Newfoundland and Labrador Refinery Project

Response to Comments on Component Study

AIR QUALITY COMPONENT STUDY ADDENDUM

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Newfoundland And Labrador Refinery Project EIS
Air Quality Component Study
Response to Comments

HUMAN RESOURCES LABOUR & EMPLOYMENT

On page 1, second sentence of first paragraph, the sentence should read " . . . high turbulent winds, which are not **conducive** to local . . ." The sentence currently states "conductive."

NLRC Response:

On page 1 of the Air Quality Component Study, please replace the second sentence of the first paragraph with the following text, to read as follows:

"The Placentia Bay region has high turbulent winds, which are not conducive to local high accumulation of air pollutants for extended periods."

Under Appendix A, Table III, the first sentence following the table should read "Emission estimates from these process units . . ." There is currently an "of" in front of the "from."

NLRC Response:

In Appendix A, Section 1.1.2 of the Air Quality Component Study, please replace the first statement under Table III with the following text, to read as follows:

"Emission estimates from these process units (Table IV) were made for…"

WILDLIFE DIVISION

The baseline information provided in the study appears adequate. Information from the literature outlining the effect of emissions on lichens should be presented in order for the reader to better understand the potential for the refinery to impact local and distant lichen populations with specific reference to *Erioderma pedicellatum*. The conclusion section should include a brief summary with respect to the potential impacts of air emissions on *E. pedicellatum* as well.

NLRC Response:

The following text relating to the effects of air emissions on lichens as an addition to the Air Quality Component Study should be inserted after the second paragraph in Section 4, Air Quality Monitoring and Follow-Up.

"Some lichen species are known as bio-indicators, meaning they convey information about their surrounding environment through reliable analytical methods. In particular, lichens can serve as an indicator of air quality, because they are capable of metabolizing certain components present in the atmosphere.

Lichens rely on airborne nutrients and water for sustenance. Because lichens lack protective structures such as cuticles found in vascular plants, any substance that comes in contact with their thalli that is capable of being metabolized is taken up by the lichen. Lichens do not discriminate between sources of airborne materials, which can be biogenic, geogenic or anthropogenic in origin.

Of interest in this case is the capability of lichens to uptake inorganic sulphur, such as SO_2, which is subsequently converted to organic sulphur (S). Lichens can do the same with nitrogen, converting NO_X to N. Both SO_2 and NO_x are common emissions from oil refineries and lichen in an area affected by emissions would be expected to convert a higher level of SO_2 or NO_x into metabolized product than in areas not affected by these emissions. Researchers can determine the isotopic composition of lichens to gather evidence relating to types and sources of atmospheric components. With the assistance of Memorial University's Department of Earth Sciences, NLRC has determined current levels of isotopes and trace elements in lichens collected in the project area.

*The Boreal felt lichen (*Erioderma pedicellatum*) is considered to be an indicator species. Erioderma has also been designated as a species of concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and as vulnerable by the Newfoundland and Labrador* Endangered Species Act*. This species is sensitive to SO_2 and has been found in the general project area for the proposed new refinery (NLRC surveys in June and October, 2007). There is concern that air emissions will negatively affect* E. pedicellatum *in the immediate project area and/or more distant locations if sufficient levels of SO_2 uptake occur.*

Monitoring of lichens is an important component of environmental effects monitoring when there is potential for effects on air quality. NLRC has committed to actions addressing both the project area itself and a wider geographic area.

NLRC will develop and implement an E. pedicellatum *Conservation and Protection Plan in the project area, which includes conducting additional surveys (ongoing in October 2007) in the potentially affected area; developing and implementing a transplant program at site to move those Erioderma most likely to suffer negative effects; continuing to refine the project design and the air emission modeling to achieve a smaller potential area of effect; and developing and implementing a lichen monitoring plan to assess the accuracy of predictions in the EIS. In addition to project area work, NLRC has committed to participating in CWS-led consultation on the development of an Erioderma management plan for the province and has initiated preliminary discussion regarding a joint lichen monitoring program with both Terra Nova National Park staff and the Department of Environment and Conservation's Parks and Natural Areas Division."*

NATURAL RESOURCES

In general this is a good study and the study proponent has taken a conservative approach erring on the side of safety with the assumptions made in the study. However given that the project is still in the conceptual stage of development and many of the air quality model inputs are based on assumptions with respect to the actual design and operations of the refinery, as the project develops and more concrete project details emerge, the model should be updated to verify that these assumptions hold true. This would provide a more accurate comprehensive assessment of actual air quality issues associated with the project.

NLRC Response:

As previously stated, this is a preliminary air quality assessment report, the intent of which was to provide conservative air quality emissions data at the project site and local communities to ensure that emissions will meet the requirements of the Provincial Regulations for Air Quality for the refinery as a whole and could be used to assess the impacts on Health and the Environment. The analysis was done this way to give conservative results for the assessment with the knowledge that the final plant configuration will provide much better results.

