NRCB | Natural Resources Conservation Board

BOARD DECISION NR 2009-01

NRCB Application No. 0702

Alberta Sulphur Terminals Ltd.
Sulphur Forming and Shipping Facility
near Bruderheim

July 2009

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SECTION 1: INTRODUCTION

1.1: Application to the NRCB

On the recommendation of the Minister of Environment, the Lieutenant Governor in Council prescribed the sulphur forming and pastille storage facility and other associated facilities proposed by Alberta Sulphur Terminals Ltd. (AST or the Applicant), a division of Hazco Environmental Services Ltd., to be located in Section 35, Township 55, Range 20, West of the 4th Meridian near the Town of Bruderheim (see Figure 1), as a reviewable project within the meaning of the *Natural Resources Conservation Board Act (NRCBA)*. Order in Council 290/2006 was signed by the Lieutenant Governor on July 12, 2006.

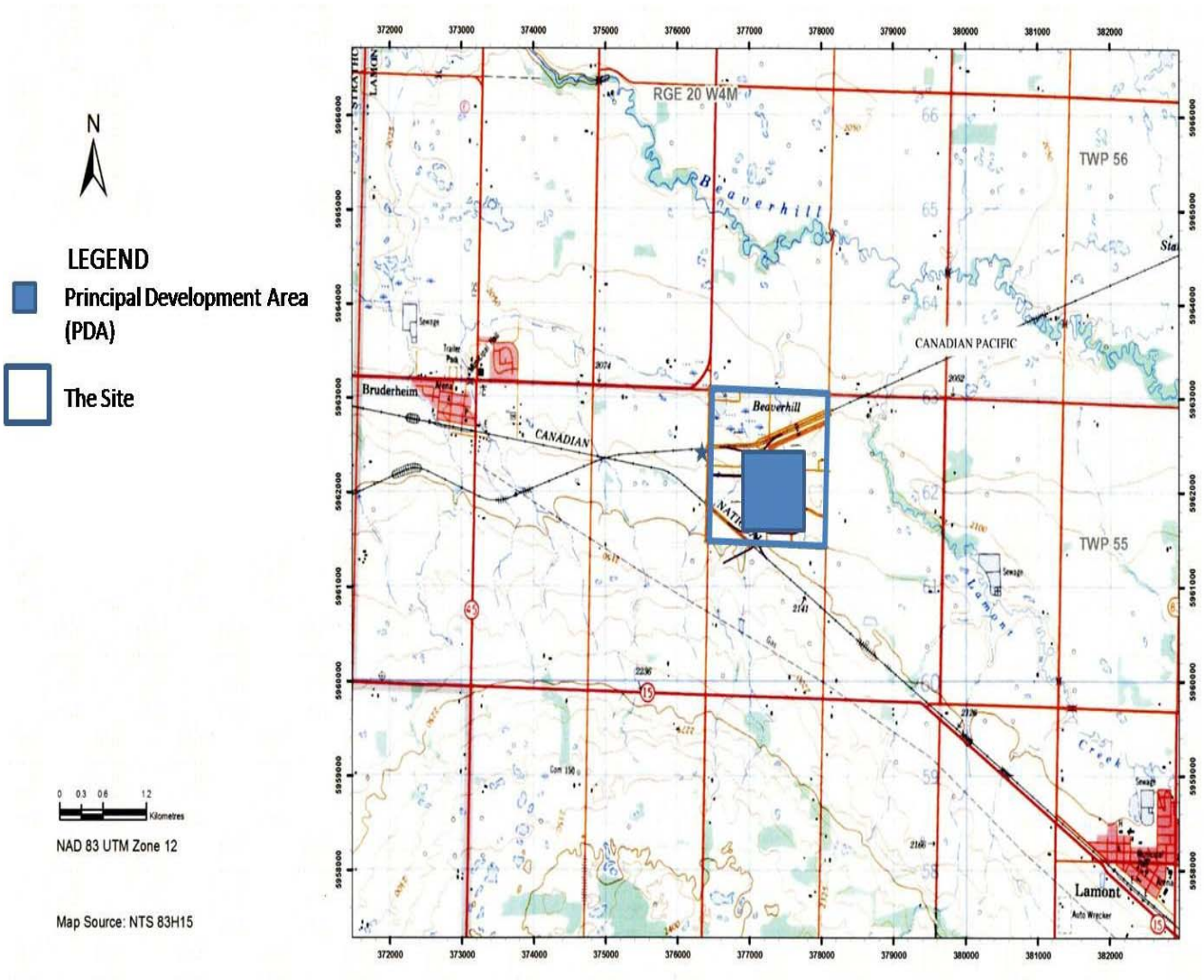

Figure 1: Project Location

The *NRCBA* provides that the Natural Resources Conservation Board (NRCB or Board) was created *"…to provide for an impartial process to review projects that will or may affect the natural resources of Alberta in order to determine whether, in the Board's opinion, the projects are in the public interest, having regard to the social and economic effects of the projects and the effect of the projects on the environment."* The *NRCBA* prohibits the commencement of a reviewable project unless the NRCB, on application, has granted an approval for the project.

On July 13, 2007, AST filed an application to construct and operate a sulphur forming and shipping facility with a capacity of 3,000 tonnes/day (the Project) to be located in Lamont County, Alberta. Figure 2 shows the Principal Development Area (PDA) and surrounding roadways. The key facilities proposed by AST for the sulphur forming and shipping facility are illustrated in Figure 3 (page 14 of this report). AST stated that the Project would service oil and gas production and refining operations within three main areas: Fort Saskatchewan, Fort McMurray and Lloydminster. The primary markets for formed sulphur are the United States, Asia Pacific and North Africa.

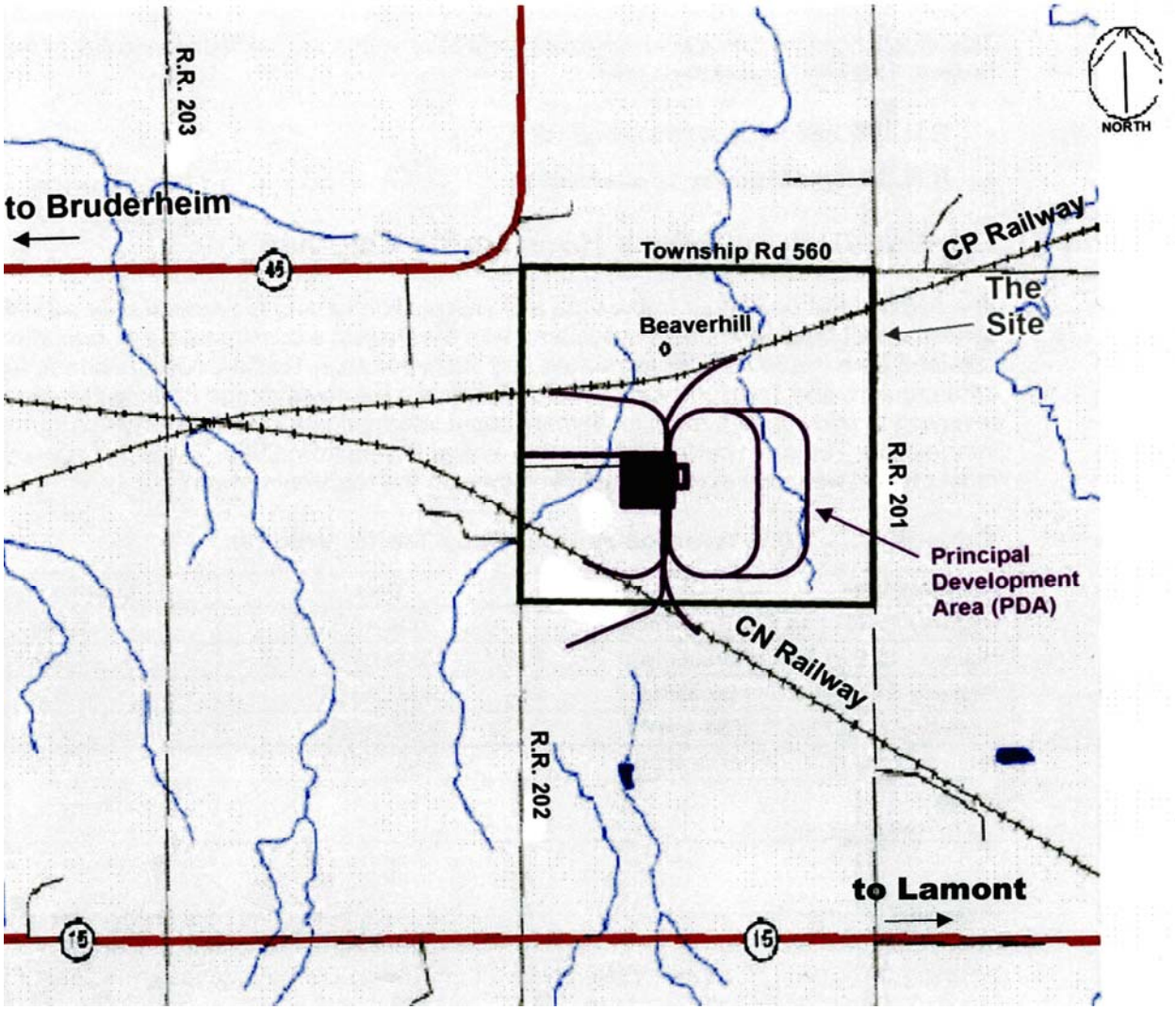

Figure 2: Principal Development Area

1.2: Scope of Review

The Board must determine the public interest in the prescribed reviewable project having regard to the social and economic effects of the Project and the effect of the Project on the environment. In considering this application, the Board has the benefit of the application materials filed by AST and detailed hearing submissions filed by interested parties. In addition the Applicant was required to prepare and submit an environmental impact assessment (EIA) to Alberta Environment (AENV) for the Project. The scope of the EIA was established in the first instance by the Final Terms of Reference issued by AENV on March 13, 2007. The *NRCBA* requires that the NRCB be satisfied that an application is complete prior to issuing a Notice of Hearing.

The application to the Board and the EIA submitted to AENV included a description of the Project as a sulphur forming facility with a capacity of 3,000 tonnes/day. The NRCB application and the EIA also included information concerning the potential for AST to expand the facility capacity to a 6,000 tonnes/day operation. AST confirmed that it was not seeking an approval for the expanded facility at this time and acknowledged that it would have to seek further approvals should it wish to construct an expansion.

Section 9 of the *NRCBA* provides that the Board may grant an approval on any terms and conditions that it considers appropriate and particularly in those circumstances where a need is identified to achieve certain objectives. The rationale for any terms and conditions is to be set out clearly in the Board's decision. A review under the *NRCBA* differs from many statutory regulatory schemes in that the Board does not have an ongoing role in the regulation of the Project. As a result, the ongoing review and enforcement of conditions included in an NRCB approval under the *NRCBA* are normally delegated to a provincial department that has an ongoing regulatory function. The Board is careful to identify the appropriate delegate, most commonly AENV, to oversee the successful implementation of those conditions.

1.3: Review Process

The Applicant filed an application with the NRCB on July 13, 2007. The Board and AENV issued a Joint Notice dated August 20, 2007 advising that the application had been filed with the NRCB, the EIA had been submitted to AENV and the application materials were available for review at various locations near the proposed project location as well as at NRCB and AENV offices in Edmonton. The Joint Notice was published in the Edmonton Journal, Lamont Leader, Redwater Review and Fort Saskatchewan Record on August 21, 2007. Following independent reviews of the filed materials by the NRCB and AENV, a consolidated request for supplemental information was sent to the Applicant on January 3, 2008 followed by further requests for supplemental information on July 10, 2008 and October 7, 2008. The information requested was determined necessary to complete the statutory mandates of the NRCB and AENV. The Applicant filed responses to the requested information on April 29, 2008, August 28, 2008 and November 24, 2008 thereby completing its application to the Board.

AENV plays a key role in the NRCB review process through its participation in the Applicant's development of the EIA report that generates the majority of information contained in the application. AENV's involvement occurs during the development of the EIA Terms of Reference and the review of the EIA in terms of completeness. In overseeing the EIA process, AENV also invites other government departments to participate to ensure the completeness of the EIA. By letter dated November 24, 2008, AENV advised the NRCB that it deemed the EIA to be

complete pursuant to Section 53 of the *Environmental Protection and Enhancement Act (EPEA)*.

After receiving the correspondence from AENV concerning the completeness of the EIA and completing its own review, the Board issued a Notice of Pre-Hearing Conference dated December 3, 2008 and published this notice in the Edmonton Journal on December 6, 2008 and in the Fort Saskatchewan Record, Redwater Review and Lamont Leader on December 9, 2008. The Pre-Hearing Conference was held on January 27, 2009 in the Lamont Hall and Recreation Centre. The Board issued a Pre-Hearing Meeting Decision Report on February 13, 2009 that commented on the major issues to be examined at the hearing, the location and timing of the hearing, deadlines for filing hearing submissions and advance intervener funding. The Notice of Hearing dated March 13, 2009 was published in the Edmonton Journal, Lamont Leader, Fort Saskatchewan Record and Redwater Review.

In the Pre-Hearing Meeting Decision Report the Panel indicated that it would be conducting a site visit prior to the hearing and invited all parties to provide a list of those items they wanted the Panel to have special regard for during the site visit. The Panel completed the site visit on April 13, 2009 and provided an oral summary of the site visit in the Chair's opening remarks at the hearing.

The hearing was conducted in the Lakeview Inn and Suites in Fort Saskatchewan from April 14 to 17, 2009, with Jim Turner (Panel Chair), Donna Tingley and Barbara McNeil sitting. This report sets out the Board's reasons for its decision with respect to its review of the application. The hearing participants are listed in Appendix A.

SECTION 2: PROJECT NEED

2.1: Project Need

2.1.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that the Project was expected to process approximately one million tonnes of sulphur annually (at initial forming capacity of 3,000 tonnes/day) rising to two million tonnes annually as market conditions evolve. AST stated that its parent company CCS Corporation (CCS) carries an Energy Resources Conservation Board (ERCB) License Liability Rating of 14.37, which is comparable to major Alberta oil and gas companies. AST confirmed that in 2007, CCS Income Trust had, through a private transaction, moved from an income trust to a privately held corporation. It confirmed that Hazco is now a subsidiary division or trade partner of CCS and AST is a majority-owned subsidiary of CCS. The Applicant also confirmed that AST holds no assets until such time as a project is assigned to AST. AST stated that the Project is covered by an insurance policy that includes coverage for $104 million in third-party damages.

AST stated that increased activity in the heavy oil sector in Alberta has resulted in more sulphur production in the Province at a time when worldwide demand for sulphur is growing. It indicated that the primary market driver for sulphur is the production of agricultural fertilizers.

AST stated that molten sulphur from oil and gas producers will be formed into a dry product for handling, loaded onto railcars for transport to Vancouver, stockpiled and eventually loaded onto ships for delivery to international markets. Currently Alberta faces a shortage of sulphur processing capacity to support oil and gas refining and consequential shortage in supply of sulphur by-product. AST indicated that the Project offers a viable, efficient, safe and environmentally sustainable option to process sulphur for export to international markets.

AST stated that the Project would take by-product sulphur from bitumen upgrading and refining facilities near Fort McMurray, Lloydminster and Fort Saskatchewan. Those facilities generated approximately one million tonnes of sulphur in 2003 (Energy and Utilities Board) with the rate of production expected to increase to three million tonnes per year by 2013. Over the same period of time, sulphur generated from sour gas production primarily in southern Alberta is expected to decrease from 5.7 million tonnes annually to 5.1 million tonnes annually. AST stated that total sulphur production (sour gas and bitumen) in the Province is expected to reach 8.4 million tonnes annually by 2013. AST submitted that this represents a shift in sulphur generation from the foothills of the Western Sedimentary basin to the Oil Sands and Industrial Heartland where sulphur forming facilities do not currently exist.

AST explained that in the early 1990s increased emphasis on sulphur recovery for environmental reasons resulted in an increased supply of sulphur which dampened prices. Under low price conditions many sulphur producers outside of Alberta ceased production which enabled Alberta to increase its market share. It indicated that in 2002 and 2003 Canada significantly increased sulphur exports to China. According to AST, with decreased production and increasing global demand for sulphur for the production of fertilizer, prices rebounded from $16 per tonne in 2001 to approximately $60 per tonne in 2005.

AST recounted that 97 percent of sulphur marketed by Alberta producers was exported outside of the Province, primarily to the United States, Asia Pacific and North Africa. AST indicated that approximately 14 percent of Alberta's sulphur production, or one million tonnes, is marketed in liquid form for the North American market. AST explained that currently the North American liquid sulphur market is completely supplied.

AST submitted that bitumen upgraders lack the economies of scale for sulphur processing compared to the Project. As a result, AST noted that few of the new heavy-oil upgrading and refining facilities have included sulphur forming as part of their core operations. The Applicant indicated that in the absence of sulphur processing facilities such as the Project the majority of sulphur generated by upgrading facilities would likely be block formed and placed into long-term, above ground storage.

AST stated that the development of other proposed sulphur forming facilities (Kinder Morgan, ICEC) that could compete with or displace the Project have stalled. Existing processing facilities located elsewhere in the province are, in AST's estimation, situated too far from main rail lines and thereby inefficient for servicing the heavy-oil producers. In addition, it submitted that many of the existing facilities utilize older forming technologies that are not as environmentally advanced in comparison to the Project.

According to AST, global demand for sulphur as an input to fertilizer production pushed prices and production significantly higher. More recently the collapse in agricultural crop prices caused a significant drop in demand for fertilizer which in turn placed downward pressure on sulphur prices and as a result, sulphur inventories grew. AST stated that the current oversupply in sulphur has decreased prices to near the bottom of the historical range of between $40 and $100 per tonne. The oversupply is partly due to reduced consumption resulting from the current economic downturn. AST further indicated that despite the current demand situation, recognized market analysts predict long-term growth in sulphur markets.

AST indicated that the fundamentals of the sulphur market that impact the Project are as follows:

- Sulphur supply, as a by-product of sour petroleum production and refining, is not influenced by the supply/demand relationship in the sulphur market but rather is influenced by the economics associated with the production and refining of petroleum. Simply put, increased petroleum production and upgrading in Alberta would result in the increased production of sulphur.
- The economics of petroleum production and upgrading is virtually unaffected by the economics of sulphur processing and/or storage. The net back on sulphur sales is only one of several considerations to the producer when making their decision to block store or to market sulphur. AST asserted that history shows that sulphur sales would continue to occur even if the sulphur generators lost money on net back arrangements.
- Not all petroleum producers can rely on block storage as an option for dealing with by-product sulphur production. Producers that use block storage recognize it is a temporary solution with growing economic consequences. The Project's viability depends on its attractiveness to sulphur producers as a reliable, efficient and conveniently located means of dealing with sulphur by-product.
- The Project's economic viability is not dependent on the level of sulphur prices. AST would charge a set rate for securing sulphur forming space at its facility. AST indicated that it expected to employ a "take-or-pay" contractual relationship that would require the sulphur producer to lease a portion of the Project's production and storage capacity. Price risk associated with the sulphur product would be borne by the producer. Should producers be unable or unwilling to sell final sulphur product the plant might be idled. Under "take-or-pay" contracts AST would continue to be paid for leased production capacity and storage. AST indicated that the take-or-pay contractual arrangements were currently being discussed with potential customers; these would be for an initial period of ten years.
- Under severely depressed market conditions for sulphur, AST indicated that it would have the ability to idle the plant. According to the Applicant this is possible due to its planned use of long-term take-or-pay contracts whereby its revenue stream would be maintained even if suppliers discontinued raw sulphur shipments.

2.1.2: Views of the Interveners

The Friends of Lamont County (FOLC), an association of 62 families who live in Lamont County, stated that there was no economic need for the Project nor any compelling reasons to locate near two populated centres – Lamont and Bruderheim. Therefore, the FOLC submitted that in the absence of economic need and numerous adverse impacts identified by area residents, the Project could not be justified.

It was the FOLC's view that with the construction of new oil sand upgraders delayed, existing forming capacity in the province should meet current needs. The FOLC stated that there are better alternatives to the Project that should be examined, namely:

- A project proposed in 2007 by Kinder Morgan Canada Terminals that, in the opinion of the FOLC, had an acceptable plant design and a preferable location.
- A project proposed by ICEC Canada Limited in 2007 for Prince Rupert.

The FOLC stated that world sulphur production is around 55 million tonnes annually of which two-thirds is used in the production of phosphate fertilizer. The FOLC stated that in 2008 Canada produced slightly over ten percent of world sulphur production. It submitted that Canada's production decreased by approximately one million tonnes from 2007 to 2008. According to the FOLC, Canada's share of the world sulphur export market has declined in recent years by 1.5 million tonnes per year which has been taken up with production increases from the Middle East.

The FOLC explained that China is the major importer of sulphur, consuming an estimated 35 percent of the total seaborne sulphur market. It stated that while China is the major market for sulphur, Canadian sulphur shipments to China have decreased from four million tonnes in 2005 to two million tonnes in 2008. The FOLC contended that Alberta is at a significant disadvantage to market its sulphur compared to the growing availability of Middle Eastern sulphur and its proximity to the Chinese market. The FOLC calculated that Canadian sulphur producers have a break even cost of $60 USD per tonne to serve the Chinese market versus $40 USD per tonne for Middle Eastern producers.

The FOLC stated that sulphur supply would continue to exceed global demand for a significant period of time. Further, it indicated that a sulphur marketing expert, Mr. Barry Clark of Pentasul, predicted that sulphur prices over the next five years would likely not trade much above $40 USD per tonne. The FOLC believed that the additional one million tonnes of formed sulphur produced by the Project would only add to an over-supply situation. In its estimation this added production would correspondingly decrease sulphur prices and could cost the Canadian economy more than $100 million annually. The FOLC concluded that if sulphur prices were insufficient to cover total production and export costs, then exporting would actually generate a cost to the economy.

The FOLC indicated that during periods of weak prices, rather than being exported, sulphur should be stored until prices recover to levels which cover production, handling and shipping costs.

2.1.3: Views of the Panel

The Panel recognizes that sulphur production in Alberta is directly related to refinery and upgrader production in the oil and gas sector. Marketing of sulphur production from Alberta oil and gas refining in Fort McMurray, the Industrial Heartland and other parts of the province is a challenge to the energy industry. The Panel concurs with the Applicant that Alberta is positioned to increase the total supply of sulphur by about two million tonnes over the next five to eight years based on projected increases in the oil and gas refining industry. The Panel believes that block storage as a means of dealing with increasing sulphur production cannot be maintained indefinitely. As a by-product of oil and gas production, sulphur can be viewed as a cost that needs to be minimized. Therefore, even if net back arrangements do not cover the full costs associated with export, the Panel finds the exporting of sulphur has economic value once the full cost of block storage and other environmental costs are considered.

The Panel also understands that the worldwide market for sulphur is driven by both the oil and gas refining sector and demand for phosphate and elemental sulphur fertilizer. Given the fluctuations in demand and resulting market variability for these resource based industries, sulphur will continue to show both challenges and opportunities for industry. The Panel believes that with the current inventories of sulphur and future growth projections for the production of new sulphur, there is a need for sulphur forming facilities in Alberta.

The Applicant explained that it would operate under long-term contract with oil and gas refining companies. It also indicated that the contractual agreements would take the form of a “take-or-pay” system. The Panel understands that take-or-pay contracts are a system whereby the Applicant leases processing space at the Project on a long-term basis to the contractor and is paid whether or not sulphur is delivered for processing. The Panel believes this is an acceptable business arrangement for the Project and notes that long-term viability is not directly and solely dependent on world sulphur market prices. The Panel notes that this contractual arrangement allows the facility to be idled and yet remain viable through sulphur market price fluctuations. The Panel is aware that the Applicant does not have any such take-or-pay contracts in place, however, believes it reasonable to assume the private investment and risk of securing contracts is wholly on the Applicant. The Panel accepts the Applicant’s evidence of its corporate structure and notes that this decision is binding on AST’s corporate successors. The Panel recognizes AST’s commitment to secure liability insurance for third-party damages and requires AST to provide AENV proof of this insurance on an annual basis (see Section 4.8.3).

The Panel agrees with both the Applicant and the FOLC that sulphur formed into pastilles offer a premium product that carries higher market desirability. In periods of time when the sulphur market is depressed, the Panel finds it reasonable that a premium sulphur product would have greater marketability compared to lower quality sulphur products.

The Panel agrees that there is a need for production of a premium sulphur product for export purposes and that the Applicant is capable of completing and operating the Project to meet that need.

2.2: Socio-Economic Impacts

2.2.1: Views of the Applicant

Utilizing the last available census (2001), Alberta Sulphur Terminals Ltd. (AST or the Applicant) reported that the Town of Bruderheim had a population of 1,202 and had seen little growth in population over the five-year period 1996 to 2001. The Town of Lamont had a population of 1,692 which grew by 6.6 percent over the same five-year period. Lastly, AST identified the population of Lamont County was 8,473 in 2001 and had grown by 2.1 percent over the period 1996 to 2001. AST indicated that the local and regional area experienced slower population growth than the Province of Alberta which saw its population grow by 9.3 percent over the five-year period. In addition, AST identified that the population of the County was generally older than the Alberta average.

AST stated that according to 2001 census data the available labour force in Lamont County was 6,804 persons with a 63 percent participation rate. Manufacturing and construction was the largest source of employment in Bruderheim with 28.1 percent of the workforce involved in that sector. For Lamont County's workforce, 23.2 percent participated in manufacturing and construction while 25.9 percent were attributed to the agricultural and resource sector.

According to AST, the 2001 unemployment rate for the Town of Bruderheim, Town of Lamont and Lamont County was seven percent, four percent and five percent, respectively.

2.2.1.1: Impacts during the Construction Phase

Economic Effects

AST estimated the total cost of the Project to be $37.5 million (2007 dollars) with $25.4 million allocated to construction costs (capital and labour) and approximately $12.1 million toward plant machinery and equipment costs.

AST estimated that plant construction would require approximately 36,000 person hours, take between six and nine months and would require a construction workforce of 45 persons. AST expected that the majority of the labour force would come from within the region. It expected that the portion of the labour force that resided outside of the region would be accommodated in local hotels and motels.

AST reported that the Project's construction phase would generate an estimated economic impact to the Province of Alberta of $53.5 million. AST indicated that it was difficult to allocate the benefit to the regional or provincial level, but suggested that the majority of the $21.1 million in labour benefits would accrue to local and regional economies. In addition to the labour benefits, AST stated that the local and regional economies would also benefit from spending by construction crews estimated at between $0.4 million and $1.9 million.

Socio-economic Impacts during the Construction Phase

AST stated that during the construction phase of the Project the expected impact to the regional population would range from a zero percent change to a 1.1 percent increase. AST stated that even at the maximum range of population increase the Project's impact on housing, schools and community services within the region would be small, temporary and reversible. AST also stated that emergency services and local infrastructure would not be significantly impacted during construction.

2.2.1.2: Impacts during the Operations Phase

Economic Effects

AST stated that the Project would employ 22 persons during the operations phase and that the facility would run two shifts, 365 days a year. AST stated that this level of workforce and shift schedule could accommodate production levels from 3,000 tonnes per day through 6,000 tonnes per day. AST stated its preference and expectation would be to hire the majority of the labour force within the region. AST stated that where possible it planned to utilize local business for maintenance services, training services and supplies.

AST stated that at a production level of 3,000 tonnes per day the Project would generate an estimated annual economic impact of $35.0 million, exclusive of taxes, with the vast majority of this benefit occurring within the Province of Alberta. AST predicted that the majority of the labour component of the economic impact, approximately $14.3 million per year, would accrue to local and regional economies.

In addition, AST estimated total taxes on land, building and machinery to be $460,000 annually with approximately 86 percent of that amount going to local and regional authorities.

Socio-economic Impacts during the Operations Phase

AST stated that, once operational, the Project was expected to increase the regional population between zero and 0.8 percent. AST stated that even at the maximum range of population increase, the impact on housing, schools and community services within the region would be negligible. AST stated that the Project's demands on water, electricity and natural gas could be met without a major impact on the region's infrastructure.

AST indicated that existing businesses providing ancillary services to the agricultural sector within the region might be negatively impacted, if the Project caused a reduction in farming activity within the Industrial Heartland.

2.2.2: Views of the Interveners

The Friends of Lamont County (FOLC) contended that the Project would be too close to residents, would cause inappropriate disturbances and would pose health and safety risks. Specifically the FOLC noted the following people and facilities would be impacted:

- The Town of Bruderheim, situated approximately two km west of the Project where there are 1,200 residents, a school, two churches, a seniors home, community hall and other recreational facilities.
- The Town of Lamont, situated approximately four km east of the Project where there are 1,600 residents, a hospital with a nursing home, an elementary school, a junior and senior high school, two churches, a senior lodge, community hall and several other recreational facilities.

The FOLC also identified a number of area residents who could be impacted by the Project. These residents were identified as either living on farming operations or country residential parcels. The FOLC identified the following nuisances resulting from the Project would negatively impact these local area residents:

- increased noise pollution from rail, motor vehicle and on-site equipment and machinery
- sulphur odours
- light pollution
- disturbances to the free flow of traffic resulting from increased rail and vehicle traffic
- visual disturbances resulting from large piles of sulphur located at the Project site

The FOLC stated that as a result of the Project the nuisance and disturbance impacts would have adverse effects on:

- the viability of many of the businesses operated by members of the FOLC
- economic growth and development in the Towns of Bruderheim and Lamont
- the potential of other more environmentally acceptable industry from developing in the area
- local residents, as there is insufficient physical and social infrastructure to support the Project

Lamont County (the County) stated that a risk assessment was necessary to determine whether the proposed development meets acceptable standards for public health and safety. The County proposed that, if the Project were approved, a development agreement should be a condition of the NRCB approval and should be required to address municipal infrastructure issues associated with roads, stormwater, drainage and water. Lamont County also advanced its view that the development agreement needed to address AST's financial contributions to municipal infrastructure which would be assessed on a user pay basis.

The County indicated that currently its contracted volunteer firefighters do not have the skills or equipment to deal with a major industrial emergency. The County also expressed the view that sulphur dioxide (SO_2) monitoring equipment should be installed at optimum locations on the Project site to allow for early detection of SO_2.

The County asserted that AST provided no independent evidence that the type or level of insurance for the Project was appropriate nor did it appear to address on-site reclamation security.

The Lamont Health Care Centre expressed concern that its 105 long-term care beds and the assisted living residents represented a vulnerable population. The Lamont Health Care Centre expressed concern with air pollution and significant difficulties associated with a possible need to evacuate the Centre.

Ms. Leslie Jans, an area resident and member of the Lamont High School Parent Council, expressed concerns with increased traffic associated with the Project and lack of responsive public consultation from the Applicant. She also indicated that dust and contaminants resulting from the Project might negatively impact the health of students and staff.

Mr. Ray Lopushinsky provided a written submission in support of the Project. Mr. Lopushinsky stated that he had lived approximately five miles from the Project site for over 60 years. He submitted that the proposed Project location had been zoned for industrial development for more than ten years and the Project would provide an increased tax base for Lamont County and increase local employment and support to community facilities.

2.2.3: Views of the Panel

The Panel recognizes that the Project is not of a significant scale when compared to other current or proposed industrial activity within the Industrial Heartland. Estimates provided by the Applicant indicate potential population increases of about one percent for both the construction and operation phases of the Project. The Applicant stated that the operations of the Project will require 22 persons with preference given to employ locally. The Panel believes that the economic activity generated by the Project will result in positive employment income effects with negligible impacts on local infrastructure.

The Panel recognizes local concern over the health and safety aspects of AST's proposed sulphur forming project. These social concerns will be addressed in subsequent sections of this report. The Panel finds, however, that many of the social-based concerns of the FOLC related to noise, traffic and other disturbances are largely the result of land use zoning rather than the Project itself. The Project is situated on land zoned for medium-heavy industrial within the Industrial Heartland. Regardless of the nature of the Project, industrial land zoning is expected to bring increased levels of noise and traffic. The extent of these types of disturbances and potential mitigation strategies are discussed in later sections of this report.

The Panel recognizes concerns identified by Lamont County relating to risk assessment. The Panel's responses to these concerns are addressed in later sections of this report.

The Panel believes that the Project will have a modest positive economic impact in the regional study area. The Project will create jobs, provide for increased activity for local businesses and generate tax revenue for Lamont County.

SECTION 3: PROJECT DESIGN

3.1: Project Design

3.1.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) filed an application seeking approval for the construction and operation of a sulphur forming and shipping facility with a capacity to receive and form elemental sulphur at a rate of 3,000 metric tonnes per day (t/d). AST stated that at some future point the capacity of the facility might be expanded to 6,000 t/d. The Applicant indicated that in response to public concern, its initial intent to block sulphur was withdrawn from the Project's design. AST indicated that any plans to block sulphur would require a separate application, public consultation and approval under the *Environmental Protection and Enhancement Act (EPEA)*.

AST indicated that the receipt, forming, temporary storage and shipping of formed sulphur would occur continuously over the lifespan of the facility (estimated to be 25 years) assuming there was a viable international market for sulphur produced in Alberta. The main components of the Project are shown in Figure 3.

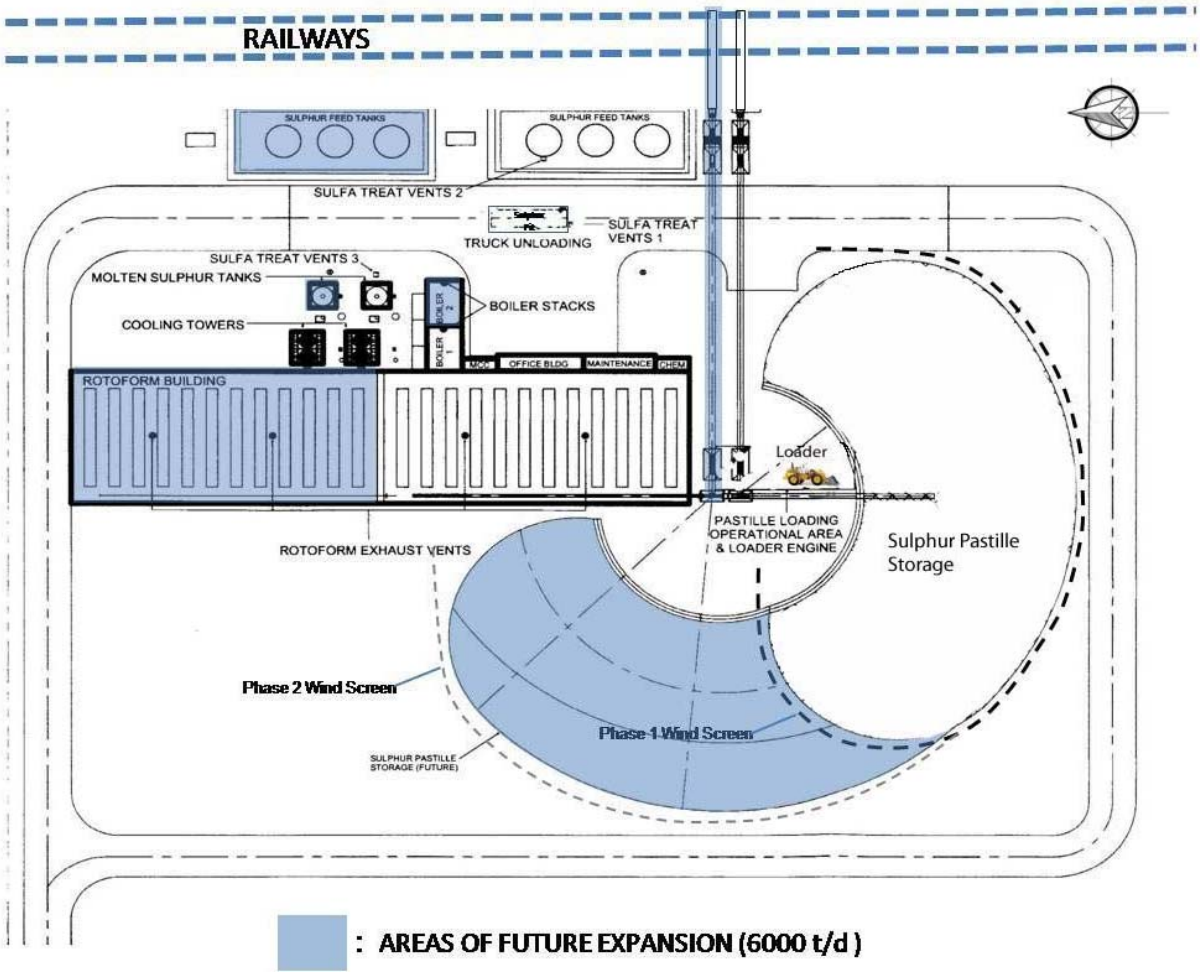

Figure 3: The Main Project Components (from AST's EIA report)

3.1.1.1: Liquid Sulphur Handling and H_2S Capture

According to AST, liquid sulphur would be received at the facility by truck, rail or at some point in the future by pipeline. Controls would be in place to ensure that only liquid sulphur that was degassed to a maximum of 10 ppm H_2S would be accepted at the facility. In its response to Supplemental Information Request (SIR) #1, Question #1, AST indicated that sulphur suppliers would be contractually obligated to supply only degassed sulphur and would be required to submit evidence that the sulphur produced by their facility contained no more than 10 ppm H_2S by weight. In addition, it stated that air quality at the receiving point would be monitored for H_2S in real-time so the reaction time to any exceedances at the point of receiving would be immediate. It indicated that operators in the receiving area would also be equipped with H_2S detectors. AST stated that any off-specification loads would be analyzed for H_2S concentration (estimated to take 24 to 48 hours) and any rejected loads would be returned to the generator.

AST stated that the tankers at the Site would be unloaded via a pumping station into an underground concrete sulphur load-out and transfer tank. AST indicated that the tank would be surrounded by a leak detection system constructed of a permeable material and a secondary containment clay-textured soil liner. In addition, the tank would be equipped with heating coils to maintain sulphur in its molten state, and a vent stack situated above the breathing zone of workers to protect them from any potential H_2S vapours that might accumulate in the tank.

AST indicated that liquid sulphur from the load-out and transfer tank would be transferred to one of six 3,000 tonne (t) insulated and heated receiving tanks. It stated that initially only three tanks would be constructed and that the tanks would be designed in compliance with ERCB Directive 55 and American Petroleum Institute (API) API 650.

