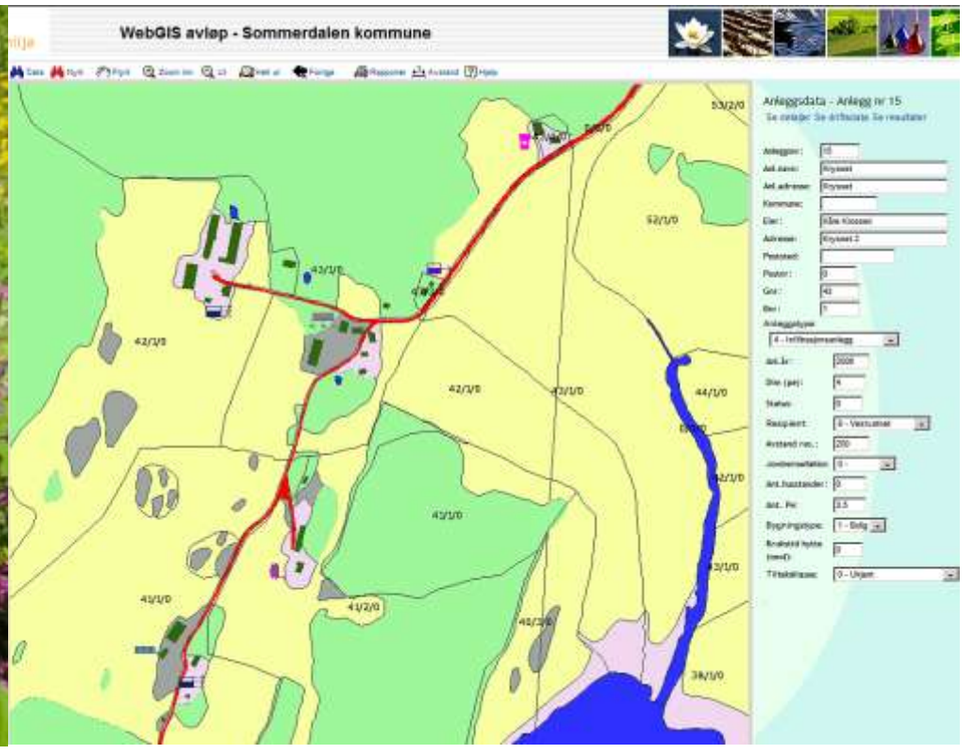
Use of a web-based GIS tool for local wastewater planning in Norway

G. Eggen[1], O. S. Hanserud[1], S. Turtumøygard[1], P. D. Jenssen[2]



Sevilla, 27th April.

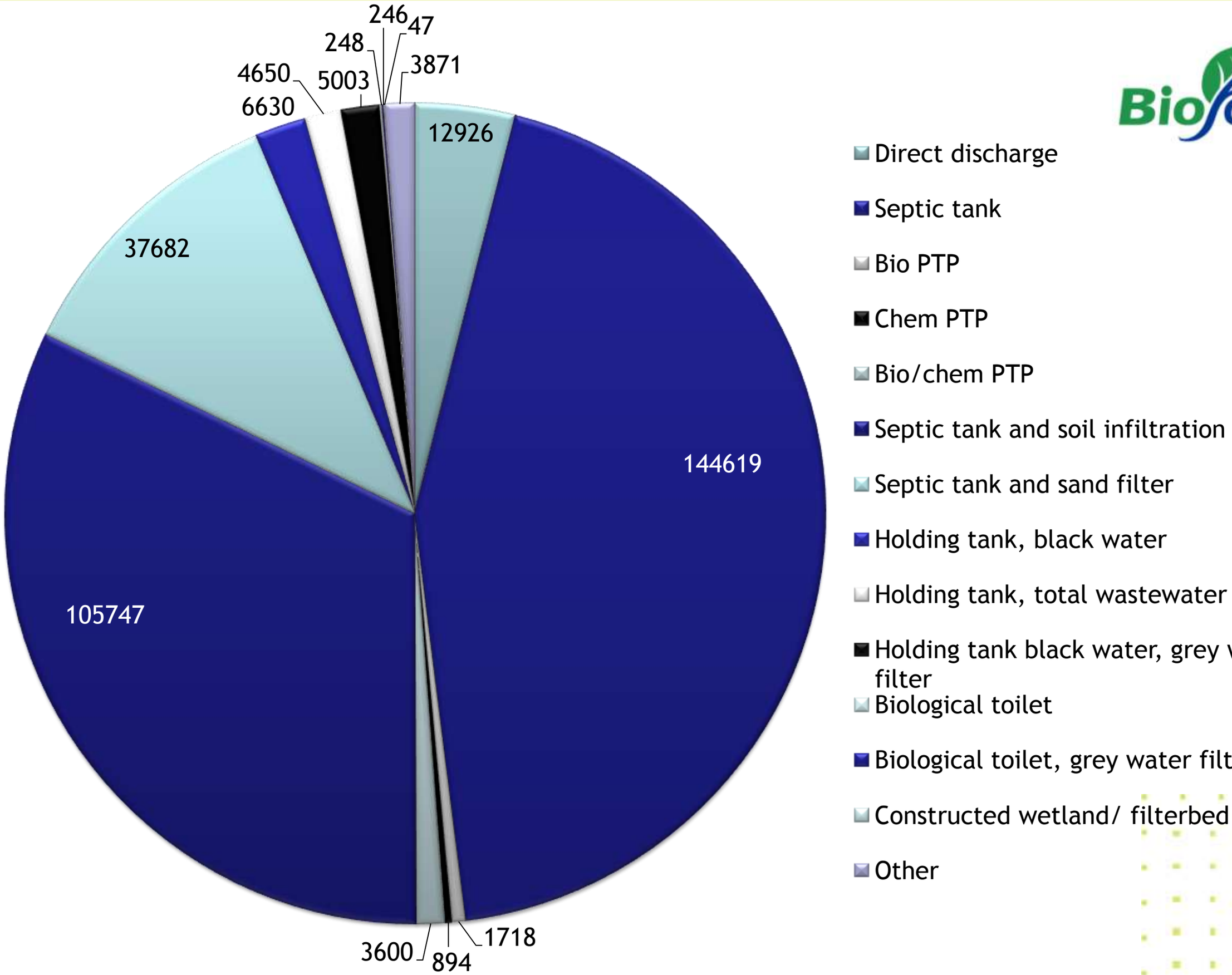
[1)] Bioforsk Soil and Environment, Norwegian Institute for Agricultural and Environmental Research, Ås
[2)] The Norwegian University of Environmental Studies and Life Sciences, UMB, Ås

NORWAY:

- Population: 4.9 M
- Most live in or near the big cities
- About 20 % live in decentralized areas with no infrastructure for wastewater treatment

Small wastewater systems in Norway for houses (<50 PE) 2005

Direct discharge	12 962
Septic tanks	144 619
Bio PTP	1 718
Chem PTP	894
Bio/Chem PTP	3 600
Septic tank and soil infiltration	105 747
Septic tank and sand filter	37 682
Holding tank black water	6 630
Biological toilet	248
Holding tank waste water	4 650
Constructed wetland/filter bed	47
Holding tank black water and grey water fil	5 003
Biological toilet and grey water filter	246
Other systems	3 871
Total	327 916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47
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3871
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37682
144619
105747
3600
894
1718
Direct discharge
Septic tank
Bio PTP
Chem PTP
Bio/chem PTP
Septic tank and soil infiltration
Septic tank and sand filter
Holding tank, black water
Holding tank, total wastewater
Holding tank black water, grey water filter
Biological toilet
Biological toilet, grey water filter
Constructed wetland/ filterbed
Other

Background

Wastewater from imperfect or missing private wastewater treatment plants can cause serious pollution of streams and lakes

Many communities are facing the challenge of restoring
and implementing old wastewater plants

