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# **QGEP Documentation**

***Release 0.5***

**The QGEP Project/OPENGIS.ch**

04 August 2016



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QGEP is a wastewater management module for QGIS based on SIA 405 (Leitungskataster) and VSA-DSS (GEP) and developed closely to the QGIS application.

This document can also be downloaded as a single PDF document: QGEP.pdf .



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## Contents

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## 1.1 QGEP Installation Guide

This will guide you through the setup of required applications and services to get your system ready for running QGEP.

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**Nota:** You also have the option of downloading a [Demo Virtual Machine](#) that has a working QGEP demo.

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### 1.1.1 Setup database server

If you expect to access the data from several different workstations, you can install the database on a network accessible server. If it is just a single desktop you are working on, this can be installed on the same machine.

#### Required Software

##### Server installation

- Install PostgreSQL (>=9.3)
  - [Windows download page](#)
- Install PostGIS (>=2.1)

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**Nota:** In a single desktop environment (no network database server) you can setup your database to trust local connections.

This way, the database won't ask for a password if you're connecting from your local workstation while no password is written anywhere. You even can do with no database password at all.

This can be done by editing the database access configuration file `pg_hba.conf` and set the auth-options from `md5` to `trust`. A database service reload is required to activate changes.

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### 1.1.2 Database initialization

You can use [pgAdmin](#) to access and manage the database server.

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**Nota:** By clicking the link you can learn how to [Install pgAdmin](#)

