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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Seeking Heat in Sewage Systems

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evolving Energy – Vancouver, BC December 2015

Outline

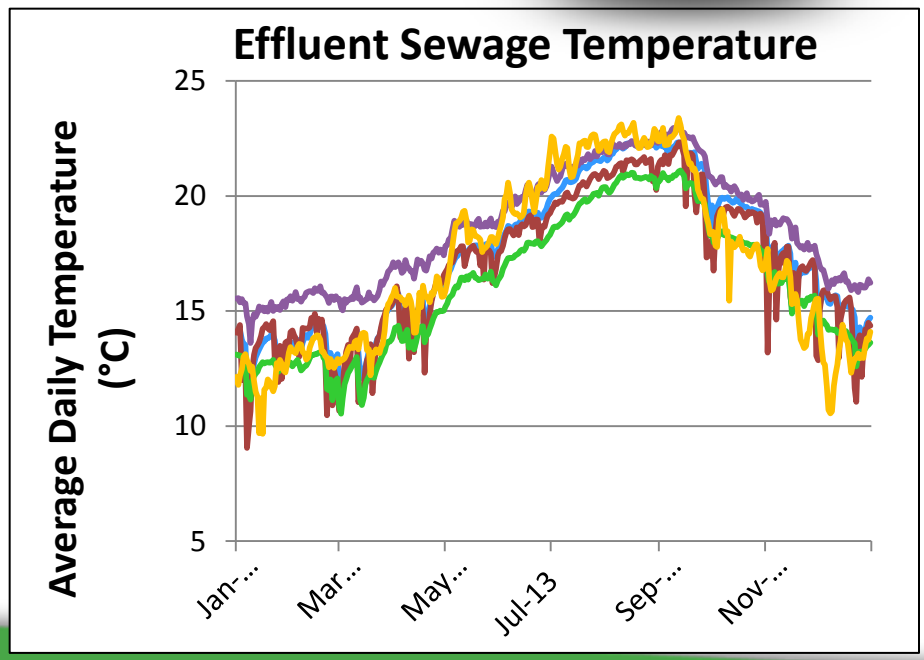
Why is Sewer Heat Interesting?

The Heat-Seeking Sewer Model

Opportunities and Applications

Sewage is a good source of energy

- Low carbon energy source
- Temperature: 10–25 ° C yearly range
  10–15 ° C winter
- Flexible: Can provide heating & cooling
- Available throughout region (supply is close to demand)
- Lots of heat!
- Good public acceptance



Not a new concept

Europe

- Switzerland (70+)
- Oslo has an 18 MW plant
- Sweden, France, Germany

Asia

- China (12)
- Japan (1)

North America

- Vancouver (1) *

Southeast False Creek Neighbourhood Energy Utility

Drivers for sewage recovery

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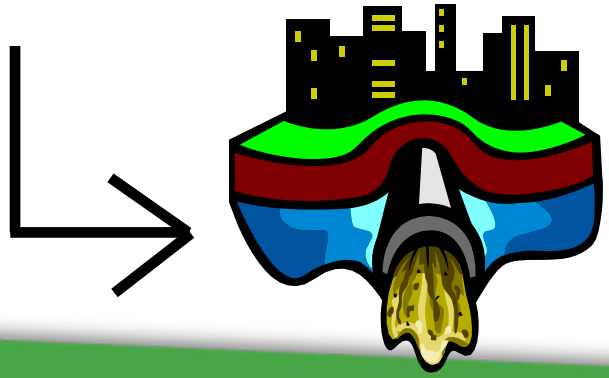
Increasing & unstable price of energy

Urgency to switch from fossil fuels

Provincial & Municipal climate change and energy goals



Increased requests for access to sewage

How to manage sewer heat resource

think water rights on a river

Governance & Technical Implications

Sewer Heat Policy

- ✓ **Metro Vancouver's Role:** MV only involved when projects are on MV infrastructure.
- ✓ **Allocation of Heat:** First-come first-served
- ✓ **Sewer Heat Users:** Anyone can enter into contracts
- ✓ **Rate Setting:** Cost recovery for tie-in, \$0 / m^3 of sewage, long-term contracts to ensure financial stability
- ✓ **Boundaries of Responsibility:** Property line responsibility
- ✓ **Project Approval Criteria:** Projects must meet technical requirements. District cooling allowed.
- ✓ **GHG Benefits and Costs:** Allocated on case-by-case basis on the basis of financial costs incurred

Technical Questions that Need to be Answered

Question 1

- How much energy can be recovered from Metro Vancouver's system?

