SÖDERHAMN PILOT SITE: PREPARATION AND MULTI-BENEFIT ANALYSIS

MUSTBE International Cross-Border Event - Stormwater Seminar in Söderhamn

Interreg Co-funded by the European Union

Central Baltic Programme

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Nils Kändler
PhD, senior researcher
URBAN WATER SYSTEMS

24.04.2025

NOAH PROJECT 2021

NOAH Söderhamn
Flood nodes RCP45 + sealevel rise 143cm

rcp45_risk_plotview
flood risk on plots
- high
- medium
- low
- no risk

Junctions_added
high sealevel risk
- low
- medium
- high
- flooding area: sealevel +143cm
- Pipeline

0 85 170 340 510 680 Meters

TalTech: 28.05.2021

MAIN CHALLENGES OF MUSTBE

- **Catchment scale systematic** planning of stormwater NBS
- **Multidimensional** approach => multi-objective stormwater planning:
  - Water quality
  - Water quantity
  - Limitations in public space
  - Transportation
  - Interest of developers (stakeholders)
  - Already functioning ecosystems (streams)
- **Smartening NBS** to reduce size & increase efficiency in removal of nutrients and haz.substanses

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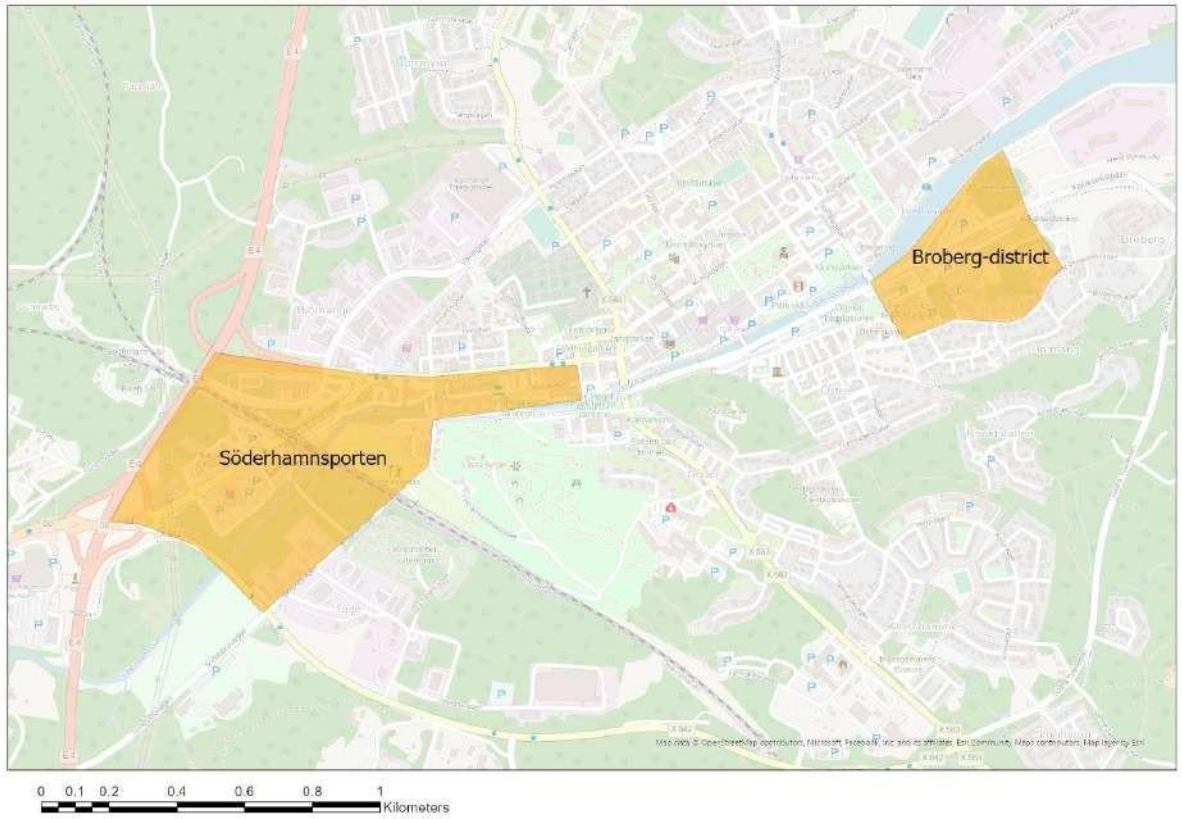
SÖDERHAMN OBJECTIVES



* **Retrofitting urban streams to nature-based treatment systems** to resist water quality deterioration threats related to intense real estate development will be demonstrated

* It is expected that the NBS will deliver pollutant removal efficiencies deliver of at least **60% for suspended solids, 30% for total Nitrogen** for developed areas.

MUSTBE WORKPLAN

1. **Analysis and design / TalTech / 2023-2024**
   - Development of GIS database
   - Field surveys
   - Multi-objective analysis of the technical solutions for stormwater treatment
   - Maintenance program

