This figure shows that the average temperature is the lowest in January (-13.5°C) and increases gradually to reach its maximum in July (18.2°C).

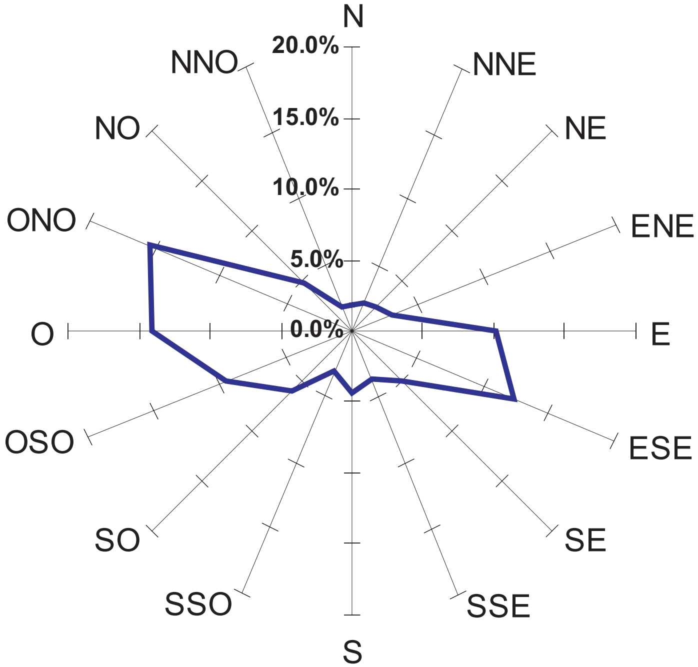
7.3.3.4 *Precipitation*

Figure 7.3.5 shows the trend in precipitation normal for rainfall, snowfall and total precipitation for each of the twelve months of the year. These values correspond to the average of the monthly quantities of precipitation measured at the Arvida station over the 30-year recording period (1961-1990).

Total precipitation (in mm) includes rainfall (in mm) added together with the water equivalent of snowfall (in mm). In general, snow that is converted to water equals a tenth of its depth when in its solid state. Total precipitation for the region is 911.2 mm, reaching the highest level in July (114.1 mm) and the lowest in April (45.7 mm).

Total average rainfall for the year is 652.0 mm and is concentrated during the period from June to September inclusively. Although the amounts are small, precipitation in the form of rainfall is also recorded in winter. The amount of rain recorded for February, the least rainy month, is 0.6 mm.

Snowfall begins in October (2.2 cm), increases gradually until December (73.7 cm) and remains around 50 cm for the months of January and February. In total, an average snowfall of 259.4 cm a year is recorded.



ALCAN

Fréquence de direction de provenance des vent (1996-2000)

TECSULT

PROJET : **14041**

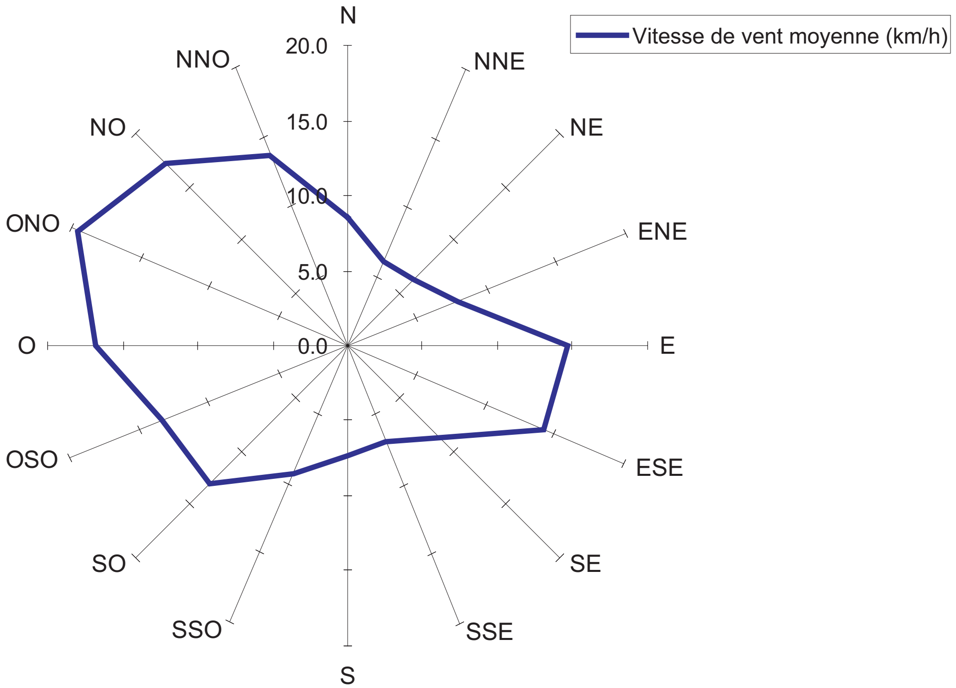
DATE : **Septembre 2005**

Fig. **7.3.2**

7.3.2@7.3.5.ai (15/09/05) pc_cm

7.3.2 Correspondence Table

S	S
SSE	SSE
SE	SE
ESE	ESE
E	E
ENE	ENE
NE	NE
NNE	NNE
N	N
SSO	SSW
SO	SW
OSO	WSW
O	W
ONO	WNW
NO	NW
NNO	NNW
Fréquence de direction de provenance des vents (1996-2000)	Wind direction frequencies (1996-2000)
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005



ALCAN

Variation de la vitesse du vent en fonction de la direction de provenance (1996-2000)

TECSULT

PROJET : **14041**

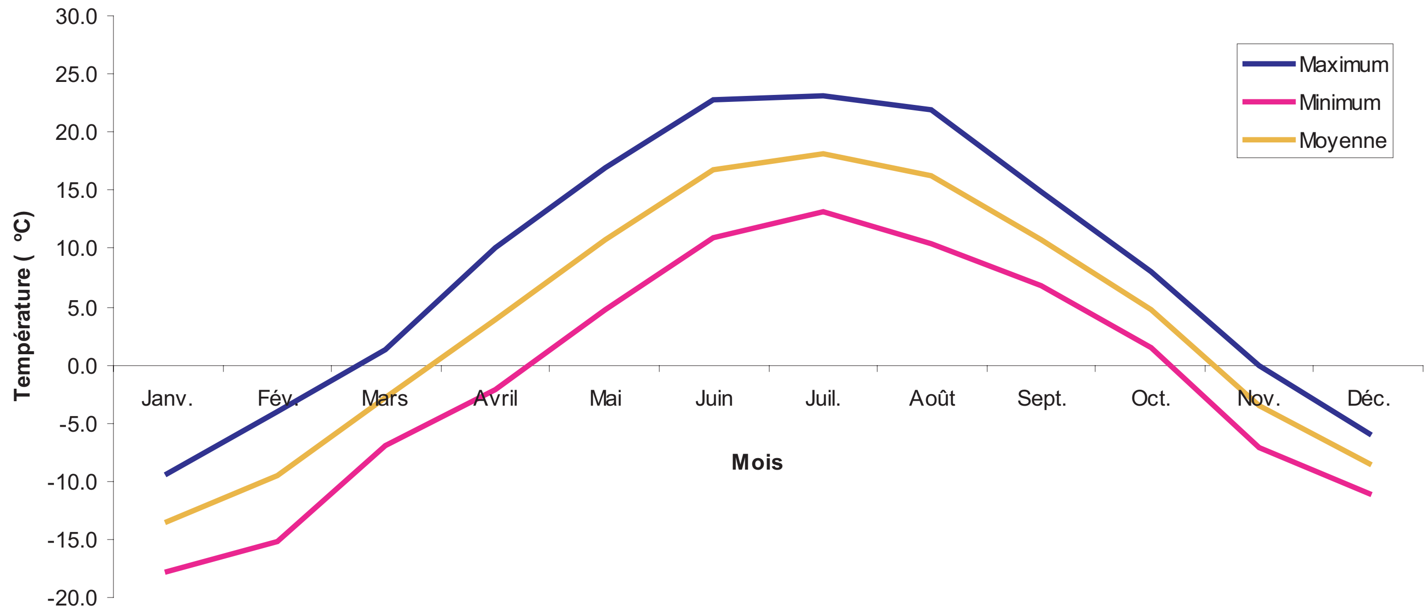
DATE : **Septembre 2005**

Fig. **7.3.3**

7.3.2@7.3.5.ai (15/09/05) pc_cm

7.3.3 Correspondence Table

Vitesse de vent moyenne (km/h)	Average wind speed (km/h)
S	S
SSE	SSE
SE	SE
ESE	ESE
E	E
ENE	ENE
NE	NE
NNE	NNE
N	N
SSO	SSW
SO	SW
OSO	WSW
O	W
ONO	WNW
NO	NW
NNO	NNW
Variation de la vitesse du vent en fonction de la direction de provenance (1996-2000)	Wind speed variation according to the direction the wind is coming from (1996-2000)
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005



ALCAN

Températures moyennes mensuelles (1996-2000)

TECSULT

PROJET : **14041**

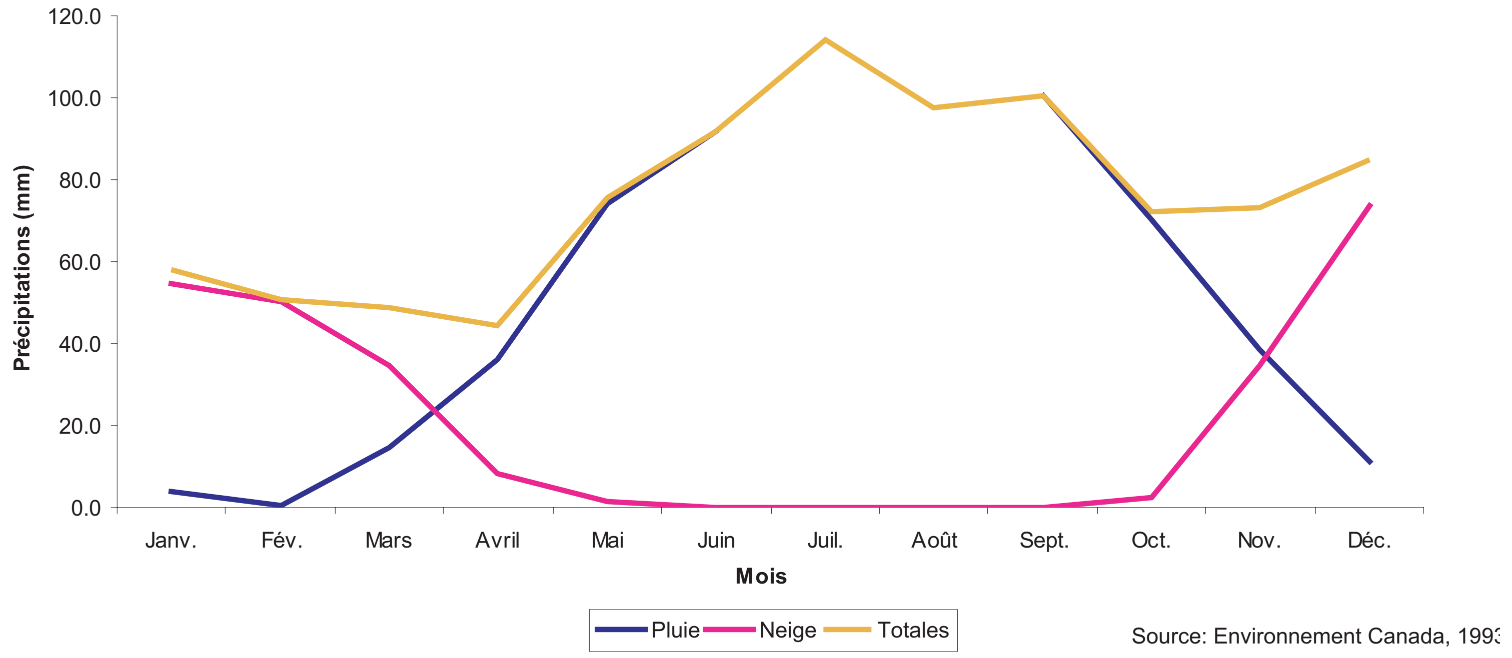
DATE : **Septembre 2005**

Fig. **7.3.4**

7.3.2@7.3.5.ai (15/09/05) pc_cm

7.3.4 Correspondence Table

Température	Temperature
Maximum	Maximum
Minimum	Minimum
Moyenne	Average
Janv.	Jan.
Fév.	Feb.
Mars	March
Avril	April
Mai	May
Juin	June
Juil.	July
Août	August
Sept.	Sept.
Oct.	Oct.
Nov.	Nov.
Déc.	Dec.
Mois	Month
Températures moyennes mensuelles (1996-2000)	Average monthly temperatures (1996-2000)
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005



ALCAN

Précipitations moyennes mensuelles (1961-1990)

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

Fig. **7.3.5**

7.3.2@7.3.5.ai (15/09/05) pc_cm

7.3.5 Correspondence Table

Précipitations	Precipitation
Janv.	Jan.
Fév.	Feb.
Mars	March
Avril	April
Mai	May
Juin	June
Juil.	July
Août	August
Sept.	Sept.
Oct.	Oct.
Nov.	Nov.
Déc.	Dec.
Mois	Month
Pluie	Rain
Neige	Snow
Totales	Total
Source : Environnement Canada, 1993	Source: Environment Canada, 1993
Précipitations moyennes mensuelles (1996-2000)	Average monthly precipitation (1996-2000)
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005

7.3.4 Surrounding Noise Environment

7.3.4.1 *Location of the Measurement Points*

In order to assess the existing levels of surrounding noise in the perimeter of the site that has been designated for the project implementation, eight measurement points were selected. They are the following:

- Point 1 2640 Juchereau Street;
- Point 2 2716 Hocquart Street;
- Point 3 2639 Couture Street;
- Point 4 north end of Mathias Street;
- Point 5 1804 Beaulieu Street;
- Point 6 1880, chemin de la Réserve;
- Point 7 2218, chemin de la Réserve;
- Point 8 2310 Hébert Street.

These measurement points are located at the homes closest to the implementation sites and/or at spots bordering on the nearest residential areas (Figure 7.3.6).

7.3.4.2 *Nature of the Measurements*

The measurements taken at each of the above-mentioned measurement points consist of statistical analyses of the continuous noise levels during 60-minute periods. These analyses were gathered during the day and night on June 13 and 14, as well as on July 18 and 19, 2001. Measurements were taken during the day between 10 a.m. and 5:30 p.m. and during the night between 10 p.m. and 3 a.m. In addition, a measurement was taken at point 8 for a continuous 24-hour period.

