CHAPTER 10

WATER QUALITY: CHEMISTRY

The water chemistry data set is limited to the results from the New Brunswick Department of the Environment's chemistry laboratory. Water samples analysis using field kits is associated with specific lake or stream surveys, such River Classification program surveys (Chapter 9).

Most of the chemistry data is associated with the Department of the Environment's Water Monitoring and River Classification programs. The remaining data is from fishery management studies performed by Bowater Pulp and Paper Canada Inc. on their freehold lands.

Although the Water Monitoring Program established its "permanent" sampling sites many years ago, their data is only available in electronic form since 1989. Each permanent site is visited annually. The River Classification program also has multi-year samplings for its classification sites. Please refer to Chapter 9 **River Classification Program** for more information on the program.

Environment Canada also has a water chemistry monitoring program with various stations throughout the Province. Their program, which was initiated in the early 1900's, contains a tremendous volume of historical data. Recently, the provincial government has taken responsibility for some of Environment Canada's monitoring sites. Attempts to merge water chemistry data from the two organizations were unsuccessful due to differences in chemical parameter codes. It will require assistance from chemists from the two agencies to match their chemical parameters.

Most surface water samples are analyzed for the standard inorganic parameter list. The River Classification program, however, sometimes includes *chlorophyll a*, an organic parameter. Should multiple samples be taken from a lake, the depth at which each sample is taken is noted.

Lake and stream surveys performed by the New Brunswick Department of Natural Resources and Energy generally include standard inorganic parameter analysis of water samples. This information is currently in paper reports only and not in electronic form.

All water chemistry data is referenced to a water sampling site within GIS. However, in many cases, sites will not have data and must be obtained from the NB Department of the Environment.

DATA SOURCES

Water chemistry data was obtained from the New Brunswick Department of the Environment. It includes data from departmental monitoring sites, plus data provided by Bowater Pulp and Paper Canada Inc. as a component of their fisheries management program. All water samples were analysed by New Brunswick Department of the Environment's lab.

POSITIONAL ACCURACY

The positional accuracy of water chemistry sampling sites is based on textual descriptions of locations and/or latitude/longitude measurements. The positional accuracy of the

hydrographic spatial data is ±1.5m to ±2.5m. Please refer to **SNB's Land and Water Standards Manual** for further details.

DATA FILES

Tabular Data
There are two data tables within the water chemistry data set. One table maintains the general information on the water collection and monitoring sites, while the second table contains the results of the lab analysis.

,   **Water Chemistry Sites** - Maintains general information on each site, including the location data for referencing within GIS.

,   **Water Chemistry Results** - Contains the lab results of the inorganic chemical parameters.

Spatial Data
An ArcView shape file was created for sampling sites for water chemistry. It includes the Department of the Environment's River Classification Program's sampling sites and Bowater Pulp and Paper Canada Inc.'s sampling sites. A point coverage is used, rather than dynamic segmentation, as some sampling sites occur in the middle of lakes.

**TABULAR
DATA
FILES**

WATER CHEMISTRY SITES

The *Water Chemistry Sites* table (wchmsite.dbf) maintains a list of permanent and non-permanent water chemistry sampling sites within the province. Permanent sites have been established by the NB Environment. Non-permanent sites are generally "one-time" assessments.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Water Chemistry Site ID	Identifier for water chemistry sampling site. Assigned by the Data Warehouse	WchmSiteID	Numeric (4)	
Water Body ID	Unique identifier of the lake or stream where the sampling site is located	Water_ID	Numeric (8)	
Water Body Name	Name of lake or stream from which water sample was taken	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the watershed of the sampled lake or stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who monitors the site	Agency_Cd	Character (4)	
Agency Program	Water chemistry data may be collected by different programs within a given agency, such as the NB Dept. of the Environment	Ag_Prog_No	Character (4)	
Agency's Site No.	Site identifier used by the agency, e.g. station number	Ag_Site_ID	Character (6)	
Site Description	Description of where the sampling site is located	Site_Des	Character (150)	
Agency Station Code	Code assigned by NB Dept. of the Environment	Ag_St_Code	Character (4)	
NAQUADAT Sub-basin Code	Alphabetic code representing Environment Canada's ENVIRODAT sub-basin in which the water body belongs. ENVIRODAT (formerly called NAQUADAT) is a national drainage system classification.	NAQUADAT_Cd	Character (2)	Code Table 14
Agency Sequence No.	Code assigned by NB Dept. of the Environment	Ag_Seq_No	Numeric (4)	
Agency Proposal No.	Code assigned by NB Dept. of the Environment	Ag_Prop_No	Numeric (3)	
Latitude	Latitude in degrees, minutes, seconds	Latitude	Character (8)	
Longitude	Longitude in degrees, minutes, seconds	Longitude	Character (8)	
UTM Easting Coordinate	UTM Easting coordinate (NAD27) of the sampling site	UTM_East	Numeric (8)	
UTM Northing Coordinate	UTM Northing coordinate (NAD27) of the sampling site	UTM_North	Numeric (8)	
UTM Zone	UTM (Universal Trans Mercator) projection system zone (NAD27) in which sampling site is located	UTM_Zone	Numeric (2)	
		St_Meas	Character (2)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Stream Type Description	Description of stream type where sample was taken	StrTyp_Des	Character (24)	Code Table 7
Year Started	First year site was sampled	Start_Yr	Character (4)	
Year Ended	Last year site was sampled	End_Yr	Character (4)	

