



## **Assessing the Need to Treat Winnipeg's Water Supply**

Presented to  
Standing Policy Committee on  
Public Works  
October 31, 2000



# Water and Waste Department

## Why Do We Need Water Treatment?

- Water treatment is about protecting Public Health
- *“The rationale for construction of a water treatment plant is based primarily on health concerns” .... Dr. Margaret Fast*
- *“Providing water that is safe and healthy to drink”* received the highest priority .... March 1999 Customer Survey



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## Why Is Water Treatment Being Considered Now?

- To reduce the risk of waterborne disease outbreaks caused by chlorine-resistant microorganisms
- To reduce the existing levels of chlorinated disinfection by-products



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## Background

- Since 1919, Winnipeg has enjoyed a high quality reliable water supply from Shoal Lake
  - minimal treatment (chlorine for disinfection prior to 1937, and fluoride for dental protection since 1956)
- In 1993 Council
  - Accepted the recommendation to undertake water treatment within a ten year time frame
  - And established a Water Treatment Reserve
- Between 1995 and 1999 a comprehensive program of monitoring, pilot testing and engineering studies was undertaken



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## Public Consultation

- “*Should Winnipeg Build a Water Treatment Plant?*” ....an eight page brochure was widely circulated
- Special Meetings of Executive Policy Committee (EPC) were held October 21 and 28, 1999
- The public provided 32 written and oral submittals at the EPC Special Meetings
  - 20 “In Support”
  - 6 “In Opposition”
  - 6 “For Information”



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## Public Health Support

*“The rationale for construction of a water treatment plant is based primarily on health concerns and it is for this reason that I offer my support for this request.” ....Dr. Margaret Fast*

*“ The Medical Officer of Health for Environmental Health agrees with the City of Winnipeg plan to construct a water treatment plant.”.... Dr. Jim Popplow*



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## Risk Assessment Workshop Participants

### ***International Specialists***

- Dr. J. Rose - University of Florida
- Dr. E. Nieminski - State of Utah
- Dr. G. Finch - University of Alberta
- Dr. B. Bellamy - CH2M Hill, Denver, Colorado

### ***Manitoba Public Health Representatives***

- Dr. Guilfoyle - Manitoba Medical Officer of Health
- Dr. J. Blanchard - Provincial Epidemiologist
- D. Rocan - Manitoba Environment

### ***City of Winnipeg Public Health Representatives***

- Dr. M. Fast - City of Winnipeg Medical Officer of Health
- Dr. S. Harlos - Deputy Medical Officer of Health



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## Workshop Conclusions

- **LOW RISK**
- **HIGH CONSEQUENCE**

### *The Experts' Opinion:*

- *“The implementation of comprehensive water treatment for the Shoal Lake water supply system is considered to be justified from the public health perspective”*



