Source Protection and Management of Surface Water Based Public Water Supplies in Newfoundland and Labrador

Robert Wight
Watershed Management Specialist

Department of Environment
Water Resources Management Division

There shall be no man or woman dare to wash any unclean linen, wash clothes… nor rinse or make clean any kettle, pot, or pan, or any suchlike vessel within twenty feet of the old well or new pump. Nor shall anyone aforesaid, within less than a quarter mile of the fort, dare to do the necessities of nature, since by these unmanly, slothful, and loathsome immodesties, the whole fort may be choked and poisoned.

Governor Gage of Virginia

Proclamation for Jamestown, Va. (1610)

Cost - Benefit Analysis of Watershed Protection

The old adage:

An ounce of prevention is worth a pound of cure.

Cost - Benefit Analysis of Watershed Protection

Costs

- Opportunity Costs
- Environmental Protection Costs
- Policy Compliance Costs
- Enforcement Costs
- Clean-up Costs

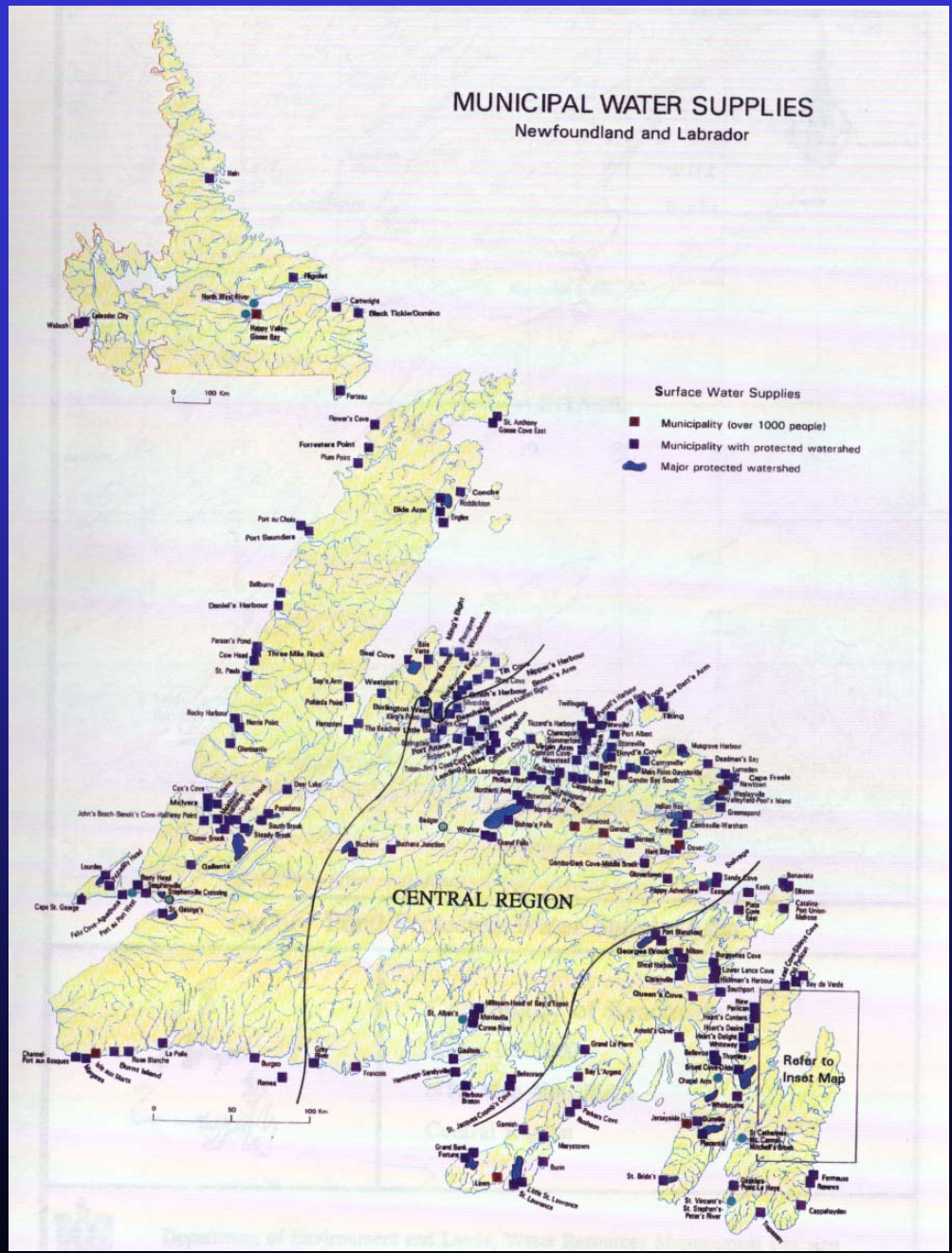
Cost - Benefit Analysis of Watershed Protection