Implementation of the water framework directive

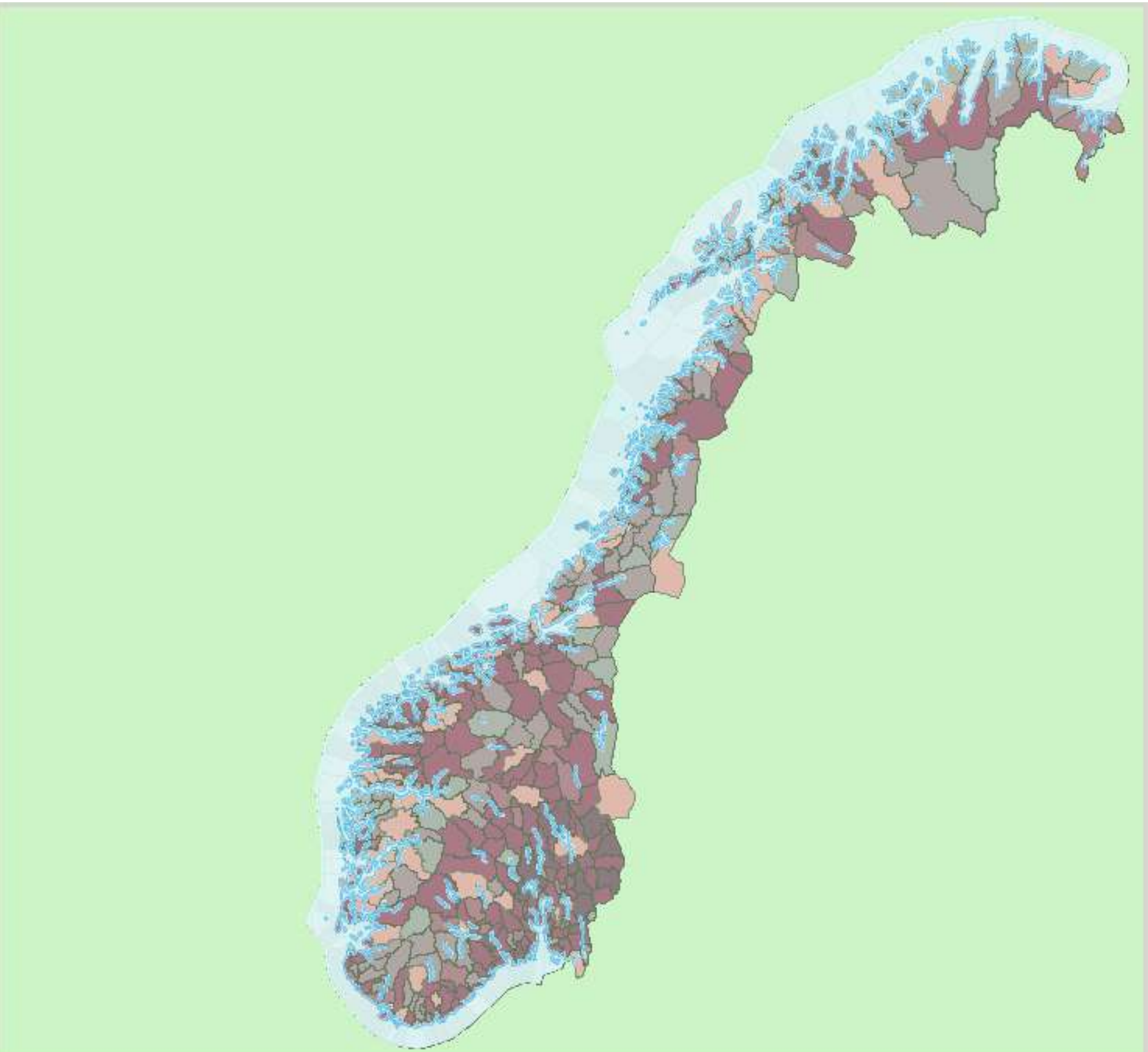
What is the contribution to pollution from small systems in a catchment?

Which measures shall be given priority and where?

Bioforsk has therefore developed the wastewater model
'WebGIS wastewater'
as a helpful tool for this work

WebGIS wastewater is an application for recording, management and monitoring of small wastewater treatment plants in rural areas with geographic location on map

1. Register data on load, type, recipient
2. Calculate treatment effect in each wastewater plant, and pollution load to the resipients
3. Calculate environmental influence
4. Register administrative data
5. Generate reports, tables, statistics, graphic presentations



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municipality

Back Reports Distance Help

Bioforsk
Senter for jord og miljø

- [x] Properties
- [x] Sewage systems
- [ ] Environ index *i*
- [ ] Status
- [ ] Vegetation cover
- [ ] Soil type
- [ ] Surface water
- [x] Buildings
- [ ] Resipients
- [ ] Roads
- [ ] Road names
- [ ] Catchment area
- [ ] Working zones
- [ ] Sludge route
- [ ] Sludge zones
- [ ] Detailed background map

http://128.39.191.10/w...

- 1 Direct discharge
- 2 Septic tank, terain
- 3 Septic tank, to water body
- 4 Soil Infiltration system
- 5 Sandfilter
- 6 Bio/Chem PTP
- 7 Bio PTP
- 8 Chem PTP
- 9 Holding tank waste water
- 10 Holding tank, black water
- 11 Biological toilet
- 12 Constructed wetland
- 13 Holding tank black water, greywater to filtration
- 14 Biological toilet, greywater to filtration
- 20 Shared system

Search system:

Owner

Choose

System number

Gnr

Adress

Search property:

Gnr

imgX: 115 imgY: 430 UTM33X: 616370 UTM33Y: 6678143 Målestokk: 180909

Klarerte områder | Beskyttet modus: Av

100 %

Bioforsk

WebGIS sewage - Nes municipality

Data | New | Move | Zoom in | Out | Main map | Back | Reports | Distance | Help

- [x] Properties
- [x] Sewage systems *i*
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- [ ] Status
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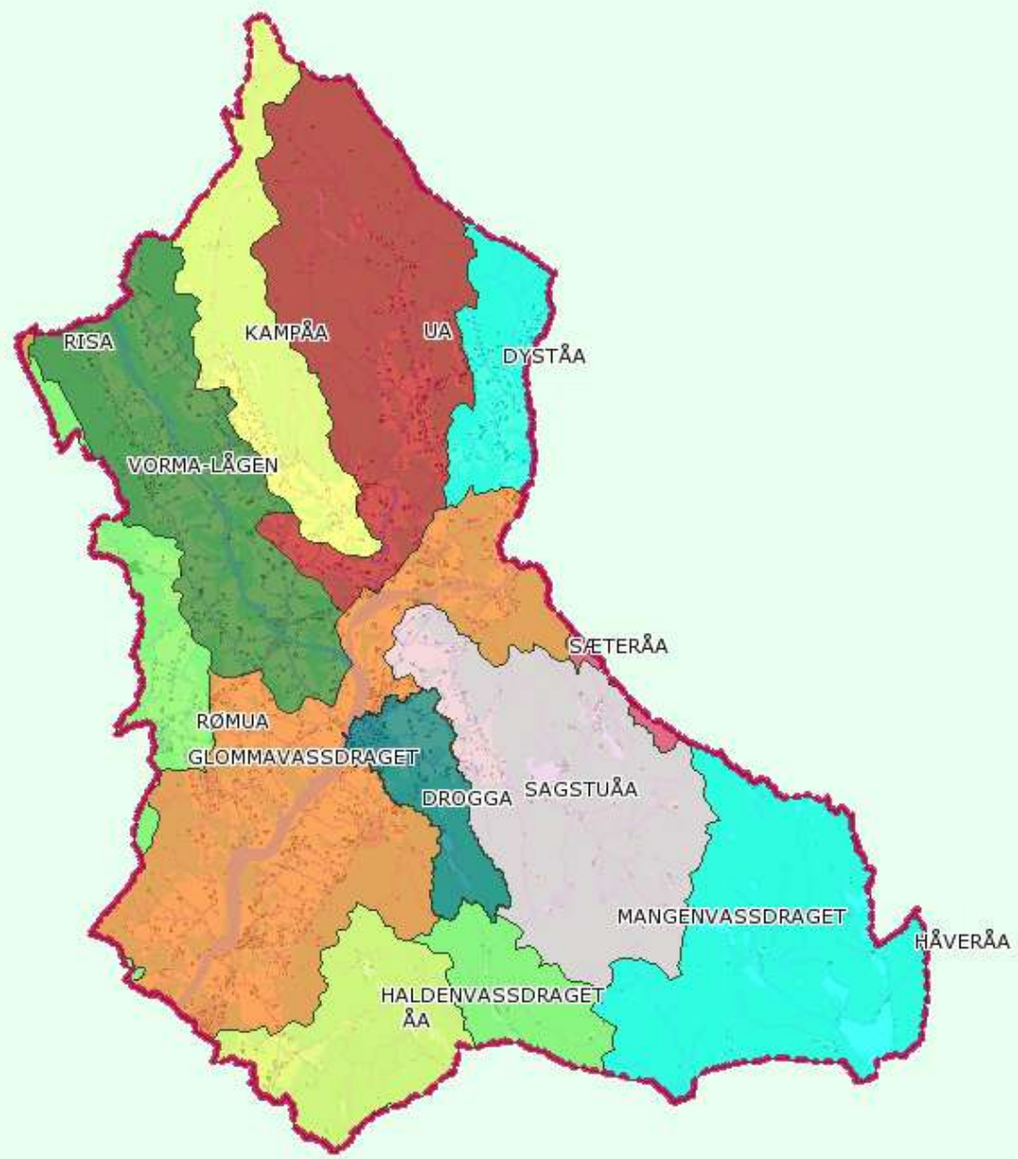

