makes up the ownership of the these partners or 2 the structure or any of the basic things you would want to know and understand if 3 you would want to do business with such an outfit. According to TransCanada's 4 answer to our Interrogatory No. 28, as of the date I signed this testimony, a limited 5 liability company called TransCanada Keystone Pipeline GP, LLC is the general 6 partner and it only owns 0.02 percent of TransCanada Keystone Pipeline, LP so 7 basically nothing. That is really scary since the general partner has the liability but 8 virtually none of the ownership and who knows if it has any other assets.

9 Q: Do you think it is in the public interest of Nebraska to not be one-hundred
10 percent clear on exactly who could become the owner of about 275 miles of
11 Nebraska land?

12 A: No.

Q: Do you think it is in the public interest of Nebraska to not be one-hundred
 percent clear on exactly who will be operating and responsible for
 approximately 275 miles of tar sands pipeline underneath and through
 Nebraska land?

17 A: No.

# 18 Q: Okay, let's continue please with your concerns of the impacts upon your land 19 and the State of Nebraska of TransCanada's easement terms.

Yes, so the next sentence talks about "...its successors and assigns (hereinafter 20 A: 21 called "Grantee")..." and this concerns me because it would allow their easement 22 to be transferred or sold to someone or some company or country or who knows 23 what that I don't know and who we may not want to do business with. This 24 pipeline would be a huge asset for TransCanada and if they can sell to the highest 25 bidder that could have terrible impacts upon all of Nebraska depending upon who 26 may buy it and I don't know of any safeguards in place for us or the State to veto 27 or have any say so in who may own, operate, or be responsible for this pipeline in 28 the future.

1 2

# Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing our State is in the public interest?

3 A: No, certainly not, in fact, just the opposite.

### 4 Q: What's next?

A: Then it says "...a perpetual permanent easement and right-of-way..." and this
really concerns me. Why does the easement and right-of-way have to be perpetual
and permanent? That is the question myself and my family want an answer to.
Perpetual to me is like forever and that doesn't make sense.

### 9 Q: Why doesn't a perpetual Easement and Right-of-Way make sense to you?

10 A: For many reasons but mostly because the tar sands are finite. I am unaware of any 11 data proving there is a perpetual supply of tar sands. I am not aware in 12 TransCanada's application where it proves there is a perpetual necessity for this 13 pipeline. My understanding of energy infrastructure like wind towers is they have 14 a decommission plan and actually take the towers down when they become 15 obsolete or no longer needed. Nothing manmade lasts forever. My land however 16 will, and I want my family or future Nebraska families to have that land as 17 undisturbed as possible and it is not in my interest or the public interest of 18 Nebraska to be forced to give up perpetual and permanent rights in the land for 19 this specific kind of pipeline project.

20

### Q: Okay, what is your next concern?

A: The easement language includes all these things TransCanada can do and it says "...abandoning in place..." so they can just leave this pipeline under my ground until the end of time just sitting there while they are not using it, but I am still prevented from doing on my land and using my land what I would like. If I owned a gas station I couldn't just leave my underground oil or fuel storage tanks sitting there. It doesn't make sense and it scares me and it is not in my interest or the public interest of Nebraska to allow this.

# Q: Now it looks like we are ready to go to the second page of the Easement is that right?

1 A: Yes.

### 2 Q: So now on the second page of the Easement what are your concerns?

3 A: Here the Easement identifies a 24-month deadline to complete construction of the 4 pipeline but has caveats that are undefined and ambiguous. The 24-month period 5 starts to run from the moment "actual pipeline installation activities" begin on 6 Landowners property. It appears that TransCanada would define this phrase as 7 needed. It would be wise to explain what types of TransCanada action constitutes 8 "installation activity" For instance, would the placement and storage of an 9 excavator or other equipment on or near the Easement property be an activity or 10 would earth have to be moved before the activity requirement is triggered. This 11 vague phrase is likely to lead to future disputes and litigation that is not in the best 12 interest of the welfare of Nebraska and would not protect property interests. The 13 24-months can also be extended in the case of "force majeure." My understanding 14 is that force majeure is often used to insulate a party to a contract when events 15 occur that are completely out of their control. In TransCanada's easement this is 16 expanded to include "without limitation...availability of labor and materials." 17 Extending this language to labor and materials is problematic because these are 18 two variables that TransCanada does have some or significant control over and to allow extension of the 24-month period over events not truly out of the control of 19 20 TransCanada and without further provision for compensation for the Landowner is 21 not conducive to protection of property rights.

22

### Q: Okay, what is your next concern?

A: Paragraphs 1.A. and 1.B. deal with the liabilities and responsibilities of
TransCanada and Landowner. In 1.A., the first sentence discusses "commercially
reasonable costs and expenses" will pay for damages caused but then limits
TransCanada's liability to certain circumstances. There is no definition of
"commercially reasonable" and no stated right that the Landowner would get to
determine the amounts of cost or expense that is "commercially reasonable."
TransCanada excepts out from their liability any damages that are caused by

Landowner's negligence or the negligence of anyone ever acting on the behalf of 1 2 Landowner. It is understandable that if the Landowner were to willfully and 3 intentionally cause damages to the pipeline that Landowner should be liable. 4 However, anything short of willful misconduct should be the lability of 5 TransCanada who is subjecting the pipeline on the Landowner and who is making 6 a daily profit from that pipeline. When evaluating the impact on property rights of 7 this provision, you must consider the potentially extremely expensive fight a 8 Landowner would have over this question of whether or not damage was an act of 9 negligence. Putting this kind of potential liability upon the Landowner is 10 incredibly problematic and is detrimental to the protection of property rights. I 11 don't think this unilateral power which I can't do anything about as the landowner 12 is in the best economic interest of the land in question or the State of Nebraska for 13 landowners to be treated that way.

# 14 Q: Is there any specific event or example you are aware of that makes this 15 concern more real for you?

A: Yes, one need not look further than a November 3, 2015 lawsuit filed against
 Nemaha County, Nebraska landowner farmers who accidently struck two
 Magellan Midstream Partners, LP pipelines, one used to transport a mixture of
 gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged
 negligence and sued the Nebraska farmer for \$4,151,148.69. A true and accurate
 copy of the Federal Court Complaint is here as Attachment No. 4.

### 22 Q: What is your next concern with the Easement language?

A: Paragraph 3 states that Landowner can farm on and otherwise use their property as
they choose unless 1) any Landowner use interferes in any way with
TransCanada's exercise of any of its rights within the Easement, or 2)
TransCanada decides to take any action on the property it deems necessary to
prevent injury, endangerment or interference with anything TransCanada deems
necessary to do on the property. Landowner is also forbidden from excavating
without prior authorization by TransCanada. So my understanding is that

1 TransCanada will unilaterally determine what Landowner can and can't do based 2 upon how TransCanada chooses to define the terms in paragraph 3. TransCanada 3 could also completely deny my request to excavate. Further, TransCanada retains 4 all "privileges necessary or convenient for the full use of the rights" granted to 5 them in the Easement. Again, TransCanada unilaterally can decide to the 6 detriment of the property rights of Landowner what TransCanada believes is 7 necessary or convenient for it. And there is no option for any additional 8 compensation to landowner for any right exercised by TransCanada that leads to 9 the removal of trees or plants or vegetation or buildings or structures or facilities 10 owned by Landowner of any kind. Such undefined and unilateral restrictions and 11 rights without having to compensate Landowner for such further destruction or 12 losses are not conducive to the protection of property rights or economic interest.

13

### **Q:** What is the next concern you have?

14 A: The Easement also allows some rights for Landowner but restricts them at the 15 same time and again at the sole and unilateral decision making of TransCanada. 16 TransCanada will determine if the actions of Landowner might in anyway 17 endanger or obstruct or interfere with TransCanada's full use of the Easement or 18 any appurtenances thereon to the pipeline itself or to their access to the Easement 19 or within the Easement and TransCanada retains the right at any time, whether 20 during growing season or not, to travel "within and along Easement Area on foot 21 or in vehicle or machinery..." Further at TransCanada's sole discretion it will 22 retain the rights to prevent any landowner activity that it thinks may "unreasonably 23 impair[ed] or interfe[ed] with" TransCanada's use of the Easement Area. Such 24 undefined and unilateral restrictions are not conducive to the protection of 25 property rights or economic interest.

26

### **Q:** What is the next concern you have with the Easement language?

A: The Easement allows TransCanada sole discretion to burn or chip or bury under
Landowner's land any debris of any kind without any input or power of
Landowner to demand an alternative method or location of debris disposal. Such

unilateral powers would negatively affect Landowners property are not conducive
 to the protection of property rights or economic interest.

### **3 Q:** What is the next concern you have with the Easement language?

4 A: Again, undefined terms leave a lot of room for confusion. What does the phrase 5 "where rock is encountered" mean and why does TransCanada solely get to 6 determine whether or not this phrase is triggered. This phrase could be used to 7 justify installing the pipeline 24 inches beneath the surface. The ability to use this 8 provision to minimal locate the pipeline at a depth of 24 inches could negatively 9 affect Landowners property are not conducive to the protection of property rights. 10 A shallow pipeline is much more likely to become a danger and liability in the 11 future given farming operations and buried irrigation lines and other factors 12 common to the current typical agricultural uses of the land in question impacted 13 by TransCanada's preferred pipeline route.

### 14 Q: What is the next concern you have with the Easement language?

15 A: There are more vague concepts solely at the determination of TransCanada such as 16 "as nearly as practicable" and "pre-construction position" and "extent reasonably 17 possible." There is nothing here that defines this or provides a mechanism for 18 documenting or memorializing "pre-construction position" so as to minimize 19 costly legal battles or wasted Landowner time attempting to recreate the soil 20 condition on their fields or pasture. Such unilateral powers would negatively affect 21 Landowners property are not conducive to the protection of property rights or 22 economic interest.

### 23 Q: What is the next concern you have with the Easement language?

A: TransCanada maintains the unilateral right to abandon the pipeline and all appurtenances thereto in place on, under, across, or through Nebraska land at any time it chooses. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral powers would negatively affect Landowners property are not conducive to the protection of property rights or economic interest.

1 **O**: What is the next concern you have with the Easement language?

2 A: TransCanada has the power to unilaterally move or modify the location of any 3 Easement area whether permanent or temporary at their sole discretion. 4 Regardless, if Landowner has taken prior steps relative the their property in 5 preparation or planning of TransCanada's taking of the initial easement area(s), 6 the language here does not require TransCanada to compensate the Landowner if 7 they decide to move the easement anywhere on Landowners property. Such 8 unilateral powers would negatively affect Landowners property are not conducive 9 to the protection of property rights or economic interests.

10

#### **O**: What is the next concern you have with the Easement language?

11 A: The Easement requires that all of the burdens and restrictions upon Landowner to 12 transfer and be applicable to any future owner of the Land in question without the ability of the future Landowner to modify or negotiate any of the language in 13 14 question to which it will be held to comply.

15 **Q**: What is the next concern you have with the Easement language?

- 16 A: The Easement allows TransCanada to assign, transfer, or sell any part of the 17 Easement to any person, company, country, etc. at their sole discretion at any time 18 to anyone. This also means that any buyer of the easement could do the same to a 19 third buyer and so on forever. There is no change of control or sale provision in 20 place to protect the Landowner or Nebraska or to provide compensation for such 21 change of control or ownership. It is not conducive to the protection of property 22 rights or economic interests to allow unilateral unrestricted sale of the Easement 23 thereby forcing upon the Landowner and our State a new unknown Easement 24 owner.
- 25

#### What is the next concern you have with the Easement language? **Q**:

26 A: There are many terms in the Easement that are either confusing or undefined terms 27 that are without context as to whether or not the Landowner would have any say so in determining what these terms mean or if the evaluation is solely in 28 29 TransCanada's control. Some of these vague undefined terms are as follows:
1	i.	"pipeline installation activities"
2	ii.	"availability of labor and materials"
3	iii.	"commercially reasonable costs and expenses"
4	iv.	"reasonably anticipated and foreseeable costs and expenses"
5	v.	"yield loss damages"
6	vi.	"diminution in the value of the property"
7	vii.	"substantially same condition"
8	viii.	"an actual or potential hazard"
9	ix.	"efficient"
10	х.	"convenient"
11	xi.	"endangered"
12	xii.	"obstructed"
13	xiii.	"injured"
14	xiv.	"interfered with"
15	XV.	"impaired"
16	xvi.	"suitable crossings"
17	xvii.	"where rock is encountered"
18	xviii.	"as nearly as practicable"
19	xix.	"pre-construction position"
20	XX.	"pre-construction grade"
21	xxi.	"various engineering factors"
22	Each one of	these above terms and phrases as read in the context of the Easement
23	could be pro-	oblematic in many ways. Notably, undefined terms tend to only get
24	definition in	n further legal proceedings after a dispute arises and the way the
25	Easement is	s drafted, TransCanada has sole power to determine when and if a
26	particular si	tuation conforms with or triggers rights affected by these terms. For
27	instance, "y	ield loss damages" should be specifically defined and spelled out
28	exactly how	the landowner is to be compensated and in what events on the front
29	end. I can't	afford to fight over this after the damage has occurred. Unfortunately,

1		the Landowner is without contractual rights to define these terms or determine
2		when rights related to them trigger and what the affects may be.
3	Q:	Do you have any other concerns about the Easement language that you can
4		think of at this time?
5	A:	I reserve the right to discuss any additional concerns that I think of at the time of
6		my live testimony in August.
7	Q:	Based upon what you have shared with the Commission above regarding
8		TransCanada's proposed Easement terms and agreement, do you believe
9		those to be reasonable or just, under the circumstances of the pipeline's
10		impact upon you and your land?
11	A:	No, I do not believe those terms to be reasonable or just for the reasons that we
12		discussed previously.
13	Q:	Did TransCanada ever offer you financial compensation for the rights that
14		they sought to obtain in your land, and for what they sought to prevent you
15		and any future land owner of your property from doing in the future?
16	A:	Yes, we received an offer from them.
17	Q:	As the owner of the land in question and as the person who knows it better
18		than anyone else, do you believe that TransCanada offered you just, or fair,
19		compensation for all of what they proposed to take from you so that their tar
20		sands pipeline could be located across your property?
21	A:	No, I do not. Not at any time has TransCanada, in my opinion, made a fair or just
22		offer for all the potential impacts and effects and the rights that I'm giving up, and
23		what we will be prevented from doing in the future and how their pipeline would
24		impact my property for ever and ever.
25	Q:	Has TransCanada at any time offered to compensate you annually, such as
26		wind farm projects do, for the existence of their potential tar sands pipeline
27		across your property.
28	A:	No, never.

- Q: At any time did TransCanada present you with or request that you, as the
   owner of the land in question, sign and execute a document called, "Advanced
   Release of Damage Claims and Indemnity Agreement?"
- 4 A: Yes, they did and it was included in the County Court lawsuit against us.
- 5 Q: Is Attachment No. 5, to your testimony here, a true and accurate copy of the 6 "Advanced Release of Damage Claims and Indemnity Agreement?
- 7 A: Yes, it is.

## 8 Q: What was your understanding of that document?

9 A: When I read that document in the plain language of that document, it was my
10 understanding that TransCanada was attempting to pay me a very small amount at
11 that time in order for me to agree to give up my rights to be compensated from
12 them in the future related to any damage or impact they may have upon my
13 property "arising out of, in connection with, or alleged to resulted from
14 construction or surveying over, under or on" my land.

15 Q: Did you ever sign that document?

16 A: No, I did not.

17 **Q: Why not?** 

A; Because I do not believe that it is fair or just to try to get me to agree to a small
sum of money when I have no idea how bad the impacts or damages that they, or
their contractors, or subcontractors, or other agents or employees, may cause on
my land at any time in the future that resulted from the construction or surveying
or their activities upon my land.

