LICA

Lakeland Industry & Community Association

Annual Report 2005

LICA INFORMATION

Lakeland Industry & Community Association
Box 8237, Bonnyville, AB T9N 2J5
Located at 5006 - 50th Avenue, Bonnyville

E-mail: lica2@lica.ca
Web site: www.lica.ca

Phone: (780) 812-2182
Toll Free: 1-877-737-2182
Fax: (780) 812-2186

Table of Contents

VISION

To be recognized as the Lakeland synergy group resolving community, industry, and environmental issues.

MISSION

To work as a dynamic team to gain understanding and knowledge and resolve issues as stewards of the environment, for the benefit of all.

LICA VALUES

- Trust, honesty, and respect
- Health, safety, and the environment
- Diversity
- Collaboration
- Responsible development
- Economic stability

MESSAGE FROM THE CHAIRMAN

Welcome to the 2005 Annual Report of the Lakeland Industry and Community Association (LICA). I would like to commend the efforts and dedication of the LICA Board of Directors, our administrator, E.(Bim) Bowers, as well as committee members and all those who brought ideas and issues to our attention. We are always eager to receive feedback, and our meetings are open to the public. Public meetings are one way that LICA listens to concerns and shares information. Residents and landowners can also contact LICA by phone, letter, e-mail, or by simply dropping by for a visit.

LICA is a community based association formed in response to concerns regarding the expanding oil and gas production in our area.

Our goals include:

- providing the public with information regarding their concerns
- providing education
- increasing communication between industry and the public, ensuring that industry expansion occurs in a responsible way
- collecting, analyzing, and communicating data regarding water and air monitoring

LICA's committees provide a way for the public to directly communicate with industry. The various committees meet regularly in an effort to cover all areas of concern, whether it be an issue of public education or related to a problem brought forth.

LICA brings community, government, energy regulators, and industry to the table to talk to each other. On behalf of LICA, we hope that 2006 is another year of such communication as our own well-being and the responsible development of the LICA region depends upon this.

It is with pleasure that LICA presents its 2005 annual report.

Robert Deresh

Board Chairman

2005 FINANCIAL STATEMENT

LAKELAND INDUSTRY & COMMUNITY ASSOCIATION
STATEMENT OF OPERATIONS AND CHANGE IN NET ASSETS
FOR THE YEAR ENDED DECEMBER 31, 2005
(Unaudited)

	2005	2004
Revenue		
Operating		
Annual report	$ 23,293	$ 20,167
Memberships	60,000	61,000
Other receipts from members	139,656	56,418
Grants	-	2,079
Interest	47	-
	222,996	139,664
Programs		
Air study	84,418	134,142
Water Study	68,472	114,189
	152,890	248,331
Total Revenue	375,886	387,995
Expenditures		
Operating		
Annual report costs	26,885	23,499
Board and committee	21,400	13,727
Capital expense	4,159	7,149
Contracted services	32,480	34,001
Insurance	2,348	2,213
Interest and bank charges	211	187
Meetings	8,034	7,255
Office	6,678	6,141
Professional fees	1,852	2,298
Public relations	11,334	5,342
Rent	6,000	5,400
Telephone	2,923	1,682
Training and development	4,632	2,862
Travel	13,311	8,019
Wages and employee benefits	11,052	7,092
Web site maintenance	1,200	2,202
	154,499	129,069
Programs		
Air study costs	152,585	134,142
Water study costs	68,472	114,189
	221,057	248,331
Total expenditures	375,556	377,400
Excess of revenue over expenditures	330	10,595
Unrestricted net assets, beginning of year	51,610	41,015
Unrestricted net assets, end of year	$ 51,940	$ 51,610

KAREN A. MERCIER Professional Corporation

LICA GEOGRAPHICAL AREA

Lakeland Industry & Community Association

LICA VOLUNTEERS

Since its inception in 2000, LICA has been very fortunate to have a number of dedicated community volunteers. They live in various parts of the LICA region and bring with them unique skills, experience, and a perspective that is key to LICA's success. For more information on how you can become an active volunteer please contact the LICA office.

Russ Kowtun, St. Paul

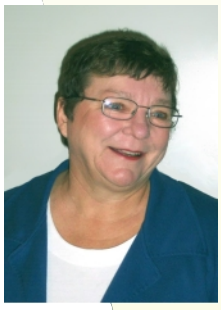
While most people would consider retiring after 35 years of public service, Russ Kowtun felt that he still had "gas left in the tank" and wanted to become more involved in the environmental issues in the LICA region. He had the good fortune of meeting the former LICA Administrator during his role as manager for the Western Canadian Spill Services and as a result became a LICA Board member in 2004.

His work experience spans many areas including Alberta Corrections, County Tax Assessor, and Alberta Emergency Management Disaster Services, to name a few. In 2003 Russ was honored with the Alberta Premier's Award of Excellence for the contributions he made to the Municipality of Wood Buffalo during the disastrous forest fires that threatened a number of communities in that area.

Russ continues to run his mixed farm operation in the St. Paul area and has a belief, shared by many, that environmental issues must be taken seriously for the benefit of future generations. After all, "everyone living in the environment contributes to the overall health of our environment and therefore we must encourage people to take an active role in their community."

Even with his prior work experience, Russ acknowledges that LICA has offered many challenges that have put him in a steep learning curve. "It is a unique organization that uses a multitude of resources to collect and share information about environmental issues with all stakeholders, including the general public." If you are a community member interested in being "part of the solution rather than the problem," participation in LICA may be worth considering.

Bev Smith, Laurier Lake



As property owners at Laurier Lake since 1978, Bev and her husband Warren took the plunge and made Laurier Lake their permanent residence in 2005. While visiting at a friend's house in Calgary, Alberta, four years before making the permanent move, some LICA materials and its strong reputation caught Bev's attention. Given her concern about the drought conditions and rumours about industry's effect on water, Bev inquired with LICA about its involvement in resolving these types of concerns, and was quickly recruited to LICA's Resolutions Committee.

Having been a volunteer with LICA for over five years now, Bev has witnessed the change in how industry responds to community concerns. "LICA has put a real face on community members - where companies meet people face to face." It has made community members more aware that there is a recourse - a place to start to resolve concerns related to industry development. She credits LICA with helping to facilitate resolution on issues like well site noise and abandoned oilfield equipment. LICA's membership - community, industry, and government - provided the opportunity to discuss these types of concerns and, more importantly, to ensure they are resolved.

So, what began as an opportunity for Bev to learn more about the drought in the area has evolved into an entire education on groundwater, watersheds, wetland conservation, and the opportunity for this retired science teacher to share her knowledge and perspective on the LICA region that she now so fondly calls home. If you have a concern and don't know how to resolve it or are interested in becoming move involved in environmental initiatives, there is no better place to start than at LICA.

2005 AT A GLANCE

2005 key activities for each of the LICA committees are as follows:

REGIONAL ENVIRONMENTAL AIR AND SOIL MONITORING COMMITTEE

- operated LICA's Regional Air Monitoring Network, consisting of 20 passive monitoring stations
- completed the Implementation Plan for the LICA Airshed Zone
- commissioned the network's first continuous air monitoring trailer (located in Cold Lake South)
- received endorsement from the Clean Air Strategic Alliance, making LICA Alberta's seventh airshed zone
- gathered another year's worth of passive monitoring data demonstrating air quality in the LICA region is within Alberta's Ambient Air Quality Objectives
- sent delegates to the "In the Zone" Airshed conference to keep current with provincial initiatives and gain information on consensus governance

REGIONAL ENVIRONMENTAL WATER MONITORING COMMITTEE

- sampled nine lakes in the LICA region in partnership with the Alberta Lake Management Society
- participated in a paleolimnology study of Moose Lake
- furthered work on the Cold Lake - Beaver River Water Management Plan
- worked with Alberta Environment on structure possibilities for a Watershed Planning and Advisory Committee (WPAC) for the Cold Lake - Beaver River Basin
- sent delegates to the annual Watershed Planning, Alberta Lake Management Society, and North American Lake Management Society conferences

COMMUNICATIONS COMMITTEE

- redesigned LICA brochure
- updated LICA website
- reviewed media publications for distribution
- developed the Annual Report
- provided support to all committees

GOVERNANCE COMMITTEE

- reviewed, revised, and developed bylaws and policies as directed by the Board
- developed a consensus model of governance required for LICA to become the umbrella for both an Airshed Zone and a Watershed Planning Advisory Committee

NEW DEVELOPMENT COMMITTEE

- hosted a community Open House on November 16, 2005, with over 90 people in attendance
- facilitated discussions with key Aboriginal stakeholders and government officials

RESOLUTIONS COMMITTEE

- facilitated discussion between the School Parent Council in Ardmore, the M.D. of Bonnyville, and industry regarding traffic concerns
- facilitated resolution of odor issues in the Lindbergh area

Regional Environmental Air and Soil Monitoring Committee Report 2005

OVERVIEW

2005 has been an important year of transition for the Regional Environmental Air and Soil Monitoring Committee (REASMC).

The committee is now endorsed by the Clean Air Strategic Alliance (CASA) as the seventh Alberta airshed zone and is positioned to expand the regional air monitoring network. The committee will continue to engage all interested stakeholders and groups in identifying and responding to local air quality issues.