The component study provides a preliminary model for the purpose of the Environmental Assessment and is based on preliminary Engineering definition of the project as noted. As the engineering and construction advances, more detailed engineering will permit the refinement of the model, which will enable the air dispersion modeling scenarios to become more accurate. It is the intent of NLRC to rerun the air dispersion models several times during detailed design and construction to get an accurate prediction of local air quality based on the types of fuels to be used and the vendor information for the equipment supplied. The results of this air quality modeling will be made available and monitoring stations that will be installed will confirm as-built conditions for air quality after the plant reaches steady state operations.

1. An example of a key assumption made that should be further defined is the actual fuels to be used in refinery operations. Once these fuels are more accurately defined, this data should be inputted into the model to verify that the initial assessment of refinery emissions is accurate (Sections 2.6, 2.6.1, 2.6.2, pages 13,14, 15).

   NLRC Response:

   See response above.

2. Another key assumption is that the study uses a generic engineering design with equipment specifications for a typical refinery like the one proposed as opposed to using the actual design and equipment that will be used once the refinery is built. As the project proceeds and these engineering details are identified then actual equipment vendor specifications should be used to develop a more accurate picture of emissions estimates (Sections 2.6, 2.6.1, 2.6.2, pages 13,14, 15).

NLRC Response:

See response above.

3. The study focuses primarily on the criteria air contaminants such as NO_X, SO_X, CO and particulate matter (PM), but should also give consideration to heavy metals (in particular nickel and vanadium), NH_3, H_2S, VOCs, dioxins and furans as well as any other relevant potential air pollutants. More knowledge of the fuels and equipment to be used may be required before these additional contaminant levels can accurately be assessed. (Section 1, page 1, 6th paragraph)

NLRC Response:

As previously stated, this is a preliminary air quality assessment report, the intent of which was to provide conservative air quality emissions data at the project site and local communities to ensure that emissions will meet the requirements of the Provincial Guidelines for Air Quality for the refinery as a whole and could be used to assess the impacts on Health and the Environment. As recognized in the above comment, more knowledge of the fuels and equipment to be used is required before a complete list of contaminants and contaminant levels can accurately be assessed. However, the criteria air contaminants modeled provide the information needed for environmental assessment purposes.

Air quality assessment studies performed in the past by SNC-Lavalin Environment Limited have shown that, typically, BTEX (benzene, toluene, ethylbenzene, and xylene) and in some occasions, 1.3-butadiene are the main chemical substances of interest for a refinery. For the air dispersion study, the assessment focused on benzene because it is by far the main substance that constitutes a health issue (i.e. of all the toxic substances produced by a refinery there are normally higher quantities of benzene emitted and it also has a very low allowable concentration criteria in the local air shed). Based on this comparative analysis, health issues with other toxic substances are not anticipated. However, to address possible concerns, the project will address other toxic substances emissions in the detailed engineering phase and communicate the results to the stakeholders.

4. The air dispersion model is largely based on meteorological data obtained from NARL for a single year (2002) period. Further study should be performed using meteorological data from multiple years to confirm that an accurate representation of true meteorological data is captured and that there is no anomaly associated with one particular year (Section 2.1.3, page 6, 2nd paragraph).

NLRC Response:

As previously stated, this is a preliminary air quality assessment report, the intent of which was to provide conservative air quality emissions data at the project site and local communities to ensure that emissions will meet the requirements of the Provincial Guidelines for Air Quality for the refinery as a whole and could be used to assess the impacts on Health and the Environment. NLRC will use multiple

years of meteorological data in the modeling that will be conducted during detailed design and before the plant goes into operation.

5. Only one "near site" meteorological station (NARL Refinery) is being used to collect meteorological data for the study. To give more confidence in the study results it may be necessary to locate other "near site" stations in the communities surrounding the refinery in order to more accurately model meteorological and air quality data and verify that there are no meteorological anomalies that the model is not picking up. (Section 2.1.3, page 5 - 2nd paragraph and page 6 -Table 2)

NLRC Response:

NLRC made extensive efforts to obtain the best available meteorological data for the air dispersion study. NLRC was able to obtain meteorological data for a number of years from the NARL site that given the proximity to the project site and the lay of the land in the area was considered to be "site specific data". Unfortunately due to construction at the NARL site the data was interrupted and only one complete year (2002) was available. Year 2003 has some small issues with record date and time stamps. Year 2004 has several missing records that compromise the confidence in the data. Years 2005 and 2006 have a long missing period because of the meteorological station relocation.

For the purposes of the component study the one complete year from the NARL site meets the requirements for site-specific data in accordance with the Guidance Document.

For final air quality modeling scenarios, meteorological data over several years collected from the project site will be used.

