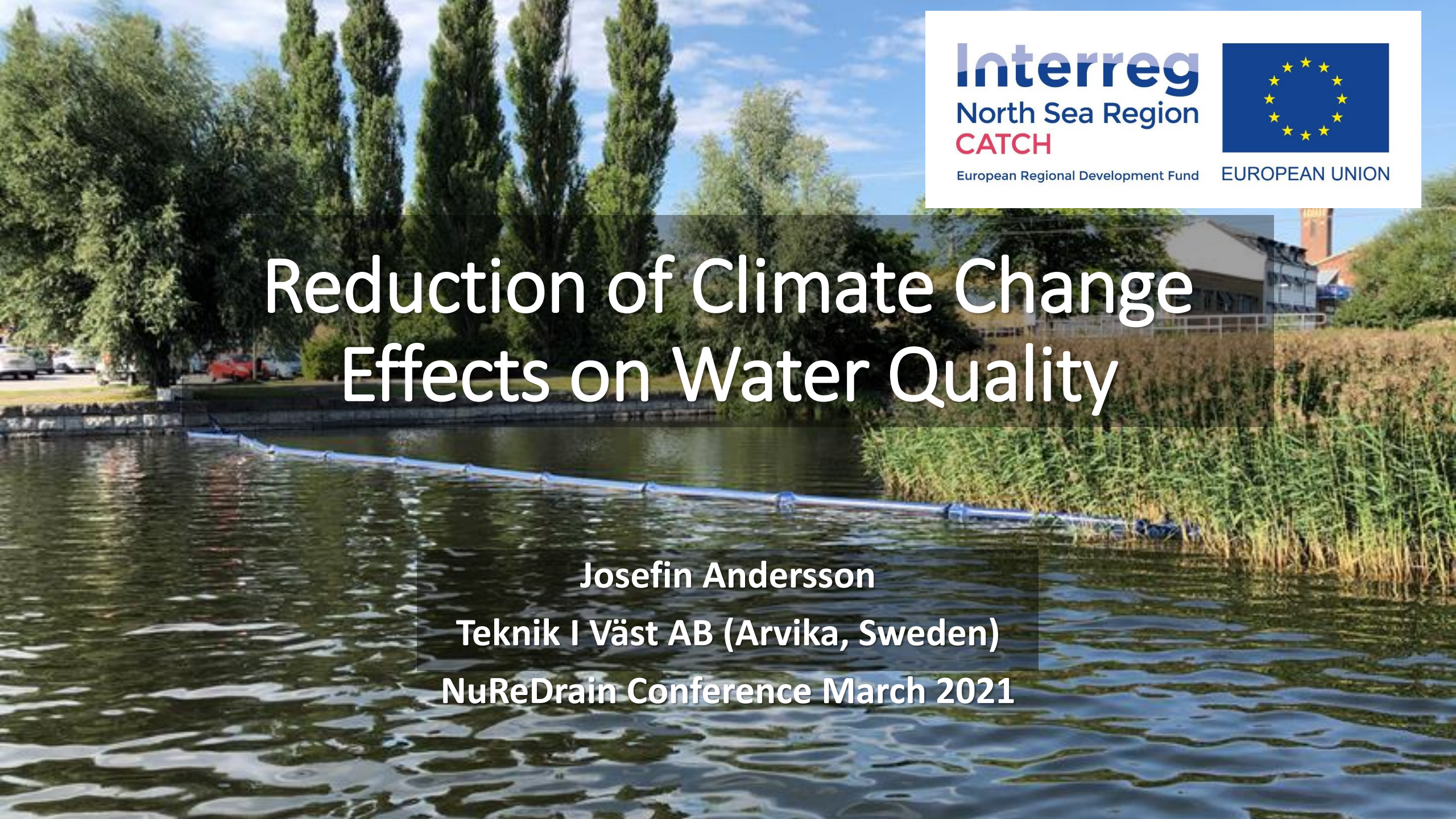

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Reduction of Climate Change Effects on Water Quality

Josefin Andersson

Teknik I Väst AB (Arvika, Sweden)

NuReDrain Conference March 2021

CATCH- project

- CATCH = water sensitive Cities: the Answer To CHallenges of extreme weather events

- The overall objective is to demonstrate and accelerate the redesign of urban water management of midsize cities in order to become climate resilient cities that are sustainable, liveable and profitable on the long term.

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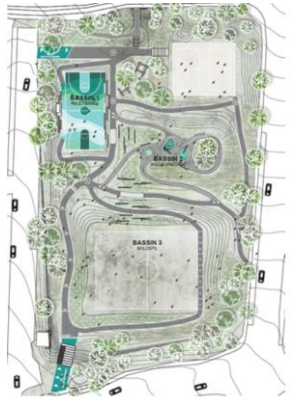

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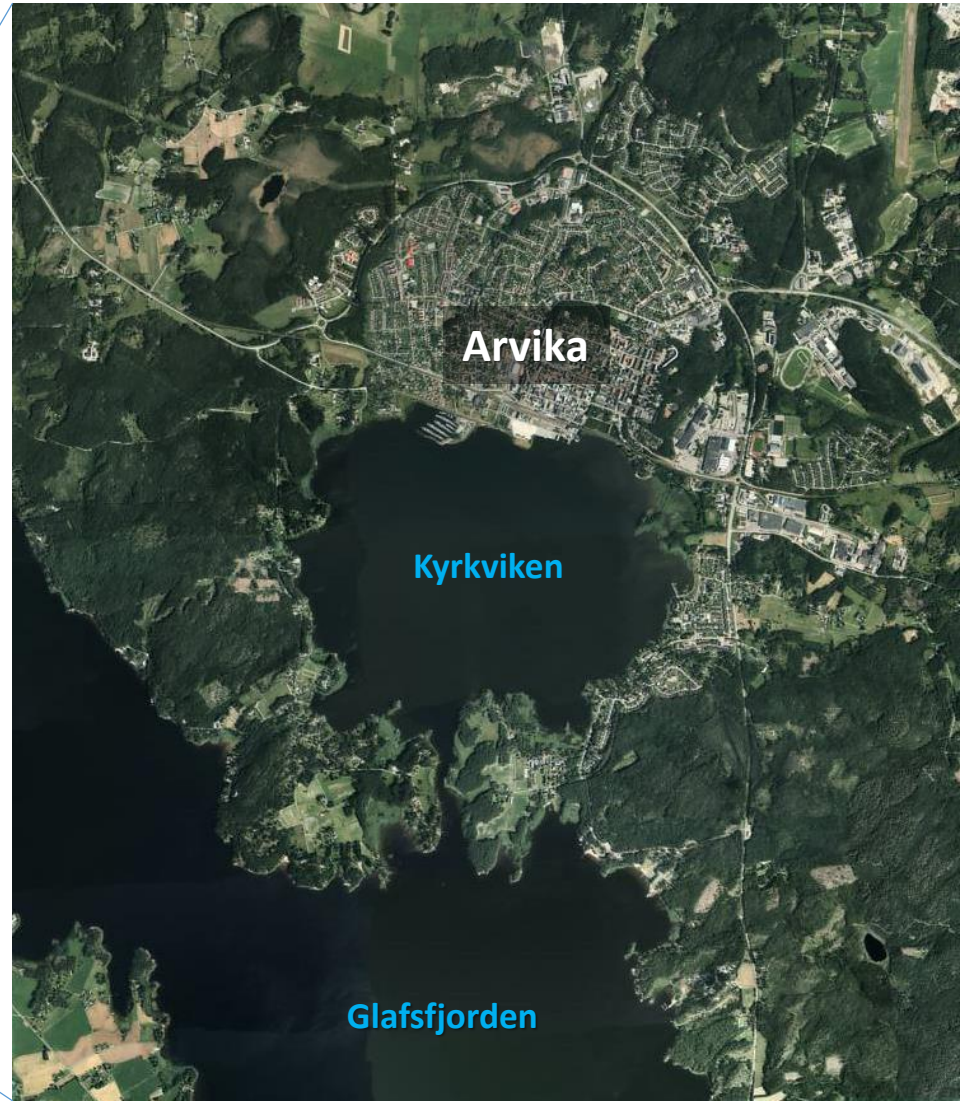
Introduction of Arvika

