Tools and Concepts for Wastewater Heat Recovery

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IDEA CampusEnergy2020

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What's the Big Deal about Wastewater Energy?

Completely Renewable

The average North American produces 200-300 litres (50-75 gal) of wastewater per day.

Low Carbon

Near-zero carbon footprint is achievable if clean electricity is used to run heat pumps.

Easy to Find

It's literally in every urban settlement.

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Sources of Wastewater for Heat Recovery

Homes & Businesses

Industries

Sewers

Wastewater Treatment Plants

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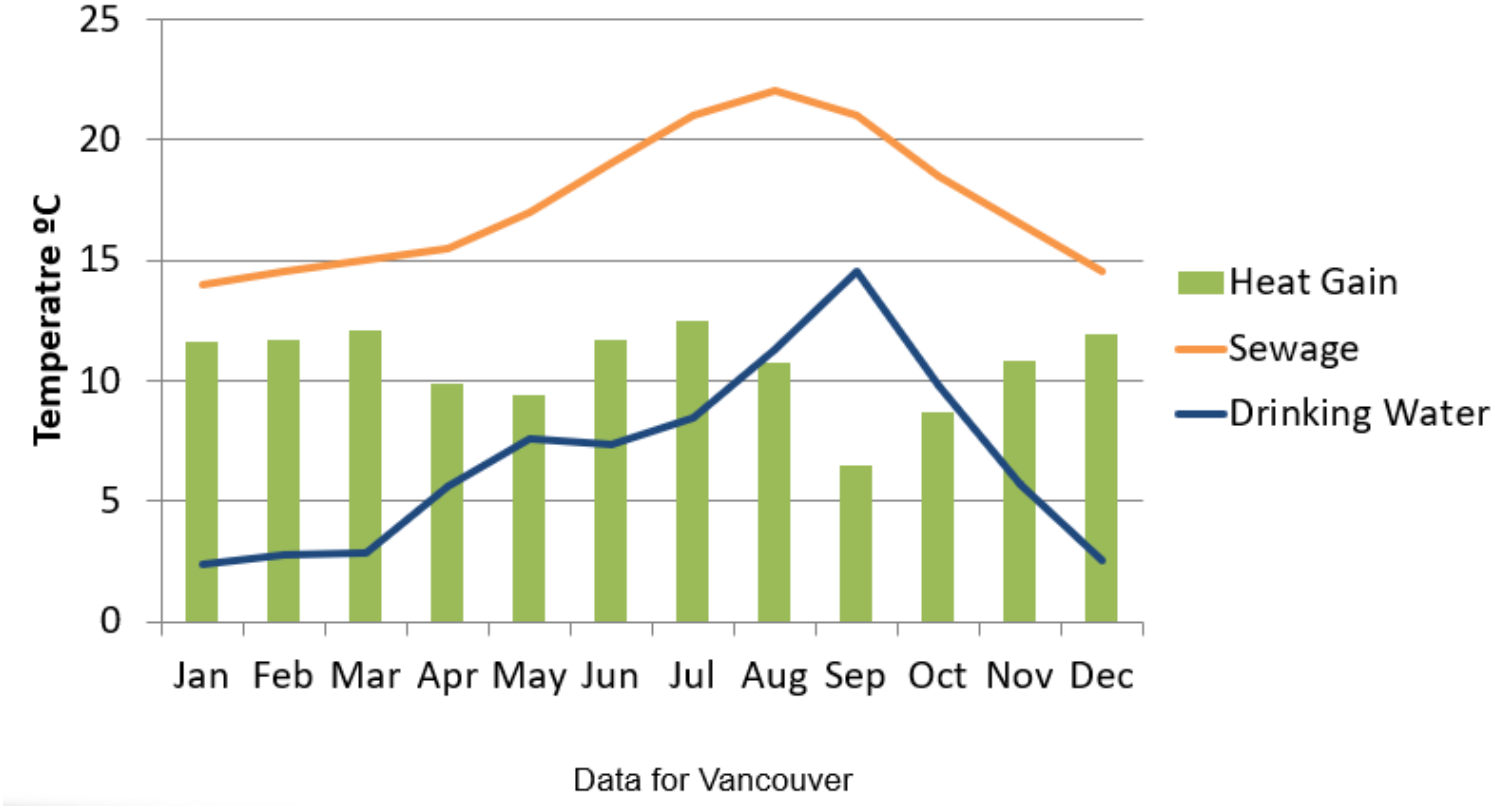
Wasted Heat

The average sewage temperature is about 10 ºC warmer than the drinking water supply in Vancouver.

In a city with 1 million people, this temperature differential amounts to about 8,000 GJ per day, or about 500 t CO_2e per day worth of natural gas.

Most of the heat loss is probably happening in the first few minutes of discharge from buildings.



