BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE PIPELINE PROJECT	))))))	HP07-001 **DIRECT TESTIMONY OF EDWARD D MILLER**

1. Please state your name and address for the record.

Answer: My name is Edward D. Miller. My address is 300 West Vermont, Salem, SD 57058. My mailing address is PO Box 557, Salem, SD 57058.

2. How are you involved with the Keystone pipeline project?

Answer: I am a landowner in Miner County, South Dakota affected by the proposed Keystone pipeline.

3. What is your professional background?

Answer: I hold a Bachelors degree in Computer Science from the University of Minnesota (1984). My work experience includes several years with Exxon Company USA in Houston, TX (1984-1992.) During my time with Exxon, I worked as a systems analyst, project leader, data analyst, database administrator and as a consultant to other internal projects and business functions.

4. What is the purpose of your testimony?

Answer: I am concerned that the proposed Keystone pipeline poses a threat of serious injury to the environment and may impair the health, safety or welfare of South Dakotans. Specifically, the oil spill estimates included in the application are significantly lower than the actual historical track record of hazardous liquid pipelines in North America. Since the pipeline environmental assessment is based on these low oil spill estimates, I'm concerned that the risk associated with this pipeline is significantly under-stated by the applicant.

5. What is the track record of pipelines in the United States?

Answer: Basically there are three major types of energy pipelines in the United States. Pipelines are regulated by the US Department of Transportation, through the Office of Pipeline Safety (OPS). The OPS classifies pipelines into the following categories: 1) gas distribution pipelines, 2) gas transmission pipelines and 3) hazardous liquid pipelines.

In terms of reported accidents per mile of pipeline, hazardous liquid pipelines involve the most risk. Accident rates per mile for hazardous liquid pipelines are about 3 times higher than accident rates for gas transmission pipelines. Furthermore, hazardous liquid pipeline accident rates are about 8 times higher than those for gas distribution pipelines.

The chart at the top of EXHIBIT A is based on historical accident and mileage data from the OPS. The diagram in the lower part of EXHIBIT A is from

a May 2000 Government Accounting Office (GAO) report on pipeline safety. As shown in both parts of this exhibit, hazardous liquid pipelines have higher overall accident rates and higher major accident rates than other types of energy pipelines. The GAO report is submitted with this testimony as supporting documentation (GAO/RCED-00-128). The OPS accident and mileage reports for each of the three types of pipeline are also included as supporting documentation.

6. What type of pipeline is the proposed Keystone pipeline?

Answer: The proposed Keystone pipeline is a crude oil pipeline. Since crude oil is classified as a hazardous liquid (Title 49 CFR), the proposed Keystone pipeline is a hazardous liquid pipeline. The two key factors here are 1) the project, which is a hazardous liquid pipeline, and 2) the location, which is North America. References to all other subjects, including other types of pipelines, and all other locations outside North America, are irrelevant while evaluating the merits of this application.

7. What sources of information regarding hazardous liquid pipelines in North America are available to the public?

Answer: The Office of Pipeline Safety maintains databases containing detailed information regarding hazardous liquid pipeline accidents in the United States. The Environmental Protection Agency (EPA) also maintains databases of pipeline accident information. The information from both sources is available

to the public through the freedom of information act.

Independent research studies including one conducted by the California State Fire Marshall are also available. The study, published in 1993, is available from the CSFM web site. Information from that report is included later in this testimony; the report is submitted here as supporting documentation.

Some pipeline industry leaders provide their operational data including oil spill statistics to the public. For instance, the Canadian pipeline company Enbridge publishes its Corporate Social Responsibility Report annually, and makes that information available to the public. The company also maintains information available to the public from their web pages, including www.enbridgecasslake.com which details remediation efforts regarding a major crude oil ground water contamination site near Cass Lake, MN. Statistics from those reports and the web pages are included later in this testimony; they are submitted here as supporting documentation.

The National Transportation Safety Board investigates major pipeline accidents in the US and publishes reports available to the public. Likewise the Transportation Safety Board in Canada investigates pipeline accidents there as well. That information is often available to the public. Statistics from the US NTSB and the Canadian TSB are included in this testimony; several of their reports are submitted here as supporting documentation.

Since the proposed Keystone pipeline is a crude oil pipeline, only information regarding hazardous liquid pipelines should be considered. Other subjects (i.e. gas transmission pipelines) are largely irrelevant and must be

excluded. Likewise, information from locations outside of North America (i.e. Europe, Asia) is largely irrelevant and must also be excluded.

8. Please provide a summary of the historical track record of hazardous liquid pipelines in the US.

Answer: The Office of Pipeline Safety (OPS) maintains databases regarding significant pipeline incidents in the United States. The OPS also provides reports to the public summarizing annual accident statistics involving hazardous liquid pipelines (Google "OPS Statistics"; follow the links.) A recent copy of a summary report is provided as EXHIBIT B. The report lists the total number of accidents, fatalities, injuries, property damage, amount of oil spilled (gross loss) and amount of oil never recovered (net loss) each year since 1986. This report only includes oil spills that are reported to OPS as 50 barrels or more. More detailed reporting has been in place since 2002, although this summary report hasn't changed so that historical comparisons are possible.

Overall totals are also provided. As the report shows, there have been thousands of accidents in the US involving hazardous liquid pipelines. These accidents have resulted in more than $1.22 trillion dollars in property damage caused by oil pipelines. More than 3.4 million barrels of oil have been spilled, and the majority of that amount, more than 2 million barrels, has never been recovered. In terms of gallons, hazardous liquid pipelines have spilled more than 143 million gallons of oil in the US since 1986; more than 84 million gallons were never recovered.

It is fairly straightforward to calculate average spill size per year and other statistics to gain insight into the industry. For instance, in 2006 there were 110 accidents that spilled a combined total of 136,263 barrels of hazardous liquids. The average spill for those accidents amounts to about 1,238 barrels of oil, which is more than 52,000 gallons.

The report also notes that the totals are subject to change as new information is submitted to OPS. Some pipeline spills, especially those involving detailed investigations, may not be finalized for several months or even a couple years after the incident takes place. Spill data for the most recent years is updated monthly.

9. How do those spill totals compare to the Exxon Valdez oil spill in Alaska?

Answer: The Exxon Valdez spilled about 10.6 million gallons of oil in the waters off Alaska. Since 1986, hazardous liquid pipelines in the US have spilled more than 13 times as much oil as the Exxon Valdez did in Alaska in 1989. Furthermore, for the years 2005 and 2006 combined, hazardous liquid pipelines spilled 273,280 barrels of oil. This recent two year total is more than that spilled by the Exxon Valdez.

10. Does the OPS incident database contain all oil pipeline spills in the US?

Answer: No. The US-DOT acknowledges "known problems with under-

reporting property damage and spill quantities..." involving hazardous liquid pipeline incidents in its DOT Performance Plan – FY 2004. That report is included here as supporting documentation. Also, the GAO report listed earlier notes that the EPA had records of 16,000 pipeline spills from 1989-1998 that were never reported to OPS. Some reasons and examples are as follows:

(1) Some hazardous liquid pipelines are exempt from OPS reporting. A recent example is the 2006 BP pipeline spill in Alaska. Even though more than 250,000 gallons of crude oil were spilled, that event is not included in the Office of Pipeline Safety incident database because that pipeline is exempt; it is considered a low stress pipeline in a rural area (49 CFR 195.2)

(2) Spills smaller than 50 barrels or 2100 gallons were excluded from OPS reporting prior to 2002. The OPS reporting threshold has changed to include all spills 5 barrels or larger to be reported, and some spills as small as 5 gallons to be reported.

(3) Some spills are under-reported in one way or another. An example of under-reporting could include the 1992 spill near Renner, SD. In that incident, about 300,000 gallons of hazardous liquid were spilled into productive farmland threatening a nearby aquifer. Even though over 220,000 gallons were lost, the OPS database record shows that the property damage was $0.

(4) Some spills are not reported at all. An example would be the Enbridge spill near Cass Lake MN discovered on the Leach Lake Indian Reservation in 2002. Even though an extensive cleanup has taken place, an estimated 48,000 gallons of crude oil remain floating on contaminated ground

water. This spill is not recorded in the OPS incident database. The company involved with the spill and cleanup maintains a website regarding those efforts at www.enbridgecasslake.com. That web based information is submitted here as supporting documentation.

11. Please provide a summary report of recent pipeline spills involving crude oil.

Answer: There are two summary reports shown in EXHIBIT C. The first report is calculated using the actual pipeline oil spill records available from the Office of Pipeline Safety for all hazardous liquid spills of 5 barrels or more since 2002. The second report includes crude oil spills only; it consists of reported spills of 5 barrels or more. All other incidents were excluded from both reports, including small spills reported in gallons and all incidents that did not involve spills at all (fires, injuries, fatalities, etc.)

The summaries only include those spills reported to the OPS since the new reporting format was adopted in response to the Pipeline Safety Improvement Act (2002).

As the first report shows, there have been 915 reported hazardous liquid spills of 5 barrels or more in the US since the beginning of 2002. Of those 915 oil spills, 168 spills contaminated water and 287 spills involved High Consequence Areas (HCAs). The spills resulted in more than 382 million dollars in property damage. Over 603,000 barrels, which is more than 25 million gallons, of hazardous liquids were spilled. The average hazardous liquid pipeline spill listed

on this report was 660 barrels, or 27,707 gallons.

As the second report in EXHIBIT C shows, there have been 446 reported crude oil spills of 5 barrels or more in the US since the beginning of 2002. Of those 446 crude oil spills, 71 spills contaminated water and 79 spills involved High Consequence Areas (HCAs). The spills resulted in more than 217 million dollars in property damage. Almost 280,000 barrels of crude oil were spilled, amounting to more oil spilled than that by the Exxon Valdez. The average crude oil pipeline spill listed on that report was 627 barrels, or 26,345 gallons.