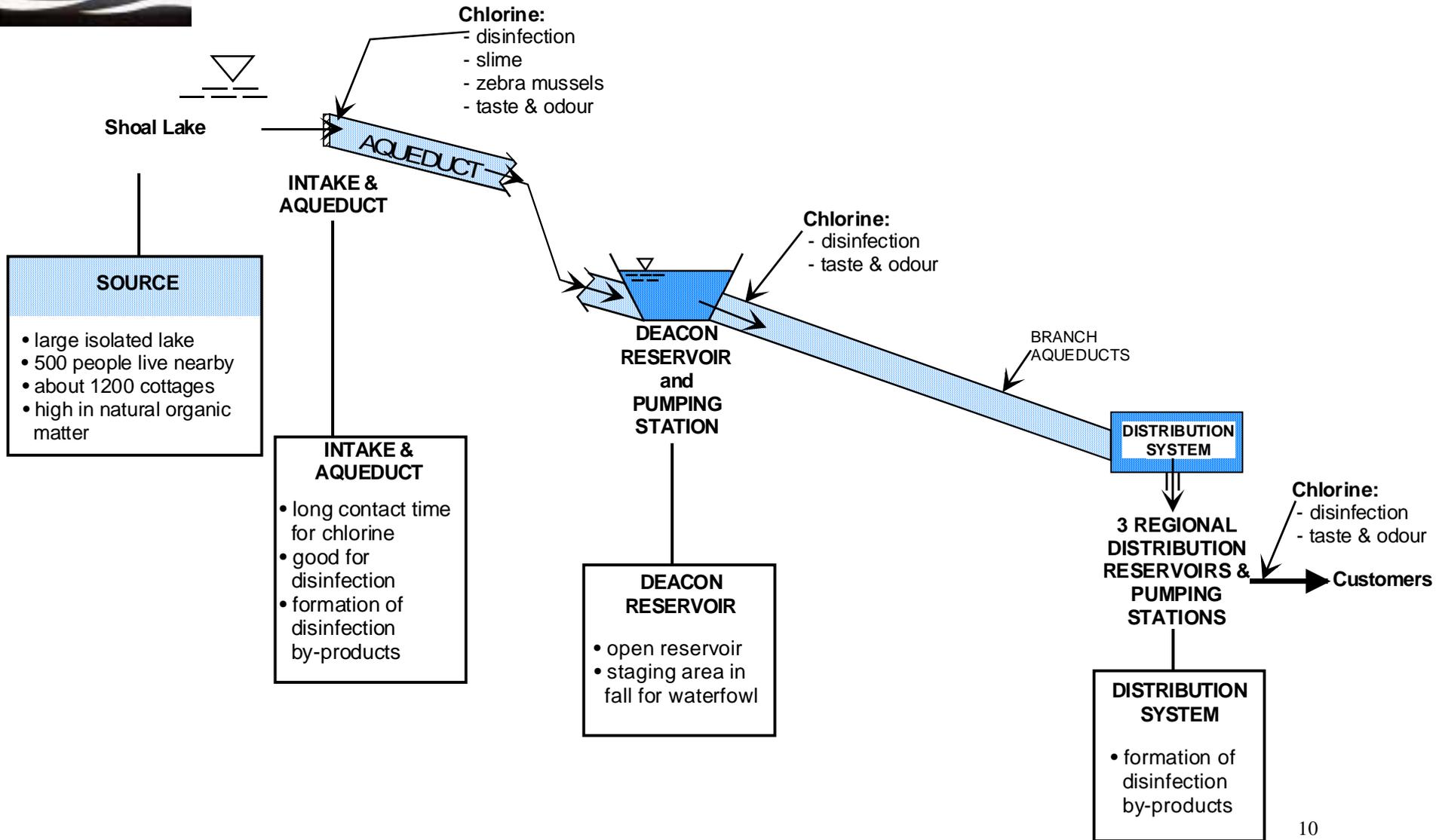
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## High Consequence

- Public confidence in municipal tap water is a valuable asset (and easily lost)
- Significant consequences result from a waterborne disease outbreak:
  - illness and loss of life
  - liability
  - loss of public confidence

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## Existing Water Supply



**SOURCE**

- large isolated lake
- 500 people live nearby
- about 1200 cottages
- high in natural organic matter

**INTAKE & AQUEDUCT**

- long contact time for chlorine
- good for disinfection
- formation of disinfection by-products

**DEACON RESERVOIR**

- open reservoir
- staging area in fall for waterfowl

**DISTRIBUTION SYSTEM**

- formation of disinfection by-products



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## Drinking Water Quality Regulation

- Unlike the USA, Canada sets guidelines rather than standards
- Provinces are responsible for regulation of drinking water
- Manitoba regulates under The Public Health Act
  - Minister issues certificates
  - Canadian guidelines used as reference for quality requirements



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## Regulatory Trends

- In USA, water quality is regulated nationally under the *Safe Drinking Water Act*
- Trend in the USA is for increasing stringency in water quality standards and guidelines to protect public health
- Canada is following this trend, ie. new Ontario Regulations



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## Waterborne Pathogens

- Chlorine is effective against bacteria and viruses
- Chlorine is relatively ineffective against *Giardia* and requires high doses and long contact times
- Chlorine is not effective against *Cryptosporidium*





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## Disinfection By-Products (DBPs)