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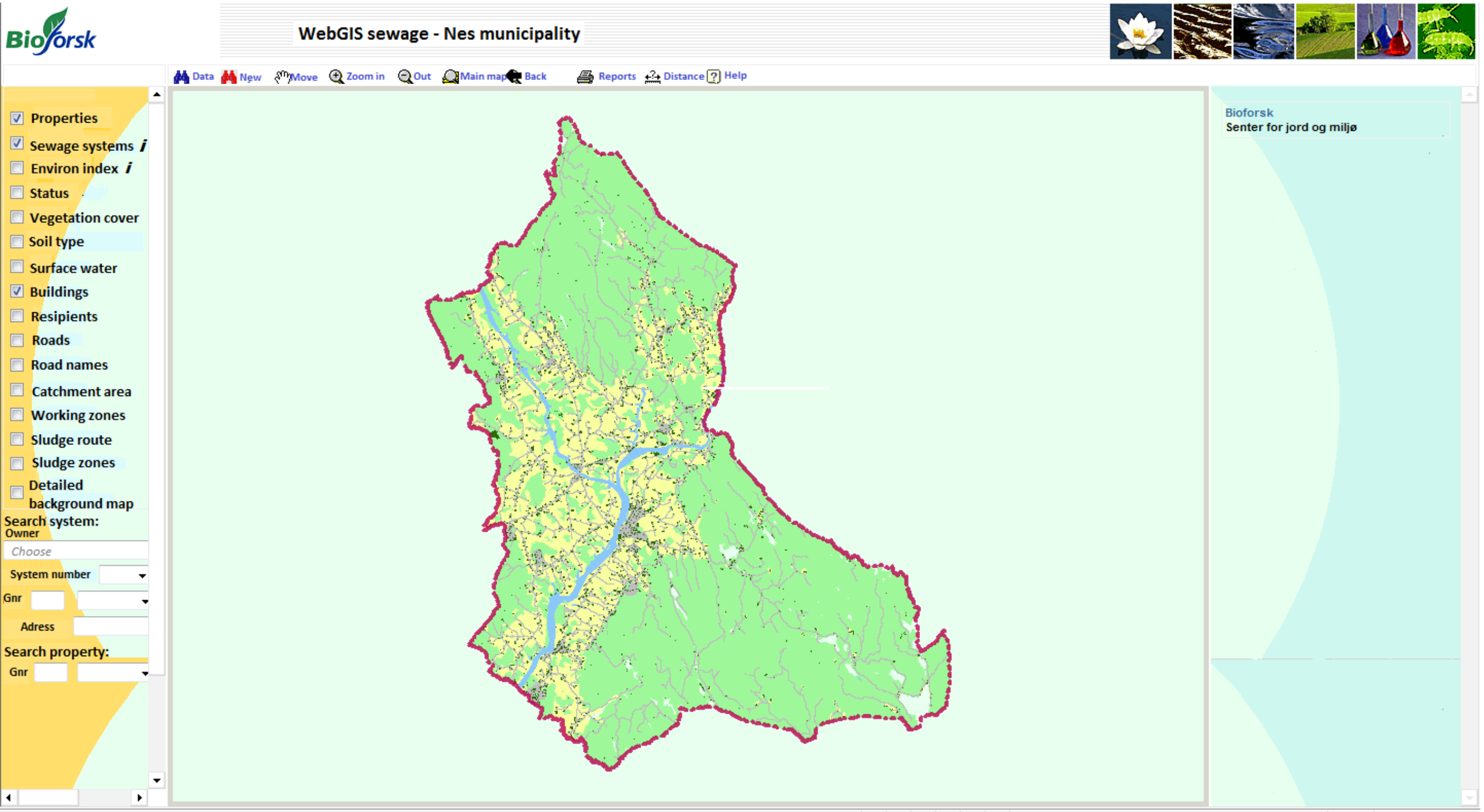
Senter for jord og miljø

imgX: 115 imgY: 430 UTM33X: 616370 UTM33Y: 6678143 Målestokk: 180909

Klarerte områder | Beskyttet modus: Av

100 %

1) Register data



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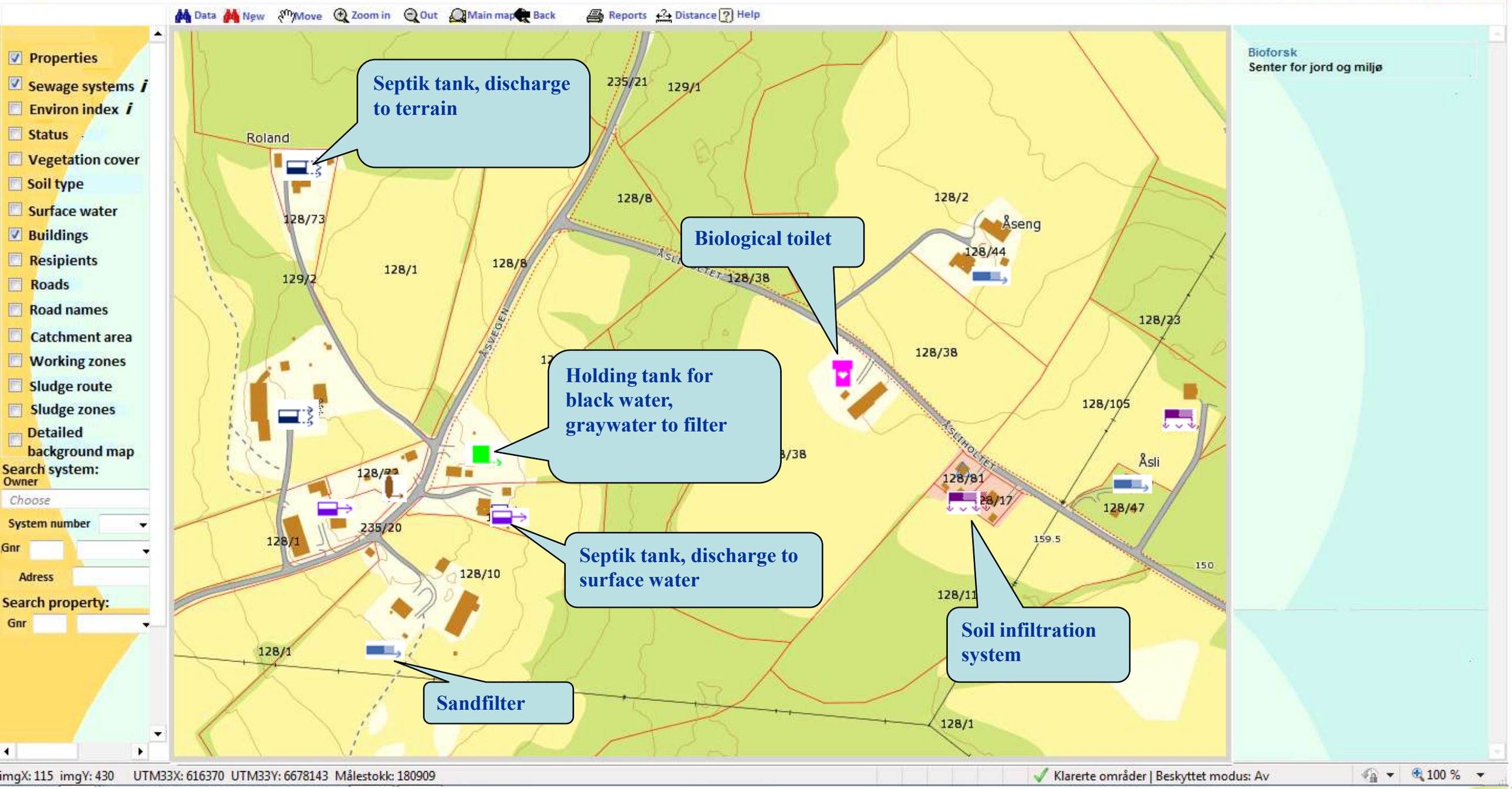