The OPS Hazardous Liquid Incident database records from 1986 through September 2007 are submitted as part of my testimony in this case. The Microsoft Excel spreadsheet containing the post 2002 records used to calculate the reports in EXHIBIT C is also included.

12. Please provide a list of recent significant crude oil pipeline spills affecting the Northern Plains in the US.

Answer: A sampling of regional crude oil pipeline spills involving the Northern Plains is included as EXHIBIT D. As shown in the exhibit, there are several recent significant crude oil spills from pipelines that have affected surface water, ground water, and high consequence areas (HCAs.) There have been several multi-million dollar cleanups and some multi-million gallon oil spills. The source for this information is the Hazardous Liquid Incident database available from the Office of Pipeline Safety. The list of spills shown in EXHIBIT D is a partial list of the more significant incidents; it is not a complete list.

13. Based on historical information from sources in North America, how often do oil pipelines leak?

Answer: In order to answer that question, a standard measure must be defined. The Spill Frequency Rate (SFR) can be defined as the number of pipeline oil spills per year for a given length of pipeline, usually 1000 miles. Since the proposed Keystone pipeline is listed at 1845 miles long in the Frequency and Volume Analysis, and since TransCanada listed its spill projections for the entire pipeline, the Spill Frequency Rate will be defined here as the number of spills per year per 1845 miles of pipeline or right-of-way.

The actual hazardous liquid pipeline Spill Frequency Rates derived from sources in North America are as follows:

(1) The California State Fire Marshall study (1993) reported an incident rate of 7.1 leaks per 1000 miles of pipeline per year. That is equivalent to 13 leaks per 1845 miles of pipe per year. The study includes all oil spills regardless of the amount spilled. Page 170 of that report lists the overall incident rates under the heading "8.1 Significant Findings". Page 170 of that report is included here as EXHIBIT E. The CSFM study is included with this testimony as supporting documentation.

(2) An industry leader, Canadian pipeline company Enbridge Inc, has publicly reported its actual oil spill statistics annually for the last several years. For the 10 year period from 1996-2005, the actual Enbridge Spill Frequency Rates range from a low of 8 reported spills per 1845 miles of right-of-

way in 2001, to a high of 21 reported spills per 1845 miles of right-of-way in 1996. Enbridge includes all actual oil spills that have been reported to regulatory jurisdictions. A summary of Enbridge spill statistics from 1996-2005 is included as EXHIBIT F. Note: Enbridge reports mileage totals in terms of miles of right-of-way instead of miles of pipeline. The Enbridge Corporate Social Responsibility reports for 2004, 2005 and 2006 are included with this testimony as supporting documents. The Enbridge Environment Health and Safety reports for years 2001, 2002 and 2003 are also included as supporting documents.

(3) The US industry average pipeline spill information is derived from the Hazardous Liquid Pipelines Incident Database maintained by the US-DOT Office of Pipeline Safety. Reporting guidelines were changed in 2002 to require reporting of all spills of 5 barrels or more and some spills as small as 5 gallons. The actual US industry average Spill Frequency Rate for the years 2002 - 2005 ranges from a high of about 5 spills per 1845 miles of pipe in 2003, to a low of about 4 spills per 1845 miles of pipe in 2005. This includes all spills of 5 gallons or more. A summary of OPS spill statistics from 1996-2005 is included as EXHIBIT G.

14. What is the projected Spill Frequency Rate for the Keystone pipeline?

Answer: TransCanada's forecast for the Keystone pipeline is one spill of 50 barrels or more over the next seven years. That calculates to a Spill Frequency Rate of approximately 0.15 spills per 1845 miles of pipeline per year.

The forecast is listed in the Frequency and Volume Analysis submitted with the application.

15. How do the actual historical Spill Frequency Rates from the sources listed above compare to the forecast Spill Frequency Rate for the Keystone pipeline?

Answer: The actual historical Spill Frequency Rates are significantly higher than TransCanada's forecast for the Keystone pipeline. The actual historical spill rates from the sources listed above are plotted on a chart included as EXHIBIT H. The TransCanada forecast rate is also plotted on that chart in EXHIBIT H. As shown in the chart, the actual historical Spill Frequency Rates are as much as 100 times as high as the forecast Spill Frequency Rate for the Keystone pipeline. The reporting thresholds for each of the sources are listed on the chart.

16. Based on historical information from the sources mentioned above, how much oil do pipelines spill in North America?

Answer: In order to answer that question, another standard measure must be defined. The Spill Volume Rate (SVR) can be defined as the amount of oil spilled per million barrel-miles of product transport. As defined by the Association of Oil Pipelines (AOPL), one barrel-mile equals one barrel of oil transported a distance of one mile. The AOPL states that the average spill volume rate for oil pipelines in the US is about 1 gallon of oil spilled per million

barrel-miles of throughput. That industry average can be confirmed by using information from the Hazardous Liquid Incident database available from the Office of Pipeline Safety.

The actual Spill Volume Rates derived from sources mentioned above are as follows:

(1) The industry leader, Enbridge, publicly reports its actual oil spill statistics annually. For the 10 year period from 1996-2005, the actual Enbridge Spill Volume Rates range from a low of 0.2 gallons spilled per million barrel-miles in 2004, to a high of 1.7 gallons spilled per million barrel-miles in 1999. The actual Enbridge spill volume rate averaged about 0.82 gallons spilled per million barrel-miles for the ten year period from 1996-2005.

(2) The US industry average information is derived from the Hazardous Liquid Pipelines Incident Database maintained by the OPS and statistics provided by the Association of Oil Pipelines. For the 10 year period from 1996-2005, the actual US industry average Spill Volume Rates ranged from a low of 0.9 gallons spilled per million barrel-miles in 2003, to a high of 2.2 gallons spilled per million barrel-miles in 1997. The recent US industry average spill volume rate is approximately 1 gallon spilled per million barrel-miles of product transport.

17. What is the projected Spill Volume Rate for the Keystone pipeline?

Answer: The Keystone spill volume rate forecast by TransCanada is about 0.072 gallons spilled per million barrel-miles of product transport. That number is

calculated based on information supplied in the Frequency and Volume Analysis submitted with the application (average of 0.37 barrels spilled per mile per year.)

18. How do the two actual historical Spill Volumes Rates compare to TransCanada's Spill Volume Rate forecast for the Keystone pipeline?

Answer: The actual historical Spill Volume Rates are more than an order of magnitude higher than TransCanada's forecast for the Keystone pipeline. The three separate spill volume rates are plotted on the chart included as EXHIBIT I. As shown in the chart, the industry leader's actual Spill Volume Rate for 1996-2005 is about 11 times higher than Keystone's projection. The actual US industry average spill volume rate for the years 1996-2005 is about 14 times higher than Keystone's forecast Spill Volume Rate.

19. What do you conclude from the spill frequency and the spill volume forecasts for the Keystone pipeline?

Answer: The Keystone spill frequency rate and spill volume rate forecasts are clearly much lower than the actual historical rates calculated from the sources listed. I'm concerned about that because these Keystone estimates are used to assess the environmental consequences associated with the pipeline. The potential adverse impact of oil spills may be significantly underestimated.

20. What are the shortcomings of the Frequency and Volume Analysis regarding the oil spill estimates?

Answer: There appear to be several considerable flaws with the Frequency and Volume Analysis submitted with the application. These shortcomings can be classified as flaws regarding data selection, data omission, data interpretation and general assumptions. When combined, these items can effectively lower the projected Keystone spill frequency and spill volume rates.

21. Please provide an example of data selection flaw.

Answer: Regarding the Frequency and Volume Analysis, there are two obvious flaws regarding data selection. The first is that the study focused extensively on projects and locations outside of North America. The second flaw is that the study focused a great deal on the wrong types of pipelines, namely natural gas pipelines.

22. Explain why the selection of projects and locations outside of North America constitutes a data selection flaw.

Answer: The consulting firm DNV (Norway) conducted the study. The majority of references listed at the end of the report are outside North America. They include Norway, the United Kingdom, Brussels, the Netherlands, Australia, Hong Kong, the country of Brunei, and even the USSR. These references are simply not relevant to hazardous liquid pipelines in North America, especially references regarding Brunei, Hong Kong and the USSR.

Furthermore, reported pipeline incident rates in Europe are lower than they are in North America. The CONservation of Clean Air and Water for Europe

group, CONCAWE, tracks the performance of hazardous liquid pipelines in Europe. Europeans maintain tight reporting thresholds and they do frequent inspections, including intelligent pig inspections. Even though their reporting threshold for spills is 1 cubic meter, their incident database has only 436 records going all the way back to 1971. The annual number of spills from 2001 – 2005 is as follows: 15, 14, 12, 5 and 11. Compare that with the OPS summary report in EXHIBIT B, which shows hundreds of spills per year in the US, and thousands of spills recorded over the last 20 years. The spill frequency rates are significantly lower in Europe than they are in North America. The CONCAWE report is titled "Performance of European cross-country oil pipelines" (report no 4/07) and is included with this testimony as supporting documentation.

23. Explain why the focus on natural gas pipelines constitutes a data selection flaw.

Answer: Another data selection flaw is evident by the study's significant focus on the wrong type of pipeline. The study referred extensively to natural gas pipelines, especially the European Gas pipeline Incident data Group or EGIG, which involves gas transmission pipelines in Europe. Since the proposed Keystone pipeline is a hazardous liquid pipeline, gas transmission pipelines are largely irrelevant. It is well known and well documented that incident rates regarding gas transmission pipelines are significantly lower than incident rates on hazardous liquid pipelines. The actual incident rate comparisons for different types of pipelines are shown in EXHIBIT A.