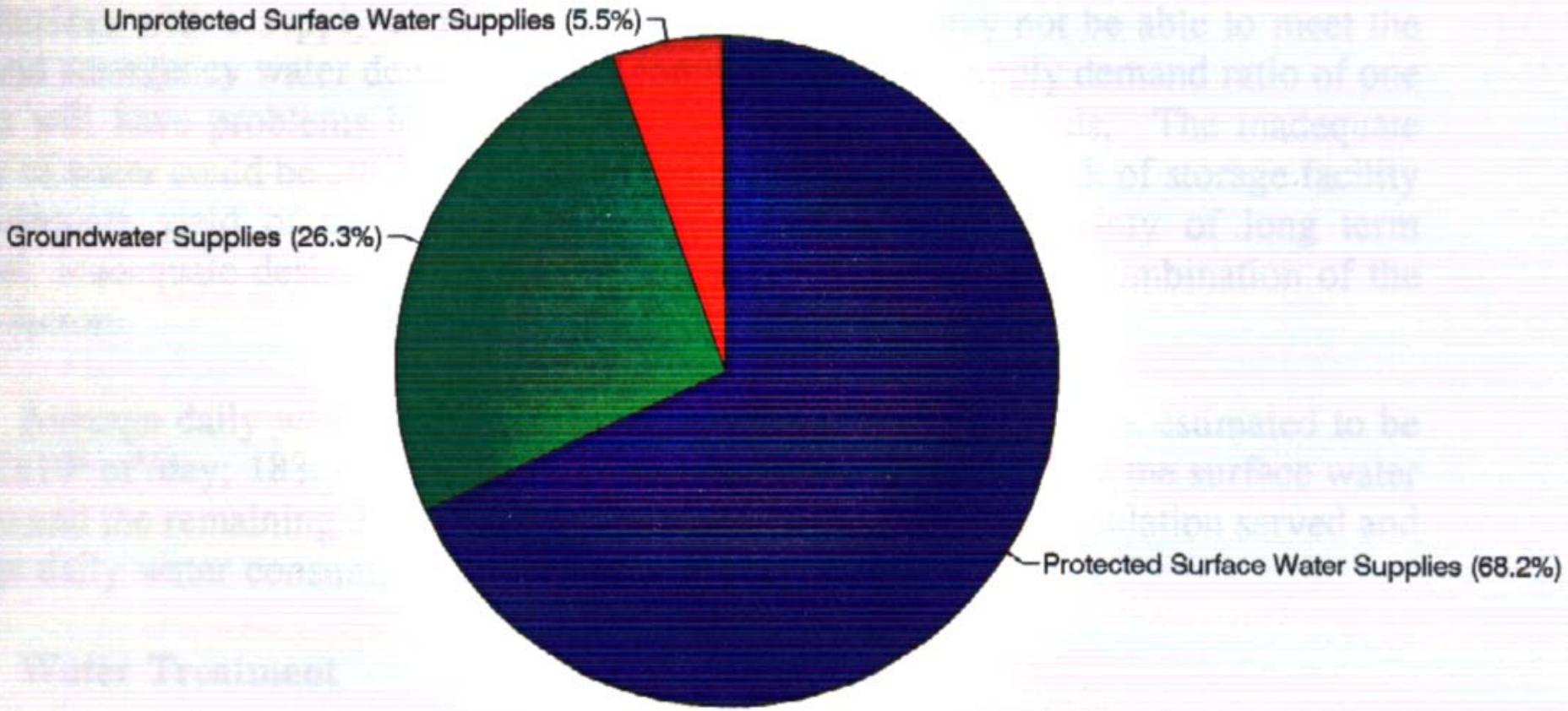
Benefits

- Reduction in Treatment Costs
- Public Health Protection
- High Quality Water Supply
- Increased Security

Cost - Benefit Analysis of Watershed Protection

Total Costs	$57 Million
Total Benefits	$546 Million


MUNICIPAL WATER SUPPLIES
Newfoundland and Labrador
Surface Water Supplies
Municipality (over 1000 people)
Municipality with protected watershed
Major protected watershed
CENTRAL REGION
Refer to Inset Map
0 100 Km
0 50 100 Km


Unprotected Surface Water Supplies (5.5%)
Groundwater Supplies (26.3%)
Protected Surface Water Supplies (68.2%)

Current Status

- 71.4 % of Population Served by Surface Water
- 406,110 People
- 329 Surface Based Public Water Supplies
- 313 Being Used
- 245 “Protected Water Supply Areas”
- 11 Conventional Water Treatment Plants
- 283 Have Chlorination Facilities
- 30 Have no Treatment What So Ever

Watershed Management Approaches

1. Unrestricted Land / Water Use - Full Scale Water Treatment

2. Prohibited Land / Water Use - No Water Treatment

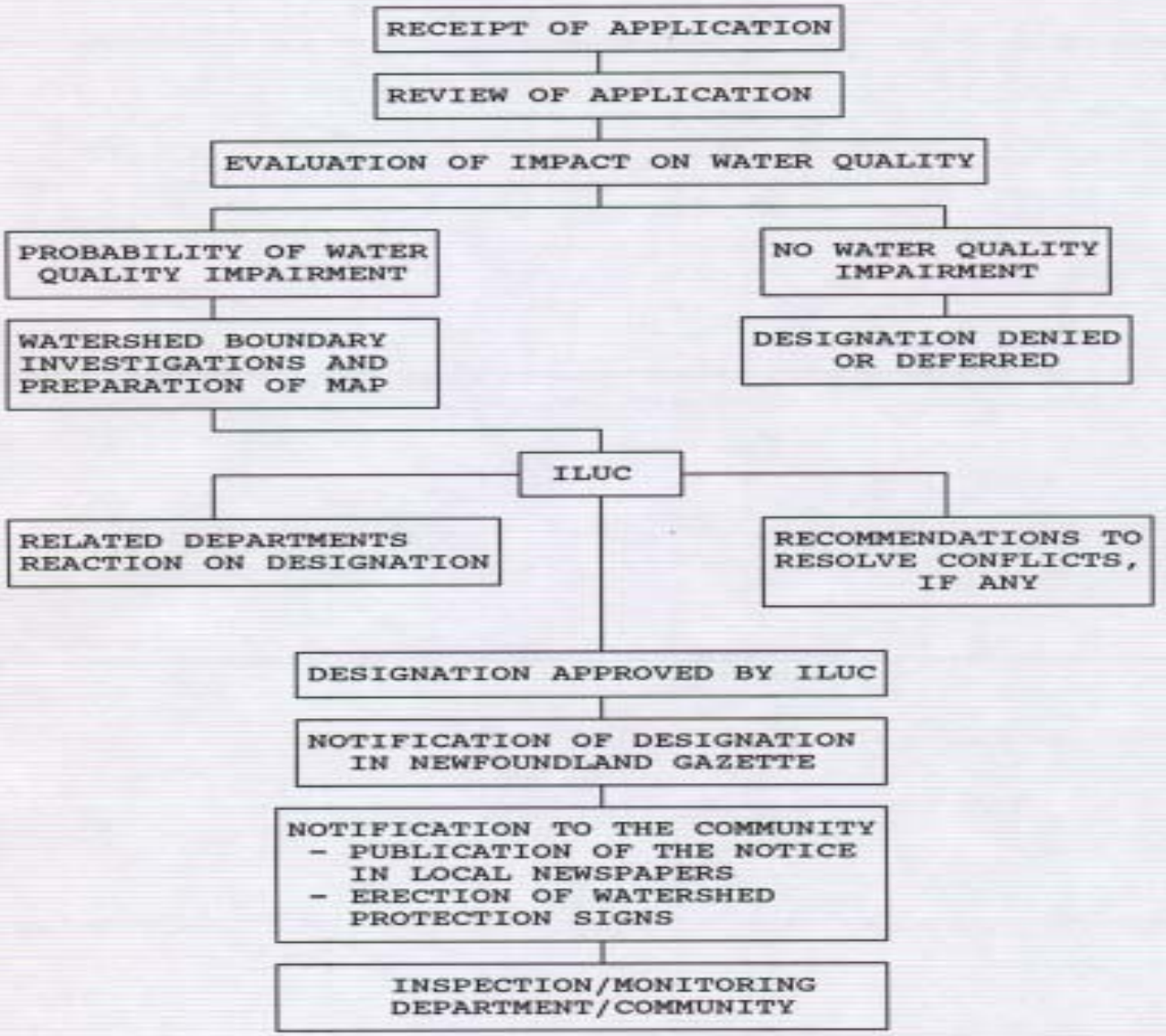
3. Integrated Resource Management - Regulated Land / Water Use