Technical description for detailed design

2. **Installation of new solutions**

   Design + construction

3. **Monitoring of pilot investments**

   Water Quality sampling

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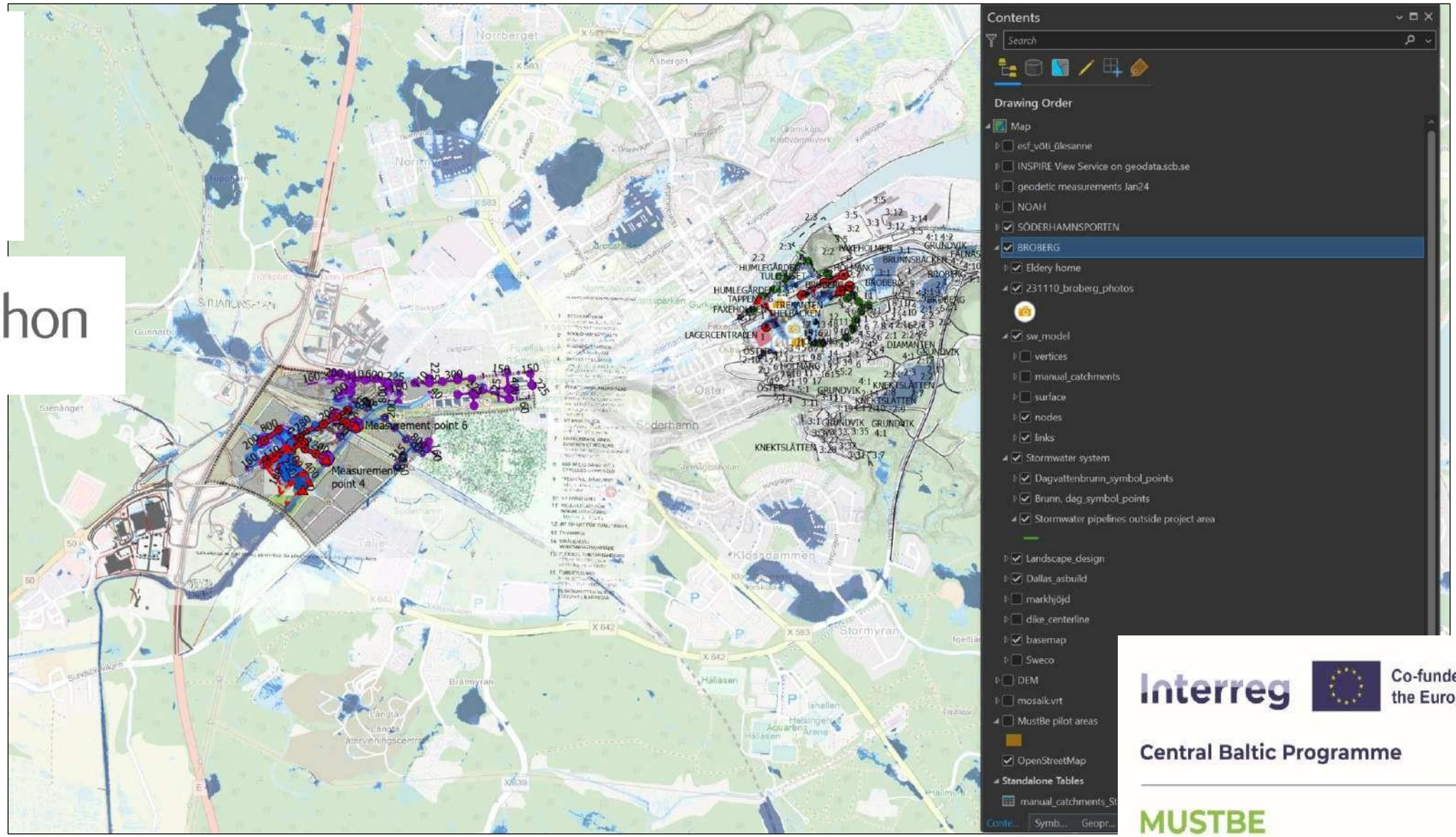
GIS BASED ANALYSIS

ArcGIS Pro

python



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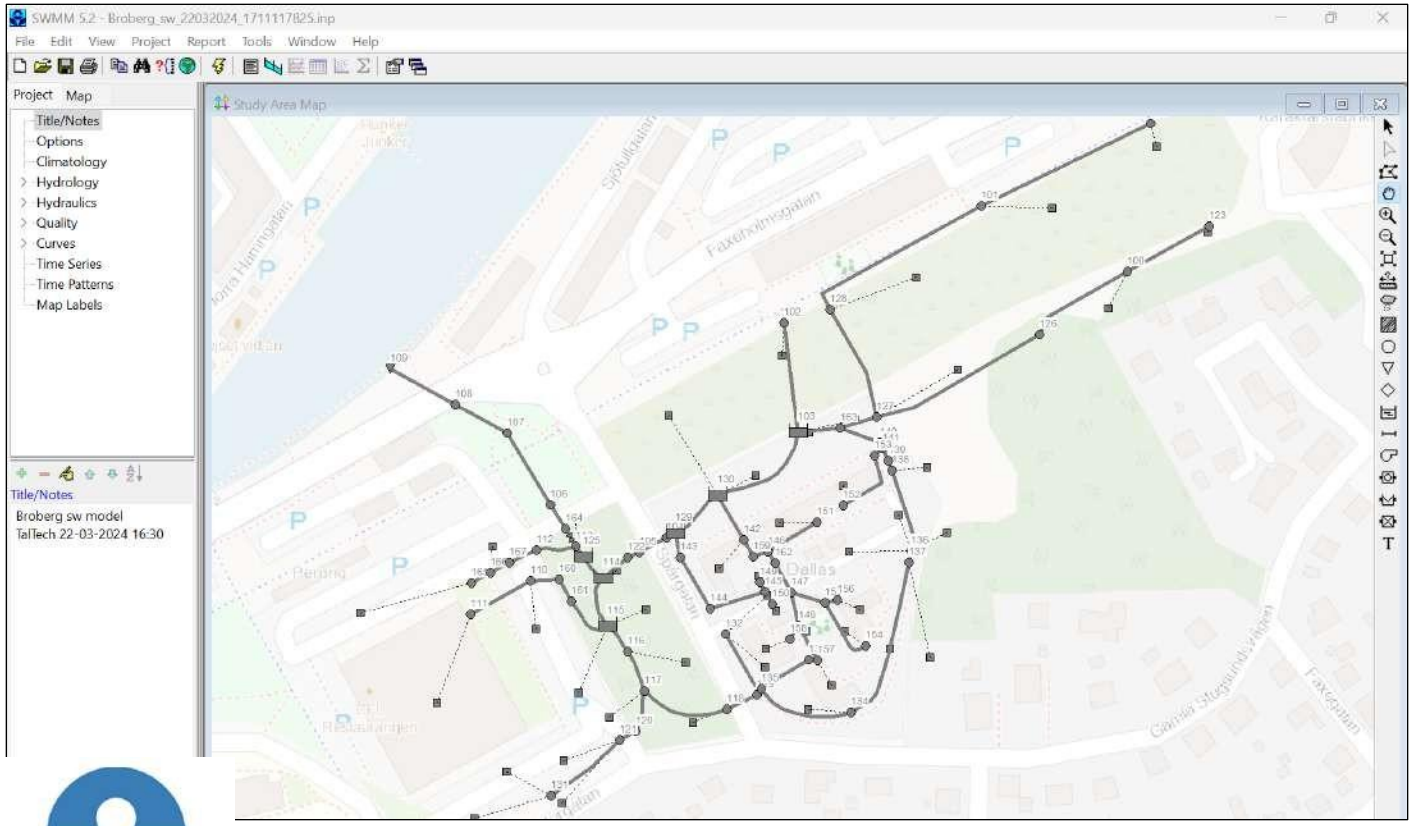
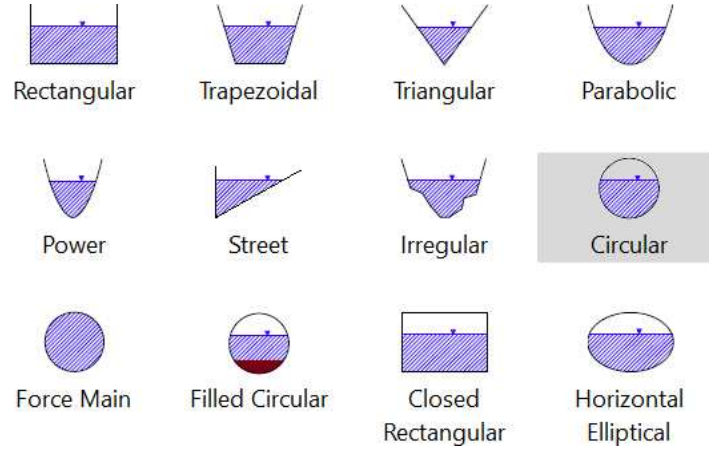
MODELLING (1D)