24. Does DNV include any references to North America?

Answer: Yes, there are references to the US; however, there are no references to Canada at all. References relevant to the United States include the DOT Office of Pipeline Safety and the California State Fire Marshall, among a few others. However, other North American sources including the US EPA and the entire country of Canada are never mentioned at all in the Frequency and Volume Analysis. North American industry leaders such as Enbridge, which has extensive crude oil pipelines across the US and Canada, and is a direct competitor to the Keystone pipeline, is not mentioned at all. Even though the California State Fire Marshall study is referenced, DNV's forecast is significantly different than the actual historical results reported by the California State Fire Marshall. Refer again to EXHIBIT H.

By including the wrong continents like Europe, Asia, etc., and the wrong types of pipeline in the study, each of which involve lower incident rates, a forecaster could estimate lower overall incident rates than those found exclusively on hazardous liquid pipelines in North America. Effectively, that could lower the spill frequency rate estimate for the Keystone pipeline.

25. Please provide an example of a data omission flaw regarding the Frequency and Volume Analysis.

Answer: A specific instance of data omission is obvious in Section 5.1 of the study. Section 5.1 refers to the amount of time that elapses between the

occurrence of a leak in the pipeline and the point in time where the pipeline is isolated or completely shut down. However, table 5.1 reveals an obvious data omission in that the amount of time required to shut down the pumps has been omitted. That omission has a significant impact on the estimate of the amount of time required to isolate the pipeline and on the amount of oil released from the pipeline. EXHIBIT J shows that the data omission can impact the estimated times and potential spills by a factor of 27% to 75% depending on the size of the hole in the pipe. Please refer to EXHIBIT J for the actual calculations.

26. Please provide an example of a data interpretation flaw regarding the Frequency and Volume Analysis.

Answer: The final conclusion of the Frequency and Volume Analysis reveals a data interpretation problem. The study claims that from 1992-2003, the OPS statistics show that the average hazardous liquid pipeline spill in the US was 0.49 barrels per mile per year. However, that calculation is not based on the amount of oil spilled from the pipeline, it is based on the amount of oil spilled and never recovered. Essentially, any oil that is recovered during cleanup is subtracted from the original volume of the actual spill. The correct answer is actually 0.84 barrels spilled per mile per year, an increase of 71% over the incorrect figure listed in the study. Please refer to EXHIBIT K for the actual calculations.

27. Please provide an example of an unrealistic assumption

included in the Frequency and Volume Analysis.

Answer: Another way to reduce the average spill volume is to make unrealistic assumptions regarding the drain down of oil after a pipeline leak is isolated by valve closure. For instance, the Frequency and Volume Analysis assumes that all small and medium pipeline leaks anywhere along the entire pipeline will be completely stopped by clamping or by gel block within 4 hours after the control center operator is notified (section 5.5). This is a very aggressive assumption which is contradicted by actual experience.

Other assumptions involve operational aspects of the pipeline such as the SCADA system, which is assumed to work correctly all the time. For instance, in 2005 the National Transportation Safety Board (NTSB) published a report regarding SCADA systems and Liquid Pipelines. The NTSB reviewed the performance of SCADA systems involved in 13 hazardous liquid pipeline accidents that the NTSB had investigated previously. The NTSB concluded that in ten of those accidents, the SCADA system actually contributed to the severity of the accident. The report, NTSB/SS-05/02 is included with this testimony as supporting documentation.

28. What are your conclusions regarding the results of the Frequency and Volume Analysis?

Answer: The net combined effect of data selection, data omission, data interpretation and general assumptions can effectively reduce the number of estimated spills and reduce the estimated volume of oil spilled. Thus, the

estimates from this study may be much lower than what could reasonably be expected under real world conditions.

Whereas historical information regarding oil spills is objective and verifiable, a forecast is largely a subjective, judgmental process often influenced by assumptions and the bias of the forecaster. For instance, the Frequency and Volume Analysis uses the words assume or assumption 24 times, the phrase modifying factor is used 20 times and the word judgment is listed 9 times. That gives forecasters a lot of flexibility.

29. What about Canada? Are there any sources of pipeline spill information available from Canada?

Answer: Yes. The Canadian province of Alberta has an extensive installed base of oil pipelines and experience with oil pipeline spills. A comprehensive summary of pipeline spills is available in a report provided by the Alberta Energy and Utilities Board (EUB). The report is called Pipeline Performance in Alberta 1990-2005. Page 47 of that report contains a summary of pipeline releases; it is included as EXHIBIT L. As listed in the report, the province of Alberta alone recorded 16,004 pipeline spills in the 16 year period from 1990-2005. Of that total, there were 4,769 hydrocarbon liquid spills, which amount to an average of about 300 spills per year. The Alberta EUB Pipeline Performance report is submitted here along with my testimony.

30. Are the majority of those spills in Alberta smaller spills?

Answer: That depends on what is considered a small spill. The report lists four separate categories regarding spill size. The smallest spill category listed in the report is <100 m3 or cubic meters. That means the category of small spills includes all spills that are less than about 26,417 gallons. By contrast, the reporting threshold in the US is 5 barrels or 210 gallons. The smallest spill category in Alberta is about 125 times as large as the OPS reporting threshold. Even though the majority of spills in Alberta are included in the first category, they may involve tens of thousands of gallons of oil. That's not what I would consider a small spill. At the other end of the spectrum, the largest spill category is >10,000 cubic meters or 2,641,700 gallons. Fortunately, there were zero reported liquid hydrocarbon spills in the largest category. The point to remember is that when TransCanada claims that spills are small, they may be referring to 26,400 gallons.

31. Have there been any significant crude oil pipeline spills affecting Canada?

Answer: Yes. A list of significant Canadian pipeline ruptures is included in Exhibit M. All of the incidents listed there were investigated by the Transportation Safety Board of Canada. The TSB report numbers are shown next to each incident. The list of ruptures is grouped by 1) Enbridge, 2) TransCanada and 3) all others. The list is then sorted by date within each group. Enbridge has had several ruptures over the years resulting in some multi-million gallon spills. An example is shown in EXHIBIT N.

There are some very interesting details regarding the Hardisty spill in 2001. The cause of the spill was a material failure; the pipe ruptured. The pipeline SCADA system detected the rupture within a reasonable amount of time and the control center operator shutdown and isolated the pipeline within a reasonable time. However, the release still amounted to more than a million gallons, demonstrating that SCADA systems and isolation plans cannot prevent some major or even catastrophic spills. Furthermore, even though it was a very large spill, pipeline crews were unable to find the rupture point and the spill for almost 14 hours, disproving the Frequency and Volume Analysis assumption that all spills can be contained or clamped off within four hours. TSB report P01H0004 is included as supporting documentation.

32. How old were the pipes involved in the ruptures investigated by the TSB in Canada?

Answer: There are 26 pipeline ruptures listed in EXHIBIT M that involved Transportation Safety Board investigations. Of those 26 ruptures, none of them occurred within the first 10 years of installation of the pipe. Four ruptures occurred during the period between the 11th and the 20th year after installation. Nine occurred between the 21st and 30th years, and ten occurred between the 31st and 40th years. Three ruptures occurred between 41 years and 50 years.

The summary indicates that the pipelines work better when they are new or fairly new. As shown at the bottom of EXHIBIT M, failure rates generally increased as the age of the pipeline increased. The California State Fire

Marshall study also indicated that failure rates increased as the pipelines aged. It is critically important to consider the long term risks associated with pipelines, since the risk of failure increases over the long term.

33. What about the spills involving TransCanada?

Answer: Like Enbridge and others, TransCanada has had several pipeline ruptures over the years as well, many of them involving fires. An example is shown in EXHIBIT O. A natural gas pipeline ruptured near a small town resulting in an explosion, fire, evacuation and considerable product loss. TSB report P02H0017 is included as supporting documentation. TransCanada also reported two pipeline breaks in the same area in Western Alberta within a 24 hour period in 2003. Emergency response plans were implemented there as well.

34. What restrictions or conditions should be attached to any crude oil pipeline permit should one ever be issued in South Dakota?

Answer: Any pipeline permit approved by the PUC must allow only one pipeline within the right of way. Each additional pipeline in the right-of-way benefits the owner of the pipeline; however, each additional pipeline in the right-of-way results in incremental damage to the landowner's property. Additional pipelines cannot be allowed without additional compensation to the landowner to offset the incremental damage to the property.

35. Should TransCanada be allowed to design the Keystone

pipeline using a 0.8 design factor?

Answer: No. The current pipeline code design factor is 0.72; no deviations from that standard should be allowed. TransCanada does not currently operate any hazardous liquid pipelines, much less those with design factors of 0.8. Pipelines that have been granted such permits are natural gas pipelines. Again, please review EXHIBIT A which highlights the significantly higher risk associated with hazardous liquid pipelines versus natural gas pipelines.

36. What other concerns do you have regarding this application?

Answer: A company called Welspun Gujarat Stahl Rohren, Ltd in Mumbai, India has announced that they had received a major pipeline order from TransCanada to be delivered over the next 12 to 18 months. The order amounts to a significant amount of money. I am concerned that the manufacturing and materials standards in India may not be as rigorous as those we have in North America. I am also concerned that this company may not be ISO certified and that TransCanada will not be able to effectively monitor the manufacturing and testing processes. Furthermore, the pipe will be subject to damage during such a long shipment. This increases the risk associated with the project.

37. Is there anything else you would like to add?

Answer: Yes, I plan to develop a PowerPoint presentation to highlight the main points of my direct testimony during the formal hearing in December. Based on written communication with the PUC, I understand that will be

acceptable as long I notify other participants and make a copy of the presentation available to them by Nov 28, 2007. The presentation will be used to highlight my written testimony and information contained in the exhibits.