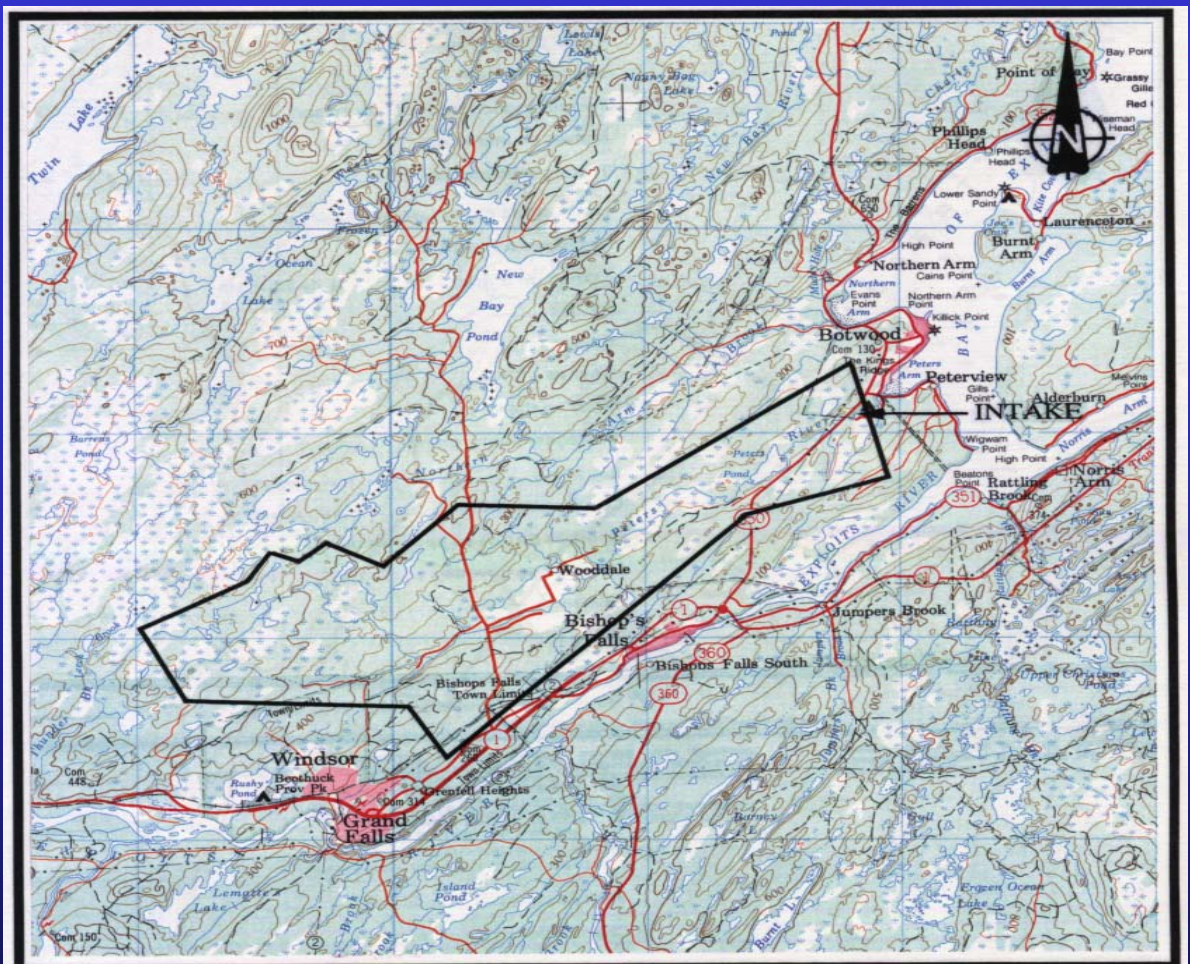
Multiple Barrier Approach

- Source Water Protection
- Water Treatment (As appropriate)
- Distribution System Maintenance
- Monitoring

Source Water Protection is the first, most important and most cost effective step in safeguarding public water supplies