- Arvika is located in Värmland, Sweden, by Lake Kyrkviken
- Prone to be affected by heavy and long-term rainfall



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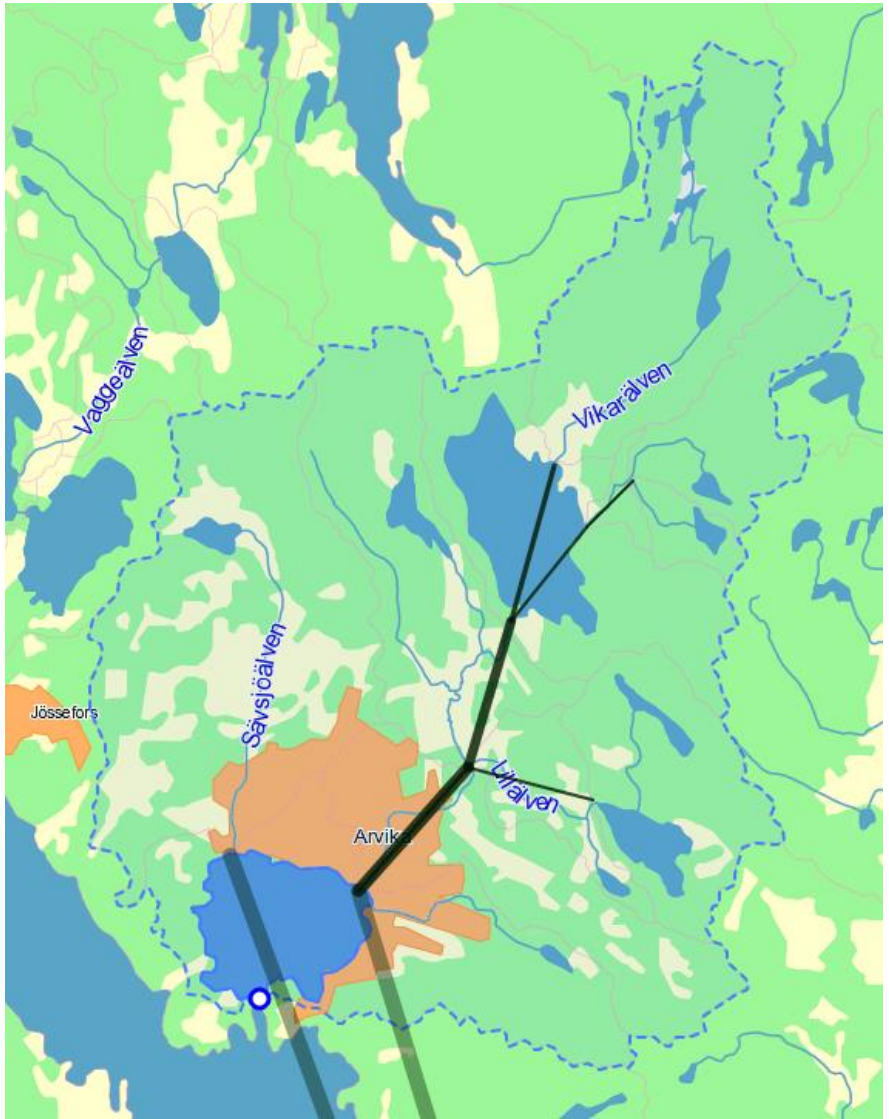
Climate Change Effects in Arvika

The consequences of climate change have been visible in Arvika for years:

- Flooding events
- Drainage system overload
- Hundreds of basements flooded
- Impairment of the poor water quality in surface waters



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Flooding event in year 2000

Drainage system overload

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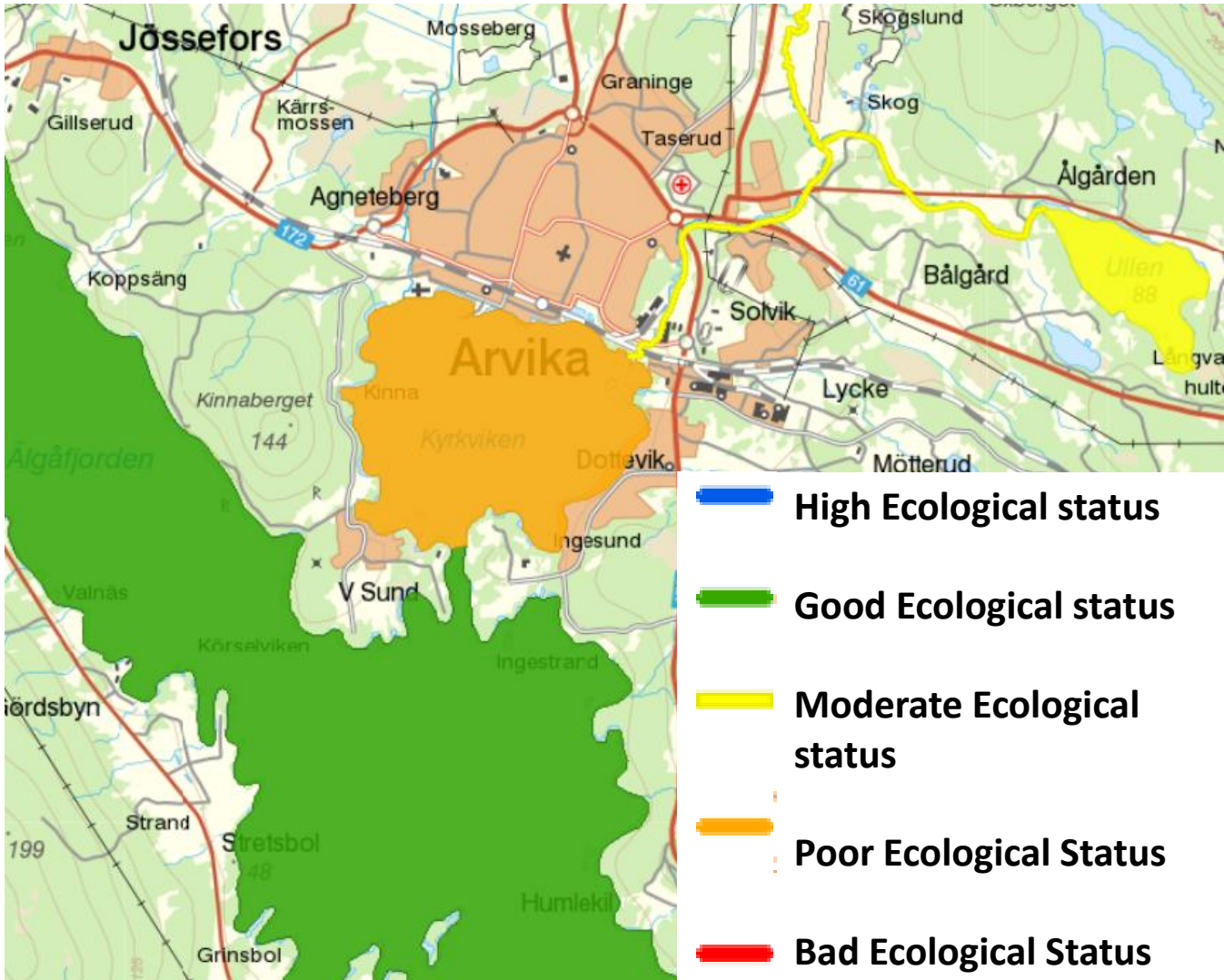
Impairment of the poor water quality in surface water

