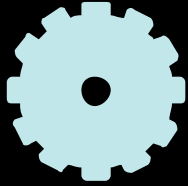


The road from 4 mgP/l to 0.1 mgP/l, optimising chemical precipitation, reliability and permitting

Laura Rossi

Project Engineer

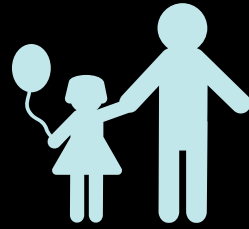
Helsinki Region Environmental Services Authority (HSY)



What we do

We produce and organise water services, waste management services and regional information

Turnover ca.
€354 million



Our customers

Residents and companies in the Helsinki Metropolitan Area:
1.1 million people

Employees
745



Our member municipalities

Helsinki
Espoo
Vantaa
Kauniainen

Premises
12





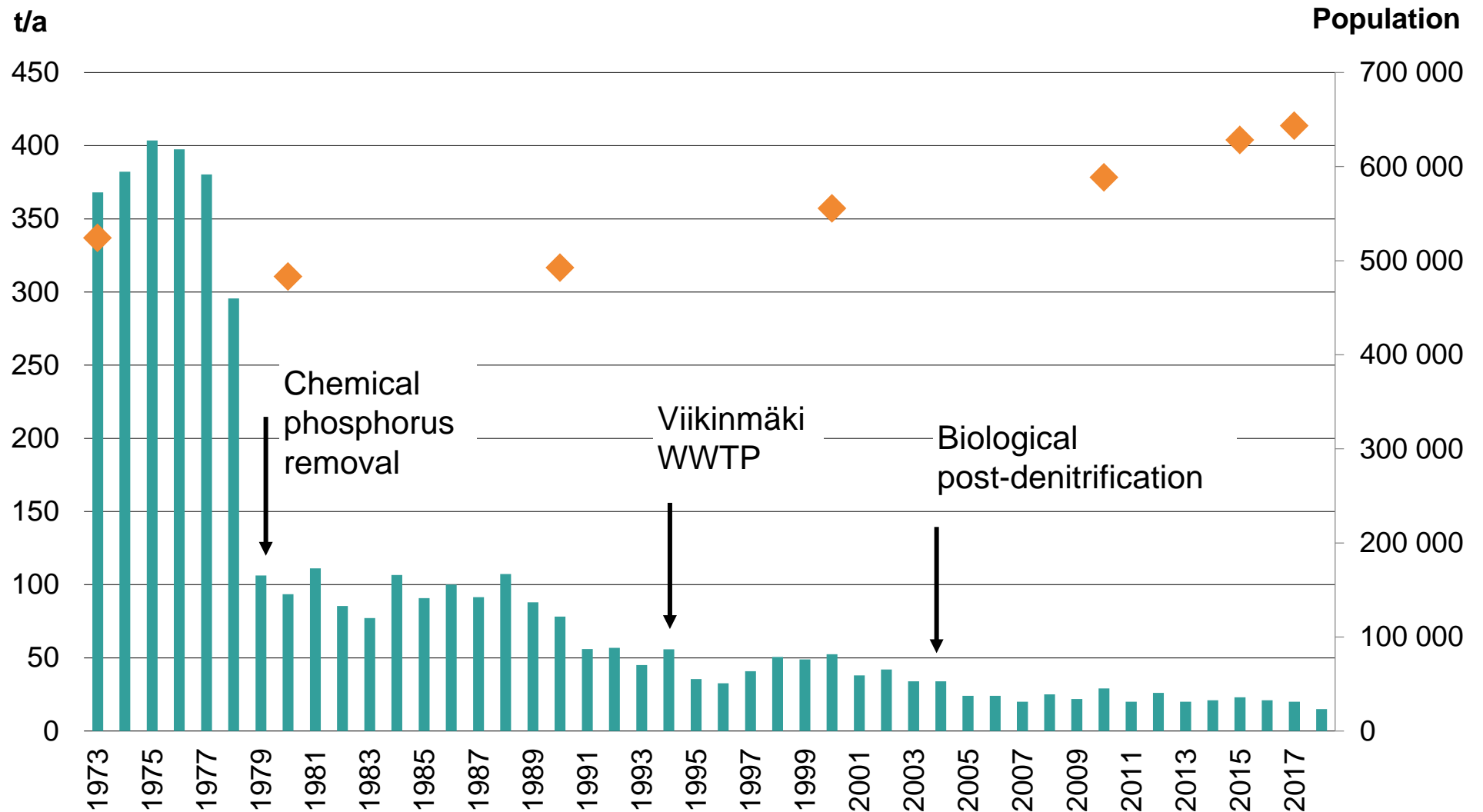
History of phosphorus removal

Helsinki

Over 100 Years Wastewater Treatment in the Helsinki Metropolitan Area

- Alppila plant 1910–1959
 - Rock filter and septic tank
- Savila plant 1915–1931
 - Rock filter and septic tank
- Kyläsaari 1932–1994
 - The first activated sludge plant in the Nordic countries
- Rajasaari 1936–1978
 - Activated sludge plant
- Tali 1957–1986
- Herttoniemi 1959–1985
- Kulosaari 1960–1975
- Lauttasaari 1962–1992
- Suomenoja 1963-2020
- Viikki 1965–1994
- Laajasalo 1966–1988
- Munkkisaari 1967–1991
- Vuosaari 1971–1994
- Viikinmäki 1994–
- Blominmäki 2022–