The PowerPoint presentation will also contain information regarding two actual pipeline spills (including photographs.) The first happened in Alaska in Oct 2001. The 0.46" thick pipeline was pierced by a gunshot and leaked at an average rate of 132 gallons per minute for about 36 hours. During that time, approximately 285,000 gallons of crude oil leaked; 121,000 gallons were never recovered. The second spill happened in July 2007 in Burnaby, BC. An excavator punctured a pipeline while updating the city sewer system. According to press reports, crude oil spewed up to 40 feet into the air for about 20 to 30 minutes. An estimated 60,000 gallons of crude oil was spilled. The TSB is conducting an investigation. Press reports and photographs are included as supporting documentation.

38. Is there anything else included with your testimony?

Answer: Yes. The number and size of documents and files submitted as part of my testimony make it infeasible to include all of them here. Several documents and files including the PowerPoint presentation will be recorded onto a CD. It will be delivered by Nov 28, 2007 in accordance with SDAR 20:10:01:02.05. A list of those documents is included in EXHIBIT P.

39. Should the PUC approve the permit for the Keystone pipeline?

Answer: No. South Dakota landowners deserve the truth.

The oil spill statistics provided by TransCanada are clearly a significant departure from reality. The actual historical track record of hazardous liquid pipelines in the US and Canada (Enbridge) is summarized in EXHIBITS H and I. The actual historical track record of pipelines in Alberta is listed in EXHIBIT L. The environmental assessment associated with this facility must be based on the facts. It must be based on the actual historical track record of hazardous liquid pipelines (only) in North America (only). Europe is irrelevant; natural gas is irrelevant. Data omissions and unreasonable assumptions are inappropriate.

TransCanada continues to demonstrate a significant lack of credibility by their unwillingness to present the truth regarding pipeline oil spills in this application. Landowners will be forced to bear the brunt of these spills.

You must temper the enthusiasm of those who have everything to gain from this project and nothing to lose. Bear in mind that there are those of us who have everything to lose and nothing to gain. As commissioners of the South Dakota PUC, you must use your authority to protect the people and resources of South Dakota. That is your responsibility. Demand the truth.

40. Does that conclude you testimony?

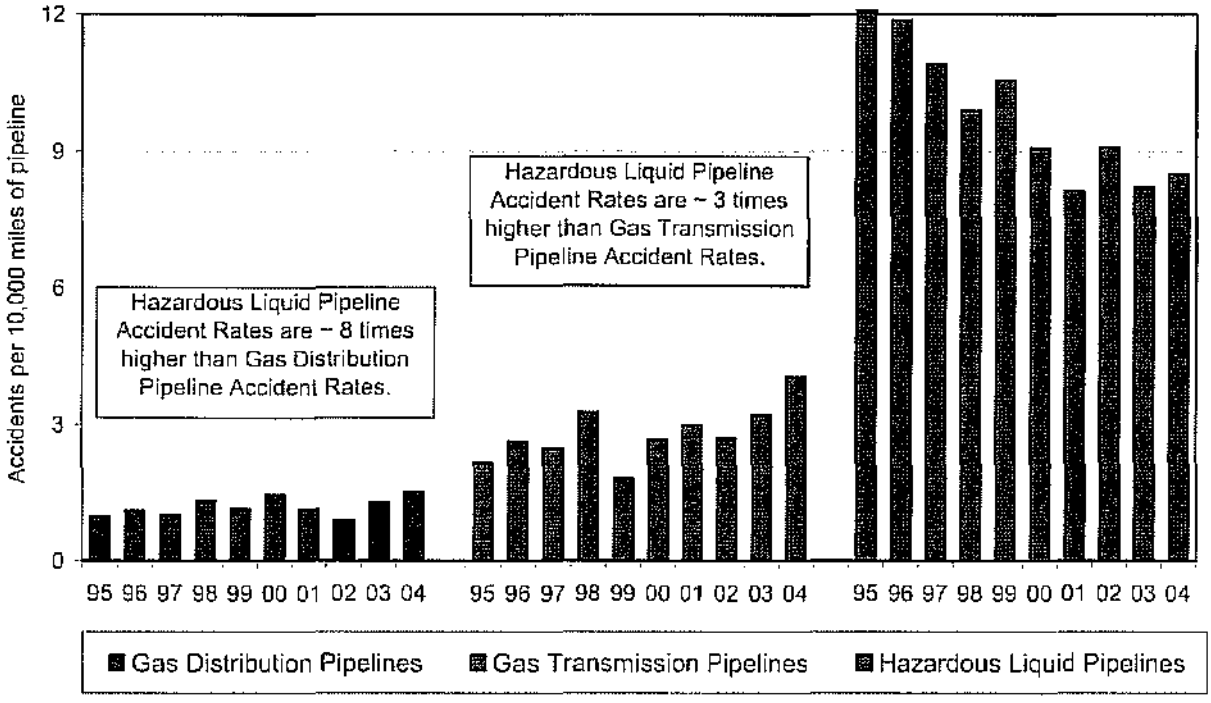
Answer: Yes it does.

Dated this 30th day of October, 2007. / signed /

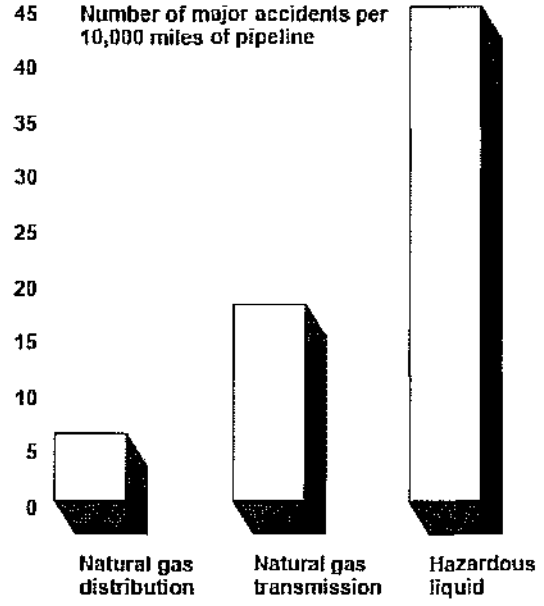
EDWARD D MILLER

LIST of EXHIBITS

Energy Pipelines in the US
Accident Rate Comparison Chart
Accidents per 10,000 Miles of Pipeline
Source: Office of Pipeline Safety



United States General Accounting Office – Pipeline Safety Report – May 2000 (1989-1998 data)



Source: GAO's analysis of OPS' data.

GAO/RCED-00-128 Oversight of Pipeline Safety

EXHIBIT A

Generated 10/19/2007

PHMSA OFFICE OF PIPELINE SAFETY
HAZARDOUS LIQUID PIPELINE OPERATORS
ACCIDENT SUMMARY STATISTICS BY YEAR
1/1/1986 - 09/30/2007

Year	No. of Accidents	Fatalities	Injuries	Property Damage	Gross Loss (Bbls)	Net Loss (Bbls)
1986	210	4	32	$16,077,846	282,791	220,317
1987	237	3	20	$13,140,434	395,854	312,794
1988	193	2	19	$32,414,912	198,397	114,251
1989	163	3	38	$8,813,604	201,758	121,179
1990	180	3	7	$15,720,422	124,277	54,663
1991	216	0	9	$37,788,944	200,567	55,774
1992	212	5	38	$39,146,062	137,065	68,810
1993	229	0	10	$28,873,651	116,802	57,559
1994	245	1	7[1]	$62,166,058	164,387	114,002
1995	188	3	11	$32,518,689	110,237	53,113
1996	194	5	13	$85,136,315	160,316	100,949
1997	171	0	5	$55,186,642	195,549	103,129
1998	153	2	6	$63,308,923	149,500	60,791
1999	167	4	20	$86,355,560	167,230	104,487
2000	146	1	4	$150,555,745	108,652	56,953
2001	130	0	10	$25,346,751	98,348	77,456
2002	147	1	0	$47,410,656	95,642	77,269
2003	131	0	5	$49,981,280	80,112	50,523
2004	144	5	16	$146,314,940	88,237	68,558
2005	139	2	2	$149,690,733	137,017	45,814
2006	110	0	2	$53,713,137	136,263	53,806
2007	83	0	2	$26,013,791	66,327	48,442
Totals [2]	**3788**	**44**	**276[1]**	**$1,225,675,095**	**3,415,329**	**2,020,638**

Historical totals may change as PHMSA receives supplemental information on incidents.

[1] Does not include 1,851 injuries that required medical treatment reported for the October, 1994 accidents that were caused by severe flooding near Houston, Texas.

[2] The reporting criteria changed in 2002 adding small spills down to 5 gallons. The change was instituted on 2/7/2002. For continuity with past trending, the data from post-2/7/2002 accidents used in our statistical summary includes only accidents meeting the reporting criteria: Accidents with gross loss greater than or equal to 50 barrels; those involving any fatality or injury; fire/explosion not intentionally set; Highly Volatile Liquid releases with gross loss of 5 or more barrels; or those involving total costs greater than or equal to $50,000.

Return to the Pipeline Statistics page

EXHIBIT B

PHMSA Office of Pipeline Safety
Hazardous Liquid Pipeline Operators
Accident Summary Statistics by Year
Hazardous Liquid Spills - 5 barrels or more

Year	Number of Accidents	Water involved	HCAs involved	Property Damage	Gross Loss barrels	Net Loss barrels	Ave Spill barrels	Ave Spill gallons
2002	182	35	48	$ 42,913,873	92,461	73,654	508	21,337
2003	184	35	54	$ 48,857,018	81,011	50,793	440	18,492
2004	166	35	48	$ 99,886,974	88,498	68,818	533	22,391
2005	159	26	55	$ 130,550,384	137,785	46,106	867	36,396
2006	131	18	46	$ 35,927,161	137,204	54,119	1,047	43,989
2007	93	19	36	$ 24,378,875	66,659	48,414	717	30,104
Totals	**915**	**168** 18%	**287** 31%	**$382,514,285** $418,048	**603,618**	**341,904**	**660**	**27,707**

PHMSA Office of Pipeline Safety
Hazardous Liquid Pipeline Operators
Accident Summary Statistics by Year
Crude Oil Spills - 5 barrels or more

Year	Number of Accidents	Water involved	HCAs involved	Property Damage	Gross Loss barrels	Net Loss barrels	Ave Spill barrels	Ave Spill gallons
2002	78	13	10	$ 26,738,641	20,238	8,844	259	10,897
2003	86	11	10	$ 18,529,314	28,850	14,106	335	14,090
2004	82	19	11	$ 61,660,836	31,279	19,755	381	16,021
2005	85	11	18	$ 86,013,150	102,901	19,253	1,211	50,845
2006	73	8	17	$ 14,775,328	84,294	5,929	1,155	48,498
2007	42	9	13	$ 9,299,370	12,201	1,455	291	12,201
Totals	**446**	**71** 16%	**79** 18%	**$217,016,639** $486,584	**279,763**	**69,342**	**627**	**26,345**

Database Generated on 10/19/2007

"Historical totals may change as PHMSA receives supplemental information on incidents."

