

# FLAGSTAFF COUNTY

## AIR QUALITY BASELINE STUDY

Submitted to:

**Flagstaff County**

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Industry contact, Aaron Studer of Husky Oil Ltd. was especially helpful in providing details of the Terminal operations. Thanks to Wade Kroening, Flint Hills Operations Manager, and the Hardisty Community Complex group of operators for their welcome reception at their meeting and annual open house on April 20, 2011.

## EXECUTIVE SUMMARY

The demand for terminal facilities is currently very strong as a result of growth in oil sands production, the seasonality of markets and greater price volatility. The advantage of having a concentrated Hub of oil storage and pipeline terminal operations at Hardisty is that the site enables Alberta oil suppliers to manage pipeline flows and tank inventory in response to market needs, oil delivery destinations and types of shipments.

There are various disadvantages associated with this concentrated storage hub, including negative effects from contaminants in air, water and soil; destruction of farmland, environmentally sensitive areas and critical habitats. The chronology of development for the 9 operating companies in the Hub was determined by reviewing 191 Alberta Environment Approvals for the quadrant of interest, representing a vast array of industrial development.

Further expansion will occur over the next few years. The Keystone XL and Alberta Clipper pipelines are expected to be in service in 2011. Husky is proposing to build two new tanks and construction of the Keystone XL Hardisty Terminal B will commence in the fall of 2011. In addition, Suncor plans to build four new 300,000 barrel tanks at Gibson's Hardisty Terminal.

The intent of current federal and provincial regulation is to ensure public safety, security and environmental protection. The regulations, though law, are fluid documents, which are continually being amended to improve environmental protection and public health and safety. Reporting of pollutant emissions in Alberta is mandated in individual operating approvals requiring industry to submit monitoring reports to Alberta Environment and the National Pollutant Release Inventory. As a result of compliance with regulation, concentrations of air pollutants are expected to be below regulatory criteria under normal operating conditions.

Pipeline spills, however uncommon, are to be expected when there are so many pipelines moving such a large volume of oil. Spills and releases have and will continue to occur, with operator error responsible for 37% of failures. Crude oil is the most common substance released; with however, a 98% recovery rate. Through the approval and licensing processes, regulatory authorities and operating companies work together to minimize these effects.

Continuous monitoring from December 2008 to December 2010 at both the Husky and Enbridge Terminals revealed that concentrations of hydrogen sulphide were well below the regulatory criteria set out in Alberta's Ambient Air Quality Objectives. Intermittent monitoring of VOCs over the same period for Husky and Enbridge Terminals resulted in BTEX concentrations well below the regulatory criteria. Health related impacts from these low concentrations are unlikely. Over the two year period, the average concentration of benzene at the Terminal was around 0.4 ppb. Comparatively, the 1 hour Alberta Ambient Air Quality Objective is 30 ppb and the annual average background level of benzene in Edmonton in 2010 was around 1.0 – 1.5 ppb (Alberta

Environment, February 2011). For the purposes of future air quality studies, these data can be used as baseline or reference values.

Emissions of volatile organic compounds may result from evaporative storage losses or equipment connection leaks (fugitive emissions), as well as from operational activities such as loading and unloading. The highest concentration of these volatile compounds can be found in the headspace of tanks with non-floating lids and displaced vapours released when tanks are refilled. This implies that the operators have the highest potential for exposure. Engineered controls for fugitive emissions are costly but can reduce or eliminate the regulatory requirement for air monitoring. Pollution abatement methods such as external and internal floating tank roofs and thermal oxidization are used effectively by companies at the Hub in this manner

Response requirements are stringent for the operating companies at the Hub. Comprehensive emergency response plans exist as a regulatory requirement and are practiced regularly. Emergency Response Plans include the most catastrophic events that could occur: a terrorist attack or natural disaster, such as lightening or a tornado. The Hardisty Mutual Aid Plan, a synergy group comprised of industry representatives, activates a call around procedure for odour complaints and emergencies. The ERCB assumes a leadership role co-ordinating emergency response. Landowners and residents in the surrounding area are also notified.

The similarity between naturally occurring air contaminants and the high level of oil and gas activity in the region make it difficult to separate the anthropogenic (human impact) emissions in the Hardisty complex from the ambient air quality. However, it is possible to determine the overall air quality in the Hardisty area and perform a comparison to other areas using common measurements as established by the Alberta Ambient Air Quality Objectives. This report provides baseline air quality information that can be used as reference values for future studies.

## 1. INTRODUCTION

Flagstaff County requested that Alberta Innovates – Technology Futures (AITF) conduct a review of air quality-related information pertaining to the growing Hardisty oil terminal hub, located at the east border of their County. The intention was to provide a level of understanding to assist the County in administering developmental permits and anticipate potential air quality concerns.

An impressive array of oil storage tanks line the eastern horizon at Hardisty, Alberta's international oil pipeline, storage and trading hub. Geography, history and adaptability make Hardisty the natural starting point of the first large additions to the North American oil-delivery network in a generation. Hardisty's role as a shipping, storage and trading hub dates back to the 1950's installation of the first long-distance pipeline for Alberta oil.

The location was convenient for pooling output from scattered production fields and has an added bonus of geological salt deposits that are hollowed out to make underground storage caverns. After the initial burst of oil sands development in the 1960's and 1970's, a provincial industrial corridor policy identified Hardisty as the hub of a transportation network for production from Cold Lake, Lloydminster, and Fort McMurray.

**Figure 1. A View of the Hub**





Recent mega-projects include the \$5.2 billion Keystone Pipeline and \$3.1 billion Alberta Clipper Pipeline, with the proposed \$7+ billion Keystone XL awaiting approval by the U.S. This puts the Town of Hardisty, Flagstaff County and the Provost Municipal District in a rare position to strongly influence voluntary collaboration on planning, as well as financing services for environmental sustainability and economic growth.

There are nine operating companies of interest in the Hardisty Hub. Table 1 describes the types of facilities each company operates.

**Table 1. Types of Facilities at the Hardisty Hub**

<b>Operating Company</b>	<b>Facility/Operator</b>	<b>Sub-Type</b>
Enbridge Midstream Inc.	Hardisty Contract Terminal/Enbridge Pipelines	Tank farm-18 crude, 1 condensate/oil loading and unloading terminal
Husky Oil Operations Ltd.	Husky Hardisty Pipeline Terminal	7 tank farms/oil loading and unloading terminals
Flint Hills Resource Canada ULC	Flint Hills Resource Hardisty Terminal/Koch Oil	Tank farm/oil loading and unloading terminal
Kinder Morgan Canada	Express Pipeline Ltd.	Oil pipeline
Gibson Energy ULC	Gibson Hardisty Terminals	Gas plant fractionation; 12 tank farms/oil loading and unloading terminals
Transcanada Keystone Pipeline GP	ConocoPhillips	Oil pipeline
IPF Cold Lake Pipeline	InterPipeline Fund	Oil sands pipeline
IPF Bow River Hardisty South	InterPipeline Fund	Conventional oil pipeline
Hardisty Caverns - Enbridge	As of June 2010 fully owned by Enbridge	4 salt caverns, 3.1 million barrels capacity, long term storage services
Canadian Natural Resources Ltd.	ECHO Pipeline + 15% IPF	Oil pipeline

There are 9 members in the Hardisty Community Complex Group (HCCG): Enbridge, Plains Midstream, Canadian Natural Resources Limited, Flint Hills Resources, Gibson Energy, Inter Pipeline, Husky Energy, TransCanada Keystone and Kinder Morgan. The group meets three times a year at the Hardisty Community Complex. The nine companies comprise the Hardisty Mutual Aid Plan (HMAP), a synergy that is intended

to work together to resolve issues, lessen impacts and encourage the use of best practices in the areas of health, safety and the environment.

The HCOG holds an annual open house which gives members of the community, adjacent to the huge tank farm complex, the opportunity to speak to company representatives about current activities, upcoming developments and voice any concerns about the impact the complex has on the community.

## **2. OBJECTIVES**

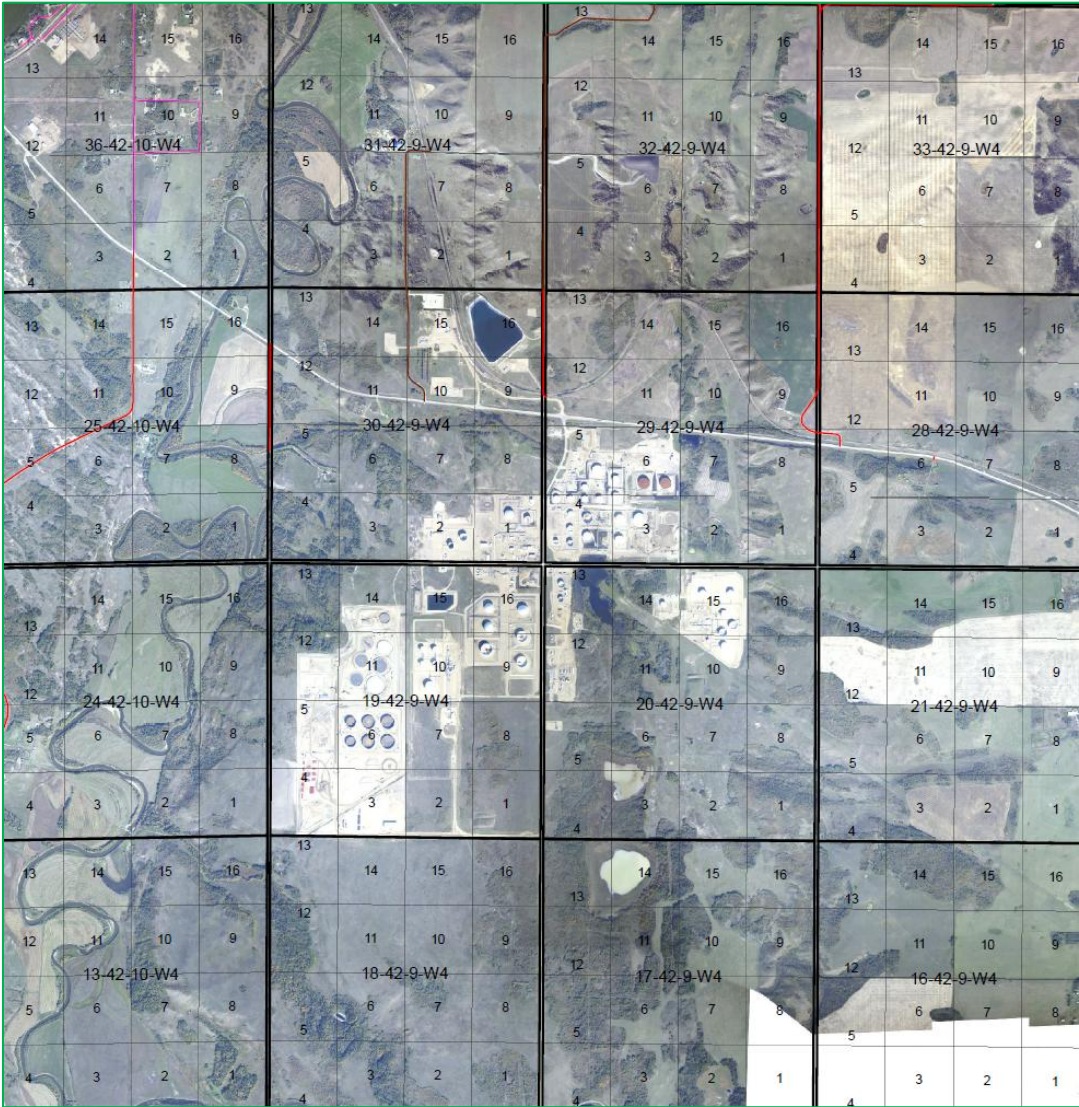
The intent of this study is to provide a “snapshot” document of basic air quality for development planning and future reference. The project objectives were to:

1. Obtain baseline data related to the air quality and air shed for the Hardisty Hub area, including:
  - Chronology of oil-related industrial development at the Hardisty Hub
  - Identification of proposed expansion or new facilities to be located within the Hardisty Hub area
  - Summary of regulatory (ERCB, AENV and NEB) requirements for facilities within the Hardisty Hub and identification of proposed regulatory changes
  - History of complaints made to the ERCB by type, location and date
  - Available historical air quality data from regulatory and operating company sources
  
2. Investigate and summarize the most probable impacts to Flagstaff County of significant emissions from oil facilities at the Hardisty Hub, including:
  - Summary of health-related impacts of typical emissions from oil storage tanks on nearby residents
  - Response requirements for operating companies in the Hardisty Hub
  - Communication requirements by regulatory agencies and operating companies with nearby residents

This report addresses all of these objectives.

The scope of this study was limited by Flagstaff County to a quadrant of 16 sections, framed by the LSDs: 16-42-09-W4, 13-42-10-W4, 36-42-10-W4 and 33-42-09-W4: the area shown in Figure 2.

**Figure 2. Quadrant of Interest (GIS Map 2010)**



There are several other facilities in Flagstaff County which contribute air emissions; these were not examined as they are outside of this quadrant, including:

- ATCO Battle River Generating Station, Forestburg
- Brownfield Sweet Gas Plant, Apache Canada Ltd.
- Thompson Lake Sour Gas Plant, Husky Oil Operations Ltd.
- Provost Sour Gas Plant, TAQA North Ltd.
- Battle River (Provost) Sour Gas Processing Plant, Apache Canada Ltd.
- Sedgewick Sour Gas Plant, Alta Gas Ltd.

Although the focus of this report is air quality, there are other environmental concerns which need to be considered when examining operations in the Hardisty Hub including groundwater quality, wastewater, hazardous materials management, solid waste, land reclamation and protection of the biota.

### 3. RESULTS AND DISCUSSION

#### 3.1 Baseline Data Related to Air Quality

There are nine operating companies of interest in the Hardisty Hub. Table 2 cross-references the Alberta Environment (AENV) approval numbers with the Energy Resources Conservation Board (ERCB) operator identification numbers. AENV pipeline codes are included for the provincial pipelines. The table also indicates which regulatory authority has governance over the operating companies.

**Table 2. Operating Companies in the Hardisty Hub**

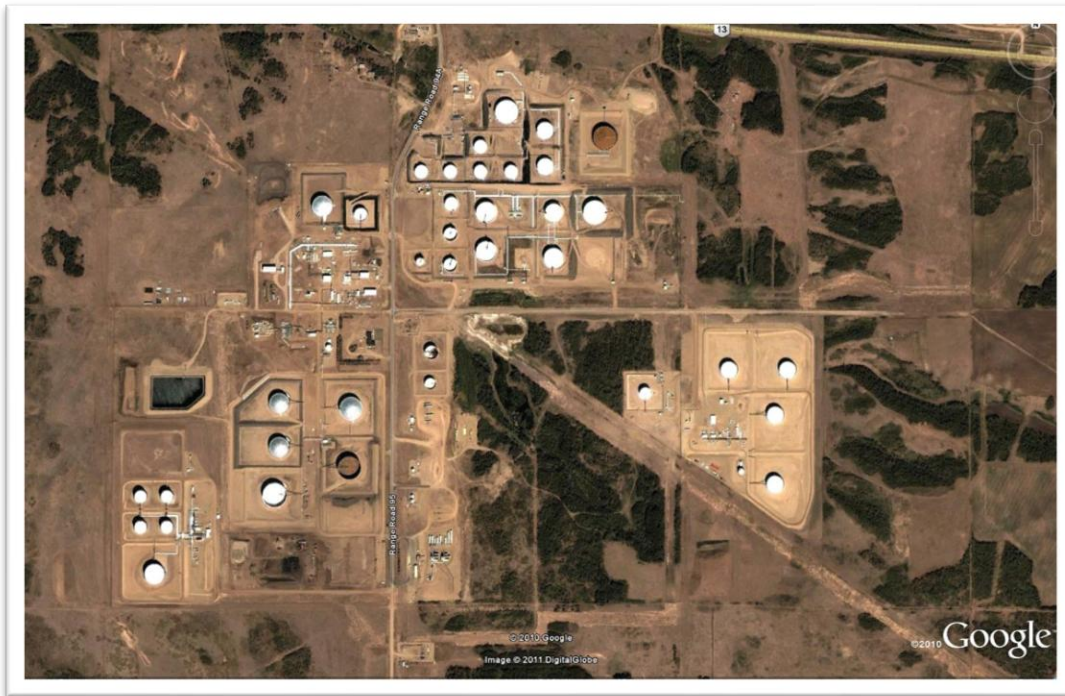
Operating Company	AENV Approval #	AENV Pipeline Code	ERCB Operator ID	Applicable Regulations		
				ERCB	AENV	NEB
Enbridge Midstream Inc.	232745		A1HH	X	X	X
Husky Oil Operations Ltd.	19443		0R46	X	X	
Flint Hills Resource Canada ULC	49229		A24D	X	X	
Kinder Morgan Canada	n/a		0WG9			X
Gibson Energy ULC	10801		0195	X	X	
Transcanada Keystone Pipeline GP	n/a		A55K			X
IPF Cold Lake Pipeline	149935	039	0HE9	X	X	
IPF Bow River Hardisty South	253711	195	0XP6	X	X	
Hardisty Caverns - Enbridge	83		0NZ1	X	X	
Canadian Natural Resources Ltd.	n/a		0HE9	X	X	

### 3.1.1 Chronology of Oil Related Industrial Development

The following information on chronology of development and proposed expansion was obtained from personal communication with operating companies, Alberta Environment Approvals, ERCB licenses, the NEB Regulatory Document Index, company websites and brochures.

Hardisty has been a pipeline centre since the 1950s, with the first facility built in 1957. Figure 3 is an image taken in 2002, and when compared with the later development shown in Figure 2, it is readily apparent that this complex has undergone significant expansion.

**Figure 3. Google Earth Image of the Hardisty Hub in 2002**



A chronology of development follows for each operating company in the Hardisty Hub:

#### **HUSKY HARDISTY PIPELINE TERMINAL**

The original construction at the Husky Hardisty Pipeline Terminal was in 1963. A permit application to Alberta Environment was submitted in 1975, and the Terminal was first licensed by AENV in 1997. Husky has had over 43 years of continuous operation and improvements.

The chronology of the Terminal is as follows:

- 1963 – original construction, 31,798m<sup>3</sup> (200,000 bbl) maximum storage
- 1968 – maximum storage 172, 978m<sup>3</sup>
- 1975 – maximum storage 174,289m<sup>3</sup>
- 1995 – vapour scrubber system installed
- 1995 – floating rooves on all tanks
- 1995 – 1997 – perimeter dikes upgraded
- 1996 – maximum storage 173,624m<sup>3</sup>; permit application
- 2001 – maximum storage 214,700m<sup>3</sup>
- 2004 – incinerator installed
- 2006 – maximum storage 262,360m<sup>3</sup>
- 2007 – permit extension
- 2008 – approval amendment, maximum storage 357,432m<sup>3</sup>
- 2009 – permit renewal
- 2009 – approval amendment, maximum storage 452,832m<sup>3</sup> (2.85M bbl)
- 2010 – approval amendment, expires March 2019

The Husky Hardisty Pipeline Terminal is currently operated under the authority of an Alberta Environment Approval to Operate. This approval (#19443-01) and subsequent amendments are granted under the Alberta Environmental Protection and Enhancement Act. The facility is also licensed under an Energy and Resources Conservation Board (ERCB) Pipeline Licence, which effectively requires Husky to comply with the applicable ERCB Directives.

**Table 3. Husky Hardisty Pipeline Terminal Facilities**

Facility ID	Facility Name	Location
ABTM0000843	Husky Hardisty Terminal	05-29-042-09W4
ABTM0075682	Husky Wcb Terminal	00/05-29-042-09W4
ABTM0075683	Husky Condensate Terminal	00/05-29-042-09W4
ABTM0075684	Husky Hsb Terminal	00/05-29-042-09W4
ABTM0104859	Husky Acs Terminal	00/05-29-042-09W4

The facilities listed in Table 3 are all part of what is referred to as the Hardisty Pipeline Terminal – one facility. The Husky Hardisty Pipeline Terminal is currently situated on

approximately 26.3 hectares (65 acres) of land located southeast of the Town of Hardisty in the MD of Provost, and Flagstaff County.

Blended heavy crude oil and bitumen from heavy oil operations and synthetic crude oil from upgrading operations are shipped from Lloydminster via Husky's Mainline pipeline to Hardisty, to connect with the Enbridge, Kinder Morgan (Express), InterPipeline Fund (IPF) and the TransCanada Keystone Pipelines. Husky has feeder pipeline interconnections with the IPF Cold Lake Pipeline at Cold Lake and Hardisty, as well as the Echo Pipeline, Chauvin Pipeline and Gibson Terminal at Hardisty.

The Pipeline Terminal currently includes fourteen above ground storage tanks used for intermediate storage of heavy crude oil, heavy oil blends, and condensate. Crude oils received at the terminal are blended as required through on-site blending skids and then transferred to tankage for short term storage prior to being pumped to nearby pipeline companies for transportation to North American Refining Markets. In addition to the 14 tanks currently on-site, Husky is currently proposing to construct two additional storage tanks.

Husky Hardisty Pipeline Terminal information provided by Aaron Studer, Team Lead MEO, Husky Oil Limited, Lloydminster.

## **HARDISTY CAVERNS**

The chronology of AENV approvals for the Hardisty Brine Cavern Storage Facility and the Hardisty Butane Fractionation and Product Storage Plant is shown in Table 4. Current approvals have been renewed until April 2015. Hardisty is the most important crude oil storage hub in Canada. Enbridge currently operates 3 million barrels of salt cavern storage at Hardisty, and in late 2009 completed construction of a new terminal with an initial capacity of 7.5 million barrels of above ground storage, making it one of the largest crude oil storage terminals in North America.

The development of Canadian Crude Separators (CCS) in 1984 came from a one rig operation started by Concord Well Servicing in 1979. The transfer of Hardisty Butane Fractionation and Product Storage Plant from Federated Pipe Lines Ltd to Canadian Crude Separators Inc. occurred on December 20, 2001.

On November 26, 2003 – Enbridge Inc. and CCS Inc. announced the official opening of their jointly owned underground crude storage facility at Hardisty – Canada's first crude oil cavern storage facility. Enbridge and CCS formed an operating partnership in June 2002 to develop Hardisty Caverns L.P. on the property acquired by CCS in 2001.

**Table 4. Hardisty Caverns Chronology**

Alberta Environment Authorization and Approvals - Hardisty Caverns				
AENV Approval # 00000083				
LSD	Approval Project	Status	Effective date	Expiry Date
31-042-09W4	Hardisty Brine Cavern Storage Facility	Issued	Mar-05	Apr-15
NE30-042-09W4	Hardisty Brine Cavern Storage Facility	Issued	Mar-05	Apr-15
31-042-09W4	Hardisty Brine Cavern Storage Facility - Disposal of Wastewater	Issued	Jan-08	Apr-15
NE30-042-09W4	Hardisty Brine Cavern Storage Facility - Disposal of Wastewater	Issued	Jan-08	Apr-15
31-042-09W4	Hardisty Brine Cavern Storage Facility - Extension	Renewed	Mar-04	Apr-05
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant	Renewed	Apr-94	
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant - Change in Activity	Renewed	Nov-02	Apr-04
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant - Extension	Renewed	n/a	
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant - Extension	Renewed	Mar-04	Apr-05
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant - Extension	Renewed	Dec-94	Apr-04
NE30-042-09W4	Hardisty Butane Fractionation and Product Storage Plant - Transfer	Renewed	Dec-01	
31-042-09W4	Hardisty Butane Fractionation and Product Storage Tank	Renewed	Dec-94	Apr-04
31-042-09W4	Hardisty Butane Fractionation and Product Storage Tank	Renewed	Jun-93	Apr-94
31-042-09W4	Hardisty Butane Fractionation and Product Storage Tank - Change in Activity	Renewed	Nov-02	Apr-04
31-042-09W4	Hardisty Butane Fractionation and Product Storage Tank - Extension	Renewed	n/a	
31-042-09W4	Hardisty Butane Fractionation and Product Storage Tank - Transfer	Renewed	Dec-01	
NE30-042-09W4	Hardisty/Drainage/CCS Inc. - F00188594	Issued	Nov-02	Dec-03
NE30-042-09W4	Hardisty/Office/Hardisty Caverns Ltd. 00188594	Issued	Nov-10	Oct-35
NE30-042-09W4	Hardisty/Stockwatering/Hardisty Caverns Ltd. 00188594 - Diversion	Issued	Nov-06	Aug-31
NE30-042-09W4	Hardisty/Stockwatering/Hardisty Caverns Ltd. 00188594 - Diversion	Issued	Aug-06	Aug-31

The \$70 million facility initially had four existing salt caverns, ranging in size from 600,000 to 900,000 barrels and planned for expansion immediately. During the construction phase, two new well bores were drilled into each cavern to increase the daily injection/withdrawal capacity to over 100,000 barrels per day. The brine pond was refurbished with two sets of liners and was expanded to receive over three million barrels of displaced brine from the caverns.

Crude oil from various sources in Western Canada is stored at the facility for eventual delivery to market through the Enbridge terminal at Hardisty.



## ENBRIDGE MIDSTREAM

A chronology of Alberta Environment approvals for Enbridge Midstream is shown in Table 5. All current approvals are renewed until February 2017.

**Table 5. Enbridge Midstream Chronology**

Alberta Environment Authorization and Approvals - Enbridge Midstream				
LSD	Approval Project	Status	Effective date	Expiry Date
19-042-09W4	Hardisty Terminal (Merchant Tank Project) - Changes to Discharge	Issued	Aug-10	Feb-17
30-042-09W4	Hardisty Terminal (Merchant Tank Project) - Changes to Discharge	Issued	Aug-10	Feb-17
19-042-09W4	Hardisty Terminal (Merchant Tank Project - Ambient Air Mon)	Issued	Feb-10	Feb-17
30-042-09W4	Hardisty Terminal (Merchant Tank Project) - Ambient Air Monitoring	Issued	Feb-10	Feb-17
19-042-09W4	Hardisty Bulk Petroleum Storage Facility	Issued	Aug-09	Feb-17
30-042-09W4	Hardisty Bulk Petroleum Storage Facility - Equipment Changes	Issued	Aug-09	Feb-17
19-042-09W4	Hardisty Terminal Oil Pipeline and Component Hydrostatic Test	Issued	Jul-09	Does not expire
19-042-09W4	Hardisty Terminal (Merchant Tank Project - Facility Redesign)	Issued	Oct-07	Feb-17
30-042-09W4	Hardisty Terminal (Merchant Tank Project - Facility Redesign)	Issued	Oct-07	Feb-17
19-042-09W4	Hardisty Terminal (Merchant Tank Project - Extension for Use)	Issued	May-07	Feb-17
30-042-09W4	Hardisty Terminal (Merchant Tank Project - Extension for Use)	Issued	May-07	Feb-17
19-042-09W4	Hardisty Terminal (Merchant Tank Project)	Issued	Feb-07	Feb-17
30-042-09W4	Hardisty Terminal (Merchant Tank Project)	Issued	Feb-07	Feb-17
24-042-10W4	Hardisty/Hydrostatic Testing/Enbridge Midstream Inc.	Expired	n/a	

In May 2006, Enbridge announced that it would proceed with the development of a new crude oil terminal at Hardisty. The terminal involved a development cost of approximately \$250 million for an initial capacity of 5 million barrels. The Hardisty Terminal Merchant Tank Project received AENV approval in February 2007. Two approvals were granted, as the Terminal is located in both 30-042-09W4 and 19-042-09W4, as can be seen in the table above.

In October, 2009, Enbridge opened its new contract terminal, the Enbridge Hardisty Contract Terminal, a 19-tank facility capable of holding 7.5 million barrels of crude oil from the oil sands. Table 5 shows that this facility, the Hardisty Bulk Petroleum Facility, obtained an AENV approval in August 2009. The new terminal will ensure the required storage and pipelines are in place to handle continually increasing oil sands production.

## ENBRIDGE PIPELINES

Enbridge is a Calgary based company, initially incorporated as Interprovincial Pipe Line (IPL) in 1949, shortly after Canada's first major oil discovery at Leduc. The original pipeline was constructed to transport oil from western Canada to refineries in the east. IPL became Enbridge Pipelines in 1998.

Enbridge is Canada's largest transporter of crude oil, with approximately 24,613 kilometres of crude pipeline, delivering on average more than 2.2 million barrels per day of crude oil and liquids. A history of Alberta Environment approvals is shown in Table 6, consisting mainly of approvals under the Water Act for hydrostatic testing.