POLLUTION PREVENTION DIVISION

1. The Report and associated dispersion modeling specify that several of the refinery fired heaters and boilers will combust heavy fuel oil containing a maximum of 0.7% sulphur, without employing significant emissions control equipment at these sources. Pursuant to section 6 of the *Air Pollution Control Regulations, 2004*, each of these sources must employ best available control technology (BACT). The Department does not consider heavy fuel oil to meet the requirements of BACT.

   In recent correspondence, the Consultant for the project has indicated to this Division that BACT will be applied at each source within the refinery, so as to satisfy the requirements of the *Air Pollution Control Regulations, 2004.* **This commitment should be included by the proponent in the EIS**. With a commitment to apply BACT to each of the refinery units combusting heavy fuel oil, the total emissions of criteria air contaminants should be significantly reduced, and ambient air quality should be significantly improved beyond that indicated in the Report.

   NLRC Response:

   "Emissions from the proposed NLRC refinery will meet the requirements of the Provincial Guidelines for Air Quality, satisfying the Air Pollution Control Regulations, 2004*. The preliminary model and assessment provided conservative air quality emissions information for the environmental assessment. The next phase of the project will look at each source within the plant and apply BACT either to the fuel source, burner technology or post-combustion control technology. NLRC is committed to assessing BACT on each point source as per the above-mentioned regulations and as described below in an excerpt from the Air Pollution Control Regulations regarding Best Available Control Technology:*

   6. (1) An owner or operator who installs a new or modified emission source shall employ the best available control technology.

   (4) Best available control technology shall be acceptable to the department and shall, in that particular circumstance, be:

   (a) the most effective emission control device or technique;

   (b) the most stringent emission control device or technique;

   (c) proven reliable in comparable processes; and

   (d) economically feasible as determined by the minister in light of industry standards after consultation with the particular owner or operator.

2. Careful inspection of the dispersion modeling has shown that several of the model inputs will need to be revised to portray the most accurate depiction possible for the predicted impact of refinery emissions on ambient air quality. If such revised modeling were to be performed at this time, it is possible that predicted ground level concentrations of contaminants could increase in certain areas. However, given the conservative nature of certain model inputs and a commitment to install BACT on sources combusting heavy fuel oil, **it is the opinion of this Division that the modeling performed is sufficient for environmental assessment purposes.** Additional revised modeling will be required during the Approval stage for the facility.

NLRC Response:

NLRC is committed to providing additional modeling as required.

3. There was no dispersion modelling undertaken for the construction phase of the project. The project Consultant has recently indicated that modeling of the construction phase was not undertaken because the details of project execution are not well enough defined at this point, and that the proponent is committed to conducting construction phase emissions modeling when the construction plans are defined. **This commitment should be included by the proponent in the Report**.

NLRC Response:

Modeling of the construction phase was not undertaken because the details of project execution are not well enough defined at this point. The schedule of the construction contracts will determine the amounts and types of equipment on site at any one time and depending on the schedule there may be higher concentrations of equipment at some times.

NLRC is committed to conducting construction phase emissions modeling when the construction plans are defined. Past experience has shown that construction emissions are not normally significant and with the isolation of the site from the existing communities we do not anticipate an exceedance of air quality standards during the construction phase.

4. The estimation of emissions from the process units using refinery fuel gas (Table IV, Appendix A) are based on an assumed higher heating value of 1020 Btu/scf. These emissions need to be corrected based on the assumed heating value of the refinery fuel gas (1265 Btu/scf). While this has resulted in the emission estimates for various sources being underestimated, this Division does not feel that the degree of underestimation is significant for environmental assessment purposes. **A revised table showing the heating value corrected emission estimates should be included in the Report.**

NLRC Response:

Process engineering, including the development of heat and mass balances, is still under development. This includes the composition of the refinery fuel systems. The current estimate of the heating value of the refinery fuel gas is approximately 1265 BTU/scf.

In the table below, the emission factors from AP42 for Natural Gas Combustion were multiplied by the corrected factor 1.24 = 1265/1020 (heating value of RFG 1265 Btu/scf and heating value of natural gas 1020 Btu/scf). This correction induces an increase in estimated annual emission of mostly of CO (18%). The increase for PM is about 3-4%, the increment for SO2 is negligible. Since NO_X emission estimates were based on maximum regulations emissions (g/GJ), this correction has no effect on estimated NO_X emissions.

Table IV (Revised): Estimation of Emissions From These Process Units (T/Year).

