



TOTAL E&P Canada Ltd.

Application to Construct and Operate an Oil Sands
Upgrader in Strathcona County

September 16, 2010

ENERGY RESOURCES CONSERVATION BOARD

Decision 2010-030: TOTAL E&P Canada Ltd., Application to Construct and Operate an Oil Sands Upgrader in Strathcona County

September 16, 2010

Published by

Energy Resources Conservation Board
640 – 5 Avenue SW
Calgary, Alberta
T2P 3G4

Telephone: 403-297-8311
Fax: 403-297-7040
E-mail: infoservices@ercb.ca
Web site: www.ercb.ca

CONTENTS

1	Decision	1
2	Introduction.....	1
	2.1 Application	1
	2.2 Background.....	2
	2.3 Interventions	2
	2.4 Hearing	3
3	Participation in the Hearing	3
4	Issues.....	4
5	Project Need and Economic Benefits	4
	5.1 Views of TOTAL	4
	5.2 Views of the CFRD	6
	5.3 Views of the Visschers	6
	5.4 Views of the Municipalities.....	6
	5.5 Findings of the Board	7
6	Project Location.....	8
	6.1 Views of TOTAL	8
	6.2 Views of the Visschers	8
	6.3 Findings of the Board	8
7	Air Emissions and Modelling	9
	7.1 Views of TOTAL	9
	7.2 Views of the CFRD	12
	7.3 Findings of the Board	15
8	Air Monitoring and the Fort Air Partnership	17
	8.1 Views of TOTAL	17
	8.2 Views of the CFRD	19
	8.3 Findings of the Board	20
9	Human Health Risk Assessment.....	21
	9.1 Views of TOTAL	21
	9.1.1 Risk Assessment Methodology	21
	9.1.2 Predicted Health Effects	22
	9.1.3 Health Surveillance	23
	9.2 Views of the CFRD	24
	9.2.1 Risk Assessment Methodology	24
	9.2.2 Predicted Health Effects	25
	9.2.3 Health Surveillance	25
	9.3 Views of the Visschers	26
	9.4 Findings of the Board	26
	9.4.1 Risk Assessment Methodology	26
	9.4.2 Predicted Health Effects	26
	9.4.3 Health Surveillance	27
10	Traffic	28
	10.1 Views of TOTAL	28

10.2 Views of the CFRD	28
10.3 Findings of the Board	29
11 Emergency Response	29
11.1 Views of TOTAL	29
11.2 Views of the CFRD	30
11.3 Findings of the Board	32
12 Water Intake/Outfall	34
12.1 Views of TOTAL	34
12.2 Views of the Visschers	34
12.3 Findings of the Board	34
13 Water Quality	35
13.1 Views of TOTAL	35
13.2 Views of the Visschers	36
13.3 Findings of the Board	37
14 Instream Flow Need	38
14.1 Views of TOTAL	38
14.2 Views of the CFRD	38
14.3 Findings of the Board	39
15 Groundwater	39
15.1 Views of TOTAL	39
15.2 Views of the CFRD	40
15.3 Findings of the Board	41
16 Light	41
16.1 Views of TOTAL	41
16.2 Views of the CFRD	41
16.3 Findings of the Board	42
17 Noise	43
17.1 Views of TOTAL	43
17.2 Views of the CFRD	43
17.3 Findings of the Board	44
18 Soils and Vegetation	45
18.1 Views of TOTAL	45
18.2 Views of the Visschers	46
18.3 Findings of the Board	46
19 Approval Expiry	46
19.1 Findings of the Board	46
Appendices	
1 Summary of Conditions and Commitments	48
2 Membership of the Citizens for Responsible Development (May 11, 2010)	58
3 Hearing Participants	59
4 Recommendations	61
Figure 1 Project Area	62

ENERGY RESOURCES CONSERVATION BOARD

Calgary Alberta

TOTAL E&P CANADA LTD.

**APPLICATION TO CONSTRUCT AND OPERATE
AN OIL SANDS UPGRADER IN STRATHCONA COUNTY**

**Decision 2010-030
Application No. 1551460**

1 DECISION

Having carefully considered all of the evidence, the Energy Resources Conservation Board (ERCB/Board) finds the project to be in the public interest. Accordingly, the Board is prepared, with the approval of the Lieutenant Governor in Council, to approve Application No. 1551460, subject to the conditions imposed by the Board and the commitments made by TOTAL E&P Canada Ltd. (TOTAL) listed in Appendix 1.

2 INTRODUCTION

2.1 Application

On December 14, 2007, pursuant to Section 11 of the *Oil Sands Conservation Act*, TOTAL filed Application No. 1551460 with the ERCB and Alberta Environment (AENV) for approval to construct, operate, and reclaim a 47 200 cubic metres per stream day (m^3/sd) oil sands bitumen upgrader. An environmental impact assessment (EIA) report formed part of Application No. 1551460.

The proposed project would be located in Strathcona County, about 4 kilometres (km) north of the City of Fort Saskatchewan, on all or parts of Sections 17, 18, 19, and 20 of Township 55, Range 21, West of the 4th Meridian. The proposed project would also include water facilities and water pipelines to be located on all or parts of Sections 24, 25, and 36 of Township 55, Range 22, West of the 4th Meridian.

TOTAL would construct the proposed project in two phases, with Phase 1 scheduled to commence operation in 2014 with a capacity of 24 000 m^3/sd , and Phase 2 scheduled to commence operation in 2018 with a cumulative capacity of 39 200 m^3/sd . Debottlenecking post-2018 would bring the proposed project to a capacity of 47 200 m^3/sd . The proposed project would produce synthetic crude oil, petroleum coke, sulphur, diluent, and other light hydrocarbon products.

TOTAL also filed the following applications with AENV:

- Application No. 001-245130, pursuant to the *Environmental Protection and Enhancement Act (EPEA)*, to construct and operate a 47 200 m^3/sd upgrader and associated infrastructure.
- File No. 00245404, pursuant to Sections 37 and 50 of the *Water Act*, to authorize the diversion of up to 12 264 000 m^3 of water per year from the North Saskatchewan River, approval of the site water management plans for the construction and operation of the upgrader, and approval to divert existing surface water runoff around the plant site.

2.2 Background

On December 12, 2007, AENV issued the final terms of reference (TOR) for the EIA, and on December 14, 2007, TOTAL filed its applications with the ERCB and AENV. On August 12, 2009, AENV declared that the EIA report was complete, pursuant to Section 53 of the *EPEA*.

On August 27, 2009, TOTAL filed a letter with the ERCB requesting that its application be set down for a hearing.

The Board issued a Notice of Hearing on November 2, 2009, that set the commencement of the hearing for February 24, 2010. The Board issued a Notice of Rescheduling of Hearing on March 31, 2010, that rescheduled the hearing to commence on June 1, 2010.

2.3 Interventions

The Citizens for Responsible Development (CFRD), whose members' properties ranged from about 2 kilometres (km) from the project lands to as far as 20 km, filed an intervention citing concerns regarding the need for the project, health impacts, air pollution and air modelling, air monitoring, risks to water supplies, light and noise pollution, emergency response planning, cumulative effects, transboundary issues, and infrastructure and land use. The CFRD opposed the application. A list of the CFRD members is in Appendix 2.

Harvey Visscher, Elaine Visscher, and Henryk Farms Ltd. (the Visschers), whose property was about 3.3 km northwest from the project lands, filed an intervention citing concerns regarding the project's release of wastewater into the North Saskatchewan River, their riparian rights and lands downstream of the project's wastewater outfall, toxic and nuisance airborne emissions, health and safety impacts, impacts on property values, use and enjoyment of land, and disruption to the community. The Visschers opposed the application.

The Alexander First Nation (the AFN) filed an intervention citing concerns regarding the impacts of the project on the AFN's constitutionally protected aboriginal and treaty rights and contending that Canada and Alberta had failed to adequately consult with the AFN.

Aux Sable Canada Ltd., North West Upgrading Inc., and Shell Canada Energy filed interventions. They took no position with respect to the application.

The Town of Gibbons, the Town of Redwater, the Town of Bon Accord, the City of Fort Saskatchewan, the City of Edmonton, Strathcona County, Sturgeon County, and the Alberta Industrial Heartland Association filed letters in support of the application. At the conclusion of the hearing, the Sturgeon Community Hospital Foundation copied the Board on a letter of support that it had addressed to TOTAL. With the exception of the City of Fort Saskatchewan, these parties did not participate in the hearing.

During the hearing, Mr. R. Merry filed an intervention to the application citing concerns regarding industrial development in the region infringing on individual rights and freedoms and the lack of evidence that the application was in the public interest. Mr. Merry did not participate in the hearing.

Following the hearing, Mr. R. Olstad filed an intervention to the application in support of the CFRD. Mr. Olstad did not participate in the hearing.

2.4 Hearing

The Board held a public hearing in Fort Saskatchewan, Alberta, which commenced on June 1, 2010, and concluded on June 11, 2010, before Board Members J. D. Dilay, P.Eng. (Presiding Member), D. McFadyen, and T. L. Watson, P.Eng. Those who appeared at the hearing are listed in Appendix 3.

The Board considers that the record was completed on July 6, 2010.

Figure 1 shows the location of the proposed project, the location of the interveners' lands, and other major features of the area. The Board panel and staff visited the proposed project site and the surrounding area during the proceedings.

3 PARTICIPATION IN THE HEARING

In identifying who may participate at a public hearing, the Board is governed by Section 26 of the *Energy Resources Conservation Act (ERCA)*, which provides that those persons whose rights may be directly and adversely affected by the Board's decision on any energy development are entitled to an opportunity to lead evidence, cross-examine, and give argument—in short, full participation at a hearing. Others who may not be able to meet the test are not afforded those participation rights by the statute. However, it has been a practice of the Board to allow those persons who would otherwise not be entitled to, to participate to some extent at a public hearing provided they offer relevant information.

The CFRD was composed of approximately 62 individual members, as well as the Boysdale Camp Foundation. Of those members, the Board decided that Sharon D'Aoust, Mike Brown, Ann Brown, Michelle Brown, Kristian Brown, Gordon Visser, and Karen Berg were persons that had rights that may be directly and adversely affected by its decision on the application, as outlined in the Board's letter of March 25, 2010.

Prior to the hearing, the Board had ruled in its decision of January 29, 2010, that it did not appear to the Board that the rights or interests asserted by the AFN would be directly or adversely affected by the Board's decision on the application, and as such the Board dismissed the objections of the AFN. Nonetheless, the AFN filed an intervention to the application on May 11, 2010. At the hearing, the AFN requested the opportunity to address the Board, and the Board granted the AFN the opportunity to make a brief statement.

Mayor J. Sheasgreen, mayor of the City of Fort Saskatchewan, registered at the hearing and requested the opportunity to address the Board. The Board granted Mayor Sheasgreen the opportunity to make a brief statement.

In its letters of January 29, 2010, and March 25, 2010, the Board ruled that Ms. B. Collier, Mr. W. Groot, and Ms. K. Radke were not persons whose rights may be directly and adversely affected by the Board's decision on the application. However, all three registered at the hearing

and requested the opportunity to address the Board. The Board granted them the opportunity to make brief statements.

4 ISSUES

In rendering its decision on this application, under Section 3 of the *ERCA*, the Board must consider whether the project is in the public interest, having regard to the social, economic, and environmental effects of the project. As a result, the Board finds that it must consider, among other things, the following issues that arose during the course of the proceeding in determining whether the project is in the public interest:

- project need and economic benefits
- project location
- air emissions and modelling
- air monitoring and the Fort Air Partnership
- human health risk assessment
- predicted health effects
- health surveillance
- traffic
- emergency response
- water
- light
- noise
- soils and vegetation
- approval expiry

In reaching the determinations contained within this decision, the Board has considered all relevant materials constituting the record of this proceeding, including the evidence and argument provided by each party. Accordingly, references in this decision to specific parts of the record are intended to assist the reader in understanding the Board's reasoning relating to a particular matter and should not be taken as an indication that the Board did not consider all relevant portions of the record with respect to that matter.

5 PROJECT NEED AND ECONOMIC BENEFITS

5.1 Views of TOTAL

TOTAL stated that bitumen production in Alberta has been increasing and was predicted to exceed three million barrels per day by 2020. TOTAL argued that additional upgrading capacity was required to match predicted bitumen production.

TOTAL stated that its proposed upgrader was part of its long-term strategy in Canada and that it was an important part of its portfolio of oil sands assets. TOTAL stated that it was a 75 per cent owner and operator of the Joslyn North Mine, it held a 50 per cent non-operating interest in the Surmont steam-assisted gravity drainage project, it owned the lands and resources formerly owned by Synenco Energy Inc, and it owned other oil sands interests. TOTAL stated that this portfolio of interrelated yet independent projects would position TOTAL as a key oil sands producer over the coming decade.

TOTAL stated that it was planning on investing some \$20 billion in oil sands over the next decade and that it expected this investment to provide dividends for TOTAL and Alberta for the next 30 years or more. Given its long-term outlook, TOTAL did not view the current price of oil or the current heavy/light price spread as determining factors on whether its upgrader should be built.

TOTAL submitted that its upgrader was consistent with the Government of Alberta's priority to provide for value-added upgrading of energy resources within Alberta. It argued that upgrading bitumen locally would have a positive and enduring socioeconomic benefit to the community, Alberta, and Canada.

TOTAL stated that if its upgrader were approved by the Board, it would be one of only four upgraders that have been approved and have the potential to proceed. According to TOTAL, other upgraders that were proposed in 2008 were not likely to proceed. TOTAL argued that its proposed upgrader would provide a long-term supply of synthetic crude oil to existing refining and petrochemical industries, which would offset declining conventional crude oil supplies.

TOTAL submitted that its proposed project would create significant economic value for Alberta, Strathcona County, and the surrounding municipalities through substantial capital investment, local economic stimulus, long-term jobs, and tax contributions.

TOTAL estimated that its project would create about 35 000 person-years of employment during construction and about 100 person-years annually during operations. TOTAL stated that its project would directly contribute about \$7 to \$9 billion to the economy. It estimated that on an annual basis, the operating expenditures for the upgrader would be over \$210 million that provincial and federal taxes would be approximately \$200 million and \$300 million respectively, and property taxes to the County of Strathcona would be about \$20 to \$30 million. In addition, the direct and indirect employment created as a result of the upgrader would contribute millions of dollars annually to the provincial and federal governments by way of income taxes.

In addition to the capital and operating costs and taxes generated by the upgrader, TOTAL stated that it has and would continue to contribute to the social fabric of the Alberta Industrial Heartland area (AIH) through its leadership and participation in important local activities, such as its ongoing support of the arts and its participation in volunteer organizations. TOTAL stated that it was already active on regional committees, such as the Alberta Industrial Heartland Land Trust Society, Life in the Heartland, Northeast Region Community Awareness Emergency Response (NR CAER), Strathcona County Community Planning, as well as the public affairs and environmental committees of the Northeast Capital Industrial Association (NCIA).

TOTAL stated that the Visschers' lands adjacent to the North Saskatchewan River were zoned as industrial and that typically industrial lands were priced higher than that for agricultural lands.

TOTAL pointed out that the Visschers had not filed any evidence in support of their claim that their lands had been devalued due to the presence of industrial development nearby. TOTAL also stated that the Visschers had other lands in the area that they had successfully sold in the past.

5.2 Views of the CFRD

The CFRD noted that while the proposed project would provide a number of economic benefits, those benefits were not without costs being borne by some members of society, in particular residents closest to the project. The CFRD questioned if the victimization of a few was necessary for the economic benefit of the many.

5.3 Views of the Visschers

The Visschers argued that Alberta's bitumen resources should be upgraded within the province whenever possible. They acknowledged the potential benefits that TOTAL's proposed upgrader could provide, but stated that there would be some undesirable effects as well. They argued that many of the positive effects of focused regional development, such as inter-industry synergies, were not being realized to the degree that had been promoted originally, whereas the negative impacts seemed to be manifesting themselves. The Visschers submitted that there were many initiatives and processes that had to be initiated in the AIH in order to deal with potential cumulative effects on noise, air, and water. They were particularly concerned about the human health effects of continued development in the AIH. They argued that if the Fort Saskatchewan health data indicated the beginning of a trend, it would be an unforgivable mistake to approve TOTAL's project.

The Visschers argued that their land was being used as a buffer by industry and that their land had been devalued. They stated that they had been attempting to sell their land since 2006 without success. They stated that recent offers for their land were significantly below market value based on what comparable land had been selling for in the area.

5.4 Views of the Municipalities

The Town of Gibbons stated that industrial development within the AIH was integral to the area's economic development strategy and important because it adds to the municipal tax base and creates local employment opportunities. Gibbons believed that the upgrader would be a significant long-term contributor to Alberta's economy.

The Town of Redwater stated that the upgrader would add value to Alberta's resources by converting bitumen into products more attractive to the market. It said that the proposed upgrader would be surrounded by additional service markets, which would result in a massive economic benefit to the area municipalities and the province. Redwater also stated that TOTAL had worked extensively with the community to identify areas of concern and to find solutions to address these concerns and was a solid member of the community.

The Town of Bon Accord and Sturgeon County both stated that they believed that the upgrader would provide significant long-term economic and social benefits to the AIH, the Capital Region, the Province of Alberta, and all surrounding municipalities.

The City of Edmonton stated that the project had the potential to positively impact the city and that TOTAL had addressed questions in a collaborative and constructive manner. Edmonton said that it was confident that it would enjoy a productive working relationship with TOTAL as the project advanced.

Strathcona County stated that it was confident that the project would be a benefit through economic growth and employment opportunities. Strathcona stated that it was proud that TOTAL had chosen to build its upgrader within its municipal boundaries.

Mayor Sheasgreen, of the City of Fort Saskatchewan, spoke at the hearing. He stated that Fort Saskatchewan has been home to major industry since the 1950s and the community has seen significant economic benefits as each new industrial project has been developed. He stated that TOTAL's project would have direct and positive impacts on the community. It would create spin-off jobs and dollars spent in the community by industry, which would provide the community with a stable economy and an enhanced quality of life. Further, industries such as TOTAL provided excellent jobs, paid taxes to all levels of government, and stimulated entrepreneurship throughout the service and supply sector. The mayor stated that TOTAL has demonstrated a commitment to responsible development and to being an integral community member and TOTAL has consulted with the municipality and met with members of the community. The mayor submitted that Fort Saskatchewan looked forward to a continued relationship with TOTAL and totally supported TOTAL's proposed upgrader project.

5.5 Findings of the Board

The Board finds that TOTAL's proposed project supports the Government of Alberta's policy to promote value-added upgrading of energy resources within the province.