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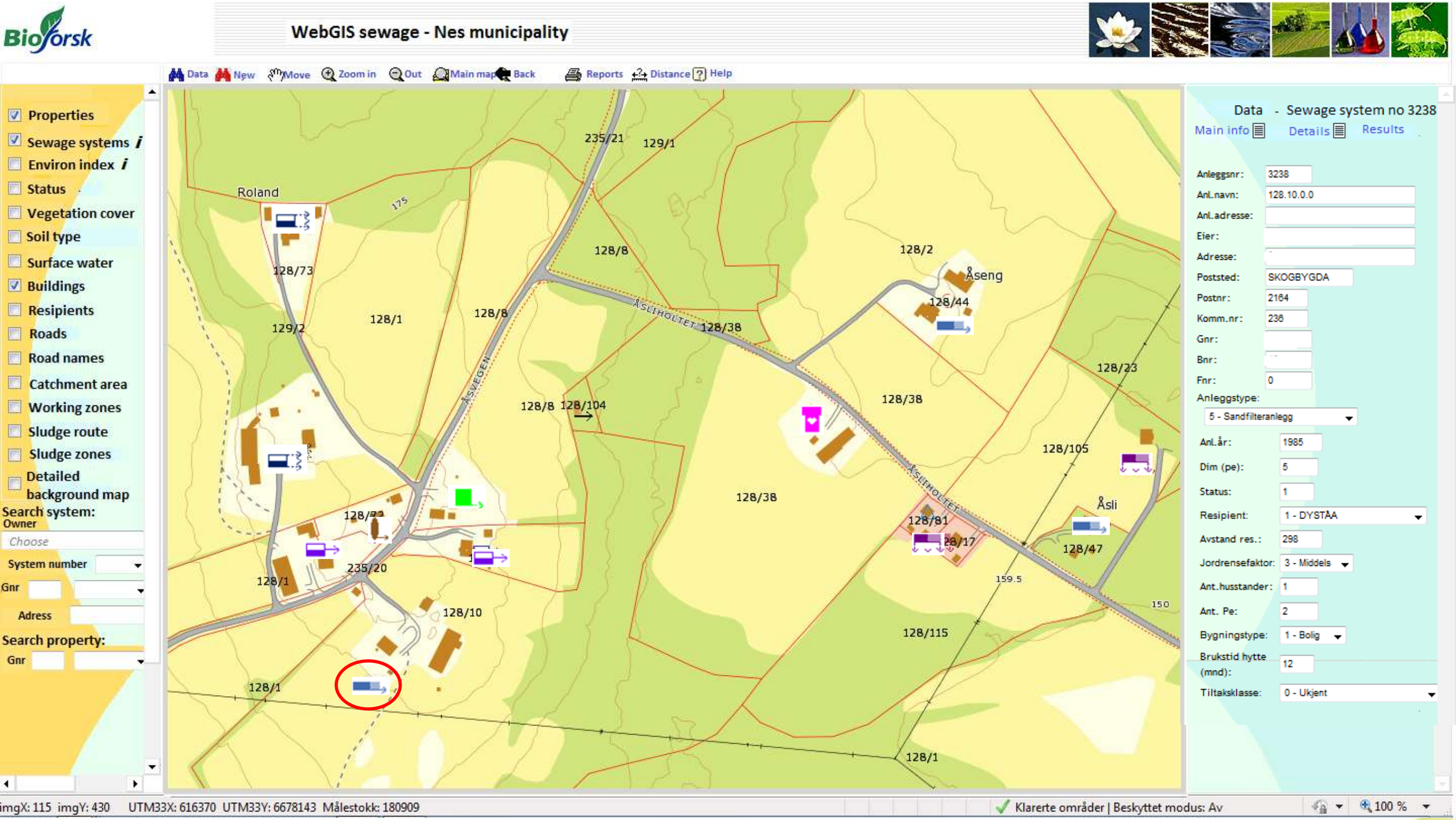

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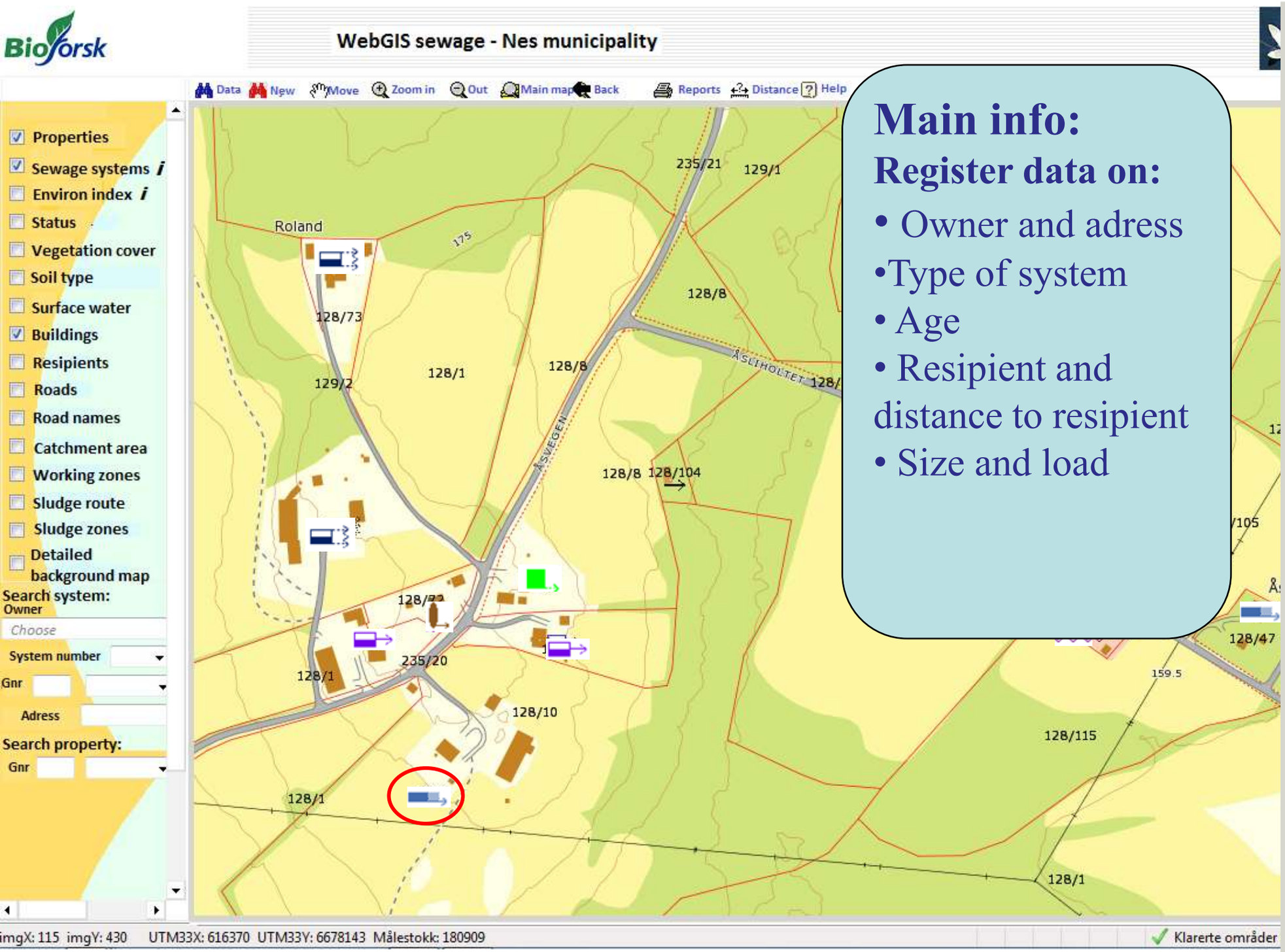
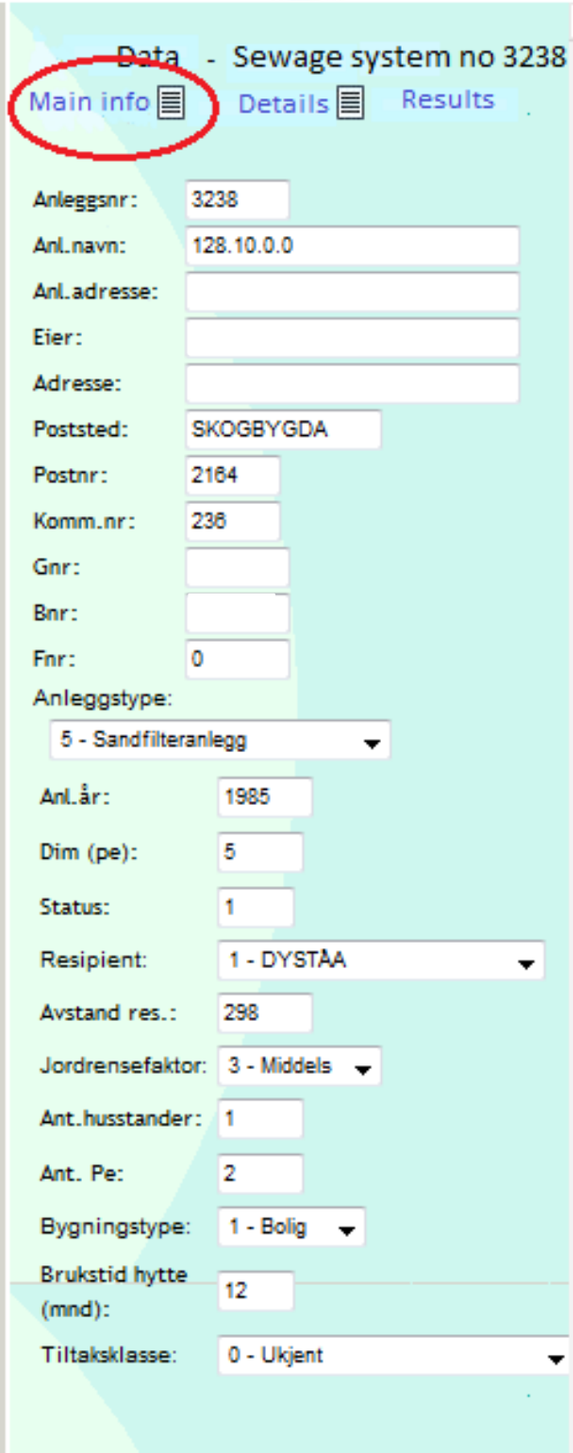


Main info:

Register data on:

- Owner and adress
- Type of system
- Age
- Resipient and distance to resipient
- Size and load