# 23 Q: When you reviewed this document, what did it make you feel?

A: I felt like it was simply another attempt for TransCanada to try to pay very little to shield themselves against known and foreseeable impacts that their pipeline, and the construction of it, would have upon my land. It made me feel that they knew it was in their financial interest to pay me as little as possible to prevent me from ever having the opportunity to seek fair compensation again, and that this must be

1		based upon their experience of unhappy landowners and situations in other places			
2		where they have built pipelines.			
3	Q:	Has TransCanada ever contacted you and specifically asked you if you			
4		thought their proposed location of their proposed pipeline across your land			
5		was in your best interest?			
6	A:	No, they have not.			
7	Q:	Has TransCanada ever contacted you and specifically asked you if you			
8		thought their proposed location of their proposed pipeline across your land			
9		was in the public interest of the State of Nebraska?			
10	A:	No, they have not.			
11	Q:	Are you familiar with the Fifth Amendment to the U.S. Constitution and the			
12		Takings Clause?			
13	A:	Yes, I am.			
14	Q:	What is your understanding of the Fifth Amendment as it relates to taking of			
15		an American citizens property?			
16	A:	My understanding is that, according to the United States Constitution, that if the			
17		government is going to take land for public use, then in that case, or by taking for			
18		public use, it can only occur if the private land owner is compensated justly, or			
19		fairly.			
20	Q:	Has TransCanada ever contacted you specially to explain the way in which			
21		the public could use its proposed Keystone XL Pipeline?			
22	A:	No, they have not.			
23	Q:	Can you think of any way in which the public, that is the citizens of the State			
24		of Nebraska, can directly use the proposed TransCanada Keystone XL			
25		Pipeline, as it dissects the State of Nebraska?			
26	A:	No, I cannot. I cannot think of any way to use this pipeline. I do not see how the			
27		public benefits from this pipeline in any way, how they can use it any way, or how			
28		it's in the public interest in any way. By looking at the map, it is quite clear to me			
29		that the only reason it's proposed to come through Nebraska, is that because we			

are geographically in the way from between where the privately-owned Tar Sands
 are located to where TransCanada wants to ship the Tar Sands to refineries in
 Houston, Texas.

4 Q: Has TransCanada ever contacted you and asked you if you had any tar sands,
5 crude petroleum, or oil and petroleum by-products that you would like to
6 ship in its pipeline?

7 A: No, it has not.

Q: Do you have any tar sands, crude petroleum, or oil and petroleum by products that you, at this time or any time in the future, would desire to place
 for transport within the proposed TransCanada Keystone XL Pipeline?

- 11 A: No, I do not.
- Q: Do you know anyone in the state of Nebraska who would be able to ship any
   Nebraska-based tar sands, crude petroleum, or oil and petroleum by products within the proposed TransCanada Keystone XL Pipeline?

15 A: No, I do not. I've never heard of such a person or company like that.

16 Q: Do you pay property taxes for the land that would be affected and impacted
 17 at the proposed TransCanada Keystone XL Pipeline?

18 A: Yes, I do.

- 19 Q: Why do you pay property taxes on that land?
- A: Because that is the law. The law requires us to pay the property taxes as the ownerof that property.
- Q: Because you follow the law and pay property taxes, do you believe you
   deserve any special consideration or treatment apart from any other person
   or company that pays property taxes?
- A: Well no, of course not. It's the law to pay property taxes if you own property. It's
  just what you do.
- Q: Do you believe the fact that you pay property taxes entitles you to special
  treatment of any kind, or special rights of any kind?

29 A: No, of course not.

1	Q:	Do you believe the fact that you pay property taxes on your land would be
2		enough to qualify you to have the power of eminent domain to take land of
3		your neighbors or other people in your county, or other people across the
4		state of Nebraska?
5	A:	Well, of course not. Like I said, paying property taxes is the law, it's nothing that
6		I expect an award for or any type of special consideration.
7	Q:	Have you at any time ever employed any person other than yourself?
8	A:	Well, yes I have.
9	Q:	Do you believe that the fact that you have, at some point in your life,
10		employed one or more other persons entitle you to any special treatment or
11		consideration above and beyond any other Nebraskan that has also employed
12		one or more persons?
13	A:	No, of course not.
14	Q:	Do you believe that the fact that you, as a Nebraska land owner and taxpayer
15		have at one point employed another person within this state, entitles you to
16		preferential treatment or consideration of any kind?
17	A:	No, of course not. If I choose to employ someone that decision is up to me. I
18		don't deserve any special treatment or consideration for that fact.
19	Q:	At the beginning of your statement, you briefly described your property that
20		would be impacted by the potential Keystone XL Pipeline. I would like you to
21		give the Commissioners a sense of specifically how you believe the proposed
22		Keystone XL Pipeline and its preferred route, which proposes to go across
23		your land, how it would in your opinion based on your knowledge,
24		experience, and background of your land, affect it.
25	A:	The KXL pipeline poses a significant threat to our farming practices. We have
26		been utilizing no-till conservation practices for the past 13 years. We also plant
27		cover crops to enhance these practices. This improves soil structure, builds
28		microorganisms and organic matter to create healthy soil. Plant root structure goes

29 down to over five feet deep. These conservation practices also prevent soil erosion

1 from wind and weather. When not protected, our sand will drift like snow, creating 2 "blowouts" while destroying productivity. Destroying the earth for pipeline 3 construction would require years of reclamation to bring back to current levels. 4 The heat from the pipe will destroy root structure, causing poor growth and yields. 5 The warm soil will harbor insects and diseases over winter. A buried pipeline will 6 continue to settle the dirt around it, creating potential cave-ins. Irrigation water 7 will wash into the trench area. Pivot tires can become stuck in such a trench line. 8 These trenches also create potential for equipment to fall into. Significant damage 9 can occur to that equipment. If the pipe happens to get damaged from such an 10 accident, it becomes our responsibility. Future farming technologies may be 11 forbidden or severely restricted. Our farm has a large number of trees that protect 12 the land from wind erosion. Many old and newer trees will have to be removed 13 and cannot be replaced. The property value of our farm will be significantly 14 decreased with this pipeline and permanent easement. Land with KXL easements 15 has already sold for less than comparable market value.

# Q: Do you have any concerns TransCanada's fitness as an applicant for a major crude oil pipeline in its preferred location, or ultimate location across the state of Nebraska?

19 A: Yes, I have significant concerns. I am aware of landowners being treated unfairly 20 or even bullied around and being made to feel scared that they did not have any 21 options but to sign whatever papers TransCanada told them they had to. I am 22 aware of folks being threatened that their land would be taken if they didn't follow 23 what TransCanada was saying. I am aware of tactics to get people to sign 24 easements that I don't believe have any place in Nebraska or anywhere such as 25 TransCanada or some outfit associated with it hiring a pastor or priest to pray with 26 landowners and convince them they should sign TransCanada's easement 27 agreements. I am aware of older folks and widows or widowers feeling they had 28 no choice but to sign TransCanada's Easement and they didn't know they could 29 fight or stand up for themselves. From a more practical standpoint, I am worried that according to their answer to our Interrogatory No. 211, TransCanada only owns and operates one (1) major oil pipeline. They simply do not have the experience with this type of pipeline and that scares me. There are others but that is what I can recollect at this time and if I remember more or my recollection is refreshed I will share those with the Commissioners at the Hearing in August.

# 6

7

**Q**:

Do you believe TransCanada's proposed method of compensation to you as a landowner is reasonable or just?

8 A: No, I do not.

9 Q: Do you have any concern about limitations that the construction of this 10 proposed pipeline across your affected land would prevent construction of 11 future structures upon the portion of your land affected by the proposed 12 easement and immediately surrounding areas?

A: Well yes, of course I do. We would not be able to build many, if any, types of
structures directly across or touching the easement, and it would be unwise and I
would be uncomfortable to build anything near the easement for fear of being
blamed in the future should any damage or difficulty result on my property in
regards to the pipeline.

18

18 Q: Do you think such a restriction would impact you economically?

19 A: Well yes, of course.

20 Q: How do you think such a restriction would impact you economically?

21 A: The future of this land may not be exactly how it's being used as of this moment, 22 and having the restrictions and limiting my ability to develop my land in certain 23 ways presents a huge negative economic impact on myself, my family, and any 24 potential future owner of the property. You have no idea how I or the future owner 25 may want to use this land in the future or the other land across Nebraska 26 potentially affected by the proposed Keystone XL tar sands pipeline. Fifty years 27 ago it would have been hard to imagine all the advances that we have now or how 28 things change. Because the Easement is forever and TransCanada gets the rights in 29 my land forever we have to think with a very long term view. By placing their pipeline on under across and through my land that prevents future development which greatly negatively impacts future taxes and tax revenue that could have been generated by the County and State but now will not. When you look at the short blip of economic activity that the two years of temporary construction efforts may bring, that is far outweighed by the perpetual and forever loss of opportunity and restrictions TransCanada is forcing upon us and Nebraska.

# 7 Q: Do you have any concerns about the environmental impact of the proposed 8 pipeline?

9 A: Yes, I do.

10 Q: What are some of those concerns?

A: As an affected land owner and Nebraskan, I am concerned that any construction,
operation, and/or maintenance of the proposed Keystone XL Pipeline would have
a detrimental impact upon the environment of my land specifically, as well as the
lands near my land and surrounding the proposed pipeline route.

15

## **Q:** Do you have any other environmental concerns?

A: Yes, of course I am concerned about potential breaches of the pipeline, failures in
construction and/or maintenance and operation. I am concerned about spills and
leaks that TransCanada has had in the past and will have in the future. This could
be catastrophic to my operations or others and to my county and the State.

Q: Do you have any thoughts regarding if there would be an impact upon the
natural resources on or near your property due to the proposed pipeline?

A: Yes, I believe that any construction, operation, and/or maintenance of the
 proposed Keystone XL Pipeline would have detrimental impacts upon the natural
 resources of my land, and the lands near and surrounding the proposed pipeline
 route.

# 26 Q: Do you have any worries about potential impacts from the proposed pipeline 27 to the soil of your land, or land near you?

A: Yes, I believe that any construction, operation, and/or maintenance of the
 proposed Keystone XL Pipeline would have a detrimental impact upon the soil of

1 land, as well as land along and surrounding the proposed pipeline route. This 2 includes, but is not limited to, the reasons that we discussed above of disturbing 3 the soil composition and makeup as it has naturally existed for thousands and 4 millions of years during the construction process, and any future maintenance or 5 removal process. I'm gravely concerned about the fertility and the loss of 6 economic ability of my property to grow the crops, or grow the grasses, or grow 7 whatever it is at that time they exist on my property or that I may want to grow in 8 the future, or that a future owner may want to grow. The land will never be the 9 same from as it exists now undisturbed to after it is trenched up for the proposed 10 pipeline.

11 **O**: 12

# Do you have any concerns about the potential impact of the proposed pipeline upon the groundwater over your land, or surrounding lands?

13 A: Yes, I'm very concerned that any construction, operation, and/or maintenance of 14 the proposed Keystone XL Pipeline would have a detrimental impact upon the 15 groundwater of not only under my land, but also near and surrounding the pipeline 16 route, and in fact, potentially the entire State of Nebraska. Water is life plain and 17 simple and it is simply too valuable to our State and the country to put at 18 unreasonable risk.

#### 19 **Q**: Do you have any concern about the potential impact of the proposed pipeline 20 upon the surface water on, or near or around your land?

21 A: Yes, I have significant concerns that any construction, operation, and/or 22 maintenance of the proposed Keystone XL Pipeline would have detrimental 23 impact upon the surface water of not only within my property boundary, but along 24 and near and surrounding the pipeline route, and in fact, across the state of 25 Nebraska.

#### 26 **Q**: Do you have any concern about the potential impacts of the proposed pipeline 27 upon the wildlife and plants, other than your growing crops on or near your 28 land?

A: Yes, I'm very concerned that any construction, operation, and/or maintenance of
 the proposed Keystone XL Pipeline would have a detrimental impact upon the
 wildlife and the plants, not only that are located on or can be found upon my land,
 but also near and along the proposed pipeline route.

# 5 Q: Do you have any concerns about the effects of the proposed pipeline upon the 6 fair market value of your land?

7 A: Yes, I do. I am significantly concerned about how the existence of the proposed 8 pipeline underneath and across and through my property will negatively affect the 9 fair market value at any point in the future, especially at that point in which I 10 would need to sell the property, or someone in my family would need to sell the 11 property. I do not believe, and certainly would not be willing to pay, the same 12 price for land that had the pipeline located on it, versus land that did not. I hope 13 there is never a point where I'm in a position where I have to sell and have to 14 realize as much value as I can out of my land. But because it is my single largest 15 asset, I'm gravely concerned that the existence of the proposed Keystone XL 16 Pipeline upon my land will affect a buyer's willingness to pay as much as they 17 would've paid and as much as I could've received, if the pipeline were not upon 18 my property. There are just too many risks, unknowns, impacts and uncertainties, 19 not to mention all of the rights you give up by the nature of having the pipeline 20 due to having the easement that we have previously discussed, for any reasonable 21 person to think that the existence of the pipeline would not negatively affect my 22 property's value.

# Q: Have you ever seen the document that's marked as Attachment No. 6, to your testimony?

25 A: Yes, I have.

26 Q: Where have you seen that before?

A: That is a map I think I first saw a couple years ago that shows the Keystone XL
I-90 corridor alternate route of its proposed pipeline through Nebraska and I

1		believe the portion of the alternative route in Nebraska essentially twins or
2		parallels Keystone I.
3	Q:	Do you believe the portion of the proposed pipeline within Nebraska as found
4		in Attachment No. 6 to your testimony, is in the public interest of Nebraska?
5	A:	No, I do not.
6	Q:	Do you believe that TransCanada's preferred route as found on page 5 of its
7		Application, and as found on Attachment No. 7, here to your testimony, is in
8		the public interest of Nebraska?
9	A:	No, I do not.
10	Q:	Do you believe that the Keystone mainline alternative route as shown on
11		Attachment No. 7 included with your testimony here is a major oil pipeline
12		route that is in the public interest of Nebraska?
13	A:	No, I do not.
14	Q:	Do you believe there is any potential route for the proposed Keystone XL
15		Pipeline across, within, under, or through the State of Nebraska that is in the
16		public interest of the citizens of Nebraska?
17	A:	No, I do not.
18	Q:	Why do you hold that belief?
19	A:	Because there simply is no public interest based on all of the factors that I am
20		aware and that I have read and that I have studied that this Commission is to
21		consider that would establish that a for-profit foreign-owned pipeline that simply
22		crosses Nebraska because we are geographically in the way between where tar
23		sands are in Canada to where it wants to ship it to in Texas could ever be in the
24		public interest of Nebraskans. We derive no benefit from this project. It is not for
25		public use. Nebraska is simply in the way and when all considerations are taken in
26		there is no net benefit of any kind for Nebraska should this project be placed in our
27		state. Even if there was some arguable "benefit" it is not enough to outweigh all
28		the negative impacts and concerns.

1 **O**: What do you think about the applicant, TransCanada's argument that it's 2 preferred route for its proposed Keystone XL Pipeline is in the public interest 3 of Nebraska because it may bring temporary jobs during the construction 4 phase to Nebraska?