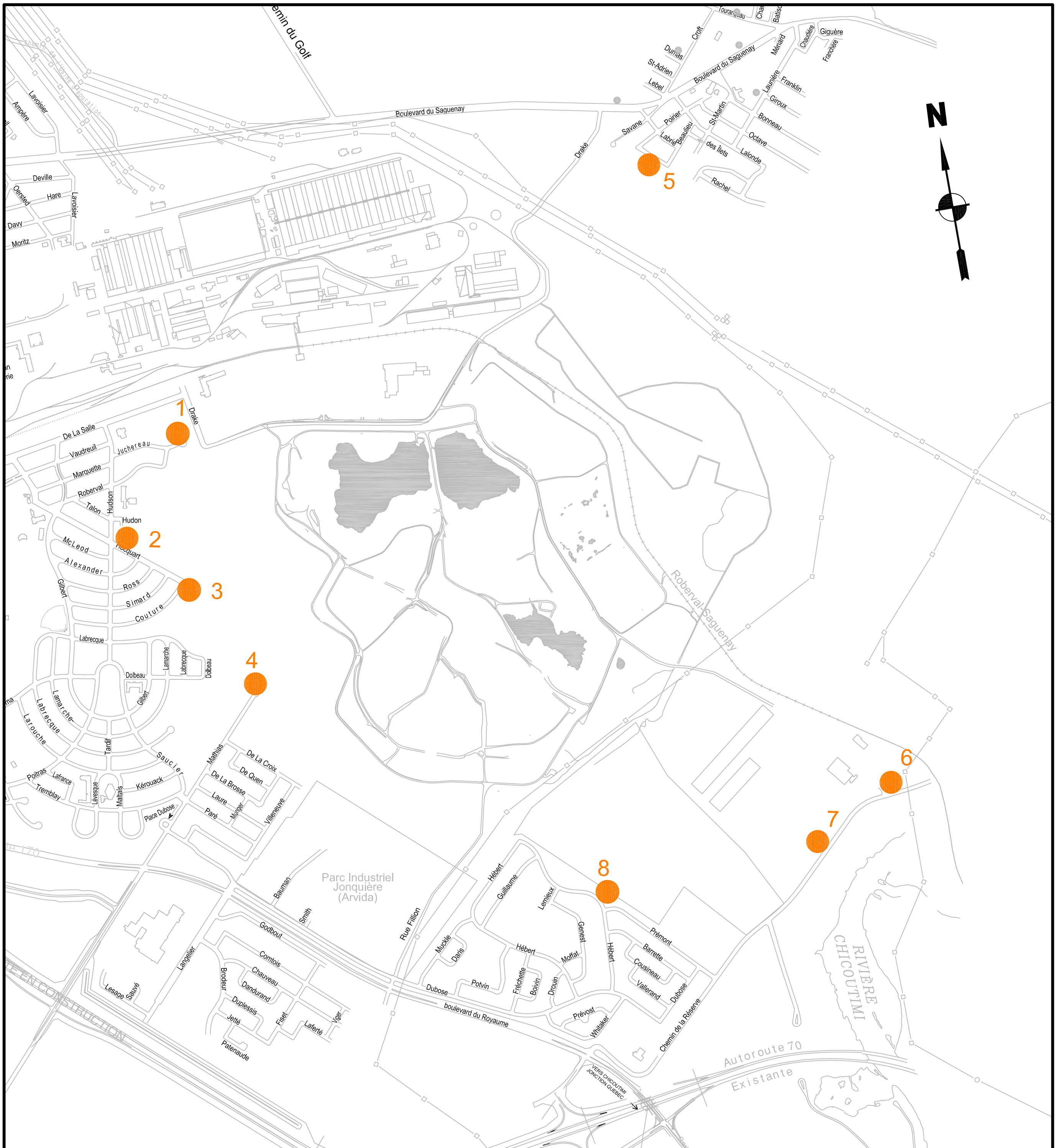
For each measurement, a microphone was placed at a height of 1.5 metres above the ground and more than 3.5 metres away from any reflective surface, wall or obstacle.

7.3.4.3 *Measuring Instrumentation*

The instrumentation used to measure noise consisted of the following equipment:

- an integrating sound level meter (ONO SOKKI, model 5120, type I);
- a sound analyzer (FFT 01dB)

This instrumentation was calibrated before and after each measurement was taken using Bruël & Kjaer standard light sources, models 4230 and 4231.



Légende :

Point de mesure

Échelle: 1: 25 000

Source du plan: Service technique, Ville de Jonquière

ALCAN

Localisation des points de mesure du climat sonore

TECSULT

Projet : **14041**

Date : **Septembre 2005**

Figure : **7.3.6**

14041_Figure_7.3.6_2005-09_fm.dwg

7.3.6 Correspondence Table

Légende	Legend
Point de mesure	Measurement point
Source du plan : Service technique, Ville de Jonquière	Plan provided by: City of Jonquière, Engineering Department
Échelle 1 : 25 000	Scale 1: 25,000
Localisation des points de mesure du climat sonore	Location of noise environment measurement points
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005

7.3.4.4 *Weather Conditions*

The weather conditions that prevailed while measurements were being taken are indicated in Table 7.3.5.

Table 7.3.5 Weather Conditions During the Main Measurement Periods

DATE	TIME	WIND DIRECTION Speed in km/h	TEMPERATURE °C	% RELATIVE HUMIDITY
June 13	2 p.m.	NW at 10	25	68
June 14	1 a.m.	Light breeze	26	71
July 18	2 p.m.	NW at 5	24	66
July 19	1 a.m.	nil	13	79

7.3.4.5 *Noise Environment During the Day*

Table 7.3.6 indicates the key results of measurements taken during the day at the different measurement points. The surrounding noise levels (Leq) recorded are between 45.6 and 54.5 dBA. All the measurement points are located in urban areas made up mostly of single-family and two-family residential dwellings.

Table 7.3.6 Results of Noise Measurements Taken During the Day (dBA)

Measurement Point	Statistical Index					Leq Equivalent level
	L1% Noise Peaks	L10%	L50% Average Noise	L90%	L95% Background Noise	
1	59.1	56.0	54.0	51.9	51.2	54.5
2	53.0	50.2	48.1	46.0	45.4	48.5
3	52.8	49.3	47.4	45.0	44.5	47.0
4	53.6	47.4	44.7	43.1	42.7	45.9
5	57.3	53.4	50.0	47.4	46.7	51.1
6	64.1	55.8	52.3	43.7	41.0	53.5
7	63.2	54.7	52.0	43.2	42.8	53.1
8	59.6	52.6	42.6	38.1	36.7	50.6 (12h)

The noise detected at these points originates from two distinct sources. The first is the Jonquière complex and the second is the traffic on nearby streets.

At point 1, the noise coming from the Jonquière complex and the traffic on nearby streets (Drake Street) maintains an ambient noise level (Leq) of 54.5 dBA. While the measurements were being recorded, several trucks and light vehicles drove by on Drake Street along the home’s property line. The equivalent levels that were reached are attributable to these vehicles. Some of the noise at this point also comes from the metal scrap yard located along Drake Street. However, it appears that this plant was not operating at full capacity during the measurement period. The background noise (level reached or exceeded during 95% of the measurement period) holds steady at around

51dBa. The level of background noise measured is fully attributable to the engines waiting in the Jonquière complex rail yard.

At points 2 and 3, the audible noise comes mainly from traffic on nearby streets, which includes Hudson Street. This light traffic accounts for equivalent levels (Leq) of 48.5 and 47 dBA respectively. The background noise is created by operations at the Jonquière complex. These levels were relatively the same at the two measurement points (45.4 and 44.5 dBA).

At point 4 (Mathias Street), the daytime Leq level is 45.9 dBA. It should be noted that the fact that this point is located at the end of a dead-end street decreases the impact of the sound of traffic. Again, the background noise comes from the Jonquière complex, which is located 1.3 km away. However, the noise of distant traffic on Royaume Boulevard also contributes to the recorded level of 42.7 dBA.

At point 5 (Beaulieu Street), the ambient Leq level is 51.1 dBA. The level of ambient noise (Leq) at this location is mostly attributable to the traffic on Saguenay Boulevard. In terms of background noise, the value detected during the daytime is 46.7 dBA.

Points 6 and 7, which are located along chemin de la Réserve, have noise levels in the range of 53 dBA. At both measurement points, part of the audible noise comes from another nearby plant. Noise from this plant is heard particularly at point 6. At point 7, noise is detected from another source that can be traced to Alcan operations in the distance. The levels of background noise at these two measurement points are essentially the same i.e. between 41 and 43 dBA.

Measurements recorded over a 24-hour period at point 8 (Hébert Street) (figure 7.3.6) indicate ambient noise levels (Leq) between 43.6 and 60.3 dBA during the daytime (7 a.m. to 7 p.m.). Had it not been for a F-18 jet that flew by, resulting in a Leq of 60.3 dBA for a one-hour period, the total recorded values would have been lower than 49.1 dBA. Noise in this area comes from distant traffic on Royaume Boulevard and from quarry operations along chemin de la Réserve. As for background noise levels, they are generally below 40 dBA.

In summary, during the day the equivalent levels recorded are mainly attributable to traffic-related noise peaks. In most of the residential areas, with the exception of homes along the edge of chemin de la Réserve, the source of background noise can be traced to operations at the Jonquière complex. However, the levels reached vary depending on the distance between the complex and the residential areas in question.

7.3.4.6 *Noise Environment During the Night*

At night, the ambient noise levels in the residential areas closest to the complex vary only slightly from the levels recorded during the day (Table 7.3.7). Some points (points 1 and 4) even have values that are higher than those recorded during the day. The sources of noise detected at all the measurement points remain operations at the Jonquière complex and traffic in the area. However, this latter source is less significant since the noise generated by railway operations at the Jonquière complex seemed more discernible depending on the measurement period and the location.

Table 7.3.7 Results of Noise Measurements Taken at Night (dBA)

Measurement Point	Statistical Index					Leq Equivalent level
	L1% Noise Peaks	L10%	L50% Average Noise	L90%	L95% Background Noise	
1	60.0	58.2	56.1	54.0	53.5	56.4
2	58.2	47.0	44.1	42.6	42.3	47.1
3	51.1	46.7	44.6	43.5	43.2	45.6
4	52.0	48.6	45.8	44.1	43.7	46.6
5	49.0	44.4	41.4	39.6	39.2	42.5
6	63.8	54.8	51.1	49.7	49.4	54.1
7	60.7	49	46.2	41.3	40.9	48.2
8	51.0	46.3	42.6	39.2	38.3	44.0 (12h)

At point 1, the ambient noise level (Leq) is 56.4 dBA, nearly 2.0 dBA higher than the level recorded during the day. It appears that the increase in ambient noise is due mainly to the overall increase in background noise in the area, which also intensifies by about 2.0 dBA in comparison to the daytime level. These increases result from more extensive railway operations at the Jonquière complex.

At point 2, the ambient noise level (Leq) is slightly lower (47.1 dBA) than the daytime level despite a significant increase in the noise peak (L1%). This brief noise occurrence did not, however, have a significant impact on the recorded Leq level. A more significant decrease was detected in terms of background noise, which abated by almost 3 dBA.

At point 3, the ambient noise level (Leq) is lower than the daytime levels; the recorded variance is about 1.5 dBA. However, the background noise levels are close to those recorded during the day and result from operations at the Jonquière complex.

At point 4 (Mathias Street), all of the statistical indices except the noise peaks (L1%) register increases over the daytime figures. However, these increases are slight and range from 0.5 (Leq) to 1 dBA (L95%).

The biggest decrease in noise levels is recorded at point 5. In fact, the ambient noise decreases by 9 dBA compared to during the day and stands at 42.5 dBA. The decrease in background noise is essentially the same (39.2 dBA). This decrease shows that noise from the Jonquière complex has little or no impact at this point.

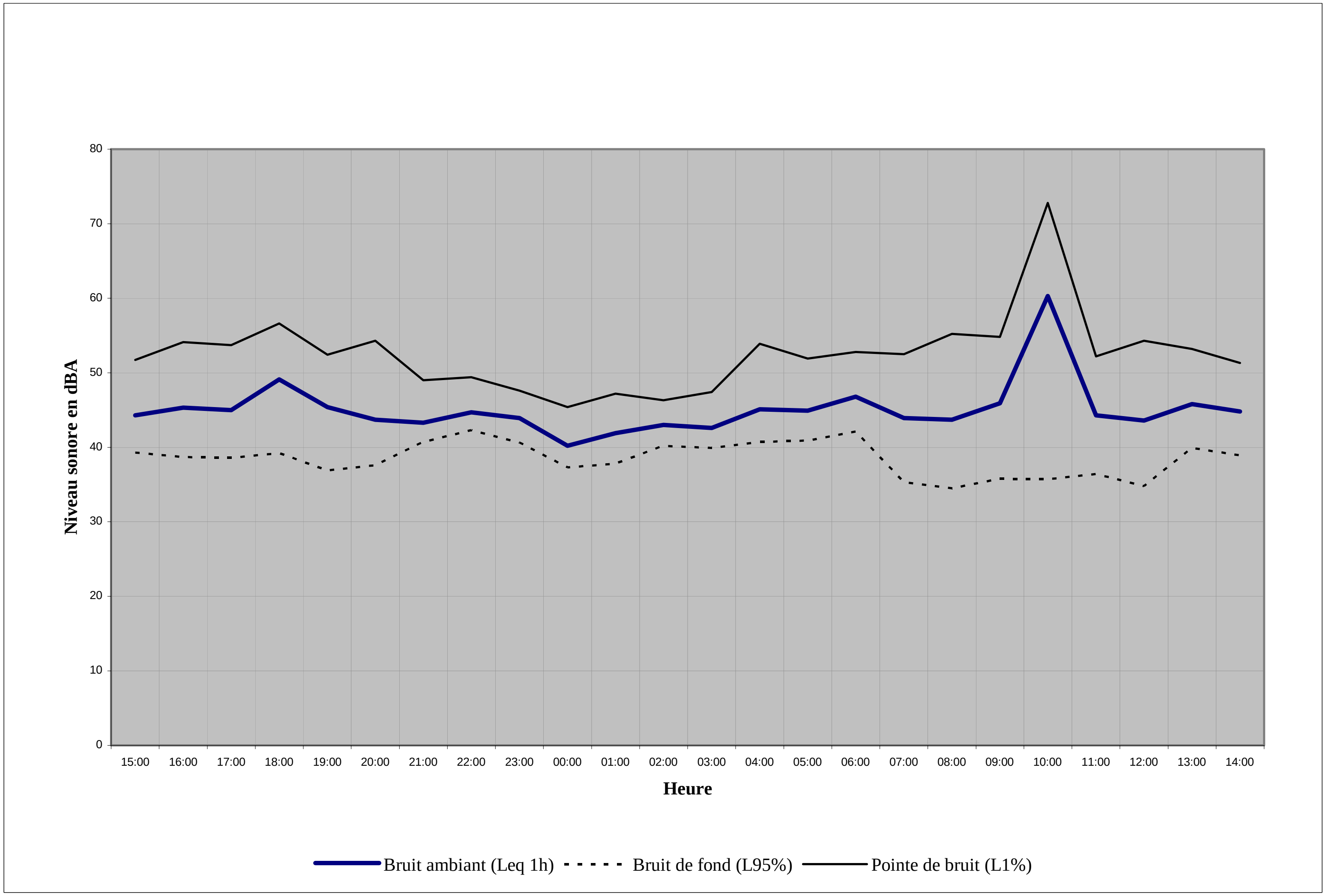
At point 6 (chemin de la Réserve), the ambient noise level (Leq) is higher at night (54.1 dBA) than during the day. The variance is attributable to the changing wind direction (carrying noise toward the homes), which causes noise from the Elkem Métal Canada Inc. plant to be heard more clearly. As well, observations carried out at the site showed that noise form the processing station next to this plant is particularly discernible during the night. Furthermore, the level of background noise also increases by 8.4 dBA.