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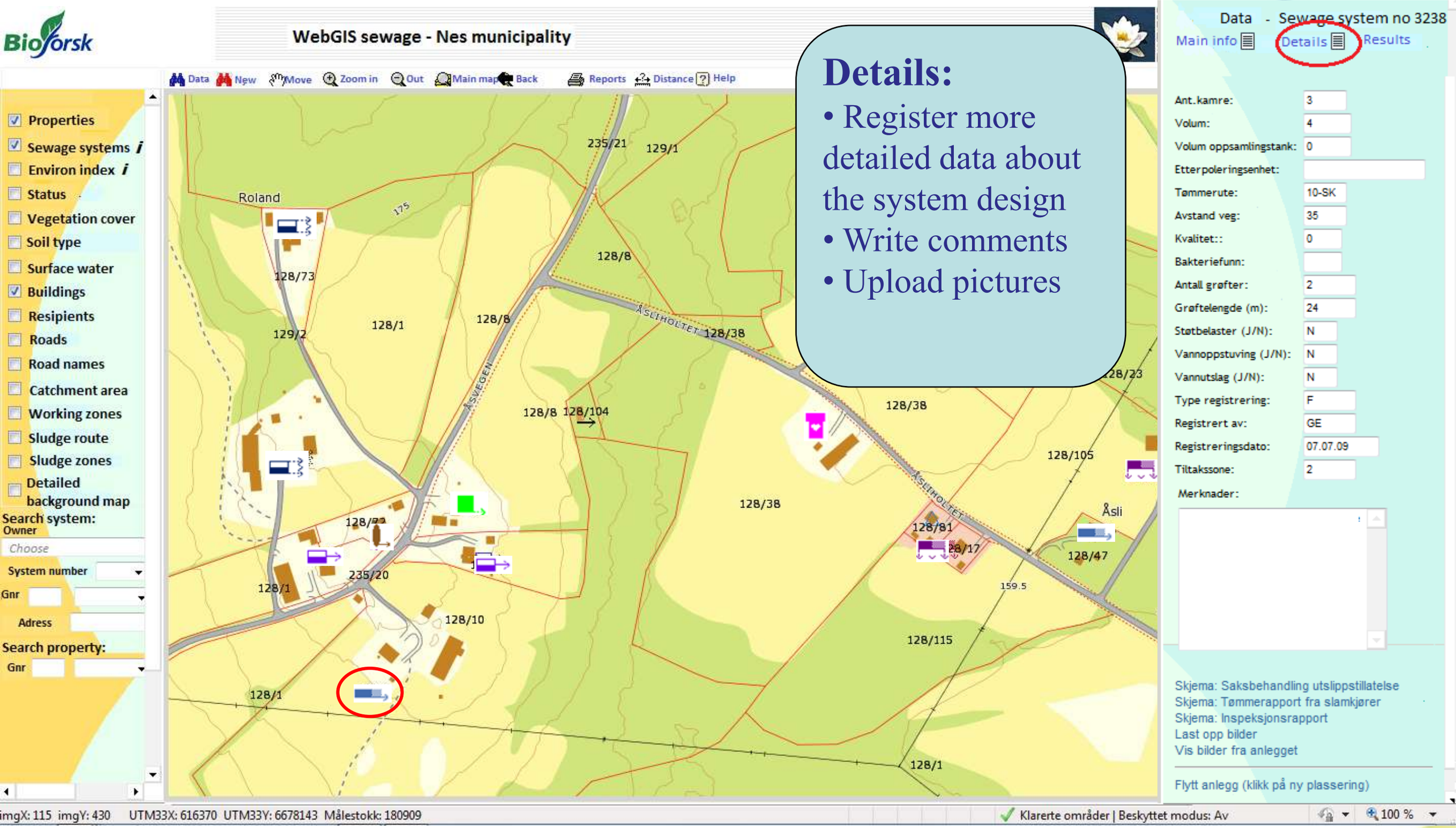


Details:

- Register more detailed data about the system design
- Write comments
- Upload pictures

2) Calculate treatment effect in each wastewater plant, and pollution load to the resipients

Based on information about:

- Type of system
- Age
- Size
- Load
- Distance to resipient

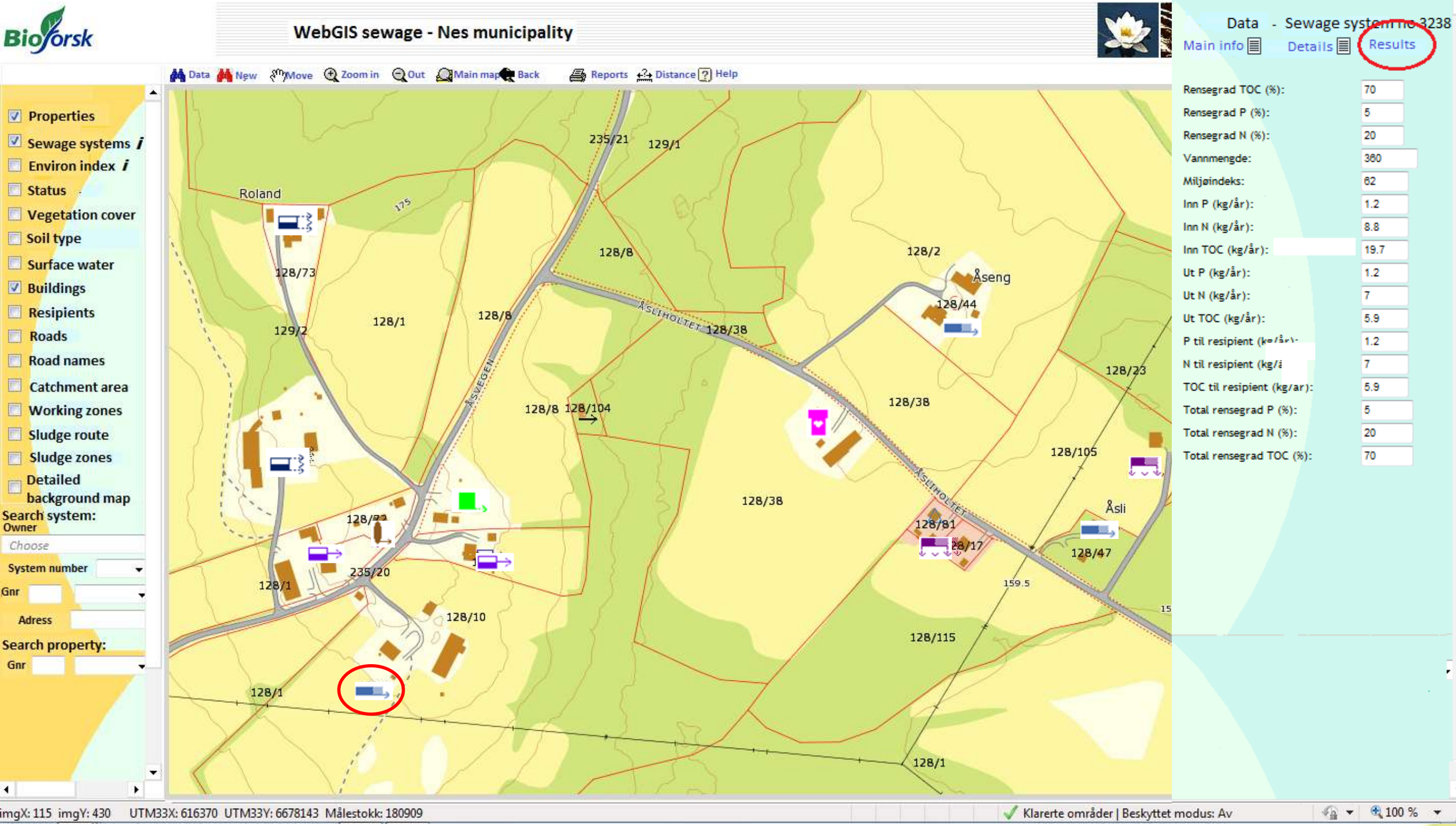
The treatment effect of each wastewater plant is calculated based on empirical formulas

Treatment effect is estimated as removal of:

- Phosphorus (P)
- Nitrogen (N)
- Organic matter (TOC)

} - Treatment in each wastewater plant
- Load to resipients

2) Calculate treatment effect in each wastewater plant, and pollution load to the resipients



2) Calculate treatment effect in each wastewater plant, and pollution load to the resipients