Item No.	Unit	SO_2	NO_x	CO	PM	PM_{10}	$PM_{2.5}$	NMTOC	VOC	Benzene	CO_2eq
1	Hydro cracker	1.5	42	37	3.3	3.3	3.3		2.4	9.2E-04	52754
2	Hydro cracker	478	133	22	48	43	30	1.2		9.3E-04	108899
3	Hydro cracker	1.5	42	37	3.3	3.3	3.3		2.4	9.2E-04	52754
4	Hydro cracker	478	133	22	48	42.6	30.0	1.2		9.3E-04	108899
5	Diesel HTU	0.79	14.3	19	1.8	1.8	1.8		1.3	4.8E-04	27757
6	Kero HTU	0.36	6.5	9	0.80	0.8	0.8		0.58	2.2E-04	12606
7	Kero HTU	1.26	23	31	2.8	2.8	2.8		2.0	7.7E-04	44233
8	Naphtha HTU	0.76	13.7	19	1.7	1.7	1.7		1.2	4.6E-04	26614
9	Naphtha HTU	1.4	38	34	3.1	3.1	3.1		2.2	8.4E-04	48277
10	Naphtha HTU	2.6	73	64	5.8	5.8	5.8		4.2	1.6E-03	91871
11	Coker Naphtha HTU	0.46	8.3	11	1.03	1.0	1.0		0.74	2.8E-04	16250
12	ADU	1611	449	73	163	144	101	4.1		3.1E-03	367252
13	VDU	3.9	107	95	8.6	8.6	8.6		6.2	2.4E-03	135444
14	Utility	1694	472	77	172	151	106	4.3		3.3E-03	386142
15	Utility	858	239	39	87	76	54	2.2		1.7E-03	195544
16	Utility										
17	H2 Plant	3.6	99	88	7.9	7.9	7.9		5.7	2.2E-03	754638
18	H2 Plant	3.6	99	88	7.9	7.9	7.9		5.7	2.2E-03	754638
19	CCR	7.7	213	188	17	17	17		12	4.7E-03	269031
20	CCR										
21	Incinerator	94									82401
22	Delayed Coker	2.3	64	57	5.1	5.1	5.1		3.7	1.4E-03	81019
23	Delayed Coker	2.3	64	57	5.1	5.1	5.1		3.7	1.4E-03	81019
24	Delayed Coker	2.3	64	56.6	5.1	5.1	5.1		3.7	1.4E-03	81019
25	Acid Gas Flare Stack										
26	High Pressure Flare Stack										
27	Low Pressure Flare Stack										
	Total	**5248**	**2394**	**1121**	**600**	**537**	**402**	**13**	**58**	**3.2E-02**	**3779058**

1. In Table 6 of the Report, the diameters for stacks GRP1 and GRP3 should be reversed to accurately depict the preliminarily proposed diameters on which the dispersion modelling is based.

   NLRC Response:

   In table 6 of the report, diameters for stacks GRP1 and GRP3 should be reversed.

2. It is our understanding that the BenSat Product tank listed in Tables 1 and 2 of the Report is no longer part of the proposed refinery's layout. **This should be noted in the Report**. The removal of the Bensat tank from the project footprint will result in a slight lowering of the estimated annual VOC emissions from the proposed facility.

NLRC Response:

Several layouts were prepared during the preliminary engineering phase. The BenSat tank appeared on some of the earlier layouts but has since been deleted. It is absent on the final layout selected for air dispersion modeling, but was still included in the estimation of annual emissions of VOCs therefore we have conservative results.

This is a function of the level of Engineering carried out to date. The layout is still at the concept phase and while the major components of the project have been defined there will still be some design changes in the layout as the design and construction of the project progresses through the project phases.

3. There is some inconsistency between Table 6 and Table III (Appendix A) of the report, as pertaining to the stacks to which various heaters report to. The number of utility steam boilers listed in Table 6 (three) also appears to be erroneous. **These tables should be revised to accurately depict the plant configuration upon which the Report is based.**

NLRC Response:

In Table III of Appendix A, "Stack number" should be replaced by "item number". For clarity see revised Table III below.

Table III (Revised): Input Data For Emissions Rate Calculation From The Stacks.

Item No.	Unit	Service	Qty of Fired Heaters	Stack No.	Heat Absorbed (MMBTU/hr)	Total Heat Fired (MMBTU/hr)	% Eff.	Fuel Type
1	Hydro cracker	Recycle Gas Htr Unit 1	1	STCK1	101	113	90%	Gas
2	Hydro cracker	Product Frac Fd Htr Unit 1	1	STCK2	144	160	90%	Oil
3	Hydro cracker	Recycle Gas Htr Unit 2	1	STCK3	101	113	90%	Gas
4	Hydro cracker	Product Frac Fd Htr Unit 2	1	STCK4	144	160	90%	Oil
5	Diesel HTU	Combined Feed Htr	1	STCK5	53	59	90%	Gas
6	Kero HTU	Rx Charge Htr	1	STCK6	24	27	90%	Gas
7	Kero HTU	Stripper Reboiler	1	STCK7	85	95	90%	Gas
8	Naphtha HTU	Charge Htr	1	STCK8	51	57	90%	Gas
9	Naphtha HTU	Stripper Reboiler	1	STCK9	93	103	90%	Gas
10	Naphtha HTU	Splitter Reboiler	2	STCK10	177	196	90%	Gas
11	Coker Naphtha HTU	Rx 2 Charge Htr	1	STCK11	29	35	83%	Gas
12	ADU	Crude Heater	3	GRP3	453	539	84%	Oil
13	VDU	Vac Heater	2	GRP3	243	290	84%	Gas
14	Utility	650# Steam Boiler	2	GRP2	476	567	84%	Oil
15	Utility	150# Steam Boiler	2	GRP2	241	287	84%	Oil
17	H2 Plant	Reformer	1	STCK17	225	268	84%	Gas
18	H2 Plant	Reformer	1	STCK18	225	268	84%	Gas
19	CCR CCR	Charge Htr, Htr 1, Htr 2, Htr 3 Vent Stack	4 -	STCK19 STCK20	523 -	575 -	91% -	Gas -
21	TGT/TO	Incinerator			-	-	-	