WATER CHEMISTRY

The *Water Chemistry* table (waterchm.dbf) maintains the lab tested water chemistry results. Some parameters have a field to qualify the data, e.g. trace amounts.

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
Water Chemistry Site ID	Identifier for water chemistry sampling site. Assigned by the Data Warehouse	WchmSiteID	Numeric (4)	
Water Body ID	Unique identifier of the lake or stream where the sampling site is located	Water_ID	Numeric (8)	
Water Body Name	Name of lake or stream from which water sample was taken	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the watershed of the sampled lake or stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency who collected the sample	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency, e.g. station number	Ag_Site_ID	Character (6)	
DOE Program	Water chemistry data may be collected by different programs within the NB Dept. of the Environment	DOE_Progrm	Character (14)	
DOE Project No.	DOE project identifier	DOE_Prj_No	Character (10)	
DOE Station No.	DOE sampling site identifier	DOE_Stn_No	Character (15)	
DOE Lab No.	Number assigned to the sample by the lab	DOE_Lab_No	Character (8)	
DOE Field No.	Number assigned to the sample by DOE in the field	DOE_Fld_No	Character (11)	
Assessment Date	Date water sample was collected - format is YYYY.MM.DD	Assmt_Date	Character (10)	
Time of Day	Time of day when water sample collected - 24 hour clock	Assmt_Time	Character (4)	
Secchi Disc Depth	Secchi disc measurement for determining water transparency. Measured in metres	Secchi	Numeric (5.2)	
Water Depth of Sample	Depth at which the water sample was collected. Measured in metres	Samp_Depth	Numeric (5.1)	
Water Temperature	Water temperature measured in °C	Water_Temp_°C	Numeric (5.2)	
Dissolved Oxygen	Dissolved oxygen (mg/L)	DO	Numeric (11.4)	
Toxic Units	Calculated field	Toxic_Unit	Numeric (11.2)	
Hardness Qualifier	Qualifies the data for hardness	L_Hard	Character (1)	