At point 7 (chemin de la Réserve), the previously observed phenomenon does not occur. There is a slight decrease in both the ambient noise (Leq) and background noise (L95%) levels. Although the Elkem plant can still be heard, the noise comes mostly from local traffic and partly from distant traffic on Royaume Boulevard.

At point 8 (Hébert Street), the nighttime ambient noise levels (Leq) (7 p.m. to 7 a.m.) show little variance in comparison to the daytime levels. It appears that this location enjoys a noise environment that is fairly stable, as is indicated by the temporal noise trends presented in Figure 7.3.7.

In summary, the ambient noise levels during the night are generally the same as, and sometimes higher than, those recorded during the day. Observations carried out at the site tend to confirm that the increase results from heightened rail activity at the Jonquière complex. However, the slight variance observed shows the consistency in the area and confirms that the recorded levels can be attributed to the same source both at night and during the day.

Figure 7.3.7 Temporal Noise Trends at 2310 Hébert Street



7.3.7 Correspondence Table

Niveau sonore en dBA	Noise level in dBA
Heure	Time
Bruit ambiant (Leq 1 h)	Ambient noise (Leq 1 h)
Bruit de fond (L95%)	Background noise (L95%)
Pointe de bruit (L1%0	Noise peak (L1%)

7.3.5 Flora and Fauna

Most of the study area is located on Alcan property is designated for industrial use. In this context and given the locations chosen for the processing plant and the carbon and inert storage site, it turns out that the flora and fauna components play a limited role in the environmental concerns related to the project and do not seem likely to give rise to any major issues.

7.3.5.1 *Vegetation*

The nature of the land use – mostly agricultural and urban – is such that the forest covers most of the rocky outcrops, gullies and areas where soil drainage is poor.

The main forest ranges are located in the outer region between the Saguenay River and the urban areas and in the rocky outcrop areas within the urban area. The forest in this area is mainly deciduous, while softwood trees are found in the more arid areas.

The main types of trees that are found are white poplar, white birch, white willow, white alder, hawthorn, and fruit trees such as dogberry, hazelnut, Juneberry and golden currant. Heath plants are also found (mainly huckleberry and Labrador tea).

The transition zones between both the agricultural and urban areas and the residential and industrial areas are uncultivated. They usually contain grasses as well as a shrub layer that pervades the low areas.

There is no vegetation on the plant site itself, which is located in the industrial area.

7.3.5.2 *Wetlands*

Because of their location within the industrial perimeter, the plant and storage area construction sites are void of any wetlands. In fact, Highway 70 crosses over the area’s only wetlands to the south. The two bogs that are found here contain a fringe forest made up mostly of black spruce and larch. A shrub layer covers the middle section of these bogs.

7.3.5.3 *Wildlife*

The wildlife in the study area is directly related to the habitats that are available – in this case urban, peri-urban and agricultural areas. The Saguenay and Chicoutimi rivers, which are on the outskirts of the area, provide a more diverse mainstay for wildlife.

TERRESTRIAL WILDLIFE

The species of mammals that could live in these types of habitats are listed in Table 7.3.8, while the avifauna in the study area includes mostly field birds (Table 7.3.9). Various species of birds can also be found in the urban areas in question (Table 7.3.9).

In urban areas, small mammals and rodents (such as ground hogs, skunks, eastern chipmunks, squirrels) and various field birds (such as the American robin, the American crow, the house sparrow and the European starling) are most often seen.

In peri-urban and agricultural sectors, wildland, wooded areas and large areas covered by grassland and bogs provide habitat conditions suitable for more diversified wildlife, and many varieties of birds can been seen here.

Some habitats are deemed to be more abundant, as suggested by Savard in 1999. These include the bogs in the southern part of the study area, alder groves, uncultivated farmland, and white spruce forests that are found on the rocky outcrops in the grasslands.

The area in which the plant itself and the temporary waste storage site will be located is part of an industrial sector void of habitat conditions. The project will therefore not result any habitat loss.

FISH

The type of fish found in the Saguenay River include, in particular, yellow pike, ouananiche, Atlantic salmon, yellow perch, monk fish and northern pike (M. Gagnon, 1995). It is also believed that smelt spawning grounds can be found (Mr. Raynald Lefebvre, Société de la faune et des parcs du Québec, personal communication).

The following species were found in the Chicoutimi River, from the Garneau waterfall to the river mouth: rainbow smelt (at the mouth of the river), brook trout, ouananiche, long-nosed sucker, white sucker, lake chub, fallfish, and three-spine stickleback. The area downstream from Highway 170 also provides a potential spawning ground for brook trout (Mr. Marc Valentine, Société de la faune et des parcs du Québec, personal communication).

Table 7.3.8 Species of Mammals Likely to be Found in Urban, Peri-urban and Agricultural Areas

RODENTS	CARNIVORES	OTHERS
Groundhog (grassland, wildland)	Red fox (fields, wildland, wooded areas)	Bat (all areas)
Red squirrel (mixed wood, softwood)	Striped skunk (urban and agricultural areas, mixed-wood and deciduous forests)	Snowshoe hare (softwood, mixed wood)
Woodland jumping mouse (deciduous, softwood)	Weasel and ermine (mixed wood, agricultural)	
Meadow vole, meadow jumping mouse, star-nosed mole (uncultivated fields, wet areas)		
Red-backed vole, pigmy shrew, lemming-vole (bogs, wet areas)		
Muskrat (wet areas)		
Eastern chipmunk (deciduous, farming fields)		
Norway rat, house mouse (urban areas)		

Source: Prescott J. et al., 1982 and Cayer G. et al., 1991.

Table 7.3.9 Birds Likely to be Found in Urban and Peri-urban Areas in the Saguenay-Lac-Saint-Jean Region

BACKYARD BIRDS*	FEEDER BIRDS*	FIELD BIRDS**	
Rose-breasted grosbeak	White-crowned sparrow	Horned lark	Tree swallow
Ruby-throated hummingbird	American tree sparrow	Song sparrow	Bank swallow
Common nighthawk	White-throated sparrow	Savannah sparrow	Barn swallow
Veery	American goldfinch	Chipping sparrow	American robin
Cedar waxwing	Red-winged blackbird	Vesper sparrow	House sparrow
Chimney swift	Pine grosbeak	Red-winged blackbird	Yellow warbler
Eastern bluebird	Blue jay	American goldfinch	Rove dove
Northern mockingbird	Pileated woodpecker	American crow	Killdeer
Northern flicker	Evening grosbeak	American kestrel	Common grackle
Yellow-bellied sapsucker	Bohemian waxwing	European starling	Mourning dove
	Dark-eyed junco	Ring-billed gull	Eastern kingbird
	Black-capped chickadee	Bobolink	Brown-headed cowbird
	Downy woodpecker	Cliff swallow	
	Hairy woodpecker		
	Purple finch		
	Red-breasted nuthatch		
	Common redpoll		

Source: * Centre de Conservation de la Faune Ailée (C.C.F.A.). This list was revised by Mr. Germain Savard (Club des ornithologues amateurs du S.L.S.J.). Rare or migratory birds were not considered.
** Jobin et al. (1994)

7.3.5.4 *Endangered Species*

In Canada, certain animal and plant species are protected under the *Species at Risk Act* (SRA). More than 200 species are designated in one of the following categories: extirpated (no longer exist in Canada), endangered, threatened or of special concern. According to the Act, projects that are required to undergo a federal environmental assessment must take into consideration the effects of the project on listed species and their critical habitat.

Because of its location within the perimeter of an industrial facility that has existed for several decades, there is no risk that the project will affect an endangered land species or its habitat.

As for aquatic species, it should be noted that beluga whales from the St. Lawrence estuary population occasionally make their way into the Saguenay. Their status under the SRA has just changed; formerly considered an “endangered species”, they are now classified as a “threatened species”.

7.4 Human Environment Components

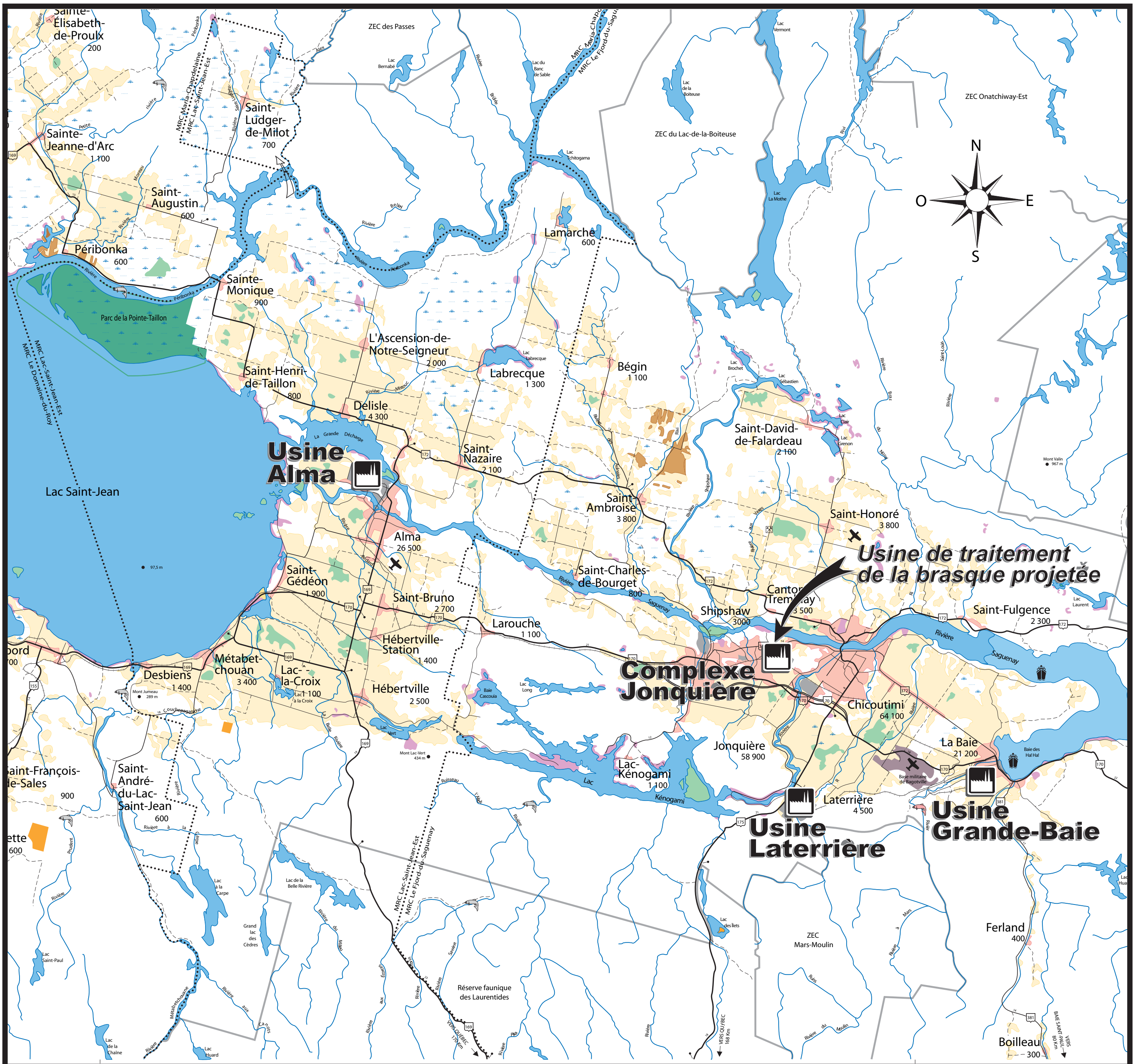
As a first step, it is important to situate the project in its regional setting. The space utilization and allotment aspects of the study zone are then described. However, in some cases, it is necessary to go beyond these aspects in order to identify the uses and resources that could be affected by the project. This is especially true in the case of the chemin de la Réserve and Chicoutimi River sector.

7.4.1 Regional Setting

The project is being implemented in a regional framework with a thin perimeter of lowlands, the most fertile of which are allotted to agriculture or sustain urban areas. Forests that cover all of the highlands outlining the valleys surround these agricultural and urban areas. The transportation network, much like the other major regional infrastructures, generally runs from west to east and follows the valley landscape.

Figure 7.4.1 provides a clear picture of the regional expanse and shows the network of aluminium plants in the region that will be serviced by the project.

The urban setting is changing to reflect the amalgamation trend that is currently permeating urban planning in Quebec. As a result, since the beginning of 2002, the cities of Jonquière, Chicoutimi, La Baie, Laterrière, as well as the municipalities of Shipshaw and Canton-Kénogami and part of Canton-Tremblay now make up the new city of Saguenay.



Source du plan: Madie, Écologie en action en Sagamie inc. 1992

LE GROUPE LEBLOND BOUCHARD

ALCAN

Situation régionale et localisation des alumineries

TECSULT Projet : 14041	Date : Septembre 2005	Figure : 7.4.1

14041-7.4.1.ai (15/09/05) pc_cm

7.4.1 Correspondence Table

Usine Alma	Alma plant
Complexe Jonquière	Jonquière complex
Usine de traitement de la brasque projetée	Proposed pot lining processing plant
Usine Laterrière	Laterrière plant
Usine Grande-Baie	Grande-Baie plant
Source du plan : Madie, Écologie en action en Sagamie inc. 1992	Plan provided by: Madie, Écologie en action en Sagamie inc. 1992
Situation régionale et localisation des alumineries	Regional site and location of aluminum plants
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005

7.4.2 Socio-economic Profile

Since the middle of the 1950s, the region's population has been affected by negative net migration (Pépin, 1969 and Côté, 1991). Recent statistics show that the region's population is increasingly ageing and its vitality is being swept away by a wave of interregional migration. The overall result is such that, since 1991, the population in the Saguenay-Lac-St-Jean region has decreased by 5.1%. According to l'Institut de la statistique du Québec, it stood at 278,519 in 2003, which is 3.7% of Quebec's population. The population decline should continue until 2021. According to statistics published by the municipality of Saguenay on its Internet site, there are currently 149, 168 residents in the municipality (68,529 in Chicoutimi, 60,412 in Jonquière, 20,227 in La Baie).

Table 7.4.1 shows the distribution of jobs by area of activity.

Table 7.4.1 Jobs Within Companies by Area of Activity in Saguenay

Areas	Jobs	%
Agriculture and fishing	946	1.3
Forestry and mining	1 418	1.9
Manufacturing and construction	16 907	22.9
Transportation and communications	4 201	5.7
Wholesale and retail businesses	13 007	17.6
Finance, insurance and real estate	2 164	2.9
Business services	4 988	6.8
Government services, health, education	20 533	27.8
Lodging and restaurants	5 175	7.0
Other services	4 551	6.2
Total	73 890	100

Source: Survey conducted by the CLD de Saguenay, 2002

The unemployment rate in the Saguenay-Lac-Saint-Jean region is systematically above the provincial average. According to statistics compiled by the ministère du Développement économique, de l'innovation et de l'exportation based on data obtained from Statistics Canada, the regional unemployment rate in 1994, 1999 and 2004 was 15.0, 11.6 and 11.9% respectively, compared to 12.4, 9.4 and 8.5% for Quebec as a whole.