- Lake Kyrkviken is classified as “poor ecological status”
- Suffers from eutrophication and oxygen deficiency
- Heavy rainfall flushes nutrients and pollutions from streets, farmland etc. to the lake without treatment



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Water Quality of Lake Kyrkviken

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Description of the Arvika pilot

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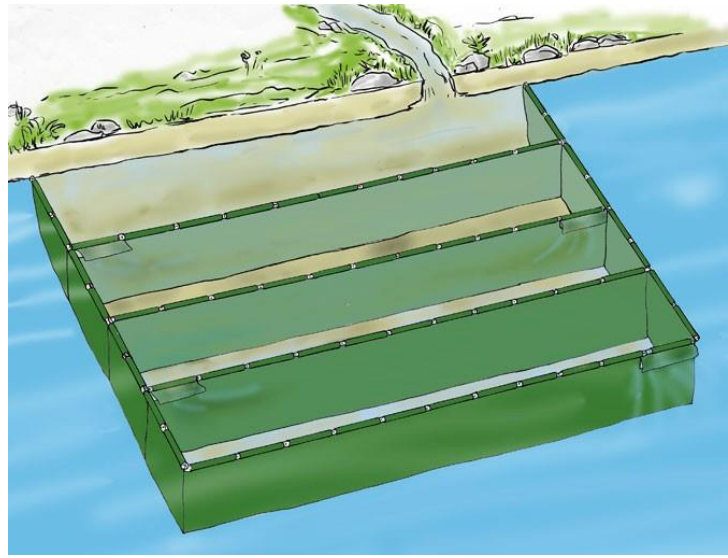
Reduction of Climate Change Effects on Water Quality

1. *Scope*
   - *Improve water quality by implementing water quality improvement measures on two locations*

2. *Objectives*
   - *Implement the identified water quality improvement methods*
   - *Create a climate adaption strategy*
   - *Communicate the above*

3. *Timeline*
   - *2017-2018: Planning and Design*
   - *2019-2020: Permissions and Construction*
   - *2019-2020: Evaluation of the project + Climate adaption strategy*



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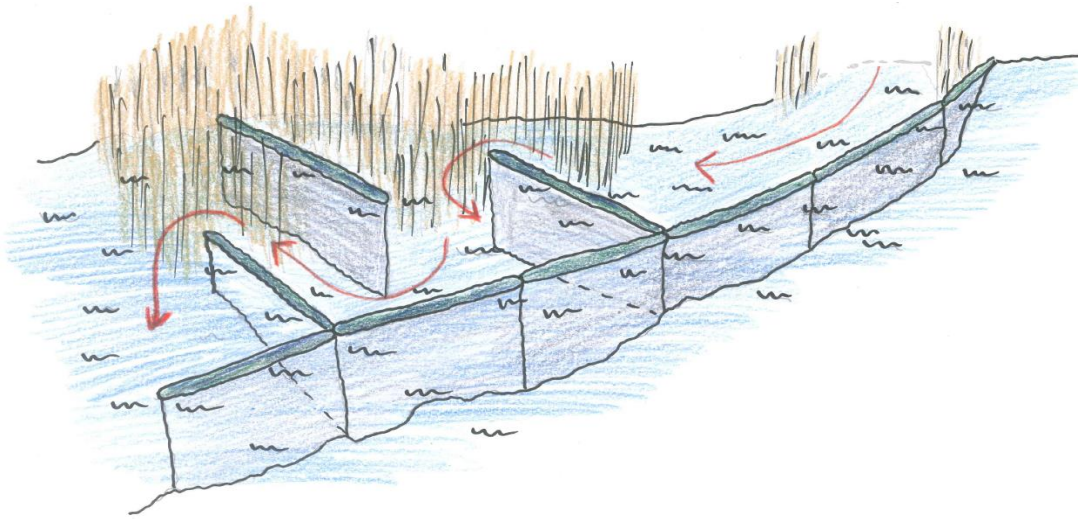
Chosen measures: screen basins

- Diverts the water flow towards the basin sections and vegetation
- The flow velocity decreases which enables particle bound phosphorous to settle instead of being spread out in the lake



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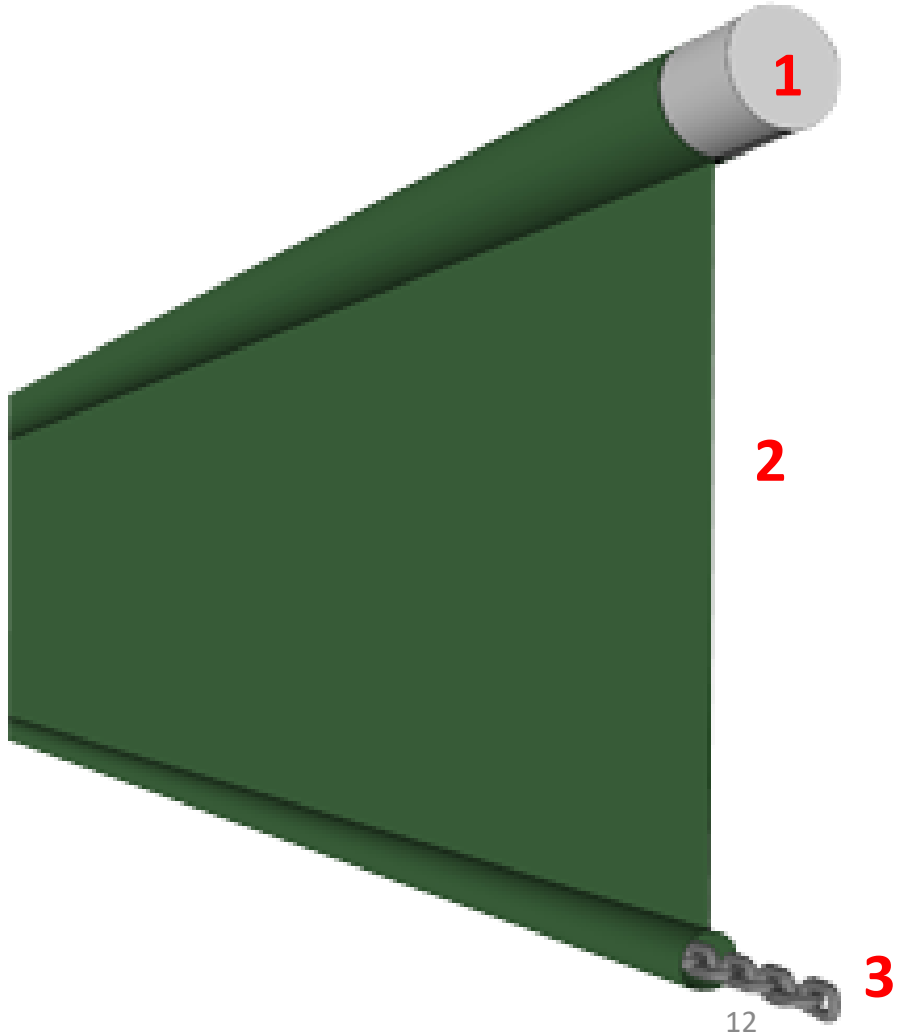
Chosen measure: Screen basins

