Stormwater filtration unit

Background, concept and applied design work

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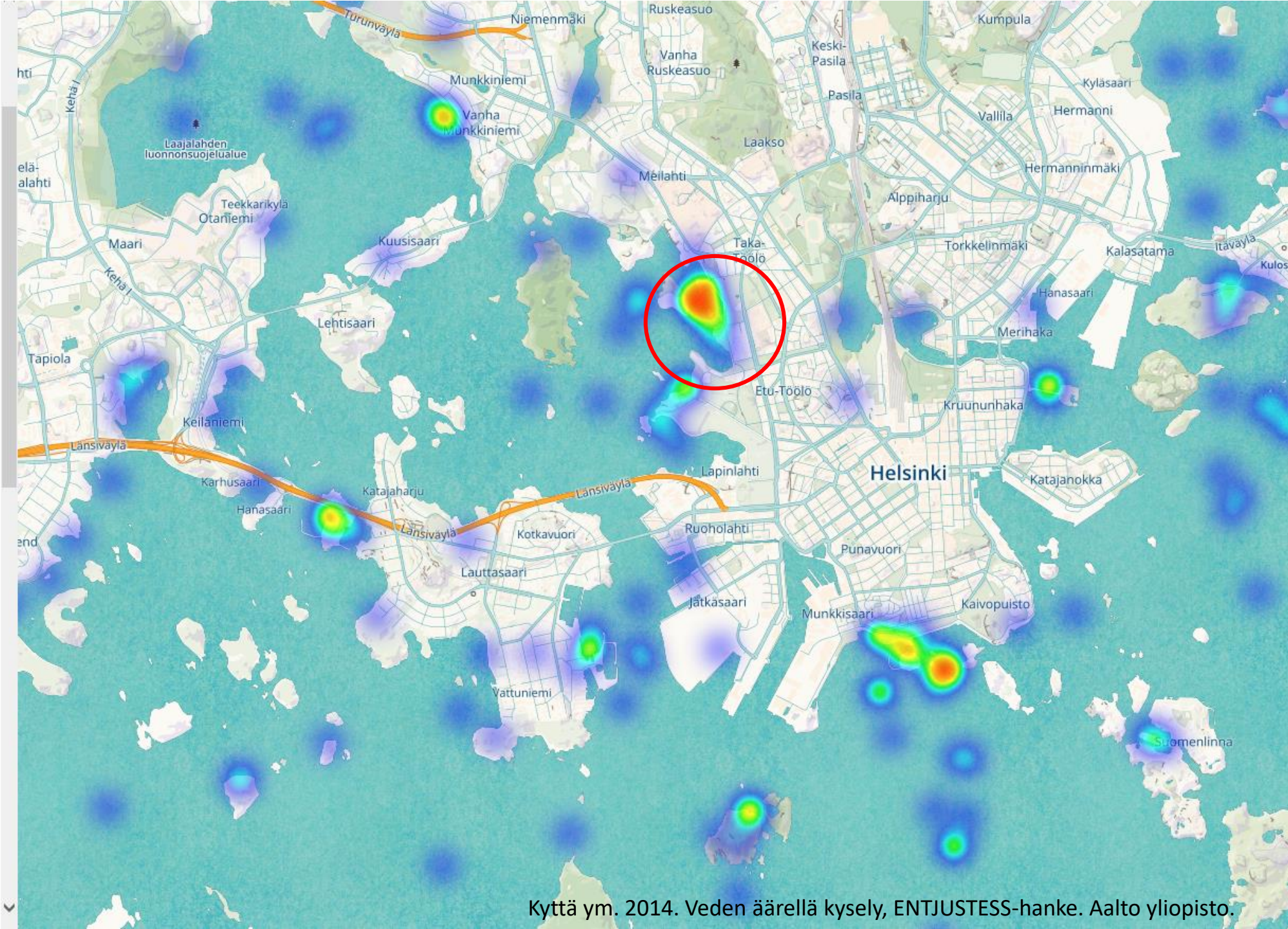
WSP Finland
Aalto university

Question	Answer	
What activities do you do in this place? (Please check all that apply)	= Canoeing or rowing	
What activities do you do in this place? (Please check all that apply)	= Sailing	
What activities do you do in this place? (Please check all that apply)	= Motor boating	
What activities do you do in this place? (Please check all that apply)	= Jet skiing, water skiing, or other motorised water sport	

- ☐ It is difficult to get to the location
- ☐ Problems or unpleasant experiences are associated with this location
- ☐ Business opportunities
- ☐ Feelings and experiences inspired by the location
- ☐ The uniqueness value of the location
- ☐ City culture and urban experiences
- ☐ Sceneries

Questionnaire stats
Total number of respondents: 2143
Total number of visitors: 100167
Total number of map responses: 27827



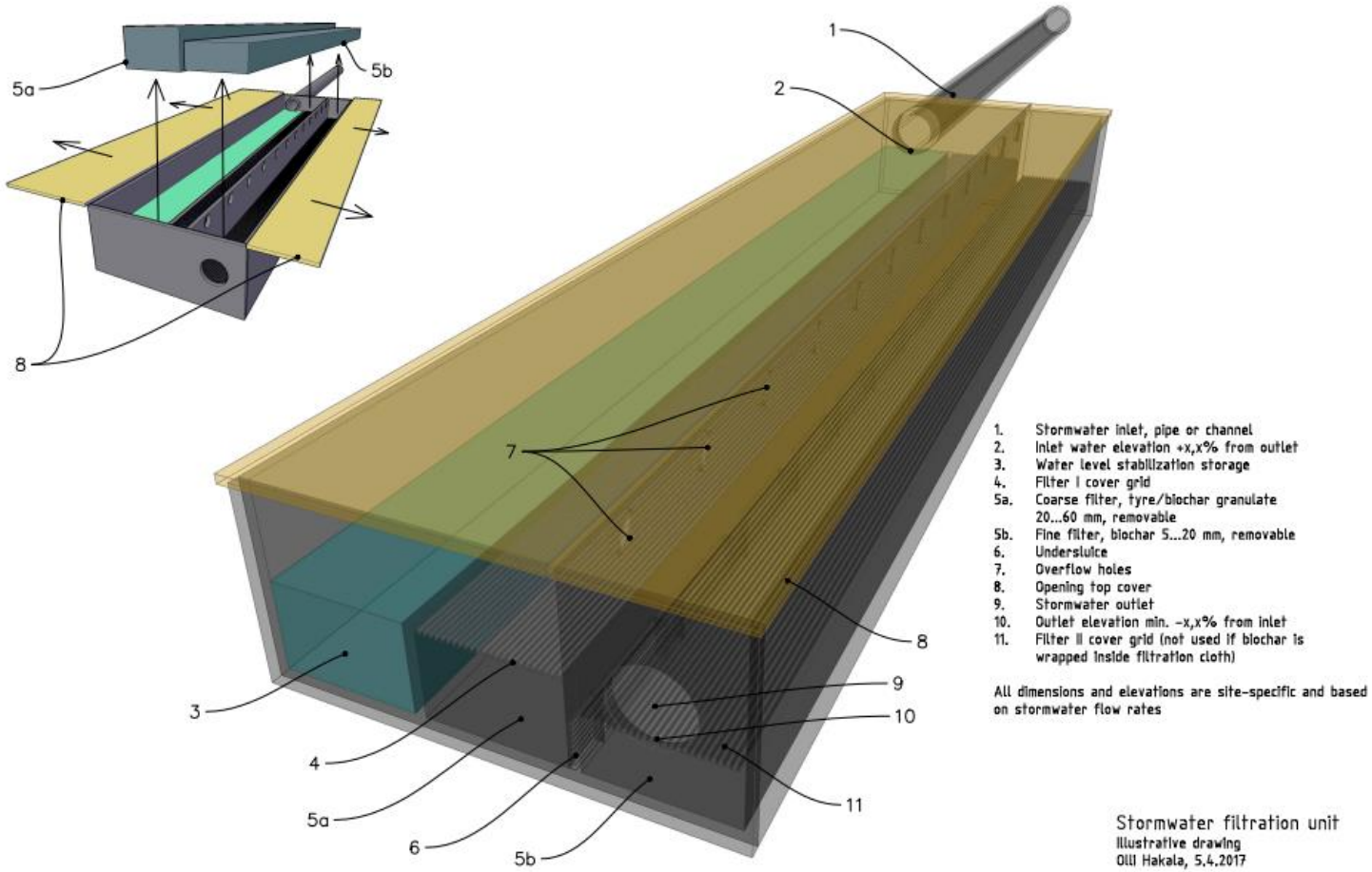
Kyttä ym. 2014. Veden äärellä kysely, ENTJUSTESS-hanke. Aalto yliopisto.

STORMWATER FILTRATION UNIT

Background

Current

Future



BACKGROUND

Concept

Policy Brief Microplastics

Master thesist

Microplastics – a growing environmental risk

New business opportunities in combatting microplastics

Road traffic – a significant source of microplastics

Road traffic generates highly significant quantities of microplastics, as well as small particles of rubber. Tyres are a mixture of synthetic and non-synthetic rubber compounds (over 80% of tyre mass) and various other chemicals. These particles, largely derived from vehicle tyres and the materials used for marking roads, are easily washed into water courses in runoff from roads. This problem should in future be considered in urban planning.

Mechelininkatu in Helsinki is one of the busiest streets in Finland. During the years 2010–2015 traffic levels averaged 21,000-35,500 vehicles per day. Calculations indicate that such traffic levels generate between 4 and 7 tonnes of car tyre wear annually on this street alone. Some of this material will soon be washed directly into a nearby sea bay through a storm drain system currently being constructed.