The creation of new jobs in the region is therefore a means of controlling population losses while helping improve the unemployment situation.

7.4.3 Characterization of the Study Area

7.4.3.1 *Use by Non-Aboriginal People*

The characterization of the study area in terms of space utilization was done using photo interpretation and ground control. Space appropriation was taken from zoning plans for the cities of Jonquière and Chicoutimi, which comply with the development plan in effect within the M.R.C. Le Fjord-du-Saguenay. Figure 7.4.2 shows land use and allocation within the study area. Figure 7.4.3 rounds out this information by illustrating land use and organization within the chemin de la Réserve sector.

The receiving environment is part of Alcan's industrial facilities at its Jonquière complex. The areas mainly affected by the project are therefore urban and peri-urban. The territory within which the proposed plant will be located is designated solely for industrial purposes.

The two sites are found in the urban section of the city of Saguenay (Jonquière sector). The Chicoutimi River yields a narrow strip of land that runs to chemin de la Réserve (Figure 7.4.3).

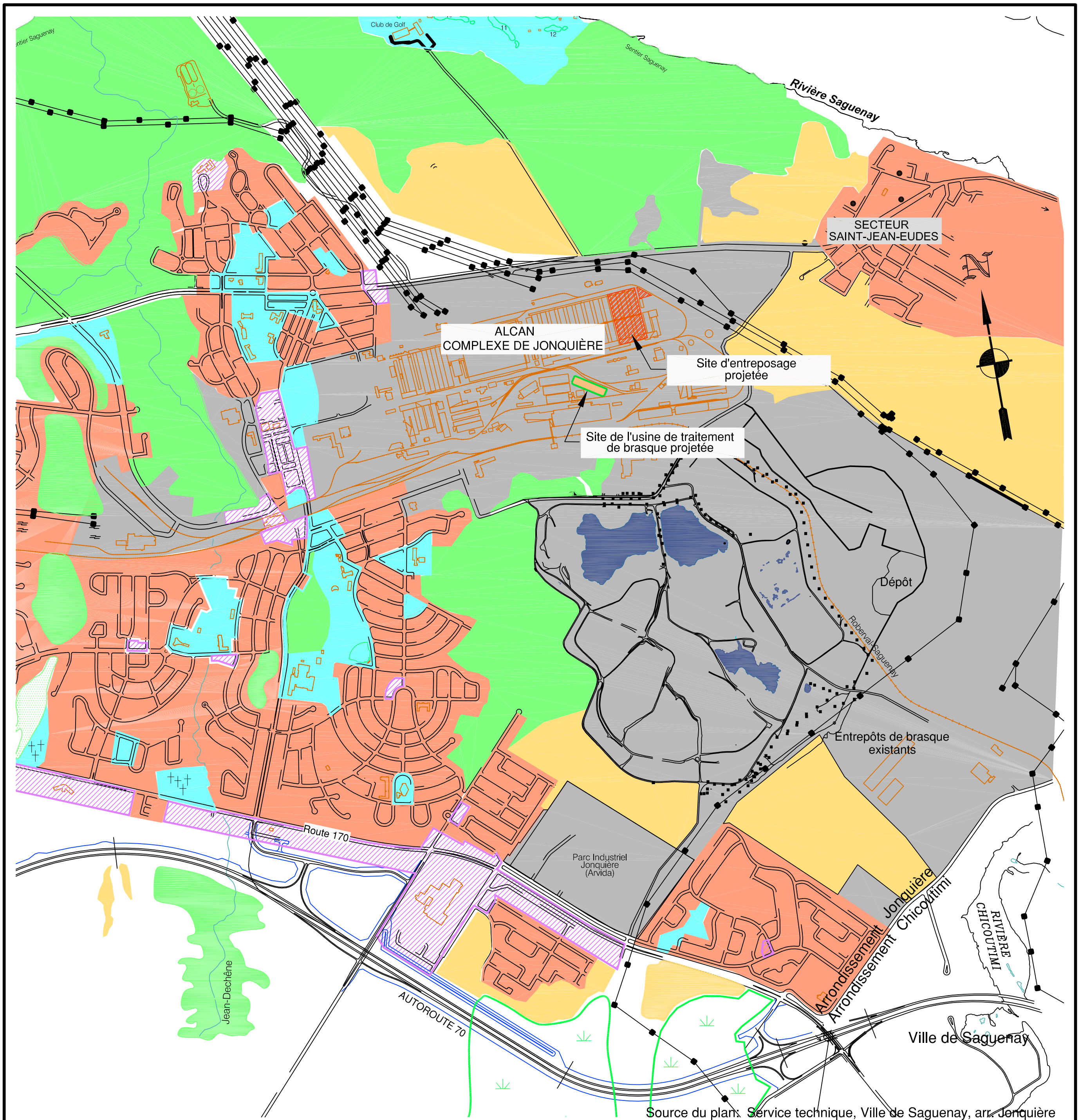
The industrial section of Alcan's Jonquière complex is surrounded by urban areas (residential, commercial, public and recreational) towards the south and west. South of the red clay disposal site, Arvida's industrial park ensures the continuity of the industrial allotment as far as Royaume Boulevard. To the south of this boulevard, the highway marks the boundary of the urban perimeter. Cultivated and uncultivated land can also be found here. Beyond the highway, agriculture completely takes over and development in this area is extensive.

Finally, to the north of the Jonquière complex's industrial area, the Saint-Jean-Eudes urban sector, forests and the Saguenay golf club can be seen as the landscape slopes toward the Saguenay River.

In the chemin de la Réserve and Chicoutimi River areas, uninterrupted residential housing is located at the edge of chemin de la Réserve. Rural residential housing is found next to the industrial areas along this boulevard (Figure 7.4.3).

7.4.3.2 *Use by Aboriginal People*

The project will be located on Alcan property within the municipality of Saguenay. The land and resources on this property are used strictly for industrial purposes and are not used for traditional purposes by Aboriginal people. Alcan is not aware of any land claims made against its property by Aboriginal groups.



Légende :

Résidentielle	Forêt et boisé
Industrielle	Tourbière
Commerciale	Friche
Publique	Agricole

LE GROUPE LEBLOND BOUCHARD

ALCAN

Utilisation et affectation du territoire
Ville de Saguenay (arrondissement Jonquière)

TECSULT

Projet : 14041

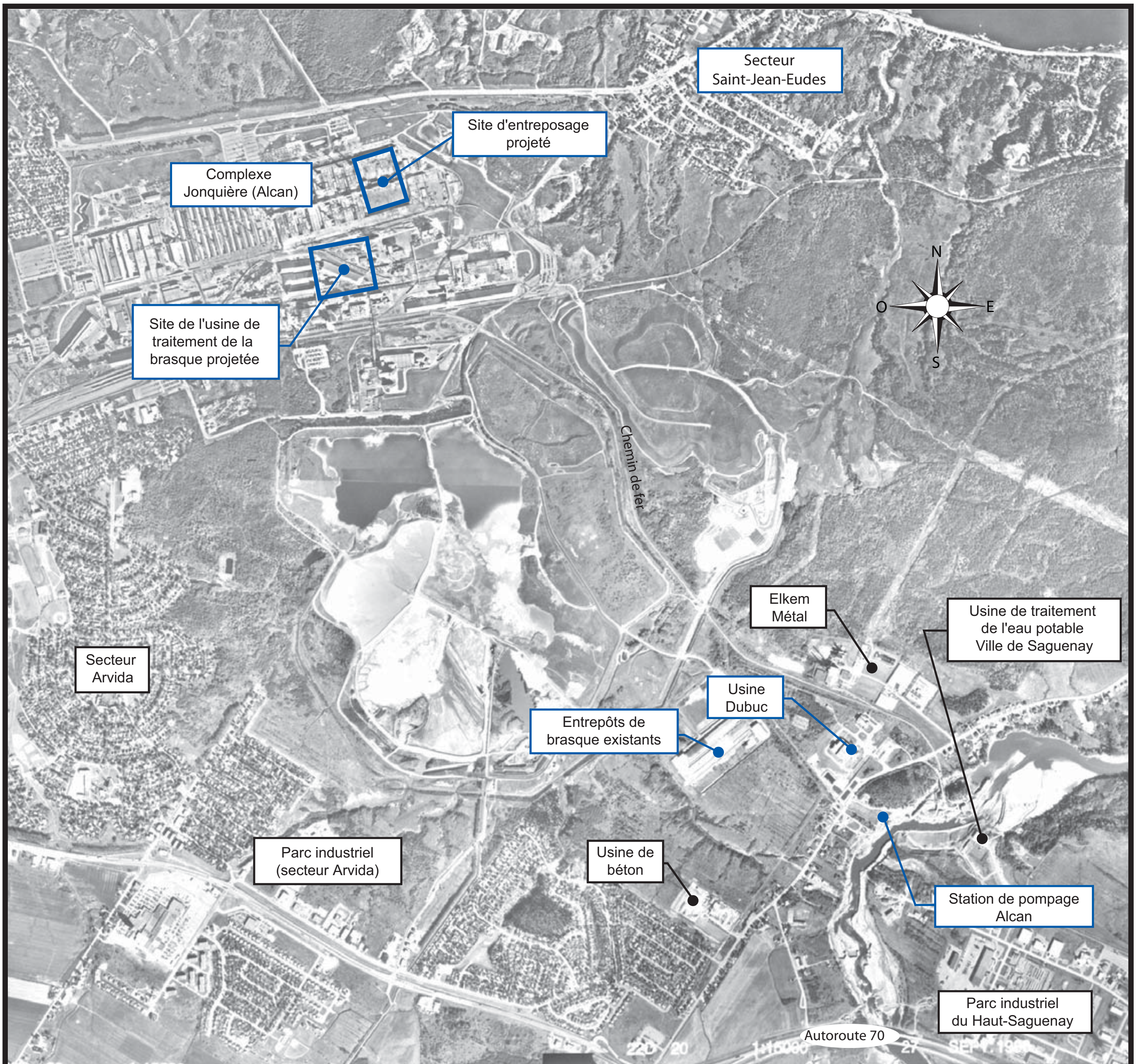
Date : Septembre 2005

Figure : 7.4.2

14041_Figure_7.4.2_2005-09_fm.dwg

7.4.2 Correspondence Table

Secteur Saint-Jean-Eudes	Saint-Jean-Eudes sector
Alcan Complexe de Jonquière	Alcan's Jonquière complex
Site d'entreposage projeté	Proposed storage site
Site de l'usine de traitement de la brasque projetée	Proposed site for pot lining processing plant
Dépôt	Repository
Entrepôts de brasque existants	Existing pot lining storage areas
Parc industriel Jonquière (Arvida)	Jonquière industrial park (Arvida)
Arrondissement Jonquière	Jonquière district
Arrondissement Chicoutimi	Chicoutimi district
Ville de Saguenay	City of Saguenay
Source du plan : Service technique, Ville de Saguenay, arr. Jonquière	Plan provided by: City of Saguenay (Jonquière district), Engineering Department
Légende	Legend
Résidentielle	Residential
Industrielle	Industrial
Commerciale	Commercial
Publique	Public
Forêt et boisé	Forest and wooded areas
Tourbière	Bog
Friche	Wildland
Agricole	Farmland
Utilisation et affectation du territoire Ville de Saguenay (arrondissement Jonquière)	Land use and allocation City of Saguenay (Jonquière district)
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005



Source: Photothèque québécoise, lignes Q96522, Q96215, photos 76, 77, 107, 109.

Échelle approximative: 1:25 000

LE GROUPE LEBLOND BOUCHARD

ALCAN

Utilisation du sol dans le secteur du Chemin de la Réserve

TECSULT

Projet : **14041**

Date : **Septembre 2005**

Figure : **7.4.3**

14041-7.4.3.ai (15/09/05) pc_cm

7.4.3 Correspondence Table

Complexe Jonquière (Alcan)	Jonquière complex (Alcan)
Site d'entreposage projeté	Proposed storage site
Secteur Saint-Jean-Eudes	Saint-Jean-Eudes sector
Site de l'usine de traitement de la brasque projetée	Proposed site for pot lining processing plant
Secteur Arvida	Arvida sector
Entrepôts de brasque existants	Existing pot lining storage areas
Usine Dubuc	Dubuc plant
Elkem Métal	Elkem Métal
Usine de traitement de l'eau potable Ville de Saguenay	Drinking water treatment plant City of Saguenay
Parc industriel (secteur Arvida)	Industrial park (Arvida sector)
Usine de béton	Cement plant
Station de pompage Alcan	Alcan pumping station
Parc industriel du Haut-Saguenay	Upper Saguenay industrial park
Autoroute 70	Highway 70
Échelle approximative 1 : 25 000	Approximate scale 1:25,000
Source : Photothèque québecoise, lignes Q96522, Q96215, photos 76, 77, 107, 109	Source: Quebec Photo Library, lines Q96522, Q96215, photos 76, 77, 107, 109
Utilisation du sol dans le secteur du chemin de la Réserve	Land use in the chemin de la Réserve sector
Projet : 14041	Project: 14041
Date : Septembre 2005	Date: September 2005

7.4.4 Infrastructure and Equipment

7.4.4.1 *Rail Network*

The Roberval-Saguenay rail network serves the proposed plant site and is linked to the Canadian National network, which serves the entire region and is in turn linked to the national network.

7.4.4.2 *Road Network*

REGIONAL NETWORK

The regional road network is built around Highway 170 and Highway 70, which form its east-west core. In Saint-Bruno, Highway 170 connects to Highway 169, which runs around Lac-Saint-Jean. Interregional links are provided by three highways: Highway 175 (linking the area to the centre of Quebec); Highway 172 (linking the area to the North Shore); and Highway 155 (providing access to the Mauricie region).

Access to the proposed plant site is provided by Highways 170 and 172, located respectively to the south and north of Alcan's Jonquière complex. The pot lining treatment plant can be accessed from Highway 170 via Fillion Street, which is located inside Arvida's industrial park.

Highway 170 from Alma accommodates regional traffic between Saguenay and Lac-Saint-Jean. It runs through 7.5 kilometres of Alma's urban sector (via Highway 169), the towns of Saint-Bruno and Larouche, and through 11.5 kilometres of the city of Jonquière. Close to 4,000 vehicles per day [10] were counted in both directions at the entrance to the city of Jonquière (intersection of Royaume Boulevard and Saguenay Boulevard). Between Saint-Bruno and Jonquière, it becomes a throughway. The throughway that bypasses Jonquière from this point was opened in 2002.

Highway 170 from La Baie also accommodates regional traffic between the Charlevoix region, the Lower Saguenay and the urban sector of Chicoutimi-Jonquière. From the city of La Baie to the proposed plant site, the highway runs through La Baie's urban area and crosses the rural and peri-urban areas to Mellon Boulevard; approximately 12,500 vehicles travel through this section in both directions each day.

Highway 172 is used by regional traffic between the Saguenay and the North Shore. It is located on the outskirts of the entrances to the villages of Sainte-Rose-du-Nord and Saint-Fulgence and crosses Chicoutimi and the Saguenay River. It provides access to the site either by way of Saguenay Boulevard and Drake Street or by way of Saint-Paul Boulevard and Highway 70.