A screen basin consists of screens

- Floating element at the top (1)
- Impermeable screen ”cloth”(2)
- Weights at the bottom (3)
- Screens are tailored after sea bottom
- Reinforced wearing cover against ice impact
- Length is adjusted to water level variations
- Anchoring is made with metal pipes



Källa: Järven EcoTech, 2019

Chosen measure: floating wetlands

- Floating wetlands consists of water vegetation that is planted in a floating framework
- The vegetation will root in the framework and build up a compact curtain of roots that slows down the water flow velocity and:
  - Enables sedimentation
  - Adsorbs dissolved nutrients

Källa: VegTech: https://www.vegtech.se/vatten/flytande-o/fotogalleri/

Example of screen basin with floating wetlands

Screen basin

Floating wetland

Foto Andreas Jacobs (från Stockholm Vatten och Avfall ”Skärmbassäng”: http://www.stockholmvattenochavfall.se/globalassets/dagvatten/pdf/skarmbassang_h.pdf)

Description of the CATCH pilot - Locations

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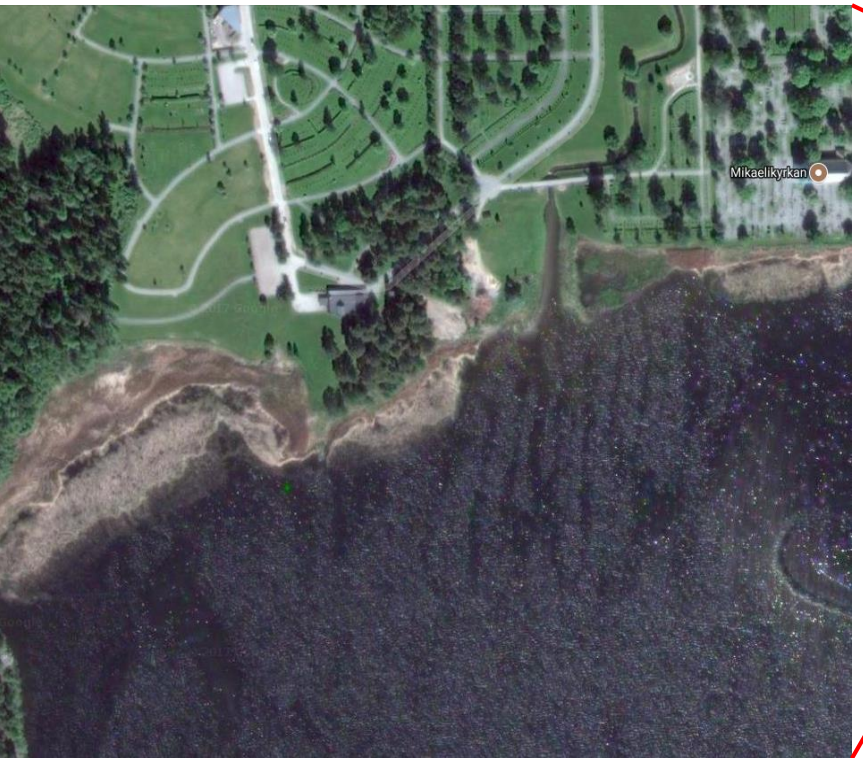