DESIGNATION PROCESS





Peter's River Basin Protected Water Supply Area

Town of Botwood/Peterview

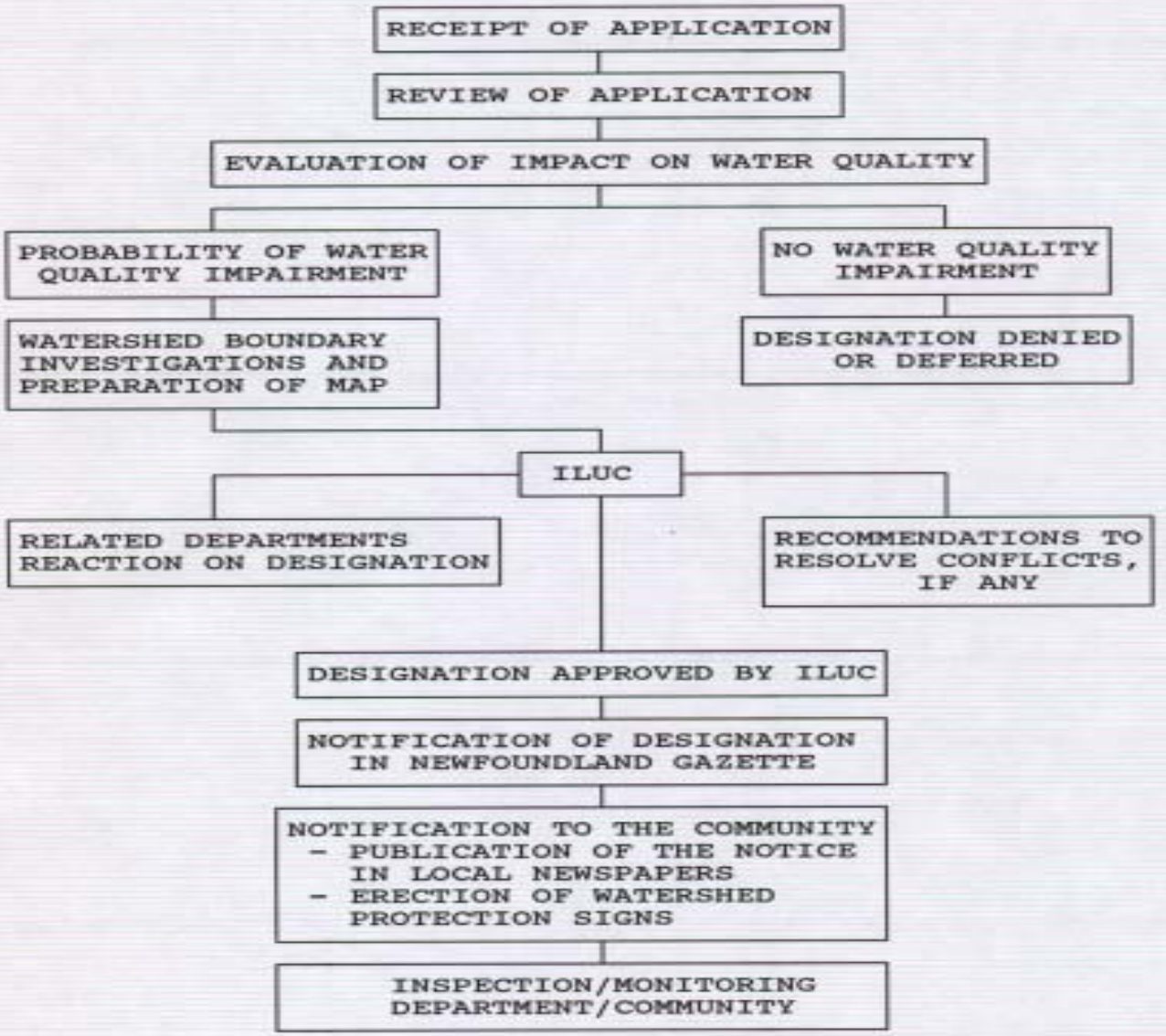
Scale: 1:250,000

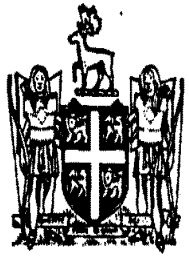
NTS Map No: 2E & 2D

Central Region

Department of Environment and Lands, Water Resources Management Division

DESIGNATION PROCESS





THE NEWFOUNDLAND GAZETTE

PART I

PUBLISHED BY AUTHORITY

Vol. 71 ST. JOHN'S, FRIDAY, MAY 10, 1996 No. 19

CONSOLIDATED NEWFOUNDLAND REGULATION 552/96

Notice of Protected Water Supply Area
under the
Environment Act
(O.C. 96-153)

Under the authority of section 10 of the *Environment Act* and the *Subordinate Legislation Revision and Consolidation Act*, the Lieutenant-Governor in Council designates the area generally known as the Cold Brook Water Supply Area as a protected water supply area.

NOTICE

This area includes all lands described as follows:

That is to say by a line drawn from military grid reference 450000 5545000 40° 00' grid azimuth for a distance of 475 metres to the commencement point;

Then from the above point by a line drawn 157° 00' grid azimuth for a distance of 200 metres;

Then from the above point by a line drawn 201° 00' grid azimuth for a distance of 600 metres;

Then from the above point by a line drawn 294° 00' grid azimuth for a distance of 300 metres;

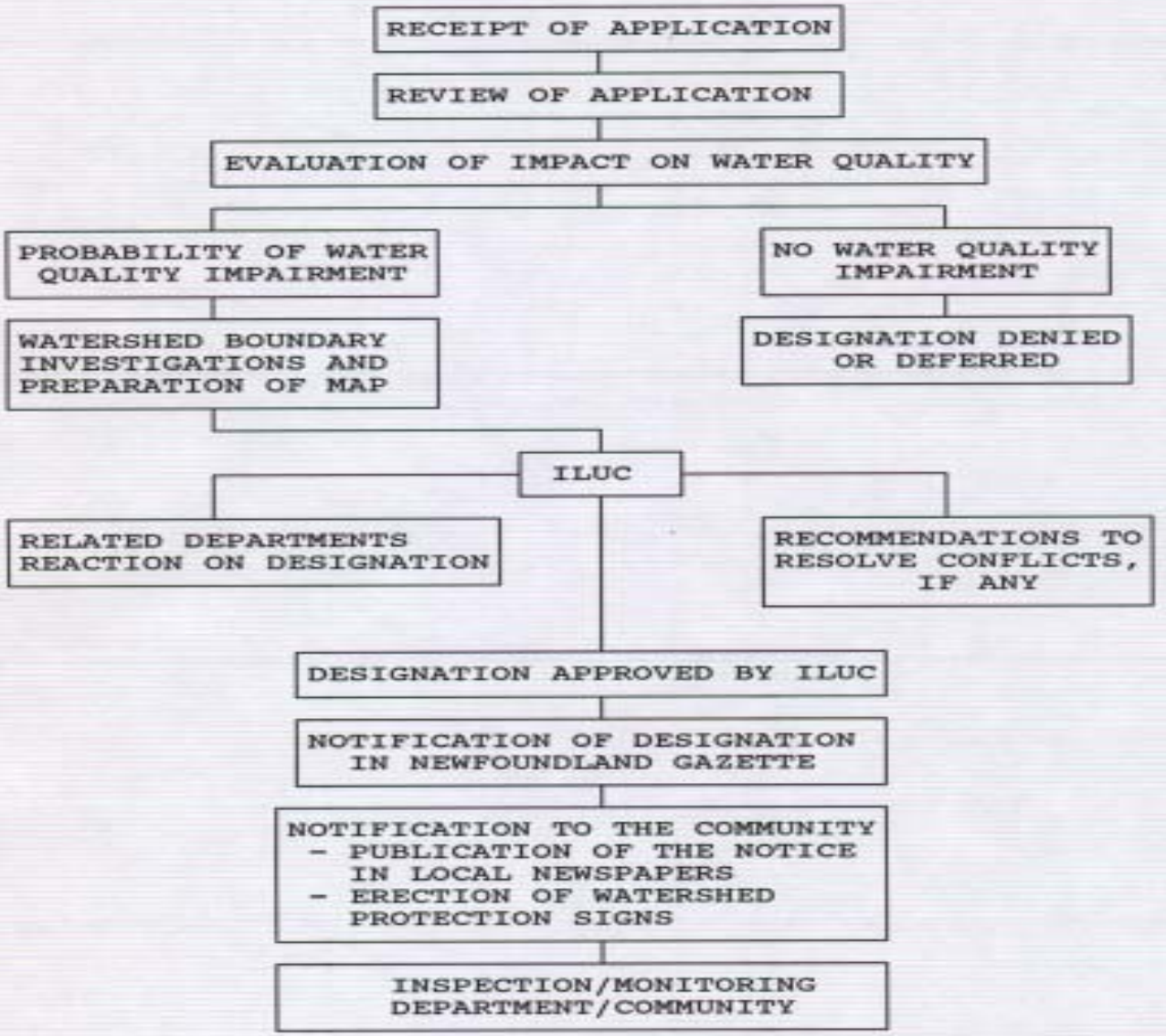
Then from the above point by a line drawn 24° 00' grid azimuth for a distance of 250 metres to the point of commencement.