**Table 6. A Chronology of Enbridge Pipelines Approvals**

<b>Alberta Environment Authorization and Approvals - Enbridge Pipelines</b>				
<b>LSD</b>	<b>Approval Project</b>	<b>Status</b>	<b>Effective date</b>	<b>Expiry Date</b>
19-042-09W4	Hardisty Area Pipeline Hydrostatic Test - Additional Testing	Issued	Nov-10	Does not expire
19-042-09W4	Hardisty Area Pipeline Hydrostatic Test	Issued	Nov-10	Does not expire
30-042-09W4	Southern Access Expansion Project - Stage 1B Hydrostatic Testing	Issued	Sep-06	Does not expire
30-042-09W4	Hardisty/Office/Enbridge Pipelines Inc - F00153358	Issued	Jul-03	Jul-28
19-042-09W4	Hardisty Terminal Tank 46 Hydrostatic Testing	Issued	Jul-02	Does not expire
19-042-09W4	Hardisty Terminal Tank 45 Hydrostatic Testing	Issued	Oct-01	Does not expire
30-042-09W4	Terrace Expansion Program Loop No. 1 - Phase 11 Hydrostatic	Issued	Aug-01	Does not expire
29-042-09W4	Tanks 1 and 9/Enbridge's Edmonton Terminal/Hydrostatic Test	Issued	Sep-99	Does not expire
29-042-09W4	Additional Storage Tank - Hydrostatic Testing	Issued	Jul-99	Does not expire
29-042-09W4	Storage Tanks at North End of Pipeline - Hydrostatic Testing	Issued	Mar-99	Does not expire
29-042-09W4	Second Amendment to Spread 1 and 2	Issued	Feb-99	Does not expire
29-042-09W4	Enbridge/Athabasca Pipeline Hydrostatic Test/Spread 3	Issued	Feb-99	Does not expire
29-042-09W4	Amendment to Spreads 1 and 2	Issued	Feb-99	Does not expire
29-042-09W4	Athabasca Pipeline Project Hydrostatic Testing - Spreads 1&2	Issued	Jan-99	Does not expire
30-042-09W4	Wild Rose Pipe Line Inc. Hydrostatic Testing	Issued	Aug-98	Does not expire
30-042-09W4	Wild Rose Pipe Line Inc. Hydrostatic Testing	Issued	Jul-98	Does not expire
30-042-09W4	Wild Rose Pipe Line Inc. Hydrostatic Testing	Issued	Jun-98	Does not expire
30-042-09W4	Interprovincial Pipeline Inc. Hydrostatic Testing	Issued	Sep-97	Does not expire
29-042-09W4	Minor Reroute of 47km from NE18-68-4W4 to NE12-64-4W4	Expired	n/a	
30-042-09W4	Fort McMurray/Pipeline/Wild Rose Pipeline	Expired	n/a	
29-042-09W4	Athabasca Pipeline Project - Crossing Locations Moved	Expired	n/a	
29-042-09W4	Athabasca Pipeline Project	Expired & renewable		
NE 20-042-09W4	Rosyth/Reclamation/Enbridge Pipelines Inc. - Temporary Diversion of Water	Expired	n/a	
30-042-09W4	Hardisty/Weir/Enbridge Pipelines Inc.	Expired	n/a	
NE 20-042-09W4	Rosyth/Reclamation/Enbridge Pipelines Inc. - Temporary Diversion of Water	Expired	13-Jul-01	22-Jul-01

In 2011, Enbridge was recognized as #34 of the *Global 100 Most Sustainable Corporations* in the world (Corporate Knights, 2011). Enbridge is currently investing \$12 billion to expand their North American pipeline and terminal network primarily to support broadening access of oil sands production to U.S. refining markets.

The \$3.1 billion Alberta Clipper pipeline project was approved by the U.S. Department of State in August 2009 and construction was completed in April, 2010. The Alberta Clipper is a 1000 mile crude oil pipeline that provides service between Hardisty and Superior, Wisconsin, as shown in the following map.

**Figure 4. Enbridge Alberta Clipper Pipeline Map**



**GIBSON ENERGY ULC**

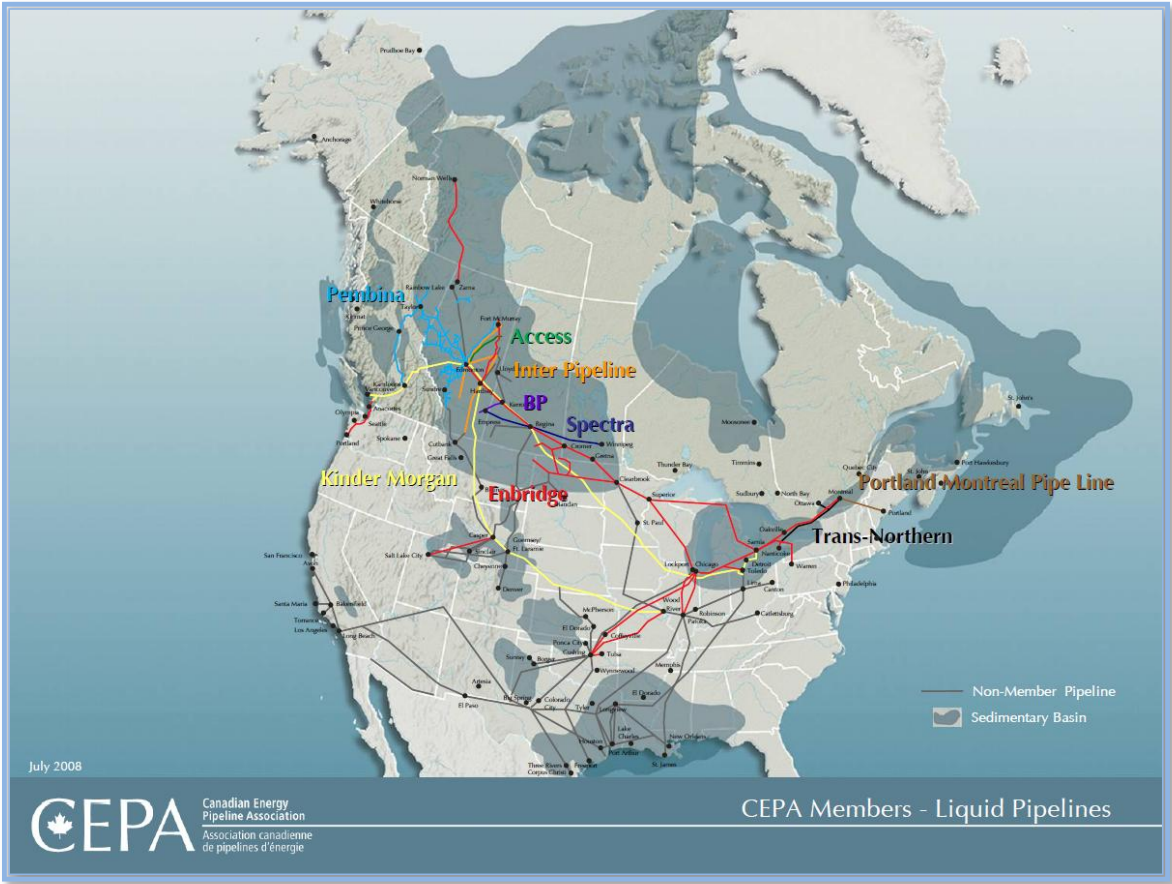
Gibson began midstream services in 1953 and built the first terminals at Hardisty in 1957. A fractionation plant was built in Hardisty in 1982. It receives trucked natural gas liquids from small gas plants and provides retail propane, butane and diluent to local markets. Gibson acquired Canwest Propane in 1990 to provide synergies for the transportation and retail distribution of propane across Western Canada.

Gibson owns and operates two feeder systems in the Hardisty area – the Bellshill Lake and Provost Pipelines. The Bellshill Lake Pipeline, consisting of 150 kilometres of pipe

extending west of the Hardisty Terminal, handles two stream types that are batched down the mainline to the terminal. The Provost Pipeline consists of almost 300 kilometres of pipe extending east of the Hardisty Terminal. The line transports two steam crude types, which are batched down the mainline into the Terminal. Diluent injection ports along the line ensure efficient crude transport.

Gibson’s Hardisty Terminal has 1.6 million barrels of storage and provides diverse terminaling services, which includes truck loading and offloading, crude blending and cooling, storage for volumes from the Bellshill Lake, Bow River, Hamilton Lake and Athabasca pipelines, and as delivery services to the Enbridge, Express and Bow River Southbound pipelines and to the adjacent terminal owned by Husky Energy. Figure 5 displays the network of pipelines across North America.

**Figure 5. North American Oil Pipeline Network (CEPA 2008)**



Gibson pipelines deliver crude from over 35 unique producer facilities into the Hardisty Terminal, which then delivers the crude throughout North America via the Enbridge, Express or Keystone pipelines.

A chronology of Alberta Environment Approvals for Gibson is shown in Table 7. Current approvals are issued until 2015. Approvals have also been provided for construction and additions.

**Table 7. Gibson Energy Chronology of Approvals**

<b>Alberta Environment Authorization and Approvals - Gibson Energy</b>				
<b>LSD</b>	<b>Approval Project</b>	<b>Status</b>	<b>Effective date</b>	<b>Expiry Date</b>
NW20-042-09W4	Amisk/Office/Gibson Energy ULC - F00268355	Issued	Jul-10	Jul-35
NW20/SW29-042-09W4	Hardisty Drainage/Gibson Energy & Husky Oil Operations Ltd.	Issued	Sep-07	Sep-10
NW20/SW29-042-09W4	Hardisty Drainage/Gibson Energy & Husky Oil Operations Ltd. - Extension	Issued	Sep-10	Sep-17
29-042-09W4	Hardisty/Drainage/Gibson Energy & Husky Oil Operations Ltd.	Issued	Sep-10	Sep-17
29-042-09W4	Hardisty/Drainage/Gibson Energy & Husky Oil Operations Ltd.	Issued	Sep-07	Sep-17
29-042-09W4	Hardisty Bulk Petroleum and Storage Facility	Issued	May-06	May-15
29-042-09W4	Hardisty Bulk Petroleum and Storage Facility - Addition	Issued	Jul-08	May-15
29-042-09W4	Hardisty Bulk Petroleum and Storage Facility - Construction	Issued	Jan-08	May-15
20-042-09W4	Hardisty Bulk Petroleum Storage and Transfer Facility - addition	Issued	Jul-08	May-15
20-042-09W4	Hardisty Bulk Petroleum Storage and Transfer Facility - Construction, Operation and Reclamation	Issued	Jan-08	May-15
20-042-09W4	Hardisty Bulk Petroleum Storage and Transfer Facility - Construction, Operation and Reclamation	Issued	May-06	May-15
20-042-09W4	Hardisty Terminal	Renewed	Jun-96	May-05
20-042-09W4	Hardisty Terminal - Construct 2 Crude Oil Storage Tanks	Renewed	Apr-06	May-06
29-042-09W4	Hardisty Terminal - Construct 2 Crude Oil Storage Tanks	Renewed	Apr-06	May-06
20-042-09W4	Hardisty Terminal - Extension	Renewed	May-05	May-06
29-042-09W4	Hardisty Terminal - Extension	Renewed	May-05	May-06
29-042-09W4	Hardisty Terminal - Hardisty Bulk Petroleum Storage & Transfer Facility	Renewed	Jun-96	May-05
20-042-09W4	Hardisty Terminal - Tank 14 - additional tank construction	Renewed	Mar-98	May-05
29-042-09W4	Hardisty Terminal - Tank 14 - additional tank construction	Renewed	Mar-98	May-05
20-042-09W4	Hardisty Terminal Storage Tank Hydrostatic Test	Issued	Oct-10	Does not expire
29-042-09W4	Hardisty Terminal Storage Tank Hydrostatic Test	Issued	Oct-10	Does not expire
29-042-09W4	Hardisty Terminal Storage Tanks (4) Hydrostatic Test	Issued	Feb-09	Does not expire
NW20/SW29-042-09W4	Hardisty Terminal Storage Tanks (4) Hydrostatic Test	Issued	Feb-09	Does not expire
30-042-09W4	Hardisty West Bulk Petroleum Storage and Transfer Facility	Issued	Apr-09	Apr-19
30-042-09W4	Hardisty West Bulk Petroleum Storage and Transfer Facility - Amended	Issued	Dec-11	Apr-19
29-042-09W4	Elk Point to Hardisty Oil Pipeline Project	Cancelled	n/a	
29-042-09W4	Provost Pipeline Project	Cancelled	n/a	
20-042-09W4	Hardisty Sour Gas Plant	Expired	n/a	
20-042-09W4	Hardisty Sour Gas Plant	Expired	n/a	

An approval was granted to Gibson Energy in January 2008 to construct four new 300,000 bbl storage tanks at the Hardisty bulk petroleum storage facility: Tanks 15, 16, 17 and 18. An approval, granted in July 2008 allowed construction of a new 2000 bbl tank, Tank 7700.

An approval granted to Gibson Energy in February, 2011 permits the construction of the 300,000 bbl Tank 14. The approval requires at a minimum, all of the following:

- An HDPE liner coupled with two layers on non-woven geotextile
- Cathodic protection system
- Leak detection system
- Pollution abatement equipment consisting of an internal floating roof with double wiper mechanical seals.

Stringent requirements for tank headspace analysis and allowable concentrations are provided in the approval.

Gibson is able to remotely monitor all key pipeline and terminal functions, 24 hours a day, 365 days a year through a Supervisory Control and Data Acquisition (SCADA) system based in Hardisty. This capability allows the facilities to be operated with clearly defined parameters and a stringent integrity system, helping to ensure safe and environmentally-sound operations.

## **INTERPIPELINE FUND - COLD LAKE PIPELINE LIMITED PARTNERSHIP**

An approval was granted to Imperial Oil Resources Limited on December 3, 1998 for the construction and reclamation of a pipeline known as the ThickSilver Pipeline Project. Alberta Environment transferred the approval from Imperial Oil Resources to Cold Lake Pipeline Limited Partnership by its General Partner Cold Lake Pipeline Limited on March 9, 2001. The history of these approvals is can be seen below in Table 8.

**Table 8. Cold Lake Pipeline Chronology of Approvals**

<b>Alberta Environment Authorization and Approvals - Cold Lake Pipeline</b>				
<b>LSD</b>	<b>Approval Project</b>	<b>Status</b>	<b>Effective date</b>	<b>Expiry Date</b>
19-042-09W4	Cold Lake Pipeline Expansion Project - Transfer	Expired	Mar-11	Expired
19-042-09W4	Cold Lake Pipeline Expansion Project - Formerly TPP	Expired	Aug-01	Dec-03
19-042-09W4	Thicksilver Pipeline Project (TPP)	Expired and renew able	Mar-98	Mar-01
20-042-09W4	Hardisty Storage Facility	Issued	Aug-01	Aug-11
19-042-09W4	Cold Lake Pipeline Expansion Hydrostatic Testing - EnCana	Issued	Oct-01	Does not expire
19-042-09W4		Issued	Oct-01	
19-042-09W4		Issued	Oct-01	
19-042-09W4		Issued	Oct-01	

On August 15, 2001 the approval was amended to change the name of the project to the Cold Lake Pipeline Expansion Project. The approval also was upgraded to require monitoring of soil salvage operations and soil handling procedures.

In 2003, EnCana Corporation sold its indirect 70% interest in the Cold Lake Pipeline System to Inter Pipeline Fund. The Cold Lake Pipeline System delivers oil from the expansive Cold Lake oil sands production region to Alberta's primary transportation hubs at Edmonton and Hardisty.

## **INTERPIPELINE FUND - BOW RIVER HARDISTY SOUTH PIPELINE**

The Bow River Pipeline System gathers oil production in southern Alberta for delivery north to the oil storage and marketing hub at Hardisty, and south to interconnecting export pipelines near the Montana border. The existence of multiple mainline transmission pipelines and flexible pumping configurations allow oil to flow in both directions.

The InterPipeline Fund invested approximately \$72 million in 2009 to expand oil delivery capabilities in order to ship segregated crude oil streams south from Hardisty to refining markets in Montana.

## **FLINT HILLS RESOURCES**

The first approval for the Hardisty Bulk Petroleum Storage Facility, approval number 00049229-00-00, was granted to Koch Oil Company Ltd. in March 1998. The approval set out stringent terms and conditions for the construction, operation and reclamation of the Facility.

The approval was amended in September, 1998 to require the construction of a thermal oxidizer. A thermal oxidizer is a process unit for air pollution control that decomposes hazardous gases at a high temperature and releases them into the atmosphere. The amendment permits effluent streams to be emitted from only the thermal oxidizer exhaust stack, the vent stack, and the floating roof tank seals.

On December 21, 2001, the approval was transferred from Koch Oil Co. Ltd. to Koch Petroleum Canada, L.P., by its General Partner Koch Petroleum Canada Ltd. Shortly after, on January 2, 2002, the approval was transferred from Koch to Flint Hills Resources Ltd.

The Hardisty Bulk Petroleum Storage Facility approval was amended in November, 2002 to allow the construction and operation of a truck-unloading facility at LSD 10-10-42-09-W4. A subsequent amendment in June 2004, permitted the construction and operation of an expansion to the truck-unloading facility.

In July 2005, the Facility approval was amended such that all storage tanks meet the ***Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Above Ground Storage Tanks*** (Canadian Council of Ministers of the Environment, CCME-EPC-87E, June 1995). The approval also required construction of a vapour collection line, modification of the thermal oxidizer and stringent emission regulations. A history of approvals at the Hardisty Bulk Petroleum Storage Facility is shown in Table 9, with the current approval effective until 2020.

**Table 9. A Chronology of Approvals for Flint Hills Resources**

<b>Alberta Environment Authorization and Approvals</b>				
<b>Flint Hills Resources Canada ULC</b>				
<b>Facility</b>	<b>Approval Project</b>	<b>Status</b>	<b>Effective date</b>	<b>Expiry Date</b>
Hardisty Bulk Petroleum Storage Facility 10-19-042-09W4	Construction, Operation & Reclamation	Renewed	Mar-10	Mar-20
	Extension	Renewed	Feb-09	Mar-10
	Extension	Expired	Feb-08	Mar-08
	Transfer	Renewed	Feb-07	n/a
	Expand Truck Unloading Facility	Renewed	Sep-06	Mar-08
	Transfer	Renewed	Jun-06	n/a
	Construction and Air Emissions	Renewed	Jul-05	Mar-08
	Expansion to Truck Unloading Facility	Renewed	Jun-04	Mar-08
	Construction of Truck Unloading Facility	Renewed	Nov-02	Mar-08
	Transfer	Renewed	Jan-02	n/a
	Transfer	Renewed	Dec-01	n/a
	Hardisty Bulk Petroleum Storage Facility	Renewed	Mar-98	Mar-08
	Thermal Oxidization	Renewed	Mar-98	Mar-08

## **TRANSCANADA KEYSTONE PIPELINE GROUP**

The \$5.2 billion Keystone Pipeline project was proposed by TransCanada Corporation on February 9, 2005. The NEB approved the construction of the Canadian section of the pipeline on September 21, 2007. An application for the Cushing Expansion was made on November 23, 2007. On March 17, 2008, the U.S. Department of State



issued a Presidential Permit authorizing the construction, maintenance and operation of facilities at the U.S. and Canada border. Applications for the Hardisty East and Hardisty West Interconnecting Facilities were filed in late 1998. The pipeline became operational on June 30, 2010. The Keystone Cushing (Phase II), the extension of the Keystone Pipeline from Steele City, Nebraska to Cushing, Oklahoma went into service in February 2011.

The Keystone Pipeline is regulated by the NEB. Alberta Environment approvals for the Keystone pipeline, shown in Table 10, are primarily under the Water Act for hydrostatic testing.

**Table 10. Keystone Pipeline Approvals from Alberta Environment**

<b>Alberta Environment Authorization and Approvals - TransCanada</b>				
<b>LSD</b>	<b>Approval Project</b>	<b>Status</b>	<b>Effective date</b>	<b>Expiry Date</b>
32-042-09W4	Hardisty/Registration/TransCanada Pipelines Ltd.	Issued	Apr-00	Does not expire
19-042-09W4	Keystone Pipeline Hydrostatic Test	Issued	Oct-09	
19-042-09W4	Keysone Pipeline (Blindloss Section)	Issued	Oct-09	
19-042-09W4	Keysone Pipeline (West Interconnect)	Issued	Oct-09	
29-042-09W4	Keystone Pipeline Hydrostatic Test	Issued	Oct-09	
29-042-09W4	Keystone Pipeline (Blindloss Section) Hydrostatic Test	Issued	Oct-09	
29-042-09W4	Keystone Pipeline (West Interconnect) Hydrostatic Test	Issued	Oct-09	
19-042-09W4	Keystone Pipeline Hydrostatic Test	Issued	Sep-09	
29-042-09W4	Keystone Pipeline Hydrostatic Test	Issued	Sep-09	
29-042-09W4	Rosyth/Removal/TransCanada Keystone Pipeline GP	Issued	Apr-09	Mar-11
29-042-09W4	Rosyth/Removal/TransCanada Keystone Pipeline GP	Issued	Mar-09	Mar-11
32-042-09W4	Amisk/Infilling Wetland/TransCanada Keystone Pipelines GP	Issued	Oct-10	May-11
32-042-09W4	Amisk/Infilling Wetland/TransCanada Keystone Pipelines GP	Issued	May-10	May-11

The Keystone XL extension was proposed in 2008; the proposed route can be seen in Figure 6. The application was filed in the beginning of 2009 and the NEB started hearings in September 2009. It was approved by the NEB on March 11, 2010 to operate the Canadian portion of the Keystone XL. On August 5, 2010 TransCanada withdrew its request to the Pipeline and Hazardous Materials Safety Administration for a special permit. The permit would have allowed TransCanada to operate the proposed Keystone XL pipeline at a slightly higher pressure than current federal

regulations for oil pipelines in the U.S., subject to building the pipeline using stronger steel and operating under additional safety conditions.

The Keystone XL project is currently under regulatory review by the US Department of State. Opposition to the massive project has been fierce, with environmentalists in the US worried that a spill could damage key drinking water sources and increase US reliance on “dirty” crude from the oil sands. The cost of the entire system was estimated to be US\$12 billion, which has recently been raised to US\$13 billion as a result of currency swings, evolving regulatory requirements and permitting delays.

## **KINDER MORGAN CANADA – EXPRESS PIPELINE LTD.**

Kinder Morgan Energy Partners was founded in 1997 in Houston, Texas. Kinder Morgan operates a number of pipeline systems and terminal facilities in Canada, including the Express pipeline. The Express pipeline carries crude oil from Hardisty to Wyoming, where it joins the Kinder Morgan Platte Pipeline to supply markets in the Midwestern United States.

On June 8, 1995 the Express Pipeline Project was proposed, involving the construction and operation of an oil pipeline from terminal facilities at Hardisty to the Canada-US border near Wild Horse, Alberta. Public hearings were held from January to March 1996.

An application for a pipeline capacity expansion was made in December 2003, along with an application for a lateral tie-in from Gibson Petroleum Ltd.’s Hardisty Terminal to Express Pipeline Ltd.’s Hardisty Terminal in December 2005. In October 2010, Kinder Morgan made applications for the Express Husky lateral replacement, the abandonment of the Express Husky lateral from KP 0 to KP 1.265 and the decommissioning of the 24-inch Express Husky lateral pipeline.

A chronology of Alberta Environment approvals for Kinder Morgan is shown in Table 11. Although Kinder Morgan is regulated by the NEB, there are four approvals for hydrostatic testing under the Water Act.

**Table 11. Chronology of Kinder Morgan Express Pipeline Approvals**

Alberta Environment Authorization and Approvals - Kinder Morgan Express Pipeline				
LSD	Approval Project	Status	Effective date	Expiry Date
19-042-09W4	Hardisty Oil Tanks (2) Hydrostatic Testing	Issued	Mar-05	Does not expire
20-042-09W4	Hardisty Oil Tanks (2) Hydrostatic Testing	Issued	Mar-05	Does not expire
20-042-09W4	Battle River Water Diversion for Hydrostatic Testing	Issued	Mar-05	Does not expire
24-042-10W4	Battle River Water Diversion for Hydrostatic Testing	Issued	Mar-05	Does not expire
20-042-09W4	Hardisty Oil Tank Hydrostatic Testing	Expired	Jan-97	Jan-98

## **CANADIAN NATURAL RESOURCES LIMITED (CNRL)**

CNRL has one 100% owned ECHO pipeline going into the Hardisty Tank Farm. In addition, CNRL owns 15% of the InterPipeline Fund. Their facilities are comprised of two meter buildings and a heat exchange site. The operation is relatively small, requiring an operator to be on site two hours per day.

## **PLAINS MIDSTREAM**

Plains Midstream Canada operates rail unloading and truck loading facilities at the Hardisty Terminal. Plains purchases LPG products including propane, butane, natural gas, ethanol, naphtha, pentane and aromatics in bulk at the Terminal and transports the LPG via the common carrier pipelines, railcars and trucks to their own terminals and third party facilities for subsequent resale to wholesale customers. Information from Plains Midstream related to their Hardisty operations was unavailable through personal communication.

### **3.1.2 Proposed Expansion or New Facilities**

#### **HUSKY OIL OPERATIONS LTD.**

Husky is currently proposing to build two additional storage tanks at the Husky Hardisty Pipeline Terminal. An approval was granted on March 8, 2011 for construction of a firewater pond.

#### **ENBRIDGE MIDSTREAM INC.**

Enbridge Pipelines Inc. submitted an application for the Hardisty Terminal Meter Manifold 150 on June 25, 2010. The purpose of the project is to meet Enbridge customer needs by providing incremental delivery capabilities at Enbridge's Hardisty Terminal. Specifically, the project is intended to allow for lines 2, 3, and 4 to deliver heavy and/or light crudes to Gibson's Hardisty Terminal, Husky Hardisty Terminal, Express, Flint Hills and Enbridge Midstream's Hardisty Contract Terminal via valve manifolds 150 and 240. Tie-ins will be occurring in 2011. The project is not subject to an environmental assessment under the Canadian Environmental Assessment Act as the NEB determined the project was contained within the Exclusion List Regulations of the CEA Act. Enbridge will be rotating tanks in order to remove one tank from operation each year.

The Alberta Clipper pipeline project was mechanically completed and ready to receive oil into the pipeline as of April 1, 2010. Line fill was completed in October 2010. Although the construction of Alberta Clipper is complete, final land restoration is still in progress. Enbridge's Alberta Clipper is a 1,607-km (1,000-mile) crude oil pipeline that provides service between Hardisty, Alberta, and Superior, WI. The initial capacity will be 450,000 barrels per day (bpd), with an ultimate capacity of up to 800,000 bpd available.

The wet weather experienced throughout the summer and fall of 2010 in Manitoba and Saskatchewan delayed restoration and monitoring activities, but the unseasonably warm weather as winter began allowed restoration crews to continue working well into the winter season. Weather permitting, the crews will continue with restoration activities throughout the spring and summer 2011.

## **INTER PIPELINE FUND – COLD LAKE PIPELINE**

Inter Pipeline Fund's 85% owned and operated Cold Lake Pipeline System is in the process of replacing and consolidating the existing control and monitoring systems with a new SCADA system. Real-time data from the SCADA system will be used for modeling, leak detection and batch tracking activities to optimize operations. IPF also plans to tie-in with Gibsons this year.

## **KINDER MORGAN EXPRESS PIPELINE**

The Express Pipeline has made the following NEB applications:

- 21 Oct 2010 – Application for the Express Husky lateral replacement
- 28 Oct 2010 – Application for the abandonment of the 24-inch Express Husky Lateral Pipeline from KP 0 to KP 1.265, Hardisty, AB
- 10 Nov 2010 – Application for the decommissioning of 24-inch Express Husky lateral pipeline

Express Pipeline Ltd. applied to the NEB in October 2010 for an authorization for the in place abandonment of 1.265 kilometres of 24-inch pipeline, and construction of a new pipeline that would replace the abandoned pipeline. The NEB granted approval to Express on February 3, 2011 for the Express Husky Lateral Pipe Replacement. Express commenced the project on March 28, 2011.

On November 10, 2010, NEB received an application from Kinder Morgan for a proposed \$4.4 million project to disconnect and abandon the existing 1300 meter, 610 mm diameter lateral tie-in between Husky's Hardisty Terminal and Express Pipelines' Hardisty Terminal. The Husky lateral pipeline is disconnected and abandoned due to severe internal corrosion over the majority of the pipeline's length. A new lateral tie-in is proposed to restore the direct crude oil pipeline connection with construction expected to occur this year.

## **TRANSCANADA KEYSTONE**

The Keystone pipeline and Keystone Terminal A with 590,000 bbl/day capacity is now in service. The Keystone pipeline route is illustrated in Figure 6.

Figure 6. Map of Keystone and Proposed Keystone XL Pipelines



## TRANSCANADA KEYSTONE XL

TransCanada announced February 15<sup>th</sup>, 2011 that approval of its controversial Keystone XL crude pipeline expansion will take longer than expected. The Keystone XL would run 3,200 km from Hardisty to Port Arthur, Texas, shown in Figure 6. The energy company also raised its estimate for the project's cost by \$1 billion. It expects U.S. authorities to approve the project in the last six months of 2011; the previous

estimate was for early in the year. Construction will commence in the fall of 2011 for the new Terminal B.