Phosphorus load to the Baltic Sea 1973 -2018 and population growth in Helsinki



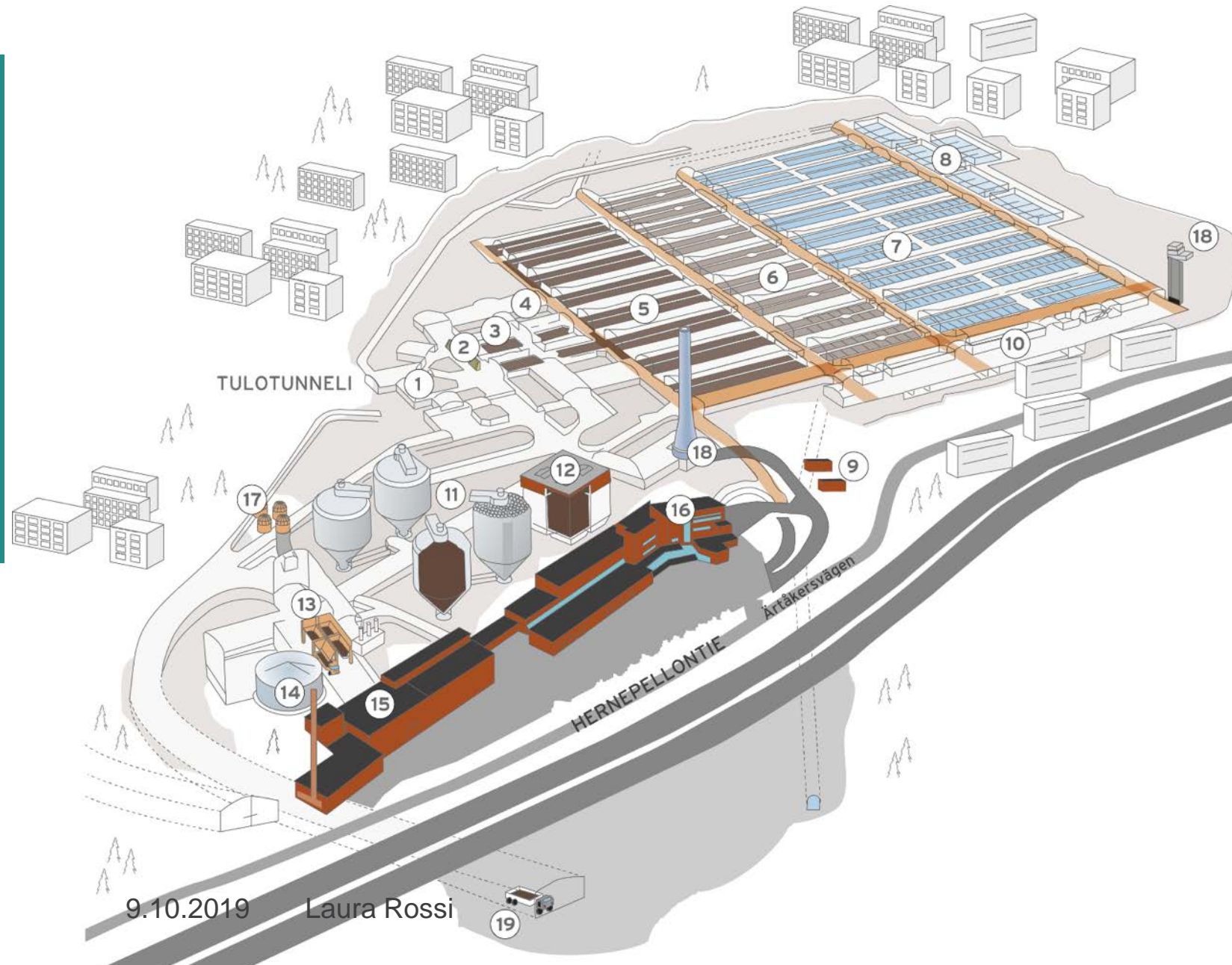


Today

Wastewater treatment in Helsinki Metropolitan area

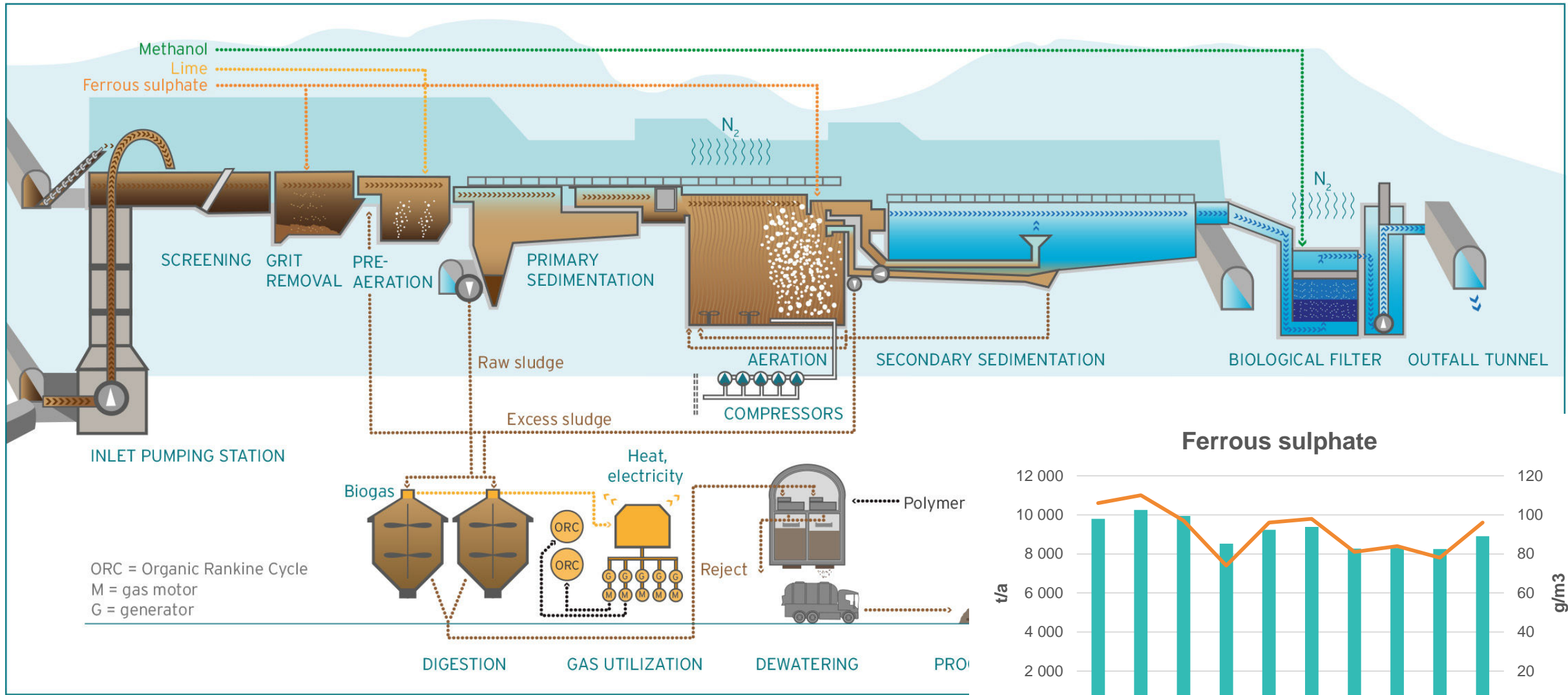
Viikinmäki wastewater treatment plant

- Start-up in 1994
- The largest treatment plant in Nordic countries
- PE 1 100 000, influent 270 000 m³/d
- Is located mostly in underground rock caverns
- Biological treatment is combined with chemical treatment

