

## FACT SHEET No. 50

# Les Services T.M.G. Inc., Mine Niobec

3400 Columbiun Road  
Saint-Honoré, Quebec  
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*A list of 106 industrial plants has been established under St. Lawrence Vision 2000 (SLV 2000), the second phase of the St. Lawrence Action Plan, launched in 1988. The overall objective is to reduce liquid toxic waste and virtually eliminate discharges of persistent toxic substances.*

*The 106 industrial plants designated under SLV 2000 are divided into four groups, each of which has been given a specific objective. The Niobec mine operated by LES SERVICES T.M.G. INC. near Saint-Honoré in the Saguenay region is part of Group 4, comprising the 50 plants targeted under the St. Lawrence Action Plan.*

*The objective set for Group 4 is to pursue cleanup efforts and perform environmental monitoring to achieve a 90% reduction in liquid toxic waste. Between 1988 and 1995, the 50 plants reduced their toxic effluent discharges by 96%.*

## INDUSTRIAL PLANT

*A columbium oxide concentrator*

LES SERVICES T.M.G. INC. operates a columbium (niobium) mining operation having an annual output of 5500 t of columbium concentrate through crushing, flotation and leaching. The production level has remained unchanged since 1988. The ferrocolumbium plant brought on stream in 1994 has no effect on the effluent. In 1995, the mining operation ran at 100% capacity and employed a work force of 170.

## PRODUCTION

### PRINCIPAL RAW MATERIALS

- Columbium ore
- Hydrochloric acid
- Fluorosilicic acid
- Oxalic acid
- Fatty acid
- Sodium hydroxide
- Iron
- Calcium oxide
- Aluminum powder and pellets
- Sodium nitrate

### FINISHED PRODUCTS

- Ferrocolumbium
- Columbium concentrate ( $\text{Nb}_2\text{O}_5$  at 60%)

# TREATMENT MEASURES

## INITIAL EFFLUENT VALUES

*ss and many heavy metals*

In 1991, based on the Action Plan characterization study conducted that year, the facility had an average effluent discharge of 6105 m<sup>3</sup>/d, containing:

- 42.56 kg/d of suspended solids (ss)
- 10.42 kg/d of iron
- 0.786 kg/d of lead
- 0.729 kg/d of nickel
- 0.397 kg/d of zinc
- 0.219 kg/d of copper

## RESOURCES AND USES TO PRESERVE

*A largely abandoned area*

The NIOBEC MINE operated by LES SERVICES T.M.G. INC. is situated near Saint-Honoré, about 8 km north of the Saguenay, and discharges its wastewater into Cimon brook, which is part of the Vases river system. The river contains few places suitable for animal habitats, and the brook has few recreational uses, although there are some riverside cottages below the brook. In the 1950s and 1960s, Cimon was a fairly popular trout stream which attracted anglers, and a swimming pond was dug behind a local dam. But anglers and bathers have since abandoned the site, although trout still migrate there in spring.

## WATER QUALITY BASED OBJECTIVES

*Environmental protection*

Water quality based objectives are established to preserve local resources and uses. These guidelines, expressed as maximum permissible loads and concentrations for effluent released into the environment, are used in choosing treatment methods which best promote environmental protection. The water quality based objectives for LES SERVICES T.M.G. INC. are available on request.

## EFFLUENT TREATMENT

*Recycling system and separation of uncontaminated water*

Infiltration water from the underground mine is treated in two settling ponds laid out in series, then released into Cimon brook. After the concentrator wastewater is precipitated, 85% of it is reused and the rest flows into a polishing pond, then into Cimon brook. Water recovered by the channel around the tailings site flows into the same polishing pond. Runoff from nearby non-industrial land and indirect cooling water drain into ditches and then flow untreated into Cornet brook. Sanitary sewage from the mining facility is collected and treated in a septic tank complete with tile field.

## PREVENTION AND CLEANUP SYSTEMS IMPLEMENTED

*Diversion of drainage water and new polishing pond*

In May 1994, a weir was built on one of the NIOBEC MINES's settling ponds for continuous sampling and gauging of the final effluent. The new installation collects wastewater and infiltration water from the mine bottom. Other measures included construction of a new polishing pond and layout of mine drainage diversion ditches. This eliminates the need to dilute the water and boosts decontamination efficiency prior to release into the natural environment. The work cost an estimated \$2 million.

## REGULATORY COMPLIANCE - WATER COMPONENT

*Compliance with federal regulations*

The NIOBEC MINE operated by LES SERVICES T.M.G. INC. comes under the federal Metal Mining Liquid Effluent Regulations and is in compliance with prescribed standards.

# POLLUTION ABATEMENT

## CHIMIOTOX INDEX ABATEMENT OF TOXIC POLLUTION

*Mostly arsenic and lead*

The Chimiotox index gauges the load of all toxic substances present in industrial effluent, using the toxicity factor assigned to each one. It is used, among other things, to monitor discharge trends over the years (see Figure 1) and determine the proportion of each pollutant (see Table 1).