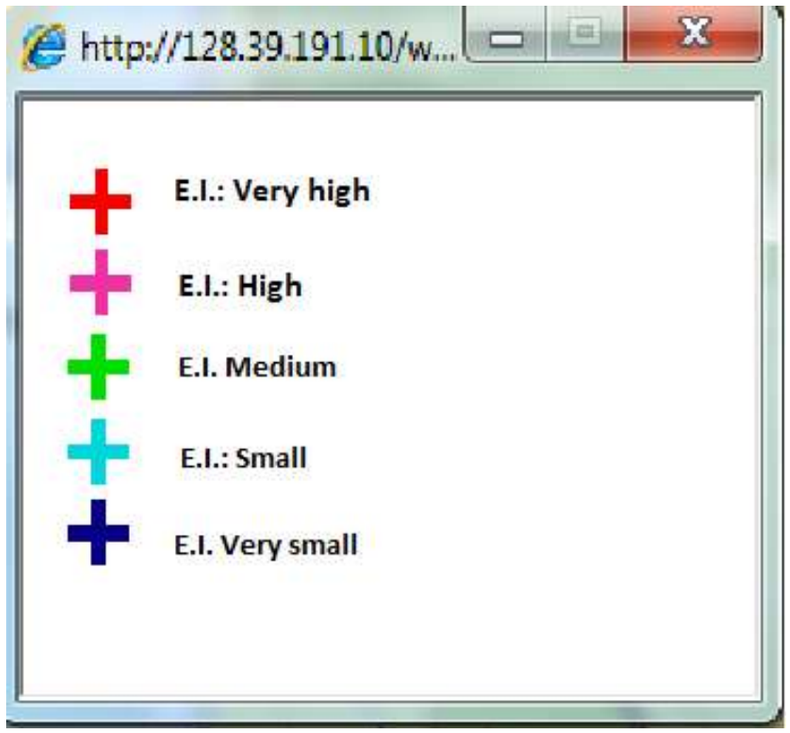
Type name and nr.	Functions for cleaning performance in % for P
1 - Direct outlet	0
2 - Mud pit with outlet to terrain	5 - 1 x (no. PE. - dimension)
3 - Mud pit with outlet to water body	5 - 1 x (no. PE. - dimension)
4 - Infiltration	75 - 5 x (no. PE. - dimension) - 10 x (year - (building year + 10))
5 - Sand filter plant	75 - 5 x (no. PE.. - dimention) - 10 x (year - (building year + 5))
6 - Mini purification plant class 1 (bio/chem)	75 - 10 x (no. PE.. - dimension)
7 - Mini purification plant class 2 (biol.)	60 - 10 x (no. PE.. - dimension)
8 - Mini purification plant class 3 (chem.)	70 - 10 x (no. PE.. - dimension)
9 - Water tight tank	100
10 - Water tight tank for black water, grey water to terrain	75
11 - Biological toilet, grey water to terrain	75

Examples of formulas in WEBGIS model

Purification performance is calculated for different types of wastewater plants.

3) Calculate environmental influence

Environmental impact index (E.I.)

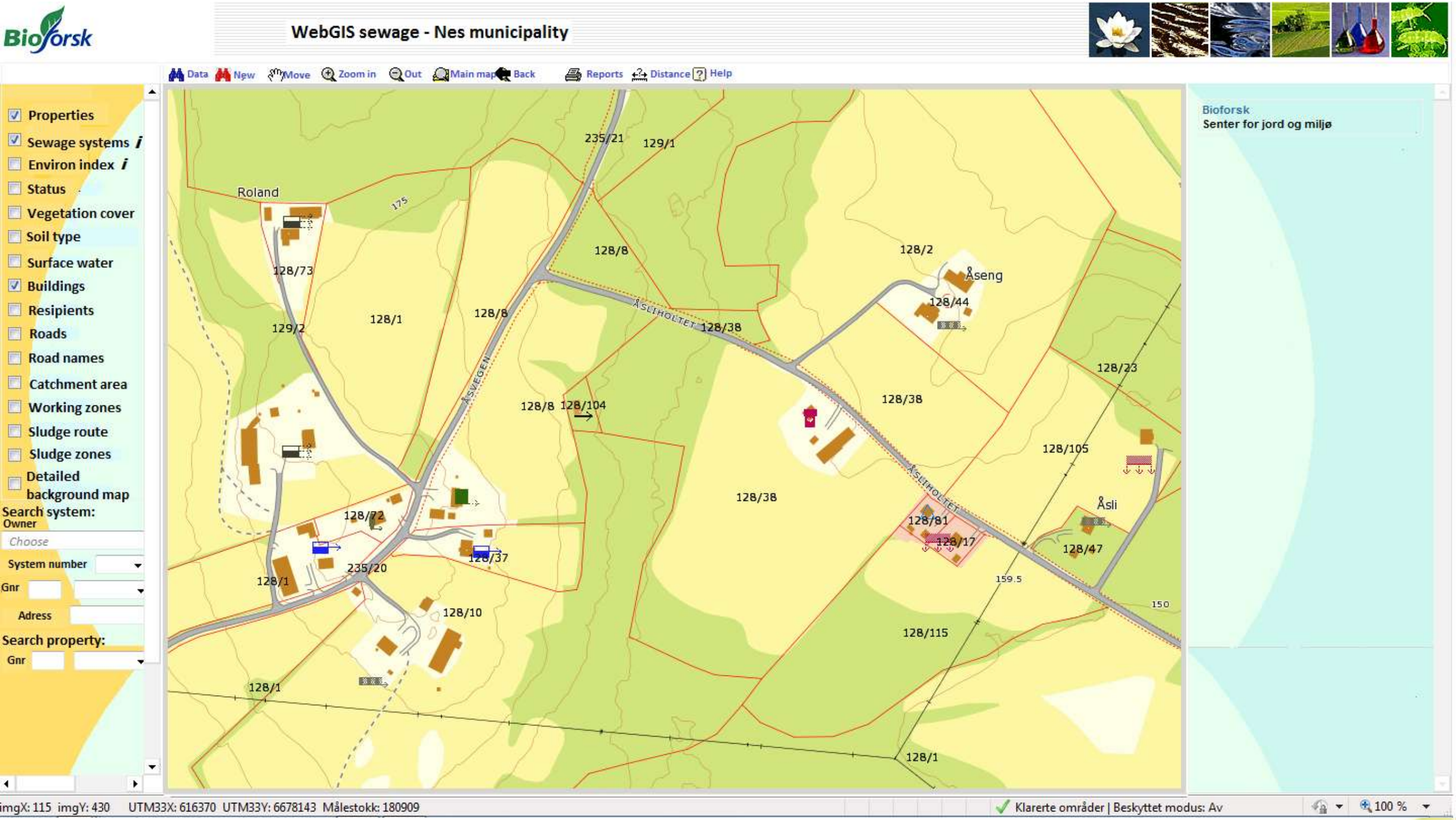


3) Calculate environmental influence

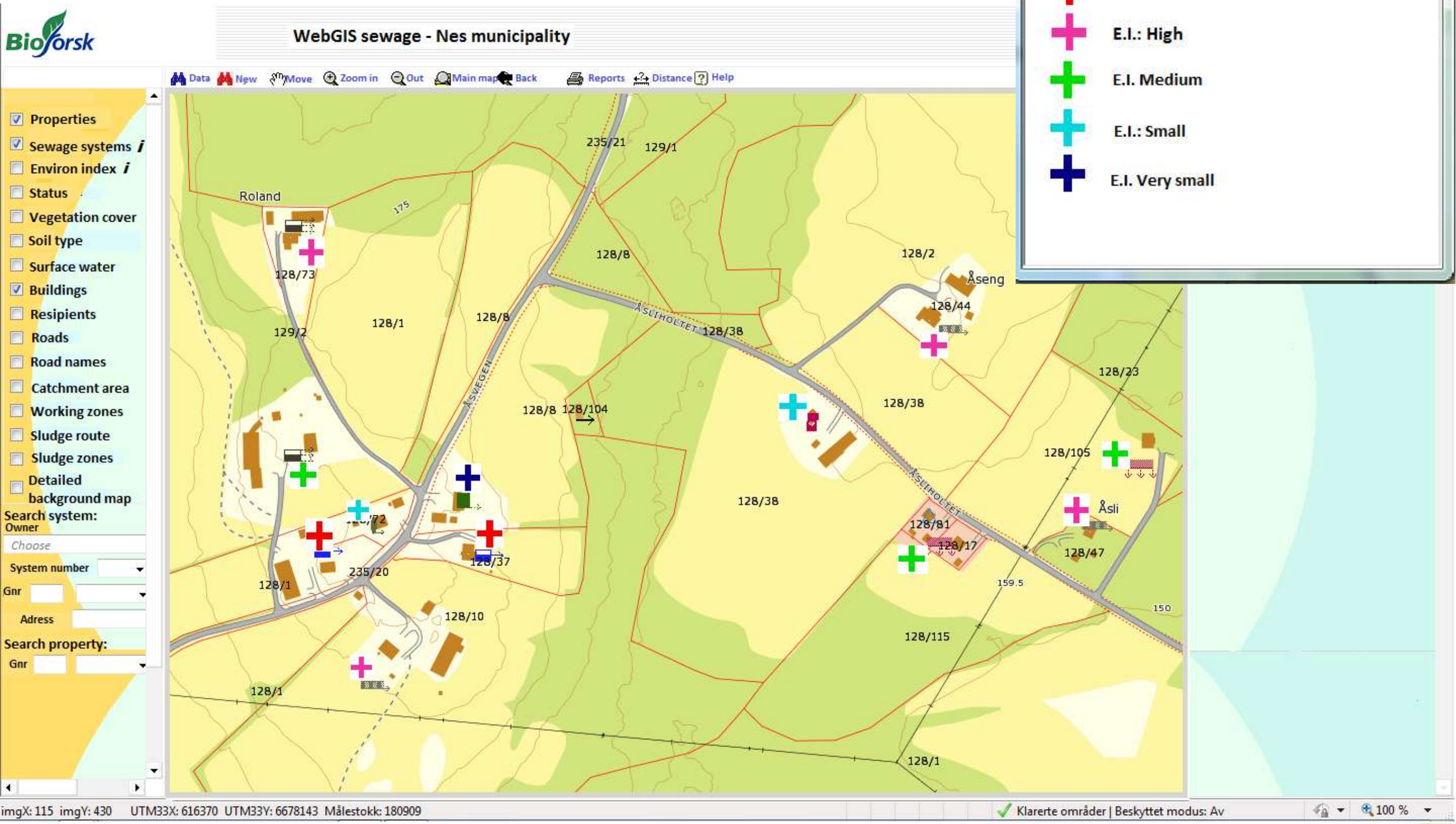
Calculating environmental impact index

- **Environmental impact index is a combined evaluation of different effects of the outlet from the plant to the resipient. This is calculated as:**
  - **(Out-P * 16 + Out-N * 3 + out-TOC) * Person equivalents**