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## Process

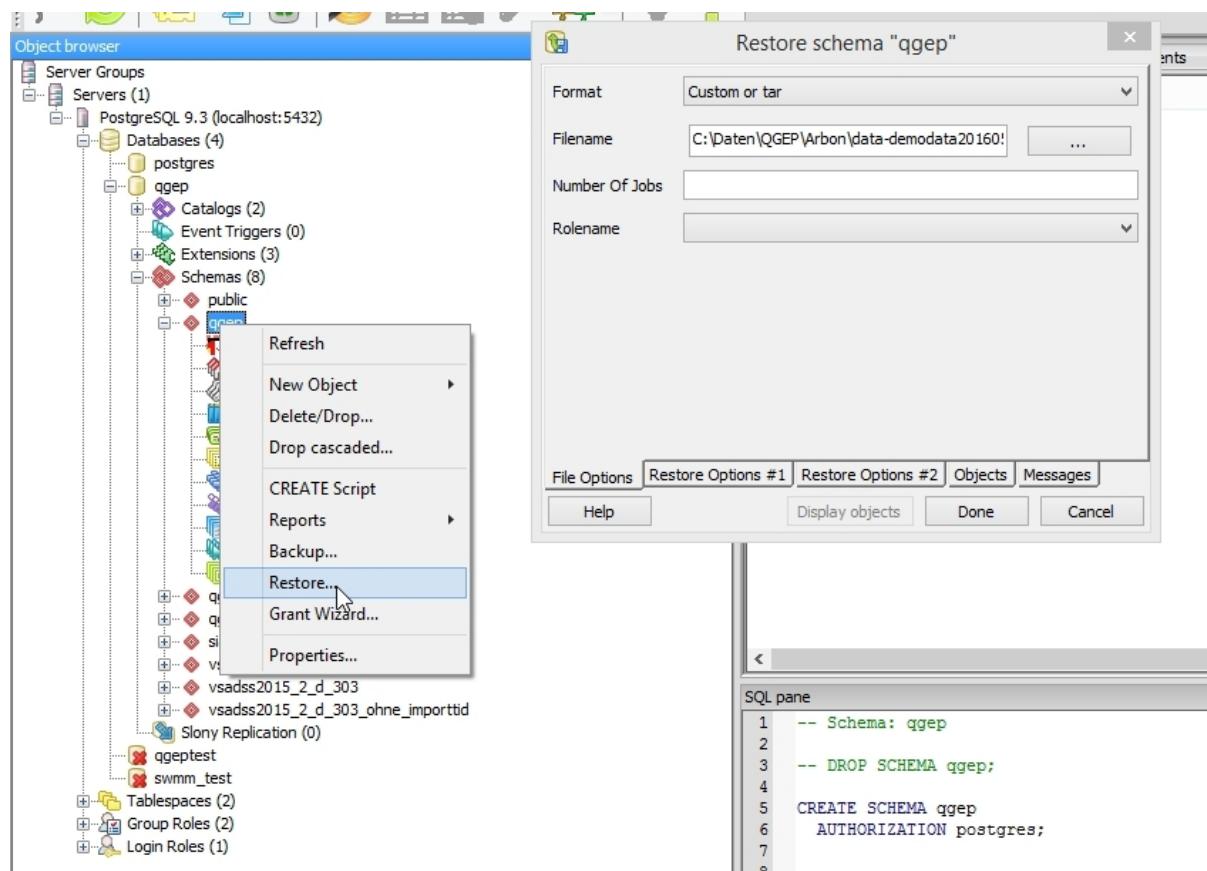
In pgAdminIII

- Connect to the database server
- Create a new group role (preferably named *qgep*, but you are free to choose)
- Create a new login role (*qgepuser* for example) and make it a member of the *qgep* group

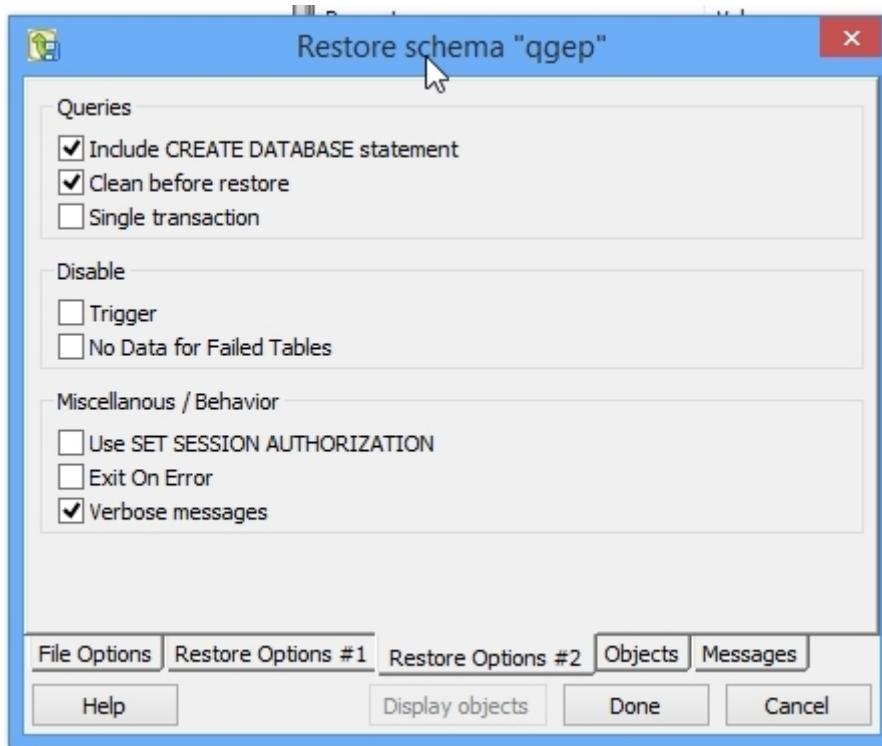
You can do this graphically or by simply opening a pgAdminIII *SQL query* window and type the following:

```
CREATE GROUP qgep;
CREATE ROLE qgepuser LOGIN;
GRANT qgep TO qgepuser;
```

- Create a new database (preferably named *qgep*, but you are free to choose)
  - Change to this database
- Create a new schema with the name *qgep*
- Open an *SQL query* Window and create the extensions (if they're not created yet)
  - CREATE EXTENSION hstore;
  - CREATE EXTENSION postgis;
- Download demo data
  - [https://github.com/QGEP/data/raw/demodata/qgep\\_demodata.backup](https://github.com/QGEP/data/raw/demodata/qgep_demodata.backup)
- Right click the *qgep* schema
  - Click *Restore*
  - Load your download of *qgep.backup*



- Restore Options #2: Activate *Clean before restore*



- Click *Restore*
- Check whether in Message window last line is Exit Code 0
- Click *Cancel*
- Right click the database and click *Refresh*
- Update privileges for the database
  - Right click the *qgep* schema
  - Properties -> Privileges Tab > Grant USAGE to group *qgep*. You can also do this as a query: GRANT USAGE ON SCHEMA *qgep* TO GROUP *qgep*;
  - Click *Grant Wizard ...*
  - Selection, click *Check All*
  - Privileges
    - \* Group *qgep*
    - \* Choose *ALL*

### 1.1.3 Setup workstation

#### Database configuration

To tell a workstation, where the database is (on the local system or on a network server) you will have to create some files initially on every device on which you will have QGIS/QGEP running. It is not required to do that on the server itself.