Question 2

- Can a new upstream sewage heat project impact an existing downstream project (thereby preventing it from meeting their thermal demands)?

Question 3

- What would be the net change in influent temperature at the wastewater treatment plant (WWTP) and would additional energy (natural gas or biogas) be needed to make up for the decreased influent temperature?

Technical Questions that Need to be Answered

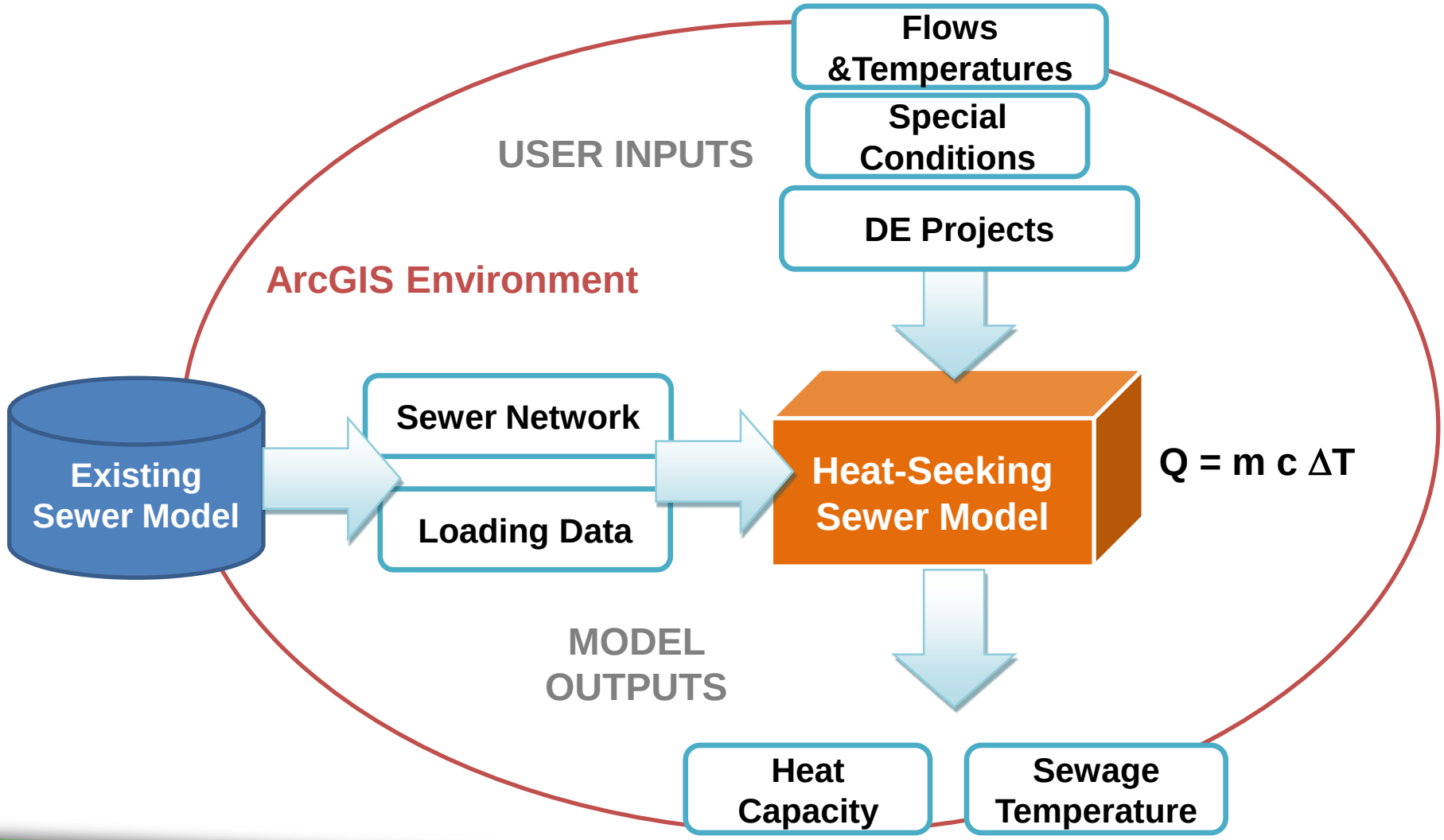
Question 4

- How do you equitably divide up the sewage heat within the sewer between municipalities, private developers, and other interested parties?