AST indicated that the SULFATREAT® process would be used to absorb H_2S from gases vented from liquid sulphur tanks and transfer points so that the H_2S concentration in emissions would be kept below 1 ppm by volume. AST contended that SULFATREAT® is a non-corrosive, non-toxic, dry material that reacts with H_2S to form pyrite, a safe and stable chemical compound.

3.1.1.2: Sulphur Forming Facilities

According to AST, three sulphur forming technologies were evaluated for the Project: the Enersul granulation process, a wet forming and wet prilling process, and the Rotoform HS® drop forming technology.

The Applicant indicated that the granulation process by Enersul, a Canadian technology which is sold worldwide, involves spraying atomized liquid sulphur into a rotating drum. Cooling steam is injected into the drum which causes the formation of sulphur droplets to solidify as they move longitudinally down the drum. As the sulphur pellets move down the drum, subsequent layers of liquid sulphur form around the sulphur pellets and they get larger and larger until the desired size is reached at which point they are removed from the drum. AST indicated that the Enersul process produces a premium product and consists of a relatively small unit, but it is a more complex process that is more difficult to manage than other sulphur forming technologies, such as the Rotoform HS® process.

AST indicated that the wet forming, wet prilling process consists of placing droplets of liquid sulphur into a water bath where they solidify into solid prill and accumulate at the bottom of the bath where they are removed for storage and export. According to the Applicant this process is quiet and generates little dust during the process, but it does not produce a premium product due to small voids in the prill that contain water and lack of uniformity in the prill shapes. AST stated the voids in the prill make them inherently weak and prone to breakup when handled. In addition, it stated that water in the voids can come into contact with bacteria that oxidizes sulphur and produces sulphuric acid which can be damaging to equipment further down the supply chain.

AST chose to use a third-generation drop forming technology from Sandvik Process Systems named Rotoform HS®. From the receiving tanks, the sulphur would be pumped to a feed tank where the sulphur would be filtered and the sulphur conditioned to the optimal forming temperature of 125°C. AST stated that the sulphur would then enter into a circulation loop fed by the Rotoform HS® drop forming equipment. Metering equipment and nozzles would be used in the Rotoform HS® process to provide a continuous sulphur feed across a rotating stainless steel belt. Cooling water would be sprayed at the underside of the stainless steel belt, causing the sulphur droplets to solidify on the upper side of the belt forming pastilles. The pastilles would gather into a hopper conveyed via a conveyor. AST indicated that initial construction would result in a forming capacity of 3,000 t/d, with an eventual forming capacity of 6,000 t/d.

The Applicant indicated that water utilized by the Rotoform HS® would be sent through a closed loop cooling tower which would provide filtration and temperature reduction. Make-up water for the cooling tower would be supplied from a runoff pond which would be designed to collect surface water from the PDA and would also serve as the source of fire protection water.

According to AST, the Rotoform HS® equipment is modular in design and flexible in that any number of machines could be used at any given time. The Applicant indicated that this technology is very clean since there is no water contact with the sulphur and there are no air surges during the process, thereby reducing dust emissions.

AST concluded that the Rotoform HS® technology represented the best available technology from the perspective of operating efficiency and environmental protection. In its response to SIR #1, Question #3, AST indicated the Rotoform HS® process was favoured over other technologies because:

- Active air emission controls would not be required
- Water and energy consumption would be lower
- The forming processes would be more easily adapted to varying rates of sulphur throughput

AST stated that there would not be vapour treatment of emissions from the Rotoform HS® building, but alarms set to go off at H_2S concentrations of 5 ppm would be installed. It indicated that if elevated levels of H_2S were detected in the Rotoform HS® building, the sulphur forming process would be stopped, essentially ending any vapour emissions.

3.1.1.3: Solid Sulphur Storage

According to AST, the solid pastilles from the Rotoform HS® unit would be transferred outside to a radial stacking conveyor and then onto an asphalt bulk sulphur storage pad. It indicated that the double lined asphalt pad, a 150 mm thick asphalt surface overlying a 300 mm clay secondary containment liner, would be equipped with surface water run-on and runoff controls. The Applicant

stated that the facility was designed for 90,000 t of storage capacity, but initially a 45,000 t storage area would be constructed.

The Applicant indicated that outdoor sulphur storage was chosen as the preferred option because it eliminated the explosion hazard presented by the confinement of sulphur dust which occurs in enclosed storage systems. Other advantages cited included ease in maintaining equipment and working in the area, along with lower capital costs. AST acknowledged that enclosing the sulphur would reduce the risk of sulphur dust generation. However, it believed that dust generation associated with outdoor storage could be controlled through good housekeeping practices, by removing dust where it occurs, using dust suppressants, and implementing air monitoring around the stockpile and the facility.

AST indicated it would construct a wind screen 6.1 m in height around the stockpile to help buffer it from the wind. The wind screen would be constructed in two phases (Figure 3). The Applicant indicated that winds from the south, southwest, west, southeast and northwest would be deflected up and over the sulphur stockpile by the wind screen. It indicated that the buildings housing the sulphur forming equipment (which have a similar height to the wind screen) would help protect the stockpile from north and northeast winds. The Applicant conceded that winds from the north and northeast might contact the stockpile before reaching the wind screen, resulting in sulphur dust deposition on the immediate leeward side of the wind screen.

AST committed to keeping the height of the sulphur stockpile below the height of the wind screen under normal operating conditions. The Applicant stated in its response to SIR #2, Question #1 that the height of the stockpile might extend above the height of the screen in the unlikely event that the rail or shipping services were interrupted for an extended period of time. In these cases, AST committed to maintaining a stockpile height of less than 10 m and greater than 6.1 m for not more than a month in duration.

AST stated that a decision on the design of the wind screen (e.g. impervious or semi-pervious material) had not yet been finalized. The Applicant indicated that it planned to rely on the expertise of its engineering firm to study the pros and cons of different designs associated with different design selection criteria and make recommendations.

AST indicated that it had not completed any studies on the effects of wind speed on fugitive dust emissions from the top of the exposed sulphur stockpile. However, in its opinion the sulphur pastilles would not be susceptible to wind erosion.

3.1.1.4: Loading Facilities for Formed Sulphur

AST indicated that at the onset of the Project, front-end loaders would be used to transfer the stockpiled sulphur to a surge bin equipped with a dust suppression package. According to AST the following measures would be taken to ensure safety and environmental performance of the front-end loaders:

- The loaders would be equipped with insulated muffler and exhaust systems, and spark arrestors to reduce ignition potential
- The front of the loader bucket would consist of polyethylene with embedded carbon fibres to prevent sparking
- Each loader would be equipped with a fire extinguisher

AST stated that a proprietary dust suppression agent would be used on the sulphur pastille storage pad, transfer points and rail load-out area. The chemical agent would be stored in tanks and delivered via pumps. The dust treated product would then be deposited on a covered load-out conveyor equipped with weight scale, and then onto rail or trucks for shipment. It indicated that to reduce dust potential, the pastilles would be treated with a dust control product before it goes into the loading hopper and the unloading chute would be lowered below the level of the railcar for loading. AST stated that an automated loading system might be introduced as part of future expansion to full production. In this instance, the formed sulphur would be transferred via front-end loaders into vertical holding bins from which a covered conveyor system would be used to load rail cars.

AST believed that front-end loaders would be effective for managing the residence time of pastilles in the stockpile. To reduce friability issues associated with the aging of pastilles, it stated that first-in pastilles would be removed first. AST contended that sulphur pastilles would spend five days or less in the stockpile under normal operation conditions.

3.1.1.5: Surface Water

AST stated that all surface water that would come into contact with the pastille storage area and sulphur handling areas would be collected in a surface water runoff collection pond. Details on the pond design and management are contained in Section 6.3.

3.1.2: Views of the Interveners

3.1.2.1: Liquid Sulphur Handling and H_2S Capture

The Friends of Lamont County (FOLC) stated that AST placed too much confidence on the diligence of suppliers to ensure that the removal of H_2S to a concentration of 10 ppm or less was achieved in the liquid sulphur delivered to AST. In addition, it felt little methodology was provided by AST on confirmation of H_2S levels in incoming shipments. To address these concerns, the FOLC

believed that on-site continuous monitoring of residual H_2S in the feed should be required.

3.1.2.2: Sulphur Forming Facilities

The FOLC stated that AST should be commended for selecting the Sandvik Rotoform HS® pastillation process because it is widely considered to produce a high quality product which is classed as a Premium Product under the Sulphur Development Institute of Canada categorization system for formed sulphur. The FOLC indicated that the friability of well produced Rotoform HS® sulphur product is low (i.e. tends to produce less fine particulate matter and hence less dust). Further it indicated that it is important for forming equipment to be properly operated and maintained in a manner that would consistently produce a high quality product. It stated that AST's proposal did not discuss how the consistency of the product would be monitored and expected that more complete details on monitoring and operation would be provided as part of the approval process.

3.1.2.3: Solid Sulphur Storage

The FOLC viewed AST's proposal to store sulphur product on outdoor pads as a storage concept that has been recognized worldwide as outdated and environmentally unfriendly. It believed that environmental impacts associated with the AST's outdoor storage option have been considered unacceptable in many other sulphur handling facilities in the world.

The FOLC indicated that there is a growing trend toward enclosed structures for the storage of formed elemental sulphur. It acknowledged AST's contention that the use of storage buildings and storage silos are very effective for controlling wind-blown dust emissions but unmanaged concentrations of dust can lead to explosive hazard. However, the FOLC stated that modern methods of handling better formed solid elemental sulphur have suppressed fugitive dust emissions within enclosed structures to minimize the explosive level to the point where the environmental advantages of containment can now be accessed. Further, it stated that many if not all of the shortcomings associated with the AST proposed freestanding, outdoor, front-end loader serviced sulphur stockpile could be addressed through use of an enclosed storage system.

The FOLC did not believe the wind screen would be effective since it would not completely enclose the stockpile and would thereby allow for wind exposure, particularly from the northwest. The FOLC also did not believe the wind screen proposed by AST would be effective when the stockpile height exceeded the height of the screen. It was also the FOLC's view that even in times when the stockpile would be below the level of the wind screen, aerodynamic turbulent flow behind the wind screen could lead to upward suction of surface fines from the stockpile.

The FOLC did not believe that AST had adequately addressed the sequencing of formed sulphur removal from the stockpile for shipment. According to the FOLC, laboratory and field studies have demonstrated that dust generation potential of

sulphur product increases with time from when it is formed due to an increase in friability. It was concerned that AST's stockpile design would make it difficult to follow a first-in-first-out practice to reduce the residence time for formed sulphur and thus dust generating potential.

The FOLC expressed a concern about fire hazards associated with the open stockpile (discussed further in Section 5.2.2). In addition, some members were concerned that, aesthetically, the sulphur stockpile might affect the value of their properties.

3.1.2.4: Loading Facilities for Formed Sulphur

It was the FOLC's view that the use of front-end loaders for management of sulphur stockpiles should be avoided or kept to a minimum. It acknowledged that AST intended to use front-end loaders initially and that an automated loading system might be introduced as part of a possible future expansion. However, the FOLC was concerned that AST had not provided assurance that the use of front-end loaders would not become a permanent feature of the facility operation. It was concerned that the crushing of sulphur product under the tires of the front-end loaders would be a major dust generator during the sulphur handling operation.

The FOLC stated that AST had provided relatively little detail on the manner in which the sulphur product would be loaded into railcars for shipment to end users. It was concerned that the loading process would result in excess fugitive dust generation. According to the FOLC, the storage and handling of formed solid sulphur causes breakdown into fine particulate which can become embedded in and form a coating on solid sulphur particles. When formed sulphur is allowed to fall through air, such as during railcar loading or delivery to the stockpile, air sparges might sweep out the fine dust. The FOLC stated that AST should explore the use of technologies to reduce or eliminate fugitive dust during railcar loading such as the use of "hinged shoe" delivery systems that move along the railcar while in constant contact with the sulphur, and use of a fully enclosed railcar load-out facility.

3.1.3: Views of the Panel

The Panel acknowledges the FOLC's concern that H_2S air emissions from vents in the sulphur receiving area will be harmful to the public. The Panel believes that the FOLC's concerns are partially addressed by AST's proposed measures to ensure the degassing of liquid sulphur to a maximum H_2S concentration of 10 ppm for public safety reasons and to ensure that the H_2S level of incoming sulphur feed meets specifications. These measures include equipping operators in the receiving area with H_2S detectors and real-time H_2S concentration air monitoring in the receiving area. In addition, AST indicated that the receiving tank and above ground storage tank vents will be equipped with SULFATREAT® technology that will absorb any residual H_2S that is liberated during the liquid sulphur transfer and storage process. As a result of the treatment, AST indicated that the H_2S concentrations in emissions from each vent would not exceed 1 ppm, which the Panel finds acceptable.

The Panel finds that the effectiveness of air monitoring in the receiving area is highly dependent on the location of the monitoring equipment. Accordingly, the Panel requires as a condition of its approval that AST establish air quality monitoring locations at optimum locations to detect any H_2S exceedances in the receiving area, to the satisfaction of Alberta Environment (AENV). AST has also indicated that it will have contractual agreements with its sulphur suppliers to ensure liquid sulphur feedstock has a H_2S concentration of 10 ppm or less. Since the terms of the contracts are known to AST and the sulphur suppliers only, the Panel feels strongly that local residents are entitled to an assurance that AST will respond appropriately to any exceedances of the H_2S 10 ppm level in the feedstock. Accordingly, to increase AST accountability to the public, as a condition of its approval, the Panel requires that any exceedances of the H_2S 10 ppm level in the feedstock be reported to AENV, including the exceedance level in the load, number of loads, dates and the response, and that AENV ensures this information is available to the public in a reasonable time.

The Panel finds that the Rotoform HS® forming technology represents the best available technology because it is recognized for its product quality. The product has a premium product classification and has superior or lower friability which means the product has the greatest ability to withstand degradation which can lead to the formation of sulphur dust. The Panel believes that AST has conducted a thorough review of other forming technologies and is in agreement with AST that the Rotoform HS® technology has lower air emissions and lower water and energy consumption than the other technologies considered. A desirable feature of the Rotoform HS® technology is that the units can be started and stopped as demand for product dictates. Given the variable demand for sulphur, the Panel finds this flexibility beneficial.

The Panel understands that air emissions from the Rotoform HS® building will not be treated. The Panel believes that the presence of H_2S alarms in the Rotoform building and staff working in the building will be able to detect excess H_2S levels due to non-spec liquid sulphur and that appropriate action will be taken to stop the process and allow the excess H_2S to dissipate.

The Panel is in agreement with the FOLC and AST that covered storage of formed sulphur represents the best storage option from the perspective of fugitive dust emissions but has a higher explosion risk than outdoor storage. It is the Panel's view that outdoor storage can achieve a level of environmental protection equivalent to indoor storage with the implementation of management practices such as:

- avoidance of automated equipment that has the potential to generate sparks
- the use of dust suppressants
- daily sweeping and washing of the sulphur pad
- safeguards such as covered loading facilities and double-lined surface water containment system with leak detection monitoring

The wind screen design was an important issue at the hearing and it is important that the screen be designed in a manner to reduce fugitive sulphur dust emissions. AST was not able to provide detailed design information on the wind screen at the hearing but indicated that this work would be conducted prior to its application to AENV. The Panel

agrees with the FOLC that turbulence associated with wind from the west, southwest, south and southeast on the leeward side of the wind screen might result in fines being sucked from the stockpile surface and becoming airborne. AST indicated that it had not conducted testing to establish the effects of air turbulence at the wind screen.

The Panel acknowledges that the wind screen will not completely enclose the sulphur stockpile. AST has indicated that the wind screen will be effective in blocking prevailing winds from the west, southwest, south and southeast. Further it stated that buildings and tanks might limit wind movement in the area where the wind screen is not present (north, northeast and possibly northwest). The Panel is in agreement with AST that the impact of winds from the northeast will be limited due to facility structures like the sulphur forming building and the tanks. The wind screen design (as presented in Hearing Exhibit 46) indicates that the stockpile might be exposed to winds from the northwest and north. Hourly wind speed information used by AST in its dispersion modeling indicates that winds from the northwest are more prevalent than northeast winds.

Due to remaining uncertainties about the wind screen design and its effectiveness, as a condition of its approval, the Panel requires that AST conduct the following work on the wind screen design and to address any deficiencies to the satisfaction of AENV, to:

- Determine the effects of wind turbulence on the stockpile having regard to the concern that this turbulence may result in an increase in fugitive sulphur dust emissions.
- Address the effects of north and northeast winds on the stockpile, which may not be blocked by the forming building and tanks.

The Panel notes that the stockpile may exceed the height of the wind screen in times when the shipment of formed sulphur is disrupted (e.g. disruption of rail service). Even though AST has indicated that the stockpile height will be allowed to exceed the fence height for not more than one month, there is a concern that fugitive dust emissions may increase during this time. Therefore, it is a condition of this approval that whenever the stockpile exceeds the wind screen height, this information must be recorded and reported to AENV and that AENV ensure this information is available to the public in a reasonable time.

It is the Panel's view that modifications to the loaders (e.g. carbon tipped blade, shielded muffler system, fire extinguisher) will be effective in reducing the potential for starting and managing fires. However there is concern about the dust generating potential associated with the crushing of pastilles under the tires and unloading into the transfer bin. To reduce the potential for dust, the Panel notes that AST has committed to good housekeeping practices such as daily sweeping and washing of the pad area, and training staff on the importance of keeping the pad clean. The Panel emphasizes the importance of this practice in ensuring the minimization of dust. The Panel agrees that the use of dust suppressants as required would be beneficial in reducing the potential for fugitive dust emissions.

The Panel agrees with the FOLC and AST that it is important to preserve the premium product status of pastilles formed using the Rotoform HS® process. Aging is an important factor which increases the friability of the pastilles resulting in increased potential for dust formation. AST has indicated that the maximum residence time for

pastilles will be five days. The Panel believes that AST will be successful in using front-end loaders to sequence the removal of sulphur from the stockpile on a first-in-first-out basis. It is the Panel's view that this low residence time will result in reduced friability of the pastilles and a resulting decrease in sulphur dust generating potential.

The Panel believes that measures proposed by AST to reduce dust in the rail load out faculties (e.g. covered conveyors, levelling of sulphur loads in railcars, covered and protected load-out structure, use of dust suppressants) will be effective in reducing fugitive dust emissions.

SECTION 4: COMMUNITY EFFECTS

4.1: Public Consultation

4.1.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) submitted that it conducted a comprehensive public consultation program it regarded as "*virtually unprecedented*" for a project of this magnitude. Within its Environmental Impact Assessment (EIA), the Applicant described three distinct stages of its consultation process. The initial stage represented consultation that occurred prior to the formal EIA process, which included activities between May 2005 and June 2006. This was followed by "Phase 1" and "Phase 2" activities. Phase 1 marked commencement of the formal EIA consultation program and included activities undertaken between June 2006 and December 2006 and Phase 2 included consultation efforts after January 1, 2007. On March 24, 2009, shortly before the hearing, AST filed details of additional activities conducted through to December 2008. A summary of AST's consultative efforts for each stage are described below.

Initial Consultation Activities (pre-EIA)

Prior to the formal EIA process, AST submitted its objectives were primarily to provide the public with information about its proposed project and to begin discussions with key stakeholders. In view of this, between May 2005 and June 2006 the Applicant published an information brochure, made a presentation to Lamont County Council, contacted neighbouring landowners, residents and occupants (telephone calls, personal and group meetings), held two open houses, mailed information packages to the open house attendees and posted information on its website. AST also opened an office in the Town of Lamont and hired a project administrator to furnish information to stakeholders, conduct public consultation and provide administrative support for its Project.

AST indicated that it gathered stakeholder concerns through letters (sent to Alberta Environment and AST), emails, open houses and various public and private meetings. AST reported that its staff met with local residents, community groups and elected officials. It stated that 63 people attended an open house in June 2005 and 129 people attended an open house in November 2005. It also stated that the initial stage of consultation was marked by "*vocal, organized opposition on the part of local residents*" which led to the formation of the Friends of Lamont County (FOLC).

Phase 1 Consultation Activities

AST indicated that Phase 1 of its consultation program (June to December 2006) included activities necessary to meet the Project's needs and objectives and to satisfy regulatory requirements. It submitted that its program was tailored in relation to the local communities' unique characteristics and level of stakeholder concerns. It was also designed to meet the Project's Terms of Reference, which specified the following requirements:

> *"AST shall undertake a consultation program during the preparation of the EIA report and within all of the communities, in the Study Area.*
>
> *Describe and document in detail the public consultation program implemented with respect to the Project, record any concerns or suggestions made by the public, and demonstrate how these concerns have been addressed, including:*
>
> *a) "the type of information provided and the issues discussed, differentiating between those which have been resolved and any outstanding issues;*
>
> *b) the key alternatives which have been identified by AST and stakeholders in the consideration of unresolved issues; and,*
>
> *c) any plans for ongoing consultations."*

AST reported that it engaged Worley Parsons Komex and RMC & Associates Ltd. to carry out a formal public consultation program. The Applicant identified several goals for its program and reiterated its objective, "…*to ensure local area residents were adequately informed about the Project and given the opportunity to provide both feedback on the Project and input into evaluating the environmental and socio-economic impacts of the AST facility*."

AST stated that it considered the consultation requirements and expectations described in EUB Directive 056, the requirements of Alberta Environment (AENV) and the Natural Resources Conservation Board. AST indicated that it confirmed with the Métis Council of Alberta and the Municipality of Lamont that no Aboriginal groups or Aboriginal group activities were within the boundaries of the Regional Study Area. It identified 56 distinct stakeholder groups, based upon AENV practices and EUB guidelines. This figure included 37 landowners or acreage owners within 1.5 km of the Project Development Area (married and common-law couples were recorded as a single stakeholder), 11 industrial or business owners and eight renters (two businesses, six residents).

AST documented its consultation activities with these stakeholders including identification of the concerns raised. It also provided information regarding interviews with elected officials and service providers listing their comments and concerns. AST indicated that it telephoned parties who had formally objected to the Project or expressed an interest in the Project by writing to AENV or AST. It provided a summary of the primary concerns identified in the telephone interviews and indicated it utilized the information gathered from stakeholders and objectors, in order to plan future consultative activities.

Phase 1 of AST's consultation included an open house in June 2006 (23 people attended), one-on-one interviews (with stakeholders, elected officials and service providers), telephone interviews, newsletters, information provided through its local office, email correspondence, community meetings and website postings.

Phase 2 Consultation Activities

Phase 2 incorporated follow-up activities from Phase 1, including the issuance of stakeholder newsletters, follow-up calls and the establishment of a community consultation committee. AST submitted that the committee's mandate was to enhance communications by sharing credible information, to problem-solve or resolve issues as opportunities arose and to build more positive relationships.

AST submitted information regarding working group meetings and numerous meetings of the "AST & Community Committee" (including agendas, committee updates, action steps, etc.). The Applicant reported significant stakeholder concerns were expressed through the consultation program and summarized Phase 2 goals were to:

- *"fulfill regulatory requirements and, where possible, surpass them*
- *notify all potential stakeholders about the Project and EIA process and provide an opportunity to participate in a manner appropriate to their needs and interests*
- *provide clear and pertinent information about the Project and EIA process to facilitate informed stakeholder feedback*
- *provide a variety of communication methods to make information readily available to stakeholders and interested parties*
- *enhance the relationship between AST and stakeholders*
- *initiate processes to facilitate the resolution of issues and concerns by residents*
- *build confidence with regulators, elected officials, stakeholders and non-governmental organizations."*

AST documented issues raised by the public and measures taken to address them. It submitted that the consultation program met the regulatory requirements and expectations and that it "…*made considerable efforts to engage stakeholders and interested parties, and to address their concerns in a proactive manner*."

At the hearing, AST summarized its consultation process noting that it spanned a period of almost four years and included five open houses, many stakeholder meetings, an updated website, newsletters, mailings and letters to address questions and concerns, presentations to Lamont County and the towns of Bruderheim, Lamont and Mundare. In addition AST opened an office in Lamont, staffed five days a week, complemented by accessibility to a project manager for a two-year period and regularly thereafter. Its consultation program included the establishment of a community consultation committee with the participation of municipal and industrial stakeholders, members of the FOLC, adjacent landowners and others.

AST stated that its EIA and associated application considered all concerns raised by the regulators and stakeholders; however, it conveyed disappointment it was unable to resolve all stakeholder concerns. Nonetheless, AST advised that the consultation program resulted in several project design changes, the most notable being the removal of any proposal for blocked sulphur storage. Further, AST reported a significant reduction in stakeholder concerns following the EIA process and consultation program and it reiterated its ongoing commitment to continue discussions with stakeholders.

In response to concerns raised that various FOLC members were not contacted by AST, the Applicant noted that conflicting evidence was presented to the Panel, as its records differed from some FOLC members' accounts with regard to the level of contact made. Nevertheless, AST asserted that its consultation program was comprehensive and offered a variety of tools for interested parties to obtain project information, provide input or otherwise engage in the process.

4.1.2: Views of the Interveners

The Friends of Lamont County (FOLC) submission included several letters from members who were critical of AST's public consultation efforts. Many FOLC members submitted that AST "…*made very little if any effort at all to contact them and address their issues.*" The FOLC submitted that AST's only public consultation efforts were carried out through open houses it considered were unsuccessful in communicating or resolving concerns. The FOLC indicated that its group was formed in response to AST's ineffectual consultation efforts and contended that AST did little follow-up when its members expressed concerns with the Project.

The FOLC suggested AST's public consultation process was through invitation only and indicated that just three of its members (Dennis Van Brabant, Dennis Maschmeyer and Luanne Penner) were invited to attend meetings, despite that other members lived on or owned adjoining lands. Mr. Van Brabant indicated that he attended nearly all of the meetings and he expressed disappointment that his key concerns were never addressed.

FOLC members provided various examples of what they perceived as shortfalls in AST's consultation process and reports. One member expressed concern that the Applicant provided different information to the County than to FOLC members. Another member disputed AST's records, noting its report suggested he received several phone calls and that voice mails were left for him without response; yet he did not have voice mail or an answering machine. Some reported that although they received letters from AST suggesting they would be contacted to set up a meeting, AST's follow up never occurred. One member surmised that AST letters that promised follow-up meetings were copied to the NRCB and AENV to give the appearance of adequate consultation, despite such consultation not being done. Some FOLC members adjacent to or near the proposed site submitted that they were never contacted by the Applicant at all.

The FOLC commented on the large volume of consultation program information materials AST provided to parties and the Board on March 24, 2009, noting these documents were AST's consultation reports filed with AENV every two months from March 13, 2007 to December 1, 2008. The FOLC observed that this information was

available prior to March 24, 2009 and commented on these documents stating they did "…*not include a list of resident's individual concerns to the Application, a follow up to concerns expressed, nor does it provide a list of those who were contacted. The documents comprising of approximately 300 pages are made up largely of form letters, proposed agendas and draft meeting notes with no attendee lists.*"

At the hearing, the FOLC questioned the type and amount of information that AST provided to stakeholders as part of its consultation program; the FOLC suggested that consultation was not meant to bombard people with information but rather to provide information. The FOLC questioned why Supplemental Information Requests and responses were listed with AST's overview of broad consultation activities. It also questioned AST's reporting of the newsletters sent to stakeholders; the FOLC confirmed with AST that only two newsletters were issued, with the last one issued two years earlier (March 2007). The FOLC submitted AST's consultation failed to address all landowner and stakeholder concerns referencing consideration of land values as an example.

Overall, the FOLC expressed general discontent with the adequacy of AST's consultation program and observed that AST's records did not identify individual resident's concerns or specific interactions with FOLC members.

Lamont County did not specifically comment on how AST carried out its public consultation program, but submitted that it had provided numerous opportunities for the Applicant to address the County's concerns regarding project-related risks and planned mitigation measures, without resolution. Further, the County recognized the importance of AST consulting with stakeholders and the public with respect to its emergency response planning.

Ms. Leslie Jans submitted that she had never discussed her concerns with the Applicant and she disputed AST's consultation records to the contrary. She also noted that although she received several information packages including a letter suggesting she would receive a follow-up call to schedule a meeting, she never heard back from AST.

Frank and Elly Cholak (Circle Cee Charolais Farms) filed a submission on behalf of their family but did not participate in the hearing. The Cholaks submitted that although two family members originally signed a petition regarding the Project, they later regretted doing so and requested their names be removed. They indicated that after they attended an open house they chose to meet with AST one-on-one to address their concerns. They submitted AST "…*was more than willing to explain the project to us and answer our concerns as they came up. Answers were also provided directly to us from professionals of all fields, when required*."

The Cholaks stated that AST's initial plan to form a public consultation committee was "…*met with much opposition from FOLC*." As adjacent landowners, they stated that they were invited to participate in the AST Consultation Committee and found the meetings provided an excellent source of information. They reported that AST provided clear and concise information at these meetings in response to concerns expressed by themselves and their neighbours.

4.1.3: Views of the Panel

The Panel recognizes that public consultation is an important two-way opportunity for the Applicant and the community of stakeholders to develop understanding about the Project and resolve key concerns on all sides.

AST engaged in widespread public consultation with the objectives of providing the public with information, initiating discussions with area stakeholders, meeting Project needs and satisfying regulatory requirements. To fulfill its public consultation objectives, AST used brochures, open houses, individual meetings and a staffed local office. It also established a locally based consultation committee to improve communications, to provide opportunities for public input into the Project's design and operations, and to cultivate trust within the community. AST indicated that it responded to local resident concerns and incorporated project design changes including eliminating sulphur block storage from its proposal.

The Panel notes that there remain ambiguous points of view between the Applicant and stakeholders with respect to the level of consultation and effectiveness of the various consultation activities. The Friends of Lamont County (FOLC) represented the concerns of many area residents as an intervener in the AST hearing. The FOLC submitted its view that AST's consultation program was deficient. Essentially FOLC found the consultation was weighted too heavily on providing information from the Applicant's point of view and was not responsive to the profound fears and concerns expressed by local residents. These concerns, documented in more detail elsewhere in this decision report include traffic, noise, air emissions and monitoring, and emergency response planning. Submissions from some area residents indicated satisfaction with the Applicant's consultation efforts.

The Panel finds the Applicant supplied sufficient information about the Project and provided opportunities for the community to participate in consultation activities. However, the Panel notes that although AST's public consultation efforts focused on its objectives and was documented, the program was not successful in establishing strong community relationships or in building trust with local stakeholders. The Applicant appeared to rely considerably on open houses, print material, meetings and phone calls to inform stakeholders on the Project and seemingly overlooked hearing and responding to the intense concerns expressed by stakeholders. As a result the Applicant was not, on a broad level, able to engage fully and effectively with landowners, residents and local authorities in addressing and resolving outstanding issues. The consequences are low trust in the community and significant local stakeholder anxiety about the Project.

The Panel notes that the Applicant stated that it considered EUB Guide 56 (ERCB Directive 56) as well as other requirements in designing and executing its public consultation. The Panel observes that the Applicant did not make use of more innovative approaches described in that Guide, such as resolution of specific issues through formalized third party mediation, to address and resolve outstanding local resident concerns.

The Panel acknowledges AST's commitment to ongoing public consultation and recommends that effective consultation continue as an ongoing and regular practice of the Applicant and the community of stakeholders for the life of the Project. The Panel

recognizes that following a long application process and a lengthy hearing all parties may view wearily the concept of further consultation and communication. However, the Panel believes that the parties need to develop an effective and enduring consultation process that is consistent, transparent and formalized. Models exist throughout the province of successful synergy and community advisory groups where industry, community representatives, local municipal jurisdictions and regulators meet to exchange information, identify and resolve ongoing issues and build community relationships in a collaborative forum. One example is the Sundre Petroleum Operator's Group whose vision is "a long term relationship, based on mutual trust, honesty and respect, by way of sharing pertinent information and resolving issues to benefit all stakeholders." Typically consultation groups are funded by industry but their successes rely on participation from all stakeholders in the community.

The Panel expects that an ongoing community consultation group for AST would establish its own terms of reference. The following are some of the Panel's suggestions for topics and issues the group could consider in its mandate:

- emergency response planning
- air, soil and water monitoring
- reporting on compliance of H_2S levels on incoming liquid sulphur feedstock
- rail traffic noise and disruptions
- open houses and facility site tours for the public to observe housekeeping practices related to open storage
- odours

4.2: Noise

4.2.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) conducted a baseline noise survey and a Noise Impact Assessment (NIA), to establish and assess noise impacts that would be attributable to its Project. As Alberta Environment (AENV) did not have noise regulations specifically applicable to AST's proposed facility, AST submitted that it was instead guided by Noise Control Directives of the Energy Resources Conservation Board (ERCB).

In 2005, AST collected baseline data by conducting a 24-hour baseline noise survey at five receptor locations situated near residences shown on Figure 4. AST noted that the monitoring locations were not positioned at the exact residence locations, as it believed some residents were opposed to having the survey done on their property. AST noted that these baseline measurements were not a requirement of its NIA to comply with the Terms of Reference for its Environmental Impact Assessment (EIA). It further noted that the baseline noise survey did not distinguish background sources of noise between existing regulated and unregulated facilities.

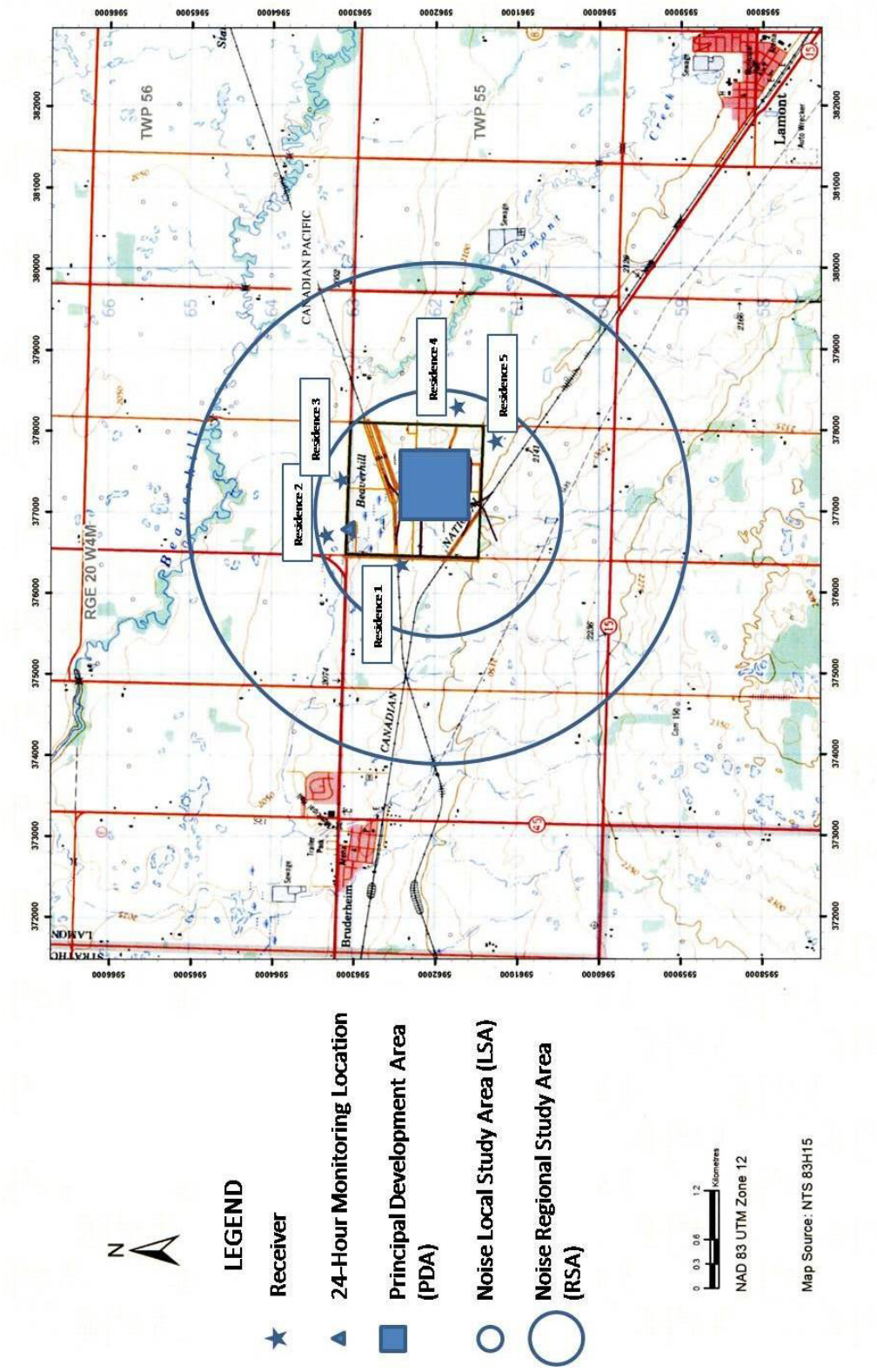

Figure 4: Noise Study Areas and Monitoring Locations

At the hearing, AST indicated that the baseline monitoring survey levels measured in 2005 remained representative of the current sound conditions. AST also concurred that its baseline monitoring surveys portrayed background noises, which are defined in ERCB Directive 38.

AST submitted that the Noise Survey Analysis (Section 4.3) of Directive 38 provided the correct methods for obtaining creditable noise measurements during a 24-hour survey. It further indicated that noise levels above the nighttime permissible sound levels (PSLs) of 40 dBA Leq, as surveyed at Residence 2, were mainly due to noise originating from the existing TransAlta station, prior to its expansion.

With respect to noise sources, the Applicant submitted that its proposed project would entail both stationary and mobile noise sources. Although AST applied for a 3,000 tonnes/day (t/d) capacity, it submitted that its noise assessment was based on a 6,000 t/d output and considered the following noise sources:

- construction noise (including site levelling and grading, pile driving, excavation, concrete pouring, steel erection and mechanical installation)
- plant operating noise
- loading and unloading of sulphur trucks and rail cars
- 45 trucks per day accessing the Site from Highway 15 to the south
- 30 trucks per day accessing the Site from Highway 45 to the north and west
- 30-car train arriving daily
- loading a unit train of up to 110 rail cars, once every two to three days (between 6 am and midnight)

AST stated that the radius of the rail loading loops would be approximately 200 m, and therefore it submitted that rolling stock wheel squeal was not a certainty. If needed, AST suggested mitigation measures to reduce or eliminate wheel squeal could include flange lubrication systems to alter the friction characteristics of the flange/rail contact or the use of sound barriers along rail locations where wheel squeal could occur.