These instructions depend on your operating system.



## Windows

Create a new directory where you want to store the configuration in. (E.g. a new folder pgconfig in your home folder). This directory will be referred to as PGSYSCONFDIR in this guide.

Set the environment variable PGSYSCONFDIR to the path to PGSYSCONFDIR.

Inside this folder, there will be two files

- pg\_service.conf
- pgpass (If you do not want to enter the password for the db every time)

**Attenzione:** On Windows, you need to save pg\_service.conf in Unix format in order to work. One way to do it is to open it with [Notepad++](#) and Edit --> EOL Conversion --> UNIX Format --> File save .

## Linux

On linux you may put the files .pg\_service.conf and .pgpass into your home folder (normally /home/ [username])

## All systems

Put the following content in the file pg\_service.conf or .pg\_service.conf. You may have to adapt the variables for your setup.

```
[pg_qgep]
host=localhost
port=5432
dbname=qgep
user=qgepuser
```

To save the password as well on the system you may use the file pgpass.

```
localhost:5432:*:qgepuser:password
```

---

**Nota:** If you don't have the database on your local machine replace any occurrence of localhost with the network address of your database server.

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## Install QGIS

- Minimum requirement 2.14
- We recommend using the latest master build (called qgis-dev on Windows) which often offers a better experience in combination with QGEP. For Windows installation, download the [OSGeo4W Installer](#) choose *advanced installation* and install qgis-dev.

## Install QGEP plugin

- Open QGIS
- Go to Plugins
  - Manage and Install Plugins
  - Settings
  - \* Add...

- Name: QGEP
- URL: <https://raw.githubusercontent.com/QGEP/repository/master/plugins.xml>
- \* Enable *Show also experimental plugins*
- Activate the plugin (see image below):
- All
  - \* Search *QGEP*
  - \* Click the checkbox next to it