Investigate SW systems that are not built!



- Hydraulics
- Hydrology
- Water Quality

Rooftop Disconnection has downspouts discharge to pervious landscaped areas and lawns instead of directly into storm drains. It can also model roofs with directly connected drains that overflow onto pervious areas.

Vegetative Swales are channels or depressed areas with sloping sides covered with grass and other vegetation. They slow down the conveyance of collected runoff and allow it more time to infiltrate the native soil beneath it.

BROBERG

Broberg area is reserved for the new municipal elderly home. The district is situated at the Söderhamns bay, covered with mostly natural surface and is highly affected by the sea-level rise. Stormwater runoff systems developed have to be profoundly analysed beforehand in order to avoid the acceleration of the flood and water quality deterioration risk. Any failure of the system will also negatively impact the BS.

SWECO

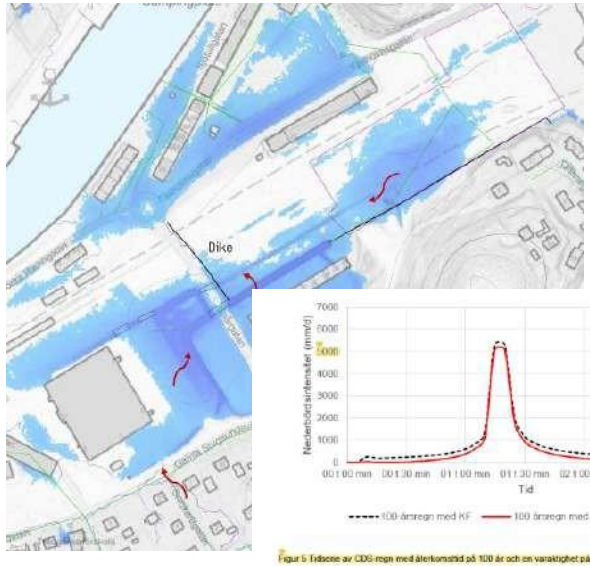
Detaljplan nytt VåBo i Söderhamn

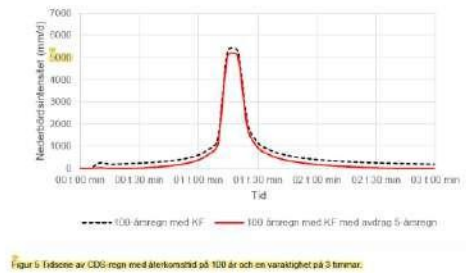
LOKALISERINGSALTERNATIV

Dagvattenutredning

Detaljplan för vårdboende på fastigheten Broberg 3:1 m.fl

Söderhamns kommun





Skyfallsutredning

Detaljplan för vårdboende på fastigheten Broberg 3:1 m.fl.

Söderhamns kommun

Utökad miljöteknisk utredning Broberg 3:1, Söderhamn

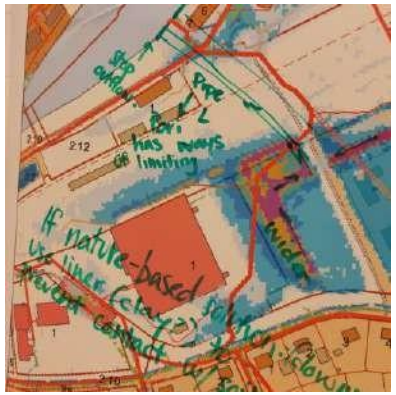
lan för vårdboende på fastigheten Broberg 3:1 m. fl.

Beräkning av högsta vattenstånd längs Sveriges kust

Sofie Schöld, Cajsa-Lisa Ivarsson, Signild Nerheim och Johan Södling

SURVEYS

- Geodetic measurements
- Geotagged photos
- Rainfall data
- Water quality analysis
- Water level measurements



Riga’s co-creation workshop (Oct2023)