EXHIBIT C

US DOT - Office of Pipeline Safety - Regional Oil Spills

Note: This is a partial list of significant regional pipeline oil spills; it is not a complete list.

Date	OPS Report ID	Operator	Location	State	Spill (gal)	Damages ($) or Comment
1/1/2007	20070029	Enbridge	Atwood	WI	63,000	$702,500
9/27/2005	20050310	Enbridge	not listed	ND	14,700	$350,000
10/21/2005	20050336	Enbridge	El Dorado	KS	98,700	$24,976
4/14/2003	20030187	Enbridge	Trail	MN	5,250	$1,000,000
Regional Crude Oil Pipeline Spills (surface water contamination)						
6/27/2006	20060218	Koch	Little Falls	MN	134,400	$4,158,716
6/8/2004	20040241	Tesoro	Center	ND	16,800	$805,000
5/13/2004	20040139	Enbridge	Superior	WI	1,680	$81,764
1/24/2003	20030083	Enbridge	Superior	WI	189,000	$2,853,000
7/4/2002	20020238	Enbridge	Cohasset	MN	252,000	$5,597,300
Regional Crude Oil Pipeline Spills (ground water contamination)						
2/5/2007	20070050	Enbridge	Clearbrook	MN	294	$49,341
2/2/2007	20070048	Enbridge	Exeland	WI	126,000	$1,633,660
10/20/2006	20060320	Enbridge	Pinewood	MN	210	$50,000
2/9/2004	20040063	Enbridge	Grand Rapids	MN	42,126	$1,089,790
July 2002	no OPS report	Enbridge	Cass Lake	MN	48,000+	?
Regional Crude Oil Pipeline Spills (HCAs affected)						
1/25/2007	20070043	Enbridge	Stanley	ND	9,030	HCA
5/3/2006	20060154	Koch	Cottage Grove	MN	1,260	HCA
12/14/2005	20050374	Enbridge	Stanley	ND	504	HCA
11/2/2005	20050320	Enbridge	Stanley	ND	252	HCA
5/13/2004	20040139	Enbridge	Superior	WI	1,680	HCA
12/2/2003	20030464	Enbridge	Clearbrook	MN	1,974	HCA
1/24/2003	20030083	Enbridge	Superior	WI	189,000	HCA
Regional Crude Oil Pipeline Spills - 50,000+ gal - (pre-2002 OPS format)						
7/27/2000	20000095	Lakehead *	Douglas Co	WI	50,400	$200,000
9/16/1998	19980147	Lakehead *	not listed	MN	239,400	$100,000
7/2/1997	19970102	Marathon	Garden Co	NE	295,092	$420,000
12/26/1996	19970010	Marathon	Nucholls Co	NE	205,800	$1,300,000
8/24/1996	19960142	Lakehead *	Donaldson Co	MN	210,000	$500,000
5/1/1993	19930093	Amoco	Patoka	IL	210,672	$300,000
3/3/1991	19910057	Lakehead *	Itasca Co	MN	1,701,000	$14,400,000
7/13/1989	19890091	Lakehead *	Pembina Co	ND	1,314,600	$1,500,000
6/16/1988	19880120	Lakehead *	Macomb Co	MI	369,600	$3,200,000
4/9/1988	19880115	Amoco	Peoria Co	IL	210,000	$1,500,000
5/27/1987	19870136	Lakehead *	Columbia Co	WI	132,300	$345,000
4/24/1986	19860087	Lakehead *	Elgin	IL	525,000	$815,000
11/7/1985	19850155	Minn Pipeline	Anoka Co	MN	251,160	?

* Note: Lakehead = Enbridge

EXHIBIT D

8.0 Conclusions

Based on the results presented for the period from January 1, 1981 through December 31, 1990, the following conclusions have been drawn regarding California's regulated hazardous liquid pipelines. These conclusions have been organized into two subsections. The first includes items which we consider to be major findings, as well as the issues specifically required to be addressed in the study by state statute. The second subsection includes what we consider to be less significant findings.

8.1 Significant Findings

a. Overall Incident Rates

The various criteria used to report hazardous liquid pipeline incidents had a direct effect on the resulting incident rates. The data collected regarding California's incidents was the only completely audited sample available. It resulted in incident rates somewhat higher than those presented in other studies. Using all of the available data, we have estimated the overall incident rates for various pipeline events as follows:

Event	Incident Rate
any size leak	7.1 incidents per 1,000 mile years
damage greater than $5,000	1.3 to 6.2 incidents per 1,000 mile years
damage greater than $50,000	up to 4.4 incidents per 1,000 mile years
any injury, regardless of severity	0.70 injuries per 1,000 mile years
injury requiring hospitalization	0.10 injuries per 1,000 mile years
fatality	0.02 to 0.04 fatalities per 1,000 mile years

b. External Corrosion

External corrosion was by far the largest cause of incidents, representing 59% of the total. Significant differences in external corrosion leak incident rates were found among the following factors:

- Older pipelines had a significantly higher external corrosion incident rate than newer lines.

EXHIBIT E

Enbridge Liquid Pipelines
Hazardous Liquid Pipeline Spills in North America

Actual Pipeline Spills Reported to Regulatory Jurisdictions

Year	Reported Spills (1)	Miles of ROW	(2) Spill Frequency Rate - SFR 1845	Gallons Spilled	Millions of Barrel-Miles	(3) Spill Volume Rate - SVR	Information Source
1996	49	4398	21	575,316	768,000	0.7	01-EHS-P16
1997	49	5560	16	915,600	771,000	1.2	02-EHS-P22
1998	39	5740	13	412,860	759,000	0.5	03-EHS-P30
1999	54	6368	16	1,207,920	687,000	1.8	04-CSR-P55
2000	43	6362	12	314,160	735,000	0.4	05-CSR-P91
2001	27	6370	8	1,078,140	695,000	1.6	06-CSR-P71
2002	46	6406	13	616,560	705,000	0.9	06-CSR-P71
2003	58	6363	17	267,834	710,000	0.4	06-CSR-P71
2004	64	6881	17	130,788	757,000	0.2	06-CSR-P71
2005	70	6886	19	412,650	695,000	0.6	06-CSR-P71
Totals	**499**	**Ten Year Period**		**5,931,828**	**7,282,000**		
Average	**49.9**	**(Annually)**	**15.1**	**593,183**	**728,200**	**0.8**	
Average	**4.2**	**(Monthly)**		**49,432**			

(1) Actual number of oil spills reported to regulatory jurisdictions.
(2) SFR - Spill Frequency Rate = Number of spills per year per 1845 miles of Right Of Way (ROW)
(3) SVR - Spill Volume Rate = Gallons spilled per million barrel-miles of throughput.

Enbridge Summary - 10 year period (1996 - 2005)

Total number of reported spills (10 years)	**499**	
Total gallons of oil spilled (10 years)	**5,931,828**	
Overall average spill size (number of gallons)	**11,887**	
Average number of spills per year	**50**	
Average number of gallons spilled per year	**593,183**	
Average Spill Frequency Rate	**15.1**	spills per 1845 miles of ROW per year
Average Spill Volume Rate	**0.8**	gallons per million barrel-miles

EXHIBIT F

US DOT - Office of Pipeline Safety
Hazardous Liquid Pipeline Spills in the US

Actual Hazardous Liquids Pipeline Spills Reported to OPS

Year	Reported Spills (1)	Miles of Pipline	(2) Spill Frequency Rate - SFR 1845	Total Gallons Spilled	Millions of Barrel-Miles	(3) Spill Volume Rate - SVR	Information Source
1996	194	163,422	2.2	6,733,272	3,822,941	1.761	OPS (86-01)
1997	171	156,638	2.0	8,213,058	3,806,271	2.158	OPS (86-01)
1998	153	154,528	1.8	6,279,000	3,826,645	1.641	OPS (86-01)
1999	167	158,248	1.9	7,023,660	3,813,680	1.842	OPS (86-01)
2000	146	160,900	1.7	4,563,384	3,564,250	1.280	OPS (86-01)
2001	130	159,889	1.5	4,130,616	3,556,841	1.161	OPS (86-01)
	Implementation of the Pipeline Safety Improvement Act - New Reporting Requirement						
2002	436	161,670	4.98	4,084,592	3,619,199	1.129	OPS(2002+)
2003	417	159,512	4.82	3,415,010	3,643,895	0.937	OPS(2002+)
2004	351	169,346	3.82	3,747,559	3,701,930	1.012	OPS(2002+)
2005	346	166,175	3.84	5,798,585	3,704,400	1.565	OPS(2002+)
Totals	**1,550**	**Four Year Period**		**17,045,746**	**14,669,424**		
Average	**387.5**	**(Annually)**	**4.4**	**4,261,437**	**3,667,356**	**1.2**	
Average	**32.3**	**(Monthly)**		**355,120**			