To answer these key questions (both now and in the future) the project team set out to develop the

Heat-Seeking Sewer Model

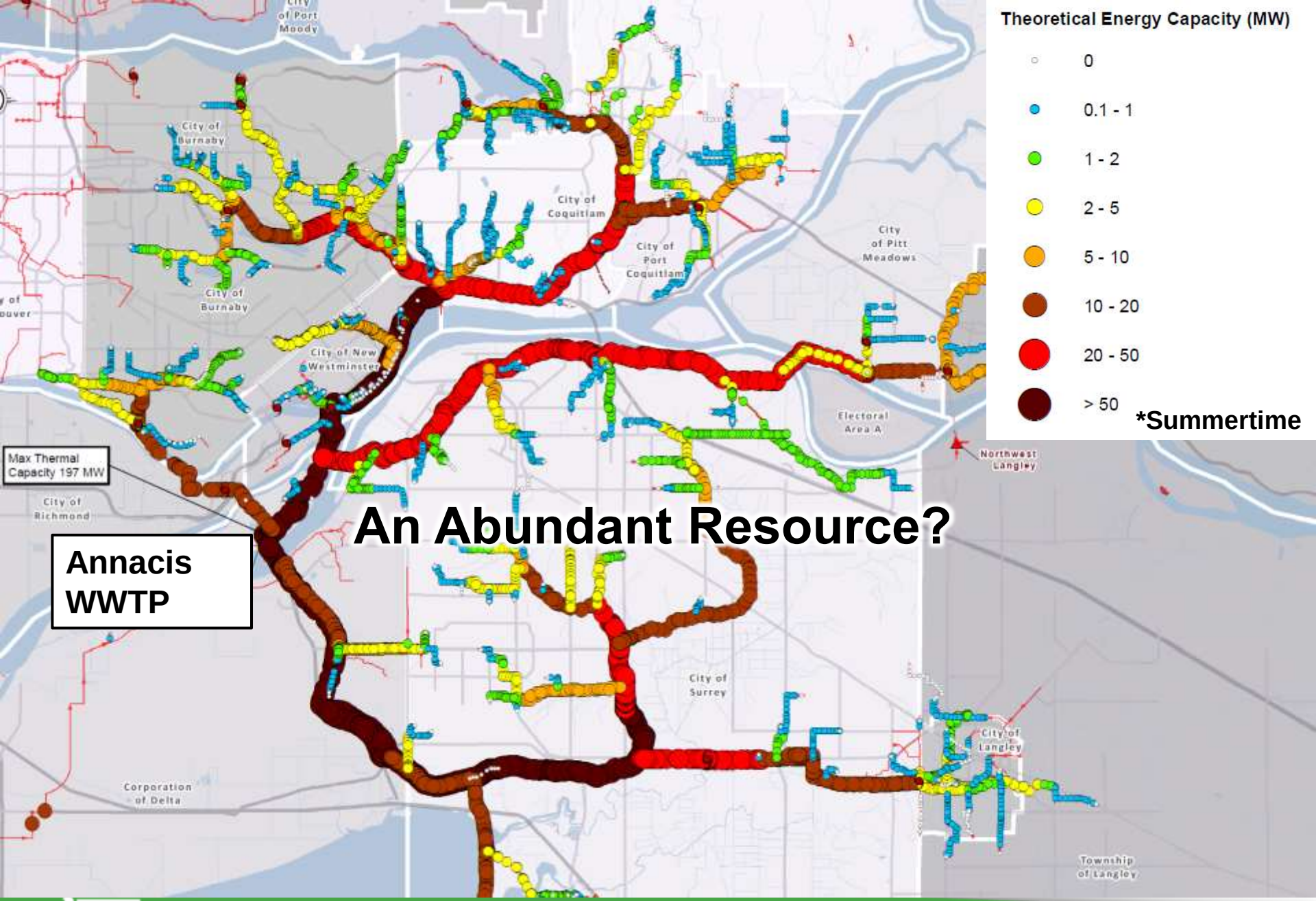
Heat-Seeking Sewer Model: How It Works



The Heat-Seeking Sewer Model

Sewer Flow & Temperatures (Metro Vancouver)

Residential	Industrial Commercial Institutional	Groundwater Infiltration	Rainwater / Snowmelt
~15-25 ºC	~15-25+ ºC	~10 ºC	~1 - 15 ºC
Diurnal Peak	Diurnal Peak	Seasonal variation in flow	Event-driven flow and temperature
Seasonal variation in temperature	Industrial areas could have higher temperatures	Steady temperature	Major issue in combined sewer systems



An Abundant Resource?