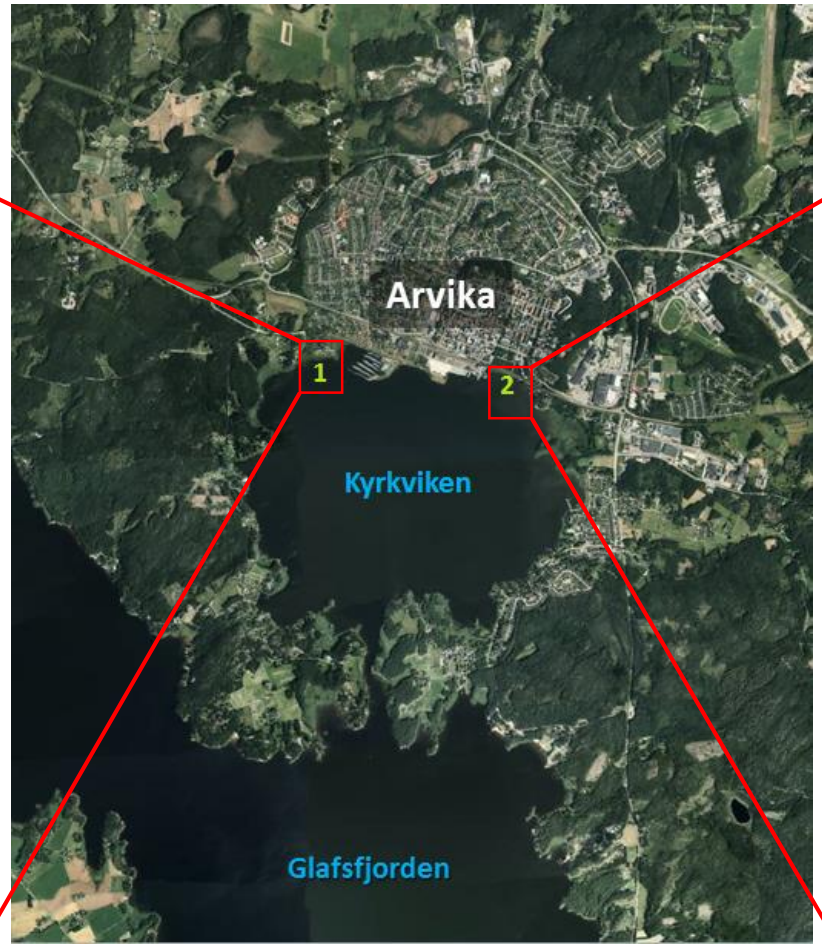

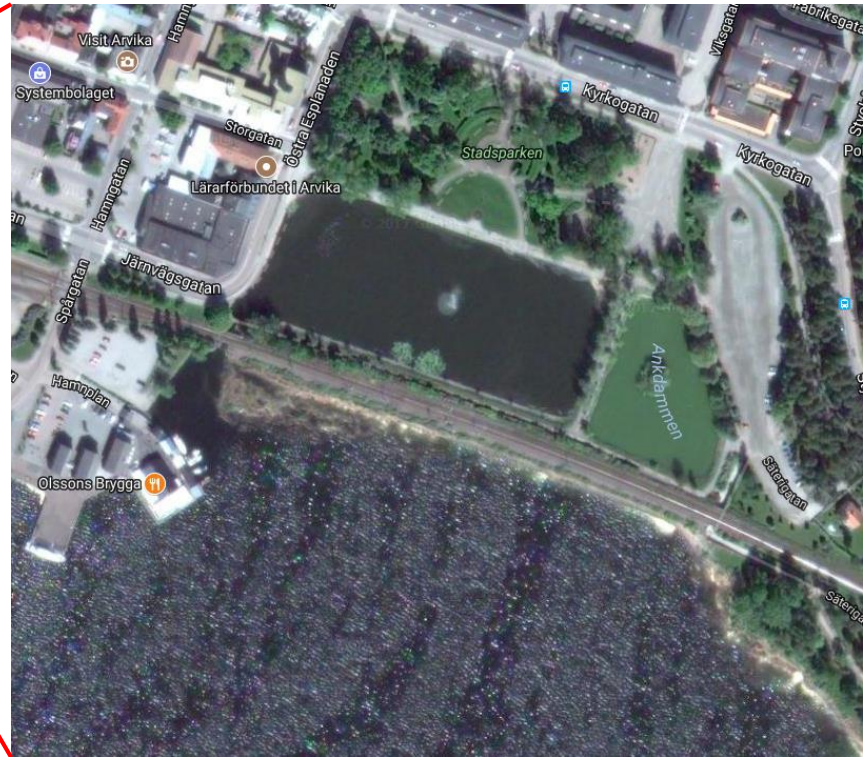

Location 1:
Outlet of Sävsjökanalen

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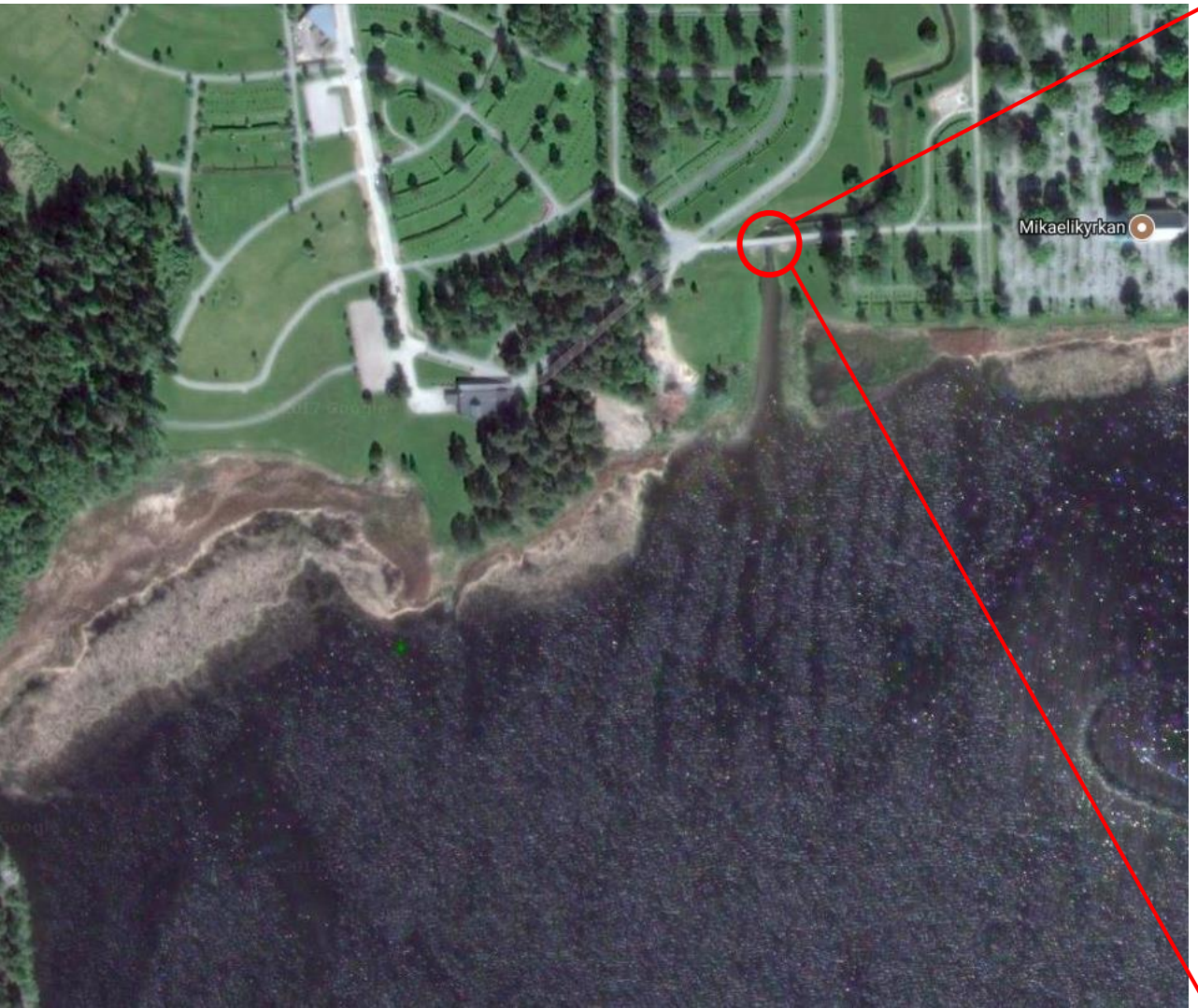
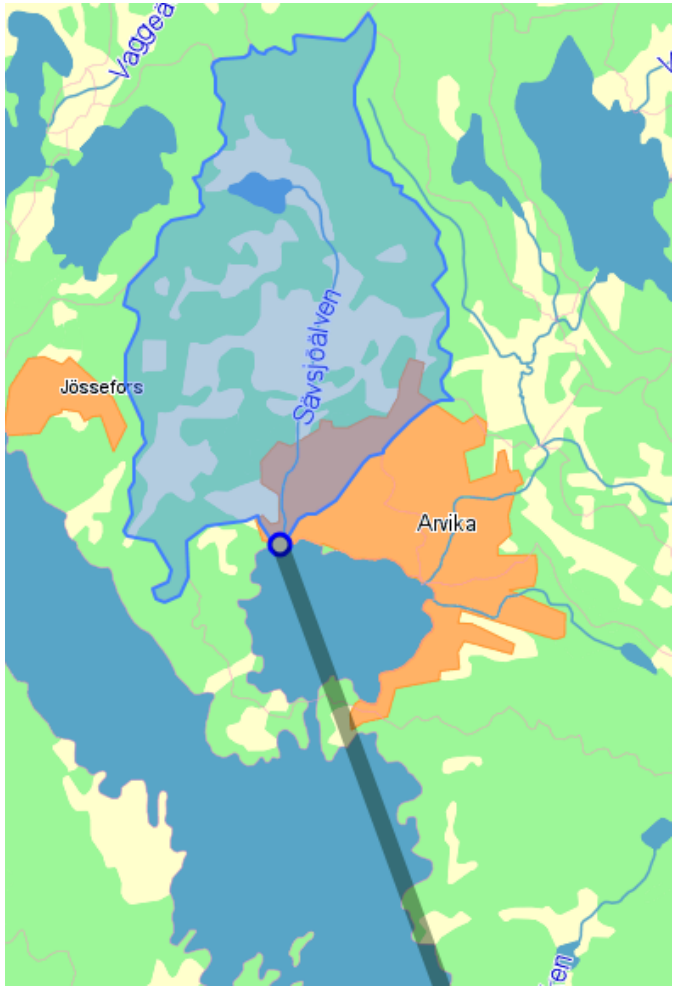