Key activities of the committee in 2005 include:

- operation of a regional air monitoring network consisting of 20 passive monitoring stations
- completion of an Implementation Plan for the LICA Airshed
- placement of one continuous air monitoring trailer in Cold Lake
- endorsement from CASA
- collection of one years' worth of passive monitoring data, which demonstrates that air quality in the LICA region is within Alberta's Ambient Air Quality Objectives (AAAQO)

LICA Air Monitoring Stations

1 Sand River
2 Therien
3 Flat Lake
4 Lake Eliza
5 Telegraph Creek
6 Elk Point Airport
7 Muriel-Kehewin
8 Bonnyville
9 La Corey
10 Wolf Lake
11 Foster Creek
12 Burnt Lake
13 Maskwa
14 Ardmore
15 Frog Lake
16 Clear Ridge
17 Fishing Lake
18 Beaverdam
19 Cold Lake South
20 Medley-Martineau
21 Fort George
22-25 Unnamed Stations

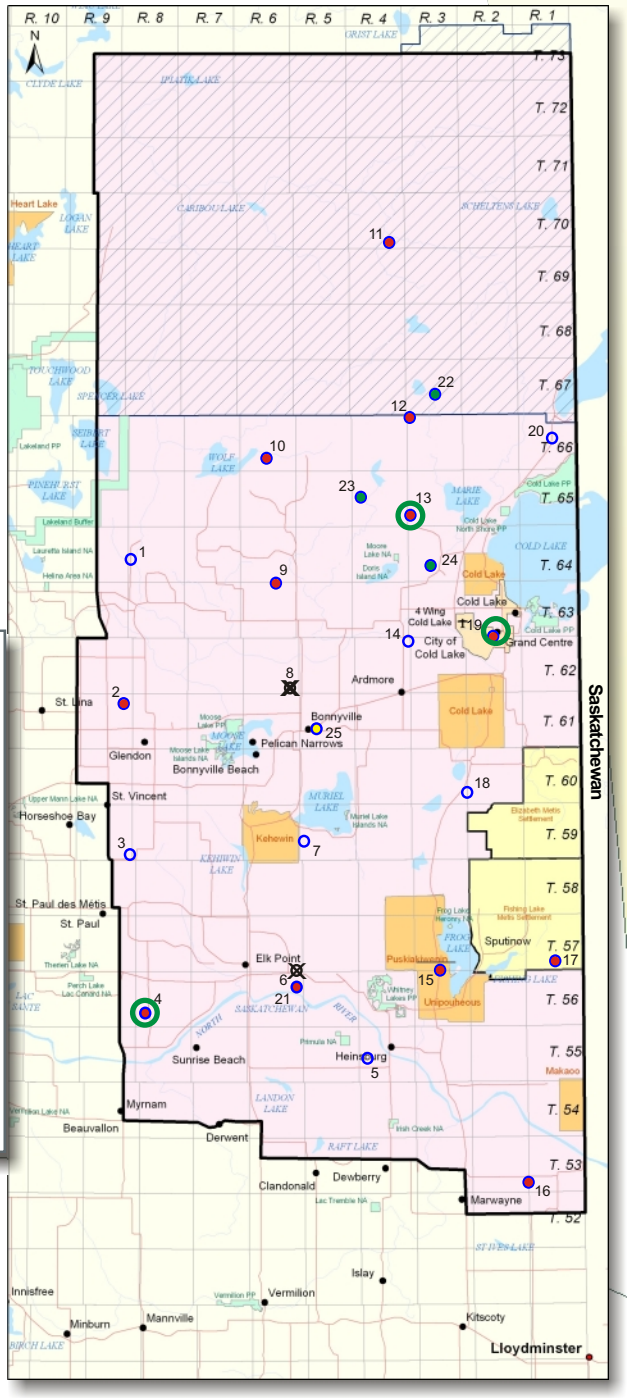


Figure 1: LICA's Air Monitoring Network

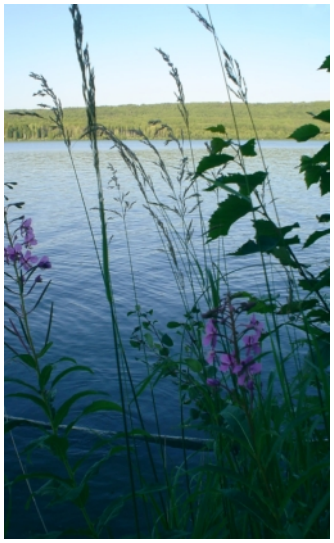
2005 ACCOMPLISHMENTS

OPERATION OF REGIONAL AIR MONITORING NETWORK

LICA operates a network of 20 passive air monitoring stations in the LICA region. This network is used to measure monthly average ground-level concentrations of sulphur dioxide, nitrogen dioxide, and ozone at all stations, and monthly average concentrations of hydrogen sulphide at selected stations. For the locations of the LICA regional network stations, see Figure 1 on page 7.

The passive monitoring stations were established in July, 2003, and are used to improve understanding of air quality within the region. Network results are used for:

- comparison of monthly average pollutant concentrations with applicable AAAQO for sulphur dioxide and nitrogen dioxide - pollutants for which annual average AAAQO exist. All results measured since the network was established are well below the applicable AAAQO. A summary of results with further discussion is presented in the Air Monitoring Results section on page 14.
- comparison with values measured in other parts of the province. These comparisons show that air quality in the LICA region is comparable to that measured at the more rural comparison sites. A summary of the comparison is also presented in the Air Monitoring Results section of this report.
- verification of modeled air quality predictions for the region. This information was used as a basis for the Implementation Plan discussed on page 9.



Passive Air Monitoring

Passive monitoring methods provide a cost-effective solution for monitoring air quality at locations where continuous monitoring is not practical. Passive sampling devices can monitor air pollutants without the need for electricity, data loggers or pumps. Passive sampling devices are lightweight, portable and relatively simple to operate. No active movement of air through the sampler is necessary.

Passive sampling involves the exposure of a reactive surface to the air, and transfer of the pollutant occurs by diffusion from the air to the surface. The surface consists of a solid chemical compound or a filter that is impregnated with a reactive solution. Samplers are typically exposed for periods of one month, and analysis is done in a laboratory. Sulphur dioxide, nitrogen dioxide, ozone, hydrogen sulphide and volatile organic compounds are common pollutants monitored using passive samplers.

A major advantage of using a passive sampling system is that a network of multiple samplers can be used over a large area to determine the spatial variation of pollutant levels. Passive samplers are also useful for looking at long-term trends of air pollutants at specific locations. However, since sampling is conducted over a period of about one month, events that last for a short time period, such as one hour, may be "averaged out".

Source: www.casahome.org

COMPLETION OF IMPLEMENTATION PLAN

The planned expansion of the regional air-monitoring network is based on a scientific review of air quality data conducted on the REASMC's behalf by Jacques Whitford Environmental Consultants. The Plan was completed in 2005 and was submitted to Alberta Environment for discussion and approval of the LICA network plans. The Implementation Plan is available on the LICA website at www.lica.ca.

Continuous Air Monitoring

Continuous monitoring equipment will provide nearly instantaneous measurements of ambient concentrations for several pollutants. Continuous sampling involves drawing air through a commercial analyzer calibrated to produce an output that is proportional to the ambient pollutant concentration. This gives the greatest resolution but is costly, due largely to the capital and operating costs involved. Data from continuous monitoring is stored in one-hour average time blocks.

Source: www.casahome.org

COMMISSIONING OF FIRST CONTINUOUS MONITORING TRAILER

In October 2005, LICA commissioned its first continuous air monitoring trailer (see Figure 2). The trailer is located in Cold Lake South at the city's West Yard. The trailer and the analyzers in it were provided by Alberta Environment (AENV) for LICA's use. LICA covered the costs required to install the analyzers, transport the trailer to Cold Lake, and commission the equipment.

Figure 2: Cold Lake South Station
Photo: Michael Bisaga

Parameters measured at the Cold Lake trailer include:

- sulphur dioxide (SO_2)
- nitrogen dioxide (NO_2)
- oxides of nitrogen (NO_X)
- ozone (O_3)
- total hydrocarbons (THC)
- total reduced sulphur (TRS)
- respirable particulate matter ($PM_{2.5}$)
- wind speed and direction

The analyzers sample the air continuously so that a new measurement is available every 30 seconds. Hourly, daily, and monthly averages are reported, as are instantaneous (30-second) maximum values for each hour. Data as recent as the previous hour are available through an internet link.

The data from the station are used for:

- comparison of hourly and daily average readings with applicable AAAQO. This comparison provides a more timely measure of air quality than is possible with the passive monitoring network. AAAQO that exist for parameters measured at the station are shown in Table 1. All of the results measured to date are within the applicable objectives. A summary of results with further discussion is presented in the Air Monitoring Results section on page 14.

- comparison with values measured in other areas of the province. These comparisons show that air quality in the LICA region is comparable to that measured at the more rural comparison sites. A summary of the comparison is also presented in the Air Monitoring Results section of this report.

- calculation of the Air Quality Index (AQI). The AQI provides a meaningful measure of outdoor air quality based on concentrations of carbon monoxide, respirable particulate matter ($PM_{2.5}$), nitrogen dioxide, ozone, and sulphur dioxide. Measurement of at least four of these five pollutants is required to calculate the AQI. The AQI rates air quality as Good, Fair, Poor, or Very Poor. (See the sidebar on page 11 for the interpretation of each of these ratings.)

  The AQI is calculated every hour for each pollutant using a government-defined formula for each component. The highest number calculated for a specific hour is used as the AQI for that hour. Because a consistent definition of AQI is used across the country, it is possible to compare air quality in different locations by comparing the percentage of time that each AQI rating applies in each location.

  To date, calculation of the AQI at the Cold Lake South station has been possible only for a very short period of time due to commissioning and equipment problems with the particulate matter analyzer; however, all calculated AQI ratings were Good.

Table 1: Alberta Ambient Air Quality Objectives for Parameters Measured at the Cold Lake Continuous Trailer

Pollutant	1-hour Average Objective	8-hour Average Objective	24-hour Average Objective
Sulphur dioxide - SO_2	172 ppb	--	57 ppb
Nitrogen dioxide - NO_2	212 ppb	--	106 ppb
Ozone - O_3	82 ppb	65 ppb (See Note 2)	--
Respirable particulate matter – $PM_{2.5}$	-- (See Note 1)	--	30 g/m^3 (See Note 3)

Notes:
1. "--" indicates that there is no objective for the averaging period indicated.
2. This is the Canada Wide Standard "Exceedence Trigger" based on an 8-hour average. Achievement is based on the forth highest measurement annually, averaged over three consecutive years.
3. This is the Canada Wide Standard "Exceedence Trigger" based on a 24-hour average. Achievement is based on the 90th percentile ambient measurement annually, averaged over three consecutive years

Air Quality Index

The Air Quality Index (AQI) provides a meaningful measure of outdoor air quality based on concentrations of carbon monoxide, respirable particulate matter ($PM_{2.5}$), nitrogen dioxide, ozone and sulphur dioxide. Measurement of at least four of these five pollutants is required to calculate the AQI. The AQI rates air quality as Good, Fair, Poor or Very Poor.

For the calculation procedures and more information, see the CASA website at www.casahome.org.

Interpretation of Ratings

Good (1-25):
Desirable range: no known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada.

Fair (26-50):
Acceptable range: adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.

Poor (51-100):
Tolerable range: not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings.

Very Poor (greater than 100):
Intolerable range: in this range, continued high readings could pose a risk to public health.

Source: Environment Canada (1980). Objective for a short-term air quality index. A report by the Federal-Provincial committee on Air Pollution.

