SECTION 8.0

SECTION 8.0
MONITORING

8.1 SURFACE WATER

8.1.1 Storm Water Runoff

The perimeter of the developed portion of the plant site is graded and ditched to gather the storm water runoff, which is generated on the site. The ditches direct the flow of water to on-site retention ponds that provide sufficient storage to limit the peak post development discharge to the peak pre-development discharge of 0.35 m^3/s (12 cfs). Although we do not judge an oil and grease/surface debris interceptor being relevant to either the construction or operation of the IWWTF or the pretreatment plant, the surface water retention pond provides some degree of protection from a possible spill from each. The water quality at the retention outlet is visually monitored following all significant rainfall events. In the event that there is evidence of poor water quality at the outlet (such as the presence of suspended materials or contaminants visible on the surface of the water), then an investigation is conducted to determine the source and nature of the contaminants. Appropriate mitigative measures are then undertaken.

8.1.2 Assiniboine River

The City of Brandon has undertaken a very significant monitoring program of the Assiniboine River with respect to the effects of effluent from the IWWTF and other significant contributors to the total pollution load in the Brandon area. This monitoring program was proposed over a four year period at a total cost of over $750,000. It involved monitoring stations from the 18th Street Bridge in Brandon to downstream of Portage la Prairie. The City of Portage la Prairie, Long Plain First Nation and Dakota Tipi First Nation, as well as the general public and Manitoba Conservation have provided input to the study plan. The study plan was submitted in 1998 by the City of Brandon to Manitoba Conservation for approval. Because high flows were present on the Assiniboine River until the summer of 2002, some portions of the study were suspended until the summer of 2002 when lower flows were common. These data will now help to calibrate an open water the summer model of the river from Brandon to Portage la Prairie. A working winter model has already been developed.

The multi-year study plan was designed to address two major issues: the effect of effluent addition on the aquatic environment at and downstream of the IWWTF outfall (with respect to ammonia, dissolved oxygen, fecal coliform bacteria and protozonan parasites (specifically, Cryptosporidium and Giardia)); and, the effect of nitrogen and phosphorous inputs on the growth of phytoplankton (algae in the water column), in particular with respect to effects on

water quality for downstream users. Addressing these two issues will resolve the major uncertainties identified in the preliminary Assiniboine River Assessment.

The study began in late 1998 with the first year of the study providing baseline data without the Maple Leaf Pork processing plant in operation. Under the one-shift scenario, at least one year of data has been collected to measure the effects of effluent inputs on ammonia, oxygen, nutrient; and, algal levels in the Assiniboine River. These data were used to calibrate the US EPA Water Quality Analysis Simulation Program (WASP) to model existing and future conditions on the Assiniboine River, both within the mixing zone near Brandon and the fully mixed part of the river extending approximately 270 km downstream to Portage la Prairie.

The study involved the following tasks:

- Development of a work plan.
- Development of a hydraulic model to support the WASP model.
- Measurement and prediction of effects within and downstream of the mixing zone, primarily related to oxygen, ammonia; and, fecal coliform bacteria.
- Measurement and prediction of effects related to the discharge of nitrogen and phosphorous and stimulation of phytoplankton growth.
- Assessing the potential effect of the spring-time input of the Assiniboine River water carrying effluent from the IWWTF on small oxbow lakes found in the Spruce Woods region.

Some monitoring of the Assiniboine River was undertaken during the original construction of the Maple Leaf Pork plant and the original IWWTF in order to provide some baseline data for the operation phase as described above.

The City of Brandon and Maple Leaf Foods Inc. are proposing an ongoing monitoring program of the Assiniboine River after the second shift is operational. The City and Maple Leaf are proposing to monitor the Assiniboine River semi-annually (once in the summer and once in the winter) at five locations at approximately 40 to 75 km intervals between Brandon and Portage la Prairie. The suggested locations are the PR 340 Bridge (near Treesbank, 51.5 km downstream of the 18th Street Bridge in Brandon), PTH 5 Bridge (north of Glenboro, 116 km), PR 34 Bridge (south of Austin, 185 km), PR 242 Hird Bridge (north of Treherne, 225 km), and PR 305 Hood Bridge (southwest of Portage, 266 km downstream of the 18th Street Bridge). These data will be useful for checking the accuracy of predictions from the summer and winter water quality models and to provide the basis for the future adjustment of the models, if required.