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Typical Resource Availability

	Multi-Family Building	Small Town / Urban District	Mid-Size City	Large City
Population	500	5,000	50,000	500,000
Recoverable Wastewater Energy (Avg. kW)	50	300	3,000	30,000
Domestic Hot Water Consumption (Avg. kW)	150	1,500	15,000	150,000

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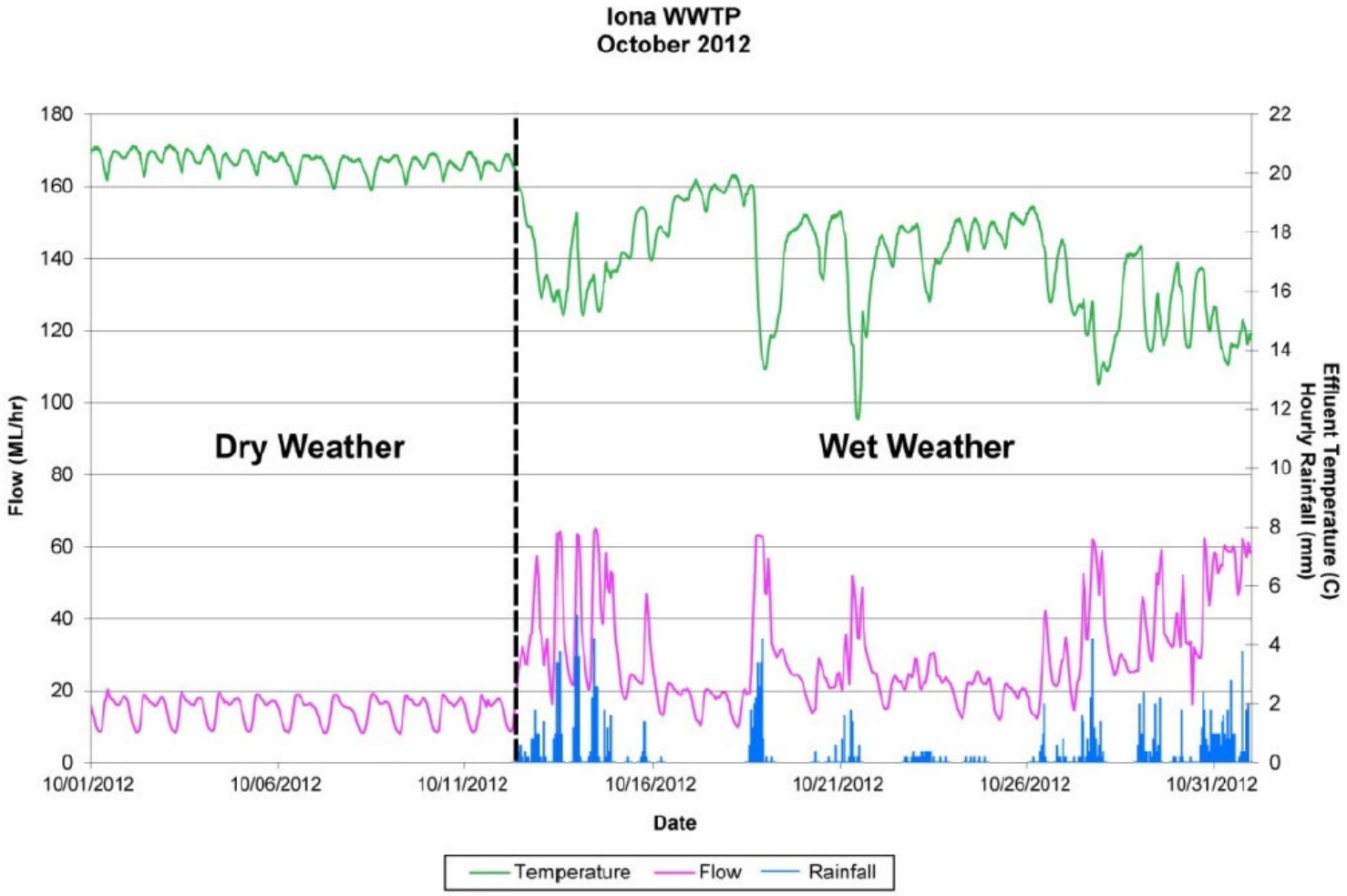
Wet Weather Effects

Dry weather flow is very predictable and steady.

Rainwater or snowmelt entering sewers spikes the flow up and the temperature down.

Over 700 US cities have combined sewer systems and will behave like this graph. Separated systems also experience wet weather flow but to a lesser extent.



