Registration Pursuant to the

Environmental Assessment Regulations 2003

under the

Environmental Protection Act

(O.C. 2003-220)

For the Proposed

L'Anse au Loup Generation Station Project

November 2014

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1.0 NAME OF UNDERTAKING

Increasing generating capacity at L'Anse au Loup Generation Station

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2.0 PROJECT RATIONALE

Newfoundland and Labrador Hydro (Hydro), a Nalcor Energy Company, is the major supplier of electrical power and energy in the Province of Newfoundland and Labrador. On the Island of Newfoundland, Hydro owns and operates hydroelectric generating plants at Bay d'Espoir (604

MW), Cat Arm (127 MW), Hinds lake (75 MW), Upper Salmon (84 MW), Granite canal (40 MW) and Paradise River (8 MW). In addition, it operates an oil fired generating station (490 MW) at Holyrood and 3 Gas Turbines (127 MW) at Hardwoods, Stephenville and Happy Valley-Goose Bay. Hydro operates 25 diesel plants (53 MW) within the province. In Labrador, Hydro is the majority owner of the Churchill Falls Hydroelectric Generating Facility (5,400 MW). Hydro maintains and operates approximately 4,000 km of transmission lines and 3,500 km of distribution lines to support its generation facilities.

The L'Anse au Loup Diesel Generating Station was constructed in 1972 and contains five (5) diesel generators and a mobile generator installed outside the plant. The service area for the station is along the Labrador Straits from L'Anse au Clair to Red Bay and includes approximately 990 customers (See Figure 1). Since 1996, Newfoundland and Labrador Hydro has purchased surplus energy from the Lac Robertson system on a secondary sales contract with Hydro Quebec. This interconnection with Hydro Quebec accounts for approximately 96% of the energy delivered into the L'Anse au Loup system. The diesel generating station is primarily operated in a stand-by capacity in the event that power is not available from Hydro Quebec as illustrated in Table 1. However, the generating station is still considered to be the firm power supply for the L'Anse au Loup System.

Table 1: L'Anse au Loup DGS: Annual Operating Hours by Generating Unit

	L'Anse au Loup DGS: Annual Operating Hours By Generating Unit								
	246	**247**	**285**	**2005**	**2012**	**2041**	**2082**	**Annual Total**	
Average	434	227	207	415	678	457	158	2,225	4.23%
2013	231	810	Out of Service	840	1,113	567	216	3,777	7.19%
2012	287	263		319	506	256	178	1,809	3.44%
2011	652	270		371	546	505	233	2,577	4.90%
2010	210	70		157	235	225	3	900	1.71%
2009	465	225		292	806	646	Not in Service	2,434	4.63%
2008	893	118		609	1,421	822		3,863	7.35%
2007	389	123		503	579	341		1,935	3.68%
2006	367	100		305	477	292		1,541	2.93%
2005	335	105	69	225	398	Not in Service		1,132	2.15%
2004	514	190	344	532	699			2,279	4.34%

Source: Environmental Services Annual Air Emission Report
Fields in Grey indicate the individual unit has exceeded 500 operating hours in a given year
Maximum operating hours in a given year is 52,560 based on 6 units running 24 hours for 365 days

The Additions to Accommodate Load Growth – Isolated Generating Stations Report (Newfoundland and Labrador Hydro, 2012) which was submitted to the Public Utilities Board in June 2012 identified that the load forecast will surpass the firm capacity at the L'Anse au Loup Diesel Generating Stations by 2013. Consequently, the generating capacity at the plant needs to be increased to meet the growing electricity needs of Hydro's customers serviced by the L'Anse au Loup generating station. This capacity is required to ensure reliable power in the event that power is not available from Hydro Quebec, due to an emergency or planned maintenance.

The justification for this project is to address the violation in the capacity planning criteria for the generating station. The criterion that will be violated is the firm generation capacity. If the firm generation capacity criterion has been violated and the demand exceeds the firm generating capacity with the largest unit unavailable, the system will suffer a power outage due to insufficient generation. Sufficient generation capacity must be available in an isolated system on a firm basis such that the peak load can be met at all times.

Currently, the installed firm capacity in L'Anse au Loup is 4,825 kW. By 2018, the forecast energy peak for the system is projected to grow to 6,007 kW. By completing the proposed generation upgrade, the L'Anse au Loup generating station will have the installed firm capacity needed to meet the forecast peak energy demands. For L'Anse au Loup, Firm Capacity = Installed Generation Capacity - HQ Contract (3,000 kW) - 1,100 kW as illustrated in Table 2.

Table 2: Firm Capacity Requirements L'Anse au Loup Generating System

Generation Source	Unit #	Existing Installed Capacity (kW)	Proposed Installed Capacity (kW)
G1 (LAL DP)	246	600	600
G2 (LAL DP)	247/2091*	600	**1,825***
G3 (LAL DP)	2041	1,000	1,000
G4 (LAL DP)	2005	800	800
G5 (LAL DP)	2012	1,100	1,100
Mobile (LAL DP)	2082	1,825	1,825
HQ Contract		3,000	3,000
Total Capacity		8,925	10,150
Firm Capacity		4,825	6,050

*Project will retire unit 247 (600 kW) and replace with unit 2091 (1,825 kW prime power)

Subsequent to the decision to upgrade the plant, and as part of the environmental assessment planning process and associated air emissions modeling, it was also determined that there is also a need to improve the air emissions profile of the plant. The diesel engine replacement, associated exhaust gas treatment, and stack height increases will be the first phase of Newfoundland and Labrador Hydro's commitment to improving air emissions. Hydro will work with government regulators to develop a long term strategy for improving air emissions, while ensuring our mandate of providing least-cost, reliable energy.

3.0 PROJECT OBJECTIVES

The primary objective is to provide safe, reliable, least cost power. The undertaking will ensure that there is sufficient generating capacity available for the in L'Anse au Loup distribution

system. Hydro intends to increase the firm capacity at the L'Anse au Loup diesel generating station by installing a new generating unit and replacing an older, smaller existing unit. Based on load forecasting, another generation expansion will be required at the site in 2019.

In addition to ensuring sufficient generating capacity, the Project will also include measures to improve the air emissions profile from the plant. These measures will include installing a low emissions engine and particulate filter, and increasing stack heights. This expanded objective is a direct result of the planning process and the determination of potential environmental effects. Activities to evaluate further facility improvements which are anticipated to validate and improve air emissions are outlined in Section 9 – Air Quality Management Plan.

4.0 PROJECT DESCRIPTION

The generation expansion at the L'Anse au Loup Diesel Generating Plant will be achieved by replacing Unit 247 (600 kW unit) diesel genset with one new 1,825 kW, diesel genset. The new genset will require a new control panel, breaker, power cables, exhaust stack, radiator and aftercooler, and all other necessary equipment to facilitate a new unit. There will be minor upgrades required to the engine hall ventilation system as well as various switchgear and plant automation modifications. A new 5,000 litre day tank will also be installed inside the plant.

With the installation of a 1,825 kW unit, the net increase in total generation will surpass 1,000 kW and therefore require an Environmental Assessment (EA) as per the provincial Environmental Protection Act (O.C. 2003-220, 34 (1)(e)). Figure 1 is a map of Labrador showing the geographical location of L'Anse au Loup.

Figure 1: Labrador System

5.0 PROJECT ALTERNATIVES

5.1 Alternatives To

The following potential alternatives that are normally considered to address the deficiencies were investigated:

1. Alternative generation sources;
2. Alternative transmission arrangements
3. Consumer Demand Management (CDM)
4. Additional Diesel Generation

As a first alternative, Hydro evaluated alternative generation sources to provide the necessary peak demand electricity. There are viability studies being completed by Hydro for potential

wind and/or hydro-electric generation sites for future construction along the Labrador coast. These options are still being evaluated and are many years from planning and construction if proven feasible. As such, alternative 1 option does not meet the required timeline for increased generation.