A vertically integrated sample from each site in winter and summer was collected and tested at minimum for: carbonaceous biochemical demand (CBOD), total suspended solids (TSS),

dissolved ammonia, chlorophyll a, dissolved nitate + nitrite, orthophosphate, total and dissolved phosphorous, dissolved reactive silica, total and dissolved Kjeldahl nitrogen and measurements of pH, conductivity, dissolved oxygen, temperature and turbidity.

8.2 GROUNDWATER

Terraprobe Limited proposed a monitoring program for the Maple Leaf Pork processing plant and the associated City of Brandon IWWTF in 1999. The proposed monitoring program was based on pre-development existing ground water impacts or contamination identified in the area, the nature of the potential contaminants from the proposed operations, the expected groundwater flow directions and pathways and the natural variability of ground water quality and ground water flow directions. The proposed monitoring program consisted of a short-term monitoring program and an initial long-term monitoring program.

The short-term monitoring program was implemented for a period of one year to assess natural variability in soil and ground water conditions and construction-related impacts. In particular, seasonal variations in water levels and changes in groundwater flow directions were noted. The short-term monitoring program identified changes that should be made to the long-term monitoring program. The short-term monitoring program used 51 monitoring wells on site including wells 1 to 39 (shallow) and 1D to 12D (deep). It monitored the water levels monthly and conducted groundwater quality testing quarterly. The ground water quality parameters included bacteria, nutrients (nitrogen and phosphorous); and, basic inorganic chemistry (anions and metals). More specifically, the parameters measured included: silver, aluminum, arsenic, boron, barium, beryllium, bismuth, calcium, cadmium, cobalt, chromium, copper, iron, potassium, magnesium, manganese, molybdenum, sodium, nickel, lead, sulphur, antimony, selenium, silicon, tin, strontium, titanium, vanadium, zinc, fluoride, chloride, bromide sulphate, TKN, nitrite, nitrate, ammonia, phosphate, total phosphorous, pH, alkalinity, DOC, hardness, conductivity, E. coli, fecal coliform and total coliform.

The initial long-term monitoring program was adjusted based on examination of seasonal variations in ground water flow directions and quantity. Since existing agricultural operations and the IWWTF could generate contaminants similar to those typical of the pork processing plant, any differentiation in the source of contaminants would be based largely on ground water flow directions (i.e., examination of potential source and pathway of contaminants). For the initial long-term monitoring locations, Terraprobe proposed monitoring wells 16, 18, 26, 28, 36, 37, and 4D for the IWWTF; monitoring wells 12, 13, 20, 30 to 33, 39, 7D, and 11D for the hog holding pens and the processing facility; wells 15, 34, and 9D for potential off-site receptors and, wells 1 to 3, 22, 24, 1D to 3D, and 12D for potential off-site sources. These wells were monitored for both water levels and quality on a semi-annual basis under the long-term program. Parameters measured were the same as for the short-term monitoring program.

In addition, Terraprobe recommended monitoring the well water at the residence (Terhune and Denbow) immediately to the northeast of the site. There is also an annual review of operating conditions such as an assessment of leaks or spills, integrity of the liner of the hog pens, and assessment of waste water quality compared to results of the ground water monitoring program. Liners are checked from a comparison of monitoring well data both up and down gradient from the hog pens. An annual monitoring report is also prepared.

Semi-annual monitoring was undertaken in 1999, 2000 and 2001. Because there were no changes in ground water flow directions in either of the stratigraphic units monitored in 2001 and there was no significant change in the concentration of the parameters monitored at most locations, Terraprobe recommended that in 2002 the monitoring be reduced from a semi-annual to an annual basis.

8.3 CITY OF BRANDON WATER SUPPLY TO PLANT

Surface water from the City of Brandon's water treatment plant is supplied to the Maple Leaf pork processing plant through a buried 375 mm (15-inch) water line. The water line was installed during the winter of 1998-99 along the south site of Richmond Avenue to the south of the Maple Leaf site. During times of low flow on the Assiniboine River, the City of Brandon has a back-up well system to supplement the potable surface water supply.

The quality of City of Brandon water supply is illustrated below for both the source water (Assiniboine River) and for treated water in Table 8.1. Both the source water and the treated water parameters are monitored anywhere from a continuous basis (incoming turbidity) to monthly for others (Cryptosporidium and Giardia).