10 Study conducted in 1996 by Quebec's ministère des Transports du Québec showing the number of vehicles counted between 7 a.m. and 7 p.m.

Highway 175 links the region to the centre of Quebec. It crosses the Réserve des Laurentides, runs along the urban community of Laterrière on Talbot Boulevard and connects to Highway 70 in Chicoutimi.

Finally, Highway 155 from the Mauricie region connects to Highway 169 at Chambord and hooks up with Highway 170 in saint-Bruno.

URBAN BOULEVARDS AND COLLECTOR ROADS

The following urban boulevards provide access to the site: Mellon Boulevard, Saguenay Boulevard, Royaume Boulevard (Highway 170) and chemin de la Réserve.

The urban setting is outlined below:

- Du Royaume Boulevard (Highway 170) is the most structured in Jonquière. In addition to providing access to numerous businesses and services, it accommodates a large part of the region's highway traffic. In fact, 12,000 to 13,000 vehicles per day were counted at the intersection of Mellon Boulevard and chemin de la Réserve. Much of this traffic has been rerouted to Highway 70 since it opened;
- Mellon Boulevard (from Highway 170 to de Lasalle Street) provides the main urban access to the site. It is a major collector road linking Highway 170 to Saguenay Boulevard, and runs through an urban area that revolves around commercial, community and residential activities. On average, approximately 4,400 vehicles use this road every day;
- Saguenay Boulevard (Highway 372) from Pont Dubuc to Drake Street covers 6 kilometres. It is a collector road linking the northern sections of Jonquière, Chicoutimi and La Baie. Although it bypasses the downtown core of these cities, it provides access to numerous businesses, residences, parks, etc. On average, approximately 4,000 to 5,000 vehicles travel this road in both directions each day on the section of Saguenay Boulevard next to the Alcan plant;
- Chemin de la Réserve is a road that runs north to south through the study area. A variety of traffic (heavy trucks and cars) shares this road that borders the cities of Jonquière and Chicoutimi.

7.4.4.3 *Water, Sewer, Electrical and Gas Systems*

The proposed plant site is fully serviced by water, sewer, electrical and gas systems. In terms of water service, Jonquière's municipal system services Drake Street and an Alcan system links to this system and then connects to a number of buildings in the industrial complex. The industrial water supply comes from Alcan's water intake near the Pont Arnaud station; a new line will link the plant to this intake.

The sewer systems (sanitary and rainwater) also service Drake Street and connect to the buildings in Alcan's industrial complex. The Jonquière complex's sanitary sewers are also connected to Jonquière's wastewater treatment facilities.

Electricity for the future spent pot lining processing plant will be supplied by Alcan's system. Finally, the industrial complex is connected to Gaz Métropolitain's natural gas system.

The main infrastructures located near the project are primarily the city of Chicoutimi water intake and an Alcan industrial water intake in the Chicoutimi River. These water intakes are located just upstream from the Pont Arnaud dam (Hydro Québec). Chicoutimi's drinking water treatment plant is located on the east bank while the Alcan pumping station is located on the west bank. In addition, the city of Jonquière has a drinking water intake in the Chicoutimi River, upstream from Highway 170 in the Garneau Waterfall sector.

7.5 Archaeological Potential

7.5.1 Geographic and Geomorphic Context

From a hypsometric standpoint, the site is located on a terrace that is slightly less than 150 metres above sea level. Observations carried out there show that the proposed plant site is located inside Alcan's industrial complex. No lakes or navigable waterways are found near the areas affected by the planned operations.

7.5.2 History of the Area

A little over 10,000 years ago, the Saguenay-Lac-Saint-Jean region was covered by Wisconsin ice caps (Richard, 1985). The melting glaciers led to the formation of an inland sea known as the Laflamme Sea; its maximum level is about 180 m above the current sea level (Parent et al., 1985).

Since this sea gradually receded within Saguenay's historical boundaries during the following millenniums, it can be concluded that given Laterrière's current altitude, it is unlikely that any humans settled here earlier than 8,000 years ago. Evidence found to date of the oldest human settlement in Saguenay-Lac-Saint-Jean dates back to 3,500 years ago (Girard and Langevin, 1996; Langevin, McCaffrey et al., 1995).

Fewer than ten archaeological sites have been found to date on the Upper Saguenay highlands. The material removed from these sites has not been sufficiently analyzed to allow us to figure out the history of prehistoric settlement along the edge of the Sables River and/or the Chicoutimi River to the south of its mouth, much less any settlement that occurred in the area between these two rivers. However, it must be recognized that in this area as well as in the Saguenay, virtually no archaeological searches have been carried out any distance form the existing bodies of water. It is therefore impossible to determine whether this accounts for the limited number of sites found to date, or whether the actual absence of settled land is responsible.

On a microscale, a review of aerial photos dating back to 1927, 1930, 1938, 1977 and 1980 (collection held by the Société historique du Saguenay, album 10.1, photos #1, #23 and #33) shows that these locations underwent only minor changes since the plant was set up in 1927. Overall, the area affected by the work does not seem to have undergone any drastic changes since being taken over by Alcan. Prior to this date, the 1927 and 1930 photos seem to indicate that this area was used for agricultural purposes. This confirms information to the effect that the lots were bought from farmers in 1925.

7.5.3 Aboriginal Way of Life

Given the region's climate (long, cold winters and short, mild summers), the eastern subarctic mixed forest prompted Aboriginal people to adopt a way of life based on the use of readily available resources (hunting, fishing, harvesting, gathering). This way of life hinged upon a small, segmented organization that responded to annual changes in climate conditions by forming groups in the winter and disbanding them in the summer. While winter encampments were set up quite a distance from major waterways, summer encampments were almost usually set up on the riverbanks and lakeshores along the main traffic systems (Martin and Rogers, 1969; Moreau, 1992). This proximity to water seemed essential for these nomads, both in terms of transportation needs and the use of fishery resources and the physiological need for liquids. As a result, the lakeshores and, to a lesser degree, the riverbanks were often areas that showed great archaeological potential.

7.5.4 Archaeological Potential of the Plant Site

7.5.4.1 *Prehistoric Period*

The recession of the Laflamme Sea began about 10,000 years ago, and the plant site emerged approximately 8,000 years ago. At first glance, it appears that during this period the area may have sparked the interest of future settlers. However, the distance between the Sables and Chicoutimi Rivers is large enough to greatly reduce the archaeological potential if, for example, someone planned to portage from the Chicoutimi River to the Sables River. In fact, it would be much easier to move downstream from one river to the next since these two rivers share the same tributaries and forks.

7.5.4.2 *Historical Period*

Research carried out at the Quebec archives in Chicoutimi failed to highlight any activities on the site other than those related to agriculture. The historical potential is therefore nil.

In conclusion, even though the sites have not undergone any major transformations over the past 70 years, there is nothing to indicate the one or more settlements were established by Aboriginal or other peoples. In short, the archaeological potential of the site appears to be extremely small. In this context, the planned development will, in all likelihood, have no effect on archaeological resources.

7.5.4.3 *Conclusion*

Given the site's limited potential and the fact that the locations in question have already been reworked for industrial purposes, the risk of impact on the architectural and heritage parameters is considered negligible.

8 IMPACT AND MITIGATION MEASURE ANALYSIS

This chapter describes the probable effects of the project on different environmental components. Where significant impacts could result from the project, mitigation measures were identified. The importance of residual impacts is assessed taking into account mitigation measures.

Cumulative Effects

As described in Section 5.3.3, the cumulative environmental effects that might result from the project, combined with other passed or future projects or work, were identified and assessed. Environmental effects were taken into consideration for the assessment of air emission cumulative effects and the impact of wastewater on the Saguenay River. Cumulative environmental effects were assessed following the method proposed by the Canadian Environmental Assessment Agency in the *Reference Guide for the Canadian Environmental Assessment Act: Addressing Cumulative Environmental Effects (November 1994).*

For the two environmental effects taken into account (air emission and impacts of wastewater), the effects of the project were first assessed within space and time boundaries as defined in section 5.3.4. Subsequently, the passed and current human activities and the future projects likely to affect these two environmental components were identified. However, in the study area, Alcan' facilities in Jonquière was the main activity and Alcan does not anticipate any large-scale projects, other than a spent pot lining processing plant. On the other hand, over the last few years, Söderberg potrooms of the Jonquière complex were closed.

Also, the public registry for authorization requests of the ministère du Développement durable, de l'Environnement et des Parcs du Québec (MDDEP) (Saguenay - Lac-Saint-Jean administrative region), was consulted to identify the recently approved projects and those for which the authorization request is being actioned in the study area. At the time of the consultation, no projects that may have a significant impact in the study area on both environmental components taken into account were identified. In the relevant sections of this chapter, the elements taken into account for the assessment of cumulative effects are identified.

The combined environmental effects were assessed taking into account environmental characteristics. As for direct impacts of the project, the significance of the cumulative effects was assessed considering the mitigation measures, when relevant.

8.1 Impacts on the Natural Environment

8.1.1 Components of the Physical Environment

The impacts on the natural environment are two-fold. First, they stem from the construction and existence of the plant and the temporary waste storage; secondly, from the transportation of raw materials to these sites, which are mostly hazardous material likely to affect the environment.

8.1.1.1 *Soil, Surface Water and Groundwater: Possibility of an Accidental Spill at the Site*

During construction, the machinery is the main source likely to have an impact on surface water and groundwater, if an accidental spill of petroleum products would occur. Considering the weak permeability of the soil, mostly composed of clay, we can assume that such an incident would not affect groundwater. The significance of such an impact would be minimal.

In case of a spill, the latter would be confined to the affected area and the spilled products would be recovered, as well as the affected environmental components (soil and water) in view of treatment or alienation. Inasmuch as the recovery of spilled substances and affected components would be complete, the impact on the environment would be nil.

8.1.1.2 *Soil, Surface Water and Groundwater: Possibility of an Accidental Spill During the Transportation of Materials*

Outside the plant site, it is mainly the possibility of an accidental spill during the transportation of spent pot lining that could affect the natural environment.

Section 8.4.5.3 describes the risks and circumstances of an accident implicating a pot lining container. The reader should refer to this section for a more detailed description.

Spent pot lining will be transported by train or truck in containers designed specifically to this effect. In case of a spent pot lining spill that would result in the contact of spent pot lining with water, a gas with methane, hydrogen and ammonia could be generated. The risk of explosion associated with such a spill would be practically nil, since the gas generated would be released in the free air and would not be confined to a closed space. The amount spilled could be as much as about 20 tons if the entire content of the container being transported would be spilled. Considering that the material would be quickly recovered, the impact would be minimal.

To mitigate the potential impacts, the implementation of the following measures is planned:

- The use of authorized carriers for transporting hazardous material;
- An agreement between the generator (other than Alcan) and the recipient (Alcan) to coordinate emergency responses in case of an accident during transportation;
- In the case of a spill, quick response in order to confine the affected air, and recover spilled materials and affected environmental components (soil, water).

Inasmuch as the recovery would be complete, the residual impact would be nil.

8.1.1.3 *Soil, Surface Water and Groundwater: Operating Activities*

Degradation of groundwater quality where the plant is located, likely to be related to these activities, is not anticipated since the process is designed to not generate liquid discharges on the site. The first portion of the process (crushing, grinding and stocking of crushed pot lining) is one that is dry. The second portion, the wet process (leaching, filtration, destruction of cyanide, evaporation and crystallization) will be in the building where the LCLL process takes place, designed to recover any accidental spill in trenches. The liquids recovered in these trenches may be recycled in the process. The only liquid discharge from the plant (blowdown water from the cooling system and blowdown water from the boiler) will be sent to the Jonquière complex water processing system (outfall sewer B).

Degradation of groundwater quality where the temporary waste storage container is located is not anticipated since the base of the storage container will be waterproofed using a layer of bituminous concrete, a geomembrane made of high-density polyethylene (HDPE) and a bentonitic geocomposite. It is anticipated that the hydraulic conductivity of the waterproofing system at the base of the container be largely smaller than $1x10^{-10}$ cm/s. Also, a waterproof membrane will cover the wastes as soon as they are placed in the container, which will eliminate, for all practical purposes, the infiltration of precipitations in the container. A drainage system will bring the small amount of leachate that could be generated to a waterproof recovery tank. The leachate will then be sent to the pot lining processing plant to be recycled.

The potential impact on the soil and surface and groundwater is therefore considered as nil.

8.1.2 Atmospheric Environment

8.1.2.1 *Construction Period*

During the construction period of the plant and the development of the storage site, the air quality could be affected because of the dust being lifted when transporting material and equipment and because of the traffic of workers.

If necessary, measures, such as applying dust depressants, will be taken to limit dust emission.

Considering the work that will be done in the Jonquière complex, the distance of the residential district with reference to the construction site, and finally the relatively short period during which the dust could be lifted, the impact of the construction on the air quality is considered minimal.

8.1.2.2 *Operating Period*

The impacts on air quality were assessed through atmospheric dispersion modelling of substances that will be released during the operation of the spent pot lining processing plant.

The substances that were part of the atmospheric dispersion modelling are particulates, ammonia (NH_3), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO). The particulates and the ammonia will be directly generated by the pot lining processing plant; as for SO_2, NO_2 and CO, they will come from combustible gas from the boiler.

The method employed for modelling as well as the results obtained are detailed in the following sections.

8.1.2.3 *Method*

METEOROLOGICAL DATA

In order to conduct the modelling, the following hourly meteorological data, for 1996 to 2000, were used:

- wind speed at the Jonquière station;
- wind direction at the Jonquière station;
- ambient temperature at the Jonquière station;
- Pasquill stability from the data taken at the Jonquière and Bagotville stations;

- mixing length at the Maniwaki station.

Most of the meteorological data used for the modelling comes from Environment Canada Atmospheric Environment Service (AES) Jonquière station. The Jonquière station seems the most appropriate since it allows for the assessment of concentrations with data that represents most the meteorological situation (wind direction and speed) that will prevail near the spent pot lining processing plant.

Data on cloud opacity, cloud coverage and ceiling are not available for the Jonquière station. This is why the corresponding data taken from the Bagotville airport station in Ville de la Baie were used to calculate the Pasquill stability required for the dispersion model.

Data on mixing length measured twice a day at the Maniwaki station was also used, this station is the one that represents best the Jonquière region. In fact, only two stations measure the mixing length in the province of Quebec, Maniwaki and Sept-Îles. The Maniwaki aerological system is similar however to this Saguenay region, Sept-Îles being highly influenced by its proximity to the Gulf of St-Lawrence. However, data on mixing length was adapted by Environment Canada at the Bagotville airport site. This data was then compiled by Environment Canada to obtain the stability classes required for the modelling.

All the data provided by Environment Canada, including the calculation of stability classes, was later validated and processed by TECSULT in order to make them compatible to the ISCST3 (Trinity, 1996) software.

TOPOGRAPHIC DATA

Topographic data for the area surrounding the spent pot lining processing plant was obtained from the ministère des Ressources naturelles du Québec topographic maps. The chart in Appendix E-1 shows the elevations of each receiver.