As a second alternative, transmission arrangements were also considered. It is not economically feasible to construct a Direct Current (DC) converter station in the region and utilize power from the Muskrat Falls project. A subsea transmission cable from the Northern Peninsula is also not a feasible option as it would still require Hydro to maintain the L'Anse au Loup Diesel generating station as a backup in the event of cable failure. The timeline for planning and construction associated with alternative transmission arrangements would also not meet the required timeline for increased capacity on the L'Anse au Loup system. For these reasons, alternative 2 was not considered a viable project option.

The third alternative, Consumer Demand Management (CDM), continues to be a component of the supply side equation for Hydro. Working through both joint utility efforts and targeting Hydro customers directly, programs have continued to expand and reach new customers with new opportunities to save. The focus to date has been on energy savings and reduction of fuel at the generation stations. Capacity and demand reductions are also achievable through CDM once the necessary planning steps have taken place. CDM programs must be economically justified and updating the marginal cost study to reflect current system realities is the first step in that process. An assessment of the current opportunities for demand savings through an updated conservation potential study is also needed. This will confirm which technologies are currently being used by customers and assist in defining the magnitude of new technology opportunities for demand reduction in existence. The utilities undertook a CDM Potential Study in 2008 and are currently updating this study in 2014 to reflect the changes in the customer market and technology developments. The 2008 study did not explore demand opportunities as capacity was not driving costs on the system. The 2014 update will address this issue but has not yet been finalized.

As previously mentioned, the current focus of CDM programs has been energy conservation as it is tied to reducing fuel use. While demand reduction programs are demonstrating successful implementation in other jurisdictions, they take time to be accepted and implemented by customers. Where successful in reducing demand, these programs are generally aided by financial programs that support retrofitting homes, and a rate structure that motivates customers to invest in and change habits. While an enhanced CDM program can be beneficial, it is not a viable option in the timeframe available to change consumer behavior and achieve savings. At this time, a CDM program that includes demand reduction in addition to energy reduction is considered a complementary program to the additions and/or changes to existing generating stations. Over time, enhanced CDM programs will serve to better manage overall system demand. However, currently what is needed is a firm increase in generation, or an equivalently firm reduction in demand to obtain both transmission and system capacity benefits.

Based on the evaluation of alternative generation, transmission arrangements and CDM, it was determined that the best solution to resolve the violation of the firm capacity criteria in L'Anse au Loup is Alternative 4 – Additional Diesel Generation. Following a facility and cost benefit analysis, it has been determined that replacing one of the existing generating units with a larger generating unit provides the best value for the project. This option, along with adding a seventh generating unit at the facility were evaluated.

A properly sized unit should minimize overall usage of all diesel units thereby reducing individual annual operating hours per diesel engine. This is because less units would be required to operate in parallel at any given time to serve the load; therefore, fewer units will be used at a time and together they accumulate fewer hours per year. Since diesel unit maintenance intervals are based on operating hours, the overall maintenance cost of the facility should be reduced accordingly.

After an evaluation of the existing units, it was determined that replacement of a 600 kW unit with an 1,825 kW, 1,800 RPM, 4,160 V genset is the best alternative. The general scope of this alternative would be to replace Unit 247 (600 kW) with a 1,825 kW diesel genset. This solution would require the least amount of work for the duration of the project. This increase in firm capacity would support the forecasted load of the L'Anse au Loup system up to the year 2019. At this point a 1,600 kW unit would be installed to replace Unit 246 (600 kW) to support the system load up to 2033.

5.2 Alternatives Means

Based on the selection of adding additional diesel generation at the site as the preferred alternative, an analysis was completed to assess the alternative means of carrying out this option based on project schedule and economic feasibility.

This analysis included consideration of the requirements under the Air Pollution Control Act which state:

"(1) An owner or operator who installs a new or modified emission source shall employ the best available control technology.
(2) Notwithstanding subsection (1), an owner or operator may install a new or modified emission source which does not comply with that subsection with the written approval of the minister.
(3) Notwithstanding subsection (1), best available control technology shall not apply to:

(a) routine maintenance, repair and parts replacement;
(b) normal increases in production rates unless otherwise prohibited;
(c) increases in hours of operation unless otherwise prohibited; or
(d) use of an alternative cleaner fuel or raw material.

(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."

Diesel engine emissions levels in North America are classified under a United States Environmental Protection Agency (EPA) standard. These classifications, or 'ratings', are referenced throughout this document. The standard was developed for equipment sold in the United States, but the ratings also identify emissions levels for equipment sold in Canada. The different levels of EPA emissions classification are referred to as Tiers. The lower Tier numbers preceded the higher Tier numbers in implementation beginning in 1996. Higher Tier numbers are more stringent, producing lower levels of air borne pollutants.

Presently, there are three EPA ratings for gensets in the 2MW capacity class required for the L'Anse Au Loup diesel plant. They are "EPA Tier I", "EPA Tier II", and "EPA Tier IV interim" (note: There is no EPA Tier III for this size class).

Based on a tender issued for a generator for the L'Anse Au Loup diesel plant, a low fuel emissions engine was proposed by the vendor. In order to provide comparable emissions to a Tier II US – EPA engine an EPA rated low emissions Engine Control Unit (ECU) program was substituted by the vendor.

Additional research was also completed on EPA Tier IV interim technology to determine economic and technical feasibility.

To date, the emissions reductions of EPA Tier IV interim gensets in this size class can only be achieved by using Selective Catalytic Reduction (SCR). SCR involves the injection of "diesel exhaust fluid" (DEF) into the exhaust gas stream to react with and reduce NOx in the presence of a catalyst.

There are significant capital expenditures associated with the installation and operation of an EPA Tier IV genset. This includes:

1) higher purchase price of the genset; and
2) addition of infrastructure for the storage and handling of the diesel exhaust fluid required for genset operation.

An EPA Tier IV genset has a higher capital cost due to the inclusion of the exhaust after treatment equipment (particulate filters and SCR) to meet Tier IV requirements. The estimated cost of the EPA Tier IV genset known to be available for this power rating is approximately 50% higher than the Low Emissions Tier II Equivalent, with a particulate filter (quoted as an extra $310k cost by Toromont Cat). The associated indirect cost with the genset is estimated to be approximately $92,000.

To operate a Tier IV genset using SCR technology also requires the addition of ancillary equipment and bulk storage for diesel exhaust fluid (DEF), piping, and pumping. The diesel exhaust fluid must be protected from freezing during winter. The fluid begins to freeze at -12 degrees Celsius. In L'Anse Au Loup, where the temperatures can go below -30 degrees Celsius, this would involve a separate, heated structure or plant extension because there is insufficient space inside the plant to accommodate the storage tank. The cost of the bulk storage upgrade including materials and installation is estimated to be approximately $94,000.

The class 5 estimate for capital expenditures for the added cost of installing an EPA Tier IV genset is $496k.

In general, emissions controls which reduce NOx emissions also increase fuel consumption. The low NOx engine being employed in this case shows lower fuel consumption than the others within the target load range at which it will be normally operated (75% load).

An EPA Tier 4 interim genset also consumes DEF. At a cost of approximately $1.48/litre this represents $12,100 per year in additional operating costs based on the current estimate of 310

operating hours per year of stand by operation at 75% load. The 6.2 litres per hour of higher fuel consumption for the Tier IV genset would also cost approximately $2,200 per year at current diesel fuel prices.

Fuel consumption rates are presented in Table 3. This does not incorporate added electrical loads to operate the secondary cooling system needed for higher tier engines, which would increase fuel consumption. Such a system could be expected to consume an additional 9 to 10 kW of power resulting in approximately 2.5 litres per hour of additional fuel consumption.