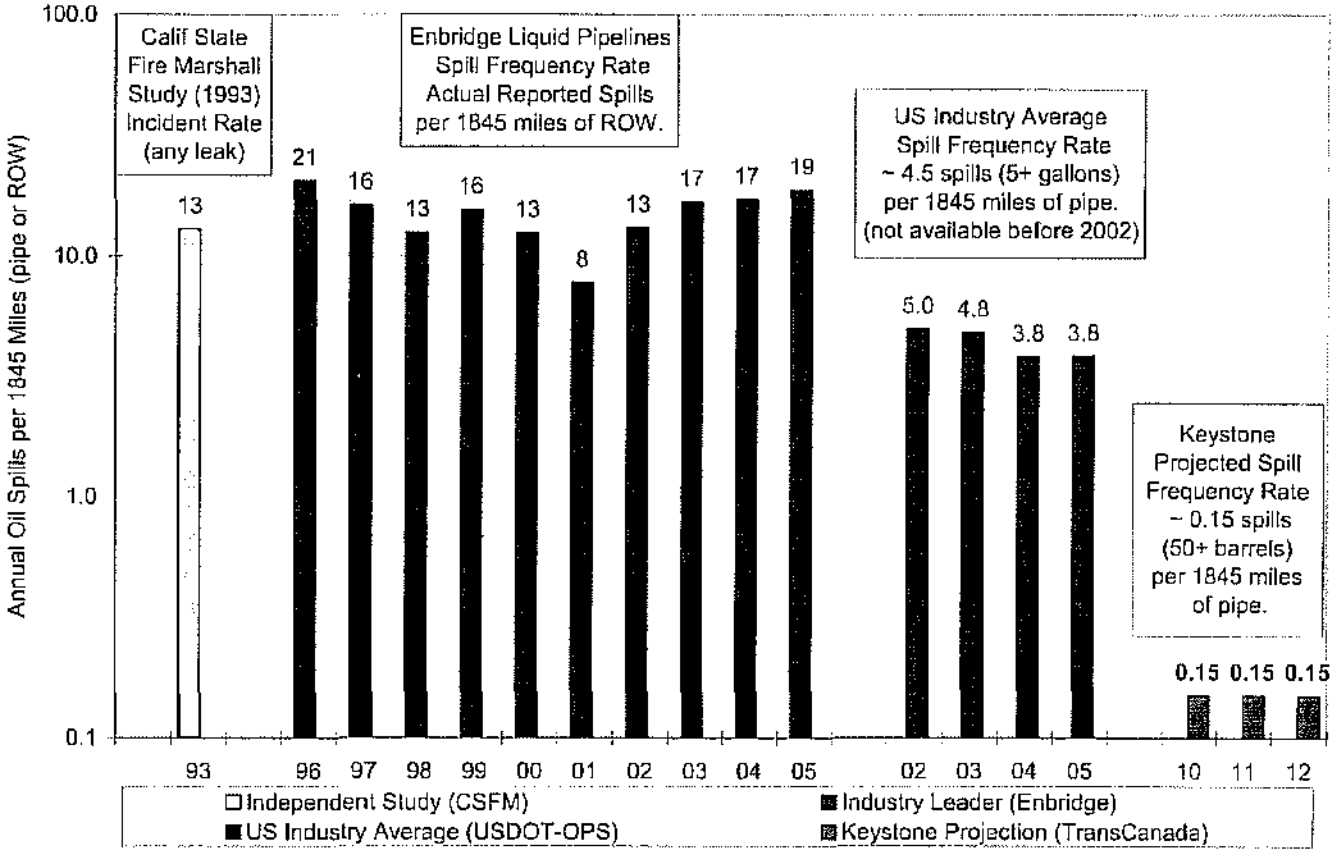
(1) Actual oil spills reported to the Office of Pipeline Safety (1+ barrel or 5+ gallons.)
(2) SFR - Spill Frequency Rate = Number of spills per year per 1845 miles of pipeline.
(3) SVR - Spill Volume Rate = Gallons spilled per million barrel-miles of throughput.

OPS Summary - 4 year period (2002 - 2005)

Total number of reported spills (4 years)	**1550**	
Total gallons of oil spilled (10 years)	**17,045,746**	
Overall average spill size (number of gallons)	**10,997**	
Average number of spills per year	**388**	
Average number of gallons spilled per year	**4,261,437**	
Average Spill Frequency Rate	**4.4**	spills per 1845 miles of pipe per year
Average Spill Volume Rate	**1.2**	gallons per million barrel-miles

EXHIBIT G

Hazardous Liquid Pipelines in North America
Spill Frequency Rate (SFR) Comparisons
Annual Number of Spills per 1845 Miles
Source: CSFM, Enbridge, USDOT-OPS, TransCanada



The Independent Study results are from the California State Fire Marshall (CSFM) study published in 1993. The "Significant Findings" are listed on page 170 of that report.

An Industry Leader in North America is the Canadian pipeline company Enbridge. The numbers presented are available from the Enbridge Corporate Social Responsibility Reports.

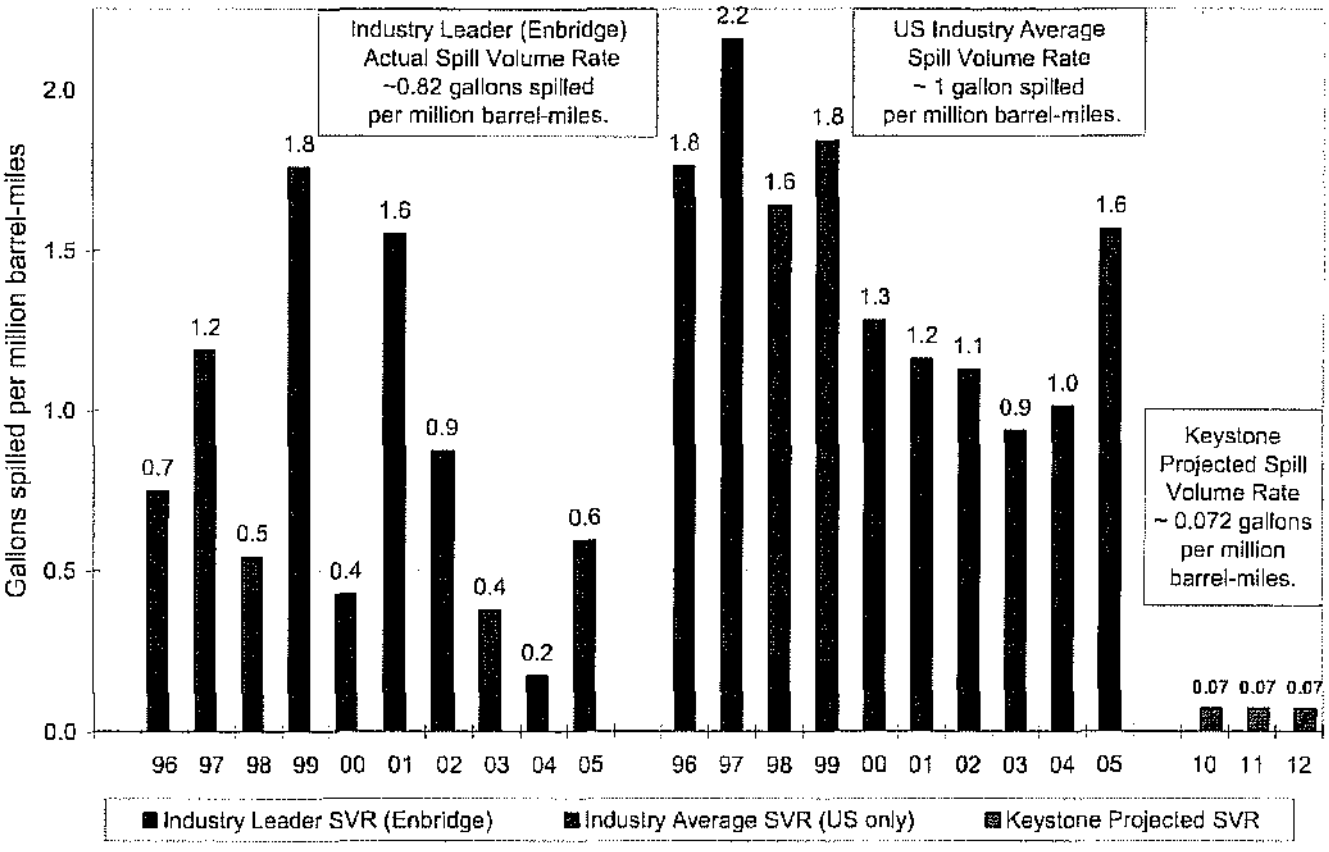
The US Industry Average information is available from the US DOT Office of Pipeline Safety. The numbers presented are calculated from the Hazardous Liquids Incident Database.

The Keystone Pipeline (projection) information is provided by TransCanada in the Frequency and Volume Analysis submitted with the permit application. In that study, the Keystone pipeline is listed at 1845 miles long. All spill frequency rates are listed relative to 1845 miles of pipeline or Right Or Way (ROW)

Note: All information is specific to hazardous liquid pipelines (only) in North America (only).

EXHIBIT H

Hazardous Liquid Pipelines in North America
Spill Volume Rate (SVR) Comparisons
Gallons of Oil Spilled per Million Barrel-Miles
Source: Enbridge, USDOT-OPS, TransCanada



The Enbridge average SVR is 11 times higher than Keystone's; the industry average is 14 times higher.

The Association of Oil Pipelines (AOPL) in Washington, DC states that the industry average spill volume rate in the US is about 1 gallon of oil spilled per million barrel miles of product transport. One barrel-mile is defined as one barrel of oil transported a distance of one mile.

An Industry Leader in North America is the Canadian pipeline company Enbridge. The numbers presented are available from the Enbridge Corporate Social Responsibility Reports.

The US Industry Average information is available from the US DOT Office of Pipeline Safety. The numbers presented are calculated from the Hazardous Liquids Incident Database and information available from the Association of Oil Pipelines.