3) Calculate environmental influence



3) Calculate environmental influence



4) Register administrative data

Sjekkliste saksbehandling utslippstillatelse

Om søknadsskjema: Om avløpsforskriften: Lokale forskrifter: Om avlop.no: Om bygging:

Eiendom og ansvarlig søker

Eiendom:
Eier:
Ansvarlig søker:
Eiendommer tilknyttet:
Eiendommens adresse:
Eiers adresse: ÅS
Søkers adresse:
Planstatus:
Postnr: 2164
Anl nr: 3238
Arkivnr:
Anleggets status: Aktivt (i drift)
Status for saksbehandlingen:

Søknaden gjelder

Omfang (husstander): 1
Antall personekvivalenter: 2
Bygningstype: Bolig

Utslippsted

Type utslippssted:
Utslippsdyp under laveste vannstand:

Dokumentasjon

Godkjent fagkyndig:
Navn fagkyndig:
Dok minirenseanlegg:
Dok rensegrad minirenseanlegg:
Dok rensegrad andre renseløsninger:
Godkjent kart:
Nabovarsel:
Avstand vei: 35

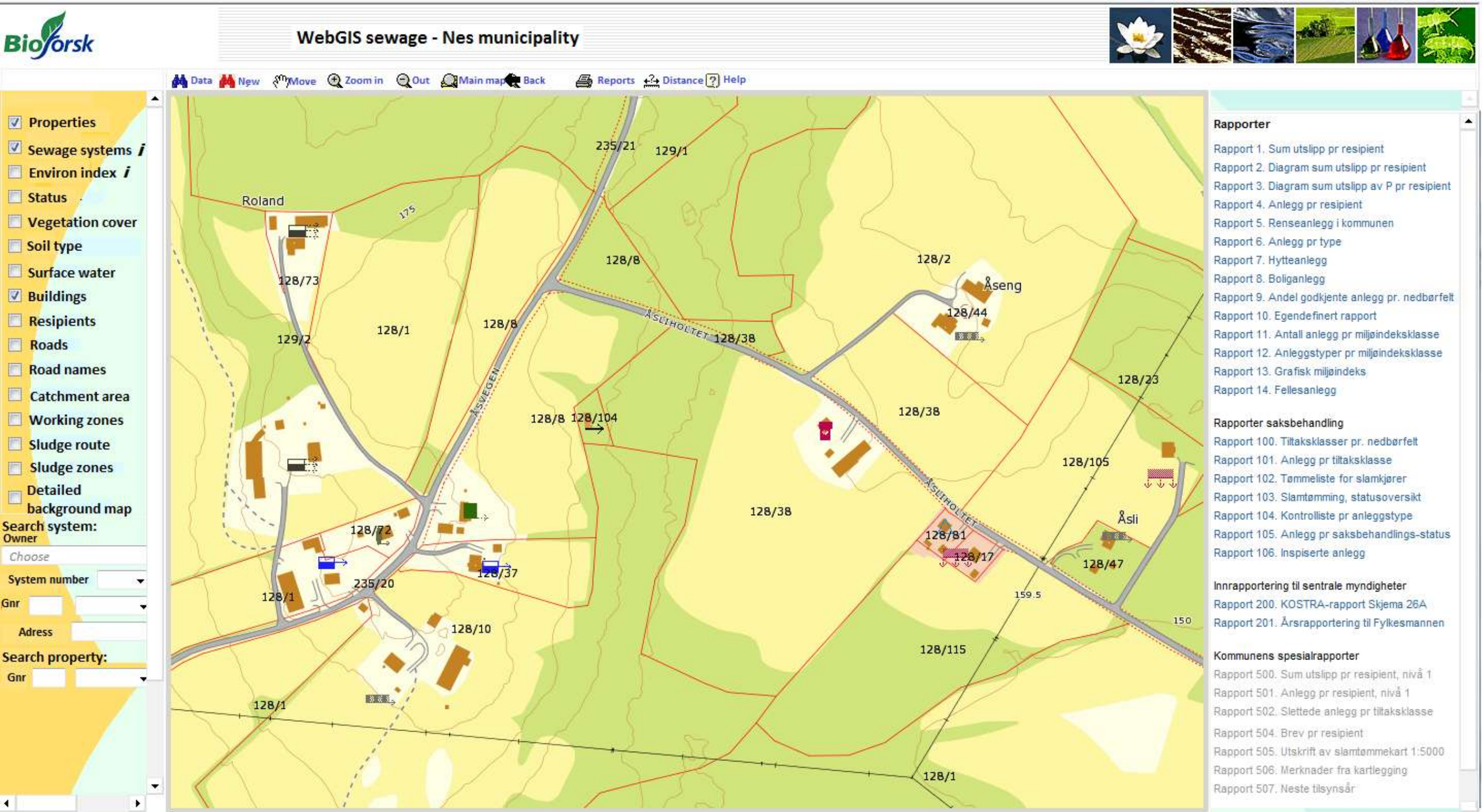
Anleggstype og rensegrad

Anleggstype: Sandfilteranlegg
Anleggsbeskrivelse:
Rensegrad:
Interesser som kan bli berørt:
Andre vilkår for utslipp:

Drift og oppfølging

Serviceavtale: Mangler
Navn på servicefirma:
Dato utslippstilatelse:
Dato byggemelding:
Dato ferdigattest:
Dato frist ferdigstillelse:
Tømmerute:
Gebyr saksbehandling meldt inn:
Gebyrkode_slam:

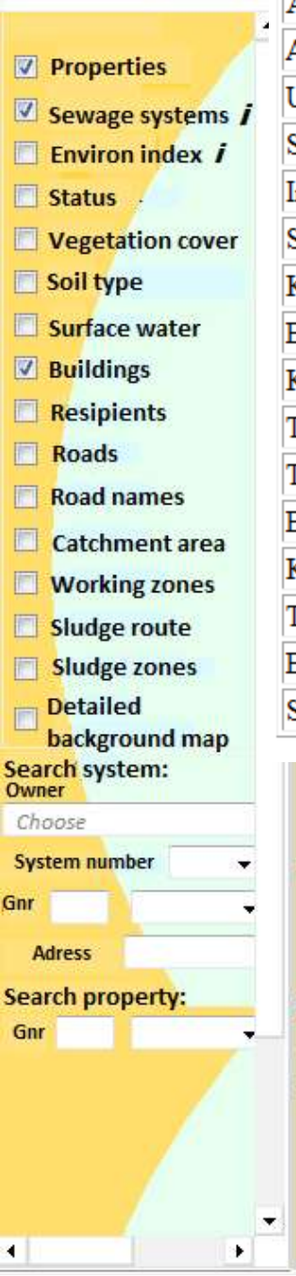
5) Generate reports, tables, statistics, graphic presentations