Table 3: Additional Fuel Consumption for Tier IV Interim

	Low Nox			Low Nox + DPF			Tier II			Tier IV		
Load	L/Hr	%	DEF L/hr	L/Hr	%	DEF L/hr	L/Hr	%*	DEF L/hr	L/Hr	%*	DEF L/hr**
100%	504	--	n/a	504	--	n/a	480.9	-4.6	n/a	484.6	-3.8	33.7
75%	376	--	n/a	376	--	n/a	378.8	+0.7	n/a	382.2	+1.6	27.2
50%	260.4	--	n/a	260.4	--	n/a	269.9	+3.6	n/a	277.8	+6.7	12.1
* Fuel Consumption % based on comparision against Low NOx/Low NOx + DPF numbers												
** DEF L/hr only applicable to Tier IV engine configuration												

An inquiry was sent to the other utilities which are members of the Canadian Off Grid Utility Association (COGUA) to establish current industry practice in Canada. Member utilities are BC Hydro, Manitoba Hydro, Qulliq Energy, Nunavut Power, Hydro One, Hydro Quebec, ATCO Electric, and Northwest Territories Power Corporation (NTPC). Five members responded to the inquiry and indicated that they do not have Tier IV gensets in this size (pers correspondence). Four utilities (NTPC, Hydro Quebec, MB Hydro, and BC Hydro) have stated that they do not have any EPA Tier IV equipment assets, while one (Hydro One) reported having two “very small” gensets capable of achieving EPA Tier IV without the use of SCR (Hydro One, John Supinski, personal communication, Jun 26; BC Hydro, Hamid Tamehi, personal communication, Aug 28; Hydro Quebec, Anne Malenfant, personal communication, Sep 2; Manitoba Hydro, Quinn Menec, personal communication, Sep 9; NTPC, Mike Ocko, personal communication, Sep 15). No COGUA utilities specifically seek EPA Tier IV equipment when tendering or have installed SCR exhaust gas after treatment.

It was concluded that the SCR has not been adopted by the remote diesel power generation industry in Canada. SCR are not considered proven, reliable control technology in the northern climate due to the lack of industry experience with SCR. As well, due to the high cost of equipment, infrastructure requirements, and added operational costs, it is not yet considered economical and is not industry standard.

Comparison of Potential Environmental Effects

Following the above analysis, a comparison of environmental effects was completed. The study focused on comparing the Low NOx and Tier II units. The Tier IV interim option was been deemed not economically feasible at this time, in comparison to the industry standards and is not considered proven, reliable control technology in light of the lack of industry experience with this type of technology in northern climates.

Air emissions model was first completed with the existing stack heights and the hourly maximum concentrations of air emissions determined. Following the completion of this initial model, further upgrades were considered for the plant utilizing the generator proposed by the vendor. These modifications included increasing the existing stack height and the inclusion of exhaust gas treatment (particulate filter).

The predicted NO_2 ground level concentrations were similar for the three engines scenarios evaluated. From a ground level perspective, the Tier II unit displayed a slightly lower concentration of NO_2 than the Low NOx unit (160 µg/m3 vs 180 µg/m3) despite having a higher emission rate for this contaminant. As expected, with the addition of the DPF, the low emissions unit produced less ground level particulate (1 µg/m3 vs 1.6 µg/m3 for the Tier II unit). A summary of these results is presented in Table 4.

The full dispersion modelling report outlining methodology used, data table and figures will be submitted separately from the registration document to the Environmental Assessment Division (SNC-Lavalin, 2014).

Table 4: Comparison of Non US EPA Rated Engine (Low Emissions and After Gas Treatment) to US EPA Rated Engine:

Air Quality Parameter	Averaging Period	Scenario B – Unit 2091 (Low Emissions)	Scenario E – Unit 2091+DPF (Low emissions + Particulate Filter)	Scenario D – Unit 2091 Tier II (US EPA Tier II equivalent)
NO_2	1 Hour	180	180	160
	24 Hour	106	105	94
	Annual	6.8	6.8	6.0
PM_{total}	24 Hour	8.4	1.3	2.1
	Annual	0.57	0.086	0.14
PM_{10}	24 Hour	6.7	1.0	1.7
$PM_{2.5}$	24 Hour	6.5	1.0	1.6
	Annual	0.44	0.066	0.11
SO_2	1 Hour	0.30	0.30	0.30
	3 Hour	0.28	0.28	0.28
	24 Hour	0.20	0.20	0.20
	Annual	0.013	0.013	0.013
CO	1 Hour	52	5.4	23
	8 Hour	45	4.7	19

Note: the values represented in Table 4 represent individual generating units running under worst case operating scenarios

Preferred Alternative

The Low Emissions engine with DPF is the preferred alternative considering:

1) The Tier IV Interim is not economically feasible, in light of industry standards;
2) The Tier IV Interim is not considered proven reliable control technology;
3) Comparable environmental effects for the Low Emissions Engine (with DPF) and the Tier II US EPA Engine; and
4) The ability of the vendor to meet deliverable requirements to ensure interrupted and reliable supply of power.

Overall this engine, Caterpillar model 3516B rated at 1825kW, best meets the BACT requirement while meeting the mandate of Newfoundland and Labrador Hydro to provide least cost, reliable power to its consumers.

6.0 PROJECT KEY ENVIRONMENTAL ASPECTS

The key environmental aspects of the Project include; air emissions, fuel storage, transport and handling facilities and noise. These key environmental aspects are discussed below.

6.1 Air Emissions

6.1.1 Air Quality Modeling

Air quality was evaluated using the CALPUFF air dispersion model. This is the preferred model outlined in guidance provided by the Department of Environment and Conservation (Guidance Document GD-PPD-019.2: Plume Dispersion Modelling). All model runs are considered to be conservative estimates as they assume the monthly peak load exists for all hours of each month.

The air dispersion modelling for the site consisted of completing model runs to evaluate six different scenarios as described below (note: Scenario A was evaluated in two phases and exists as A – Current Configuration and A – Replacement Configuration):

A. Current Configuration: evaluated emissions utilizing the current configuration of the LAL DGS including engines and stacks
A. Replacement Configuration: evaluated emissions utilizing current stack configuration but replaced unit 247 (600 kW) with a new unit 2091 (1825 kW)
B. Raised Stacks: evaluated emissions utilizing the scenario A-Replacement Configuration engine layout but the facility stacks have been increased to

14.1 metres for units inside the power house and 10.5 metres for mobile unit 2082

C. Hydro Quebec Contribution: This scenario represents the facility operations an estimated 96% of each year. Engine and stack configuration were evaluated as per Scenario B but the modelled loads have been supplemented with transmission power from Hydro Quebec.

D. US EPA Tier II: stack configuration was evaluated as per Scenario B but the engine configuration was modified to include an EPA Tier II rated engine instead of the engine chosen for the undertaking.

E. Exhaust Gas Treatment: same facility configuration as Scenario B but unit 2091 (1825 kW) has been fitted with a diesel particulate filter as a form of secondary exhaust gas treatment

Air quality modeling was completed in isolation for the new engine equipped with a diesel particulate filter and compared to air quality guidelines. Values in displayed in Table 5 (below) were obtained from modelled results for Scenario E.

Table 5: Comparison of Selected Alternative with Guideline Values:

Air Quality Parameter	Averaging Period	Scenario E – Unit 2091+DPF (Low emissions + Particulate Filter)	Guideline Criteria
NO_2	1 Hour	180	400
	24 Hour	106	200
	Annual	6.8	100
PM_{total}	24 Hour	1.3	120
	Annual	0.086	60
PM_{10}	24 Hour	1.0	50
$PM_{2.5}$	24 Hour	1.0	25

	Annual	0.066	8.8
SO_2	1 Hour	0.30	900
	3 Hour	0.28	600
	24 Hour	0.20	300
	Annual	0.013	60
CO	1 Hour	5.4	35,000
	8 Hour	4.7	15,000

Note: the values represented in Table 5 represent an individual generating unit running under worst case operating conditions

In order to determine the overall environmental effect of the plant upgrade, further air quality modelling was completed which predicted the existing plant emissions under worst case operating conditions with no Hydro Quebec contribution to load (Scenario A-Current Configuration in the SNC Lavalin air dispersion modelling report). These results were compared to the plant with the new engine and increased stack heights. This model scenario removed generating unit 247 (to be retired) and incorporated the new unit 2091. Unit emission rates for unit 2091 were adjusted to include exhaust gas treatment in the form of a diesel particulate filter. Stack heights for the facility were also raised from the current height to 14.1 metres for units inside the powerhouse and 10.5 metres for mobile unit 2082 (Scenario E in the SNC Lavalin air dispersion modelling report).