The land surrounding the future plant is relatively uneven. In fact, in a 16 km^2 radius of the plant, the altitude of the receivers vary from 10 to 130 metres, the majority (70%) vary from 90 to 130 metre high compared to sea level.

BUILDING DATA

The existence of buildings can affect air flow around these buildings and influence the plume configuration from a source. It is therefore necessary to take into account the building configuration when carrying out the modelling.

Data relating to the physical dimensions of buildings near sources, as well as the positioning and the elevation of the sources in comparison to the buildings, was entered in the BPIP software, developed by the Environment Protection Agency (EPA). The results are shown in Appendix E-2.

EMISSION SOURCE DATA

Emission source data is the fourth category of data. Data relating to emission rates and to source characteristics are set out in Appendix E-3. Drawings showing atmospheric emission sources (plan view and elevation drawing) are displayed in Appendix F.

SELECTION OF THE STUDY AREA

Modelling calculations were done in two steps:

- An initial modelling was first carried out by establishing an initial grid of receptors placed every 500 metres, on a distance of 5 km on either side of the plant, this aimed at determining the area where the highest concentrations will be measured;
- Results obtained from this initial modelling helped define that the highest results would be in a 4 km by 4 km radius of the plant. A second receiver grid covering this area and including receivers every 100 metres was later used to make more precise calculations around the plant.

The software used for these calculations is the ISCST3 software (Trinity, 1996), Release 2. One of the characteristics of this release is that it is able to integrate calculations made with COMPLEX-I, a software used to calculate concentrations in uneven land. The options chosen for the modelling are shown in Appendix E-3.

8.1.2.4 *Results – Total Concentrations of Suspended Particulates*

The spent pot lining processing plant will have 14 sources of particulate emission, the characteristics are shown in Appendix E-3. Corresponding soil level particulate concentrations were assessed for periods of 24 hours and on an annual basis.

Table 8.1.1 shows the maximum concentrations obtained by modelling for each meteorological data period and year used in the modelling outside the limits of the property. The maximum modeled values can naturally be found in different areas from one year to the next. The results are compared to current standards that are 150 $\mu g/m^3$ (daily average) and 70 $\mu g/m^3$ (yearly average).

Table 8.1.1 Total Modelled Maximum Particulate Concentrations

Period	Meteorological Data Year	Maximum Concentration (µg/m³)	Standard (µg/m³)	Standard Percentage (%)
24 hrs	1996	1.45	150	1.0
	1997	1.93		1.3
	1998	1.46		1.0
	1999	1.89		1.3
	2000	2.28		1.5
1 year	1996	0.13	70	0.2
	1997	0.13		0.2
	1998	0.12		0.2
	1999	0.12		0.2
	2000	0.12		0.2

The 50 maximum modelling results for 1996 to 2000 and the location of the receiver where these concentrations were calculated are shown in the Appendix E-4 table.

Figure 8.1.1 illustrates isograms of total particulate concentrations from the plant calculated on an annual basis for 2000 within a 2.0 km radius of the plant. Figures illustrating the isograms of total particulate concentration for 1996, 1997, 1998 and 1999 are shown in Appendix E-4.

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.

LÉGENDE :

- Courbes de concentrations
- Limite de propriété

ÉCHELLE 1 : 25 000

0 0,5 1,0 Km

ALCAN

CONCENTRATIONS MOYENNES ANNUELLES DE PARTICULES (µg/m³) - Année 2000

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

FIGURE : **8.1.1**

14041-8.1.1.ai (15/09/05) pc_cm

8.1.1 Correspondence Table

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES,QUÉBEC, 1994.	Source: MAP FROM THE MINISTÈRE DES RESSOURCES NATURELLES,QUEBEC, 1994.
Mètres	Metres
LÉGENDE	LEGEND
Courbes de concentrations	Concentration Curves
Limite de propriété	Property Limits
CONCENTRATIONS MOYENNES ANNUELLES DE PARTICULES (µg/m³) - Année 2000	ANNUAL AVERAGE PARTICLE CONCENTRATIONS (µg/m³) – Year 2000
ÉCHELLE 1 : 25 000	SCALE 1:25,000
Projet : 14041	Project: 14041
DATE Septembre 2005	DATE September 2005

Results shown in Table 8.1.1 show that the maximum daily concentrations assessed would be no more than 1.5% of ambient air standard for total particulates. Table 8.1.1 also shows that the maximum annual concentrations assessed would be approximately 0.2% of the annual ambient air standard for total particulates.

CUMULATIVE EFFECTS

For atmospheric emissions, the contribution of past and current human activities in the study area reflects the measurement data of contaminants in the ambient air. Data from the Quebec MDDEP air quality monitoring station in Parc Berthier, Jonquière, was used to this end. In the study area, Alcan's Jonquière complex is the main activity. As for future activities, Alcan does not anticipate any significant project, other than the pot lining processing plant, in the study area. On the other hand, over the last few years, Söderberg potrooms of the Jonquière complex were closed.

At the MDDEP station in Parc Berthier, Jonquière, the daily maximum total particulate concentrations recorded from 1996 to 2001 vary between 105 and 198 µg/m^3, which is 70 to 132% of the standard. As for the annual average concentrations[11] recorded, these vary between 29.6 and 38.0 µg/m^3, i.e. 42 and 54% of the annual standard.

At one of Alcan's air quality measuring stations located in the same area as the MDDEP station, the particulate concentrations measured during the same period vary between 27.4 and 38.6 µg/m^3 ; the average value for 2004, during which the last four Söderberg potrooms were closed, is 29,5 µg/m^3 and lower than 27 µg/m^3 in 2005 (January to June). Alcan's daily measures reveal that the 150 µg/m^3 standard was exceeded for the first time only on May 25, 2000[12].

Table 8.1.2 shows the assessment of particulate concentrations from the pot lining processing plant to the corresponding receiver at the MDDEP's air quality monitoring station in Jonquière – Parc Berthier. These results show that the potential contribution of the pot lining processing plant as for concentration of total particulates, which would be recorded at this station, would be between 0.1 and 0.4% of the calculated values between 1996 and 2000.

11 Geometric average of concentrations measured on a daily basis.
12 Personal communication with Mr. Robert Desgagnés from Alcan, on 29-07-05.

Table 8.1.2 Comparison of Maximum Modelled Particulate Concentrations at the Parc Berthier Station with Measured Results from 1996 to 2000

Period	Meteorological Data Year	Maximum Modelled Concentration in Parc Berthier (µg/m^3)	Measured Concentration in Parc Berthier (µg/m^3)	Contribution from the New Source (%)
24 h	1996	0.27	198	0.1
	1997	0.46	137	0.3
	1998	0.37	161	0.2
	1999	0.50	142	0.4
	2000	0.60	150	0.4
1 an	1996	0.07	36,3	0.2
	1997	0.07	29,8	0.2
	1998	0.06	32,7	0.2
	1999	0.06	38,0	0.2
	2000	0.06	29,6	0.2

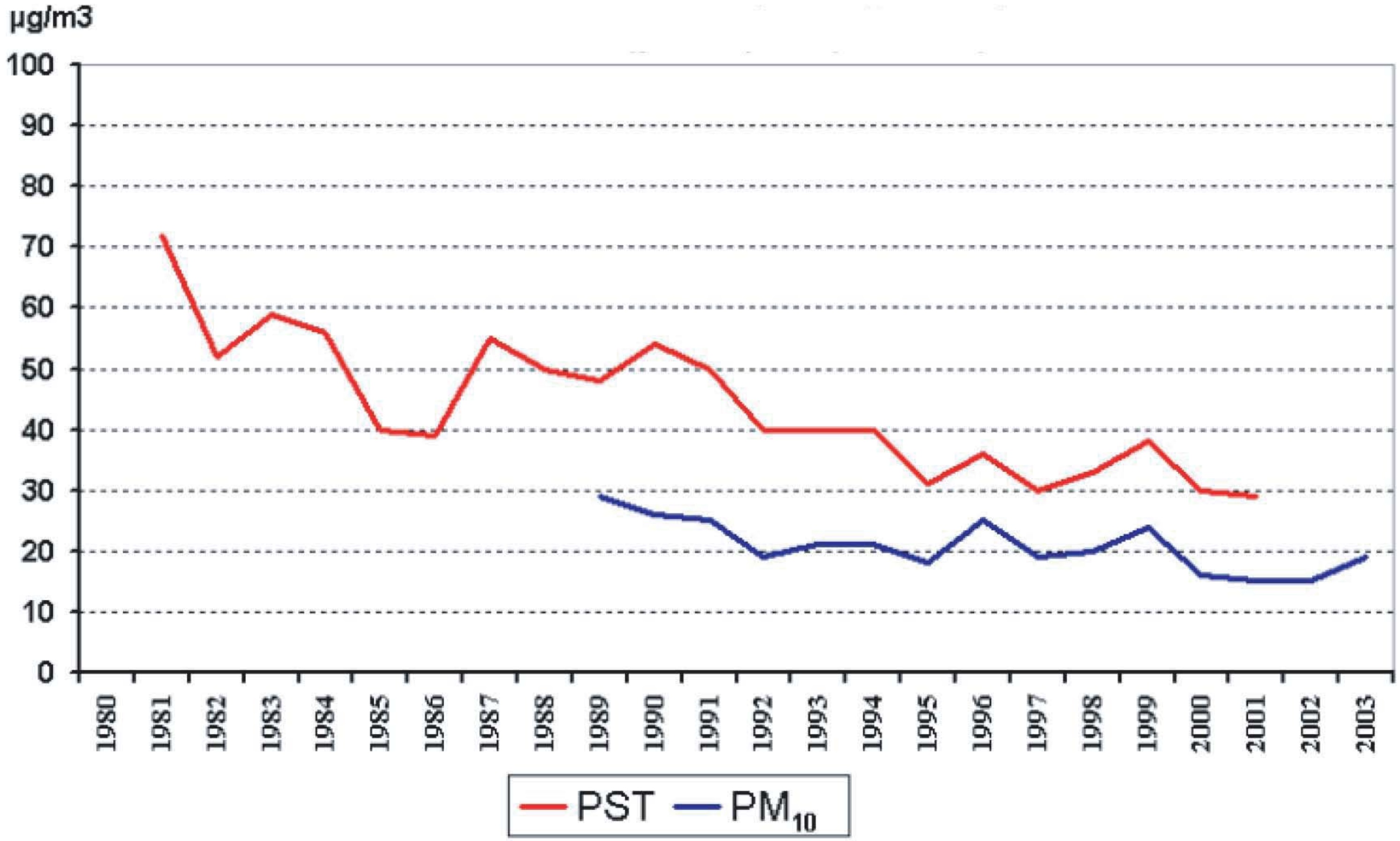
The conclusion drawn from the above-mentioned data is that the concentrations of total particulates in the area where the pot lining processing plant will be built exceed occasionally the current standards. According to modelling results, the potential contribution of emissions from the pot lining processing plant to the concentrations of all particulates would however not be very significant. The impact of the project on the concentration of particulates in the environment can therefore be considered as minimal.

Air quality data from the MDDEP's station in Parc Berthier, Jonquière, show a falling tendency of concentrations of total particulates between 1981 and 2001[13.](see Figure 8.1.2). This reduction would be attributable, among other things, to the closure of 10 out of 14 Söderberg potrooms in the Jonquière complex and to the improved operation mode of the potrooms. According to 2002 data, particulate emissions from the last four Söderberg potrooms still in operation was 1,600 tons annually and were approximately 40% of total emissions from the potrooms in operation at the Jonquière complex. The total particulate emissions that would come from the pot lining processing plant would be less than 10 tons annually. These last four Söderberg potrooms were closed indefinitely in April 2004, so it would be justified to assume that the corresponding air quality improvement trend, already noticed at the end of 2004, and beginning of 2005, should be confirmed.

We can expect that additional emissions from the project will not change this air quality improvement trend.

13 Total particulates are no longer measured at the Parc Berthier station, since the beginning of 2002.

Évolution des concentrations moyennes des particules totales et des particules MP10 à la station du Parc Berthier à Jonquière (1980-2003)



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Évolution des concentrations moyennes des particules totales et des particules MP10 à la station du Parc Berthier à Jonquière (1980-2003)

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

Fig. **8.1.2**

14041-8.1.2.ai (15/09/05) pc_cm

8.1.2 Correspondence Table

PROJET : 14041	PROJECT: 14041
Évolution des concentrations moyennes des particules totales et des particules MP10 à la station du Parc Berthier à Jonquière (1980-2003)	Trend for Average Total Particle and PM 10 Particulates Concentrations (Annual Averages) at the Parc Berthier Station in Jonquière
Évolution des concentrations moyennes des particules totales et des particules MP10à la station du Parc Berthier à Jonquière (1980-2003)	Trend for Average Total Particle and PM 10 Particulates Concentrations (Annual Averages) at the Parc Berthier Station in Jonquière
DATE : Septembre 2005	DATE: September 2005

8.1.2.5 *Results - Concentrations of Fine Particulates*

As part of the project assessment process under the Quebec *Environment Quality Act*, the MDDEP's Direction du suivi de l'état de l'environnement[14] specified that the criterion for fine particulates (diameter of less than 2.5 µm, PM 2.5) developed by the Canadian Council of Ministers of the Environment (CCME) would, in this case, be taken into account (see Appendix D). According to this reference, the 98^{th} percentile value distributions of the 24-hour concentration averaged over three consecutive years must not exceed 30 µg/m^3.

To assess the concentration of fine particulates (PM 2.5) in the ambient air resulting from the future spent pot lining processing plant's emission sources, it was considered that the diameter of all particulates released by the plant would be less than 2.5 µm. This very safe assumption is based on the fact that, for the purposes of this estimate, there are grounds to consider that the efficiency of the removal bag filters is 100% for particulates larger than 2.5 µm. However, for roof ventilators (10 sources), the emission rate assessment includes all particulates that can be found in the plant's ambient air, i.e. particulates larger than 2.5 µm in diameter. Thus, the assumption for the emission rate of fine particulates assessment remains conservative.

Table 8.1.3 shows the values obtained by modelling. The concentration for the 98^{th} percentile is the highest value among all six values assessed for each receiver. Results show that the potential contribution of the spent pot lining plant to the concentration of fine particulates in the ambient air would represent less than 3% of the standard.

Table 8.1.3 Modelled Concentrations of Particulates Smaller than 2,5 µm (PM 2,5)

Period	Meteorological Data Year	Concentration 98^{th} Percentile (µg/m^3)	Average over 3 Years (µg/m^3)	Criterion (µg/m^3)	Criterion Percentage (%)
24 hrs	1996	0.64		30	
	1997	0.97			
	1998	0.85	0.82(1)		2.7
	1999	0.65	0.82(2)		2.7
	2000	0.76	0.75(3)		2.5

(1) Averaged values for the 98^{th} percentile for 1996, 1997 and 1998
(2) Averaged values for the 98^{th} percentile for 1997, 1998 and 1999
(3) Averaged values for the 98^{th} percentile for 1998, 1999 and 2000

14 Ministère du développement durable, de l'environnement et des parcs (formerly ministère de l'Environnement (MENV)).

CUMULATIVE EFFECTS

For the assessment of cumulative effects of fine particulates in the ambient air, the same considerations as in Section 8.1.2.4 were taken into account.