The regulatory process conducted by the Department of State is continuing, within a heightened political environment and opposition to the project has been expressed. If Keystone XL wins regulatory approval, TransCanada expects the massive Alberta-to-Texas line to start up some time in 2013. The State Department has jurisdiction because the pipeline would cross the Canada-U.S. border. Canadian approvals are already in place.

The expansion project will include three new oil storage tanks, each having a capacity of 350,000 bbl., which will be identified as the Keystone XL Hardisty B Terminal. This Terminal will be reserved for upset or irregular operating conditions only, as typical operation will be to receive volumes directly from shipper-owned tanks to the pump station. The intent is to reduce the number of project tanks for terminal and tank turnovers by using existing tank infrastructure in the area. The Keystone XL Hardisty B Terminal operational tanks will only be used in times of batch or volume interruption, thereby minimizing possible emissions.

## **GIBSON ENERGY ULC**

On January 26<sup>th</sup>, 2011 Gibson Energy entered into a business relationship with Suncor Energy Inc. to build and operate four 300,000 barrel tanks at Gibson's Hardisty Terminal. While located proximal to Gibson's Hardisty Terminal, the four tanks are to be built as a standalone facility and will be named the Hardisty West Terminal, scheduled to commence operations in June 2012.

## **FLINT HILLS**

Flint Hills plans to upgrade their incinerator and improve the containment berms around their tanks this year.

The following information on sour gas processing plants and the Battle River power plant is outside the scope of this study as these facilities fall outside of the area of interest. The information was requested at the presentation of this report to the Flagstaff County Council.

## **SOUR GAS PROCESSING PLANTS**

Acid or sour gas plants treat gas with amines to remove hydrogen sulphide (H<sub>2</sub>S), mercaptans and carbon dioxide (CO<sub>2</sub>). The process is commonly referred to as sweetening because resulting products no longer have the sour foul odours of mercaptans and hydrogen sulphide. Catalytic sulphur recovery converts the H<sub>2</sub>S into

elemental sulphur. An acid gas flare stack at the amine stripper plant releases sulphur dioxide (SO<sub>2</sub>) emissions.

Sour gas processing in Alberta is responsible for almost 50% of Alberta's industrial SO<sub>2</sub> emissions. The main industry category for NO<sub>x</sub> emissions is natural gas production, particularly compressor engines, contributing almost 50% to the total annual NO<sub>x</sub> emissions in Alberta.

Several sour gas plants are located in or nearby Flagstaff County including the following:

- The Sedgewick Sour Gas Processing Plant, operated by Alta Gas Ltd., is located at 06-27-41-13-W4M and has an Alberta Environment Approval to release up to 1.99 tonnes SO<sub>2</sub> per day from 2012-2019.
- The Thompson Lake Sour Gas Processing Plant, operated by Husky Oil Operations Ltd. has a low pressure acid gas flare stack. The duration of flaring events is limited to less than 72 hours.
- The Battle River (Provost) Sour Gas Processing Plant, operated by Apache Canada Ltd. is located at 2-10-39-10-W4M and has an Approval to release up to 1.90 tonnes SO<sub>2</sub> per day.
- The Signalta Resources Ltd. Forestburg Sour Gas Processing plant located at 13-14-42-16-W4M has 3 flare stacks and Approval to release 3.6 tonnes SO<sub>2</sub> per day.

As a requirement of Alberta Environment Approval, these plants must also monitor the air for SO<sub>2</sub> and H<sub>2</sub>S; provide monthly and annual air reports for NO<sub>x</sub>, SO<sub>2</sub>, particulate matter and volatile organic carbons (VOCs); and also monitor industrial run-off. In addition to being key primary air contaminants, SO<sub>2</sub> and NO<sub>x</sub> are also major contributors to acid deposition.

The Brownfield Sweet Gas Processing Plant, operated by Apache Canada Ltd., is located at 2-2-39-11-W4M. This plant has an Alberta Environment Approval which permits release of up to 1.46 tonnes NO<sub>x</sub> per day.

Air quality monitoring downwind of Apache Canada in Battle River was conducted in the fall of 2005 and spring of 2006 by Alberta Environment. Sulphur compounds were notably higher in the spring. The results indicated that elevated SO<sub>2</sub> and H<sub>2</sub>S concentrations were likely due to industrial emissions. The maximum one-hour SO<sub>2</sub> and H<sub>2</sub>S concentrations were 3% and 80% of Alberta's one-hour air quality objectives, respectively. The one-hour average SO<sub>2</sub> concentration measured downwind of Signalta Resources was 52% of Alberta's air quality objective. Elevated NO and NO<sub>2</sub>



concentrations were also measured at this site. The maximum one-hour average NO<sub>2</sub> concentration was 4% of the air quality objective.

## **POWER PLANT**

Alberta Power (2000) Ltd. owns several quarters of land along the Battle River and has operated the ATCO Power Battle River Generating Station since 1956. The plant is coal-fired and located in Paintearth County at SW 29-40-15-W4M, 15 km south of Forestburg. Approximately 9000 tonnes of coal per day are required to produce the plant capacity of around 685 MW. Water for the generating station is supplied by the Forestburg Reservoir, created in 1954 - a 12 metre high dam located on the Battle River. Alberta Power is the largest user of the Battle River, however, most of the water that is used by the power plant for cooling is returned to the Reservoir.



**ATCO Power Battle River Generating Station (ATCO Power)**

Fuel is provided by Paintearth and Vesta coal mines operated by the mining company Prairie Mines and Royalty Ltd., a subsidiary of Sherritt International Ltd. The mining company works with ATCO to ensure that the mined land is returned to levels of productivity as good or as better than existed prior to mining.

The burning of coal is the largest single anthropogenic source of mercury air emissions. Although coal contains only small concentrations of mercury, it is burnt in very large volumes. The power plant released 72 kg of mercury into the air in 2009; anticipated release of mercury for 2011 was expected to be 75 kg.

Other air emissions from the power plant in 2009 included 24,842 tonnes of sulphur dioxide and 9,634 tonnes of nitrogen oxides. The total greenhouse gas emissions reported for this facility in 2009 were 5,172,452 tonnes CO<sub>2</sub>e (Environment Canada 2010).

### **3.1.3 Summary of Regulatory Requirements Governing Operations in the Hardisty Hub**

#### **A. FEDERAL REGULATIONS**

##### **National Energy Board (NEB)**

Information pertaining to NEB regulations and NEB-regulated pipelines was obtained from the NEB website [www.neb-one.gc.ca](http://www.neb-one.gc.ca) and NEB regulatory contact, Paul Hess.

Pipelines that cross provincial or national borders are regulated by the National Energy Board, ensuring the safety, security and environmental protection of those pipelines. In the Hardisty Hub area, Enbridge Midstream, Kinder Morgan and the TransCanada Keystone Pipeline Group are regulated by the National Energy Board. The NEB also conducts pipeline system and facility inspections, construction inspections, pipeline crossing audits and inspections, documentation and safety audits and pipeline accident investigations.

Pipeline systems which are wholly contained within a province typically fall under that province's regulatory jurisdiction. Each regulatory body has the power to inspect pipelines under construction including pipeline construction sites, operating pipelines and facilities, and impose fines and/or shut pipelines down until required or remediation is completed.

Environmental regulation involves both assessment of the environmental impact of projects prior to their approval and construction, and environmental audits while they are operational. Environmental regulation can be very complex, involving a number of regulatory agencies at both federal and provincial levels; many of these agencies have signed agreements regarding inter-jurisdictional cooperation.

The **National Energy Board Act IV** [SOR/96-244] governs the construction and operation of pipelines. Persons intending to conduct excavation or construction

activities near pipelines are required to comply with the **National Energy Board Pipeline Crossing Regulations, Parts I and II** [SOR/88-528, SOR/88-529].

In addition, the **Onshore Pipeline Regulations**, 1999 [SOR/99-294], sets out the minimum requirements for all stages of a pipeline lifecycle. Section 48, in particular, provides an Environmental Protection Program.

### **Canadian Environmental Assessment Agency**

The **Canadian Environmental Assessment Act** (1992, c.37) and its regulations are the legislative basis for federal environmental assessment. The act:

- Allows for a thorough review of all projects to ensure that development in Canada or on federal lands does not cause significant adverse environmental effects in areas surrounding the project
- Allows an opportunity for public participation and co-operation with Aboriginal peoples
- Promotes co-operation and co-ordinated action between federal and provincial governments on environmental assessments

### **Canadian Standards Association**

The Canadian Standards Association is a not-for-profit membership-based association serving business, industry, government and consumers in Canada and the global marketplace. The CSA works to develop standards such as enhancing public safety and health, advancing the quality of life, helping to preserve the environment and facilitating trade. Applicable standards include:

- **Canadian Standards Association Z276** - Pipelines transporting liquefied natural gas
- **Canadian Standards Association Z662** – Pipelines transporting liquid or gaseous hydrocarbons

### **Transportation Safety Board (TSB)**

The **Canadian Transportation Accident Investigation and Safety Board Act** (1989, c. 3) provides the legal framework to govern the advancement of transportation safety in the marine, pipeline, rail and air modes of transportation. The TSB governs pipeline accidents and incidents under a number of regulations, for example: **Regulations Respecting the Canadian Transportation Accident Investigation and Safety Board (SOR/92-446)**.

The TSB can conduct independent investigations, including public inquiries when necessary to make findings as to causes and contributing factors of transportation

occurrences, identifies safety deficiencies, makes recommendations and reports publicly on their investigations and findings.

## **B. PROVINCIAL REGULATIONS**

The Government of Alberta Ministries below each play a role in regulating the activities at the Hardisty Hub:

- Environment
- Sustainable Resource Development
- Energy (including the Energy Resources Conservation Board - ERCB)

Air emissions are subject to provincial regulation. They must meet **Canadian Council of Ministers of the Environment (CCME)** objectives or equivalent. Provincial permits are issued for emissions; the most stringent guidelines apply, whether it is federal or provincial. Prior to project approval, all regulatory conditions must be met.

Alberta Environment oversees reclamation and remediation activities on private land. Alberta Sustainable Resource Development oversees activities on public land. Alberta's Upstream Oil and Gas Reclamation and Remediation Program ensures that land used for oil and gas development is restored to a productive state. Alberta Environment oversees the development of guidelines and documentation used to administer these parallel programs.

### **Alberta Energy Resources Conservation Board (ERCB)**

The ERCB is an independent, quasi-judicial agency of the Government of Alberta. The ERCB adjudicates and regulates matters related to energy and utilities within Alberta to ensure that the development, transportation and monitoring of the province's energy resources are in the public interest. This is achieved through its activities in the application and hearing process, standards setting and regulation, monitoring, and surveillance and enforcement. The ERCB provides the energy development license to operate.

The **Energy Resources Conservation Act** establishes the ERCB rules of practice and ERCB Administration Fees Regulation. The **Alberta Pipeline Act** (Ch.P-15, RSA 2000), updated Nov 2010, establishes a scheme of approvals administered by the ERCB for the construction and operation of pipelines in Alberta. Regulatory governance is provided in the **Alberta Pipeline Regulations** (91/2010).

The **Oil and Gas Conservation Act** (RSA 2000), sets out a regulatory regime and scheme of approvals administered by the ERCB for the development of oil and gas resources in Alberta.

The ERCB has a list of Directives which set out new or amended ERCB requirements or processes to be implemented and followed by licensees, permittees and other approval holders under the jurisdiction of the ERCB, for example, ***ERCB Directive 056 – Energy Development Applications and Schedules*** presents the requirements and procedures for filing a licence application to construct or operate any petroleum industry energy development that includes facilities, pipelines or wells.

## **Alberta Environment (AENV)**

The ***Environmental Protection and Enhancement Act*** supports and promotes the protection, enhancement and wise use of the environment. The following is a list of some applicable regulations, codes of practice, standards and guidelines made under the *Environmental Protection and Enhancement Act*:

### **REGULATIONS**

- Approvals and Registrations Procedure
- Approvals, Inspections, Abatement and Enforcement
- Conservation and Reclamation
- Conservation Easement Registration
- Emissions Trading
- Environmental Appeal Board
- Environmental Assessment
- Environmental Assessment (Mandatory and Exempted Activities)
- Environmental Protection and Enhancement (Miscellaneous)
- Release Reporting
- Remediation Certificate
- Substance Release
- Waste Control

### **CODES OF PRACTICE**

- Release of Hydrostatic Test Water
- Release or Temporary Diversion of Water for Hydrostatic Testing – Notification

### **STANDARDS AND GUIDELINES**

- Air Monitoring Directive
- Alberta Soil and Groundwater Remediation Guidelines
- Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities
- Ambient Air Quality Objectives
- Compulsory Industry Monitoring and Alberta's Environmental Regulatory Program
- Continuous Emissions Monitoring Systems (CEMS) Code
- Emission Standards and Guidelines
- Environmental Assessment/Evaluation
- Existing Ambient Air Quality Objectives

- Guidelines for Secondary Containment for Above Ground Storage Tanks
- Monitoring and Reporting Directives
- Petroleum Storage Tank Guidance Documents

Approvals under the **Water Act (Nov 2010)** are required for any activity that may or does affect water management (surface and ground water), subject to exemptions in the Water (Ministerial) Regulation. Typical activities include pipeline and road crossings of watercourses and water bodies, erosion control installations, and activity in flood plains. Construction of pipelines and/or telecommunication lines crossing a water body, water course crossings and outfalls are exempt from an approval under the Water Act provided they are done according to the applicable codes of practice. In addition, the **Alberta Fire Code** and the **Climate Change and Emissions Management Act** may also be applicable.

The Husky Hardisty Pipeline Terminal is currently operated under the authority of an Alberta Environment Approval to Operate. This approval (#19443-01) and subsequent amendments are granted under the Alberta Environmental Protection and Enhancement Act. The facility is licensed under an ERCB Pipeline Licence, which effectively requires Husky to comply with the applicable ERCB directives. The approval sets out environmental monitoring requirements and requires the facility to act in accordance with the following guidelines:

- Guidelines for Secondary Containment for Above Ground Storage Tanks, Alberta Environment, 1997, as amended.
- Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks, CCME-EPC-87-E, as amended. Applies to all aboveground storage tanks containing liquid hydrocarbons or organic compounds.

Additional storage tank guidelines:

- Remediation Guidelines for Petroleum Storage Tank Sites. Alberta Environment 1994.
- Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil. Canadian Council of Ministers of the Environment 2000.
- Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities. Alberta Environment 2001.
- Guidelines for Managing Risks at Contaminated Sites in Alberta. Alberta Environment 2000.
- Risk Management Guidelines for Petroleum Storage Tank Sites. Alberta Environment 2001.
- CAN/CSA-Z769-00: Phase II Environmental Site Assessment, Canadian Standards Association

## **Pipeline Authorization & Consultation Requirements**

Approval from various regulatory bodies is required, depending on the type and ownerships of the land which the pipeline crosses. On Crown Land, National Resources Canada must approve timber clearing, disposal and salvage. Environment Canada, Department of Fisheries and Oceans and Alberta Environment must approve plans for stream, lake and river crossings. Environment Canada and Alberta Environment approve plans for archeological and historic sites crossings. Environmental regulators must also approve plans for top soil stripping, erosion control, land reclamation, re-vegetation and re-forestation. Each regulatory body has the power to inspect pipelines under construction including pipeline construction sites, operating pipelines and facilities, and impose fines and/or shut pipelines down until required remediation is completed.

The pipeline authorization and consultation requirements in Alberta are as follows:

### **Alberta Sustainable Resource Development - Public Lands Act Approval**

- Pipeline Agreements (PLA) – authorize pipeline construction; these agreements may remain in effect for as long as required
- Pipeline Installation Leases (PIL) – grant exclusive surface rights for surface right-of-way installations; maximum term is 25 years and is renewable
- Temporary Field Authority (TFA) – any other disposition authorized by the Crown; provides for the issuance of a short-term (less than 1 year) disposition under the Public Lands Act and Mines and Minerals Act.

### **ERCB - Energy Development License**

- Directive 056: Energy Development Applications and Schedules – requires any petroleum industry development that includes wells, pipelines or other structures (i.e. batteries, plants) to obtain an ERCB licence to construct and operate. The ERCB's requirements are primarily intended to ensure environmental protection, public safety, resource management, compliance assurance and that potentially affected stakeholders' issues have been examined.
- Directive 077: Pipeline Requirements and Reference Tools – supplements the Pipeline Act and amalgamates ERCB directives.

### **ERCB - Emergency Response Authorization**

- Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry – an activity-specific emergency response plan is required for review in cases where a pipeline or facility contains a hazardous product.

## Alberta Environment

- **Water Act Notice** – the Codes of Practice relevant to pipeline activities include *Pipelines and Telecommunication Lines Crossing a Water Body; Outfall Structures on Water Bodies and Temporary Diversion of Water for Hydrostatic Testing of Pipelines*.
- **Water Act Licence** – required for all diversions (e.g. withdrawals, storage); typical diversions for pipelines include temporary water diversions for the hydrostatic testing of pipelines
- **Water Act Approval** – required for any activity that may or does affect water management (surface and ground water), subject to exemptions in the Water (Ministerial) Regulation; for example, pipeline and road crossings of watercourses and water bodies.
- **Environmental Protection and Enhancement Act** – an approval is required for the conservation and reclamation of pipelines, as well as hydrostatic testing; registration is required under the *Code of Practice for the Release of Hydrostatic Test Water from the Hydrostatic Testing of Petroleum Liquid and Gas Pipelines*.

## C. PROPOSED REGULATORY CHANGES

On May 3, 2010, an amendment to National Energy Board Onshore Pipeline Regulations, 1999 was proposed: ***Adoption of CSA Z246.1-09 Security Management for Petroleum and Natural Gas Industry Systems***. The proposed amendment will require companies to have a Security Program in accordance with CSA Z246.1-09 that is systematic, comprehensive and proactive in managing security threats and associated risks. The Security Program will be appropriately integrated into a company's overall management system to provide for safe and secure practices in the design, construction, operation and maintenance of a pipeline system. This proposed regulatory change will be in effect as of April 1, 2011.

The National Energy Board has proposed the ***Damage Prevention Regulations***, which are an amalgamation and modernization of two existing regulations under the National Energy Board Act: the Pipeline Crossing Regulations, Part I and II. The proposed Regulations would update requirements related to preventing damage to pipelines, providing for the protection of property and the environment, and the safety of the public and employees. The Pipeline Crossing Regulations will be repealed. Consultation was closed on September 13, 2010.

The Alberta government formed a joint industry/government ***Task Force on Regulatory Enhancement*** chaired by Alberta Energy Parliamentary Assistant Diana McQueen. The task force has completed a full review of the natural resource



regulatory system in Alberta. The review focused on three departments: Sustainable Resource Development, Environment and then Energy, including the ERCB. Industry feels there is a duplicative process with the ERCB and then Alberta Environment. Ways to streamline oil and gas applications and addressing delays was the key role of the task force. The new process will continue to maintain high environmental standards and respect landowner rights. The task force completed their review in December 2010 and implementation is expected this year.

On January 21, 2011, an amendment regulation to the Oil and Gas Conservation Act was filed by the ERCB. The amended regulation changes the **Orphan Fund Levy** payable by a licensee or approval holder for the 2011/12 fiscal year, prescribing a \$12 million Orphan Fund Levy. The Orphan Fund, formerly the Well Abandonment Fund, is fully funded by the oil and gas industry through a levy based on a licensee's share of its deemed liabilities to total industry deemed liabilities. The levy is also based on the revenue requirements identified by the Alberta Orphan Oil and Gas Abandonment and Reclamation Association (Orphan Well Association) in their 2011/12 budget.

Recent and proposed applicable regulatory changes with the ERCB are described in the following four tables, which were derived from the ERCB Regulatory Change Report on March 17, 2011. These tables demonstrate the ERCB consultation process to obtain input from stakeholders and interested parties.

**Table 12. ERCB Planned Regulatory Changes**

File Name	Title	Status	Description
Directive 029	Energy and Utility Development Applications and the Hearing Process	Planned	Explains the process to determine whether applications will be approved or denied
Directive 031	Guidelines for Energy Proceeding Cost Claims	Planned	Cost recovery for public hearing preparation and presentation
Directive 067	Applying for Approval to Hold EUB Licences	Planned	Details how a party obtains approval to hold an ERCB licence
Draft-MOUrelNotif	MOU between AEP and EUB Regarding Coordination of Release Notification Requirements	Planned	Outlines release notification requirements for the upstream oil and gas industry
Dvt-RulesofPractice	ERCB Rules of Practice	Planned	Outlines the procedural rules applicable to ERCB proceedings

The planned regulatory changes in Table 12 are anticipated to start within the fiscal year 2011/12. Note that MOU represents a memorandum of understanding, and IL represents an informal letter.

**Table 13. ERCB Regulatory Changes in Progress**

<b>File Name</b>	<b>Title</b>	<b>Status</b>	<b>Description</b>
Directive 007	Volumetric and Infrastructure Requirements	In Progress	Regulatory requirements for the electronic submission of all well, facility and pipeline monthly information
Directive 038	Noise Control	In Progress	Clarification - removes utility requirements
Directive 056	Energy Development Applications and In Progress Schedules	In Progress	Routine updates and clarifications
Directive 058	Oilfield Waste Management Requirements for the Upstream Petroleum Industry	In Progress	Regulatory requirements for the handling, treatment and disposal of upstream oilfield waste - consolidation
Directive 060	Upstream Petroleum Industry Flaring, Incinerating and Venting	In Progress	Regulatory requirements and guidelines - revision
Directive 066	Requirements and Procedures for Pipelines	In Progress	Pipeline inspections - rewrite in progress
Directive 071	Emergency Preparedness and Response Requirements for the Petroleum Industry	In Progress	Provides the minimum emergency preparedness and response requirements - draft released for feedback
Directive 077	Pipelines - Requirements and Reference Tools	In Progress	Supplements Pipeline Act and Pipeline Regulations; amalgamation
Draft - Cavern	Cavern Directive	In Progress	New directive will set out requirements for solution mining, solids disposal and cavern storage projects
Draft - OGCRPt7	Oil and Gas Conservation Regulations Amendment	In Progress	Requirements for notifying the ERCB for the construction of newly licenced facilities
Draft - PopTanks	Pop Tanks	In Progress	Review of OGCR Storage Regulation and Air Pollution regulation for waiver on suitable piping to an open tank
Dvt-OGCR8-110-HVP	Use of High Vapour Pressure Hydrocarbons	In Progress	Focuses on high vapour pressure hydrocarbons blended with propane in fracturing operations

Regulatory changes in progress are changes that are currently in development with various timelines and informal consultation.

**Table 14. ERCB Regulatory Changes Closed for Comments**

<b>File Name</b>	<b>Title</b>	<b>Status</b>	<b>Description</b>
Directive 017	Measurement Requirements for Upstream Oil and Gas Operation	Closed for Comments	Requirements relating to the measurement, accounting, and reporting of gas and liquid production. Consultation closed July 23, 2010
Directive 055	Storage Requirements for the Upstream Petroleum Industry	Closed for Comments	Clarification to areas that are repeatedly queried. Consultation closed September 30, 2009
Draft - WaterBodies	Oil and Gas Development Within or Proximal to Water Bodies	Closed for Comments	Draft directive to clarify requirements - 2nd round of consultation closed November 30, 2010

The formal consultation/comment period for the regulatory change in Table 14 has been closed.

**Table 15. ERCB Regulatory Changes Completed**

File Name	Title	Status	Description
Directive 019	Compliance Assurance	Completed	Focuses on non-compliance and voluntary self-disclosure. Revised edition effective Nov 1, 2010
Directive 063	Requirements and Procedures for Oilfield Waste Management Facilities	Completed	Ensures consistent facility inspections and an industry guide. Effective Jan 1, 2011
Directive 064	Requirements and Procedures for Facilities	Completed	Ensures consistent facility inspections and an industry guide. Effective Jan 1, 2011
Directive 066	Requirements and Procedures for Pipelines	Completed	Ensures consistent pipeline inspections and an industry guide. Re-issued Mar 9, 2011
Directive 077	Pipelines - Requirements and Reference Tools	Completed	Amalgamates previous ERCB directives and documents into one document

The regulatory changes in Table 15 have been completed and published within the fiscal year 2010/11.

### 3.1.4 History of Complaints

The ERCB were unable to provide any details of historical or recent complaints from the public in the quadrant of interest, however, they were able to provide details of reportable releases. The Energy Resources Conservation Board (ERCB) implemented the Field Surveillance Inspection System (FIS) in 2002, for the electronic submission of upstream oil and gas activity notifications, release incidents and inspections. The FIS system was upgraded on January 30, 2011 to increase the functionality of the user interface. Table 17 is the FIS release report, provided by the ERCB for the quadrant of interest, from 1978 up to January 4, 2011.

**Table 16. Summary of Releases from 1978 - 2010**

Release	Number of Releases	Volume Released (m <sup>3</sup> )	Volume Recovered (m <sup>3</sup> )
Condensate	3	97	55
Crude Oil	27	1248.4	1223.2
Gas Production	4	309	309
Glycol	1	2	2
<b>Total</b>	<b>35</b>	<b>3310.8</b>	<b>3176.4</b>

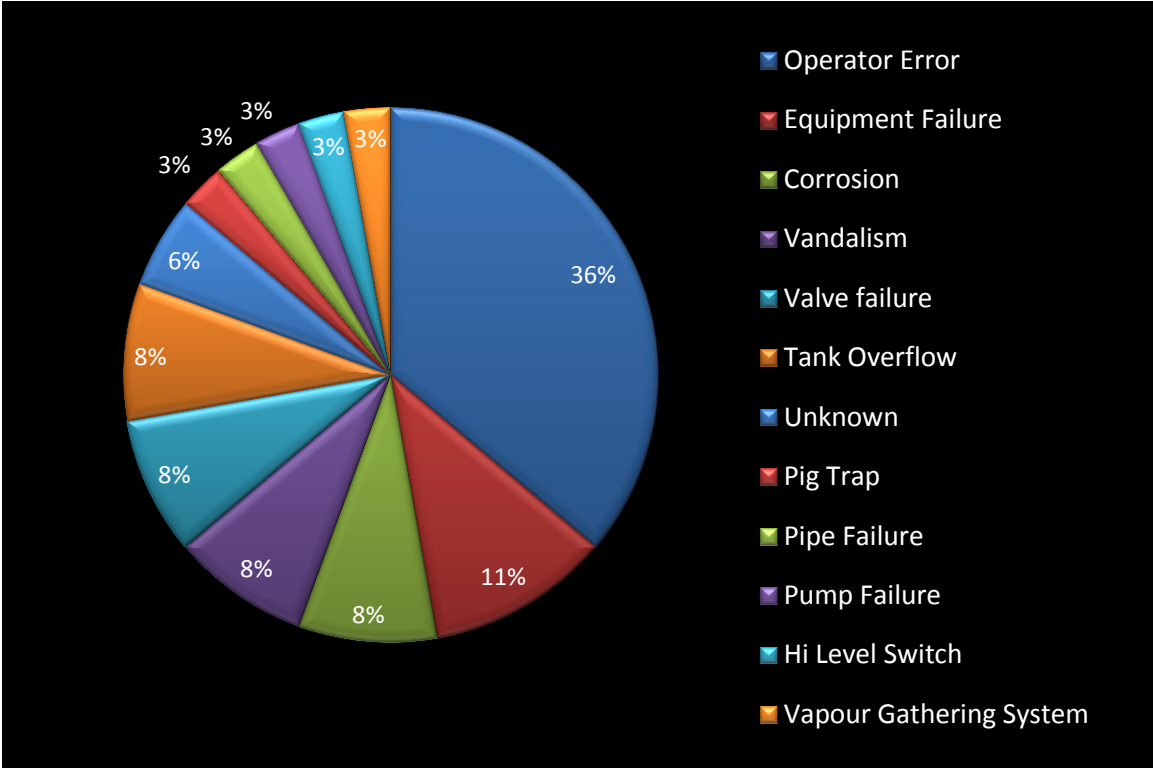
The most common release, as shown in Table 16, is crude oil, which had a 98% recovery rate. Releases of gas and glycol were claimed to be both fully recovered. Condensate had the worst recovery rate of 57%. In the event of a spill, all volatile fractions would be lost very quickly to the air (1-2 days) and within three weeks the remaining longer chain hydrocarbons would likely have degraded to very low concentrations (Santos, 2003).