AIRSHED ZONE ENDORSEMENT

CASA and Airshed Zones

The Clean Air Strategic Alliance (CASA) was established in March 1994 as a new way to manage air quality issues in Alberta. CASA is a multi-stakeholder partnership, composed of representatives selected by industry, government and non-government organizations. All CASA participants make decisions by consensus.

CASA is responsible for strategic planning related to province-wide air quality issues in Alberta. To guide this process, CASA has endorsed a Comprehensive Air Quality Management System (CAMS) for the province. The CAMS promotes the locally-driven establishment of airshed zones to address local air quality issues when and where appropriate.

Many of Alberta's air quality issues are local, both in their cause and the solutions required. In these cases, province-wide approaches may be inappropriate and inefficient.

Instead, an airshed zone can enable local stakeholders to design local solutions to address local air quality issues. Airshed zones are guided by local or regional multi-stakeholder non-profit societies who use the CASA consensus model to make decisions. These societies work within a designated area to monitor, analyze, and report on air quality and they recommend and implement actions to improve air quality within that zone. Stakeholders involved in airshed zone management may also develop a response plan to deal with air quality concerns in their region. Airshed zones typically implement air quality monitoring programs within their designated area and supply data to the CASA data warehouse at http://www.casadata.org.

Source: www.casahome.org

In December, 2005, LICA requested and received endorsement from CASA as an Alberta airshed zone, becoming the seventh such zone in the province (see Figure 3). CASA, an organization dedicated to the identification and resolution of air quality issues in the province, provides the framework within which airshed zones function (see sidebar and the CASA website at www.casahome.org). For some of the benefits of the airshed zone approach, see sidebar.

The CASA Board of Directors approved, by consensus, LICA's request for endorsement. The CASA Board commended LICA for the logical and pragmatic approach LICA used to develop regional environmental monitoring programs.

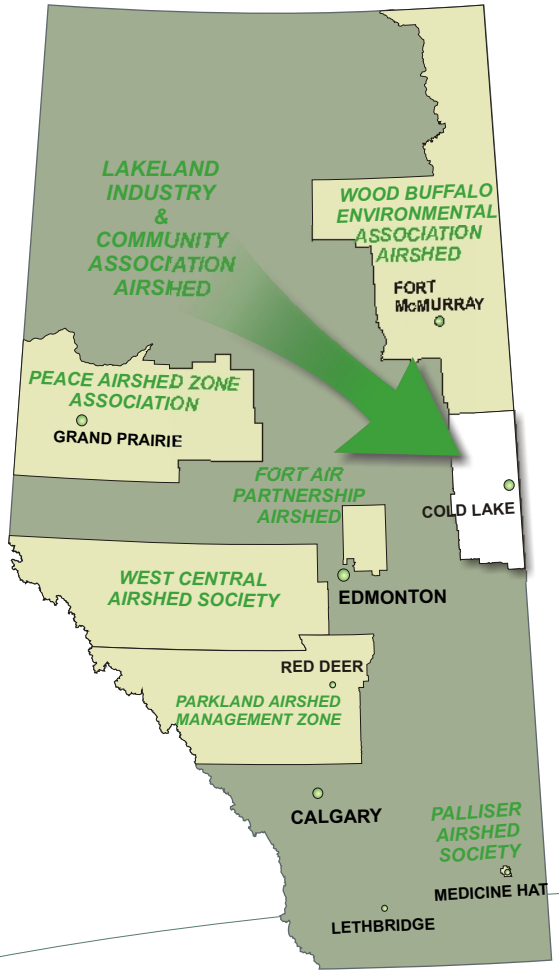


Figure 3: Airshed Zones in Alberta
Source: Alberta Environment

Benefits of Airshed Zones

Residents of the Region can:

- Learn more about local air quality and what affects it
- Compare air quality in our region to that in other areas and to available air quality standards
- Influence air quality monitoring in their communities by using the airshed zone as a conduit to provide their feedback to industry and government
- Better understand industries', governments' and their own roles and responsibilities in maintaining good air quality

All levels of government can:

- Communicate with all stakeholders on air quality issues and initiatives in the region
- Inform potential residents and potential industries of the airshed zone's existence, purpose and benefits
- Manage perceptions about air quality in the airshed zone, using air quality data
- Use data to help assess exposure effects on humans, animals, and the environment

Local industry can:

- Use air quality data in environmental impact assessments
- Use the air monitoring network to meet the ambient air monitoring regulatory requirements of their Operating Approvals
- Coordinate their air monitoring efforts and leverage their investments in air quality monitoring

Source: Fort Air Partnership

PLANS FOR 2006

OPERATION AND EXPANSION OF THE REGIONAL AIR MONITORING NETWORK

Additional Passive Monitoring Stations

Four additional passive monitoring stations will be added to the network in 2006. Three of these will be near the industrial facilities in the northern part of the LICA area; the fourth will be added in the southeastern part of the LICA area. The stations are being added to improve coverage of the region.

One of the existing stations will be moved into Bonnyville to provide urban results and to potentially be used in an educational initiative related to air quality. See Figure 1 on page 7 for the location of the existing and new stations.

Additional Continuous Monitoring Trailers

Two continuous air monitoring trailers will be added to the network in 2006. One will be located close to Imperial Oil's Maskwa plant facility, to be representative of areas in the region with in-situ bitumen recovery operations. The second new station will be located in the southern part of the region and will be representative of parts of the LICA area that have not been affected by human activity. The south station location will be finalized in early 2006. The proposed locations of the continuous trailers are shown on Figure 1.

Cold Lake Station

The Cold Lake Continuous Monitoring Station will be housed in a new trailer in 2006 because the current one is in poor repair. A replacement trailer, purchased by AENV, is expected to be delivered in late spring. The station will be out of service during installation of the equipment in the new trailer, but LICA will work to minimize the time during which data are unavailable.

BUILDING CAPACITY

Program Manager

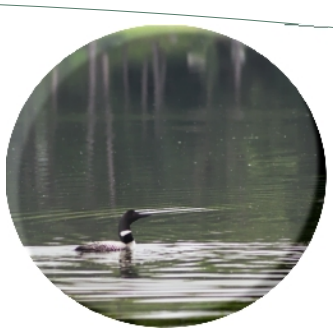
A program manager will be hired to oversee day-to-day operation of the regional air monitoring network and to provide technical guidance to the airshed zone on an ongoing basis. The Program Manager will review the monitoring results regularly and will report to Alberta Environment should any measurements exceed an Alberta Ambient Air Quality Objective. The Program Manager will then work, in cooperation with industry members and other LICA stakeholders, to determine and address, if possible, the cause of the event.

Communication of Results

Communication of monitoring results will continue in 2006 using the LICA website and public LICA meetings. Additional communication plans include making regional monitoring data available on the CASA Data Warehouse website and exploring the possibility of presenting the Air Quality Index on a weekly basis in the local news media.

Stakeholder Participation

Communication about the existence, benefits, and role of the LICA Airshed zone will be a focus for 2006. Interested stakeholders from all sectors (community, industry, environmental groups, and others) will be encouraged to take part in the process.



SOILS AND BIODIVERSITY ISSUES

While the focus of the REASMC has been very much on air quality monitoring to date, the committee's mandate also includes soil monitoring for potential acidification impacts. Neither regional air monitoring results, nor ambient monitoring conducted by industry suggest there is any current issue with acid deposition in the area; however, some of the simulation work conducted for various environmental impact assessments indicates there could be an issue under some cumulative development scenarios.

Another potential area of interest to LICA is biodiversity monitoring, which provides a scientific basis for determining the impact of cumulative development on the variety of flora and fauna in the area. In 2005 the REASMC invited guests from the Alberta Biodiversity Monitoring Program (ABMP) and the Lakeland Agricultural Research Association (LARA) to discuss their programs.

In 2006, the committee will determine requirements and options for future work in both of these areas.

AIR MONITORING RESULTS

PASSIVE NETWORK

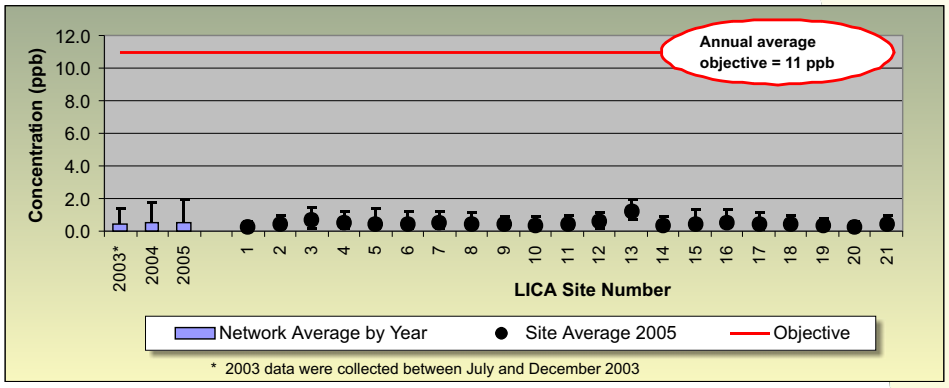
The charts that follow summarize ground level concentrations of sulphur dioxide, nitrogen dioxide, hydrogen sulphide, and ozone measured across the LICA region for 2005 (see the Key Air Quality Parameters on page 19 for information about these pollutants).

The blue bars on the left hand side of the graphs represent network averages (that is, averages of all monthly values measured at all of the LICA network sites) for 2003, 2004, and 2005. The remainder of the results are based on all data collected in 2005. The charts show the maximum, average, and minimum values for each station in the LICA area. The readings are shown with bars with a dot. The dot represents the average reading during the period. The bars show how much the maximum and minimum values differ from the average.

Sulphur Dioxide

The Alberta Ambient Air Quality Objective for annual average ground level concentration of sulphur dioxide is 11 parts per billion (ppb). All monthly values measured in the LICA network are well below that threshold, as are the annual averages at each site (not shown), and the annual network averages. There have been no significant changes or trends in the values measured in the LICA network.