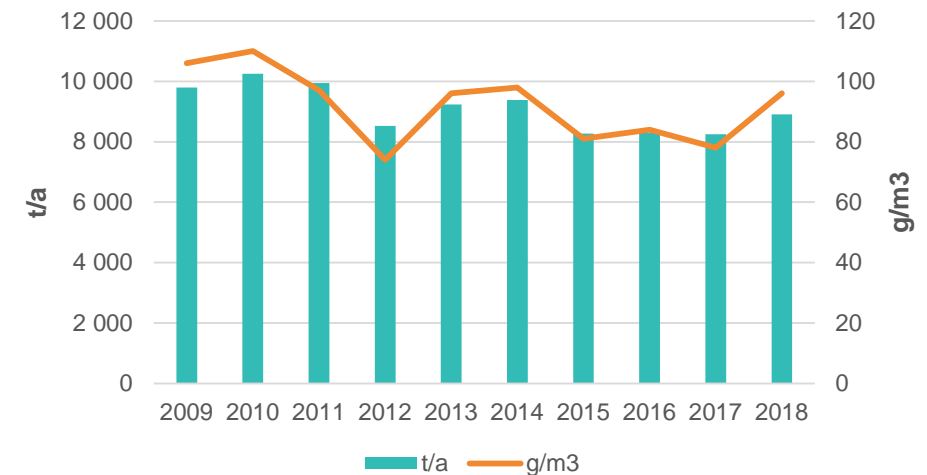


Phosphorus	IN	OUT	Red. %
t/a	600	15	97
mg/l	6,5	0,16	97

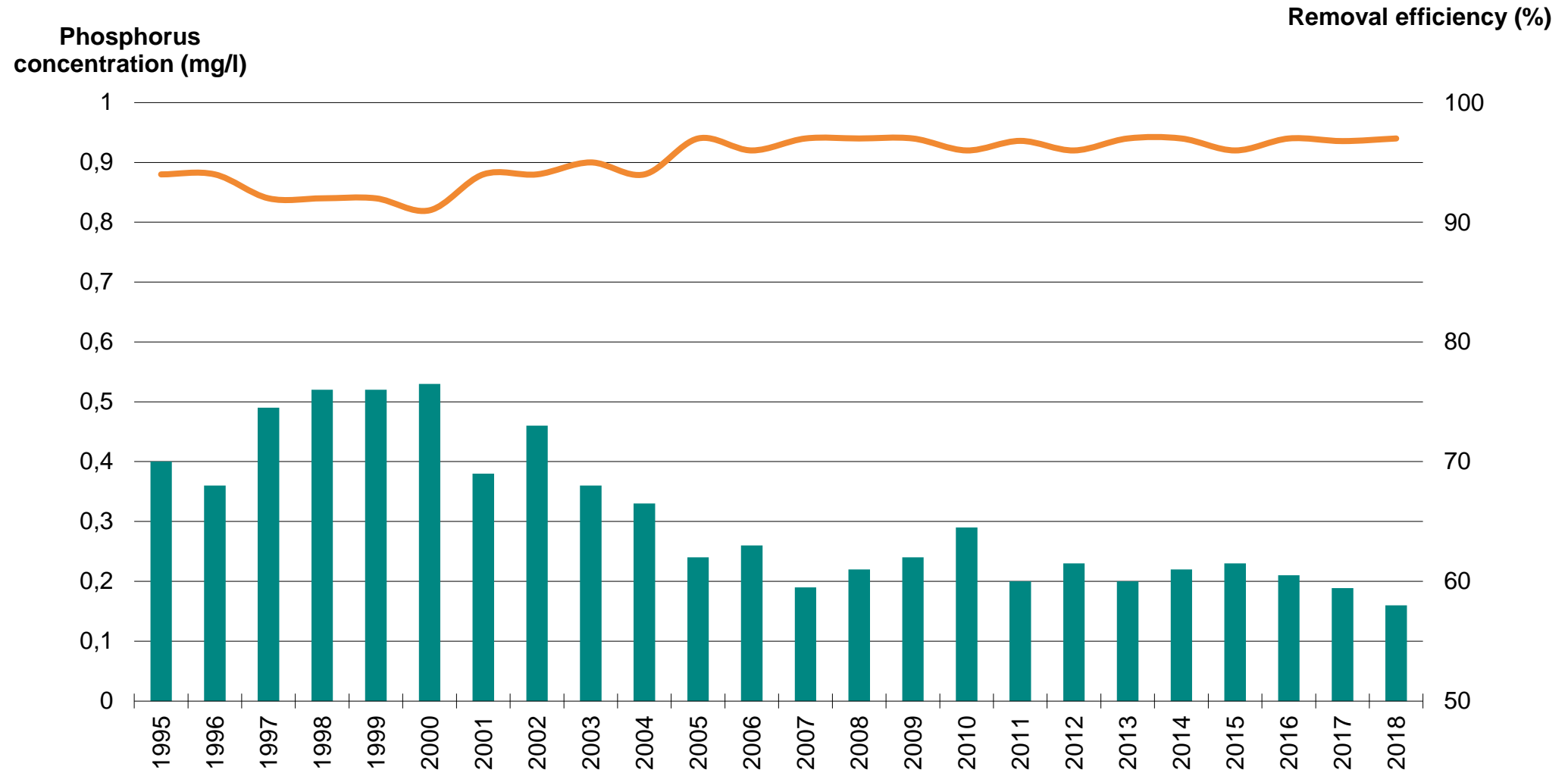
Viikinmäki wastewater treatment process



Ferrous sulphate



Phosphorus concentration in treated wastewater



Phosphorus concentration

Removal efficiency



Treatment requirements and results

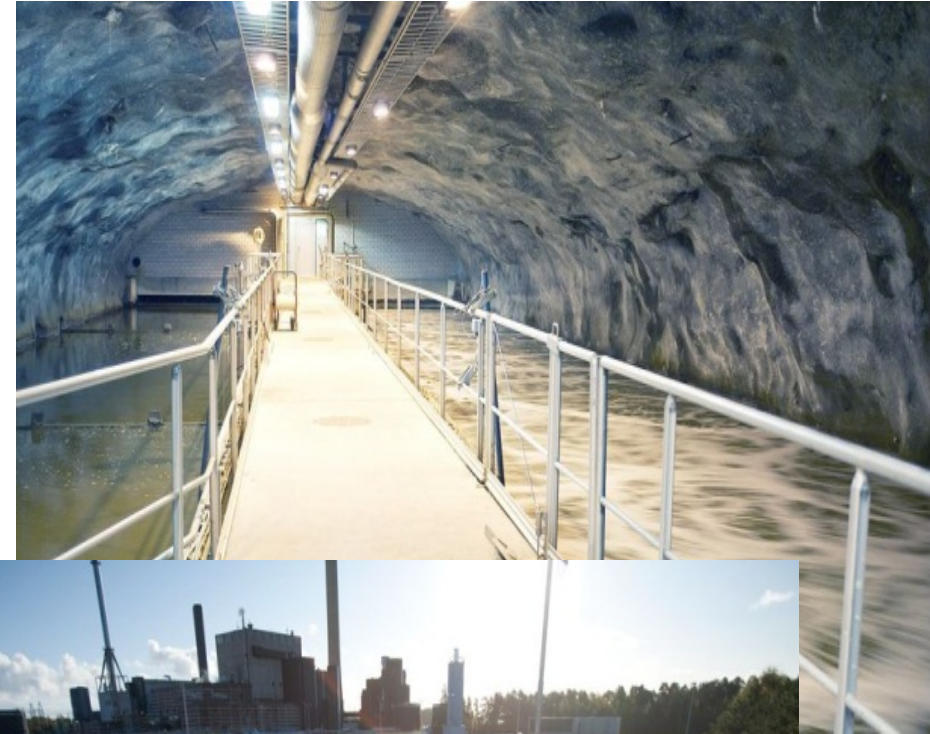
	Effluent permit limit values	EU directive	Results 2018	Total load 2018
BOD₇ - quarter	Viikinmäki ≤ 10 mg/l ≥ 95 % Suomenoja ≤ 10 mg/l ≥ 95 %	≤ 30 mg/l ≥ 70 %	Viikinmäki 4.6 mg/l 98 % Suomenoja 5.0 mg/l 98%	Viikinmäki 425 t/a Suomenoja 178 t/a
Phosphorus P - quarter	Viikinmäki $\leq 0,3$ mg/l ≥ 95 % Suomenoja $\leq 0,35$ mg/l ≥ 95 %	$\leq 1,0$ mg/l ≥ 80 %	Viikinmäki 0.16 mg/l 97% Suomenoja 0.23 mg/l 97%	Viikinmäki 15 t/a Suomenoja 8 t/a
Nitrogen N (tot.) - year	Viikinmäki ≥ 80 % Suomenoja ≥ 70 %	≤ 10 mg/l ≥ 70 %	Viikinmäki 4,9 mg/l 91% Suomenoja 17 mg/l 76%	Viikinmäki 454 t/a Suomenoja 594 t/a