**Table 17. ERCB FIS Release Incident External Report**

Location	Incident Date	Source	Failure Type	Licensee	Substance Released	Volume Released	Volume Recovered
03-32-042-21W4	05/01/1978	Multiphase Pipeline	Corrosion	0057 ExxonMobil Canada Ltd.	Crude Oil	1.0 m3	1.0 m3
05-29-042-09W4	02/24/1980	Tank Farm/Oil Terminals	Valve failure	0086 Husky Oil Ltd.	Crude Oil	9.0 m3	9.0 m3
14-20-042-09W4	10/21/1982	Tank Farm/Oil Terminals	Operator Error	0537 Husky Pipeline Ltd.	Condensate	10.0 m3	1.0 m3
04-29-042-09W4	08/21/1986	Custom Treating Facility	Hi Level Switch	0537 Husky Pipeline Ltd.	Condensate	32.0 m3	25.0 m3
07-33-042-09W4	02/01/1987	Crude Oil Pipeline	Damage By/Others	0R46 Husky Oil Operations Limited	Condensate	55.0 m3	29.0 m3
05-29-042-09W4	02/01/1989	Miscellaneous	Operator Error	0195 Gibson Energy ULC	Crude Oil	1.0 m3	0.0 m3
08-22-042-09W4	02/10/1989	Miscellaneous	Operator Error	0R46 Husky Oil Operations Limited	Crude Oil	15.0 m3	14.0 m3
01-30-042-09W4	11/29/1990	Pump Station	Vandalism	0J70 Interprovincial Pipe Line Co.	Crude Oil	1.0 m3	0.0 m3
05-29-042-09W4	11/07/1991	Pump Station	Pig Trap	0J70 Interprovincial Pipe Line Co.	Crude Oil	14.0 m3	720.0 m3
05-29-042-09W4	05/03/1992	Crude Oil Group Battery	Tank Overflow	0537 Husky Pipeline Ltd.	Crude Oil	13.0 m3	696.0 m3
05-29-042-09W4	07/25/1992	Pump Station	Operator Error	0R46 Husky Oil Operations Limited	Crude Oil	13.0 m3	12.0 m3
05-29-042-09W4	10/19/1992	Pump Station	Operator Error	0537 Husky Pipeline Ltd.	Crude Oil	2.0 m3	2.0 m3
05-29-042-09W4	11/02/1992	Crude Oil Group Battery	Tank Overflow	0R46 Husky Oil Operations Limited	Crude Oil	20.0 m3	18.0 m3
05-29-042-09W4	11/04/1992	Pump Station	Vapour Gathering System	0195 Gibson Energy ULC	Crude Oil	20.0 m3	18.0 m3
04-29-042-09W4	04/19/1993	Pump Station	Tank Overflow	0039 Talisman Energy Inc.	Crude Oil	1.0 m3	1.0 m3
05-29-042-09W4	10/05/1993	Custom Treating Facility	Operator Error	0R46 Husky Oil Operations Limited	Crude Oil	5.0 m3	4.0 m3
05-29-042-09W4	01/12/1994	Miscellaneous	Equipment Failure	0195 Gibson Energy ULC	Crude Oil	1.0 m3	1.0 m3
05-29-042-09W4	07/28/1994	Pump Station	Equipment Failure	0R46 Husky Oil Operations Limited	Crude Oil	14.0 m3	14.0 m3
04-29-042-09W4	12/22/1995	Miscellaneous	Operator Error	0195 Gibson Energy ULC	Crude Oil	16.0 m3	16.0 m3
04-29-042-09W4	02/11/1996	Tank Farm/Oil Terminals	Operator Error	0195 Gibson Energy ULC	Crude Oil	1000.0 m3	1000.0 m3
05-20-042-09W4	03/25/1996	Tank Farm/Oil Terminals	Operator Error	0M74 Koch Oil Co. Ltd.	Crude Oil	11.0 m3	11.0 m3
04-29-042-09W4	10/31/1997	Miscellaneous	Valve failure	0195 Gibson Energy ULC	Crude Oil	18.0 m3	14.0 m3
15-20-042-09W4	12/18/1997	Crude Oil Group Battery	Equipment Failure	0WG9 Express Pipeline Ltd.	Crude Oil	3.0 m3	2.0 m3
04-29-042-09W4	02/24/1998	Tank Farm/Oil Terminals	Operator Error	0195 Gibson Energy ULC	Crude Oil	18.0 m3	12.0 m3
13-20-042-09W4	11/18/1998	Crude Oil Pipeline	Damage By/Others	0W00 Koch Pipelines Canada Ltd.	n/a	n/a	n/a
04-29-042-09W4	06/01/1999	Pump Station	Operator Error	0195 Gibson Energy ULC	Crude Oil	0.4 m3	0.4 m3
10-20-042-09W4	02/08/2000	Crude Oil Group Battery	Equipment Failure	0WG9 Express Pipeline Ltd.	Crude Oil	3.0 m3	3.0 m3
06-30-042-09W4	05/16/2001	Miscellaneous	Pump Failure	0WH2 Enbridge Pipelines Inc.	Crude Oil	20.0 m3	19.0 m3
10-19-042-09W4	07/07/2001	Custom Treating Facility	Valve failure	0ZA2 Koch Petroleum Canada Ltd.	Crude Oil	10.0 m3	10.0 m3
04-29-042-09W4	08/11/2003	Crude Oil Pipeline	Corrosion Internal	0195 Gibson Energy ULC	Crude Oil	15.0 m3	10.8 m3
08-28-042-21W4	09/29/2003	Natural Gas Pipeline	Unknown	0JL8 Apache Canada Ltd.	Gas Production (Raw)	103 m3	103 m3
14-20-042-09W4	10/27/2003	Unknown	Unknown	Unknown	Crude Oil	4.0 m3	3.0 m3
08-27-042-21W4	12/23/2004	Natural Gas Pipeline	Pipe Failure	0TB3 NOVA Gas Transmission Ltd.	Gas Production (Raw)	103 m3	103 m3
11-20-042-09W4	07/22/2006	Gas Plant Fraction Sweet	Operator Error	0KP3 Gibson Gas Processing Ltd.	Gas Production (Marketable)	n/a	n/a
12-19-042-09W4	01/11/2009	Other Pipeline	Operator Error	A1HH Enbridge Midstream Inc.	Glycol	2.0 m3	2.0 m3
07-35-042-21W4	07/14/2010	Natural Gas Pipeline	Corrosion Internal	0026 EnCana Corporation	Gas Production (Raw)	103 m3	103 m3

It is interesting to note that the types of failures have shifted over the 33 year period of release reporting. Figure 7 presents a breakdown of the most common failures responsible for releases.

**Figure 7. Incidences of Failures Responsible for Releases**



Operator error was responsible for 37% of releases over the 33 year period of release reporting. This provides an indication that these operators should receive additional training supported by management direction and policies to ensure that these types of incidents are not repeated.

Vandalism was responsible for 9% of releases – a significant contribution. The proposed amendment to the NEB Onshore Pipeline Regulations, 1999: Adoption of CSA Z246.1-09 Security Management for Petroleum and Natural Gas Industry Systems will provide stricter guidelines for the planning and prevention of malicious damage.

### 3.1.5 Historical Air Quality Data

#### Alberta Environmental Exposure Objectives

Air monitoring data collected at the Hub is measured against the Alberta ambient air quality objectives (AAAQO), issued by Alberta Environment, under Section 14 (1), of the Environmental Protection and Enhancement Act, 1992. The objectives are intended to provide protection of the environment and human health.

The objectives are used:

- To report on the state of Alberta's atmospheric environment
- To inform Albertans on air quality through an air quality index
- To establish approval conditions for regulated industrial facilities
- To guide special ambient air quality surveys
- To assess compliance near major industrial emission sources.

For example, the AAAQO for sulphur dioxide (SO<sub>2</sub>) are as follows:

- The 1-hour average AAAQO for SO<sub>2</sub> is 172 ppb based on pulmonary effects.
- The 24-hour average AAAQO for SO<sub>2</sub> is 48 ppb adopted from the European Union, which based its objective on human health
- The 30-day average AAAQO for SO<sub>2</sub> is 11 ppb to be used for passive monitoring.
- The annual average AAAQO for SO<sub>2</sub> is 8 ppb, adopted from the European Union which based its objective on the protection of ecosystems.

#### Air Quality Management Frameworks

Air quality management frameworks provide for cumulative effects management, which addresses the combined or cumulative effects of multiple developments taking place over time. Cumulative effects management recognizes that our watersheds, airsheds and landscapes have a finite carrying capacity. Alberta's current regulatory system is based on a project-by-project approval and mitigation of the adverse effects of each project. This approach is acceptable for low levels of development but does not adequately address the cumulative effects of all activities under the current pace of development. The components of a management framework include:

- Establishing Ambient Air Quality Objective Triggers or Limits
- Monitoring to assess conditions and trends
- Modeling to forecast trends and timelines
- Management actions to specified triggers and limits to ensure sustainability

The framework adds four ambient air quality levels, called “triggers” to the existing objectives, with management intent and responses within each level. Triggers are set to provide sufficient time to plan and implement management actions to prevent reaching the “limits”, which are the existing AAAQO.

## **Alberta Environment Mobile Air Quality Monitoring Survey**

Alberta Environment conducted ambient air monitoring to assess the air quality in the area of the Hardisty Bulk Petroleum Storage Terminals in October 2005 and March 2006. At this time, 8 companies operated bulk petroleum storage terminals within the vicinity of Hardisty. Petroleum is transported in and out of the area via pipeline, truck or rail.

The sample period included a time when petroleum loading/unloading was taking place at one of the facilities. This allowed the examination of potential fugitive emissions during such an operation. The pollutants measured included:

- ammonia
- carbon monoxide
- oxides of nitrogen
- total reduced sulphur
- hydrogen sulphide
- total hydrocarbons
- methane
- reactive hydrocarbons
- sulphur dioxide
- polycyclic aromatic hydrocarbons
- total suspended particulate including fine and coarse particulate
- meteorological parameters wind direction and speed

There were Alberta Ambient Air Quality Objectives for 5 of the measured pollutants; none of these AAAQO were exceeded. The concentrations of hydrocarbons as well as oxides of nitrogen, total reduced sulphur and sulphur dioxide were comparable to levels typically measured in rural environments.

Elevated concentrations of hydrocarbons, NO, NO<sub>2</sub> and particulate matter were measured downwind of one of the bulk petroleum storage terminals at a time loading/unloading was taking place; elevated hydrocarbons are likely due to fugitive emissions during loading/unloading of petroleum; exhaust from trucks is likely the main source of NO and NO<sub>2</sub>; re-suspended road and soil dust, as well as vehicle exhaust contributed to elevated particulate matter.

Air emissions from the Signalta Forestburg and Apache Battle River sour gas plants were also examined in this study.

## **Air Emissions**

Volatile organic compounds (VOCs) emitted during crude oil and petroleum product terminal storage activities have the potential to be significant from both an environmental and an economic perspective. Emissions of VOCs may result from:

- Evaporative losses during storage (storage losses). Storage losses occur due to changes in temperature and pressure which cause vapour to be forced from the tank through vents into the atmosphere.
- Operational activities such as filling, withdrawal, additive blending and loading/unloading of transport links (working losses).
- Leaks from seals, flanges and other equipment connections (fugitive losses).
- Additional emissions may occur from vapour combustion units and vapour recovery units.

Other air pollutants that may be found over the Hardisty Hub include: sulphur dioxide, oxides of nitrogen, hydrogen sulphide, ammonia, carbon monoxide, hydrocarbons, methane, polycyclic aromatic hydrocarbons and particulate matter.

## **Available Historical Air Quality Data from Regulatory and Operating Company Sources**

The high level of oil and gas activity in the area and the similarity of the air contaminants make it difficult to separate the anthropogenic emissions in the Hardisty complex from the ambient air quality. However, it is possible to determine the overall air quality in the Hardisty area and perform a comparison to other areas using the Alberta Ambient Air Quality Objectives.

With the completion of the first phase of Enbridge Liquids Pipeline contract tankage project in Hardisty in 2009, Enbridge and other industry partners established an ambient air monitoring network to monitor the air quality in the area. Enbridge currently has 2 continuous ambient monitors at the Hardisty Terminal for H<sub>2</sub>S, total reduced sulphur and wind, as well as passive monitoring for BTEX (benzene, toluene, ethylbenzene and xylene) on the National Air Pollution Surveillance (NAPS) schedule. In addition to the air monitoring stations, Enbridge conducts semi-annual head space air sampling on each storage tank to ensure emission-control devices are functioning.

Cold Lake Pipelines currently has passive monitoring for SO<sub>2</sub>, NO<sub>2</sub> and ozone at 4 locations of the Hardisty Bulk Petroleum Storage Facility. Tank headspace analysis data is sent to Alberta Environment as part of the Annual Air Report; this data however is not entered into the database and is not available.

Alberta Environment's industrial air monitoring requirements in the Hardisty Hub are summarized in the following table:



**Table 18. Alberta Environment Industrial Air Monitoring Requirements**

Facility Name	Company Name	Parameter	Type of Ambient Air Monitoring	# of Months Monitoring is Conducted	# of Stations	Date Monitoring Started	Comments
HARDISTY TERMINAL	Enbridge	H <sub>2</sub> S	Continuous	12	2	01-Oct-08	Sodbuster station = station 1, crones = station 2. Data provided.
		TRC					
		Wind					
		VOC	Intermittent				
HUSKY HARDISTY TERMINAL	Husky	H <sub>2</sub> S	Continuous	12	2	01-Sep-09	Data provided.
		TRC	Continuous				Data provided.
		Wind	Continuous				Data provided.
		Temperature	Continuous				Not in AENV database.
		VOC	Intermittent				Data provided.
HARDISTY BULK PETROLEUM STORAGE FACILITY	Husky	SO <sub>2</sub>	Passive	12	4	01-Jan-04	Data submitted in the annual reports. No data entered in AENV database since no monthly reports are required.
		NO <sub>2</sub>					
		Ozone					
HARDISTY BUTANE FRACTIONATION AND PRODUCT STORAGE PLANTS	Enbridge	NA	None	0	0	NA	No approval requirements for ambient air monitoring.
HARDISTY BULK PETROLEUM STORAGE	Flint Hills	NA	None	0	0	NA	
HARDISTY BULK STORAGE	Gibson	NA	None	0	0	NA	

NOTES: H<sub>2</sub>S = hydrogen sulphide  
 TRC = total reduced sulphur  
 VOC = volatile organic compounds  
 SO<sub>2</sub> = sulphur dioxide  
 NO<sub>2</sub> = nitrogen dioxide

Reporting of pollutant emissions in Alberta is mandated in individual operating approvals and by the province's Air Monitoring Directive. Industry is required to submit monitoring reports to Alberta Environment. Reporting requirements are specified in approvals and vary depending on the substance, size and nature of the facility. The reports summarize ambient and source monitoring data and provide information on the quality assurance and quality control measures performed to ensure accurate data. Details on the reporting requirements of any individual Approval, may be found by using Alberta Environment's Authorization/Approval viewer.

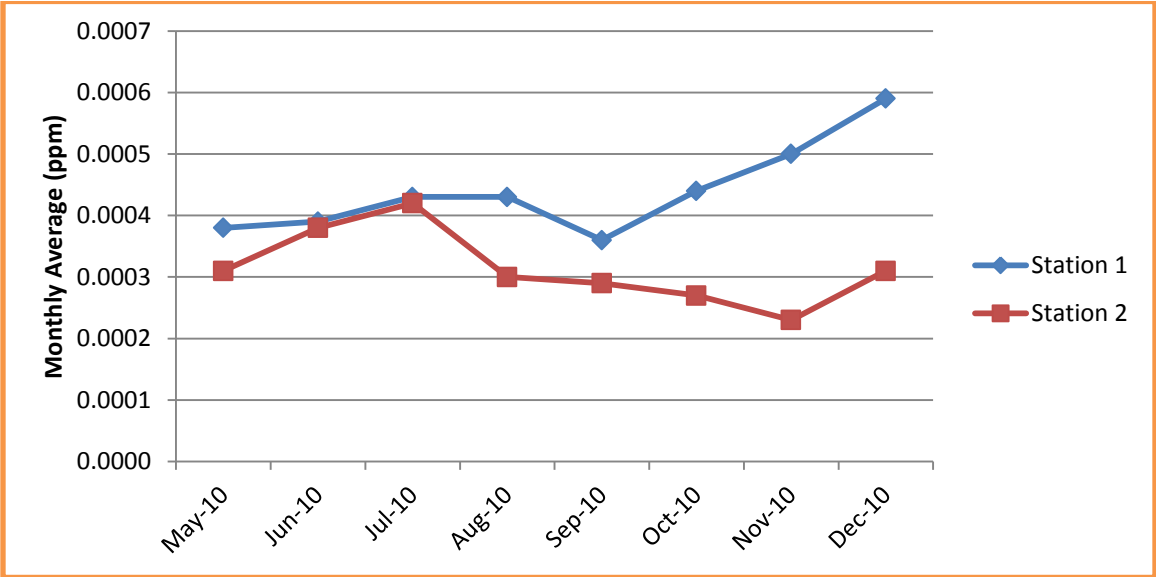
Alberta Environment Industrial Air Monitoring provided all available Hardisty Hub area industrial air monitoring data for the last 2 years, which can be found in the appendix.

Hydrogen sulphide is a colourless gas with a rotten egg odour. Total reduced sulphur (TRS) includes hydrogen sulphide, mercaptans, dimethyl sulphide and other sulphur

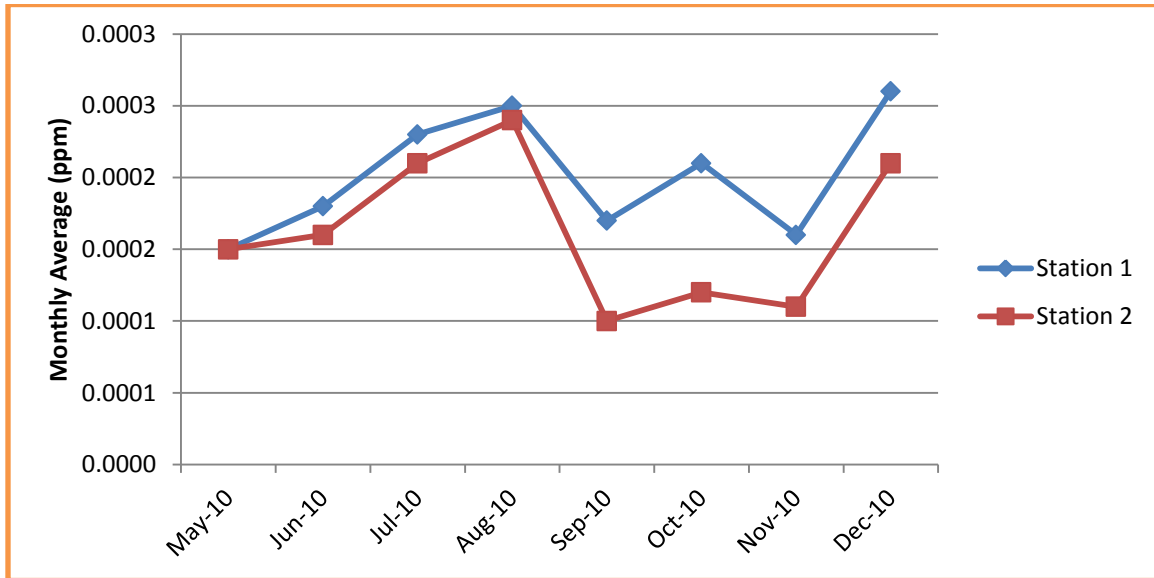
compounds). Sulphur dioxide is not included in the determination of TRS. Industrial sources of these compounds include fugitive emissions from petroleum refineries, tank farms for unrefined petroleum products and petrochemical plants.

The following graphs plot continuous air monitoring for hydrogen sulphide and total reduced sulphur at the Enbridge and Husky Terminals.

**Figure 8. Enbridge Continuous Air Monitoring - Total Reduced Sulphur**

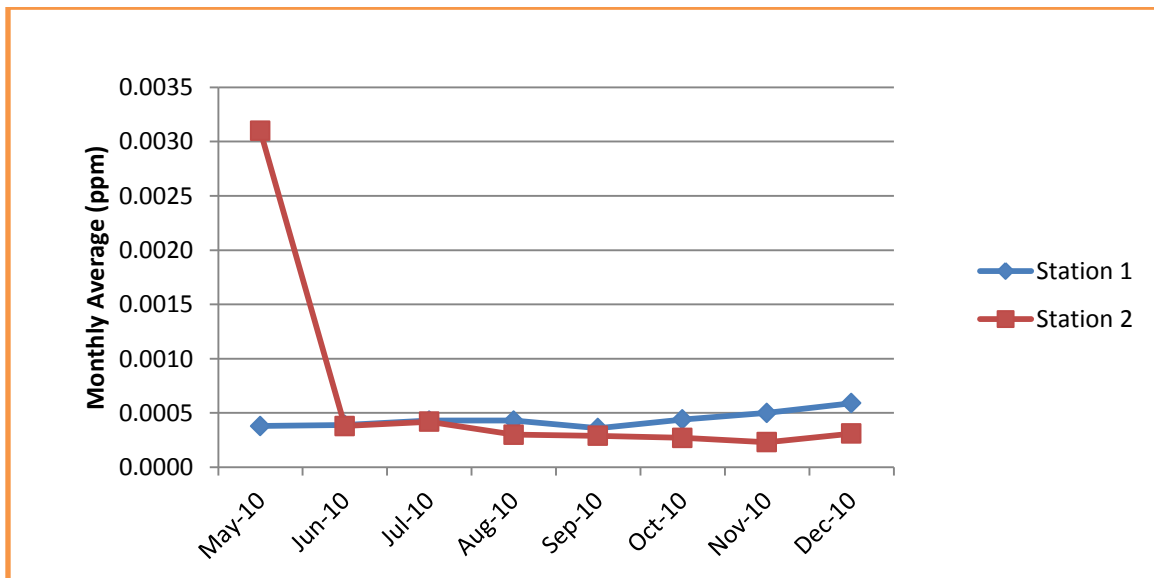


**Figure 9. Enbridge Continuous Air Monitoring - Hydrogen Sulphide**

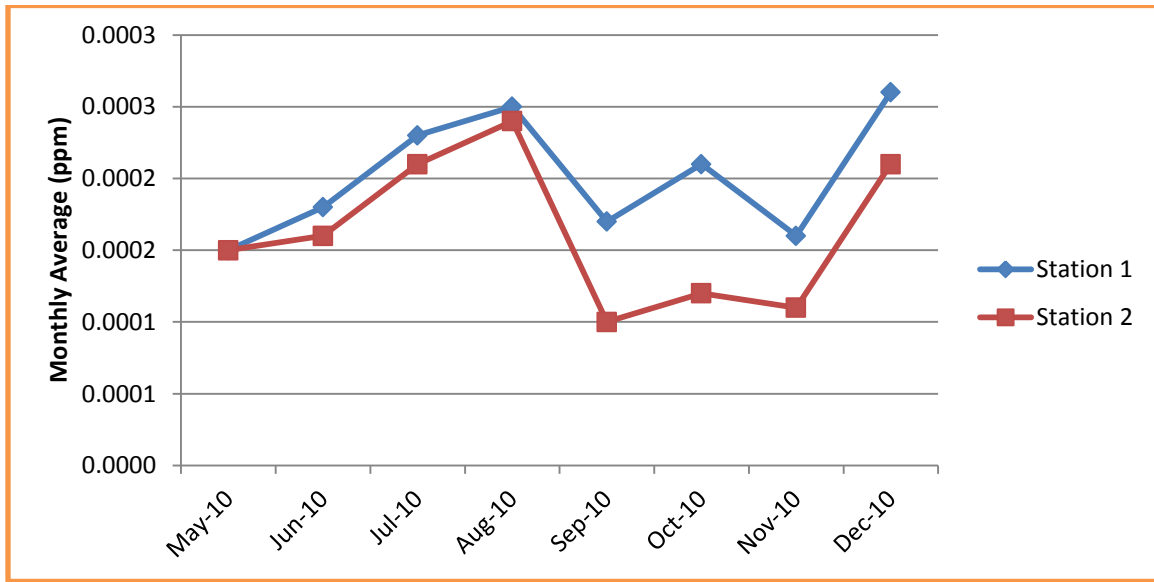


The AAAQO for hydrogen sulphide is 0.010 ppm (1 hour average) and 0.003 ppm (24 hour average), these objectives are based on odour. There were no exceedances of either guideline in the 2 year monitoring period examined. There are no AAAQO for total reduced sulphur at this time.

**Figure 10. Husky Continuous Air Monitoring - Total Reduced Sulphur**

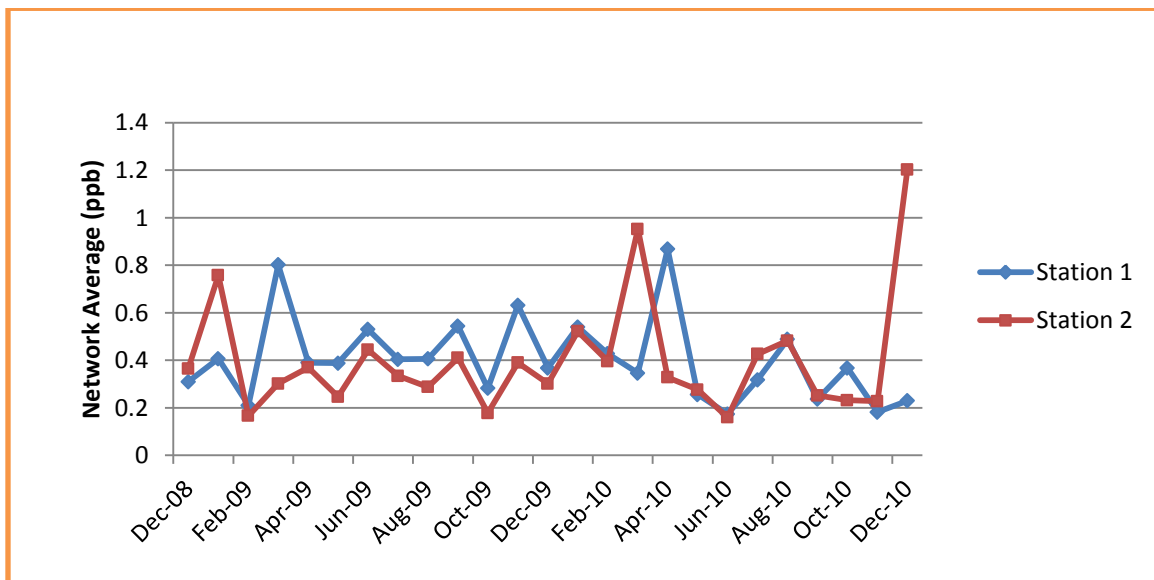


**Figure 11. Husky Continuous Air Monitoring - Hydrogen Sulphide**



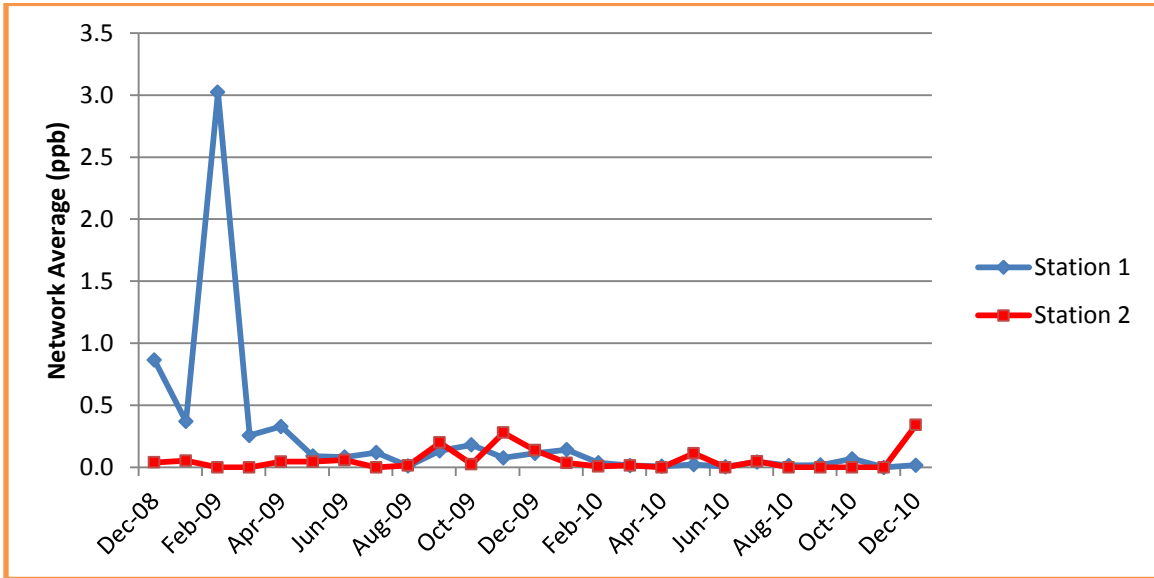
BTEX (benzene, toluene, ethylbenzene and xylenes) are volatile organic compounds (VOCs) typically found in petroleum products. These compounds are the most soluble of the major petroleum compounds and, therefore, are common indicators of gasoline contamination (Texas Environmental Research Consortium, 2009). BTEX are monitored intermittently following the National Air Pollution Surveillance (NAPS) program. There are established federal and provincial standards for each of the BTEX compounds. These standards were derived using an effects-based process and toxicity data from studies conducted in the early 1990's.