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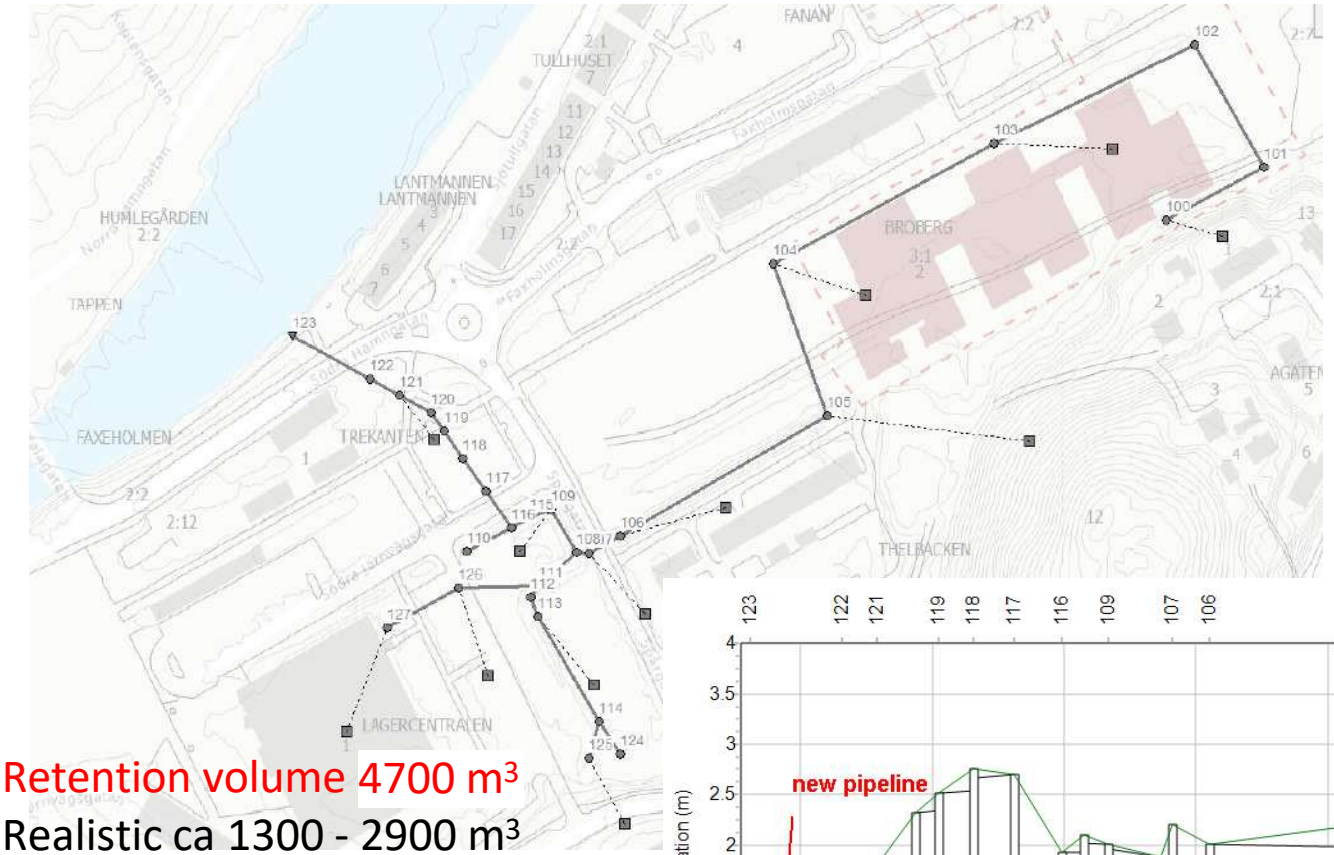
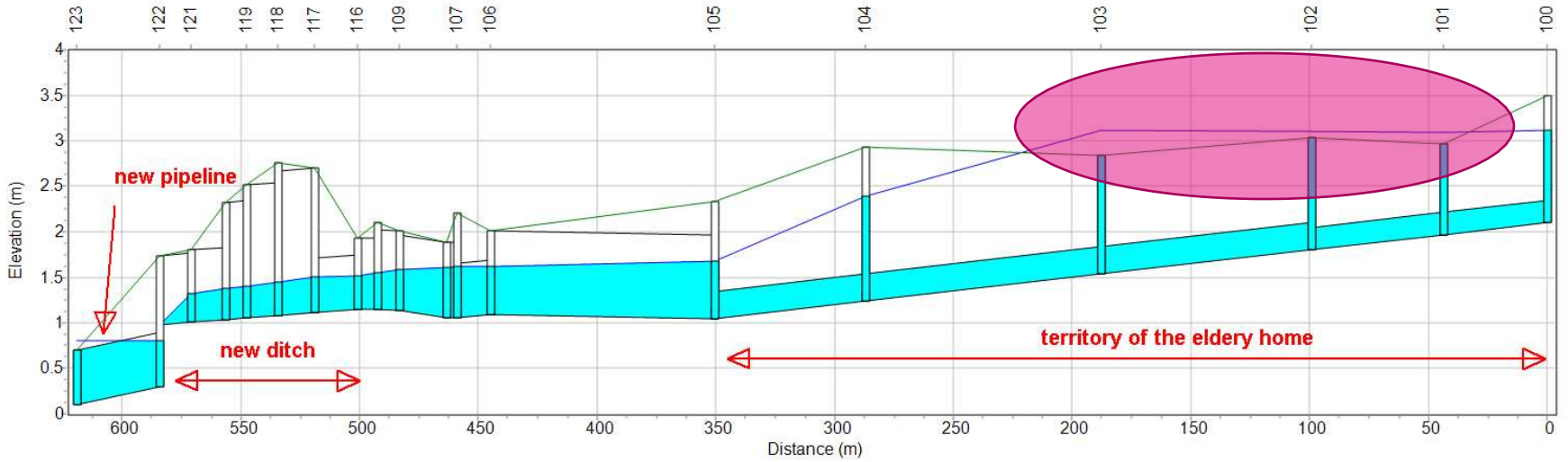
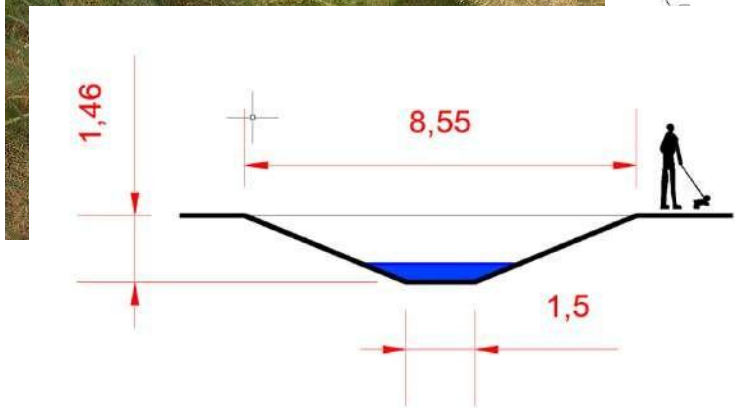
BROBERG – SW MODEL