It’s All About Temperature

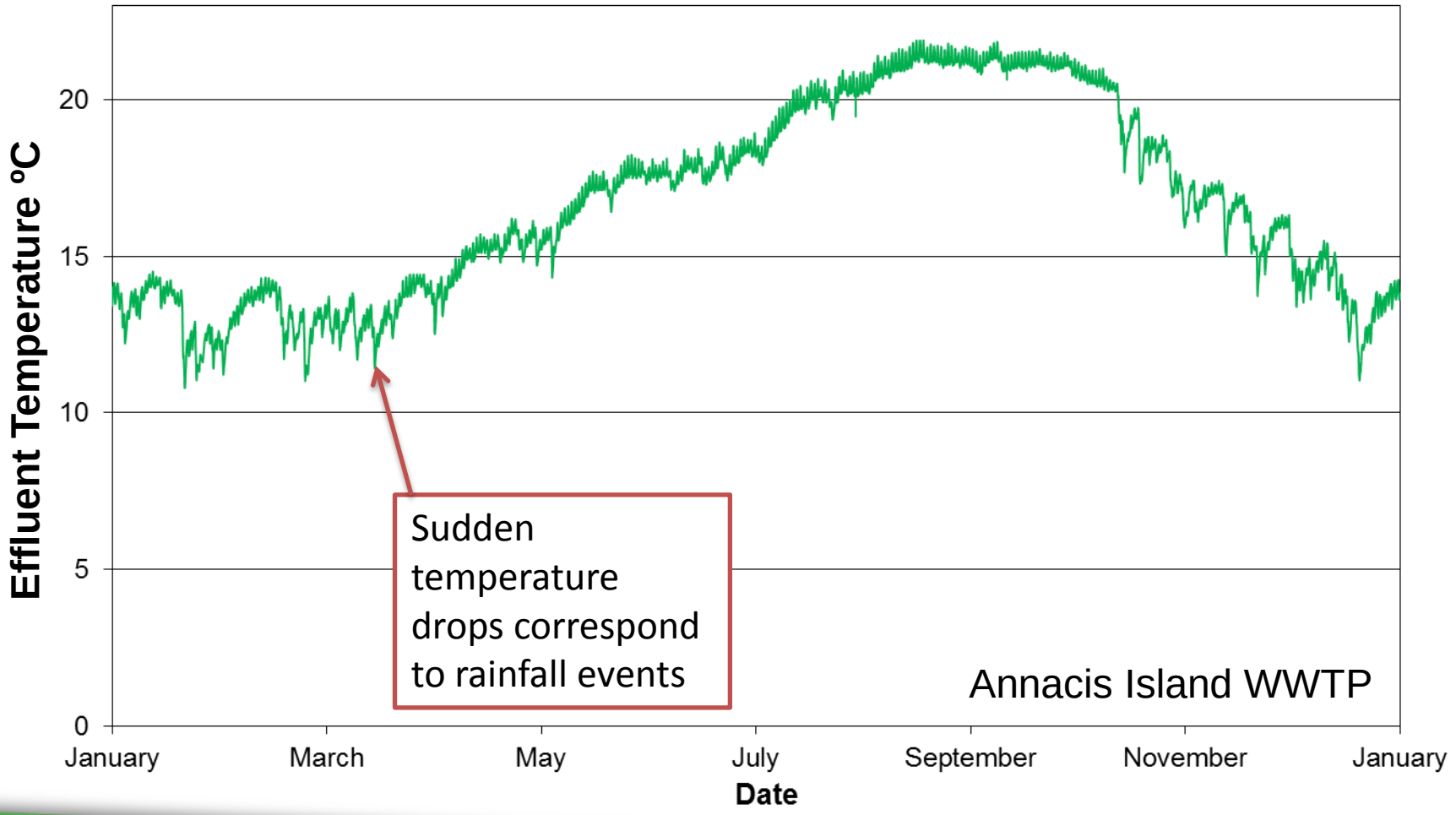
11 ºC

Sustained temperatures below 11 ºC may reduce biological wastewater treatment process efficiency.