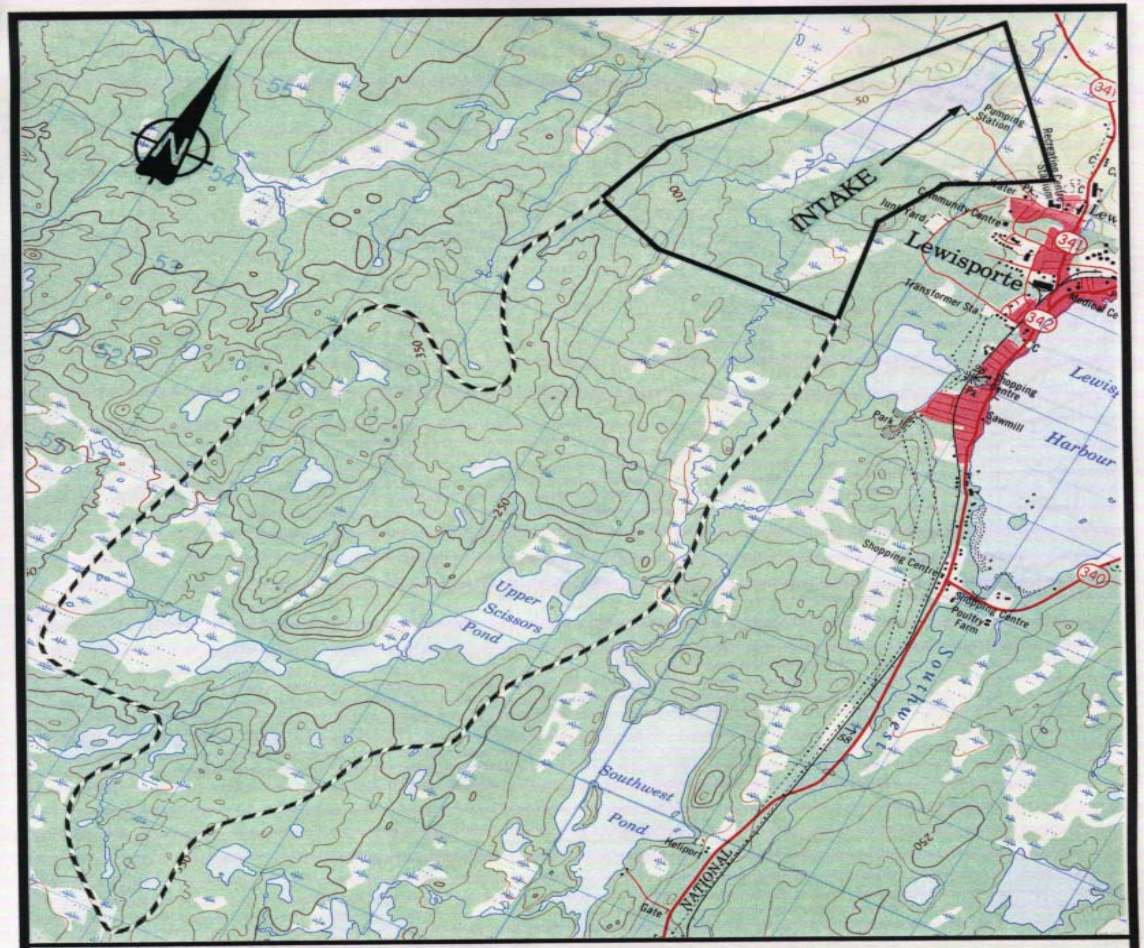
All bearings refer to Grid North.

147/89

The Cold Brook Water Supply Area Notice, Newfoundland Regulation 147/89, is repealed.

DESIGNATION PROCESS





Stanhope Pond Protected Water Supply Area

Town of Lewisporte

Scale: 1:50,000

NTS Map No: 2E/3 & 2E/6

Central Region

Department of Environment and Lands, Water Resources Management Division

Watershed Management

- Inventory and Mapping - Atlas
- Land Use Inventory
- Watershed Management Plans
- Watershed Management Committees
- Certificates of Environmental Approval

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF ENVIRONMENT

APPLICATION FOR ENVIRONMENTAL APPROVAL FOR A DEVELOPMENT ACTIVITY IN A PROTECTED PUBLIC WATER SUPPLY AREA

In accordance with the Ministerial policy prepared under **Section 10** of the *Environment Act, SN 1995 c E-13.1*, approval is requested to carry out a development* activity in a protected public water supply area.

(1) State the name of the town/community which owns/operates the water supply.

.....

.....

(2) **PROPOSED ACTIVITY:** Select the activity to be undertaken:

Forestry	☐	Aggregate Extraction	☐
Mineral Exploration	☐	Recreational Facility	☐
Agricultural Operation	☐	Linear Development	☐

Other.....