The Board accepts that significant net positive economic benefits will accrue to the region, Alberta, and Canada as a result of TOTAL's proposed project. Benefits will include construction jobs and permanent employment during operations; capital and operating expenditures; government corporate, property, and income taxes; and TOTAL's ongoing involvement in the social and cultural fabric of the region.

The Board notes that although the Visschers' property is located some distance from the proposed TOTAL site, it is adjacent to other major industrial sites in the AIH, and that for all intents and purposes, it and other nearby properties are surrounded by industrial development. The Board has indicated in past decisions that this kind of situation is highly undesirable. The Board is unable to determine if this area will be used for industrial development as it has no evidence in this regard. If it were to be used for industrial development in the not-too-distant future, that might result in the opportunity for the Visschers to sell their land. The Board believes that this unique situation may be one that could be remedied by the involvement and assistance of the Alberta Industrial Heartland Land Trust Society.

The Board acknowledges that while some members of the region are opposed to the proposed upgrader, representatives from the surrounding municipalities have strongly endorsed the project and the benefits that it will provide.

Accordingly, the Board finds that there is a need for the proposed upgrader. Having found that there is a need for the upgrader and that it will have a substantial positive net economic benefit,

the Board turns its attention in the following sections to the issues of location and impacts that could result from the proposed project.

6 PROJECT LOCATION

6.1 Views of TOTAL

TOTAL stated that it had examined three possible locations for its proposed upgrader, namely, its Joslyn and Surmont leases in the Athabasca oil sands region, as well as the AIH. As a result of its examination, TOTAL concluded that the AIH was the best location for the upgrader, based on socioeconomic and environmental factors, transportation infrastructure, production and byproduct utilization, potential integration opportunities, and project economics.

TOTAL submitted that the AIH offered good pipeline infrastructure for the supply of bitumen feedstock and transport of synthetic crude oil product; industrial infrastructure, such as power, roads, and rails to support the project; other nearby industries that could process products and byproducts from the upgrader; and a labour market experienced in the construction and operation of upgraders. The AIH also offered opportunities for synergies in the area of cooperative industrial development, including support and mutual aid programs, to better organize and support regional initiatives for the benefit of industry and the general public.

TOTAL acknowledged that not all individuals in the region supported its choice of location in the AIH, but submitted that land-use policy decisions designating the area as suitable for heavy industrial development had already been made by elected representatives and TOTAL's choice of location was consistent with those land-use policy decisions.

6.2 Views of the Visschers

In final argument, the Visschers argued that in light of the concentration of industry in the AIH and the growing evidence of undesirable impacts, there were better locations in the province for TOTAL's proposed upgrader. The Visschers argued that the AIH was reaching a point where people would be affected in a real, significant, and negative way. They argued that it would be more appropriate to locate the upgrader elsewhere in the province where road, and rail, and pipeline infrastructure and power and water were available and where other communities could share the revenue, jobs, and burdens associated with industrial development.

The Visschers agreed that Alberta's bitumen should be upgraded in the province whenever possible. However, the Visschers submitted that bitumen could be shipped long distances and that building the upgrader near Red Deer, Calgary, Lethbridge, or Peace River was not only feasible, but would also make more sense. They argued that these locations had a population base and supporting infrastructure, municipal tax revenues would be more evenly spread throughout the province, and there would be less stress on the infrastructure and environment in one region. The Visschers concluded that overbuilding in the AIH did not make sense.

6.3 Findings of the Board

The Board finds that subject to the mitigation measures proposed by TOTAL, the proposed location is suitable, having regard for the region's heavy industrial zoning; proximity to

infrastructure for feedstock, fuel, power and product marketing; and proximity to a substantial labour market.

7 AIR EMISSIONS AND MODELLING

7.1 Views of TOTAL

TOTAL indicated that its EIA contained evaluations of potential interactions of the upgrader's air emissions with the airshed, which included a thorough and comprehensive cumulative EIA. TOTAL stated that there would be no unacceptable environmental effects from the project with the incorporation of its proposed mitigation design features.

TOTAL stated that its air quality assessment followed practices endorsed and accepted by AENV, including the preparation of a comprehensive regional emissions source inventory, review of ambient air quality monitoring data, the characterization of the regional topographic and meteorological conditions, and the application of the CALPUFF dispersion model.

TOTAL indicated that AENV's 2003 *Air Quality Model Guideline* were in force at the time of modelling, and therefore, TOTAL's use of the one-year Mesoscale Model (MM5), version 3.5, meteorological data set for 2002 was appropriate. TOTAL also indicated that recent changes to the air quality model guideline in May 2009 requiring the use of five years of MM5 data did not apply to its assessment. Furthermore, TOTAL's expert, Mr. Davies, stated that since working on the TOTAL application, he had worked on two other assessments for which he used five years of MM5 data in accordance with the updated 2009 model guideline. Based on his experience, Mr. Davies believed that if TOTAL had used five years of MM5 data, the modelling results would generally have varied from year to year in the order of 5 to 10 per cent, which was unlikely to change the conclusions of TOTAL's air assessment.

TOTAL stated that it chose a 50 km by 50 km regional study area (RSA) for consistency with AENV's plans to manage air emissions in the AIH, consistency with previous upgrader assessments, and because the highest changes to air quality due to the project would occur locally. TOTAL indicated that it had used the up-to-date regional emissions inventory originally compiled for the BA Upgrader application that was subsequently given to the Fort Air Partnership (FAP) by the NCIA. TOTAL also indicated that the project-only ambient predictions would reach the 10 per cent threshold of the Alberta Ambient Air Quality Objectives (AAAQO) at approximately 13 km, and therefore, a 26 km by 26 km study area would have been sufficient. However, in order to be inclusive of the surrounding communities, it used an expanded RSA.

TOTAL did not agree with the CFRD's claim that it had failed to include a large amount of emissions and used Mr. Davies experience with the SCREEN 3 model to explain why it would not be necessary to include the Wabamun power plant emissions. Mr. Davies stated that running the SCREEN 3 model indicated that predicted maximum concentrations at a distance of 50 km from a source would be decreased by a factor of 10. Increasing that distance to 95 km, which was the distance from the proposed upgrader to the Wabamun power plants that the CFRD claimed should have been included, would in his view decrease predictions by an overall factor of 20. Therefore, TOTAL stated that it would not be necessary to include the Wabamun power plant emission sources since the additive effects of those facility emissions would not change the key conclusion associated with the assessment.

TOTAL stated that at the time it performed the modelling, AENV made the 2002 MM5 data set available to the modelling community. TOTAL indicated that the 2002 MM5 data set had a higher resolution than the previously available 1995 MM5 data set and that it would provide a worst-case scenario from a photochemical perspective since it was a relatively warm and dry year.

TOTAL stated that it had provided a reasonable accounting of fugitive emissions by using average emissions factors derived from operating petroleum refineries. It stated that average data could overstate fugitive emissions in a modern, well-run refinery or upgrader. TOTAL indicated that fugitive emissions tended to be negatively skewed by a few poorly functioning emissions sources while most other sources were well controlled, with emissions below the industry average. It was TOTAL's position that this was the reason that literature from Canadian and European studies could show large differences in the amount of fugitive emissions between facilities.

In its assessment of fugitive emissions sources, TOTAL stated that it incorporated a number of design features to minimize emissions. To control emissions, TOTAL committed to a formal leak detection and repair (LDAR) program compliant with Canadian Council of Ministers of the Environment (CCME) *Environmental Code of Practice for Measurement and Control of Fugitive VOC Emissions*, use of double-sealed pumps, use of low-emission packing on automated valves, closed-loop sampling systems, and installation of both floating roofs and a vapour recovery system on sour tanks.

TOTAL stated that it had used regional measurement data from three airport stations, two AENV stations, and five FAP stations. It incorporated relative humidity data from one AENV station and two FAP stations and retrieved solar radiation values from the Canadian Ecodistrict Climate Normals database for the period 1961 to 1990, published by Agriculture and Agri-Food Canada in 1997. Although it did not use it directly, it reviewed the upper air data from Stony Plain from historical literature in support of its air assessment.

TOTAL indicated that it focused its secondary pollutants assessment on the criteria air contaminants of sulphur dioxide (SO₂) and oxides of nitrogen (NO_x) to predict the amount of sulphate and nitrate that could be formed. TOTAL also indicated that it did not carry the modelling through to include secondary organic aerosols, which it stated was part of the research part of the CALPUFF model and was not appropriate for a regulatory setting.

TOTAL did not perform photochemical modelling. TOTAL understood from its discussions with AENV that AENV did not expect photochemical modelling to be part of the EIA process. TOTAL noted that AENV had already performed some photochemical modelling as part of setting provincial policies and that it was contemplating further modelling efforts. TOTAL indicated that it would continue to support these regional initiatives, including assessments of photochemical effects of ozone (O₃) and particulate matter of 2.5 micron diameter (PM_{2.5}), through its membership in the NCIA.

TOTAL noted that it applied the CALPUFF dispersion model to predict changes to air quality for short- and long-term trends. TOTAL stated that the maximum SO₂ and nitrogen dioxide (NO₂) concentrations from the project alone would be below the AAAQO under typical operating conditions. However, TOTAL acknowledged that it predicted occasional hourly and daily SO₂ exceedances in the base-case scenario. TOTAL indicated that it predicted these base

case exceedances to occur without the emissions from the proposed upgrader and that it did not expect SO₂ emissions from the project to add to the number of SO₂ exceedances. In terms of potential acid input (PAI) predictions, even with project SO₂ and NO_x contributions, the average predicted PAI values were below the AENV target load. Furthermore, the project would be a minor source of PM_{2.5}, and although TOTAL predicted exceedances of the Canada-wide standards (CWS) for the Edmonton urban area, it predicted none for the AIH.

TOTAL introduced the *US EPA Final Rule: Primary National Ambient Air Quality Standard for Sulphur Dioxide* publication, which stated that the United States Environmental Protection Agency's (US EPA's) new one-hour 75 parts per billion (ppb) SO₂ standard was based on the three-year average of the annual 99th percentile of one-hour daily maximum concentrations. Furthermore, TOTAL stated that this new US EPA standard could not be directly compared to Alberta's one-hour standard of 172 ppb because they were different statistical data sets.

TOTAL indicated that it would be following a no continuous flaring policy, but acknowledged that the flaring system would remain an integral safety feature of the upgrader that would restrict flaring to only emergency situations. In order to achieve this, TOTAL stated that the upgrader design incorporated specific enhancements that included a delayed coker unit blow-down compressor, a flare gas recovery compressor, improved amine regeneration reliability, and a staged approach to its flare design that incorporated steam injection to achieve smokeless flaring. Furthermore, TOTAL committed to prepare a flare management program that would comply with the spirit and intent of ERCB *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting* and provide it to AENV no later than 12 months prior to start-up.

TOTAL noted that it had assessed six different possible upset scenarios and determined that the maximum predicted SO₂ concentrations would be well below the threshold of 1300 micrograms per cubic metre (µg/m³) at which adverse effects on asthmatics has been observed. Furthermore, TOTAL stated that these concentrations and upset frequency predictions were very conservative and comparable to the Petro-Canada Oil Sands Inc.'s Fort Hills Sturgeon upgrader application.

TOTAL challenged the CFRD's assertion that flare combustion efficiencies were low. TOTAL noted that a technical paper coauthored by Dr. Seabold, Dr. Kostiuk, and Mr. Strocher was cited in Ms. Goodwin's submission. This document showed that for 1296 samples taken, all combustion efficiencies were over 98 per cent, while 1292 of these were greater than 99 per cent. The document also stated that approximately 200 flare efficiency studies reported average combustion efficiencies at 96.4 per cent, while that of the full-scale remote sensing field testing undertaken in more recent years was 98.5 per cent.

TOTAL also did not agree with the CFRD's claim that upstream flaring volumes from regions served by the St. Albert, Drayton Valley, Red Deer, and Wainwright ERCB Field Centres should have been included in the air assessment. TOTAL stated that it was not necessary to include these emissions in order to evaluate the effects of the project changes to local air quality. In addition, TOTAL stated that the associated NO_x emissions in these regions ranged from 0.003 to 0.03 tonnes per day (t/d). In comparison to the three modelling evaluation cases that ranged from 160 to 176 t/d of NO_x emissions, TOTAL did not view these emission sources as having a significant effect on the assessment of air quality changes associated with the proposed upgrader.

TOTAL stated that it provided comparisons of model predictions to measured data for general indication of model performance rather than validation. TOTAL stated that its assessment tended

to overestimate the hourly and annual time averages and underestimate the daily average. TOTAL also asserted that hourly averaging times, which were generally being overpredicted, were the more important averaging times from a health assessment perspective.

In addition, TOTAL stated that a more robust indicator of model performance would be to compare the top 25 measured values with the top 25 predicted results instead of focusing only on the maximum values. While TOTAL acknowledged that there would always be some concerns around model uncertainty, it pointed out that the underpredicted 24-hour SO₂ value was still within the US EPA generally accepted expectation of dispersion model accuracy of a factor of two, and that the CALPUFF model was an acceptable model in Alberta.

TOTAL indicated that its design to control sulphur emissions included the use of three two-stage sulphur recovery units in combination with two SCOT tail gas units and three sulphur degassing units. It expected this design to achieve 99.8 per cent sulphur recovery and expected to be regulated to 99.5 per cent sulphur recovery on a quarterly basis as required in ERCB *Interim Directive 2001-3: Sulphur Recovery Guidelines for the Province of Alberta*.

In terms of NO_x emissions, TOTAL stated that it committed to the use of low NO_x burners in all its furnaces, heaters, and boilers and would thereby meet or exceed the CCME guidelines for NO_x emissions.

7.2 Views of the CFRD

The CFRD stated that TOTAL's EIA had a number of deficiencies in the air quality assessment. The CFRD questioned the use of the 2002 MM5 data set. It noted that drafts of the May 2009 model guideline were available as early as 2007. The CFRD stated that it was surprised that TOTAL did not incorporate impending changes, but rather chose to use only 2002 data for its May 2009 update. According to the CFRD, this raised unnecessary uncertainties by not employing best modelling practices in a region where industry and communities were in such close proximity.

The CFRD questioned TOTAL's selection of the year 2002 since it was documented as being extremely dry from May through September. Temperature records from the three regional airports indicated that this year had a very warm winter and cold spring. Furthermore, the CFRD said that the uncertainties were increased by the fact that historically late winter and early spring have the worst air quality. However, ambient wind rose measurement data were not available for all of 2002 for every station because some continuous air monitoring stations were installed at various times throughout the year. Therefore, this made comparison of modelled predictions to actual measurements impossible. According to the CFRD, there was little justification for using the year 2002 and it would have been advisable to choose a different year or multiple years.

The CFRD expert Dr. McDonald stated that it was insufficient to assess atmospheric chemistry one chemical at a time and instead advocated for a source receptor analysis approach. Dr. McDonald explained that this approach depended on a unique chemical signature from each source and concurrent local meteorology to determine the concentrations of pollutants at different receptors. The fact that ambient air exceedances had been experienced in the AIH suggested to Dr. McDonald that it would be a very good idea to perform a regional source receptor analysis prior to increasing emissions through the approval of another project.

The CFRD indicated that it had concerns about the size of the modelling domain in the AIH in comparison to other parts of the province. Dr. McDonald stated that the modelling domain in the oil sands region of Fort McMurray has steadily increased since 1990, predominantly driven by upgraders and not the mines. In contrast, the modelling domain and study areas in the AIH were quite small in comparison to the oil sands region despite the fact that similar types of upgraders were proposed and approved for this region. Dr. McDonald stated that the selection of a spatial and temporal boundary was critical because it had the ability to include or exclude data. Therefore, some regionally agreed-upon boundaries that made physical sense would likely decrease uncertainty and increase trust of model assessments.

The CFRD's consultant, Ms. Goodwin, stated that the 50 km by 50 km RSA was too small and not in accordance with AENV guidance to capture the 10 percentile isopleth of the AAAQO. Ms. Goodwin noted that the figures presented by TOTAL did not show the 10 percentile isopleths and that the isopleths would likely be outside of the study area map, indicating the inadequate size of the study area. Furthermore, Ms. Goodwin stated that the AENV model guideline was subject to interpretation and TOTAL could have chosen to apply it in the broadest sense to include additional sources.

Ms. Goodwin stated that due to the small size of the study area, TOTAL had omitted a number of emissions sources in its assessment. Ms. Goodwin stated that in the 100 km by 100 km model domain, TOTAL had identified only 41 of 175 facilities and omitted flares from other operators in the AIH. Ms. Goodwin also stated that the model domain needed to be increased by at least a factor of 4 in order to capture important adjacent emissions relevant to this application, such as the Wabamun power plants. Furthermore, Ms. Goodwin pointed to the ERCB *ST60B: Upstream Petroleum Industry Flaring and Venting Report* to indicate that significant emissions from the upstream oil and gas sector, including 170 oil and gas batteries and 440 oil and gas batteries with flares, were omitted. Having regard for these omissions, Ms. Goodwin disagreed with TOTAL's stated claim that it had captured most of the emissions in its assessment.

Ms. Goodwin acknowledged commitments by TOTAL to minimize the frequency and duration of flaring. However, she remained concerned that TOTAL had not sufficiently captured emissions from flaring and had not characterized the large array of toxic combustion byproducts that could be created from flaring due to underestimated combustion inefficiencies. As a result, Ms. Goodwin recommended that the ERCB limit the volumes, duration, and frequencies of flaring.

Ms. Goodwin also acknowledged that TOTAL had committed to a number of control features to minimize fugitive emissions. However, Ms. Goodwin expressed concerns about the emission factors used to calculate fugitive emissions, which could be markedly lower than actual measurements. These lower estimates, as well as the contribution of fugitive emissions to secondary transformation products were a concern because both of these factors likely had harmful consequences on human and ecological health.

The CFRD expressed concern that TOTAL had not used the upper air meteorological data from Stony Plain in its air assessment. According to the CFRD, this station was an internationally accepted and validated upper air station that was extensively used in weather forecasts. The omission of these data in the assessment would mean that mixing heights used in the model would not be directly compared to this data set.

The CFRD questioned the receptor grid spacing that TOTAL selected for its assessment because it used a higher density of receptors around the industry fence lines and fewer receptors in and around the communities. The CFRD expressed concern that this indicated a compliance-driven approach instead of trying to focus on improving general ambient air quality understanding. The CFRD acknowledged that AENV did provide some guidance in this matter; however, it suggested that the model guideline allowed TOTAL flexibility to use a denser grid around communities as well.