Location 1: Outlet of Sävsjökanalen



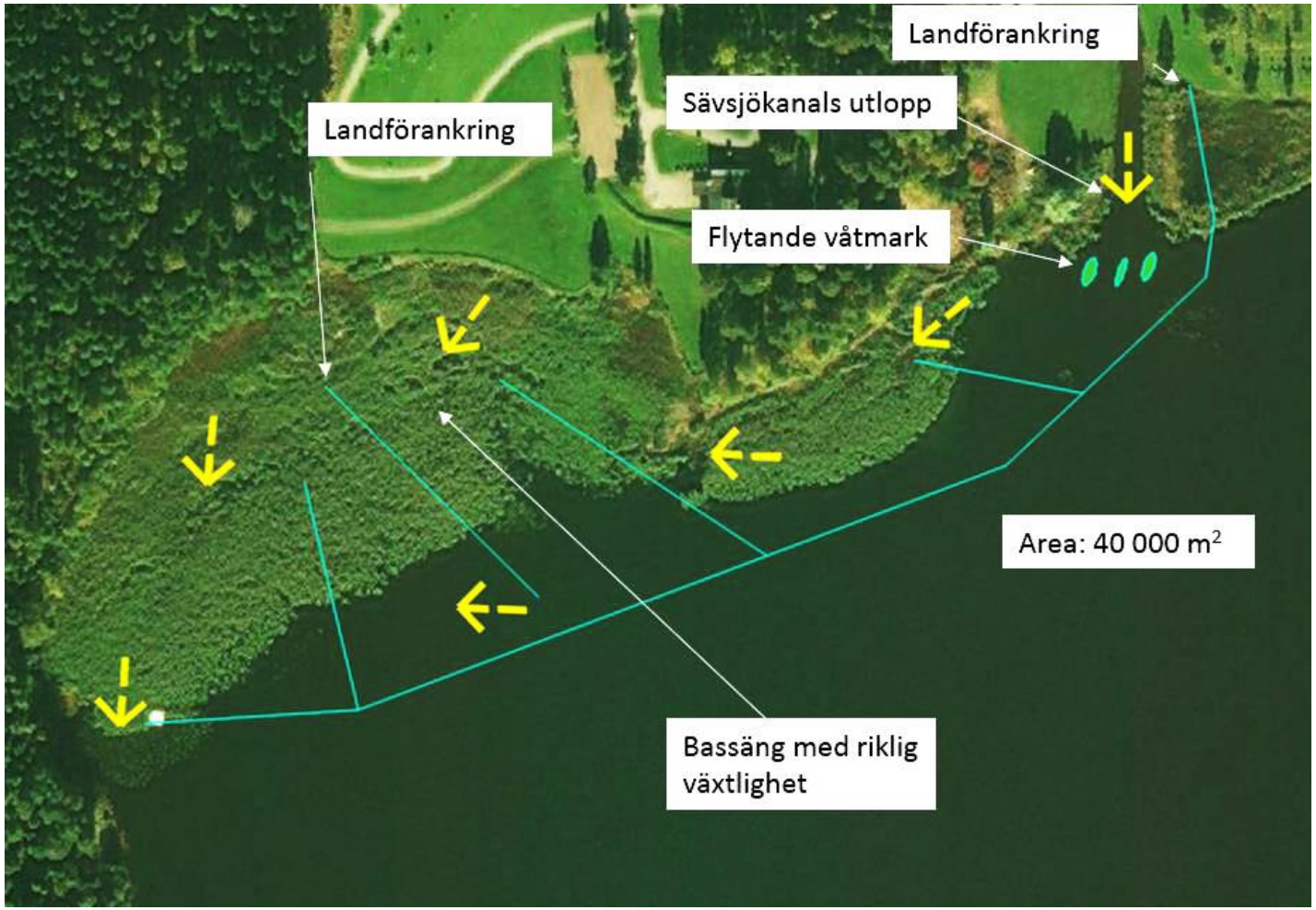
Sävsjökanalen

- Watershed: 3 000 ha
- Average annual discharge: 360 L/s
- Water level variation: 3,5 m

Kyrkviken

- Phosphorous load from Sävsjökanalen:
  - ca 580 kg P/year
- Total phosphorous load:
  - ca 3 000 kg P/year

Location 1: Outlet of Sävsjökanalen



Källa: WSP, 2018

Dimension

- Area: 40 000 m^2
- Residence time: 2 days
- Reduction effect: 50-60 %

Yearly phosphorous reduction

- Ca 320 kg P/year

Yearly reduction of total phosphorous load to Kyrkviken

- Ca 10 %

Results Outlet of Sävsjökanalen

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Description of the CATCH pilot - Locations