- Formed as a reaction between chlorine and natural organic matter in the water
- Objectives for DBPs and waterborne pathogen control are in conflict
  - more disinfection, better pathogen kill
  - more disinfection, higher DBPs
- Research has identified an association between DBPs and illness
- The DBP guidelines in Canada have become much more stringent; the US continues to lower allowable concentration levels



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## Taste, Odour and Appearance

- Public confidence in tap water is strongly influenced by taste and odour
- Unpleasant taste and odour from algae are a frequent summer occurrence
- 41% of customers are not satisfied with how their water looks and tastes



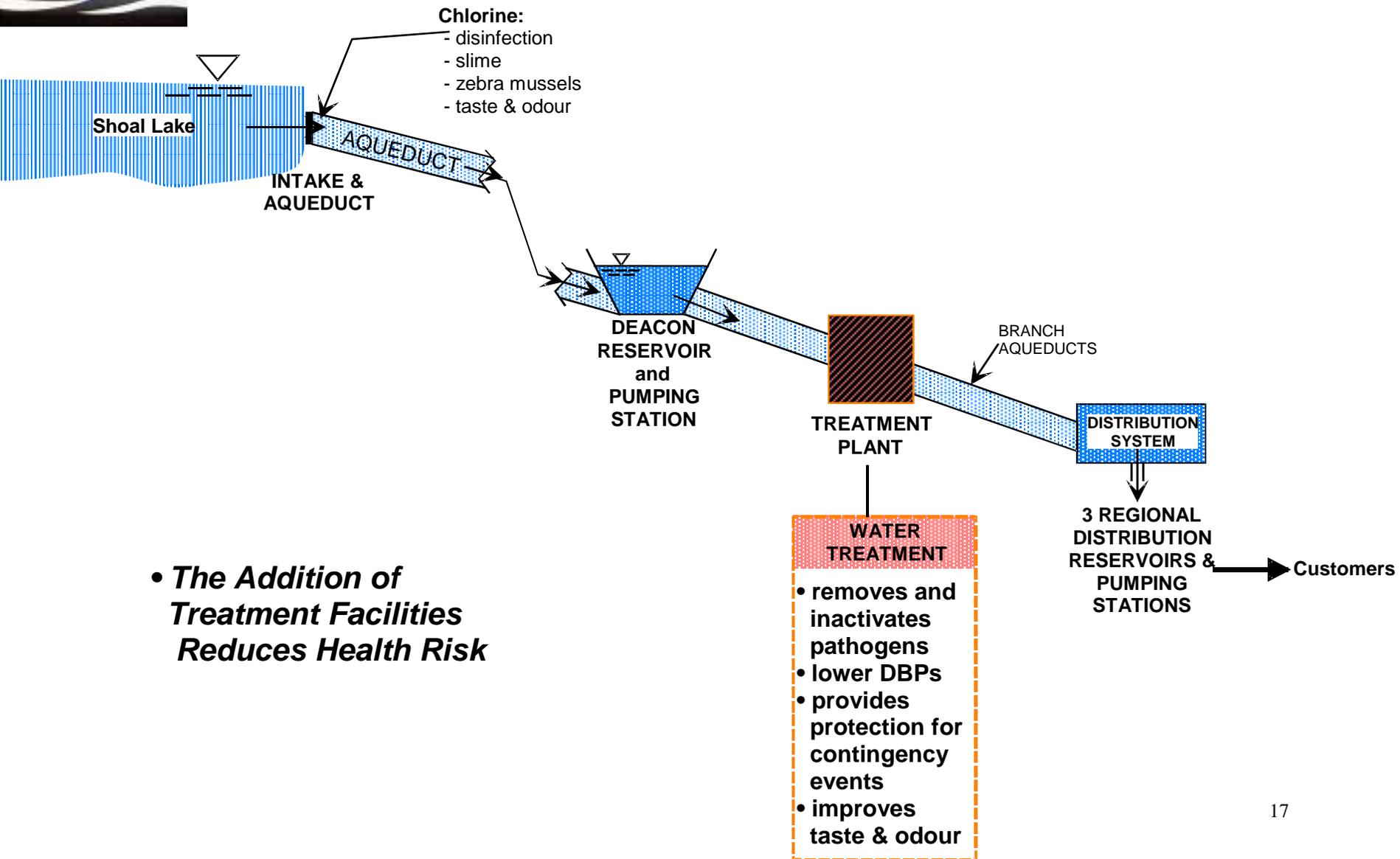
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## Process Selection