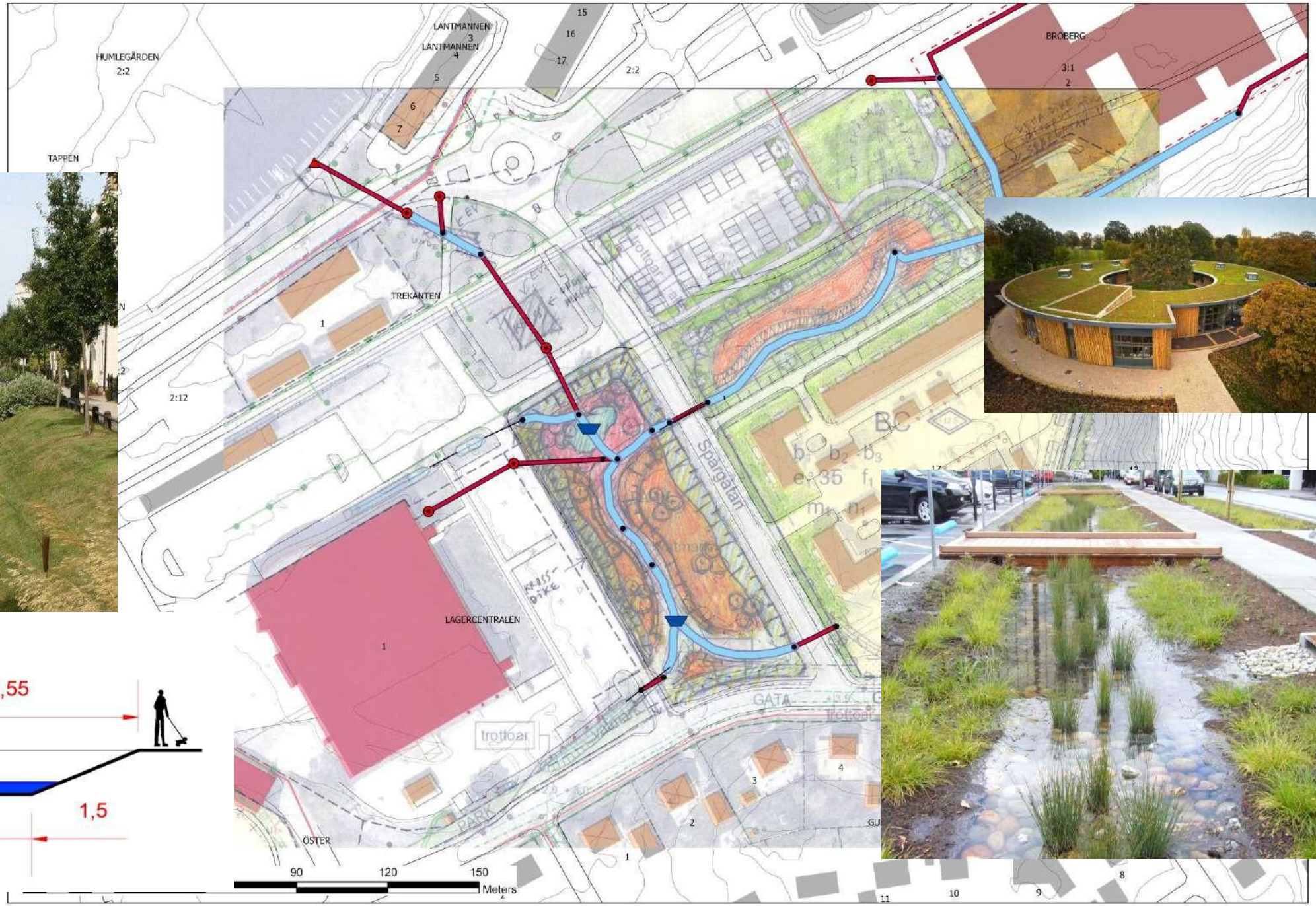
5year rainfall with duration of 10 min and intensity **96 mm/h**
Groundwter inflow 10 LPS from each startnode



Retention volume 4700 m³
Realistic ca 1300 - 2900 m³




1,46
8,55
1,5


HUMLEGÅRDEN
2:2
LANTMANNEN
LANTMANNEN
TAPPEN
TREKANTEN
2:12
BROBERG
3:1
Spårgatan
LAGERCENTRALEN
trottoar
ÖSTER
90
120
150
Meters

SÖDERHAMNSPORTEN

Söderhamnsporten will be the new busy transportation hub combining railway, highways, and connections to the centre. Area has mainly impermeable natural surfaces; situation will substantially change in coming years -new streets, parking lots, building, combined of amenity areas like parks and walkways are planned. Söderhamnsån is passing the district, requiring delicate decisions while planning stormwater systems while the increased stormwater runoff will directly impact water quality in the BS. There has been flooding with impact on Söderhamnsån on several occasions during past 10 years.