A CAR TYRE WEIGHING ABOUT 8 KILOS TYPICALLY LOSES AS MUCH AS 10–20% OF ITS WEIGHT DURING ITS LIFETIME

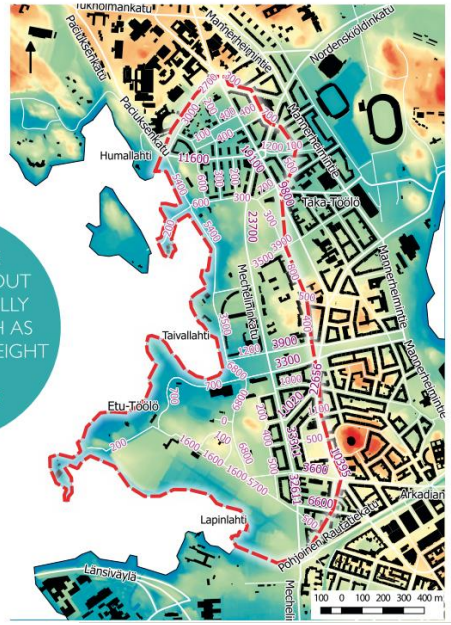
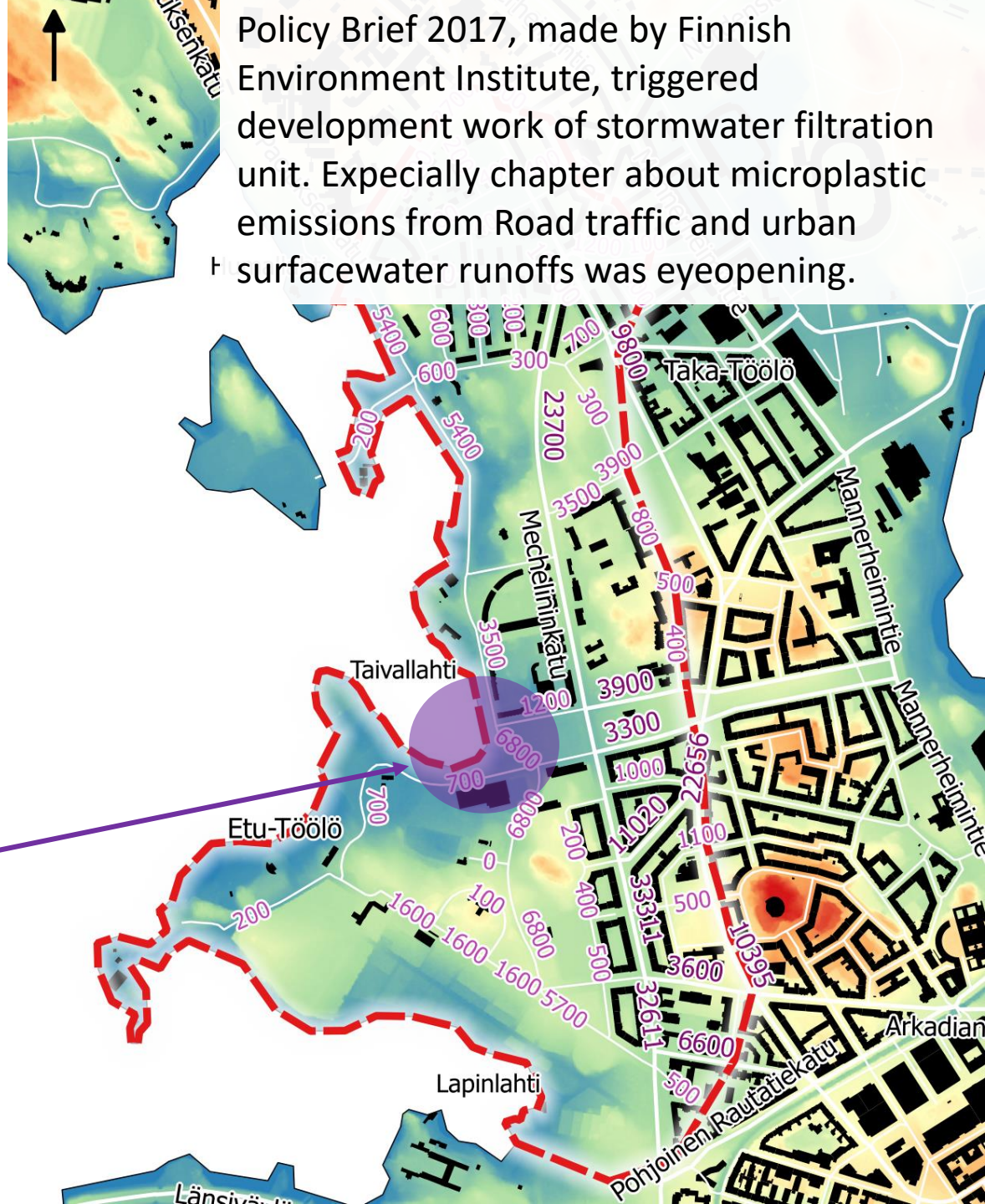
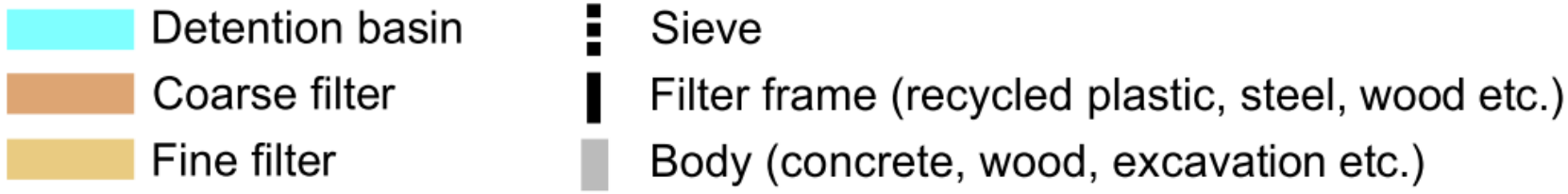


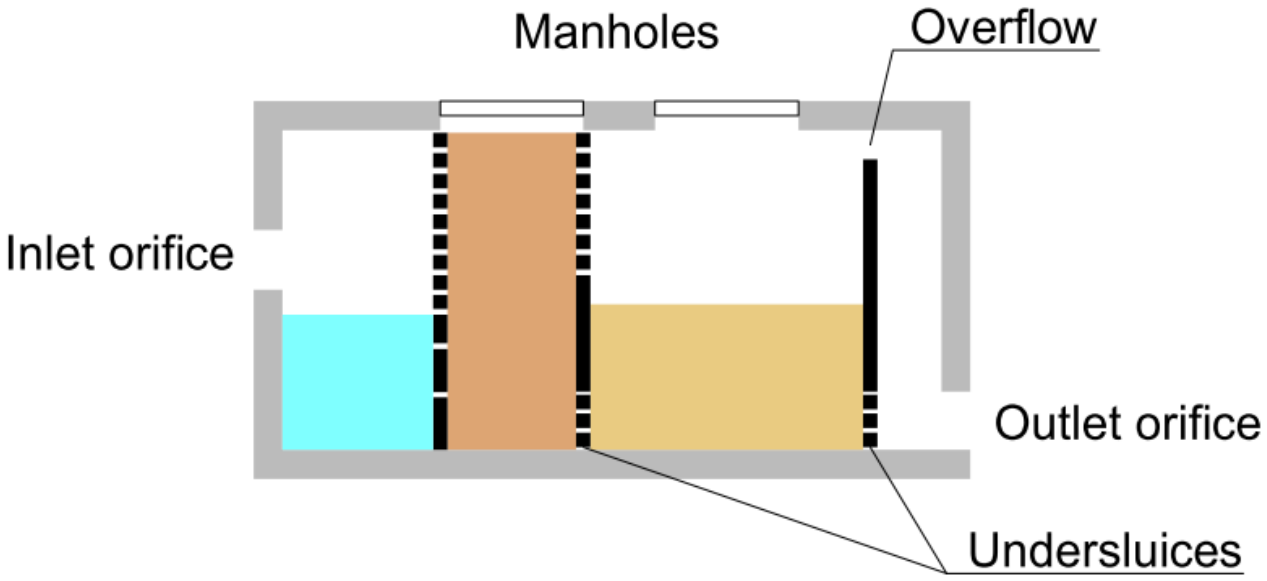
FIGURE 3. MECHELININKATU CAR TYRE WEAR ANALYSIS AREA AND AVERAGE ANNUAL DAILY TRAFFIC. SOURCE OF TRAFFIC DATA: CITY PLANNING DEPARTMENT, TRAFFIC PLANNING DIVISION 2017.

Policy Brief 2017, made by Finnish Environment Institute, triggered development work of stormwater filtration unit. Expecially chapter about microplastic emissions from Road traffic and urban surfacewater runoffs was eyeopening.



Concept

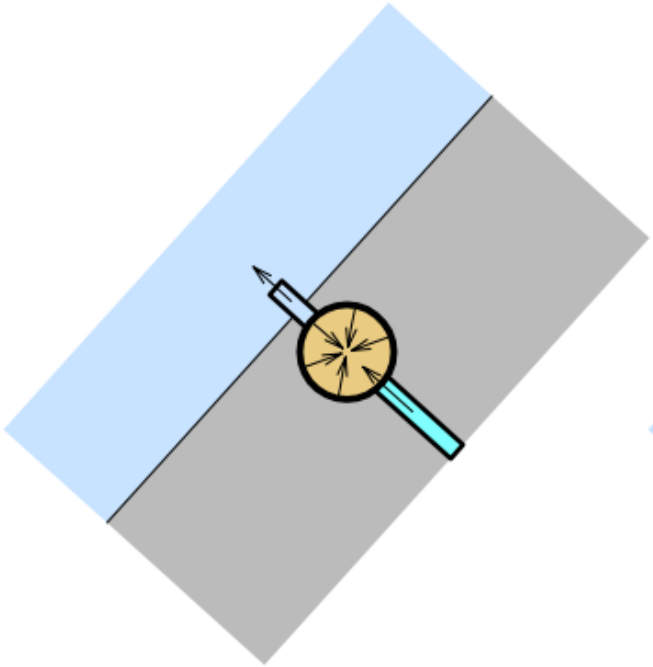




(Unpublished material from Olli Hakalas master thesis *Hulevesien suodatusarkun vesitekninen testaus ja konseptin soveltaminen Taivallahden ranta-alueiden yleissuunnitelmassa. Aalto university.*)

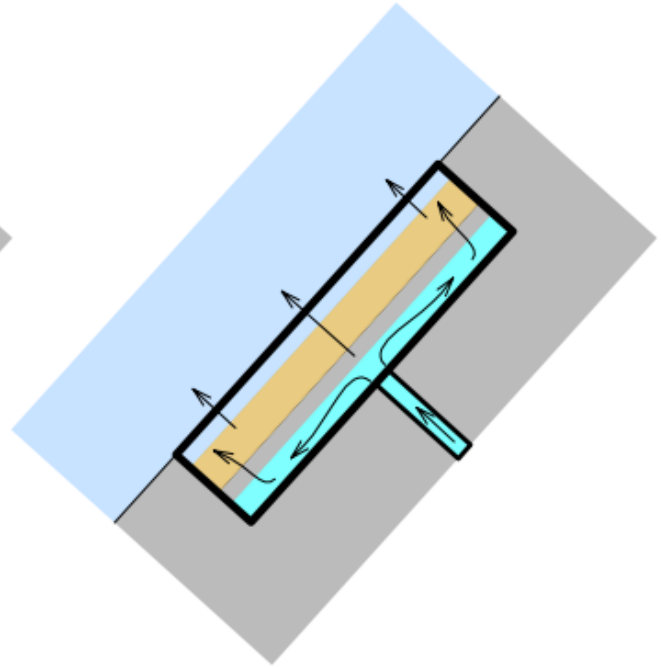
FLOW Large scale

FILTER WITHOUT FLOW DISTRIBUTION



LOADING IN ONE SPOT

FILTER UNIT WITH DISTRIBUTED FLOW



ANTI-CLOGGING DESING CONCEPT

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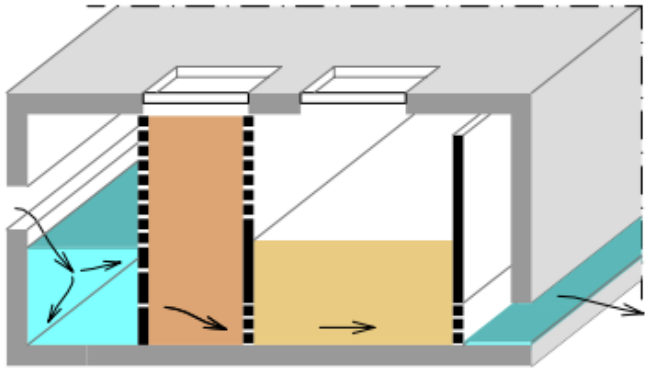
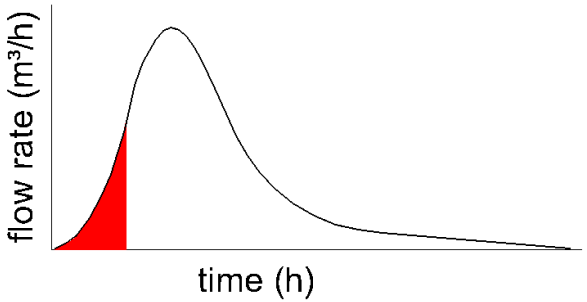
FLOW Small scale