AST predicted that the construction noise levels at the nearest residences would range from 47.3 – 55.0 dBA Leq (weighted decibel energy equivalent sound level). It submitted that these findings were based upon extrapolation from existing noise emissions data from power plant construction. AST indicated that this prediction method complied with a Nova Scotia Department of Environment Guideline, which AST used as no other applicable prediction methods were available.

AST compared its NIA to ERCB Noise Directive 99-8 and subsequently adjusted it to meet ERCB Directive 038, which replaced Directive 99-8. AST took the following into account in its assessment:

- the five receptor locations situated near residential locations (as shown on Figure 4)

- current sound contributions from existing sound sources, such as highways and rail lines
- associated truck traffic and associated rail traffic

AST concurred that it had not considered the effect of the wind screen on noise reflection. It also submitted that it had not modeled any neighbouring facilities since noise contributions from the neighbouring facilities would be included in the ambient sound levels. The Applicant submitted that it used the German standard RLS-90 for the truck traffic noise modeling as it found the RLS-90 standard provided good agreement between predictions and measured sound levels.

AST responded to concerns about the omission of the front-end loader as a noise source in the NIA. In this regard, AST submitted that since the loader would operate when the train was on-site, and the sound power level of the train would be higher than the sound of the loader, the assessment would not change. AST stated that it would respond to any noise issues related to the back-up beeper from the front-end loader and would also provide mitigation measures as required.

AST concluded that the predicted combined daytime and night-time sound levels with baseline and facility and transportation sources would be below the daytime ERCB permissible sound levels (PSLs) of 55 dBA Leq for Residences 1 and 5, and 50 dBA Leq for Residences 2, 3 and 4, and would be below the night-time ERCB PSLs of 45 dBA Leq for Residences 1 and 5, and 40 dBA Leq for Residences 2, 3 and 4. AST acknowledged that three particular residences (Residences 2, 3 and 4) are approaching the ERCB nighttime PSL of 40 dBA Leq, as indicated in Table B of Exhibit 35.

AST affirmed its commitment to comply with ERCB Directive 038: Noise Control and suggested that Alberta Environment (AENV) might be the appropriate body to act as a regulator with respect to noise generated by its Project.

In conjunction with its operations, AST committed to participate in a Noise Management Plan under development by the Northeast Capital Industrial Association (NCIA). AST also assured that it would investigate community complaints and would implement a policy for site transportation noise. It indicated that this policy would address truck idling and would include the use of engine retarder brakes for vehicles arriving and leaving its site.

4.2.2: Views of the Interveners

The FOLC expressed concern that there would be an increase in noise pollution from the Project as a result of increased rail and road traffic, from equipment such as front-end loaders (engine noise and back-up beeper), conveyors, and operating equipment, the AST rail park development and continuous shuffling of rail cars during loading and unloading. The FOLC indicated its concern for the increase in train noise at night and the noise from warning horns from the facility. The FOLC also suggested that noise issues already occurred in the area as corroborated by a noise barrier constructed by Canexus, north of its facility.

The FOLC alleged that the Nova Scotia Department of Environment document, used by AST to estimate the construction noise from the Project, had little applicability to the

actual construction noise that would be generated. The FOLC also attested that construction of the rail lines should have been included in AST's construction noise estimates.

The FOLC alleged that the baseline noise survey conducted by AST was not valid as the monitoring locations were not located at the residents' properties, as required by ERCB Directive 038. The FOLC was also concerned with the microphone location at Residence 2, as it was beside an electrical substation and it appeared the substation had been expanded since the survey was conducted.

Further, the FOLC noted the surveys are very weather dependent and the wind was from a south-westerly direction for the majority of the survey. The FOLC indicated that the noise survey might not represent the true noise environment as wind was present at Residence 4 during the survey. It reviewed the recordings and indicated that the wind persisted throughout the night at the monitoring locations; the FOLC suggested that this affected the quality of the recording at Residence 4 and exceeded the allowable levels for wind velocity during the survey.

The FOLC also indicated that AST should have made observations during the monitoring survey to include trains, location of receivers and other nearby sources, and should have catalogued and flagged those for future use in the preparation of an NIA. The FOLC stated that upon review of the impact assessment there seemed to be a disconnect with respect to the inclusion of those observations. The FOLC recommended that a new baseline sound monitoring survey be completed.

The FOLC contended that AST's noise impact assessment was not valid for several reasons, including AST's failure to take into account issues such as topographical effects or low frequency noise. The FOLC indicated that AST failed to include the noise contribution of the TransAlta substation (a regulated facility). The FOLC also noted that this substation had been expanded since the noise impact assessment was prepared and monitoring data measurements were taken.

During the hearing, the FOLC indicated that the presence of two large dirt berms by Residence 1, near the Canexus facility, should have been flagged as a problem-solving response to a facility where noise was a concern. Further, it stated that AST did not adequately account for transportation noise, such as front-end loader usage and back-up beepers.

The FOLC suggested that the data AST collected for the train noise monitoring was irrelevant as it dated back to 1973; the FOLC pointed to significant changes in train design since that time. The FOLC also suggested that the German Standard RLS90 data was irrelevant, and stated that Germany's truck traffic noise modeling was dissimilar due to quieter designs and lower exhaust emissions as compared to North American trucks. Furthermore, it noted that frequency band data was not available in the calculation method.

Members of the FOLC expressed concerns that train loading operations could extend into the nighttime hours, causing sleep disturbance for nearby residents. The FOLC also referenced train level crossings as an additional source of noise concerns in relation to whistles, bells and possible warning horns. With respect to its modeling, the FOLC also

suggested that AST should have modeled trains as point sources, rather than line sources. Additional factors the FOLC felt were inadequately investigated by AST included source sound power levels for the existing facilities within the study area and rolling stock wheel squeal.

The difference between intermittent and continuous noise and the acceptability of the level of each type of noise was described by the FOLC. In the case of back-up beepers, it indicated that the sound is very tonal and a much lower level of intermittent noise level would be accepted than for a constant longer term sound. The FOLC conceded that, although potentially irritating, there is a safety purpose for back-up beepers to be audible and annoying.

The FOLC suggested that the municipality, Alberta Environment (AENV) or the Northeast Capital Industrial Association (NCIA), through the proposed regional noise management tool, might be the appropriate body to regulate sound for the Project.

Given the complex noise environment, the FOLC requested that AST complete a proper NIA in compliance with ERCB Directive 038 and also complete a post-commissioning noise survey, complete with an NIA, reflecting measured values of significant sources and source order ranking of these sources at the residences, if the Project were approved. If approved, it also requested that there be a condition on the approval to mitigate the back-up beeper noise from the front-end loaders, for example using alternatives such as adjustable beepers and/or strobe lights.

Lamont County reported that the Industrial Heartland Area Structure plan states:

> *"Where any source within a major new heavy industrial development may create an impact associated with noise, light, odour, or other nuisance to an existing residence in its vicinity, the level of nuisance should be quantitatively assessed and mitigated to reduce the cumulative impact of each nuisance factor to a level below a standard which, in the opinion of the regulatory authority with jurisdiction, does not present a significant impediment to the residential use and enjoyment of the property at the location of the residence."*

Elk Island Public Schools expressed concern regarding noise from increased rail and truck traffic and how it would affect staff and students.

4.2.3: Views of the Panel

The Panel recognizes that, while this is not an ERCB noise-regulated facility, AST committed to comply with ERCB Directive 038.

The Panel finds that, while AST purported to meet the requirements of ERCB Directive 038 with its submission of NIAs and baseline surveys, the data submitted was not in compliance with Directive 038. Key areas of deficiency are as follows:

- the omission of the cumulative sound levels of existing facilities, namely the recently expanded TransAlta substation (a regulated facility) and the Triton and Canexus facilities (unregulated facilities)

- the omission of significant sound sources which include the front-end loader for the proposed project and existing oil pumping units near the proposed facility
- the baseline monitoring locations were not located at the impacted residences
- the omission of the relative contribution of each sound source at the residences
- the omission of verification that the cumulative noise levels do not exceed the permissible sound levels (PSLs) at each of the impacted residences

To address these deficiencies, as a condition for its approval, the Panel requires AST to conduct a new NIA and conduct comprehensive sound monitoring surveys at each impacted residence in compliance with the requirements of ERCB Directive 038: Noise Control in advance of receiving an operating approval from AENV. The updated NIA and sound monitoring surveys must be completed to the satisfaction of AENV and the results of these assessments are to be made available to interested members of the community.

The Panel requires as a condition that AST conduct a post-commissioning comprehensive sound monitoring survey to verify compliance with Directive 038 within six months of Project start-up. Diagnostic sound pressure level measurements of the Project must also be undertaken to verify the assumptions used in the NIA. This information would be used to develop further attenuation measures should the results of the survey indicate non-compliance with Directive 038. This survey work must be completed to the satisfaction of AENV who will ensure that the results are made available to interested members of the community.

The Panel recommends that AST incorporate best available technology to mitigate the noise from the back-up beepers of the front-end loader to minimize the impact of this noise source on the community.

4.3: Odour

4.3.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) suggested that the primary concern with respect to odour would be hydrogen sulphide (H_2S) emissions. Potential odours were assessed by comparing either three minute or one hour chemical concentrations that were generated through the air modeling, with established mean odour thresholds. The odour thresholds used were 14 µg/m^3 for H_2S, 2880 µg/m^3 for sulphur dioxide (SO_2) and 400 µg/m^3 for nitrogen dioxide (NO_2). AST concluded that peak air concentrations were not expected to exceed mean odour thresholds at the locations where the maximum air concentrations were expected to occur, which was at the fenceline. AST committed to maintain a 24-hour phone-in line to address odour complaints and to respond to complaints in a timely manner.

4.3.2: Views of the Interveners

The Friends of Lamont County (FOLC) were concerned that there would be levels of fugitive emissions of H_2S and SO_2 from the Project that would reach their homes and work places that would cause noxious odours. It alleged that fugitive emissions were not adequately accounted for in the modeling of H_2S emissions, mainly from the offloading of liquid sulphur from rail cars and trucks.

If the Project were approved, the FOLC requested that the following conditions be placed on AST's approval:

- AST monitor, measure and mitigate to lessen or prevent the offensive odours from being released off the AST Principal Development Area (PDA) as per requirements in Section 116 of the *Environmental Protection and Enhancement Act*
- AST be required to construct and improve the Project in such a manner that would assist to control or eliminate offensive odours
- AST implement a system whereby if offensive odours are being experienced outside of the PDA and neighbours have complained, AST shut down its facility until the winds have subsided

Lamont County reported that the Industrial Heartland Area Structure plan states that where any new heavy industrial development creates an odour impact, the impact must be assessed and mitigated.

Joanne Bourque, an area resident, was concerned that two growing towns, Lamont and Bruderheim, one with a major health care facility, would have to tolerate odours from the Project.

Elk Island Public Schools expressed concern for odours from fugitive emissions of SO_2 or H_2S and the extent to which these emissions might affect staff and student safety and wellness.

4.3.3: Views of the Panel

The Panel agrees with AST that there will not be issues with odour past the fenceline of the Project, during normal operating conditions, as AST has committed to only accepting degassed liquid sulphur (to 10 ppm). The Panel expects that AST will honour its commitment to address odour complaints, should they occur.

The Panel is aware that AST has committed to monitoring H_2S concentrations at the fenceline (discussed in Section 6.1.1 of this report), which would be the most likely cause of odour, and does not impose further odour control conditions on AST.

4.4: Light

4.4.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) specified that the facility would operate 24 hours a day and would be lit with five-foot candles (50 Lux) outside of all active receiving, processing and shipping facilities.

AST committed to mitigate light impacts by implementing the following measures:

- wherever practical, facility lighting would be directed away from adjacent residences
- light sources would be situated above the facilities and would be directed downwards and inwards to reduce the area outside of the facilities area that is affected by lighting
- trees and shrubs around the perimeter of the Site would be left in place to establish a visual barrier to light propagation

4.4.2: Views of the Interveners

Lamont County reported that the Industrial Heartland Area Structure plan states that where any new heavy industrial development creates a light impact, the impact must be assessed and mitigated.

4.4.3: Views of the Panel

The Panel accepts that impacts from light from the Project are not expected to cause public concern and expects that AST will honour its commitments to mitigate light impacts.

4.5: Rail and Road Traffic

4.5.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that a traffic impact assessment (TIA) was conducted to assess potential impacts of the proposed sulphur forming and shipping facility (the Project) on the adjacent roadway infrastructure and traffic operations. AST indicated that the purpose of the TIA was to evaluate the traffic activity along the adjacent highways and provide reliable guidance on the location and function of access to Section 35-55-20 W4M (the Site). AST included anticipated travel characteristics of vehicle traffic generated by the Project, evaluated traffic activity along Highways 45 and 15, including intersection traffic operations, and provided guidance on the location and function of the Site access to accommodate generated traffic, both at the Site and off site. AST outlined that when doing a TIA, consideration must be given to incremental traffic increases on roads accessing highways to ensure that the function and integrity of the highway system and key intersections are maintained.

AST stated that there would be rail and road transportation to and from the Site, with access for receiving molten sulphur and shipping formed sulphur pastilles via Highway

45, Highway 15, Range Road (RR) 202, and existing Canadian National Railway (CN) and Canadian Pacific Railway (CPR) rail lines. The Project would be located between Highway 45 and Highway 15, between the CPR and CN rail tracks, east of RR 202. AST stated that the Principal Development Area (PDA) within the Site would be along RR 202, approximately 2.2 km east of Bruderheim in Lamont County. The PDA is bordered by the two railway crossings on the north (CPR) and south (CN). AST noted that all vehicle access to the Site would be from existing RR 202, which connects with both Highways 15 and 45, and that these would be designated the preferred routes for vehicle traffic. AST identified the Site as one of a few areas in the Province that are adjacent to both major railway systems.

AST stated that RR 202 provides direct access to the Site, crosses two railway lines, and is a two-lane gravel roadway with a non-posted speed limit of 80 km/h. AST submitted that Highway 15, located south of the Site, runs east/west and is a two-lane paved highway with a speed limit of 100 km/h. The intersection with RR 202 is approximately 3.2 km east of the Highway 45 intersection with Highway 15. AST noted that Highway 45, located northwest of the Site, is a two-lane paved highway with a speed limit of 100 km/h and a speed reduction to 80 km/h at the curve. AST outlined that Highway 45 runs north/south from Highway 15 to provide access to Bruderheim, turns and runs east/west into Bruderheim and proceeds approximately 2.2 km east of Bruderheim where it curves to run north/south and connect with Highway 38. RR 202 and Township Road 560 connect at the curve, with the two intersections forming a triangle. AST indicated that the key intersections considered for the TIA were the RR 202 and Highway 45 intersection and the RR 202 and Highway 15 intersection.

AST stated that traffic data, peak hour traffic data and intersection turning movement data used for the TIA were obtained from the Alberta Infrastructure and Transportation Traffic Count Database, with the most current data available being from 2006. AST noted that traffic volumes on both Highways 15 and 45 have fluctuated over the last ten years but have remained relatively constant. Highway 45 traffic volumes were characterized as low, with less than 800 vehicles travelling daily past the RR 202 intersection, and Highway 15 traffic volumes were characterized as more significant in the vicinity of RR 202 intersection, with approximately 5,000 vehicles per day.

AST deemed the anticipated level of road use associated with the construction phase of the Project to be insignificant relative to the capacities of these routes. During operations, it was anticipated that 194 vehicle trips would occur from the Site per day, with 150 trips attributed to truck traffic (i.e. 75 trucks per day). AST submitted that the predicted daily volume of vehicles on a two-lane road facility would not affect the operational characteristics of the road. AST stated that exact figures had not been determined for the current number of car trips on RR 202, but anticipated that there would likely be less than 100 vehicles a day on the road. AST stated that a structural analysis, structural integrity analysis or specific survey was not completed on RR 202 as part of the TIA, but it would do so if it was a requirement from Lamont County. AST assured that fair and appropriate contributions would be made to ensure RR 202 was adequate and maintained.

AST proposed that truck traffic would be restricted to daytime hours to mitigate potential noise impacts. AST indicated that for purposes of the TIA it was assumed that truck traffic would be dispersed throughout the full 24 hours of the day and, as it was determined that the combination of both site-generated and surrounding peak-hour

traffic would produce the highest traffic flow rates, the weekday AM and PM peak hours were selected for the TIA. AST estimated additional traffic volume generated by the Project based on predicted numbers of employees per shift, start and finish times of shifts, and daily molten sulphur delivery operations. It was assumed that each employee and liquid sulphur shipment generated one inbound and one outbound trip during the day and the trips were adjusted to reflect the likelihood of occurring during the peak hour of surrounding road traffic. AST predicted that approximately 90 percent of the total trips to the Site would be to and from the west, accessing the Site from Highway 15, while approximately 10 percent of the total trips to the Site would be to and from the north, accessing the Site from Highway 45. AST assumed background traffic increases with linear growth rates of 2.5 percent per year for Highway 15 and 0.5 percent per year for Highway 45, with two time horizons used: a 2007 horizon for the Project build-out scenario and a 2022 horizon as the future time period. AST prepared total traffic forecasts by adding the background traffic to the predicted traffic generated by the Project and concluded that the Project would have the potential to generate 35 additional trips during the AM peak hour and 24 additional trips during the PM peak hour.

AST conducted a capacity analysis at key intersections to evaluate traffic conditions during peak periods by completing unsignalized intersection assessments at the RR 202/Highway 45 and RR 202/Highway 15 intersections for the weekday AM and PM peak hours. AST anticipated no change in the operating level of service at the RR 202/Highway 45 intersection and acceptable levels of service to continue at the RR 202/Highway 15 intersection upon the addition of Project generated traffic under both time horizon scenarios. AST also assessed these intersections based on the Highway Geometric Design Guide, and concluded that the existing design and access of the RR 202/Highway 45 intersection (Type I intersection) was appropriate for the Project, and that, based on traffic growth rates, the RR 202/Highway 15 intersection would require a left turn lane and acceleration lane (standard Type IVb Alberta Infrastructure and Transportation intersection). AST noted that following the TIA, the RR 202/Highway 15 intersection had been upgraded by Alberta Transportation similar to that recommended in the TIA and would not require further improvements.

Based on the improvements and analysis, AST submitted that the road system surrounding the Project would be able to support an increase in vehicle traffic and maintain acceptable Level of Service and Volume to Capacity standards. AST did not anticipate that further traffic control changes would be required at either assessed intersection. AST concluded from the completed TIA that impacts to traffic volume would be relatively minor in comparison to current and predicted traffic volumes.

AST stated that current railway traffic was assessed, based on one 24-hour survey, as being at up to four trains a day along the railway lines. Railway traffic was considered a potential Project impact on the roadway system. AST determined that there would be adequate room for trucks to wait for a train to pass without significantly impacting road traffic, but that specific analysis was not completed. AST stated that during peak Project operations, train traffic would be anticipated to consist of one incoming liquid sulphur train daily and one outgoing formed sulphur pastille train every two to four days. This would result in approximately two to three trains a week being released from the Site. AST outlined that one loading unit train would consist of approximately 110 railcars, with a maximum future potential of 126 railcar unit trains. AST concluded that the predicted

increase in railway traffic outside of the Site and the potential safety issues related to railway traffic was not considered significant.

4.5.2: Views of the Interveners

The Friends of Lamont County (FOLC) expressed concerns regarding increased truck and railway traffic associated with the Project. The FOLC submitted that increased traffic would be considered a hassle to everyday life, creating stress to residents, and was concerned with the proposed increase in the total volume of traffic and the number of large trucks, railcars and trains. The FOLC stated that increased traffic would have multiple impacts, making relatively routine trips in the area cumbersome as increased rail traffic would have the potential to increase travel times and distances, decreasing safety on the surrounding roads and railway crossings, particularly at night, and making agricultural operations more difficult in instances where moving equipment and grain/product was required. The FOLC noted that RR 202 is a gravel road and that significant increased truck traffic would result in considerable dust generation.

The FOLC submitted that during emergency situations travel might be impeded by truck and railway traffic, increasing response or action times. The FOLC stated that concerns also existed with respect to school buses and safety of children, as well as the possibility that bus routes might have to be adjusted to avoid rail crossings, potentially significantly increasing already relatively considerable travel times.

The FOLC presented that there is currently variable railway traffic in the area. Estimations by the FOLC ranged from limited or negligible train traffic to considerable train traffic on the railways. The FOLC suggested that there might be as few as one or two trains a day to as many as 12 to 20 trains a day, with at least four at night.

The FOLC requested that AST, in conjunction with CN and CPR, investigate and mitigate potential impacts as a result of increased rail and road congestion, including delays and blockage of egress routes in the case of an emergency. The FOLC proposed that the Project construction and operations not commence until regional infrastructure is upgraded to safely accommodate increased traffic, as the FOLC believed that the current road and railway system would not be able to handle large increases in traffic volume associated with the Project.

Lamont County expressed concern regarding the ability of the municipal infrastructure to accommodate increased traffic volumes. Lamont County stated that RR 202 would have to be upgraded, as it is currently a gravel road that may not be designed for heavy industrial traffic. Lamont County felt that a development agreement would be required to address municipal infrastructure, particularly the roadways and specifically RR 202. Lamont County was unsure as to the total cost that would be required to improve RR 202 to an adequate standard, but suggested that the cost to, and contribution from, AST should be appropriate relative to the scope of the required upgrades and maintenance for the road. Lamont County noted that council, not administration, would be the final determiner of the terms of the road construction and that a development agreement would be required to determine fair share contribution.

Ms. Leslie Jans, the Town of Lamont and Elk Island Public Schools expressed concerns relating to increased truck and railway traffic, specifically how it was going to be

guaranteed that designated truck traffic travel routes were adhered to and also the associated safety issues to the students and communities related to increased traffic.

4.5.3: Views of the Panel

The Panel acknowledges that rail and road traffic issues are important to understanding potential impacts from the Project and that consideration must be given to incremental traffic increases on primary and secondary access routes to and from the Site. The Panel believes that it is appropriate to focus on RR 202, Highway 15, Highway 45 and the two railway systems crossing and servicing the Site.

The Panel accepts that approximately 194 additional vehicle trips will be generated from the Site per day and that the assumption of 90 percent Highway 15 use and 10 percent Highway 45 use is reasonable as presented by AST. Although the predicted volume of the total number of additional vehicles will result in a significant increase in traffic along RR 202, the predicted number of total additional vehicles is not believed to be of great significance with respect to the relatively more major Highways 15 and 45, particularly given the industrial nature and zoning of the surrounding area. The Panel concludes that the total volume of road traffic proposed to be generated is reasonable for the Project, given predicted traffic growth rates for the region and general location of the Project within an industrial region.

The Panel notes that some discrepancy exists in times of expected truck traffic presence between the TIA and noise assessment. In the TIA, truck and vehicle traffic was assumed to be distributed throughout the full 24-hours of the day, while a proposed method to mitigate traffic noise was to restrict truck traffic to daytime hours. The Panel believes that, although restricting truck traffic to daylight hours would increase the number of additional trips generated during the AM and PM peak hours in the TIA, it would not significantly affect the outcome and recommendations of the TIA. Though significant with respect to RR 202, the number of additional trips generated during each of the peak hours would remain relatively minor as compared to the total peak hour traffic volumes on Highway 15 and 45. The Panel concludes that this is an acceptable increase in traffic given the nature of the Project, predicted traffic growth rates and location within the industrial region.

The Panel notes that the TIA completed by AST suggested that improvements to the intersection of RR 202 and Highway 15 be constructed to accommodate increased traffic volumes, but that these improvements have already been undertaken by Alberta Transportation. The Panel finds that, based on the TIA and improvements already constructed at the intersection of RR 202 and Highway 15 by Alberta Transportation, no further improvements would be required at this time to the intersections for the given volume and proposed traffic routes.

The Panel concurs that RR 202 is the most appropriate route providing access to the Site. Given the proposed increase in the total volume and nature of the traffic, the Panel is unsure of the current ability of the gravel road to adequately and safely accommodate the additional traffic as sufficient evidence was not presented one way or another and no assessment of RR 202 has been completed. The Panel notes that AST has agreed to accept some responsibility regarding required improvements, maintenance, and costs associated with RR 202 and that Lamont County has proposed to resolve this through a

development agreement. While the Panel believes it is not the sole responsibility of AST to upgrade the road and it should not bear the full financial burden as other industrial and residential users of the road are present in the area, the Project will be responsible for significant traffic volume and pressure increases. The Panel finds that AST is responsible to contribute its fair share to maintain and improve the road if required, as AST had committed. The Panel is confident a resolution of this issue can be reached between AST and Lamont County (see Section 4.8).

The Panel observes that the predicted Project impact on railway traffic is relatively uncertain. Current predictions of train traffic on the railway lines range from one or two trains a day (presented by the FOLC), to four trains a day (presented by AST), to up to 20 trains a day (also presented by the FOLC). The Panel believes that the increase of two to three, 110 to 126 railcar unit trains, would be noticeable regardless of the current levels of train traffic. The Panel also believes that this is a reasonable increase to railway traffic on the railway lines and that having relatively easy and close access to both major railway lines is advantageous to AST. Although the importance of railway crossing safety will increase and the probability of delays due to trains may increase, it should not be unexpected given the nature of rural railway crossings and activities expected within an industrial area. The Panel recommends communications between AST, the communities, Alberta Transportation, CN and CPR to ensure crossings are appropriately and adequately marked and controlled.

The Panel also recommends that AST ensure that all traffic, particularly vehicle and truck traffic, adhere to the outlined preferred access routes for access to and from the Site and also ensure that all traffic associated with the Project follow all applicable safety precautions and laws (i.e. speed limits, vehicle maintenance, warning whistles, etc.)

4.6: Property Values

4.6.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that, in 1999, Lamont County, along with the City of Fort Saskatchewan, Strathcona County and Sturgeon County, participated in a coordinated regional growth and development plan. As a result of this initiative, 330 km^2 of land in the three counties was zoned for industrial and medium-heavy industrial use and is now referred to as the Industrial Heartland (Figure 5). The Project would be located inside an area of Lamont County zoned for medium-heavy industrial use that forms part of the Industrial Heartland.

AST stated that, as per Statistics Canada's 2001 census, there are 3,215 dwellings in Lamont County with 410 located in the Town of Bruderheim and 635 in the Town of Lamont.

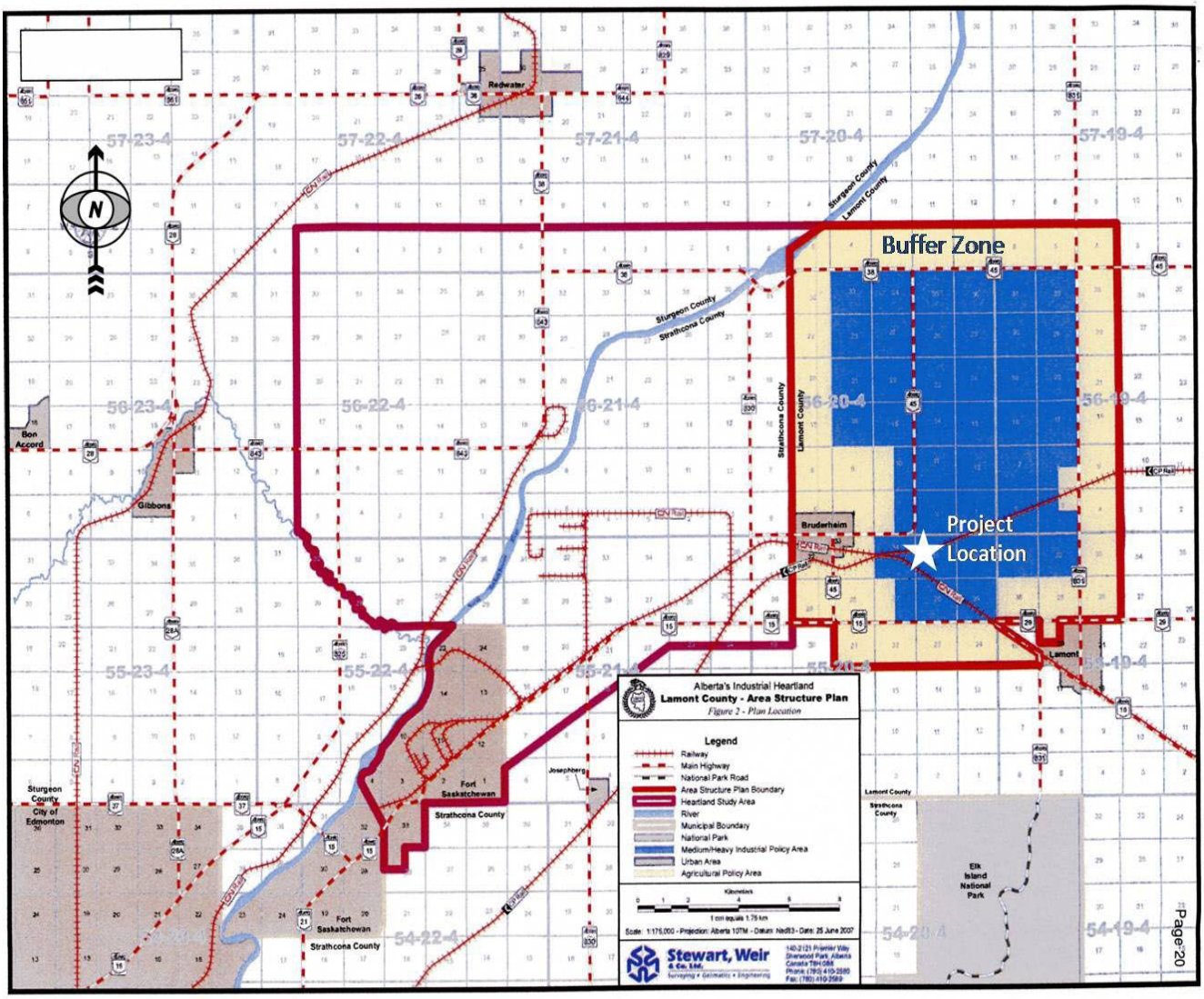

Figure 5: Map of Alberta's Industrial Heartland

AST identified that, as per Statistics Canada's 2001 census, the average value of dwellings in the Town of Bruderheim, the Town of Lamont and Lamont County was $94,804, $86,605 and $89,310, respectively. This compares to an average dwelling value of $159,698 in the Province of Alberta in 2001.

AST stated that in the period from 1996 to 2001, dwelling values in the Towns of Bruderheim and Lamont increased by 29.5 percent and 17.6 percent, respectively. This compares to a 20.5 percent increase in value for all dwellings in the Province of Alberta over that same time frame. AST suggested that the increase in values in the Towns of Bruderheim and Lamont were likely associated with the general increase in demand for housing in the province.

AST stated that property values in close proximity to the Project are highly variable and not predictable for the following reasons:

- A residential property located near industrial development might experience a decrease in its value as a residential property due to various external nuisances but its option value could possibly increase if it is viewed as a viable parcel for industrial development.
- The value of a property located within the Industrial Heartland is greatly determined by its zoning. The zoning of property is at the discretion of the Lamont County Council.
- Property values in the local and regional area have increased dramatically over the last five years along with property values in Alberta. It is difficult to disaggregate changes in local property values from constantly changing values in Alberta.

AST concluded the following with respect to property values within the Local Study Area, as a result of the Project:

- Industrial land is unlikely to lose value.
- In the buffer zone and in the Towns of Bruderheim and Lamont, changes are not predictable.

AST further stated that it is difficult to predict what the cumulative effects of projects near the buffer zone would be on property values for those residences within the buffer zone (see Figure 5). Furthermore, current valuations of properties within the buffer zone already take into account the existing industrial development within the Industrial Heartland. Several existing industrial developments (Canexus, ERCO and Triton) are located closer to the buffer zone than the Project and therefore AST predicted that the Project would not have any additional impact on property values.

AST stated that the Project would not be expected to have an impact on property values in the immediate vicinity of the Project. In addition, AST indicated that the Alberta Industrial Heartland Land Use Classification is expected to have a neutral or positive impact on property values.

AST stated that the Project itself would not impact area property values because of its existence in the area. The impact on that value of properties situated in close proximity to the Project is the direct result of the area being zoned for medium-heavy industrial and cannot be attributed to any one specific industrial development.

AST believed that land use has the largest impact on market value of a given property. Based on a review of the real estate market in the area, the history of development, and land use documents, AST believed that there is no conclusive evidence that property values would be negatively impacted by the Project. On the basis of the area's land use designation, AST believed that, properties that were previously designated agricultural and are now designated as "Heavy/Medium Industrial Policy Area" might increase in value significantly or might have already enjoyed such increases.

AST stated that unserviced land in the region that is zoned for heavy industry has been bought for $12,000 to $15,000 per acre by speculators, while farmland in Lamont County

sold for $1,000 to $1,500 per acre. AST provided an example at the hearing that in 2007 an 80-acre parcel of land situated immediately south of the Project site (the north half of the northeast quarter of section 26-55-20-W4) was sold for approximately $14,000 per acre to Calgary Ventures, Inc. The Applicant indicated that in 2007, agricultural land in Lamont County sold in a range of between $300 and $1,200 an acre.

4.6.2: Views of the Interveners

The Friends of Lamont County (FOLC) stated that property values situated in close proximity to the Project would decrease as a result of real or perceived concerns regarding health, safety and other nuisances such as dust, noise and increased traffic volumes.

In addition, the FOLC stated that home sales in the Towns of Lamont and Bruderheim and in surrounding areas would decrease since sulphur would be visible from Highway 15.

The FOLC provided the following comments on the potential Project impacts on property values:

- Generally speaking, properties in close proximity to industrial activity with health and safety hazards or nuisance experience noticeable losses in property values, typically in the order of 10 to 40 percent when compared to an unimpaired property.
- The FOLC noted that consideration must be given to the cumulative effect that existing and proposed industrial development might have on nuisance impacts and corresponding potential losses on property values.
- The FOLC indicated that the Project's true impact on property value must be assessed on a case-by-case basis. Furthermore, while "rules of thumb" do not generally apply, the closer the property is located to the source of the external hazard or nuisance the greater the impact. Conversely, losses diminish the greater the distance from the source.
- In rural settings, research indicates that industrial development most significantly impacts smaller acreage properties while larger holdings of agricultural land are least impacted.
- Once the Project is in place, and actual value losses have been realized, there are very few mechanisms available to landowners that would help to mitigate their damages. Due to severe budget constraints, the Alberta Industrial Heartland and Land Trust Society is unable to assist all of the property owners within the heavy industrial areas or the adjacent buffer areas who wish to relocate.

4.6.3: Views of the Panel

The Panel acknowledges that the Project is located within the Industrial Heartland zone and recognizes the complexities related to land valuation and potential impact on land values resulting from industrial activity. The Applicant provided evidence showing an increase in the value of land sold after local areas were zoned industrial and included in

the Industrial Heartland. The FOLC indicated that there would be negative impacts on lands within close proximity to the Project and potentially in the towns of Lamont and Bruderheim as a result of the sulphur piles being visible from Highway 15. The FOLC indicated that property values would decrease post-Project due to real or perceived concerns regarding health, safety and other nuisances such as noise, traffic and dust.

Since the Project is located within areas zoned as medium/heavy industrial the Panel believes that some increased level of nuisance related disturbances are expected. Furthermore, there is already some level of industrial activity in the vicinity of the proposed AST project. However, the Panel recognizes that there are particular concerns about emergency response planning, air emissions and potential sulphur fires. These specific issues are addressed in subsequent sections of this report and the Panel has directed that additional steps be taken by the Applicant to mitigate these concerns. The Panel believes that property values will be less impacted by the Project given these recommendations and conditions.

The Panel concurs with both the Applicant and the FOLC that the only substantive method to determine potential impacts on land values is a post-project analysis on a case-by-case basis. However, the benefits and costs of the Project must be weighed before a decision is rendered by the Panel based on the information gathered during the application review and hearing. As such, the Panel finds that given the nature and location of the Project, the municipal zoning and the current co-existence of local land owners with industrial development, the potential for impact on land values resulting from the Project will be minimal.

4.7: Site Suitability

4.7.1: Views of the Applicant

The AST site is located in a portion of Section 35-55-20 W4M in Lamont County in an area that is zoned medium-heavy industrial. The Applicant stated that it selected the Site based on economic and environmental criteria. The parcel of land selected by AST is currently being used for agricultural purposes.

The Site is located within the Alberta Industrial Heartland, in close proximity to existing and proposed oil refining and bitumen upgrading facilities that will generate increasing volumes of sulphur as part of Alberta's planned oil sands production operations. AST stated that to date, none of these facilities have included the capabilities to form and ship sulphur suitable for export.

AST submitted that the Site is located along the major transportation corridor connecting the oil sands regions of eastern Alberta to the municipal and industrial complex of central Alberta. Significant quantities of sulphur are generated in the source areas of eastern Alberta that do not currently have sulphur forming capabilities.

Both Canadian Pacific and Canadian National rail lines run through the Site and would provide efficient delivery of liquid sulphur and shipment of formed sulphur. AST submitted that this would minimize the disturbance that would otherwise be required to establish rail access to the forming facility.

At the time AST was looking for a site the proposed location was commercially available. An attractive feature of the property was that it would not involve the relocation of any permanent residents.

4.7.2: Views of the Interveners

Lamont County expressed concerns that the site selected might not satisfy the Major Industrial Accidents Council of Canada (MIACC) criteria based on the risk associated with a fire-generated sulphur dioxide cloud potentially drifting off site. Lamont County also submitted that the water drainage from the Site could pose challenges to existing road structures. Further, the County stated that the development could negatively impact other development in the County and have an effect on existing adjacent land uses. The County directed the Board to the municipal zoning provisions for the lands, noting the municipal evaluation criteria for heavy industrial development as a discretionary use.

The FOLC submitted that although the proposed site is zoned for industrial use, it is in the middle of a populated area with some of Alberta's best quality soil. The FOLC referred to the Municipal Planning Decision finding that the location was not appropriate for the proposed facility due to the proximity of the many residences and to the Towns of Bruderheim and Lamont. FOLC submitted evidence suggesting that the Site is in a low area and that as a consequence there could be concerns related to the accumulation of H_2S. Anecdotal reference was made to "45 acres of standing water" on the proposed site. The FOLC stated that there is a risk to groundwater and existing shallow water wells used by its members. It said that there were superior alternative sites west of the selected property that were vacant, not as close to occupied residences or large livestock operations, closer to AST's potential suppliers, on two rail lines and not in the middle of actively farmed fertile land.