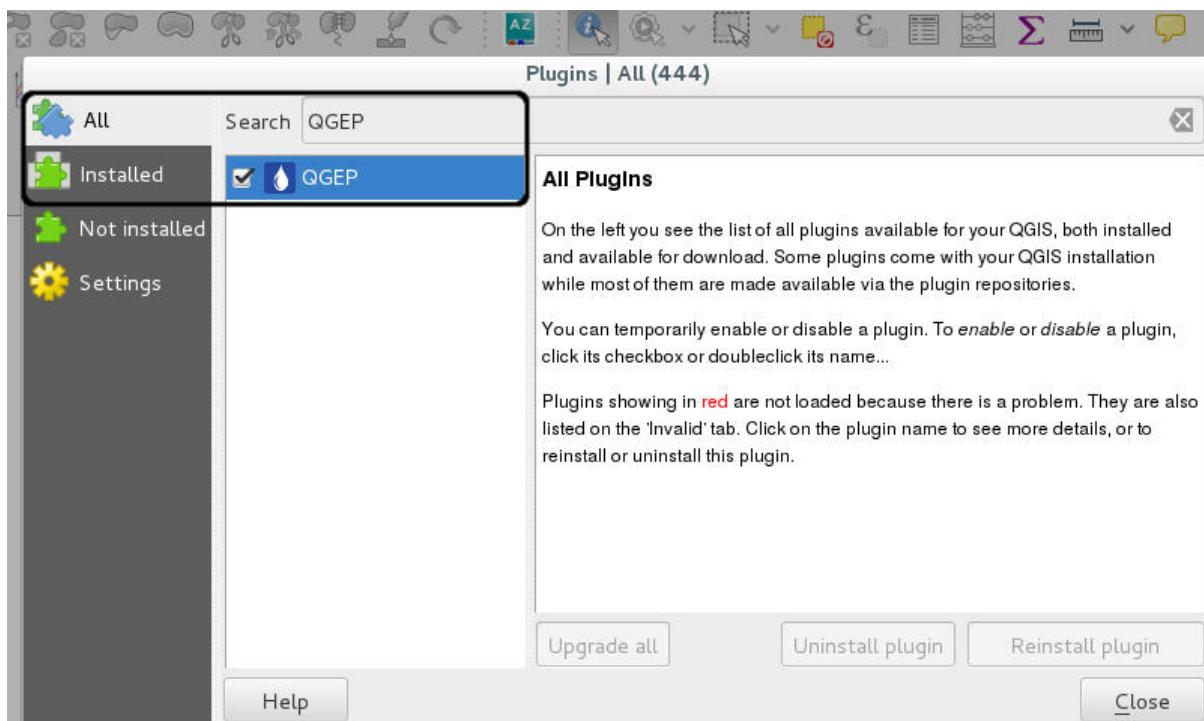


Fig. 1.1: Add the QGEP plugin

### Install the demo project

- Download <https://github.com/QGEP/data/archive/demodata.zip>
- Extract the file
- Restore the file *qgep\_demodata.backup* with pgAdminIII
- Open *project/qgep\_en.qgs* with QGIS

## 1.2 QGEP User Guide

This represents a guide on how to collect data in QGEP (digitizing), edit existing data and use various tools like length profile, network following and plan plotting.

### 1.2.1 Digitizing in QGEP

This represents a guide on how to correctly collect and digitize data of sewer networks including building the topology.

## Data entry

There are basically two ways:

- Data entry by constructing or digitizing in the QGEP GIS itself
- Data entry in an external programm or software and then importing the position and/or technical data into QGEP e.g.:
  - coordinates from manholes from measurement
  - position and/or technical data from another GIS or CAD system
  - using data from the surveyor (e.g. property boundaries) as a basis for defining catchment borders
  - other

Data entry in QGEP needs some understanding of the underlaying data model [VSA-DSS](#), but is supported with some great data collecting wizards and forms that link the different tables correctly together. Especially the linking of manholes and reaches to a complete sewer network is highly automated and can be controlled with the network following tool.

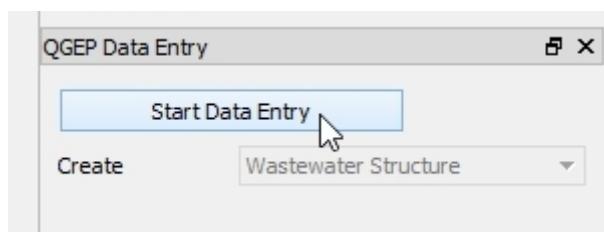
### General

When digitizing you start with the point elements (wastewater structures such as manholes, special structures). Then you can connect those with line elements (channels with reaches).

- To start with data entry select the QGEP button “wizzard”



- On the left side bottom the following window appears “QGEP Digitizing”. Click “Start Data entry”, so that you get into the edit mode