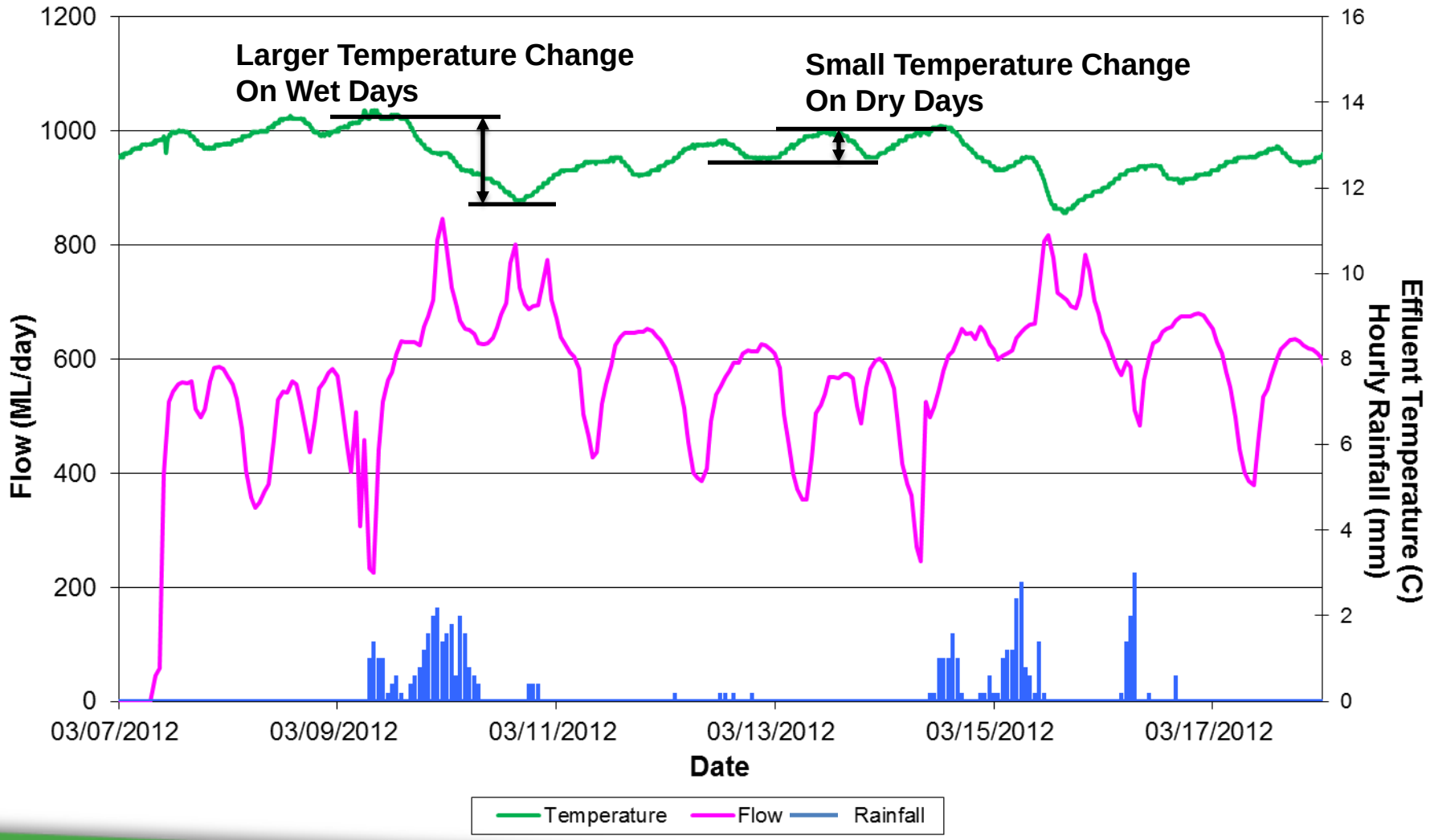
25 ºC

Elevated wastewater temperature leads to bacterial growth causing odour and corrosion.