The effect of the plant upgrades, as expected, resulted in an overall decrease in the predicted ground level concentration of contaminants as illustrated in Table 6. It should be noted that model scenarios A and E represent worst case operating conditions which are anticipated to occur approximately 4% of each year.

Table 6: Dispersion Modelling – Existing Plant Configuration vs. Proposed Upgrade

Air Quality Parameter	Averaging Period	Scenario A: Current Configuration (µg/m^3)	Scenario E: Exhaust Gas Treatment (µg/m^3)	Total Decrease in Ground Level Concentration (µg/m^3)	Percent Reduction
NO_2	1 Hour	1601	1262	339	21%
	24 Hour	1035	923	112	11%
	Annual	149	71	78	52%
PM_{total}	24 Hour	79	43	36	46%
	Annual	13	6.3	6.7	52%
PM_{10}	24 Hour	63	34	29	46%
$PM_{2.5}$	24 Hour	61	33	28	46%
	Annual	9.7	4.9	4.8	49%
SO_2	1 Hour	2.9	1.6	1.3	45%
	3 Hour	2.7	1.5	1.2	44%
	24 Hour	2.1	1.1	1.0	48%
	Annual	0.33	0.15	0.18	55%
CO	1 Hour	790	390	400	51%
	8 Hour	726	344	382	53%

The full dispersion modelling report outlining methodology used, data table and figures will be submitted separately from the registration document to the Environmental Assessment Division (SNC-Lavalin, 2014).

Although the new unit is within the guideline values and resulted in an overall improvement in air quality, the modelling did indicate that the facility as a whole could experience periods where air quality guidelines would be exceeded. As previously stated and depicted in the dispersion modelling report, emissions were evaluated using several operating scenarios for the L'Anse au Loup facility. The main scenarios for discussion include a routine operating scenario where the system load is assisted with transmission power from Hydro Quebec (Scenario C). A worst case evaluation was also

conducted where the entire system load is covered utilizing only diesel generation (Scenario E).

Instances where guideline criteria have been exceeded are summarized below. Table 7 provides details on maximum modelled concentrations used to determine facility compliance and summarizes how often and where these events are predicated to occur. The surface area of the impacts has also been included. This information is supported by isopleth mapping found in Appendix A which documents the physical location of these events inside the model domain.

Table 7: Summary of Guideline Exceedances (worst values over 4-years)

Scenario C – Hydro Quebec Contribution							
Contaminant	**Averaging Period**	**Guideline (µg/m³)**	**Maximum Predicted Ground Level Concentration (µg/m³)**	**Total count and frequency of modelled events displaying exceedance above guideline**		**Distance from Plant (metres)**	**Area of Exceedance (km²)**
NO_2	Hourly	400	469	64	0.73%	70-400	0.030
	Daily	200	349	7	1.9%	35-290	0.035
Scenario E – Worst Case Operating Conditions with Exhaust Gas Treatment							
Contaminant	**Averaging Period**	**Guideline (µg/m³)**	**Maximum Predicted Ground Level Concentration (µg/m³)**	**Total count and frequency of modelled events displaying exceedance above guideline**		**Distance from Plant (metres)**	**Area of Exceedance (km²)**
$PM_{2.5}$	Daily	25	33	10	2.7%	45	0.0025
NO_2	Hourly	400	1262	4719	54%	35-1350	1.3
	Daily	200	923	199	55%	30-1140	0.52

Note:

Maximum Predicted hourly concentration (µg/m³) represents the 9th highest model result.

Maximum Predicted daily concentration (µg/m³) represents the 2nd highest model result.

Instances where the modelling predicted an exceedance to guideline criteria can occur as a singular event or at the same time across multiple receptors.

The 2014 project is considered the first step to upgrading the facility and bringing emissions in-line with guideline values. However, based on the noted guideline exceedances, Newfoundland and Labrador Hydro has determined that an air quality management plan will be implemented for this facility which is further detailed in Section 9.

6.2 Fuel Storage, Transport and Handling

The proposed undertaking does not require any change to the bulk fuel storage system at L'Anse au Loup. As previously stated, a new 5,000 litre day tank will be installed inside the plant building. This upgrade will allow for a longer run time between fills from the bulk tanks. In the event of a spill or leak of fuel, the Hydro Environmental Emergency Response Plan will be used to define appropriate roles and responsibilities. Should such an event occur, Hydro will notify government agencies, remediate the affected area and restore the environment to the satisfaction of the Department of Environment and Conservation.

The facility will continue to monitor and reconcile bulk fuel inventory as per regulatory requirements. At a minimum, fuel tanks will be gauged or dipped (including a water dip) at least weekly. Gauge or dip records will be reconciled against receipt and withdrawal records to determine any apparent fuel losses for the system. Reconciliation records will be kept for a minimum of two (2) years and Hydro will inform the Government Service Centre (GSC) immediately of any apparent losses above normal as indicated by two (2) consecutive reconciliations. As the operator of a storage tank system, Hydro will also determine cumulative apparent losses on a semi-annual basis and inform the GSC if the apparent loss exceeds one-half of 1% throughout for the period.

As a result this aspect of the proposed undertaking will not pose any significant risk to the surrounding environment.

6.3 Noise

Historical noise map surveys completed on the L'Anse au Loup property show that measured sound decibel levels (dB) range from 65 db at the east of the property (adjacent to main highway), to 85 db at the west of the property adjacent to the radiators. A decibel comparison chart (http://www.gcaudio.com/resources/howtos/loudness.html) has identified a normal conversation at a distance of 3 feet to be approximately 60-65 dB while noise from city traffic (measured inside a vehicle) can be as high as 85 dB.

Manufacturer data obtained from Caterpillar suggest that the proposed unit 2091 will not significantly alter the noise profile for the generating station. The unit will be outfitted with an exhaust stack silencer which will produce a maximum attenuated sound level of 74 dB at 15 metres which is consistent with previously completed site measurements.

Following installation and commissioning of the new generating unit, Hydro will complete a noise mapping survey of the L'Anse au Loup property. This study will document the noise levels at various locations on the property and identify if any additional engineered controls are needed to reduce sound levels to acceptable levels.

7.0 PROJECT SCHEDULE

The project schedule is being driven by a need to increase generating capacity for the upcoming winter season and direction from the Public Utilities Board. Planning and procurement activities commenced in 2013 and continue during 2014. Hydro anticipates commissioning the unit by the end of the 2014 calendar year.

It should also be noted that as the particulate filter was added to the Project after the initial tender and award. As such the schedule for design, tender, award, delivery and installation of the filter is currently under development. The installation is anticipated, however, to be

completed by April 2015. Once a detailed schedule is developed the schedule will be provided to the pollution prevention division.

8.0 CONSTRUCTION MITIGATION

The majority of the project will occur inside the existing building at the L'Anse Au Loup generating station. There are no planned changes to site footprint so construction mitigation is anticipated to be minimal. The site can be accessed by paved road, so dust suppression may not be required. If required, standard and approved dust suppression methods will be employed. Any leaks or spills of hydrocarbon or other hazardous material associated with transportation and storage of materials and construction at the site will be the responsibility of the Contractor. Newfoundland and Labrador Hydro will, however, provide the necessary oversight to ensure all preventative measures are in place and any spill are reported, mitigated and remediated as per regulatory requirements.

9.0 AIR QUALITY MANAGEMENT PLAN

Newfoundland and Labrador Hydro is committed to pollution prevention and continual improvement. In order to better understand the L'Anse au Loup air emissions and potential solutions to address any concerns identified Newfoundland and Labrador Hydro has committed to developing an air quality management plan to be implemented for this facility in consultation with the Pollution Prevention Division at DOEC.

Model Refinement

The air quality management plan will involve an improvement to the current dispersion model developed for the L'Anse au Loup diesel plant. The use of production data verses load forecasting will produce more accurate operating scenarios and modelled results. The improved data quality will better characterize the potential impacts predicted by the CALPUFF model.