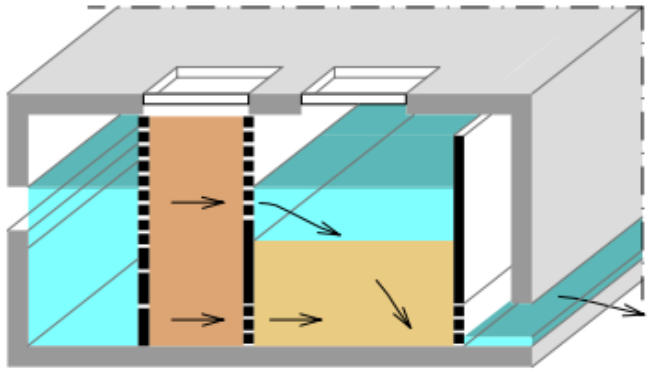
FIRST FLUSH



MAXIMUM RETENTION AND CONTACT TIME

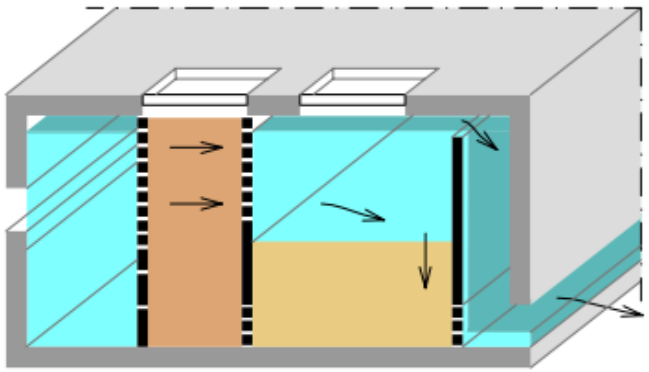


BASIC FLOW



MAXIMUM FLOW DIRECTIONS, MINIMUM CLOGGING

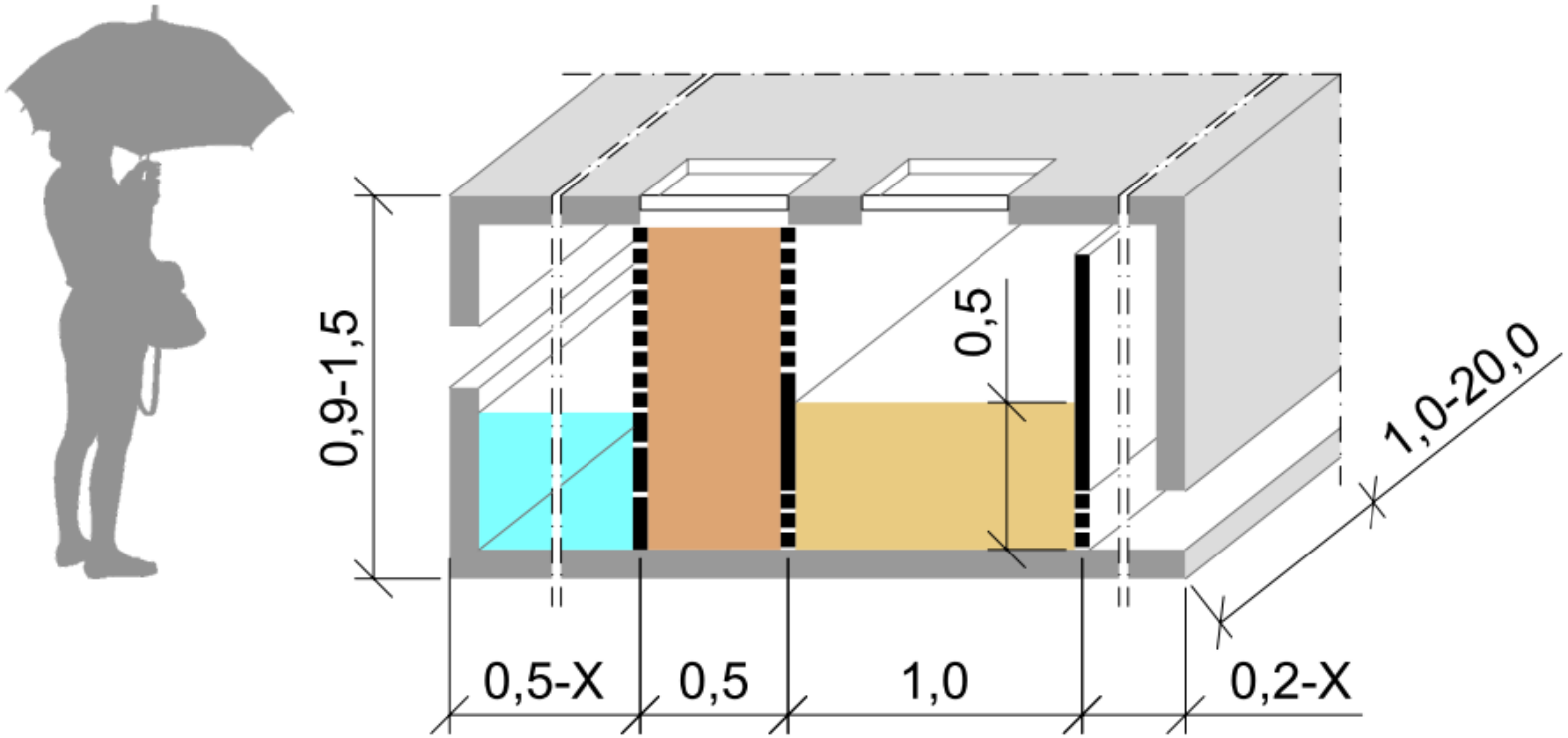
PEAK FLOW



MAXIMUM FLOW RATE

(Unpublished material from Olli Hakalas master thesis *Hulevesien suodatusarkun vesitekninen testaus ja konseptin soveltaminen Taivallahden ranta-alueiden yleissuunnitelmassa. Aalto university.*)

DIMENSIONS



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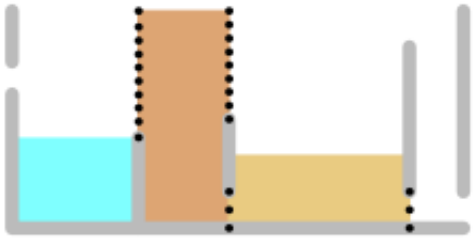
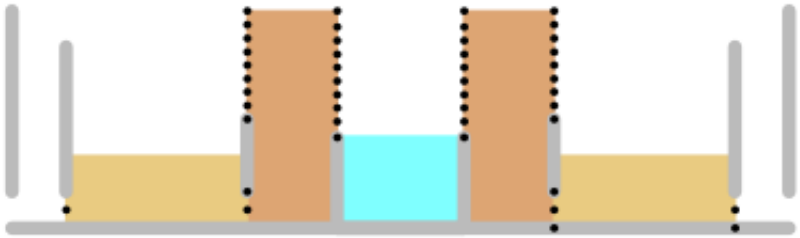
SECTION , Scalability and formability

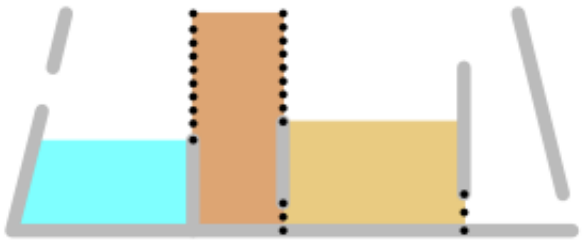
"BASIC"



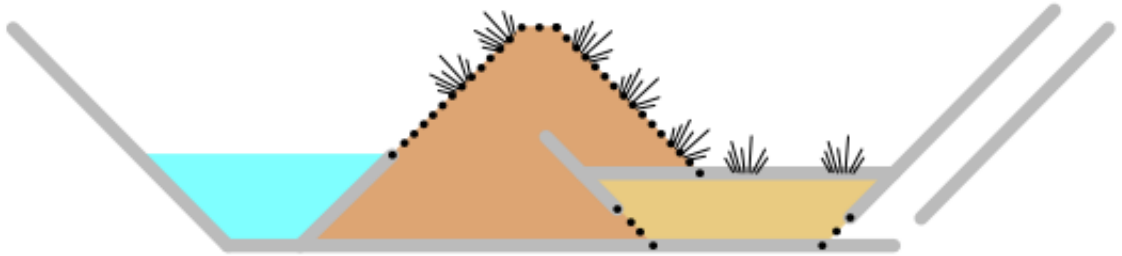
"MIRROR"



"TRAPEZOID"



"EARTHWORKS"



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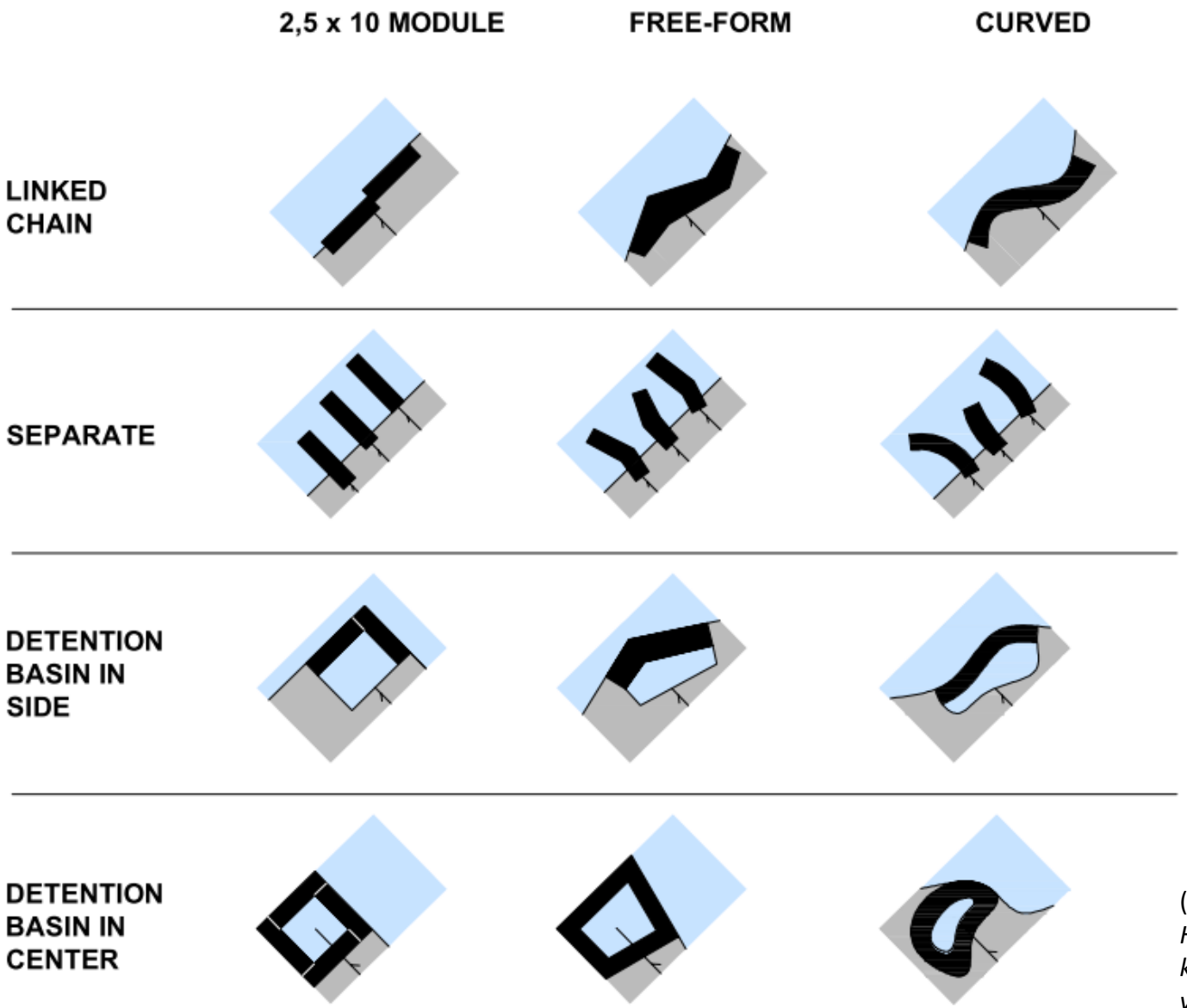
TYPOLOGIES