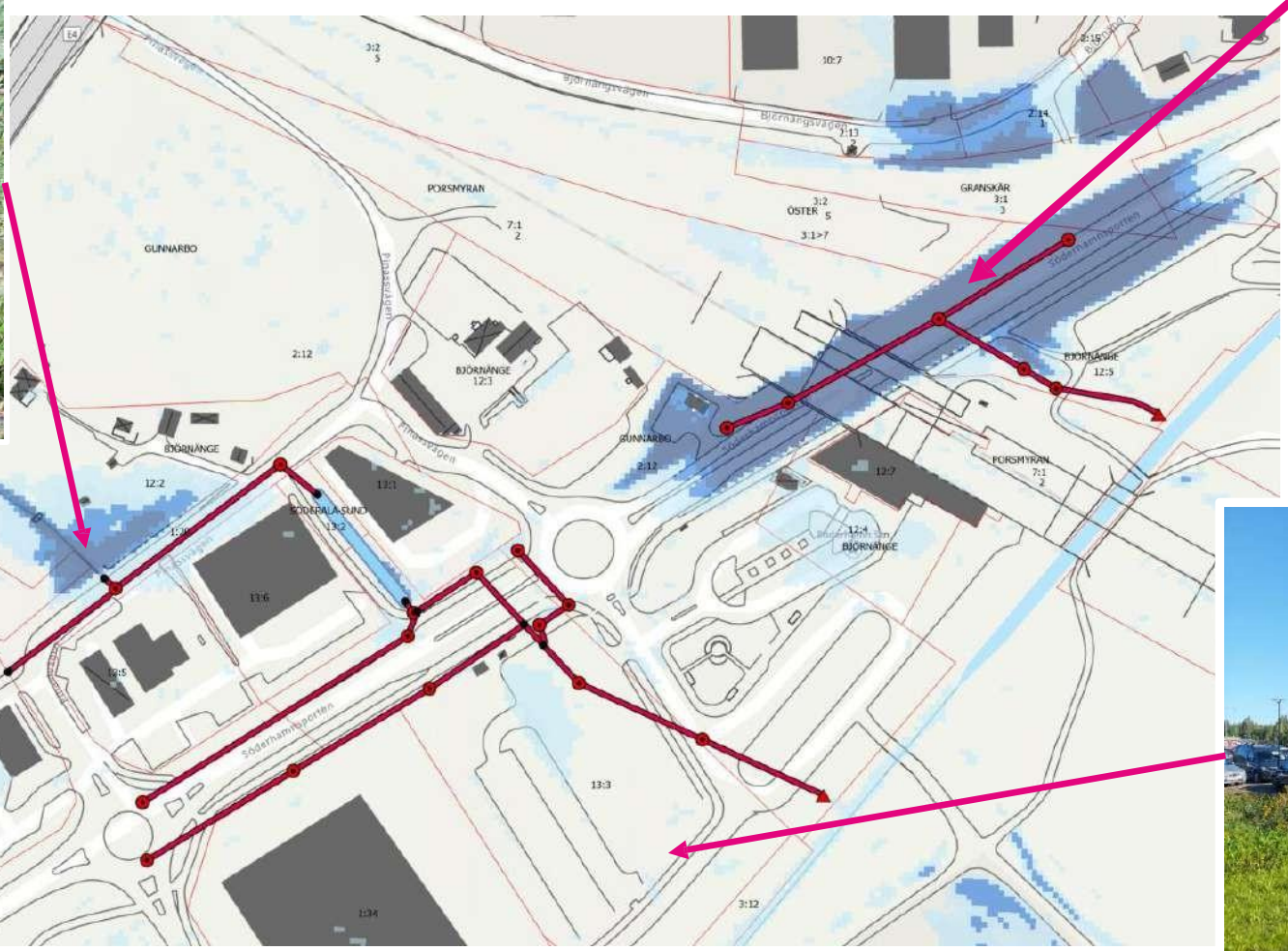
Flödesmätningar, automatisk vattenprovtagning och förslag till åtgärder i Söderhamnsåns avrinningsområde

Tony Persson och Daniel Rickström

2018-12-20

Illustrationsplan med förslag på struktur för allmänna platser och kvartersindelning

SÖDERHAMNSPORTEN



The large volumes of water in Söderhamn affected many residents in the Söderhamn area. At Bergbacken,
tenants are now being evacuated. Foto:Christian Höijer/Sveriges Radio - 14 august 2013

29-08-2023 Photo: Josefin Flink

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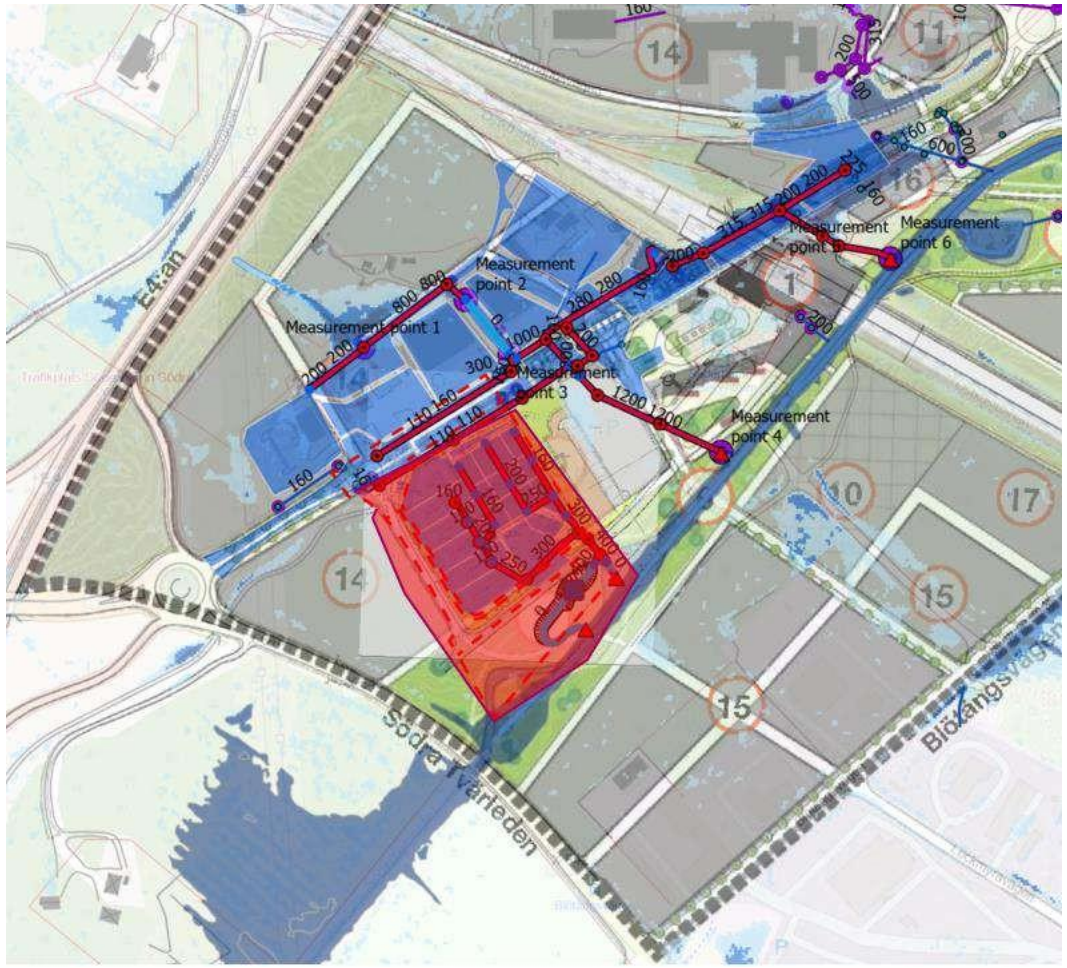
WILLY'S OUTLET