4.7.3: Views of the Panel

The Panel notes that participants raised a number of economic, social and technical issues in the context of site suitability. The primary economic factors include proximity to sulphur supply, market opportunity, existing transportation infrastructure and effects on existing land uses. Social factors include land use and effects on the community and public infrastructure. The technical issues relate to the potential environmental effects, risk assessment and environmental effects. The Panel has set out its findings on many of these issues elsewhere in this report and has not repeated the reasons for those findings in this section.

The Panel finds that this site has significant attributes for a sulphur forming facility of the scale proposed by AST. The proximity to existing and proposed sulphur supplies and the immediate access to existing rail facilities are viewed by the Panel as positive factors in its suitability assessment of the proposed site for a sulphur forming and shipping operation.

The development site is located in the Alberta Industrial Heartland with the associated compatible land use designation. The Panel notes that Lamont County's current land use provisions are intended to promote the potential for industrial development through restricting residential development within the Industrial Heartland. Having regard for the

long term vision for these lands the Panel does not anticipate that the AST development will have a negative impact on other development opportunities in the County.

The Panel heard concerns that the AST development will affect current land uses. Having regard for the Panel's conclusions on air, soil, surface and groundwater effects, set out in other sections of this report, the Panel is satisfied that these will not have a significant negative effect on current land use. The Board anticipates that agricultural land use on adjacent lands will continue for some time as industrial development grows in the region. The Panel notes that the AST development is less compatible with existing rural residences in the immediate vicinity. Most notably, potential adverse effects on these residences could include noise, traffic and visual impacts. The Panel has examined these effects in other sections of this report and, while not dismissing the effects on the landowners, finds that the benefits associated with this site outweigh the anticipated negative effects on current regional land uses.

4.8: Municipal Concerns

4.8.1: Views of the Applicant

The Applicant stated that the Project lands have been zoned as medium-heavy industrial by Lamont County since 1997. AST responded to the concerns raised by Lamont County in relation to risk assessment, emergency response planning, water drainage, emergency water supply, the scope of any approval granted, insurance coverage and the need for a development agreement. While these concerns are considered by the Panel in more detail elsewhere in this report, this section will briefly summarize the position of the Applicant.

The 2005 Risk Assessment conducted by AST identified the major hazards associated with a sulphur forming facility, provided an assessment of risks associated with the major hazards and stated conclusions on the acceptability of the risks. The risk assessment concluded that the fundamental risk issue was associated with a sulphur fire at the proposed facility. In the event of a sulphur fire the risk assessment analyzed the risk of a sulphur dioxide cloud potentially drifting off site towards the public. The assessment concluded that there would be enough sulphur on site to create an off-site impact if a large fire were to occur, however, it was the position of AST that the Project met standards established by the Major Industrial Accidents Council of Canada (MIACC) and in so doing satisfied the criteria set out in the Lamont County Area Structure Plan.

AST stated that the emergency response plan (ERP) presented to the NRCB was a preliminary document that exceeded the requirements of the Terms of Reference established by AENV. AST stated that the ERP would continue to evolve through discussions with Northeast Region Community Awareness and Emergency Response (NR CAER) and its members and as further information was obtained from residents and Lamont County. AST committed to ongoing participation as a member of NR CAER, noting that part of the membership requirement was the review and acceptance of an ERP acceptable to that organization. The Applicant noted that as a member of NR CAER, Lamont County would have the opportunity to ensure that an appropriate ERP was developed.

AST stated that stormwater runoff would be collected and contained in a runoff containment pond and that this water would be used for cooling. Any water that was not

suitable for use as cooling water would be taken off site for disposal. In extreme runoff conditions which might occur when volumes exceed the one in 25 years, 24-hour runoff event, it might be necessary to release water from the pond. In that event AST made the commitment that any water released would be neutralized and tested prior to the release to confirm that it complied with water quality criteria that it expected to be specified in its AENV approval.

AST stated that it was not relying on the Regional Water Commission Line for firefighting purposes. Rather, the Applicant stated that its 6,000 m^3 pond would be filled by collecting runoff from the sulphur processing and storage area. Water collected in this pond would be used for cooling and firefighting. AST proposed it would connect to the Regional Water Commission Line to obtain make-up water to replace water lost through evaporation, however, by limiting its demand for water from this line it would not require that the line capacity be sized to respond to emergency demands.

AST stated that in its opinion, roads in the area are adequate to accommodate additional traffic volumes generated by the Project. However, it is stated that *"should further upgrading be required to Range Road 202 having regard to the fact that there is already an industrial use of that road, AST is prepared to pay its appropriate share."*

AST's application to the NRCB was for a 3,000 tonnes/day sulphur forming capacity with an associated 45,000 tonnes of pastille storage, however, the application also disclosed that the facility might be expanded in the future by a doubling of capacity. In the Application AST used the term "initial capacity" to describe the 3,000 tonnes/day facility and the term "ultimate capacity" to describe the 6,000 tonnes/day facility. AST provided information in its EIA that would provide the opportunity for parties to understand the key environmental effects from the "ultimate facility." Notwithstanding the inclusion of such information in its Application materials, AST stated that it was seeking an approval to construct and operate the "initial capacity" project and it understood that it would need to obtain further required approvals and amendments to construct and operate the "ultimate facility."

AST stated that it carries insurance with third party liability coverage limits of $104 million. AST asserted that any serious impacts associated with a worst-case scenario were expected to be limited to inside of AST's property boundary and that in any event it did not foresee a potential claim approaching even close to the level of coverage that it maintains. AST asked the NRCB to conclude that the stated amount of coverage was appropriate having regard for the potential risk.

In response to Lamont County's request that the NRCB require as a condition that AST enter into a Development Agreement with the County, AST stated that such a condition was not appropriate. AST submitted that a condition requiring a Development Agreement on such terms as the County alone might require would not be in keeping with the provisions of Section 619 of the *Municipal Government Act*. The Applicant stated that it was prepared to discuss the conditions of a Development Agreement with the County and further stated that it would work cooperatively with the County in reaching an agreement suitable to both parties.

4.8.2: Views of the Interveners

In April 2006 the Lamont County Municipal Planning Commission denied the development permit application submitted by Hazco Environmental Services Ltd. due to several concerns related to the information or lack of information and the possible negative impact of the development on the County, including adjacent land uses. The County remained opposed to the Project as it was presented, however in its submissions to the NRCB it requested that specific conditions be attached to any approval issued by the Board. Additionally, the County stated that as the NRCB was essentially "*stepping into the shoes of the municipal planning authority*" that the Board should consider the provisions relevant to heavy industrial development set out in the County's municipal planning documents. Many of the concerns expressed by Lamont County relate to specific technical issues that are covered in greater detail elsewhere in this Decision Report and therefore the views included in this section have been summarized.

The County's written materials stated that the risk assessment did not consider surrounding developments, most notably the Canexus facility. At the time it submitted these materials the County acknowledged that it had received further information from AST in relation to this concern but had not yet completed a review of these materials. The County stated that it is one of four municipalities in the province that references MIACC standards and that this inclusion should be taken as a clear statement of the County's intention that all heavy industrial development within its boundaries meets such standards. The County submitted that the conclusions of the risk assessment were seriously compromised as it was completed without full regard to the specific design elements of the facility.

The County stated that it was clear that the current form of AST's emergency response plan was deficient. It noted several components that would need to be included as the plan was developed. Some of the key elements that would need further information and clarification are: monitoring, detectors, adequacy of stored water to respond to firefighting needs and outside emergency response capacity and protocol. In stating its concerns the County advised the Board that it does not maintain its own fire department, but rather contracts for emergency fire response services from five towns and villages that maintain volunteer fire departments. Currently these volunteer firefighters do not have the skills or equipment to deal with a heavy industrial emergency. The County asked the Board to require that AST seek the input and approval of Lamont County for its emergency response plan. The County further suggested that the County would be amenable to a mediation process in the event of a failure to reach agreement with AST.

The County asked that AST be required to enter into a municipal development agreement to respond to stormwater drainage issues. The County stated that there is a need for such an agreement to ensure that there is no inappropriate interference with the stormwater drainage patterns in the vicinity of the lands. The County pointed out that this was important given the agricultural nature of the surrounding area.

The County also stated that an assessment had not been completed to determine whether access to the Regional Water Commission Line was appropriate, and if so, at what cost and design considerations. At present this line ends approximately a half mile west of the AST lands and the County would expect to recover reasonable costs of extending this line using appropriate design standards to accommodate future access

from other users along any extension. Again, the County believed that this should be a matter that would best be dealt with by a condition requiring AST to enter into a development agreement with the County.

Similarly, the County stated that Range Road (RR) 202 would need to be upgraded to handle the truck traffic generated in the event that the application was approved. The County submitted that its Municipal Development Plan provides in Policy 8.7 that *"no industrial development shall result in any additional costs to the County unless the County agrees to share the costs."*

The County noted that during the course of the hearing process, AST made a number of commitments in response to concerns or questions raised by various participants. The County asked that, should the Board determine that it was prepared to approve the application, these various commitments be entrenched as conditions to the approval.

The County stated that it was concerned that the level of insurance held by AST might be insufficient should a catastrophic incident occur. The County had not seen any information from an expert which demonstrated that the level of insurance provided by CCS Corporation (AST's parent company) would be adequate.

The County noted that even with an NRCB approval in place, a municipal development permit would be required for this project. The County submitted that it would be appropriate for the Board to require AST to enter into a development agreement with the County as part of the development permit process. As the County would be responsible for the provision and maintenance of various services that might be affected as a direct result of AST's project, it advocated that such a development agreement would be an appropriate instrument to assure municipal interests were protected. Further, the County wanted any approval issued by the Board to be clear in stating that the scope of such approval was limited to the 3,000 tonnes/day facility.

4.8.3: Views of the Panel

The Panel accepts that it has a responsibility to review and understand the key components and elements of the relevant municipal planning documents as part of the task of assessing the public interest. In reviewing the municipal planning documents of Lamont County, the Panel has determined that the proposed development is not inconsistent with the provisions contained therein, but is aware that the development would be considered a discretionary use. The majority of issues raised by the County are technical issues that have been examined in considerable detail elsewhere in this report.

To this point in time the Panel agrees with the County that there are questions whether there is adequate capacity and an appropriate plan to respond to Level 2 or Level 3 emergencies. The Panel believes that it is important that Lamont County have a role in the development of the emergency response plan in order to have confidence in its completeness. Having said this, the Panel does not believe that AST should be required to obtain the approval of the County for this document. The Panel has decided that it will require as a condition that AST must provide a final emergency response plan acceptable to the Panel. As part of its condition the Panel requires that AST include a summary of its consultation efforts in developing the ERP. The Panel is confident that

an appropriate consultation effort will result in the County's interests being adequately reflected in the final ERP.

The Panel finds that the risk assessment meets MIACC criteria. In reaching this conclusion the Panel is comfortable with the methodology and calculations employed by AST. A more complete summary of the Panel's assessment of the risk assessment is contained in Section 5 of this report.

Having regard for the available evidence, the Panel is of the opinion that there may be some potential for stormwater to affect RR 202. The Panel does not find that AST should be responsible for any pre-existing problems with stormwater; rather, if there are identified risks and a need for mitigation arising from the AST project, the Panel believes it to be the responsibility of AST. Therefore the Panel includes as a condition that AST will pay any reasonable costs associated with stormwater management measures attributed to its project in order to protect RR 202.

In considering the respective submissions of AST and Lamont County on the issue of a development agreement, it is clear to the Panel that despite the long history of the development proposal there have been only limited discussions between the County and AST on those issues that could be expected to be addressed in a development agreement. The Panel has not reached any conclusions on whether RR 202 will need to be upgraded to respond to traffic associated with the AST project. This is a question that will need to be examined by Lamont County and AST. Similarly, the Panel is satisfied that there will be costs associated with AST's access to the Regional Water Commission Line. The Panel was not provided with any details that would allow it to assess the cost associated with such access. AST should initiate negotiations with the County in order to pay its fair share of the cost for access to the water line and for the determination of any necessary road improvements. While the Panel is not prepared to require that AST enter into a development agreement with Lamont County, it notes that AST accepted the responsibility to pay its fair share of costs associated with road upgrades attributable to the Project and water utility service access. The Panel views this as a commitment of AST and is confident that the parties can successfully negotiate a resolution of these issues. The Panel has included as a condition to its form of approval that AST shall bear any reasonable costs associated with obtaining access to the Regional Water Commission Line and the cost of its fair share of upgrades to RR 202 that are necessitated by the Project.

The Panel concludes that it is important that operations such as that proposed by AST maintain insurance that will reasonably respond to foreseeable events. Even though the likelihood of such events is remote and measures are taken to avoid their occurrences, such losses may occur and insurance can provide a monetary response. The Panel has a great deal of evidence that describes the worst case scenario for this facility and predictions of what might be impacted should such an event occur. In order to ensure that adequate insurance coverage remains in place, the Panel requires as a condition that AST provide AENV with annual proof of insurance along with documentation summarizing the details of coverage and rationale supporting the adequacy of the coverage.

The Panel has considered the request of Lamont County to document and entrench as conditions to any approval all of the commitments made by AST during the course of hearing. The NRCB views the commitments made by an applicant either in its written

application or verbally at a hearing as obligations that survive the approval process, independent of their inclusion as conditions to an approval.

SECTION 5: RISK MANAGEMENT

5.1: Emergency Scenario Development

5.1.1: Views of the Applicant

5.1.1.1: Risk Assessment

Alberta Sulphur Terminals Ltd. (AST or the Applicant) conducted a risk assessment in 2005 on the proposed Project which, although not required as part of Alberta Environment's (AENV) Terms of Reference, was initially undertaken to address Lamont County's concerns and which ultimately established the requirement for an emergency response plan. AST adopted a globally accepted methodology in conducting the risk assessment which included the following steps: identification of the hazard, consequence analysis, probability analysis and risk analysis.

AST considered the following hazards in the assessment: sulphur pile fire, truck transportation incident, railroad transportation incident, pipeline release through rupture or leak, dissolved hydrogen sulphide (H_2S) released from molten sulphur, possible flammability of H_2S if allowed to collect inside equipment and sulphur dust explosion. AST indicated that sulphur dust was conducive to an explosion as the lower explosive limit (LEL) for sulphur dust in air was 30 to 35 g/m^3 and that generally dust particles less than 400 µm can explode (median particle size of sulphur dust is 30 µm.) There was also the possibility of a sulphur fire from combustion of dust in the pastille storage pile from an ignition source such as a spark from a front-end loader. AST concluded that the major hazard with an impact beyond the fenceline of the facility was a sulphur fire brought on by a sulphur dust explosion or an event that causes the sulphur pastilles to catch fire. In the assessment, to be conservative, AST assumed that dust would be present on the Site at all times.

AST identified that the consequence of a sulphur fire would be the formation and release of sulphur dioxide (SO_2), which would have an impact on workers as well as the neighbouring community, as it is toxic if inhaled. In order to determine the severity of the consequence, AST determined the amount of sulphur that is needed to burn to create a toxic cloud that would have off-site impacts. It used the American Industrial Hygiene Association Emergency Response Planning Guideline (ERPG) Level 2 of 3 ppm as the threshold which if exceeded would impact residents ("*ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing any irreversible or other serious health effects or symptoms that could impair their abilities to take protective action"*). AST calculated a rough quantity of material that would have an impact at varying distances from the source, using two tools: the Dow Chemical Exposure Index 2nd Edition, and the U.S. Environmental Protection Agency Risk Management Plan (EPA-RMP) rule look up table plus the RMP*Comp program for calculating

distances. AST determined that 1,400 kg of SO_2 would be required to be released in a fire, to impact the health of an individual as far away as 5 km from the Site in a fire scenario. AST concluded that there would be enough sulphur on site to create an off-site impact.

In order to determine the probability of a sulphur fire, failure data for several scenarios were identified by AST using the Centre for Chemical Process Safety data to determine mean time between failures. AST attested that the probability of the circumstances where a major fire could occur was based on all three of the following happening at the same time: operator error (1 per 28 years), detection system failure (1 per 25 years) and process control system failure (1 per 19 years). AST recognized that there was a one in ten chance that ignition might occur. AST did not account for emergency response when quantifying probability.

AST indicated that the assessment concluded that the risk of a fatality due to the occurrence of a sulphur fire at the Project site was in the range of one in 7.5×10^5 to 7.5×10^6 [(1/28)×(1/25)×(1/19)] in a year at the fenceline of the Project. AST also indicated that the risk to an individual five km from the Project boundary would be one in a million.

In its risk analysis, AST used the Major Industrial Accidents Council of Canada (MIACC) Risk Acceptability Criteria to describe the level of risk for a member of the public who is inadvertently exposed to an industrial incident. According to the MIACC criteria, as the risk contour moves towards the source of the risk, the risk level increases according to the land uses, not being higher than 1×10^{-4} risk of a fatality (Figure 6). AST indicated that in order to address the global consensus concerning industrial risks and land use planning, Canada adopted the MIACC criteria. AST concluded that the risk from this Project complies with the value specified by the MIACC of no higher than 1×10^{-4} at the fenceline. The assessment also concluded that the design of the fire water system capabilities, the detection systems and personnel procedures and training would need to be recognized in the emergency response plan development.

Figure 6: Acceptable Level of Risk Criteria (MIACC) (Supplemental Information Request Response #1, Attachment 7, Risk Assessment)

AST stated that the acceptable risk criteria calculated was for involuntary/individual risk, which is the risk an industry imposes on an individual. AST concluded that because the probability and risk of an event is well below the MIACC Acceptable Level of Risk Criteria it was determined the societal risk (multiple fatalities at one location) could be stated in the same way.

AST indicated in March 2009 that with the new knowledge of the burning rate of sulphur of 40 kg/hr (for a fire burning for two hours) provided by Alberta Sulphur Research Ltd. (ASRL), local residents would not be impacted by a sulphur fire. In its closing arguments, AST also mentioned that sulphur is not listed as one of the substances to which the MIACC criteria applied.

AST also evaluated the potential risks associated with the Canexus sodium chlorate facility located near the Project area, as the operator of the chlorate plant raised concerns that chlorate, which is a strong oxidizer, could react violently with sulphur, which can oxidize exothermically to form SO_2. The potential contact pathway for sodium chlorate and sulphur is through deposition of fugitive sulphur dust emanating from the Project and depositing on the chlorate facility. AST conducted testing to quantify the reaction potential between chlorate and sulphur. Based on the results of these tests, AST concluded that the optimum ratio of sodium chlorate to sulphur or oat flour that would create a potentially explosive mixture was 70 percent chlorate to 30 percent sulphur. AST predicted that the potential ratio that could occur as a result of the Project was 99.998 percent sodium chlorate to 0.002 percent sulphur. Based on this ratio, it indicated that the proposed sulphur facility would not increase risk to the Canexus facility as the predicted ratios of sodium chlorate to sulphur would not create an explosion hazard. The risks identified by AST were similar to the risks associated with the presence of crop dust assuming that crop dust and sulphur dust were present in similar proportions.

5.1.1.2: Upset Scenario

Based on laboratory studies conducted by ASRL, AST determined that a small sulphur fire in the pastille storage pile would have a SO_2 emission rate of 13.3 g/s with a sulphur burn rate of 4 kg/10 minutes assuming that the fire would be would be put out after ten minutes. The result of AST's modeling was that the maximum predicted hourly average concentration of SO_2 for this upset scenario, was 433 $\mu g/m^3$ (which was less than the Alberta Ambient Air Quality Objective of 450 $\mu g/m^3$) and would occur on the south plant boundary.

5.1.1.3: Worst Case Scenario

AST indicated that it was not aware of any real-world Alberta incidences of a sulphur fire within a forming facility that could be used to develop a worst case scenario for the Project. It also argued that the Macassar fire scenario presented by the Friends of Lamont County (FOLC) was not a realistic worst case scenario, as the circumstances that led to the Macassar fire were not similar to the proposed Project. At the Macassar site, sulphur was stored for 30 years and it was not a premium product, the site had poor housekeeping, was unmanned, had no fire protection plan in place and an inadequate fire water supply.
AST indicated that the worst case scenario was developed using the following approach, normally intended for activities such as sour gas wells:

- Test burns were completed by ASRL to investigate the rate of growth of the fire on a pastille storage pile under laboratory conditions with a fire started as a single point source and resulting in a growth rate of 0.33 cm/minute.
- Scaling factors were used to account for a two-hour period of fire growth.
- Test burns were also conducted to determine the rate of combustion of solid sulphur and resulting in a combustion rate of 0.04 $g/min.cm^2$.
- Emission rates were determined by multiplying the area of liquid sulphur by the average rate of sulphur combustion per unit area of molten sulphur, as measured by the tests.
- A factor of safety of 25 was then applied to account for other factors (including the effects of wind on fire expansion and multiple ignition locations) with the resultant sulphur burn rate of 1,000 kg/hr used as the basis for air dispersion modeling.
- The emissions were modeled using CALPUFF, in order to generate an isopleth (contour line on a map) of 5 ppm SO_2 concentration for the purpose of emergency response planning.
- The emissions were modeled as an area source over a 25 m^2 area, but conclusions with respect to plume dispersion results or fire emissions were not sensitive to the magnitude of the assumed area.

AST indicated that the worst case scenario it used was reasonable for the following reasons:

- Sulphur fires are slow burning and easily extinguished and any fires that might occur on the pastille stockpile would migrate to the bottom and perimeter of the pile where there is less fuel for combustion and lesser tendency for the fire to expand, as the fire can only expand along the foot of the sulphur stockpile.
- Wind at ground level would be minimal because the storage pad is surrounded by a 6.1 m high wind screen.
- Formed sulphur is not classed as a flammable solid.

AST concluded that predicted maximum concentrations occurred under low wind speed and stable atmospheric conditions (15 minute averages), and the isopleth of a 5 ppm SO_2 concentration occurred at a distance of approximately 1.5 km from the Project fenceline.

5.1.1.4: Spills

AST stated that in the event of a liquid sulphur spill, the sulphur would solidify quickly and any resultant soil contamination would remain localized. Within the fenceline, AST would collect the contaminated sulphur and soil and have it disposed of at an approved waste management facility.

AST indicated that if there were spills from trucks or rail cars that occurred off the property, it was the responsibility of those who have care, custody and control of the sulphur to deal with the spills.

5.1.2: Views of the Interveners

5.1.2.1: Risk Assessment

The FOLC submitted that AST had not completed a credible risk assessment for the Project as it did not appear to be based on a real scenario. The FOLC alleged that AST had underestimated the probability of a large-scale sulphur fire or explosion occurring at the Site. The FOLC provided information on sulphur fires within Alberta, including examples of fires at sulphur facilities located at Ram River, Zama City and in Calgary at Tiger Industries.

The FOLC understood that the risk assessment concluded that there should be no public residing within the one in 10,000 and one in 1,000,000 zones of risk of a fatality due to a sulphur fire.

The FOLC attested that the original and revised estimates in the risk assessment were not justified by the available evidence, did not match values used elsewhere by AST, appeared to be based on flawed extrapolation of laboratory tests to the field and did not represent a worst case scenario that should be used for emergency planning.

Lamont County's Municipal Development Plan stated that industrial development may require a risk assessment. Lamont County was concerned with the adequacy of the risk assessment conducted by AST. The County alleged that a risk assessment should review and accept a design, not simply state that something could possibly be designed to an acceptable level. The County also had concerns with AST's probability calculations using generic industry averages.

5.1.2.2: Worst Case Scenario

The FOLC stated that the scenario used by AST to determine the worst case was not based on a real-world situation and therefore under-predicted the consequences of a large scale sulphur fire. The FOLC presented the findings from a review of a sulphur storage fire that occurred at an AECI Ltd. facility in Macassar, South Africa in December 1995, which the FOLC alleged should be the basis for the worst case scenario. The FOLC indicated that the Macassar facility contained 15,700 tons (U.S.) of solid sulphur in an approximate area of 200 m × 130 m. The sulphur had been stored there for a period of 8 to 30 years or longer and was unmanned. The fire was started by a brush fire and nearly half of the sulphur burned in a 21-hour period, releasing an estimated 14,000 tons (U.S.) of SO_2. There were high and persistent winds (average of 6.5 m/s) during the event. Thousands of people were evacuated from the nearby town of Macassar located 2.5 to 4 km downwind. The closest water hydrant was one km away from the Site and unable to provide sufficient water for fire control.

The FOLC alleged that portions of the Town of Bruderheim are closer to AST's proposed location of the sulphur pile than Macassar was to AECI's sulphur pile and that AST's sulphur storage capacity far exceeds the quantity of sulphur that was stored at the AECI facility.

The FOLC provided a review of AST's determination of the worst case scenario and expressed the following conclusions and concerns:

- The AST site was frequently subject to high wind speeds that exceeded velocities needed to promote rapid propagation of a sulphur fire. Using the meteorological data from the Environmental Impact Assessment (EIA), wind speeds exceeded 4 m/s for over half of the year, 6 m/s for over 23 percent of the time and 10 m/s for over 1.2 percent of the time. The AST site also commonly had persistent high wind speeds (over 4 m/s). These wind events could occur from all directions and could direct plumes to nearby inhabited areas, including the Towns of Bruderheim and Lamont. AST did not address the significance of these wind velocities or of wind persistence that would fan flames on the sulphur stockpile and therefore underestimated the fire propagation rate (0.33 cm/minute versus 132 cm/s from the Macassar fire example). The height of the storage pastille pile was not taken into account and is related to the amount of turbulence and wind.

- The adequacy of the wind screen to reduce the effects of wind on the storage pile during a fire was not evaluated.
- Only a single fire ignition location for the determination of the SO_2 emissions was used; in a worst case scenario there would likely be more than one.
- A fire burning one tonne of sulphur per hour, would spread to an area of 83.3 m^2 (based on ASRL reports areal emission rate estimates), rather than 25 m^2, used by AST in CALPUFF.
- The whole area of the pad would be burning in a worst case scenario.
- If a sulphur burning area of 25 m^2 was assumed, then the estimated sulphur burning rate would be 82.5 kg/10 minutes and have an SO_2 emission rate of 275 g/s. The emission rate was estimated by multiplying the burning area by the areal emission rate; to be conservative, a lower areal emission rate than that obtained by ASRL was used in this calculation, based on real-world experience.
- A comparison by the FOLC of emission scenarios provided by AST in the application materials, demonstrated that they are inconsistent and incorrect with respect to the stated assumptions. For example, different emission rates were used in the risk assessment and the modeling of the worst case scenario.
- In the Macassar fire, the estimated SO_2 emission rate for the major duration of the fire was 278,000 g/s, and the estimated average emission rate over the 21-hour fire period was 185,000 g/s, as compared to the emission rate apparently used by AST for a worst case fire scenario of 556 g/s.
- Based on FOLC's real world data, a sulphur fire burning at the proposed AST facility for one hour, should have an SO_2 emission rate of 50,176 g/s based on the 3,000 tonnes/day capacity (or 100,353 g/s for the 6,000 tonnes/day capacity), which represents a reasonable worst case fire.
- For large sulphur fires, stability class D (neutral) is most likely and thus simulations conducted using the average wind speed in this stability class are most realistic and most relevant (stability class is a classification system developed to represent the amount of atmospheric turbulence near the earth's surface that influences the manner and extent to which plumes disperse in the atmosphere). However, it is not the worst case from the perspective of dispersion modeling. Stability class D also occurred most frequently, >50 percent of the time at the proposed Project location.

- The Screen3 air dispersion model was used in multiple simulations to predict downwind concentrations from an AST sulphur pile fire. In each case, stability class D was used, wind speed was 4.6 m/s, an area source (90 m × 90 m) was modeled, the initial dispersion was 6.1 m and rural dispersion conditions were assumed. A more extreme worst case for comparability to AST and to ERCB calculations was also performed under stability class E (stable) with the average wind speed of 3.5 m/s. Seven emergency response guideline levels were evaluated for each of the five emission scenarios. For stability class D, the 5 ppm call out zone for the AST worst case scenario emission rate was 1.5 km and for stability class E was 2.7 km. For stability class D, the 5 ppm call out zone for the true worst case scenario emission rate for the 6,000 tonnes/day capacity was 40 km and >100 km from stability class E.
- Plotting wind trajectories from the East-South-East and from the West-South-West, with the true worst case scenario emission rates for the 6,000 tonnes/day capacity, demonstrated that both Towns of Bruderheim and Lamont could be exposed to very high SO_2 concentrations exceeding ERPG-3 Level of 15 ppm.

The FOLC's expert, Dr. Hyne, conceded during examination that the likelihood of a Macassar-type fire at the Project was very small. He indicated that properly positioned air monitoring equipment should allow for early detection and proper management of any fire by on-site staff.

The Lamont Health Care Centre was concerned with the potential risk of toxic smoke from any sulphur fire on the health of surrounding residents.

The Lamont High School Parents Council alleged that in the event of a sulphur fire, strong winds could quickly move toxic air into the town.

Ms. Leslie Jans, a local resident indicated that there are frequent strong winds in the area that have the ability to move toxic SO_2 emissions from a fire off site quickly. She had no confidence in AST's ability to control a sulphur fire, should one occur on its site. She was also concerned with the effects of toxic emissions on soil, plants and the effects on the food chain.

5.1.2.3: Spills

The FOLC expressed concern for the release of sulphur from railcars during transport through Bruderheim and elsewhere and release of molten sulphur from trucks in the case of an accident. The FOLC alleged that AST had not considered the liability for sulphur spills both on and off the Project site. The FOLC provided evidence of actual train derailments and their effects.

5.1.3: Views of the Panel

The Panel believes that risk assessments provide a valuable understanding of the risk that is introduced to an individual by a new facility. The Panel understands that everyone is exposed to a number of risks as a member of society and as a result of normal daily activities. The Panel also understands that most people differentiate between risks that are accepted voluntarily and risks imposed through the conduct of others. If people make a conscious choice to expose themselves to risk, it is generally viewed as a more acceptable risk than when risk is imposed by someone else.

The Panel is satisfied that AST has conducted a credible risk assessment of the Project using the appropriate methodology and the best information available at the time it was conducted. The Panel finds that the Centre for Chemical Process Safety failure data used by AST for the probability calculations are acceptable. The Panel agrees with AST that there is little comparative risk information. Based on AST's risk assessment, the Panel concludes that the risk from the Project is expected to be very small, being no higher than 1×10^{-4} at the fenceline. The Panel also agrees that the magnitude of the risks is consistent with risks associated with other similar industrial facilities. Therefore, the Panel concludes that the risks associated with the proposed Project are in compliance with MIACC criteria at the Project fenceline.

The Panel agrees with AST that the ratios of sodium chlorate to sulphur that were predicted as a result of the Project would not increase the risk of an explosion hazard at the adjacent Canexus facility.

The Panel understands that the upset and worst case scenarios were developed by AST after the risk assessment was concluded and that additional, more Project specific data was gathered subsequently, including extensive air modeling. The Panel also understands that the risk assessment was used solely to establish that there were risks that are associated with this type of facility, but those risks would be small. However, the risk assessment did not lay out the emergency response planning zone.

The Panel accepts that AST used the best available data that was most relevant to the proposed Project in developing the upset and worst case scenarios. The Panel agrees that the laboratory study conducted by ASRL is credible and applicable to this Project, and that a single fire ignition location is acceptable, as the safety factor accounted for multiple locations. The Panel believes that AST addressed the issue of wind propagation through the use of a generous safety factor on the sulphur burn rate prior to dispersion modeling and included further mitigation with a wind screen and limitations on the height of the storage pile subject to conditions imposed by the Panel and set out in Section 3 of this report. Therefore, the Panel finds that AST's development and characterization of the worst case scenario in the event of a sulphur fire at the Project is acceptable.

The Panel finds that the Macassar fire scenario presented by the FOLC is not applicable in this case because of the differences in underlying facts including: Macassar was abandoned, there were no fire breaks, there had been no housekeeping for some time, there was no water available for fighting the fire, there was no firefighting plan, the formed sulphur was old and it was a different type of product, the size of the pile, and

access issues. The Panel also notes that FOLC's expert, Dr. Hyne, expressed the opinion that the likelihood of a Macassar-type fire at the AST site was very small.

The Panel agrees with AST that any liquid sulphur spills within the fenceline will quickly solidify, be localized and cleaned up without causing any significant environmental effects. The Panel understands that AST does not control the liability of any spills off site as trucks and trains would not be under control of AST, but highly recommends that AST assist in the cleanup of any spills that may occur.

5.2: Emergency Response Plan

5.2.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that it recognized safety as a primary concern in any industrial facility. As such, it prepared an emergency response plan (ERP) that it stated would address all regulatory requirements and ensure public safety. AST contended that it exceeded the requirement for emergency response planning detailed within the *EPEA* Terms of Reference by creating a preliminary ERP. AST indicated that the risk assessment exercise for the proposed facility that AST undertook also indicated the need for an ERP to be developed. In preparing the ERP document, AST indicated that it used the SO_2 concentration evacuation limits contained in the ERCB Directive 071 *Emergency Preparedness and Response Requirements for the Petroleum Industry* (Directive 071), to define its evacuation zone should an incident occur. AST also indicated it incorporated into its ERP, emergency response measures outlined within the Standards Council of Canada's CAN/CSA Z731-03 (CSA Z731): *Emergency Preparedness and Response.*

AST stated that it recruited emergency response professionals to assist in the design of the ERP and to confirm that the plan would allow AST to effectively respond to any emergency. AST indicated that it welcomed additional ERP recommendations provided by emergency response professionals for enhancement of the emergency response document.

AST submitted that the most probable and significant emergency that might occur at its proposed facility is a sulphur fire which would result in SO_2 production. AST further detailed that it had redundant systems such as dual power sources, and firefighting equipment to help mitigate these emergencies. AST provided an overview of the SO_2 monitoring systems that it would have in place throughout the facility to assist in detecting an incident.

AST indicated that its awareness of the public's concerns surrounding SO_2 monitoring limits would result in AST increasing the detection sensitivity of the air monitoring units. AST stated it agreed with the FOLC positions that an SO_2 monitoring detection concentration of 4ppm was not appropriate, and AST committed to using a lower SO_2 concentration alarm level. While AST did not commit to a specific threshold limit, it did indicate that the SO_2 alarm threshold on its monitoring system could be the Alberta Ambient Air Quality Objective (AAAQO) SO_2 threshold of 450 $\mu g/m^3$.

AST acknowledged the interveners' concerns about external emergencies such as grass fires impacting operations at the Project. It stated that it is common practice to maintain

a buffer zone around industrial facilities, essentially a fire break, so that accidents occurring outside the industrial development, such as a grass fire, would not spread into and impact operations at the industrial facility. AST indicated its intent was to maintain the unused land as cultivated farm land which has a lower susceptibility to grass fires than other uncontrolled lands.

AST identified three distinct levels of an emergency through which an incident, such as a sulphur fire, could progress. AST referenced these incident levels as: Level 1, 2 or 3 emergencies and AST defined the various levels as:

- Level 1 emergency: an emergency that could be controlled with onsite personnel. No threat to the public and minimal environmental impact. No interest from outside parties. Level 1 emergencies are mostly associated with AST's "upset" scenario emergency.
- Level 2 emergency: an emergency that could not be isolated or controlled but could be managed by local fire and or emergency services. AST indicated that such local external emergency resources would come from Lamont County (the County) or potentially the Town of Bruderheim. Level 2 emergencies would also be defined by detecting any SO_2 plumes or air monitoring readings outside the proposed lease's boundary.
- Level 3 emergency: an emergency that could not be isolated or controlled and could not be managed by local fire or emergency services. AST indicated that the mutual aid organization, Northeast Regional Community Awareness and Emergency Response (NR CAER), would be contacted and public notification would ensue at this emergency level. Public protection measures such as sheltering in place or evacuation would be enacted during this level.

AST stated that regardless of the level of emergency, training on emergency response procedures and the ERP would be vital. It indicated that all on-site staff would undergo H_2S Alive, Self Contained Breathing Apparatus and Safety training.

AST stated that it considered NR CAER a world-renowned industrial mutual aid organization capable of providing trained industrial firefighters or response personnel. AST acknowledged that a portion of its emergency response plan was reliant upon the NR CAER organization for emergency response. AST however, emphasized that ultimately the responsibility of emergency response and public safety resided with itself as the licensee of the proposed facility. AST qualified that while the NR CAER call out system would be utilized should a Level 3 emergency occur there is a responsibility on behalf of the public to register with the NR CAER system so as to be included within any potential notifications.

AST agreed that membership in NR CAER is voluntary, and committed to becoming a member in good standing. It stated that part of becoming a member of good standing with NR CAER included the vetting and NR CAER peer review of AST's ERP. AST indicated that the County is a participant within NR CAER and that this review process would ensure the ERP conformed to the area standard for emergency response. AST further committed to ensuring the ERP would meet CSA Z731 requirements.

AST recognized that additional details needed to be included prior to finalizing and potentially implementing the ERP document. Upon questioning of the role of County responders during an emergency, AST stated that it interpreted the County's role during any emergency to encompass emergency response measures "beyond the fenceline." AST expanded upon this interpretation to mean such varied response activities as isolating access to the incident site, assisting in locating area residents who have special needs within the 5 ppm SO_2 evacuation zone, or hauling in additional water needed for fire suppression at the Project location. AST indicated that consultation with the County to determine the precise role of County responders during an emergency needed to occur. AST committed to undergoing such further consultation prior to commencement of operations.

AST recognized that the ERP is a "live" document and as such, ongoing consultation with the County and other stakeholders would have to occur to account for any changes in resources, throughout the life of the Project. AST acknowledged details specific to firefighting equipment and manpower resources needed during an incident had yet to be finalized. AST also stated that it intended to visit with residents "within close proximity" to the Project and would identify any special care needs or any issues that need to be addressed, should the ERP be enacted.