Dr. McDonald expressed concern at the practice of excluding the applicability of AAAQO from developed or industrialized areas. Dr. McDonald stated that as emissions increased, the observed concentrations would also increase leading to a larger number of predicted exceedances. However, common practice in EIAs shows that as the size of the developed area increases inside a relatively constant study area, the counter-intuitive pattern of increased emissions yielding lower predicted concentrations and fewer predicted ambient air exceedances emerges. The CFRD indicated that an important opportunity existed at this time to stop this practice and suggested that the applicability of the AAAQOs should be across the entire domain, including within developed or industrialized areas.

The CFRD stated that it was concerned with TOTAL's inadequate evaluation of secondary pollutants, such as O₃ and particulate matter. Dr. McDonald stated that the role of secondary organic aerosols in the formation of secondary particulates was in the order of 50 to 60 per cent of the load. Dr. McDonald expressed frustration that over the last 20 years, very little progress had been made in addressing this issue despite the fact that large investments by various companies had been made for consultants to prepare EIAs.

The CFRD expert Dr. Batterman indicated that he had a number of concerns with TOTAL's air assessment. According to Dr. Batterman, it inadequately defined the study area, excluded secondary pollutants, excluded developed areas from the assessment, and used an inadequate number and placement of receptors. Furthermore, Dr. Batterman stated that TOTAL's use of the 2002 MM5 data set was not representative and a comparison to 1995 MM5 data showed some 2002 predictions that were significantly lower than 1995 values.

Dr. Batterman indicated that TOTAL did not provide an adequate or fair assessment of model performance and that there was considerable underprediction of both the 1- and 24-hour concentrations. Dr. Batterman stated that TOTAL had underpredicted 1-hour SO₂ concentrations at the FAP stations by a range of 44 to 72 per cent and underpredicted NO₂ at some stations by 43 per cent and H₂S 1- and 24-hour values by a factor of 5, 20, and sometimes 100.

Dr. Batterman suggested that the Board should have short-term sulphur recovery guidelines to avoid spikes of SO₂ emissions as a result of process upsets, in addition to the long-term quarterly recovery requirement. Dr. Batterman expressed concern that process upsets could lead to high emission rates in the short-term, while still allowing facilities to meet long-term recovery requirements.

Dr. Batterman also gave evidence of the recently amended US EPA revised national ambient air quality standards for SO₂. Once fully promulgated in 2013, the 24-hour standard would be eliminated, leaving only the 1-hour standard of 75 ppb. Dr. Batterman indicated that these changes were health driven and that if this standard were applied to Alberta, both the number and spatial extent of SO₂ exceedances would increase tremendously.

The CFRD expressed concern that a number of exceedances have occurred in the region and the air quality has already been degraded. The addition of another project would only increase this concern.

7.3 Findings of the Board

The Board notes CFRD's view that TOTAL's air quality assessment contained potential deficiencies. However, the Board finds that TOTAL performed the air quality assessment satisfactorily, in accordance with AENV's EIA TOR requirements, and acknowledges that the EIA was deemed complete by AENV.

The Board notes that TOTAL used the 2003 AENV *Air Quality Model Guideline*, which was in force at the time, for the preparation of the air quality assessment. The Board acknowledges that TOTAL received the 2002 MM5 data set from AENV and therefore finds its use acceptable. As a result, the Board is not inclined to condition the approval requiring TOTAL to remodel the air quality assessment. However, in the event that the timing for the project changes significantly, the Board may require TOTAL to submit an updated air quality assessment that reflects potential design changes and the state of industrial development in the AIH at that time.

The Board notes that the size of the RSA chosen by TOTAL is sufficient to include the effects of the project in accordance with AENV guidance. The Board acknowledges that the RSA is consistent with other recent project applications in the AIH. The Board does not accept the claim by the CFRD that the size of the RSA needs to be increased to 200 km by 200 km and therefore does not believe that a large volume of relevant emissions were omitted in the air quality assessment. Furthermore, the Board disagrees with the CFRD's assertion that emissions from the areas serviced by the ERCB's St. Albert, Drayton Valley, Red Deer, and Wainwright Field Centres be included in the air quality assessment. It is neither necessary nor useful to expand the modelling study area to such an extent in order to understand the impacts on air quality from the proposed project.

The Board notes Ms. Goodwin's contention that TOTAL did not fully account for fugitive emissions from the proposed upgrader. The Board does not agree with Ms. Goodwin and finds that TOTAL used acceptable methods to compile an emissions inventory and account for fugitive emissions. Ms. Goodwin acknowledged that the updated design for the upgrader included a substantial decrease in fugitive emissions. Ms. Goodwin also acknowledged that the proposed controls would be beneficial for reducing fugitive emissions and that many concerns have been eliminated because they were being managed by TOTAL. Therefore, the Board finds that Ms. Goodwin's concerns have been adequately addressed by TOTAL.

The Board notes that Ms. Goodwin is an industrial hygiene consultant and demonstrated only a limited familiarity in air emissions and air dispersion modelling. The Board finds that this familiarity falls short of the expected standard for technical experts that the Board finds helpful at its hearings. The Board notes that Ms. Goodwin did not have a clear understanding of the AENV model guideline and how they are practically applied in the context of specific projects like the TOTAL upgrader. The Board also notes that Ms. Goodwin's technical knowledge of how TOTAL compiled the emissions inventory and how it proposed to mitigate fugitive emissions to be very uninformed. The Board expects expert witnesses at ERCB hearings to have a firm understanding of the issues, materials, and provincial regulations before making definitive and alarmist statements.

The Board notes the source receptor analysis approach put forward by the CFRD. The Board believes that AENV and the FAP are the appropriate organizations mandated to deal with air quality management plans in the AIH. Therefore, the Board recommends that AENV and the FAP consider this approach and, if appropriate, make any provisions in future monitoring plans to address the CFRD's concerns.

The Board acknowledges TOTAL's commitment to a no continuous flaring policy, as well as the specific design features that TOTAL incorporated in order to limit flaring to emergency situations. The Board accepts TOTAL's commitment to prepare a flare management plan and procedures that comply with the spirit and intent of *Directive 060*. The Board finds that the mitigation steps proposed by TOTAL meet the intent of minimizing flaring.

The Board notes that TOTAL has committed to an LDAR program to minimize fugitive emissions for the proposed project. The Board acknowledges the importance of this program and understands that TOTAL will be working with AENV towards an effective LDAR program as part of an *EPEA* approval.

The Board notes that TOTAL accounted for secondary pollutants as required by the EIA TOR. The Board also notes the assertion by the CFRD that secondary organic aerosols and photochemical modelling of O₃ should have been assessed by TOTAL. The Board understands that these are currently not required by AENV and appreciates the evolving nature of EIA requirements. As such, the Board will rely on AENV to set out the appropriate requirements for addressing secondary pollutants.

The Board notes Dr. Batterman's concerns regarding the apparent discrepancies between modelled concentrations and air monitoring data. The Board finds that it is not reasonable to expect a perfect match between modelled and monitored data. The Board notes for example that although the maximum 1-hour SO₂ concentrations are underpredicted by 44 per cent, the 99.9th percentile is overpredicted by 13 per cent. Furthermore, the daily maximum 24-hour SO₂ concentrations are underpredicted by an average of 27 per cent, while the annual concentrations are overpredicted by 9 per cent. The Board acknowledges that while dispersion modelling will continue to improve over time, this is one tool and it is important to manage air quality in the AIH through a number of methods, such as ambient air monitoring, source monitoring, and effective LDAR programs.

The Board notes that TOTAL will design its facility to achieve 99.8 per cent sulphur recovery and has requested to be approved to achieve 99.5 per cent sulphur recovery on a calendar quarter-year basis. Therefore, consistent with past practices on sulphur recovery for upgraders, the Board will condition TOTAL's approval to require it to achieve 99.5 per cent on a calendar quarter-year basis within six months of commencing start-up activities.

The Board heard evidence during the hearing that it should adopt short-term sulphur recovery guidelines, in addition to the existing calendar quarter-year requirement. The Board disagrees with Dr. Batterman and notes that short-term emissions are already regulated under *EPEA* approvals from AENV.

The Board notes the information presented by Dr. Batterman regarding recent changes to the US EPA ambient air quality SO₂ standard. The Board notes his assertion that the application of the new US EPA standard in Alberta would lead to a tremendous increase in the number and spatial

extent of SO₂ exceedances. The Board does not accept this assertion since no evidence was presented to the Board to support those claims. Dr. Batterman was unable to provide an analysis of what this would mean for Alberta if it adopted the new US EPA standard. Therefore, it is unknown at this time how the new US EPA one-hour SO₂ standard would contrast to the Alberta one-hour standard.

The Board notes that the maximum 1-hour (9th highest) SO₂ concentration outside of the upgrader fence line is below the AAAQO of 450 µg/m³. This concentration is associated with higher than normal SO₂ emissions and poor dispersion conditions. Taking into account the conservative nature of the modelling, the Board finds that SO₂ emissions from the proposed upgrader pose a very low risk to the health and safety of the public.

The Board notes that all three assessment cases show predicted exceedances of the CWS for PM_{2.5} and the AAAQO for ammonia, benzene, and H₂S. The Board finds that PM_{2.5} exceedances are strongly influenced by the urban areas of Edmonton and Fort Saskatchewan, while the 1-hour ammonia, benzene, and H₂S exceedances are associated with other commercial/industrial locations. The 24-hour H₂S exceedance of 4.61 µg/m³ at one agricultural/residential receptor is only slightly above the guideline of 4 µg/m³ and is located near another proposed upgrader site. The Board finds that, in all of these cases, the contribution from the proposed TOTAL upgrader would not be significant.

8 AIR MONITORING AND THE FORT AIR PARTNERSHIP

8.1 Views of TOTAL

TOTAL stated that the mandate of the FAP was to work within a multistakeholder framework to prioritize what should be monitored, and where, in an efficient manner that avoided duplication. TOTAL stated that it was confident that the publicly available air monitoring data appropriately characterized the air quality in the region. TOTAL acknowledged that the air monitoring network would likely continue to expand as new operators established facilities in the AIH and became active members of the FAP.

TOTAL indicated that industry did not drive the FAP, which was an open multistakeholder organization that gave each party the ability to influence the development of the ambient air monitoring network. TOTAL stated that the FAP's technical committees discussed the adequacy of and potential additions to the air monitoring network. Furthermore, TOTAL stated that it alone could not direct the FAP or AENV to undertake additional monitoring or modelling; however, it committed to bring issues of concern forward and to work with all stakeholders to improve regional monitoring.

TOTAL stated that it viewed the FAP as a credible regional air monitoring network useful for indicating regional air quality. It acknowledged that the concept of "early warning" could hold different meanings for various stakeholders. TOTAL noted that in terms of overall ecological health, the network could be considered as an early warning system, e.g., the high ambient measurements for PM_{2.5} and O₃ that had triggered management plans by AENV. However, in terms of an emergency response for an incident, the FAP was not intended to be an early warning system. TOTAL indicated that it would employ a comprehensive source monitoring program within its fence line that would be capable of early detection of emissions during emergencies.

This program would include continuous stack emission monitoring of the largest SO₂ and NO_x emissions sources, manual stack surveys, and a LDAR program that would be in place during operations to manage air quality.

TOTAL indicated that AENV had the responsibility to audit the FAP air monitoring network. TOTAL further stated that the purpose of an audit was to critically challenge the system with the goal of improvement. Despite the CFRD's concerns, the fact that previous audits identified deficiencies was in TOTAL's view a positive sign pointing to a system that was working to improve performance. In addition, any questionable data would be flagged as such in the Clean Air Strategic Alliance (CASA) data warehouse, thereby ensuring that data limitations were clearly indicated, allowing for appropriate use of the data.

TOTAL introduced a letter from the FAP and AENV dated June 15, 2009, regarding *Decision 2009-02: Petro Canada Oil Sands Inc. Application to Construct and Operate an Oil Sands Upgrader in Sturgeon County*, January 20, 2009. In this letter, the FAP and AENV collaborated to clarify the roles of the FAP and other organizations involved in the AIH.

This letter specifically outlined the roles of the FAP and AENV in regional air quality management and areas that they are not responsible for. According to the letter, the FAP's role in air quality monitoring and reporting includes, but is not limited to,

- operating the ambient air monitoring network stations on behalf of industry, AENV, and Environment Canada,
- compiling and submitting ambient air quality data to AENV and the CASA data warehouse,
- preparing and distributing information and public education materials regarding FAP's role, ambient air quality data, and air quality monitoring
- participating in AENV's air quality management plans as requested (e.g., development of ozone management plans), and
- alerting both AENV and industry when there is an AAAQO exceedance.

FAP is not responsible for

- emergency notifications or evacuation alerts,
- public health advisories, and
- monitoring emissions from facilities.

AENV is responsible to

- conduct annual audits of ambient monitoring stations to ensure compliance with the *Air Monitoring Directive (AMD)*,
- make unannounced compliance inspections to ensure that facilities are meeting requirements of environmental legislation,
- follow up on AAAQO exceedances and work to identify and correct areas of noncompliance with environmental legislation,
- develop modelling to predict ambient air quality,
- develop and review AAAQOs, and

- develop and implement cumulative effects management systems.

8.2 Views of the CFRD

The CFRD stated that it had lost confidence in the FAP and in AENV to oversee the appropriate operation of the FAP monitoring network as mandated under the AMD. AENV had failed to enforce its own audit protocols and the FAP failed to communicate audit failures in an open, transparent, and timely manner. The CFRD believed that industry had too much control over the direction of the FAP.

The CFRD stated that the number of air monitoring equipment audit failures was unacceptable and continued to erode the public's confidence in the FAP. AENV failed to follow up on the nine equipment audit failures in 2008 in accordance with audit protocol. The CFRD stated that the monitor measuring benzene, toluene, ethylbenzene, xylene, and other hydrocarbons was only audited once in two years despite the AMD requirement for an annual audit. Furthermore, the CFRD stated that even though it observed improvements in audit results in 2009, it remained concerned.

The CFRD stated that according to the audit protocol, data from failed audits were to be deemed invalid and flagged in the CASA data warehouse. The CFRD presented three examples of where data should have been flagged as edited or modified; however, long after the fact subsequent searches did not show the data to be flagged. The CFRD indicated that it was concerned that this invalidated data were still being relied upon by the regulators in making project-related decisions. However, the CFRD did acknowledge that the information was flagged in tabular format, while the graphical format did not indicate the same data limitation.

The CFRD stated that recently the FAP contractor operating the monitoring network showed a disregard for the audit protocol. Following notification by AENV that an audit would be conducted, the FAP contractor proceeded to perform maintenance on some of the monitoring stations over the weekend. The CFRD indicated that this action was strictly prohibited, tainted the audit results, and once again placed the FAP's credibility in question.

The CFRD stated that confusion surrounding the purpose of the FAP air monitoring network as an early warning system remained. The CFRD indicated that AENV, the FAP, and the Alberta Industrial Heartland Association had indicated in some of their documentation that air monitoring served many purposes, with early warning being one of them. The CFRD contended that it was not the public that was confused, but rather the regulators.

The CFRD indicated that it would like to see the FAP completely overhauled into an organization that was planned, implemented, and managed by independent scientists. The CFRD also stated that the existing network was focused around the industrial operations corridor and was not able to measure gradients of pollutants. In addition, there was only one monitoring station on the west side of the river in Sturgeon County and the CFRD expressed its concern that there was no protection for people living close to industry in that area.

The CFRD repeatedly noted the lack of information being communicated as a key concern for the public. Specifically, it pointed out that information about the FAP members, including public representatives, was quick to change without notice and in some cases was updated just prior or during a hearing.

The CFRD also stated that data considered by TOTAL to be early warning data from within the plant site needed to be made public in order to aid in emergency response.

8.3 Findings of the Board

The Board acknowledges the CFRD's view that the FAP has lost its credibility through poor performance of the air monitoring network and insufficient oversight from AENV to ensure that audits are performed according to the AMD and that industry exercises too much control over the organization. The Board also notes TOTAL's position that the FAP is a multistakeholder organization that is open to the public, credible, and characterizes regional air quality appropriately.

The Board notes the apparent confusion regarding the mandate of the FAP. The Board notes that the CFRD sees the FAP as providing early warning system capabilities during operational emergencies. In contrast, TOTAL views the FAP to be an early warning system from an ecological perspective and sees its own internal monitoring systems and procedures to support an efficient emergency response plan (ERP). According to the letter from the FAP and AENV dated June 2009, the role of the FAP is to generate and provide air quality data to the public, government, and industry. However, the FAP does not see its role to include emergency notifications or evacuation alerts, public health advisories, or monitoring emissions from facilities. The Board believes that the role of the FAP is clear from this correspondence. The Board also believes that it is clear that the FAP does not have any involvement or responsibility for emergency response and that it cannot be used as such.

The Board understands that AENV is responsible for ensuring that the FAP operates in accordance with the AMD. The Board acknowledges the letter dated June 2009 that provides clarification regarding the scope and mandate of the FAP and AENV. The Board notes that the FAP has recently amended its organizational structure and has increased the number of public members from two to six in order to ensure that public concerns are heard. The Board also notes that the 2009 audit of the ambient air network showed improvement in a number of areas in contrast to previous years. Therefore, the Board does not believe that a complete overhaul of the FAP is warranted. However, the Board notes the CFRD's concern that public participation is not as strong as it could be due to the public's limited availability and lack of scientific knowledge. The Board acknowledges Dr. McDonald's suggestions for increasing the level of scientific input through academic involvement and recommends that AENV explore this possibility to strengthen public confidence in the FAP.

The Board acknowledges that some exceedances of the AAAQOs have occurred at some of the FAP air monitoring stations. The Board finds that these exceedances occur infrequently, are highly localized, and are short-term in nature. The Board also finds that the FAP has improved procedures for handling exceedances by providing explanations for potential causes and making the important distinction between industrial and natural sources to help focus the operational response from industry. Furthermore, the Board understands that AENV has the mandate to follow up on these events and encourages AENV to continue to work closely with the FAP and the public to resolve concerns. The Board notes that the air quality in the AIH has generally improved or remained consistent, as stated in the AENV 2008 Ambient Air Quality Trend report. The Board also notes Dr. McDonald's comments about the AIH enjoying some of the cleanest air quality and most effective industrial measures in the country.

The Board heard concerns about the FAP and its performance regarding network maintenance and audits. The Board recognizes that AENV is responsible for the effective operation of the FAP in support of AENV's management of air quality in the region. The Board acknowledges the concerns raised by the CFRD about audit results and the required follow-up by both AENV and the FAP. The Board finds that significant improvements have been made as evidenced by the improved audit performance in 2009. The Board encourages both the FAP and AENV to strive for continuous improvement in the operation of the air monitoring network.

