

# INTEGRATED FILTER SYSTEM FOR HIGHWAY STORMWATER POLLUTION

European Green Capital Oslo 2019  
European and Norwegian Water Association  
Bærekraftige urbane hydrologiske systemer  
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## Treatment of highway stormwater pollution in Norway

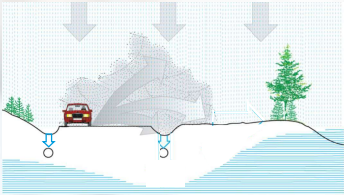
| ADT      | Vulnerability | Treatment |
|----------|---------------|-----------|
| > 3 000  | Medium/high   | 1-step    |
| > 15 000 | High          | 2-step    |
| > 30 000 | All           | 2-step    |



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## Treatment of highway stormwater pollution in Norway



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## Multifunctional side area

- > Drainage
- > Flood protection
- > Traffic safety
- > Snow deposit
- > Potential to treat polluted road runoff



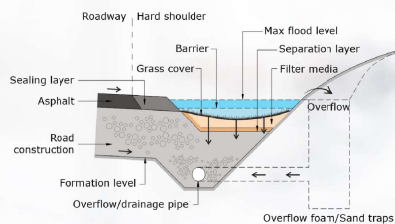
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## Intergrated biofilter system

### DESIGN CRITERIA:

- > Infiltration and removing pollutants
- > Clogging
- > Water retention
- > Flood control
- > Maintenance



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## Clogging and treatment effectiveness in an old highway trench

### OBSERVATIONS:

- 4-7 cm thick layer of asphalt wear and dust
- Infiltration rate in the surface; 20 cm/h, 30 - 45% of underlying original masses



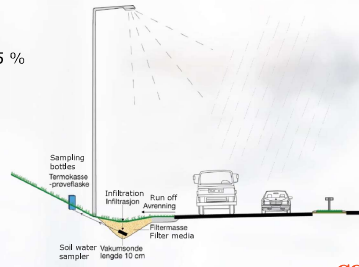
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## Clogging and treatment effectiveness in an old highway trench

### OBSERVATIONS:

- Treatment effectiveness (soil water sampling); 60 – 95% heavy metals, 95 % organic micropollutant



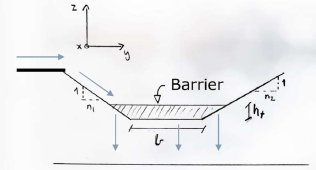
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## Retention trench

- > Aims to retain a design storm achieved by small barriers spaced along the ditch
- > The height of the barriers are a function of:
  1. Infiltration capacity of trench
  2. Volume of incoming storm water
  3. Lateral and longitudinal gradient of trench, as well as bottom width

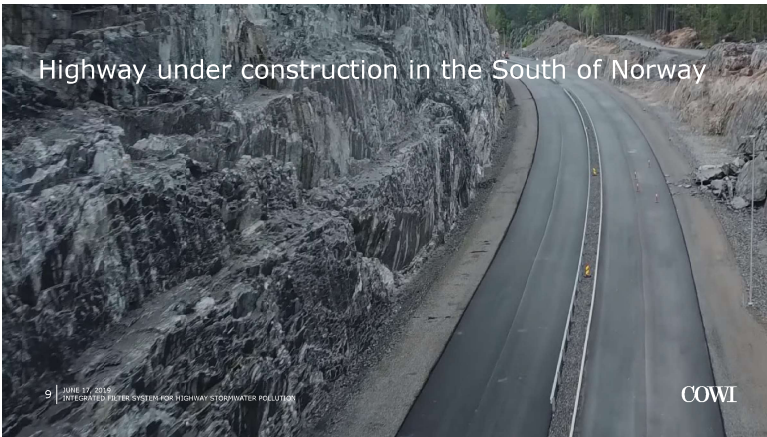
$$V_t = \frac{h_t^2 * b}{l_b * 2} + \frac{h_t^3 * (n_1 + n_2)}{l_b * 6} \text{ [m}^3\text{]}$$



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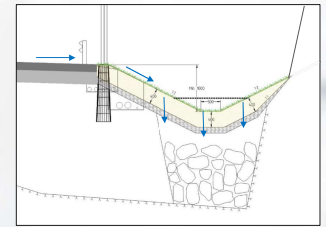
## Highway under construction in the South of Norway



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## Highway under construction in the South of Norway



(Ref.: Betonmast Hæhre/COWI)

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## Biofilter system in a new street project



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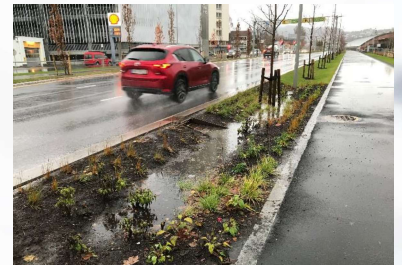
Ill.: Norwegian Public Road Administration

## Biofilter system in a new street project

### WHAT DID THE PROJECT ACCOMPLISH ?

- > Treatment of the polluted street runoff
- > High flood safety
- > No discharge to the public combined sewer network
- > Simpler stormwater solution, easier and cheaper to operate
- > 10-20 million NOK lower construction cost

(Ref.: Kirstine Laukli, kirstine.laukli@vegvesen.no  
The Norwegian Public Road Administration)



(Photo: Kirstine Laukli)

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## New street standard in Oslo

### KEY GOALS FOR STORMWATER MANAGEMENT:

- > Local and open stormwater management.
- > Reduce the stormwater discharge to the sewer network.
- > Treat the street runoff to achieve better water quality in the Oslo watercourses.
- > The streets must function as safe flood pathways in the city.

The use of green structure combined with biofilter facilities is highly emphasized in the new street standard.

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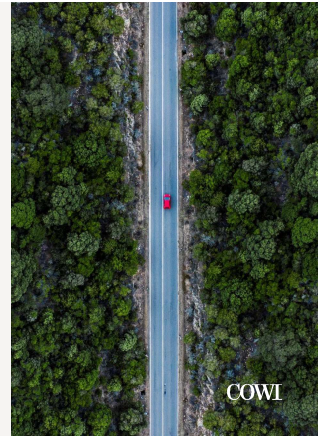
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## Further development of the biofilter system in Norway

- > Define the range of natural soil types suitable for filter mass to achieve the environmental requirements.
- > The functionality of the solution during winter.
- > Document the cleaning effect for the facilities that are already operating.
- > Suitable types of vegetation combined with filter solution in city streets.

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THANK YOU FOR  
YOUR ATTENTION!



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