5 First of all, not all jobs are created equally. Most jobs that are created, whether A: 6 temporary or on a permanent basis, don't come with a project that has all the 7 potential and foreseeable negative impacts, many of which we have discussed here 8 and other witnesses throughout the course of this hearing have and will discuss. If 9 I decide to hire and employ someone to help me out in my farming or ranching 10 business, I've created a job but I haven't done so at the risk or detrimental impact 11 to my land or my town or my county or my state. And I've hired someone who is 12 working directly for me, a Nebraska landowner, citizen, taxpayer, to help produce 13 and grow a Nebraska product to be sold so that I can pay Nebraska taxes. So, all 14 jobs are not created equal. Additionally, I understand from what I'm familiar with 15 from TransCanada's own statements that the jobs numbers they originally touted 16 were determined to be a minute fraction of the permanent jobs that had been 17 projected. According to their answer to our Interrogatory No. 191, TransCanada 18 has created only thirty-four (34) jobs within Nebraska working specifically on 19 behalf of TransCanada and according to their answer to Interrogatory No. 196, as 20 of May 5, 2017 they only employ one (1) temporary working within Nebraska. 21 Further, according to their answer to Interrogatory No. 199, TransCanada would 22 only employ six to ten (6 to 10) new individuals if the proposed Keystone XL was 23 constructed on its Preferred Route or its Mainline Alternative Route.

24

**O**: Are you opposed to the preferred route of the proposed KXL Pipeline simply 25 because it would cross your land?

- 26 A: No, absolutely not. I am opposed to this project because it is not in the public 27 interest, neither within my community nor within our state.
- 28 **Q**: Would you be happier if instead of crossing your land, this proposed pipeline 29 was to cross someone else's land?

A: No, absolutely not. I would get no joy in having a fellow citizen of my state have
 the fear and anxiety and potential foreseeable risks and negative impacts that this
 type of a project carrying this type of product brings foisted upon anyone in this
 state or any other state.

5

# 6

**Q**:

# Do you think there is any intelligent route for the proposed Keystone XL Pipeline to cross the state of Nebraska?

A: I don't believe there is an intelligent route because as I have stated I don't believe
this project anywhere within Nebraska is within the public interest. However, if
you are presenting a hypothetical that if this proposed KXL Pipeline absolutely
had to go somewhere in the state of Nebraska, the only intelligent route I believe
would be to twin or closely parallel the existing Keystone I Pipeline. Both the
preferred route and the mainline alternative routes are economic liabilities our
state cannot risk.

# 14 Q: What do you rely upon to make that statement?

15 A: Well, the fact that a pipeline owned and operated by TransCanada, Keystone I, 16 already exists in that area is reason enough as it is not in our best interest or the 17 public interests to have more major oil pipelines crisscrossing our state. Second, 18 they have all the infrastructure already there in terms of relationships with the 19 counties and local officials and first responders along that route. Third, they have 20 already obtained easements from all the landowners along that route and have 21 relationships with them. Fourth, that route avoids our most sensitive soils, the 22 sandier lighter soils. Fifth, that route for all practical purposes avoids the Ogallala 23 Aquifer. Sixth, they have already studied that route and previously offered it as an 24 alternative. Seventh, it just makes the most sense that as a state we would have 25 some intelligent policy of energy corridors and co-locating this type of infrastructure near each other. 26

# Q: Does Attachment No. 8 here contain other documents you are competent to speak about that you wish to be part of your testimony and to discuss in more detail as needed at the August 2017 Hearing?

1 A: Yes.

# Q: Do you have any other concerns you would like to reiterate or can think of at this time you would like the Commissioners to understand?

4 A: Yes. TransCanada refuses to agree to remove this pipeline after its usefulness has 5 expired. They will be leaving a continuous toxic waste dump across Nebraska. 6 The pipe will be significantly deteriorated by then. In other words, this is a disaster 7 waiting to happen. Property rights ensure that private corporations cannot take 8 land via eminent domain unless it is in the public interest. There is no public 9 benefit from this pipeline to the citizens of Nebraska. This is a situation of 10 granting a foreign corporation the right to take land from American citizens. The 11 whole purpose is for corporate gain and greed. TransCanada wants to use eminent 12 domain as a means of "hostile business acquisition." That is not in the public 13 interest. The non-negotiable terms of TransCanada's easement violate good 14 business practices. They provide a one-time payment for a lifetime of risks. The 15 easement takes control of a portion of land down the middle of the farm. It is not 16 like a road or highway where the land is generally at the edge of the property. By 17 putting it through the middle of a property, the landowner provides more security 18 from vandalism or terrorism. The farmer also deals with all the reclamation and 19 productivity issues. In the cases of most spills, it has been a landowner or tenant 20 who has discovered leaks. The company knows that the farmers will be over the 21 easement on a regular basis to observe potential problems. For all the risks and 22 extra work, annual payments should be made to the landowner. Wind energy 23 easements make annual payments to the landowner. No wise businessman would 24 sign TransCanada's easement that offers a lot of risk and no reward. If anything 25 TransCanada should offer a lease not a one-time payment.

# Q: Have you fully expressed each and every opinion, concern, or fact you would like the Public Service Commissioners to consider in their review of TransCanada's Application?

1 **A:** No, I have not. I have shared that which I can think of as of the date I signed this 2 document below but other things may come to me or my memory may be 3 refreshed and I will add and address those things at the time of the Hearing in 4 August and address any additional items at that time as is necessary. Additionally, 5 I have not had an adequate amount of time to receive and review all of 6 TransCanada's answers to our discovery and the discovery of others so it was 7 impossible to competently and completely react to that in my testimony here and I 8 reserve the right to also address anything related to discovery that has not yet 9 concluded as of the date I signed this document below. Lastly, certain documents 10 requested have not yet been produced by TransCanada and therefore I may have 11 additional thoughts on those I will also share at the hearing as needed.

# Q: What is it that you are requesting the Public Service Commissioners do in regards to TransCanada's application for the proposed Keystone XL Pipeline across Nebraska?

15 A: I am respectfully and humbly requesting that the Commissioners think far beyond 16 a temporary job spike that this project may bring to a few counties and beyond the 17 relatively small amount of taxes this proposed foreign pipeline would possibly 18 generate. And, instead think about the perpetual and forever impacts of this 19 pipeline as it would have on the landowners specifically, first and foremost, but 20 also thereby upon the entire state of Nebraska, and to determine that neither the 21 preferred route nor the Keystone mainline alternative route are in the public 22 interest of the citizens of the state of Nebraska. And if the Commissioners were 23 inclined to modify TransCanada's proposed routes and were to be inclined to grant 24 an application for a route in Nebraska, that the only potential route that would 25 make any intelligent sense whatsoever would be twinning or near paralleling of 26 the proposed KXL with the existing Keystone I pipeline. It simply does not make 27 sense to add yet another major oil pipeline crisscrossing our state creating new 28 pumping stations, creating new impacts on additional counties and communities 29 and going through all of the court processes with myself and other landowners like

1 me when this applicant already has relationships with the landowners, the towns 2 and the communities along Keystone I, and that Keystone I is firmly outside of the 3 sand hills and a significantly further portion away from the heart of the Ogallala 4 Aquifer than the preferred route or the Keystone mainline alternative route.

5 Q: Are all of your statements in your testimony provided above true and 6 accurate as of the date you signed this document to the best of your 7 knowledge?

8 A: Yes, they are.

9 Q: Thank you, I have no further questions at this time and reserve the right to
10 ask you additional questions at the August 2017 Hearing.

Helen Hanlery

Subscribed and Sworn to me before this	30th	_ day of	May	2017.
Notary Public				
State of Nebraska - General Notary PATRICIA M. SMITH My Commission Expires January 21, 2019				
			and an and	

Attachment No. 1



May 2017 - XADrawings/50388X KEYSTONE XL\9000\_9999/9358

Attachment No. 2





Attachment No. 3

Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

(Above Space for Recorder's Use Only)

Tract No.: ML-NE-AT-30255.000

### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration") Helen J. Tanderup and Arthur R. Tanderup, wife and husband, as joint tenants, whose mailing address is 52343 857 Road, Neligh, NE 68756 (hereinafter called "Grantor") does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), a perpetual permanent easement and operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other equipment and appurtenances thereto (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines), for the transportation of crude

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petroleum, oil and petroleum by-products, on, under, across and/or through a strip of land 50 feet in width, as more particularly described in <u>Exhibit A</u>, which is attached hereto and made a part hereof (the **"Easement Area**") located on real property situated in the County of Antelope, State of Nebraska owned by Grantor and described as follows:

A tract of land containing 160.29 acres, more or less, situated in the County of Antelope, in the State of Nebraska, being further described as the SW1/4 of Section 5, Township 26 North, Range 6 West of the 6th P.M., as recorded in Book 116, Page 168 in the Deed Records of Antelope County, Nebraska; less and except any conveyances heretofore made.

(the "**Property**"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "**Initial Construction Period**"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional Temporary Work Space" and are more particularly described in <u>Exhibit A</u> hereto (the "**Temporary Work Space**"), provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

A. Grantee will pay all commercially reasonable costs and expenses that result from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's crops, pastures, drainage systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property, including but not limited to, any and all tree, crop, plant, timber, harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee

Grantor's Initials

harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

3. Provided its use of the Property does not in any manner interfere with or prevent the exercise by Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

4. Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee shall not be prevented from traveling within and along Easement Area on foot or in vehicle or machinery; (iv) Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with.

5. During the Initial Construction Period, Grantee shall also provide suitable crossings on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of all brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil to its original, pre-construction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its pre-construction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period) by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment.

Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including, 13. without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" referring to this instrument and setting forth the modified legal description of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid, Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

14. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of negligence, recklessness, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

15. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

16. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

17. It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

18. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

19. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

20. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

21. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_day of \_\_\_\_\_

GRANTOR(S):

Helen J. Tanderup

Arthur R. Tanderup

# [ACKNOWLEDGMENTS APPEAR ON FOLLOWING PAGE]

STATE OF		
COUNTY OF		
The foregoing instrument was acknowledged before me this	day of	20
By Helen J. Tanderup		
Notary Publi	ic Signature	
Affix Seal Here		
STATE OF		
COUNTY OF		
The foregoing instrument was acknowledged before me this	day of	20
By Arthur R. Tanderup		

Notary Public Signature

Affix Seal Here

5

۰.





Attachment No. 4

## 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 1 of 5 - Page ID # 1

## IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE	)	CASE NO
COMPANY, a New York Corporation,	)	
	)	
Plaintiff,	)	
	)	COMPLAINT
V.	)	
	)	
RICHARD ANDREW, JANE ANDREW,	)	
LUKE ANDREW, and BRYCE ANDREW,	)	
	)	
Defendants.	)	

**COMES NOW** Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

## PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

- 2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
- 3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
- 4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
- 5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

### JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

### **GENERAL ALLEGATIONS**

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

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law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

#### FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the rightof-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

- 23. Defendants were negligent in the following particulars:
  - a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
  - b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;
  - c. Defendants failed to comply with the statutory requirements of the OCNS;
  - d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
  - e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

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26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

### SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

### JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.
ZURICH AMERICAN INSURANCE COMPANY, Plaintiff,

By: /s/ Albert M. Engles ENGLES, KETCHAM, OLSON, & KEITH, P.C. 1350 Woodmen Tower 1700 Farnam Street Omaha, Nebraska 68102 (402) 348-0900 (402) 348-0904 (Facsimile) Albert M. Engles, #11194 Dan H. Ketcham, #18930 Michael L. Moran, #24042 James C. Boesen, #24862 Attachment No. 5

## TRANSCANADA KEYSTONE PIPELINE, LP

## ADVANCE RELEASE OF DAMAGE CLAIMS AND INDEMNITY AGREEMENT

## Tract No. : ML-NE-AT-30255.000

We, <u>Helen J. Tanderup and Arthur R. Tanderup, wife and husband, as joint tenants</u>, of <u>Antelope</u> County, in the State of <u>Nebraska</u>, (hereinafter "Grantor") acknowledge receipt of:

<u>Five Thousand Seven Hundred Sixty Dollars and No Cents</u> (\$5,760.00), now paid to Grantor by TransCanada Keystone Pipeline, LP (hereinafter "Company"), in full payment and settlement, in advance, for all damages listed on the Advance Damages Computation Form attached hereto as Appendix A. In consideration of said advance payment, Grantor and Grantor's heirs, executors, administrators and assigns, do hereby release and forever discharge Company from any and all causes of action, suits, debts, claims, expenses, general damages, interest, costs and demands whatsoever, at law and in equity, against Company, which Grantor ever had, has now, or which Grantor's insurers, heirs, executors, administrators, successors or assigns hereafter can, shall or may have in the future, relating to all damage items listed on Appendix A, arising out of, in connection with, or resulting or alleged to have resulted from construction or surveying over, under or on the following lands (hereinafter collectively referred to as the "Lands"):

Situated in the County of Antelope, State of Nebraska:

#### SW/4

# Section 5, Township 26N, Range 6W

Grantor understands and agrees that payment of such consideration is not deemed to be an admission of liability on the part of Company. Grantor agrees to accept said advance payment on behalf of Grantor and Grantor's tenants, if any, and to take full responsibility for compensating any and all of Grantor's tenants for any damage or loss that is owed to said tenants as a result of Company's use of any pipeline easement acquired by Company from Grantor on the Lands. Grantor will indemnify, defend, and hold Company and the Company's officers, agents, and employees harmless from any claim asserted by Grantor's tenants, tenants' successors-in-interest, or tenants' heirs for compensation, restitution, crop loss, consideration, or damage of any kind that Grantor's tenants may be lawfully entitled to as a result of Company's construction or surveying activity within any easement acquired by Company from Grantor on the Lands.

IN WITNESS WHEREOF, we have hereunto set our hands on this \_\_\_\_\_\_ day of

\_\_\_\_\_\_, 20\_\_\_\_.
Owner Signature
Owner Signature
Owner/Owner Representative Name
Owner/Owner Representative Name

Attachment No. 6





KXL002000

Attachment No. 7



Attachment No. 8

Attachment 8.1



# Attachment 8.2

# Soils Inventory Report

# ARTHUR TANDERUP

Tract	Land Unit	Map Unit Symbol	Map Unit Name	Acres	Percent
1322		6700	Thurman loamy fine sand, 0 to 2 percent slopes	0	0%
1322		3164	Doger loamy fine sand, 0 to 2 percent slopes	0	0%
1322		6635	Boelus fine sand, 0 to 6 percent slopes	0.2	1%
1322		4786	Valentine fine sand, 0 to 6 percent slopes	0.3	2%
1322		6798	Loretto sandy loam, 0 to 3 percent slopes	1.5	9%
1322		6724	Thurman fine sand, 2 to 6 percent slopes	1.9	12%
1322		3163	Doger fine sand, 0 to 6 percent slopes	2	12%
1322		6636	Boelus loamy fine sand, 0 to 3 percent slopes	2.9	18%
1322		6723	Thurman fine sand, 0 to 2 percent slopes	3.5	21%
1322		6637	Boelus loamy fine sand, 2 to 6 percent slopes	4	25%
			Total:	16.3	
1322	1	6700	Thurman loamy fine sand, 0 to 2 percent slopes	0	0%
1322	1	6635	Boelus fine sand, 0 to 6 percent slopes	0.3	0%
1322	1	6792	Loretto loarn, 2 to 6 percent slopes	0.5	0%
1322	1	3164	Doger loamy fine sand, 0 to 2 percent slopes	0.9	1%
1322	1	4786	Valentine fine sand, 0 to 6 percent slopes	1	1%
1322	1	6798	Loretto sandy loam, 0 to 3 percent slopes	5.2	4%
1322	1	6637	Boelus loamy fine sand, 2 to 6 percent slopes	7.7	6%
1322	1	6753	Nora silt loam, 2 to 6 percent slopes	8.1	6%
1322	1	3163	Doger fine sand, 0 to 6 percent slopes	17.8	13%
1322	1	6724	Thurman fine sand, 2 to 6 percent slopes	20.6	15%
1322	1	6723	Thurman fine sand, 0 to 2 percent slopes	32.7	24%
1322	1	6636	Boelus loamy fine sand, 0 to 3 percent slopes	42.5	31%
			Total:	137.3	

# Attachment 8.3

## Map Unit Description

#### Antelope County, Nebraska

Map unit: 6792 - Loretto Ioam, 2 to 6 percent slopes

Component: Loretto (100%)

The Loretto component makes up 100 percent of the map unit. Slopes are 2 to 6 percent. This component is on hillslopes on uplands. The parent material consists of loamy eolian deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY058NE Loarny ecological site. Nonimigeted land capability classification is 2e. Irrigated land capability classification is 3e. This soll does not meet hydric criteria. 1 .....