The Board notes the concern raised by the CFRD with regard to the flagging of data as a result of audit failures, maintenance, or calibration of air monitors. The Board notes that the FAP compiles and submits air quality data to AENV and the CASA data warehouse. The Board believes that the appropriate and timely flagging of data serves an important purpose and therefore recommends to AENV and CASA to explore ways that more clearly articulate the limitations of the CASA data to users, regardless of data retrieval method used (i.e., graphs or tables).

The Board notes that the lack of timely communication between residents and the FAP is a concern for the CFRD. The Board understands that public outreach regarding the FAP's mandate is an important activity and that the organization was without a communications director for some time. The Board finds that the letter dated June 2009 from the FAP and AENV provides many helpful clarifications regarding the roles of the different organizations involved in the AIH. The Board believes that the FAP should continue to strive for improved communication with all stakeholders and expects TOTAL to assist in bringing residents' concerns forward to the FAP and AENV.

The Board notes the concerns of the CFRD on the lack of progress for the proposed plans to deal with regional air quality. The Board understands that emissions caps have been proposed for the region but not finalized and that management plans for pollutants such as O₃ are currently being developed. The Board finds it important to complete these frameworks and management plans in order to provide certainty and direction for all stakeholders. Therefore, the Board encourages AENV to expedite the completion of these air management frameworks and management plans.

9 HUMAN HEALTH RISK ASSESSMENT

9.1 Views of TOTAL

9.1.1 Risk Assessment Methodology

TOTAL stated that the methodology it used in its human health risk assessment (HHRA) was based on international standards that have been accepted by federal and provincial regulators and that Alberta Health and Wellness (AHW) and Health Canada reviewed the HHRA. TOTAL also indicated that its HHRA was conservative and that it employed a number of safety or uncertainty factors. TOTAL claimed that it considered all applicable human receptors and exposure pathways and it included a sufficient number of receptor locations, which also consisted of worst-case fence line receptors. TOTAL included over 200 chemicals in its HHRA based on its proposed engineering design and its experience with similar upgrader projects. TOTAL stated that it was unlikely that there would be additional chemicals emitted by the proposed upgrader

that were not included in its assessment and that it had not intentionally excluded any chemicals from the HHRA that might be emitted from the proposed facility.

TOTAL indicated that it considered blood, immune system, endocrine disruption, reproductive endpoints, and multiple health endpoints for chemicals where applicable. In response to concerns about endocrine disrupting compounds raised by the CFRD, TOTAL claimed that endocrine disrupting compounds were generally chlorinated and that it did not expect chlorinated compounds to be emitted from the proposed facility. TOTAL stated that in no case were occupational exposure limits applied to the general population and it applied the same health limits it used for the general population to industrial areas.

TOTAL stated that Health Canada supported the additive method applied to address exposure to multiple chemicals with similar toxicological endpoints, and, based on epidemiological studies, TOTAL believed that this mode of action represented the only interaction to occur at environmentally relevant concentrations. TOTAL used chemical surrogates to address chemicals with no, or limited, toxicity data. It selected surrogate chemicals on the basis of their being the most toxic chemical having a similar molecular structure, and therefore assumed similar toxicological properties, as the actual chemical with limited data.

TOTAL defended the use of the SUM15 methodology for evaluating particulate matter by indicating that AHW confirmed that it supported using this methodology in the HHRA. TOTAL also claimed that using an alternative method would not change the conclusions of its evaluation.

TOTAL stated that its approach used to evaluate cumulative effects considered its upgrader emissions in combination with existing and approved developments, as well as disclosed planned future developments, and that this approach was consistent with AENV requirements. TOTAL stated that this did not apply to the assessment of metal emissions, which it undertook solely for the proposed upgrader after it completed the initial HHRA. TOTAL claimed that any predicted risks due to metal emission exposures were low enough that a cumulative assessment of human health risks from metal emissions was not warranted.

TOTAL also indicated that one of the CFRD's health experts, Mr. Dixon, agreed that the HHRA was conducted in compliance with conventional wisdom. Mr. Dixon said that he had no issues with how TOTAL had defined individual exposures and that the methods used were the best currently available. While Mr. Dixon argued that the conventional risk assessment approach prescribed by Health Canada and the US EPA was, in his view, deficient, TOTAL stated that this view was contrary to those of AHW and Health Canada, and that the approach used was well accepted. TOTAL also stated that, while the CFRD critiqued the risk assessment process, it did not provide practical alternatives.

TOTAL clarified that in its May 2009 update, it addressed the issues of reducing the number of receptor locations and application of a dilution factor to assess indoor air quality, raised by Dr. Batterman. In particular, it noted that the number of receptor locations was constant for all scenarios and that it did not apply a dilution factor for volatile chemicals for indoor air.

9.1.2 Predicted Health Effects

TOTAL concluded that, based on the HHRA, it expected no adverse health effects as a result of its proposed project. TOTAL also indicated that due to the conservative nature of its

methodology and the low risks to human health that it predicted, a change of 5 to 10 per cent in the dispersion modelling estimates would not change the conclusions of the HHRA.

The HHRA determined that, for some chemicals, baseline exposures might exceed applicable exposure limits (i.e., the concentration ratio might exceed 1.0). The HHRA predicted the acute inhalation risk quotient for SO₂ at the fence line to exceed 1.0 for the application case (including the emissions from the upgrader), but not the base cases. However, TOTAL indicated that these predicted exceedances were infrequent and limited to locations immediately adjacent to industrial facilities and that adverse health effects were not expected from these incidents. The HHRA also indicated that the contribution of the proposed upgrader to the concentrations was generally low. TOTAL indicated that some of the exceeded SO₂ guidelines used are intended for vegetation (the 24-hour average guideline), and exceedances of these guidelines would not necessarily result in adverse impacts to human health.

In response to the CFRD evidence, TOTAL disagreed with the assertion that the proposed project would deteriorate air quality and would result in health defects in the surrounding population.

9.1.3 Health Surveillance

TOTAL stated that the 2003 *Fort Saskatchewan and Area Community Exposure and Health Effects Assessment Program* specifically looked at the effects of industrial development in the area on the local population, and that this study concluded that the health of residents of the Fort Saskatchewan area was comparable to the rest of the province.

TOTAL also opposed the CFRD's assertion that the health of the surrounding population was already diminished by current projects, citing the *Fort Saskatchewan and Area Community Exposure and Health Effects Assessment Program* and the 2007 *How Healthy Are We?* report, both published by AHW. It also indicated that the assessment by Dr. Batterman did not include confounding factors, did not demonstrate the reasons for observed differences in health, and selectively applied the available data. TOTAL stated that it considered the available community health assessments undertaken by the regional health authorities to be sufficient for determining the baseline health of the potentially affected population.

In response to the CFRD's concerns about elevated rates of hospitalization and some forms of cancer in the area, TOTAL claimed that these were based on selective use of the data and that cancer rates in the area were comparable to the rest of the province. TOTAL also noted that Dr. Predy, Alberta's Senior Medical Officer of Health, had indicated that cancer rates in the Fort Saskatchewan area were not statistically different from those in the rest of the province.

TOTAL was of the view that the health surveillance programs conducted by AHW should continue, these programs provided sufficient information to determine the baseline level of health in the surrounding area, and TOTAL should remain financially independent of these programs.

9.2 Views of the CFRD

9.2.1 Risk Assessment Methodology

The CFRD questioned the ability of the HHRA to reliably predict potential health risks. Mr. Dixon stated that the HHRA cannot account for physiological complexities and biochemical interactions in humans. The CFRD's experts also stated that the risk assessment process did not adequately address exposures to mixtures of chemicals, exposure of individuals who may be highly susceptible to air pollutants, or individuals with pre-existing medical conditions. The CFRD also expressed concern with the ability of conventional risk assessments to adequately address effects such as ototoxicity, endocrine disruption, immunosuppression, neurotoxicity, latency, or chronic low-level exposures and indicated that developmental effects could occur at low exposure levels. Mr. Dixon stated that while some of these areas were now receiving attention from regulatory bodies, he believed that TOTAL undervalued the predicted health risks and had not properly built these effects into the currently available exposure limits applied in its HHRA.

Dr. Batterman stated that the HHRA excluded secondary pollutants and used an inadequate number and placement of receptors. He stated that demographic and health information on the surrounding communities was incomplete, as was characterization of background exposures, and that there were data gaps in knowledge about adverse health effects from specific hazardous substances. He stated that the risk assessment was based on "expected" exposure parameters and that uncertainty was not adequately addressed. He stated that epidemiological data suggested that the dose-response relationship used for benzene in the risk assessment might not be conservative and indicated that metabolites of other chemicals might also cause leukemia.

Dr. Batterman also took issue with what he believed was TOTAL's assumption that indoor air concentrations of pollutants were reduced by 25 per cent. When told that the 25 per cent reduction was not used in the updated (May 2009) HHRA, Dr. Batterman indicated that he did not recall any evidence that it was not used based on his review of the report.

The CFRD also argued that the risk assessment looked at probabilistic harm across a population rather than individual or community effects, an approach which blurred the effects on individuals and communities. The CFRD submitted that the assessment by TOTAL did not include a receptor of the "most exposed actual person," which would represent an individual who works at the facility and lives in the nearby area. The CFRD also indicated that it did not believe that the HHRA process adequately addressed cumulative effects and it felt that the HHRA could not address issues such as whole-body chemical responses. Mr. Dixon advocated for a hazard-based approach instead of the risk-based approach adopted by TOTAL, which would require total containment of any toxic chemicals emitted.

With respect to the assessment of particulate matter, the CFRD submitted that the SUM15 method used a threshold for determining human health effects due to particulate matter exposure that was not used in newer guidelines adopted in other jurisdictions and that using new literature would significantly increase the risk estimates.

9.2.2 Predicted Health Effects

The CFRD submitted that health effects could not be determined until after exposure occurred. The CFRD also stated that many toxic effects could have long latency periods and the effects might not be discovered for years. The CFRD also argued that air quality in the region would deteriorate as further industrial development proceeded, causing public health and environmental quality to suffer.

The CFRD expressed concern that uncertainty in the results of the air dispersion modelling resulted in underpredicted risks in the HHRA, specifically for benzene and volatile organic compounds, and recommended that TOTAL undertake additional health monitoring and surveillance to ground truth its predictions. The CFRD stated that it was not confident in the assertion by TOTAL that there would be no human health risks and believed that target hazard levels would likely be exceeded for multiple chemicals. The CFRD also submitted that while the uncertainty might not cause a significant change in the results of the HHRA, these risks were still significant when considered from a cumulative health standpoint.

The CFRD also stated that there were already numerous exceedances of AAAQO for H₂S, PM_{2.5}, SO₂, and O₃ in the area. Dr. Batterman indicated that a new US guideline for SO₂ had been released based on human health considerations, which was lower than the Alberta guideline.

9.2.3 Health Surveillance

The CFRD argued that AHW data suggested that health indicators such as emergency room and hospital admission rates and male hematopoietic cancer rates were higher in Fort Saskatchewan than other areas of the Capital Health Region. Dr. Batterman acknowledged that the data could not demonstrate a causative role of industrial pollution and were not controlled for confounding factors, but indicated that he believed the data showed a need for further investigation prior to approving further industrial activity in the area.

The CFRD concluded that the current community health monitoring programs were not sufficient for the purposes employed by TOTAL and were inadequate to make a baseline assessment of community health specific to impacts predicted from the project. This was due to several factors, including insufficient spatial resolution of participants, a large portion of the study population living outside the area that would be affected by the project, a small sample size not allowing for proper epidemiological statistical analysis, data that predated existing industrial operations, and a lack of ability to correlate differences in health to a specific project or control for confounding influences. The CFRD argued that additional health surveillance was necessary and could possibly include personal exposure monitoring or body burden analysis of potentially affected individuals.

Dr. Batterman indicated that the analysis of cancer data by Dr. Chen was not specific to the area affected by the upgrader and did not account for several factors, such as long latency periods, testing of the most highly exposed individuals, size of the sample area compared to the scope of the project, sample size, and wind dispersion. The CFRD also referred to a statement made by Dr. Predy that AHS would look at any issues that arose from ERCB hearings.

The CFRD also provided anecdotal information regarding the incidence of cancer in the AIH.

9.3 Views of the Visschers

The Visschers generally supported the views of the CFRD.

9.4 Findings of the Board

9.4.1 Risk Assessment Methodology

The Board acknowledges that the potential health risks associated with existing and future industrial activities are of concern to residents in the area. The primary objective of an HHRA is to provide a conservative estimate of the risk and significance of potential adverse effects on an individual, community, or population that could arise from changes in environmental quality due to a project. The goal is to ensure that any potential risks associated with a project are negligible or insignificant.

The Board is satisfied that the HHRA was conducted in accordance with accepted standards and notes that both AHW and Health Canada have reviewed it. Although the Board does not have in evidence the results of those reviews, it is confident that AHW and Health Canada will deal with any concerns within their jurisdictions. The Board acknowledges that there are uncertainties and limitations in the currently available methodologies of health risk assessment. However, the methodologies used by TOTAL are the best available and are endorsed by AHW and Health Canada. Further, the health-based toxicity limits used in the risk assessment include uncertainty factors intended to address these limitations. Also, predicted exposure concentrations were well below the toxicity limits for most chemicals, and the HHRA predicted that contributions of the proposed upgrader would be small compared to existing concentrations, which, with few exceptions, are well below air quality standards and health benchmarks.

The Board also notes that while the CFRD expressed concern about the risk assessment process, it proposed no practical alternatives.

9.4.2 Predicted Health Effects

The Board notes that TOTAL concluded that it expected no adverse health effects as a result of its project. The Board believes that it is also important to note that TOTAL performed its modelling on a conservative basis and predicted no exceedances of AENV's 1-hour AAAQO for SO₂ to occur beyond the project fence line. While TOTAL indicated that it did not expect any human health effects, the Board believes that there is still the need for an effective monitoring plan. The Board also notes that the *2003 Fort Saskatchewan and Area Community Exposure and Health Effects Assessment Program* indicates that SO₂ concentrations in the Fort Saskatchewan area are mainly due to local sources, such as vehicle emissions, and that the few times the air quality in the area was rated as "poor," the cause was determined to be forest fires.

The Board does not accept the CFRD's assertion that health effects cannot be predicted until after exposure has occurred. While the Board agrees that predictions of health risks are subject to uncertainty as discussed above, uncertainty factors are intended to address these limitations, and both AHW and Health Canada support the use of the risk assessment process to predict human health effects.

The Board does not accept the CFRD's assertion that health risks have been underpredicted due to deficiencies in the air modelling since, as discussed in Section 13 of this report, the Board finds the air modelling approach to be acceptable.

9.4.3 Health Surveillance

Health surveillance involves the measurement of various health outcomes, including hospital admissions, mortality, and incidence of various diseases and health conditions, including cancer. Health surveillance can be used to compare different populations and evaluate trends in population health. It generally cannot establish the cause of a health trend on its own. It is also important to note that, unlike human health risk assessment, health surveillance cannot predict the effects of a future development on health.

While the Board acknowledges the rates of hospital and emergency department admissions reported for Fort Saskatchewan by the CFRD to be of concern to the CFRD, it notes that no causative role for industrial pollution has been demonstrated, and in fact the Capital Health Region *How Healthy Are We?* 2007 report indicates that emergency department admissions were generally highest in rural areas and that for most age groups "unintentional injury" was the largest cause of these admissions. The Board agrees with the CFRD that the spatial resolution of these data are inadequate to draw definitive conclusions about the health status of individuals within the AIH compared to those outside the area. Therefore, the Board encourages AHS to evaluate the available data further, including examining any differences in the causes of emergency department visits and hospital admissions between different areas and looking for spatial trends at scales smaller than the existing administrative regions.

The Board notes that with respect to cancer rates, a transcript of an interview with Dr. Predy presented into evidence included a statement by him that there does not appear to be a statistically significant difference in cancer rates in the AIH compared to the rest of the province. The Board also notes Dr. Predy's willingness to consider issues arising from ERCB hearings. Considering the ongoing development of the region, potential lag times for effects, and concerns about hematopoietic cancers raised by Dr. Batterman, the Board encourages AHS to continue surveillance of cancer rates in the area and to consider evaluating spatial variations in the data at a finer scale than administrative regions where possible in order to confirm whether or not there may be localized variations in areas of high industrial exposure.

The Board notes that the *2003 Fort Saskatchewan and Area Community Exposure and Health Effects Assessment Program* concluded that the health of residents of the Fort Saskatchewan area was comparable to the rest of the province. The Board agrees with the CFRD that there were limitations to this study, but does not believe that these limitations invalidate the conclusions. However, considering the changes to the area since 2003 and potential lag times for health effects, the Board encourages AHS to update this study on a regular basis. While it recognizes the serious difficulty in having people participate in such studies, the Board recommends that AHS strive to obtain better representation of the regional population in future studies.

10 TRAFFIC

10.1 Views of TOTAL

TOTAL stated that it had engaged with Strathcona County and other industrial interests to develop a transportation plan that included the upgrading of Range Road 220, Township Road 554, and the intersection of Range Road 220 with Highway 15.

TOTAL stated that it was also supportive of the 2009 AIH *Transportation Study*, which dealt with regional transportation issues. TOTAL believed that implementation of the study's recommendations would address many of the residents' transportation concerns and recommendations included upgrades to

- Highway 825 from Highway 37 to Highway 643
- Highway 643 from Highway 825 to Highway 38
- Highway 15 from Highway 830 to west of Range Road 213
- Highway 643 from Highway 28A to Highway 825

10.2 Views of the CFRD

Ms. A. Brown stated that Highway 825 was the only highway access she had coming into Fort Saskatchewan, it was very narrow, and it had lots of industrial traffic. Ms. Brown provided photos showing traffic congestion on Highway 825 and the intersection with Highway 37 and Highway 15 and the intersection with Highway 37.

Ms. Brown stated that she had serious concerns over the volume of traffic coming in from Edmonton on Highway 15 and on Highway 37 from St. Albert. Ms. Brown also expressed concerns over the volume of traffic at the intersection of Highways 37 and 825 and the volume of traffic coming into Fort Saskatchewan across the North Saskatchewan River Bridge on Highway 15.

Ms. Brown expressed concerns regarding the impact traffic and traffic congestion along the highways and intersections could have on evacuation in the event of an emergency or on the ability of emergency vehicles to get through. Ms. Brown also expressed concerns over the presence of trucks carrying dangerous cargo.