Provide specific details on the above activity .....

.....

.....

(3) **LOCATION:** On the largest scale available map provide information on the exact location of the proposed activity.

(4) **ACCESS ROUTES:** On the largest scale available map indicate the exact access route(s) which will be used in order to carry out the proposed activity.

Existing ☐ Proposed ☐

(5) **SIZE AND VOLUME:** Indicate the size of the operation and the estimated volume of material to be removed (if applicable).

Size (ha) _____ Volume (m3) _____

* Development means the carrying out of any activity or operations on, over, or under land or water for social or economic benefits, or the making of any change in the use or the intensity of use of any land, water, building or premises.

File No: 550-01-02-05-005

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Environment and Labour

CERTIFICATE OF APPROVAL

Pursuant to the *Environment Act*, SN 1995 c E-13.1, Section(s) 10

Date: February 5, 2001 Approval No: C.A. 01-021

Proponent:

Attention:

Re: Aggregate Extraction - Peter's River Basin Protected Water Supply Area

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Approval is hereby given for: Extraction of up to 30,000 cubic metres of aggregate material and blending sand over a 4.1 hectare site located near Peter's River, near the Botwood Airstrip (Mines File No.: 7115738) in the Peter's River Basin Protected Water Supply Area (used by the Towns of Botwood and Peterview) with reference to application and Development Plan dated January 15, 2001.

This approval does not release the proponent from the obligation to obtain appropriate approvals from other concerned provincial, federal and municipal agencies.

This approval is subject to the terms and conditions indicated in Appendix A (attached). A completion report, Appendix B (attached), must be submitted upon completion of the work. Unless noted otherwise, this approval is valid only until December 31, 2001.

It should be noted that prior approval of any significant changes in the operation or size of the proposed development activity must be obtained from the Department of Environment and Labour. New approval must be obtained in the event of changes in ownership or management of the project.

Failure to comply with the terms and conditions will render this approval null and void, place the proponent and their agent(s) in violation of the *Environment Act* and make the proponent responsible for taking any remedial measures as may be prescribed by this Department.

MINISTER

Buffer Zones

Water Body	Minimum Buffer Zone
Intake Pond	150 metres
River Intake	150 metres for 1 km upstream and 150 metres downstream
Main River Channel	75 metres
Major Ponds, Lakes and Tributaries	50 metres
Other Water Bodies	30 metres

Watershed Management

- Inventory and Mapping - Atlas
- Land Use Inventory
- Watershed Management Plans
- Watershed Management Committees
- Certificates of Environmental Approval
- Monitoring and Investigation
- Conflict Resolution

Water Quality Monitoring

- Raw (Source) Water Quality
- Tap (Treated) Water Quality

Raw (Source) Water Quality

- Physical Parameters
- Chemical Parameters
  - Inorganic
  - Organic
- Radiological
- Microbiological

Raw (Source) Water Quality

- Physical Parameters
  - Temperature
  - Conductivity
  - pH
  - Colour
  - Turbidity
  - Dissolved Oxygen
  - Total Dissolved Solids

Raw (Source) Water Quality

- Chemical Parameters
  - Inorganic
    - Metals
    - Major Ions
    - Nutrients
  - Organic
    - Total Organic Carbon
    - Hydrocarbons
    - Pesticides
    - Creosote
    - Pentachlorophenols
    - Other organic parameters as required

Raw (Source) Water Quality

- Radiological
  - Uranium
  - Other radiological parameters as required.
- Microbiological
  - Total Coliform
  - Feacal Coliform

Tap (Treated) Water Quality

- Physical Parameters
- Chemical Parameters
  - Inorganic
  - Organic
- Radiological
- Microbiological

Tap (Treated) Water Quality

- Physical Parameters
  - Temperature
  - Conductivity
  - pH
  - Colour
  - Turbidity
  - Dissolved Oxygen
  - Total Dissolved Solids

Tap (Treated) Water Quality

- Chemical Parameters
  - Inorganic
    - Metals
    - Major Ions
    - Nutrients
  - Organic
    - Chlorination Disinfection By-Products
      - Trihalomethanes(THMs) & Haloacetic Acids(HAAs)
    - Total Organic Carbon
    - Hydrocarbons
    - Pesticides
    - Creosote
    - Pentachlorophenols
    - Other organic parameters as required

Tap (Treated) Water Quality

- Radiological
  - Uranium
  - Other radiological parameters as required.

- Chlorine Residual Testing
  - Free Chlorine
  - Total Chlorine

Water Quality Monitoring

- Partnership with Municipalities
  - Limited Provincial Budget
  - Limited Municipal Budgets
  - Combination of Funds Allows Broader Coverage of Communities and Parameters
  - Greater Consistency

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Environment
Water Resources Management Division

DRINKING WATER QUALITY MONITORING PROGRAM - SURFACE WATER (2001-2002)

Please review the following options, and check the ones which suit your community's water quality monitoring needs. If you do not want any water quality monitoring done, please check item 4, and return this form to us so that we will have a record of your instructions. Please note that actual analytical costs will be invoiced to the Council or Local Service District Committee directly by the laboratory or laboratories. **Actual invoice costs may be different than those estimated below, which are based upon 2000-2001 costs, depending upon the best price we can negotiate with laboratories bidding for this work.**

Please note that if you have more than one water supply source please complete and submit a separate form for each one.

1 - RAW WATER

Samples of raw (untreated) water will be collected from the pond/lake/river/reservoir for analysis of selected representative inorganic chemical parameters.

Cost: 4 samples @ $65.00 + HST (one sample in each season) = $ 299.00 ☐
2 samples @ $65.00 + HST (one sample spring and fall) = $ 149.50 ☐

2 - TAP WATER

Samples of tap (treated) water will be collected from one location within your distribution system for analysis of selected representative inorganic chemical parameters.

Cost: 4 samples @ $65.00 + HST (one sample in each season) = $ 299.00 ☐
2 samples @ $65.00 + HST (one sample spring and fall) = $ 149.50 ☐

3 - THM

Samples of tap (treated) water will be collected from one or more location(s) within your distribution system for analysis of total trihalomethanes (THM)in each of the four seasons. Samples for THM analysis should preferably be collected at several points in the distribution system.