Once the site dispersion model has been refined, there will be a better understanding of any noted exceedance to regulatory criteria in terms of ground level concentrations and location/frequency of exceedance.

Monitoring

Once the dispersion model has been refined, an environmental monitoring feasibility study will be completed in consultation with the Pollution Prevention Division at DOEC. The feasibility study will become the framework for an environmental effects monitoring program to evaluate impacts to the local air shed as predicted by the dispersion model.

Determination of Potential Engineering Controls for NOX Emissions

Based on the results of the monitoring program, Newfoundland and Labrador Hydro will commit to undertaking a preliminary evaluation of engineering control mechanisms with potential for bringing diesel unit emissions in compliance with current regulations, if required. Potential technologies will be considered in light of technical and economic feasibility.

The evaluation of engineering control mechanisms will include consideration of:

- Regulatory Requirements;
- Diesel Emission Control Technologies and Their Applicability;
- Plant Case Studies; and
- Implications of Control Technology Application;
    - Equipment Requirements;
    - Maintenance and Operation;
    - Compliance;
    - Cost ; and
    - Technical Considerations.

Once technical and feasible alternatives have been determined an alternative will be selected for further development and incorporated into the planning and budgetary processes.

Evaluation of Residual Environmental Compliance Concerns

Following determination and implementation of feasible control technologies, if required, NLH will conduct an evaluation of any residual environmental compliance concerns projected to be still a concern following successful implementation of any emission control initiatives identified.

Schedule of Implementation

In 2015, Newfoundland and Labrador Hydro is committed to further developing the Air Quality Management Plan for the L'Anse au Loup Plant. Based on the final plan NLH will identify on an as needed basis, long term solutions to address identified concerns and will consult with the Department of Environment and Conservation, and specifically the Pollution Prevention, on the preferred alternatives.

The update to the plan will then be incorporated into our long term planning and budgetary process as per the Public Utilities Board regulatory process.

10.0 LIST OF POTENTIAL ENVIRONMENTAL APPROVALS

The proposed project will require a number of provincial, federal and municipal approvals in relation to its construction and operations activities, which may include those listed in Table 9 below.

Table 9: List of Potential Environmental Approvals Required

Approval Potentially Required	**Legislation / Regulation**	**Project Component / Activity Requiring Approval or Compliance**	**Department or Agency**	**Requirements**
Release from the Environmental Assessment Process	Environmental Assessment Regulations, 2003 under the Environmental Protection Act	Project	Department of Environment and Conservation	Greater than 1 MW requires registration as an Undertaking
Certificate of Approval	Air Pollution Control Regulations	Facility Operation	Pollution Prevention Division, Department of Environment and Conservation	An operating approval is required for standby diesel generators with capacity greater than 100kW and which operate greater than 500 hours per year
Policy Directives	Water Resources Act	Project activities	Water Resources Division, Department of Environment and Conservation	The Department has a number of potentially applicable policy directives in place, including those related to: Infilling Bodies of Water; Use of Creosote Treated Wood in Fresh Water; Treated Utility Poles in Water Supply Areas; Land and Water Developments in Protected Water Supply Areas; Development in Shore Water Zones and Development in Wetlands.

Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Approval or Compliance	Department or Agency	Requirements
Preliminary Application to Develop Land	Urban and Rural Planning Act, Protected Road Zoning Regulations	Construction activity	Service NL	A development permit is required to build on and develop land, whether Crown or privately owned, within the building control lines of a Protected Road.
Fuel Tank Registration – Storing and Handling Gasoline and Associated Products	Environmental Protection Act, and Storage and Handling of Gasoline and Associated Products Regulations	Storing and handling gasoline and associated products	Engineering Services Division, Service NL	Fuel Tank Registration required for storing and handling gasoline and associated products.
Permit for Storage, Handling, Use or Sale of Flammable and Combustible Liquids	*Fire Prevention Act,* and *Fire Prevention Flammable and Combustible Liquids Regulations*	Storing and handling flammable liquids	Engineering Services Division, Government Service Centre	This permit is issued on behalf of the Office of the Fire Commissioner. Approval is based on a review of information provided for the Certificate of Approval for Storing and Handling Gasoline and Associated Products.

Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Approval or Compliance	Department or Agency	Requirements
Compliance Standard	Dangerous Goods Transportation Act and Regulations	Storing, handling and transporting fuel, oil and lubricants	Department of Transportation and Works	If the materials are transported, handled and stored fully in compliance with the regulations, a permit is not required. A Permit of Equivalent Level of Safety is required if a variance from the regulations is necessary. Transporting goods considered dangerous to public safety must comply with regulations.
Compliance Standard	Fire Prevention Act, and Fire Prevention Regulations	On-site structures (temporary or permanent)	Engineering Services Division, Service NL	All structures must comply with fire prevention standards.
Compliance Standard	Environmental Control Water and Sewage Regulation under the Water Resources Act	Any waters discharged from the project	Pollution Prevention Division, Department of Environment and Conservation	A person discharging sewage and other materials into a body of water must comply with the standards, conditions and provisions prescribed in these regulations for the constituents, contents or description of the discharged materials.

Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Approval or Compliance	Department or Agency	Requirements
Compliance Standard	Occupational Health and Safety Act and Regulations	Project-related occupations	Service NL	Outlines minimum requirements for workplace health and safety. Workers have the right to refuse dangerous work. Proponents must notify Minister of start of construction for any project greater than 30 days in duration.
Compliance Standard	Workplace Hazardous Materials Information System Regulations, Occupational Health and Safety Act	Handling and storage of hazardous materials	Operations Division, Service NL	Outlines procedures for handling hazardous materials and provides details on various hazardous materials.
Compliance Standard	Environmental Protection Act, Air Pollution Control Regulations	Project operations (diesel generators)	Pollution Prevention Division, Department of Environment and Conservation	The Regulations outline specific ambient air quality standards and emission standards, as well as relevant engineering design (e.g., stack height) requirements and other provisions
Compliance standards; permits may be required.	National Fire Code	On-site structures (temporary or permanent)	Service NL	Approval is required for fire prevention systems in all approved buildings.
Compliance standards; permits may be required.	National Building Code	On-site structures (temporary or permanent)	Service NL	Approval is required for all building plans.

Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Approval or Compliance	Department or Agency	Requirements
Development or Building Permit	Urban and Rural Planning Act, 2000, and Relevant Municipal Plan and Development Regulations	Development within municipal boundary	Community Council	A permit is required for any development or building within municipal boundaries.
Approval for Waste Disposal	Urban and Rural Planning Act, 2000, and Relevant Municipal Plan and Development Regulations	Waste disposal	Community Council	The use of a community waste disposal site in Newfoundland and Labrador by proponents/contractors to dispose of waste requires municipal approval. Restrictions may be in place as to what items can be disposed of a municipal disposal site.

11.0 PUBLIC CONSULTATION

Public consultation is a key element to the environmental assessment process. In addition to the 30 day public consultation period provided for via the Department of Environment and Conservation, NLH has undertaken public consultation activities prior to the registration of this project.

On October 14th, 2014 members of the project team met with the town council of L'Anse au Loup to provide a project overview, a discussion of environmental effects and mitigations. Town council members were invited to express their concerns and the project team provided a response. Council members felt this was a good project and their main concern was Hydro's

ability to provide reliable power. They were pleased to be involved in the process and provided no objections to the project proceeding as planned. Concerns noted by the Town council are provided in Table 10 and the response provided by the project team is also included.

Table 10: Summary of Town Council Meeting

Identified Concern	Response
Hydro's ability to "keep the lights on"	The upgrade in capacity will retire an aging unit which will give increased reliability and provide the necessary generation to meet system loads.
Is there adequate capacity at the generating station	Once the new unit is in place, the installed capacity will meet system demands until 2020. Another new unit is tentatively slated for 2019 to address loads beyond 2020.
Has the necessary work been completed on the distribution system to deliver power to residents.	Winter readiness work has been ongoing throughout the year.

Following the meeting with the town on October 14th, an open house was held in L'Anse au Loup that evening. There was a minimal turnout at the open house with six residents in attendance. There were no concerns provided and the overall consensus was that the project is good for the community.