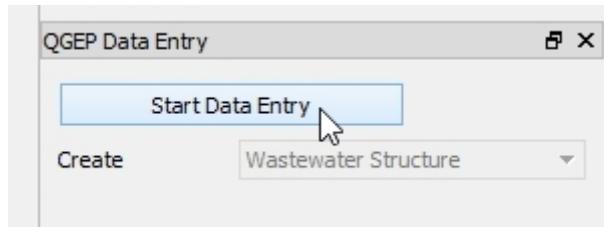


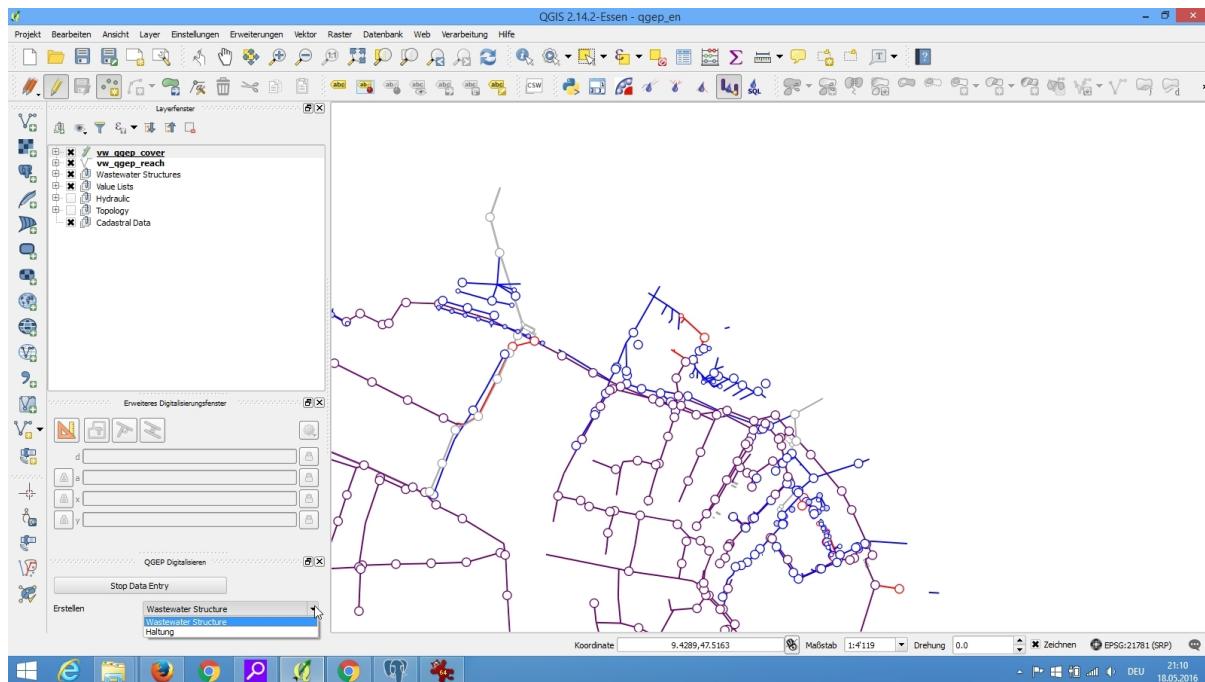
## Digitizing Waste water structures

### General

QGEP has a wizard to correctly collect manholes and special structures.

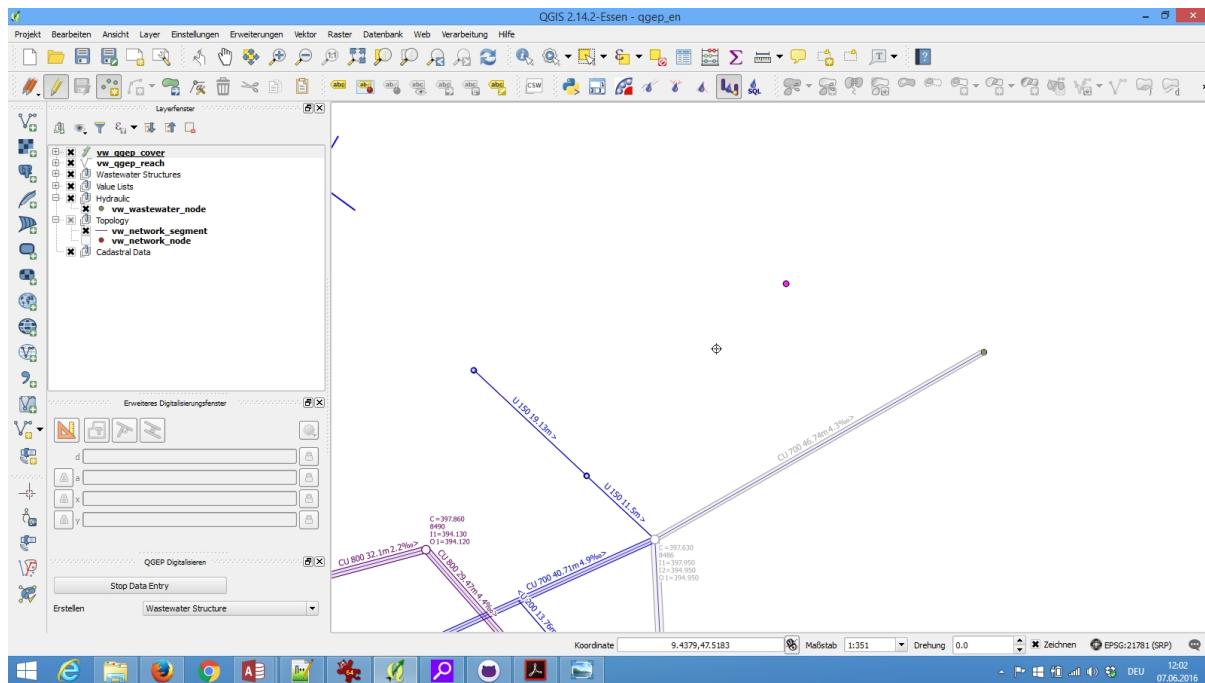
Select the “wizard” button, then click “start data entry” and choose “wastewater structure” in the pull down menu.