The Keystone Pipeline (projection) information is provided by TransCanada in the Frequency and Volume Analysis submitted with the permit application. In that study, the Keystone pipeline is projected to spill about 0.37 barrels per mile per year. Based on the nominal capacity of 591,000 barrels per day, the spill volume rate is calculated at 0.072 gallons spilled per million barrel-miles.

Note: All information is specific to hazardous liquid pipelines (only) in North America (only).

EXHIBIT I

Data Omission Example from the Frequency Volume Study

CONFIDENTIAL

5.1 Detection, Verification, Response and Isolation

Table 5-1 Time from Leak Start to Closure of RGVs for Reported Causes

Hole size	Response Time	Valve Closure
Small	30 minutes	3 minutes
Medium	15 minutes	3 minutes
Large	9 minutes	3 minutes

Table 5-2 Time from Leak Start to Closure of RGVs for Non-Reported Causes

Leak Rate (as percentage of throughput)	Detection and Verification	Isolation
	Belowground Pipe	Time for RBV to Close
Less than 1.5%	90 days	3 minutes
5%	90 minutes	3 minutes
53%	5 minutes	3 minutes

Data Omission: The time needed to shut down the pumps is omitted.

Correct Version

Table 5.1 Time from Leak Start to Closure of RGVs for Reported Causes

Hole Size	Response Time	Pump Shutdown	Valve Closure	Total Time	Time/Spill Increase
Small	30	omitted	3	33	
Actual	30	9	3	42	27%
Medium	15	omitted	3	18	
Actual	15	9	3	27	50%
Large	9	omitted	3	12	
Actual	9	9	3	21	75%

Impact: The pipeline isolation times and potential spill sizes increase up to 75%.

EXHIBIT J

Frequency Volume Study
Data Interpretation Example

Hazardous Liquids Pipelines Incident Database (Source: OPS)

Year	Total Pipeline Mileage (miles)	Gross Loss Total Oil Spilled (barrels)	Net Loss Oil Never Recovered (barrels)
1992	155,113	137,065	68,810
1993	153,444	116,802	57,559
1994	154,731	164,387	114,002
1995	154,933	110,237	53,113
1996	163,422	160,316	100,949
1997	156,638	195,549	103,129
1998	154,528	149,500	60,791
1999	158,248	167,230	104,487
2000	160,900	108,652	56,953
2001	159,889	98,348	77,456
2002	161,670	95,642	77,269
2003	159,512	80,112	50,523
Totals	1,893,028 (Total Miles)	1,583,840 (Total Spill)	925,041 (Net Loss)

Real World Calculation
Average leak volume per mile ==== > **0.84** barrels
(TOTAL SPILL divided by TOTAL MILES)

Frequency Volume Study
Average leak volume per mile ========== > **0.49** barrels
(NET LOSS divided by TOTAL MILES)

The Real World
Average leak volume per mile is **71%** higher than their interpretation.

The Frequency Volume study doesn't use the TOTAL Spill in the calculation.
They subtract the amount of oil recovered from the original spill total.
The net result is that the average spill size is reduced because of data interpretation.

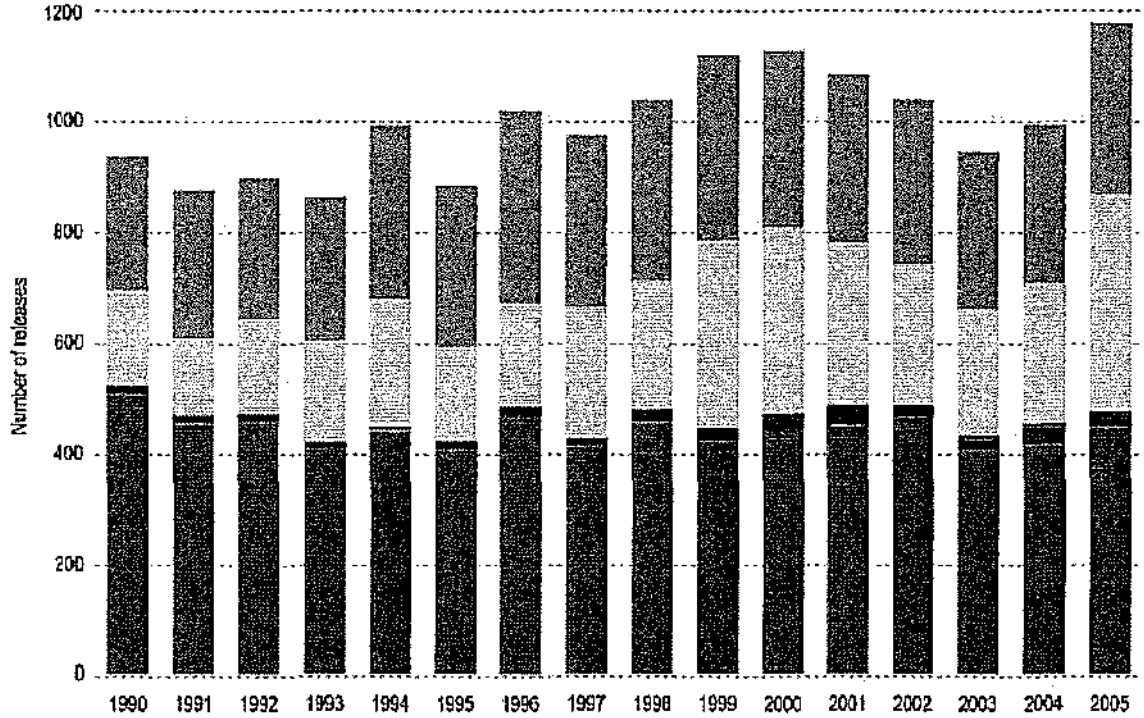
EXHIBIT K

Pipeline Performance in Alberta, 1990-2005

April 2007

Alberta Energy and Utilities Board

Figure 19. Pipeline releases by substance released per year
All pipeline releases from January 1, 1990, to December 31, 2005 (test failures are excluded)



PRODUCT	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total number	% of total
Hydrocarbon liquid	244	268	256	261	315	291	349	311	330	337	320	305	299	286	286	311	4769	29.8
Hydrocarbon gas	188	138	168	179	228	189	185	234	231	338	333	291	252	225	251	388	3778	23.6
Other	2	4	1	2	2	2	1	1			1	1	1	9	9	12	45	0.3
Sour gas	14	11	14	12	6	14	18	13	21	21	30	36	21	19	29	18	299	1.9
Water	511	457	461	411	444	410	470	417	460	426	445	454	469	408	420	450	7113	44.4
Total number releases	939	878	900	865	995	886	1022	976	1042	1122	1129	1087	1042	947	995	1179	16 004	
% of total	5.9	5.5	5.6	5.4	6.2	5.5	6.4	6.1	6.5	7.0	7.1	6.8	6.5	5.9	6.2	7.4		100.0

<u>Sixteen Year Summary:</u> (1990-2005): 16,004 total pipeline releases – 1000 per year on average.
There were 4,769 hydrocarbon liquid releases reported – about 300 per year or about 6 per week.

EXHIBIT L

National Energy Board of Canada
List of Pipeline Ruptures (1992 – 2007)
Transportation Safety Board Investigations

(Grouped by Enbridge, TransCanada, Others; Sorted by date)

TSB #	Company	Date	Age	City	Product	Comment
P07H0014	Enbridge	04/15/07	39	Glenavon, SK	Crude	261,000 gal spill.
P01H0049	Enbridge	09/29/01	29	Binbrook, ON	Crude	13,200 gal spill
P01H0004	Enbridge	01/17/01	33	Hardisty, AB	Crude	1+ million gal spill
P99H0021	Enbridge	05/20/99	31	Regina, SK	Crude	825,000 gal spill
P96H0008	Enbridge	02/27/96	28	Glenavon, SK	Crude	211,000 gal spill.
P95H0047	Enbridge	11/13/95	30	Langbank, SK	Crude	203,000 gal spill.
P95H0023	Enbridge	06/16/95	27	Windthorst, SK	Condensate	
P94H0048	Enbridge	10/03/94	31	St. Leon, MB	SynCrude	1.1 million gal spill
P02H0017	TransCanada	04/14/02	33	Brookdale, MB	Gas	Immediate ignition
P97H0063	TransCanada	12/02/97	28	Cabri, SK	Gas	Resulted in ignition.
P96H0049	TransCanada	12/11/96	39	Stewart Lake, ON	Gas	Delayed ignition.
P96H0012	TransCanada	04/15/96	34	St. Norbert, MB	Gas	Delayed ignition.
P95H0036	TransCanada	07/29/95	22	Rapid City, SK	Gas	Immediate ignition.
P95H0003	TransCanada	02/04/95	22	Vermillion Bay, ON	Gas	Immediate ignition.
P94H0049	TransCanada	10/06/94	37	Williamstown,ON	Gas	
P94H0036	TransCanada	07/23/94	22	Latchford, ON	Gas	Resulted in ignition.
P92T0005	TransCanada	07/15/92	19	Potter, ON	Gas	Resulted in ignition.
P02H0052	TNPL	12/07/02	50	St-Clet, QU	Diesel	
P02H0024	Westcoast	05/15/02	45	Fort St. John, BC	Sour gas	
P00H0037	Westcoast	08/07/00	43	Hope, BC	Gas	
P98H0044	Westcoast	12/08/98	40	Kobes Creek, BC	Sour gas	Resulted in ignition.
P97H0024	Westcoast	04/30/97	19	Ft. St. John, BC	Sour gas	Resulted in ignition.
P94H0018	BP Canada	05/10/94	17	Regina, SK	Ethane	Fire from pump.
	Westcoast	04/25/94	32	Rigel, BC	Sour gas	
P94H0003	Foothills	02/15/94	12	Maple Creek, SK	Gas	Resulted in ignition.
P93H0007	Westcoast	05/13/93	24	Fort St. John, BC	Sour gas	Delayed rupture.