If we assume that 60% of the particulates in suspension smaller than 10 µm in diameter are particulates smaller than 2.5 µm, then we can estimate that, between 1996 and 2003, the concentration of PM 2.5 (98^{th} percentile) in the ambient air at the MDDEP Parc Berthier station should have varied from 31 to 62 µg/m^3. Averages over three consecutive years would have varied from 38 to 54 µg/m^3. These values represent 127 and 180% of the proposed reference.

According the measurement of PM 10 at the Alcan measuring station (Berthier) in 2004, the value of the 98^{th} percentile is 51.8 µg/m^3, which represents a 98^{e} percentile concentration of 34.9 µg/m^3 for PM 2.5.

Table 8.1.4 shows the assessment of the contribution of plant emissions to the fine particulate concentration for the receiver based on the position of the MDDEP's air quality monitoring station in Jonquière – Parc Berthier. This data shows that the potential maximum contribution from the pot lining processing plant for fine particulate concentration (PM 2.5), which would be recorded at this station, would be between 0.5 and 0.6% of concentrations of PM 2.5 estimated from PM 10 concentrations measured between 1996 and 2000 (98^{th} percentile). If we consider the estimated values from 2001 to 2003, the potential maximum contribution from the pot lining processing plant to concentrations of PM 2.5 would vary between 0.7 and 0.9%.

Table 8.1.4 Modelled Concentration of Particulates Smaller than 2.5 µm (PM 2.5) at the Parc Berthier Station

Period	Meteorological Data Year	Concentration 98^{th} Percentile (µg/m^3)	Three-Year Average (µg/m^3)	Estimated Concentration at Parc Berthier (µg/m^3)	New Source Contribution (%)
24 hrs	1996	0.40			
	1997	0.32			
	1998	0.30	0.34	54 (1)	0.6
	1999	0.33	0.32	52 (2)	0.6
	2000	0.21	0.28	51 (3)	0.5
	2001			43 (4)	
	2002			39 (5)	
	2003			38 (6)	

(1) Averaged values for the 98^{th} percentile for 1996, 1997 and 1998
(2) Averaged values for the 98^{th} percentile for 1997, 1998 and 1999
(3) Averaged values for the 98^{th} percentile for 1998, 1999 and 2000
(4) Averaged values for the 98^{th} percentile for 1999, 2000 and 2001
(5) Averaged values for the 98^{th} percentile for 2000, 2001 and 2002
(6) Averaged values for the 98^{th} percentile for 2001, 2002 and 2003

Air quality data from the Parc Berthier station in Jonquière shows a downtrend for fine particulate concentrations between 1981 and 2003 (see Figure 8.1.3). As for total particulates, the closure of the last four Söderberg potrooms, in April 2004, gives reason to believe that the fine particulate concentrations in the ambient air for the area where the pot lining processing plant will be built should decrease. Also, as the modelling results show, the potential contribution of emissions from the pot lining processing plant to concentrations of fine particulates would not be very significant; we can therefore expect that the additional emissions from the project will not change the continued improvement trend of air quality in the region.

8.1.2.6 *Results – Ammonia Concentrations*

The spent pot lining processing plant will have six ammonia atmospheric emission sources. As described in Section 3.2.2.1, an incinerator will be installed at the hot water heater air vent outflow. The integration of the incinerator constitutes a mitigation measure in order to limit the ammonia emissions, in the air, from the spent pot lining processing plant.

Ammonia is a colorless gas that, at high concentrations, irritates the eyes and respiratory tracts. This gas has an intense odour. The detection threshold for the odour of ammonia, as noted in references, is less than 5 ppm (ACGIH, 1991).

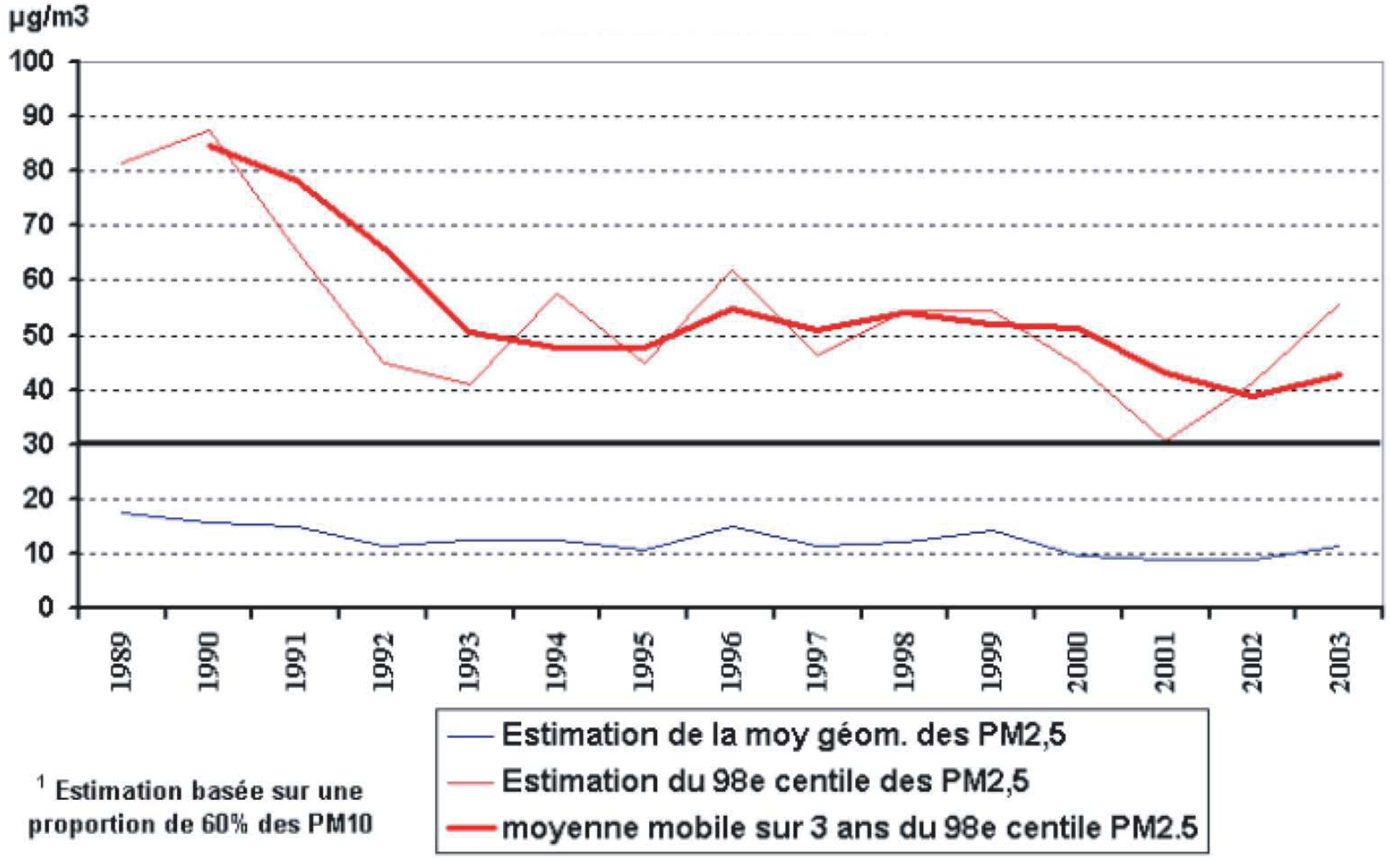
The characteristics of these sources are shown in Appendix E-3. For ammonia, the ground-level concentrations resulting from emissions from the future plant were assessed for one-hour periods and on an annual basis.

Table 8.1.5 shows the maximum ammonia concentrations obtained by modelling, outside the property limits. These concentrations are compared to the criteria of ambient air specified by the MDDEP's Direction du suivi de l'état de l'environnement as part of this project (see Appendix D), they are 3,200 $\mu g/m^3$ for one hour and 100 $\mu g/m^3$ annually.

Table 8.1.5 Modelled Maximum Concentrations of Ammonia

Period	Meteorological Data Year	Maximum Concentration ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Criterion Percentage (%)
1 hour	1996	412	3,200	12.9
	1997	406		12.7
	1998	414		12.9
	1999	409		12.8
	2000	395		12.3
1 year	1996	2.6	100	2.6
	1997	2.3		2.3
	1998	2.4		2.4
	1999	2.3		2.3
	2000	2.3		2.3

Évolution de l'estimation(1) du 98e centile des particules fines (MP 2,5) à la station du Parc Berthier à Jonquière



[1] Estimation basée sur une proportion de 60% des PM10

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Évolution de l'estimation(1) du 98e centile des particules fines (MP 2,5) à la station du Parc Berthier à Jonquière

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

Fig. **8.1.3**

14041-8.1.3.ai (15/09/05) pc_cm

8.1.3 Correspondence Table

PROJET : 14041	PROJECT: 14041
Évolution de l'estimation(1) du 98e centile des particules fines (MP 2,5) à la station du Parc Berthier à Jonquière	Estimated Trend for the 98e Percentile of Fine Particles (PM 2.5) at the Parc Berthier Station in Jonquière
Estimation basée sur une proportion de 60% des PM10	Estimate based on a percentage of 60% of PM10.
Estimation de la moy géom. Des PM2,5 Estimation du 98e centile des PM2,5 Moyenne mobile sur les 3 ans du 98e centile PM2,5	Estimated geometric average of PM2.5 Estimated 98th percentile of PM2.5 Moving average over 3 years for the 98th percentile of PM2.5
Évolution de l'estimation(1) du 98e centile des particules fines (MP 2,5) à la station du Parc Berthier à Jonquière	Estimated Trend for the 98e Percentile of Fine Particles (PM 2.5) at the Parc Berthier Station in Jonquière
DATE : Septembre 2005	DATE: September 2005

The maximum concentrations obtained would be at the most 12.9% of the ammonia hourly criterion. These results show that the use of incinerators helps reduce the maximum ammonia concentration by approximately 70% in the ambient air outside the property limits compared to situations where there are no incinerators.

Figure 8.1.4 illustrates the isograms of ammonia concentrations calculated on an annual basis for 1996 in the area within a 2 km radius of the plant. Figure 8.1.5 shows the isograms of maximum hourly concentrations of NH_3 (1998).

The 50 highest results obtained from modellings carried out with meteorological data for 1996 to 2000, the location of the receiver where these concentrations were recorded and the weather conditions corresponding to the hourly maximums are shown in tables 1.1 to 1.5 of Appendix E-5.

The 50 highest results for annual average concentrations for each meteorological data year are shown in tables 1.6 to 1.10 of Appendix E-5.

ODOURS

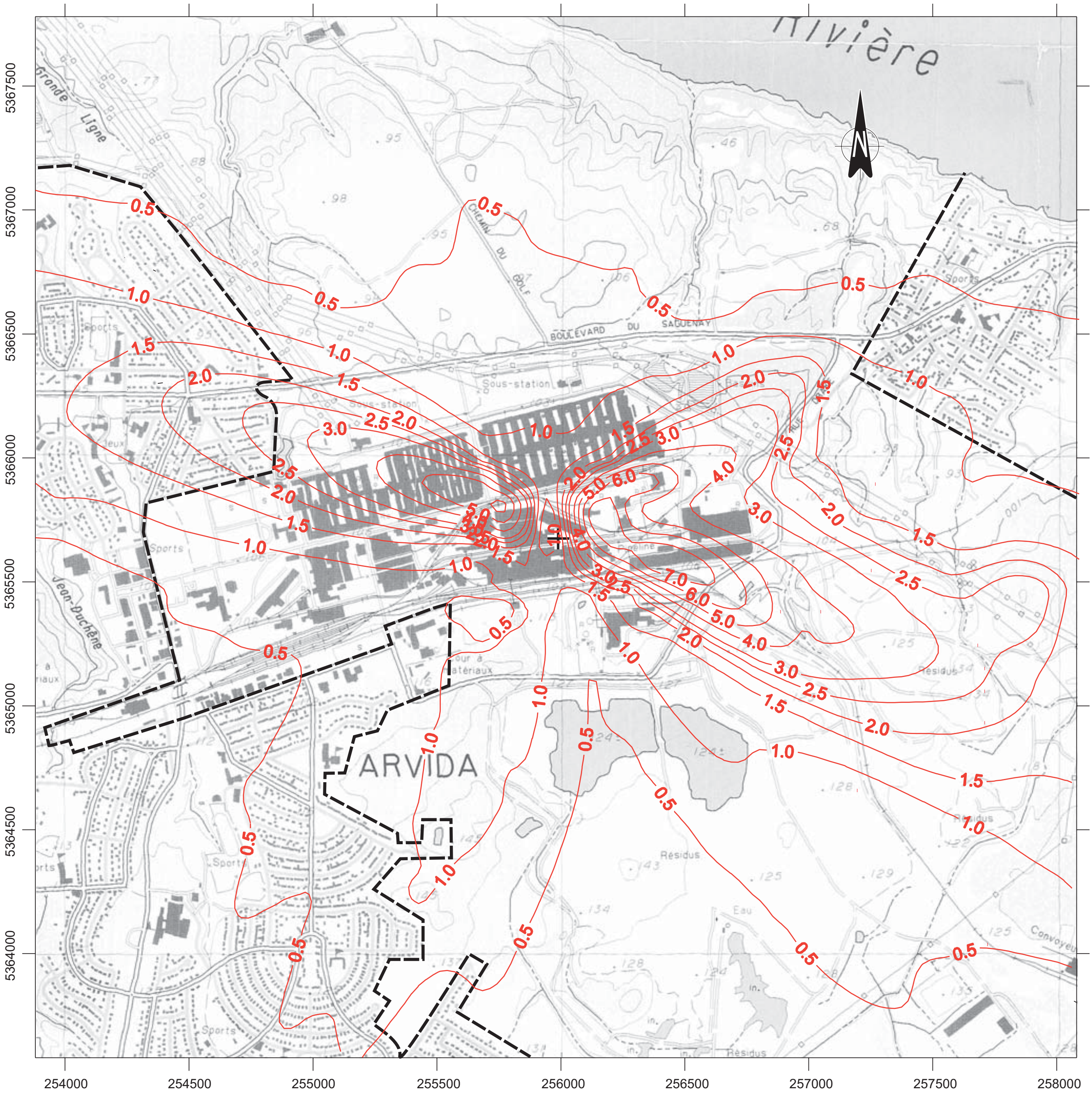
Modelled results for ammonia show that, for each period, the criteria proposed are encountered. Considering that the hourly basis criterion (3,200 $\mu g/m^3$) is lower than the ammonia odour threshold (5 ppm, i.e. 3,600 $\mu g/m^3$)[15], we can therefore expect that the odour of the anticipated ammonia emissions will not be perceived outside the plant area and will have only minor impacts on the quality of the atmospheric environment.

8.1.2.7 *Results - SO_2 Concentrations*

The spent pot lining processing plant will have one emission source of sulphur dioxide (SO_2), i.e. the boiler, for which the characteristics are explained in Appendix E-3. Natural gas, the fuel used in this boiler, generally contains only traces of sulphur. Emission rates of SO_2 were established based on the typical concentrations of sulphur in natural gas. Ground-level concentrations resulting from the emissions of the boiler were assessed for one-hour periods and on an annual basis.