Map unit: 6798 - Loretto sandy loam, 0 to 3 percent slopes

Component: Loretto (100%)

The Loretto component makes up 100 percent of the map unit. Slopes are 0 to 3 percent. This component is on hillslopes on uplands. The parent material consists of loamy ealian deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72. Inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sandy ecological site. Nonirrigated land capability classification is 2a. Irrigated land capability classification is 2a. This soll does not meet hydric criteria.

#### Map Unit Description

#### Antelope County, Nebraska

Map unit: 6637 - Boelus loamy fine sand, 2 to 6 percent slopes

#### Component: Boelus (100%)

The Boelus component makes up 100 percent of the map unit. Slopes are 3 to 6 percent. This component is on hillslopes on uplands. The parent meterial consists of explant sands over silty collan deposits. Depth to a root restrictive layer is greater than 60 inches. The netural dreinege class is well dreined. Weter movement in the most restrictive layer is moderately high. Available weter to a depth of 60 inches is high. Shrink-swell poteritial is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sendy ecological site. Nanimigated land capability classification is 3e. Imgated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 6700 - Thurman loamy fine sand, 0 to 2 percent slopes

Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 0 to 3 percent. This component is on hummooks on uplands. The parent material consists of sendy epilan deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained: Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll is not flooded. If is not ponded. There is no zone of water saturation within a depth of 72 low: Shrink-swell potential is low. This soll flooded is a bout 2 percent. This component is in the R1020Y064NE Sendy ecological site. Nonirigated land capability classification is 38. Irrigated land capability classification is 36. This soll does not meet hydric criteria.

Map unit: 6723 - Thurman fine sand, 0 to 2 percent slopes

#### Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 0 to 3 percent. This component is on hummocks on uplands. The parent material consists of sandy collan deposits. Depth to a root restrictive layer is greater than 60 inches. The netural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CV054NE Sandy ecological site. NonIrrigated land capability classification is 4a. Irrigated land capability classification is 4a. This soll does not meet hydric criteria

Map unit: 6724 - Thurman fine sand, 2 to 6 percent slopes

Component: Thurman (99%)

The Thurman component makes up 99 percent of the map unit. Slopes are 3 to 6 percent. This component is on ridges on uplands. The parent material consists of sandy ealien deposits. Depth to a root restrictive layer is greater then 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within e depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R102CY054NE Sandy ecological site. Nonirrigeted land capability classification is 48. Irrigated land capability classification is 48. This soll does not meet hydric criteria.

Map unit: 6753 - Nora silt loam, 2 to 6 percent slopes

Component: Nora (100%)

The Nora component makes up 100 percent of the map unit. Slopes are 2 to 6 percent. This component is on hillslopes on uplands. The parent material consists of fine-slity calcareous losss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soll is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic metter content in the surface horizon is about 3 percent. This component is in the R102CY058NE Loamy ecological site. Nonirrigeted land capability classification is 2a. Irrigated land capability classification is 3a. This soll does not meet hydric criteria. The celcium carbonete equivalent within 40 inches; typically, does not exceed 10 percent.



SDA Natural Resources **Conscrvation Service** 

1:1.

Survey Area Version: 7 Survey Area Version Date: 10/29/2009

# Map Unit Description

## Antelope County, Nebraska

# [Minor map unit components are excluded from this report]

Map unit: 3163 - Doger fine sand, 0 to 6 percent slopes

Component: Doger (100%)

The Dogencomponent makes up 100 percent of the map unit. Slopes are 0 to 6 percent. This component is on hillslopes on oplands. The parent meterial consists of eclien early. Depth to a cost restrictive layer is directer than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of wells, saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This companient is in the R065XY056NE Sends 22/25 P.z. ecological sigen of maner women in the soliday nonzen is about a percent, this companent is in the robust robust control of the solid ces not meet hydric chiefte.

Map unit: 3164 - Doger learny fine sand, 0 to 2 percent slopes

## Component: Doger (100%)

The Doger component mekes up 100 percent of the map-unit. Slopes are 0 to 3 percent, This component is on hillslopes on uplends. The parent material consists of sollar sands. Depth to a root restrictive layer is greater than 50 inches. The netural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to e depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded, it is not pended. There is no zone of water seturation within eldepth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the RD65XY054NE Sandy 22±25" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydrid criteria.

Map unit: 4766 - Valentine fine sand, 0 to 6 percent slopes

### Component: Valentine (98%)

The Velentine component makes up 98 percent of the map unit. Slopes are 6 to 6 percent This component is on ridges on sendirille. The Velentine component makes up 98 percent of the map unit. Slopes are 0, to 6 percent 4nts component is on noges on sentifille, duries on sentifillis. The parent material consists of sollar sends. Depth to a postrestructive layer is greater than 60 inches. The natural drainage classifier accessively diatried. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shink-swell potential is low. This soll is not noted at the potent. This is not zone of water saturation within a depth of 72-low. Shink-swell potential is low. This soll is not not as about 7 percent. This component is in the R065XY055NE Sands 22-25" P.z. Inches. Organic matter content in the surface holdow is bout 7 percent. This component is in the R065XY055NE Sands 22-25" P.z. ecological site. Noningeted land capability classification is 60. Indigated and capability classification is 4e. This solf does not meet hydric ecological site. Noningeted land capability classification is 60. Indigated and capability classification is 4e. This solf does not meet hydric

criteria.

Map unit: 6635 - Boelus fine sand, 0 to 8 percent slopes

## Component: Boelus (100%)

The Boelus component makes up 100 percent of the map unit. Slopes are 0 to 6 percent. This component is on hillstopes on uplends. The parent meterial consists of collan sends over sliby collan deposits. Depth to a root restrictive lever is greater than 60 inches. The ne parent meternal consists of commen series over entry comments, wepting, and realizes involve layer is grader and your and series and over the neuronal drainage class is well drainad. Weter movement in the most restrictive layer is moderately high. Available water to a depth of 60. Inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 persent. This component is in the R102CY054NE Sendy ecological site. Nonimigeted land cepeblility classification is 4e. Imigeted land capability classification is 4e. This soil does not meet hydric criteria. The celcium cerbonate equivalent within 40 inches, typically, does not exceed 6 percent.

Mep unit: 8636 - Boolus loamy fine sand, 0 to 3 percent slopes

#### Boelus (99%) Component:

The Boolus component makes up 99 percent of the map unit. Slopes are 0 to 9 percent. This component is on knolls on utilands. The r ne coeius component makes up se percent or me mep ant, slopes are u to a percent, this component aron, shore on aparters the parent meterial consists of eolien sends over ally collen deposits. Deprinto e root restrictive leveris greater, men counters. The netural drainage class is well drained. Water movement in the most restrictive leveris moderably high. Available water to a depity of coincides areinage class is well areined, water movement in the most restrictive layer is moderately high. Available water to a depth of 60 mones Is high. Shrink-swell potential is moderate. This soil is not fiboded. It is not ponded. Fibre is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface honzon is about 2 percent. This component is in the RTD2CY064VE Sandy ecological site. Nonimigated land capability classification is 3e. Imigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonete equivalent within 40 inches, typically, does not exceed 3 percent.



SDA Natural Resources **Conservation Service** 

Survey Area Version: 7 Survey Area Version Date: 10/29/2009

# Attachment 8.4

# SARGENT PUMP DESIGN WORK SHEET

SARGENT IRRIGATION CO.

### MEL ICH NE.

JOB NAME :Art Tanderup LOCATION :SW 1/4-5-26-6 Antelope Co PUMP BRAND: WESTERN LAND ROLLERPOWERED BY: POWER UNITPUMP SIZE: 8 X 2 X 1.25PUMP SET FT: 120 PUMP RPM : 1760 AGING FACTOR : 1.1 IRRIG TYPE : PIVOT PIVOT PSI : 55 850 GPM FROM : 93.5 FT PUMP LOSS : 3.2 FT CHECK VALVE LOSS : 1.39 FT HOOK-UP LOSS : .22 FT ELEVATION PIVOT LOSS : O FT : 14.66 FT 55 PSI X 2.31 : 127.05 FT -----TOTAL HEAD : 240.02 FT BOWL BRAND : Western Land Roller 5 STAGE 12CH BOWL A. 1 -H 1/4C & 4 -H 3/4C H. P. FACTOR : 100 % AMOUNT OFF :-1.08 THRUST Lbs : 3542 REQUIRED LATERAL: 2842867 HEAD FACTOR : 100 % ACTUAL HEAD : 238.94 BOWL HP : 65.76 BOWL LATERAL : .563 SHAFT STRETCH: .117 BOWL ADJUSTMENT : 1.91 TURNS SHAFT LOSS : 1 BOWL EFFIC : 77.99 % GEAR DRIVE LOSS : 2.78 : 77.99 % PUMP EFFICIENCY : 73.75 % MOTOR TYPE : DIESEL GEAR RATIO : 1 - 1 MOTOR RPM : 1760 FUEL COST :\$ .75 ANNUAL FUEL : 4190 ANNUAL COST :\$ 3142 MOTOR HP : 69.55 HP PER / GAL : 16.6 FUEL PER / HR: 4.19 ANNUAL HOURS : 1000 :\$ 3142.17 \*\*BOWL ADJUSTMENT IS RELATIVE SHAFT STRETCH PLUS .060 In .\*\* MOTOR POWER AND ANNUAL COST ARE FOR PUMP POWER ONLY AND DOES NOT I UDE COOLING FAN OR PIVOT DRIVE POWER REQUIREMENTS ENGINEER :Dennis Francis DATE :10-15-1994

# Attachment 8.5

Home News Who Killed the Finest Soybean Soil?

# Who Killed the Finest Soybean Soil?

APRIL 22, 2017 02:31 AM

Like 10 Share Tweet



A breached sediment barrier at the mouth of a terrace is a violation of Georgia's Soil and Water Commission's Green Book.

© Randy Dowdy



By **Chris Bennett** Farm Journal Technology and Issues Editor

# Randy Dowdy says he'll face major yield loss from natural gas pipeline project

As he walked along muddy turnrows under pounding January rains, Randy Dowdy knew part of the topsoil from the farm that birthed the highest soybean yields in world history was gone. His 171.7 bu. soybeans and 521 bu. corn from fall harvest faded far into the past.

Email

Today the topsoil on more than 40 acres has been stripped or flipped and replaced or mixed with fresh dirt. In agriculture, dirt is death and soil is life. Compounding the topsoil loss, 100 acres of wetlands caught much of the fertilizer-heavy slurry as it spilled off Dowdy's Brooks County land in southern Georgia. The reconstruction bill is expected to top \$1 million.

Dowdy signed an easement in 2015 giving Spectra Energy right of way across a mile of his land for the Sabal Trail natural gas pipeline, a 515-mile project running through Alabama, Georgia and Florida. The section of the project on Dowdy's land began after fall harvest and was slated for completion the first week of 2017.

On Dec. 6, Dowdy contacted Sabal Trail management, expressing concern about erosion and emphasizing the sensitivity of his ground. According to Dowdy, he continued to contact management and was assured construction would be done on schedule.

"I texted again Jan. 9 and nothing was done," Dowdy says. "No rebuilt terraces, cover crops or restoration."

The third week of January, the skies opened. Construction was ongoing and Dowdy's unprotected topsoil was exposed to heavy rains. Across a 180-acre farm, two-thirds of the runoff was headed directly for the terraces. Sabal Trail's sediment barriers at the mouth of each terrace acted like corks, backing up water into the fields until the watershed surrendered to gravity, escaping across barriers, over terraces and into a creek. Dowdy's meticulously crafted elixir of protozoa, microbials and organic matter was whisked away. Bon voyage to soil health.

Who is to blame? Dowdy points to Sabal Trail and alleges regulatory violations. Sabal Trail declined interview requests citing privacy concerns. Parent company Spectra Energy didn't respond to phone or email questions.

When Dowdy signed the easement, the agreement included a stipulation: Sabal Trail would return all land to its preconstruction condition, both in fertility

#### and soil deposition.

Dowdy's ground runs at a steep 10% to 12% grade. Cover crops and terraces control water runoff and slow the flow to a 1% grade equivalency. The gas line runs mainly north to south, and Dowdy's terraces run east to west. The gas line breaks through every terrace.

Dowdy says the topsoil disaster was a direct result of Sabal Trail negligence in following the Georgia Soil and Water Commission's Green Book (Manual for Erosion and Sediment Control in Georgia) regulations. "Sediment barriers in concentrated flows of water; no straw covers; no safety sediment fences; and many more violations," Dowdy contends.

At Sabal Trail's request, he provided three restoration estimates. One: costs of topsoil purchase, extraction, hauling, grading, soil health applications and terrace reconstruction. Two: estimation of damage to wetlands. Three: long-term yield loss projections. According to



"It's one thing to rebuild terraces, haul in topsoil and straw, plant cover crops and spread chicken litter. It's another thing to gain soil life from dead dirt." - Randy Dowdy, Brooks County, Georgia

Dowdy, Sabal Trail agreed to pay for topsoil restoration and allowed him to begin the process.

He hauled in eight to 18 trucks of lower grade topsoil per day and used one excavator, one motor grader, two bulldozers, two tractors and hay blowing equipment for a \$25,000 price tag per day. Before Sabal Trail would write a check, Dowdy was required to sign a release waiving compensation for future yield loss and wetlands damage. "They knew I would spend \$700,000-plus and were squeezing me, but there was no way I would sign," he explains.

In March, Dowdy filed a complaint with the Environmental Protection Division (EPD) of Page 3 of 5

Georgia. EPD enforces Green Book regulations but only monitors potential construction project violations on a complaint basis: One representative in south Georgia covers nine counties. "We rely on people letting us know about issues. However, we investigate every single complaint we get," says Burt Langley, EPD's director of compliance.

Joe Freeman, environmental compliance officer with EPD, visited the site on March 10 and didn't see any best management practices violations. "Mr. Dowdy has already undertaken the re-terracing of his fields, and the evidence is effectively covered. It may have been different if I'd seen things in December," Freeman says.



While repairing an irrigation line, Randy Dowdy found jumbled soil deposition. "Even the soil that was saved and put back on my land wasn't segregated."

"The only people involved in reviewing compliance with permitting standards are on Sabal Trail's payroll," Dowdy responds. "Isn't that the fox guarding the henhouse? What's the point of having an agency that issues permits if they don't personally police for compliance?"

On March 11, while fixing an irrigation line leak, Dowdy found jumbled soil deposition—a violation of Sabal Trail's agreement. Rance Harrod, irrigation manager at Nashville Tractor, ran an excavator: "I pushed off a couple inches of topsoil and hit at least a 6" layer of a hard clay and blackish dirt mix. The excavator was struggling, and the ground was coming up in chunks."

In succession, Harrod scraped off 2" of topsoil, 6" of hard clay and 10" to 15" of various mixtures before digging into the

expected bright orange Georgia clay. "How do other landowners know this hasn't been done on their land?" Dowdy asks. "Farmers and landowners are just supposed to sign a release and the story is over?"

Dewey Lee, University of Georgia agronomist, says the ramifications of soil disturbance and erosion on Dowdy's ground are incalculable. "It's impossible to replace the positive effects of Randy's management on his soils in a short period of time. Just in the disturbance, you lose aggregation, organic matter, fertility and nutrients," Lee says. "The negative effects are immediate, but of far more concern, the longterm effects could last decades."

Dowdy believes he's facing a lifetime of yield loss on the affected ground due to the negligence of Sabal Trail. He's hauled in more than 1,000 loads of new dirt and expects he needs at least 800 more. In part, the breadbasket topsoil of the world's record soybean yield and some of the highest corn yields is being replaced by a forced substitute.