**Figure 12. Benzene Monthly Average Reading – Enbridge**



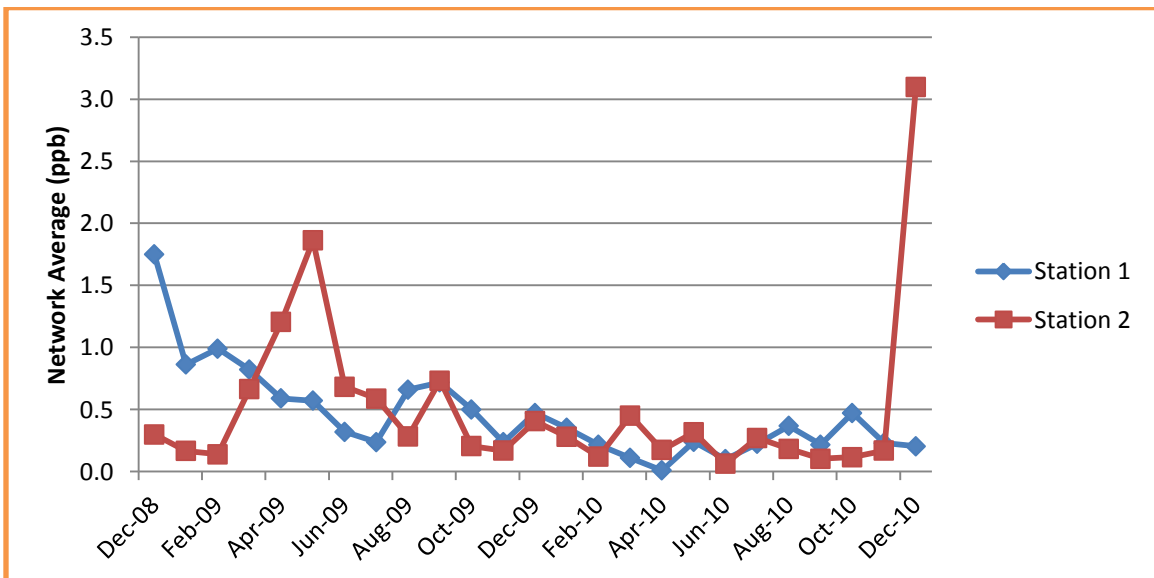
The AAAQO for benzene is 9 ppb (1 hour average). The monthly network average readings for Enbridge from December 2008 to December 2010 are well below this objective.

**Figure 13. Ethylbenzene Monthly Average Reading – Enbridge**



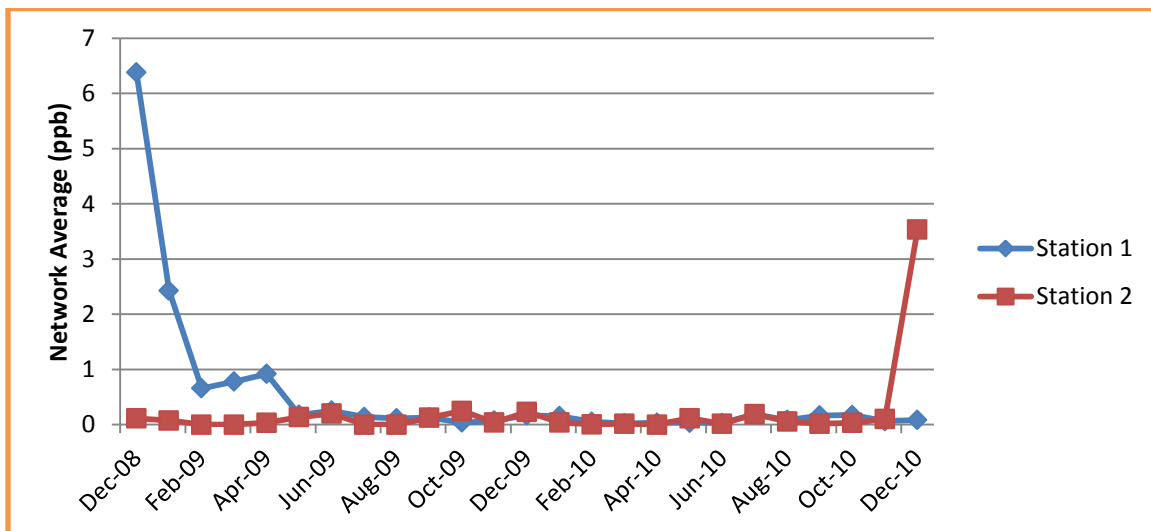
The AAAQO for ethylbenzene is 460 ppb (1 hour average). The monthly network average readings for Enbridge are almost nil throughout the monitoring period evaluated, with the exception of one spike in February 2009.

**Figure 14. Toluene Monthly Average Reading – Enbridge**



The AAAQO for toluene are 499 ppb (1 hour average) and 106 ppb (24 hour average). The monthly network average readings for Enbridge are significantly below these objectives.

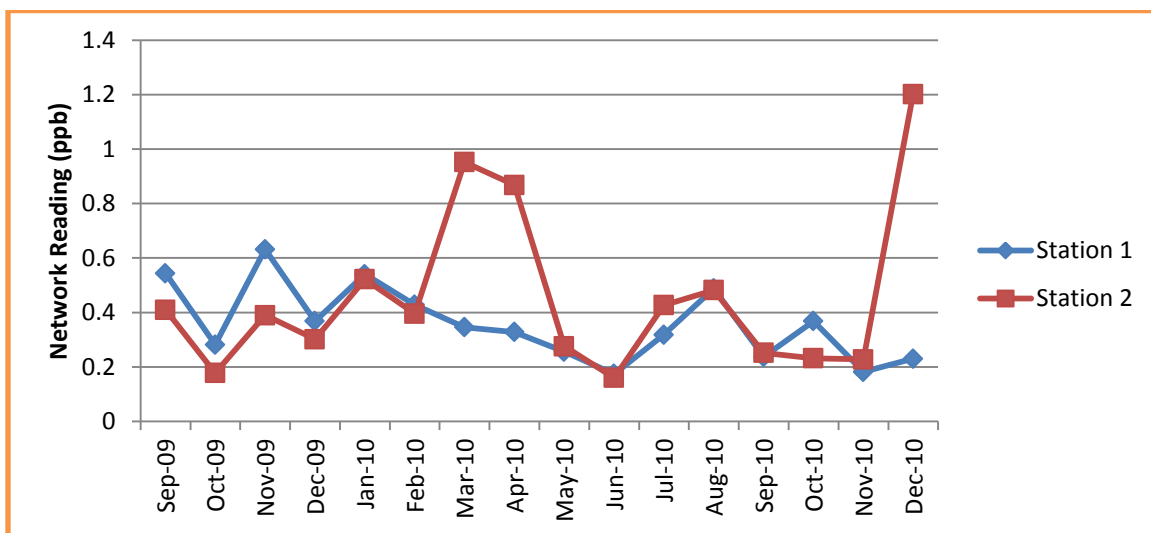
**Figure 15. Xylenes Monthly Average Reading - Enbridge**



The AAAQO for xylenes are 530 ppb (1 hour average) and 161 ppb (24 hour average). There were no exceedances of any BTEX objectives at Enbridge from December 2008 to December 2010.

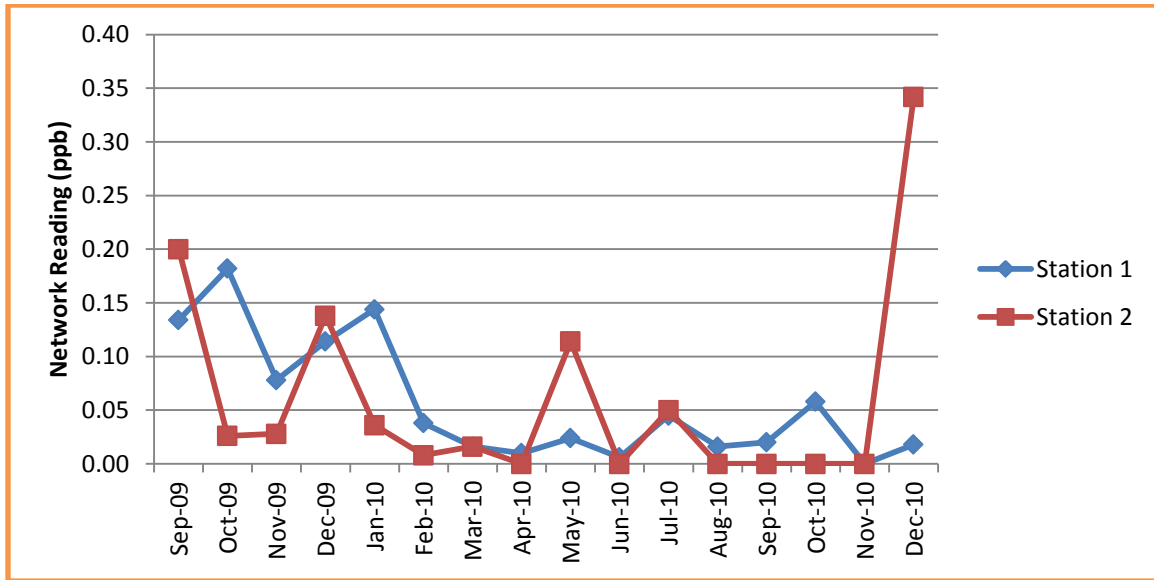
The next four graphs plot the monthly average network readings for BTEX passive monitoring at Husky.

**Figure 16. Benzene Monthly Average Reading – Husky**



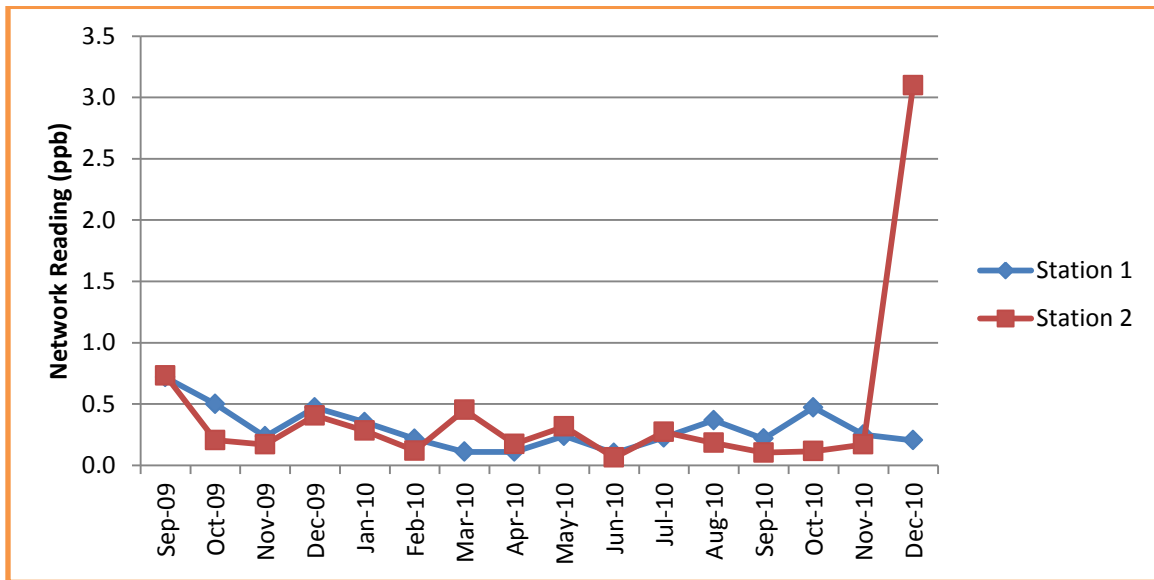
The AAAQO for benzene is 9 ppb (1 hour average).

**Figure 17. Ethylbenzene Monthly Average Reading – Husky**



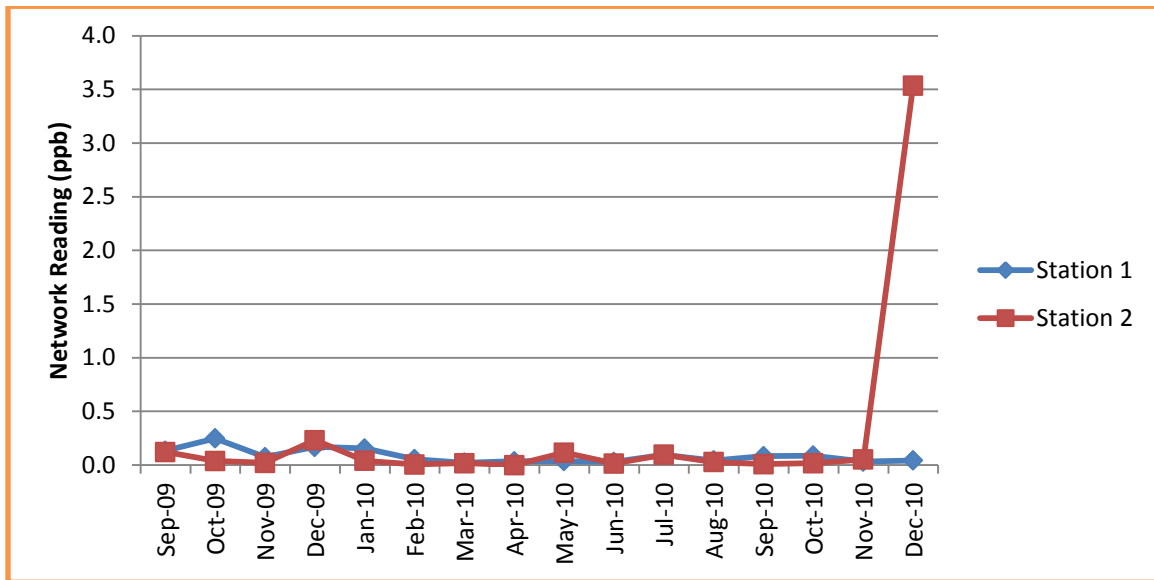
The AAAQO for ethylbenzene is 460 ppb (1 hour average)

**Figure 18. Toluene Monthly Average Reading - Husky**



The AAAQO for toluene are 499 ppb (1 hour average) and 106 ppb (24 hour average).

**Figure 19. Xylenes Monthly Average Reading - Husky**



The AAAQO for xylene are 530 ppb (1 hour average) and 161 ppb (24 hour average).

The BTEX levels at Husky were also low. There were no exceedances of any AAAQO for BTEX at Husky from December 2008 to December 2010.

In addition to industry, sources of BTEX emissions occur within households. The three key sources associated with air shed BTEX emissions are motor vehicles, chemical product manufacturing and domestic solid fuel burning. Within households, there may be other domestic sources of BTEX from solvents, glues, polishes, cleaners and cooking.

To put these BTEX levels in perspective, a wood burning stove could produce a benzene level around 2-4 ppb indoors in winter (Australia Department of the Environment and Heritage, 2004). This level is similar to the occasional peak readings of benzene measured at Husky and Enbridge. Over the two year period, the average concentration of benzene was around 0.4 ppb at all four monitoring stations.

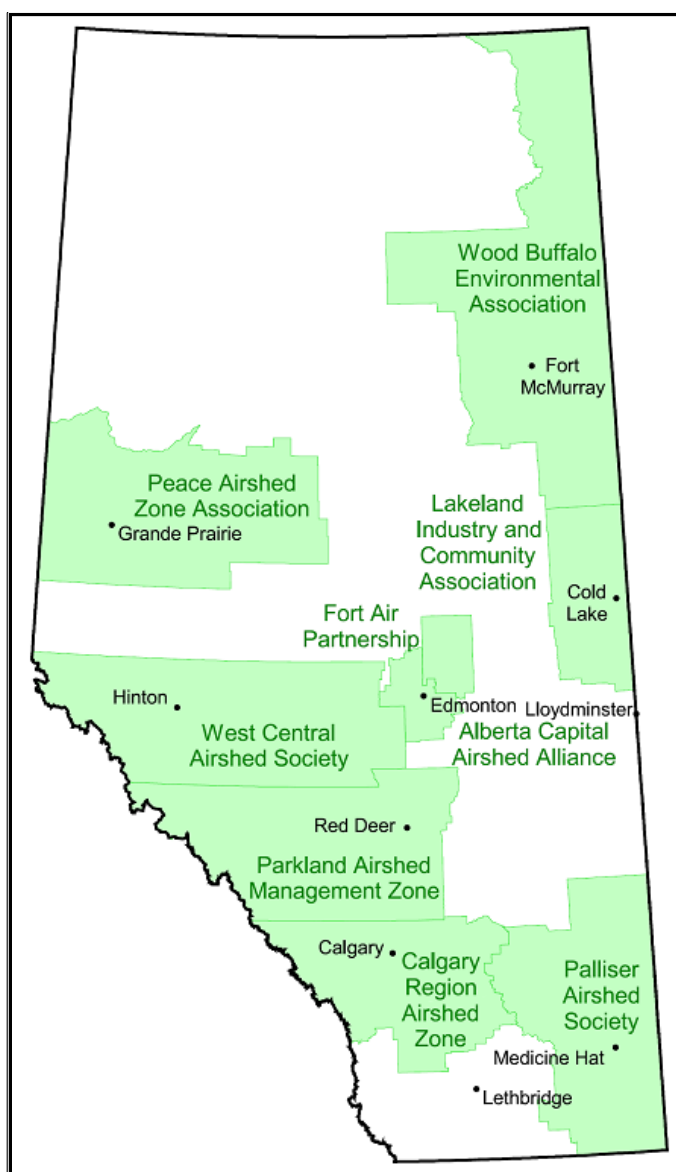
Clearstone Engineering is currently studying *Benzene Sources, Emissions from Storage Tanks*, and developing a database system for understanding emission issues related to the oil and gas industry. The target sources are: fugitive equipment leaks, pneumatic devices, storage losses, process venting and flaring, and engines and heaters. In addition, Alberta Environment has commissioned a study by AECOM Technology Corporation to develop a code of practice to reduce fugitive equipment leaks and storage losses.



## ALBERTA AIR SHED ZONES

Alberta has nine airshed management zones which provide air monitoring data to the Alberta's Clean Air Strategic Alliance (CASA) Data Warehouse, identified on Figure 20. Airsheds are formed because of concerns about air quality in an area. In order to manage air quality, it must first be monitored. Airshed zones are guided by local or regional multi-stakeholder non-profit societies that work within an area to monitor, analyze and report on air quality, as well as recommend and implement actions to improve air quality in that zone. The Alberta Air Shed Council was set-up in 2007 to act as a resource for forming airsheds (<http://albertairshedsCouncil.ca>)

Figure 20. CASA Air Shed Zones



Air quality issues in Alberta are generally local and province-wide approaches are not effective. The air quality management zones provide an opportunity for local stakeholders to design local solutions to their concerns. Currently Division 7 (the counties of Flagstaff, Beaver, Paintearth, Stettler and M.D.'s of Provost and Wainwright), as well as Division 10 (the counties of Camrose, Beaver, Minburn, Vermilion, Two Hills and Lamont) do not have an airshed zone as can be seen in the map above.

An airshed zone can be defined on the basis of emissions sources, dispersion characteristics, or administrative characteristics. The airshed zone approach makes it possible to improve existing monitoring in the region and make local and regional monitoring systems more efficient in order to obtain quality information about regional air quality. Forming an airshed zone over the Hub would require a partnership of industry, provincial and municipal governments, the health authority, and other interest groups and individuals. Subsequently, an assessment will be made to describe current continuous and passive monitoring programs in the area to make a plan for an air monitoring network that is comprehensive and accurate.

Airshed zones are non-profit societies, therefore, funding should be proportioned fairly amongst the members at levels consistent with their relative impact on the zone's air quality. This can be determined by assessing annual emission inventories. By using the "emitters pay" philosophy, it would be possible to form and operate an airshed zone entirely funded by voluntary industry members.

The operating companies are already subject to stringent air monitoring requirements, which offers some redundancy to the airshed suggestion. In addition, point source sampling is superior to ambient monitoring for efficiency assessments of abatement systems. Although an airshed zone for this area might be premature at this time, continued expansion will cause an increase in the cumulative effects monitoring, which in turn may necessitate an airshed.

## **NATIONAL POLLUTANT RELEASE INVENTORY**

The National Pollutant Release Inventory (NPRI) is Canada's publicly accessible inventory of pollutant releases, disposals and transfers for recycling. Air emission data must be reported by facilities to the NPRI and published by Environment Canada under the authority of the Canadian Environmental Protection Act, 1999.

The NPRI prepares comprehensive emission summaries and trends for key pollutants, based on facility-reported data and emission estimates for other sources such as motor vehicles, residential heating, forest fires and agriculture. Facilities at the Hub reporting to the NPRI include Husky, Enbridge, Gibsons and Flint Hills. Current and historical emission data is available on Environment Canada's website:

[Environment Canada - Pollution and Waste - Tracking Pollution in Canada](#)

## GROUNDWATER MONITORING

In addition to air monitoring, a groundwater monitoring program has been in effect at the Gibson Petroleum Hardisty Pipeline Terminal since November 1995. Groundwater monitoring and sampling occurs biannually during the spring and fall seasons as a component of the licensing requirement of the facility (Alpine Environmental, 2005). The groundwater quality data is compared with historic data and guidelines (Health Canada, 2010) to assess potential changes in groundwater quality conditions.

Eight above grade groundwater monitoring wells are monitored for standpipe combustible headspace vapour concentrations, depth to water and/or liquid petroleum hydrocarbons and bottom of well. Groundwater samples are collected for determination of parameters as specified by the Alberta Environmental Protection and Enhancement Act (AEPEA) Approval for the location 4-29-42-9-W4:

- pH
- electrical conductivity (EC)
- salinity
- heavy metals
- major ions
- total cyanide
- total arsenic
- chemical oxygen demand (COD)
- orthophosphate
- total kjeldahl nitrogen
- phenol
- total dissolved solids (TDS)
- turbidity
- total organic carbon (TOC)
- oil and grease
- BTEX
- total volatile hydrocarbons (TVH)
- total extractable hydrocarbons (THE)

An air quality assessment of the proposed Keystone Hardisty Tank Roof Reconfiguration was conducted in 2008. The air quality assessment was completed in support of regulatory applications to construct and operate the proposed TransCanada Keystone Pipelines GP Ltd. EFR oil product storage tanks. Atmospheric emission from the Hardisty Complex in the form of evaporative losses from storage tanks include vapours of various sulphur and hydrocarbon compounds.

For this assessment, H<sub>2</sub>S, mercaptans and benzene were selected as the key air contaminants of interest from the Hardisty Complex. Emission rates vary, depending on the type of tank, operating parameters, ambient temperature, wind speed and the

type of product stored in the tank. All maximum predicted ground-level concentrations of H<sub>2</sub>S, mercaptans and benzene associated with the Keystone Terminal Tanks were well below the regulatory criteria for ambient air quality (J. Whitford AXYS Ltd., 2008).

## **3.2 Most Probable Impacts to Flagstaff County**

### **3.2.1 Summary of Health Related Impacts of Typical Emissions from Oil Storage Tanks on Nearby Residents**

#### **ALBERTA'S AMBIENT AIR QUALITY OBJECTIVES**

Alberta's Ambient Air Quality Objectives (AAAQO) are established under Section 14 of the Environmental Protection and Enhancement Act (EPEA R.S.A. 2000, c.E-12, as amended). The AAAQO provide a basis for determining acceptable air quality.

The Ambient Air Quality Objectives are used for:

- Reporting on the state of the atmospheric environment in Alberta.
- Reporting to Albertans on the quality of the air through Alberta's Air Quality Index.
- Establishing approval conditions for regulated industrial facilities.
- Evaluating proposals to construct facilities that will have air emissions.
- Guiding special ambient air quality surveys.
- Assessing compliance near major industrial air emission sources.

AAAQOs are not levels to "pollute-up-to" but rather as ceilings that we do not want to reach. Some AAAQOs are based on odour perception. This is the case for ammonia, nitrogen dioxide and hydrogen sulphide. For these chemicals, people are likely to detect an odour at concentrations well below levels that may affect human health. Alberta's Ambient Air Quality Objectives for one-hour average concentration of pollutants monitored are listed below:

- Hydrogen sulphide – 10 ppb (1 hour); 3 ppb (24 hour)
- Benzene – 9 ppb
- Ethylbenzene – 460 ppb
- Toluene – 499 ppb
- Xylene – 530 ppb

There is no AAAQO for total reduced sulphur.

## COMMUNITY HEALTH AND SAFETY ISSUES

There is always potential public exposure to spills, fires, and explosions, although the probability of large magnitude events directly associated with storage operations in well designed and managed facilities is usually low (International Finance Corporation, 2006). Operators of these facilities have emergency response plans that consider the safety and protection of the communities and community infrastructure as appropriate. The likelihood of community exposure to chemical hazards during normal operations may be greater during road, rail, or water transport activities associated with fuel delivery and distribution.

**Figure 21. Pipeline Leak by Peace River (Plains All American Pipeline Photo)**



In 2009, Alberta's pipeline industry set a record-low pipeline failure rate of 1.7 per 1000 km of pipeline. Nevertheless, although pipeline leaks in Alberta are rare, the ERCB is currently working with Plains Midstream Canada, Alberta Environment and other agencies during clean-up efforts following a crude oil pipeline failure about 100 km northeast of Peace River, shown in Figure 21. About 28,000 barrels (4.5 million liters) poured out of the Plains Midstream Rainbow pipeline on April 29<sup>th</sup>, 2011, the second largest oil spill in Alberta history. Plains has mobilized environmental assessment staff, spill response specialists and monitoring equipment to contain the spill, minimize its impact and begin clean-up efforts (ERCB News Release, May 5, 2011).

This is the second major spill from the Rainbow line, which travels 772 km from Zama to Edmonton and leaked 7,500 barrels in late 2006. An investigation determined that stress corrosion cracking, fatigue cracking and external coating failure caused the

release. These are issues related to age; the Rainbow line was built in 1966. An investigation into the incident by the ERCB is underway.

The Buncefield fire, shown in Figures 22 and 23, was caused by a series of explosions at an oil storage terminal in Hertfordshire, England in 2005. The initial large explosion led to further explosions which overwhelmed 20 large storage tanks. The cause of the explosion was determined to be a fuel-air explosion of very high strength (<http://news.bbc.co.uk> 9 May 2006).



**Figure 22. Photograph of the Buncefield Tank Fire (2005)**



**Figure 23. Smoke Visible from the Buncefield Blast**

These examples provide assistance for risk assessments to prevent such incidents from happening again. In Buncefield, lessons learned indicated improved guidelines were required for: the design and operation of storage sites, emergency response to incidents, and advice to planning authorities.

In considering the most catastrophic events that could occur, terrorist attack and natural disaster (lightening, tornado) would be of the most severe. Disaster planning and extensive training will help to mitigate a natural disaster. A comprehensive security program is essential for reducing risks involved with terrorism. On April 1, 2011, the amendment to the NEB Onshore Pipeline Regulations: *Adoption of CSA Z246.1-09 Security Management for Petroleum and Natural Gas Industry Systems* became effective. This legislation requires companies to have a Security Program that is systematic, comprehensive and proactive in managing security threats and associated risks.

## **TOXICOLOGY OF POLLUTANTS OF CONCERN**

### **Hydrogen Sulphide**

Hydrogen sulphide (H<sub>2</sub>S) is a potentially toxic colourless gas, with a rotten egg odour. It is produced naturally by decaying organic matter. It may be released from sewage, sulphur hot springs, volcanoes, and natural gas. It is a by-product of a number of industrial processes, including oil refining. Exposures to H<sub>2</sub>S can occur in both the parts per million (ppm) and parts per billion (ppb) range, depending on the setting. Environmental exposures are typically in the ppb range while occupational exposures can occur in the ppm range.

The odour of H<sub>2</sub>S may be first identified by some individuals at levels as low as 0.5 ppb, while others may not detect the smell until levels of 130 ppb. Exposure to lower concentrations (10-20 ppm) can result in eye irritation, shortness of breath and fluid in the lungs. At 100-150 ppm, the olfactory nerve is paralyzed and the sense of smell disappears. Long-term, low-level exposure (~2 ppm) may result in fatigue, loss of appetite, headaches, irritability, poor memory and dizziness. At higher levels H<sub>2</sub>S becomes an asphyxiant and causes death. The lethal concentration for 50% of humans (LC50) for 5 minutes exposure is 800 ppm (Agency for Toxic Substances and Disease Registry - World Health Organization, 2003).

### **Volatile Organic Compounds (VOCs)**

Volatile organic compounds are organic compounds that easily become vapours or gases. Along with carbon, they contain elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulphur or nitrogen. When combined with NO<sub>x</sub>, VOCs react to form ground-level ozone, or smog which contributes to climate change. All BTEX compounds (benzene, toluene, ethylbenzene and xylene) are on the Canadian

Environmental Protection Act (CEPA) priority substances list. Benzene has been classified as Group I (Carcinogenic to Humans) using the classification scheme developed by Health and Welfare Canada

The health effects of VOCs varies, and can range from being highly toxic suspected carcinogens to having no known health effects, depending on nature of the volatile organic compound, the level and length of exposure.