5.2.2: Views of the Interveners

The Friends of Lamont County (FOLC) attested that the ERP submitted with AST's EIA was not site-specific nor was it in accordance with CSA Z731 or the ERCB's Directive 071. The FOLC stated that the ERP did not include details on what protective equipment should be used and where air quality monitors should be located. The FOLC indicated that based on the surrounding population base, the emergency planning zone should be larger than what AST detailed within its ERP. The FOLC also asserted that ERCB Directive 071 emergency response requirements should apply to this Project. The FOLC emphasized that placement of the H_2S and SO_2 monitors was absolutely critical, and the placement of the detectors should be located at both high and low elevation locations within the AST fenced property. The FOLC concluded that without placement of such monitors it is possible for an emergency to go undetected and have elevated SO_2 levels extend beyond AST's fenceline. However, the FOLC's expert witness, Dr. Hyne, acknowledged that with properly selected and efficiently placed monitoring devices, an incident could probably be handled by AST on-site staff (hence AST's Level 1) and would not require outside sources to mitigate the emergency. The FOLC requested that should the Project be approved, it would like to see "live" H_2S and SO_2 monitoring results from the facility, posted directly on an internet site that is available to the public.

The FOLC contested the various SO_2 exposure criteria utilized by AST. It noted and provided evidence on various international SO_2 requirements, such as ERPG guidelines, that were more stringent than the ERCB's SO_2 evacuation guidelines that were used by AST in the development of the ERP. The FOLC attested that AST's guidelines for SO_2 levels were inconsistent with the best available guidance and practices. It took the position that much lower concentrations would be appropriate for notification and planning purposes. The FOLC specifically referenced the Acute Expose Guidelines Level 2 exposure limit of 0.75 ppm or the ERPG – exposure limit of 3 ppm to be more appropriate for notification and planning.

The FOLC attested that detection limits lower than the SO_2 4 ppm threshold used by AST would be required to identify or indicate the presence of a sulphur fire. It suggested that the detection limits should be just above the area's SO_2 air ambient levels of 0.04 ppm (120 µg/m^3).

The FOLC indicated that AST had not established that it would have the resources on site to control a sulphur fire or protect the public from a large scale emergency. It also alleged that local responders were not trained or equipped to respond to a sulphur fire. It contended that AST's response capabilities were limited to upset conditions only and the emergency response capabilities of NR CAER were overrated for this proposed project.

The FOLC contested that external incidents such as grass fires could impact the proposed facility and therefore impact resident safety. Reference was made to a large grass fire that occurred within the general vicinity of the Project in May of 2008 and the damage that this fire caused to the area. The FOLC indicated that when such emergencies occurred in areas with industrial development, public safety could be jeopardized.

The FOLC also expressed concern over the public protection measure "sheltering in place" which AST indicated could be implemented during an emergency. The FOLC indicated that in emergencies resulting in extended high SO_2 concentration levels, sheltering in place would fail to provide adequate protection.

The FOLC stated that AST had not approached residents to discuss emergency response requirements. The FOLC alleged that it would be difficult to evacuate people during an emergency as the area is largely agricultural and people could be in the field away from land line phones or in areas where cell phone coverage is unreliable. It also noted that the train crossings within the evacuation zone could block egress routes and hence impede evacuation. Members of the FOLC also indicated concern over the number of school buses that could be within the evacuation zone should an incident occur at the AST location and how these buses would be contacted in the event of an emergency. Members of the FOLC also noted the nearby industrial plants and questioned how those workers would be notified or evacuated should an emergency at the AST location occur.

The County stated that it was very concerned with the ERP developed by AST. The County contested, that contrary to what was detailed within AST's preliminary ERP regarding local fire and emergency services involvement, the responsibility of enacting an effective emergency response rests with AST. The County indicated that it currently did not have the skilled first responders or the equipment needed to deal with a heavy industrial emergency such as a fire at a sulphur forming facility. The County contended that while it is mandated through the *Emergency Management Act* to respond to any emergency within its boundaries, its responsibility would stop at the AST fenceline. The County clearly indicated that none of its firefighters, all whom are volunteers, would enter the site of the AST development in response to an emergency. Nor would the County call on any other fire departments with which it currently has mutual aid agreements to assist with addressing an emergency on the incident location.

The County also highlighted that a mutual aid understanding or agreement is not a binding contract. It stated that there is never a guarantee that another industry would respond in a mutual aid situation. The County indicated the involvement of a mutual aid partnership would depend on the partners' availability of resources at the time of the incident.

It was further identified by the County that consultation efforts with AST had been inadequate to address its concerns. It noted that under Directive 071 requirements, to which petroleum companies must abide, "...*licensee must attempt to reach a mutual understanding with local authorities on the specific needs and roles and responsibilities of each party during an emergency and include a summary of the rules and responsibilities in its ERP*." While the County recognized that the proposed Project does not fall within the Directive 071 requirements, it contended that such a statement, if adopted by AST or conditioned on any potential approval of the Project, would ensure a meaningful and appropriate evaluation of the ERP by the County.

The County contended that AST's ERP as presented was "deficient." The County expressed concern with such identified deficiencies as air monitoring devices, fire water pond configuration and fire detection systems. The County stipulated that its statutory obligation to respond to an emergency on a location with such deficiencies would put its first responders in danger as it would be the initial responder who would be asked to assist in emergency response should outside assistance be needed. Given this, the County requested that, should the proposed Project be deemed within the public's interest, AST be required to present the finalized draft emergency response document to the County for review and comment, prior to approval.

Lamont Health Care Centre stated that it was concerned for the safety of the many patients that utilize the Centre. The Lamont Health Care Centre stated that it was primarily concerned with an incident occurring at the proposed AST location which would result in the evacuation of the Centre or the need for its patients to shelter in place within the Centre. The Lamont Health Care Centre contended that its patients are part of a "vulnerable population" and the need to evacuate or shelter in place, due to an AST emergency, in a facility with a poor ventilation system could be detrimental to those people's health and safety.

The representative for the Lamont High School Council indicated concern for the safety of the students and staff members of the Lamont High School. It expressed a desire that the distances used by AST for its evacuation and notification zones should be expanded beyond the 1.5 km that AST indicated.

Joanne Bourque expressed concern for how the hospital and extended health care facility, schools and residences would be evacuated in the case of a fire.

Elk Island Public Schools was concerned with the emergency response planning for the area to ensure there would be sufficient, trained resources to deal with a major fire or other worst case scenario at the sulphur storage terminal. It also had concerns regarding collaboration with the municipal fire departments or contractors and the anticipated response times.

5.2.3: Views of the Panel

The Panel finds that the greatest potential risk to the public from the Project is a large sulphur fire and the corresponding health risk of SO_2 emissions off site. While the risk is small, the Panel agrees with AST that a risk remains. AST's ability to respond effectively to a large sulphur fire was a major issue at this hearing.

The Panel does not find any deficiencies with the evacuation zone determination limit of 5 ppm SO_2 concentration, which corresponds to the AST 1.5 km evacuation zone. The Panel finds such zone size to be acceptable.

The FOLC and Lamont County were very critical of the emergency response plan submitted by AST as part of its EIA. Both the FOLC and the County believed that they needed to be involved and consulted in the development of the ERP. The FOLC and the County also charged that the ERP was not site-specific and did not address many important operational issues that could arise in the event of an emergency.

The Panel is very concerned with the lack of meaningful discussion between AST and Lamont County concerning the availability and role of County services in the event of an emergency and how AST will coordinate emergency services with the County. This issue was of particular importance for the County which, as legislated by the *Municipal Emergency* Act, is the first responder to any emergency within its jurisdictional boundaries.

The Panel recognizes that AST expects to rely on NR CAER, a well-known area mutual aid organization, to provide assistance to AST in firefighting, and communicating with and evacuating neighbours if necessary. However, the Panel finds that the ERP prepared by AST lacks detail about the arrangement with NR CAER and the specific plans for residents within the evacuation zone. Having heard evidence from all parties, it is the view of the Panel that affected parties have an unclear and undocumented understanding of how the enactment of AST's ERP would align with local fire and other emergency services in the event of an incident.

While the Panel agrees with AST that the site identified for the Project has many positive attributes for a sulphur forming facility given its zoning, access to road and rail transportation, and its topography, it notes that the proposed location gives rise to a need for enhanced location specific emergency response procedures within the final ERP. The Panel finds that the location of the proposed project, with its proximity to two towns, Lamont and Bruderheim, as well as numerous individual landowners, raises special concerns regarding the health and safety of landowners and sensitive residents in the surrounding area such as the Bruderheim and Lamont health facilities.

The Panel is especially concerned with the lack of detail in AST's ERP concerning the emergency response actions and responsibilities of both a Level 2 and Level 3 emergency. While detail is provided regarding activities to be undertaken by AST should a Level 1 (or "upset") incident occur, there is a lack of information about response procedures should the incident escalate. Without such detail, the Panel is unable to validate AST's capacity to respond to a large (Level 2 or 3) sulphur fire and ensure the safety of the public. It is the Panel's view that one of the key public protection measures to be used by AST in the detection of larger sulphur fires (Level 2 and 3 emergencies) is

AST's air monitoring capabilities. The Panel shares the FOLC's views that placement of H_2S and SO_2 monitoring units is critical to detection of emergencies. Also, it is the Panel's view that many other questions raised by residents such as evacuation and egress, emergency notification given the large number of farming operations in the area, poor cell phone coverage and school buses traversing the evacuation zone are entirely reasonable.

The Panel recognizes the ERP appended to its EIA was preliminary and that AST was not required to complete and submit a final ERP as a requirement of completing its EIA for submission to AENV. Nevertheless, because the NRCB operates under broad public interest legislation, it interprets its legal mandate as authorizing it to look beyond the strict requirements of the EIA Terms of Reference to ensure that all relevant issues, such as detailed by the interveners, are properly canvassed and addressed. The Panel is pleased however that AST has welcomed suggestions and recommendations for improving the ERP document, and notes that such openness could be conducive to the creation of an emergency response plan acceptable to all responders with a role in emergency response.

The Panel accepts that AST provided a complete application and that the ERP was developed to meet the EIA Terms of Reference. The Panel does not question AST's intention to finalize the ERP and address the issues raised by the interveners. However, based on the factors set out above, the Panel finds, in this case, it is necessary that it review and approve the final ERP. Accordingly, this decision describes those parts of the preliminary ERP which require elaboration and enhancement and prescribes the approval process for the final ERP.

With respect to the final ERP, the Panel agrees with the AST assertion that the NRCB does not have formal guidelines or rules surrounding emergency response planning. The Panel also acknowledges that AST does not fall within the jurisdiction of the ERCB's *Directive 071, Emergency Preparedness and Response Requirements for the Petroleum Industry*. Nevertheless, the Panel encourages AST to adopt and follow relevant procedures from Directive 071.

The Panel directs AST to include within its final ERP details pertaining to who will have the charged responsibility to notify area residents and how and when this flow of communication will occur should an incident happen. Further, the Panel requires AST to include within its final ERP more detailed information pertaining to the procedures for evacuation of the public from the AST designated evacuation zone, how AST (or its mutual understanding partners) will attempt to isolate the evacuation zone from vehicles and persons traversing it, and details as to how AST will address any communication difficulties (such as poor cell phone coverage) with area residents. The Panel also directs AST to include more detailed information surrounding the roles and responsibilities of external emergency response stakeholders (such as the County and NR CAER), including emergency fire response services.

AST informed the Panel that the ERP would be completed once final design for the facility was completed and that it would be vetted and peer reviewed by NR CAER, to which AST committed to becoming a member in good standing. Information on NR CAER membership approval and peer review process was not provided in the hearing and are therefore not the subject of Panel comment. However, the Panel strongly encourages AST's membership in NR CAER and peer review of AST's ERP. Any

enhancements on the ERP that are noted by NR CAER through its peer review (of which the Panel notes Lamont County is a participant) are expected to be included within the ERP. The Panel also notes that AST committed to consult with the County to clarify and confirm the role of County responders during an emergency. The Panel expects this commitment to be fulfilled.

With respect to further consultation with the County, both the County's and AST's statements supporting the need for ongoing and additional consultation are echoed by the Panel. The Panel notes that during the hearing, AST committed to following the CSA Z731 guidelines when enhancing its ERP. Section 4 of the CSA Z731 details such guidelines pertaining to communication and consultation (among other emergency management topics). Therefore the Panel directs that the consultation and communication requirements detailed within Section 4 of CSA Z731 are to be followed and incorporated into its ERP. The Panel directs AST to consult stakeholders within the evacuation zone, document such consultation efforts and submit the results within the final ERP.

The Panel listened carefully to the interventions at the hearing and observed that many residents within the AST evacuation zone are fearful for the health and safety of their families should an emergency arise. The Panel also heard the genuine concern by County representatives over the failure to agree on a plan for the coordination of firefighting and other county services in the event of an emergency. AST urged the Panel to follow the approach of the ERCB in the Northwest Upgrader Hearing decision (EUB Decision 2007-058) in not requiring a final ERP as a condition of approval. However, due to the nature of the potential risks posed by the Project and its location in relation to residents and communities, and given the NRCB's broad public interest mandate, the Panel's finding that the AST project is in the public interest is contingent on the NRCB being satisfied that a completed ERP is in place.

Accordingly, it is a condition precedent to Panel approval of this application that AST provide the NRCB with its final Emergency Response Plan for NRCB approval before AST begins any construction whatsoever on its Project. AST may determine the timing for submission of the final ERP for NRCB approval, but the final ERP must contain sufficient detail to enable the NRCB to properly assess the adequacy of the ERP. Panel expectations for the final ERP are summarized below. In assessing the adequacy of the AST final ERP, the NRCB will have reference to relevant provisions of ERCB Directive 071 and CSA Z731 listed below and appended to this document.

Summary of Panel Required ERP Enhancements and Conditions

While the Panel views the conditions set out below as necessary for inclusion in the final ERP, it also notes that they are minimum requirements. Should AST determine that additional information pertaining to emergency response should be included in the final ERP, the Panel encourages it to do so.

In summary, the Panel requires that the following be included in the final ERP for submission to the NRCB for final approval. To facilitate all stakeholders' understanding of the level of detail the Panel is requiring of AST's ERP, the following list includes both

CSA Z731 and Directive 071[1] references in parenthesis. A copy of the referenced sections are contained with Appendix D of this report.

- Details as to who will have the charged responsibility to notify area residents and how and when this flow of communication will occur should an incident happen. (CSA Z731: Clause 4.7 and 5.4.9, Directive 071: Section 2.1.3 and Section 5.9)
- Details as to all roles and responsibilities AST's mutual understanding partners will have with emergency response actions. AST will also provide more detailed information surrounding the roles and responsibilities of all external emergency response stakeholders (such as Lamont County and NR CAER) including emergency fire response services. (CSZ Z731: Clause 4.8 and 4.10, Directive 071: Section 2.1.3)
- Details as to how evacuation of the public from the AST designated evacuation zone is to occur. (CSA Z731: 4.9, Directive 071: Section 5.2.2)
- Details as to how AST (or its mutual understanding partners) will attempt to isolate the evacuation zone. (CSA Z731: 4.9, Directive 071: Section 5.2.5)
- Details as to how AST will address any communication difficulties (such as poor cell phone coverage) with area residents. (CSA Z731: 4.12, Directive 071: Section 5.8)
- Documentation of consultation efforts with all stakeholders within the evacuation zone (cognizant of relevant privacy restrictions concerning confidential information). (CSA Z731: Clause 4.8 and 4.10, Directive 071: Section 4.0)
- Documentation of notification efforts and discussions with the Town of Bruderheim and the Town of Lamont.

SECTION 6: ENVIRONMENTAL AND HUMAN HEALTH EFFECTS

6.1: Air Emission Impacts

6.1.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) indicated that air emissions would be generated from the Rotoform HS® exhaust vents, boiler stacks, SULFATREAT® vents (treating emissions from the storage tanks), truck unloading area, pastille loading operational area and locomotive engine loading/unloading area. For the baseline case, emissions were included from the nearby Canexus plant. For the cumulative case, emissions were included from seven announced future developments in the area (between 14 and 24 km away).

According to AST, the contaminants of potential concern included carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen oxides (NO_x), particulate matter less than 2.5

[1] Directive 071 references are for ERP development purposes and are not to be interpreted as AST conducting sour gas operations or submitting to ERCB regulatory authority.

μm ($PM_{2.5}$) and sulphur dioxide (SO_2). H_2S would be expected to be liberated only at transfer points through agitation. The Rotoform HS® exhaust vents would be expected to release H_2S and $PM_{2.5}$ only. The boiler stacks would be expected to release CO, NO_x, $PM_{2.5}$ and SO_2.

AST indicated that the following measures would be taken to reduce air emissions:

- Low NO_x boilers would be employed.
- Only degassed sulphur (to 10 ppm) would be accepted. AST assured that this would be maintained through quality control/quality assurance programs and contractual obligations and penalties. It would also look to unusual odours and monitoring of H_2S as potential indications of exceedances.
- Exhaust from liquid sulphur receiving and storage tanks would be subject to a SULFATREAT® process to ensure H_2S concentrations do not exceed 1 ppm by volume.
- Dust suppression agents would be applied to all transfer points including behind the hopper and at the rail-out.
- The asphalt pad would be swept and washed on a daily basis.
- Conveyor belt systems would be covered.
- A wind screen 6.1 m in height would be constructed around the sulphur stockpile to help buffer the wind. AST indicated that winds from the west, southwest, south, southeast and northwest would be deflected up and over the stockpile by the wind screen. Buildings housing the sulphur forming equipment would help protect the stockpile from north and northeast winds.

AST employed the following approach and data sources in the prediction of ground level concentrations of the identified emissions:

- The CALPUFF plume dispersion model was used to calculate ground level concentrations from multiple emission sources including point, fugitive and mobile (based on a production output of 6,000 tonnes/day of formed sulphur – AST's current application is only for 3,000 tonnes/day).
- Point sources modeled included the four Rotoform HS® exhaust vents and the two boiler stacks.
- Area sources modeled included the pastille loading and operational area, the locomotive engine and track mobile and the SULFATREAT® vents. It was AST's view that the truck and rail tanks would be under suction when emptying their contents into the receiving tanks therefore there should be no fugitive emissions at that point; accordingly, only engine emissions were modeled in the track area.

- The pastille storage pile was not included as an area source as "*measurements have shown that 99.8 percent of the sulphur particles associated with the pastille forming process retain diameters of greater than 2 mm. Particles of these diameters are non-erodible. Large non-erodible particles would shield finer suspendable dust from actions by the wind.*" Also, $PM_{2.5}$ is generated primarily by incineration processes, but can be generated mechanically through grinding and pulverization – none of these processes are proposed to occur as part of the Project, according to AST.
- Emission results from the Alberta Shell Shantz facility were used for the Rotoform HS® units.
- $PM_{2.5}$ and PM_{10} emissions for the loading area were estimated from sand and gravel operations that use a front-end loader.
- Maximum values for background concentrations measured at the Lamont continuous monitoring station (part of the Fort Air Partnership) were used rather than the 90 percentile concentration recommended by Alberta Environment, except for $PM_{2.5}$ which used the 98 percentile value, if the values were higher than the predicted values.
- Wind data were collected at the Lamont air quality monitoring station while all other climate data were collected at the nearest source of climatological information, the Edmonton International Airport at Leduc. The predominant wind direction was from the southwest.
- Ground level concentrations for 5,264 receptor locations, as well as acid deposition (SO_2 and NO_x), particulate deposition (emissions of sulphur particles) and ozone formation were predicted.

AST provided Table 1 which summarized and illustrated the results of the ground level concentrations modeled for the cumulative case. According to Table 1, the maximum concentrations of all contaminants for the various averaging periods would remain below the Alberta Ambient Air Quality Objectives (AAAQO) within the Project fenceline. There was no change between the application case and the cumulative case, demonstrating that proposed projects in the area would not have an effect on the predicted ground level concentrations for the application case.

Table 1: Maximum Ground-Level Concentrations of Criteria Pollutants Predicted for the Study Area (Cumulative Case) (Table 2.6-2, Volume IIA, Air, Noise and Human Health Environmental Impact Assessment)

Air Contaminant	Averaging Period	Observed Ambient Background Concentration ($\mu g/m^3$)	Maximum Predicted Ground-level Concentration ($\mu g/m^3$)	Total Ground-level Concentration, Including Background ($\mu g/m^3$)	AAAQO ($\mu g/m^3$)
CO	One-hour	5,800.0	238.00	6,038.0	15,000
	8-hour	3,300.0	51.40	3,663.0	6,000
H_2S	One-hour	8.0	2.20	10.2	14
	24-hour	2.3	1.00	3.3	4
NO_2	One-hour	102.0	209.00	311.0	400
	24-hour	55.0	39.00	99.0	200
	Annual	15.0	2.20	16.2	60
$PM_{2.5}$	24-hour	20.5*	6.00	26.5	30**
SO_2	One-hour	120.0	19.40	139.4	450
	24-hour	35.0	0.60	35.6	150
	Annual	7.0	0.03	7.0	30

Notes:
* 98^{th} percentile value.
** The CWS applies to community centres and not to maximum predicted impacts.

AST also indicated that Project emissions would not lead to ozone creation as meteorological conditions within the Local Study Area are such that NO_x emissions result in the scavenging rather than the creation of ozone.

AST proposed to monitor wind speed and wind direction, ambient H_2S, and $PM_{2.5}$ concentrations at one location on the site boundary on a continuous basis. AST indicated that the information is not expected to be available in real time online but it committed to making this data available to the public on a non-real-time basis

AST also proposed an H_2S and SO_2 monitoring program with personal monitors and continuous monitors in the vicinity of the liquid sulphur storage tanks, sulphur reception area, inside the forming building and in the sulphur load-out area. It also proposed source emissions testing on Rotoform HS® exhaust vent emissions for compliance, and ambient air monitoring once per year to evaluate potential fugitive emissions of elemental sulphur. It stated that compliance and ambient monitoring programs would be designed as a condition of the EPEA approval.

AST indicated that it was a member of the Northeast Capital Industrial Association who is a major funder of the Fort Air Partnership. AST committed to being a member of the Fort Air Partnership and also committed to participating in regional initiatives relative to air quality issues.

AST indicated that the Project's contribution to greenhouse gas emissions (GHGs) would be approximately 3,600 tonnes/year for the Project output of 3,000 tonnes/day of

pastilles. The source of GHGs from the Project would be from the natural gas fired boiler which would consume approximately 100 tonnes of gas per month (20,000 GJ/month). AST concluded that the transportation of sulphur to and from the facility would occur in any event and hence does not add to the overall emissions of GHGs.

6.1.2: Views of the Interveners

The Friends of Lamont County (FOLC) submitted that the County's airshed was already overloaded with contaminants and the FOLC was concerned with the existing air quality and cumulative air effects of the Project.

The FOLC attested that AST underestimated or did not address the potential effect of H_2S, fine particulates (dust) and SO_2. Examples of deficiencies the FOLC noted were:

- Too much confidence was placed in the diligence of others with respect to the removal of residual H_2S in the feed liquid sulphur to specified levels and too little methodology was provided for "on-site" confirmation of the level.
- Fugitive H_2S from unloading road or rail transportation vessels did not appear to be included in the dispersion modeling.
- The Rotoform HS® exhausts did not have any treatment for H_2S.
- Fine particulates from the pastille pile, conveyors and rail loading point did not appear to be included in the dispersion modeling.

The FOLC expressed concern that the effectiveness of the wind screen was not evaluated. The FOLC contended that there would be turbulent flow behind the wind screen which could lead to upward suction of surface fines from the stockpile.

The FOLC expressed concern that buildings and vehicles within the Town of Bruderheim and farm buildings and equipment in the area would be subject to corrosion from SO_2 emissions from the facility.

The FOLC contended that the proposed onsite monitoring was insufficient.

The FOLC requested that the following conditions be placed on the approval if the Project were approved:

- AST's operation should not commence until an effective and comprehensive ambient air monitoring network is established in the Industrial Heartland Area.
- AST should install and maintain permanent total perimeter, continuous air monitoring stations at the Project fenceline to effectively monitor air emissions from the Project and provide the monitoring data to the public via an independent third party website, including $PM_{2.5}$, H_2S and SO_2.
- AST should install and maintain permanent continuous air monitoring stations at each occupied residence within 2 km of the Project fenceline to effectively monitor the emissions from the Project and provide the monitoring data to the public via an independent third party website, including $PM_{2.5}$, H_2S and SO_2.

- AST should install and maintain H_2S and SO_2 total perimeter monitors with audible alarms.

Lamont County was concerned with potential Project impacts on air quality in the surrounding area. It accepted that appropriate monitoring of ongoing operations could ensure that migration of fugitive emissions do not exceed predictive modeled conditions.

The Town of Lamont stated that it wanted any business, as a condition of its licence, to meet air quality standards – which would require air quality monitoring stations and regular reporting. If the business did not meet those standards at any time, it suggested automatically revoking the business license.

6.1.3: Views of the Panel

The Panel is aware that the air assessment modeled was for a 6,000 tonnes/day output but the application being considered was for 3,000 tonnes/day.

The Panel finds that AST used the best available data and made the appropriate assumptions in a conservative manner to conduct air dispersion modeling used for determining the predicted ground level concentrations of air emissions. The Panel recognizes that the Lamont continuous monitoring station, part of the Fort Air Partnership, provides appropriate background concentrations for the contaminants of concern at the Project location. The Panel accepts that there will not be significant fine particulate emissions from the sulphur stockpile as the pastilles are considered a premium product which has reduced friability.

The Panel agrees with AST that the system proposed for unloading of the degassed liquid sulphur from the railcars and trucks will not generate significant H_2S emissions. However, the Panel reiterates (see Section 3.1.3) that there needs to be effective air monitoring to detect liquid sulphur that may not have been degassed to 10 ppm H_2S.

The Panel agrees that the model used (CALPUFF) to determine the maximum ground level concentrations is appropriate for the type of emissions that are expected to be generated from the Project and the terrain of the area.
The Panel finds that the modeled maximum ground level concentrations are shown to be below the Alberta Ambient Air Quality Objectives (AAAQO). However, the Panel notes that modeled maximum ground level concentration of H_2S and $PM_{2.5}$, are approaching the AAAQO for the cumulative case. It also believes that the results from dispersion modeling are accurate only to the extent that assumptions made are correct and believes that monitoring is required to verify those assumptions. The Panel accepts AST's commitment to having a continuous air monitor for wind speed and wind direction, H_2S, and $PM_{2.5}$, and recommends that AST work towards having monitoring data available to the area residents, in a timely manner. The Panel also understands that there will be compliance and ambient monitoring programs as part of the Alberta Environment (AENV) approval and recommends to AENV that H_2S and SO_2 be monitored as part of the ambient program. The Panel notes AST's commitment to consult with its experts for determining optimal locations for continuous and passive air monitoring equipment.

The Panel agrees with AST that the Project's emissions will not lead to ozone creation, since the meteorological conditions in the Project area are such that NO_x emissions result in the scavenging rather than the creation of ozone.

If there are cases where exceedances of AAAQO are detected, the Panel is confident in AENV's ability to deal with the issue using its regulatory tools.

The Panel believes that the FOLC's request to have continuous air monitoring stations at all the nearby residences is excessive; however, the Panel recommends that AST work with community members to agree on appropriate air monitoring at residences, potentially making use of passive monitoring technology.

The Panel believes that there is already a comprehensive air monitoring network available through the Fort Air Partnership. The Panel sees value in AST's participation as an active member of the Fort Air Partnership and recommends that it maintain active participation. The Panel also recommends that AST be involved in other initiatives that may come forward to reduce air emissions on an Industrial Heartland Area level or on a provincial level.

The Panel does not believe that any evidence has been brought forward to show that SO_2 emissions from the Project would be at levels high enough to cause corrosion to buildings or equipment in the vicinity.

The Panel agrees that the Greenhouse Gas contribution from the Project will be minimal.

6.2: Groundwater Impacts

6.2.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) presented results of a comprehensive geologic and hydrogeologic investigation conducted on the Site. The investigation consisted of test drilling, piezometer and water table well installation, tests for permeability, characterization of groundwater quality and determining the groundwater flow directions and flow rates beneath the Site. AST's main conclusions from the investigation were as follows.
Bedrock beneath the Site consists of claystone, siltstone and sandstone of the Belly River Formation. The bedrock is overlain by 3 to 8 m of unconsolidated sediments consisting of glacial till and glaciolacustrine clay, silt and sand.

AST stated it encountered two zones of sandstone units within the bedrock. One zone was present at a depth between 80 and 83.5 m, while the other was present at depths ranging from 5.8 to 14.9 m. AST indicated that, based on information from published reports and from Alberta Environment (AENV) water well logs available for the region, the shallow sandstone zone was also present in adjacent sections of land and was commonly used as an aquifer by local residents for both household and livestock supply. AST was confident that the shallow sandstone units beneath the Site and adjacent sections are hydraulically connected.

AST said it performed pumping tests on both the shallow and deep sandstone units beneath the Site. It indicated that results of the pumping tests showed that water from

the deeper sandstone unit was available in only minute amounts and that its chemical quality was too poor for livestock or human consumption.

AST said results of the pumping test on the shallow sandstone unit indicated that it would be possible to withdraw up to 1.7 igpm from the aquifer on a sustainable basis and that this amount would not be enough to supply its requirement for cooling tower makeup water of about 5 igpm.

AST said that because the amount of groundwater available from the aquifer was insufficient for its requirements, and because of concerns of such use expressed by local residents, it had decided not to use groundwater from the Site. Instead, AST provided evidence that it had secured an agreement in principle with Lamont County to use water from the Lamont County Water Utility as needed.

AST was confident that water level measurements taken in numerous piezometers and water table wells located throughout the Site indicated that the primary direction of the hydraulic gradient and groundwater flow within the unconsolidated sediments and the shallow sandstone aquifer was from south to northeast. It said this was in approximate agreement with the regional topographic gradient, or slope, which is also from south to north.

AST also said it determined that the vertical hydraulic gradient beneath the Site ranged from neutral to slightly upward and the northeast shallow groundwater flow was generally directed parallel to the ground surface and slightly upward toward the ground surface in some places.

AST indicated that the possibility exists for soil and groundwater acidification resulting from deposition of elemental sulphur in the PDA and the subsequent transformation of the sulphur to sulphuric acid through bacterial oxidation. It concluded, however, that there is a large reservoir of acid buffering minerals such as calcium and magnesium carbonate in the soil and the resulting alkalinity would neutralize any reduction in pH for an extended period of time. AST said that, given the predicted rates of sulphur deposition and the existing soil buffering capacity, any measurable effects of sulphur deposition on soil and groundwater pH and quality would be confined to the PDA over the 25-year lifetime of the Project.

AST acknowledged that dissolved sulphate would be formed as a result of atmospheric deposition of sulphur near the facility and the sulphate would subsequently be transported in groundwater. It further acknowledged that the groundwater systems below the PDA are also potentially connected to five registered water wells located immediately north of the Site.

AST said that hydraulic conductivity measured in three wells completed in the shallow sandstone aquifer ranged from 2.1×10^{-7} to 6.6×10^{-6} m/s and that the geometric mean of those conductivities is 1.8×10^{-6} m/s. AST determined that the hydraulic gradient within the upper bedrock sediments ranged from 0.005 to 0.009 m/m, with an average of 0.007 m/m, using water level elevations from six wells completed in near surface bedrock sediments. It estimated the effective porosity of the shallow sandstone aquifer to be 20 percent.

AST used the geometric mean hydraulic conductivity of the shallow sandstone unit, the average hydraulic gradient of 0.007 m/m within the upper bedrock sediments, and its estimate of effective porosity of 20 percent to derive a representative lateral groundwater flow velocity of 2.0 m/yr. It said that using these values along with a distance of 1,000 m between the principal development area and potential receptor wells to the north resulted in a minimum time of 500 years for potential contaminants to traverse that distance.

AST said that dissolved sulphate concentrations appear to be naturally elevated in surficial deposits at the Site and reported that concentrations range from 787 to 1,380 mg/L at three test holes. It stated that mechanisms of natural attenuation, such as precipitation of gypsum, mechanical dispersion and molecular diffusion, would limit the concentrations of additional sulphate that could be transported to the northern site boundary.

AST proposed to monitor the shallow groundwater quality biannually at locations between the potential sources of contamination (e.g. the plant site, water storage pond, liquid sulphur storage tanks and the loading and off-loading facilities) and that, because of the very slow rate of groundwater movement, it would have ample time to design and implement any remedial actions to stop off-site movement of contaminants if this would be required.

AST also committed to monitor water quality in any of the five registered water wells it said were located down gradient (north) of and in close proximity to the Site, if the well owners want it to do so. It said that any on-site and off-site groundwater monitoring program would typically be designed to detect any changes in groundwater quality that might be attributable to the facility over time.

AST was confident that the design of the facility and its general operations procedures would mitigate against any potential groundwater contamination beneath, and adjacent to, the Site. It said that such preventative measures would include the following:

- The proposed sulphur pastille storage pile would be located on an asphalt pad surrounded by a ditch to prevent any precipitation that comes in contact with the sulphur pile from leaving the Site. Any water entering the ditch would be disposed of into the water retention pond or hauled to an approved disposal facility.
- The storage pad would be cleaned on a regular basis to avoid build-up of waste sulphur and keep it from entering the water drainage system.
- The cooling water retention pond would be double lined with a compacted clay and a synthetic liner. The liners would be separated by a drainage layer that would be monitored so that any leakage through the synthetic liner could be detected and collected, and leakage through the clay liner prevented.
- Storage tanks for liquid sulphur would be constructed of impervious concrete, surrounded by a gravel layer, and would also be monitored for potential leakage.

AST explained that it did not conduct a field-verified survey of water wells located within a 1.6 km radius of the facility for two reasons. First, AST's consultant directed its staff

not to request access to residents' water wells because such requests might be perceived as being harassing or disrespectful. Second, AST indicated that because it had decided not to pursue permission to divert groundwater for industrial use, it asked AENV representatives if it should continue with the well survey. AST indicated its decision to abandon the well survey was supported by AENV.

6.2.2: Views of the Interveners

The Friends of Lamont County (FOLC) stated that most of its members living in proximity of the proposed facility depend on and use groundwater from shallow wells as their main or total water supply. It said groundwater was used for the purpose of human consumption, household supply, stock watering and greenhouse operations.

The FOLC expressed concern that AST did not conduct field verification or inspection of its water wells as was required by the Terms of Reference issued by AENV.

The FOLC was specifically concerned that the proposed facility would degrade the water quality in its water wells, that the water would no longer be useable for current purposes and its consumption could result in health problems. The FOLC was also worried that the industrial use of groundwater by AST would reduce the amount of groundwater available to the FOLC, cause groundwater supplies in its wells to diminish and its water wells to go dry. The FOLC believed that its property values would decline because of AST's effects on groundwater quality and availability beneath its lands.

The FOLC was concerned that if its groundwater quality and availability were adversely affected by the facility, it would have no recourse to have the problems rectified. It proposed that before AST's operation commenced, AST should conduct a regional groundwater assessment that would include flow rate and water quality testing of all water wells within 2.5 km of the proposed site. It also said that AST should establish a program to have all the FOLC water wells similarly tested on an annual basis if the Project commenced. The FOLC was of the opinion that AST should provide funding for that testing program.

Finally the FOLC requested that AST establish a contingency fund to secure clean water resources for any landowners whose water wells might be affected by the Project.

6.2.3: Views of the Panel

The Panel acknowledges AST's diligence in conducting a comprehensive and professionally competent groundwater investigation at the Site. However, the Panel notes that most of AST's geological and hydrogeological characterization was limited to the southern half of the Site and much of the investigation did not extend to the depth of an important shallow sandstone aquifer identified by AST. The Panel also notes that AST has shown that geologic conditions relating to the surficial and shallow bedrock sediments beneath the Site are complex, both in regard to sediment composition and lateral continuity.

The Panel agrees with AST's conclusion about the existence and distribution of a shallow bedrock aquifer beneath the Site, the hydraulic continuity of that aquifer to the north and its connection to water wells located immediately to the north. Similarly, the

Panel agrees that this aquifer will not be capable of sustained production at the rate specified and needed by AST without resulting in undue interference with water well yields located adjacent to the Site. The Panel therefore agrees with AST's conclusion and commitment to use water from the Lamont County Water Utility for use as cooling tower makeup water.

Because of AST's commitment to use an alternative water source for this Project, the Panel agrees that AST's request to AENV not to conduct a survey of water wells within 1.6 km of the Site was reasonable. However, the Panel agrees only with respect to potential interference with future availability of groundwater to users residing on adjacent lands. The Panel concludes that AST's facilities and their operation will not impact the amount of groundwater available to users on adjacent lands.

The Panel accepts and agrees with AST's evidence that acidification of soil and groundwater will not occur beyond the Site of the facility, because of the readily available calcium minerals in the soil and its resulting high alkalinity and buffering capacity. The Panel also agrees that AST's evidence shows that high naturally occurring sulphate concentrations exist in groundwater within surficial sediments in some places beneath the Site.

The Panel notes and accepts AST's evidence that the natural direction of shallow groundwater flow is to the north and northeast, and in the direction of up to five shallow registered water wells located north of the Site. The Panel also accepts that any impacts to shallow groundwater chemistry, such as elevated sulphate concentrations, may be evident in those wells.

The Panel also acknowledges AST's calculations of groundwater flow velocities to the north-northeast. The Panel believes that because of the complexity of geologic conditions beneath the Site, it is quite possible that determination of shallow sandstone hydraulic conductivity in only three wells, and hydraulic head of shallow bedrock units in six wells may not be sufficient to characterize hydraulic conditions of the sandstone with regard to these two parameters. The Panel, as a condition of its approval, therefore directs AST to collect additional information about hydraulic conductivity of geologic materials at the Site and local hydraulic gradients to the satisfaction of AENV, before it designs and implements its groundwater monitoring program for the Project. The Panel also agrees with AST's commitment to include monitoring of any of the five registered water wells located north of its site for groundwater quality changes as part of its monitoring program, if owners of those wells request such monitoring.

The Panel acknowledges the FOLC's suggestion that AST conduct a regional groundwater assessment that would include flow rate and water quality testing of all water wells within 2.5 km of the proposed site. However, while the Panel recommends that more groundwater information may be required for the northern part of the Site, it agrees with AST's evidence that the principle direction of groundwater flow is to the north and northeast. The Panel therefore does not support the suggestion by the FOLC for a regional groundwater assessment.