Item No.	Unit	Service	Qty of Fired Heaters	Stack No.	Heat Absorbed (MMBTU/hr)	Total Heat Fired (MMBTU/hr)	% Eff.	Fuel Type
22	Delayed Coker	Coker Htr 1	1	GRP1	156	173	90%	Gas
23	Delayed Coker	Coker Htr 2	1	GRP1	156	173	90%	Gas
24	Delayed Coker	Coker Htr 3	1	GRP1	156	173	90%	Gas

Total heat fired (MM Btu/hr) is per service not per stack. For example ADU has 3 heaters and the total heat fired is 539 MM Btu/hr so 180 MM Btu/hr per heater.

1. As dry deposition was excluded from the dispersion modeling, a brief commentary and **graphic and/or table should be added to the Report to demonstrate that the effects of modeling without dry deposition are insignificant.**

NLRC Response:

In Section 1.1.2 (Process Unit Emissions Via Stacks) of Appendix A in the Air Quality Component Study, please add the following new text immediately following Table IV. Table IV-A and Figure 2-A should be considered as additions to the same section as well.

"Concerning dry deposition, it was understood that the concerns about dry deposition applied only for particulates. Since ambient air quality standards apply to fine particulates (PM_{10}, $PM_{2.5}$) that disperse as gases, dry deposition can be considered as not significant. This is standard procedure in most air quality assessments of industrial projects. Without including dry deposition the conservative approach was used, i.e. all material emitted remains in the atmosphere. Even with this assumption, modeling results show that maximum impacts for the proposed refinery are only a small fraction of current ambient background concentrations and air quality guidelines. Including dry deposition would not change this conclusion. Including dry deposition in the model will reduce the concentrations of air contaminants in the communities, as some material would hit the ground before it would reach the communities.

As a comparison, two CALPUFF runs were performed for the boiler stack (GRP2, fuel oil firing), which is the major source of particulate emissions with and without dry deposition. The following size distribution of particulates emission was used as input to Calpuff (Appendix A, Table IV-A). The same receptors and meteorology used in the July EIS were used in these model runs. The maximum daily and annual predictions from the modeling are shown in the Figure A-2 for both cases: with and without consideration of dry deposition of PM_{10}. Results show virtually no difference in results and the isopleths almost completely overlie each other."

Table IV-A: Size distribution of PM_{10} particulates for dry deposition modeling

AP-42 Uncontrolled Fuel-Oil combustion			**CALPUFF Input**						
				Mid Size	Filtrable part.	Condensable part.	Total	**Input Group 8**	
Size (µm)*	Cumulative %	% per class	Species	Diameter (µm)	Emission rate (g/s)	Emission rate (g/s)	Emission rate (g/s)	Geo. Mean Diameter (µm)	Geo. STD devia.
>15	100	9.0	PMG	**20**	0.640	0.000	0.640	20	0.0
15	91	5.0	PM15	12.5	0.355	0.000	0.355	12.5	0.0
10	86	9.0	PM10	8	0.640	0.000	0.640	8	0.0
6	77	21.0	PM6	4.25	1.492	0.000	1.492	4.25	0.0
2.5	56	17.0	PM2.5	1.875	1.208	0.000	1.208	1.875	0.0
1.25	39	3.0	PM1.25	1.125	0.213	0.000	0.213	1.125	0.0
1	36	6.0	PM1.0	0.8125	0.426	0.000	0.426	0.8125	0.0
=0.625	30	30.0	PMS	**0.5**	2.132	1.104	3.236	0.5	0.0
Totals		100			7.106	1.104	8.211		