Long-term exposure to volatile organic compounds can cause damage to the liver, kidneys and central nervous system. Short-term exposure to volatile organic compounds can cause eye and respiratory tract irritation, headaches, dizziness, visual disorders, fatigue, loss of coordination, allergic skin reactions, nausea, and memory impairment (A. Kraut, 2000).

There are two stations at Husky Hardisty Terminal and two stations at Enbridge Contract Terminal which monitor the volatile organic compounds (VOCs) using a passive canister sampling system. Alberta Environment provided air quality data from these stations from the last two years, VOCs were well below the AAAQO.

### **3.2.2 Response Requirements for Operating Companies**

#### **National Energy Board Response Requirements**

Since the terrorist attacks in the US on September 11, 2001, the federal government has been examining the security of Canada's critical infrastructure including energy. The focus has been on identifying critical oil and gas infrastructure and assessing the level of emergency preparedness of NEB-regulated companies should they become targets of terrorism or other criminal activities.

The operating companies governed by the NEB in the Hardisty Hub area, Enbridge Midstream, Kinder Morgan and TransCanada Keystone Pipeline Group are audited for compliance with the ***Onshore Pipeline Regulations 1999 (OPR-99)***, including security and emergency preparedness programs. Full compliance requires an emergency preparedness and response (EPR) program including the following elements:

- EPR Program Development (Hazard Assessment)
- Emergency Procedures Manual
- Liason Program (First Responders)
- Continuing Education Program (Public)
- Emergency Response Training
- Emergency Response Exercises
- Incident and Response Evaluation
- Emergency Response Equipment



The following are some NEB reporting requirements outlined in the Canadian Environmental Assessment Act for the Enbridge Alberta Clipper pipeline, which is expected to be operational in 2011:

- Early summer rare vegetation survey
- Late summer survey report
- Pre-construction weed survey
- Wetland characterization survey
- Wildlife and habitat survey
- Fish population and riverine habitat inventories at watercourse crossings proposed

Results indicate that a high standard of environmental protection was achieved throughout the construction of the Alberta Clipper Pipeline Project.

## **Alberta Environment Response Requirements**

Any spill release or emergency that may cause, is causing or has caused an adverse effect to the environment must be immediately reported to Alberta Environment (AENV). AENV defines the environment in a broad sense: the components of the earth including air, land, water, all layers of the atmosphere, all organic and inorganic matter, living organisms and interacting natural systems (Alberta Environment, 2005).

Response requirements are specified in each individual Alberta Environment approval. Over the last 25 years, 191 approvals were found in the identified quadrant. For example, approval number 00010801-01-03, effective February 7, 2011 provides for the construction, operation and reclamation of Tank 14 by Gibson Energy. The approval requires an Annual Air Report, which includes an evaluation and comparison of headspace analyses results to maximum allowable concentrations. The approval also requires a summary of all actions taken to address any concentration that exceed the predicted applicable maximum allowable headspace concentrations.

The following regulations govern release reporting:

- Environmental Protection and Enhancement Act, R.S.A. 2000, c.E-12 (as amended)
- Release Reporting Regulation, A.R. 117/93 (as amended)
- Transportation of Dangerous Goods Regulations (SOR 2001-286) under the Transportation of Dangerous Goods Act, 1992, S.C. 1992, c.34
- Dangerous Goods and Handling Act, R.S.A. 2000, D-4 (as amended)
- Oil and Gas Conservation Act, R.S.A. 2000, c. 0-6 (as amended)

Under these regulations, a releasable substance is any matter that is capable of becoming dispersed or transformed into the environment; or any sound, vibration, heat, radiation, or other form of energy. An adverse effect can be impairment of or damage to the environment, human health or safety, or property (Alberta Environment, 2005). Alberta Environment recommends that local authorities establish appropriate training and response systems and immediately notify AENV of any releases. An adverse effect may be difficult to determine, depending on the chemical and physical characteristics of the substance and where it was released. If uncertain about the potential for adverse effects, AENV recommends the release be reported. Releases can occur quickly, or over a long period of time. Numerous small releases can result in a potential adverse effect even if the individual release itself may not (Alberta Environment, 2005).

## **Industry Response**

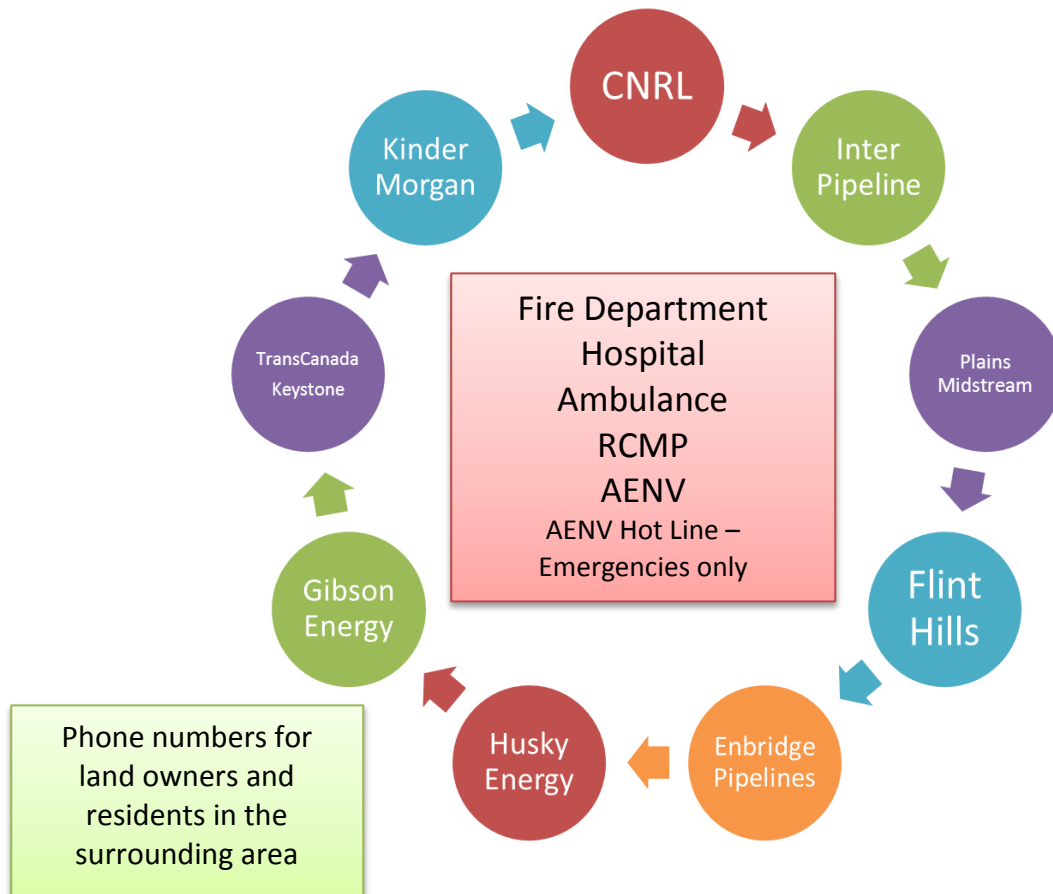
Establishing emergency response plans is a key element of emergency preparedness. ERCB licensees must have a general or corporate level emergency response plan (ERP). Corporate-level ERPs do not require ERCB approval but must be submitted for review upon request. ERPs exist as a requirement of approval and are practiced regularly.

An example of the level of response required to control a disaster can be found at Greensboro, NC. In 2007, a lightning strike ignited one of the 72 tanks on a farm owned by Colonial Pipeline Company in Greensboro. Over 150 firefighters were involved and nearly 2,000 gallons of specialized foam created to fight petroleum fires was used. Twenty police officers were required to close down roads and secure the area. This had the potential to be a major event, but extensive training on disaster scenarios at the tank farm and precise execution of protocols were effective in keeping the fire from spreading and becoming a catastrophic event (News-Record.com, Greensboro, NC , 2010)

If a complaint or emergency occurs at the Hub, the Hardisty Mutual Aid Plan (HMAP) call around procedure is activated and Wainwright ERCB notified (Kroening, 2011). The ERCB respond to emergencies on a 24-hour basis and assumes a leadership role in coordinating emergency response amongst the company, the municipality in which the emergency occurs, and the provincial Emergency Management Authority.

For complaints, the call around must be completed back to the starting company in order to make sure that all parties are aware of the complaint. If the initial company does not receive a call back within 20 minutes, the call around should be started again. If a company identifies a problem as being theirs, that company would call the other companies on the call around list to inform them that the source has been discovered. The call around is tested once per month. The company employing the HMAP chairman, currently Inter Pipeline, initiates the test (Kroening, 2011).

**Figure 24. HMAP Call Around Procedure for Odour Complaints and Emergencies**



Licensees must be prepared to respond quickly and effectively to protect the health, safety and welfare of people and to limit damage to property and the environment. The operating companies have emergency response trailers on site that can be used as emergency operating centres (EOC) if required. An EOC is a central command and control facility responsible for carrying out the principles of emergency preparedness and emergency management, or disaster management functions at a strategic level in an emergency situation, therefore ensuring the continuity of operations.

Enbridge has recently introduced a flagship community investment program called the *Safe Community Program*, which provides monetary support to police agencies, fire fighters, emergency medical services and other responders to emergency situations in the communities they operate. Through this program, grants are given to eligible organizations to acquire such support as new safety equipment, professional training and deliver safety educational programs in their neighbourhoods.

Enbridge addresses pipeline integrity and emergency responsiveness from a variety of aspects, including initial system design, materials, construction practices, and

operation, maintenance and inspection procedures. There are three major components:

✓ **Release Prevention**

Considerations include: route selection; selection of pipeline materials; coating; regulatory compliance; post-construction testing, operation, maintenance and inspection; pipeline operation and control; protection of pipelines from third-party damage and corrosion; maintenance and patrol.

✓ **Release Detection**

There are several provisions to enable early detection of a release. Aerial patrols, foot patrols and internal inspections are fundamental. Enbridge's public awareness program, which includes information on how to recognize and respond to pipeline releases, is also a key component in Enbridge's pipeline release identification and notification program. A Supervisory Control and Data Acquisition (SCADA) system is the central component of the pipeline control system. The SCADA system includes pipeline sensing devices and automated alarms to warn operators of abnormal conditions. In addition, Enbridge has implemented a small release detection system which is installed in sensitive areas to increase the ability to remotely and quickly detect very small releases.

✓ **Release Response**

Enbridge has a detailed emergency response plan that demonstrates the Company's response capabilities in accordance with regulatory requirements. Enbridge operators are trained and equipped to respond to an emergency. Enbridge facilities in the Hardisty Hub: the Hardisty Caverns Limited Partnership, which provides storage service; and the Hardisty Contract Terminal are equipped with mobile response units (equipped for both land and water-based releases) and heavy equipment. As well, pre-staged containment and recovery equipment is maintained at various other locations along the pipeline (Enbridge Pipelines LLC, 2007).

Although pipelines are proven to be the safest transportation mode for energy commodities and leaks are rare, it is important that the land owners and residents in the area are aware of warning signs. The liquid hydrocarbons contained in the pipeline systems are flammable, and are potentially explosive under certain conditions. The pipelines carry many kinds of products with individual characteristics, so the warning signs can vary:

- Smell – an odour similar to gasoline or diesel, or a stronger less pleasant gasoline smell
- Sound – a hissing or roaring noise may be a pipeline leak
- See – a moist patch or pool of liquid may be crude oil; light brown or yellow liquid may be synthetic crude or condensate; a steam-like cloud or a frost-like appearance on the ground may be a natural gas liquid

Upon detecting any of the warning signs, leave the area quickly, move to a safe position upwind and call the local emergency number (Canadian Energy Pipeline Association, 2010).

### 3.2.3 Communication Requirements

Courtesy calls are given to Alberta Environment by the operating companies when opening a tank or a line. In a Terminal emergency, the HMAP call around is activated with a first call to the Wainwright ERCB who activates the emergency response and Alberta Emergency Management Agency. The NEB are called immediately for pipeline emergencies. Once emergency response has been activated, land owners and residents in the area are notified.

Regulatory agencies and industry are required to listen to the public. The public can get involved by attending open houses, call information lines or visit websites provided by the companies. Most information is available for public viewing on the regulatory agency websites. This appears to be the preferred method for both industry and regulatory agencies to share information.

The National Energy Board website, [www.neb-one-gc.ca](http://www.neb-one-gc.ca) **Major Applications and Projects before the NEB**, provides an overview of current and proposed projects. The NEB encourages regulated companies to communicate with and involve the public when they are developing projects. Public involvement, including that of Aboriginal peoples, is a fundamental component during each phase in the lifecycle of a project in order to address potential impacts. Some companies ask for input in to the planning and design of a project prior to submitting an application to the Board. It is important that landowners and other affected people or groups make their concerns known to the company as early as possible and stay involved in the process. The NEB wants to hear from people with an interest in a project before making a decision about a company's proposal. The public can participate in various ways, described in **The Public Hearing Process** on the NEB website. The website also lists upcoming **Hearings and Information Sessions**.

Similarly, the ERCB seeks public involvement. The ERCB website [www.ercb.ca](http://www.ercb.ca) lists **Projects and Issues**, as well as **News and Releases** on their home page. Participant involvement is a requirement of the ERCB Directive 056: Energy Development Applications, consisting of personal consultation and notification. The applicant is required to inform parties whose rights may be directly and adversely affected by the proposed application by:

- Distributing a project description and the ERCB public information package
- Identifying potential impacts
- Responding to questions and concerns
- Discussing options, alternatives and mitigating measures

- Seeking confirmation of non-objection through cooperative efforts
- Notification by written correspondence

Alberta Environment seeks public consultation as a key component of the approval process. The Alberta Environmental Protection and Enhancement Act states that the public be notified of all approval applications. Anyone directly affected by an application may submit a written statement to the Director outlining concerns, and may appeal a decision to issue an approval. A review of a proposed application determines whether the activity's general and overall impact on the environment is in accordance with the Act and regulations. The review may address design plans, site suitability, proposed monitoring programs and substance release. An applicant may be required to hold public information meetings or address public statements of concern.

Husky Energy is committed to respectful, honest and transparent communication with the public. Initial project planning includes meeting individual stakeholders and hosting open houses. Husky participates in community-based organizations that work toward fostering positive relationships among stakeholders and resolving local issues (Husky Energy 2011).

Kinder Morgan states *“As part of our public awareness program, we regularly communicate with first responders, public officials, excavators and those who live or work near our pipelines. Through various open houses and presentations, we inform stakeholders about the presence of pipelines in the communities and the steps required to prevent pipeline damage.”* Kinder Morgan staff practices emergency response several times a year and often include local first responders to ensure an efficient joint response (Kinder Morgan 2011).

TransCanada has a comprehensive emergency response plan for the proposed Keystone XL pipeline. The Keystone XL Operations Control Centre will be staffed 24 hours a day, seven days a week. Operators will be able to stop the flow and isolate a suspected leak within 12 minutes. Pipeline Emergency Response personnel will be dispatched to the scene immediately. Local law enforcement, fire departments and local emergency responders will be trained by Keystone personnel how to protect themselves and the public, in the event that they are required to respond to a spill (TransCanada, 2010).

Enbridge provides information about their activities to neighbours, community residents and officials through their **Public Awareness Program**. The program provides information to landowners and tenants along the route, emergency preparedness information to local officials, and damage prevention guidance to excavators and residents along the route. All members of affected communities should know where pipelines are located in their communities, be aware of what to do in an emergency, and avoid damage to pipelines from excavation (Enbridge 2011).

## 4. CONCLUSIONS

Hardisty's role as a shipping, storage and trading hub dates back to the 1950's installation of the first long distance pipeline for Alberta oil. The Hardisty Hub has since become a hub of a transportation network for production from Cold Lake, Lloydminster and Fort McMurray. The chronology of this development for 9 operating companies was established by reviewing the history of Alberta Environment Approvals, ERCB licenses and NEB Regulatory Document Index. Overall, 191 approvals were located and reviewed for the quadrant of interest, representing a vast array of industrial development.

A significant amount of expansion is proposed over the next few years. The Keystone XL and Alberta Clipper pipelines are expected to be in service this year. Husky is proposing to build two new tanks and construction of the Keystone XL Hardisty Terminal B will commence in the fall of 2011. In addition, Suncor plans to build four new 300,000 barrel tanks at Gibson's Hardisty Terminal. It can be concluded that this development will continue.

**Figure 25. A Few of the Tanks at the Hardisty Hub**



The intent of current federal and provincial regulation is to ensure public safety, security and environmental protection. The regulations, though law, are fluid documents, which are continually being amended to improve environmental protection and public health and safety. Reporting of pollutant emissions in Alberta is mandated in individual operating approvals and industry is required to submit monitoring reports to Alberta Environment. As a result of compliance with regulation, concentrations of air

pollutants are expected to be below regulatory criteria under normal operating conditions

Landowners and other affected stakeholders need to make their concerns known to industry as early as possible and stay involved in the regulatory approval process. Regulatory authorities want to hear from people with an interest in a project before making a decision about a company's proposal. Getting involved with public consultation and public hearings in future proposals will ensure that concerns are addressed; resulting changes may be incorporated into plant design before construction. As regulators of the energy industry, the ERCB and NEB have the authority to approve or deny proposed energy developments and to decide which parties have standing in cases of outstanding concerns or objections.

Although a history of personal complaints was not available from the ERCB, a history of incident releases from 1978 to present was examined. It was determined that operator error was the most common cause of release and crude oil was the most common substance released. Alberta Environment recommends that local authorities establish appropriate training and response systems and provide immediate notification of any releases. Releases can occur quickly, or over a long period of time. Numerous small releases can result in a potential adverse effect even if the individual release itself may not. In the air, a release can often be detected as an odour.

Continuous monitoring from December 2008 to December 2010 at both the Husky and Enbridge Terminals revealed that concentrations of hydrogen sulphide were well below the regulatory criteria set out in Alberta's Ambient Air Quality Objectives. Intermittent monitoring of VOCs over the same period for Husky and Enbridge Terminals resulted in BTEX concentrations well below the regulatory criteria. For the purposes of future air quality studies, these data can be used as baseline or reference values. Health-related impacts from these low concentrations are unlikely. .

Ambient air monitoring conducted near the Hardisty Terminal by Alberta Environment in 2005 and 2006 found elevated hydrocarbons only during the loading and unloading of petroleum, probably due to fugitive emissions. Overall, the concentrations of hydrocarbons as well as oxides of nitrogen, total reduced sulphur and sulphur dioxide found at the Terminal were comparable to levels typically measured in rural environments.

Medical aid, fire protection and traffic are the top three concerns of the operators at the Hub. Rapid response to medical emergencies and fire protection are made possible by Flagstaff County emergency responders. The Hardisty fire department staffs volunteer members from the operating companies, who can provide the department with insight into terminal operations and ERPs. Although traffic congestion in the Terminal and on Highway 13 is increasing and several hundred trucks a day are moving around, the collision rate is relatively low.



In considering the most catastrophic events that could occur at the tank farm, terrorist attack and natural disaster such as lightening or a tornado could be the most severe. Disaster planning and extensive training, both from the surrounding community and operating companies, would be essential to help mitigate a natural disaster. Because a comprehensive security program is essential for reducing risks involved with terrorism, the HMAP operators are planning a security table top exercise in the summer of 2011 involving the ERCB, NEB and RCMP.

The operating companies are already subject to stringent air monitoring requirements, which seems to offer redundancy to the airshed suggestion. In addition, the emission source monitoring of tank headspace is superior to ambient monitoring for efficiency assessments of abatement systems. Although an airshed zone for this area might be premature at this time, continued expansion will cause an increase in the *Cumulative Effects Monitoring* which may necessitate the development of an airshed zone. The effects of the sour gas plants and power plant in the facility must also be considered.

The airshed zone approach would make it possible to improve existing monitoring and make local and regional monitoring systems more efficient in order to obtain quality information about regional air quality. Forming an airshed zone over the Hub would require a partnership of industry, provincial and municipal governments, the health authority, and other interest groups and individuals. By assessing annual emission inventories and using the philosophy that funding should be proportioned fairly amongst the members at levels consistent with their relative impact on the zone's air quality, it would be possible to form and operate an airshed zone entirely funded by voluntary industry members.

## 5. RECOMMENDATIONS

Based on the results of this baseline study, it is recommended that Flagstaff County:

- ✓ Periodically check the Alberta Environment Authorization/Approval Viewer [Approval Documents Search](#) using LSDs of interest. Seek further involvement in the AENV regulatory approval process and ERCB energy development applications for future projects and expansions by participating in public hearings and public consultation. It is easier to resolve issues at the local level before they become matters of great concern
- ✓ Assign a representative to attend the Hardisty Community Complex Group meetings and annual open house to maintain communication with the operating companies. Early involvement in informal discussions with industry may lead to greater influence on project planning and mitigation of impacts
- ✓ Collaborate with local operating companies of pipelines and terminals for emergency response. Some of the companies may provide funding for Flagstaff County to purchase equipment and take training on disaster scenarios at the tank farm (e.g. Enbridge Safe Communities Program).
- ✓ Encourage Flagstaff County residents to steward their surrounding environment by immediately reporting releases, unusual odours or any adverse effects to Alberta Environment and Flagstaff County Office.
- ✓ Investigate forming an airshed zone within the next 5 years, initiate informal discussion with Alberta Environment, industry partners and other affected or interested parties.
- ✓ Repeat this study within 5 years and compare to the information obtained in this baseline study with emphasis on the impact of new facilities. Request annual air reports and related studies from Alberta Environment. Request a repeat of the *2005-2006 Alberta Environment Air Quality Monitoring in the Area of Hardisty Bulk Petroleum Storage* study within the next 2-3 years.
- ✓ Expand the scope of the next air quality study to include all facilities releasing air emissions in Flagstaff County, including the ATCO Battle River Generating Station at Forestburg; the Thompson Lake, Battle River, Sedgewick and Signalta Forestburg sour gas processing plants, and the Brownfield sweet gas plant.

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## Appendix 1. Air Monitoring Data

**Table 19. Continuous Air Monitoring - Hydrogen Sulphide Data for Enbridge Hardisty Terminal**

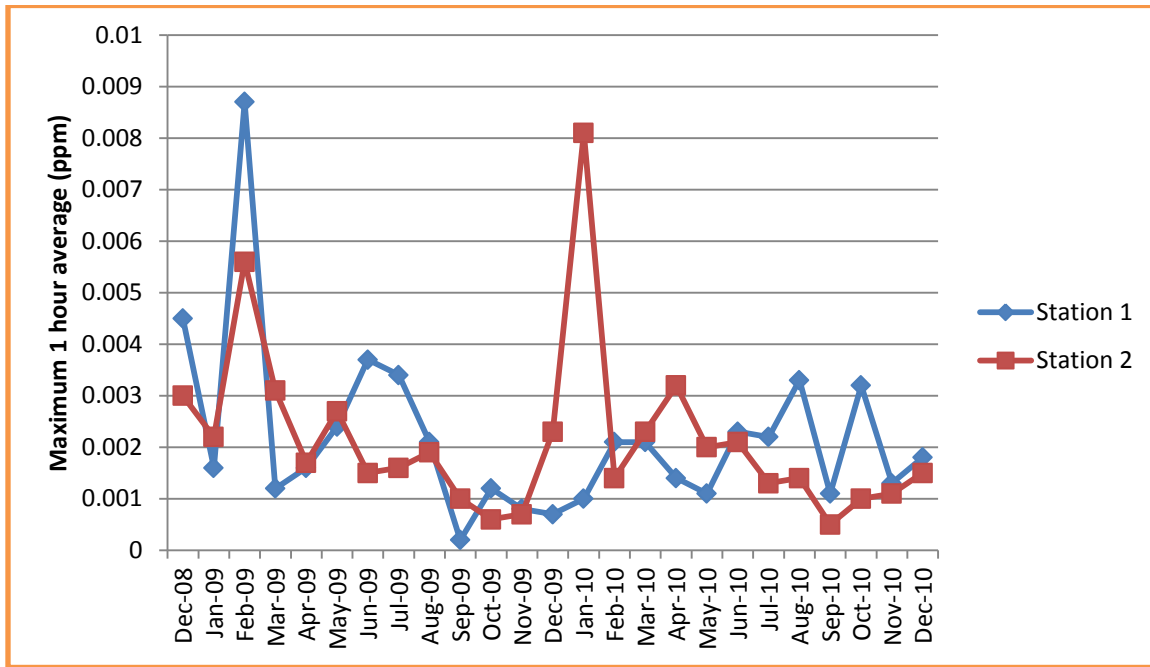
Month/Year	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
	Maximum 1 Hour (ppm)		Maximum 24 Hour (ppm)		Monthly Average (ppm)	
Dec-08	0.0045	0.0030	0.0016	0.0012		
Jan-09	0.0016	0.0022	0.0005	0.0007		
Feb-09	0.0087	0.0056	0.0010	0.0010		
Mar-09	0.0012	0.0031	0.0004	0.0008		
Apr-09	0.0016	0.0017	0.0003	0.0003		
May-09	0.0024	0.0027	0.0003	0.0005		
Jun-09	0.0037	0.0015	0.0004	0.0005		
Jul-09	0.0034	0.0016	0.0006	0.0004		
Aug-09	0.0021	0.0019	0.0005	0.0005		
Sep-09	0.0002	0.0010	0.0006	0.0004		
Oct-09	0.0012	0.0006	0.0003	0.0003		
Nov-09	0.0008	0.0007	0.0003	0.0002		
Dec-09	0.0007	0.0023	0.0005	0.0005		
Jan-10	0.0010	0.0081	0.0005	0.0006		
Feb-10	0.0021	0.0014	0.0005	0.0006		
Mar-10	0.0021	0.0023	0.0004	0.0003		
Apr-10	0.0014	0.0032	0.0003	0.0016		
May-10	0.0011	0.0020	0.0004	0.0010	0.0002	0.0002
Jun-10	0.0023	0.0021	0.0005	0.0004	0.0002	0.0002
Jul-10	0.0022	0.0013	0.0004	0.0004	0.0002	0.0002
Aug-10	0.0033	0.0014	0.0006	0.0004	0.0003	0.0002
Sep-10	0.0011	0.0005	0.0003	0.0002	0.0002	0.0001
Oct-10	0.0032	0.0010	0.0008	0.0003	0.0002	0.0001
Nov-10	0.0013	0.0011	0.0004	0.0004	0.0002	0.0001
Dec-10	0.0018	0.0015	0.0007	0.0006	0.0003	0.0002

**Table 20. Continuous Air Monitoring - Total Reduced Sulphur Data for Enbridge Hardisty Terminal**

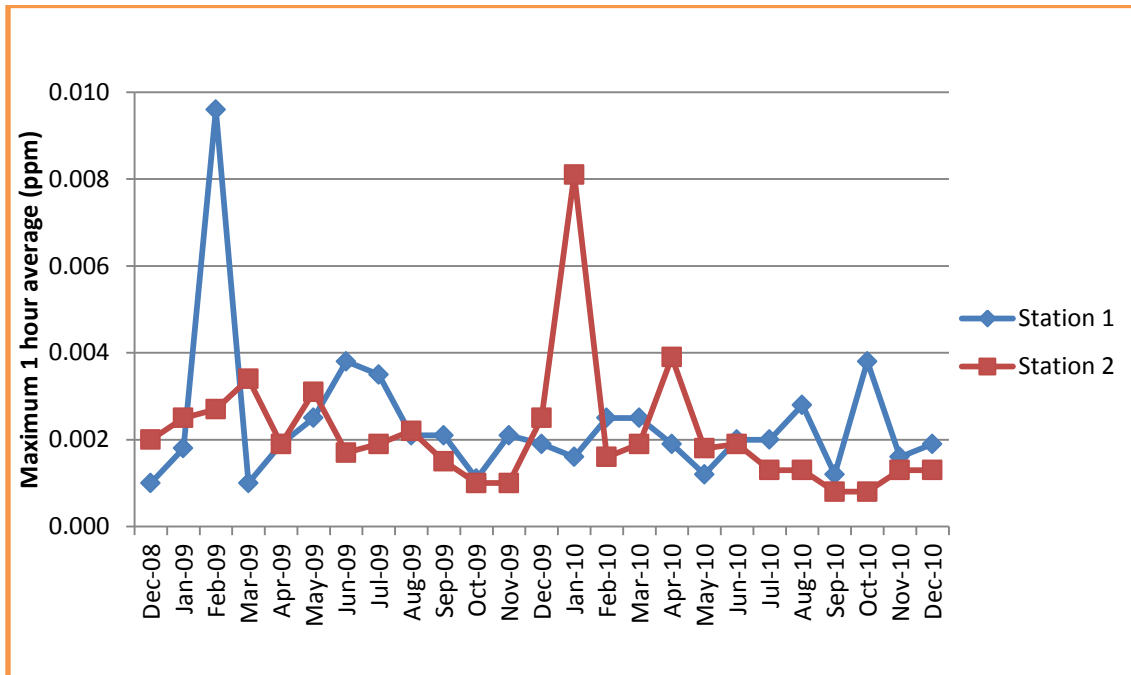
Month/Year	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
	Maximum 1 Hour (ppm)		Maximum 24 Hour (ppm)		Monthly Average (ppm)	
Dec-08	0.0010	0.0020	0.0003	0.0007		
Jan-09	0.0018	0.0025	0.0003	0.0008		
Feb-09	0.0096	0.0027	0.0014	0.0009		
Mar-09	0.0010	0.0034	0.0002	0.0009		
Apr-09	0.0019	0.0019	0.0003	0.0006		
May-09	0.0025	0.0031	0.0004	0.0007		
Jun-09	0.0038	0.0017	0.0006	0.0007		
Jul-09	0.0035	0.0019	0.0006	0.0008		
Aug-09	0.0021	0.0022	0.0006	0.0007		
Sep-09	0.0021	0.0015	0.0008	0.0008		
Oct-09	0.0011	0.0010	0.0003	0.0005		
Nov-09	0.0021	0.0010	0.0005	0.0005		
Dec-09	0.0019	0.0025	0.0008	0.0008		
Jan-10	0.0016	0.0081	0.0010	0.0009		
Feb-10	0.0025	0.0016	0.0009	0.0009		
Mar-10	0.0025	0.0019	0.0007	0.0005		
Apr-10	0.0019	0.0039	0.0007	0.0020		
May-10	0.0012	0.0018	0.0006	0.0010	0.0004	0.0003
Jun-10	0.0020	0.0019	0.0006	0.0006	0.0004	0.0004
Jul-10	0.0020	0.0013	0.0006	0.0006	0.0004	0.0004
Aug-10	0.0028	0.0013	0.0006	0.0005	0.0004	0.0003
Sep-10	0.0012	0.0008	0.0005	0.0004	0.0004	0.0003
Oct-10	0.0038	0.0008	0.0008	0.0004	0.0004	0.0003
Nov-10	0.0016	0.0013	0.0007	0.0005	0.0005	0.0002
Dec-10	0.0019	0.0013	0.0011	0.0005	0.0006	0.0003