Baltic Sea Action

Strict target setting by the owners

- Summary targets for Viikinmäki and Suomenoja WWTP
- Stricter than environmental permits
- Target set by HSY board:
 - Nitrogen max 1 200 t/year
 - Target for maximum **bonus payment** 1 000 t/year
 - Phosphorus max 38 t/year
 - Target for maximum **bonus payment** 30 t/year

In June 2007, the mayors of the Cities of Helsinki and Turku initiated the Baltic Sea Challenge in order to **improve the condition of the Baltic Sea**. The goal of the challenge is to have a positive impact on the condition of both the coastal waters of the cities and throughout the Baltic Sea region





Research and Development

Viikinmäki WWTP

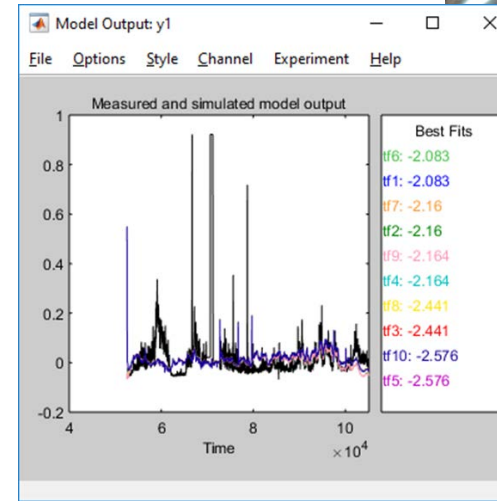
Operation improvements and Investments

- Original investments for **denitrification 1998**
- Investments for expansion of the activated sludge process (**8th line**) and **Biostyr® post-denitrification 2004**
- Investment for **direct precipitation of by-pass waters 2008**
- **Strict control of bypassing events 2008-**
- Investment for **9th treatment line 2014**
- **Improved wet weather wastewater influent modeling** at Viikinmäki WWTP using on-line weather radar information



Research and Piloting

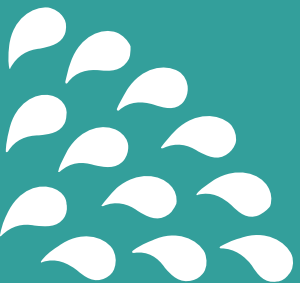
- **Effluent phosphorus polishing** by disc filtration (Hydrotech)
- **Bypass water treatment** by precipitation & disc filtration (Dynadisc) – also primary COD removal tests (replacement of primary sedimentation)
- **Improved Automation control** of precipitation chemical addition
- **Phosphorus recovery** from wastewater by RAVITA™ process (patented)



Puhtaasti parempaa arkea | En rent bättre vardag | Purely better, every day

THANK YOU FOR YOUR ATTENTION!

Laura Rossi | laura.rossi@hsy.fi



Helsingin seudun ympäristöpalvelut -kuntayhtymä
Samkommunen Helsingforsregionens miljöjänster
Helsinki Region Environmental Services Authority