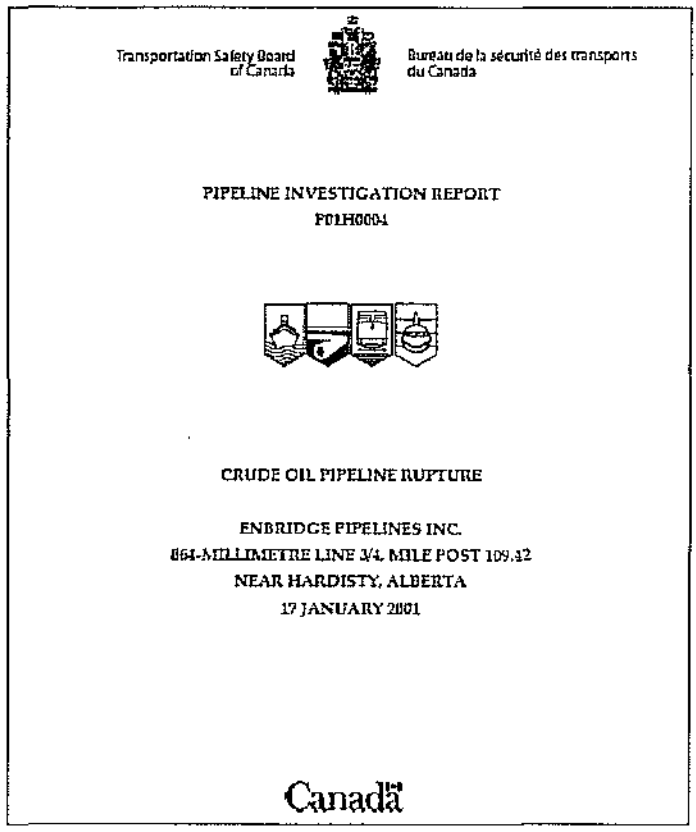
Total – There were 26 pipeline ruptures over a 15 year period investigated by the TSB.

Ruptures – Age of Pipe Distribution

Number of years from installation to failure (above listed ruptures)						**Totals**
Age of Pipe	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	12-50 yrs
Ruptures	0	4	9	10	3	26

Average ages of the pipe at time of rupture ~ 30 years; the range is 12 – 50 years.

EXHIBIT M


Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

PIPELINE INVESTIGATION REPORT

P01H0004

CRUDE OIL PIPELINE RUPTURE

ENBRIDGE PIPELINES INC.

864-MILLIMETRE LINE 3/4, MILE POST 109.42

NEAR HARDISTY, ALBERTA

17 JANUARY 2001

Canada

Summary

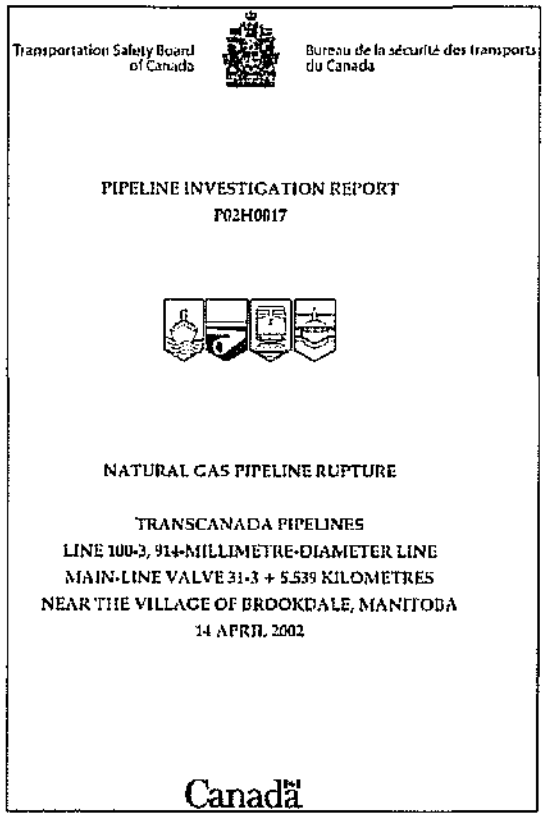
At 0045 mountain standard time on 17 January 2001, a rupture occurred on the Enbridge Pipelines Inc. 864-millimetre outside diameter Line 3/4 at Mile Post 109.42, 0.8 kilometres downstream of the Hardisty pump station near Hardisty, Alberta. The rupture occurred in a permanent slough that was fed by an underground spring. Although the line was shut down at the control centre in Edmonton, Alberta, within minutes of the rupture, the exact location of the rupture was not found until 1415 mountain standard time. Approximately 3800 cubic metres of crude oil was released and contained within a 2.7-hectare section. As of 01 May 2001, 3760 cubic metres of crude oil had been recovered.

Other Factual Information

At 0045 mountain standard time (MST), the control centre operator in Edmonton, Alberta, controlling Line 3/4 noticed a pressure drop at the Hardisty pump station and immediately began to shut down the mainline units at that pump station. As the line was being shut down, the emergency notification procedure was begun.

During the morning of 17 January 2001, the pipeline route downstream of the Hardisty pump station was both walked and flown along numerous times in an effort to identify the possible leak location. At approximately 1415, company personnel walking the line noticed that crude oil had surfaced through a crack in the ice near the edge of a slough about 300 metres (m) downstream of the Hardisty pump station. At that time, company personnel secured the site and began to implement oil containment, oil recovery and pipeline repair operations.

EXHIBIT N



Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

PIPELINE INVESTIGATION REPORT
P02H0017

NATURAL GAS PIPELINE RUPTURE

TRANSCANADA PIPELINES
LINE 100-3, 914-MILLIMETRE-DIAMETER LINE
MAIN-LINE VALVE 31-3 + 5.539 KILOMETRES
NEAR THE VILLAGE OF BROOKDALE, MANITOBA
14 APRIL 2002

Canada

TSB Investigation Report Excerpt 1

"At approximately 2310, the first verbal report from a member of the public indicated that there was an explosion and fire on TransCanada's system near Brookdale, approximately 1.2 km from Rural Road 464. At the same time, TransCanada's SCADA system gave very strong visual and graphical evidence to the CGCC of a possible line break between Stations 30 and 34. From this time on, several calls from the public and emergency services organizations were received by the CGCC related to the explosion and fire."

TSB Investigation Report Excerpt 2

"At approximately 2318, TransCanada advised the Royal Canadian Mounted Police (RCMP) of a possible line break near Brookdale and that TransCanada personnel had been dispatched to the rupture site. The RCMP advised TransCanada that it would be implementing a 4 km radius evacuation area around the rupture site and would be evacuating local residents within this perimeter."

TSB Investigation Report Excerpt 3

"At approximately 0230, the major fire self-extinguished at the break site due to actions undertaken at 0130. The isolation of the break site was accomplished with the automatic closure of four MLVs and various tie-over valves with adjacent lines, by low-pressure shut-off devices and the remote closure of 22 valves by the CGCC through the SCADA system. As a precaution, the operating pressures for Lines 100-2 and 100-4 were temporarily reduced to 1000 kPa, until the integrity of these two adjacent main lines could be confirmed. At the time of the break, the estimated pressure at the rupture site was 6010 kPa. The total volume of natural gas consumed by the fire and lost to atmosphere was estimated at 6 812 600 cubic metres."
(conversion: 240,583,000 cubic feet)

EXHIBIT O

List of Supporting Documents and Files – SD PUC H07-001

1) Source: US-DOT-PHMSA-OPS (Office of Pipeline Safety) Reports
Accident Summary and Annual Mileage Reports
a) Gas Distribution; b) Gas Transmission; c) Hazardous Liquids

2) Source: US-DOT-PHMSA-OPS (Office of Pipeline Safety) Data Files
Hazardous Liquid Incident Databases
a) L_DATA (1985-2002) download files
b) LIQ0102 (2002-2007) download files and Excel spreadsheet file.

3) Source: US-DOT a) Performance Plan – FY 2004

4) Source: US-GAO General Accounting Office
a) Report GAO/RCED-00-128 Pipeline Safety

5) Source: Enbridge
a) Environment Health and Safety Reports: 2001, 2002, 2003
b) Corporate Social Responsibility Reports: 2004, 2005, 2006
c) Web Pages detailing Cass Lake Spill and Recovery Efforts

6) Source: Alberta Energy and Utilities Board
a) Report 2007-A: Pipeline Performance in Alberta, 1990-2005

7) Source: Transportation Safety Board (Canada)
Pipeline Rupture Investigations (Enbridge, TransCanada)
a) Report P01H0049 b) Report P01H0004 c) Report P99H0021
d) Report P96H0008 e) Report P94H0048 f) Report P02H0017

8) Source: National Transportation Safety Board (US)
a) NTSB/SS-05/02 SCADA in Liquid Pipelines Safety Study
b) NTSB/PAR-04/01 Cohasset, MN spill

9) Source: Association of Oil Pipelines (AOPL)
a) Shifts in Petroleum Transportation (1984-2004) Report
b) Web pages - 1 gallon spilled per million barrel miles

10) Source: CONCAWE (Conservation of Clean Air and Water in Europe)
a) Report no. 4/07 - Performance of European Cross-Country Pipelines

11) Source: National Energy Board – Canada
a) List of Ruptures investigated by TSB

12) Source: California State Fire Marshall
a) Hazardous Liquid Pipeline Risk Assessment – Conclusion

13) TransCanada a) Press Releases

14) Source: Alaska Department of Environmental Conservation
a) Statewide 10 Year Summary b) TAPS After Action Report

15) Press Reports (including photos)
a) Burnaby, BC spill b) Alaska TAPS spill
c) TransCanada Pipeline order (India)

EXHIBIT P