Back to news

# Comments

No comments have been posted to this News Article

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# Before the Nebraska Public Service Commission

In the Matter of the Application

of

TransCanada Keystone Pipeline, LP for Route Approval of Keystone XL Pipeline Project, Pursuant to *Major Oil Pipeline Siting Act*  **Application No: OP-003** 

Direct Testimony of James "Jim" Tarnick in Support of Landowner Intervenors

State of Nebraska	)
	) ss.
Nance County	)

1	0.	Plaasa stata vour nomo
1	Q:	r lease state your name.
2	A:	My name is James "Jim" Tarnick
3	Q:	Are you an intervener in the Public Service Commission's proceedings
4		regarding TransCanada's application for approval of its proposed Keystone
5		XL tar sands pipeline across Nebraska?
6	A:	Yes, I am.
7	Q:	Do you own land in Nebraska, either directly or through an entity of which
8		you are an owner that could be affected by the proposed TransCanada
9		Keystone XL pipeline?
10	A:	Yes, I do and it is located in Nance County.
11	Q:	Is Attachment No. 1 to this sworn statement copies of true and accurate aerial
12		photo(s) of your land in question here with the area of the proposed KXL
13		pipeline depicted?
14	A:	Yes.
15	Q:	What do you do for a living?
	٨	

1 Q: Do you have any children?

2 A: Yes.

- 3 Q: Is Attachment No. 2 to this sworn statement a copy(ies) of picture(s) of you
  and or your family?
- 5 A. Yes.
- 6 Q: Do you earn any income from your land?
- 7 A: Yes.
- 8 Q: Have you depended on the income from your land to support your livelihood
  9 or the livelihood of your family?
- 10 A: Yes.

# 11 Q: Have you ever in the past or have you thought about in the future leasing all 12 or a portion of your land in question here?

- 13 A: Yes, I have thought of it and that concerns me. I am concerned that a prospective 14 tenant may try to negotiate a lower price for my land if it had the pipeline on it and 15 all the restrictions and risks and potential negative impacts to farming or ranching 16 operations as opposed to land that did not have those same risks. If I was looking 17 to lease or rent ground I would pay more for comparable non-pipeline land than I 18 would for comparable pipeline land and I think most folks would think the same 19 way. This is another negative economic impact that affects the landowner and the 20 county and the state and will forever and ever should TransCanada's preferred or 21 mainline alternative routes be approved. If they were to twin or closely parallel to 22 Keystone I the vast majority of landowners would be those that already have a 23 pipeline so there would be considerable less new incremental negative impacts.
- 24

# Q: Do you have similar concerns about selling the land?

A: Well I hope not to have to sell the land in my lifetime but times change and you
never know what is around the corner and yes I am concerned that if another piece
of ground similar to mine were for sale and it did not have the pipeline and mine
did that I would have a lower selling price. I think this would be true for pipeline
ground on both the preferred and mainline alternative routes.

1	Q:	What is your intent with your land after you die?
2	A:	Like I said I hope not to have to sell and I hope that it stays in the family for years
3		to come but I have thought about getting out if this pipeline were to come through.
4	Q:	Are you aware that the preferred route of TransCanada's Keystone XL
5		Pipeline would cross the land described above and owned by you?
6	A:	Yes.
7	Q:	Were you or an entity for which you are a member, shareholder, or director
8		previously sued by TransCanada Keystone Pipeline, LP?
9	A:	Yes, we were in 2015. TransCanada Keystone Pipeline LP sued us by filing a
10		petition for condemnation against our land so it could place its proposed pipeline
11		within an easement that it wanted to take from us on our land.
12	Q:	Did you defend yourself and your land in that condemnation action?
13	A:	Yes, we did. We hired lawyers to defend and protect us and we incurred legal fees
14		and expenses in our resistance of TransCanada's lawsuit against us.
15	Q:	Has TransCanada reimbursed you for any of your expenses or costs for fees
16		incurred?
17	A:	No, they have not.
18	Q:	In its lawsuit against you, did TransCanada identify the amount of your
19		property that it wanted to take for its proposed pipeline?
20	A:	The lawsuit against us stated they would take the amount of property that is
21		reasonably necessary to lay, relay, operate, and maintain the pipeline and the plant
22		and equipment reasonably necessary to operate the pipeline.
23	Q:	Did TransCanada define what they meant by "property that is reasonably
24		necessary"?
25	A:	No, they did not.
26	Q:	Did TransCanada in its lawsuit against you, identify the eminent domain
27		property portion of your land?
28	A:	Yes, they did.

# Q: Did TransCanada describe what rights it proposed to take related to the eminent domain property on your land?

3 A: Yes, they did.

# 4 Q: What rights that they proposed to take did they describe?

5 TransCanada stated that the eminent domain property will be used to "lay, relay, A: 6 operate, and maintain the pipeline and the plant and equipment reasonably 7 necessary to operate the pipeline, specifically including surveying, laying, 8 constructing, inspecting, maintaining, operating, repairing, replacing, altering, 9 reconstructing, removing and abandoning one pipeline, together with all fittings, 10 cathodic protection equipment, pipeline markers, and all their equipment and 11 appurtenances thereto, for the transportation of oil, natural gas, hydrocarbon, petroleum products, and all by-products thereof." 12

Q: Prior to filing an eminent domain lawsuit to take your land that
 TransCanada identified, do you believe they attempted to negotiate in good
 faith with you?

16 A: No, I do not.

17 Q: Did TransCanada at any time approach you with or deliver to you their
 18 proposed easement and right-of-way agreement?

19 A: Yes, they did.

20Q: At the time you reviewed TransCanada's easement and right-of-way21agreement, did you understand that they would be purchasing a fee title22interest in your property or that they were taking something else?

- A: I understood that they proposed to have the power to take both a temporary
   construction easement that could last for a certain period of time and then also a
   permanent easement which they described to be 50 feet across or in width, and
   that would run the entire portion of my property from where a proposed pipeline
   would enter my property until where it would exit the property.
- Q: Is the document included with your testimony here as Attachment No. 3, a
   true and accurate copy of TransCanada's proposed Easement and Right-of-

1 Way agreement that they included with their condemnation lawsuit against 2 vou?

3 A: Yes, it is.

4 Q: Have you had an opportunity to review TransCanada's proposed Easement
5 and Right-of-Way agreement?

6 A: Yes, I have.

- Q: What is your understanding of the significance of the Easement and Right-of8 Way agreement as proposed by TransCanada?
- 9 A: My understanding is that this is the document that will govern all of the rights and 10 obligations and duties as well as the limitations of what I can and cannot do and 11 how I and any future landowner and any person I invite to come onto my property 12 must behave as well as what TransCanada is and is not responsible for and how 13 they can use my land.

# 14 Q: After reviewing TransCanada's proposed Easement and Right-of-Way 15 agreement do you have any concerns about any portions of it or any of the 16 language either included in the document or missing from the proposed 17 document?

- A: Yes, I have a number of significant concerns and worries about the document and
   how the language included and the language not included potentially negatively
   impacts my land and thereby potentially negatively impacts my community and
   my state.
- Q: I would like you to walk the Commissioners through each and every one of
  your concerns about TransCanada's proposed Easement and Right-of-Way
  agreement so they can develop an understanding of how that language and
  the terms of that contract, in your opinion, potentially negatively impacts you
  and your land. So, if you can start at the beginning of that document and
  let's work our way through it, okay?

A: Yes, I'll be happy to express my concerns about TransCanada's proposed
 Easement and Right-of-Way agreement and how it negatively could affect my
 property rights and my economic interests.

4 Q. Okay, let's start with your first concern please.

5 A: The very first sentence talks about consideration or how much money they will 6 pay to compensate me for all of the known and unknown affects and all of the 7 rights I am giving up and for all the things they get to do to my land and for what 8 they will prevent me from doing on my land and they only will pay me one time at 9 the signing of the easement agreement. That is a huge problem.

# 10 Q: Explain to the Commissioners why that is a problem.

11 A: It is not fair to the landowner, the county, or the State. It is not fair to the 12 landowner because they want to have my land forever for use as they see fit so 13 they can make a daily profit from their customers. If I was to lease ground from 14 my neighbor I would typically pay twice a year every year as long as they granted 15 me the rights to use their land. That only makes sense – that is fair. If I was going 16 to rent a house in town I would typically pay monthly, every month until I gave up 17 my right to use that house. By TransCanada getting out on the cheap and paying once in today's dollars that is monthly, bi-annual, or at least an annual loss in tax 18 revenue collection on the money I would be paid and then pay taxes on and 19 20 contribute to this state and this country. It is money I would be putting back into 21 my local community both spending and stimulating the local economy and 22 generating more economic activity right here. Instead TransCanada's shareholders 23 keep all that money and it never finds its way to Nebraska.

24 Q: What

# What is your next concern?

A: The first paragraph goes on to say Grantor, which is me the landowner, "does
hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a
limited partnership..." and I have no idea who that really is. I have no idea who is
forcing this pipeline on us or who the owners of the entities are, or what are the
assets backing this limited partnership, or who the general partner is, or who all

1 the limited partners are, and who makes up the ownership of the these partners or 2 the structure or any of the basic things you would want to know and understand if 3 you would want to do business with such an outfit. According to TransCanada's 4 answer to our Interrogatory No. 28, as of the date I signed this testimony, a limited 5 liability company called TransCanada Keystone Pipeline GP, LLC is the general 6 partner and it only owns 0.02 percent of TransCanada Keystone Pipeline, LP so 7 basically nothing. That is really scary since the general partner has the liability but 8 virtually none of the ownership and who knows if it has any other assets.

9 Q: Do you think it is in the public interest of Nebraska to not be one-hundred
10 percent clear on exactly who could become the owner of over 275 miles of
11 Nebraska land?

12 A: No.

Q: Do you think it is in the public interest of Nebraska to not be one-hundred
 percent clear on exactly who will be operating and responsible for
 approximately 275 miles of tar sands pipeline underneath and through
 Nebraska land?

17 A: No.

# 18 Q: Okay, let's continue please with your concerns of the impacts upon your land 19 and the State of Nebraska of TransCanada's easement terms.

Yes, so the next sentence talks about "...its successors and assigns (hereinafter 20 A: 21 called "Grantee")..." and this concerns me because it would allow their easement 22 to be transferred or sold to someone or some company or country or who knows 23 what that I don't know and who we may not want to do business with. This 24 pipeline would be a huge asset for TransCanada and if they can sell to the highest 25 bidder that could have terrible impacts upon all of Nebraska depending upon who 26 may buy it and I don't know of any safeguards in place for us or the State to veto 27 or have any say so in who may own, operate, or be responsible for this pipeline in 28 the future.

1 2

# Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing our State is in the public interest?

3 A: No, certainly not, in fact, just the opposite.

# 4 Q: What's next?

A: Then it says "...a perpetual permanent easement and right-of-way..." and this
really concerns me. Why does the easement and right-of-way have to be perpetual
and permanent? That is the question myself and my family want an answer to.
Perpetual to me is like forever and that doesn't make sense.

9 Q: Why doesn't a perpetual Easement and Right-of-Way make sense to you?

10 A: For many reasons but mostly because the tar sands are finite. I am unaware of any 11 data proving there is a perpetual supply of tar sands. I am not aware in 12 TransCanada's application where it proves there is a perpetual necessity for this 13 pipeline. My understanding of energy infrastructure like wind towers is they have 14 a decommission plan and actually take the towers down when they become 15 obsolete or no longer needed. Nothing manmade lasts forever. My land however 16 will, and I want my family or future Nebraska families to have that land as 17 undisturbed as possible and it is not in my interest or the public interest of Nebraska to be forced to give up perpetual and permanent rights in the land for 18 19 this specific kind of pipeline project.

20

# Q: Okay, what is your next concern?

A: The easement language includes all these things TransCanada can do and it says
...abandoning in place..." so they can just leave this pipeline under my ground
until the end of time just sitting there while they are not using it, but I am still
prevented from doing on my land and using my land what I would like. If I owned
a gas station I couldn't just leave my underground oil or fuel storage tanks sitting
there. It doesn't make sense and it scares me and it is not in my interest or the
public interest of Nebraska to allow this.

# Q: Now it looks like we are ready to go to the second page of the Easement is that right?

1 A: Yes.

# 2 Q: So now on the second page of the Easement what are your concerns?

3 A: Here the Easement identifies a 24-month deadline to complete construction of the 4 pipeline but has caveats that are undefined and ambiguous. The 24-month period 5 starts to run from the moment "actual pipeline installation activities" begin on 6 Landowners property. It appears that TransCanada would define this phrase as 7 needed. It would be wise to explain what types of TransCanada action constitutes 8 "installation activity" For instance, would the placement and storage of an 9 excavator or other equipment on or near the Easement property be an activity or 10 would earth have to be moved before the activity requirement is triggered. This 11 vague phrase is likely to lead to future disputes and litigation that is not in the best 12 interest of the welfare of Nebraska and would not protect property interests. The 13 24-months can also be extended in the case of "force majeure." My understanding 14 is that force majeure is often used to insulate a party to a contract when events 15 occur that are completely out of their control. In TransCanada's easement this is 16 expanded to include "without limitation...availability of labor and materials." 17 Extending this language to labor and materials is problematic because these are 18 two variables that TransCanada does have some or significant control over and to 19 allow extension of the 24-month period over events not truly out of the control of 20 TransCanada and without further provision for compensation for the Landowner is 21 not conducive to protection of property rights.

22

# **Q:** Okay, what is your next concern?

A: Paragraphs 1.A. and 1.B. deal with the liabilities and responsibilities of
TransCanada and Landowner. In 1.A., the first sentence discusses "commercially
reasonable costs and expenses" will pay for damages caused but then limits
TransCanada's liability to certain circumstances. There is no definition of
"commercially reasonable" and no stated right that the Landowner would get to
determine the amounts of cost or expense that is "commercially reasonable."
TransCanada excepts out from their liability any damages that are caused by

Landowner's negligence or the negligence of anyone ever acting on the behalf of 1 2 Landowner. It is understandable that if the Landowner were to willfully and 3 intentionally cause damages to the pipeline that Landowner should be liable. 4 However, anything short of willful misconduct should be the lability of 5 TransCanada who is subjecting the pipeline on the Landowner and who is making 6 a daily profit from that pipeline. When evaluating the impact on property rights of 7 this provision, you must consider the potentially extremely expensive fight a 8 Landowner would have over this question of whether or not damage was an act of 9 negligence. Putting this kind of potential liability upon the Landowner is 10 incredibly problematic and is detrimental to the protection of property rights. I 11 don't think this unilateral power which I can't do anything about as the landowner 12 is in the best economic interest of the land in question or the State of Nebraska for 13 landowners to be treated that way.

# 14 Q: Is the 15 conce

# Is there any specific event or example you are aware of that makes this concern more real for you?

A: Yes, one need not look further than a November 3, 2015 lawsuit filed against
 Nemaha County, Nebraska landowner farmers who accidently struck two
 Magellan Midstream Partners, LP pipelines, one used to transport a mixture of
 gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged
 negligence and sued the Nebraska farmer for \$4,151,148.69. A true and accurate
 copy of the Federal Court Complaint is here as Attachment No. 4.