* = indicated size

In bold: estimated value

PM10	7.216	g/s
PM2.5	5.084	g/s

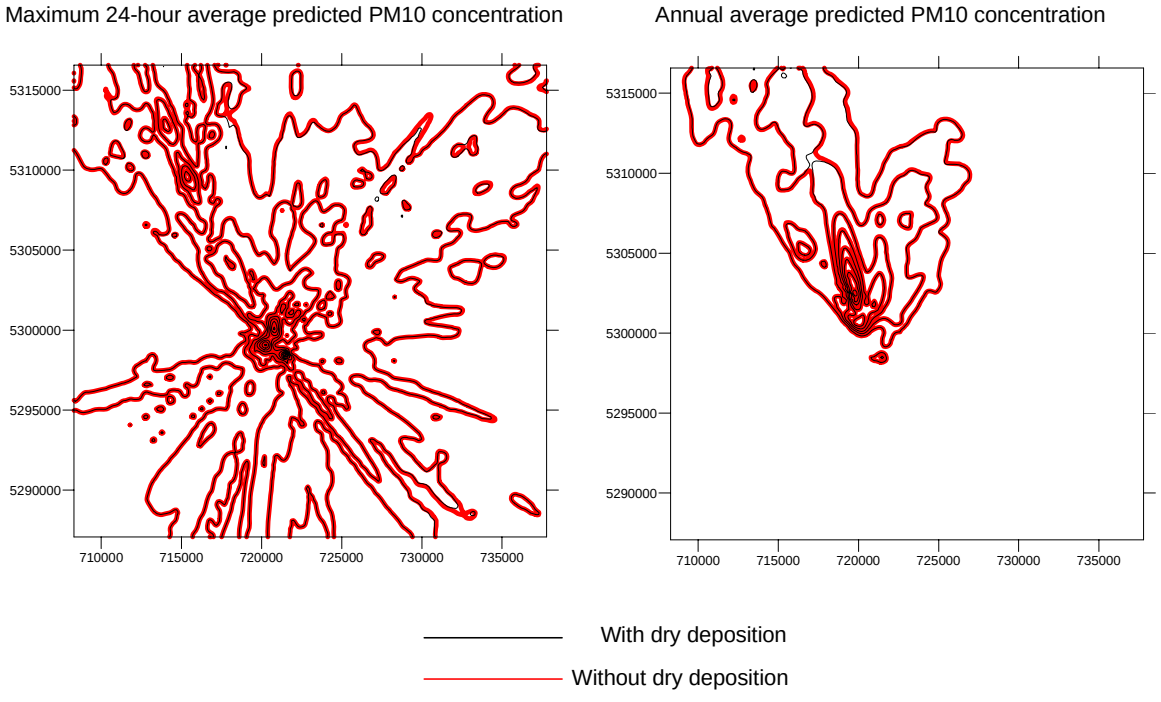

Figure 2-A: CALPUFF model results with and without dry deposition

1. The Report states that the number of bulk carriers for coke transport is 25 per year. The proponent has recently indicated that there is a typo in the number of coke carriers, and that the correct number of vessels for coke would be 37 for 50,000 DWT vessels or 30 for 60,000 DWT vessels. **This correction should be included in the Report.** The impact of these additional vessels on air emissions is not anticipated to be significant.

NLRC Response:

There is a typographical error in the number of coke carriers in Table VII: Input Parameters, Appendix A. However, the total number of ships is not affected: there will still be 400 to 450 as a total number. As well the air emissions calculations that were supplied in the component study based on these numbers is conservative. The correct number of vessels for coke would be 37 for 50,000 dwt vessels and 30 for 60,000 dwt vessels. The amended Table VII is provided below.

Revised Table VII: Input Parameters

Products	Ship type	Tonnage of Vessel (DWT)	Number of ships/year
Crude type	VLCC	319,000	39
Crude type	Suezmax	150,000	27
Gasoline	Handymax	50,000	20
Gasoline	Handymax	40,000	8
Gasoline	Handymax	30,000	11
Kerosene	Panamax	60,000	12
Kerosene	Handymax	50,000	15
Kerosene	Handymax	40,000	18
Kerosene	Handymax	30,000	25
RBOB	Handymax	50,000	17
RBOB	Handymax	40,000	16
RBOB	Handymax	30,000	22
Diesel	Panamax	80,000	45
Diesel	Handymax	50,000	48
Sulphur	Bulk Carrier	20,000	73
Coke	Bulk Carrier	50,000/60,000	37/30

HEALTH CANADA

Health Canada has reviewed the Air Quality Component Study (July 2007) of the Environmental Impact Statement (EIS) for the Newfoundland and Labrador Refinery project. Health Canada offers the following comments:

1. Health Canada noted that dispersion modeling was characterized as preliminary in this report, and that there was mention of refining some of the emissions estimates, and characterizing other emissions sources, as part of the detailed engineering phase. Health Canada relied on the results of preliminary dispersion modeling for the evaluation of the information on air quality and the associated potential for health impacts. It was also noted that the Newfoundland and Labrador ambient air quality standards that were compared to the results of the preliminary dispersion modeling are either equivalent or more stringent than the corresponding National Ambient Air Quality Objectives.