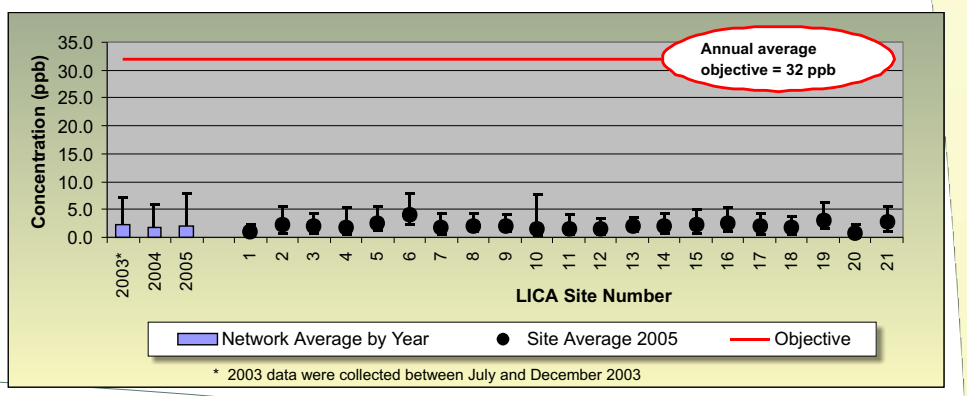
Figure 4: Network Sulphur Dioxide Results



Nitrogen Dioxide

The Alberta Ambient Air Quality Objective for ground level concentration of nitrogen dioxide is 32 ppb. All monthly values measured in the LICA network are well below that threshold, as are the annual averages at each site (not shown), and the annual network averages. There have been no significant changes or trends in the values measured in the LICA network.

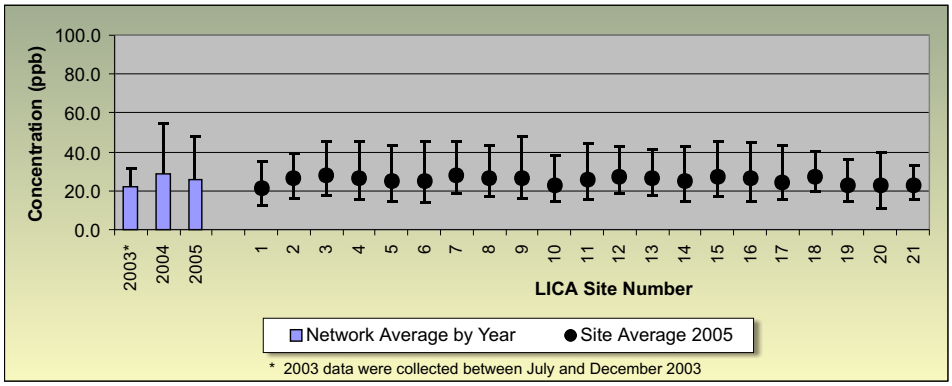
Figure 5: Network Nitrogen Dioxide Results



Ozone

There is no Alberta Ambient Air Quality Objective for annual average ground level concentration of ozone. There have been no significant changes with time in the values measured in the LICA network. The average values measured are consistent across the network, that is, there is no significant variation between sites.

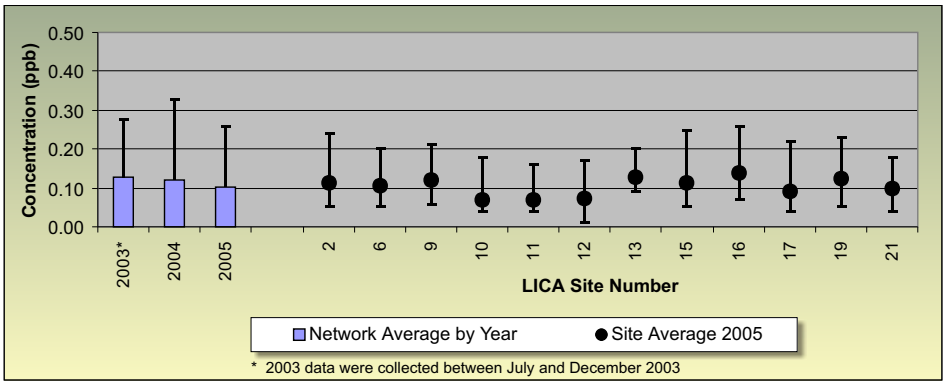
Figure 6: Network Ozone Results



Hydrogen Sulphide

There is no Alberta Ambient Air Quality Objective for annual average ground level concentration of hydrogen sulphide. Hydrogen sulphide is measured at selected sites in the LICA network. There have been no significant changes with time in the values measured at these stations.

Figure 7: Network Hydrogen Sulphide Results



COMPARISONS WITH OTHER ALBERTA SITES

The charts that follow provide a comparison of air quality in the Lakeland area with that in other parts of Alberta. Six LICA sites were selected for the purposes of comparison - those with the three lowest and the three highest annual averages for each pollutant measured. The dots indicating the 2005 averages from the LICA sites are shown as green dots on the charts that follow. The bars above and below the dots show the maximum and minimum monthly values, respectively. Other Alberta sites for comparison were chosen to represent a mixture of industrial (Edmonton East, Fort Saskatchewan - 92 St/96 Ave station, Fort McMurray - Athabasca Valley station) and rural (Beaverlodge and Fort Chipewyan) locations. Data for the comparison sites were taken from the CASA data warehouse for the period from January - December, 2005, except Beaverlodge for which January - November, 2005, data were available. All comparison sites are continuous stations for which raw data were analyzed to yield annual averages, shown as blue diamonds, and minimum and maximum monthly averages, indicated by the bars above and below those symbols, which can then be compared with the monthly values from the LICA passive network.

Sulphur Dioxide

All values are below the Alberta Ambient Air Quality Objective. The LICA network averages are comparable to the more rural sites.

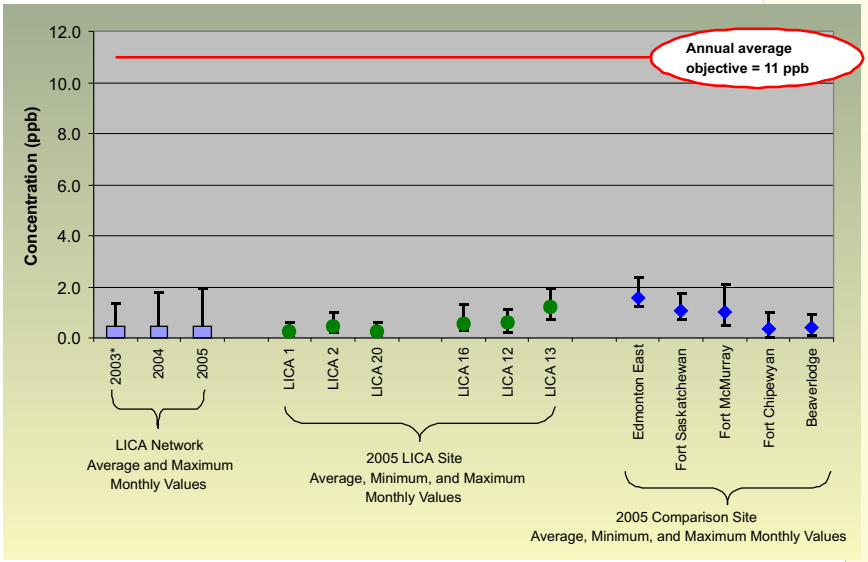


Figure 8: Comparison of Alberta site Sulphur Dioxide Measurements

Nitrogen Dioxide

All values are below the Alberta Ambient Air Quality Objective. The LICA network averages are comparable to the more rural sites. All of the LICA network values are significantly lower than the averages from the more industrial sites.

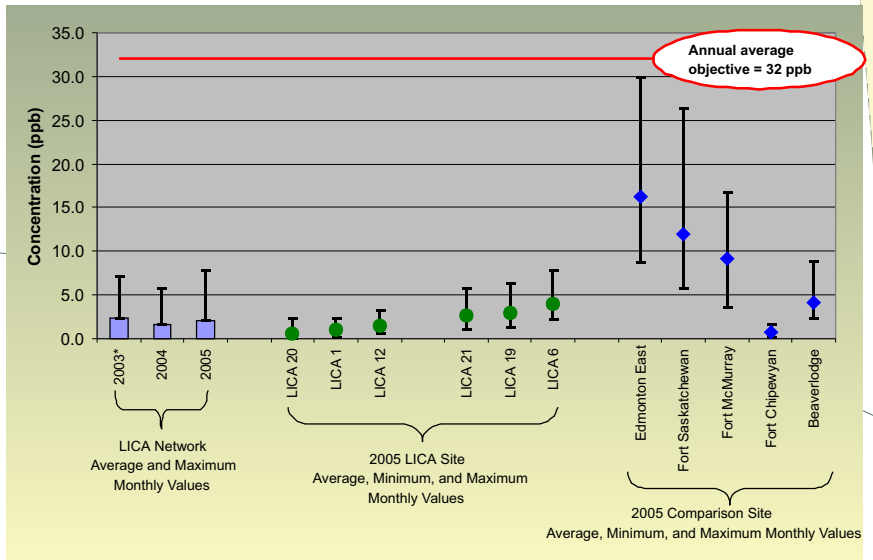
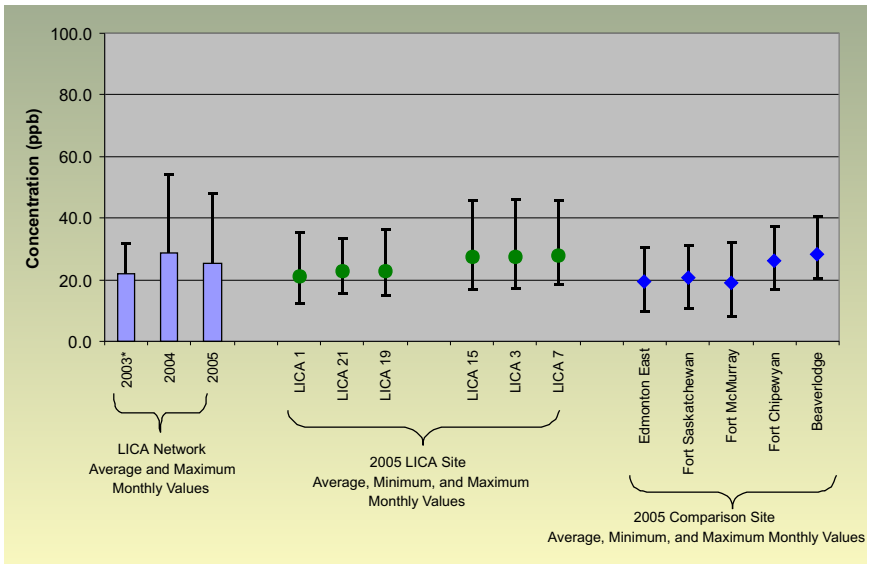


Figure 9: Comparison of Alberta site Nitrogen Dioxide Measurements

Ozone

The LICA network averages are comparable to the more rural sites.