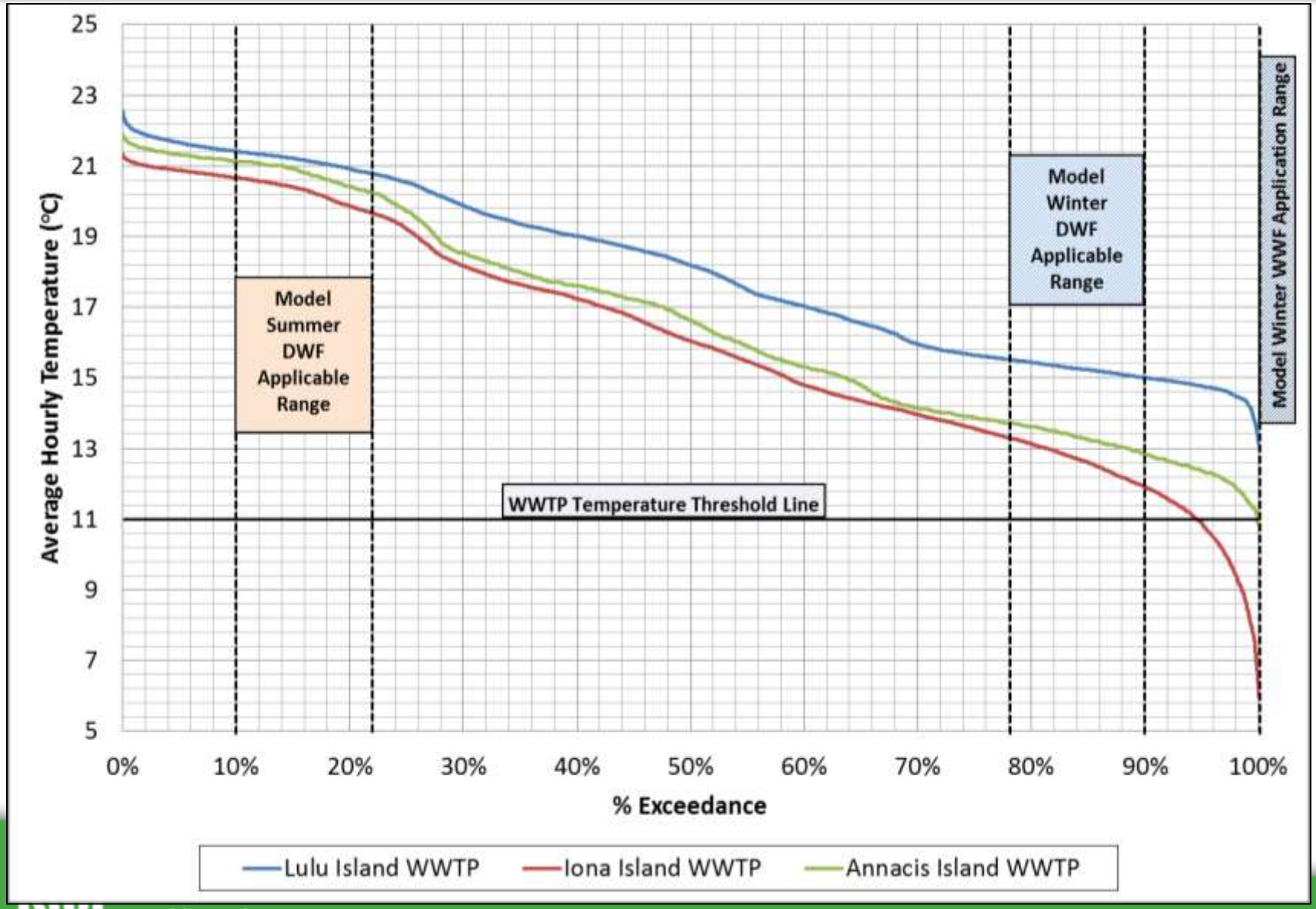
Annual Wastewater Temperature Profile



Daily Wastewater Temperature Profile

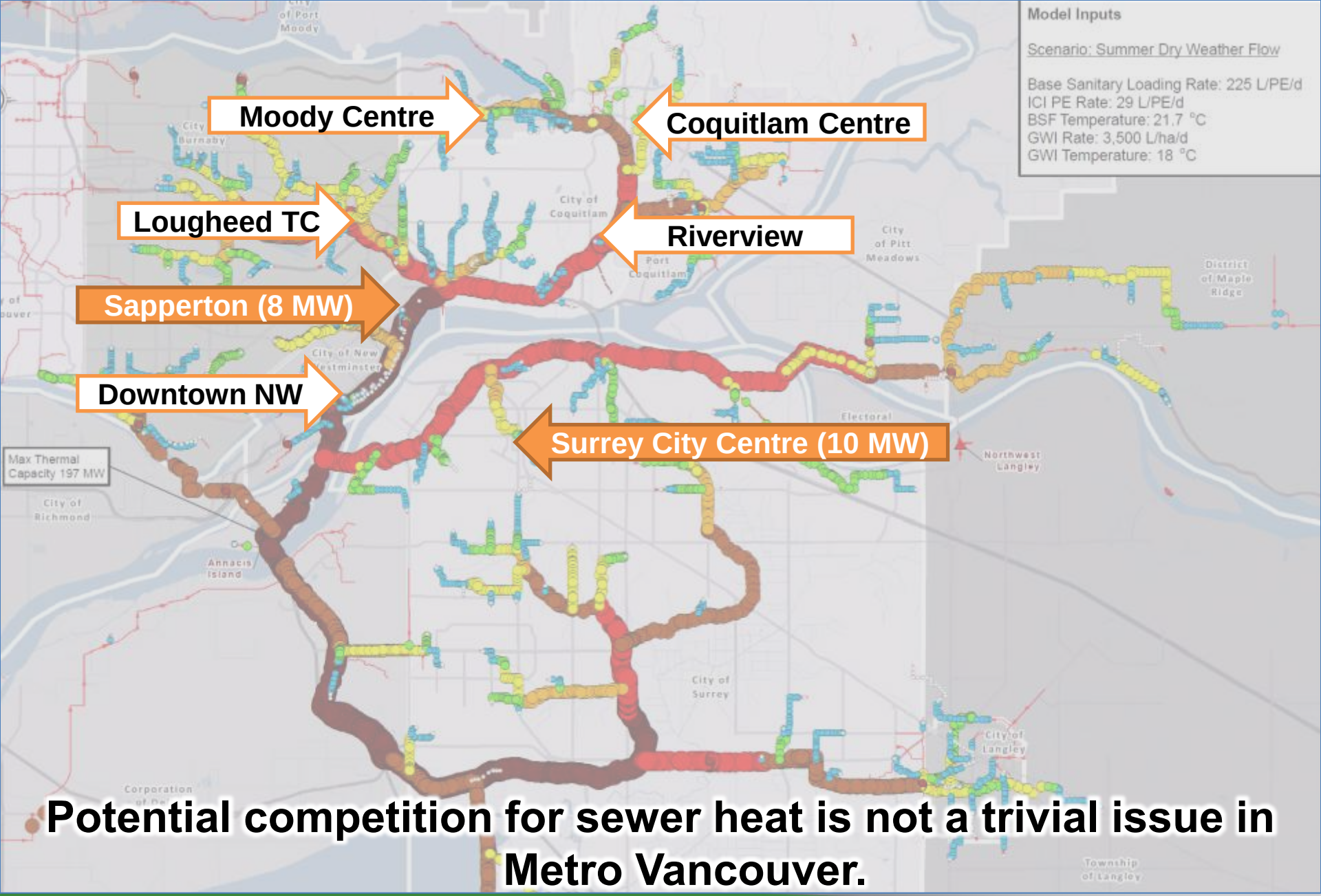


Wastewater Effluent Temperatures



Model Verification

Catchment	Flow Rate % Difference	Summer Temps. % Difference	Winter Temps % Difference
Lions Gate WWTP	0.6%	1.5%	3.2%
Iona Island WWTP	0.6%	-2.9%	**-6.7%**
Lulu Island WWTP	0.6%	0.3%	-0.7%
Annacis Island WWTP	1.6%	-0.2%	**-7.0%**
Northwest Langley WWTP	0.0%	-0.3%	0.9%



Potential competition for sewer heat is not a trivial issue in Metro Vancouver.