NLRC Response:

Dispersion modeling is characterized as preliminary as detailed engineering of the facility has not yet been performed. However, all values used in the air quality study are conservative. Also, it is expected that final emissions during steady state operations will be lower than indicated in the study and air quality effects will be lower than predicted.

2. In reference to the preliminary dispersion modeling, it was noted that benzene levels were predicted, however, as there are no local air quality standard for benzene, a comparison to a health-based guidance value was not conducted. Health Canada notes that there have been a number of reviews of benzene that have evaluated the carcinogenicity of benzene and developed cancer potency values that could be used as the basis for predicting the cancer risks from this substance. For example, the Tumorigenic Concentration developed during the course of the Canadian Environmental Protection Act Priority Substances List Assessment for benzene could be used to develop a unit risk, which in turn could be used in conjunction with the dispersion modeling predictions to estimate cancer risks from benzene. This should be done, either as part of this report, or as part of the "health impact assessment" referred to Section 3.2 of the EIS Air Quality Component Study.

NLRC Response:

The Quebec guidelines for benzene concentrations have been used for this preliminary dispersion modeling study. The 10 mg/m^3 limit is used on a daily basis for petrochemical facilities in that province. Benzene concentrations predicted for the NLRC project are negligible in the populated areas and even at the NLRC property limit. The concentrations are so low in fact that they would not be discernable from variability in natural background levels.

3. Health Canada noted that emission rates will be studied and defined in the detailed engineering phase such as emissions from upset and intermittent releases and from the construction phase, and refined estimates of emissions during operation of the facility. To fully evaluate the air quality implications and associated health implications of this project, Health Canada is requesting this information when it becomes available.

NLRC Response:

NLRC plans to communicate results from revised studies as the information becomes available.

4. It was noted that the list of chemicals of potential concern considered in this EIS was limited to sulphur dioxide, nitrogen dioxide, carbon monoxide, suspended particulates (PM_{10} and $PM_{2.5}$), and benzene. This list includes a number of substances that are often considered to be the principal ones of concern from an air quality perspective. However, it is a much shorter than the full list of substances that are likely to be emitted from the refinery, or that have been considered in some other environmental assessments for petroleum refineries. Health Canada recommends that the proponent include a larger number of substances that will be emitted from the proposed refinery in the evaluation of air quality and the associated potential impacts on human health.

NLRC Response:

Air quality assessment studies performed in the past by SNC-Lavalin Environment Limited have shown that, typically, BTEX (benzene, toluene, ethylbenzene, and xylene) and in some occasions, 1.3-butadiene are the main chemical substances of interest for a refinery. For the air dispersion study, assessment focused on benzene because it is by far the main substance that constitutes a health issue (i.e. of all the toxic substances produced by a refinery there are normally higher quantities of benzene emitted and it also has a very low allowable concentration criteria in the local air shed). Based on this comparative analysis we do not anticipate any health issue with other toxic substances. However, to address possible concerns, the project will address other toxic substances emissions in the detailed engineering phase and communicate the results to the stakeholders as requested in item 3.

5. The proposed refinery will be designed to process 300,000 barrels per day with potential for expansion to 600,000 barrels per day at some future date. Have cumulative effects that included emissions from the proposed expanded refinery been evaluated?

NLRC Response:

If NLRC decides to proceed with phase 2 of the project, the cumulative effects of both phases will be addressed to make sure the overall project is acceptable to the environment and human health.

6. The dispersion modeling described in Section 3.1.2 of the report predicts that maximum predicted concentrations near the property line will comprise a substantial fraction of the ambient air quality standard for sulphur dioxide and nitrogen dioxide (between 74 and 84% of the 1-hour and 24-hour standards). In Section 2.5, concerning background concentrations, it is reported that, for the project site itself, the provincial Department of Environment and Conservation estimates that the hourly and 3-hour average concentrations of sulphur dioxide may exceed the provincial air quality

standards a few times during the year, mainly because of sulphur dioxide emissions from the existing North Atlantic Refinery in Come by Chance.

Health Canada also notes that, in Table 14, the sum of the predicted maximum short-term concentrations outside of the property line from the operating refinery and the unloading ships exceeds the 1-hour and 24-hour ambient air quality standards for sulphur dioxide, and the 1-hour standard for nitrogen dioxide. Consequently, it seems possible that the cumulative maximum short-term concentrations of sulphur dioxide and nitrogen dioxide may well exceed the associated ambient air quality standards for some distance outside of the property line. This would seem to be particularly the case when the winds pass over the proposed refinery itself or the marine facilities for the proposed refinery, in line with the existing refinery at Come by Chance for sulphur dioxide, or when the winds pass over the proposed refinery in line with the proposed marine facilities for nitrogen dioxide.