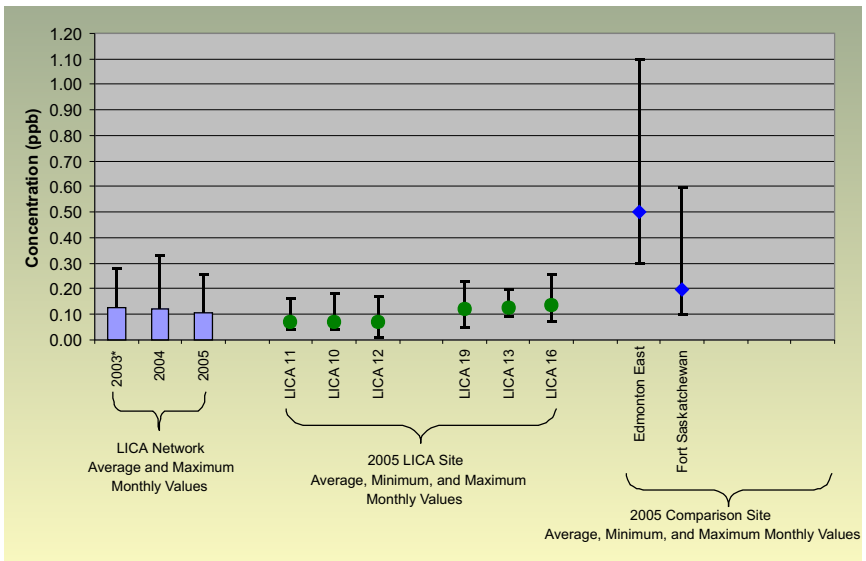
Figure 10: Comparison of Alberta site Ozone Measurements



Hydrogen Sulphide

No rural comparison site values were available. The LICA network values are significantly lower than those in the industrial location sites.

Figure 11: Comparison of Alberta site Hydrogen Sulphide Measurements



Cold Lake South Station Monitoring Results

Table 2 summarizes the average and maximum values measured at the Cold Lake South station between the end of October and the end of December, 2005. As indicated, none of the hourly or daily average values exceeded applicable Alberta Ambient Air Quality Objectives.

Table 2: Key Parameters - Continuous Monitoring Data - 2005 October to December Summary

Parameter	Average	Max Values				Operational Time (%)	Readings Above AENV Objectives	
		24-hr	Date	1-hr	Date		24-hr	1-hr
Sulphur Dioxide (SO_2 measured in ppb)	0.7	2.19	07-Dec	5.00	14-Nov	91.4	0	0
Nitrogen Dioxide (NO_2 measured in ppb)	5.2	13.23	21-Dec	26.19	05-Dec	98.3	0	0
Oxides of Nitrogen (NO_x measured in ppb)	7.7	58.45	22-Dec	94.03	22-Dec	98.3	0	0
Nitric Oxide (NO measured in ppb)	2.7	46.14	22-Dec	82.36	22-Dec	98.3	0	0
Ozone (O_3 measured in ppb)	18.3	33.32	09-Dec	43.11	10-Nov	91.5	0	0
Total Hydrocarbons (THC measured in ppb)	2.0	3.04	26-Dec	3.73	28-Dec	97.3	0	0
Total Reduced Sulphur (TRS measured in ppm)	0.5	0.95	22-Dec	1.26	22-Dec	88.9	0	0
Particulate Matter ($PM_{2.5}$ measured in g/m^3)	2.5	6.73	06-Nov	23.53	24-Dec	50.8	0	0

Key Air Quality Parameters

Sulphur dioxide

SO_2

- a toxic, colourless gas with a pungent odour
- primarily formed by combustion processes or by the flaring of gas containing sulphur compounds

Nitrogen dioxide

NO_2

- a toxic, pungent, reddish-brown gas
- formed by the reaction of atmospheric ozone with the nitric oxide produced from combustion

Hydrogen sulphide

H_2S

- a toxic, colourless gas with a "rotten eggs" odour
- potential sources include "sour" oil and gas, animal feedlots, and sewer gas (i.e. leaks)

Ozone

O_3

- a strong oxidizer with a sweet smell
- can be transported from the upper atmosphere or produced by the reaction of oxides of nitrogen with volatile organic compounds

Total Hydrocarbons

THC

- a family of chemicals containing carbon and hydrogen
- sources include vegetation, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion and aircraft traffic. Vehicles are the major source of hydrocarbons at urban locations.

Total Reduced Sulphur

TRS

- includes hydrogen sulphide, mercaptans, dimethyl sulphide, dimethyl disulphide and other sulphur compounds, but not sulphur dioxide
- potential sources are as listed for H_2S

Respirable Particulate Matter

$PM_{2.5}$

- airborne particles in solid or liquid form with median diameter less than 2.5 micrometres
- sources include construction, agriculture, combustion and forest fires
- can also be formed by reaction of other pollutants

Regional Environmental Water Monitoring Committee Report 2005

OVERVIEW

2005 was another important year for the Regional Environmental Water Monitoring Committee (REWMC).

The group continued local water-related initiatives, and participated in Alberta Environment's Cold Lake - Beaver River Basin Advisory Committee. Major accomplishments of the Basin Advisory Committee, co-chaired by LICA, were the completion of four State of the Basin reports, and progress towards an update of the 1985 Cold Lake - Beaver River Water Management Plan.

Key activities of the Water Committee in 2005 include the following projects:

- the Lakewatch Program in partnership with the Alberta Lake Management Society and Alberta Environment
- the Great Canadian Shoreline Cleanup
- paleolimnology study with Alberta Environment's Northern Region, the University of Waterloo, and McGill University
- presentation of interim results of the Muriel Lake Study
- participation on the Basin Advisory Committee for the Cold Lake Beaver River Water Management Plan

2005 ACCOMPLISHMENTS

Cold Lake Beaver River Management Plan Progress Report

Background and Current Status

During the summer of 2003, plans to update the 1985 water management plan for Cold Lake and the lower portion of the Beaver River Basin resulted in the establishment of a Basin Advisory Committee (BAC) and the development of Terms of Reference that outlined the topics to be addressed and the technical studies to be completed.

Four technical teams were established to look at specific components of the basin to summarize and update the existing scientific knowledge. This up-to-date information will be used when developing management recommendations for the updated plan. Each technical team completed a State of the Basin report for their area of expertise; all four reports, as well as a summary (overview) report, were released for broader public distribution by the Basin Advisory Committee and Alberta Environment in early 2006. These four State of the Basin reports include:

- Surface Water Quality
- Surface Water Quantity and Aquatic Resources
- Groundwater Quantity and Brackish Water

Complete reports can be found at:
http://environment.gov.ab.ca

The updated water management plan for Cold Lake and the lower portion of the Beaver River Basin will provide a current look at the state of the Cold Lake-Beaver River Basin, and suggest a strategy to meet the current and future water needs of the basin. The updated plan will strive to balance community, economic, and environmental issues and values with government legislation and policy for protecting and managing water resources in this area.

Planning Area

The Cold Lake-Beaver River (CLBR) planning area is part of the CLBR Basin located in Alberta that drains to the outlet of Cold Lake. It also includes the lower Beaver River Basin that drains to the Alberta/Saskatchewan boundary.

The management plan study area focuses on the following major lakes and downstream rivers: Jackfish Creek, Manatokan Creek, Marie Creek, Moose Lake River, Muriel Creek, Reita Creek, Sand River, Wolf River, Cold Lake, Moose Lake, Muriel Lake, and Marie Lake.

Working in Partnership

As part of Alberta Environment's Water for Life Strategy, there is now more emphasis on working with local partners to manage the water resources within the basin. Alberta Environment has been working closely with LICA during the information gathering stage of the planning exercise and will continue this partnership during the development of the management recommendations. AENV and LICA are co-chairs of the Basin Advisory Committee - the group responsible for reviewing technical information and providing advice on management plan recommendations. The Basin Advisory Committee is a multi-stakeholder group comprised of local governments, industry, Metis Settlements, and First Nations, federal and provincial government departments, and members of the public. In addition to reviewing technical information, this committee provides advice and recommendations on the range of views and community values to be considered when preparing the Water Management Plan Update.

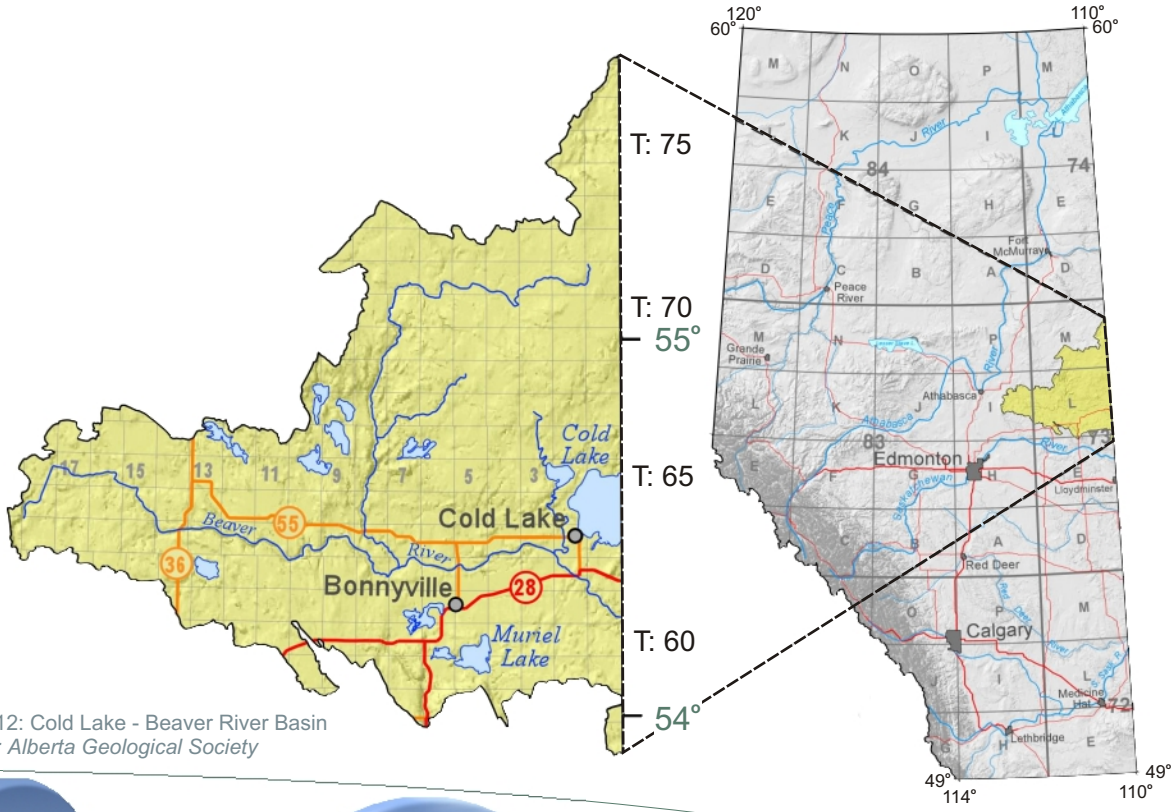
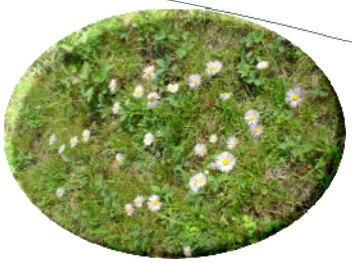


Figure 12: Cold Lake - Beaver River Basin
Source: Alberta Geological Society



Summary of Key Findings:

Some of the key findings from the four State of the Basin Reports are listed below. This information will assist in determining the best management options available for each of the main themes to be addressed in the management plan update.