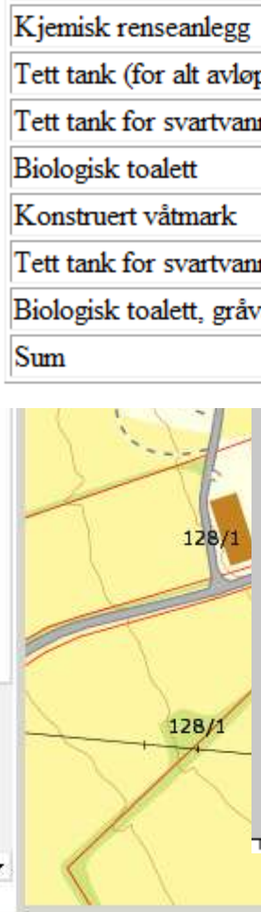


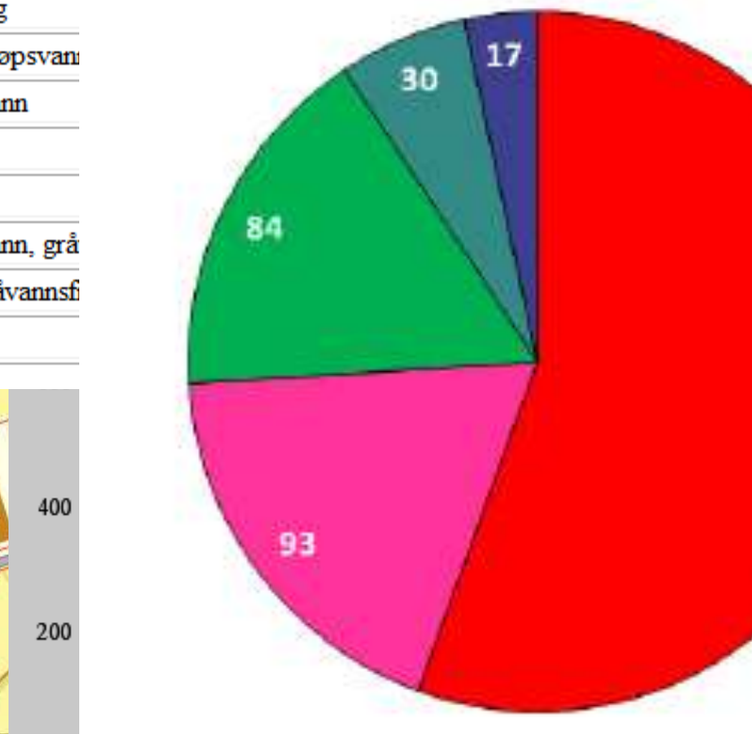
5) Generate reports, tables, statistics, graphic presentations

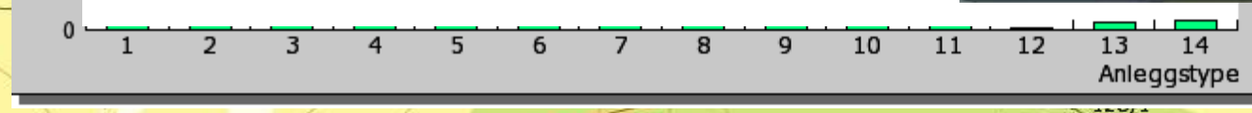
Spredt avløp fra fast bosetting, Nes

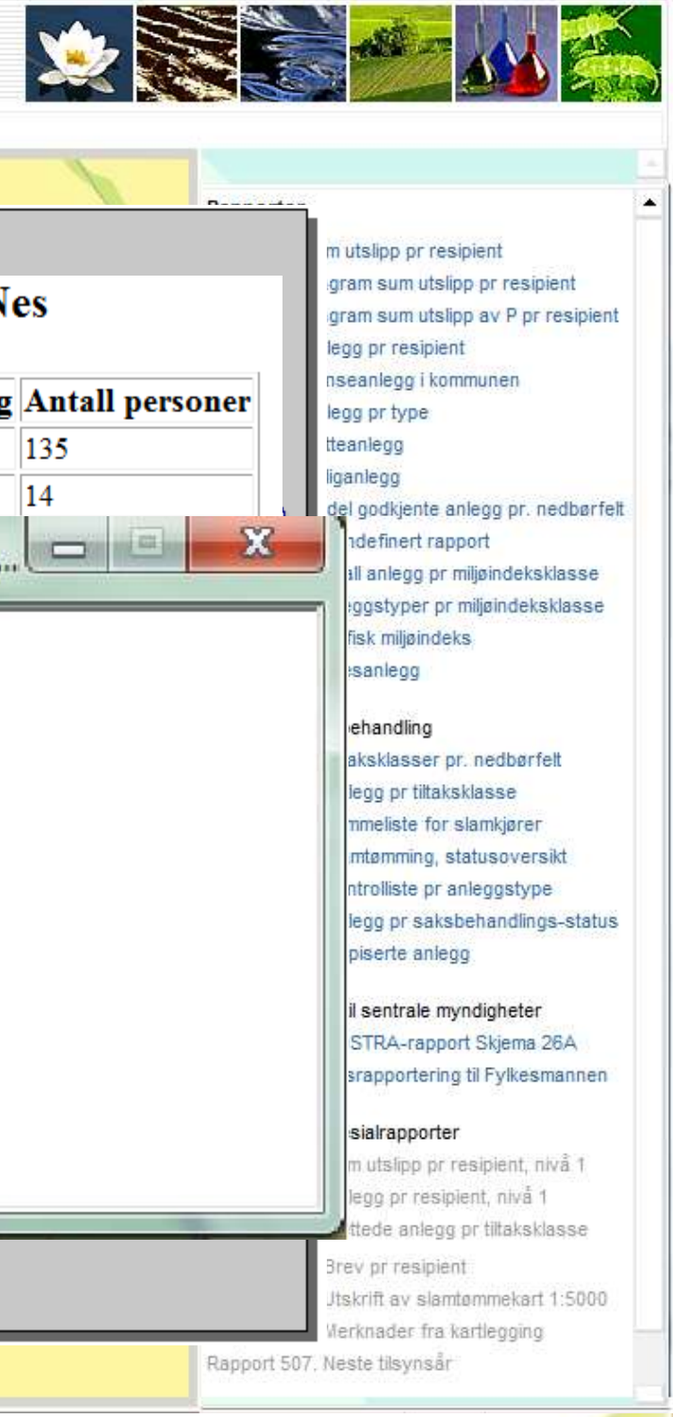
Anleggstype	Antall anlegg	Antall personer
Annen løsning	59	36
Urenset(1)	7	24
Slamavskiller	1613	3962
Infiltrasjonsanlegg	124	312
Sandfilteranlegg	352	955
Kjemisk/biologisk renseanlegg	224	675
Biologisk renseanlegg	13	38
Kjemisk renseanlegg		
Tett tank (for alt avløpsvan		
Tett tank for svartvann		
Biologisk toalett		
Konstruert våtmark		
Tett tank for svartvann, grå		
Biologisk toalett, gråvannsfi		
Sum		

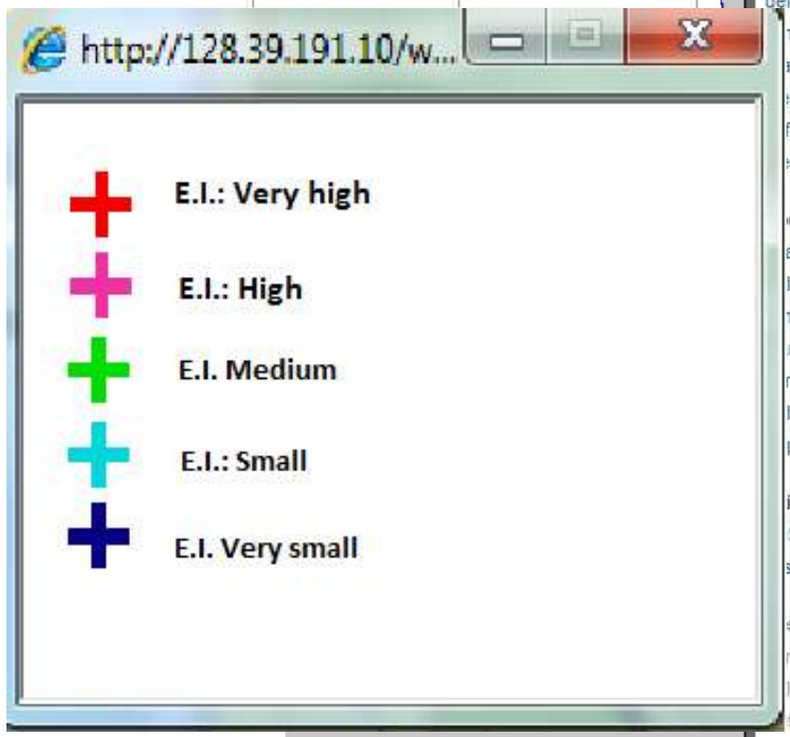












Conclusion

- **WebGIS Wastewater:**

➢ Tool for the authoroties to register and manage on site wastewater treatment plants

➢ Estimation of treatment effect of each plant and discharge to resipient

➢ Evaluate the environmental impact, tool for prioritizing measures

➢ Watershed approach, comparison between different municipalities

➢ For authorities “WebGIS waste water” is a tool for making priority plans

50 Norwegian municipalities use this tool so far

Start WEBGIS

http://webgis.no/webgisavlop_sommerdalen/avloplogin.htm

Username (Brukernavn): “jbv”
Password (Passord): ”avlop”

Or english version:

http://bioweb04.bioforsk.no/Wastewater_GIS

WEBGIS sewage – technical details

Based on map system Map Server (open source Univ. of Minnesota)

Models developed at Bioforsk

The application is developed for MS Internet Explorer, but can also be run by other browsers

The system is running at the Bioforsk web server

There is no need for installation of software on the users computers

Broadband Internet connection is recommended

php programming language

MS Access database

ESRI shape map files

JP Graph (open source)

GD generate Diagram on the fly

Thank you for your attention!!!

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