# 22 Q: What is your next concern with the Easement language?

A: Paragraph 3 states that Landowner can farm on and otherwise use their property as
 they choose unless 1) any Landowner use interferes in any way with
 TransCanada's exercise of any of its rights within the Easement, or 2)
 TransCanada decides to take any action on the property it deems necessary to
 prevent injury, endangerment or interference with anything TransCanada deems
 necessary to do on the property. Landowner is also forbidden from excavating
 without prior authorization by TransCanada. So my understanding is that

1 TransCanada will unilaterally determine what Landowner can and can't do based 2 upon how TransCanada chooses to define the terms in paragraph 3. TransCanada 3 could also completely deny my request to excavate. Further, TransCanada retains 4 all "privileges necessary or convenient for the full use of the rights" granted to 5 them in the Easement. Again, TransCanada unilaterally can decide to the 6 detriment of the property rights of Landowner what TransCanada believes is 7 necessary or convenient for it. And there is no option for any additional 8 compensation to landowner for any right exercised by TransCanada that leads to 9 the removal of trees or plants or vegetation or buildings or structures or facilities 10 owned by Landowner of any kind. Such undefined and unilateral restrictions and 11 rights without having to compensate Landowner for such further destruction or 12 losses are not conducive to the protection of property rights or economic interest.

13

# Q: What is the next concern you have?

14 A: The Easement also allows some rights for Landowner but restricts them at the 15 same time and again at the sole and unilateral decision making of TransCanada. 16 TransCanada will determine if the actions of Landowner might in anyway 17 endanger or obstruct or interfere with TransCanada's full use of the Easement or 18 any appurtenances thereon to the pipeline itself or to their access to the Easement 19 or within the Easement and TransCanada retains the right at any time, whether 20 during growing season or not, to travel "within and along Easement Area on foot 21 or in vehicle or machinery..." Further at TransCanada's sole discretion it will 22 retain the rights to prevent any landowner activity that it thinks may "unreasonably 23 impair[ed] or interfe[ed] with" TransCanada's use of the Easement Area. Such 24 undefined and unilateral restrictions are not conducive to the protection of 25 property rights or economic interest.

26

# **Q:** What is the next concern you have with the Easement language?

A: The Easement allows TransCanada sole discretion to burn or chip or bury under
Landowner's land any debris of any kind without any input or power of
Landowner to demand an alternative method or location of debris disposal. Such
unilateral powers would negatively affect Landowners property are not conducive
 to the protection of property rights or economic interest.

### 3 Q: What is the next concern you have with the Easement language?

4 A: Again, undefined terms leave a lot of room for confusion. What does the phrase 5 "where rock is encountered" mean and why does TransCanada solely get to 6 determine whether or not this phrase is triggered. This phrase could be used to 7 justify installing the pipeline 24 inches beneath the surface. The ability to use this 8 provision to minimal locate the pipeline at a depth of 24 inches could negatively 9 affect Landowners property are not conducive to the protection of property rights. 10 A shallow pipeline is much more likely to become a danger and liability in the 11 future given farming operations and buried irrigation lines and other factors 12 common to the current typical agricultural uses of the land in question impacted 13 by TransCanada's preferred pipeline route.

### 14 Q: What is the next concern you have with the Easement language?

15 A: There are more vague concepts solely at the determination of TransCanada such as "as nearly as practicable" and "pre-construction position" and "extent reasonably 16 17 possible." There is nothing here that defines this or provides a mechanism for documenting or memorializing "pre-construction position" so as to minimize 18 costly legal battles or wasted Landowner time attempting to recreate the soil 19 20 condition on their fields or pasture. Such unilateral powers would negatively affect 21 Landowners property are not conducive to the protection of property rights or 22 economic interest.

### 23 Q: What is the next concern you have with the Easement language?

A: TransCanada maintains the unilateral right to abandon the pipeline and all appurtenances thereto in place on, under, across, or through Nebraska land at any time it chooses. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral powers would negatively affect Landowners property are not conducive to the protection of property rights or economic interest.

1 **Q**: What is the next concern you have with the Easement language?

2 A: TransCanada has the power to unilaterally move or modify the location of any 3 Easement area whether permanent or temporary at their sole discretion. 4 Regardless, if Landowner has taken prior steps relative the their property in 5 preparation or planning of TransCanada's taking of the initial easement area(s), 6 the language here does not require TransCanada to compensate the Landowner if 7 they decide to move the easement anywhere on Landowners property. Such 8 unilateral powers would negatively affect Landowners property are not conducive 9 to the protection of property rights or economic interests.

**O**:

#### 10 What is the next concern you have with the Easement language?

11 A: The Easement requires that all of the burdens and restrictions upon Landowner to 12 transfer and be applicable to any future owner of the Land in question without the 13 ability of the future Landowner to modify or negotiation any of the language in 14 question to which it will be held to comply.

#### 15 **Q**: What is the next concern you have with the Easement language?

16 A: The Easement allows TransCanada to assign, transfer, or sell any part of the 17 Easement to any person, company, country, etc. at their sole discretion at anytime 18 to anyone. This also means that any buyer of the easement could do the same to a 19 third buyer and so on forever. There is no change of control or sale provision in 20 place to protect the Landowner or Nebraska or to provide compensation for such 21 change of control or ownership. It is not conducive to the protection of property 22 rights or economic interests to allow unilateral unrestricted sale of the Easement 23 thereby forcing upon the Landowner and our State a new unknown Easement 24 owner.

### 25

#### What is the next concern you have with the Easement language? **Q**:

26 A: There are many terms in the Easement that are either confusing or undefined terms 27 that are without context as to whether or not the Landowner would have any say 28 so in determining what these terms mean or if the evaluation is solely in 29 TransCanada's control. Some of these vague undefined terms are as follows:

1	i.	"pipeline installation activities"
2	ii.	"availability of labor and materials"
3	iii.	"commercially reasonable costs and expenses"
4	iv.	"reasonably anticipated and foreseeable costs and expenses"
5	v.	"yield loss damages"
6	vi.	"diminution in the value of the property"
7	vii.	"substantially same condition"
8	viii.	"an actual or potential hazard"
9	ix.	"efficient"
10	х.	"convenient"
11	xi.	"endangered"
12	xii.	"obstructed"
13	xiii.	"injured"
14	xiv.	"interfered with"
15	XV.	"impaired"
16	xvi.	"suitable crossings"
17	xvii.	"where rock is encountered"
18	xviii.	"as nearly as practicable"
19	xix.	"pre-construction position"
20	XX.	"pre-construction grade"
21	xxi.	"various engineering factors"
22	Each one of	these above terms and phrases as read in the context of the Easement
23	could be pro-	oblematic in many ways. Notably, undefined terms tend to only get
24	definition in	n further legal proceedings after a dispute arises and the way the
25	Easement is	s drafted, TransCanada has sole power to determine when and if a
26	particular si	tuation conforms with or triggers rights affected by these terms. For
27	instance, "y	ield loss damages" should be specifically defined and spelled out
28	exactly how	the landowner is to be compensated and in what events on the front
29	end. I can't	afford to fight over this after the damage has occurred. Unfortunately,

1		the Landowner is without contractual rights to define these terms or determine		
2		when rights related to them trigger and what the affects may be.		
3	Q:	Do you have any other concerns about the Easement language that you can		
4		think of at this time?		
5	A:	I reserve the right to discuss any additional concerns that I think of at the time of		
6		my live testimony in August.		
7	Q:	Based upon what you have shared with the Commission above regarding		
8		TransCanada's proposed Easement terms and agreement, do you believe		
9		those to be reasonable or just, under the circumstances of the pipeline's		
10		impact upon you and your land?		
11	A:	No, I do not believe those terms to be reasonable or just for the reasons that we		
12		discussed previously.		
13	Q:	Did TransCanada ever offer you financial compensation for the rights that		
14		they sought to obtain in your land, and for what they sought to prevent you		
15		and any future land owner of your property from doing in the future?		
16	A:	Yes, we received an offer from them.		
17	Q:	As the owner of the land in question and as the person who knows it better		
18		than anyone else, do you believe that TransCanada offered you just, or fair,		
19		compensation for all of what they proposed to take from you so that their tar		
20		sands pipeline could be located across your property?		
21	A:	No, I do not. Not at any time has TransCanada, in my opinion, made a fair or just		
22		offer for all the potential impacts and effects and the rights that I'm giving up, and		
23		what we will be prevented from doing in the future and how their pipeline would		
24		impact my property for ever and ever.		
25	Q:	Has TransCanada at any time offered to compensate you annually, such as		
26		wind farm projects do, for the existence of their potential tar sands pipeline		
27		across your property.		
28	A:	No, never.		

- Q: At any time did TransCanada present you with or request that you, as the
   owner of the land in question, sign and execute a document called, "Advanced
   Release of Damage Claims and Indemnity Agreement?"
- 4 A: Yes, they did and it was included in the County Court lawsuit against us.
- 5 Q: Is Attachment No. 5, to your testimony here, a true and accurate copy of the 6 "Advanced Release of Damage Claims and Indemnity Agreement?
- 7 A: Yes, it is.

### 8 Q: What was your understanding of that document?

9 A: When I read that document in the plain language of that document, it was my
10 understanding that TransCanada was attempting to pay me a very small amount at
11 that time in order for me to agree to give up my rights to be compensated from
12 them in the future related to any damage or impact they may have upon my
13 property "arising out of, in connection with, or alleged to resulted from
14 construction or surveying over, under or on" my land.

15 **Q:** Did you ever sign that document?

16 A: No, I did not.

17 **Q:** Why not?

A; Because I do not believe that it is fair or just to try to get me to agree to a small
sum of money when I have no idea how bad the impacts or damages that they, or
their contractors, or subcontractors, or other agents or employees, may cause on
my land at any time in the future that resulted from the construction or surveying
or their activities upon my land.

### 23 Q: When you reviewed this document, what did it make you feel?

A: I felt like it was simply another attempt for TransCanada to try to pay very little to shield themselves against known and foreseeable impacts that their pipeline, and the construction of it, would have upon my land. It made me feel that they knew it was in their financial interest to pay me as little as possible to prevent me from ever having the opportunity to seek fair compensation again, and that this must be

1		based upon their experience of unhappy landowners and situations in other places				
2		where they have built pipelines.				
3	Q:	Has TransCanada ever contacted you and specifically asked you if you				
4		thought their proposed location of their proposed pipeline across your land				
5		was in your best interest?				
6	A:	No, they have not.				
7	Q:	Has TransCanada ever contacted you and specifically asked you if you				
8		thought their proposed location of their proposed pipeline across your land				
9		was in the public interest of the State of Nebraska?				
10	A:	No, they have not.				
11	Q:	Are you familiar with the Fifth Amendment to the U.S. Constitution and the				
12		Takings Clause?				
13	A:	Yes, I am.				
14	Q:	What is your understanding of the Fifth Amendment as it relates to taking of				
15		an American citizens property?				
16	A:	My understanding is that, according to the United States Constitution, that if the				
17		government is going to take land for public use, then in that case, or by taking for				
18		public use, it can only occur if the private land owner is compensated justly, or				
19		fairly.				
20	Q:	Has TransCanada ever contacted you specially to explain the way in which				
21		the public could use its proposed Keystone XL Pipeline?				
22	A:	No, they have not.				
23	Q:	Can you think of any way in which the public, that is the citizens of the State				
24		of Nebraska, can directly use the proposed TransCanada Keystone XL				
25		Pipeline, as it dissects the State of Nebraska?				
26	A:	No, I cannot. I cannot think of any way to use this pipeline. I do not see how the				
27		public benefits from this pipeline in any way, how they can use it any way, or how				
28		it's in the public interest in any way. By looking at the map, it is quite clear to me				
29		that the only reason it's proposed to come through Nebraska, is that because we				

are geographically in the way from between where the privately-owned Tar Sands
 are located to where TransCanada wants to ship the Tar Sands to refineries in
 Houston, Texas.

4 Q: Has TransCanada ever contacted you and asked you if you had any tar sands,
5 crude petroleum, or oil and petroleum by-products that you would like to
6 ship in its pipeline?

7 A: No, it has not.

Q: Do you have any tar sands, crude petroleum, or oil and petroleum by products that you, at this time or any time in the future, would desire to place
 for transport within the proposed TransCanada Keystone XL Pipeline?

- 11 A: No, I do not.
- Q: Do you know anyone in the state of Nebraska who would be able to ship any
   Nebraska-based tar sands, crude petroleum, or oil and petroleum by products within the proposed TransCanada Keystone XL Pipeline?

15 A: No, I do not. I've never heard of such a person or company like that.

16 Q: Do you pay property taxes for the land that would be affected and impacted
 17 at the proposed TransCanada Keystone XL Pipeline?

18 A: Yes, I do.

- 19 Q: Why do you pay property taxes on that land?
- A: Because that is the law. The law requires us to pay the property taxes as the ownerof that property.
- Q: Because you follow the law and pay property taxes, do you believe you
  deserve any special consideration or treatment apart from any other person
  or company that pays property taxes?
- A: Well no, of course not. It's the law to pay property taxes if you own property. It's
  just what you do.
- Q: Do you believe the fact that you pay property taxes entitles you to special
  treatment of any kind, or special rights of any kind?

A: No, of course not.

1	Q:	Do you believe the fact that you pay property taxes on your land would be		
2		enough to qualify you to have the power of eminent domain to take land of		
3		your neighbors or other people in your county, or other people across the		
4		state of Nebraska?		
5	A:	Well, of course not. Like I said, paying property taxes is the law, it's nothing that		
6		I expect an award for or any type of special consideration.		
7	Q:	Have you at any time ever employed any person other than yourself?		
8	A:	Well, yes I have.		
9	Q:	Do you believe that the fact that you have, at some point in your life,		
10		employed one or more other persons entitle you to any special treatment or		
11		consideration above and beyond any other Nebraskan that has also employed		
12		one or more persons?		
13	A:	No, of course not.		
14	Q:	Do you believe that the fact that you, as a Nebraska land owner and taxpayer		
15		have at one point employed another person within this state, entitles you to		
16		preferential treatment or consideration of any kind?		
17	A:	No, of course not. If I choose to employ someone that decision is up to me. I		
18		don't deserve any special treatment or consideration for that fact.		
19	Q:	At the beginning of your statement, you briefly described your property that		
20		would be impacted by the potential Keystone XL Pipeline. I would like you to		
21		give the Commissioners a sense of specifically how you believe the proposed		
22		Keystone XL Pipeline and its preferred route, which proposes to go across		
23		your land, how it would in your opinion based on your knowledge,		
24		experience, and background of your land, affect it. So please share with the		
25		Commissioners the characteristics of your land that you believe is important		
26		for them to understand, while they evaluate TransCanada's application for a		
27		route for its proposed pipeline to cross Nebraska and across your land,		
28		specifically.		

1 A: The KXL pipeline would intrude on my family, farm and ranch in many ways. 2 The pipeline would run near the well that provides drinking water for my family. 3 Negative impacts to this well is a huge concern. Like the house well, the pipeline 4 would run close to our livestock well. Damage to the well, including 5 contamination or construction problems could cut off access to the well or 6 negatively impact our use of the well and this would lead to sickness or death of 7 my cow herd. The pipeline would run right through my field, where I irrigate with 8 9 different wells that feed a center pivot. There would be disruption of water and 9 electricity, as these lines run throughout the field. Also I am concerned with 10 liability with my tillage and harvest equipment. Where we live the water table can 11 be one (1) foot or even at ground level in a wet year. The pipeline would sit in 12 water and this is a huge concern of point source contamination.

## Q: Do you have any concerns TransCanada's fitness as an applicant for a major crude oil pipeline in its preferred location, or ultimate location across the state of Nebraska?

16 A: Yes, I have significant concerns. I am aware of landowners being treated unfairly 17 or even bullied around and being made to feel scared that they did not have any 18 options but to sign whatever papers TransCanada told them they had to. I am 19 aware of folks being threatened that their land would be taken if they didn't follow 20 what TransCanada was saying. I am aware of tactics to get people to sign 21 easements that I don't believe have any place in Nebraska or anywhere such as 22 TransCanada or some outfit associated with it hiring a pastor or priest to pray with 23 landowners and convince them they should sign TransCanada's easement 24 agreements. I am aware of older folks and widows or widowers feeling they had 25 no choice but to sign TransCanada's Easement and they didn't know they could 26 fight or stand up for themselves. From a more practical standpoint, I am worried 27 that according to their answer to our Interrogatory No. 211, TransCanada only 28 owns and operates one (1) major oil pipeline. They simply do not have the 29 experience with this type of pipeline and that scares me. There are others but that is what I can recollect at this time and if I remember more or my recollection is
 refreshed I will share those with the Commissioners at the Hearing in August.