It should be noted that relatively short durations of exposure to sulphur dioxide and nitrogen dioxide can cause health effects in vulnerable populations, such as asthmatics, so one would not necessarily have to be resident in the plume for extended periods of time for there to be health effects in susceptible people. Health Canada recommends the Air Quality Component Study:

- Indicate the nearest occupied properties from the site boundary lines
- Discuss the potential for non-resident sensitive receptors to be present, even for relatively short periods, in the areas that could experience the cumulative exposures in excess of the ambient air quality standards for sulphur dioxide and nitrogen dioxide outside of the property line (e.g., recreational fishermen).
- Discuss the potential for expansion of the refinery to 600,000 barrels per day.

NLRC Response:

All populated areas are located at a distance of 4 km or more from the refinery, therefore no cumulative impacts associated with the cumulative effect of the existing and new sources in the populated areas are anticipated. There is an erroneous interpretation of Table 14 where it is assumed that maximum concentrations from the refinery and ships are added. Table 14 specifically shows that these 2 sources are not additive and the simulations of both sources do not increase the result of emissions from either the refinery or the ships. Therefore, the assessment has not found any exceedances in the dispersion study for the project.

It is very important to understand that the air quality study is performing a worst-case simulation during normal operation of the refinery and the ships' loading-unloading. In practice, this is not anticipated as a problem. It is necessary to keep in mind that the simulations overestimate the reality for many reasons:

- *The maximum emissions of each of the sources (existing and proposed refinery) do not occur at the same time (i.e. are unlikely to be cumulative, and certainly not the max hour in a year);*
- *The meteorological conditions do not add all sources (existing and proposed refinery) contribution at a given receiver at the same time;*

- *Real emissions will be lower than predicted in our study (to be validated during the detailed engineering phase);*
- *The existing NARL (North Atlantic Refinery Limited) emissions diminish every year and will be significantly less in 2012 when we plan to start NLRC phase 1.*

To specifically answer Health Canada questions:

- *Potential for non-resident sensitive receivers exposure for short periods: Simulations already show ambient air pollutant concentrations related to the NLRC refinery to be below criteria (refer to above erroneous interpretation of Table 14).*
- *Emissions evaluation for a 600,000 bpd refinery has not been performed at the present time. Expansion would require a separate assessment and the cumulative impacts of existing sources (which would include NLRC phase 1) and NLRC phase 2 would be addressed at this time.*

7. It is noted that the predicted modeling information does not necessarily mean that emissions from the proposed refinery will be of concern. The dispersion modeling is reported to be conservative in a number of respects, and it is reported that emissions estimates are anticipated to be reduced during the detailed engineering phase. However, given that the proposed refinery is projected to add substantially (roughly 50% of current emissions, or more if the potential future expansion of this facility occurs) to sulphur dioxide emissions in this, an area that already experiences exceedances of the short-term ambient air quality standards for sulphur dioxide, Health Canada recommends:

- A more sophisticated dispersion modeling exercise for the operation of the refinery be incorporated at the detailed engineering phase to reflect a more realistic scenario or scenarios.
- A focus on technology and process to reduce emission of sulphur dioxide, as well as nitrogen dioxide.
- Establishment of an appropriate network of follow-up air quality monitoring stations, which the proponent has committed to do, that will complement the existing network, and will include stations in some additional communities and at the property limit. It is noted that a specific study related to the analysis of the air monitoring network will be made at the detailed engineering phase and that the air quality monitoring plan will be developed in consultation with regulators and the Community Liaison Group.

NLRC Response:

The more sophisticated modeling that Health Canada recommends is already planned to be done during the detailed engineering phase. It is important to note that the existing air emissions conditions (without the project) are improving every year because NARL is required to reduce its atmospheric emissions.

- *Source reduction of SO_2 and NO_2: This is also planned to be considered in the detailed engineering phase and also requested by NL DEC*

- *<u>Ambient air quality monitoring network</u>: The existing network (NARL has stations at Come By Chance, Sunnyside, etc.) will be complemented by NLRC stations at Goobies, North Harbour and at the property limit. The final ambient air quality-monitoring network will be designed during the detailed engineering phase in collaboration with the projects' stakeholders (Regulator and Community Liaison Group).*

8. Air pollution has health effects at low levels and is generally considered as having no threshold for effect up to and including mortality. Health Canada supports the proponent's commitment to making Continuous Improvement an integral part of their environmental programs. Canada-wide Standards for PM and Ozone, in addition to the numerical standard, also include the goals of Keeping Clean Areas Clean and Continuous Improvement (KCAC/CI). KCAC/CI are designed to prevent the use of the concept that "polluting up" to a level is acceptable and to mitigate against the deterioration of air quality.

<u>NLRC Response:</u>

NLRC commits to reduce as much as feasible its atmospheric emissions. NLRC also confirmed to Environment Canada that they would meet the Atmospheric Emissions Federal Regulatory Framework and the goal of Keeping Clean Areas Clean.