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
Hardness	Hardness, calculated (mg/L)	Hard	Numeric (11.5)	
NO_3	Nitrate, calculated (mg/L)	NO3	Numeric (11.5)	
Al-X Qualifier	Qualifies the data for aluminum, extracted	L_AL_X	Character (1)	Code Table 15
Al-X	Aluminum, extracted	AL_X	Numeric (11.5)	
Al-XGF Qualifier	Qualifies the data for aluminum, graphite furnace	L_AL_XGF	Character (1)	Code Table 15
Al-XGF	Aluminum, graphite furnace method (µg/L)	AL_XGF	Numeric (11.5)	
ALK-G Qualifier	Qualifies the data for alkalinity, grans	L_ALK_G	Character (1)	Code Table 15
ALK-G	Alkalinity, Grans (mg/L)	ALK_G	Numeric (11.5)	
ALK-P Qualifier	Qualifies the data for alkalinity, phenol	L_ALK_P	Character (1)	Code Table 15
ALK-P	Alkalinity, Phenol (mg/L)	ALK_P	Numeric (11.5)	
ALK-T Qualifier	Qualifies the data for alkalinity, total	L_ALK_T	Character (1)	Code Table 15
ALK-T	Alkalinity, Total	ALK_T	Numeric (11.5)	
As-XGF Qualifier	Qualifies the data for arsenic, graphite furnace	L_AS_XGF	Character (1)	Code Table 15
As-XGF	Arsenic, graphite furnace (µg/L)	AS_XGF	Numeric (11.5)	
Ba-X Qualifier	Qualifies the data for barium, extracted	L_BA_X	Character (1)	Code Table 15
Ba-X	Arsenic, extracted	BA_X	Numeric (11.5)	
B-X Qualifier	Qualifies the data for boron, extracted	L_B_X	Character (1)	Code Table 15
B-X	Boron, extracted	B_X	Numeric (11.5)	
Br Qualifier	Qualifies the data for bromide	L_BR	Character (1)	Code Table 15
Br	Bromide	BR	Numeric (11.5)	
Ca-D Qualifier	Qualifies the data for calcium	L_CA_D	Character (1)	Code Table 15
Ca-D	Calcium (mg/L)	CA_D	Numeric (11.5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
Cd-XGF Qualifier	Qualifies the data for cadmium, graphite furnace	L_CD_XGF	Character (1)	Code Table 15
Cd-XGF	Cadmium, graphite furnace (µg/L)	CD_XGF	Numeric (11.5)	
CHL-A Qualifier	Qualifies the data for *chlorophyll a*	L_CHL_A	Character (1)	Code Table 15
CHL-A	*Chlorophyll a*	CHL_A	Numeric (11.5)	
Cl Qualifier	Qualifies the data for chloride	L_CL	Character (1)	Code Table 15
Cl	Chloride	CL	Numeric (11.5)	
Cl-IC Qualifier	Qualifies the data for chloride, ion chromatography	L_CL_IC	Character (1)	Code Table 15
Cl-IC	Chloride, ion chromatography (mg/L)	CL_IC	Numeric (11.5)	
Color (CLRA) Qualifier	Qualifies the data for color	L_CLRA	Character (1)	Code Table 15
Color (CLRA)	Color (TCU)	CLRA	Numeric (11.5)	
Cd-X Qualifier	Qualifies the data for cobalt, extracted	L_CO_X	Character (1)	Code Table 15
Cd-X	Cobalt, extracted	CO_X	Numeric (11.5)	
COND Qualifier	Qualifies the data for conductivity	L_COND	Character (1)	Code Table 15
COND	Conductivity (µsie/cm)	COND	Numeric (11.5)	
Cr-X Qualifier	Qualifies the data for chromium, extracted	L_CR_X	Character (1)	Code Table 15
Cr-X	Chromium, extracted	CR_X	Numeric (11.5)	
Cr-XGF Qualifier	Qualifies the data for chromium, graphite furnace	L_CR_XGF	Character (1)	Code Table 15
Cr-XGF	Chromium, graphic furnace (µg/L)	CR_XGF	Numeric (11.5)	
Cu-X Qualifier	Qualifies the data for copper., extracted	L_CU_X	Character (1)	Code Table 15
Cu-X	Copper, extracted	CU_X	Numeric (11.5)	
Cu-XGF Qualifier	Qualifies the data for copper, graphite furnace	L_CU_XGF	Character (1)	Code Table 15
Cu-XGF	Copper, graphite furnace (µg/L)	CU_XGF	Numeric (11.5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
DOC Qualifier	Qualifies the data for dissolved organic carbon	L_DOC	Character (1)	Code Table 15
DOC	Dissolved organic carbon	DOC	Numeric (11.5)	
F Qualifier	Qualifies the data for fluoride	L_F	Character (1)	Code Table 15
F	Fluoride (mg/L)	F	Numeric (11.5)	
Fe-X Qualifier	Qualifies the data for iron, extracted	L_FE_X	Character (1)	Code Table 15
Fe-X	Iron, extracted (mg/L)	FE_X	Numeric (11.5)	
Hg-T Qualifier	Qualifies the data for mercury	L_HG_T	Character (1)	Code Table 15
Hg-T	Mercury	HG_T	Numeric (11.5)	
K Qualifier	Qualifies the data for potassium	L_K	Character (1)	Code Table 15
K	Potassium (mg/L)	K	Numeric (11.5)	
Mg-D Qualifier	Qualifies the data for magnesium	L_MG_D	Character (1)	Code Table 15
Mg-D	Magnesium (mg/L)	MG_D	Numeric (11.5)	
Mn-X Qualifier	Qualifies the data for manganese, extracted	L_MN_X	Character (1)	Code Table 15
Mn-X	Manganese, extracted (mg/L)	MN_X	Numeric (11.5)	