Costs: 4 THM samples @ $37.00 + HST at 4 sites in distribution system = $ 680.80 ☐
4 THM samples @ $37.00 + HST at 3 sites in distribution system = $ 510.60 ☐
4 THM samples @ $37.00 + HST at 2 sites in distribution system = $ 340.40 ☐
4 THM samples @ $37.00 + HST at 1 site in distribution system = $ 170.20 ☐

4 - No water quality monitoring for 2001 - 2002. ☐

Community _____ Signature _____ Date _____

File No: 550-01-02-03-FIELD(1)

Laboratories

All analyzing laboratories must be Accredited by

C anadian
A ssociation
E nvironmental
A nalytical
L aboratories

WATER ANALYSIS LABORATORIES

81 PARK AVENUE, P.O. BOX 205, MOUNT PEARL, NEWFOUNDLAND, A1N 2C2, PHONE: (709) 364-2328 FAX: (709) 368-7770

A DIVISION OF DOMESTIC COMMERCIAL WATER TREATMENT CO. LTD.

Analytical Results:

Date Submitted: 12/06/2000

New-wes-valley Town Council
P.O. BOX 64
BADGER'S QUAY
NFLD, A0G1B0

Submitted By: Robert Wight\env.
Contact : ACCOUNTS PAYABLE
P.O. Number :
Fax Number -

Water Analysis Code: 8203

Sample Identification: NEW-WES-VALLEY CP SOURCE 2000\11\27

	Parameter		Value	Units		Date	Parameter		Value	Units	Date
1	Alkalinity	<	0.5	mg/L CaC03	33		Orthophosphate	<	0.01	mg/L P	
2	pH		4.53	Units	34		Bromide	<	0.05	mg/L Br	
3	True Color		182.	TCU	35		Biochemical Oxygen Demand			mg/L O2	
4	Specific Conductance		49.5	uS/cm	36		Oil and Grease			mg/L	
5	Turbidity		0.76	NTU	37		Uranium			mg/L U	
6	Hardness		4.5	mg/L CaC03	38		Salinity			g/Kg	
7	Calcium		0.81	mg/L Ca	39		Chlorine Residual			mg/L Cl2	
8	Magnesium		0.61	mg/L Mg	40		Chemical Oxygen Demand			mg/L O2	
9	Manganese	<	0.01	mg/L Mn	41		Boron			mg/L B	
10	Iron		0.15	mg/L Fe	42		Barium			mg/L Ba	
11	Copper	<	0.01	mg/L Cu	43		Beryllium			mg/L Be	
12	Zinc	<	0.01	mg/L Zn	44		Cobalt			mg/L Co	
13	Potassium		0.16	mg/L K	45		Selenium			mg/L Se	
14	Sodium		6.24	mg/L Na	46		Tin			mg/L Sn	
15	Chloride		7.6	mg/L Cl	47		Vanadium			mg/L V	
16	Fluoride	<	0.01	mg/L F	48		Arsenic			mg/L As	
17	Sulfate		1.1	mg/L S04	49		Silver			mg/L Ag	
18	Dissolved Organic Carbon		15.3	mg/L C	50		Mercury	<	0.001	mg/L Hg	
19	Total Solids		36	mg/L	51		Antimony			mg/L Sb	
20	Total Suspended Solids	<	2	mg/L	52		Molybdenum			mg/L Mo	
21	Total Dissolved Solids		36	mg/L	53		Sulfide			mg/L S	
22	Nitrate	<	0.005	mg/L N	54		Trihalomethanes (total)			mg\L THM	
23	Ammonia			mg/L N	55		Chloroform			mg\L CHCl3	
24	Kjeldahl Nitrogen		0.29	mg/L N	56		Dichlorobromomethane			mg\L	
25	Total Phosphorus	<	0.01	mg/L P	57		Dibromochloromethane			mg\L	
26	Cadmium	<	0.002	mg/L Cd	58		Bromoform			mg\L CHBr3	
27	Lead	<	0.001	mg/L Pb	59		BTEX			mg/L BTEX	
28	Aluminum		0.11	mg/L Al	60		Benzene			mg/L C6H6	
29	Chromium	<	0.01	mg/L Cr	61		Toluene			mg/L	
30	Nickel	<	0.01	mg/L Ni	62		Ethylbenzene			mg/L	
31	Silicon			mg/L Si	63		Xylenes			mg/L	
32	Nitrite	<	0.005	mg/L N	64		THM Forming Potential			mg/L CHCl3	

Department of Environment and Labour

Water Resources Management Division

Raw Water Quality Data — *Municipal Water Supply*

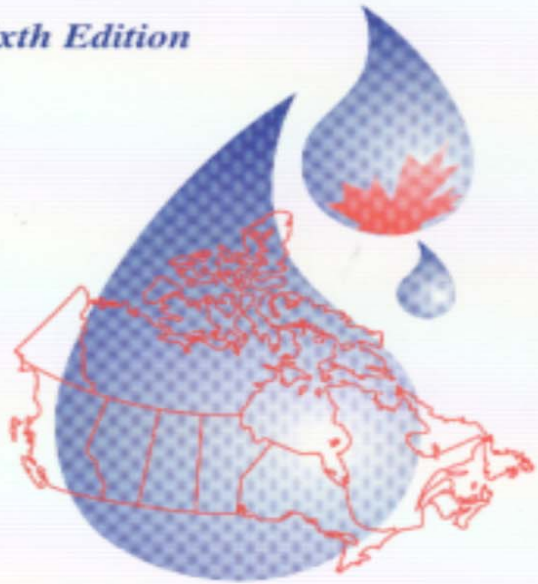
Community Name NEW-WES-VALLEY (CARTER'S) **Region** CENTRAL