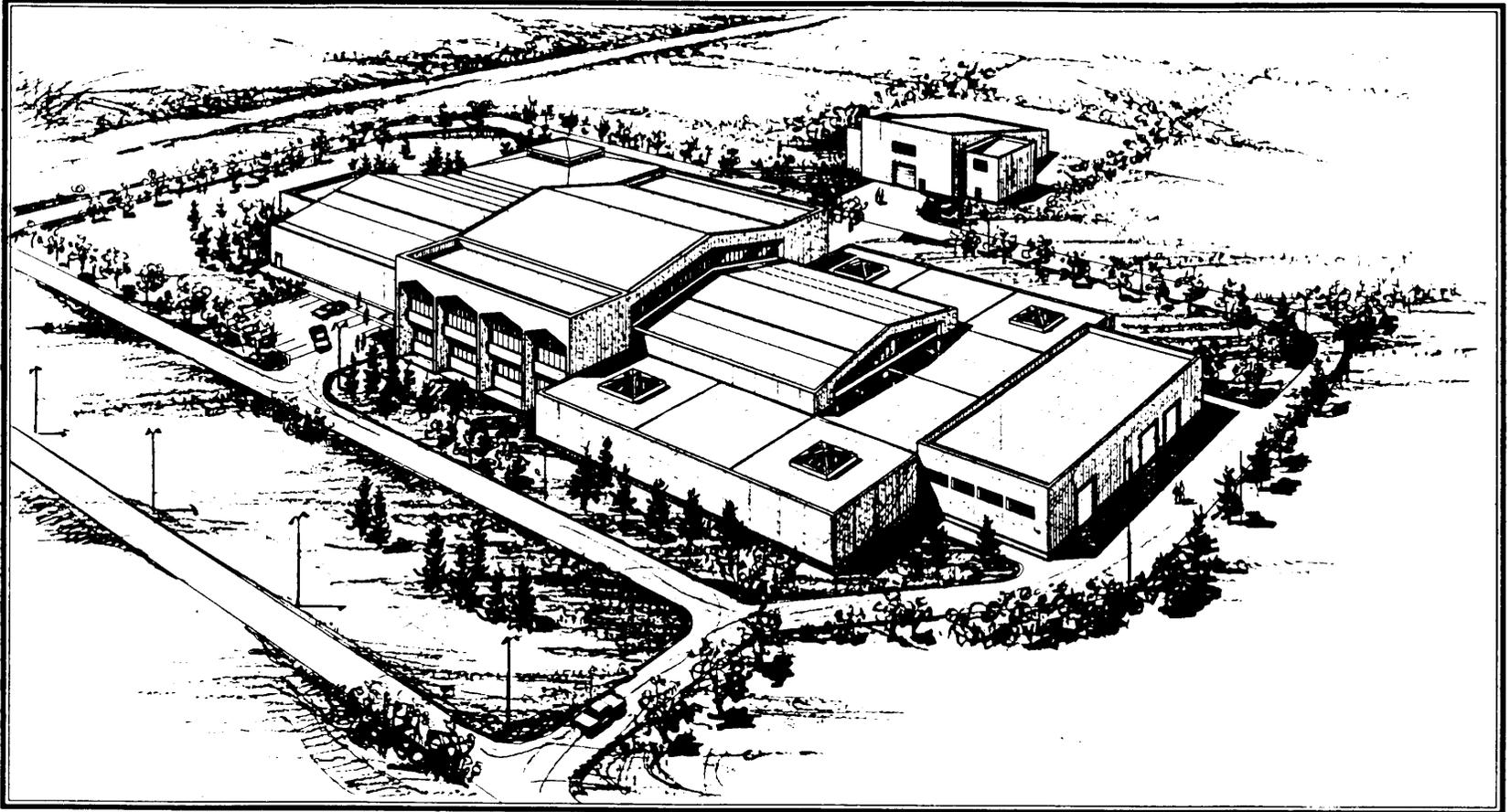
- Goals and criteria for potable water in Winnipeg were developed
- A flexible evaluation model for evaluating alternative treatment technologies was developed
- Comprehensive testing program was conducted over 18 months
- Most cost effective approach to achieving water quality goals was selected
- A conceptual design for the preferred (base-line) “state-of-the-art” water treatment plant was completed