Metro Vancouver's Sewage Opportunity

100 MW Raw Sewage Heat Region-Wide

Heat up to 700 High-Rise Buildings

Avoid 200,000 tonnes CO2e Annually

Why Sewer Heat Works in Metro Vancouver

- 1 -
2010 Olympics

Capital Assistance

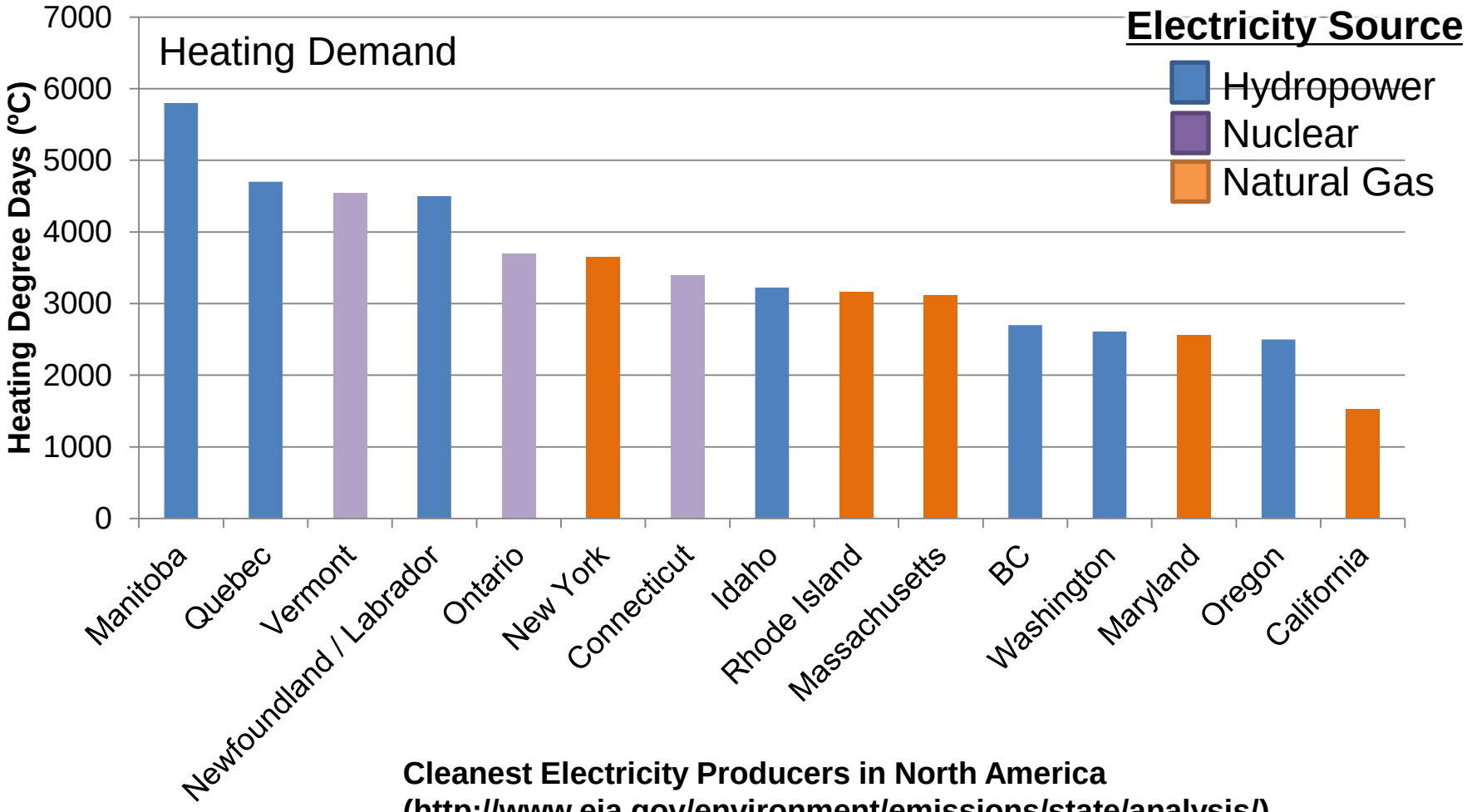
- 2 -
Cheap, Clean Electricity

Heat Pumps Make Sense

- 3 -
High Density Building Boom

Demand

Where Else Might Sewer Heat Work?



Cleanest Electricity Producers in North America (http://www.eia.gov/environment/emissions/state/analysis/)

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