## Digitizing

Now the cursor changes to the digitizing symbol and you can select the location of the new point element.



Then the vw\_gep\_cover form opens and you can start adding data in the General tab:

Select the type you want [discharge\_point, infiltration\_installation, manhole, special\_structure]

Then add the identifier (this is the attribute that will be displayed on the map).

For manholes and special structures you then choose also the function [either in manhole\_function or special structure\_function] (will be automatically displayed or hidden in the future depending on ws\_type)

Add other attributes on this General Tab. Now you can click OK.





Save the information of this layer by stopping the data entry wizard



You can re-edit your point object selecting the edit mode and then click with the info cursor on the object you want to edit. If you do not select the edit mode, you can just look add the existing data.

For detailed information about editing see the edit chapter ([Editing of existing data](#)).

## Further attributes and classes

When a point object is digitized a series of steps take place in the background in the QGIS database: a) a new object in the class wastewater structure is added b) a new object in the respective subclass [discharge\_point, infiltration\_installation, manhole, special\_structure] is added and linked c) a new cover object is added and linked to the waste water structure d) a new wastewater node object is generated in wastewater network elements and its subclass wastewater nodes e) When you add additional objects such as structure parts (besides covers there are access aids, backflow prevention etc) then QGEP automatically generates the objects in the needed tables and subtables and sets the foreign keys to the waste water structure.

..(take more from GEPView-Howto 1.2. Chapter 4.1)

## Digitizing detailed geometry

### General

You can add a detailed geometry to waste water structures. This is recommended in the following cases:



- For special structures and infiltration points, because they are not normed structures like manholes, where you can define dimension1 and 2 to describe the extension.
- For infiltration installations where dimension1 and 2 are not enough to describe the geometry
- Important: Detailed geometry is usually not used for manholes or channels!

### Digitizing tool

- Select the vw\_qgep\_cover layer
- Select the object where you want to add a detailed geometry with the info tool
- Right click the object and select the vw\_qgep\_cover layer
- Choose “Digitize”
- You can now start digitizing the polygon.
- Right click to stop.