6.3: Surface Water Impacts

6.3.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that baseline studies and effects assessments were conducted for surface water quantity and surface water quality for the proposed sulphur forming and shipping facility (the Project). AST described existing water quantity characteristics, baseline surface water and sediment quality, analyzed significant potential impacts on surface water due to the Project, outlined mitigation plans to minimize these effects, and proposed a monitoring plan and implementation program to assess the impacts to surface water and mitigation plan performance.

AST stated that assessments were based on spatial boundaries comprised of a Local Study Area (LSA), defined as the boundary of Section 35-55-20 W4M (the Site), and a Regional Study Area (RSA) set 500 m beyond the Site boundary on the north and east sides and followed the local watershed boundary on the south and west sides. The Principal Development Area (PDA) was considered as the sulphur forming and shipping facility (west-central portion of the Site) and the rail transfer loop. AST chose temporal boundaries that coincided with current conditions, the anticipated lifespan of the Project (25 years) at maximum disturbance, and closure. Other projects considered in the surface water assessment included anthropogenic disturbances in close proximity to the Project, particularly two sodium chlorate plants, one fabrication facility, and each of the Lamont and Bruderheim wastewater treatment plants.

AST outlined that to characterize the surface water and climatic environmental setting for the assessment of surface water quantity, long-term regional data, available literature and data sources, and short-term Project area-specific information observed through field monitoring visits were used.

AST stated that areas influenced by surface water included a dugout in the northwest quarter section of the Site, an ephemeral, marshy wetland area in the northwest quarter section, a relatively smaller waterlogged marshy area in the northeastern region of the Site (along the southern edge of the CPR rail line), and two ephemeral drainages, one running south to north through the western half of the Site and the other south to north through the eastern half of the Site. Topography and drainage at the Site were typical of that within the Beaverhill watershed, sloping gently from north to south towards the North Saskatchewan River and being poorly drained ground moraine. AST identified Elk Island National Park, Cooking Lake-Blackfoot Recreation Area, Beaverhill Lake, designated a Wetland of International Importance by the RAMSAR Convention in 1987, and the Cooking Lake Moraine area, one of four important areas identified by the Nature Conservancy of Canada for its mosaic of grasslands, woodlands, and wetland habitats, as also being within the Beaverhill watershed.

AST stated that historical transportation construction (i.e. roads and railway lines) around and within the Site have altered Site specific conditions, reducing the natural drainage and increasing the amount of wetland area on the Site. Culverts were determined to be primarily responsible for surface water drainage from the Site. AST surmised that drainage and surface water flow was likely present and controlled on Site during snowmelt and precipitation events. AST submitted that the Site calculated water

balance was approximately equal (i.e. total annual inputs of 80,200 m^3/y and total annual outputs of 80,000 m^3/y), with negligible groundwater-surface water interactions. AST stated that while there is potential for minimal groundwater discharge to the wetland area in the northwest corner of the LSA, the wetland was interpreted to not recharge to the groundwater. Peak instantaneous flow calculations were also conducted for the Site under various precipitation events. AST concluded that under assessed conditions, erosion and sediment transport was not an issue within the LSA.

AST stated that monitoring and sampling investigations, including surface water quality, sediment quality and snow monitoring at various locations within the LSA, RSA, and beyond, including locations within Lamont Creek and Beaverhill Creek, were conducted between June 2006 and March 2007. AST noted that some surface water sampling locations were dry during some sampling events due to their ephemeral nature. Samples were collected and analyzed for field parameters (temperature, electrical conductivity, pH and dissolved oxygen), routine water chemistry parameters (i.e. major ions), nutrients (nitrogen and phosphorus), total suspended solids and turbidity, dissolved and total trace metals, and organics (oils and greases, total petroleum hydrocarbons, total extractable hydrocarbons, and benzene, toluene, ethylbenzene, and xylene). AST compared collected samples and data against Alberta Surface Water Quality Guidelines, Canadian Water Quality Guidelines and Canadian Sediment Quality Guidelines.

AST noted that results from baseline surface water, snow and sediment quality samples were typical of what would be expected in the region. Field measured water quality results and pH values generally indicated alkaline conditions, with pH values generally lower during winter sampling activities. AST stated that electrical conductivity values were generally greater than 700 µS/cm, with significantly larger values in winter due to proportionally greater groundwater/baseflow contributions to surface water and/or concentration due to ice formation. Dissolved oxygen concentrations were above 7.0 mg/L within Lamont Creek, which exhibited hypereutrophic characteristics, but were significantly below Alberta Surface Water Quality Guidelines within Beaverhill Creek, indicating anoxic conditions and eutrophic to hypereutrophic characteristics.

AST noted that, in general, major ion and routine parameter concentrations were within Alberta Surface Water Quality Guidelines and all ion concentrations were relatively low. Seasonal variability, typically with higher winter concentrations, was also observed. AST indicated that slightly elevated chloride concentrations, higher than expected background concentrations, were likely the result of possible anthropogenic sources (e.g. wastewater treatment plants, road salts and dust suppressants).

AST stated that most surface water and sediment metal concentrations were generally below Alberta Surface Water Quality and Sediment Quality Guidelines, with a few exceptions. AST noted that generally, surface water and sediment samples analyzed for organics were below or near analytical detection limits. AST stated that snow samples were in general agreement with surface water samples and were not influenced substantially by acid generating deposits.

AST identified construction and operation of the PDA as being located within the western drainage basin of the Site. AST predicted that because the PDA was relatively small in area compared to the drainage basin and that because the PDA would essentially have a closed circuit drainage system, surface water quantity, including the water balance and

peak flows, would not be significantly affected by the Project. No surface water, other than that collected within the surface water runoff collection pond, was proposed to be collected or used. AST proposed to implement surface water management measures to minimize changes to surface water quantity during construction and operation. These included installation of defined crossings of watercourses, using stormwater management facilities to collect, convey, and contain surface water runoff from the PDA into the appropriately sized surface water runoff collection pond, and providing appropriate culverts for the Site. Best management practices were also proposed. AST expected negligible cumulative hydrologic effects due to the Project.

AST stated that potential changes to surface water quality could produce adverse effects to other components of the ecosystem including aquatic resources and human health. AST described that surface disturbances during Project construction had the potential to cause changes in water quality, primarily relating to erosion and sediment runoff as a result of activities close to waterbodies and changes in land use. AST proposed to mitigate these potential impacts by preventing the release of silt and sediments, including measures to minimize disturbances near streambanks, creating setback distances (at least 100 m) from waterbodies where practicable, installing defined crossings of watercourses, following best management practices to minimize erosion, developing a stormwater management plan, and diverting potentially impacted runoff to the wetland located in the northwest corner of the Site. AST stated that during the operational phase of the Project, increased runoff might be produced from paved and hard packed areas and might potentially contain deleterious substances. Proposed mitigation included the diversion of potentially impacted runoff to the surface water runoff collection pond and/or the wetland located in the northwest corner of the Site. AST also noted that wash water potentially generated from maintenance of the sulphur pastille storage pad would be directed to the collection pond.

AST stated that runoff from the PDA would be collected into a surface water collection pond. The collected water was proposed to be used for cooling water and firefighting purposes. AST predicted that under normal operating conditions, when collected water is used as the primary cooling water source, the collection pond might have a net zero or net negative water balance, with additional water provided by Lamont County Regional Water Utility as required. AST noted that additional make-up water provided by the Lamont Regional Water Utility line might be required to maintain minimum water volumes in the collection pond for firefighting, but that the Lamont Regional Water Utility line would not be relied on for firefighting purposes. AST did not know of any required upgrades that would be required to the Lamont Regional Utility water line to fulfill this purpose.

AST proposed that the runoff water collection pond would have a volume capacity of approximately 11,000 m^3. This was calculated to be in excess of the runoff associated with the 1 in 25 year, 24-hour rainfall event (approximately 4,600m^3) in addition to the proposed volume of water required for firefighting purposes (approximately 6,000 m^3). AST noted that the collection pond would be double-lined (60 mil high density polyethylene liner over compacted clay), and would have monitoring, sampling, testing, and neutralization as required. A Site drainage system and a high density polyethylene lined perimeter ditch would convey water to the surface water runoff collection pond. AST stated that potential flooding within the LSA would not adversely affect the Project as the PDA would be graded to contain all runoff from the sulphur forming and storage

areas, to divert other runoff water around the area, and that the surface water diversion system would be designed and that the surface water diversion system will be adequately and appropriately designed. AST also noted that potential wash water generated from maintenance of the sulphur pastille storage pad would be directed to the collection pond.

AST stated that the potential for changes in surface water quality as a result of acidifying compound deposition would consist primarily of nitrogen and sulphur oxide stack emissions from the sulphur forming plant and windborne emissions from the sulphur pastille storage and handling processes. AST stressed that areas with naturally high buffering capacities were advantageous locations for sulphur forming and handling facilities because acid deposition can cause pH reductions, increasing the mobility of some trace metals in surface water, reducing water quality and potentially adversely affecting aquatic systems. AST stated that surface water sample analysis was used to evaluate the sensitivity of surface water specific to the Site, with the most important constituent being alkalinity. AST concluded that the wetland area, streams and creeks at the Site have high buffering capacity and negligible sensitivity to acidification. AST also concluded that potential acid input rates from the Project would be significantly lower than the critical load of acidity at the Site, based on comparisons of the potential acid input and calculated critical load of acidity. AST stated that the impact of the deposition of dry acidifying compounds on snow and subsequent melting was not expected to impact the LSA or RSA.

AST proposed to implement an environmental management system to ensure sulphur oxide emissions would be minimized, further mitigating the potential impacts on surface water from deposition of acidifying compounds. This included, but was not limited to, establishment of an air quality monitoring program, a surface water monitoring program, implementation of safe operational procedures to reduce the potential for accidental or uncontrolled releases, and development of an emergency response plan for potential unplanned events. AST stated that cumulative effects were considered, that the effects of the Project on surface water quality were predicted to be low to moderate, and that the Project was not anticipated to release other deleterious compounds into the aquatic ecosystem. Therefore no cumulative effects were anticipated.

AST stated that potential for upset conditions, generally the result of unplanned events, could result in a negative impact to receiving surface water quality. AST proposed to implement an environmental management system to mitigate potential impacts from upset conditions to surface water quality. This included, but was not limited to, work procedures to reduce the potential for upset conditions, development of an emergency response plan, management and application of chemicals required for processing to be in closed systems, runoff from the sulphur forming and storage areas being collected into the surface water collection pond, the initial sulphur load-out and transfer tank comprising an in-ground concrete tank, leak detection systems surrounding transfer and storage tanks and pastille storage area, and an asphalt storage pad for pastilles with run-on and runoff controls. AST stated that the surface water collection pond would have monitoring, sampling, testing, and neutralization (if required) prior to release, where a controlled release was required. AST stated that controlled releases from the runoff collection pond (if required under extreme runoff events) and other areas outside the PDA would be diverted to the wetland in the northwest corner of the Site. The estimated volume of released water was predicted to be less than three to four percent of the total flow to the wetland under such conditions. AST stated that it was difficult to calculate

potential water chemistry or total dissolved solids from the surface water collection pond, which might include chemicals associated with corrosion inhibitors, cooling water conditioning chemicals and bio-fouling agents. AST concluded that the wetland had a high acid neutralizing capacity, would likely be able to contain the total volume of water anticipated to be released, and would improve the water quality through retention, filtration, and biodegradation prior to discharge to Beaverhill Creek.

AST stated that if water samples collected from the collection pond indicated that the water was unsuitable as a source of cooling water supply, the water would be collected, shipped and disposed of at a water disposal facility. AST noted that no water quality requirements would be imposed for use of water from the surface water collection pond as an emergency or firefighting source of water. AST emphasized that no wastewater would be generated or released from the Project or Site and that all wastewater would be stored and disposed of appropriately.

AST stated that an assessment had not been conducted with respect to Lamont County stormwater drainage system in relation to the northwest corner of the LSA or adjacent road allowance. AST did not believe there would be an impact on the stormwater drainage system as no impact was expected on surface water drainage within the LSA.

AST proposed hydrological and surface water quality monitoring during construction and operation activities to ensure impacts were mitigated. All sampling locations were yet to be determined, but were suggested to include surface water at the Site (i.e. drainages and wetlands), surrounding creeks (i.e. Lamont and/or Beaverhill Creeks), and possibly potentially impacted dugouts and other surface water bodies surrounding the Site. AST suggested that monitoring of surface water quality be conducted at a reasonable frequency, consistent with groundwater monitoring, and that any water released from the runoff collection pond be sampled and tested to comply with Alberta Surface Water Quality Guidelines and Water Quality Based Effluent Limits. AST also stated that the surface water quantity and quality monitoring program would be adaptively managed.

6.3.2: Views of the Interveners

The Friends of Lamont County (FOLC) expressed concerns regarding interactions and negative impacts of the Project on surface water quantity. The FOLC submitted that considerable water had been observed within the proposed Site in the 1970's. The area at that time was known as, or to be part of, Mud Lake with an approximate depth of 4 to 5 m and would temporarily close local roadways. The FOLC noted that the Site was in a relatively low area and that runoff from the Site had previously overtopped the highway and railway line. The FOLC stated that the considerable potential volume of water was not adequately assessed by AST and was concerned with what impact the Project would have on its members' water supply. The FOLC stated that water diversions or changes to drainage on the Site might interfere with current surface water rights agreements. The FOLC felt that there was no convincing evidence that a volume equal to three hours of fire water protection in the collection pond was adequate to ensure safety should an incident occur.

The FOLC expressed concerns regarding the interactions and potentially negative impacts of the Project on surface water quality. The FOLC stated concerns that water quality in dugouts, used as water sources for livestock, would become contaminated and

not suitable for watering. The FOLC submitted that acidic runoff from the Site, and specifically the sulphur pastille storage pile, would impact surface water quality in surrounding dugouts and creeks, specifically Beaverhill Creek. Concerns were also presented regarding surface water contamination as a result of sulphur dust deposition. The FOLC noted that there was no proposed wastewater runoff collection, treatment or disposal system. The FOLC stated that relatively little detail was given outlining how water contamination was intended to be prevented, or what activities would be undertaken should surface water contamination as a result of the Project occur. The FOLC submitted that those dugouts and other surface water bodies surrounding or in reasonable proximity to the Site should be included in surface water sampling activities and reported accordingly.

Lamont County expressed concern regarding the stormwater drainage system at or near the Site. With increased traffic and stresses on the road and infrastructure, particularly near the northwest corner and wetland at the Site, the County wanted to ensure that adequate compensation and maintenance would be provided to maintain and/or upgrade the roadways and stormwater drainage system. Lamont County requested that issues regarding stormwater drainage be addressed through the condition of a development agreement, ensuring that there would be no inappropriate interference with the stormwater drainage pattern in the vicinity of the Site.

Lamont County also stated that there was no certainty that the County water line could accommodate the volume of water required by AST and that upgrades to the water supply system would be the responsibility of AST. Lamont County noted that the water line would have to be extended approximately half a mile to the Site and that an increase in the size of line might also be required. Lamont County stated that there was uncertainty in the calculation and determination of the required volume of water (6,000 m^3) in the collection pond and the adequacy of providing for three hours of fire water for firefighting purposes. Lamont County expressed concern relative to the availability of water to respond to an emergency on Site. Uncertainty as to the total volume of water required to fight a worst case scenario and to the rate of water that would be required remained. Lamont County stated that the Regional Water Commission Line might not have the capacity to supply water beyond the proposed three-hour limit for a worst case scenario emergency and that an alternative source of water for the purposes of fighting a worst case scenario fire had not been addressed beyond the three-hour limit of the stormwater collection pond. Lamont County submitted that a development agreement would be required to ensure adequate water supply from the County's water system to the Project.

Elk Island Public Schools stated concerns regarding the possibilities and uncertainties associated with surface water and wastewater runoff. Leslie Jans, the Lamont High School Council, and Elk Island Public Schools stated concerns regarding the possibilities and uncertainties associated with sulphur dust contamination of surface water and wastewater runoff.

6.3.3: Views of the Panel

The Panel acknowledges that surface water quantity and quality issues are important to understanding potential environmental impacts. Surface water plays an important role in ecosystem and human health. The Panel finds that reasonable work was conducted by

AST on the baseline studies and effects assessments for surface water quantity and quality for the Project.

The Panel understands that the surface water quantity assessment conducted by AST, specific to the Site, was based on pertinent available data and literature, as well as Site specific information obtained during field activities. Anecdotal evidence provided by the FOLC suggests that the Site may be prone to flooding, resulting in considerable standing water at the proposed location and has also resulted in washing out of surrounding roadways and railways. However, the Panel accepts evidence presented by AST based on current and recent historical conditions suggesting limited standing water at the Site. Development and growth of wetland areas, particularly in the northwest corner of the Site, is likely the result of infrastructure construction (i.e. road, highway and railway construction) on and around the Site. The Panel also anticipates that proper Site contouring and drainage, facility location, drainage control and routing at and around the PDA should provide adequate protection from the effects of surface water flow.

The Panel understands that AST conducted baseline assessments and interpretations for surface water quality based primarily on two sampling events. The Panel accepts that most parameters were within the guideline values and were deemed typical for the region. While the Panel believes that the methods employed by AST were adequate to characterize surface water quality in a general sense for the area, significant variations in specific parameter concentrations were noted. This, combined with some uncertainties as to possible effects of sulphur compound deposition, potential runoff, and cumulative effects (e.g. with wastewater effluent from Lamont and Bruderheim) within surface water bodies on and surrounding the Site, emphasizes to the Panel that sampling and monitoring activities are important requirements needed to validate predicted effects and impacts. The Panel observes that current baseline sampling and analysis activity displays significant variation for some species and parameters of potential concern. Additional baseline sampling would increase confidence in the characterization of surface water quality and possibly provide a better understanding for those parameters that display temporal variation as a result of natural process and/or anthropogenic activities. Of particular interest would be parameters associated with the Project (i.e. sulphur species, associated ions, and select metals) that can display variation as a result of relatively natural processes as well as other activities in the area and should be the focus of additional baseline sampling (i.e. do not necessarily need to include organics, snow samples, all trace metals, etc.). The Panel requires as a condition that another baseline monitoring/sampling event be conducted and reported to Alberta Environment, to not only improve pre-Project characterization of surface water quality, but also aid in the assessment of surface water quality during Project construction and operation, thus increasing the ability to determine the source of changes to surface water quality within surface water bodies surrounding the Site should they be observed.

The Panel understands that AST proposed the total volume of the surface water collection pond to be approximately 11,000 m^3. Of this volume, the volume of water designated to collect and store the 1 in 25 year, 24-hour rainfall event was approximately 4,600 m^3, with the remainder being allotted for fire water protection and freeboard. The Panel considers the volume required for collection and storage of the 1 in 25 year, 24-hour precipitation event adequate (i.e. approximately 4,600 m^3), and acknowledges that this is in addition to the volume deemed necessary for firefighting purposes and

freeboard. This is for the situation when the amount of water within the surface water collection pond is at the minimum volume required for firefighting purposes (i.e. approximately 6,000 m^3). As such, the surface water collection pond would not necessarily provide adequate protection from a relatively large precipitation event when pond levels are greater than the minimum required for other purposes. The Panel notes that considerable management efforts would be required to ensure both an adequate volume of water and required free space to meet all intended purposes of the proposed surface water collection pond (i.e. stormwater collection, cooling water supply, fire water supply and freeboard). While protection of the environment is a priority, which would require the surface water collection pond to continually be at or below the minimum volume required for firefighting purposes, the Panel believes it to be in the public interest to always ensure an adequate volume of water for firefighting purposes is in the surface water collection pond. While this may result in unplanned releases from the surface water collection pond to the wetland in the northwest corner of the Site under significant precipitation events, given that proper sampling, analyzing and treatment of the water is conducted, the effects of such an event would be of considerably less consequence as compared to an inadequate volume of water being available should a fire occur. The Panel accepts that under proper management of the surface water collection pond, the proposed volume is appropriate.

The Panel acknowledges that AST committed to test, analyze, and treat the water within the surface water collection pond to meet discharge guidelines on a regular basis and in the event a release of water from the surface water collection pond is required. Although AST could not predict with any certainty what the concentrations of all chemicals would be in the collection pond at any given time, the Panel accepts that should a release occur during a major precipitation event, most possible contaminants would be relatively dilute and would not likely pose a significant threat to the health of the wetland in the northwest corner of the Site or the surrounding environment. The Panel recommends sampling, analyzing and treating water within the collection pond on a regular and appropriate basis, and that the frequency of these activities should be increased during the times of highest probability for major precipitation events (i.e. spring and summer). The Panel recognizes that water quality testing activities within the surface water collection pond will also be part of AST's assessment as to the suitability of the water to be used in the sulphur forming process as cooling water. AST submitted that if the water within the pond was determined to be of poor quality for cooling water purposes it will be collected and disposed of at a designated disposal or treatment facility. While the Panel does not necessarily believe it to be required, collection and disposal of water from the surface water collection pond may be another option for the management of excess water in the collection pond as opposed to releases. The Panel accepts that AST will follow generic criteria for routine sampling and prior to releases as outlined within Alberta Environment (AENV) guidelines, though recommends that AENV potentially include sulphur species and select indicators of corrosion/biological inhibitors and metals, as deemed appropriate, when considering the sampling, analyzing, and treatment activity options.

The Panel recognizes that concern was expressed with respect to potential changes in water quality within the wetland in the northwest corner of the Site and implications this may have on groundwater quality. The Panel notes that during the surface water assessments it was determined that there is and would remain to be relatively minor surface water-groundwater interactions at the Site, particularly within the wetland. The Panel accepts that potential impacts associated with surface water-groundwater

interactions should be at a minimum for both surface water quantity and quality, given that observations indicate the combination of relatively fine textured soil beneath the wetland area, a near neutral surface water balance, a neutral to slightly upward vertical hydraulic gradient, and the probability of the wetland area being a local discharge area. Proposed surface water quantity and quality monitoring activities will be adequate to ensure these assumptions are validated and guide remedial activities should they be required.

The Panel agrees, as AST suggested, that it is advantageous from an environmental standpoint to locate this type of operation in an area that has a high natural buffering capacity, characterized by relatively high alkalinity concentrations. The natural buffering capacity, or high alkalinity concentrations, will limit some of the acid causing processes and lower the sensitivity of the water to acidification. The Panel notes though that the buffering capability in water bodies may not be infinite and reactions are often not instantaneous, which will require continued surface water quality monitoring and possible treatment, likely through liming, to ensure surface water in the LSA remains within guideline specific values. The Panel is of the opinion that based on predicted levels of sulphur deposition rates, the sensitivity of surface water in the surrounding environment is relatively low and the likelihood of significant acid generation is low. The Panel also notes that even with significant buffering capacity and the additional potential sulphate ion removal through gypsum precipitation, the continued loading and relatively high dissolved parameter concentrations required for such reactions may reduce surface water quality with respect to dissolved ions and pH, for both aesthetic and health reasons.

The Panel is aware that drainage and surface water diversion issues were considered possibly problematic by the FOLC and Lamont County. Considerable water diversions at the Site were not anticipated by AST and no collection of surface water, in addition to that collected within the surface water collection pond, or additional discharge of water from the Project was proposed. The Panel believes that the Project will not interfere with any surface water rights or agreements that may currently exist in the region, belonging to FOLC members or other parties, and should have no effect on surface water quantity upgradient from the Site. The Panel also accepts that the net result of the surface water collection pond and surface water diversion system (preventing runoff and run-on) would be to remove a relatively small volume of water from draining the Site (i.e. decreasing potential stormwater discharge), thus would not have a significant direct effect on Lamont County stormwater drainage system. Nonetheless, the Panel recommends that potential issues associated with the stormwater drainage system, pertaining to water volumes or otherwise, be outlined and resolved between AST and Lamont County (see Section 4.8).

The Panel recognizes concerns were raised over wastewater storage, treatment, and disposal associated with the Project. AST stated that all wastewater will be stored and removed off site for treatment or disposal. The Panel acknowledges this as the best option for wastewater handling at the Site and accepts this as an appropriate means. This is also the anticipated method of handling water within the surface water collection pond that is deemed not useful for cooling water from a water quality standpoint. The Panel concludes that this issue has been appropriately mitigated.

The Panel believes that many of the issues associated with surface water quantity and quality highlight the importance of an appropriate and adequate surface water sampling and monitoring program. Although the Project is not anticipated to have significant impacts on surface water quantity and quality, the importance of surface water to the health of the ecosystem and humans requires that these predictions be verified and that any observed impacts are mitigated. The Panel expects that AST will conduct all monitoring and sampling activities as it committed to do before and during construction, as well as during operations. This includes water levels in the wetland in the northwest corner of the Site and water quality of the waterbodies within the LSA. Parameters to be considered should be in accordance with those commonly analyzed for and considered at similar type facilities in Alberta and those agreed upon with AENV.

The Panel notes that AST would not object to including surface water bodies on private lands (i.e. dugouts) in the surface water quality sampling program. The Panel recognizes this as being a responsible action and expects this commitment to be upheld, granted the water body is appropriate and has the potential to be affected by activities associated with the Project. Sampling and monitoring results must be compared to baseline levels to validate the surface water assessments and guide treatment/remedial activities should they be required. All water quality criteria must also meet the appropriate guideline requirements. The sampling and monitoring protocol must also be adaptively managed to remain applicable and appropriate.

6.4: Aquatic Resources

6.4.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) stated that baseline studies and an impact assessment were conducted for aquatic resources in relation to the proposed sulphur forming and shipping facility (the Project). AST acknowledged that aspects of the Project affecting aquatic resources might also be subject to other regulatory jurisdictions (e.g. *Water Act*, *Environmental Protection and Enhancement Act*, and the Department of Fisheries and Oceans Canada's *Fisheries Act.*)

AST stated that assessments were based on spatial boundaries that included a Local Study Area (LSA), Section 35-55-20 W4M (the Site) plus a 200 m buffer beyond the perimeter of the Site, and a Regional Study Area (RSA), the Site plus a 1,000 m buffer beyond the perimeter of the Site. The Principal Development Area (PDA) was considered as the sulphur forming and shipping facility (west-central portion of the Site) and the rail transfer loop. AST chose temporal boundaries that coincided with conditions as of October 2006, the anticipated lifespan of the Project at maximum disturbance, and closure. Other projects considered in the aquatic resources assessment included anthropogenic disturbances in close proximity to the Project, particularly two sodium chlorate plants, and one fabrication facility.

AST outlined that the assessment included identification of aquatic habitats and a survey of baseline aquatic resource conditions. During field exercises, inventories and assessments of habitat, fish population, and benthic invertebrates were conducted at areas denoted as Wetland 01 (wetland area in the northwest portion of the LSA), Wetland 02 (wetland area in northeast portion of the LSA), and Lamont Creek (within the eastern portion of the RSA).

AST characterized Wetland 01 as consisting of a marsh, ephemeral in nature, and a dugout, considered pool habitat. AST stated that Wetland 01 contained relatively large numbers of brook stickleback (*Culaea inconstans*), ranging in size from 45 to64 mm, and fathead minnow (*Pimephales promelas*), ranging in size from 45 to 79 mm, both typical of waterbodies that suffer oxygen depletion. AST determined that Wetland 01 had negligible habitat potential for salmonids, was eutrophic-hypereutrophic, and full of submerged vegetation, though provided habitat for amphibians, mammals (e.g. muskrat), and birds (e.g. waterfowl, blackbirds, and herons).

AST characterized Wetland 02 as consisting of a marsh area, comprised of cattail (*Typha latifolia*) with grasses and shrubs, and shallow (0.2 m) to no free water. AST concluded that Wetland 02 did not provide habitat for fish but provided habitat for amphibians and birds (e.g. waterfowl, blackbirds and herons).

AST characterized Lamont Creek, at a point approximately 0.5 km east of the eastern property boundary, as a perennial, meandering watercourse that is occasionally confined. AST stated that only few brook stickleback and fathead minnow, both typical species of poor water quality, were identified in Lamont Creek. AST concluded that Lamont Creek had poor habitat potential for salmonids, moderate habitat potential for brook stickleback and moderate to limited potential for northern pike (*Esox lucius*) habitat. AST determined that the invertebrate community had low diversity, dominated by oligochaete worms and chironomid larvae and that duckweed (*Lemna sp.*) was prevalent throughout Lamont Creek. AST suggested that use of the creek by livestock, associated manure inputs and wastewater inputs from the Town of Lamont likely contributed significantly to poor water quality within Lamont Creek.

AST summarized that Wetland 01 and Lamont Creek were considered low value fish habitat, Wetland 02 was not considered fish habitat and all three aquatic resources provided a filtering function for surface water runoff as well as habitat for birds, mammals, amphibians and invertebrates.

AST identified potential sources of impact to aquatic resources from siting, construction and operation of the Project. AST stated that the health of the aquatic ecosystems within the LSA and RSA were primarily governed by water quality and water quantity. As such, potential impact assessments to aquatic resources were made in-line and in conjunction with those made in the surface water assessments (Section 6.3).

AST stated that surface disturbances would occur primarily during construction activities, but that the Project was proposed to be sited in a manner that would avoid the loss of aquatic habitat or interfere with drainages that would significantly influence aquatic habitat. AST believed that the use of previously disturbed areas on the Site and the location of the PDA would minimize disturbances. It was also believed that due to current poor water, aquatic resources would not be sensitive to minor surface disturbances.

AST stated that there might be potential for the acidification of aquatic resources as a result of dust and emission deposition which might have the potential to acidify soils and surface water runoff entering the aquatic environment. AST predicted that there would not be appreciable deposition of particles beyond the PDA, outlined that sulphur storage

piles would be sheltered from the wind, that a dust suppression management plan would be instituted and relatively low levels of gaseous or stack emissions were predicted.

AST stated that stormwater and wastewater had the potential to adversely impact aquatic resources if contaminated and released into the environment. AST noted that no wastewater would be generated and released into the environment as a result of the Project. AST outlined that potentially impacted surface runoff would be collected, contained, reused, and then monitored and treated prior to discharge of any excess surface water that might be discharged during extreme runoff events.

AST stated that contaminant spills could potentially impact aquatic resources. AST outlined that any sulphur spills would be responded to and cleaned immediately, all storage facilities would comply with appropriate regulatory requirements, that the asphalt sulphur pastille storage pad would include containment, a clay soil liner, surface water runoff/run-on controls, and a leak detection system, and that a leak detection monitoring plan would be implemented, mitigating potential impacts from contaminant spills.

AST stated that cumulative effects of each impact on aquatic resources were evaluated on a regional scale.

AST noted that monitoring and adaptive management strategies for aquatic resources would follow those outlined for surface water quality and quantity and groundwater, including additional monitoring in Wetland 01 for turbidity, temperature, pH, and dissolved oxygen.

AST concluded that the potential impacts of the Project, such as the harmful alteration, disruption, or destruction, the input of deleterious substances, or cumulative effects, to aquatic resources was unlikely to occur and was not considered significant.

6.4.2: Views of the Interveners

The Friends of Lamont County (FOLC) expressed concerns regarding the interactions and negative impacts of the Project on aquatic resources. The FOLC stated that the Project site contained a wetland that supported aquatic life and birds. The FOLC submitted that negative effects would be experienced by the wetland area in the northwest corner of the Site, including the available habitat and health of ducks, geese, waterfowl and red-winged blackbirds should contamination from surface water or groundwater occur.

6.4.3: Views of the Panel

The Panel acknowledges that aquatic resources are important to understanding potential ecosystem environmental impacts and that many issues associated with aquatic resources are closely linked to water and, specifically, surface water. The Panel finds that reasonable work was conducted by AST on the baseline studies and effects assessments for aquatic resources for the Project.

The Panel understands that the aquatic resources assessment conducted by AST, specific to the Site, was based on pertinent available data and literature, as well as site-specific information obtained during a subsequent groundtruthing reconnaissance survey

that included inventories and assessments of habitat, fish population and benthic invertebrates.

The Panel finds it appropriate that within Wetland 01, drainage and water in the area designated as marshy was ephemeral in nature and that the dugout was considered pool habitat. The Panel accepts that Wetland 01 was characterized as having negligible habitat potential for salmonids, providing some habitat for brook stickleback and fathead minnows, was eutrophic-hypereutrohpic, full of submerged vegetation, and provides habitat for amphibians, mammals, and birds; while Wetland 02 was characterized as not providing habitat for fish but provides habitat for amphibians and birds. The Panel notes that characterization of Lamont Creek, based on the assessment location, concluded that Lamont Creek had poor habitat potential for salmonids, moderate to limited habitat potential for brook stickleback and northern pike, and that the invertebrate community had relatively low diversity.

The Panel notes that potential sources of impacts to aquatic resources are associated with location of facilities within the Site, and during construction and operation activities and that the health of the aquatic resources is governed by water quality and quantity. The Panel acknowledges that the location of proposed infrastructure would minimize further potential disturbances to aquatic resources at the Site and that aquatic resources would likely not be sensitive to relatively minor surface disturbances. As no significant impacts or effects are predicted to occur to either surface water quality or quantity, given proper mitigation and management practices are followed (as outlined in Section 6.3), the Panel concludes that associated impacts to the aquatic resources as a result of the Project would be relatively benign as well and would not require additional management activities.

The Panel recognizes that monitoring and adaptive management strategies for aquatic resources will follow those outlined for surface water and groundwater, including additional monitoring within Wetland 01.

6.5: Soil Impacts

6.5.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) reported that, as agreed upon and required in the Terms of Reference for the Project's Environmental Impact Assessment (EIA), the following assessments regarding the soil resources had been undertaken and completed:

- Soil survey of the Principal Development Area (PDA), Local Study Area (LSA) and Regional Study Area (RSA) to describe and map the soil types and their distribution.
- Soil sampling and analyses to characterize the pre-disturbance morphological, physical and chemical properties of the soil types and to assess the pre-disturbance agricultural soil capability classes.
- Soil sampling and analyses to determine the suitability and availability of soil materials within the study areas for reclamation and to develop a soil conservation and reclamation plan for the PDA.

- Evaluation of available soil information to determine the sensitivity of LSA and RSA soils to acidic deposition for the baseline, application and cumulative scenarios.
- Evaluation of activities associated with the Project which might cause soil contamination or soil deterioration at the local and regional scale and of subsequent mitigative measures.

AST stated that detailed baseline soil surveys had been completed for the LSA (survey intensity 1) and the RSA (survey intensity 2). AST reported that, based on published information, the RSA soils were classified as predominately Chernozemic and Solenetzic, with agricultural capability classes ranging from 2-5, that is soils with slight to very severe limitations to sustained production of specified crops. AST indicated that for these Chernozemic and Solenetzic soils, climate and/or sodic subsoils were the factors most limiting the agricultural capability rating. AST reported that the LSA included Chernozemic, Solenetzic, Organic and Disturbed/Reclaimed soils. AST noted that the area of Disturbed/Reclaimed soils in the LSA, with an agricultural capability rating of 4, amounted to 44.6 ha within the total LSA area of 405.7 ha. AST assumed that reclamation in the future would return equivalent capability for all Class 2-4 soils and concluded that the overall cumulative impact of the Project to land capability for agriculture is neutral or increased capacity.

With regard to a baseline assessment of soil suitability for reclamation, AST stated that, based on the assessed agricultural capability rating for these soils, the LSA soils are severely limited because of natural occurring subsoil sodicity and salinity. AST noted that the quality of the disturbed or reclaimed soils in the PDA had been degraded by past site reclamation efforts which involved replacement of the stripped topsoil with a soil mixture of topsoil and sodic subsoil. AST concluded that proactive measures were required in the early stages of the Project to ensure that additional deterioration of the PDA soil quality did not occur during site preparation and to ensure that the salvaged topsoils were preserved for final site reclamation. AST indicated that salvaged topsoils and subsoils would be segregated, stockpiled separately and maintained at a location some distance from the sulphur forming activities to ensure that the quality of the soils was preserved until the time of use for site reclamation, sometime in the future.

AST reported that, employing the methodology and specific interpretive guidance provided in "*Application of Critical, Target and Monitoring Loads for the Evaluation and Management of Acid Deposition*" (CASA & AENV, 1999), the degree to which LSA and RSA soils are affected by acid deposition from sulphur dioxide (SO_2), nitrogen oxides (NOx) emissions was determined by considering the inherent sensitivity of the soils to a change in pH, as well as the degree of current acid loading to the soils or Potential Acid Inputs (PAI). Based on published information by AENV and CASA, AST established that the Project LSA and RSA soils are located in the regional grid cell classified as low sensitivity to PAI. AST reported that, in addition to the assessment of receptor sensitivity at a regional scale (1.0 longitude x 1.0 latitude), sensitivity to acidification was also evaluated at a local scale for soils in the LSA and RSA, using analytical data collected from representative inspection locations and/or published soil chemical data. AST concluded that the mineral and organic soils in the LSA and RSA are moderately to well buffered and are of low to medium overall sensitivity to wet and dry acid deposition. In assessing the Application and Cumulative cases, AST reported that the predicted average PAI values associated with emissions from the Project and from the

neighbouring Canexus sodium chlorate plant is 0.04 keq H^+/ha·y at the Site boundary. AST concluded that the total predicted PAI values at the Site, including background, are 0.21 keq H^+/ha·y and 0.29 keq H^+ /ha·y for the application and cumulative cases, respectively. AST noted that these values are below the critical load of 0.50 keq H^+ /ha·y for soils which are moderately sensitive to acid input.

AST predicted that the maximum annual average dry deposition of elemental sulphur (S^0) would be 1.11 kg/ha·y at the south PDA boundary. AST concluded that an addition of this magnitude of S^0 to the land was not significant when considering the normal plant nutrient uptake of sulphur by agricultural crops such as alfalfa and canola routinely grown in the area.

AST reported that the predicted estimate of maximum annual average dry S^0 deposition considered particulate emissions from the Rotoform HS® units and resuspended elemental sulphur dust from the loading area. AST said that the modeling for dry deposition of S^0 did not include any particulate emissions from the pastille storage pile nor from the transfer points associated with the conveyor belt activity. AST stated that the following specifics were considered in rationalizing its approach to modeling for dry deposition of S^0:

- The conveyor belt would be covered to prevent wind dispersion of S^0 dust.
- The pastille storage pile would be the source of little S^0 dust. Measurements have shown that 99.8 percent of the sulphur particulates associated with the pastille forming process retain diameters of >2.0 mm. Particles with mean diameters of these sizes are non-erodible and non-suspendable by the wind.
- S^0 particulates <PM_{10} would not be generated or associated with the sulphur pastille stockpile. Particles of these sizes, particularly $PM_{2.5}$, are generated as a result of either incineration or by mechanical means involving pulverization and grinding. Neither of these processes occurs in the Rotoform HS® process.
- AST would produce a premium formed S^0 product. A premium S^0 product, by design, is not friable and is capable of maintaining its integrity during the rigours of stockpiling and subsequent loading onto railcars.
- AST would implement mitigative measures to reduce the potential dispersion of sulphur dust. These measures would include the use of S^0 dust suppression chemicals, construction of a 6.1 m wind screen around the pastille storage and loading area and regular and frequent clean-up of the pastille storage and loading area (sweeping, washing, containment and disposal of off-specification S^0).