Table 8.1: Water Analysis - City of Brandon

Parameter	Treated Water	Source
Conductivity (μmho/cm)	490	915
pH	7.9	8.6
Alkalinity total ($CaCO_3$) (mg/l)	66	261
Ca (mg/l)	46.6	79
Mg (mg/l)	7.11	42
Hardness ($CaCO_3$) (mg/l)	136	373
Mn (mg/l)	<0.02	<0.13
Fe (mg/l)	<0.04	<0.39
K (mg/l)	9.5	9.4
Na (mg/l)	70	67
Cl (mg/l)	28	26
SO_4 (mg/l)	214	200

8.4 POINT SOURCE AIR EMISSIONS TESTING

Point source air emissions testing is not planned because air emissions have not been found to be a problem at the existing IWWTF nor is it anticipated to be a problem at the expanded IWWTF. Air emissions from the Maple Leaf Pork plant in Brandon or at other pork processing facilities or their treatment plants has not been an issue nor has relevant data been found. Should air emissions become a concern in the future, the City of Brandon and Maple Leaf Foods Inc. are committed to air emissions monitoring from the expanded IWWTF, the pretreatment plant or the pork processing plant.

8.5 BACKGROUND AMBIENT AIR QUALITY TESTING

Background ambient air quality test results were available from the Manitoba Ambient Air Quality Annual Reports by B. Fenske, February 1994 to the end of 1996 prior to the Maple Leaf Pork development. Air monitoring stations in Brandon exist at the Assiniboine Community College (Monitoring Station 5131) and 1104 Princess Street (Monitoring Station 9201). Only one year of data since Maple Leaf Pork began operations is available (1999).

Pre-Maple Leaf Foods Inc.'s development in Brandon data being reported for Brandon consisted of: Nitrogen Dioxide (NO_2), Nitric Oxide (NO), Nitrogen Oxides (NO_x), Oxidants Ozone (O_3), Ammonia (NH_3), Total Suspended Particulate (TSP), Lead (Pb) and Sulphates (SO_4). Available 1-hr and 24-hour data are presented in Table 8.2.

Table 8.2: Average Ambient Air Quality Data for Brandon, Manitoba

Parameter	1990	1991	1992	1993	1994	1995	1996
NO_2 (pphm)	28.5 1-hr 6.4 24-hr	29.2 1-hr 7.8 24-hr	N/A 1-hr N/A 24-hr	24.8 1-hr 10.1 24-hr	34.9 1-hr 5.6 24-hr	13.0 1-hr 3.8 24-hr	8.0 1-hr 4.9 24-hr
NO (pphm)	15.7 1-hr 7.4 24-hr	14.4 1-hr 4.6 24-hr	9.9 1-hr 4.2 24-hr	46.4 1-hr 4.9 24-hr	27.4 1-hr 8.4 24-hr	9.3 1-hr 2.6 24-hr	N/A 1-hr N/A 24-hr
NO_x (pphm)	31.0 1-hr 8.7 24-hr	25.3 1-hr 5.9 24-hr	N/A 1-hr N/A 24-hr	74.7 1-hr 16.4 24-hr	35.6 1-hr 10.3 24-hr	16.4 1-hr 5.3 24-hr	N/A 1-hr N/A 24-hr
O_3 (pphm)	6.1 1-hr 4.6 24-hr	5.4 1-hr 4.3 24-hr	5.3 1-hr 4.4 24-hr	5.0 1-hr 3.7 24-hr	5.9 1-hr 4.7 24-hr	7.4 1-hr 4.9 24-hr	7.8 1-hr 5.7 24-hr
NH_3 (ppm)	7.7 1-hr 2.7 24-hr	4.3 1-hr 1.2 24-hr	5.2 1-hr 1.2 24-hr	4.1 1-hr 0.8 24-hr	3.6 1-hr 0.4 24-hr	4.0 1-hr 0.8 24-hr	4.9 1-hr 1.0 24-hr
TSP Max 24-hr ($\mu g/m^3$)	181 (5131) 115 (9201)	88 (5131) 92 (9201)	85 (5131) 133 (9201)	N/A (5131) 94 (9201)	N/A (5131) 96 (9201)	N/A (5131) 96 (9201)	N/A (5131) 138 (9201)
Pb Max 24-hr ($\mu g/m^3$)	0.03 (5131) 0.04 (9201)	0.04 (5131) 0.07 (9201)	0.03 (5131) 0.04 (9201)	N/A (5131) 0.04 (9201)	N/A (5131) 0.03 (9201)	N/A (5131) 0.04 (9201)	N/A (5131) 0.04 (9201)
SO_4 Max 24-hr ($\mu g/m^3$)	4.24 (5131) 4.63 (9201)	4.24 (5131) 4.63 (9201)	3.65 (5131) 5.37 (9201)	N/A (5131) 4.76 (9201)	N/A (5131) 4.09 (9201)	N/A (5131) 4.12 (9201)	N/A (5131) 6.17 (9201)

Note: 1. pphm denotes parts per hundred million.
2. (5131) denotes location as Brandon, Assinboine Community College.
3. (9201) denotes location as Brandon, 1104 Princess Street.