# Water and Waste Department



# Water and Waste Department

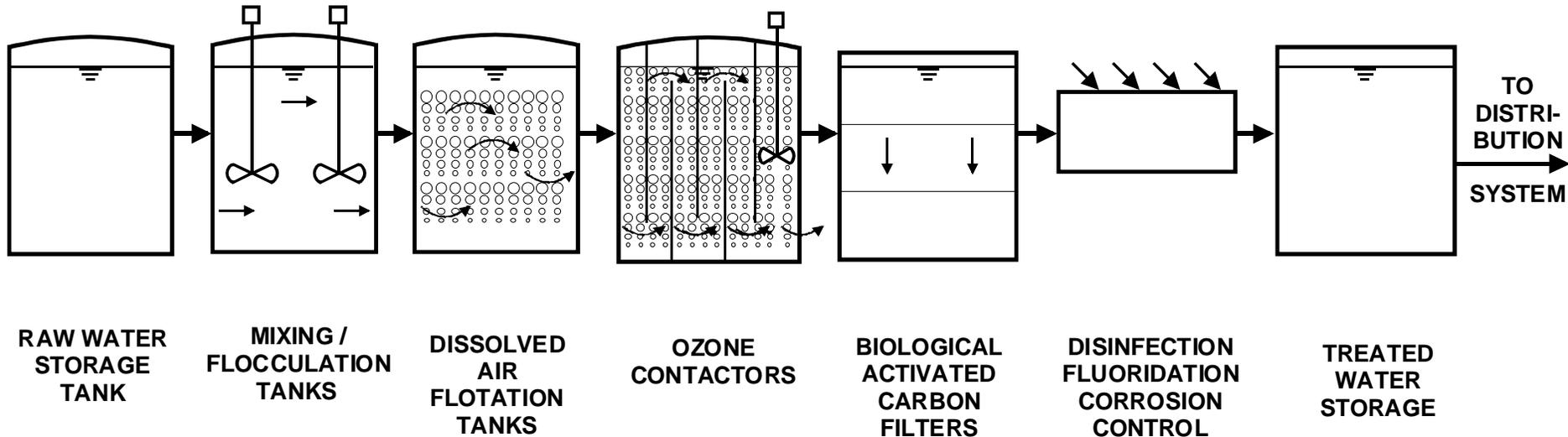


 **City of Winnipeg**  
**Water Treatment Plant**  
(Conceptual Design)



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## RECOMMENDED TREATMENT PROCESS





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## Water Quality Targets Using the Recommended Treatment Process

Treatment Goal	Specific Parameter	Typical Winnipeg Drinking Water Quality	Canadian Guidelines	Water Quality Goals	Pilot Results
Clear water	Turbidity (NTU)	0.3 – 2.6	< 1.0	<0.1	0.04 - 0.08
DBP control	TTHMs ( $\mu\text{g/L}$ )	112	100	100 (40)	<100 without GAC, <30 with GAC
	THAAs ( $\mu\text{g/L}$ )	86	NG	NG (30)	<30 with BAC
Taste and odour control	TON (threshold odour number)	10 - >200	Aesthetic	<10	TON <10 (year-round)



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## New Technologies being Considered

- Ultraviolet Light Disinfection
  - may be an effective alternate for control of *Giardia* and *Cryptosporidium* for unfiltered surface water
  - potential to reduce capital and operating costs
- Membrane Filtration
  - proven as an effective barrier to *Giardia* and *Cryptosporidium*
  - membranes are becoming more cost competitive



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## What is the Construction Cost?