WATER QUANTITY (WATER SUPPLY AND DEMAND)

- the Cold Lake - Beaver River Basin currently has sufficient water resources to meet current and projected demands
- climatic conditions over the past 20 years have been drier than average resulting in lower lake and stream levels; some areas within the basin have been more impacted by these climatic conditions than other areas
- since 1985, there has been no significant increase in surface water allocations and approximately a 50% increase in industrial groundwater allocations
- actual water use is about 30-35% of allocations for all water use sectors (i.e. municipal, industrial, residential)
- freshwater requirements per barrel of oil produced have decreased substantially compared to 1985 due to increases in recycling and uses of alternate water sources (e.g. brackish, produced water)
- model runs using maximum allocations of groundwater show no long-term impacts to adjacent aquifers and surface water bodies

PROTECTION OF AQUATIC RESOURCES

- the health of the basin's fish populations remain below optimum due to past over harvesting and habitat change; however, there are some signs of localized improvement (Lake Trout in Cold Lake)
- increasingly poor water quality in some lakes (e.g. Moose, Muriel, and Kehewin) may be reaching critical levels for fish productivity
- land use has had less impact on wildlife than climatic conditions, but these activities remain a concern south of the Beaver River

GROUNDWATER QUALITY

- regional groundwater quality is generally within Canadian Drinking Water Guidelines and has no change detectable over time
- there are a number of potential point and non-point sources of contamination located within areas that are sensitive to contamination (i.e. exposed aquifers)

SURFACE WATER QUALITY

- although there are localized exceptions, fertility of lakes within the basin has generally not changed over the past 20 years
- low precipitation has increased salinity, pH, and ion concentrations; lakes with larger watersheds were least affected
- there is a strong relationship between land use and lake fertility (i.e. nutrients in the lake)
- nutrients (phosphorous/nitrates/nitrites) have decreased in the Beaver River
- no threats were presently evident to sources of drinking water

Groundwater is a Key Part of the Updated Plan

There will be more emphasis on groundwater supply and demand in this updated plan. With the help of Alberta Geological Survey (AGS), the underlying geological structure and underlying aquifers have been extensively mapped (see Figure 13). By knowing the sub-structure of the basin, potential interactions between groundwater withdrawals and surface water can be determined. Because groundwater withdrawals have been mentioned as one of the main concerns within the basin, there has been a significant amount of effort to understand the true nature of groundwater availability, withdrawals, and interactions. The main areas of focus during this study included:

- Supply and location of groundwater resources
- Assessment of groundwater quality
- Potential effects of groundwater withdrawals (i.e. interaction with surface and other aquifers)

With the completion of the four State of the Basin reports, the Basin Advisory Committee is now prepared to move on to the next phase of the planning exercise. This includes additional consultation with stakeholders, hosting workshops, drafting the updated plan, and hosting public meetings for reviews and comments.

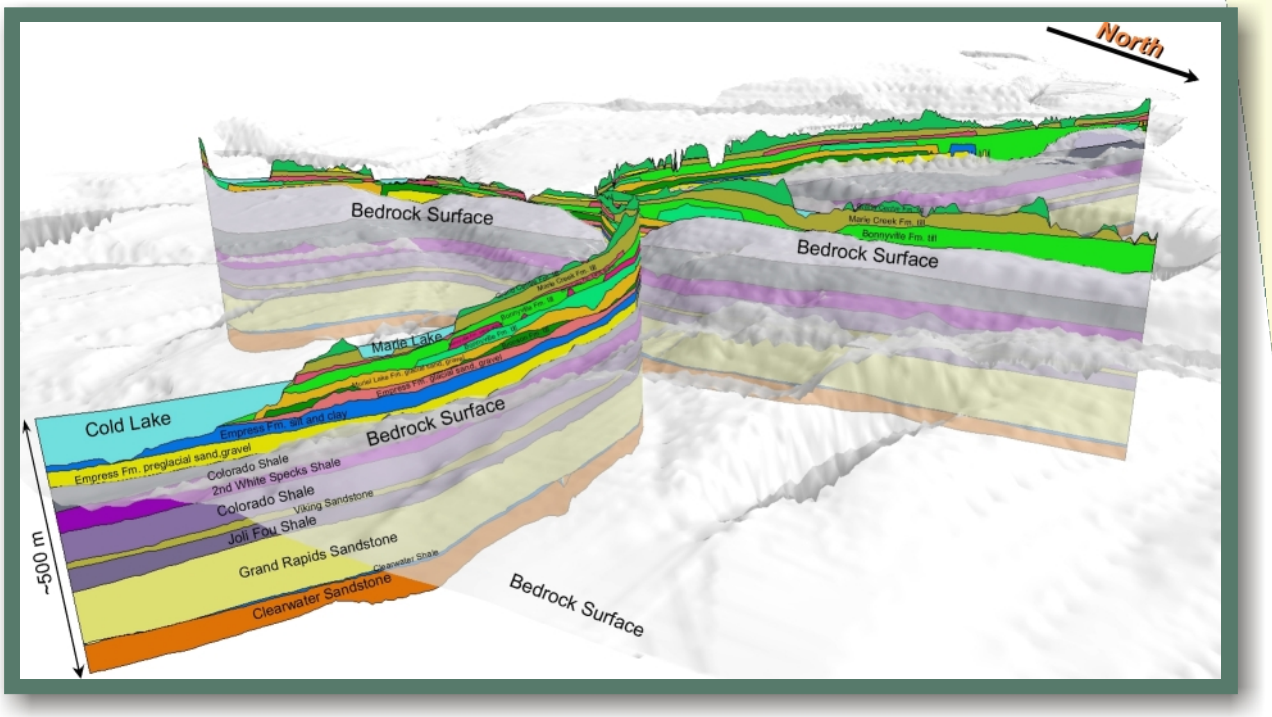
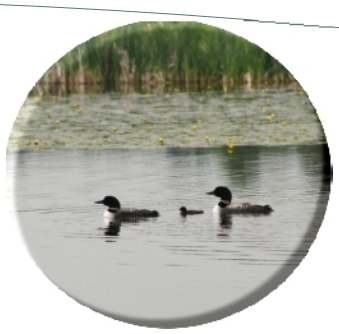


Figure 13: Geological Structure and Aquifers in the Cold Lake - Beaver River Basin
Source: Alberta Geological Survey


LAKEWATCH PROGRAM

Alberta Lakewatch is a volunteer water quality monitoring program used by stewardship groups and community associations to collect water quality data from individual lakes in Alberta. Lakewatch is offered by the Alberta Lake Management Society (ALMS) and is run in partnership with Alberta Environment (AENV). Since Lakewatch began in 1996, over 40 lakes across Alberta have been sampled.

LICA works in partnership with ALMS on the Lakewatch program by providing funding and organizing volunteers. In 2005, funding to monitor nine lakes was provided by LICA; in 2006, nine lakes will be monitored. Table 3 shows the lakes in the LICA region that have been included in the Lakewatch program, as well as the lakes that will be monitored in 2006.

Table 3: Lakes monitored by LICA. 2006 lakes may change depending on volunteers and Lakewatch Program costs

Lake	2002	2003	2004	2005	2006	2007	2008	2009	2010
Angling	X	X	X			X	X		
Bluet	X	X	X	X				X	X
Garnier	X	X	X	X				X	X
Laurier	X	X	X			X	X	X	
Kehewin	X	X	X	X				X	X
Marie	X	X	X			X	X	X	
Moose	X	X	X	X	X		X	X	
Frog		X	X	X	X			X	X
Hilda			X	X	X			X	X
Fishing				X	X	X	X		
Crane				X	X	X			X
Wolf				X	X	X	X		
Muriel					X	X	X		
Bear Trap					X	X	X	X	X
Tucker					X	X	X		

X Sample Season Completed
X Partial Sampling Season Completed
X Proposed Sampling

During the 2005 lake-monitoring season Bluet, Crane, Fishing, Frog, Garnier, Hilda, Kehewin, Moose, and Wolf Lakes were sampled by landowners and residents who volunteered their time. Reports from the 2005 sampling season, as well as past reports, are available on the ALMS website at www.alms.ca. The following is a summary of the results for the 2005 Moose Lake sampling.

Moose Lake Monitoring Results

Moose Lake is one of the greenest lakes in the LICA area. In 2005, the quality of Moose Lake water was very similar to that of 2004; nutrients, water greenness (i.e., amount of algae in water), salinity, and pH has not changed significantly over the last year (Table 4). Salinity of Moose Lake water has increased over the past two decades due to dry climate. Salinity did not improve very much in 2005, which corresponds to a decrease in water levels (see Figure 14).

Table 4: Average concentration of selected parameters sampled in Moose Lake during summer 2005.