Ms. Brown noted that with respect to road upgrades along Highways 825, 37, and 15, the 2009 AIH *Transportation Study* concluded that "the construction sequence of these roads will depend on the actual sequence of the Heartland projects, but in all cases road upgrades should be completed prior to construction of the related hydrocarbon facility." Given that TOTAL supported the traffic study, Ms. Brown expressed some hope that the road upgrades would be completed prior to the construction of TOTAL's upgrader. However, Ms. Brown also noted that an AIH *Transportation Study Frequently Asked Questions* (FAQ) document stated the following:

Q: When is construction of the bypass around Fort Saskatchewan expected to begin?

A: There is no set time for the construction of the bypass. This study has helped identify the need for the bypass as well as a preliminary routing. This information will be passed on to the Government of Alberta to consider in their long-term planning.

In light of the FAQ, Ms. Brown noted that once again there were plans and studies but no commitments or concrete action on the part of government or industry to deal with transportation issues that have been identified since the industrial zoning of the region.

10.3 Findings of the Board

The Board acknowledges the frustration of residents with respect to the growing volumes of traffic in the area. The Board notes, however, that industrial and consequential urban growth leads to increased traffic and changing traffic patterns, causing some measure of inconvenience.

The Board notes TOTAL's discussions with Strathcona County to develop a transportation plan that would result in the upgrading of Range Road 220, Township Road 554, and the intersection of Range Road 220 with Highway 15. The Board finds that as these upgrades are tied directly to TOTAL's proposed project, it expects that TOTAL will aggressively pursue their completion in parallel with the construction of its upgrader.

The Board notes the findings of the 2009 AIH *Transportation Study* and agrees that the implementation of its recommendations would go a long way to address the broader regional transportation concerns of the residents. The Board notes, however, that some of the recommended improvements were dependent on a number of upgrader developments, which have not proceeded as planned. As such, the Board is unable to assess if all of the recommended improvements are still necessary. However, to the extent that the study's recommendations are relevant to the development of TOTAL's proposed project, the Board encourages their implementation and expects that TOTAL will keep the local municipalities fully apprised of its development plans to ensure that construction of the proposed upgrader and supporting infrastructure are properly coordinated.

11 EMERGENCY RESPONSE

11.1 Views of TOTAL

As part of its application, TOTAL filed a corporate ERP in accordance with requirements for ERCB upgrader applications. TOTAL stated that in addition, it would prepare an effective, comprehensive, and thorough site-specific ERP for its proposed project once it had completed detailed engineering and prior to the commencement of operations. TOTAL noted that its site-specific ERP would meet the requirements of ERCB *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry* (2008 edition), the Canadian Standards Association's *CSA-Z731-03: Emergency Preparedness and Response*, and applicable references found in the *Alberta Occupational Health and Safety Act, Regulation, and Code*. TOTAL committed to submit its site-specific ERP to the Board upon completion.

TOTAL stated that it would provide its neighbours and stakeholders with an opportunity to review, discuss, and provide suggestions for improvement to its site-specific ERP. In addition, TOTAL stated that it would consult with other area operators to ensure that its site-specific ERP was coordinated with other existing third-party ERPs.

TOTAL explained that each of its operations had an ERP that was tested through routine exercises. The emergency exercises were designed to test the effectiveness of an ERP by

examining response procedures and identifying areas for improvement. TOTAL committed to testing its site-specific ERP and communication procedures by conducting a full-scale exercise prior to commencement of operations. TOTAL further stated that the exercise would include participation by all relevant county services.

TOTAL stated that it was aware of residents' concerns with respect to notification of emergencies and incidents. As part of its site-specific ERP, TOTAL committed to develop and use a specific and effective notification system for all individuals in its emergency planning zone (EPZ). TOTAL noted that with less than 20 residents in its EPZ, it was well within its own means to contact the residents directly without using a third party call-out system.

TOTAL stated that its EPZs in and around its operation were calculated conservatively. TOTAL stated that in the event that residents around its facility were divided by its planning zone, those residents across the road or in the same subdivision but just outside of its EPZ would also receive the same information as those inside during an emergency.

TOTAL stated that based on reasonably foreseeable emergency scenarios at its proposed upgrader, it did not anticipate a scenario that would necessitate a large-scale evacuation. TOTAL added that based on resident density and weather conditions at the time of an incident, it would deal with each resident one-on-one. TOTAL committed to consult with the community to create a site-specific plan that took into consideration their concerns based on anticipated contingencies.

TOTAL recognized that sheltering in place was a potential mitigation measure accepted in *Directive 071*, but stated that the most hazardous events anticipated for its operation would be contained within its fence line and any effects outside of its fence line would be minor. TOTAL acknowledged the concerns of nearby residents regarding the efficacy of sheltering in place.

TOTAL emphasized that following any incident at a TOTAL facility, it conducted a thorough investigation. TOTAL stated that it was part of its corporate culture to disseminate findings to all other TOTAL groups to enhance their operations and verify emergency response programs.

TOTAL recognized concerns raised by residents regarding the use of NR CAER as a means to inform and notify residents of emergency incidents in the area. TOTAL clarified that NR CAER was a mutual-aid emergency response association consisting of industry, chemical transporters, and regional municipal emergency response departments. NR CAER's purpose was to share emergency response best practices, facilitate emergency response training and exercises, further community awareness and education, and to notify the community of non-emergency information. TOTAL stated that NR CAER's community notification system was not an emergency response or an early warning system.

TOTAL clarified that the FAP was a comprehensive and credible regional ambient air quality monitoring network that provided ambient air quality measurements and that this monitoring was not for emergency response purposes.

11.2 Views of the CFRD

Dr. Edelstein stated that *Directive 071* was a "foundational regulation" that did not fully address the full range of protective issues and needs of residents in the AIH. He added that the

responsibility of ensuring safety should fall on TOTAL. He also stated that he believed the apparent deficiencies in TOTAL's corporate ERP could not be remedied through a site-specific ERP.

Dr. Edelstein was of the view that it appeared that TOTAL had put a great deal of consideration and detail into its emergency command structure. However, he questioned its effectiveness because the ERP lacked evidence or evaluation of how the command structure might have worked in previous emergency responses.

Dr. Edelstein also questioned the accuracy of TOTAL's calculated EPZ, initial isolation zone (IIZ), and protective action zone (PAZ). He stated that the ERP did not provide any historical data verifying the accuracy of TOTAL's calculated planning zones versus the size of actual releases that occurred from other facilities currently in operation in the AIH. He contended that rarely can a line or boundary be drawn where risk stops. He further submitted that his work has shown that those who were bounded inside defined zones, such as an EPZ, tended to receive more protection from industry or government than those just outside of a zone.

Dr. Edelstein questioned TOTAL's ability to notify residents of an emergency. He was of the view that there was a lack of analysis or evidence in the TOTAL corporate ERP regarding the use and effectiveness of NR CAER as a notification system. Drawing from resident feedback on previous notifications and warnings in the AIH, he concluded that emergency notification to residents using the NR CAER call-out or call-in system was "ineffectual, unreliable and sometimes downright incompetent."

In the absence of data in the TOTAL corporate ERP, Dr. Edelstein challenged the effectiveness and reliability of TOTAL's proposed emergency detection systems, such as the Supervisory Control and Data Acquisition system. He contended that such systems could experience performance difficulties and malfunctions, and therefore, it was necessary to identify what the detection system's weaknesses were.

Dr. Edelstein further commented on the apparent weakness of FAP, which he believed also has a role in emergency detection.

Dr. Edelstein contended that sheltering in place was not an effective public protection measure in the AIH. He pointed out that homes in the area have not been built to be protective. Furthermore, he added that the daily activities of the residents, along with their existing physical or mental conditions, would not make it feasible for them to suitably shelter or receive notification to shelter.

Dr. Edelstein also argued that evacuation of residents, an alternative protection strategy to sheltering in place, was not viable in the AIH. He was of the view that the TOTAL corporate ERP did not outline a specific evacuation plan or other details such as evacuation notification, egress routes, assistance, or reception centres. Moreover, based on his experience with the volume of traffic and congested roads in the region, he questioned how residents could evacuate if traffic congestion prevented vehicular movement.

Dr. Edelstein stated that although the corporate ERP outlined a partnership with NR CAER, it did not provide details regarding the working relationship between TOTAL personnel and NR CAER members during an emergency response. More specifically, he stated that the ERP failed

to outline joint exercises, ERP training and equipment, how external partners would be activated, and the roles and responsibilities of external responders during an emergency incident.

Ms. Brown expressed concern that ERPs were ineffective if incidents were not able to be detected. She argued that air monitoring should be used as an early warning system. She further suggested that air monitoring detection be included as part of TOTAL's ERP.

Ms. Brown echoed the concerns expressed by Dr. Edelstein regarding traffic congestion. Ms. Brown questioned her ability to evacuate the area with congested traffic should there ever be a need to do so. In addition, Ms. Brown further questioned the ability of emergency services to get through traffic to reach her at home if they were called.

11.3 Findings of the Board

The Board notes that Dr. Edelstein's experience is in social psychology and concludes that he is not an expert in emergency planning and response. The Board has considered Dr. Edelstein's submission and testimony and has given them little weight in its decision.

The Board is strongly of the view that sheltering in place is a viable public protection measure. While sheltering in place is an issue of concern for persons regardless of the type of emergency, the Board acknowledges that this public protection measure has long been widely recognized by emergency management professionals, organizations, and government and health agencies as an effective alternative to evacuation in an emergency that involves a chemical release. The Board finds that Dr. Edelstein's alarmist comments regarding the effectiveness of sheltering in place may potentially jeopardize public safety, particularly in circumstances where sheltering in place is safer than evacuation. In addition, the Board questions the basis of Dr. Edelstein's statements that homes in the AIH ERP are inadequate for sheltering. The Board notes that Dr. Edelstein lacks the technical knowledge required to adequately assess building structures in relation to their suitability for sheltering. In addition, the Board notes that Dr. Edelstein's organization, Ramapo College, includes sheltering in place in its ERP.

The Board acknowledges TOTAL's commitment to review the typical daily home activities or circumstances of each residence in its planning zones in order to ensure that an effective and fulsome shelter-in-place program is implemented for its surrounding residents.

The Board notes that the use of planning zones, such as the EPZ, IIZ, and PAZ, are tools to assist operators with mitigation, emergency planning, and resource allocation during an emergency response. The Board does not agree that the zones draw a boundary between those who receive protection and those who do not, as suggested in Dr. Edelstein's submission. As required by *Directive 071*, companies must also plan, in consultation and partnership with local authorities, for public protection both inside and outside of the calculated EPZ.

The Board finds that Dr. Edelstein appeared to be confused during the hearing regarding the difference between a corporate ERP and a site-specific ERP. The Board would like to clarify that a site-specific ERP contains area-specific plans and emergency procedures. Site-specific ERPs include detailed information, such as area maps, resident location and contact information, hazard information specific to the operating area, local authority and mutual aid agreements that set out respective roles and responsibilities, resident notification procedures, and detailed area-specific evacuation plans. Operators are required to submit site-specific ERPs to the ERCB for

review prior to the commencement of operations as outlined in *Directive 071*. The Board will not allow operations to commence until it has approved the site-specific plan.

Directive 071 requires all operators to have a corporate-level ERP containing plans and procedures that will assist in effective emergency response where a site-specific ERP is not required by the Board. The Board expects operators to maintain and update, when necessary and to an appropriate level, their corporate ERP based on the risks, hazards, and potential consequences of the emergency scenarios that its operations present to the public.

The Board notes that TOTAL filed a corporate-level ERP consistent with the requirements for upgrader applications. The Board acknowledges TOTAL's commitment to develop a site-specific ERP for its operation and its commitment to consult and work with residents and other area operators in the AIH in the development of its site-specific ERP. The Board expects the site-specific ERP will incorporate any planning considerations as a result of information collected in TOTAL's resident consultations.

The Board acknowledges the concerns expressed by interveners with respect to traffic congestion and its potential effects on evacuation from the area during an emergency. During the proceedings, the Board toured the area in which the development was proposed and the broader area and observed the traffic congestion first-hand during some rush-hour periods.

The Board recognizes that TOTAL stated that it did not foresee an emergency at its proposed upgrader operation that would require large-scale evacuation from the AIH. The Board notes that *Directive 071* requires all site-specific ERPs to contain evacuation plans and procedures to protect potentially affected members of the public. Therefore, the Board expects TOTAL to include evacuation plans and any mitigating factors or special considerations that it may employ should an emergency occur during peak traffic times in its site-specific ERP.

The Board acknowledges TOTAL's commitment to conduct a full-scale emergency response exercise with participation from all relevant county services before commencement of operations. However, due to specific concerns raised by residents regarding traffic, the Board will condition the approval to require TOTAL to conduct a full-scale emergency response exercise that must be performed during a peak traffic period and include notification and actual or simulated evacuation of affected residents/exercise participants prior to start up of operations. The Board expects TOTAL to use lessons learned from the exercise to enhance or modify its site-specific ERP.

The Board will condition the approval to require TOTAL to submit in its site-specific ERP an assessment of all hazards, including H₂S release, and appropriate responses based on the hazards for the Board's review and approval following completion of detailed engineering and design and TOTAL's full-scale emergency response exercise. The Board will base its review of this ERP on, among other things, plans and procedures that mitigate traffic issues that could inhibit or prevent effective and efficient evacuation of residents in the AIH, as well as applicable *Directive 071* requirements.

The Board acknowledges the concerns expressed by the interveners with respect to notification of incidents using third party call-out and call-in systems. The Board notes that TOTAL committed to use direct communication in the event that residents need to be notified of an

emergency. The Board expects TOTAL to outline an emergency notification system and plan in its site-specific ERP in detail to assist in alleviating intervenor concerns.

12 WATER INTAKE/OUTFALL

12.1 Views of TOTAL

TOTAL confirmed that it was not planning to build a water intake structure on the North Saskatchewan River, but rather that it would be using Dow Chemical's existing water intake structure for its proposed upgrader. As a result, TOTAL stated that there was no requirement for a federal *Fisheries Act* licence.

TOTAL stated that it would build its own outfall structure for its proposed upgrader. TOTAL further stated that it had reviewed its proposed outfall with the Department of Fisheries and Oceans Canada, which had confirmed that no *Fisheries Act* application for the outfall was required.

TOTAL noted that its outfall would be constructed in accordance with AENV's *Code of Practice for Outfall Structures on Water Bodies*, which required an applicant to

- maintain the equivalent quantity and productive capacity of the aquatic environment at and adjacent to the outfall structure,
- take all measures possible to control erosion of or sedimentation into the water body, and
- stabilize all areas disturbed by the outfall structure within one growing season after completion of the structure.

12.2 Views of the Visschers

Mr. Visscher expressed concern that TOTAL did not identify a colony of American white pelicans that made their home on an island in the North Saskatchewan River immediately adjacent to the location of TOTAL's proposed treated wastewater outfall. Mr. Visscher stated that this species of pelicans was designated as "sensitive," meaning that careful management was required to ensure that the species did not revert back to "endangered" status. Mr. Visscher believed that the colony would not survive if TOTAL were allowed to construct its outfall within their habitat.

The Visschers' aquatic consultant, Mr. White, expressed concerns regarding the lack of detail in the application concerning the impacts of TOTAL's treated wastewater outfall on downstream erosion and scouring, channel bed morphology and stability, sediment resuspension, and site remediation.

12.3 Findings of the Board

The Board notes that TOTAL will be using Dow Chemical's existing water intake structure and that TOTAL has confirmed that its proposed water outfall will not require a federal *Fisheries Act* licence.

The Board notes Mr. Visscher's concern regarding the presence of American white pelicans in proximity to TOTAL's proposed water outfall structure. The Board expects that TOTAL will avoid the breeding and nesting periods of the pelicans when constructing its outfall. Furthermore, the Board expects TOTAL to work with Alberta Sustainable Resource Development to monitor the health of the colony.

The Board notes Mr. White's concerns regarding the lack of certain details in the application about the outfall. The Board does not share his concerns because TOTAL must satisfy AENV, the responsible authority regulating the construction and operation of the outfall, that the outfall will be fully compliant with its requirements.

13 WATER QUALITY

13.1 Views of TOTAL

TOTAL presented evidence from a number of AENV reports citing the quality of the North Saskatchewan River over the past 60 years. After reviewing these reports, TOTAL concluded that the City of Edmonton was responsible for a significant loading of nutrients, metals, bacteria, and organic material into the river, which has led to large downstream populations of algae and macrophytes and large daily fluctuations in the levels of dissolved oxygen in summer. TOTAL stated, however, that due to more stringent discharge standards and the upgrading of municipal water treatment facilities, concentrations of total phosphorus, total dissolved phosphorus, total nitrogen, total coliform, and fecal coliform bacteria downstream from Edmonton had significantly decreased by 2002. TOTAL acknowledged that while some parameters of river quality had gotten worse over time due to significant population growth and economic development, other parameters had improved and that as late as 2008, AENV had concluded that the river quality was good.

In response to concerns regarding the release of phenolic compounds in its treated wastewater stream, TOTAL committed to meeting the CCME Water Quality Guidelines for the Protection of Aquatic Life of 0.004 milligrams per litre (mg/L). TOTAL also noted that with respect to the impact of phosphorous and other nutrients reducing the amount of dissolved oxygen in the water, TOTAL's modelling indicated that with its project the dissolved oxygen level at Pakan would be maintained above the protection of aquatic life guideline of 6.5 mg/L. TOTAL stated that it would comply with AENV water quality discharge limits and indicated that this would be protective of the aquatic environment in the North Saskatchewan River.

TOTAL stated that its stormwater pond would be sized to accommodate a 1-in-100-year, 24-hour precipitation event. TOTAL confirmed that it would test stormwater for compliance with the *EPEA* discharge standards before release. TOTAL stated that if test results indicated noncompliance, it would reprocess the water in its wastewater treatment plant.

TOTAL stated that in the unlikely event that an extreme precipitation event occurred, it would direct overflow from the stormwater pond east onto low-lying TOTAL lands. TOTAL stated that it would construct ditches and berms around the edges of its project area to contain the water on site and to prevent any impact of this water on lands adjacent to its project area or other surrounding lands.

TOTAL stated that it was a member of the NCIA and that the NCIA was a member of the North Saskatchewan Watershed Alliance. TOTAL also indicated that it was working with AENV and other industry stakeholders to develop a regional aquatic monitoring framework for the North Saskatchewan River.

13.2 Views of the Visschers

Mr. White expressed concerns over the concentration of phenols, nitrogen, and phosphorous that TOTAL estimated would be discharged into the North Saskatchewan River from its operations.