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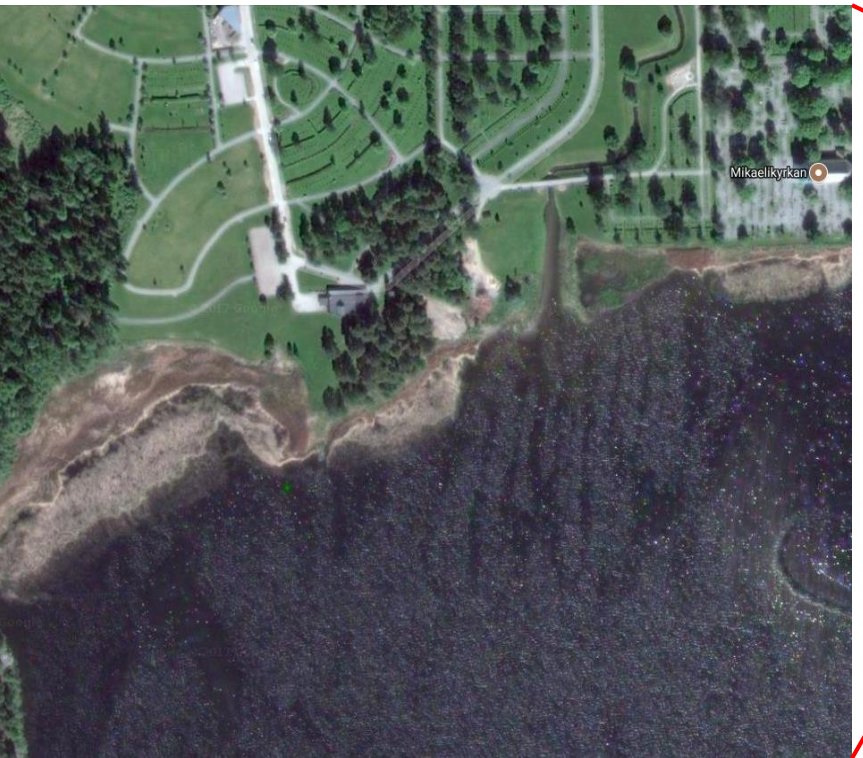
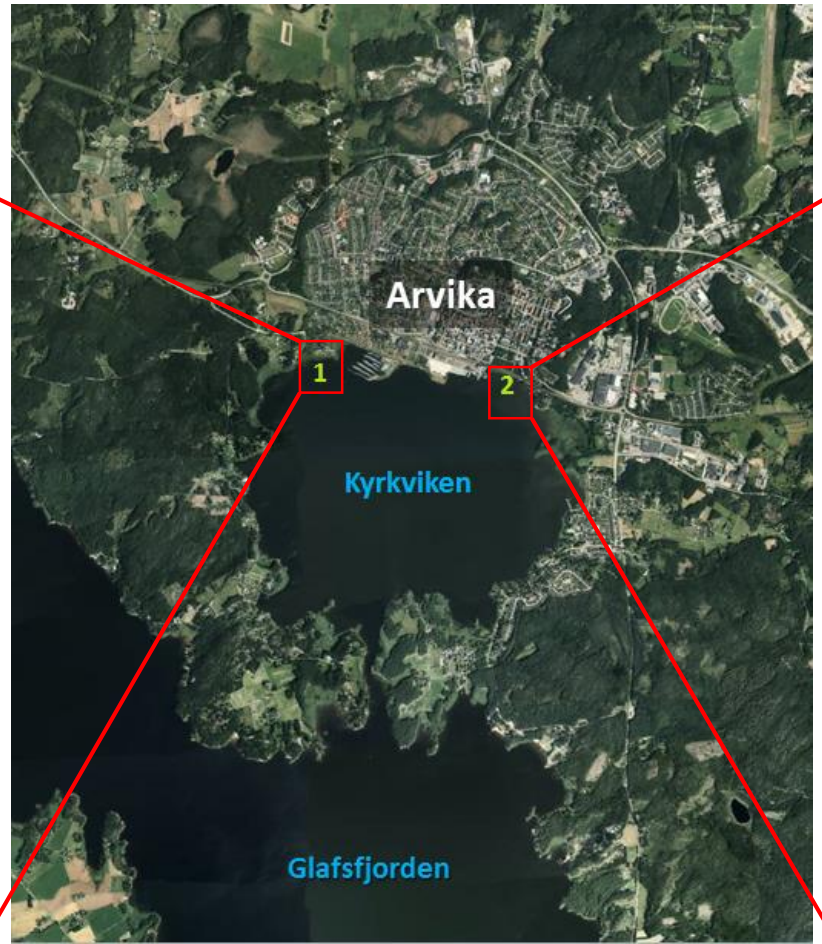
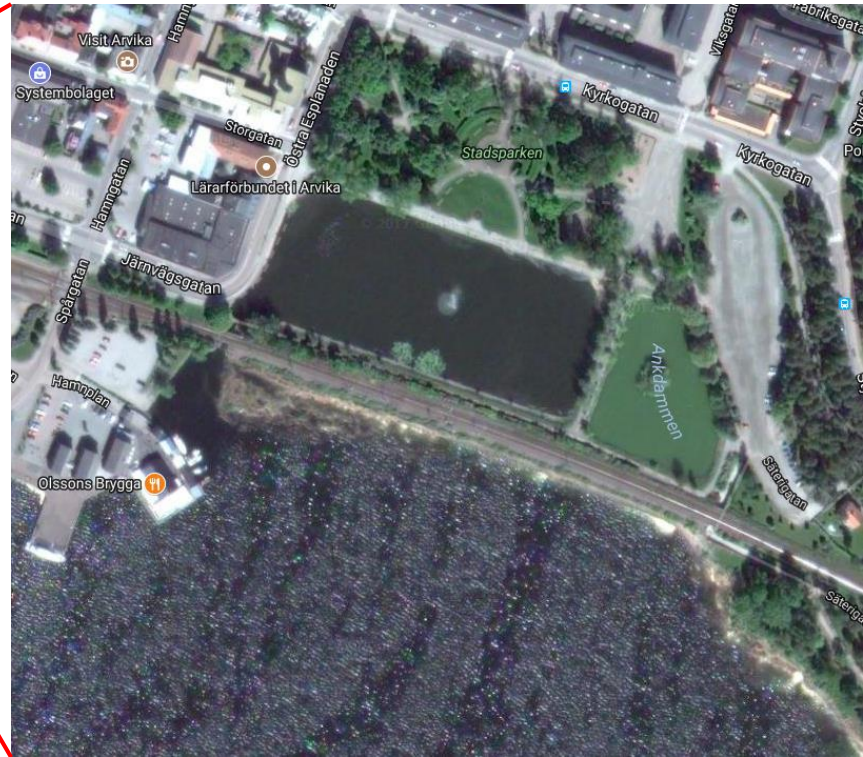
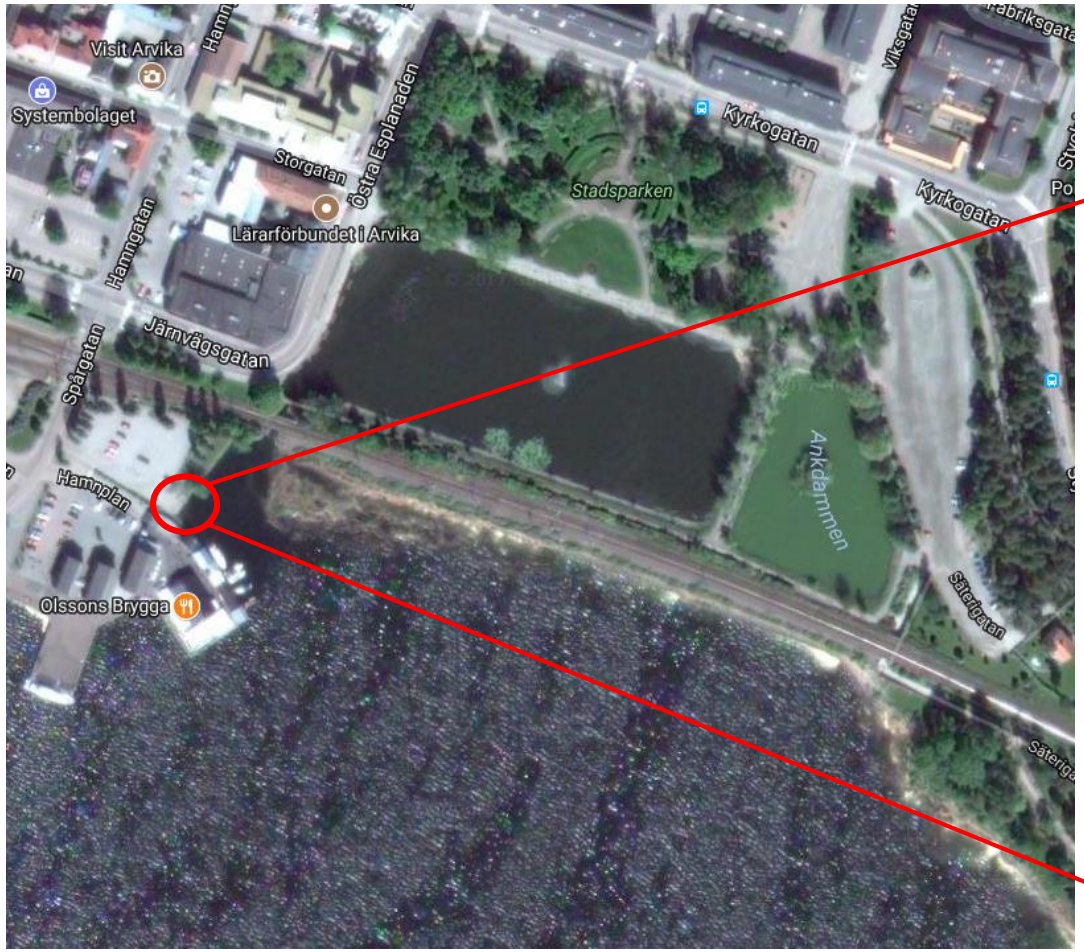


