

*Constructed Wetlands
for Treatment of
Condensate in Water*

1997-2000

Constructed Wetland Funding

- **Cost: \$500,000 over four years**

- ◆ *\$180k construction*

- ◆ *\$320k detailed monitoring and laboratory work*

- **Funders:**

Gulf Canada, Environment Canada (PERD)

CAPP, Komex

Researchers

- **University of Calgary (M.Sc. Student)**
- **University of Alberta (Microbial)**
- **Alberta Agriculture (Plant health)**
- **Dr. Woody Reed (Technical review)**
- **Komex**

Problem / Solution

- **Mechanical treatment can be expensive to operate over long term pump and treat projects**
- **Constructed wetlands may be a more economic treatment alternative**

Constructed Wetland Objectives

- **Assess treatment capacity of pilot scale wetland**
- **Evaluate year-round operation**
- **Determine economics of wetlands**
- **Develop design parameters for scale-up**

Constructed Wetland Plant Growth



July 1997

- 2000 phragmites and cattails in a 50 m lined gravel bed
- Aerated, heated in winter

July 1999

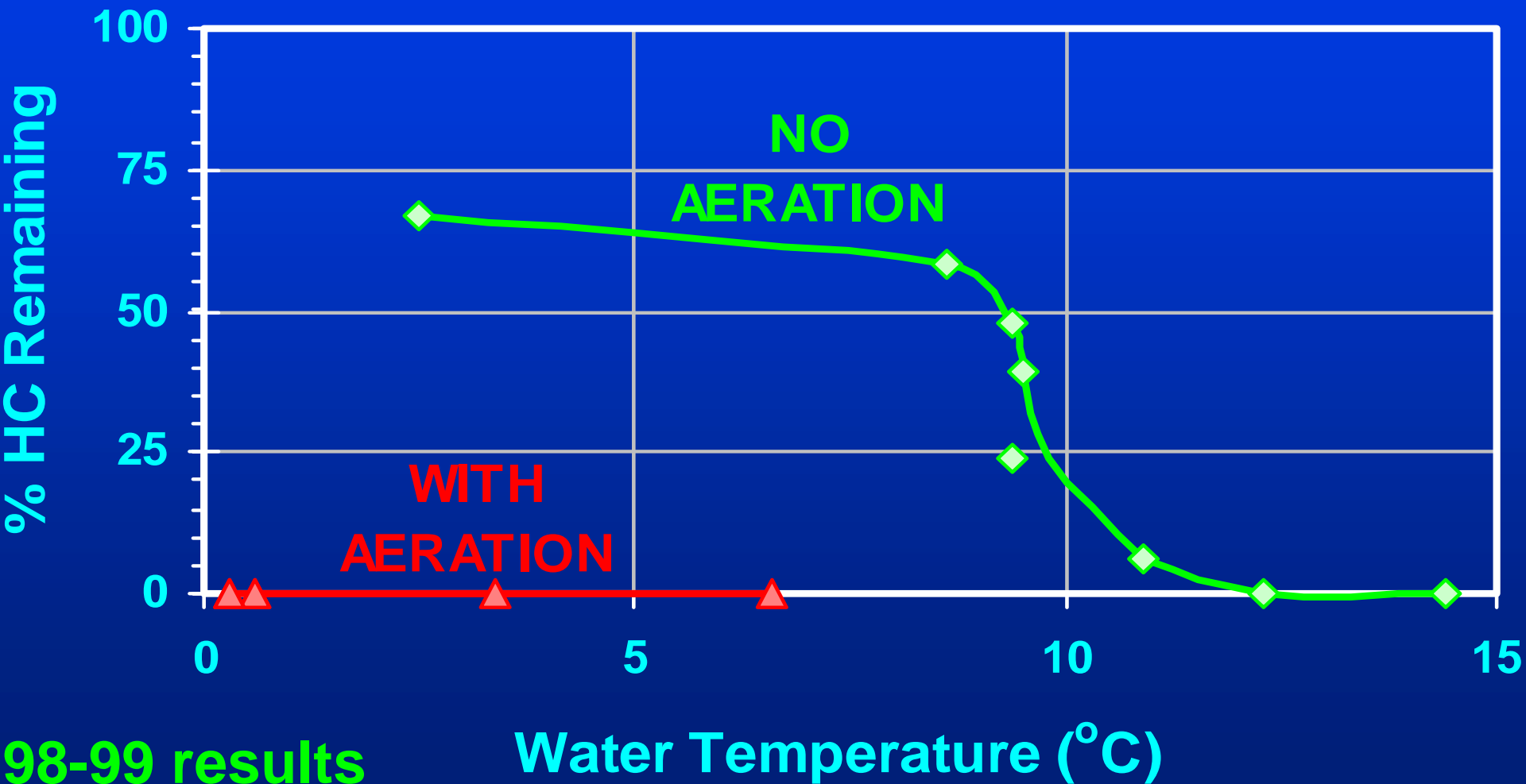
**Wetland treats 50% of flow
Mech. Treatment in background₂**



Hydrocarbon Removal Processes

- **Volatilization - accounts for 50-70%**
- **Biodegradation - 30-50%**
- **Dilution by rainfall - up to 10%**
- **Plant Uptake - not apparent**
- **Sorption - negligible**

No aeration: need >10 C for 100% removal
With aeration: 100% removal at all temperature



98-99 results

Water Temperature (°C)

Decreased efficiency in 1999/2000

Possible causes (*requires verification*):

- reduced residence time, possibly due to increased root growth
- increased plant cover may be reducing volatilization
- no insulating snow cover caused an ice cover

2001 Objectives

- **Assess causes of treatment efficiency decline**
- **Evaluate plants' role in treatment process (Lab)**
- **Assess economics of wetland**
- **Assess options to enable full scale treatment**

Constructed Wetlands: Implications

- **Successful for year round condensate removal**
- **Aeration required during winter to reduce freezing and improve mass removal**
- **Economics appear promising, due to reduced maintenance requirements relative to mechanical treatment**