It should be noted that other data presented by B. Fenske is contained in the reports but have not been summarized herein.

The pre-Maple Leaf development Brandon data indicated that there was considerable variation in the maximum levels of most air quality parameters from year to year. As an urban area, Brandon air quality would be expected to meet the Maximum Acceptable Levels (M.A.L) values in the Objectives and Guidelines for Various Air Pollutants – Ambient Air Quality Criteria, Manitoba Conservation. From Fenske's data, it appears there are only a few instances where Brandon air quality parameters exceed M.A.L. values (other than 24-hour ozone values) and that no significant trends are evident. Twenty-four hour ozone values are not significant and Manitoba Conservation generally places more significance on the one-hour values (Personal Communication – Jean Van Dusen, Manitoba Environment). There were no instances where the one-hour ozone values exceeded M.A.L. values in Brandon over the seven-year period examined (1990-1996). Ammonia (NH_4) values have been exceeded in Brandon in each of the seven years examined, but for no more than a maximum of 36 times per year, with an average of only 11 or 12 times per year.

Data for 1999, 2000 and 2001, the only years that post-Maple Leaf Pork development is available is summarized below in Table 8.3. Compared to the pre-development data in Table 8.2, the data generally show that the post-Maple Leaf Pork development air quality is not worse than pre-development levels; in fact, some parameters (NO_2 and ammonia except for 1994) were lower than all other years (1990 through 1996). It is also interesting to note that all values, except ozone (O_3), of all parameters from 1999 maximum one-hour and maximum 24-hour data were exceeded by values from 1990 through 1996. Although in 1999, the ozone levels in Brandon were slightly elevated above pre-development data, since the ozone data for 2000 and 2001 is within the previous data range and Maple Leaf Pork has been operating at a higher production rate in these latter two years, the increase in 1999 is very unlikely attributable to Maple Leaf Pork. With the limited data available it appears that the Maple Leaf Pork development has not had a significant impact on air quality within the City of Brandon.

Table 8.3: Post-Maple Leaf Pork Air Quality Data for Brandon, Manitoba

Parameter	1999	2000	2001
NO_2 (pphm)	6.6 1-hr 3.3 24-hr	7.1 1-hr 3.0 24-hr	7.9 1-hr 3.0 24-hr
NO (pphm)	18.3 1-hr 6.5 24-hr	14.2 1-hr 4.9 24-hr	27.9 1-hr 5.7 24-hr
NO_x (pphm)	20.8 1-hr 9.5 24-hr	18.3 1-hr 7.6 24-hr	31.2 1-hr 7.9 24-hr
O_3 (pphm)	8.9 1-hr 6.5 24-hr	6.2 1-hr 4.6 24-hr	6.3 1-hr 4.6 24-hr
NH_3 (ppm)	3.0 1-hr 0.6 24-hr	3.1 1-hr 0.4 24-hr	2.7 1-hr 0.5 24-hr
Inhalable Particulate (PM_{10})	499.9 1-hr 153.4 24-hr	498.0 1-hr 201.6 24-hr	451.5 1-hr 131.4 24-hr
TSP Max 24-hr ($\mu g/m^3$)	95 (5131)	N/A (5131)	N/A (5131)
Pb Max 24-hr ($\mu g/m^3$)	N/A[4] (5131) N/A (9201)	N/A[4] (5131) N/A (9201)	N/A[4] (5131) N/A (9201)
SO_4 Max 24-hr ($\mu g/m^3$)	N/A (5131) N/A (9201)	N/A (5131) N/A (9201)	N/A (5131) N/A (9201)

Note:
1. pphm denotes parts per hundred million.
2. (5131) denotes location as Brandon, Assiniboine Community College.
3. (9201) denotes location as Brandon, 1104 Princess Street
4. N/A = Not Available
5. Source: www.gov.mb.ca/conservation/climatechange/airquality

REFERENCES

Fenske, B. February, 1994-1998, Manitoba Ambient Air Quality Annual Reports

Manitoba Conservation, 1999, 2000, and 2001. Climate Change Branch. Air Quality/Annual Statistics (www.gov.mb.ca/conservation/climatechange/airquality)