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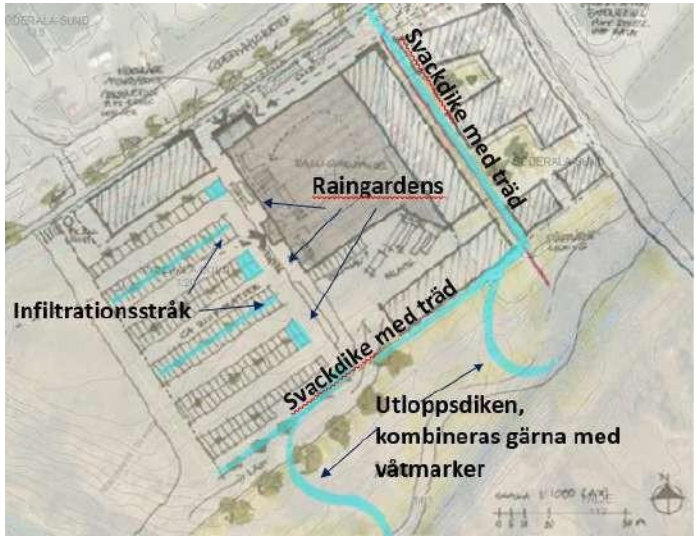
DETAILED PLAN

Söderhamns kommun

TYRÉNS
LAGAKRAFTHANDLING
DIARIENUMMER BMN B-2017-731

PLANBESKRIVNING

Detaljplan för Söderhamnsporten Etapp 1
Söderhamn, Söderhamns kommun, Gävleborgs län



- the designed flow will increase by **approximately 409%** in the case of a 10-year rain.

- substances nitrogen and phosphorus increase by **approximately 300%** after exploitation without stormwater measures.

- The objective for stormwater management is to **keep down the dimensioning flow** so that it does not exceed the existing flow **of 61 l/s (240 l/s)** from the investigated area.

- It can be achieved through various types of measures that absorb and delay water. Calculating the size of the delay reservoir with a drain time of 10 minutes means that a volume of approximately **220 m³ is required**.

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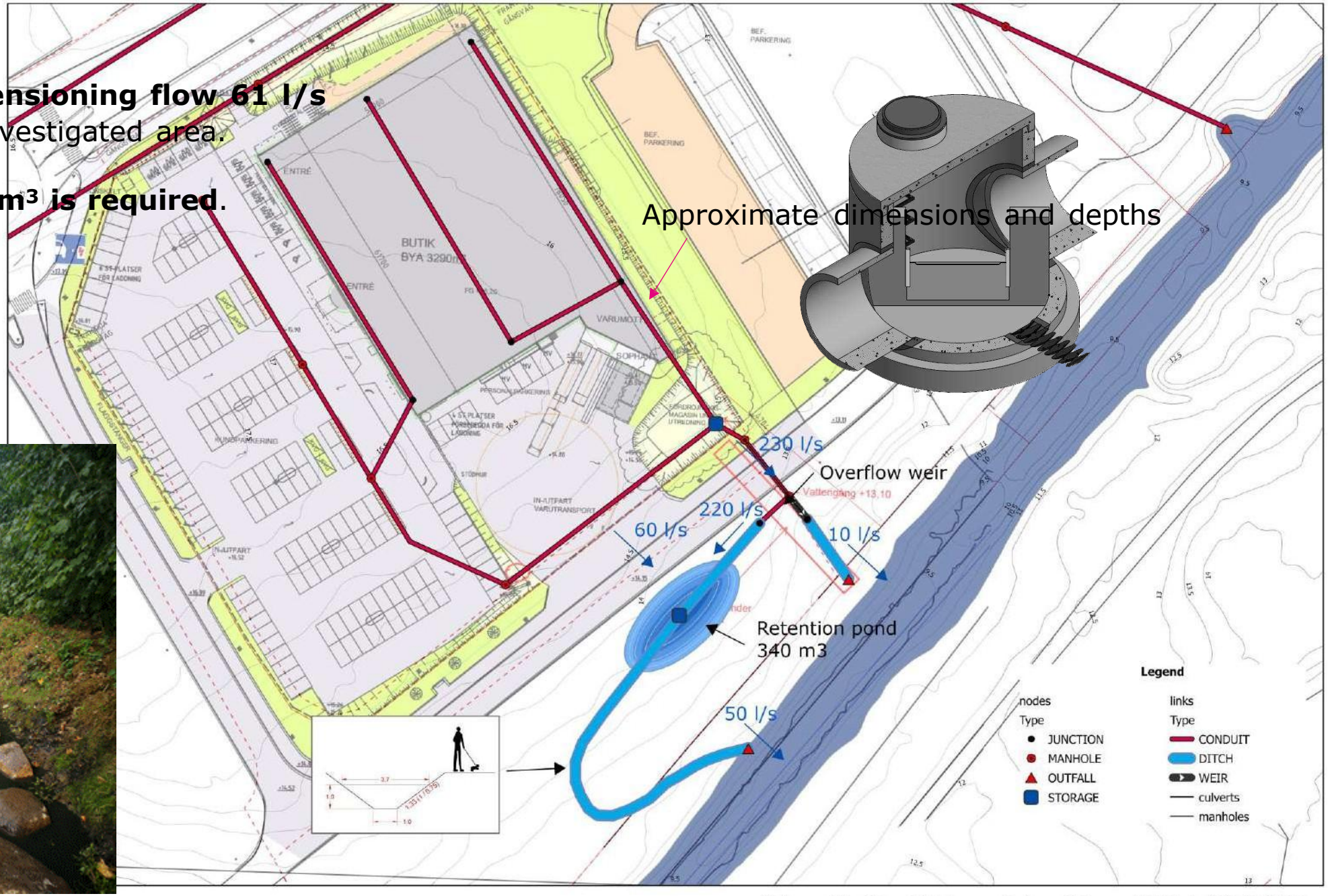
TYRENS:
10-year rain
keep down the dimensioning flow 61 l/s (240 l/s) from the investigated area.

- delay reservoir **220 m³ is required**.