15 The odour threshold generally corresponds to when 50% of the individuals of the panel perceive the odour. People that have a more accute sense of smell could however perceive smaller concentrations.

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.



Mètres

LÉGENDE :

- Courbes de concentrations
- Limite de propriété

ÉCHELLE 1 : 25 000

0 0,5 1,0 Km

ALCAN

CONCENTRATIONS MOYENNES ANNUELLES DE NH3 (µg/m³) - Année 1996

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

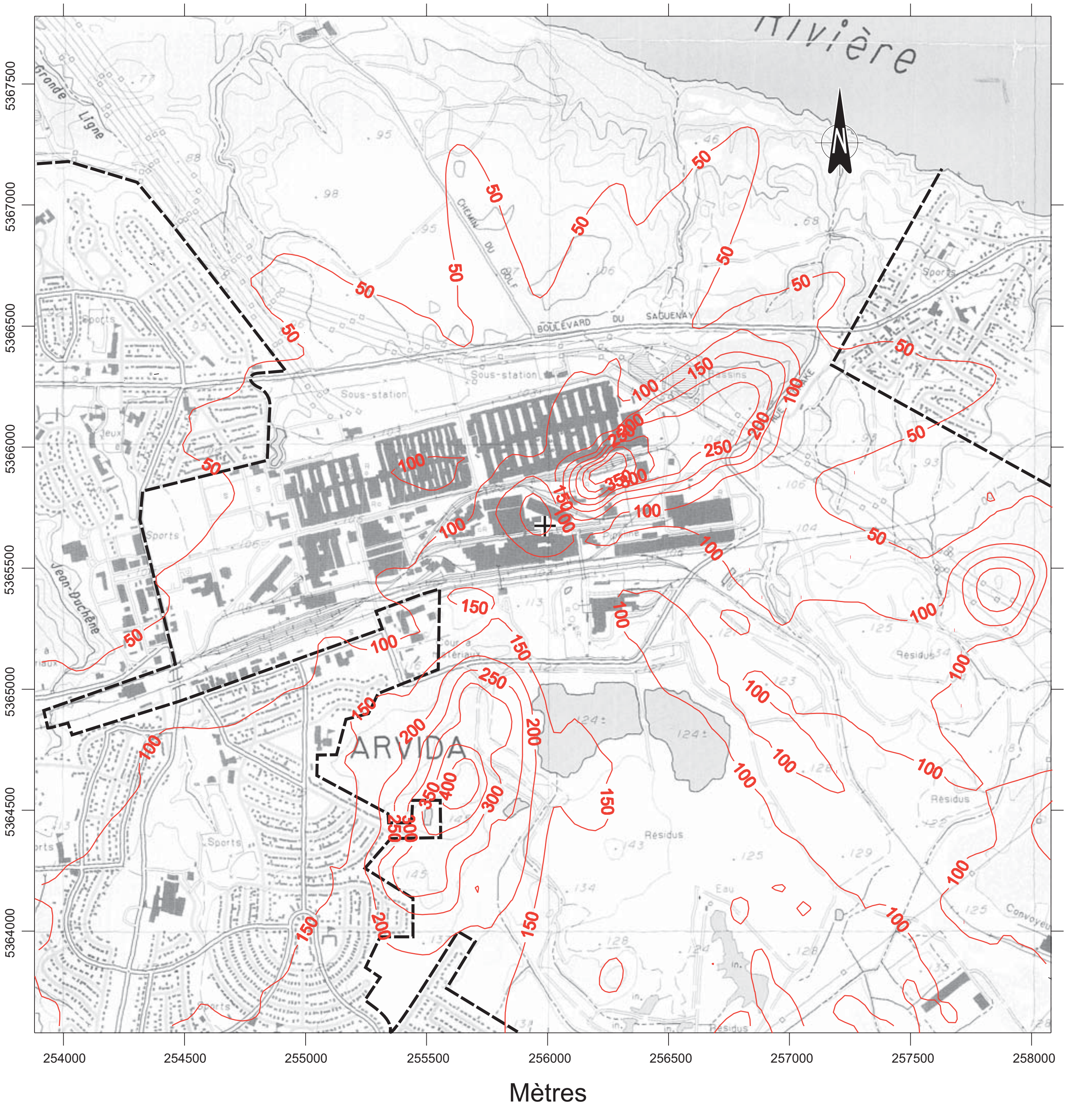
FIGURE : **8.1.4**

14041-8.1.4.ai (115/09/05) pc_cm

8.1.4 Correspondence Table

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.	Source: MAP FROM THE MINISTÈRE DES RESSOURCES NATURELLES, QUEBEC, 1994.
CONCENTRATIONS MOYENNES ANNUELLES DE NH_3 (µg/m³) - Année 1996	ANNUAL AVERAGE CONCENTRATIONS OF NH_3 (µg/m3) – Year 1996
Mètres	Metres
LÉGENDE	LEGEND
Courbes de concentrations	Concentration Curves
Limite de propriété	Property Limits
ÉCHELLE 1 : 25 000	SCALE 1:25,000
DATE : Septembre 2005	DATE: September 2005

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.



LÉGENDE :

Courbes de concentrations

Limite de propriété

ÉCHELLE 1 : 25 000

0 0,5 1,0 Km

ALCAN

CONCENTRATIONS MAXIMALES HORAIRES DE NH3 (µg/m³) - Année 1998

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

FIGURE : **8.1.5**

14041-8.1.5.ai (15/09/05) pc_cm

8.1.5 Corresesondence Table

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES,QUÉBEC, 1994.	Source: MAP FROM THE MINISTÈRE DES RESSOURCES NATURELLES,QUEBEC, 1994.
Mètres	Metres
LÉGENDE	LEGEND
Courbes de concentrations	Concentration Curves
Limite de proprété	Property Limits
ÉCHELLE 1 : 25 000	SCALE 1:25,000
CONCENTRATIONS MAXIMALES HORAIRESDE NH3 (µg/m³) - Année 1998	HOURLY MAXIMUM CONCENTRATIONS OF NH3 (µg/m3) – Year 1998
PROJET : 14041	PROJECT: 14041
DATE : Septembre 2005	DATE: September 2005

Table 8.1.6 shows the modelled maximum concentrations outside the property limits for each of the periods. These concentrations are compared to the ambient air criteria specified by the Quebec MDDEP's Direction du suivi de l'état de l'environnement as part of the project assessment under the Quebec *Environment Quality Act* (see Appendix D). These are 0.6 ppm (1,570 $\mu g/m^3$) over a period of four minutes, 900 $\mu g/m^3$ over a period of one hour, 300 $\mu g/m^3$ over a 24-hour period and 60 $\mu g/m^3$ annually.

Concentrations over a period of four minutes were calculated from one-hour values using the following equation:

$$C_1 = C_2 (15)^{0,2}$$

where, C_1 is the concentration for four minutes and C_2 is the concentration for one hour.

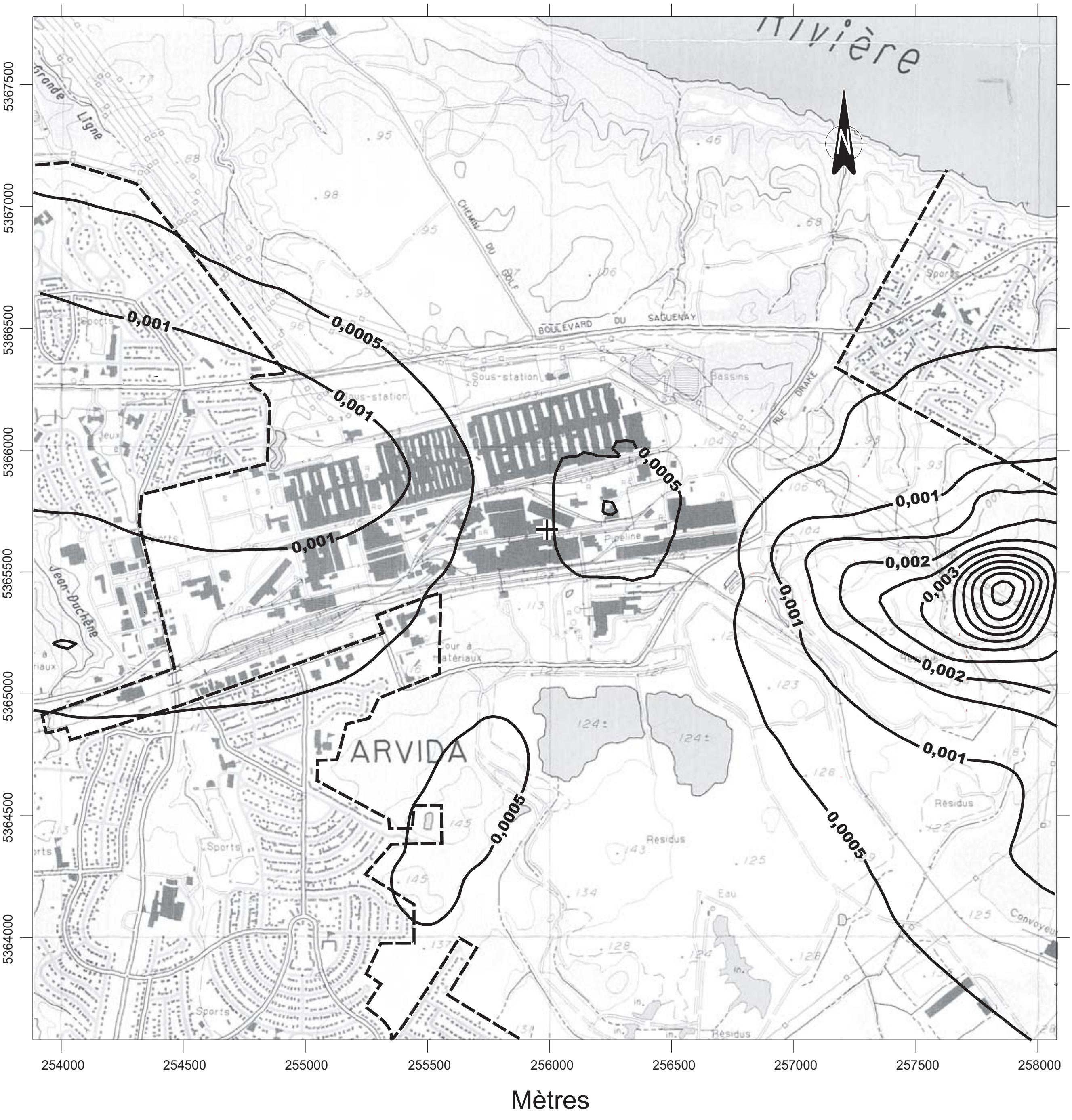
Figure 8.1.6 illustrates the isograms of maximum concentrations of sulphur dioxide on an annual basis for the meteorological data year that had the worst results (i.e. 2000) within a 2 km radius of the plant.

Table 8.1.6 Modelled Maximum Concentrations of SO_2

Period	Meteorological Data Year	Maximum Concentration ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Criterion Percentage (%)
4 minutes	1996	0.29	1,570 (0.6 ppm)	0.02
	1997	0.22		0.01
	1998	0.17		0.01
	1999	0.15		0.01
	2000	0.22		0.01
1 hour	1996	0.17	900	0.02
	1997	0.13		0.01
	1998	0.10		0.01
	1999	0.09		0.01
	2000	0.13		0.01
24 hours	1996	0.01	300	0.003
	1997	0.02		0.007
	1998	0.02		0.007
	1999	0.02		0.007
	2000	0.02		0.007
1 year	1996	0.001	60	0.002
	1997	0.001		0.002
	1998	0.002		0.004
	1999	0.002		0.004
	2000	0.002		0.004

As shown in Table 8.1.6, concentrations of SO_2 caused by the emissions of the new facilities are insignificant. In fact, the emissions of SO_2 are less than 0.02 % of the ambient air quality criterion obtained from this study.

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.



LÉGENDE :

- Courbes de concentrations
- Limite de propriété

ÉCHELLE 1 : 25 000

0 0,5 1,0 Km

CONCENTRATIONS MOYENNES ANNUELLES DE SO_2 (µg/m³) - Année 2000

ALCAN

TECSULT

PROJET : **14041**

DATE : **Septembre 2005**

FIGURE : **8.1.6**

14041-8.1.6.ai (15/19/05) pc_cm

8.1.6 Correspondence Table

Source : CARTE DU MINISTÈRE DES RESSOURCES NATURELLES, QUÉBEC, 1994.	Source: MAP FROM THE MINISTÈRE DES RESSOURCES NATURELLES, QUEBEC, 1994.
Mètres	Metres
LÉGENDE	LEGEND
Courbes de concentrations	Concentration Curves
Limite de propriété	Property Limits
ÉCHELLE 1 : 25 000	SCALE 1:25,000
CONCENTRATIONS MOYENNES ANNUELLES DE SO_2 (µg/m³) - Année 2000	ANNUAL MAXIMUM CONCENTRATIONS OF SO_2 (µg/m3) – Year 2000
PROJET : 14041	PROJECT: 14041
DATE : Septembre 2005	DATE: September 2005

CUMULATIVE EFFECTS

In order to assess the impact of emissions of sulphur dioxide on the quality of ambient air, modelled concentrations of emissions from the pot lining processing plant are compared to those measured in the ambient air. At the Parc Berthier station in Jonquière, the hourly maximum concentrations measured between 1996 and 2002 varied from 443 to 540 µg/m^3, which represents 49 and 60% of the criterion.

Daily maximum concentrations that were measured varied from 197 to 291 µg/m^3 (66 to 97% of the criterion) and annual average concentrations varied from 24.6 to 33.8 (41 and 56% of the criterion). If we add the modelled maximum concentrations, we see that the criteria are never exceeded.

8.1.2.8 *Results - Concentrations of Carbon Monoxide (CO)*

The spent pot lining processing plant will have one emission source of CO, i.e. the boiler, its characteristics are found in Appendix E-3. CO ground-level concentrations were assessed for periods of one hour and eight hours.

Table 8.1.7 shows the modelled maximum concentrations outside the property limits. These concentrations are compared to the ambient air criteria specified by the Quebec MDDEP's Direction du suivi de l'état de l'environnement as part of the project assessment under the Quebec *Environment Quality Act* (see Appendix D). These are 35,000 µg/m^3 over a one-hour period and 13,000 µg/m^3 over an eight-hour period.

Table 8.1.7 Modelled Maximum Concentrations of CO

Period	Meteorological Data Year	Maximum Concentration (µg/m^3)	Criterion (µg/m^3)	Criterion Percentage (%)
1 hour	1996	26.53	35,000	0.07
	1997	19.70		0.06
	1998	15.20		0.04
	1999	13.87		0.04
	2000	20.33		0.06
8 hours	1996	3.33	13,000	0.03
	1997	4.65		0.04
	1998	4.80		0.04
	1999	4.46		0.03
	2000	5.11		0.04

Figure 8.1.7 illustrates the isograms of maximum concentrations of CO calculated on an annual basis for the year that had the worst results (year 2000) within a 2 km radius of the plant.

The results show that the impact of CO emissions caused by the pot lining processing plant boiler is minimal. In fact, the ground-level concentrations calculated are less than 0.07% of the criterion.