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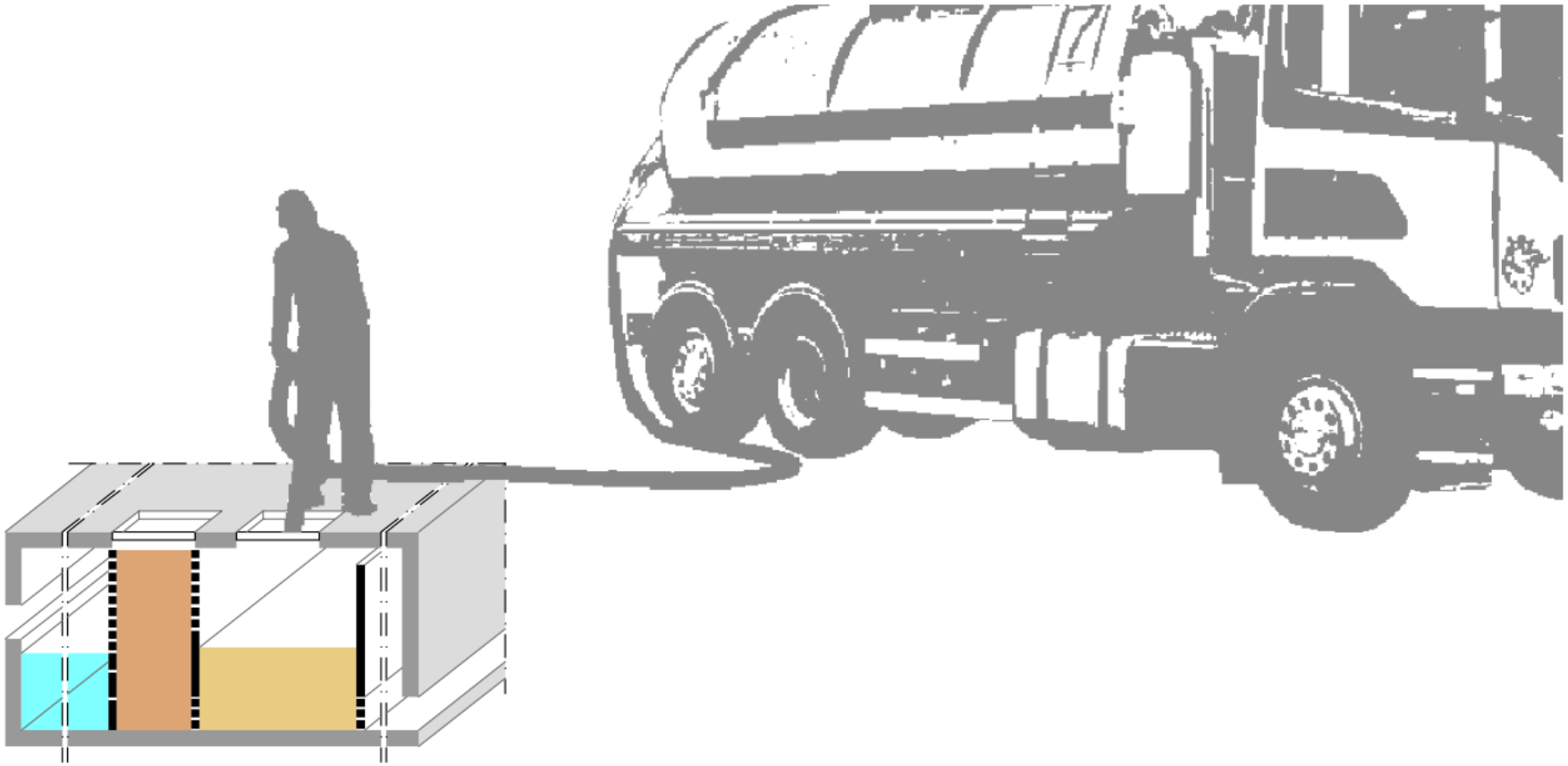
FILTER REPLACE



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Example applications

FU can be integrated with green infrastructure…

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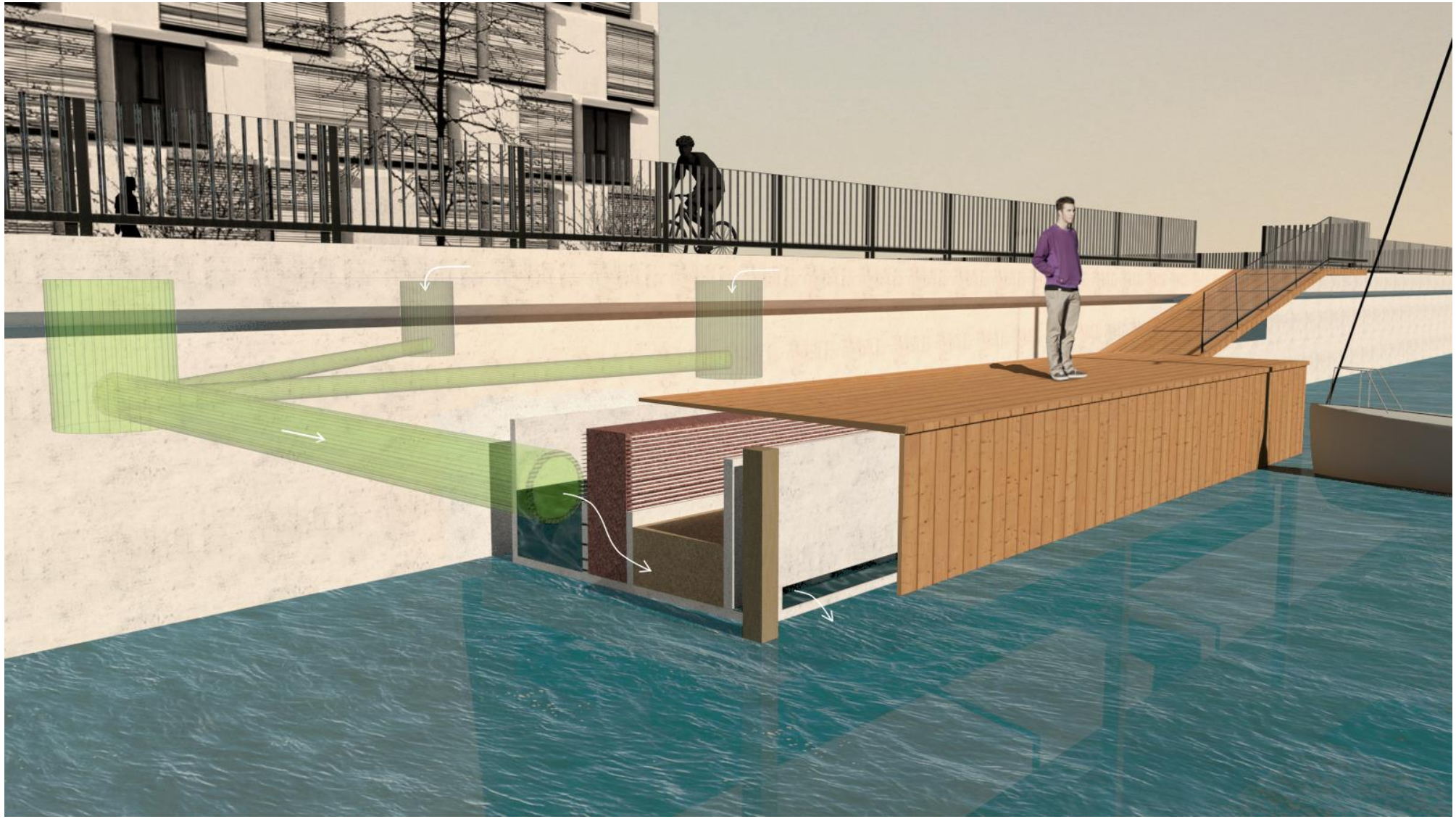
…and with grey infrastructure



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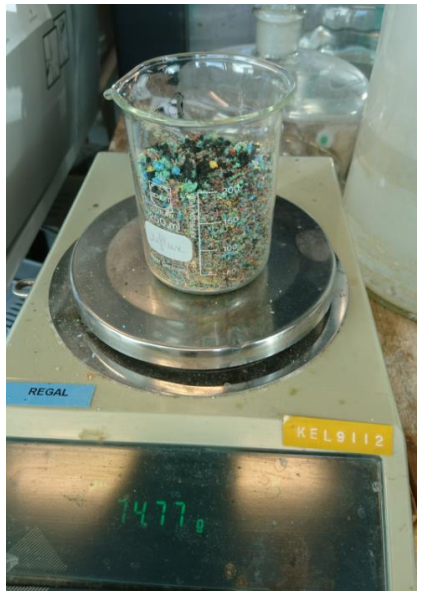
SSA hydraulic model