Mr. White stated that phenols could be directly toxic to aquatic life and that there was a risk of phenols accumulating up through the food chain. However, on cross-examination, Mr. White stated that phenolic bioaccumulation wasn't expected to occur. Mr. White noted that according to TOTAL's cumulative effects assessment, the long-term average and peak concentrations of phenolic compounds in TOTAL's treated wastewater would be 0.2 mg/L and 0.4 mg/L respectively. This compared to the CCME's water quality guideline of 0.004 mg/L. Mr. White stated that TOTAL predicted the concentration to be 0.006 mg/L at 2 km downstream from the outfall.

Mr. White stated that phosphorous strongly stimulates algal growth and could result in oxygen depletion in aquatic systems. He stated that according to TOTAL's cumulative effects assessment, the long-term average and peak concentrations of phosphorous in TOTAL's treated wastewater would be 1.2 mg/L and 2.2 mg/L respectively. This compared to Alberta's surface water quality guideline of 0.05 mg/L. He stated that the concentration 70 km downstream from TOTAL's outfall would be 0.14 mg/L, which represented a 0.01 mg/L increase above baseline conditions.

Mr. White stated that excessive concentrations of nitrogen could also stimulate algal growth, which could result in oxygen depletion causing water anoxia and fish kills. He stated that according to TOTAL's cumulative effects assessment, the long-term average and peak concentrations of nitrogen in TOTAL's treated wastewater would be 15 mg/L and 28 mg/L respectively. This compared to Alberta's surface water quality guideline of 1 mg/L. He stated that the concentration would be 1.13 mg/L 70 km downstream from TOTAL's outfall, which represented a 0.02 mg/L increase above baseline conditions.

Mr. White stated that reduced water flow in the North Saskatchewan River due to glacial ablation, precipitation changes, increased consumptive use, and discharges from the City of Edmonton, combined with TOTAL's proposed level of pollutant discharges and the elevated temperatures of those discharges, would have a synergistic and detrimental effect on aquatic life and the food chain that was dependant on that aquatic life, particularly at the point of TOTAL's treated water discharge. He also stated that TOTAL largely ignored these synergies in its cumulative affects assessment.

Mr. White expressed concern over TOTAL's proposed discharge of stormwater into the river. He stated that it wasn't clear in TOTAL's application what water quality parameters it was going to measure and what was an acceptable exceedance of any given parameter before TOTAL released the stormwater to the river. However, he acknowledged that on further review and based on testimony from TOTAL, he was satisfied that TOTAL's approach to managing its stormwater would be appropriate.

Mr. White stated that the North Saskatchewan River was impaired. He stated that as with any other river in the province, water quality was good at the headwaters, but downstream there were impacts due to agriculture, a major urban centre, and industry, and that the quality of the water decreased and continued to decrease towards the Saskatchewan border. He acknowledged that according to AENV, some elements of river water quality had been improving over the years. However, he stated that some of AENV's water quality standards, such as phosphorous, were not as stringent as they could be, which would lead to a conclusion that river water quality was better than it should be. He stated that AENV's reporting of selected parameters was not indicative of overall river water quality and that quality measurements at any given point in time were subject to the influence of a number of factors, such as rainfall and groundwater input, that could result in better river water quality simply through the act of dilution.

Mr. White was of the view that AENV was not doing enough to monitor the health of the river. Mr. White noted that of the 18 or so sub-basins in the North Saskatchewan River watershed, there were only two locations, at Devon and Pakan, that were rigorously monitored by AENV.

Mr. White stated that it was an ongoing challenge to manage and monitor the river and that he would like to see TOTAL as a strong member, and a funding partner, of the North Saskatchewan Watershed Alliance, the Watershed Planning and Advisory Council.

13.3 Findings of the Board

The Board notes that water quality in the North Saskatchewan River is influenced by a number of human uses that currently include urban, industrial, and agricultural inputs. Although the contribution of the TOTAL upgrader to these inputs is minor relative to background levels and inputs from other sources, the Board notes that the concentration of phosphorous in particular is predicted to be above the CCME's water quality guidelines downstream of the AIH.

Given the cumulative nature of discharges of pollutants and nutrients to the North Saskatchewan River, the Board is of the view that there is a need for all industries and municipalities to work cooperatively to maintain water quality in the river. The upgrading industry in general, including TOTAL, is represented on regional air and water committees led by AENV. Therefore, the Board is satisfied that TOTAL is aware of emerging issues and the need to respond to those issues. Regional monitoring is appropriate for determining changes in water quality in the river. The Board notes that TOTAL is engaged with AENV in developing a regional monitoring framework and encourages TOTAL to continue to actively participate in the development and implementation of this framework.

However, it is also important that TOTAL measure its contribution to pollutant and nutrient loading in the river. TOTAL has indicated that it will comply with whatever discharge limits are in its *EPEA* approval. The Board is confident that AENV, as the lead regulatory authority for managing surface water quality, will incorporate appropriate conditions into TOTAL's *EPEA* approval to control the release of phenols, nitrogen, and phosphorous into the North Saskatchewan River.

The Board notes that TOTAL has committed to employing technology that would reduce its discharge of phenols to the river to meet CCME water quality guidelines. The Board recommends that AENV consider including this as a condition of its *EPEA* approval.

14 INSTREAM FLOW NEED

14.1 Views of TOTAL

TOTAL acknowledged that the North Saskatchewan River flow data from 1912 to 2008 have shown a decline in flow of 18 per cent per 100 years. TOTAL stated that flows are cyclical over many decades and that extrapolation of historic stream flows into the future must be regarded cautiously since the historic hydrologic data record is limited and there is an incomplete understanding of many atmospheric, oceanic, and landscape processes that collectively underlie stream flows. TOTAL stated that projecting a trendline from a period of high flows, as was evidenced in the 1910s, to a period of low flows, as is currently observed, would lead to the conclusion that flow rates in the North Saskatchewan River had suffered a significant decline. However, the underlying cyclic nature of flows did not support the conclusion that flow rates have, or would continue, to decline.

TOTAL stated that, based on work by L. Comeau of the University of Saskatchewan, the contribution of glacial flow to the North Saskatchewan River for the period 1975 to 1998 was 7.3 per cent at Whirlpool Point and 2.6 per cent at Edmonton. TOTAL stated that this was the best number available based on the peer-reviewed literature. TOTAL argued that when Mr. Clissold determined the contribution of glacial flow at Edmonton, he did not account for the presence of a number of small glaciers and glaciers in the eastern part of the watershed. TOTAL argued that as a result, Mr. Clissold's assessment of the rate of glacial ablation and contribution to flow at Edmonton was incorrect.

TOTAL pointed to AENV's water management framework for the Capital Region and the AIH, which stated that "sufficient water remains in the North Saskatchewan River to maintain aquatic life and support current and proposed industrial development ... even with the development of eight planned upgraders, consumptive use on the North Saskatchewan River is forecast to use only 6 per cent of the mean annual flow." TOTAL further noted that it was within AENV's legislative mandate under the *Water Act* to impose water usage restrictions for instream flow need (IFN) reasons in the unlikely event that it became necessary to do so.

14.2 Views of the CFRD

The CFRD's hydrogeological consultant, Mr. Clissold, outlined concerns regarding the IFN of the North Saskatchewan River and the potential implications to TOTAL's proposed upgrader. He acknowledged that he was not giving expert testimony as a hydrologist, but had undertaken a relatively simple analysis using the methodologies and data available to identify potential concerns that the Board, TOTAL, and the public should be cognizant of in planning for future development.

Based on his modelling, Mr. Clissold concluded that there has been a decrease in the annual flow in the North Saskatchewan River of 18 per cent per 100 years and that the contribution of glacial flow to the river as measured at Edmonton was 6 per cent. From this, he projected that beginning in 2030, the combination of the loss of glacial flow and the historic decline in river flow could result in 26 weeks in which the IFN of the North Saskatchewan River would not be met.

14.3 Findings of the Board

The Board notes that Mr. Clissold acknowledged that his expertise was in hydrogeology and not in the field of assessing river flow rates and that his assessment of the flow rates for the North Saskatchewan River was a relatively simple analysis designed to illustrate potential issues that industry and the regulatory bodies should be aware of as opposed to a definitive prediction of events that will occur.

The Board is aware that the determination of the IFN for the North Saskatchewan River is a complex process and involves a broad range of expertise. The Board understands that a process is underway to determine the IFN as part of an integrated watershed management plan being developed through the North Saskatchewan Watershed Alliance under the direction of AENV.

While the Board acknowledges Mr. Clissold's findings regarding the potential for increasing periods where the IFN of the North Saskatchewan River may not be met, the Board also notes that AENV has concluded that there is adequate water available in the river to meet current and proposed industrial development. The Board notes that through the *Water Act*, it is AENV's responsibility to allocate water resources and TOTAL will be subject to any restriction that AENV may impose as circumstances warrant.

15 GROUNDWATER

15.1 Views of TOTAL

TOTAL's local study area (LSA) for assessing groundwater effects consisted of its project development area. It selected the LSA to characterize groundwater conditions beneath the upgrader site and account for any potential local effects on groundwater from upgrader development. It used the RSA to identify the area in which groundwater might potentially be affected by upgrader construction or operations. It determined the RSA to be 3.2 km, which encompassed the area that could be affected by groundwater dewatering.

TOTAL characterized the first layer underlying its project area as a surficial sand layer with a horizontal groundwater velocity estimated at 1.5 metres/annum (m/a). This layer had no natural barriers against contamination from surface spills and, as a result, the potential for contamination of the groundwater in this shallow layer was high. A clay and clay till layer was beneath this layer that met AENV's criteria for a geologic barrier, i.e., at least 5 m of fine-grained material with a bulk hydraulic conductivity of less than 1×10^{-7} metres per second. TOTAL stated that this layer provided an effective barrier to prevent contamination from the surficial aquifer to the underlying Beverly Channel aquifer. Furthermore, TOTAL stated that it had moved its storage facilities to areas of its project that were underlain by thicker clay and clay till units in order to further enhance the protection of the Beverly Channel aquifer.

TOTAL stated that it would implement numerous mitigation and monitoring measures to prevent contamination of the shallow groundwater and that its engineered protection measures would meet or exceed the requirements of ERCB *Directive 055: Storage Requirements for the Upstream Petroleum Industry*. These measures would include the construction of permanent stormwater ponds early in the construction period to handle any runoff, concrete pads and paving for all process units and all storage and handling facilities, closed-circuit runoff sewers in the

process area, leak detection and collection systems, secondary containment for storage tanks, above-land process lines to facilitate inspection and maintenance, spill response preparedness and procedures, and an extensive groundwater monitoring program.

TOTAL agreed to a recommendation by Mr. Clissold to install piezometers or monitoring wells where the base of the shallow sand aquifer was at its lowest elevation, particularly in the northeast part of the project area. TOTAL also stated that it was a member of the NCIA groundwater monitoring program and that it had a groundwater monitoring well in the upgrading area of the project as recommended Mr. Clissold. TOTAL stated that it would consider the need for any additional monitoring sites.

TOTAL committed to a groundwater sampling frequency of twice per year, which was a generally accepted frequency for sampling. Given the estimated horizontal groundwater velocity of 1.5 m/a, if a spill occurred it would travel only about 0.8 m between sampling events. TOTAL stated that it would implement more frequent sampling if during the course of monitoring it concluded that more frequent monitoring was required.

TOTAL acknowledged that it had not yet developed its spill response plan but would do so along with its ERP and that these plans would be operational at the time of commissioning.

15.2 Views of the CFRD

Mr. Clissold stated that there were three separate aquifers underlying the site of TOTAL's proposed upgrader, a shallow unconfined sand aquifer that extends to depths of up to 30 m below ground level, the Beverly Channel aquifer below that, and a third aquifer below the Beverly Channel aquifer consisting of several low permeability bedrock units that he did not expect to be negatively impacted by surface activity.

Mr. Clissold acknowledged that the shallow unconfined sand aquifer would need to be dewatered and that he would not expect dewatering activities to significantly affect groundwater supplies or other aquifers in the area. He stated that dewatering was a temporary activity whose effects would last two or three years at most.

Mr. Clissold was of the view that there was a high probability that the shallow unconfined sand aquifer would become contaminated as the only barriers to its contamination were manmade.

Mr. Clissold acknowledged the presence of a clay layer between the shallow unconfined sand aquifer and the Beverly Channel aquifer and noted that this layer met the requirements of AENV as a geological barrier to groundwater flow. However, he was of the view that the downward hydraulic gradient and the existence of microfractures in the clay layer could ultimately lead to contamination of the Beverly Channel aquifer.

Mr. Clissold acknowledged that TOTAL had examined the potential for groundwater contamination and that his concerns over contamination of the Beverly Channel aquifer could be mitigated by proper monitoring. He stated that the two existing monitoring wells in the Beverly Channel aquifer should be sufficient. With respect to contamination of the shallow unconfined sand aquifer, he suggested that TOTAL could be more aggressive and install capture wells that would be pumped continuously, thus creating a hydraulic low. This would allow for the continuous monitoring of groundwater quality rather than only twice per year as proposed by

TOTAL. He did not suggest additional containment measures beyond those identified in *Directive 055*.

15.3 Findings of the Board

The Board acknowledges TOTAL's proposed mitigation and monitoring measures to prevent contamination of the shallow groundwater aquifer. The Board notes that, pursuant to the *Water Act*, AENV is the responsible authority for groundwater diversions and monitoring. The Board expects that TOTAL will work with AENV to develop an appropriate groundwater monitoring program and that TOTAL will consider as part of its program installing capture wells with continuous pumping systems to provide for continuous groundwater monitoring as suggested by Mr. Clissold.

16 LIGHT

16.1 Views of TOTAL

TOTAL stated that its LSA for light impacts was 2 km. While lights of a similar intensity to the upgrader's could be seen at a distance of more than 2 km, light impacts beyond this distance were typically comparable to general lighting near the receptors, for example, streetlights. TOTAL stated that because of the surrounding industrial facilities to the north, west, and southwest of the proposed project area, most of the residential receptors within two km of its project were located to the south along Highway 15 where there were many street lights.

TOTAL acknowledged that even small amounts of light emitted from the most sensitive angles could cause light pollution over a 200 km radius, i.e. sky glow. TOTAL stated that it did not measure sky glow as part of its baseline light assessment or take it into consideration as part of its impact assessment. TOTAL noted, however, that mitigation of sky glow would result from its general approach to proper lighting design for the upgrader.

TOTAL acknowledged that it was in the best interest of all to minimize lighting from the proposed upgrader and its effects on the surrounding community. TOTAL stated that it intended to be an industry leader in this respect. TOTAL stated that it agreed with many of the recommendations put forward by the CFRD's lighting consultant, Mr. Benya, such as the use of motion sensors, incandescent lighting, fully shielded luminaires and directional luminaires and that it would implement those recommendations as far as possible as it progressed in the detailed design of its upgrader.

16.2 Views of the CFRD

Mr. Benya stated that the petroleum industry in central Alberta has caused the region to become one of the most light-polluted areas in Canada on a per capita basis and that most of this could be mitigated or eliminated by better light design practices.

Mr. Benya stated there were four significant types of light pollution affecting the region: artificial sky glow, light trespass, glare, and flaring. He stated that the various types of light pollution, in addition to being offensive and unattractive, could disrupt the circadian rhythms of

living creatures, affect hunter/prey behaviors, bird migration patterns, and increase cancer risks in women.

Mr. Benya stated that TOTAL incorrectly used “illuminance” and “luminance” to assess the impacts of light from its project. He stated that, as a result, TOTAL’s baseline assessment was technically invalid. He argued that TOTAL’s use of these metrics was suitable only to measure the impacts of a light source at close distances and that at further distances, for example at a residence, the metrics would indicate little impact from a light source despite that source being glaring, offensive, and damaging to the appreciation of the night sky.

Mr. Benya acknowledged that TOTAL had committed to incorporate his ten suggested mitigation measures to reduce light impacts from its proposed project and that by doing so it would result in a safe and secure site that reduced light impacts.

Mr. Benya recommended that third-party verification of TOTAL’s final lighting design should be undertaken to ensure that light impacts were minimized. With respect to dealing with the issue of sky glow, he recommended that a regional light monitoring program be established to more accurately assess the collective light pollution in the region. He stated that organizations such as the International Dark Sky Association could provide feedback and analysis on this issue.

Mr. Benya acknowledged that there was limited or no regulatory guidance in dealing with lighting issues. However, as guidance to the Board in its deliberations, he suggested the combination of the American Petroleum Institute 540 recommendations and the Illuminating Engineering Society’s Recommend Practice 33-99 would be appropriate.

16.3 Findings of the Board

The Board notes TOTAL’s commitment to incorporate as part of its final project design Mr. Benya’s suggested mitigation measures to reduce light impacts from its proposed project. The Board also notes Mr. Benya’s concurrence that adoption of his suggested mitigation measures would result in a safe and secure site that reduced light impacts. As such, the Board is satisfied that concerns regarding light impacts can be mitigated through proper design and the adoption of the suggested mitigation measures. The Board expects TOTAL to pursue Mr. Benya’s suggested mitigation measures and to provide the Board with information to demonstrate that it has incorporated his measures in its final lighting design.

The Board recognizes that light pollution is an emerging issue in the AIH. While the Board acknowledges that elements of light pollution are due to the practices of industry, the Board believes that the most significant contribution to light pollution in the region is the presence of the City of Edmonton and the City of Fort Saskatchewan. Nonetheless, to the extent that industry impacts can be mitigated, the Board notes Mr. Benya’s suggestions for a regional light monitoring program. The Board expects that TOTAL will raise this issue with the NCIA with the objective of developing an appropriate monitoring and mitigation program to deal with industrial light impacts and that TOTAL will keep the Board apprised of its efforts in this matter.

The Board notes that efforts are already underway to address light impacts, as evidenced from the commitments made by North West Upgrading Inc. (*Decision 2007-058: North West Upgrading Inc., Application to Construct and Operate an Oil Sands Upgrader in Sturgeon County*) and Suncor Energy (*Decision 2009-002*).

17 NOISE

17.1 Views of TOTAL

TOTAL submitted a baseline noise survey (BNS) and a noise impact assessment (NIA) dated December 2007 to establish and assess noise impacts on human receptors attributable to its proposed project. TOTAL submitted an updated NIA, dated November 2008, subsequent to a revised plant layout. TOTAL indicated that the approach it used to complete the BNS and the NIAs was consistent with the requirements of ERCB *Directive 038: Noise Control*.

TOTAL indicated that the BNS levels measured in 2007 remained representative of current sound conditions and that it did not intend to do another BNS study before construction. TOTAL also stated that all machinery ordered for the project would have a maximum specified noise level of 85 A-weighted decibel (dBA) at 1 m.