**Figure 26. Maximum 1 Hour Average Hydrogen Sulphide - Enbridge**



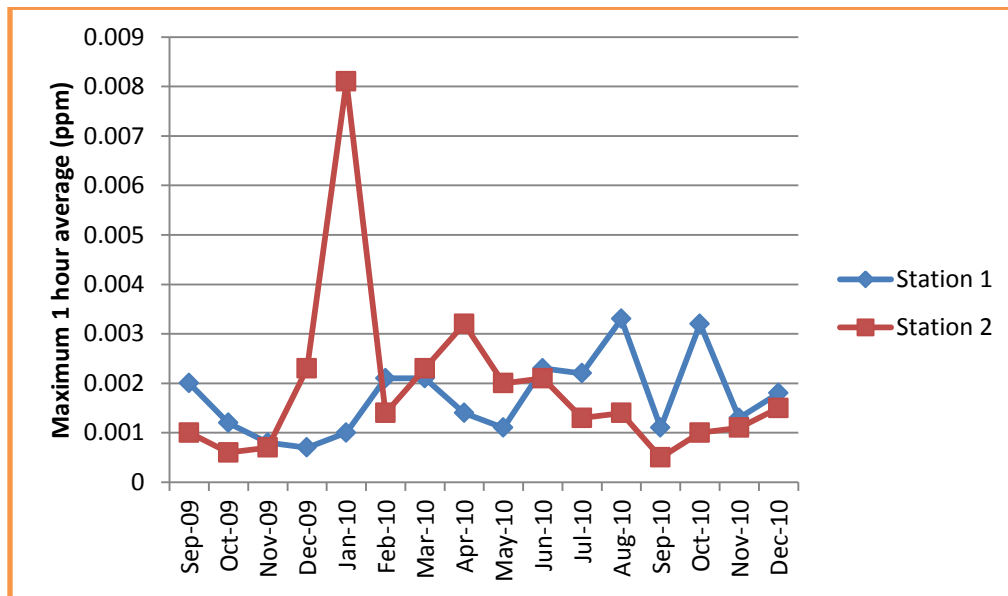
**Figure 27. Maximum 1 Hour Average Total Reduced Sulphur - Enbridge**



**Table 21. Continuous Air Monitoring - Hydrogen Sulphide Data for Husky Hardisty Terminal**

Month/Year	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
	Maximum 1 Hour (ppm)		Maximum 24 Hour (ppm)		Monthly Average (ppm)	
Sep-09	0.0020	0.0010	0.0006	0.0004		
Oct-09	0.0012	0.0006	0.0003	0.0003		
Nov-09	0.0008	0.0007	0.0003	0.0002		
Dec-09	0.0007	0.0023	0.0005	0.0005		
Jan-10	0.0010	0.0081	0.0050	0.0006		
Feb-10	0.0021	0.0014	0.0005	0.0006		
Mar-10	0.0021	0.0023	0.0004	0.0003		
Apr-10	0.0014	0.0032	0.0003	0.0016		
May-10	0.0011	0.0020	0.0004	0.0010	0.0002	0.0002
Jun-10	0.0023	0.0021	0.0005	0.0004	0.0002	0.0002
Jul-10	0.0022	0.0013	0.0004	0.0004	0.0002	0.0002
Aug-10	0.0033	0.0014	0.0006	0.0004	0.0003	0.0002
Sep-10	0.0011	0.0005	0.0003	0.0002	0.0002	0.0001
Oct-10	0.0032	0.0010	0.0008	0.0003	0.0002	0.0001
Nov-10	0.0013	0.0011	0.0004	0.0004	0.0002	0.0001
Dec-10	0.0018	0.0015	0.0007	0.0006	0.0003	0.0002

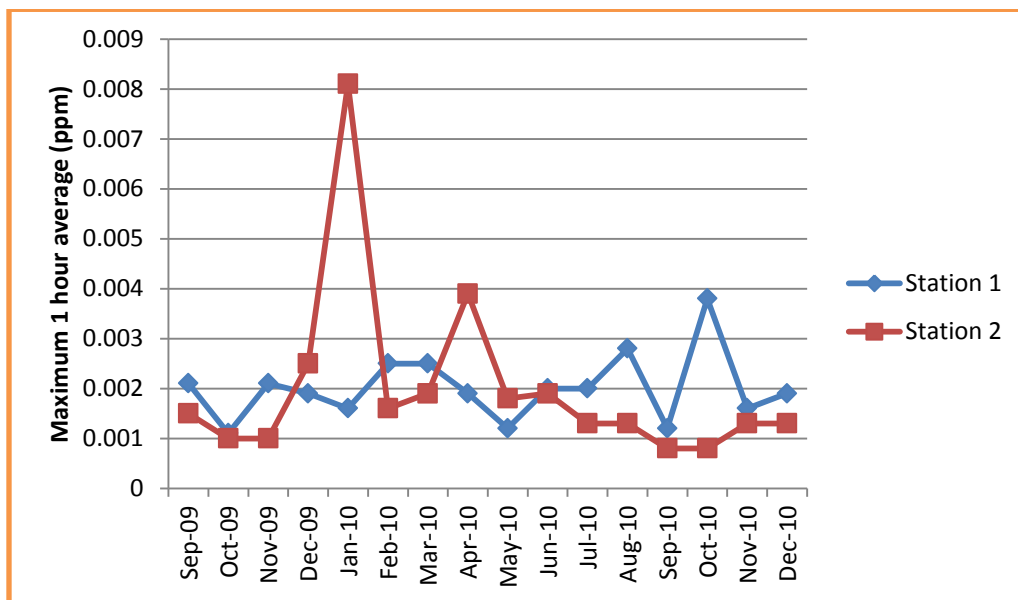
**Figure 28. Maximum 1 Hour Average Hydrogen Sulphide - Husky**



**Table 22. Continuous Air Monitoring - Total Reduced Sulphur Data for Husky Hardisty Terminal**

Month/Year	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
	Maximum 1 Hour (ppm)		Maximum 24 Hour (ppm)		Monthly Average (ppm)	
Sep-09	0.0021	0.0015	0.0008	0.0080		
Oct-09	0.0011	0.0010	0.0003	0.0005		
Nov-09	0.0021	0.0010	0.0005	0.0005		
Dec-09	0.0019	0.0025	0.0008	0.0008		
Jan-10	0.0016	0.0081	0.0010	0.0009		
Feb-10	0.0025	0.0016	0.0009	0.0009		
Mar-10	0.0025	0.0019	0.0007	0.0005		
Apr-10	0.0019	0.0039	0.0007	0.0020		
May-10	0.0012	0.0018	0.0006	0.0010	0.0004	0.0031
Jun-10	0.0020	0.0019	0.0006	0.0006	0.0004	0.0004
Jul-10	0.0020	0.0013	0.0006	0.0006	0.0004	0.0004
Aug-10	0.0028	0.0013	0.0006	0.0005	0.0004	0.0003
Sep-10	0.0012	0.0008	0.0005	0.0004	0.0004	0.0003
Oct-10	0.0038	0.0008	0.0008	0.0004	0.0004	0.0003
Nov-10	0.0016	0.0013	0.0007	0.0005	0.0005	0.0002
Dec-10	0.0019	0.0013	0.0011	0.0005	0.0006	0.0003

**Figure 29. Maximum 1 Hour Average Total Reduced Sulphur - Husky**



**Table 23. Benzene and Ethylbenzene Passive Monitoring Data - Enbridge Hardisty**

Month/Year	Benzene				Ethylbenzene			
	Peak Reading (ppb)		Network Average (ppb)		Peak Reading (ppb)		Network Average (ppb)	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
Dec-08	0.500	0.440	0.310	0.365	2.900	0.040	0.866	0.040
Jan-09	0.540	1.970	0.407	0.758	0.880	0.060	0.370	0.055
Feb-09	0.420	0.220	0.210	0.167	8.620	0.000	3.023	0.000
Mar-09	2.570	0.420	0.802	0.302	0.520	0.000	0.258	0.000
Apr-09	0.670	0.590	0.390	0.370	0.330	0.140	0.330	0.047
May-09	0.810	0.470	0.388	0.247	0.260	0.280	0.092	0.047
Jun-09	0.730	0.740	0.530	0.444	0.140	0.300	0.084	0.060
Jul-09	0.480	0.430	0.404	0.334	0.260	0.000	0.120	0.000
Aug-09	0.670	0.420	0.406	0.288	0.380	0.080	0.013	0.016
Sep-09	0.630	0.500	0.544	0.410	0.290	0.900	0.134	0.200
Oct-09	0.420	0.250	0.282	0.178	0.620	0.080	0.182	0.026
Nov-09	2.110	0.820	0.632	0.390	0.120	0.090	0.078	0.280
Dec-09	0.720	0.680	0.368	0.302	0.280	0.520	0.114	0.138
Jan-10	0.640	0.690	0.540	0.522	0.410	0.050	0.144	0.036
Feb-10	0.600	0.530	0.428	0.396	0.060	0.040	0.038	0.008
Mar-10	0.500	3.150	0.346	0.952	0.050	0.080	0.016	0.016
Apr-10	3.210	0.470	0.868	0.328	0.050	0.000	0.010	0.000
May-10	0.320	0.430	0.256	0.276	0.060	0.570	0.024	0.114
Jun-10	0.290	0.290	0.174	0.160	0.030	0.000	0.006	0.000
Jul-10	0.650	1.480	0.318	0.427	0.060	0.120	0.045	0.050
Aug-10	0.720	0.630	0.488	0.482	0.050	0.000	0.016	0.000
Sep-10	0.320	0.450	0.237	0.252	0.060	0.000	0.020	0.000
Oct-10	0.880	0.320	0.368	0.232	0.130	0.000	0.070	0.000
Nov-10	0.280	0.460	0.182	0.228	0.000	0.000	0.000	0.000
Dec-10	0.260	5.130	0.230	1.202	0.050	1.710	0.018	0.342

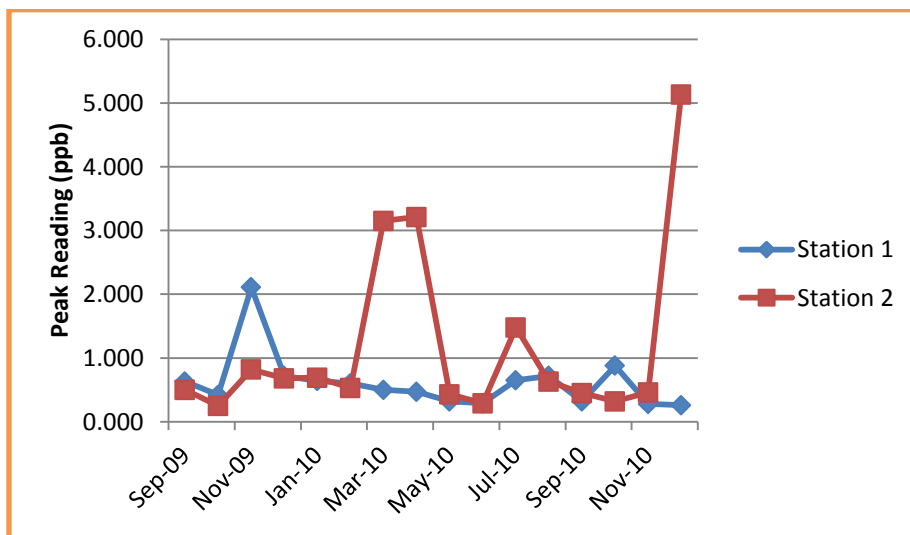
**Table 24. Toluene and Xylenes Passive Monitoring Data - Enbridge Hardisty**

Month/Year	Toluene				Xylenes			
	Peak Reading (ppb)		Network Average (ppb)		Peak Reading (ppb)		Network Average (ppb)	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
Dec-08	4.200	0.390	1.750	0.300	22.300	0.160	6.378	0.115
Jan-09	1.770	0.310	0.863	0.167	5.430	0.110	2.430	0.078
Feb-09	2.190	0.250	0.990	0.140	1.120	0.000	0.660	0.000
Mar-09	2.620	2.420	0.822	0.666	1.510	0.000	0.780	0.000
Apr-09	1.040	1.510	0.590	1.206	0.920	0.110	0.920	0.037
May-09	1.090	4.840	0.572	1.863	0.760	0.820	0.178	0.137
Jun-09	0.860	0.880	0.320	0.684	0.430	1.000	0.254	0.200
Jul-09	0.550	0.970	0.238	0.588	0.640	0.000	0.141	0.000
Aug-09	1.790	0.820	0.660	0.284	0.300	0.110	0.114	0.002
Sep-09	2.090	2.410	0.718	0.732	0.190	0.600	0.133	0.126
Oct-09	0.830	0.440	0.500	0.206	0.120	0.980	0.038	0.249
Nov-09	0.580	0.270	0.236	0.170	0.100	0.060	0.074	0.040
Dec-09	1.490	1.150	0.472	0.406	0.460	0.940	0.170	0.232
Jan-10	0.570	0.340	0.352	0.282	0.450	0.060	0.154	0.039
Feb-10	0.310	0.220	0.216	0.120	0.070	0.030	0.054	0.006
Mar-10	0.180	1.890	0.110	0.452	0.070	0.090	0.022	0.017
Apr-10	0.050	0.440	0.010	0.174	0.060	0.000	0.035	0.000
May-10	0.720	0.690	0.240	0.316	0.150	0.650	0.036	0.116
Jun-10	0.140	0.100	0.100	0.064	0.080	0.070	0.029	0.015
Jul-10	0.550	0.900	0.224	0.272	0.260	0.330	0.190	0.192
Aug-10	0.540	0.330	0.368	0.184	0.140	0.120	0.086	0.056
Sep-10	0.270	0.200	0.217	0.104	0.290	0.090	0.167	0.018
Oct-10	0.810	0.190	0.472	0.116	0.370	0.110	0.174	0.034
Nov-10	0.520	0.530	0.230	0.170	0.130	0.320	0.066	0.104
Dec-10	0.280	14.800	0.204	3.098	0.170	17.450	0.086	3.536

**Table 25. Benzene and Ethylbenzene Passive Monitoring Data - Husky Hardisty**

Month/Year	Benzene				Ethylbenzene			
	Peak Reading (ppb)		Network Average (ppb)		Peak Reading (ppb)		Network Average (ppb)	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
Sep-09	0.630	0.500	0.544	0.410	0.290	0.900	0.134	0.200
Oct-09	0.420	0.250	0.282	0.178	0.620	0.080	0.182	0.026
Nov-09	2.110	0.820	0.632	0.390	0.120	0.090	0.078	0.028
Dec-09	0.720	0.680	0.368	0.302	0.280	0.520	0.114	0.138
Jan-10	0.640	0.690	0.540	0.522	0.410	0.050	0.144	0.036
Feb-10	0.600	0.530	0.428	0.396	0.060	0.040	0.038	0.008
Mar-10	0.500	3.150	0.346	0.952	0.050	0.080	0.016	0.016
Apr-10	0.470	3.210	0.328	0.868	0.050	0.000	0.010	0.000
May-10	0.320	0.430	0.256	0.276	0.060	0.570	0.024	0.114
Jun-10	0.290	0.290	0.174	0.160	0.030	0.000	0.006	0.000
Jul-10	0.650	1.480	0.318	0.427	0.070	0.120	0.045	0.050
Aug-10	0.720	0.630	0.488	0.482	0.050	0.000	0.016	0.000
Sep-10	0.320	0.450	0.237	0.252	0.060	0.000	0.020	0.000
Oct-10	0.880	0.320	0.368	0.232	0.130	0.000	0.058	0.000
Nov-10	0.280	0.460	0.182	0.228	0.000	0.000	0.000	0.000
Dec-10	0.260	5.130	0.230	1.202	0.050	1.710	0.018	0.342

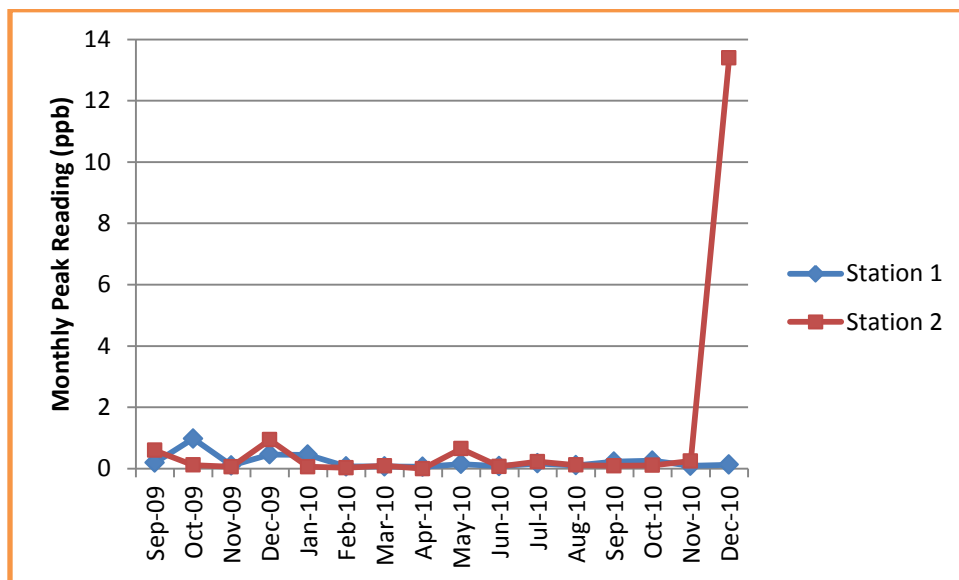
**Figure 30. Benzene Monthly Peak Reading – Husky Hardisty**



**Table 26. Toluene and Xylenes Passive Monitoring Data - Husky Hardisty**

Month/Year	Toluene				Xylenes			
	Peak Reading (ppb)		Network Average (ppb)		Peak Reading (ppb)		Network Average (ppb)	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
Sep-09	2.090	2.410	0.718	0.732	0.190	0.600	0.133	0.122
Oct-09	0.830	0.440	0.500	0.206	0.980	0.120	0.249	0.038
Nov-09	0.580	0.270	0.236	0.170	0.100	0.060	0.074	0.020
Dec-09	1.490	1.150	0.472	0.406	0.460	0.940	0.170	0.232
Jan-10	0.570	0.340	0.352	0.282	0.450	0.060	0.154	0.039
Feb-10	0.310	0.220	0.216	0.120	0.070	0.030	0.054	0.006
Mar-10	0.180	1.890	0.110	0.452	0.070	0.090	0.022	0.017
Apr-10	0.180	0.440	0.110	0.174	0.060	0.000	0.035	0.000
May-10	0.720	0.690	0.240	0.316	0.150	0.650	0.036	0.116
Jun-10	0.140	0.100	0.100	0.064	0.080	0.070	0.029	0.015
Jul-10	0.550	0.900	0.227	0.272	0.170	0.230	0.095	0.096
Aug-10	0.540	0.330	0.368	0.184	0.110	0.120	0.043	0.028
Sep-10	0.270	0.200	0.217	0.104	0.230	0.090	0.083	0.009
Oct-10	0.810	0.190	0.472	0.116	0.260	0.110	0.087	0.017
Nov-10	0.520	0.530	0.250	0.170	0.090	0.250	0.033	0.052
Dec-10	0.280	14.800	0.204	3.098	0.130	13.400	0.043	3.536

**Figure 31. Xylenes Monthly Peak Reading - Husky Hardisty**



## Appendix 2. Active Reporting Operators

**Table 27. Active Reporting Operators in Quadrant 12-36-42-10W4, 16-33-42-9W4, 4-13-42-10W4, 1-16-42-9W4**

Facility ID	Facility Name	Operator Name	Sub Type	Location
ABIF0007665	Home Hardisty Storage (brine)	CSS Corporation	Enhanced recovery scheme	10-30-042-09W4
ABGP0001702	Gibson Hardisty	Gibson Energy ULC	Gas plant fractionation	11-20-042-09W4
ABMS0501722	lpl Hardisty Terminal	ATCO Pipelines (North T8263923)	Non-reporting meter station	00/01-30-042-09W4
ABPL0000135	Express Pipeline (sweet)	Express Pipeline Ltd.	NEB regulated pipeline	00/10-19-042W4
ABPL0000195	Bow River Hardisty South	Pipeline Management Inc.	Oil pipeline	04-29-042-09W4
ABPL0083119	Cold Lake 14-20-42-9W4	Canadian Natural Resources Ltd.	Oil pipeline	00/14-20-042-09W4
ABPL0110257	Keystone Pipeline	Transcanada Keystone Pipeline Gp.	National Energy Board (NEB)	00/01-29-042-09W4
ABTM0000708	Fhr Hardisty Terminal	Flint Hills Resource Canada ULC	Tank farm/oil loading and unloading terminal	10-19-042-09W4
ABTM0000707	Gibson Marketing #1 Hardisty Tank	Gibson Energy ULC		04/04-29-042-09W4
ABTM0000722	Gibson Hardisty	Gibson Energy ULC		04-29-042-09W4
ABTM0000725	Gibson Marketing #2 Hardisty Tank	Gibson Energy ULC		00/04-29-042-09W4
ABTM0000813	Koch Hardisty Terminal	Pipeline Management Inc.		12-20-042-09W4
ABTM0000826	Gibson Hardisty Light Terminal	Gibson Energy ULC		04-29-042-09W4
ABTM0000843	Husky Hardisty Terminal	Husky Oil Operations Ltd.		05-29-042-09W4
ABTM0000895	Gibson Hardisty Heavy Terminal	Gibson Energy ULC		04-29-042-09W4
ABTM0000897	Gibson Segregated Cond. At Hardisty	Gibson Energy ULC		04-29-042-09W4
ABTM0000987	Gibson Echo Blend Terminal	Gibson Energy ULC		04-29-042-09W4
ABTM0075074	Gibson Hardisty Athabasca Terminal	Gibson Energy ULC		00/04-29-042-09W4
ABTM0075682	Husky Wcb Terminal	Husky Oil Operations Ltd.		00/05-29-042-09W4
ABTM0075683	Husky Condensate Terminal	Husky Oil Operations Ltd.		00/05-29-042-09W4
ABTM0075684	Husky Hsb Terminal	Husky Oil Operations Ltd.		00/05-29-042-09W4
ABTM0077960	Gibson Hardisty Albian Synthetic	Gibson Energy ULC		00/04-29-042-09W4
ABTM0083047	Hardisty Wcs Terminal	Husky Oil Operations Ltd.		00/05-29-042-09W4
ABTM0083064	Gibson Hardisty Mackay Heavy	Gibson Energy ULC		04-29-042-09W4
ABTM0085039	Hardisty Ngl Facility	Husky Oil Operations Ltd.		00/05-29-042-09W4
ABTM0101459	Hardisty Contract Terminal	Enbridge Midstream Inc.		-19-29-042-09W4
ABTM0102339	Battle River Terminal	Gibson Energy ULC		00/03-29-042-09W4
ABTM0104382	Gibson Hardisty Cold Lake	Gibson Energy ULC		00/04-29-042-09W4
ABTM0104859	Husky Acs Terminal	Husky Oil Operations Ltd.		00/05-29-042-09W4



### Appendix 3. Alberta Environment Notices under the Water Act

LSD	AENV Approval #	Approval Project - Water Act, Code of Practice for the Temporary Diversion of Water for	Approval Holder	Date Received
19-042-09W4	00283255-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Unnamed Lake	Enbridge Pipelines	Nov-10
NW 20-042-09W4	00283538-00-00	Pipelines and Telecommunication Lines Crossing a Water Body at NW 20-42-9-W4 affecting the Wetland - Non Peatlands	Enbridge Pipelines	Nov-10
NW 20-042-09W4	00280441-00-00	Hydrostatic Testing of Pipelines at NW20-42-9W4 affecting the Unnamed Stream - Unclassified	Gibson Energy ULC	Oct-10
17-042-09W4	00266633-00-00	Pipelines and Telecommunication Lines Crossing a Water Body affecting the Wetland - Non Peatlands	Enbridge Pipelines Inc.	Mar-10
NW 20-042-09W4	00265326-00-00	Pipelines and Telecommunication Lines Crossing a Water Body at NW 20-42-9-W4 affecting the Wetland - Non Peatlands	Enbridge Pipelines	Jan-10
25-042-10W4	00264800-00-00	Hydrostatic Testing of Pipelines at NW25-42-10W4 affecting the Unnamed Aquifer - Unclassified	Enbridge Pipelines Inc.	Dec-09
19-042-09W4	00263961-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Unnamed Stream	Enbridge Midstream Inc.	Oct-09
19-042-09W4	00263962-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Unnamed Stream	Enbridge Midstream Inc.	Oct-09
SE30-042-09W4	00264041-00-00	Hydrostatic Testing of Pipelines at SE30-42-9-W4 affecting the Unnamed Stream - Unclassified	Enbridge Pipelines Inc.	Oct-09
19-042-09W4	00263275-00-00	Hydrostatic Testing of Pipelines at N 19-42-9-W4 affecting the Unnamed Lake	Enbridge Midstream Inc.	Sep-09
19-042-09W4	00263528-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Surface Runoff	Enbridge Midstream Inc.	Sep-09
19-042-09W4	00263529-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Surface Runoff	Enbridge Midstream Inc.	Sep-09
19-042-09W4	00263148-00-00	Hydrostatic Testing of Pipelines at NE 19-42-9-W4 affecting the Unnamed Lake	Enbridge Pipelines	Aug-09
29-042-09W4	00263145-00-00	Hydrostatic Testing of Pipelines at various locations and water bodies affecting the Unnamed Aquifer	TransCanada Keystone Pipeline	Aug-09
29-042-09W4	00262982-00-00	Hydrostatic Testing of Pipelines at NW29-42-9W4 affecting the Unnamed Aquifer	TransCanada Keystone Pipeline	Aug-09
NW 20-042-09W4	00251898-00-00	Hydrostatic Testing of Pipelines at NW20-42-9W4 affecting the Unnamed Lake - Unclassified	Gibson Energy ULC	Nov-08
NE30-042-09W4	00251057-00-00	Pipelines and Telecommunication Lines Crossing a Water Body at NE 30-42-9-W4 affecting the Unnamed Stream - Unclassified	ATCO Gas	Oct-08
SW29-042-09W4	00244387-00-00	Hydrostatic Testing of Pipelines at SW29-042-09W4 affecting the Unnamed Stream - Unclassified	Gibson Energy ULC	Aug-07
SW29-042-09W4	00244387-00-00	Hydrostatic Testing of Pipelines at SW29-042-09W4 affecting the Unnamed Stream - Unclassified	Gibson Energy ULC	Aug-07
24-042-10W4	00242068-00-00	Hydrostatic Testing of Pipelines at various locations affecting the Battle River	Express Pipeline Ltd.	Mar-05
NE30-042-09W4	00199438-00-00	Pipelines and Telecommunication Lines Crossing a Water Body at NE 30-42-9-W4 affecting the Unnamed Stream - Unclassified	Hardisty Caverns Ltd.	May-03
13-042-10W4	00177945-00-00	Pipelines and Telecommunication Lines Crossing a Water Body at various locations affecting the Battle River	Penn West Petroleum Ltd.	Jan-02
19-042-09W4	00152952-00-00	Hydrostatic Testing of Pipelines at NE19-42-9W4 affecting the Battle River	EnCana Corporation	Oct-01
24-042-10W4	00155440-00-00	Hydrostatic Testing of Pipelines at various locations affecting the Battle River	Enbridge Pipelines Inc.	Sep-01
19-042-09W4	00154260-00-00	Hydrostatic Testing of Pipelines at NE19-42-9W4 affecting the Unnamed Lake	EnCana Corporation	Aug-01
SW29-042-09W4	00077008-00-00	Hydrostatic Testing of Pipelines at SW29-042-09W4 affecting the Unnamed Lake	Gibson Energy ULC	Sep-99
SW29-042-09W4	00077008-00-00	Hydrostatic Testing of Pipelines at SW29-042-09W4 affecting the Unnamed Lake	Gibson Energy ULC	Sep-99

## Appendix 4. Summary of Information – September 8, 2010

### Flagstaff Air Quality Baseline Project

The following is a summary of preliminary information obtained by Alberta Innovates – Technology Futures (AITF) to determine the current status of available emissions information affecting air quality in the Hardisty Hub area.