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Challenges

MAINTAIN SEWER SYSTEM OPERATIONS

GETTING ACCESS TO SEWAGE

SOLIDS HANDLING

TEMPERATURE / USE LIMITATIONS

COST AND GHG FOOTPRINT OF ELECTRICITY

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Technology

- Building-Scale
- Inline Systems
- Offline Systems
- Heat Pumps

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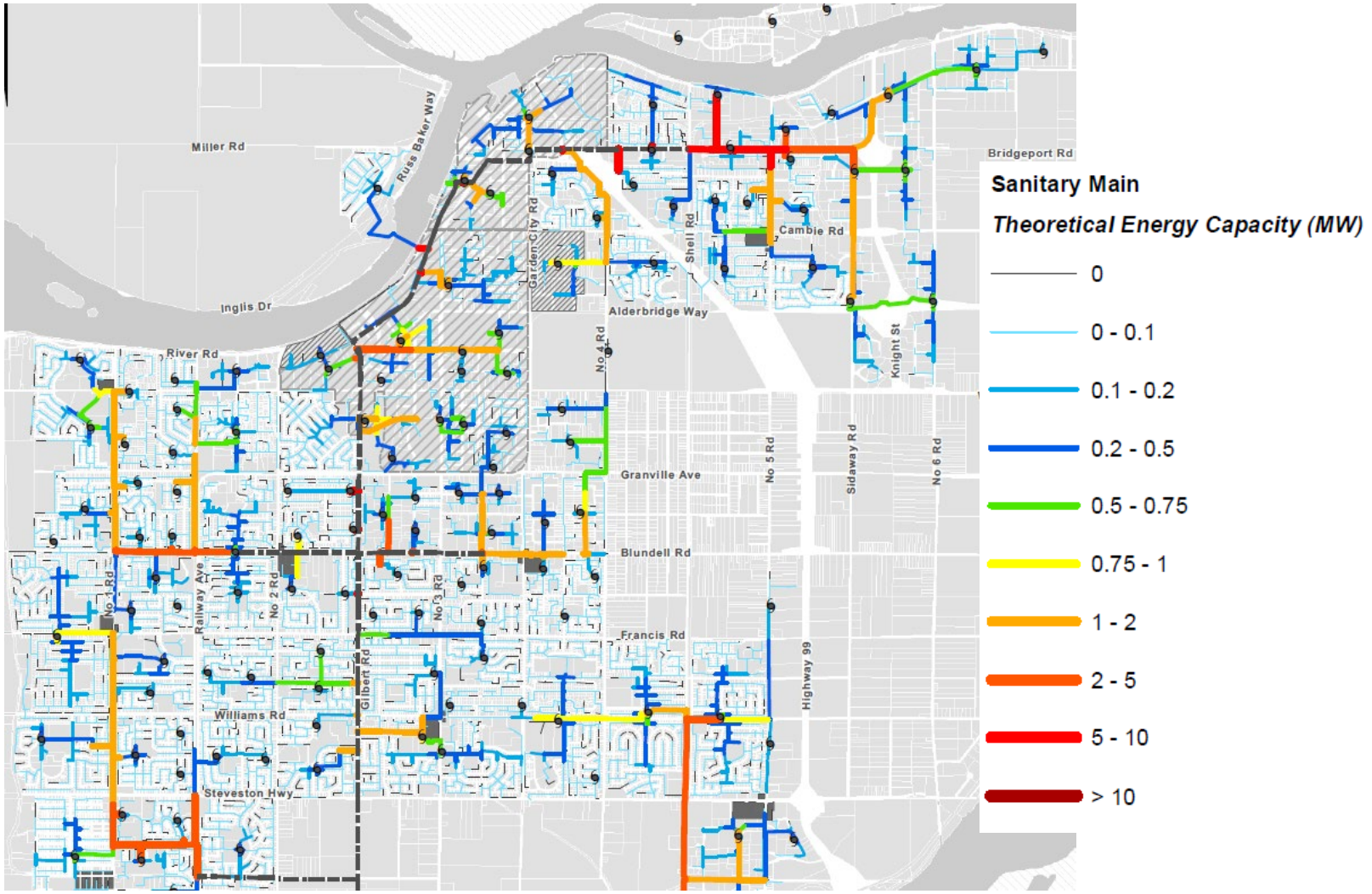
“Heat-Seeking Sewer Model”

Uses an existing sewer system hydraulic model to generate heat resource analysis. Can quantify impacts of multiple projects.

Allows cities to identify opportunities ranging from micro-scale to major district energy systems.



Model results from Richmond, BC.

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Supportive Policy – BC Context

2007

GHG Reduction Targets Act – commits public sector organizations to carbon neutrality and sets goal of 33% reduction in GHG emissions by 2030

2010

Winter Olympics – Vancouver and Whistler heat the Athletes' Villages with wastewater

2015

Metro Vancouver develops draft policy for Liquid Waste Heat Recovery

2018

Metro Vancouver introduces Carbon Pricing Policy for capital projects

2020

North Shore Wastewater Treatment Plant to include 5 MW effluent heat recovery system.

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Long-Range Outlook

Circular Economy

Decarbonizing Electrical Grids

Lower Temperature Requirements for Buildings

Improved Products and Expertise

Questions?

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False Creek Energy Centre Sewage Heat Pump
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