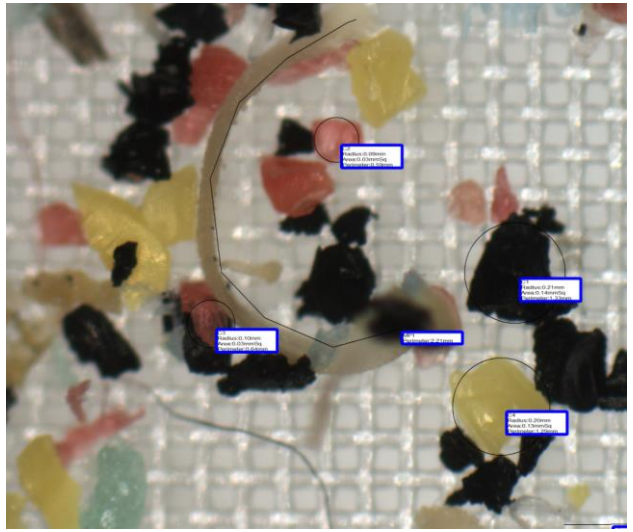
Prototype of the SFU

Picture from hydraulic tests made in laboratory

Microplastic

pollutant removal test in laboratory



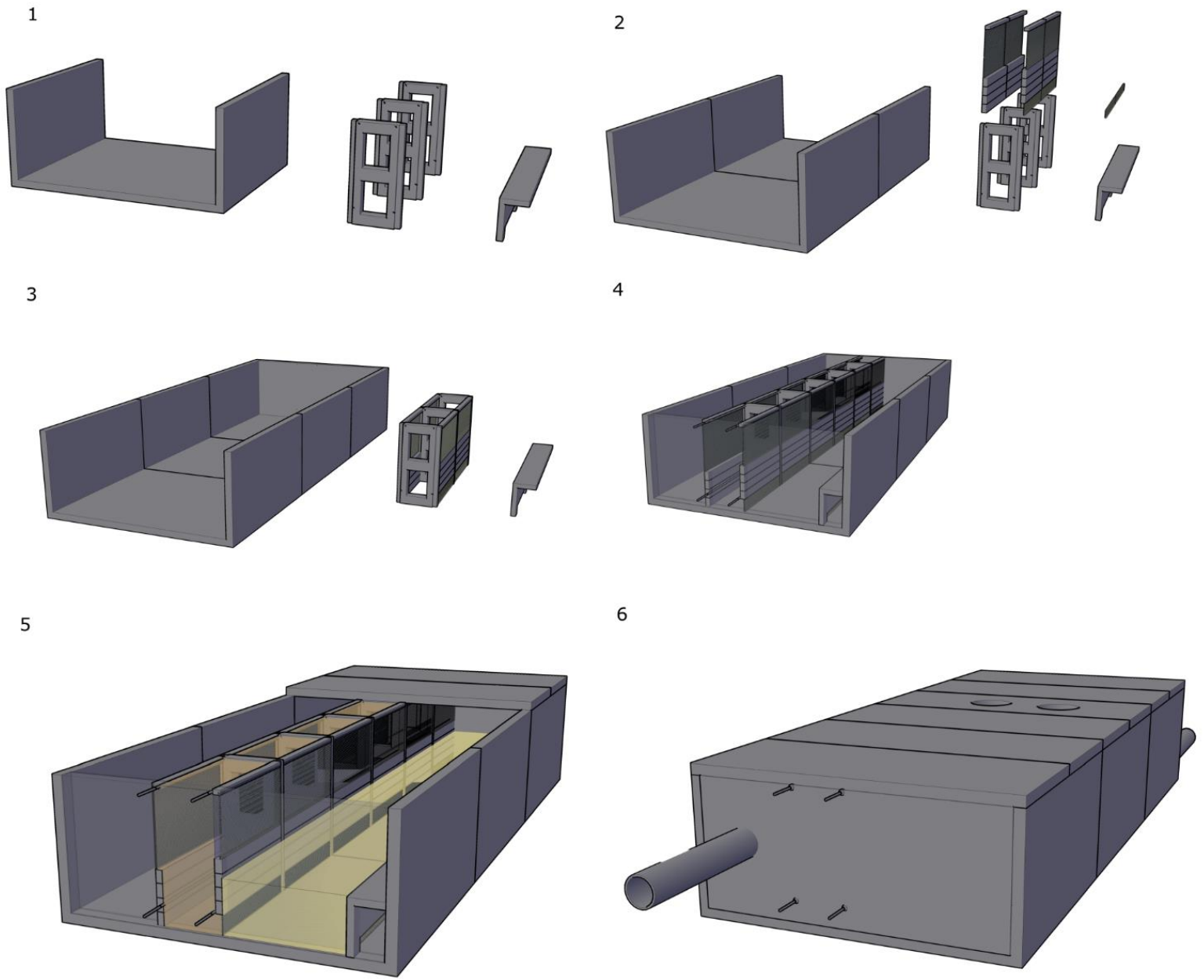


CURRENT STATE

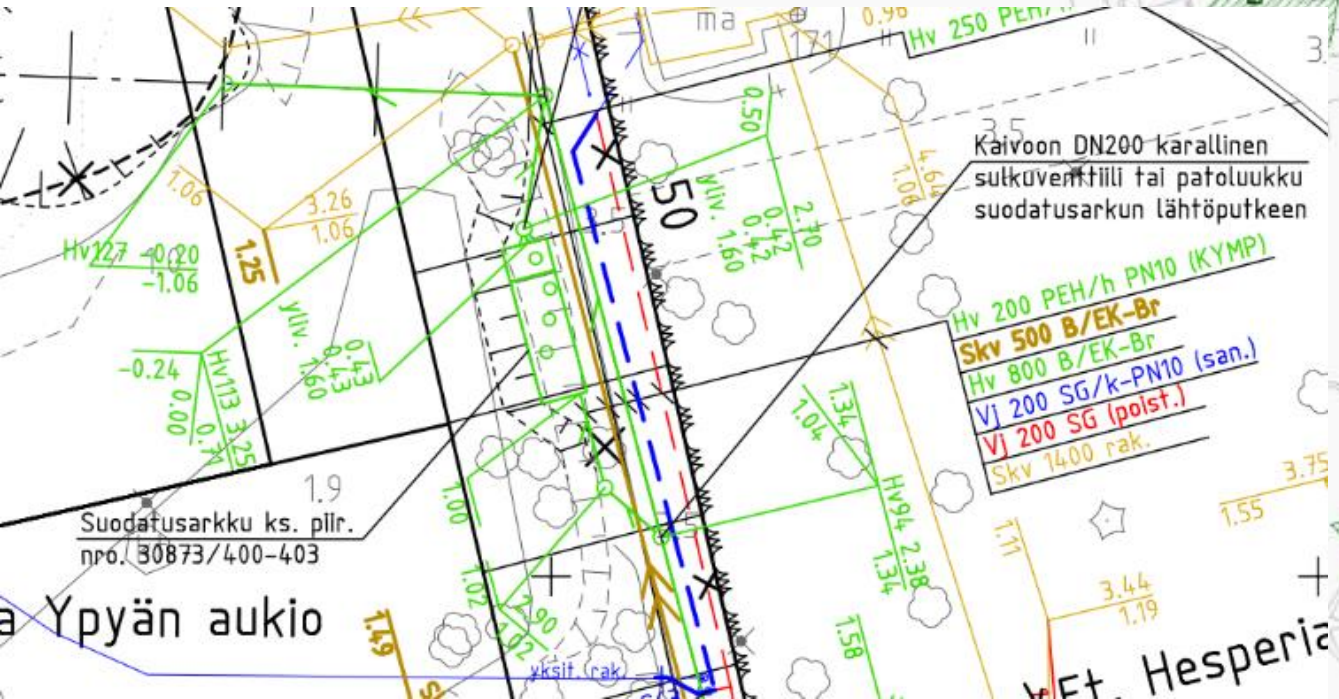
Ongoing iWater- and

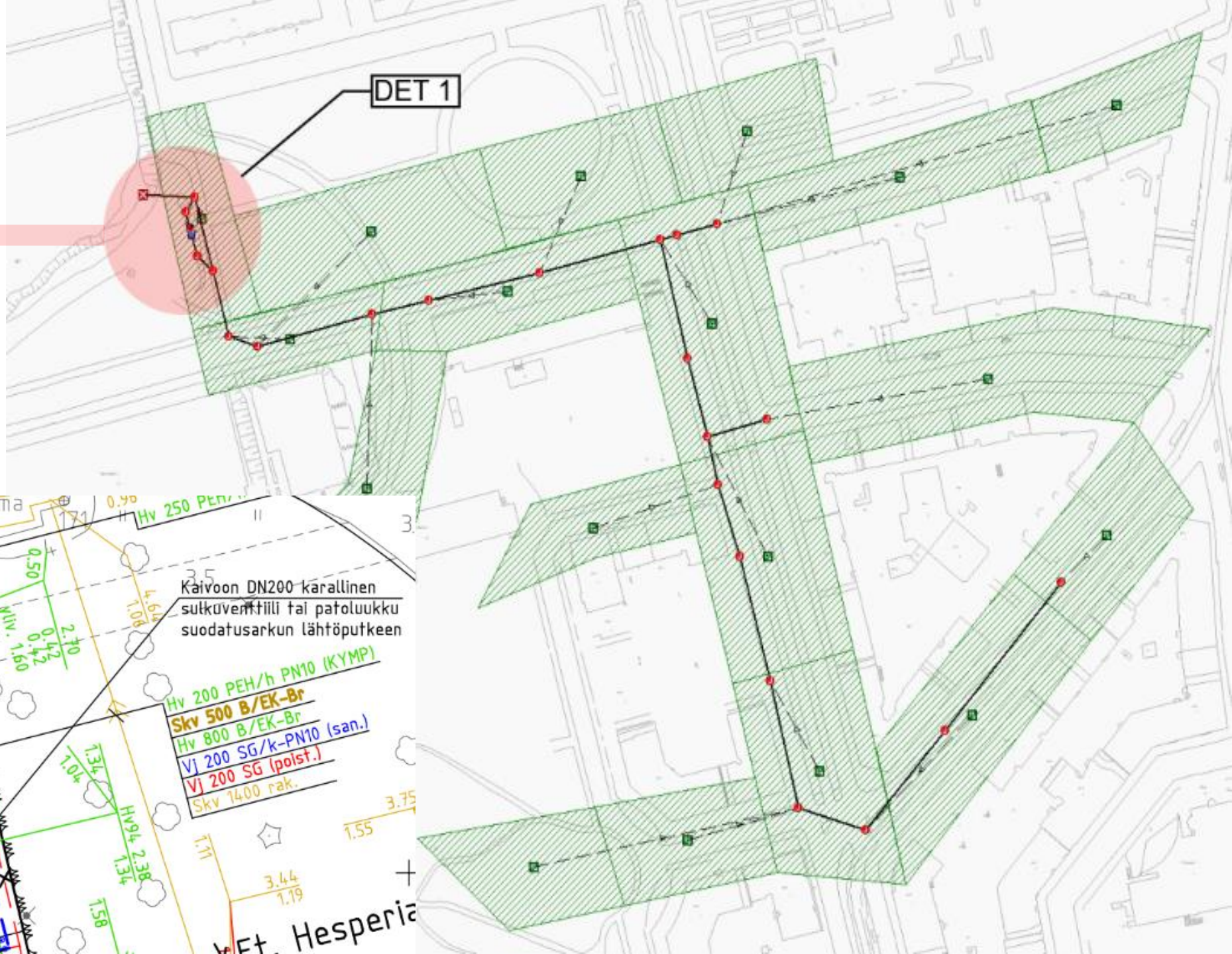
Smart&Clean -projects

Pilot unit will be built from **concrete elements** and filter media frames are made of **recycled plastic lumber**

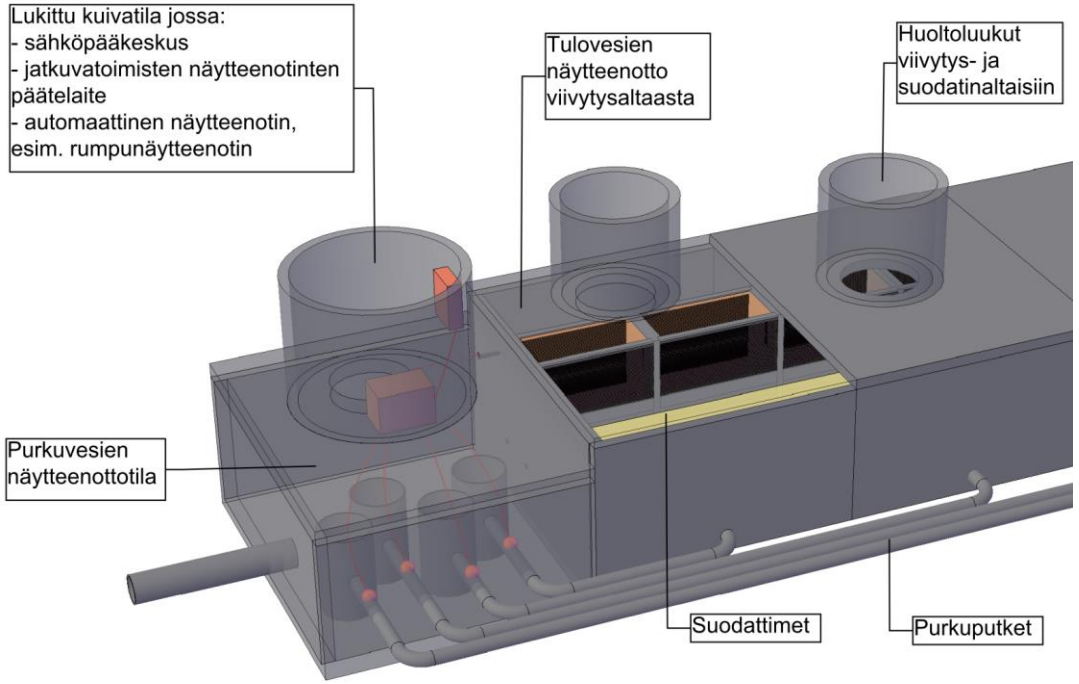


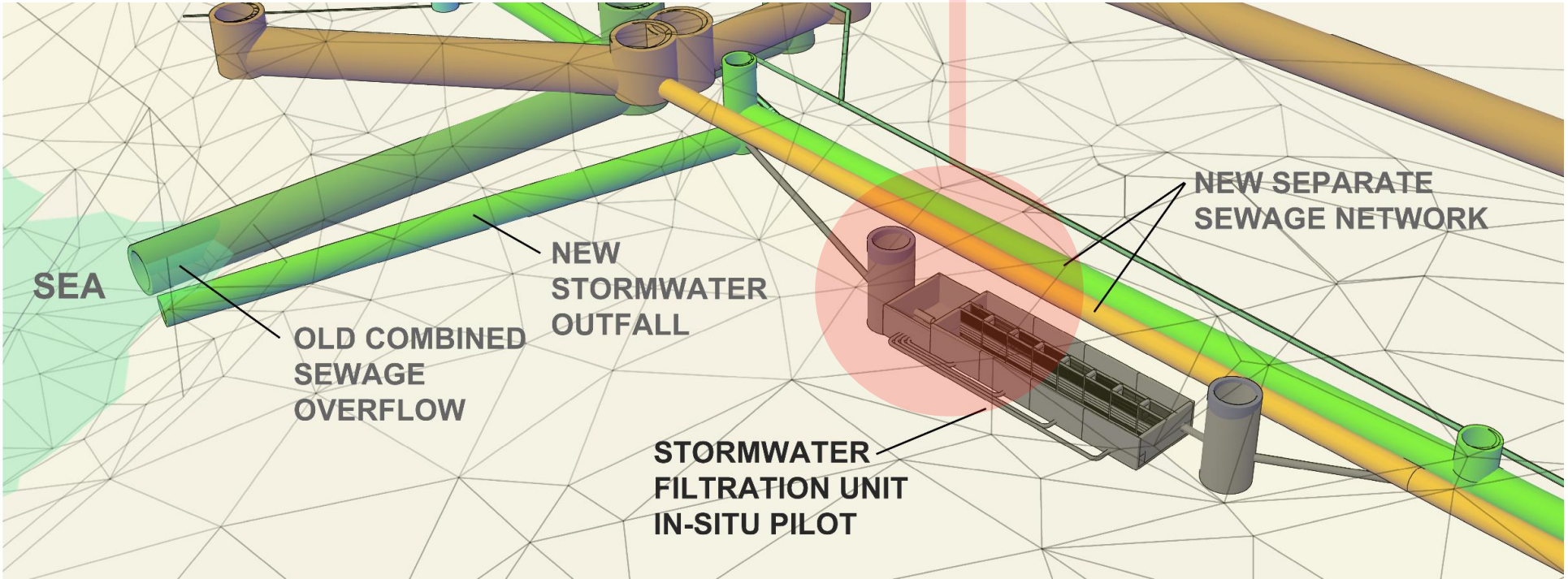
Pilot catchment area is about 6 ha. Urban fabric is dence and area is heavily trafficked





1-4 different filter materials can be tested simultaneously. Real-time measurement instruments monitor **basic quality+quatity data** before and after filtration. In addition, laboratory water samples will be taken





FILTERMEDIA

Recommendations from Finnish Research Center VTT

IN-SITU test will be comparative. 1-4 filtermedia mixes will be measured.