### Digitizing Drainage Channel

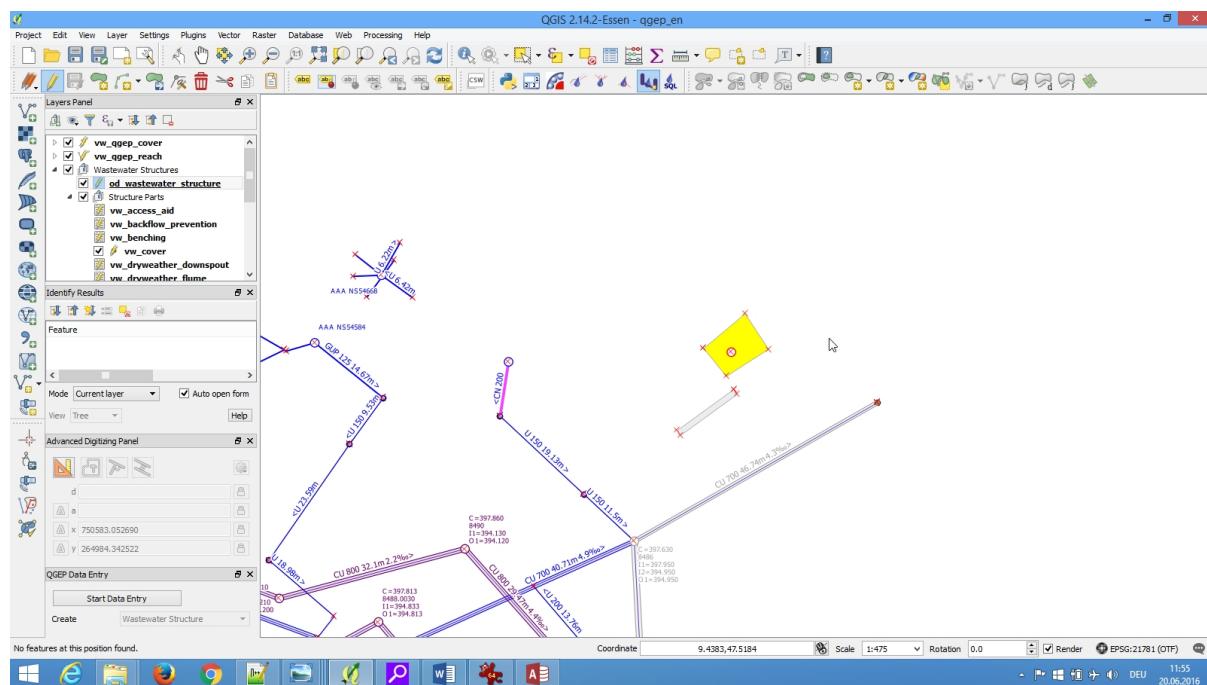
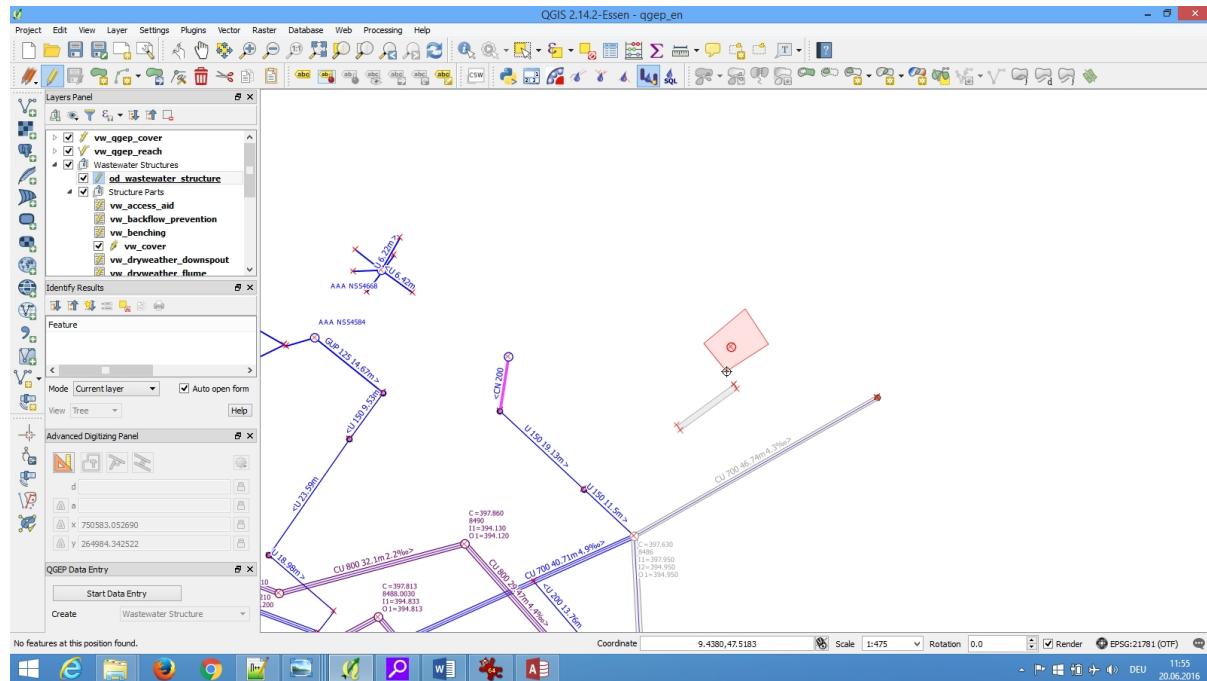
#### General

You can add a polygon to a manhole with function drainage channel.

### Digitizing tool

- Select the vw\_qgep\_cover layer
- Select the object where you want to add a geometry for the drainage channel with the info tool
- Right click the object and select the vw\_qgep\_cover layer
- Choose “Digitize Drainage Channel”
- You can now start digitizing the area polygon.