Construction costs (2000 \$)	\$149.0 Million
Contingency	\$ 14.9
Inflation allowance	\$ 11.0
Engineering - Design & Contract Admin.	\$ 22.6
- spent to-date	\$ 2.5
Finance and Administration	\$ 3.0
Other:	
- Alternate Service Delivery Study, Risk Assessment, Environmental Hearings/Approvals	<u>\$ 1.0</u>
<b>Total Estimated Cost</b>	<b>\$204 Million</b>



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## What is the Operating Cost?

Power/Natural Gas	\$1.5 Million
Chemicals/Consumables	\$4.0
Operating Staff	\$0.7
Residuals Management	\$0.6
Plant Maintenance	\$1.4
Inflation Allowance	\$1.8
Taxes	<u>\$2.0</u>
<b>Total Annual Estimated</b>	<b>\$12 Million (2006)</b>



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## Financial Plan

- In 1993, Council approved 10-year plan to finance and construct a water treatment plant
- The 10 year plan provides capital and operating cost for water treatment
- Water treatment will not cause rates to increase beyond current levels



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## Water Treatment Reserve Fund Capital Expenditure and Financing Plan

Year	CAPITAL EXPENDITURE	BLOCK 1 WATER RATE (per hcf)	FINANCING			BALANCE, END OF YEAR	
			Reserve Fund		Debt	Reserve Fund	Debt
			Rate per hcf	Annual Contribution			
1994	0	\$1.55	\$0.07	1,503		1,503	
1995	240	\$1.70	\$0.13	3,435		4,698	
1996	977	\$1.89	\$0.02	1,287		5,008	
1997	533	\$2.10	\$0.02	904		5,379	
1998	362	\$2.32	\$0.40	9,640		14,657	
1999	261	\$2.54	\$0.42	12,024		26,420	
2000	2,500	\$2.70	\$0.44	11,318		35,238	
2001	3,000	\$2.75	\$0.44	11,477		43,715	
2002	6,127	\$2.75	\$0.46	11,986		49,574	
2003	26,000	\$2.78	\$0.59	15,157		38,694	
2004	84,000	\$2.82	\$0.47	12,530	34,012	1,235	34,012
2005	80,000	\$2.83	\$0.44	10,739	67,988	0	102,000
2006				0		0	102,000
<b>Total</b>	<b>204,000</b>			<b>102,000</b>	<b>102,000</b>	<b>0</b>	<b>102,000</b>



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## Rate Adjustments Without Treatment

- If Council decides not to proceed with treatment:
  - decrease in the combined water and sewer rate of about 18% from 1999 rates spread over the next 4 to 6 years



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## Proposed Water Treatment Program Schedule

- **2000:**
  - Decision to proceed
- **2000-2003:**
  - Consider new treatment technologies
  - Alternative services delivery study
  - Environmental/regulatory approval studies
  - Risk assessment/cost reviews
  - Facility design
  - Tendering process
- **2004-2006:**
  - Construction
- **late 2006:**
  - Commissioning/Operation



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## Conclusion

- The risk of a waterborne disease outbreak is low but the consequences are high
- Long-term exposure to disinfection by-products are associated with cancer
- The present system does not meet all water quality guidelines
- Treatment plant will cost about \$204 M to build and \$12 M/yr to operate (2006 dollars)



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## Recommendations

1. The City proceed with treatment of the water supply as described in the report
2. Design and construction activities be undertaken so that the water treatment plant be operational in the year 2006
3. The water treatment process, as identified through the pilot testing, be adopted as a baseline process for comparison to alternatives and new technologies



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## Recommendations cont'd

### 4. The Administration:

- Investigate and report on new technologies such as ultraviolet disinfection and membranes
- Investigate and report on alternative project delivery strategies
- Prepare documents in support of any application by Council for Federal and Provincial funding



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## What Would Water Treatment Do For Winnipeg?

- Helps protect against outbreaks from parasites such as *Cryptosporidium* and *Giardia*
- Allows us to reduce the amount of chlorine added to the water supply
- Allows us to meet evolving *Guidelines for Canadian Drinking Water Quality*
- Supports the long-term health and well being of our community