StormFilter Material Testing Summary Report

Localized performance of bio- and mineral-based filtration material components

Authors: Laura Wendling, Kalle Loimula, Hannele Kuosa, Juhani Korkealaakso, Hanna Iitti and Erika Holt

Confidentiality: Public

FUTURE

Taivallahti waterfront master plan

Design consider Ørestad as a reference and WSUD as a design approach

Ørestad, example of a stormwater detention basin.
Suorce: Wikipedia

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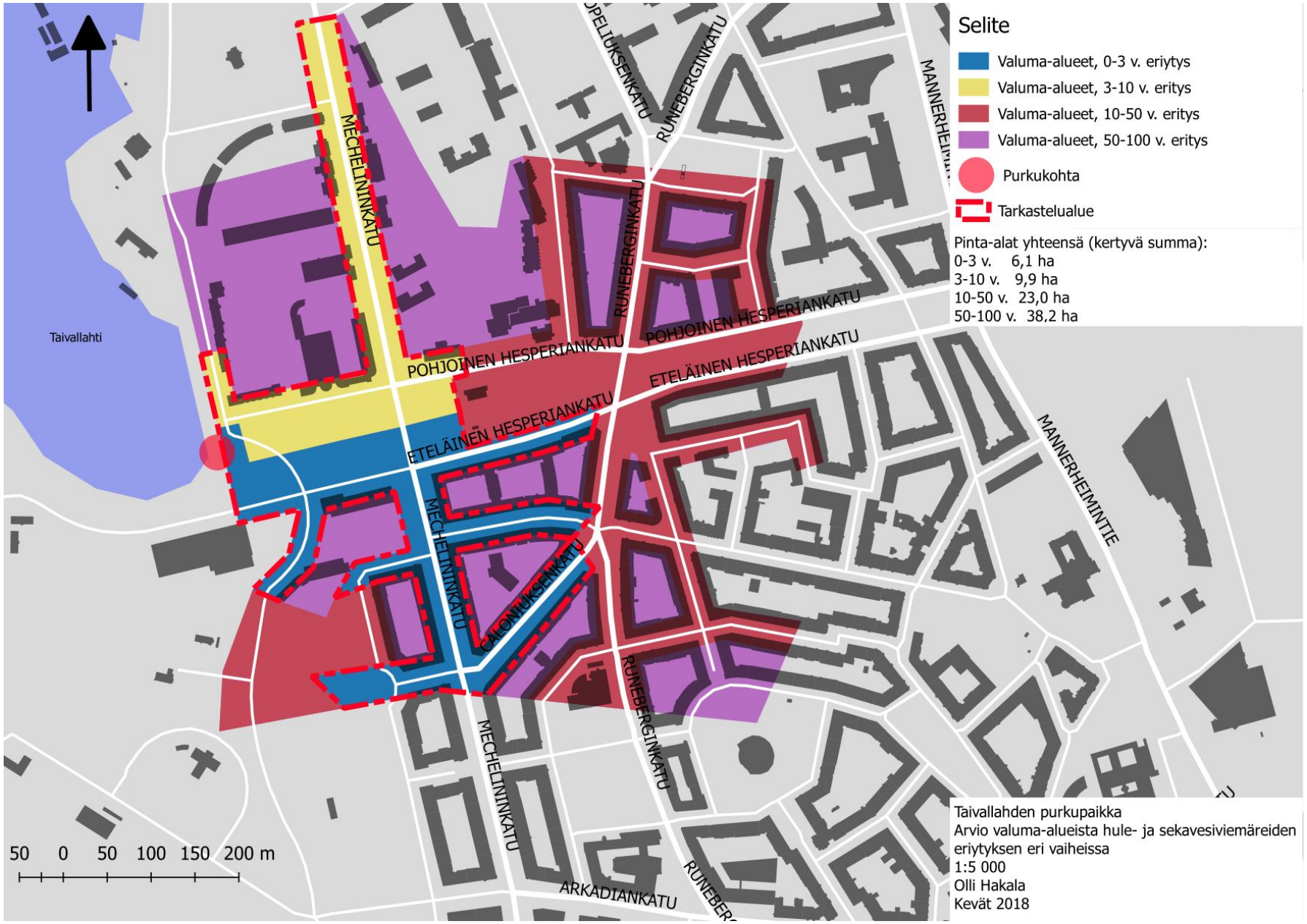
Catchment area in Master plan is 10 ha.



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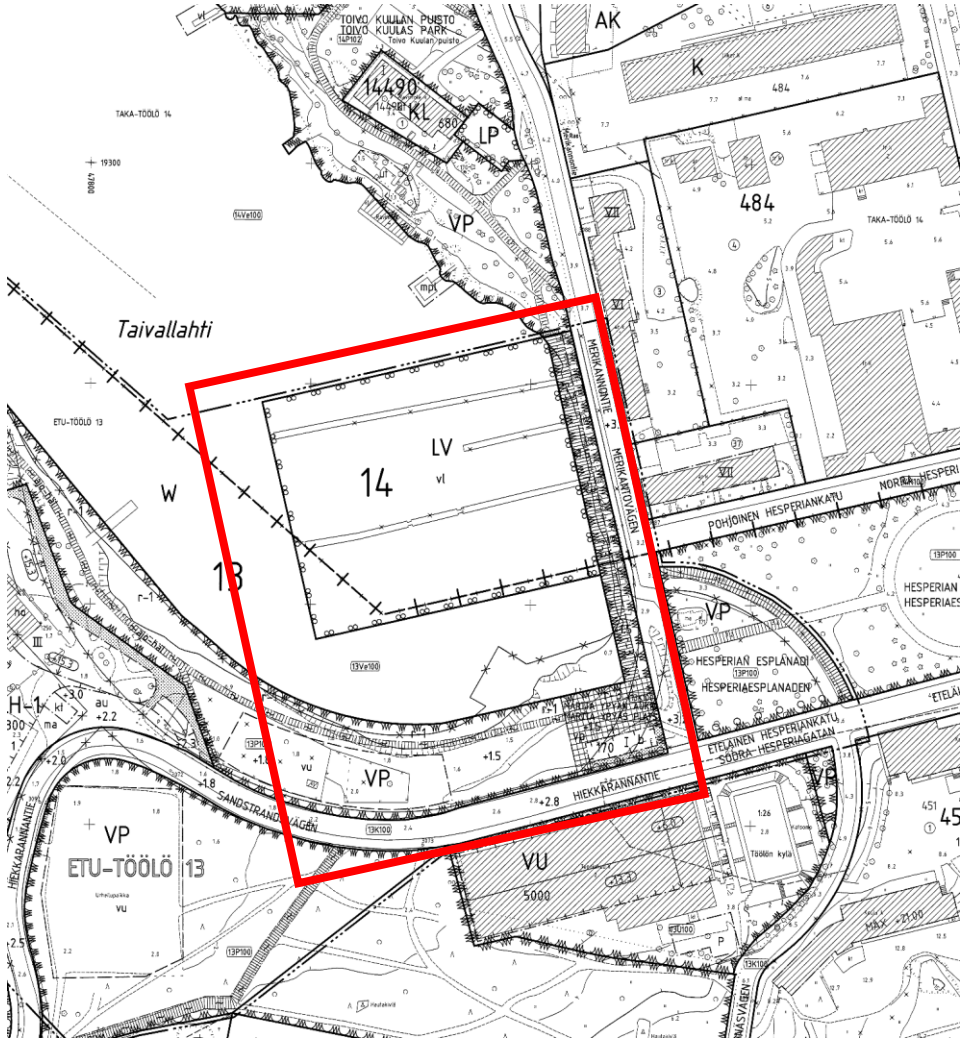
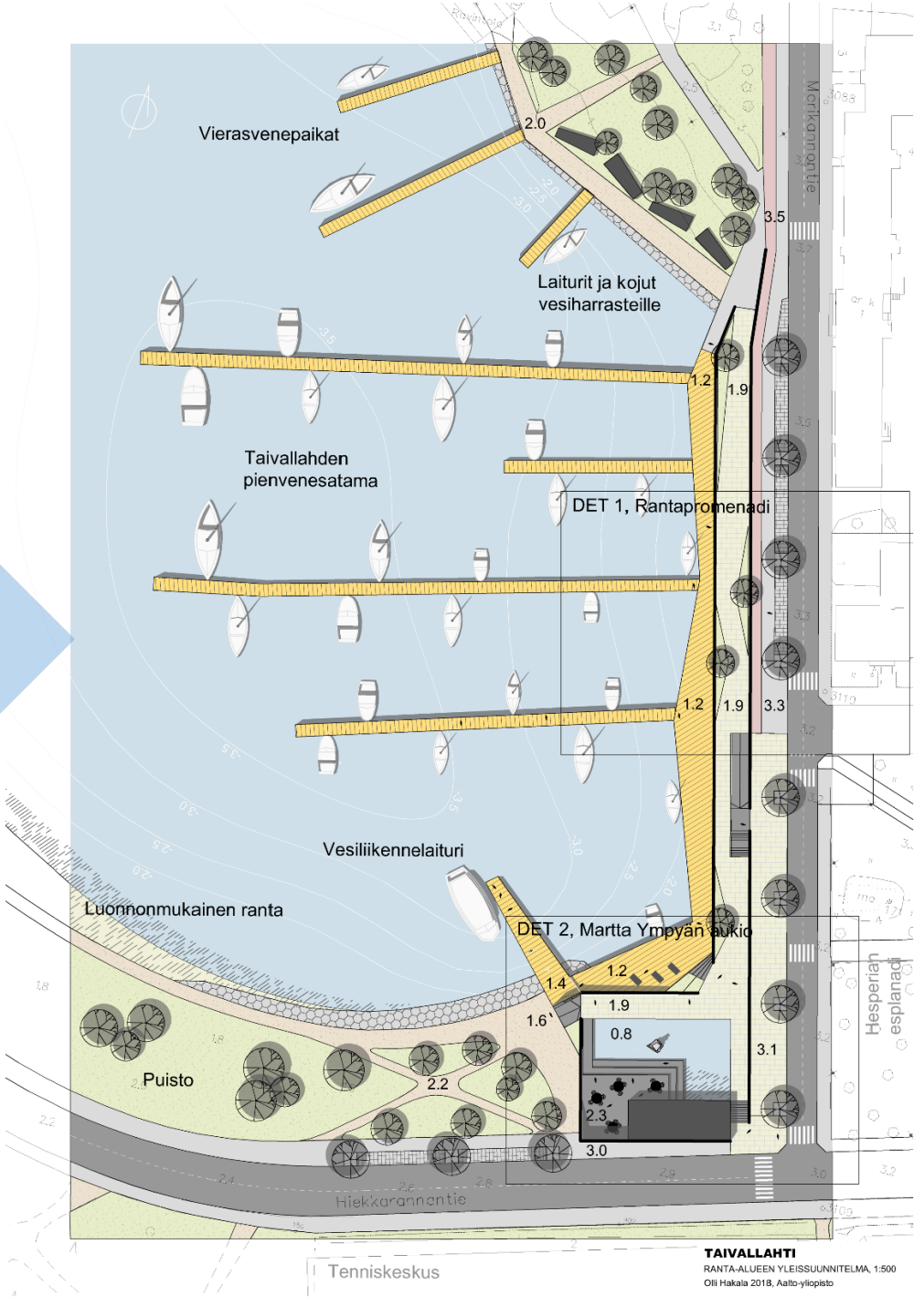
New zonin map and design perimeter:



INTEGRATION



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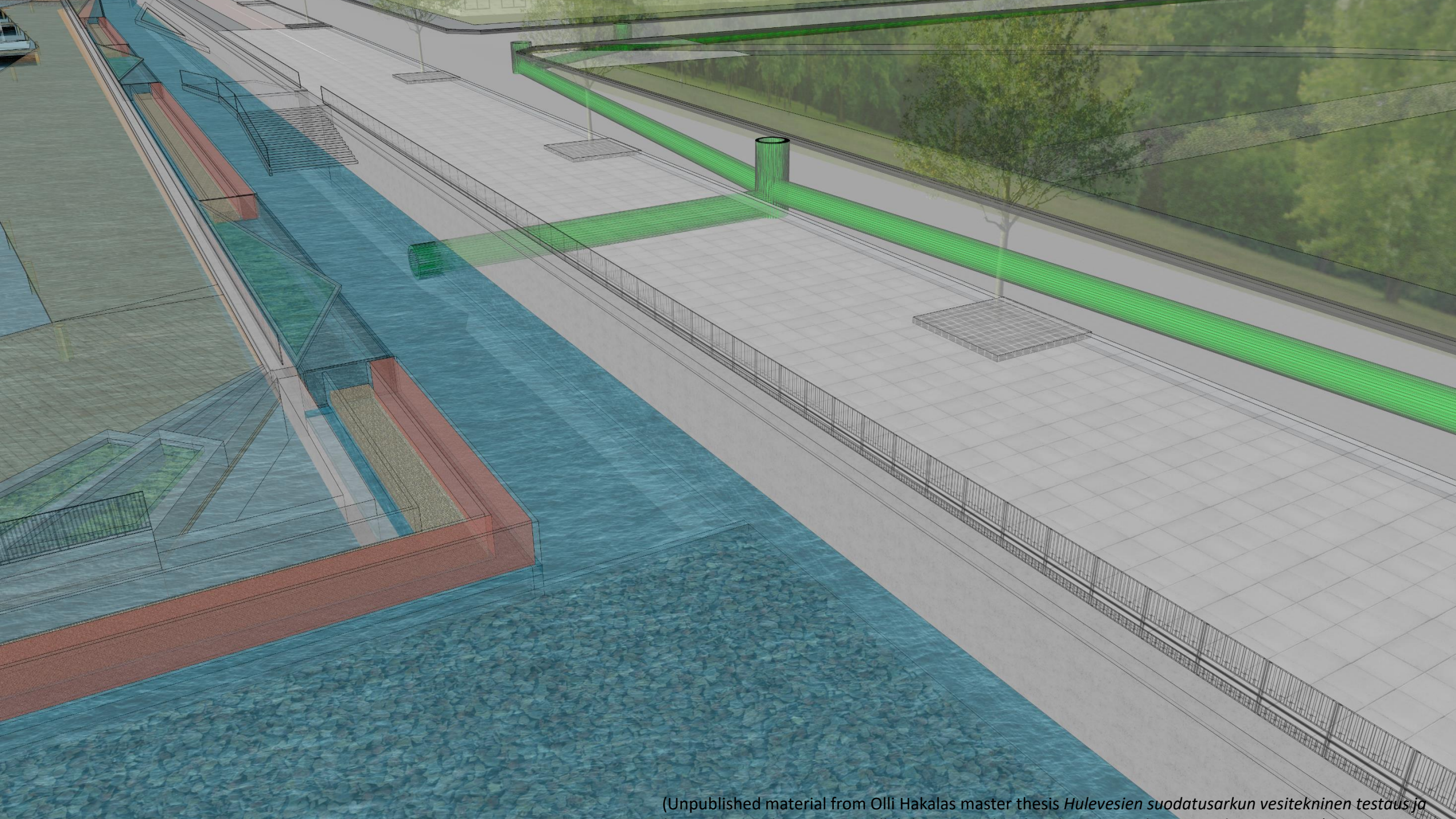
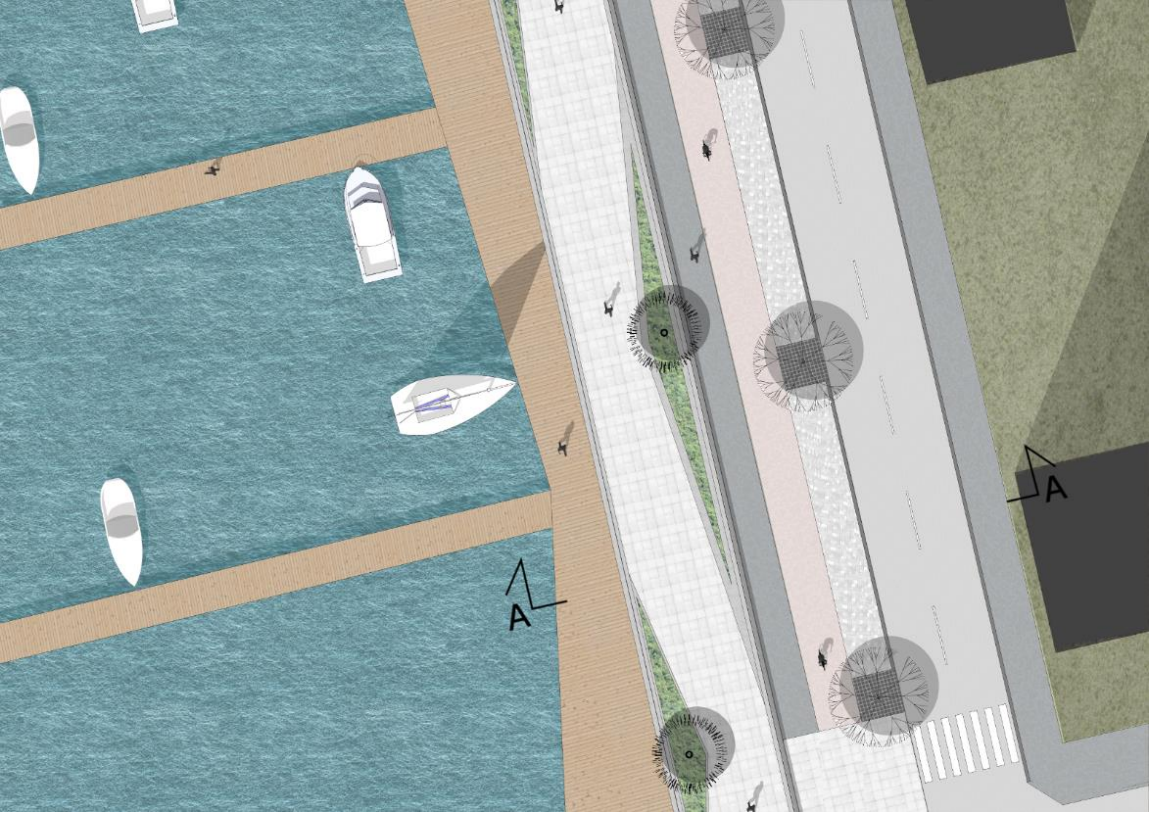
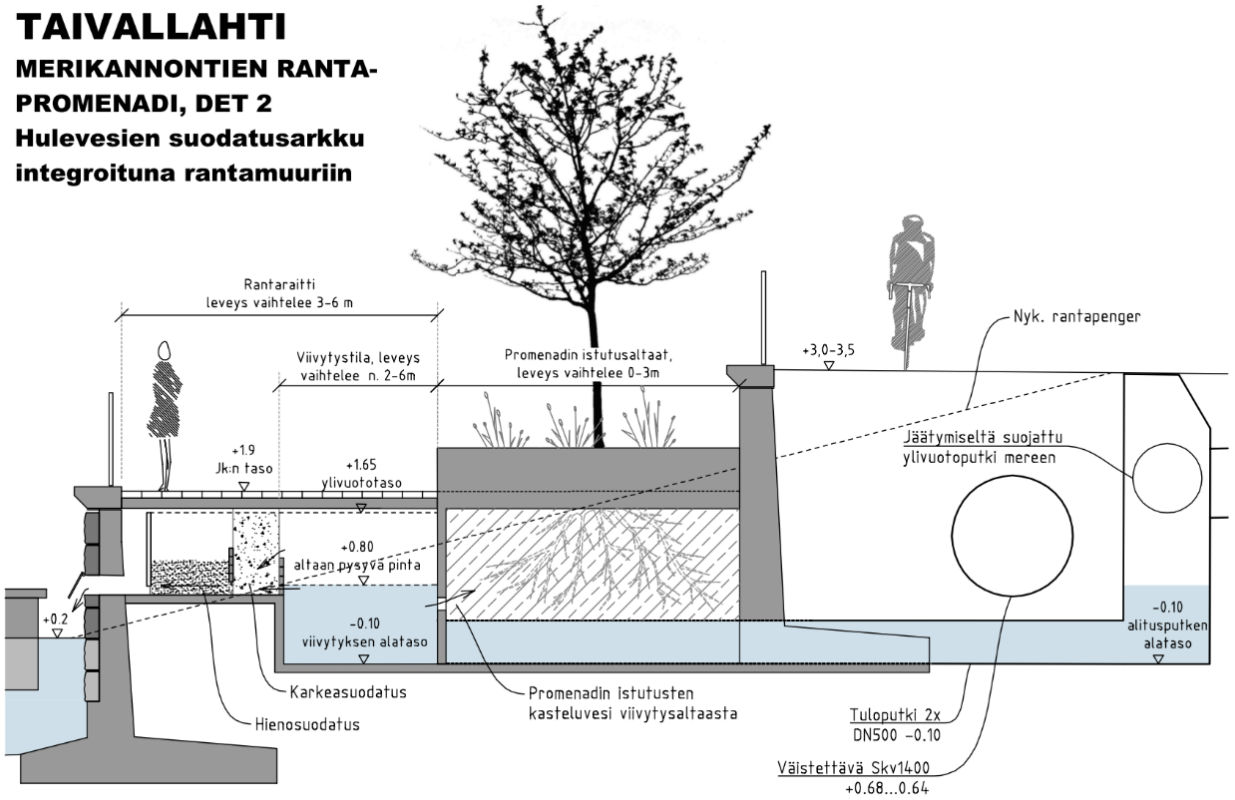
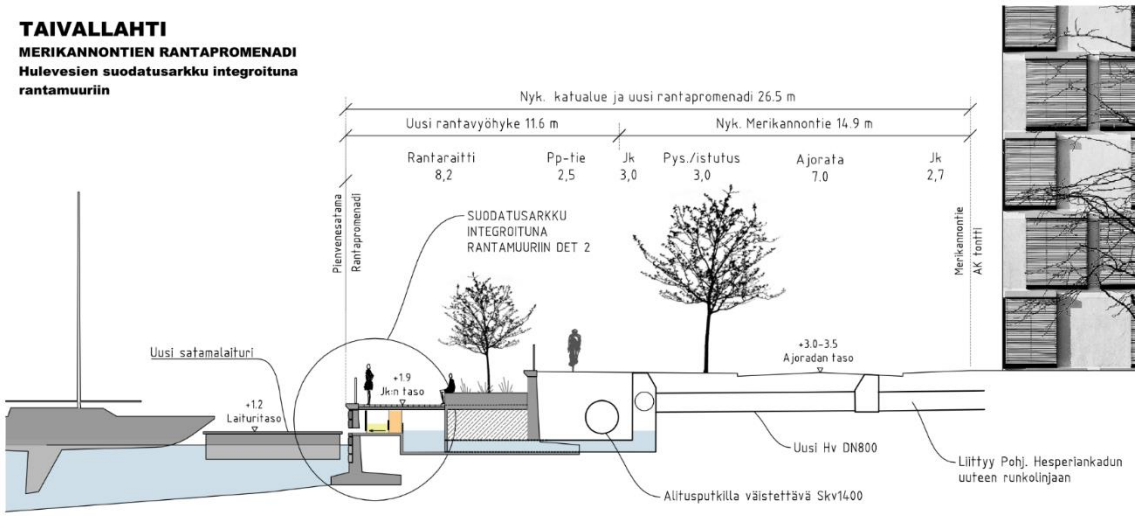