TOTAL stated that it had taken steps to mitigate the potential noise impacts of its project, including

- adopting best practices in noise management and implementing site landscaping to create berms with trees on the southeast side of its project lands to minimize sight lines, and
- designing and staging the upgrader to reduce noise during construction and operations.

TOTAL stated that it would complete an additional NIA that would take into account detailed project design decisions to identify any potential noncompliance noise levels. It would use this assessment to refine mitigation measures necessary to ensure the project complied with the requirements of *Directive 038*.

TOTAL stated that it would participate in the Regional Noise Management Plan (RNMP) under development by the NCIA and conduct a post-commissioning noise monitoring survey.

17.2 Views of the CFRD

The CFRD's noise consultant, Mr. Farquharson, completed a review of TOTAL's BNS and the NIAs.

With respect to the BNS, Mr. Farquharson noted a number of omissions including microphone location for each residence, record of calibration results at each monitoring location, the exclusion of low frequency components of the existing sound environment, and exclusion of graphs showing measured sound levels and any isolation analysis. Mr. Farquharson recommended that the BNS should be redone in accordance with *Directive 038*, and should include simultaneous measurements of the A- and C-weighted sound levels and measurement of 1/3 octave band values.

Mr. Farquharson noted that the results of a revised BNS should be provided to the ERCB, the community, and the NCIA.

With respect to the NIAs, Mr. Farquharson noted that they did not include all noise sources associated with the project and they were based on a conceptual project design. The NIAs did not

include the electrical substation and potential low frequency tonal components, nor the sound of rail car movements associated with the shipment of various products from the project.

Mr. Farquharson recommended that the NIA be redone based on the final design of the project at the point when equipment selection and procurement were initiated. Mr. Farquharson also recommended that the revised NIA be subject to peer review along with submission to the ERCB.

Mr. Farquharson recommended that TOTAL commit to a post-commissioning noise monitoring survey and provide a comparison of the predicted results to those measured.

Mr. Farquharson stated that the use of community advisory panels by the NCIA as public input to the RNMP would be a good step in addressing the noise issues in the area.

17.3 Findings of the Board

The Board finds that TOTAL did not meet the requirements of *Directive 038*. The Board finds the following key deficiencies:

- the omission of significant sound sources, which includes the electrical substation and rail car movements associated with the shipment of various products from the upgrader
- the omission of information required to meet minimum reporting requirements, which includes a record of calibration results, operating conditions for facility or facilities included in the survey, graphs showing measured sound levels and any isolation analysis, and a summary table including the permissible sound level (PSL) for dwelling, measured sound level, isolation analysis results, and valid hours of the survey.

The Board recognizes that NIA's are often based on conceptual engineering and design work and not the final engineering details. The ERCB's process to evaluate applications such as TOTAL's allows for an applicant to provide an initial evaluation of noise impacts, which is followed by a further assessment once the final engineering design work has been completed. In this instance, the Board notes that the NIA submitted with the application was prepared at the conceptual engineering and design stage and accepts the CFRD's recommendation that TOTAL be required to resubmit an NIA after its detailed engineering design has been completed. The Board also recognizes that TOTAL agreed to prepare a revised NIA based on detailed design. As a result, the Board will condition the approval to require TOTAL to submit a revised NIA, prepared in accordance with the requirements of *Directive 038*, six months prior to starting construction.

The Board understands that the results of the revised NIA may identify additional mitigation measures to ensure compliance with *Directive 038* requirements or that it may be necessary to refine some of the mitigation measures included in TOTAL's commitment list (see Appendix 1). As such, the Board expects any new mitigation measures or refinements to the commitments to be clearly identified in the NIA.

The Board accepts the CFRD's recommendation that TOTAL redo its baseline sound monitoring surveys. The Board also accepts the CFRD's recommendation to include the simultaneous measurement of the A-weighted and C-weighted sound levels in 1/3 octave band values to evaluate low frequency noise. The Board will condition the approval to require TOTAL to redo its baseline sound monitoring surveys in accordance with the requirements of *Directive 038*,

which will include the simultaneous measurement of the A-weighted and C-weighted sound levels in 1/3 octave band values.

The Board notes TOTAL's commitment to conduct a post-commissioning sound monitoring survey. The Board will condition TOTAL's approval to require TOTAL to conduct the post-commissioning sound monitoring survey three months after start-up to verify compliance with the requirements of *Directive 038*.

The Board acknowledges TOTAL's commitment to participate in the RNMP being developed for the AIH. The Board notes that the RNMP will include both ERCB regulated and non-regulated facilities in the AIH and that input from affected stakeholders will be incorporated in the formulation of the RNMP.

18 SOILS AND VEGETATION

18.1 Views of TOTAL

TOTAL stated that as part of its soil conservation and reclamation plan, it would use best management practices for the salvage and storage of productive soils to ensure that the agricultural capability of lands within the proposed project's footprint could be restored to predisturbance equivalency should the industrial focus of the area change in the future.

TOTAL acknowledged that emissions from its project, other industrial facilities in the region, and the City of Edmonton would be a source of acid forming emissions, such as SO₂ and NO_x. At high concentrations, these emissions could cause stress to vegetation, including the death of some species. TOTAL stated, however, that the annual average predicted acid deposition from its proposed upgrader was within the target load specified by AENV.

TOTAL noted that AENV, as part of its long-term soil monitoring program, had established an acid deposition monitoring plot located in the Bruderheim area. TOTAL also noted the Beaverhills Vegetation Study, which was designed to monitor bryophyte diversity and abundance in response to air pollutants such as SO₂, NO₂, and O₃. The Beaverhill Vegetation Study included impacts to Elk Island National Park. TOTAL acknowledged that further monitoring of acid deposition in the region would be useful and that it had held discussions with AENV and the NCIA about establishing a regional terrestrial monitoring program to provide further information on the area.

Notwithstanding the potential effects of acid deposition on vegetation, TOTAL mentioned a media report that cited drought as having a negative impact on numerous trees in the North Saskatchewan River valley and other areas. With respect to Mr. Visscher's concern that it was industrial emissions that were impacting trees on his property, TOTAL stated that Mr. Visscher acknowledged that he had not examined the drought-impacted areas in the City of Edmonton's Kinnard ravine, nor had Mr. Visscher contacted the City of Edmonton representative Michael Seltzer for further information.

18.2 Views of the Visschers

Mr. Visscher stated that since 2005, many trees on his property adjacent to the North Saskatchewan River had died or were showing signs of increased stress. He did not believe that the impact to his trees was due to drought or herbicide damage as he could see no evidence of such effects in other places in the river valley or in other areas that he farmed. He believed that this was a local phenomenon.

Mr. Visscher stated that he had made Shell, Provident, and TOTAL aware of the problems with his trees as they were his closest industrial neighbours. However, none of them offered to have one of their environmental specialists investigate, take samples, or follow up with him in an attempt to understand what might be happening to his patch of trees. Mr. Visscher stated that he would appreciate having the issue investigated and would cooperate with any company that expressed an interest in doing so. Mr. Visscher stated that he had been unable to locate professional assistance to help him determine what was impacting his trees.

18.3 Findings of the Board

The Board accepts that TOTAL's soil conservation and reclamation plans will be consistent with the guidelines established by AENV. The Board acknowledges TOTAL's objective of ultimately restoring the agricultural capability of its project lands.

The Board accepts that TOTAL's predicted acid deposition will be within the criteria specified by AENV.

The Board notes the current regional acid deposition monitoring work. While no evidence was presented that would indicate that the region is currently under stress, given the increasing industrialization of the area and the proximity of the City of Edmonton as a source of acid forming emissions, the Board encourages TOTAL to continue its discussions with AENV and the NCIA about the possible need for broadening the network.

The Board notes Mr. Visscher's concerns about the trees on his property showing signs of increased stress. While the Board acknowledges that this could be due to acid deposition, it could also be the result of other factors. Mr. Visscher did not provide any evidence as to the cause of this stress or that TOTAL's project would result in further stress. Furthermore, the Board notes that TOTAL's predicted acid deposition will be within the deposition criteria specified by AENV.

The Board believes that the impact to Mr. Visscher's trees is an operational issue and it will follow up with those facilities adjacent to Mr. Visscher's property.

19 APPROVAL EXPIRY

19.1 Findings of the Board

The Board notes that the AIH is an area in which government policies, guidelines, and management frameworks are continuing to evolve in response to proposed industrial development. The Board further notes that changing economic circumstances have materially

impacted planned developments in the region. Given the evolving regulatory and policy framework for the AIH and the uncertainty of industrial development, to ensure that the approval remains relevant, the Board finds that it is appropriate to stipulate a time limit on it. Accordingly, the Board will condition the approval to expire on December 31, 2016, unless TOTAL satisfies the Board by no later than October 1, 2016, that construction has commenced or unless the Board stipulates a later date. In making a determination on whether or not to stipulate a later date, the Board may require TOTAL to provide updated assessments that reflect the state of industrial or other developments in the AIH at the time.

Dated in Calgary, Alberta, on September 16, 2010.

ENERGY RESOURCES CONSERVATION BOARD

<original signed by>

J. D. Dilay, P.Eng.
Presiding Member

<original signed by>

D. McFadyen
Board Member

<original signed by>

T. L. Watson, P.Eng.
Board Member

APPENDIX 1 SUMMARY OF CONDITIONS AND COMMITMENTS

Conditions generally are requirements in addition to or otherwise expanding upon existing regulations and guidelines. An applicant must comply with conditions or it is in breach of its approval and subject to enforcement action by the ERCB. Enforcement of an approval includes enforcement of the conditions attached to that licence. Sanctions imposed for the breach of such conditions may include the suspension of the approval, resulting in the shut-in of a facility. The conditions imposed on the licence are summarized below.

The Board notes that TOTAL has made certain undertakings, promises, and commitments (collectively referred to as commitments) to parties involving activities or operations that are not strictly required under ERCB requirements. These commitments are separate arrangements between the parties and do not constitute conditions to the ERCB's approval of the application. The commitments that have been given some weight by the Board are summarized below.

The Board expects the applicant to comply with commitments made to all parties. However, while the Board has considered these commitments in arriving at its decision, the Board cannot enforce them. If the applicant does not comply with commitments made, affected parties may request a review of the original approval. At that time, the ERCB will assess whether the circumstances regarding any failed commitment warrant a review of the original approval.

CONDITIONS

- The Board conditions TOTAL's approval to require it to achieve 99.5 per cent sulphur recovery on a calendar quarter-year basis within 6 months of commencing start-up activities.
- The Board conditions the approval to require TOTAL to conduct a full-scale emergency response exercise that must be performed during a peak traffic period and include notification and actual or simulated evacuation of affected residents/exercise participants prior to start up of operations.
- The Board conditions the approval to require TOTAL to submit in its site-specific ERP, an assessment of all hazards, including an H₂S release, and appropriate responses based on the particular hazard for the Board's review and approval following completion of detailed engineering and design, and its full-scale emergency response exercise.
- The Board conditions the approval to require TOTAL to submit a revised NIA, prepared in accordance with the requirements of *Directive 038*, six months prior to starting construction.
- The Board conditions the approval to require TOTAL to redo its baseline sound monitoring surveys, in accordance with the requirements of *Directive 038*, which will include the simultaneous measurement of the A-weighted and C-weighted sound levels in 1/3 octave band values.
- The Board conditions TOTAL's approval to require TOTAL to conduct the post-commissioning sound monitoring survey three months after start-up to verify compliance with the requirements of *Directive 038*.

- The Board conditions the approval to expire on December 31, 2016, unless TOTAL satisfies the Board by no later than October 1, 2016, that construction has commenced or unless the Board stipulates a later date.

COMMITMENTS BY TOTAL

In addition to the commitments listed in this report, the following are commitments that TOTAL has made in its application, its supplemental information responses, and during the course of the hearing. These commitments are Exhibit 58 from the hearing.

Design

- TOTAL plans to use three two-stage sulphur recovery units (SRUs) in combination with two SCOT tail gas treating units (TGTUs) and Shell-licensed degassing. This design is expected to achieve 99.8% sulphur recovery. TOTAL expects to be regulated to 99.5% sulphur recovery on a quarterly basis as required in ERCB *ID 2001-3*, as has been the generally accepted requirement for upgraders in the AIH.
- The H₂S content of the plant fuel gas will be controlled to 50 ppmv or less.
- The vent gas from the SCOT process will be combusted in a thermal oxidizer. Natural gas/fuel gas will be added to the thermal oxidizer to ensure that the stack top temperature exceeds 538°C to ensure adequate combustion.
- The tail gas incinerator stack will be a minimum 100 m in height.
- Liquid sulphur will be loaded into railcars using loading arms. Steam ejectors will be included to remove H₂S traces during loading operations.
- A flare gas recovery compressor will be installed to prevent flaring during normal operating conditions. All streams routinely emitted from equipment will be recovered and returned to the process.
- The flare system will be designed to meet the spirit and intent of ERCB *Directive 060*. Both hydrocarbon flares will be equipped with steam assist.
- Flare designs will be provided to AENV within 12 months following completion of detailed engineering.
- All furnaces, heaters, and boilers will use low NO_x burners and will be designed to meet or exceed the Canadian Council of Ministers of the Environment (CCME) guidelines for NO_x emissions.
- During normal operations, coke will be stored in an enclosed coke barn.
- All water quantities that have been in contact with petroleum coke will be kept within the delayed coking unit and recycled into delayed coker operations.
- Features will be included in the coke system design to reduce dust buildup and the risk of fire in the conveying and storage systems.

- To reduce fugitive emissions, volatile organic compounds (VOCs), and greenhouse gases (GHGs), the following design considerations have been included:
 - pumps in volatile liquid hydrocarbon, H₂S, or high reid vapour pressure (RVP) service will have double mechanical seals
 - equipment operational drains will discharge into a closed-drain system
 - sample points will be closed loop, discharging into a closed system
 - where appropriate, on-stream quality analysis will be used instead of manual sampling
 - all hydrocarbon and sour service pressure relief valves will be routed to the flare systems
 - vapour recovery equipment and double-seal floating roofs with a fixed cover will be installed on tanks containing volatile components according to CCME PN 1180
 - a flare gas recovery compressor will reroute the gas to the upgrader main gas header
 - tank drains for product and water phases will be discharged into closed drain drums
 - the American Petroleum Institute (API) separator, dissolved air flotation (DAF) unit, and biological treatment units are designed to be covered and with nitrogen blanketing
 - low-emission packing will be used on actuated valves in volatile liquid hydrocarbon, H₂S or high RVP service
- Controls specific to managing GHG emissions will include
 - integration of heat transfer between DRU1 and DCU (Phase 1) and DRU2 and VDU (Phase 2)
 - installing thermally efficient heaters, furnaces, and boilers
 - pre-heat combustion air to increase combustion efficiency in all major furnaces
 - insulating transport pipelines and hot process vessels to conserve energy
 - implementing a leak detection and repair program (LDAR) program to control and reduce fugitive methane emissions
- CO₂ recovery facilities that would recover and sequester CO₂ from the hydrogen production unit are under consideration for the future. The plot plan will include space for these facilities.
- Health and safety standards require minimum lighting levels for facility operation and maintenance. As long as this priority is met, TOTAL commits to reducing the upgrader's light footprint to as low as possible.
- Mitigation measures will be implemented to reduce light levels at receptor locations. These mitigation measures could include the following:
 - reducing the amount of lighting in facility areas when not required
 - selecting locations for lights so that only required areas are lit
 - using shielded or directional lights to reduce stray lighting

- using spotlights on the ground that shine no higher than 45° above vertical and are located no farther away than the structure height
- lighting exterior signs from the top
- using low reflectance ground cover beneath outdoor lighting
- installing vegetation or berms to block direct lines of sight
- The following lighting mitigation measures will be adopted, to the extent possible, in the final lighting design:
 - As much as possible, use fully shielded luminaires, preferably with flat-bottom lenses and no upwards light.
 - If effective shielding can be demonstrated using structures or topography to prevent obtrusive glare, “semi-cutoff” luminaires may be employed as long as the total direct uplight lumens on the site does not exceed 2 per cent of the total lamp lumens of all lighting on the site.
 - Directional luminaires such as floodlights shall not be used unless (a) they are highly directional with a NEMA beam spread not greater than 3 x 3; (b) they are aimed at a target requiring this type of light; and (c) they are fully shielded to prevent spill light. This luminaire type is especially poor at off-site glare control and should only be used when absolutely needed.
 - Due to temperature extremes, high pressure sodium and/or LED are the most likely light sources. High CCT LED sources should be avoided; LED systems should be rated 3000K CCT or lower. Incandescent or halogen lamps operated by motion sensors in low-traffic areas are also acceptable.
 - When special purpose lighting is required, e.g. aircraft obstruction lighting, avoid strobing lights and employ the most minimal red lighting system permitted.
 - Do not overlight. Light levels should meet API 540 and applicable IESNA recommendations but shall not exceed them. Task light levels should be restricted to task areas only.
 - Do not light areas not requiring light, e.g., fields, areas of dirt storage, etc. Avoid lighting of low-use site roadways, remote equipment, etc. Use lighting controls to turn off lights when people are not present.
 - Ensure that off-site light trespass does not exceed 1.1 lux in any plane at the property line; at site entrance roads and driveways, the light trespass line shall be measured at the curb line opposite the site entry for 50 m on either side of the center line of the entrance drive.
 - Whenever possible, set back lighting systems at least 2.5 mounting heights.
 - Use adaptive lighting to reduce light levels during periods of low activity or lack of actual need.
- TOTAL will use best available technology economically achievable to comply with ERCB *Noise Directive 038*.

- Once detailed design is completed and equipment is specified/purchased, a revised noise impact assessment will be undertaken and provided to the ERCB and relevant stakeholders.
- TOTAL will participate in the Regional Noise Management Plan (RNMP) being developed by the NCIA.
- A list of chemicals to be used in the upgrader will be provided to AENV 12 months before start-up.
- Diversion berm network plans will be provided to AENV three months following completion of detailed engineering.
- TOTAL will comply with the AENV Water Management Framework for the North Saskatchewan River.
- TOTAL will obtain water from the North Saskatchewan River (NSR) using an existing third-party shared intake.
- Water withdrawals will be minimized by preferential use of air cooling and maximising recycling of water.
- The facility will include raw water ponds with a 14 day retention time.
- Uncontaminated stormwater will be directed to the non-process stormwater pond and contaminated surface water material will be processed in the wastewater treatment facilities.
- Before discharge to the NSR, the treated water will be sent to the treated water pond for testing. If test results show noncompliance with *EPEA* discharge standards, the content of that cell will be pumped back to be reprocessed in the waste water treatment plant.
- The treated water pipeline to the NSR will discharge through a concrete outfall structure with energy dissipation. The outfall will be constructed in accordance with the *Code of Practice for Outfall Structures on Waterbodies*.
- A wastewater treatment sludge disposal strategy will be provided to AENV 12 months before start-up.
- TOTAL will implement design measures to protect soil and groundwater quality, including
 - construction of permanent stormwater ponds lined with an impervious liner early in construction to handle runoff
 - concrete pads/paving for all process units, sulphur/coke/chemical storage and handling facilities
 - closed-circuit runoff sewers in process area
 - leak detection and collection system and secondary containment for storage tanks in accordance with *ERCB Directive 055*
 - above-ground process lines to facilitate inspection and maintenance

- perimeter ditches will be constructed around the project development area (PDA) to prevent outside surface water from flowing into the PDA and to convey it to downstream watercourses.
- If TOTAL were to change the design of the upgrader in a significant manner, the changes would be discussed with the ERCB.