AST predicted that deposition of S^0 particulates, >10 microns in size, would primarily occur within the PDA or within a range of 100 m to several hundred meters of the forming and storage operations. AST stated that S^0 deposition in this area was expected to be greater than 1.1 kg/ha·y. AST believed that soil acidification would occur gradually, allowing for early detection of soil pH change and subsequent implementation of appropriate mitigation or remedial measures.

As a mitigative plan, AST said that it would, as a part of its approvals with AENV, comply with regulatory soil monitoring requirements (AENV Air Monitoring Directive Appendix A-7. Soil Monitoring Guidelines. AENV 1989). AST noted that AENV's Soil Monitoring Guidelines would require AST to submit a precise soil monitoring plan (i.e. soil sampling design, soil sampling locations, soil sampling frequency, soil analytical parameters, reporting timeline). AST stated that it was committed to work with AENV to develop an acceptable and comprehensive plan to monitor soil pH and to adjust the soil pH, if required, by liming.

6.5.2: Views of the Interveners

The Friends of Lamont County (FOLC) submitted that the EIA did not adequately consider the amount of S^0 dust that would be generated by and dispersed from AST's sulphur forming and storage facility. The FOLC said that AST failed to include, in the modeling conducted to estimate the maximum average annual dry deposition of S^0, particulate sulphur contributions from the pastille stockpile and the entire possible loading area. The FOLC maintained that S^0 particulates <10.0 microns would be produced, not only during the pastille forming process, but also as a result of the extended operation of front-end loaders. FOLC stated the crushing and grinding of pastilles in contact with front-end loader tires and the loading bucket would generate S^0 particulates of variable mean diameters.

The FOLC said that consistent production of a premium quality formed S^0 product is not a routine matter but dependent upon key operating factors involved in the forming process. The FOLC stated that less than premium quality pastilles could be produced. The FOLC indicated that less than premium quality pastilles would enhance the friability of the product (e.g. formation of protrusions) and increase the generation of S^0 particulates which could be dispersed.

The FOLC questioned the effectiveness and reliability of AST's commitment to maintain good "housekeeping" practices with regard to the pastille storage and loading pad to prevent the dispersion of S^0. The FOLC indicated that the visual evidence in this regard, provided from other similar operating facilities, showed that a significant amount of crushed or ground sulphur was likely to remain at or near the pastille stockpile.

The FOLC stated that, although AST committed to construct a wind screen around the pastille stockpile pad, AST failed to complete any studies regarding the height, structure or positioning of such a screen and the subsequent effect of wind speed and wind dynamics on the potential dispersion of S^0 particulates from the top of the exposed sulphur storage stockpile and loading area. The FOLC noted that, due to the influence of regional topography, the area around AST's proposed facility has windy conditions.

FOLC members that reside and have agricultural operations in the vicinity of the planned AST facility stated that they have a common concern regarding possible impacts to the soil as a result of S^0 dispersion and deposition from AST's operations. The FOLC believed that uncertainty exists to how far dispersed S^0 would travel and how S^0 deposition would impact soil quality and productivity. FOLC members noted that several multi-generational farms would be potentially impacted by AST's planned operation. The FOLC stated that these farm families wished assurance that their agriculture businesses would not be diminished by the Project and could continue to operate successfully.

6.5.3: Views of the Panel

The Panel recognizes and understands that the potential impact of elemental sulphur (S^0) dust and potential acid inputs (PAI) deposition on agricultural lands from AST's operations is a significant concern to the FOLC and other area residents. However, in considering the FOLC's assertion that AST's predicted rate and extent of deposition of S^0 and PAI were significantly underestimated, the Panel finds that the evidence presented to support this view was speculative. The Panel notes that, while visual evidence was submitted by the FOLC to support its assertion, the S^0 forming and storage facilities selected as examples were not directly comparable to AST's proposed facility and operations. The Panel also finds that the FOLC failed to provide specific quantitative data to contradict AST's predictions on this issue. Consequently, the Panel accepts AST's modeled predictions regarding S^0 and PAI deposition and concludes, with reasonable certainty, that any significant impacts due to the dispersion and/or emission of acidifying compounds from AST's operations will be confined to the PDA.

In accepting AST's prediction that the maximum annual average S^0 deposition will occur at the southern boundary of the PDA and AST's conclusion that any significant acidifying impacts to vegetation and soils will be confined to the PDA, the Panel expects a timely and rigorous implementation of the operational commitments that AST declared to mitigate the dispersion and emission of acidifying compounds from its operations. The Panel notes that AST's stated commitments in this regard are:

- to manufacture a premium sulphur product on a consistent and ongoing basis
- to develop, implement and maintain "first in – first out" protocols that will ensure that the residence time of any given day's production of pastilles transferred to and stored on the pad, is no more than five days under normal operating conditions
- to implement and maintain, as routine operational procedures, comprehensive "house-keeping" protocols to minimize and manage dust and off-specification pastilles
- to utilize, as an ongoing operational practice, dust suppressant chemicals during the transfer of formed S^0 pastilles
- to construct a covered conveyer system for the transfer of S^0 pastilles
- to design, assess and construct an effective wind screen to minimize S^0 dispersion from the area of the pastille stockpile pad

The Panel also expects AST to fulfill its commitment to work with AENV to develop and implement a comprehensive soil monitoring program (AENV Air Monitoring Directive Appendix A-7. Soil Monitoring Guidelines. AENV 1989) to detect early changes in soil pH due to acidifying depositions from AST's operations and to remediate impacted soil when necessary.The Panel understands that this soil monitoring plan will be part of AST's regulatory approvals from AENV.

Since the biotransformation of any accumulated S^0 to acidic compounds in soil is recognized by experts to be slow, the Panel concludes that a three-year monitoring frequency, as typically recommended by AENV, is appropriate as an initial schedule for soil sampling and analyses. The Panel, however, recommends that AST, in conjunction

with AENV, review the ongoing frequency of soil monitoring and adjust the frequency, as necessary, based on the measured and observed rate of soil acidification in affected soils.

6.6: Reclamation Plan

6.6.1: Views of the Applicant

In development of the reclamation plan, Alberta Sulphur Terminals Ltd. (AST or the Applicant) focused efforts on the Principal Development Area (PDA) and the Local Study Area (LSA). AST defined the PDA as the area that would contain the essential project components such as the sulphur forming facilities, sulphur pastilles storage area, rail and road access and unloading areas and the LSA as the Site (Section 35-55-20 W4M) plus a 200 m buffer area.

AST claimed that the PDA would have an impact on underlying agricultural lands during construction and operation of the Project because of surface disturbance, dust deposition, contaminant spills, introduction of non-native and invasive vegetation species and air emissions. However, AST expected that the impacts would be local in extent, low to moderate in magnitude, short-term to mid-term in duration and reversible.

AST stated that all topsoil would be stripped from areas in the PDA to be disturbed by the Project. The amount of topsoil in the PDA was estimated by AST to be 62,000 m^3 (0.25 m depth across the 24.8 ha PDA area). AST indicated that approximately 89 percent of the soils in the PDA are Solonetzic or reclaimed soils that have a Solonetzic origin. The Applicant indicated that a qualified soil inspector would be present during stripping of Solonetzic soils to reduce over-stripping and mixing of topsoil with subsoil materials. AST indicated that subsoils are characterized by an enriched sodium concentration which, if mixed with topsoil, could significantly reduce topsoil quality. AST rated the suitability of the topsoil in the PDA as fair to poor for reclamation.

Due to the Solonetzic origin of most soils in the PDA, subsoils were rated by AST as unsuitable for reclamation. AST stated that excessive compaction of subsoils would be reduced by limiting operational traffic to established roadways. Also, AST indicated that subsoils might need to be excavated in some areas, for example, for construction of the surface water pond. These soils would be stored in a separate stockpile.

AST indicated that soil stockpiles would be located in areas of the PDA that are level and would provide stable foundations for long-term storage. Separate stockpiles would be established for Solonetzic and Chernozemic soils. The stockpiles would have setbacks to ensure admixing does not occur and would be placed at least 30 m from a surface water body and at least 250 m from any source of acidifying sources. The Applicant indicated that measures would be taken to protect the stockpiles and disturbed areas of the PDA from erosion. Interim measures proposed by the Applicant included spraying soil surfaces with water, installing water erosion control matting and applying crop residue matting such as straw. In the longer term, stabilization measures include vegetating the stockpiles with an appropriate seed mix that would be salt and drought tolerant.

AST indicated that the objective of the surface reclamation at the Site would be to achieve equivalent land capability (defined in the Alberta Environment [AENV]

Conservation and Reclamation Regulation as "*the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical*") and obtain a Reclamation Certificate from AENV. The Applicant stated that all infrastructure (e.g. buildings, foundations, rail lines) would be removed from the Site at the end of the Project. Any soil contamination detected at the Site during decommissioning would be remediated according to regulatory guidelines as soon as possible within one year of decommissioning of all or a portion of the facility.

AST stated that reclamation would be complete within five years of complete decommissioning of the facility. A summary of the reclamation process proposed by the Applicant is provided below:

- The stormwater retention pond and berms, and the raised pads at the Site would be removed
- The Site would be re-graded and re-vegetated and the drainage patterns restored to pre-Project conditions.
- Any compaction of subsoil would be relieved by ripping and, if required, addition of soil amendments prior to placement of topsoil. The subsoil work would be supervised by a qualified soil scientist.
- Topsoil would be replaced to the final elevation.
- Soil quality would be assessed. If necessary, liming treatments would be applied to ensure that soil pH is suitable for plant growth.
- The Site would be re-vegetated according to AENV land reclamation criteria. Weed management on the Site would continue until a reclamation certificate was issued from AENV.

It is AST's view that proper reclamation practices upon Project closure would return soil to better quality than currently exists in the Project Development Area.

6.6.2: View of the Interveners

Lamont County expressed concern that AST provided no independent evidence that the type or level of insurance for this project was appropriate. Further, the County contended that the insurance did not appear to address on-site reclamation security (e.g. irrevocable letters of credit, bonds) which AENV routinely requires for certain types of activities, such as gravel pits.

6.6.3: Views of the Panel

According to AENV's *Conservation and Reclamation Regulation*, the AST project is considered "Specified Land" and the Applicant is therefore required by AENV to reclaim the Project and obtain a Reclamation Certificate pursuant to the *Environmental Protection and Enhancement Act* (*EPEA*) from AENV. Land reclamation is required to return disturbed land to a state where, at a minimum, it is at least as capable of supporting the same kinds of land uses as before the disturbance. The Panel believes that AST has conducted the necessary studies on site characteristics (e.g. topography, drainage patterns, and soil and vegetation types) to develop an effective reclamation

plan. In addition, the Panel notes that AST will be required by AENV to provide the necessary financial security in an amount determined by AENV to be sufficient to ensure completion of conservation and reclamation on the land.

6.7: Effects of Air Contaminants on Human Health

6.7.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) conducted a Human Health Risk Assessment (HHRA) for the normal operational conditions of the Project using a production output of 6,000 tonnes/day of formed sulphur (the application is for 3,000 tonnes/day). It stated that HHRA methodology was consistent with protocols developed by Health Canada and the United States Environmental Protection Agency. AST also contended that the HHRA was reviewed by Alberta Health and Wellness.

6.7.1.1: Human Health Risk Assessment Methodology

AST employed the following four-step approach in conducting the HHRA:

1. Problem Formulation

   AST identified the chemicals of potential concern as carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen oxides (NO_x), particulate matter less than 2.5 µm ($PM_{2.5}$), sulphur dioxide (SO_2), volatile organic compounds (VOCs) (including acetaldehyde, acrolein, benzene and formaldehyde), polycyclic aromatic hydrocarbons (PAH) compounds with the ability to persist or accumulate and metals. In addition to the chemicals of concern, AST also evaluated the following mixtures:

   - H_2S, NO_2, SO_2, acetaldehyde and acrolein were considered potential respiratory irritants.
   - Acetaldehyde, acrolein and formaldehyde were considered potential eye irritants.
   - Acrolein and H_2S were considered potential nasal irritants.

   Elemental sulphur was not included by AST in the assessment as sufficient health effects data were not available for the development of provisional acute or chronic exposure limits for sulphur. AST indicated that the deposition rate of sulphur predicted for the Project was below typical sulphur fertilizer rates for agricultural purposes and thus not anticipated to cause vegetation, soil or human health impacts.

   According to AST, primary and secondary routes of exposure were assessed. Primary routes of exposure included inhalation. Secondary routes of exposure included food ingestion (including local beef, dairy, eggs, fruits, vegetables) and inadvertent contact with soil. AST stated that the surface water pathway was not assessed as no releases of untreated water to the environment were expected. It also stated that the groundwater pathway was not assessed as the Project was not expected to impact groundwater quality due to the reactive nature of sulphate, and the expected low groundwater flow velocity.

The five receptor life stages that were included by AST in the HHRA were infant, toddler, child, adolescent and adult.

Receptor locations used by AST varied for the acute and chronic case. Receptor locations for the chronic case (long-term effects) included the Town of Lamont, Town of Bruderheim and nearby residences. The maximum ground level concentrations located off site were not included in the chronic case because AST believed that it was not reasonable to assume that a person would be exposed continuously over a 75-year period at these locations. The receptor locations considered by AST for the acute case (short-term effects) include those considered in the chronic case and the maximum ground level concentrations located off site.

2. Toxicity Assessment

The exposure limits used in the assessment by AST were chosen based on the most scientifically defensible limits, not necessarily the worst-case limits. AST used the following information sources to determine the exposure limits for adverse human health effects:

- Alberta Environment
- Health Canada
- United States Environmental Protection Agency
- World Health Organization
- Canadian Council of Ministers of the Environment
- Agency for Toxic Substance and Disease Registry
- California Office of Environmental Health Hazard Assessment
- Ontario Ministry of the Environment
- Texas Commission of Environmental Quality
- Netherlands National Institute of Public Health and the Environment
- American Conference of Governmental Industrial Hygienists

According to AST, the toxicity assessment examined potential acute (short-term) and chronic (long-term) health risks associated with the identified chemicals of concern.

3. Exposure Assessment

AST's exposure estimates were based on background ambient air measurements and results of the dispersion modeling. More information on air measurements and dispersion modeling is available in Section 6.1. Baseline, application and cumulative cases used by AST for assessing the effects of air contaminants on human health were the same as those referred to in the air quality section.

For determining chronic health risk, AST made the following assumptions:

- Individuals would be at the receptor locations for the duration of their lives (75 years).
- People would maintain permanent residency in the area and never leave their homes.
- Residential receptors would obtain all of their country food from local sources.

4. Risk Characterization

AST used Risk Quotients (RQ) [air concentration ($\mu g/m^3$)/acute or chronic exposure limit ($\mu g/m^3$)] to characterize the risk from the chemicals of concern. The Applicant interpreted RQs as follows:

RQ≤1 – signified that the estimated exposure is less than or equal to the exposure limit and negligible health risks are predicted

RQ>1 but ≤10 – suggested low to moderate potential risk, but the significance of which must be balanced against the high degree of conservatism incorporated into the HHRA

RQ>10 – signified moderate to high potential risks

AST expressed potential carcinogenic risks as lifetime cancer risks (LCRs). LCRs refer to the predicted number of cancer cases per 100,000 people that could potentially result from exposure to carcinogens.

AST also conducted an assessment based on Health Canada's SUM15 method at the request of Alberta Health. It used the 98 percentile ambient measurements of $PM_{2.5}$ annually averaged over 3 consecutive years. AST concluded that the estimates of mortality rates would have an increase of 1.7 per 1,000,000 people per day as a result of the Project for the application case, the respiratory hospital admissions would increase by 0.8 per 1,000,000 people per day, and the cardiovascular hospital admissions would increase by 0.7. AST stated that the Project's $PM_{2.5}$ emissions were not expected to increase the background mortality and morbidity rates to a measurable extent.

6.7.1.2: Results of the HHRA

Acute Health Risk

AST indicated that all acute predicted RQs were below one for the baseline, application and cumulative cases and all receptor locations with the following exceptions:

- Acrolein had a RQ value of 9.7 for the application and cumulative case, and a baseline case value of 2.6 for the receptor located at the maximum ground level concentration. The acrolein RQ value was also greater than one at the other receptor locations, but in those locations the baseline and the application cases were the same, indicating that the Project had no effect at those receptors

according to AST. The acute exposure limit for acrolein was based on eye irritation.

- RQ values were greater than one at the three receptor locations for the acute eye irritant mixture for all cases (1.8 for the application case, 1.8 for the baseline case and 1.9 for cumulative case) indicating that the Project did not have an incremental effect according to AST. The mixture component to which the most risk is attributable is acrolein (>90 percent).

AST stated that exhaust emissions from diesel trucks would be the largest contributor (73 percent) to total predicted acrolein emissions from the Project.

AST indicated that no acute human health effects were expected from exposure to acrolein despite RQ values being greater than one for the following reasons:

- *"The maximum predicted [ground level concentration] is at least 50 times lower than the lowest observable adverse effect level (LOAEL) for acrolein in humans and that people would typically be exposed to much lower air concentrations than the maximum [ground level concentration]."*
- *"At the residence, Bruderheim and Lamont locations, 95 percent of the hourly acrolein concentrations were predicted to be less than the exposure limit. For the maximum ground level air concentration, 90 percent of the hourly acrolein concentrations were predicted to be less than the exposure limit. The number of hours in a year that acrolein concentrations are predicted to exceed the exposure limit was determined for each location based upon the worst-case meteorological data for a given year."*
- *"The acrolein exceedances were due to the conservative nature of the exposure limit that was used in the human health risk assessment. Since use of that exposure limit for this Project, the regulatory agencies have updated those limits, both on a short-term and on a long-term basis, and those limits are now considerably higher, suggesting that the health risks, if we would predict them, they would be much lower."*

Chronic Health Risks

AST indicated that all chronic predicted RQs were below one for all the cases and receptor locations with the following exceptions:

- The chronic inhalation RQ value for acrolein was greater than one for the baseline, application and cumulative cases at all receptor locations (the highest was 2.5 for the application case for the Lamont receptor, with a 2.4 for baseline and a 2.6 for cumulative). AST submitted that the slight differences between the baseline and application cases suggested that the Project emissions were expected to have a negligible incremental impact.

- The chronic nasal irritant mixture RQ value was greater than one (1.6 for baseline, 1.7 for application and 1.9 for cumulative) for all cases at the three receptor locations. According to AST, the slight differences between the baseline and application cases RQ values suggested that the Project emissions were expected to have a negligible incremental impact.

AST stated that all predicted lifetime cancer risks associated with estimated Project air emissions were less than one in 100,000. AST indicated that the incremental cancer risks directly associated with the Project emissions were essentially negligible.

AST presented that all predicted cumulative air concentrations of metals were less than their respective chronic inhalation exposure limits, suggesting that lifetime exposure to the predicted cumulative air concentrations of metals were not anticipated to be associated with adverse health impacts.

AST concluded that the estimated cumulative concentrations of all metals in soil were compliant with AENV's Alberta Tier One Soil and Groundwater Remediation Guidelines therefore, exposure to metals in soils as a result of the Project were not expected to result in adverse health effects to the area residents.

6.7.2: Views of the Interveners

The Friends of Lamont County (FOLC) was concerned about potential Project impacts on the health of residents in the area since it felt the air dispersion modeling underestimated or did not address the potential effect of H_2S, fine particulates and SO_2. The FOLC was also concerned with how air pollution from the Project would affect those suffering from asthma, allergies and other respiratory conditions.

In cross-examination, the FOLC questioned AST on why the 2005 World Health Organization Air Quality Guidelines for $PM_{2.5}$ and SO_2 were not used in the HHRA for exposure limits, as these appeared to be more conservative than the limits AST used.

The FOLC requested that a community health risk assessment be conducted or funded by AST to assess not just the exposure and response of residents to chemicals of concern, but also the impact to their health and well-being and other incidental effects associated with the rapid industrialization of their community, such as living with the fear of emergencies, exposure to toxic chemicals, uncertainty of their tenure in their current residences and lands, as well as a gradual disintegration and destruction of their community.

Lamont County advised that the Board should pay particular attention to the acute and chronic risks to the health and safety of County residents living beyond the heavy industrial zone.

The Lamont Health Care Centre was concerned that the Project would have a negative health impact on the residents in the area, specifically due to the increase in fine particulate matter in the air. It stated that residents had already experienced contaminants in the air entering the Centre's ventilation system. The Centre was

concerned that there would be an increase in cases of asthma and other pulmonary disorders.

The Lamont High School Council indicated that it already had many students with asthma and breathing problems. It feared that air quality would be deteriorated further by the Project and that the number of students affected by respiratory disorders would increase. The Council stated that the cumulative effects of sulphur dust and contaminants were a significant concern considering the very frequent strong winds and wind direction through this topographically low-lying town.

Ms. Leslie Jans, a local resident expressed concern for air quality and public health. Ms. Jans questioned what would happen with the dust in the air with respect to wind movement on land, surface water quality, the quality of food grown in local gardens and livestock forage. She attested that the cumulative effects could be irreversible.

Robert Bourque, a local resident, stated that he was concerned about the potential Project's effect on his family's health. He expressed particular concern as he indicated that he and his family have asthma and he also suffers from sulphur allergies.

Elk Island Public Schools were concerned with environmental contaminants such as dust emissions and particulates and the extent to which these contaminants could impact school staff, in particular student safety and wellness.

6.7.3: Views of the Panel

The Panel is aware that the HHRA used the air modeling results which were for a 6,000 tonnes/day output but the application being considered was for 3,000 tonnes/day.

The Panel agrees that AST used the best available exposure limits, including those for $PM_{2.5}$ and SO_2, in the HHRA as these were most applicable within Canada and for the appropriate time scale. The Panel is aware that Alberta Health participated in the review of the method, exposure limits and conclusions of the HHRA, but did not provide any direct opinions on the HHRA to this Panel.

The Panel accepts the method used for the HHRA and understands that risk quotients (RQ) greater than one, but less than ten represent a potential low to moderate risk to human health with regard for the conservatism built into the assessment. The Panel agrees with AST that conservative assumptions were made in the assessment. The Panel understands the conclusions of the HHRA, and that this methodology is commonly accepted. However, when an RQ value of one is met or exceeded, the Panel agrees that it is important for the Applicant to conduct a critical assessment of that exceedance and to also look at the consequence of that exceedance, and that it should not be dismissed just because the assumptions made were conservative. In the case of this HHRA, AST assessed that acute exposure to acrolein could cause eye irritation. AST determined that the exhaust emissions from diesel combustion are the largest contributor to the acrolein emissions. The Panel strongly recommends that AST make an effort to reduce emissions associated with diesel combustion on site and keep apprised of any new developments in the reduction of diesel emissions. It is outlined in Section 4.2 of this report that AST has committed to limiting truck idling on site and the Panel believes that this will assist in reducing emissions. The Panel understands that

the trucks on site will mainly be operated by contractors and not under the direct control of AST, but believes that AST must be diligent in overseeing emission reduction efforts such as anti-idling.

The Panel agrees with AST that the results of the SUM15 analysis show that the Project's $PM_{2.5}$ emissions contribution were not expected to increase the background mortality and morbidity rates to a measurable extent, as there was no evidence to state otherwise. The Panel understands that this method uses a more conservative $PM_{2.5}$ objective (15 µg/m^3), than what is currently used by Alberta Environment (30 µg/m^3).

The Panel agrees with AST's conclusion that the contributions from the Project for the acute eye irritant mixture, chronic inhalation for acrolein and chronic nasal irritant mixture did not show a significant incremental effect.

The Panel acknowledges the concerns of area residents about the potential decrease in the air quality as a result of the Project and how this may cause health issues. The Panel believes that results of the HHRA have shown that these concerns are not warranted; however, the Panel strongly supports the ongoing ambient monitoring for SO_2 and $PM_{2.5}$ and AST's sharing of this data with the community (addressed in Section 6.1.3 of this report) to help alleviate the concerns of residents. The Panel also recommends that the community stay actively involved in providing feedback to AST. The Panel does not believe that a community health risk assessment suggested by the FOLC will provide any value to the Panel for making its decision on this application. As indicated above, the HHRA provided by AST was conducted using commonly accepted methodology and the Panel believes that it fulfills the need for determining health impacts from the proposed Project.

The Panel agrees with AST that there is not expected to be any adverse health effects from the proposed Project or from the cumulative effects of existing, approved and proposed projects in the area.

6.8: Effects on Agriculture

6.8.1: Crops

6.8.1.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) predicted that a maximum average annual dry deposition of 1.1 kg S^0/ha·y would occur at the south boundary of the Site. AST estimated that S^0 deposition values would decrease to less than 0.1 kg/ha·y within about 4 km from the Site boundary. AST concluded that this level of S^0 deposition was below values that would negatively impact any crops or vegetable produce grown in the area. AST indicated that the predicted rate of S^0 deposition was minimal when compared to the normal plant nutrient requirements for sulphur by crops such as barley and canola routinely produced in the area. AST noted that an average yield of alfalfa will withdraw about 30 kg S^0/ha. AST said that the degree of soil acidification resulting from the predicted rate of S^0 deposition was also small compared to localized soil acidification that generally occurs due to the current agricultural practice of applying ammonia-based fertilizer.

6.8.1.2: Views of the Interveners

The Friends of Lamont County (FOLC) stated that the data regarding the extent of fugitive S^0 dispersion from existing sulphur storage facilities in AB, particularly comparable facilities such as Shell Shantz, showed that AST's prediction of S^0 deposition was significantly underestimated. The FOLC maintained that acidification of farmland and lower crop yields due to excessive S^0 deposition and PAI would result in financial losses and jeopardize their farming future.

The FOLC doubted that S^0 deposition and PAI would benefit crop growth as a source of fertilizer nutrients. The FOLC explained that area operators raising a crop of canola might be expected to add 20 to 25 pounds of plant available sulphur per acre to the soil per crop year in the form of $(NH_4)_2SO_4$. The FOLC indicated that the addition of 20 to 25 pounds of S^0/yr would not benefit crop growth greatly in the first year of application, as the mineralization of S^0 to plant available forms of sulphur generally occurs slowly.

6.8.1.3: Views of the Panel

As valid quantitative evidence to the contrary was not presented, the Panel accepts AST's predictions regarding S^0 and PAI deposition and concludes that the potential impacts of the Project on agricultural crops (production and quality) will not be significant. The Panel believes that agricultural crops in the area will be exposed to less than the predicted maximum average annual S^0 deposition rate of 1.1 kg S^0/ha·y. The Panel notes that the current production of agricultural crops in the area involves fertilization with sulphur at rates that may be 16-22 times the predicted rate of S^0 deposition.

The Panel expects that, with AST's commitment to implement mitigative measures to manage and control S^0 dispersion and PAI emissions, significant acidifying depositions will be limited to the PDA. In this regard, the Panel notes that AST has, as a part of its required approvals from AENV, committed to a comprehensive soil sampling and remediation program to monitor and amend soil acidification in the PDA and LSA.

6.8.2: Animal Health

6.8.2.1: Views of the Applicant

Alberta Sulphur Terminals Ltd. (AST or the Applicant) reported that the major conclusion of the interpretive overview of the Science Advisory Panel of the WISSA (Western Interprovincial Scientific Studies Association) *Western Canada Study* on *Animal Health Effects Associated With Oil and Natural Gas Field Facilities*, was that exposure to the emissions from oil and gas facilities was not adversely affecting productivity in the cattle industry in western Canada. AST accepted that there were some exceptions to the overall lack of association between exposure to the emissions from oil and gas facilities and adverse impacts on cattle health and productivity that were revealed by the WISSA study, however in virtually all cases, the exceptions ultimately were judged to be of questionable or unknown significance.

Based on the information provided in the WISSA study and the comments made by the Science Advisory Panel, AST viewed the inference of causality between sulphur dioxide (SO_2) and calf mortality and SO_2 and hydrogen sulphide (H_2S) and calf treatment to be tenuous in the absence of consistency, specificity, strength and biological plausibility, all of which are necessary, important and well-established benchmarks for determining a cause and effect relationship. AST also reported that in the Environmental and Occupational Health journal, Volume LXIII, 2, Number 4, 2008, Dr. Tee Guidotti (co-chair of the Scientific Advisory Panel of the WISSA study) stated in reference to the results of the WISSA study, that "*statistical association does not necessarily mean a cause and effect relationship in science, and there are many reasons why an apparent association, especially an isolated one, can be false or the results of other factors*."

AST attested that little effort appeared to have been made by the FOLC to characterize the Project's limited contributions of SO_2 and H_2S and how these could affect the productivity of the livestock in the area. AST indicated that even if there was a causal relationship concluded by the WISSA study, considering the Project was expected to maximally contribute only 0.01 ppb (0.03 $\mu g/m^3$) of SO_2, the Project's contribution of SO_2 emissions were not expected to have a measurable effect on cattle in the region.

AST indicated that with respect to calf treatment, the Project's predicted H_2S concentrations were well below the possible threshold of effect identified by the principle investigator of the WISSA study. As such, AST attested that any long-term H_2S concentrations contributed by the Project to the Lamont area were not expected to increase the risk of calf treatment.

Under conventional agricultural production, AST concluded that the rate of sulphur deposition from the Project would not exceed the rate of sulphur removal by existing agricultural activity in the area.

AST concluded that the Project was not expected to adversely affect health or productivity of cattle found in the local area.

6.8.2.2: Views of the Interveners

The Friends of Lamont County (FOLC) stated that many members of the FOLC operated a livestock business as their sole source of income such as cattle or pure bred swine and were concerned that the Project would have a negative health impact on their livestock. The FOLC submitted that AST had not included any assessment of animal health risks in their application. They were specifically concerned with H_2S, SO_2 and particulate matter emissions. The FOLC reported that some members had experienced cattle and calf losses in the past due to producing oil wells in the area.

The FOLC reported that in regards to calf mortality, the WISSA study concluded that calves exposed to the highest measured concentrations of SO_2, were about 1.4 times more likely to die than calves exposed to the lowest measured

concentrations. The FOLC reported in other words, the ten most exposed herds (to SO_2) would have a cumulative 27 more dead calves than would the ten least exposed herds. The FOLC stated that the exposure to sulphur dioxide in the three month period before calving was most suggestive of a causal exposure response relationship.

The FOLC extracted Clean Air Strategic Alliance (CASA) ambient SO_2 concentration data for the Lamont continuous monitoring station for the three months prior to a calving date of April 1, which would somewhat match the data in the WISSA study. The FOLC reported that the 95 percentile concentration for SO_2 was 3.62 ppb and the annual 75 percentile was 2.13 ppb compared to the 95 percentile exposure to SO_2 in the three month period prior to calving in the WISSA study, which was 1.9 ppb. The FOLC concluded that, based on this information it could be expected that cattle herds near Lamont would experience increased calf losses due to the effect of SO_2, without any contributions from new facilities. The FOLC attested that health effects would likely be caused by spikes, possibly from a small unreported sulphur fire.

The FOLC reported that in regards to calf treatment, the WISSA study concluded that the exposure of calves to SO_2 during their first 30 days of life resulted in a 1.3 percent increase in the risk of treatment and exposure to H_2S resulted in a 2 percent increase in the risk of treatment when comparing the first and fourth exposure quartiles. The FOLC concluded that both SO_2 and H_2S were shown to be associated with calf treatments at concentrations less than the maximum average concentrations measured at Lamont at current levels, therefore any additional emissions could be expected to increase the risk of calf sickness.

The FOLC indicated that selenium deficiency in cattle would be exacerbated by high sulphur in the soil and the copper deficiency in cattle would be exacerbated by high sulphur in the forage. The FOLC recommended that potential interactions with trace mineral nutrients should be investigated by determining current soil and forage sulphur, selenium and copper concentrations and evaluating the trace mineral status of cattle in the area. However, the FOLC also indicated that in Alberta, the maximum regulated level of selenium in cattle feed was insufficient and a lot of livestock producers require a prescription diet for their cattle in order to have an above regulated level.

The FOLC concluded that there was insufficient reliable information regarding the effects of sulphur dust on cattle to make any comments on the effect of the Project.

6.8.2.3: Views of the Panel

The Panel agrees with AST's position that it must have regard for the overall conclusion of the WISSA study, which was that exposure to the emissions from oil and gas facilities, was not adversely affecting productivity in the cattle industry in western Canada. The WISSA study specifically evaluated H_2S and SO_2 emissions, and therefore the Panel sees the relevance of this study with respect to the proposed Project.

The Panel does not accept that there is a causal relationship between SO_2 and calf mortality and SO_2 and H_2S and calf treatment. The Panel agrees with the opinion of Dr. Tee Guidotti (co-chair of the Scientific Advisory Panel of the WISSA study) in that the statistical association observed does not necessarily mean a cause and effect relationship.

The Panel understands that the contribution of SO_2 emissions from the Project would be minimal. If current concentrations of SO_2 and H_2S in the ambient air in the area were causing calf mortality and increased calf treatment, the Panel did not receive any evidence to support this. The Panel recommends that Alberta Environment include SO_2 as a parameter of the ambient monitoring program that will be required as a condition in AST's approval, in order to verify the Project's contributions, as outlined in Section 6.1.3 of this report.

The Panel believes that trace mineral deficiencies (such as copper and selenium) are widespread and well documented in this province completely independently of any effects of industrial emissions, and livestock producers supplement livestock diets as part of regular management practice, as agreed to by the FOLC's expert. The Panel did not observe any correlation between the evidence provided by the FOLC and the effect of the Project on these metal deficiencies.

The Panel agrees with AST that the rate of sulphur deposition from the Project would not exceed the rate of sulphur removal by existing agricultural activity in the area and therefore would not have any effect on cattle health.

6.9: Effects on Vegetation, Wildlife and Biodiversity

6.9.1: Views of the Applicant

AST reported that baseline field surveys of the Site to characterize and assess the biophysical resources which included vegetation, wildlife and biodiversity had been completed. AST stated that the impacts of the proposed Project on the biophysical resources and the measures necessary to mitigate these effects had been evaluated for both the application and cumulative scenarios.

AST acknowledged that the potential impacts related to the Project on the biophysical resources were:

- Vegetation - surface disturbance, dust deposition, contaminant spills, introduction of non-native and invasive species, deposition from S^0 and PAI
- Wildlife – deposition from PAI and S^0, direct mortality, i.e. traffic related animal mortality, habitat availability, noise, fragmentation (habitat and movement corridors)
- Biodiversity – surface disturbance, anthropogenic edge, linear disturbances

AST predicted that, based on the information obtained from the baseline, application and cumulative impact assessments, the effects of the Project could be summarized as follows:

- Vegetation – negative, local in geographic extent, negligible to low-to-moderate in magnitude, short-term to mid-term in duration and reversible.
- Wildlife – negative, local in geographic extent with the exception of direct mortality and noise effects, low to moderate in magnitude, [2] class 3-4 in impact rating
- Biodiversity – negative, local in geographic extent, long term in duration, low in magnitude, class 3 in impact rating except for anthropogenic edge effect which is class 4

6.9.2: Views of the Interveners

Potential effects of AST's project on vegetation, wildlife and biodiversity were not identified as significant issues by the interveners. However, the interveners expressed concern regarding the possible negative impacts of the Project on the wetland habitat located in the LSA and the associated biophysical resources.

6.9.3: Views of the Panel

The Panel finds that AST conducted an acceptable assessment of the potential effects of the Project on vegetation, wildlife and biodiversity. The Panel notes that AST adopted strategies, methods and interpretive standards that are current and well recognized by expert practitioners to complete the assessments and to develop the conclusions presented. The Panel agrees with AST that, in view of past agricultural practices and recent developments under the current industrial land use designation, the biophysical resources of the Site have already been significantly affected by anthropogenic factors.

The Panel concludes that the predicted Project impacts on vegetation, wildlife and biodiversity will be acceptable when minimized by AST commitment to implement the necessary ongoing mitigative measures in a timely manner.

SECTION 7: PANEL DECISION

Having regard for the commitments made by AST and subject to the conditions outlined in this report, the Panel concludes that the Project is in the public interest.

The Board is directed by the *Natural Resources Conservation Board Act (NRCBA)* to review the AST application to determine whether, in the Board's opinion, the proposed sulphur forming and shipping facility with the capacity of 3,000 tonnes/day is in the public interest, having regard to the social and economic effects of the Project and its effect on the environment. The Panel has considered the entire record of this review in reaching the conclusions contained in this report, including the evidence and argument provided by each participant. This report focuses on the

[2] Class 3 impact rating: slight but recovering change in indicator species
Class 4 impact rating: no change in quantity or quality of indicator species

major issues identified by the participants at the hearing and such focus should not be interpreted as an indication that the full record was not reviewed thoroughly by the Panel in its consideration of the application.

The Panel has completed an assessment of the social, economic and environmental effects of the Project, both beneficial and adverse. As with any significant industrial project, effects on the community are to be expected. For a project to be in the public interest, the Board must be convinced that the identified project benefits to the region and to the province can be achieved without unacceptable environmental or social effects. Where potential adverse effects are identified, the Board may impose conditions on an approval to provide a level of mitigation or to advance project benefits. The Panel has considered the scope, quality and reliability of information submitted by the proponent predicting these effects, the risk of a negative effect occurring, preventative measures proposed by AST, planned mitigation measures, compliance with current regulations and standards and follow-up surveillance and monitoring. This section of the report contains a summary of the Panel's public interest assessment of the Project.

The Panel recognizes that sulphur production in Alberta is directly related to upgrader and refinery production in the oil and gas sector and that the marketing of sulphur presents a challenge to the energy industry. The Panel is satisfied that sulphur production can be expected to increase in concert with the forecasted increase in oil and gas production in Alberta. The Panel believes that the business model adopted by AST represents a commercially viable enterprise. Having regard for the volume of sulphur currently being inventoried as block storage, the Panel believes that AST will be successful in securing "take-or-pay contracts" with a sufficient number of producers to commercially operate the facility.