### 3 Q: Do you believe TransCanada's proposed method of compensation to you as a 4 landowner is reasonable or just?

5 A: No, I do not.

# Q: Do you have any concern about limitations that the construction of this proposed pipeline across your affected land would prevent construction of future structures upon the portion of your land affected by the proposed easement and immediately surrounding areas?

10 A: Well yes, of course I do. We would not be able to build many, if any, types of 11 structures directly across or touching the easement, and it would be unwise and I 12 would be uncomfortable to build anything near the easement for fear of being 13 blamed in the future should any damage or difficulty result on my property in 14 regards to the pipeline.

15 Q: Do you think such a restriction would impact you economically?

16 A: Well yes, of course.

### 17 Q: How do you think such a restriction would impact you economically?

18 A: The future of this land may not be exactly how it's being used as of this moment, 19 and having the restrictions and limiting my ability to develop my land in certain 20 ways presents a huge negative economic impact on myself, my family, and any 21 potential future owner of the property. You have no idea how I or the future owner 22 may want to use this land in the future or the other land across Nebraska 23 potentially affected by the proposed Keystone XL tar sands pipeline. Fifty years 24 ago it would have been hard to imagine all the advances that we have now or how 25 things change. Because the Easement is forever and TransCanada gets the rights in 26 my land forever we have to think with a very long term view. By placing their 27 pipeline on under across and through my land that prevents future development 28 which greatly negatively impacts future taxes and tax revenue that could have 29 been generated by the County and State but now will not. When you look at the

- short blip of economic activity that the two years of temporary construction efforts
   may bring, that is far outweighed by the perpetual and forever loss of opportunity
   and restrictions TransCanada is forcing upon us and Nebraska.
- 4 Q: Do you have any concerns about the environmental impact of the proposed
  5 pipeline?

6 A: Yes, I do.

- 7 Q: What are some of those concerns?
- A: As an affected land owner and Nebraskan, I am concerned that any construction,
  operation, and/or maintenance of the proposed Keystone XL Pipeline would have
  a detrimental impact upon the environment of my land specifically, as well as the
  lands near my land and surrounding the proposed pipeline route.

12

### **Q:** Do you have any other environmental concerns?

A: Yes, of course I am concerned about potential breaches of the pipeline, failures in
construction and/or maintenance and operation. I am concerned about spills and
leaks that TransCanada has had in the past and will have in the future. This could
be catastrophic to my operations or others and to my county and the State.

Q: Do you have any thoughts regarding if there would be an impact upon the
natural resources on or near your property due to the proposed pipeline?

- A: Yes, I believe that any construction, operation, and/or maintenance of the
   proposed Keystone XL Pipeline would have detrimental impacts upon the natural
   resources of my land, and the lands near and surrounding the proposed pipeline
   route.
- Q: Do you have any worries about potential impacts from the proposed pipeline
  to the soil of your land, or land near you?
- A: Yes, I believe that any construction, operation, and/or maintenance of the proposed Keystone XL Pipeline would have a detrimental impact upon the soil of land, as well as land along and surrounding the proposed pipeline route. This includes, but is not limited to, the reasons that we discussed above of disturbing the soil composition and makeup as it has naturally existed for thousands and

1 millions of years during the construction process, and any future maintenance or 2 removal process. I'm gravely concerned about the fertility and the loss of 3 economic ability of my property to grow the crops, or grow the grasses, or grow 4 whatever it is at that time they exist on my property or that I may want to grow in 5 the future, or that a future owner may want to grow. The land will never be the 6 same from as it exists now undisturbed to after it is trenched up for the proposed 7 pipeline.

### 8 Q: Do you have any concerns about the potential impact of the proposed pipeline 9 upon the groundwater over your land, or surrounding lands?

10 A: Yes, I'm very concerned that any construction, operation, and/or maintenance of 11 the proposed Keystone XL Pipeline would have a detrimental impact upon the 12 groundwater of not only under my land, but also near and surrounding the pipeline 13 route, and in fact, potentially the entire State of Nebraska. Water is life plain and 14 simple and it is simply too valuable to our State and the country to put at 15 unreasonable risk.

### 16 Q: Do you have any concern about the potential impact of the proposed pipeline 17 upon the surface water on, or near or around your land?

A: Yes, I have significant concerns that any construction, operation, and/or
maintenance of the proposed Keystone XL Pipeline would have detrimental
impact upon the surface water of not only within my property boundary, but along
and near and surrounding the pipeline route, and in fact, across the state of
Nebraska.

## Q: Do you have any concern about the potential impacts of the proposed pipeline upon the wildlife and plants, other than your growing crops on or near your land?

A: Yes, I'm very concerned that any construction, operation, and/or maintenance of
the proposed Keystone XL Pipeline would have a detrimental impact upon the
wildlife and the plants, not only that are located on or can be found upon my land,
but also near and along the proposed pipeline route.

Q: Do you have any concerns about the effects of the proposed pipeline upon the
 fair market value of your land?

3 A: Yes, I do. I am significantly concerned about how the existence of the proposed 4 pipeline underneath and across and through my property will negatively affect the 5 fair market value at any point in the future, especially at that point in which I 6 would need to sell the property, or someone in my family would need to sell the 7 property. I do not believe, and certainly would not be willing to pay, the same 8 price for land that had the pipeline located on it, versus land that did not. I hope 9 there is never a point where I'm in a position where I have to sell and have to 10 realize as much value as I can out of my land. But because it is my single largest 11 asset, I'm gravely concerned that the existence of the proposed Keystone XL 12 Pipeline upon my land will affect a buyer's willingness to pay as much as they 13 would've paid and as much as I could've received, if the pipeline were not upon 14 my property. There are just too many risks, unknowns, impacts and uncertainties, 15 not to mention all of the rights you give up by the nature of having the pipeline 16 due to having the easement that we have previously discussed, for any reasonable 17 person to think that the existence of the pipeline would not negatively affect my 18 property's value.

### 19 Q: Have you ever seen the document that's marked as Attachment No. 6, to your 20 testimony?

21 A: Yes, I have.

22 Q: Where have you seen that before?

A: That is a map I think I first saw a couple years ago that shows the Keystone XL
 I-90 corridor alternate route of its proposed pipeline through Nebraska and I
 believe the portion of the alternative route in Nebraska essentially twins or
 parallels Keystone I.

Q: Do you believe that TransCanada's preferred route as found on page 5 of its
Application, and as found on Attachment No. 7, here to your testimony, is in
the public interest of Nebraska?

- 1 A: No, I do not.
- Q: Do you believe that the Keystone mainline alternative route as shown on
  Attachment No. 7 included with your testimony here is a major oil pipeline
  route that is in the public interest of Nebraska?

5 A: No, I do not.

6 Q: Do you believe the I-90 corridor alternative route, specifically for the portion
7 of the proposed pipeline within Nebraska as found in Attachment No. 6 to
8 your testimony, is in the public interest of Nebraska?

9 A: No, I do not.

Q: Do you believe there is any potential route for the proposed Keystone XL
 Pipeline across, within, under, or through the State of Nebraska that is in the
 public interest of the citizens of Nebraska?

13 A: No, I do not.

14 Q: Why do you hold that belief?

15 A: Because there simply is no public interest based on all of the factors that I am 16 aware and that I have read and that I have studied that this Commission is to 17 consider that would establish that a for-profit foreign-owned pipeline that simply 18 crosses Nebraska because we are geographically in the way between where tar sands are in Canada to where it wants to ship it to in Texas could ever be in the 19 20 public interest of Nebraskans. We derive no benefit from this project. It is not for 21 public use. Nebraska is simply in the way and when all considerations are taken in 22 there is no net benefit of any kind for Nebraska should this project be placed in our 23 state. Even if there was some arguable "benefit" it is not enough to outweigh all 24 the negative impacts and concerns.

# Q: What do you think about the applicant, TransCanada's argument that it's preferred route for its proposed Keystone XL Pipeline is in the public interest of Nebraska because it may bring temporary jobs during the construction phase to Nebraska?

1 A: First of all, not all jobs are created equally. Most jobs that are created, whether 2 temporary or on a permanent basis, don't come with a project that has all the 3 potential and foreseeable negative impacts, many of which we have discussed here 4 and other witnesses throughout the course of this hearing have and will discuss. If 5 I decide to hire and employ someone to help me out in my farming or ranching 6 business, I've created a job but I haven't done so at the risk or detrimental impact 7 to my land or my town or my county or my state. And I've hired someone who is 8 working directly for me, a Nebraska landowner, citizen, taxpayer, to help produce 9 and grow a Nebraska product to be sold so that I can pay Nebraska taxes. So, all 10 jobs are not created equal. Additionally, I understand from what I'm familiar with 11 from TransCanada's own statements that the jobs numbers they originally touted 12 were determined to be a minute fraction of the permanent jobs that had been 13 projected. According to their answer to our Interrogatory No. 191, TransCanada 14 has created only thirty-four (34) jobs within Nebraska working specifically on 15 behalf of TransCanada and according to their answer to Interrogatory No. 196, as 16 of May 5, 2017 they only employ one (1) temporary working within Nebraska. 17 Further, according to their answer to Interrogatory No. 199, TransCanada would 18 only employ six to ten (6 to 10) new individuals if the proposed Keystone XL was 19 constructed on its Preferred Route or its Mainline Alternative Route.

### Q: Are you opposed to the preferred route of the proposed KXL Pipeline simply because it would cross your land?

A: No, absolutely not. I am opposed to this project because it is not in the public
interest, neither within my community nor within our state.

### Q: Would you be happier if instead of crossing your land, this proposed pipeline was to cross someone else's land?

A: No, absolutely not. I would get no joy in having a fellow citizen of my state have
the fear and anxiety and potential foreseeable risks and negative impacts that this
type of a project carrying this type of product brings foisted upon anyone in this
state or any other state.

### Q: Do you think there is any intelligent route for the proposed Keystone XL Pipeline to cross the state of Nebraska?

A: I don't believe there is an intelligent route because as I have stated I don't believe this project anywhere within Nebraska is within the public interest. However, if you are presenting a hypothetical that if this proposed KXL Pipeline absolutely had to go somewhere in the state of Nebraska, the only intelligent route I believe would be to twin or closely parallel the existing Keystone I Pipeline. Both the preferred route and the mainline alternative routes are economic liabilities our state cannot risk.

### 10 Q: What do you rely upon to make that statement?

11 A: Well, the fact that a pipeline owned and operated by TransCanada, Keystone I, 12 already exists in that area is reason enough as it is not in our best interest or the 13 public interests to have more major oil pipelines crisscrossing our state. Second, 14 they have all the infrastructure already there in terms of relationships with the 15 counties and local officials and first responders along that route. Third, they have 16 already obtained easements from all the landowners along that route and have 17 relationships with them. Fourth, that route avoids our most sensitive soils, the 18 sandier lighter soils. Fifth, that route for all practical purposes avoids the Ogallala 19 Aquifer. Sixth, they have already studied that route and previously offered it as an 20 alternative. Seventh, it just makes the most sense that as a state we would have 21 some intelligent policy of energy corridors and co-locating this type of 22 infrastructure near each other.

### Q: Do you have any other concerns you would like to reiterate or can think of at this time you would like the Commissioners to understand?

A: Yes. A pumping station would be located near the farmhouse we live in. Leaks
 from this station and the noise created are huge concerns to our quality of life and
 economic interests and property rights.

Q: Have you fully expressed each and every opinion, concern, or fact you would
 like the Public Service Commissioners to consider in their review of
 TransCanada's Application?

4 No, I have not. I have shared that which I can think of as of the date I signed this **A:** 5 document below but other things may come to me or my memory may be 6 refreshed and I will add and address those things at the time of the Hearing in 7 August and address any additional items at that time as is necessary. Additionally, 8 I have not had an adequate amount of time to receive and review all of 9 TransCanada's answers to our discovery and the discovery of others so it was 10 impossible to competently and completely react to that in my testimony here and I 11 reserve the right to also address anything related to discovery that has not yet 12 concluded as of the date I signed this document below. Lastly, certain documents 13 requested have not yet been produced by TransCanada and therefore I may have 14 additional thoughts on those I will also share at the hearing as needed.

# Q: What is it that you are requesting the Public Service Commissioners do in regards to TransCanada's application for the proposed Keystone XL Pipeline across Nebraska?

18 A: I am respectfully and humbly requesting that the Commissioners think far beyond 19 a temporary job spike that this project may bring to a few counties and beyond the 20 relatively small amount of taxes this proposed foreign pipeline would possibly 21 generate. And, instead think about the perpetual and forever impacts of this 22 pipeline as it would have on the landowners specifically, first and foremost, but 23 also thereby upon the entire state of Nebraska, and to determine that neither the 24 preferred route nor the Keystone mainline alternative route are in the public 25 interest of the citizens of the state of Nebraska. And if the Commissioners were 26 inclined to modify TransCanada's proposed routes and were to be inclined to grant 27 an application for a route in Nebraska, that the only potential route that would 28 make any intelligent sense whatsoever would be twinning or near paralleling of 29 the proposed KXL with the existing Keystone I pipeline. It simply does not make

sense to add yet another major oil pipeline crisscrossing our state creating new
pumping stations, creating new impacts on additional counties and communities
and going through all of the court processes with myself and other landowners like
me when this applicant already has relationships with the landowners, the towns
and the communities along Keystone I, and that Keystone I is firmly outside of the
sand hills and a significantly further portion away from the heart of the Ogallala
Aquifer than the preferred route or the Keystone mainline alternative route.

### 8 Q: Are all of your statements in your testimony provided above true and 9 accurate as of the date you signed this document to the best of your 10 knowledge?

11 A: Yes, they are.

12 Q: Thank you, I have no further questions at this time and reserve the right to
13 ask you additional questions at the August 2017 Hearing.

James "Jim" Tarnick

Subscribed and Sworn to me before this \_\_\_\_\_ day of May, 2017.

\_\_\_\_\_

\_\_\_\_\_

Notary Public

James "Jim" Tarnick

June day of <del>Ma</del>y, 2017. Subscribed and Sworn to me before this 2nd

Notary Public Frek



Attachment No. 1



May 2017 - X:\Drawings\50388X KEYSTONE XL\9000\_9999\9358

### KXL019181

Attachment No. 2



Attachment No. 3

Prepared by and after recording please return to: TransCanada Keystone Pipeline, LP 1106 Benjamin Avenue, Suite 600 Norfolk, NE 68701

#### (Above Space for Recorder's Use Only)

Tract No.: ML-NE-NA-30155.000

#### EASEMENT AND RIGHT-OF-WAY AGREEMENT

For and in consideration of the sum of Ten Dollars (\$10.00) paid in accordance with this Easement and Right-of-Way Agreement (this "Agreement"), the mutual promises of the parties herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged (collectively, the "Consideration"), James Tarnick, whose mailing address is PO Box 267, Fullerton, Nebraska 68638 (hereinafter called "Grantor") does hereby grant, sell, convey and warrant unto TransCanada Keystone Pipeline, LP, a limited partnership having its principal place of business at 13710 FNB Parkway, Suite 300, Omaha, Nebraska 68154, its successors and assigns (hereinafter called "Grantee"), a perpetual permanent easement and right-of-way (the "Easement") for the purposes of surveying, laying, constructing, inspecting, maintaining, operating, repairing, replacing, altering, reconstructing, removing and abandoning in place one (1) pipeline, not to exceed thirty-six inches (36") in nominal pipe diameter, together with all fittings, cathodic protection equipment, pipeline markers, and all other equipment and appurtenances thereto (it being expressly understood, however, that this Easement shall not give Grantee the right to construct or operate above-ground high voltage electrical transmission lines), for the transportation of crude petroleum, oil and petroleum by-products, on, under, across and/or through a strip of land 50 feet in width, as more particularly described in Exhibit A, which is attached hereto and made a

part hereof (the "Easement Area") located on real property situated in the County of Nance, State of Nebraska owned by Grantor and described as follows:

A tract of land containing 160 acres, more or less, situated in the County of Nance, in the State of Nebraska, being further described as the SW1/4 of Section 21, Township 16 North, Range 5 West of the 6th P.M., as recorded in Book 79, Page 386 in the Deed Records of Nance County, Nebraska; less and except any conveyances heretofore made.