Construction

- During construction, any cleared vegetation will be mulched rather than burned to reduce smoke emissions.
- To ensure proper salvage and compliance with regulatory requirements, a qualified environmental monitor (i.e., soil scientist) will be present during soil salvage operations to provide direction to the construction supervisor.
- Topsoil will be salvaged and stored in a way that will reduce potential soil loss and degradation through erosion, compaction, rutting, and loss of viable plant material and will reduce admixing with subsoil.
- TOTAL will salvage and stockpile all merchantable timber, then determine appropriate means of disposal in consultation with AENV. Non-merchantable timber (i.e., slash) will be chipped and used as mulch for erosion control, where appropriate. The remainder will be incorporated with salvaged peat–mineral cover soil. TOTAL proposes to chip or shred all woody debris and incorporate it in the topsoil to enhance decomposition.
- Salvaged peat will be used as an enhancement to salvaged subsoil.
- TOTAL will recontour the site to ensure that a stable, self-sustaining surface drainage network is in place and will ensure that in cut-and-fill areas, no slopes are greater than 3:1.
- TOTAL plans to stockpile all salvaged soils on TOTAL lands. TOTAL has allocated sufficient space to stockpile the salvaged topsoil resources along the southern and eastern side of the site to provide a visual barrier from the adjacent highway.
- Salvaged topsoil will be seeded to ensure long-term stability of the piles and reduce possible losses in quality. Excavated subsoil and grade spoil will also be seeded to prevent redistribution of this material through erosion. The seed will be double-sampled for weed analysis and sourced in Alberta to avoid possible introduction of nuisance or noxious weeds.
- A weed management program will be developed to ensure regulatory compliance. As required under Alberta's *Weed Control Act*, species defined as restricted or noxious in the *Weed Regulation (A/R 171/2001)* will be removed or controlled throughout all project phases. Weed management will begin once site preparation starts and continue throughout project operations until a reclamation certification has been obtained.
- TOTAL will compensate for loss of any identified rare plants through transplanting, collection of seeds, or other means as approved by AENV.

- Where practical, noisy construction activity will be restricted to daytime hours of 07:00 to 20:00 on weekdays and 09:00 to 20:00 on weekends to limit noise effects on nearby residents.
- An application under the Groundwater Evaluation Guideline will be submitted to AENV six months before cut-and-fill activities.
- Groundwater from dewatering activities will be conveyed to a temporary on-site holding pond or the stormwater management pond. The groundwater will be tested for compliance with *EPEA* discharge standards before release to the NSR.
- At the time of construction, when dewatering plans have been finalized and are ready to be implemented, TOTAL will consult with its neighbours, notably Shell Canada, to identify the potential for overlapping dewatering programs, possible cumulative effects on the water table, and mitigation measures, if required.
- Construction activities, particularly site clearing, will be planned to avoid critical nesting period for birds. If construction needs to be started during the breeding season, nest searches will be completed by qualified experts to ensure construction activities do not disturb breeding birds. If an active nest is found, an appropriate buffer will be maintained around the nest until the nest is no longer used.
- TOTAL does not plan to have a worker lodge. If circumstances change (i.e., a worker lodge is planned), TOTAL will advise the ERCB, AENV, Strathcona County, and local residents.
- TOTAL will continue to cooperate with Strathcona County to address the recommendations contained in the *Transportation Study*.
- TOTAL plans to develop cooperation protocols with the following local and regional service providers during upgrader construction and operations:
 - Strathcona County Emergency Services (Heartland Hall) regarding emergency response
 - Alberta Health Services (Strathcona Health Centre and Fort Saskatchewan Health Centre) regarding notification and coordination of patient transfers in the case of industrial injuries
 - RCMP regarding traffic issues

Operations

- A site-specific emergency response plan (ERP) will be prepared and submitted to the ERCB six months before operations. This would include procedures for spill response and follow-up.
- TOTAL will undertake a full-scale ERP exercise involving local stakeholders prior to start-up.
- TOTAL will prepare a flare management plan and flare management procedures that comply with the spirit of ERCB *Directive 060* and draw on the extensive experience of TOTAL's

worldwide operations. The flare management plan will be provided to AENV no later than 12 months before start-up.

- An odour reporting protocol will be provided to AENV six months before start-up.
- An LDAR strategy, compliant with the CCME *Environmental Code of Practice for Measurement and Control of Fugitive VOC Emissions* will be provided to AENV six months before start-up.
- TOTAL will implement appropriate dust management procedures, according to industry best practices. The access route to the TOTAL site will be paved to reduce particulate matter (PM) emissions.
- Chemicals will be handled according to TOTAL's environmental management system and chemical handling procedures. Chemicals will be stored according to the recommended best practices of the chemical manufacturers, adhering to regulations and specific Material Safety Data Sheet (MSDS) requirements.
- A post-commissioning noise baseline survey will be undertaken.

Monitoring and Management

- The thermal oxidizer stack will be equipped with a continuous emissions monitoring system (CEMS) to continuously measure key stack parameters (including SO₂). The monitoring will be undertaken in accordance with the Alberta CEMS' procedures.
- All heater and boiler stacks exceeding 105 gigajoule per hour (GJ/h) will be equipped with continuous stack emissions monitoring systems to continuously measure key stack parameters (including NO_x). The monitoring will be undertaken in accordance with CCME Guideline PN 1286.
- Manual stack surveys will be done in accordance with the Alberta Stack Sampling Code.
- TOTAL will measure trace VOC and polycyclic aromatic hydrocarbon (PAH) emissions periodically, which will also be used to support the NPRI reporting needs. NPRI and the GHG reporting requirements will be met by a combination of monitoring or direct measurements, mass balance, process specific emission factors, or engineering estimates.
- H₂S content will be monitored by the use of a real-time, online analyzer on the plant's fuel gas system.
- TOTAL, with Alberta Infrastructure and Transportation, will evaluate the need for installation of appropriate signs along roadways affected by cooling tower induced fogging.
- TOTAL will continue to be a member of the Fort Air Partnership (FAP) and support the regional ambient air monitoring program to ensure that appropriate issues are addressed and that the network is fit for purpose.
- TOTAL commits to provide feedback to FAP on any deficiencies with respect to FAP as identified by residents of the Alberta Industrial Heartland.

- TOTAL will support regional initiatives by the appropriate government bodies, such as Alberta Health and Wellness, to monitor and study the health of the residents of the area.
- A groundwater monitoring and management program will be implemented that meets *EPEA* approval conditions. The detailed groundwater management program will be formalized in consultation with AENV and will include appropriate numbers of piezometers and/or monitoring wells relative to proposed facility locations and aquifer elevation.
- The groundwater monitoring program will provide early detection of changes in groundwater conditions. TOTAL will develop and implement an incident-specific groundwater response plan if changes in groundwater quality are detected.
- TOTAL will continue to participate in the NCIA Regional Groundwater Quality Program.
- Measures will be undertaken to control clubroot and other restricted/noxious weeds, outlined in TOTAL's weed management plan, which will comply with the Alberta Clubroot Management Plan. TOTAL will have discussions with Strathcona County regarding clubroot testing and control and plans to work with Alberta Agriculture and Rural Development to detect if clubroot is present.
- Through its membership in the NCIA and FAP, TOTAL will continue to participate in the Beaverhill Vegetation Study and any other related regional monitoring programs to further evaluate effects of air emissions on sensitive species.
- TOTAL will compensate for wetland loss based on the completed provincial wetland policy. TOTAL plans on developing a wetland compensation plan for the upgrader, in consultation with, and approved by, AENV.

Stakeholder Engagement

- TOTAL will consult residents in the emergency planning zone (EPZ) on the draft site-specific ERP, including proposed response arrangements, 12 months before start-up.
- TOTAL will ensure an effective emergency notification system is established to notify residents in the EPZ in the event of an emergency; this will be developed in consultation with residents within the EPZ.
- TOTAL will commit to including in the EPZ those individuals who (i) during an emergency, may be put in a compromising health-related or emergency-related position, and (ii) who would otherwise be excluded because they are located just outside the zone.
- TOTAL will provide prior notification to residents in the EPZ regarding any significant planned maintenance activities.
- TOTAL will continue to participate in municipal transportation planning initiatives and will support the implementation of the Capital Region 10-year transportation plan, which includes key infrastructure upgrades for the area.

- TOTAL will discuss with the NCIA the funding of community advisory panels for review of the Regional Noise Management Plan.
- TOTAL will have an odour-response protocol to address feedback from nearby residents or from other reported off-site odours.
- If a noise complaint is received, TOTAL will conduct a local survey to determine if the upgrader is the cause. If TOTAL identifies the upgrader facilities as the cause, TOTAL will determine mitigation measures and, where feasible, implement them to reduce the noise.
- TOTAL will make available annual environmental performance data for the upgrader to stakeholders and residents.
- TOTAL will continue to participate in the joint industry community engagement committee to work collaboratively to address residents' concerns.
- TOTAL will continue its membership on the NCIA, including the Board of Directors, and participate in regional initiatives.
- TOTAL will continue to be a member of Alberta's Industrial Heartland Land Trust Society to support the Voluntary Residential Property Purchase Program (VRPPP).

**APPENDIX 2 MEMBERSHIP OF THE CITIZENS FOR RESPONSIBLE
DEVELOPMENT (MAY 11, 2010)**

Armstrong, Bryan, Irene Hope, and Faith
Acton, Jim (Boysdale Camp Foundation)
Berg, Karen and Ron
Brown, Mike and Anne
Callaghan, Patricia
Collier, Barb and Stephen
Cooreman and Tully, Craig and Sarah
D'Aoust, Sharon
Dowle, Stella and Daniel
Drabble, Florence and Rex
Dzurney, Axel
Ebbers, Ron and Marlene
Fairweather, Rob and Wendy
Groot, Wayne and Luzmaria
Groot, Don and Pat
Groot, William and Bertha
Kiriak, Russ and Stella
Lusk, Susan and Warren
Meijer, Roelof and Marianne
Nolan, Sharon and Peter
Pratt, John and Lorraine
Prins, Toula and Reg
Prins, Harvey
Radke, Kathryn
Sudayko, Joan and Mike
Swiderski, Rob and Sophie
Visser, Mike
Visser, Annette and Gordon
Visser, Bonnie and Dave

APPENDIX 3 HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in report)

Witnesses

TOTAL E&P Canada Ltd. (TOTAL)

M. Ignasiak
K. Slipp
S. R. Miller

W. Brown
M. Davies, of
Stantec
L. Halsey, P.Geol., of
Stantec Inc.
G. Hegmann, P.Eng., of
Stantec
G. M. Houston, P.Eng.
M. Ingen-Housz, of
Nichols Applied Management
B. Koppe, P.Biol., of
Intrinsic Environmental Sciences Inc.
J. Kupper, Ph.D., of
Worley Parsons Canada Limited
E. Obasi, of
Stantec Consulting Ltd.
N. Schmidt, Ph.D., P.Eng., of
Golder Associates Ltd.
S. Sulis, P.Eng., of
RWDI Air Inc.
M. Treier
L. Wall

Citizens for Responsible Development (CFRD)

W. L. McElhanney
E. T. Chipiuk

Dr. S. Batterman, Ph.D., of
University of Michigan
J. R. Benya, of
Benya Lighting Design
R. J. Clissold, of
Hydrogeological Consultants Ltd.
R. Dixon, P.Eng., of
Commhealth
Dr. M. R. Edelstein, Ph.D., of
Ramapo College of New Jersey
J. Farquharson, of
FDI Acoustics Inc.
V. Goodwin, of
V.M. Goodwin Research and Consulting
Ltd.
Dr. K. McDonald, Ph.D., of
Concordia University College
K. Berg
A. Brown

Principals and Representatives
(Abbreviations used in report)

Witnesses

Harvey Visscher and Elaine Visscher and
Henryk Farms Ltd. (Visschers)
K. Wilson

J. White, P.Biol., of
Aquality Environmental Consulting
H. Visscher

Alexander First Nation (AFN)
E. Paul

City of Fort Saskatchewan
J. Sheasgreen

North West Upgrading (North West)
D. Bertsch, P.Eng.

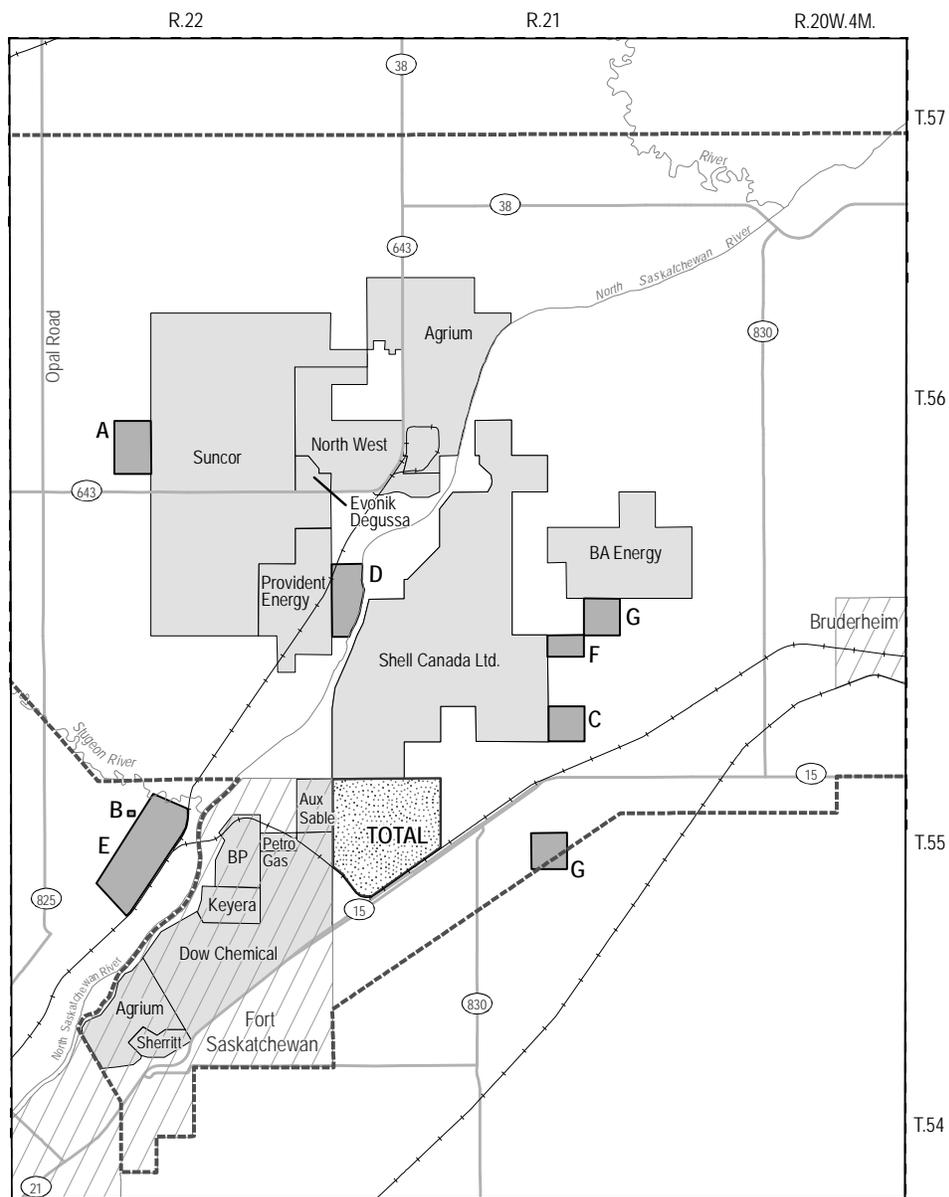
Shell Canada Ltd. (Shell)
D. Kolenick

Energy Resources Conservation Board staff
T. Grimoldby, Board Counsel
D. Burns, Board Counsel
B. Germain, P.Eng.
E. Rahn
D. Stein
D. Barter

APPENDIX 4 RECOMMENDATIONS

This section is provided for the convenience of readers. In the event of any difference between the recommendations in this section and those in the main body of the decision, the wording in the main body of the decision shall prevail.

- The Board notes the source receptor analysis approach put forward by the CFRD. The Board believes that AENV and the FAP are the appropriate organizations mandated to deal with air quality management plans in the AIH. Therefore, the Board recommends that AENV and the FAP consider this approach and, if appropriate, make any provisions in future monitoring plans to address the CFRD's concerns.
- The Board acknowledges Dr. McDonald's suggestions for increasing the level of scientific input through academic involvement and recommends that AENV explore this possibility to strengthen public confidence in the FAP.
- The Board believes that the appropriate and timely flagging of data serves an important purpose and therefore recommends to AENV and CASA to explore ways that more clearly articulate the limitations of the CASA data to users, regardless of data retrieval method used (i.e., graphs or tables).
- While it recognizes the serious difficulty in having people participate in health studies, the Board recommends that AHS strive to obtain better representation of the regional population in future studies.
- The Board notes that TOTAL has committed to employing technology that would reduce its discharge of phenols to the river to meet CCME water quality guidelines. The Board recommends that AENV consider including this as a condition of TOTAL's *EPEA* approval.



Legend

- | | | |
|------------------------------------|-------------------------|---|
| — River | City/Town | Landowner/intervener residence |
| —+— Railroad | Proposed TOTAL upgrader | A - Groot |
| — Road | Industry | B - Brown |
| - - - Alberta Industrial Heartland | | C - Radke |
| | | D - Visscher |
| | | E - Visser (Norbest Farms Ltd.) |
| | | F - D'Aoust |
| | | G - Berg |
| | | *Interveners not shown on map:
Collier (NW.8.56.23.w4) |

Figure 1. Project area