Parameters	Units	Drinking Water Guidelines	Analytical Data	Parameters	Units	Drinking Water Guidelines	Analytical Data
Sample Date			Nov 27, 2000	Sample Date			Jun 13, 2000
Analyzing Labratory			WAL	Analyzing Labratory			WAL
Alkalinity	(mg/L)		0.25	Alkalinity	(mg/L)		0.25
Aluminium	(mg/L)		0.11	Aluminium	(mg/L)		0.06
Arsenic	(mg/L)	0.025		Arsenic	(mg/L)	0.025	
Cadmium	(mg/L)	0.005	0.001	Cadmium	(mg/L)	0.005	0.001
Calcium	(mg/L)		0.81	Calcium	(mg/L)		0.84
Chloride	(mg/L)	<= 250	7.6	Chloride	(mg/L)	<= 250	5.9
Chromium	(mg/L)	0.05	0.005	Chromium	(mg/L)	0.05	0.005
Copper	(mg/L)	<= 1.0	0.005	Copper	(mg/L)	<= 1.0	0.03
D O C	(mg/L)		15.3	D O C	(mg/L)		6.8
Fluoride	(mg/L)	1.5	0.005	Fluoride	(mg/L)	1.5	0.005
Iron	(mg/L)	<= 0.3	0.15	Iron	(mg/L)	<= 0.3	0.16
Pottasium	(mg/L)		0.16	Pottasium	(mg/L)		0.11
Kejhal Nit.	(mg/L)		0.29	Kejhal Nit.	(mg/L)		0.44
Lead	(mg/L)	0.01	0.0005	Lead	(mg/L)	0.01	0.0005
Magnesium	(mg/L)		0.61	Magnesium	(mg/L)		0.35
Manganese	(mg/L)	<= 0.05	0.005	Manganese	(mg/L)	<= 0.05	0.005
Mercury	(mg/L)	0.001	0.0005	Mercury	(mg/L)	0.001	0.0005
Sodium	(mg/L)	<= 200	6.24	Sodium	(mg/L)	<= 200	4.19
Nickel	(mg/L)		0.005	Nickel	(mg/L)		0.005
Nitrate (ite)	(mg/L)		0.0025	Nitrate (ite)	(mg/L)		0.0025
pH	(pH units)	6.5 - 8.5	4.53	pH	(pH units)	6.5 - 8.5	4.71
Tot. Phosphorus	(mg/L)		0.005	Tot. Phosphorus	(mg/L)		0.005
Sulphate	(mg/L)	<= 500	1.1	Sulphate	(mg/L)	<= 500	0.8
T D S	(mg/L)	<= 500	36	T D S	(mg/L)	<= 500	24
Zinc	(mg/L)	<= 5.0	0.005	Zinc	(mg/L)	<= 5.0	0.005
Colour	(TCU)	<= 15	182	Colour	(TCU)	<= 15	109
Spec. Cond.	(uS/cm)		49.5	Spec. Cond.	(uS/cm)		38.7
Turbidity	(NTU)	1	0.76	Turbidity	(NTU)	1	0.64
Temperature	(°C)		2	Temperature	(°C)		14.2
T S S	(mg/L)		1	T S S	(mg/L)		1
Total Col.	(/100mL)			Total Col.	(/100mL)		
Faecal Col.	(/100mL)			Faecal Col.	(/100mL)		

Health Canada Santé Canada

Guidelines for Canadian Drinking Water Quality

Sixth Edition



Canada

APPENDIX A - RAW WATER DATA

(New-Wes-Valley, Carter's Pond)

Raw (or untreated) water is collected directly from the source (pond, lake or stream) prior to disinfection or other treatment. It is analyzed to determine the quality of water that flows into your treatment/distribution system, and is a direct indicator of the health of the ecosystem that makes up the natural drainage basin or watershed area. Monitoring of raw water quality is the most important tool to assess the impact of land use changes on source water and to ensure the integrity of a public water supply.

A review of the raw water quality data for 2000 indicates that the following parameter(s) has(have) exceeded the **Guidelines for Canadian Drinking Water Quality, Sixth Edition**. The parameters exceeding the guidelines have been marked with an (* or flag) in the attached data report.

pH

The observed pH values were **4.71** in the spring and **4.53** in the fall. The pH of drinking water should be between 6.5 and 8.5. pH of 7 is neutral, and considered ideal. However, in many parts of Newfoundland, raw water pH is outside of the ideal range. This is due to the underlying bedrock, lack of soil and vegetative cover, abundance of wetlands, and other environmental factors. Water with low pH may result in corrosion of the distribution system. In some communities the raw water is treated with soda ash or lime to bring the pH to an acceptable level.

Colour

The observed colour values were **109 TCU** in the spring and **182 TCU**, in the fall. The drinking water limit for colour (15 TCU) is set for aesthetic reasons. In most cases, it is a reflection of the concentration of natural organic matters in the water. Without large amounts of soil cover, there is little natural buffering capacity against high colour. Typically, waters with high colour have high organic content, and may have a foul taste once chlorinated. There is also the potential for the formation of trihalomethanes.

Water Quality Data

- One Centralized Data Registry
  - Consistent and Timely
    - Input
    - Storage
    - Retrieval
    - Reporting - Mail-outs and Internet
    - Identification of Water Quality Problems

Summary

- Watershed Protection and Management is one of this Province's Strengths
- 78 % of Surface Supplies are Designated
- Existing Legislation and Policy with New Draft Legislation and Regulations Pending
- 3 Full Time Specialists Dedicated to Program
- Example for Other Provinces
- National and International Recognition

Source Water Protection in Canada

Province	Legislation	Source Water Protection Approach	Special Features
1. Newfoundland	Environment Act	• Designation • Water Quality Monitoring • Land Use Control within the watershed • Public education • Stakeholders' participation	• 245 of 285 public water supplies designated as protected water supplies • Seven watershed monitoring committees were appointed • Three watershed management plans have been prepared • No compensation provision in the Environment Act
2. New Brunswick	Clean Water Act and Regulations	• Designation • 75 metres buffer zone around watercourses • Land use control within the buffer zone • Land use amendment • Public consultation	• 31 of 65 public water supplies designated as protected water supplies • A number of watershed management plans have been prepared • Some provision for compensation in the Act
3. Nova Scotia	Environment Act and Regulations	• Designation • Setback requirments • Land use regulations for each designated area • Public consultation	• 21 of 81 public water supplies designated as protected water supplies • Some provision for compensation in the Act
4. Quebec	Environmental Quality Act and Regulations	• Pollution prevention • 10 to 15 meters setback requirement	• No compensation provision in the Act
5. Ontario	Ontario Water Resources Act Conservation Authorities Act Safe Drinking Water Act	• Land use control • Watershed management planning	• Some provision for compensation • A number of watershed management planning related documents have been prepared
6. British Columbia	Forest Practices Code	• 100 metres no development buffer zone requirement around water supply intakes • Land use restrictions	• A number of watershed management plans have been prepared • Five of 1100 public water supplies are restricted for public access