Summary of these events is provided in Appendix B.

12.0 REFERENCES

Submission to the Public Utilities Board: *Additions to Accommodate Load Growth – Isolated Generating Stations, Hopedale, L'Anse au Loup and Nain, June 2012*

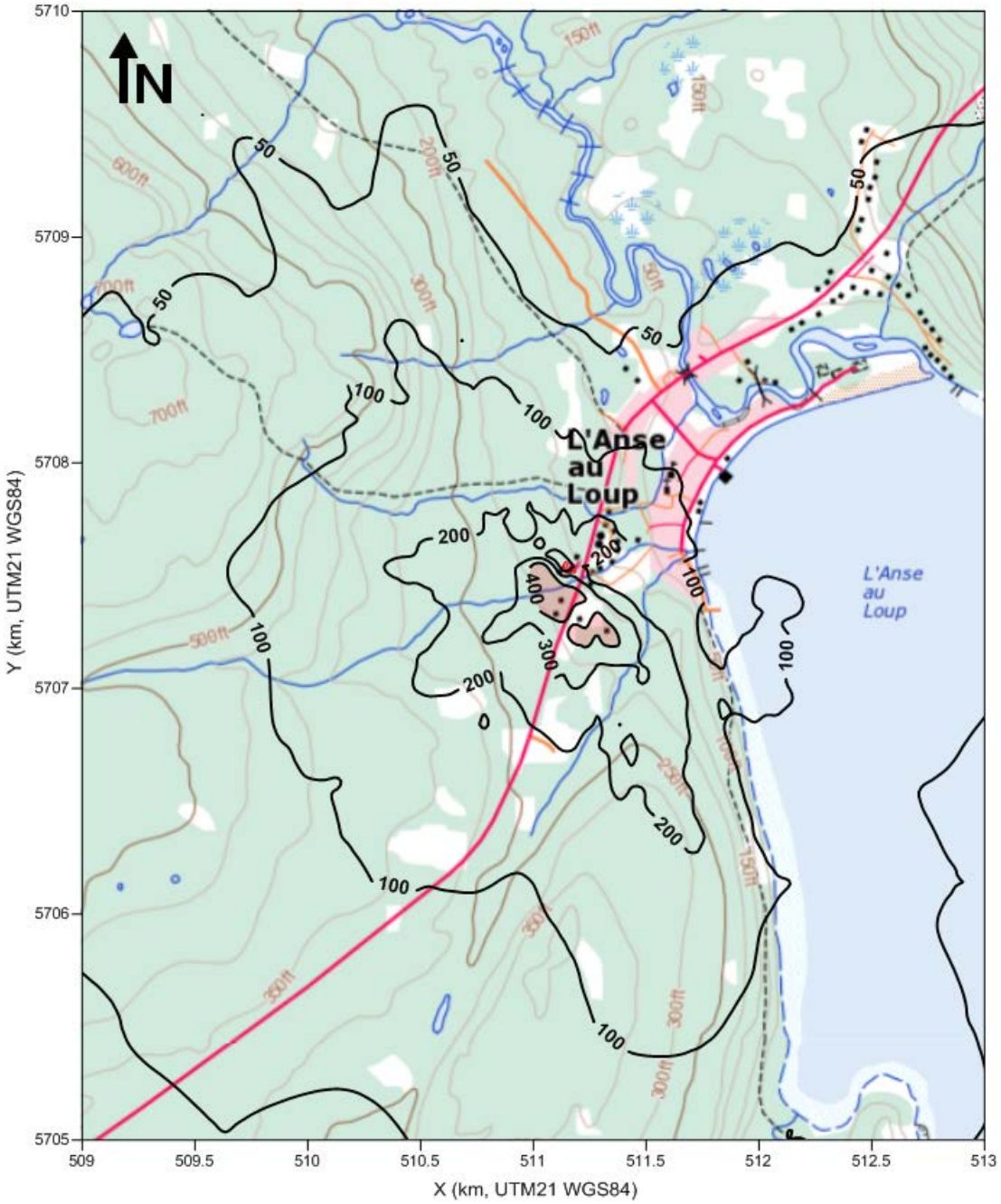
Submission to the Public Utilities Board: *Additions to Accommodate Load Growth – Isolated Generating Stations, Hopedale, L'Anse au Loup and Nain, Addendum Report (2013), August 2, 2013*

SNC-Lavalin Project 620213: *CALPUFF Air Dispersion Modelling – L'Anse au Loup Diesel Generating Plant*

APPENDIX A

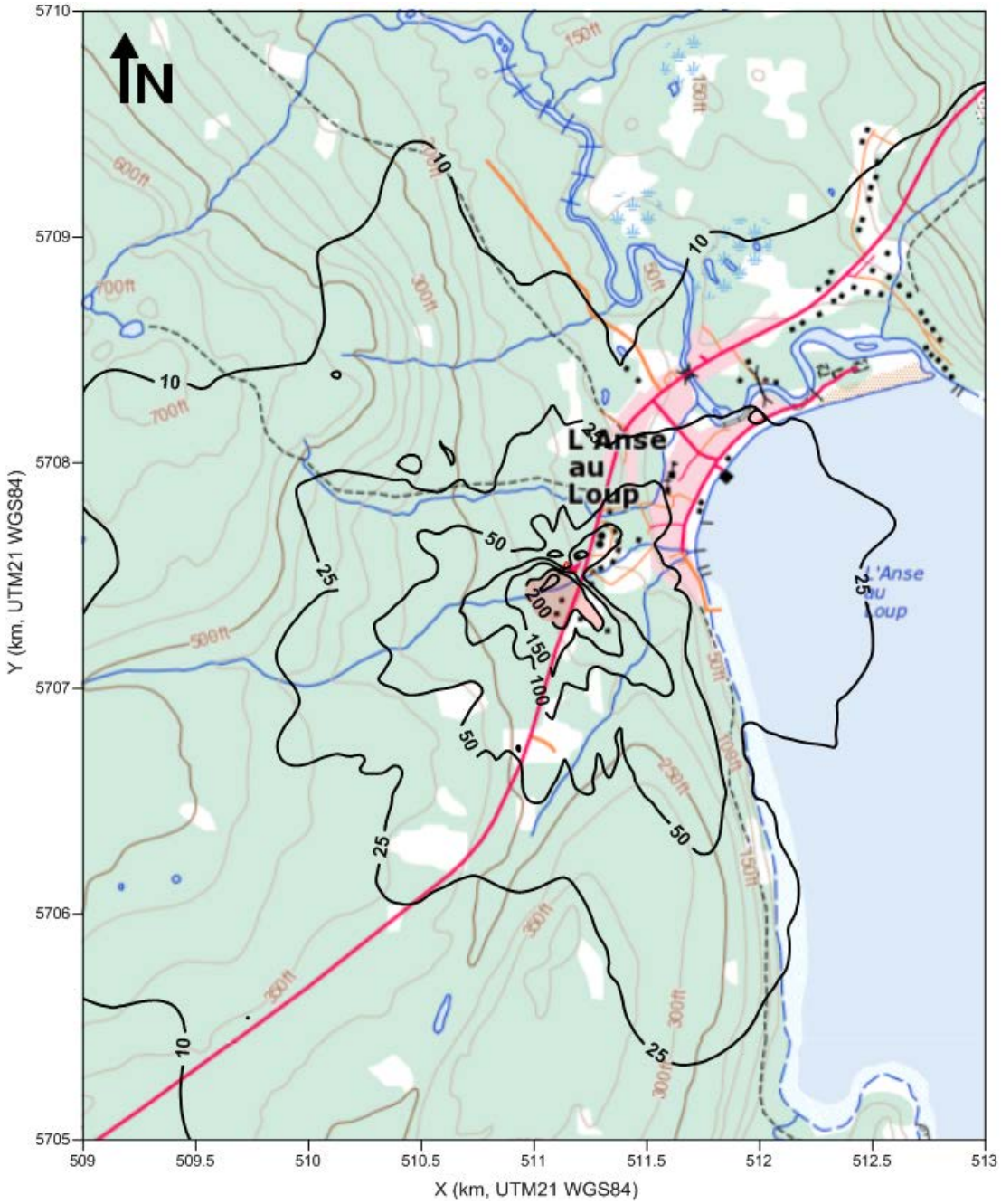
Isopleth Mapping of Modelled Guideline Exceedances