Excavation:
- Pond 350 m³
- Ditches 157 m³

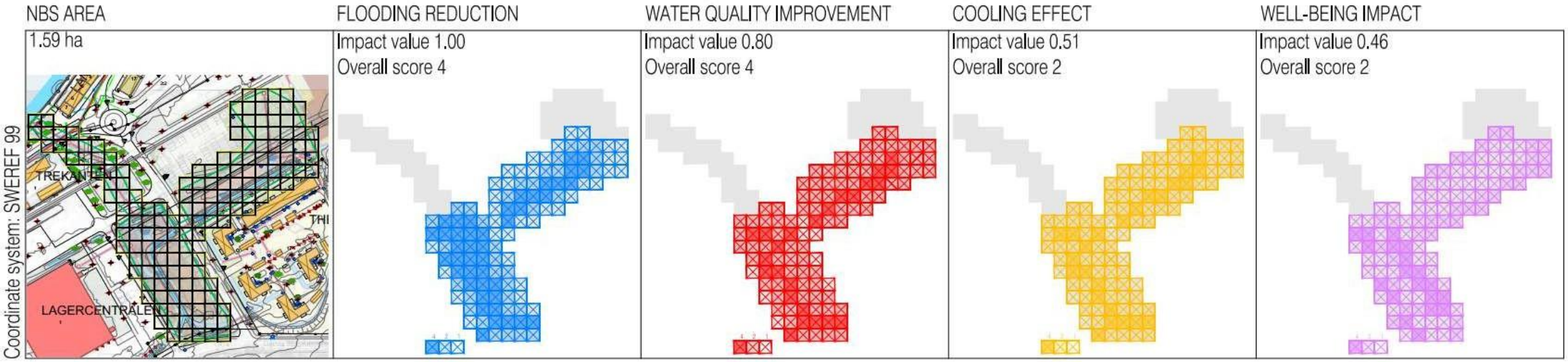
Total: 500 m³



MULTIDIMENSIONAL ANALYSIS

Analysed benefits: flooding reduction, water quality improvement, cooling effect, well-being impact.

BROBERG - Sediment and stormwater retention pond. Population density 1117.0 (1 km2). Scale M 1:1000 Coordinate system: SWEREF 99



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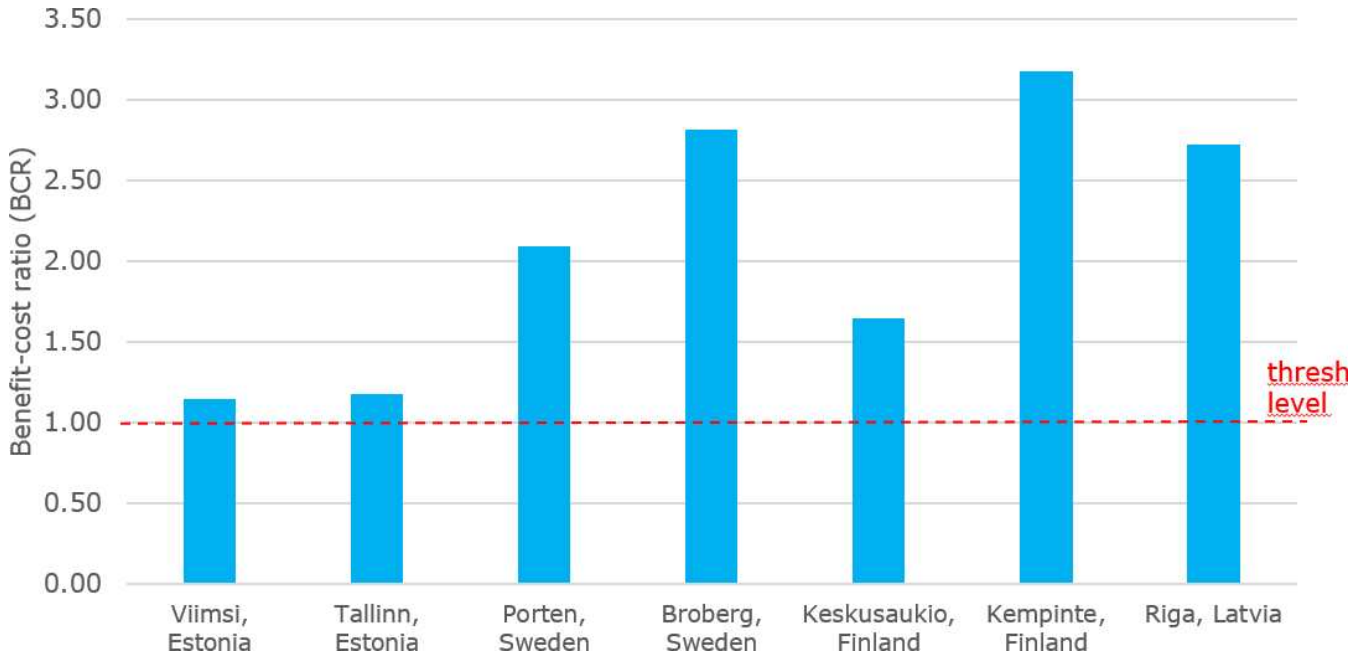
BENEFIT-COST ANALYSIS OF MULTIDIMENSIONAL NBS

Pilot area	Investment	Cost NPV	Benefits NPV	Benefit-cost ratio (BCR)
Viimsi, Estonia	488,237.06 €	526,060.76 €	602,138.85 €	1.14
Tallinn, Estonia	394,157.30 €	428,808.08 €	505,978.45 €	1.18
Porten, Sweden	61,488.49 €	89,729.12 €	187,860.94 €	2.09
Broberg, Sweden	384,465.47 €	412,282.22 €	1,162,605.18 €	2.82
Keskusaukio, Finland	64,412.72 €	90,752.52 €	149,696.41 €	1.65
Kempinte, Finland	257,650.88 €	295,104.13 €	938,677.60 €	3.18
Riga, Latvia	368,989.10 €	406,442.35 €	1,107,810.38 €	2.73

Financially successful



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LET'S WRAP IT UP

- **Geospatial data adds value**
- **Simple surveys**
- **Drainage modelling**
- **Multi-dimensional analysis**

Söderhamns kommun

Söderhamn NÄRA

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