(the "Property"). In addition, during the original construction of the pipeline (including, without limitation, Grantee's reclamation, mitigation and/or restoration activities), but in no event longer than twenty-four (24) months from the date Grantee commences actual pipeline installation activities on the Property (the "Initial Construction Period"), the easement and right-of-way granted hereunder shall also include the area described under the headings "Temporary Work Space," "Temporary Access Easement" and "Additional Temporary Work Space" and are more particularly described in Exhibit A hereto (the "Temporary Work Space"), provided, however, such time shall be extended for such period of time that Grantee is unable to exercise its rights hereunder due to force majeure. For purposes of this Agreement, "force majeure" shall mean any event beyond the reasonable control of Grantee, including, without limitation, weather, soil conditions, government approvals, and availability of labor and materials.

The aforesaid Easement is granted subject to the following terms, stipulations and conditions which are hereby covenanted and agreed to by Grantor. By acceptance of any of the benefits hereunder, Grantee shall be deemed to have agreed to be bound by the covenants applicable to Grantee hereunder.

1. The liabilities and responsibilities of the Grantor and Grantee for claims for damages and losses relating to the Easement, the Easement Area or Temporary Work Space are described in the paragraphs below:

A. Grantee will pay all commercially reasonable costs and expenses that result from the Grantee's, or anyone acting on the Grantee's behalf, use of the Easement Area or Temporary Work Space, including but not limited to damages caused by petroleum leaks and spills and damages to Grantor's crops, pastures, drainage systems, produce, water wells, livestock, bridges, lanes, improvements, equipment, fences, structures or timber, except to the extent the damages are caused by the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf. Notwithstanding the foregoing, Grantor acknowledges and agrees that Grantee has compensated Grantor, in advance, for the reasonably anticipated and foreseeable costs and expenses which may arise out of, are connected with, or relate in any way to Grantor's conveyance of the Easement and the proper installation, presence or operation of the pipeline upon the Property, including but not limited to, any and all tree, crop, plant, timber, harvest or yield loss damages, diminution in value of the Property, or any other reasonably foreseeable damages attributable to or arising from Grantee's proper execution of the initial construction, mitigation, and restoration activities within the Easement.

B. If claims or legal actions for damages arise from Grantee's, or anyone acting on the Grantee's behalf, use of this Easement, Grantee will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantor harmless in this regard, except to the extent that those claims or legal actions result from the negligence, recklessness, or willful misconduct of the Grantor or anyone acting on the Grantor's behalf.

C. If claims or legal actions arise from the Grantor's, or anyone acting on the Grantor's behalf, entry into, or use of the Easement Area or Temporary Work Space, Grantor will be responsible for those claims or legal actions, and will defend, indemnify and hold the Grantee harmless in this regard, except to the extent that those claims or legal actions result from the

negligence, recklessness, or willful misconduct of the Grantee or anyone acting on the Grantee's behalf.

2. Grantee shall have the right to remove all fences from the Easement Area and the Temporary Work Space, as required for purposes of construction or repairs of Grantee's pipeline, and Grantee shall repair all such fences promptly upon completion of construction or repairs on Grantor's Property to substantially the same condition as such fences were in prior to removal by Grantee. Grantee further shall have the right to install access gates in any fences which cross the Easement Area. Grantee and its designated contractors, employees and invitees hereby agree to keep all access gates closed at all times when not in use to prevent the cattle, horses and/or other livestock located on the Property from straying.

Provided its use of the Property does not in any manner interfere with or prevent the exercise by 3. Grantee of its rights hereunder, or create an actual or potential hazard to the pipeline or its appurtenances, the undersigned Grantor, its successors, heirs or assigns, reserve all oil, gas and minerals on and under the Property and the right to farm, graze and otherwise fully use and enjoy the Property; provided, however, that Grantee shall have the right hereafter to cut, keep clear and remove all trees, brush, shrubbery, undergrowth, buildings, engineering works, structures and other obstructions or facilities, without additional compensation, in the Easement Area being conveyed that are deemed by Grantee to injure, endanger or interfere in any manner with the proper and efficient construction, operation, use, inspection, maintenance or repair of said pipeline, or fittings, cathodic protection equipment and other appurtenances thereto; and, provided, further, that Grantor shall not excavate or otherwise alter the ground elevation from such ground elevation that existed at the time construction is completed, construct any dam or otherwise create a water impoundment within or over the Easement Area without prior authorization of Grantee. Grantee shall have all privileges necessary or convenient for the full use of the rights herein granted, together with reasonable ingress and egress over and across that part of the Property located adjacent to the Easement Area and Temporary Work Space, provided, however, except in case of emergency, Grantee agrees that to the extent existing public roads, public rights-of-way, the Temporary Access Easements (if any) or other easements in favor of Grantee provide reasonable access to the Easement Area and Temporary Work Space, Grantee shall use such existing roads, rights-of-way, and easements for ingress and egress.

4. Grantor shall, upon thirty (30) days prior notice to Grantee, further have the right to construct, maintain, repair, and operate above ground fences, roads, streets, alleys, sidewalks, bridges, and drainage pipes across the Easement Area at an angle of not less than forty-five (45) degrees to the Grantee's pipeline; provided, however, Grantor shall exercise said rights in such a manner so that (i) the Grantee's pipeline or its appurtenances located within the Easement Area shall not be endangered, obstructed, injured or interfered with; (ii) Grantee's access to the Easement Area, the Grantee's pipeline and its other appurtenances located thereon are not interfered with; (iii) Grantee shall not be prevented from traveling within and along Easement Area on foot or in vehicle or machinery; (iv) Grantee's pipeline is left with proper and sufficient and permanent lateral support; and (vi) Grantee's use of the Easement Area for the purposes set forth herein is not unreasonably impaired or interfered with.

5. During the Initial Construction Period, Grantee shall also provide suitable crossings on, over and across the Easement Area so as to afford Grantor reasonable access over and across and the Easement Area in accordance with Grantor's customary use of the Property.

6. Grantee shall dispose of all brush and debris, if any, cleared from the Easement Area by burning, chipping, and/or burying, which method of disposal shall be selected by Grantee in Grantee's sole discretion.

7. Grantee shall install the Grantee's pipeline to a minimum depth of forty-eight inches (48") below current grade level and any then existing drainage ditches, creeks and roads, except at those locations where rock is encountered, the pipeline may be installed with a minimum depth of twenty-four inches (24"). Such depth shall be measured from the top of the pipe to the surface of the ground.

8. In areas of cropland, Grantee agrees to cause the topsoil to be removed from the trench to a depth of twelve inches (12") or the topsoil depth, whichever is less, and return, as nearly as practicable, said topsoil to its original, pre-construction position relative to the subsoil.

9. Prior to the conclusion of the Initial Construction Period, Grantee shall grade and slope the Easement Area and Temporary Work Space in order to restore the same to its pre-construction grade to the extent reasonably possible and to the extent such grade does not interfere with the maintenance and/or safe operation of the Grantee's pipeline.

10. Grantee shall maintain the Easement Area (and the Temporary Work Space during the Initial Construction Period) by keeping it clear of all litter and trash during periods when Grantee and its employees, agents, or contractors are on the Property.

11. Notwithstanding anything herein to the contrary, except as otherwise required by applicable laws, regulations or industry standards, Grantee shall not install or maintain any permanent above-ground structures of any kind on or within the Easement Area other than pipeline markers (which markers may be required to be placed along the Easement Area by applicable Department of Transportation Code regulations and other applicable statutes and regulations of governmental authorities) and cathodic protection equipment. After the Initial Construction Period expires, no pipelines, above-ground structures, installations, equipment or apparatus of any kind will be on or within the Temporary Work Space.

12. In the event Grantee elects to abandon the Easement Area in whole or in part, Grantee may, at its sole election, either leave the improvements in place or remove them. In the event Grantee elects to remove the improvements, Grantee shall restore the Easement Area, as nearly as is practicable, to its condition prior to removal. In the event Grantee elects to abandon the improvements in place, Grantee shall comply with all then applicable federal and state laws, rules and regulations relating to such abandonment.

Grantor acknowledges and agrees that the information set forth at Exhibit A hereto, including. 13. without limitation, the location and area of the proposed Easement Area depicted, is approximate and preliminary and is based upon publicly available information, calculations, measurements and estimates without the benefit of site-specific on the ground investigation, inspection or survey; Grantor further acknowledges and agrees that Grantee shall have the right to modify the location of the Easement Area and/or Temporary Work Space within the Property as a result of, among other things, site investigation, inspections or surveys, various engineering factors or to correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. In the event such a modification is required by Grantee, Grantee may modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" referring to this instrument and setting forth the modified legal description of the Easement Area and/or Temporary Work Space, which description may be set forth by map attached to said Notice. A copy of the Notice shall be delivered to the Grantor. Without limiting Grantee's right to modify the location of the Easement Area and/or Temporary Work Space by recording a "Notice of Location" as aforesaid, Grantor agrees to execute and deliver to Grantee any additional documents Grantee may request to modify or correct the legal description of the Easement Area and/or Temporary Work Space to conform with the actual location of the required Easement Area and/or Temporary Work Space. If such documents are required, they will be prepared by Grantee at its expense. Grantor shall receive additional reasonable compensation only if the acreage within the Easement Area and/or Temporary Work Space increases as a result of the changed location.

14. Grantee shall comply in all material respects, at Grantee's sole cost, with all applicable federal, state, and local laws, rules, and regulations which are applicable to Grantee's activities hereunder, including, without limitation, the construction, use, operation, maintenance, repair and service of the Grantee's pipeline. Notwithstanding the foregoing, Grantee shall not be responsible for any costs that are necessitated, caused by, or are the result of any act or omission of negligence, recklessness, or willful misconduct by the Grantor or anyone acting on the Grantor's behalf.

15. All notices under this Agreement shall be in writing, addressed to the addresses first set forth above and be delivered by certified mail, postage prepaid, and return receipt requested, next business day delivery via a reputable national courier service, regular United States mail, facsimile, e-mail or hand delivery. A party may change its address for notice by giving notice of such change to the other party.

16. The undersigned hereby bind themselves, and their respective heirs, executors, administrators, successors and assigns, to this Agreement unto Grantee, its successors and assigns. The Easement granted hereby shall create a covenant and burden upon the Property and running therewith.

17. It is agreed that this Agreement constitutes the entire agreement between the parties and that no other agreements have been made modifying, adding to or changing the terms of the same. This Agreement shall not be abrogated, modified, rescinded or amended in whole or in part without the consent of Grantor and Grantee, in writing and executed by each of them, and duly recorded in the appropriate real property records.

18. The rights granted hereby to Grantee may be assigned by Grantee in whole or in part, in Grantee's sole discretion.

19. The terms, stipulations, and conditions of this Easement are subject to all applicable laws, regulations, and permit conditions.

20. This Agreement shall be governed by the law of the State in which the Easement Area is situated.

21. This Agreement may be executed in counterparts, each of which shall be considered an original for all purposes; provided, however, that all such counterparts shall together constitute one and the same instrument.

IN WITNESS WHEREOF, Grantor has executed this Agreement as of the \_\_\_\_day of \_\_\_\_\_ , 20\_\_\_\_\_.

GRANTOR(S):

James Tarnick

### [ACKNOWLEDGMENTS APPEAR ON FOLLOWING PAGE]

r 7

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_\_day of \_\_\_\_\_20\_\_\_

By James Tarnick

. . .

Notary Public Signature

Affix Seal Here



Attachment No. 4

### 8:15-cv-00403 Doc # 1 Filed: 11/03/15 Page 1 of 5 - Page ID # 1

### IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE	)	CASE NO
COMPANY, a New York Corporation,	)	
	)	
Plaintiff,	)	
	)	COMPLAINT
V.	)	
	)	
RICHARD ANDREW, JANE ANDREW,	)	
LUKE ANDREW, and BRYCE ANDREW,	)	
	)	
Defendants.	)	

**COMES NOW** Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

### PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

- 2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
- 3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
- 4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
- 5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

#### JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

#### **GENERAL ALLEGATIONS**

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

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law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

#### FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the rightof-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

- 23. Defendants were negligent in the following particulars:
  - a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
  - b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;
  - c. Defendants failed to comply with the statutory requirements of the OCNS;
  - d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
  - e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

3
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26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

#### SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

#### JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

4

ZURICH AMERICAN INSURANCE COMPANY, Plaintiff,

By: /s/ Albert M. Engles ENGLES, KETCHAM, OLSON, & KEITH, P.C. 1350 Woodmen Tower 1700 Farnam Street Omaha, Nebraska 68102 (402) 348-0900 (402) 348-0904 (Facsimile) Albert M. Engles, #11194 Dan H. Ketcham, #18930 Michael L. Moran, #24042 James C. Boesen, #24862 Attachment No. 5

# TRANSCANADA KEYSTONE PIPELINE, LP

# ADVANCE RELEASE OF DAMAGE CLAIMS AND INDEMNITY AGREEMENT

### Tract No. : ML-NE-NA-30155.000

I, <u>James Tarnick</u>, of <u>Nance</u> County, in the State of <u>Nebraska</u>, (hereinafter "Grantor") acknowledge receipt of:

Five Thousand Eight Hundred Forty Dollars and No Cents (\$5,840.00), now paid to Grantor by TransCanada Keystone Pipeline, LP (hereinafter "Company"), in full payment and settlement, in advance, for all damages listed on the Advance Damages Computation Form attached hereto as Appendix A. In consideration of said advance payment, Grantor and Grantor's heirs, executors, administrators and assigns, do hereby release and forever discharge Company from any and all causes of action, suits, debts, claims, expenses, general damages, interest, costs and demands whatsoever, at law and in equity, against Company, which Grantor ever had, has now, or which Grantor's insurers, heirs, executors, administrators, successors or assigns hereafter can, shall or may have in the future, relating to all damage items listed on Appendix A, arising out of, in connection with, or resulting or alleged to have resulted from construction or surveying over, under or on the following lands (hereinafter collectively referred to as the "Lands"):

Situated in the County of Nance, State of Nebraska:

**SW/4** 

# Section 21, Township 16N, Range 5W

Grantor understands and agrees that payment of such consideration is not deemed to be an admission of liability on the part of Company. Grantor agrees to accept said advance payment on behalf of Grantor and Grantor's tenants, if any, and to take full responsibility for compensating any and all of Grantor's tenants for any damage or loss that is owed to said tenants as a result of Company's use of any pipeline easement acquired by Company from Grantor on the Lands. Grantor will indemnify, defend, and hold Company and the Company's officers, agents, and employees harmless from any claim asserted by Grantor's tenants, tenants' successors-in-interest, or tenants' heirs for compensation, restitution, crop loss, consideration, or damage of any kind that Grantor's tenants may be lawfully entitled to as a result of Company's construction or surveying activity within any easement acquired by Company from Grantor on the Lands.

IN WITNESS WHEREOF, I have hereunto set our hands on this\_\_\_ day of

\_\_\_\_\_, 20\_\_\_\_.

Owner Signature

Owner Signature

Owner/Owner Representative Name

Owner/Owner Representative Name

Attachment No. 6





KXL002000

Attachment No. 7