Figure 1: Maximum Hourly Average Predicted Concentration (µg/m³) of NO_2 in Ambient Air for the LAL DGS (2010-2013) – Scenario C



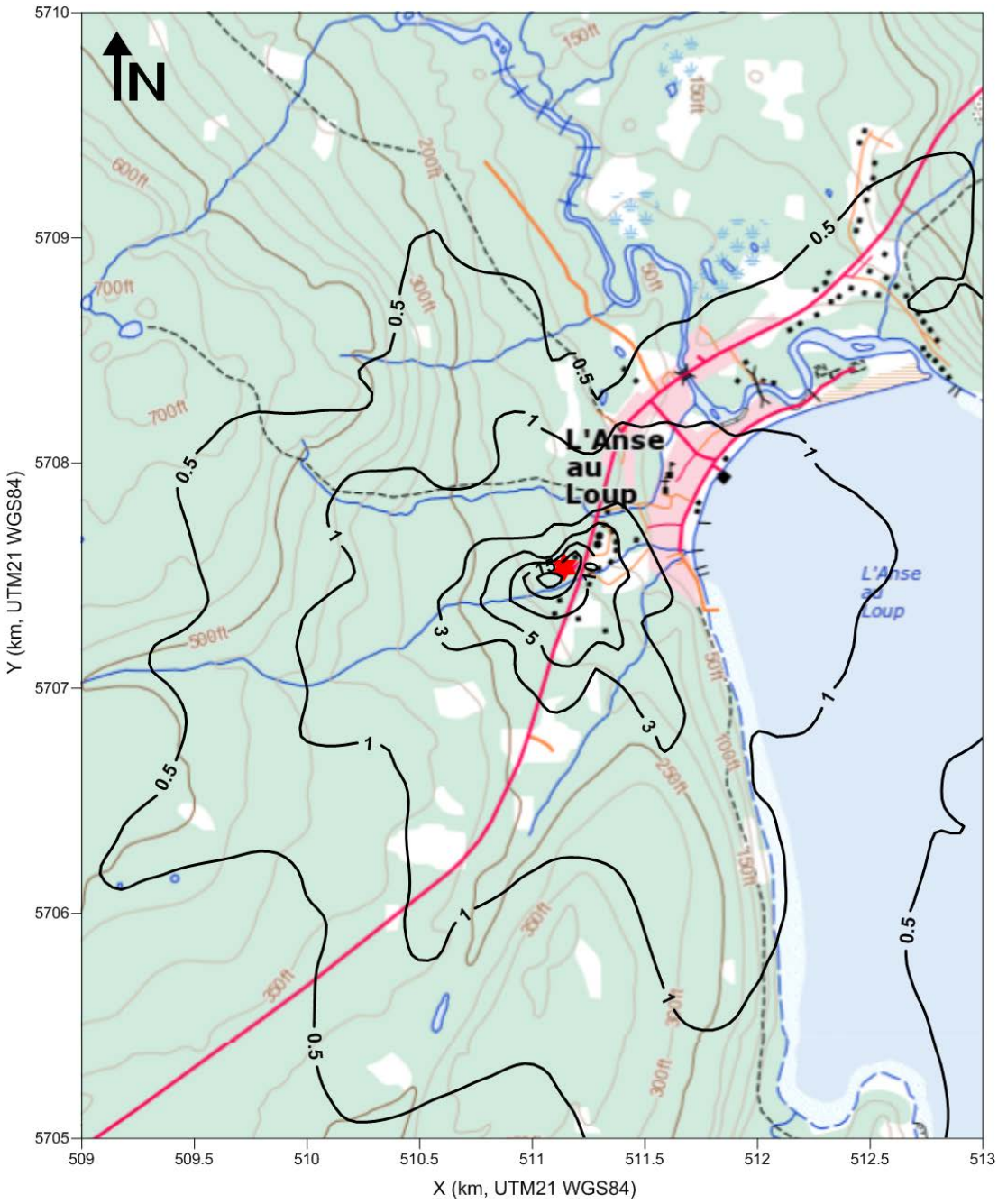
The pink shaded area represents the area of exceedance with respect to the 400 µg/m³ AAQS for hourly NO_2.

Figure 2: Maximum Daily Average Predicted Concentration (µg/m³) of NO_2 in Ambient Air for the LAL DGS (2010-2013) – Scenario C



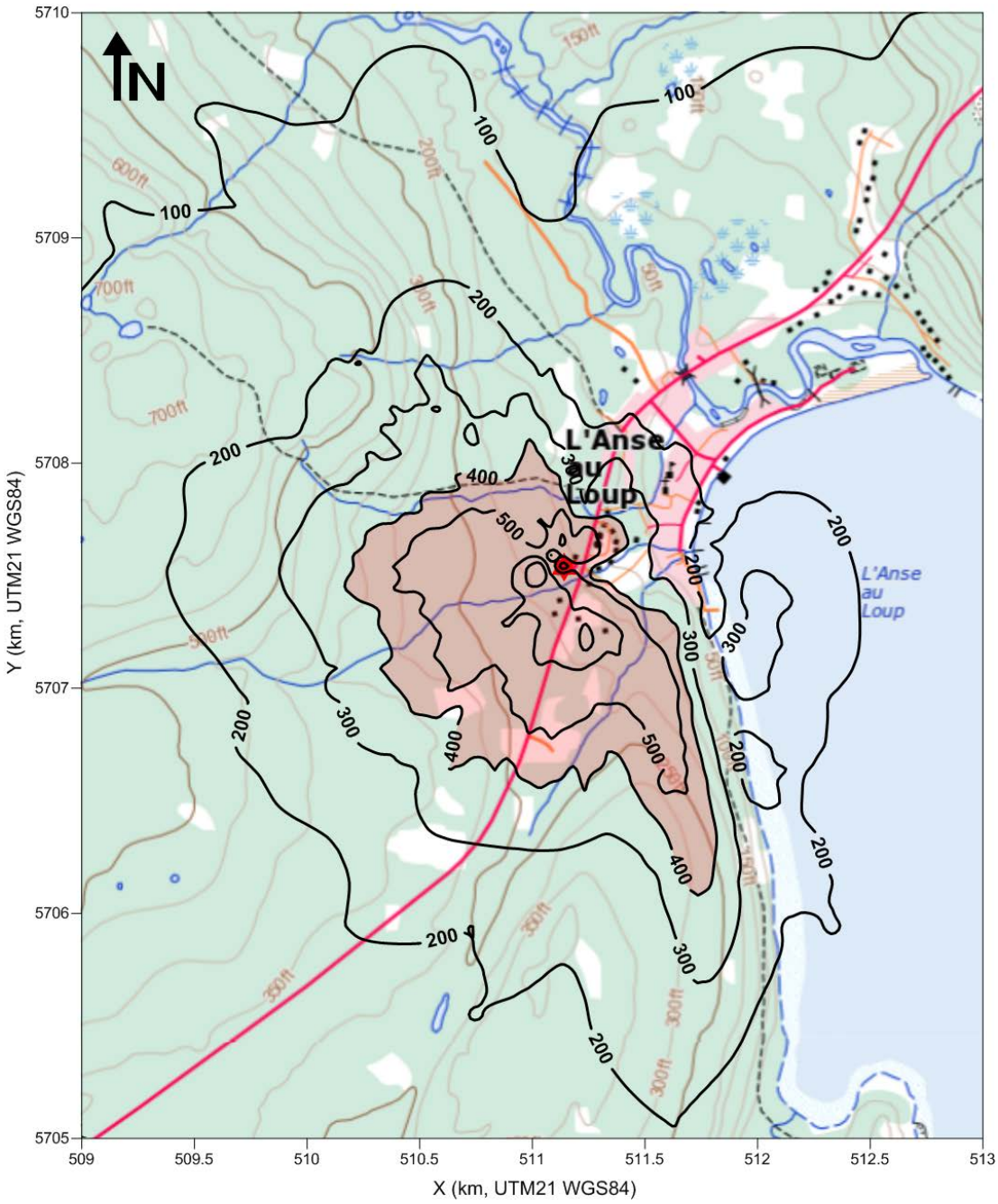
The pink shaded area represents the area of exceedance with respect to the 200 µg/m³ AAQS for daily NO_2.