#### EXECUTIVE SUMMARY

In response to a request by Flagstaff County, Alberta Innovates – Technology Futures (AITF) has performed a cursory review of available information relating to air quality in the Hardisty area as a result of possible fugitive emissions from the oil facilities in the Hardisty Hub. This preliminary review was to determine a list of consultants specializing in air monitoring in Alberta, conduct a preliminary assessment of available data, and develop an action plan for this project within a limited budget of 5 hours allotted time.

There are 8 members in the Hardisty Complex Operating Group (HCOG) which each member company have specific Alberta Environment permit requirements which are regulated by the Energy Resources Conservation Board. The National Energy Board has jurisdiction over product which is shipped trans-boundary to Sarnia and Cushing, Oklahoma.

There is limited air monitoring information currently available, and there are two types of related monitoring which are performed which are tank headspace H<sub>2</sub>S readings for all companies with tank storage, and ambient air monitoring at two locations for Enbridge and Husky. The constituents which are monitored for air quality are H<sub>2</sub>S and SO<sub>2</sub>. In addition to these gases, other gases which result in odours include volatile organic compounds and mercaptans. Fugitive emissions are difficult to measure because of their low concentrations and the complexity of dispersion parameters. The emissions would typically occur from tank venting, upset conditions during equipment upgrades, plant upset conditions and tank unloading.

There are several consulting engineering firms which can provide air monitoring expertise and these are listed on the Consulting Engineers of Alberta website. Consulting engineers currently performing work for the HCOG include Clearstone Engineering for air monitoring, and Stantech Engineering for tank headspace monitoring. AITF can provide further investigative services and develop a more detailed plan for air monitoring.

AITF recommends that Flagstaff County consider the following action plan to better understand the baseline data available in the Hardisty area:

- Provide additional 30 hours and \$ 1,000 in expenses to AITF to:
  - obtain aerial photos of the area, identify the legal sub-division locations of the existing facilities, and assess the extent of recent complaints registered through the ERCB Calgary office
  - request copies of available reports from regulatory agencies by license #'s
  - Contact other relevant municipalities for their air shed monitoring strategy and available information as a guide to developing Flagstaff requirements
  - Obtain recommendations from Clearstone Engineering and Stantech Engineering as to what useful information can be reasonably obtained, and recommended strategy based on their specific experience at the Hardisty Hub
  - Attend an onsite meeting in Hardisty with Flagstaff County and HCOG

- Report back to Flagstaff County with a scope of recommended work (within available budget funds) to achieve representative baseline data in the Hardisty air shed
- Request access to information from the HCOG and meet on site with the HCOG chairperson to better understand the operations at the Hub, and its impact on fugitive emissions and how to improve communication with local residents in Flagstaff County
- Hire a consultant or AITF to conduct an air shed evaluation (and gap analysis) based on current available data and cooperate with HCOG going forward on a regular basis

## DISCUSSION

As background information, it is AITF's understanding in recent consultation with Flagstaff County that:

- Flagstaff would like to be proactive in understanding the potential impacts of industrial developments in the Hub area.
- Flagstaff would like to access and understand current emissions affecting air quality and monitoring information within the local air shed area of the Hub.
- Flagstaff have not had any complaints made to them regarding air quality concerns, however, however the town of Hardisty, acreages, a recreational lake and farms are in close proximity to the Hub.
- Flagstaff are aware of the large number of existing oil storage tanks (Enbridge, Husky Oil, Flint Hills, Kinder Morgan and Gibson Energy Fractionation Plant) in the adjacent county of Provost and possible fugitive emissions of VOCs (volatile organic compounds) which enter into the County of Flagstaff County.
- There is a new TransCanada pumping station in the County of Flagstaff which includes 3 storage tanks with product from Fort McMurray which is being sent to Oklahoma and eastern US.
- Sources of fugitive emissions producing odours could result from:
  - Upset conditions during upgrades or repairs to facilities
  - Fractionating plant upsets
  - Tank venting
  - Truck unloading
- The fugitive emissions could include a complex variety of volatile gases including hydrogen sulphide (H<sub>2</sub>S), sulphur dioxide (SO<sub>2</sub>), volatile organic compounds (VOCs) and mercaptans.

Telephone enquiries were made to the Energy Resources Conservation Board (ERCB), Alberta Environment (AEnv) and the Hardisty Complex Operators Group (HCOG) resulting in the following information:

- There are eight (8) operating pipeline companies in the Hardisty area which are a part of the HCOG. These companies currently operate facilities in the County of Provost and/or County of Flagstaff.
- There regulatory agencies having an interest in the fugitive emissions affecting air quality in this area include the Alberta Energy Resources Conservation Board, Alberta Environment, and the National Energy Board.
- It is AITF's understanding that the Oil and Gas Conservation Regulations (Alberta Regulation 151/71 – Oil and Gas Conservation Act) have requirements under Section 7.070 (page 45) pertaining to "any facility that receives gas containing more than 10 moles per kilomole of hydrogen sulphide or a higher or lower ratio as the Board may by order, stipulate having regard to the nature of production, the remoteness of the area and other circumstances".
- The gas burned or disposed of by a method approved under subsection 7.07 (3) "shall be burned or disposed of so as to ensure that the concentrations of hydrogen sulphide and sulphur dioxide do not exceed:
  - The maximum permissible concentrations set out in the Alberta Ambient Air Quality Guidelines as established and amended from time to time by Alberta Environment,
  - Standards subject to the Alberta Environmental Protection and Enhancement Act, and

- Standards specified by the ERCB”.
- In essence, Alberta Environment establishes the environmental guidelines for oilfield gas releases and the ERCB regulates and enforces these requirements. ERCB are primarily interested in raw crude oil storage, whereas Alberta Environment is interested in upgraded products such as synthetic crude oils, synthetic bitumen, processed crude oils and stabilized crude oils.
- The National Energy Board has regulations pertaining to product transported across provincial or international borders, and may default to Provincial requirements. Trans-boundary products are shipped to Sarnia, Ontario and Cushing, Oklahoma.
- According to the HCOG, the following is a table showing the list of companies with facilities located within the Hub and the applicable regulatory agencies having jurisdiction for emissions from oil facilities:

OPERATING COMPANY	ERCB	AENV	NEB
Enbridge	✓	✓	✓
Husky Oil	✓	✓	
Flint Hills	✓	✓	
Kinder Morgan			✓
Gibson Energy Fractionating Plant	✓	✓	
Trans Canada Pipelines			✓
Cold Lake Pipeline	✓	✓	
Plains Midstream	✓	✓	

- There have been odour complaints made to the ERCB and this information can be obtained from their Information office in Calgary through their electronic Field Inspection System. They require LSD (legal sub-division) co-ordinates to access this specific information and charge \$ 11 for each result found.
- Alberta Environment advises that there is very little air quality information available, air quality is not routinely monitored and this is only taken at specific monitoring points. Individual companies may have additional information that is taken for their own purposes and not submitted as part of their permit requirements.
- There are aerial photos of the Hub which can be purchased from Challenger Geomatics. Detailed mapping information is not readily available as it is considered “critical infrastructure” for national security reasons.
- Enbridge and Husky have set up two ambient air monitoring stations (trailers) as per Stantech recommendations to comply with their operating permits. This information is not available to the other HCOG members; however there are negotiations underway to amalgamate the Enbridge & Husky information exchange with the rest of the HCOG group. The two monitoring trailers are located at NE 30-42-9 W4m and 21-42-9 W4m.

- Alberta Environment permits for each of the companies is a matter of public record and can be obtained from Alberta Environment as long as the Approval # is obtained.
- Most of the facilities are located within the County of Provost, however the following facilities are located within the County of Flagstaff:
  - Enbridge underground caverns
  - Plains Midstream rail facility
  - Husky tank (1)
  - TransCanada Pipeline facility
- The National Energy Board (NEB) was not contacted due to the limited time available.

Don Harfield  
AITF Vegreville

## Appendix 5. Updated Information Arising from the PTAC Forum

### Flagstaff County Air Quality Baseline Project (as of October 27, 2010)

#### Executive Summary

The intent of this report is to assist Flagstaff County in further refining their objectives for the completion of the Flagstaff County Air Quality Baseline Project.

At Flagstaff County request, Don Harfield attended the PTAC (Petroleum Technology Alliance Canada) 2010 Air Issues Forum in Calgary on September 27 for the purpose of:

- Reporting back findings related to the proposed project objectives, and
- Establishing relevant relationships helpful to achieving their project objectives.

Subsequent to the PTAC Forum, Flagstaff County provided to AITF, a detailed air quality related environmental report provided to them by TransCanada Pipelines specifically related to the Keystone XL Pipeline Expansion project including three new oil product storage tanks at the Hardisty terminal. This information was prepared in 2008.

Based on the presentations at the PTAC Forum and the TCPL supplied information, the following key points are provided:

- Reliable air quality information is difficult to obtain and the PTAC Air Issues Committee has several current initiatives which will ultimately aid Flagstaff County to obtain and understand the relevance of air quality baseline data at the Hardisty Complex:
  - Alberta Environment has commissioned a study by AECOM Technology Corporation to develop a code of practice to reduce fugitive equipment leaks and storage losses.
  - The Clean Air Strategic Alliance (CASA) is finalizing a report targeted at reducing flaring and venting of solution gas from the UOG (upstream oil and gas) industry.
  - Alberta Environment has developed a database (ARIES) of emissions based on a 2008 data which should be tempered with direct industry data for increased reliability.
  - Alberta Environment has developed the Regional Planning Initiatives Land Use Framework which includes an Air Quality Management Framework which is intended to ensure maximum emission limits are never exceeded.
  - Carleton University recently studied Flare and Venting Mitigation Opportunities and Measurement of Particulate Matter from Flares.
  - Clearstone Engineering is currently studying Benzene Sources, Emissions from Storage Tanks, and developing a database system for understanding emission issues related to the oil and natural gas industry.
- The ARP Committee is seeking input for research needs which is funded by industry. The Environmental Research Advisory Council (ERAC) recently announced a call for Alberta Upstream Petroleum Research Fund (AUPRF) applications related to Air Issues, Soil and Groundwater Issues, Ecological Issues, and Water Issues. The deadline for industry applications is November 8.
- Based on a cursory review of the TCPL provided Keystone Pipeline Expansion Project, significant work has been performed by Clearstone Engineering indicating that “all maximum predicted ground-level concentrations of H<sub>2</sub>S, Benzene, and mercaptans associated with the Keystone XL Hardisty B Terminal tanks are well below the relevant regulatory criteria for ambient air quality.”

It is recommended that Flagstaff County consider their previously stated objectives for the proposed study still valid, and the information provided in the AITF September 8 Summary and this Updated Information from the PTAC Forum be reference material.

### Background Information

Based on the preliminary information provided in the AITF September 8 “Summary of Information”, Flagstaff County wishes to refine their project objectives to be as follows:

- Obtain baseline data related to the air quality and air shed for the Hardisty Hub area, including:
  - History of complaints made to the ERCB by type, location and date
  - Chronology of oil related industrial development at the Hardisty Hub by type, location and date
  - Identification of proposed expansion or new facilities to be located within the Hardisty Hub area
  - Summary of Regulatory (ERCB, AENV and NEB) requirements for facilities within the Hardisty Hub and identification of proposed regulatory changes
  - Available historical air quality data from Regulatory and Operating Company sources
- Investigate and summarize the most probable impacts to Flagstaff County of significant emissions from oil facilities at the Hardisty Hub, including:
  - Summary of health related impacts of typical emissions from oil storage tanks on nearby residents
  - Response requirements for Operating Companies in the Hardisty Hub area
  - Communication requirements by Regulatory agencies and Operating Companies with nearby residents
- The intent is to provide a “snapshot” document of current information which can be understood at a basic level and be referred to in five (5) years for comparison purposes when gathering and updating the information.

### PTAC Forum Related Information

The mandate of PTAC is “facilitating innovation, collaborative research and technology development, demonstration and deployment for a responsible Canadian hydrocarbon energy industry.”

The PTAC Air Research Planning (ARP) Committee has the following mandate:

- Identify existing or emerging issues of interest to industry, regulators, and other stakeholders involved in the upstream oil and gas industry
- Facilitate collaborative research and technology development in the upstream oil and gas industry

Membership in the ARP committee includes Natural Resources Canada, Alberta Environment, Alberta Energy Resources Conservation Board (ERCB) and CAPP (Canadian Association of Petroleum Producers) and member companies. Randy Dobko of Alberta Environment is the current chair of this committee.

Air Issues Forum is an annual meeting for the ARP Committee to provide an update of their research and activities, with the objective to obtain feedback from industry regarding research priorities and needs. Public Policy issues related to industry priorities for this committee include:

- Improving air emissions inventories through improved emissions factors and reporting methodologies
- Understanding the relationship between source emissions and ambient air concentrations
- Improving air emissions estimation methodologies
- Identifying effective air emissions reduction opportunities currently available to industry

- Developing emissions reductions opportunities through best management practices, industry recommended practices or standard operating practices.

The ARP Committee are seeking input for research needs going forward as not all past research was relevant. Funding is provided from industry and the ARP Committee is planning on expanding their mandate. They meet quarterly and are seeking interested persons for involvement from the upstream oil and gas industry.

Diana McQueen, Alberta Environment's Parliamentary Assistant, presented the "Regulatory Enhancement Project" verbally without the aid of a slide presentation. Alberta claims to be the only entity which has specific GHG emission reduction targets, and has several good news stories including the reclamation of the Suncor tailings pond. The Regulatory Enhancement Project has the objective to provide modern, efficient and effective environmental stewardship through a cross ministry team of Sustainable Resource Development (SRD), Energy and Environment. The intention is to develop a "one window, streamlined approach" to environmental applications for industry. There will be a recommendation report to the Minister and Cabinet by the end of the year. Questions from the floor queried the likelihood of success given that this has been considered many times in the recent past and whether the one window versus individual regulators approach is most expedient given the complexity of the environmental stewardship issues.

Lynne Patenaude, Environment Canada, presented an Update on the Comprehensive Air Management System (CAMS). Their "Turning the Corner" plan was introduced in 2007 and marked the first federal proposal to address air pollution from key sources, including industry. The proposed CAMS relies on collaboration to improve air quality and is a comprehensive approach that addresses emissions from all sources. Their emphasis is on regional airsheds and air zone management. They are developing a code of practice for fugitive equipment leaks and storage losses from all oil & gas sectors, not just the UOG (upstream oil and gas) sector. The BLIERs (base-level industrial emission requirements) are intended to reflect requirements for industrial emissions in areas where ambient air quality standards are being met and are not intended to achieve all emission reductions needed to meet CAAQS (Canadian Ambient Air Quality Standards). Environment Canada has engaged AECOM Technology Corporation to develop a code of practice to reduce fugitive equipment leaks and storage losses from the oil and gas sectors focusing on unintentional equipment leaks and storage, loading & unloading losses. The work is scheduled to be completed by the summer of 2011.

Andrew Higgins, CASA (Clean Air Strategic Alliance) provided an update of the Flaring and Venting Project Team. CASA is a non profit organization which conducts strategic air quality planning for Alberta with a vision of "the air will have no adverse odour, taste or visual impact and have no measurable short or long term adverse effects on people, animals or the environment" and a mission "to recommend strategies to assess and improve air quality in Alberta, using a consensus process. The project team facilitated a study conducted by Golder Associates including an analysis of ERCB data and a review of policy options. The goals were to understand the costs and benefits of eliminating routine solution gas flaring & venting, and recommend criteria by which conservation would be exempted. The results of the study determined that most sites are conserving at >90% efficiency, there were numerous sites that vent or flare small volumes and there are thousands of sites in various stages of the production cycle which complicated the analysis of trends. The report is being finalized for sector review and will be presented to the CASA board at their December 2010 meeting.

Wayne Hillier, Husky Energy, reviewed the GHG (greenhouse gas) Protocols in the UOG (upstream oil and gas) Industry. The Alberta Specified Gas Emitter Regulation became effective on July 1, 2007 and requires existing Alberta facilities that emit more than 100,000 tonnes of GHG per year to reduce emissions intensity by 12% from 2003 through the 2005 baseline. Reduction targets are phased in for new facilities. There are approx. 100 facilities which contribute to 50% of the total provincial emissions. Emission Performance Credits (EPC's) are created in the regulated system by facilities that achieve better than target performance. Compliance payments are made to the Climate Change and Emissions Management Fund at a cost of \$ 15/tonne of CO<sub>2</sub> equiv. The fund supports transformative technologies leading to industry change and environmental improvements. BC also has regulations that establish a



price for CO<sub>2</sub> (equivalent) emissions, whereas Saskatchewan is developing their regulations. The credits of \$ 15/tonne CO<sub>2</sub> equiv. equates to \$ 5.60/e3m<sup>3</sup> gas otherwise vented and \$0.80/e3m<sup>3</sup> gas otherwise combusted. Alberta's CCEMC has awarded \$ 71 million and BC's Pacific Carbon Trust will spend \$ 25 million to support energy efficiency, green power and CCS (carbon capture and storage). During the Q&A discussion, Wayne Hiller advised that Alberta may be considering lowering the level from the current level of 100,000 tonnes of CO<sub>2</sub> eq/yr to 50,000.

Bob Bioletti, Alberta Environment Air Policy, presented their Recent Air Emissions Inventory Activities. The new AENV Emissions Inventory (ARIES) software is web-based with desktop applications using point, mobile and area sources with GIS (geographic information systems) capability. The harmonized inventory from 2008 data includes over 130,000 industrial point sources. The consultant's report recommended that the facility data be validated by industry to increase the reliability of the data. The information in the database is based on a survey conducted in late 2009 to early 2010 with only 2 months provided for the submissions and roughly 80% of the facilities were required to resubmit their data. Ongoing activities are focused on harmonizing the survey data, integration with the ARIES software, and ongoing improvements due to advancements in methodology. During the Q&A discussion, Bob Biolette advised that the survey may be repeated in about 3 years, but not in the immediate future.

Lori Adamache, Alberta Environment Air Policy Specialist, presented the Regional Planning Initiatives Land Use Framework. This 58 page document is available by searching this on the internet. The Alberta Land Stewardship Act was passed June 2009 and defines the scope of regional plans, effect and implementation accountability. There are 7 new land-use regions and plans including the Lower Athabasca and the South Saskatchewan River defined regions. The defined outcomes for the Air Quality Management Framework has defined outcomes of ensuring air quality continues to support healthy populations and communities, and proactively manage air quality to prevent reaching ambient air quality objectives. The elements of the Air Quality Management Framework include 1) ambient air quality triggers and limits, 2) annual assessment of local air quality within the region, management responses when ambient air quality triggers or limits are reached, and 4) communication to stakeholders. The four levels of air quality limits are 1) well below AQO (air quality objectives limits), 2) below AQO, 3) Below but approaching AQO, and AQO exceeded. The intent is that the management responses are to take appropriate actions such that the AQO limits are never exceeded.

Randy Dobko, Alberta Environment and Chair of the PTAC Air Research Planning Committee, led a discussion to generate ideas for specific projects related to the Public Policy Issues – Industry Priorities slide in his earlier presentation at this forum. Although there was limited feedback, the priorities were restated as follows:

- Improving air emissions inventories through improved emissions factors and reporting methodologies
- Understanding the relationship between source emissions and ambient air concentrations
- Improving air emissions estimation methodologies
- Identifying effective air emissions reduction opportunities currently available to industry, and
- Developing emissions reductions opportunities through best management practices, industry recommended practices or standard operating practices.

Matt Johnson, Carleton University, presented An Analysis of Flare and Vent Mitigation Opportunities in Alberta however his slide presentation was not provided. His research indicated that 60% of GHG emissions are from UOG (upstream oil and gas) oil batteries due to flaring and venting. The resultant issues that he presented were: 1) wells need to be tied into nearby batteries to capture the vented or flared gas, 2) the gas composition needs to be compatible with the pipeline for safety and processing reasons, and 3) 32% of CO<sub>2</sub> eq comes from “paper” batteries in the Lloydminster area and these “paper” batteries are administratively defined (not real batteries).

Alex De Visscher, University of Calgary, presented Photochemical Degradation of BTEX in Waste Gas: Experiments and Modelling. BTEX is an acronym that stands for benzene, toluene, ethylbenzene, and xylenes. These compounds are some of the volatile organic compounds (VOCs) found in petroleum

derivatives such as petrol (gasoline). Toluene, ethylbenzene, and xylenes have harmful effects on the central nervous system. BTEX removal is expensive and is in the early stages of development. Experimental data suggests that the energy cost of BTX removal is in the order of \$ 25,000 per ton and simulations predict that this cost can be reduced to less than \$ 10,000 per ton by pre-mixing with ozone.

Jim Grant, Clearstone Engineering, presented Identifying All Sources of Benzene at UOG Sites & Facilities for Dave Picard who was in Russia at this time. The Canadian Council of Ministers of the Environment (CCME) endorsed a Canada Wide Standard for Benzene in 1995 with Phase 1 requiring reductions of 30% followed by Phase 2 with an additional 12%, with the objective to reduce the national ambient concentrations of benzene. Clearstone Engineering is performing a study to identify and assess sources of benzene emissions in the UOG industry and develop recommendations for managing these sources. Currently, only benzene emissions from glycol dehydrators are estimated, controlled and regulated. The target sources are 1) fugitive equipment leaks, 2) pneumatic devices, 3) storage losses, 4) process venting & flaring, and 5) engines and heaters. The sampling program is scheduled for the fall/winter of 2010 and the analyses will be reported along with recommendations on how to deal with significant sources within a few months after the sampling.

Matt Johnson, Carleton University, presented Measuring PM Emissions in the UOG Industry. Particulate Matter (PM) emissions is a global issue and PM emissions from flares exceeds 135 billion cubic meters per year. This is a health issue and a key contributor to climate issues. Current emission factors (CAPP Guide, US EPA Fire, US EPA AP-42) are greatly suspect and more research data is required. Direct measurements in the a controlled lab need to be develop consistent with flares in the field to account for various flare regimes such as turbulent, transition shear. The best guess is that the CAPP factor is too high (more than 2 times) but this needs to be substantiated by larger scale tests.

Jim Grant, Clearstone Engineering, presented Tanks BMP Development: Improved Assessment and Management of Emissions from Storage Tanks. This study had the objective to develop improved methods for assessing and managing emissions from storage tanks and is currently in progress. Work to date includes an initial literature review of estimation and measurement techniques and wind effects, and an initial sampling program of crude oil and tank vapours, measurement of vertical concentration profiles in the tank space and imaging of emissions from vacuum breakers during refloating of tank roofs. Included in this study will be the identification of potential emissions from unintentional gas carry through and malfunctioning vapour recovery or control systems, and developing “best management practices” for managing storage losses.

Goran Palibrk, Clearstone Engineering Ltd. presented the Nodal Analysis Project for Dave Picard who was in Russia at this time. The objectives of this study is to 1) develop an interactive flow diagram of the UOG industry, 2) building a database system for tracking related information, 3) establish a web site to serve as a useful information source and learning tool, and 4) allow users to quickly obtain very specific information related to the oil and natural gas industry in a more efficient manner. This model is under construction and the home page of the tool is intended to be located at the Natural Resources Canada (NRCan) website. Future refinements are to include populating all the nodes with photos, developing utilities to manage the information, and enhance the user interface.

Contacts made at the PTAC Forum for the benefit of Flagstaff County include:

- Randy Dobko, AEnv Sr. Engineer (tel 780-427-6869)
- Rob Biolette, AEnv Air Emissions Engineer (tel 780-415-9374)
- Lori Adamache, AEnv Air Policy Specialist (tel 780-644-7511)
- Jim Spangelo, ERCB Sr. Engineer (tel 403-297-3566)
- Catherine Thistlethwaite, ERCB Technician (tel 403-297-6918)
- Rob Kemp, AMEC Air Quality Group Leader (tel 403-387-1682)
- Michael Peltzner, OASIS Industrial Air Quality Specialists BDE Mgr (tel 403-245-4152)

### Keystone Expansion Pipeline Related Information

Subsequent to the PTAC Forum, Flagstaff County has provided detailed air quality data provided to them by TransCanada Pipelines related to the proposed Keystone XL (Keystone Expansion) pipeline. The Keystone Pipeline System is a pipeline system to transport crude oil from the Athabasca Oil Sands via Hardisty terminal to refineries in Illinois and Oklahoma, and further to the U.S. Gulf Coast.

According to information provided to Flagstaff by TransCanada Pipelines, the expansion project “will involve three new oil product storage tanks, each having a capacity of 350,000 bbl (55,600 m<sup>3</sup>). These tanks will comprise the Keystone XL Hardisty B Terminal and will be located just to the north of the approved Keystone Hardisty A Terminal at the existing Hardisty Complex, near the Town of Hardisty, Alberta. The existing Hardisty Complex is an oil-products-storage-and-handling terminal and is a central zone for oil pipeline distribution systems in Alberta. The Keystone XL Hardisty B Terminal is reserved for upset or irregular operating conditions only, as typical operation will be to receive volumes directly from shipper-owned tanks to the pump station. The intent is to reduce the number of project tanks for terminal and tank turnovers by using existing tank infrastructure in the area. Only in times of batch or volume interruption will the Keystone XL Hardisty B Terminal operational tanks be used, thereby minimizing possible emissions.”

The TCPL report entitled “Keystone XL Pipeline Project Environmental and Socio-Economic Assessment - Section 12: Assessment of Environmental Effects on Atmospheric Environment” provides detailed information related to air quality testing performed at the Hardisty terminal site and modeling results related to the Keystone XL Hardisty B Terminal tanks. The following is the summary in this report:

- All maximum predicted ground-level concentrations of H<sub>2</sub>S, Benzene, and mercaptans associated with the Keystone XL Hardisty B Terminal tanks are well below the relevant regulatory criteria for ambient air quality. The areas of maximum effect are along the northern edge of the Hardisty Complex property boundary, which is also the northern edge of the Project PDA.
- All predicted ground-level concentrations of H<sub>2</sub>S, benzene, and mercaptans at sensitive receptor locations are well below the relevant regulatory criteria and all air contaminant concentrations in and around the Town of Hardisty are well within acceptable regulatory limits.

Attached to the subject TCPL report is a letter from Dave Picard of Clearstone Engineering dated September 14, 2008 which states that:

- The presented emission estimates do not consider contributions due to inspection and maintenance activities such as tank degassing and cleaning. Current tank degassing and cleaning activities should be carefully reviewed to identify, where appropriate, opportunities to better control or avoid odorous emissions during these events. Some techniques that have been used by other companies with varying degrees of success have included spraying an odour neutralizing agent into the exhaust of air movers used during tank degassing and cleaning, and circulating an H<sub>2</sub>S scavenging agent in the tank before it is opened. This latter approach may not be effective if large amounts of sludge exist in the tanks.
- The following are specific mitigative options that may be considered to address any air quality issues that may arise at the terminal:
  - Where the potential for odours can be managed but not fully eliminated, develop formal operating practices to schedule these activities during times when any impacts will be minimized (e.g., when the wind direction is optimal and there is a reasonable amount of atmospheric turbulence). These procedures should include notifying the applicable regulatory authorities and nearby receptors in advance of activities that may produce offsite odours.
  - Manage the disposition of products so that the tanks with the greatest emissions are located towards the centre of the terminal thereby allowing maximum atmospheric dispersion before the emissions reach the site boundary.

This information is useful reference material, however, the information is specifically focused on the Keystone Expansion Pipeline facilities and is two years old.

Don Harfield, AITF