Parameter	1986	1993	1997	2002	2004	2005
Total Phosphorus (µg/L)	40	41	48	50	47	44
Water greenness (µg/L chla)	18	23	25	17	27	27
Water clarity (m Secchi)	2.5	2.0	2.8	1.6	2.7	-
Salinity (mg/L TDS)	400	474	480	590	-	580
pH	8.6	9.0	8.6	8.8	8.9	9.0

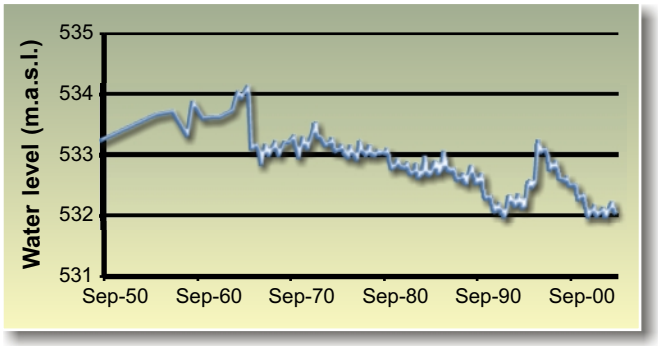


Figure 14: Water level history of Moose Lake.

2005 Volunteer Recognition

The success of the Lakewatch Program is dependent on its volunteers. On October 10, 2005, LICA organized a volunteer appreciation banquet, which was attended by 11 Lakewatch volunteers. Special mention went to Bob Hornseth and Laurier Sylvester (Moose Lake), Ken and Ed Dion (Kehewin Lake), and James Capjack (Garnier Lake), all of whom have been with the program for at least four years.

Volunteers were asked to rate the program through a satisfaction survey; results indicated that the program met or exceeded volunteer expectations and rated volunteer satisfaction as excellent or good. The following feedback is from the volunteer survey:

"I enjoyed the program and have a better knowledge of sampling."
"Lakes in this area benefit from this program."
"Lakewatch staff was knowledgeable and skilled."
"Lakewatch captured the interest of the cottagers."
"With respect to improvements, none come to mind."

Vien Lam (right) with volunteer, Don Cassidy (Crane Lake).

The Lakewatch Program has benefited greatly from the dedication and passion of Vien Lam, the 2005 Lakewatch Coordinator. Vien wore his heart on his sleeve and worked countless hours in guiding and educating volunteers. Volunteers found him knowledgeable, skilled, friendly, and helpful. Vien came to ALMS with three years experience as coordinator of the Royal Tyrrell Museum's Day Digs Program, a volunteer fossil excavation program. Through his experience with ALMS, Vien has recently started a new position with Alberta Environment, in the Water Monitoring Section. We wish Vien good luck in his new position and look forward to working with next years ALMS co-ordinator.

GREAT CANADIAN SHORELINE CLEANUP

Each September, hundreds of thousands of volunteers from around the world join forces during the International Coastal Cleanup (ICC) coordinated by the Ocean Conservancy. In the past 17 years, more than 4.5 million volunteers from 120 countries, including Canada, have participated.

The Great Canadian Shoreline Cleanup has become Canada's largest contributor to the ICC, and one of Canada's largest environmental direct action programs. The Vancouver Aquarium started the program over 11 years ago, and it has grown from a local beach cleanup to a national program with volunteers in every province and territory.

Besides collecting trash from a local shoreline, important data is collected. With every cleanup, volunteers fill out an ICC data card. Every piece of garbage collected is recorded, sent back to the Vancouver Aquarium, tabulated, and forwarded to the ICC, where it is used to affect legislation about aquatic debris.

In September, 2005, the REWMC organized and participated in the cleanup of two local lakes - Ernestina and Bear Trap. Table 5 below is a summary of the garbage and debris collected at each of these lakes.

Table 5: Summary of Great Canadian Shoreline Cleanup at Ernestina and Bear Trap Lakes.

	Ernestina Lake	Bear Trap Lake
Shoreline traveled	1.6 km	0.7 km
Garbage (kg)	56	90
# of people	4	10
Some interesting items collected	3" x 10' plastic pipe, sleeping bag, 3 propane tanks, 2 plastic chairs	44 beverage containers, 42 cigarette filters, 49 food wrappers, dog leash, necklace

In addition to the clean-up organized by the REWMC, LICA member companies Imperial Oil Resources, BlackRock Ventures Inc., and Canadian Natural Resources Limited cleaned up Bourque Lake, Hilda Lake, and Wolf Lake.

For more information about The Great Canadian Shoreline Cleanup visit www.vanaqua.org/cleanup/home.

Cleanup Crew for Bear Trap Lake

(back row from left to right):
Joe Prusak (AENV)
Carol Engstrom (Husky Energy)
Chrysta Lane (Imperial Oil Resources)
Robert Deresh (LICA)
Kevin Ryan (Devon Canada)
Maxine Howland (Resident)
Glynis Carling (Imperial Oil Resources)

(front row from left to right):
Brent Moore (Devon Canada)
Lori Neufeld (Imperial Oil Resources)
Michael Bisaga (AENV)

PALEOLIMNOLOGY STUDY

Alberta Environment, LICA, and researchers from the University of Waterloo and McGill University have partnered in a paleolimnology study to learn about the environmental history of Moose and Kehewin Lakes.

Paleolimnology (*paleo*, ancient and *limne*, a lake) is the name of the science practiced by this team. Core samples are retrieved, and using physical, chemical, and biological information archived in the lake sediments, past environmental conditions over different time scales are reconstructed and interpreted. This branch of science can also track the cumulative stress effects of such things as climatic variability, acid deposition, and nutrient enrichment on aquatic communities.

In June 2005, the research team sampled Moose and Kehewin Lakes with equipment and sampling expertise from AENV's Monitoring Branch; lab space was made available in Cold Lake through Alberta Sustainable Resource Development.

The Study, which should be completed in the fall of 2007, will better our understanding of these lakes and add to the overall knowledge of water resources in the LICA area.

A core-us of scientists:

(left to right):
Roland Hall (Professor, University of Waterloo)
Irene Gregory-Eaves (Professor, McGill University)
Zofia Taranu (Masters student, McGill University)
Dörte Köster (Post-Doctorate Fellow, University of Waterloo)
Théo Charette (AENV)
Francine Forrest (AAFRD)

Not in photo: Mike Bilyk (AENV)

Gently does it...

Mike Bilyk lowers the sediment corer into Moose Lake. When the corer reaches lake bottom, a lead "messenger" is released, activating suction on the core tube, which is then pulled to the surface

Core up close:

This core sample shows what has been happening in Moose Lake over the past 200 years. The colour change at the 4.5-inch mark is of particular interest to the lake scientists.

MURIEL LAKE STUDY

In 2002 LICA partnered with the Muriel Lake Basin Management Society (MLBMS) to determine why the water level in Muriel Lake has decreased in the past few decades. Dr. Bill Donahue from the University of Alberta was commissioned to complete the study.

Findings from the study show Muriel Lake has experienced a dramatic decline in water supply since the mid-1980s, causing the lake to drop more than three meters. It is not known whether this recent change in Muriel Lake is simply a reflection of how the lake typically responds to drought or due to some other change or human activity within the lake basin.

Sediment cores taken from Muriel Lake in 2002 were dated and analyzed for remains of a particular phytoplankton that continually settle out and are incorporated in the lake sediment. A large number of species of algae were identified in the sediment, and the composition of the algal community generally shifted over time from species that prefer fresh water to species that are tolerant of lake salinity. Computer modeling suggests that salinity was relatively stable between 1875 and the mid 1980s, after which salinity has increased substantially. Periodic lake chemistry sampling by AENV corroborates this. Another interesting finding was a lack of change in salinity in the 1930-40s. This suggests there was either no drought in the region during that time, or the supply of water from Muriel Lake's catchment area to the lake has changed since then.

A final analysis of oxygen-based chemical tracers will be measured in the sediment profile to detect changes in the dominance of surface water or groundwater inputs into Muriel Lake. Hopefully this will provide evidence of the status of Muriel Lake during the 1930-40s. If a drought did occur in the region, as seen on the prairies as a whole, it would suggest catchment alteration is the most likely cause for recent changes in Muriel Lake's water supply.

Dr. Donahue will have a report completed by the end of February 2006.

PLANS FOR 2006

COLD LAKE - BEAVER RIVER WATER MANAGEMENT PLAN

With the completion of the technical reports, the Basin Advisory Committee is looking to move forward on other steps necessary to complete the planning process. These steps include:

- host and gather stakeholder input from a scheduled workshop
- complete the first draft of the updated management plan
- receive public feedback from open house events (draft plan review)
- revise draft accordingly, based on public feedback
- forward plan to AENV for approval and implementation

FORMATION OF A WPAC

A Watershed Planning and Advisory Council (WPAC) is a partnership involving all interests that use or impact the water resources in a region. All members on the WPAC are equal partners in the management of the watershed. A WPAC for the Cold Lake Beaver River Basin is currently being established. Membership on this WPAC will include a combination of the existing Basin Advisory Committee, LICA's Regional Environment Water Monitoring Committee, and interested stakeholders from the watershed.

The goal of the WPAC is to effectively, fairly, and efficiently manage the watershed at a local level. This is accomplished through implementation of the management plan, coordination of monitoring programs, and promotion of sustainable land use practices. The Watershed Planning and Advisory Committee will also be responsible for coordinating mitigation, enhancement, and education programs for the basin.

PALEOLIMNOLOGY STUDY

LICA will continue to support research efforts at Moose and Kehewin Lakes.

MURIEL LAKE STUDY

In 2006, the committee will facilitate discussions with the Muriel Lake Basin Management Society, AENV, and the MD of Bonnyville to address historical changes made to the Muriel Lake watershed, if it is determined that catchment alteration is the reason for the changes to Muriel Lake.

CREEK CROSSINGS

A survey and inventory of roads that cross creeks in the Northern LICA area will be undertaken and documented in 2006. The goal is to prioritize crossings in need of repair and make recommendations for repair to the crossing owner.

LAKEWATCH PROGRAM

LICA will continue to partner with ALMS on the Lakewatch Program until 2010 and will aim to monitor a similar number of lakes every year, depending on volunteers and costs.

OTHER EVENTS

LICA will continue to participate in the Great Canadian Shoreline Cleanup.

LICA will also sponsor an “Eco-Day” at Crane Lake in the summer, 2006.

COMMON INDUSTRY TERMS

Abandoned Well
A well that is permanently shut down because it has ceased to produce crude oil or natural gas or because it was a dry hole.

Abandonment
Converting a drilled well to a condition that can be left indefinitely without further attention and will not damage freshwater supplies, potential petroleum reservoirs, or the environment.

Acid Deposition
A broad term for the different ways acidic compounds precipitate from the atmosphere and deposit onto surfaces. It can include wet deposition by means of acid rain, fog, and snow and dry deposition of acidic particles (also known as aerosols).