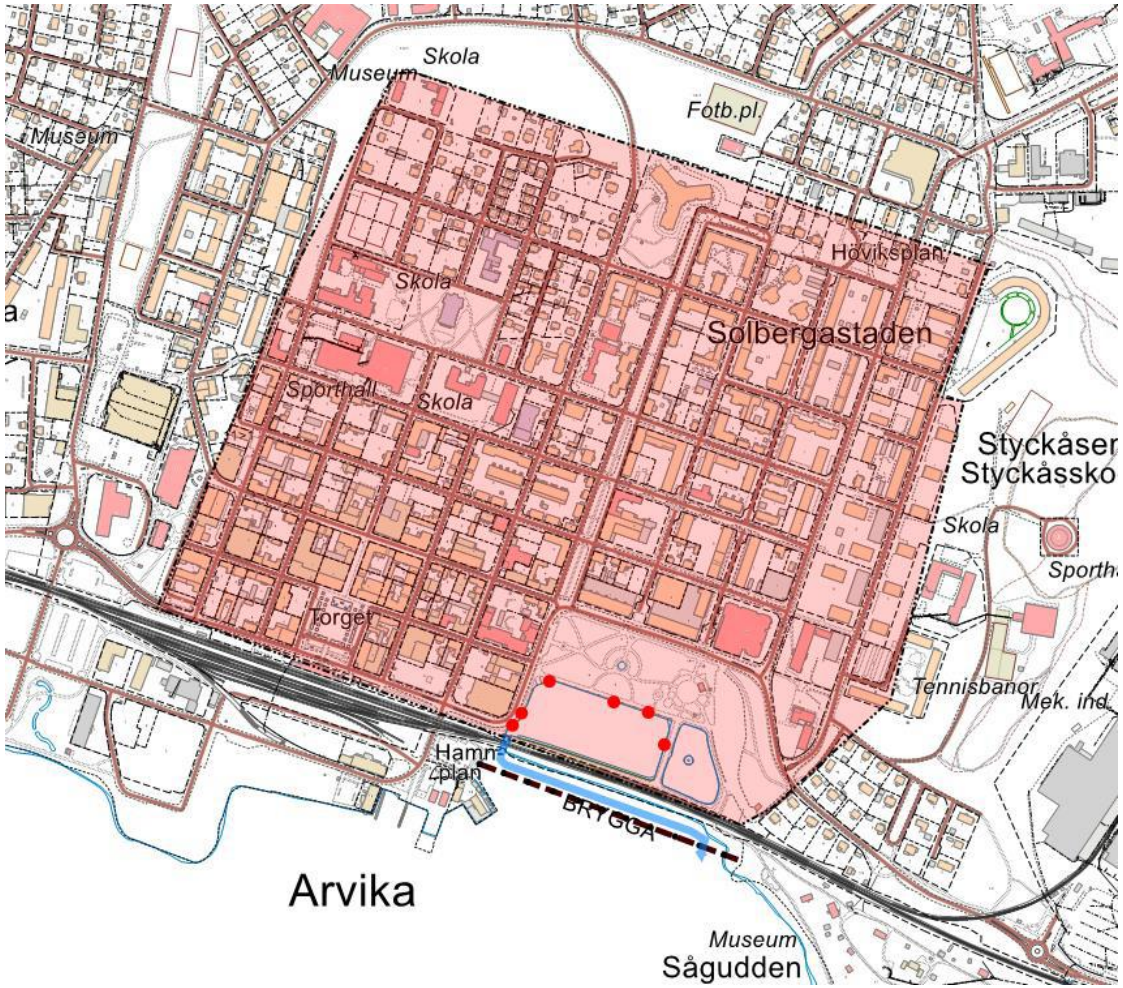




Location 2: Outlet of Kattviken



Location 2: Outlet of Kattviken



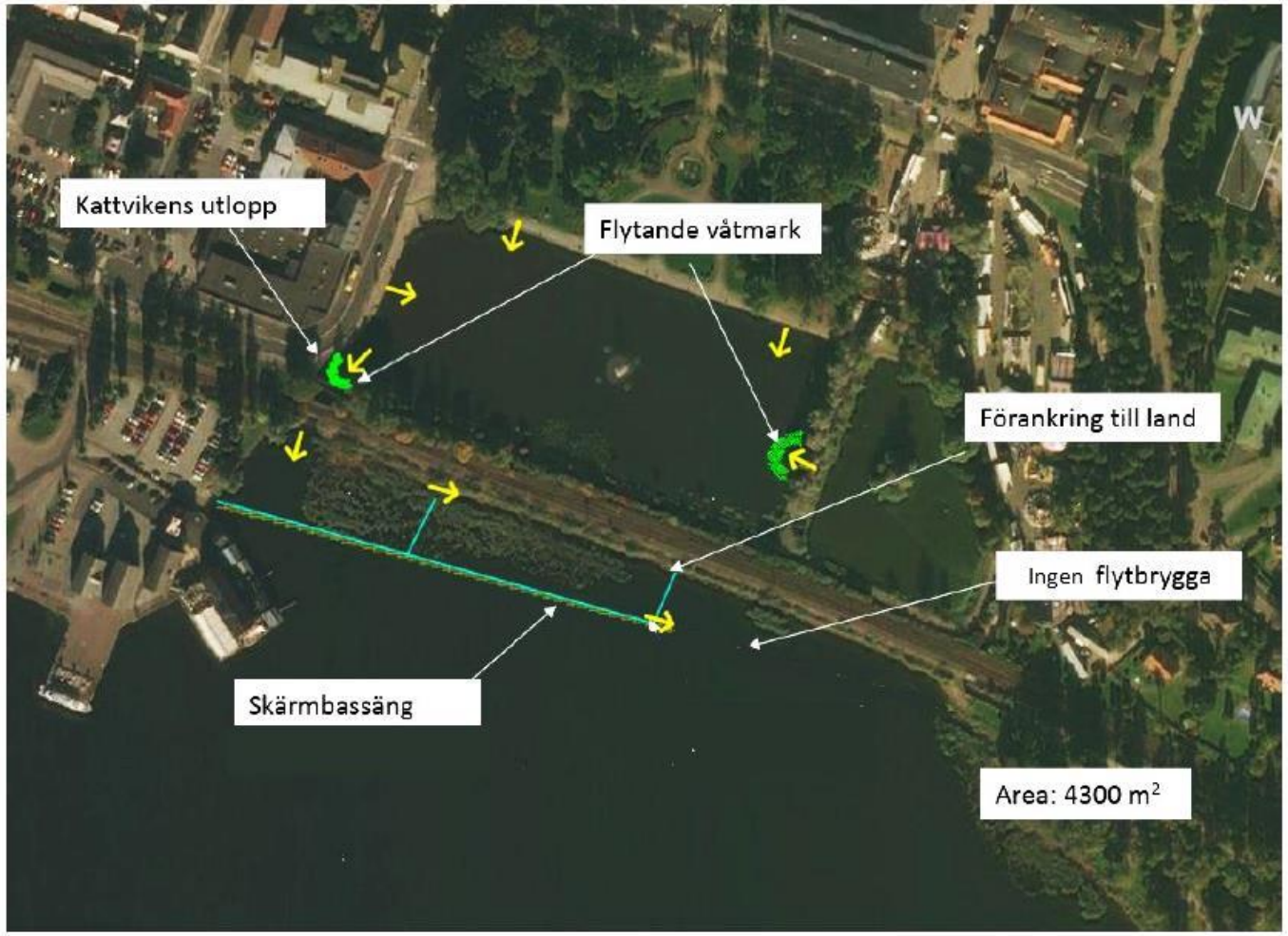
Kattviken

- Watershed: 71 ha
- Storm water outlet: 5 st
- Outlet from city park pond
- Average annual discharge: 7,41 L/s
- Water level variation: 3,5 m

Kyrkviken

- Phosphorous load from Kattviken:
  - ca 110 kg P/year
- Total phosphorous load:
  - ca 3 000 kg P/year

Location 2: Outlet of Kattviken



Källa: WSP, 2018

Dimension

- Area: 4 300 m^2
- Residence time: 5 days
- Reduction effect: 50-60 %

Yearly phosphorous reduction

- Ca 60 kg P/year

Yearly reduction of total phosphorous load to Kyrkviken

- Ca 2 %

Results Outlet of Kattviken

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Lessons learnt

Screen basins

- Permit and procurement procedure is time consuming
- Take water level variations into account

Floating wetlands

- Make sure the location is protected from high water velocity and waves

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