The Panel finds that the Project will have a positive economic impact on a regional basis. The Project will generate increased activity for local businesses and additional tax revenue for Lamont County. Notwithstanding this finding, the Panel recognizes that the scale of the Project is modest compared to some of the large scale industries located within Alberta's Industrial Heartland. Indeed, given the operational requirement of 22 full-time employees, the Panel believes that there will be negligible impacts on local infrastructure. In reviewing the municipal planning documents of Lamont County the Panel has determined that the proposed development is not inconsistent with the provisions contained therein.

The Panel believes that AST has proposed adequate measures to ensure the degassing of liquid sulphur to a maximum H_2S concentration of 10 ppm for public safety reasons and to ensure that the H_2S concentration of incoming sulphur feedstock meets specifications. The Panel understands that the effectiveness of air monitoring in the receiving area is highly dependent on the location of the monitoring equipment. Accordingly, the Panel requires as a condition of this approval that AST establish air quality monitoring locations at optimum locations to detect any H_2S exceedances in the receiving area, to the satisfaction of Alberta Environment (AENV) Further in order to increase accountability to the public, the Panel requires as a condition that any exceedances of the H_2S 10 ppm concentration in the feedstock be reported to AENV, including the exceedance level in the load, number of loads, dates and response, and that AENV ensures this information is available to the public in a reasonable time.

The Panel finds that the selected Rotoform HS® sulphur forming technology represents the best available technology because it produces a premium product that has lower friability resulting in less sulphur dust. Rotoform HS® technology also has lower air emissions and lower water and energy consumption than other technologies considered.

The Panel notes that covered storage of formed sulphur represents the best option from the perspective of fugitive dust emissions, but has a higher explosion risk. In the Panel's view, it is important that management practices such as avoiding the use of equipment that has the potential to generate sparks and using dust suppressants be employed. Safeguards such as covered loading facilities, double-lined surface water containment system with leak detection monitoring can be implemented at the outdoor storage site to achieve a level of environmental protection equivalent to indoor storage. In order to reduce the potential for dust, the Panel notes that AST has committed to good housekeeping practices such as daily sweeping and washing of the pad area and training staff on the importance of keeping the pad clean.

While the Panel is confident that an adequately designed wind screen will reduce airborne emissions from the storage site, it notes some uncertainty remains as a final wind screen design has not been completed by AST. As a consequence, the Panel requires that AST conduct the following work on the wind screen design and address any deficiencies, both to the satisfaction of AENV, to:

- determine the effects of wind turbulence on the stockpile having regard to the concern that this turbulence may result in an increase in fugitive sulphur dust emissions
- address the effects of north and northeast winds on the stockpile, which may not be blocked by the forming building and tanks

The Panel heard the community concern that fugitive dust emissions may increase when the stockpile height exceeds the height of the wind screen in times when the shipment of formed sulphur is disrupted. Accordingly the Panel requires as a condition to the NRCB approval that, whenever the stockpile exceeds the wind screen height, AST is required to record and report the description and dates of the height exceedances to AENV and that AENV should ensure this information is made available to the public in a reasonable time.

While the Panel recognizes that the AST facility is not an ERCB noise regulated facility, it notes the commitment of AST to comply with ERCB Directive 038. The Panel finds that the materials submitted by AST have not allowed the Panel to have complete confidence that AST will be able to establish compliance with its commitment in relation to ERCB Directive 038. Because of these deficiencies and the potential noise impacts on residents, the Panel has determined that AST must complete additional work. The Panel requires as a condition to its approval that in advance of receiving an operating approval from AENV, AST recomplete the noise impact assessment and conduct comprehensive sound monitoring surveys at each impacted residence in compliance with the requirements of ERCB Directive 038 to the satisfaction of AENV. The results of these assessments are to be made available to interested members of the community by AST. In addition the Panel imposes as a condition to its approval that AST conduct a post-commissioning comprehensive sound monitoring survey to verify compliance with Directive 038 within six months of Project start-up to the satisfaction of AENV. This survey shall include diagnostic sound pressure level measurements of the AST facility to verify the assumptions used in the noise impact assessment. Again, the results of these assessments are to be made available to interested members of the community by AST. The Panel believes that these steps are necessary to generate the information needed to develop further attenuation measures should the results of the survey indicate non-compliance with ERCB Directive 038.

Having regard for the evidence, the Panel does not foresee significant adverse odour and light effects from the Project. Having said this, the Panel notes that AST has committed to the monitoring of H_2S concentrations at the fenceline which could be the most likely cause of odour. AST also committed to address odour complaints and mitigate light impacts should they occur.

In its assessment of road and rail traffic the Panel focused on Range Road (RR) 202, Highways 15 and 45 and the two railway systems crossing and servicing the Site. Although the predicted volume of the total number of additional vehicles will result in a significant increase in traffic along RR 202, the predicted number of total additional vehicles is not believed to be of great significance with respect to the relatively more major Highways 15 and 45, particularly given the industrial nature and zoning of the surrounding area. The Panel notes that the improvements to the intersection of RR 202 and Highway 15 suggested in AST's transportation impact assessment have already been undertaken by Alberta Transportation. The Panel has not reached any conclusions on whether RR 202 will need to be upgraded to respond to traffic associated with the AST project. The Panel notes that AST has accepted the responsibility to pay its fair share of costs associated with road upgrades attributable to its project. The Panel believes that the increase of two to three, 110 to 126 railcar unit trains would be noticeable regardless of the current levels of train traffic. The Panel also believes that this is a reasonable increase to railway traffic on the railway lines and that having relatively easy and close access to both major railway lines is advantageous.

In reviewing the municipal planning documents of Lamont County the Panel has determined that the proposed development is not inconsistent with the provisions contained therein, but is aware that the development would be considered a discretionary use. The Panel understands that it is not uncommon for a municipality to require private developers to bear the costs associated with public improvements that are necessitated by a development. The Panel is aware that the provisions of the *Municipal Government Act* restrict the municipal role in such activities in respect to projects that are reviewable by the Natural Resources Conservation Board. Having regard for this, the Panel requires that AST:

- pay any reasonable costs associated with storm water management measures attributed to its project in order to protect RR 202
- bear any reasonable costs associated with obtaining access to the Regional Water Commission Line and the cost of its fair share of upgrades to RR 202 that are necessitated by the Project
- provide AENV with annual proof of insurance along with documentation summarizing the details of coverage and rationale supporting the adequacy of the coverage

While the Panel is not prepared to require that AST enter into a development agreement with Lamont County it is confident that the identification of any necessary upgrades and the costs apportioned to AST can be resolved through negotiation between the parties.

The Panel is satisfied that AST conducted a credible risk assessment of the Project using the appropriate methodology and the best information available at the time it was conducted. The Panel finds that the greatest potential risk to the public from the Project is a large sulphur fire and the corresponding health risk of SO_2 emissions off site. While the risk of a large fire is small, the Panel agrees with AST that a risk remains. The Panel agrees that the laboratory study conducted by ASRL is credible and applicable to this Project, and that a single fire ignition location is acceptable, as the safety factor accounted for multiple locations. The Panel believes

that AST addressed the issue of wind propagation through the use of a generous safety factor on the sulphur burn rate prior to dispersion modeling and included further mitigation with a wind screen and limitations on the height of the storage pile. Therefore, the Panel finds that AST's development and characterization of the worst case scenario in the event of a sulphur fire at the Project is acceptable.

The Panel is concerned with the lack of meaningful discussion between AST and Lamont County concerning the availability and role of County services in the event of an emergency and how AST will coordinate emergency services with the County. The Panel recognizes that AST expects to rely on NR CAER, a well-known area mutual aid organization, to provide assistance to AST in emergency firefighting services and communicating with and evacuating neighbors, if necessary.

However, the Panel finds that the emergency response plan (ERP) prepared by AST lacks detail about the arrangement with NR CAER and the specific plans for residents within the evacuation zone. The Panel finds that the location of the proposed project, with its proximity to the towns of Bruderheim and Lamont as well as numerous individual landowners, raises concerns regarding human health and safety in the surrounding area. Due to the nature of the risks posed by the Project and its location in relation to residents and communities, the Panel finds that it is necessary for the Panel to review and assess the AST's final ERP. Accordingly, it is a condition precedent to the NRCB approval of this application that AST provide the NRCB with its final ERP. AST may not begin construction of the Project prior to the NRCB being satisfied that the final ERP adequately addresses:

- Details as to who will have the charged responsibility to notify area residents and how and when this flow of communication will occur should an incident happen. (CSA Z731: Clause 4.7 and 5.4.9, Directive 071: Section 2.1.3 and Section 5.9)
- Details as to all roles and responsibilities AST's mutual understanding partners will have with emergency response actions. AST will also provide more detailed information surrounding the roles and responsibilities of all external emergency response stakeholders (such as Lamont County and NR CAER) including emergency fire response services. (CSZ Z731: Clause 4.8 and 4.10, Directive 071: Section 2.1.3)
- Details as to how evacuation of the public from the AST designated evacuation zone is to occur. (CSA Z731: 4.9, Directive 071: Section 5.2.2)
- Details as to how AST (or its mutual understanding partners) will attempt to isolate the evacuation zone. (CSA Z731: 4.9, Directive 071: Section 5.2.5)
- Details as to how AST will address any communication difficulties (such as poor cell phone coverage) with area residents. (CSA Z731: 4.12, Directive 071: Section 5.8)
- Documentation of consultation efforts with all stakeholders within the evacuation zone (cognizant of relevant privacy restrictions concerning confidential information). (CSA Z731: Clause 4.8 and 4.10, Directive 071: Section 4.0)
- Documentation of notification efforts and discussions with the Town of Bruderheim and the Town of Lamont.

The Panel finds that AST used the best available data and made conservative assumptions to predict ground level concentrations of air contaminants. The Panel agrees with AST that the

system proposed for unloading of the degassed liquid sulphur from the railcars and trucks will not generate significant H_2S emissions. However, the Panel has required effective air monitoring to detect liquid sulphur that may not have been degassed to 10 ppm H_2S. The Panel recognizes that the Lamont continuous monitoring station, part of the Fort Air Partnership, provides appropriate background concentrations for the contaminants of concern at the Project location. The Panel accepts that there will not be significant fine particulate emissions from the sulphur stockpile as the pastilles are expected to have low friability. The Panel accepts AST's commitment to have a continuous air monitor for wind speed and direction, ambient H_2S and $PM_{2.5}$ concentrations, and recommends that AST work towards having monitoring data available to the area residents in a timely manner. The Panel also understands that there will be compliance and ambient monitoring programs as part of the AENV approval, and recommends to AENV that H_2S and SO_2 be monitored as part of the ambient program. The Panel notes AST's commitment to consult with its experts for determining optimal locations for continuous and passive air monitoring equipment. The Panel agrees with AST that there is not expected to be any adverse health effects from the proposed project or from the cumulative effects of existing, approved and proposed projects in the area.

The Panel acknowledges AST's diligence in conducting a comprehensive and professionally competent groundwater investigation at the Site. However, the Panel notes that AST's investigation was limited in extent and that most of AST's geological and hydrogeological characterization was limited to the southern half of the Site and much of the investigation did not extend to the depth of an important shallow sandstone aquifer identified by AST. The Panel notes that AST has shown that geologic conditions relating to the surficial and shallow bedrock sediments beneath the Site are complex, both in regard to sediment composition and lateral continuity. The Panel accepts and agrees with AST's evidence that acidification of soil and groundwater will not occur beyond the facility boundary since surrounding area soils have high alkalinity and buffering capacity.

The Panel believes that because of the complexity of geologic conditions beneath the Site, it is quite possible that determination of shallow sandstone hydraulic conductivity in only three wells, and hydraulic head of shallow bedrock units in six wells may not be sufficient to characterize hydraulic conditions of the sandstone with regard to these two parameters. The Panel, as a condition of its approval, therefore requires AST to collect additional information about hydraulic conductivity of geologic materials at the Site and local hydraulic gradients to the satisfaction of AENV, before it designs and implements its groundwater monitoring program.

The Panel understands that AST conducted baseline assessments and interpretations for surface water quality based primarily on two sampling events. While the Panel believes that the methods employed by AST were adequate to characterize surface water quality in a general sense for the area, significant variations in specific parameter concentrations were noted. Additional baseline sampling would increase confidence in the characterization of surface water quality and possibly provide a better understanding for those parameters that display temporal variation as a result of natural process and/or anthropogenic activities. Of particular interest would be parameters associated with the Project (i.e. sulphur species, associated ions and select metals) that can display variation as a result of relatively natural processes as well as other activities in the area and should be the focus of additional baseline sampling. The Panel requires as a condition that another baseline monitoring/sampling event be conducted and reported to AENV. This will not only improve pre-Project characterization of surface water quality, but also aid in assessing the potential impacts of Project construction and operation on surface water quality in the area.

The Panel recognizes and understands that the potential impact of elemental sulphur (S^0) and potential acid inputs (PAI) deposition on agricultural lands from AST's operations is a significant concern to the FOLC and other area residents. The Panel accepts AST's modeled predictions regarding S^0 and PAI deposition and concludes, with reasonable certainty, that any significant impacts due to the dispersion and/or emission of acidifying compounds from AST's operations will be confined to the PDA. The Panel also expects AST to fulfill its commitment to work with AENV to develop and implement a comprehensive soil monitoring program to detect early changes in soil pH due to acidifying depositions from AST's operations and to remediate impacted soil when necessary. The Panel understands that this soil monitoring plan will be part of AST's regulatory approvals from AENV. Since the biotransformation of any accumulated S^0 to acidic compounds in soil is recognized by experts to be slow, the Panel concludes that a three-year monitoring frequency, as typically recommended by AENV, is appropriate as an initial schedule for soil sampling and analyses. The Panel, however, recommends that AST, in conjunction with AENV, review the ongoing frequency of soil monitoring and adjust the frequency based on the measured and observed rate of soil acidification in affected soils.

According to AENV's *Conservation and Reclamation Regulation*, the AST project is considered "Specified Land" and is therefore required by AENV to reclaim the Project when operations cease and obtain a Reclamation Certificate pursuant to the *Environmental Protection and Enhancement Act* (*EPEA*) from AENV. Land reclamation is required to return disturbed land to a state where, at a minimum it is at least as capable of supporting the same kinds of land uses as before the disturbance. The Panel believes that AST has conducted the necessary studies on site characteristics (e.g. topography, drainage patterns, and soil and vegetation types) to develop an effective reclamation plan. In addition, the Panel notes that AST will be required by AENV to provide the necessary financial security in an amount determined by AENV to be sufficient to ensure completion of conservation and reclamation on the land.

Having regard for all predicted impacts, the Panel has determined that the AST proposal meets the Board's statutory public interest test. Of the positive affects identified by the Panel, the potential of this facility to respond to by-product sulphur generated from upgrader and refinery operations is viewed as a useful activity. As with all projects that are reviewed by the NRCB, some of the predictions contained in the application have a degree of uncertainty. In order to limit the uncertainty and ensure the public interest is protected, the NRCB may impose approval conditions and it has done so with this application. Perhaps most notable is the Panel's requirement that AST complete its emergency response plan to the satisfaction of the NRCB prior to commencing construction. The Panel is confident that the approval, with the associated conditions attached, will address key areas of concern, provide appropriate levels of mitigation and protect the public interest.

The NRCB views the commitments made by an applicant either in its written application or verbally at a hearing as obligations that survive the approval process, independent of their inclusion as conditions to an approval. The Panel is cognizant that its legislated mandate is primarily limited to a one-time determination of whether to grant an approval. Unlike an industry regulator that has the ability to revisit and modify the terms of an approval in response to operational experience and changing technology, NRCB approvals are not easily amended and are binding on successors. In order to respond to this situation the Panel believes that a pragmatic approach is sometimes required when assessing the ongoing compliance of an approval holder. While the starting point in this assessment may well be a simple question of whether the approval holder is fulfilling commitments made during the course of the application process, the Panel does not believe that blind servitude to commitments that are no longer

relevant and beg revision serves the public interest. Rather, the Panel views its responsibility to identify the objectives associated with the proponent's key commitments in its decision report so that, should there be a future need to assess compliance, the integrity of the decision can be preserved.

DATED at CALGARY, ALBERTA, this 21st day of July, 2009.

Original signed by:

Jim Turner, Chair

Donna Tingley

Barbara McNeil

APPENDIX A: NRCB FORM OF APPROVAL

THE PROVINCE OF ALBERTA
NATURAL RESOURCES CONSERVATION BOARD ACT
NATURAL RESOURCES CONSERVATION BOARD

IN THE MATTER of a project of Alberta Sulphur Terminals Ltd. for approval to construct and operate a sulphur forming and pastille storage facility near Bruderheim, Alberta

APPROVAL NO. NR–2009-3

WHEREAS by Order in Council 290/2006 the Lieutenant Governor in Council, on the recommendation of the Minister of Environment, pursuant to section 4(f) of the Natural Resources Conservation Board Act, prescribed as a reviewable project the Sulphur Forming and Pastille Storage Facility and other associated facilities proposed by Alberta Sulphur Terminals Ltd., a division of Hazco Environmental Services Ltd., to be located on Section 35, Township 55, Range 20, West of the 4th Meridian near Bruderheim, Alberta; and

WHEREAS the Natural Resources Conservation Board is prepared to grant approval to the application by Alberta Sulphur Terminals Ltd., subject to the conditions herein contained, and the Lieutenant Governor in Council has given authorization, hereto attached.

THEREFORE, the Natural Resources Conservation Board hereby orders as follows:

1. The project of Alberta Sulphur Terminals Ltd., for construction and operation of a sulphur forming and pastille storage facility and other associated facilities located near Bruderheim, as described in Application No. 0702, from Alberta Sulphur Terminals Ltd. to the Board filed July 13, 2007 and all supplemental material supporting the Application filed with the Natural Resources Conservation Board, is approved, subject to the undertakings and commitments in the application and the terms and conditions herein contained.
2. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment, establish air quality monitoring locations at optimum locations to detect any H_2S exceedances in the receiving area.
3. Alberta Sulphur Terminals Ltd. shall report any exceedances of the H_2S 10 ppm concentration in the feedstock to Alberta Environment, including the exceedance level in the load, number of loads, dates and response. Alberta Environment shall ensure this information is available to the public in a reasonable time.

APPENDIX A: NRCB FORM OF APPROVAL (continued)

4. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment, conduct the following work on the wind screen design and address any deficiencies:
    - determine the effects of wind turbulence on the stockpile having regard to the concern that this turbulence may result in an increase in fugitive sulphur dust emissions; and
    - address the effects of north and northeast winds on the stockpile, which may not be blocked by the forming building and tanks.
5. Alberta Sulphur Terminals Ltd. shall, whenever the stockpile exceeds the wind screen height, record and report the description and dates of the height exceedances to Alberta Environment and Alberta Environment shall ensure this information is made available to the public in a reasonable time.
6. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment and in advance of receiving an operating approval from Alberta Environment, recomplete the noise impact assessment and conduct comprehensive sound monitoring surveys at each impacted residence in compliance with the requirements of ERCB Directive 038. The results of these assessments are to be made available to interested members of the community by Alberta Sulphur Terminals Ltd.
7. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment, conduct a post-commissioning comprehensive sound monitoring survey to verify compliance with Directive 038 within six months of Project start-up. The results of these assessments are to be made available to interested members of the community by Alberta Sulphur Terminals Ltd.
8. Alberta Sulphur Terminals Ltd. shall:
    - pay any reasonable costs associated with storm water management measures attributed to its project in order to protect RR 202; and
    - bear any reasonable costs associated with obtaining access to the Regional Water Commission Line and the cost of its fair share of upgrades to RR 202 that are necessitated by the Project.
9. Alberta Sulphur Terminals Ltd. shall provide Alberta Environment with annual proof of insurance along with documentation summarizing the details of coverage and rationale supporting the adequacy of the coverage.
10. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment, collect additional information about hydraulic conductivity of geologic materials at the site and local hydraulic gradients before it designs and implements its monitoring of potential adverse impacts to shallow groundwater to the north of the Project.
11. Alberta Sulphur Terminals Ltd. shall, to the satisfaction of Alberta Environment, conduct further pre-project baseline surface water quality monitoring/sampling to increase the ability to determine the source of surface water quality changes within surface water bodies surrounding the site.

APPENDIX A: NRCB FORM OF APPROVAL (continued)

12. Alberta Sulphur Terminals Ltd. shall complete its final emergency response plan to the satisfaction of the Natural Resources Conservation Board. This Approval comes into force upon the Natural Resources Conservation Board being satisfied that the final emergency response plan adequately addresses:

- details as to who will have the charged responsibility to notify area residents and how and when this flow of communication will occur should an incident happen;
- details as to all roles and responsibilities Alberta Sulphur Terminals Ltd.'s mutual understanding partners will have with emergency response actions;
- details as to how evacuation of the public from the Alberta Sulphur Terminals Ltd. designated evacuation zone is to occur;
- details as to how Alberta Sulphur Terminals Ltd. (or its mutual understanding partners) will attempt to isolate the evacuation zone;
- details as to how Alberta Sulphur Terminals Ltd. will address any communication difficulties (such as poor cell phone coverage) with area residents;
- documentation of consultation efforts with all stakeholders within the evacuation zone (cognizant of relevant privacy restrictions concerning confidential information);
- documentation of notification efforts and discussions with the Town of Bruderheim and the Town of Lamont.

Made at the City of Calgary, in the Province of Alberta, this day of , 2009.

NATURAL RESOURCES CONSERVATION BOARD

Jim Turner, Panel Chair

Donna Tingley

Barbara McNeil

APPENDIX B: HEARING PARTICIPANTS

	REPRESENTATIVES	WITNESSES
AST	Daron Naffin Shawn Munro	Robert Mann Gordon Johnson Douglas McCutcheon Douglas Leahey Bart Koppe Ray Davis Richard Wright Robert McManus David Berrade Robert Telford
FRIENDS OF LAMONT COUNTY	Richard Secord Eva Chipiuk Debbie Bishop	Jim Hyne Brian Gettel Richard Kennedy James Farquharson Stuart Batterman Dennis Van Brabant Dennis Maschmeyer Walter Schneider Kevin Schultz Robert Kottke Wesley Hauer Elfrieda Hauer Douglas Maschmeyer Gerald Maschmeyer Audrey Rinas Sharon Krill Connie Nesbut Kent Harrold
LAMONT COUNTY	Jeneane Grundberg David Dmytryshyn Marie Kurylow	Wayne Woldanski Allan Harvey
LESLIE JANS	Leslie Jans	
LAMONT HIGH SCHOOL PARENT COUNCIL	Leslie Jans	

APPENDIX B: HEARING PARTICIPANTS (continued)

	REPRESENTATIVES	WITNESSES
LAMONT HEALTH CARE CENTRE	Kent Harrold	
TOWN OF BRUDERHEIM	Tim Duhamel	
ELK ISLAND PUBLIC SCHOOLS	Bazil David	
JOANNE AND ROBERT BOURQUE	Joanne Bourque	

NRCB STAFF WHO ATTENDED THE HEARING

Walter Ceroici
Jim Fujikawa
Mike Iwanyshyn
Carly Kaban
Bill Kennedy
Warren Kindzierski (consultant)
Cynthia Ravensdale (ERCB)
Susan Schlemko
Don South (ERCB)
Richard Stein
Mike Wenig
Peter Woloshyn

APPENDIX C: ACRONYMS AND ABBREVIATIONS

AAAQO	Alberta Ambient Air Quality Objectives
AENV	Alberta Environment
API	American Petroleum Institute
ASRL	Alberta Sulphur Research Ltd.
AST	Alberta Sulphur Terminals Ltd. (the Applicant)
Board	Natural Resources Conservation Board
CASA	Clean Air Strategic Alliance
CCS	CCS Corporation (AST's parent company)
CO	carbon monoxide
EIA	Environmental Impact Assessment
EPA-RMP	Environmental Protection Agency Risk Management Plan
EPEA	*Environmental Protection and Enhancement Act*
ERCB	Energy Resources Conservation Board
ERP	emergency response plan
ERPG	Emergency Response Planning Guideline
EUB	Energy and Utilities Board
FOLC	Friends of Lamont County
GHG	greenhouse gas emissions
H_2S	hydrogen sulphide
HHRA	human health risk assessment
Igpm	Imperial gallons per minute
Leq	energy-equivalent continuous sound level
LEL	lower explosive limit
LOAEL	lowest observable adverse effect level
LSA	local study area
MIACC	Major Industrial Accidents Council of Canada
mg/L	milligram per litre
µS/cm	microSiemen per centimetre

APPENDIX C: ACORONYMS AND ABBREVIATIONS (continued)

$\mu g/m^3$	microgram per cubic metre
NCIA	Northeast Capital Industrial Association
$(NH_4)_2 SO_4$	ammonium sulphate
NIA	noise impact assessment
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NR CAER	Northeast Region Community Awareness and Emergency Response
NRCB	Natural Resources Conservation Board
NRCBA	*Natural Resources Conservation Board Act*
PAH	polycyclic aromatic hydrocarbons
PAI	potential acid inputs
PDA	principal development area
PM	particulate matter (eg. PM_{10} depicts particles of 10 micrometres or less)
ppm	parts per million
Project	project proposed by Alberta Sulphur Terminals Ltd.
PSLs	permissible sound levels
RQ	risk quotients
RSA	regional study area
SIR	Supplemental Information Request
S^0	elemental sulphur
SO_2	sulphur dioxide
TIA	traffic impact assessment
USD	United States dollar
VOCs	volatile organic compounds
WISSA	Western Interprovincial Scientific Studies Association

APPENDIX D: SUMMARY OF CSA Z731 AND DIRECTIVE 071 REFERENCES

CSA Z731

- **Clause 4.7 Roles and Responsibilities**

  The roles and responsibilities of individuals and groups in an emergency shall be specified in the ERP

  The ERP should specify the scope of the participants' activities (what, where, when and how), what communications with the public will consist of, when outside authorities are to be called, what on-site actions are expected, how such actions are to be accomplished, etc.

  Flow charts and action checklists are valuable for condensing information and making decisions. If checklists are used, they should contain sufficient detail to ensure that all crucial activities are considered.

- **Clause 4.8 Resources**

  Analysis of emergency scenarios based on identified hazards helps determine what internal and external resources are necessary to deal with an emergency.

  The ERP shall identify all resources (including their locations) needed to ensure an appropriate response capability in an emergency.

  The capabilities of emergency response contractors should be assessed. This can be accomplished by drawing on the expertise of business associations, individuals within the organization, government agencies and so forth.

  Awareness of the capabilities and scope of authority of local emergency services, regulatory agencies, and other public resources in important. Integration with these resources should be considered by the organizations (See also Clause 4.12)

- **Clause 4.9 Emergency Response Procedures**
  - 4.9.1

    Emergency response procedures that incorporate the most appropriate responses to identified hazards shall be devised. These procedures may be embodied in general instructions as well as detailed protocols for undertaking specific critical tasks (e.g., transfer of dangerous substances) during an emergency and during the return to normal operations.

  - 4.9.2

    Emergency response procedures shall include, by not be limited to, the following:

    a) control of access to the area within the perimeter and

    b) identifying and accounting for personnel engaged in on-site response activities.

- 4.9.3

  For a facility, the ERP shall describe the following (or indicate where the appropriate information can be obtained):

  a) procedures and locations of key isolation points for utilities shut-off;
  b) spill control procedures and locations of spill control points
  c) assembly instructions and locations of assembly points; and
  d) locations and operation of emergency protective equipment

  The ERP shall include or reference the facility documents that identify storage locations and control procedures for any dangerous substances in the facility.

- **Clause 4.10 Mutual Aid Agreements**

  Mutual aid agreements enhance emergency response capabilities by allowing for sharing of personnel and equipment. This is particularly useful, for example, when one organization lacks special resources needed to mitigate an emergency and theses are available through others who are party to the agreement.

  Agreements of this type can be applied to a variety of situations. For organizations operating in the same geographical area, they allow resources to be pooled, thus minimizing costs, administrative confusion, unnecessary duplication of efforts and incompatibility of materials and equipment. Mutual aid agreements are also very useful in transportation accidents where considerable distances separate the accident site from the party required to provide emergency response.

  Mutual aid agreements should be entered into wherever possible (see Annex E). A mutual aid agreement shall be in writing and signed by an authorized representative of each party to the agreement. All mutual aid agreements shall be reproduced or referenced in the ERP. The ERP shall also specify the procedures for activating mutual aid.

- **Clause 4.12 Communication Systems**

  Communication systems that promote the rapid communication of accurate information are vital to the safe and efficient handling of emergencies.

  The organization shall establish one or more emergency communication systems. System equipment, including alarms, shall be tested annually (more frequent testing may be necessary because of government regulations, equipment manufacturer requirements, conditions of use, the nature of the potential hazards, and organizational requirements). All users of a system shall be trained in the use of the system's protocols and equipment.

The ERP shall identify:

a) communication system responsibilities and personnel, including:

   i) a spokesperson or spokespersons to facilitate initial and subsequent communications with employees, responders, the medic, etc.; and

   ii) the personnel responsible for advising the public and others that an emergency has ended and

b) fixed equipment to be used during an emergency (e.g., warning systems).

   For emergencies involving multiple responding organizations, consideration should be given to integrated or coordinated communications. This may require sharing of equipment.

- **Clause 5.4.9 Public Communications**

  The following communications with the public directly affected by an emergency shall be undertaken and documented:

  a) an explanation of the extent of the emergency (e.g., the effect the emergency may have on people in the vicinity and the actions the affected population should take; a description of the hazards involved and their short- and long-term effects);

  b) an announcement of the public protection measures being implemented;

  c) an explanation of the status of the emergency response and the actions being taken to resolve the situation (including how long it is anticipated that resolving the situation will take; an explanation of the steps taken to address concerns;

  d) an explanation of the steps to be taken to prevent similar emergencies in the future; and

  e) contact details for sources of additional information.

DIRECTIVE 071

Section 2.1.3 Responsibilities of Personnel

8) The licensee must identify the roles and responsibilities of personnel required to effectively respond to an emergency. One or more functions can be assigned to an individual depending on the complexity of the potential response to an emergency.

Section 4.1 When Are Notification and Consultation Required?

1) The licensee must carry out public and local authority

APPENDIX D: SUMMARY OF CSA Z731 AND DIRECTIVE 071 REFERENCES (continued)

Table 2: When to notify and consult

<table>
<tr><th>Situation</th><th colspan="2">Notification and consultation requirements</th></tr>
<tr><td>Developing a site-specific ERP
- sour well
- sour operations
- HVP pipeline
- cavern storage facility</td><td colspan="2">Notification of and consultation with members of the public within the EPZ are required prior to submitting an application to the ERCB for approval when
- developing a sour well site-specific drilling and/or completion ERP
- developing a sour operations ERP
- developing an ERP for HVP pipeline and cavern storage facilities

Consultation is required with the local authority and others listed in Section 4.2 to confirm and coordinate each party’s roles and responsibilities.</td></tr>
<tr><td></td><td colspan="2">Notification and consultation are required if an existing EPZ either increases or decreases from its current size based on the following:</td></tr>
<tr><td></td><td>Change</td><td>Action</td></tr>
<tr><td rowspan="2">Change in EPZ size</td><td>New EPZ is smaller than current EPZ</td><td>Residents who are no longer within the EPZ and the local authority are to be notified and informed of the change.</td></tr>
<tr><td>New EPZ is larger than current EPZ</td><td>Residents within the expanded portion of the EPZ and the local authority are to be notified and informed of the change in accordance with the requirements in Section 4.3.</td></tr>
</table>

Section 4.2 Preparing for the Public Involvement Program

2) The licensee must identify all residents and local authorities within and adjacent to the EPZ.

3) If an EPZ intersects an urban density development, the licensee must include the entire development within the EPZ for the purpose of conducting the public involvement program.

4) If an EPZ includes a portion of an urban centre, the licensee is not required to identify each individual residence within the urban centre; however, contact must be made with the appropriate urban director(s) of emergency management to review key emergency response information and confirm and coordinate each party’s roles and responsibilities.

5) The licensee must identify in its ERP all urban density developments, campgrounds, and public facilities, such as schools, community centres, and senior citizen centres, within the EAZ; however, direct notification and consultation are not required.

6) Prior to commencement of the public involvement program, the licensee must confirm and coordinate roles and responsibilities in accordance with the protocols established with:
   - the local authorities,
   - the directors of emergency management (or designates/deputy directors) for all municipalities within and adjacent to the EPZ, and
   - the local RHA or applicable federal health branch.

Under Section 11 of the *Emergency Management Act*, the local authority of each municipality is responsible for the direction and control of the local authority's emergency response. The local authority's Municipal Emergency Plan (MEP) describes its framework for response to major emergencies and disasters. The licensee should be familiar with the structure of an MEP, which can be accessed through the Alberta Emergency Management Agency.

7) The licensee must attempt to reach a mutual understanding with local authorities on the specific needs and roles and responsibilities of each party during an emergency and include a summary of the roles and responsibilities in its ERP reflecting the mutual understandings.

   This is to ensure that there is no confusion or misunderstanding of the roles and responsibilities in the event of an incident requiring activation of the ERP. If the licensee and the local authority fail to reach a mutual understanding on roles and responsibilities, the ERCB encourages the use of third-party dispute resolution services through either local synergy groups or independent practitioners to assist in resolving the parties' concerns. If appropriate, and with agreement from both parties, the ERCB may provide facilitation through its Appropriate Dispute Resolution Program.

   If changes to the ERP are necessary as a result of public consultation, the licensee is required to have further discussions with the appropriate local authority and other government agencies.

   The ERCB also strongly encourages the licensee to support and work with local synergy groups that have been established in areas throughout the province, whenever possible.

Section 4.3 Conducting the Public Involvement Program

8) The licensee must notify or notify and consult those listed in Table 3.

Table 3: Who to notify or notify and consult within the EPZ

Notification and Consultation	Notification Only
Permanent and part-time residents, including those residing on dead-end roads beyond the EPZ where occupants are required to egress through the EPZ. Business owners and/or operators and industrial operators, including oil and gas operators with manned facilities. Private and public recreational property owners, operators, and occupants. Rural public facilities and publicly used development, such as schools, community centres, registered campgrounds, and picnic areas.	Nonresident landowners and farmers renting land who don't live on the property but whose lands are within the setback distance as outlined in *Directive 056*. These persons must be considered in the development of the ERP and be advised that their property lies within the EPZ through an information package sent by registered mail. Registered trappers, guides, outfitters, and registered grazing lease and allotment users. Oil and gas operators with unmanned facilities (e.g., wells). Owners of rented residences in an EPZ must be advised that their property lies within the EPZ through an information package sent by registered mail.

APPENDIX D: SUMMARY OF CSA Z731 AND DIRECTIVE 071 REFERENCES (continued)

Section 5.2.2 Evacuation and/or Sheltering Within the EPZ

4) The licensee must address how the evacuation of the response zones that are within the EPZ will be accomplished during an incident, including how transients, such as hunters, trappers, recreational users, and nonresident landowners, will be located and evacuated.

5) Special procedures may be required for evacuating public facilities. If large numbers of people are involved, the licensee must address assistance with transportation (e.g., providing school buses) or changes in the normal notification procedures.

   Sheltering indoors is a viable public protection measure in circumstances when:

   - there is insufficient time or warning to safely evacuate the public that may be at risk,
   - residents are waiting for evacuation assistance,
   - the release will be of limited size and/or duration,
   - the location of a release has not been identified, or
   - the public would be at higher risk if evacuated.

6) The licensee must include shelter-in-place instructions in its public information package and ERP.

Section 5.2.5 Isolation Procedures

During an incident, members of the public may be at risk if exposed to the hazard.

10) The licensee must ensure that procedures, such as establishing and managing manned roadblocks, are identified in the ERP and are in place to restrict unauthorized entry into the response zones during a sour gas or HVP product release that could potentially jeopardize public safety.

    The licensee should identify any special procedures needed to address any major highways and railways passing through the EPZ that could be impacted by the hazard.

Section 5.8 Communications Planning

The development and implementation of an effective communications plan is essential to emergency response.

19) The licensee must

   - describe its procedures in the ERP for contacting and maintaining communication with key licensee personnel, government agencies, support services, and the media;
   - clearly define the responsibility to contact the ERCB and other responders identified in the plan in the event of an emergency; the ERCB recommends that a communications flowchart be included in the ERP, identifying responsibilities by role;

- ensure that the ERP clearly describes procedures that will be implemented during an incident to contact and maintain communication with directly impacted members of the public in order to keep them informed of the situation and actions being taken; this includes plans for communicating implementation of public protection measures, such as evacuation and sheltering in place for occupants within and beyond the EPZ, if applicable; and
- describe procedures that will be used to inform and update the media and procedures in getting factual messages out to the public at large in an expeditious manner; the messages should be coordinated among all parties.

20) If there are separate ERPs for a gathering system that is tied into the sour operations facility, HVP pipeline, or cavern storage facility, then all the licensees must ensure that their ERPs have a bridging paragraph outlining what emergency communication will take place between the parties in the event of an emergency. The sour operations, HVP pipeline, or cavern storage facility ERP bridging paragraph refers to the other ERPs and vice versa.

5.9 Responsibilities of Personnel

21) In its ERP, the licensee must

- identify roles and responsibilities of personnel required to effectively respond to the emergency, and
- provide the names of key personnel and responders.

One or more functions can be assigned to an individual depending on the complexity of the potential response to an emergency. As a minimum, the licensee is expected to assign the following responsibilities to personnel, if applicable:

- field incident command,
- public safety coordination, including evacuation and sheltering,
- roadblocks and rovers,
- air quality monitoring,
- ignition, and
- communication with the responders, media, and public.

Contact the Natural Resources Conservation Board at the following offices:
Dial 310.0000 to be connected toll free.

Edmonton Office
4th Floor, Sterling Place, 9940 - 106 Street
Edmonton, AB T5K 2N2
T (780) 422.1977 F (780) 427.0607

Calgary Office
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Calgary, AB T2P 3G4
T (403) 662.3990 F (403) 662.3994

Email: info@nrcb.gov.ab.ca
Web Address: www.nrcb.gov.ab.ca

Copies of the *NRCB Act, Rules of Practice of the Natural Resources Conservation Board Regulation and Administrative Procedures Act* are available through the Queen's Printer. NRCB Guides are available by contacting the NRCB's Edmonton Office.

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