Figure 3: Maximum Daily Average Predicted Concentration (µg/m³) of $PM_{2.5}$ in Ambient Air for the LAL DGS (2010-2013) – Scenario E



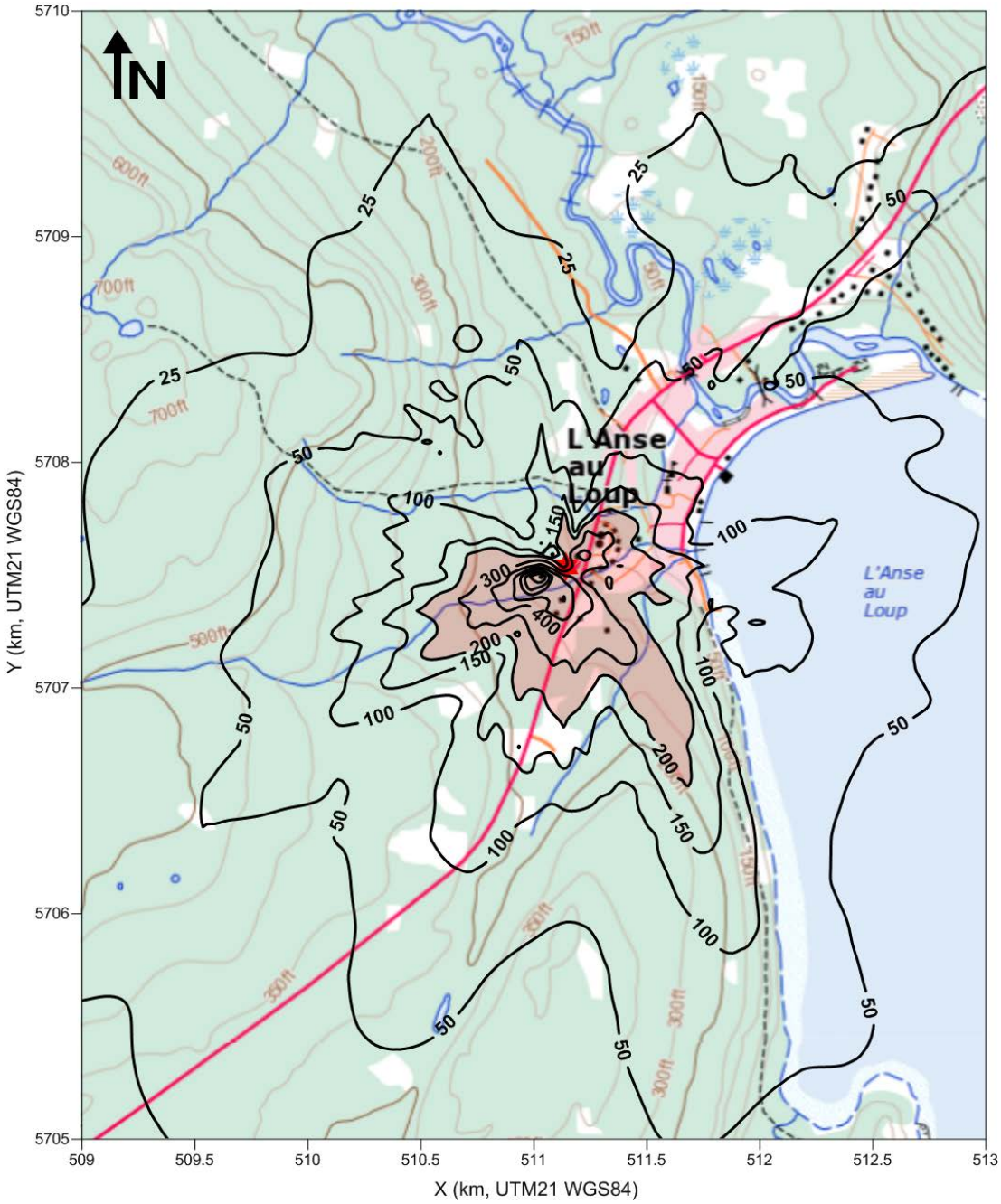
The pink shaded area represents the area of exceedance with respect to the 25 µg/m³ AAQS for daily $PM_{2.5}$.

Figure 4: Maximum Hourly Average Predicted Concentration (µg/m³) of NO_2 in Ambient Air for the LAL DGS (2010-2013) – Scenario E



The pink shaded area represents the area of exceedance with respect to the 400 µg/m³ AAQS for hourly NO_2.

Figure 5: Maximum Daily Average Predicted Concentration (µg/m³) of NO_2 in Ambient Air for the LAL DGS (2010-2013) – Scenario E



The pink shaded area represents the area of exceedance with respect to the 200 µg/m³ AAQS for daily NO_2.

APPENDIX B

PUBLIC CONSULTATION

NL Hydro: L'Anse au Loup Public Consultation

Meeting Notes
October 14, 2014

On October 14, 2014 NL Hydro held two sessions as a part of a public consultation required under the environmental assessment process for the upgrading of the L'Anse au Loup plant.

The first session was presentation-style, where members of the L'Anse au Loup Town Council were invited for a full description of the upgrade required, the proposed asset to satisfy the need, and the factors taken into consideration when NL Hydro made the recommendation for the installation of the new Genset engine and particulate filter.

Four attendees where present at the presentation with NL Hydro and were in support of the upgrade and installation of the new engine, stating, in agreement, that the most important things for the people of their community was that NL Hydro could keep the lights on. The idea of additional back-up generation capacity to meet growing demand was welcomed. The Mayor called it "*a good news story*" for the town.

The group raised a number of matters for discussion including:

- The possibility of getting more power from the Romaine River once that comes online
- Interest in understanding whether or not Hydro Quebec is experiencing more demand on their system, and how that might impact the availability of power in LAL
- Any regulations that may require the power to be down at Lac Robertson before power at LAL plant comes on
- The useful life of the other engines in the plant, and future requirements for additional updates to the LAL plant
- NL Hydro's winter readiness in terms of overall system maintenance
- Any anticipated trouble with the system from Hydro's perspective
- People really just want to know they power will stay on day to day, and when HQ cannot supply it, they want to know LAL has the capacity to meet the demand

NL Hydro also held a two-hour Open House event in the evening, where members of the L'Anse au Loup community were invited to attend and learn more about the upgrade required, the proposed asset to satisfy the need, and the factors taken into consideration when NL Hydro made the recommendation for the installation of the new Genset engine and particulate filter.

Set-up to encourage dialogue and quick access to NL Hydro subject matter experts, members of the community had the opportunity to move from station to station to learn more about the specific elements of the upgrade that interested them most and also ask questions. Handouts with information were available to everyone as take-a-ways, and those attending had the

opportunity to sign up to receive more information and updates on the project throughout the fall.

Six members of the community attended the Open House, and echoed the general support for the upgrade to the LAL plant given the need for additional generation capacity to meet growing demand. One attendee living next door to the plant expressed her frustration with the smoke coming from the stacks when in use, but otherwise appreciated the importance of the upgrade. Team members noted that this project will improve the overall air emissions profile of the plant and encouraged the community member to contact NLH in the future with any specific concerns. Others not living in such a close proximity to the plant noted they have never had an issue with the noise or smoke coming from the stacks. Some in fact said the sight of smoke coming from the stacks "was comforting on a cold winter day, knowing the power would be back on soon."

There were no unanswered questions from the Open House session. Feedback received from the session was an interest to continue to receive more and updated information on the upgrade over the fall, and support for the addition of generation in their plant.