(Unpublished material from Olli Hakalas master thesis *Hulevesien suodatusarkun vesitekninen testaus ja*







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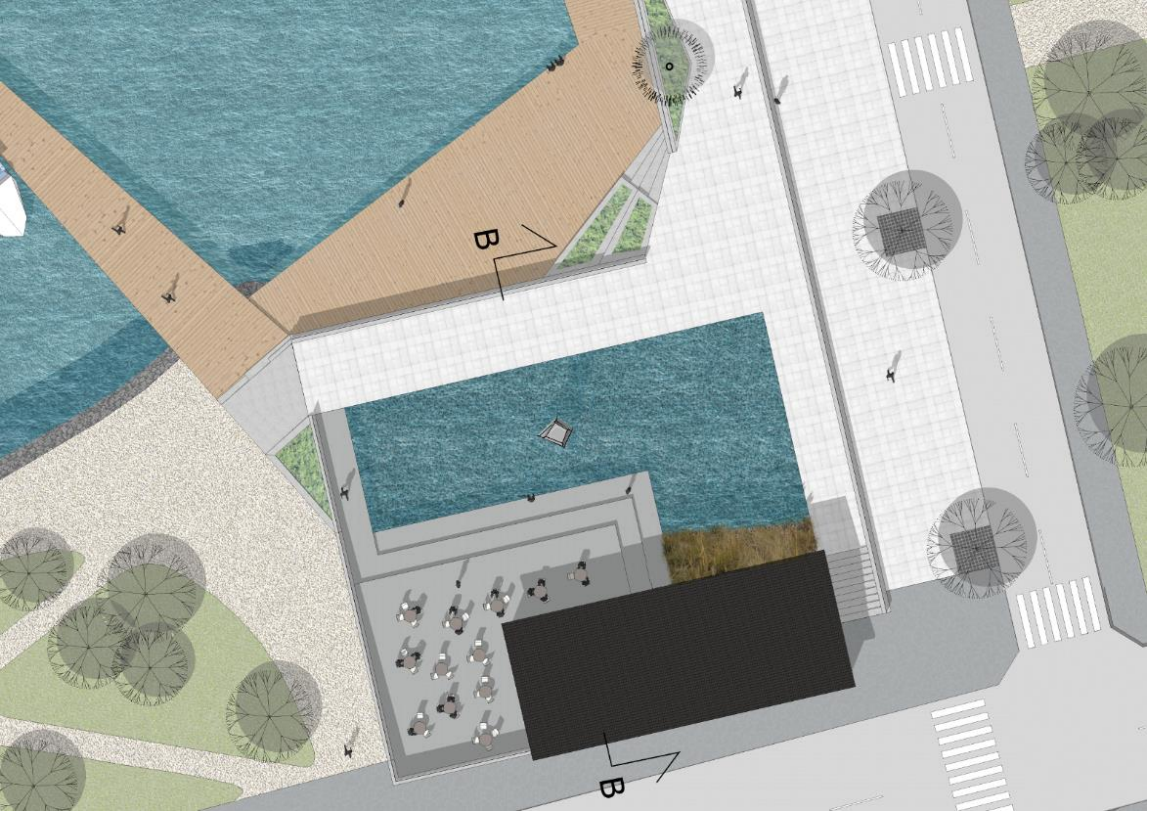
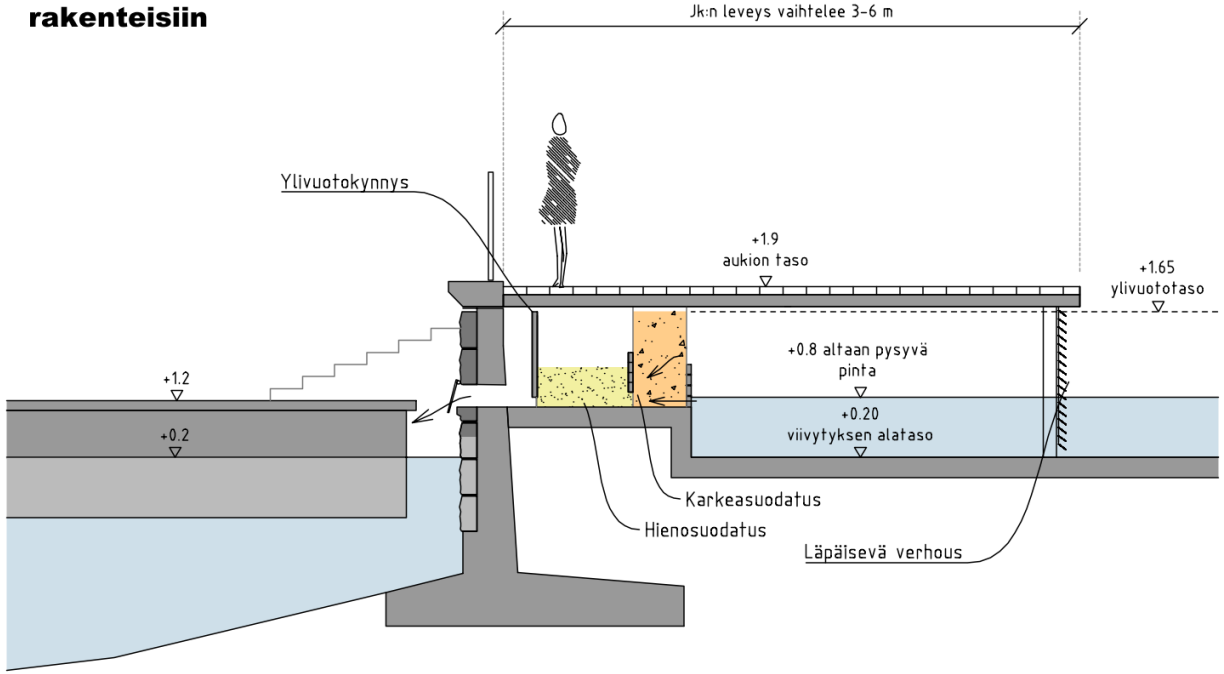


TAIVALLAHTI

MARTTA YMPYÄN AUKIO , DET 1

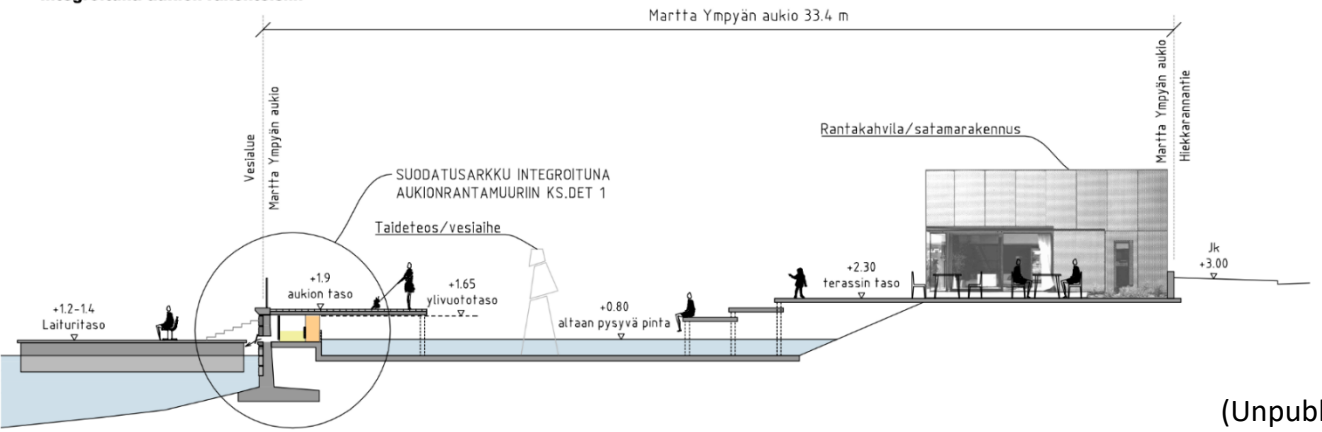
Hulevesien suodatusarkku ja viivytysallas integroituna aukion rakenteisiin



TAIVALLAHTI

MARTTA YMPYÄN AUKIO

Hulevesien suodatusarkku ja viivytysallas integroituna aukion rakenteisiin



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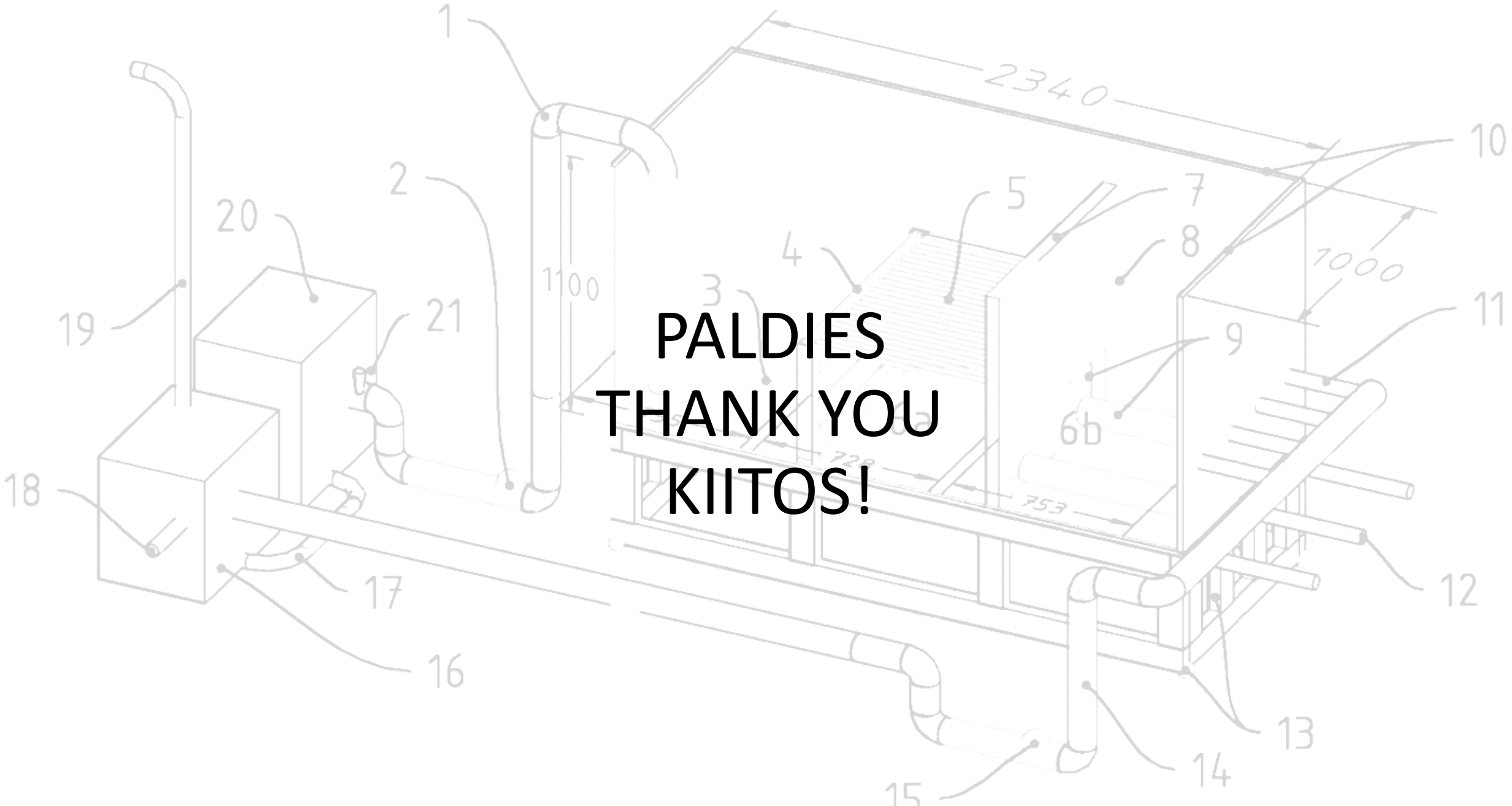

PALDIES
THANK YOU
KIITOS!