Alberta Ambient Air Quality Objectives (AAAQO)
Are established by Alberta Environment to define desired environmental quality that will protect public health and ecosystems. The following are some of the factors considered when establishing air quality objectives: sensitivity of receptors, substance behavior in the atmosphere, natural levels and fluctuations, pollution control, and monitoring technology. AAAQOs are used to assess compliance and evaluate the performance of industrial facilities; all industrial facilities must be designed to meet AAAQOs.

Aquifer
A body of permeable rock, for example, unconsolidated gravel or sand stratum, that is capable of storing significant quantities of water, is underlain by impermeable material, and through which groundwater moves.

Battery
Equipment to process or store crude oil from one or more wells.

Barrel
The common unit for measuring petroleum. One barrel contains approximately 159 litres.

Biodiversity
The variety and abundance of species (plants and animals), and the natural communities, ecosystems, and landscapes in which they occur.

Benzene
A light aromatic hydrocarbon, which occurs naturally as a part of oil and natural gas activity. It is a component of car exhaust and can be emitted from oil and gas facilities. It is a known carcinogen and is an occupational and public health concern.

Background Concentration
The concentration of a chemical substance in an area considered to be relatively unaffected by industry or other human activity. Background often refers to naturally occurring or uncontaminated levels. Background concentrations in one region may be different than those in other areas.

Bitumen
Petroleum in semi-solid or solid forms that cannot be pumped without being heated or diluted.

Blow-out
An uncontrolled flow of gas, oil, or other fluids from a well.

Brackish Water
Saline, non-potable water that is poorly suited for domestic or agricultural purposes.

Cogeneration
A highly efficient energy system that produces both electricity and heat from one energy source.

Condensate
Hydrocarbons, usually produced with natural gas, which are liquid at normal pressure and temperature.

Consensus Decision-Making
A process for group decision-making. An entire group of people can come to an agreement where the input and ideas of all participants are gathered to arrive at a final decision that is acceptable to all. Consensus fosters better solutions and the growth of community and trust among participants.

Cyclic Steam Stimulation
A method of producing heavy oil which involves injecting steam, allowing time for the steam to heat and soften the heavy oil, and producing the heavy oil from the same wellbore used to inject the steam.

Diluent
Light petroleum liquids used to dilute bitumen and heavy oil so they can flow through a pipeline.

Directional (deviated) Well
A well drilled at an angle from the vertical by using a slanted drilling rig or by deflecting the drill bit; directional wells are used to drill multiple wells from a common drilling pad or to reach a subsurface location beneath land where drilling cannot be done.

Enhanced Oil Recovery (EOR)
Any method that increases oil production by using techniques or materials that are not part of normal pressure maintenance or water flooding operations. For example, natural gas can be injected into a reservoir to "enhance" or increase oil production.

Fracturing (or fracing)
The practice of pumping special fluids down the well under high pressure; fracturing causes the formation to crack open, creating passages for the reservoir fluids to flow more easily into the wellbore.

Horizontal Drilling
Drilling a well that deviates from the vertical and travels horizontally through a producing layer.

Hydrocarbons
A group of compounds consisting of hydrogen and carbon. In ambient air, hydrocarbons are broken down into two major categories: methane and non-methane hydrocarbons (NMHC). Methane (CH_4) is a colourless, odourless gas and is the most common hydrocarbon in the earth's atmosphere. NMHCs are important from an air quality perspective because they can lead to the formation of ground level ozone and at high concentrations, certain NMHCs can be toxic to humans, animals, or vegetation. Sources of hydrocarbons include vegetation, vehicle emissions, petrochemical industries, dry cleaning, and natural gas combustion.

Hydrogen Sulphide and Reduced Sulphur Compounds
Hydrogen sulphide (H_2S) is a highly toxic, naturally occurring, reduced sulphur compound. It has the odour of rotten eggs. Other highly odourous reduced sulphur compounds include: mercaptans, dimethyl sulphide, and dimethyl disulphide. Industrial sources include natural gas plants, petrochemical plants, sewage treatment facilities, pulp and paper plants, and confined feeding operations. Natural sources of H_2S include sulphur hot springs, sloughs, swamps, and lakes.

Infill Drilling
Wells drilled between established producing wells on a lease in order to increase production from the reservoir.

Injection Well or Injector
A well used for injecting fluids (air, steam, water, natural gas, natural gas liquids, surfactants, alkalines, polymers, etc.) into an underground formation for the purpose of increasing recovery efficiency.

In-Situ
In its original place; in position; in-situ recovery refers to various methods used to recover deeply buried bitumen deposits. Methods include Steam Assisted Gravity Drainage (SAGD) and Cyclical Steam Stimulation (CSS).

Oil Sands
A deposit of sand saturated with bitumen found mainly in the Athabasca, Peace River, and Cold Lake areas of Alberta.

Oxides of Nitrogen and Nitrogen Dioxide
Formed by the reaction of nitric oxide (NO) and ozone (O_3). Nitrogen dioxide (NO_2) is a reddish-brown gas with a pungent odour and is partially responsible for the "brown haze" observed near large cities. In urban areas, vehicle emissions are the primary source of oxides of nitrogen.

Ozone
Ground-level ozone is a colourless gas that forms just above the earth's surface. Ground-level ozone is not emitted directly into the atmosphere. It results from photochemical reactions between oxides of nitrogen and volatile organic compounds in the presence of sunlight. High levels typically occur from May to September, between noon and early evening.

Paleolimnology
The study of the past conditions and processes of lakes.

Primary Recovery
Producing oil by using either reservoir pressure or single pumps.

Spud, Spudding, or Spudding In
Beginning to drill a well.

Stakeholder
A person or group who can affect or is affected by an action. Responsible decision-making requires consideration of the effects on all stakeholders.

Steam Assisted Gravity Drainage
A recovery technique for extraction of heavy oil or bitumen that involves drilling a pair of horizontal wells one above the other; one well is used for steam injection, the other well is used for production.

Steam Injection
An improved recovery technique in which steam is injected into a reservoir to reduce the viscosity (or resistance to flow) of the bitumen.

Sulphur Dioxide
Is a colourless gas that smells like burnt matches. It can combine with oxygen and water to form acid rain. In Alberta, natural gas processing plants are responsible for nearly half of the sulphur dioxide emissions in the province.

CURRENT MEMBER COMPANIES INFORMATION

BAYTEX ENERGY LTD.
Head Office: 2200, 205 - 5th Ave., S.W.
Calgary, AB

Field Office: Box 358
Ardmore, AB T0A 0B0

Kevin Golem (780)826-3410

FLINT ENERGY SERVICES LTD.
6411 - 51 Ave.
Bonnyville, AB T9N 1L3

Brian Wittmack (780)812-3919

BLACKROCK VENTURES INC.
2600, 605 - 5th Ave., S.W.
Calgary, AB T2P 3H5

Carrie Cochran (403)781-1419

HUSKY ENERGY
Box 6525, Station D
Calgary, AB T2P 8G7

Carol Engstrom (403)298-6175
Keith Scheidt (780)639-5010

CANADIAN NATURAL RESOURCES LTD.
Box 6968
Bonnyville, AB T9N 2H4

Shawn Brockhoff (780)826-8124
Roxane Bretzlaff (780)826-8214

IMPERIAL OIL RESOURCES LTD.
P.O. Box 1020
Bonnyville, AB T9N 2J7

Rick Gallant (780)639-5117
Paula McMillan (780)639-5194

CCS ENERGY SERVICES
2400, 530 - 8 Ave., S.W.
Calgary AB T2P 3S8

Kerri Engler (403) 231-1132

INTER PIPELINE FUND
P.O. Box 7189
Bonnyville, AB T9N 2H5

Mel Hawryluk (780)826-3620

DEVON CANADA CORPORATION
P.O. Box 7905, 6210 - 50th Ave.
Bonnyville, AB T9N 2J2

Kevin Ryan (780)573-2476
Brent Moore (780)689-0414

OPTI CANADA INC.
Suite 2100, 555 - 4th Ave., S.W.
Calgary, AB T2P 3E7

Michael Burt (403)218-4706

ENCANA CORPORATION
Bag 1015
Bonnyville, AB T9N 2J7

Sherry Hennessey (780)573-7357

PARAMOUNT ENERGY OPERATING CORP.
#500, 630 - 4TH Ave., S.W.
Calgary, AB T2P 0J9

Bonnie Jones (403)269-4457

KEY CONTACTS

UTILITY EMERGENCIES	
Atco Electric 24 Hour	1-800-668-5506
Alta Gas, Bonnyville	1-866-222-2067
North East Gas Co-op, Bonnyville	780-826-4002
TransAlta Utilities Corp.	1-800-667-2345
Buried Utilities Locations	1-800-242-3447
ALBERTA ENERGY AND UTILITIES BOARD (AEUB)	
Bonnyville Field Office	780-826-5352
General Inquiries about the AEUB	403-297-8311
GOVERNMENT OF ALBERTA	
Service Alberta (toll free access)	310-0000
Alberta Environment (AENV)	
Emergencies, Spills and Complaints	1-800-222-6514
General Inquiries (Northern Region)	780-427-7617
Alberta Sustainable Resource Development	
Fish and Wildlife Division	
Bonnyville	780-826-3142
Cold Lake	780-639-3377
St. Paul	780-645-6313
Public Lands Division	
Bonnyville	780-826-4297
St. Paul	780-645-6336
Report a Poacher	1-800-642-3800
Forest Fire Line (report a forest fire & smoke)	310-FIRE (3473)
Alberta Agriculture, Food and Rural Development	
General Inquiries	1-866-882-7677
The Farmers' Advocate	780-427- 2433
Alberta Human Resources and Employment	
Workplace Health and Safety	1-866-415-8690
Alberta Infrastructure and Transportation	
Transportation of Dangerous Goods (Emergencies)	1-800-272-9600
Regional Health Authorities	
Aspen Regional Health Authority	349-8705
East Central Regional Health Authority	608-8800
Registrar of Land Agents	780-415-4600
Surface Rights Board	780-427-2444
Land Compensation Board	780-422-2988
MLA Denis Ducharme	780-826-5658
MLA Ray Danyluk	780-645-6999
GOVERNMENT OF CANADA	
Environment Canada	
Prairie and Northern Office (General Inquiries)	780-951-8600
Severe Weather Reporting	1-800-239-0484
MP Brian Storseth	1-800-667-8450
National Energy Board	1-800-899-1265
OTHER	
Pacific Geoscience Centre (earthquake inquiries)	1-250-363-6500