Na Qualifier	Qualifies the data for sodium	L_NA	Character (1)	Code Table 15
Na	Sodium (mg/L)	NA	Numeric (11.5)	
NH_3-T Qualifier	Qualifies the data for ammonia	L_NH3T	Character (1)	Code Table 15
NH_3-T	Ammonia (mg/L)	NH3T	Numeric (11.5)	
Ni-X Qualifier	Qualifies the data for nickel, extracted	L_NI_X	Character (1)	Code Table 15
Ni-X	Nickel, extracted (mg/L)	NI_X	Numeric (11.5)	
NO_2-D Qualifier	Qualifies the data for nitrite	L_NO2D	Character (1)	Code Table 15
NO_2-D	Nitrite (mg/L)	NO2D	Numeric (11.5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
NOX Qualifier	Qualifies the data for nitrate/nitrite	L_NOX	Character (1)	Code Table 15
NOX	Nitrate/nitrite (mg/L)	NOX	Numeric (11.5)	
Pb-XGF Qualifier	Qualifies the data for lead, graphic furnace	L_PB_XGF	Character (1)	Code Table 15
Pb-XGF	Lead, graphic furnace (µg/L)	PB_XGF	Numeric (11.5)	
pH Qualifier	Qualifies the data for pH	L_PH	Character (1)	Code Table 15
pH	pH	PH	Numeric (11.5)	
pH-GAL Qualifier	Qualifies the data for pH, Grans alkalinity titration	L_PH_GAL	Character (1)	Code Table 15
pH-GAL	pH, Grans alkalinity titration	PH_GAL	Numeric (11.5)	
Sb-XGF Qualifier	Qualifies the data for antimony, graphite furnace	L_SB_XGF	Character (1)	Code Table 15
Sb-XGF	Antimony, graphite furnace (µg/L)	SB_XGF	Numeric (11.5)	
Se-XGF Qualifier	Qualifies the data for selenium, graphite furnace	L_SE_XGF	Character (1)	Code Table 15
Se-XGF	Selinium, graphite furnace	SE_XGF	Numeric (11.5)	
SO_4 Qualifier	Qualifies the data for sulfate	L_SO4	Character (1)	Code Table 15
SO_4	Sulfate	SO4	Numeric (11.5)	
SO_4-IC Qualifier	Qualifies the data for sulfate, ion chromatography	L_SO4_IC	Character (1)	Code Table 15
SO_4-IC	Sulfate, ion chromatography (mg/L)	SO4_IC	Numeric (11.5)	
SS Qualifier	Qualifies the data for suspended solids	L_SS	Character (1)	Code Table 15
SS	Suspended solids	SS	Numeric (11.5)	
TDS Qualifier	Qualifies the data for total dissolved solids	L_TDS	Character (1)	Code Table 15
TDS	Total dissolved solids, calculated (mg/L)	TDS	Numeric (11.5)	
TKN Qualifier	Qualifies the data for total Kjeldahl nitrogen	L_TKN	Character (1)	Code Table 15
TKN	Total Kjeldahl nitrogen (mg/L)	TKN	Numeric (11.5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . No. Decimals)	Comments
Tl-XGF Qualifier	Qualifies the data for thallium, graphite furnace	L_TL_XGF	Character (1)	Code Table 15
Tl-XGF	Thallium, graphite furnace	TL_XGF	Numeric (11.5)	
TOC Qualifier	Qualifies the data for total organic carbon	L_TOC	Character (1)	Code Table 15
TOC	Total organic carbon (mg/L)	TOC	Numeric (11.5)	
TP-L Qualifier	Qualifies the data for total phosphorous	L_TP_L	Character (1)	Code Table 15
TP-L	Total phosphorous (mg/L)	TP_L	Numeric (11.5)	
Turbidity (TURB)Qualifier	Qualifies the data for turbidity	L_TURB	Character (1)	Code Table 15
Turbidity (TURB)	Turbidity (NTU)	TURB	Numeric (11.5)	
Zn-X Qualifier	Qualifies the data for zinc, extracted	L_ZN_X	Character (1)	Code Table 15
Zn-X	Zinc, extracted (mg/L)	ZN_X	Numeric (11.5)	
Zn-XGF Qualifier	Qualifies the data for zinc, graphite furnace	L_ZN_XGF	Character (1)	Code Table 15
Zn-XGF	Zinc, graphite furnace	ZN_XGF	Numeric (11.5)	

SPATIAL
DATA
FILES

WATER CHEMISTRY MONITORING POINTS

The *Water Chemistry Monitoring Points* spatial file (whcm-sites.shp) is a point coverage representing the locations of monitoring sites. A point file was created rather than using dynamic segmentation as some sampling sites are in the middle of lakes where there is no route system to attach the data.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Internal ID	Internal ID generated by GIS to uniquely identify each point	ID	Numeric (8)	
Water Chemistry Site ID	Identifier for water chemistry sampling site assigned by the Data Warehouse	WchmSiteID	Numeric (6)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Agency's Site ID	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Water Body ID	Unique number of the lake or stream in which the site belongs	Water_ID	Numeric (8)	
Water Name	Name of sampled lake or stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit in which the site belongs	Drainge_Cd	Character (17)	Appendix A