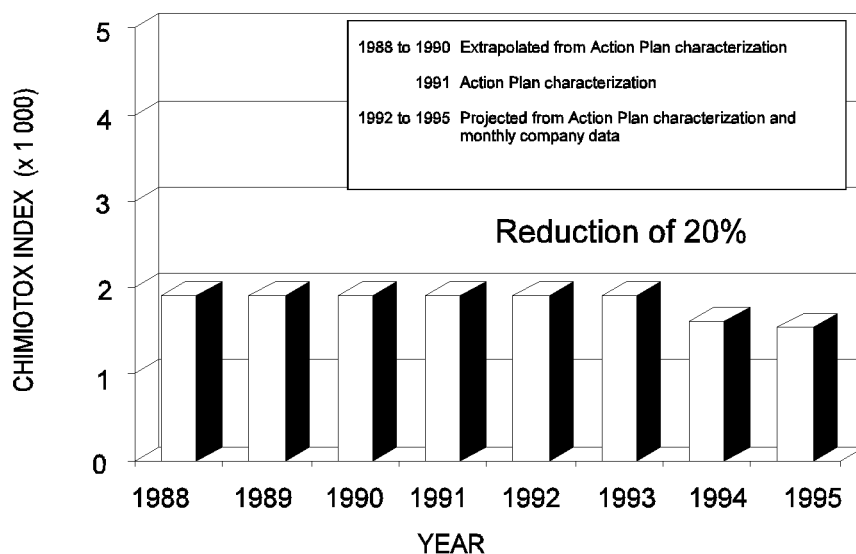
Table 1 gives the characterization data gathered in 1991 pursuant to Action Plan requirements, as well as the Chimiotox values estimated from those figures, for an effluent flow of 6105 m<sup>3</sup>/d. In testing for more than 120 substances, 17 were found. The figures show a predominance of arsenic in the treated wastewater. Arsenic makes up 53% of the Chimiotox index, followed by lead (13%) and cadmium (9%).

Figure 1 is plotted from the 1991 characterization data, which were also used to extrapolate Chimiotox indices for 1988-1993. The 1994 and 1995 indices were estimated from the 1991 results and company data. Between 1988 and 1995, the Chimiotox index fell 20%, owing chiefly to the treatment system introduced in 1994.

*Table 1 Chimiotox Index (1991) - Les Services T.M.G. Inc., Niobec Mine\**

Substance	Load (kg/d)	Toxic Weighting Factor	Chimiotox Units (CU)
Arsenic	0.018	57 143	1 017
Lead	0.7834483	314	247
Cadmium	0.185	909	168
Copper	0.219	424	93
Mercury	5.47 x 10 <sup>-04</sup>	166 667	91
Aluminum	5.940	11	68
Chromium	0.099	500	49
Nitrites-Nitrates	8.909	5	45
Manganese	4.309	10	43
Total Phosphorus	0.726	50	36
Iron	10.420	3	8
Azote ammonical	10.000	0.8	8
Nickel	0.729	10	7
Zinc	0.397	9	4
Cyanure	0.017	200	3
Bis-(2-ethylhexyl)phthalate	0.002	1 667	3
Antimony	1.046	2	2
<b>CHIMIOTOX INDEX</b>			<b>1 920</b>

\* For effluent discharge of 6105 m<sup>3</sup>/d (17 substances detected in testing for more than 120).



*Figure 1 Changes in toxic effluent discharges, 1988-1995 - Les Services T.M.G. Inc., Mine Niobec*

## VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

### *Mercury detected*

One long-range objective of SLV 2000 is the virtual elimination of 11 persistent bioaccumulative toxic substances from the St. Lawrence and its tributaries. The targeted substances are those designated by the International Joint Commission in August 1993: PCBs, DDT, dieldrin, toxaphene, dioxins, furans, mirex, mercury, lead alkyl, benzo(a)pyrene and hexachlorobenzene.

The 1991 Action Plan characterization study pointed up one of the 11 targeted substances (mercury, with a load of 0.5 g/d).

## PEEP TOXICITY REDUCTION

### *Average toxicity*

The Potential Ecotoxic Effects Probe, or PEEP, combines the results of six standardized bioassays measuring the toxic effects of effluent. The results are expressed on a logarithmic scale of increasing toxicity ranging from 1 to 10 and are used to monitor discharge trends over the years. One series of bioassays was conducted for LES SERVICES T.M.G. INC., MINE NIOBEC. The 1991 PEEP index was established at 3.8, in the average range of the PEEP indices found for the 50 Action Plan plants.

## REDUCTION IN SUBSTANCES MONITORED

### *Drop in heavy metals*

Based on company data, in 1995 the mining operation had an average effluent discharge of 6601 m<sup>3</sup>/d, containing:

- 67.2 kg/d of suspended solids (ss)
- 2.5 kg/d of iron
- 0.4 kg/d of zinc

Company data show that the nickel, lead and copper were cut by 100%, and iron by 77%. The new polishing pond and mine drainage diversion ditches were factors in boosting settling pond efficiency and reducing the pollutant load.

## KEY POINTS

- 100% reduction in discharge of nickel, lead and copper between 1991 and 1995
- In 1994, runoff water was diverted and a polishing pond was built at a cost of \$2 million
- Chimiotox index reduced by 20%

Based on December 1995 inventory.  
Information reviewed by Gilles Legault, SLV 2000.

## ADDITIONAL INFORMATION

### **Chimiotox index and PEEP:**

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### **Water quality based objectives:**

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### **Records officer at the Ministère de l'Environnement et de la Faune du Québec (MEF):**

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