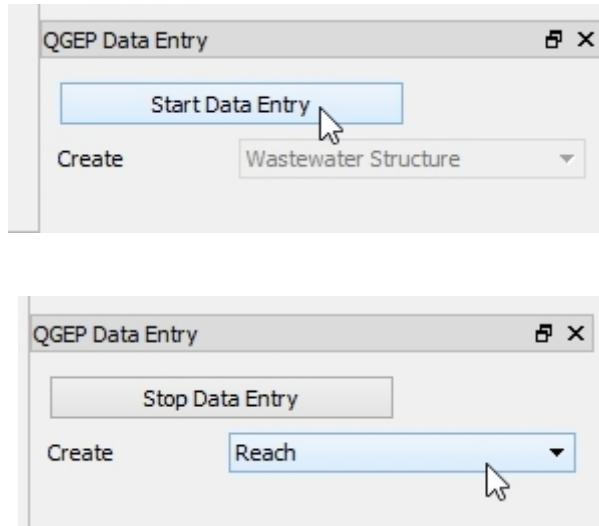


- Right click to stop.

### Digitizing Channels

#### General

QGEP has a wizard to correctly build channels and connect them to the manholes / special structures and build up the topology for waste water nodes and reaches.



Important: Start digitizing in the direction of the flow - starting with the from node and finishing with the to node / manhole.

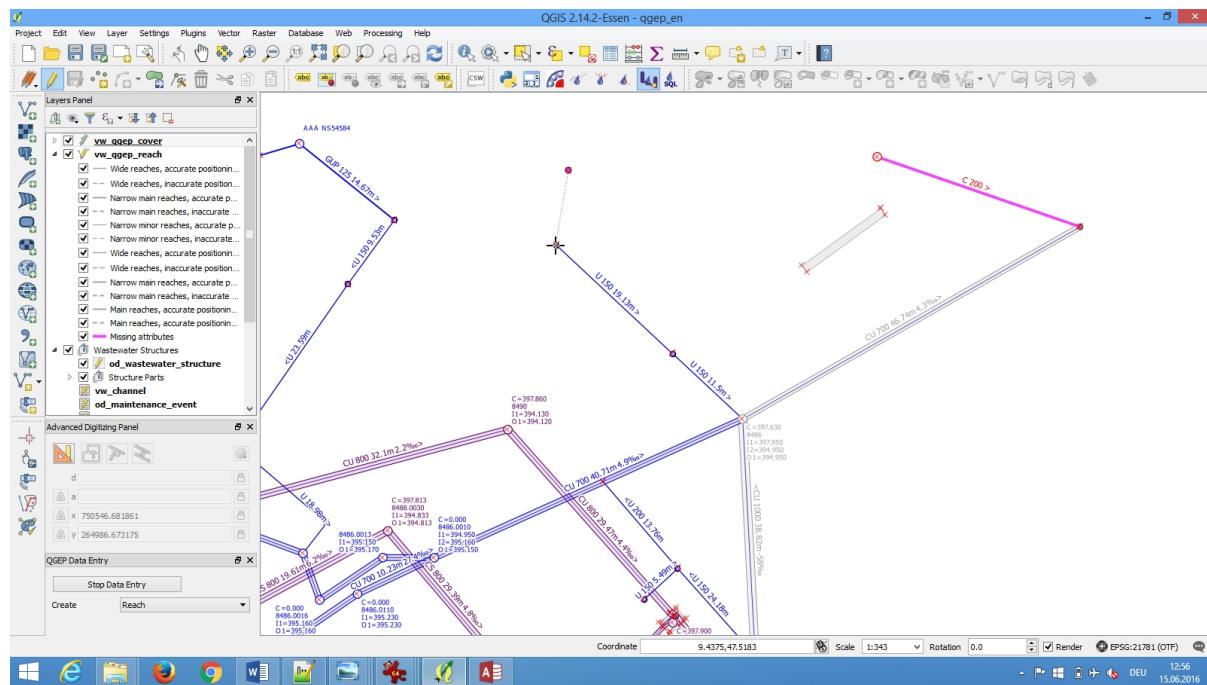
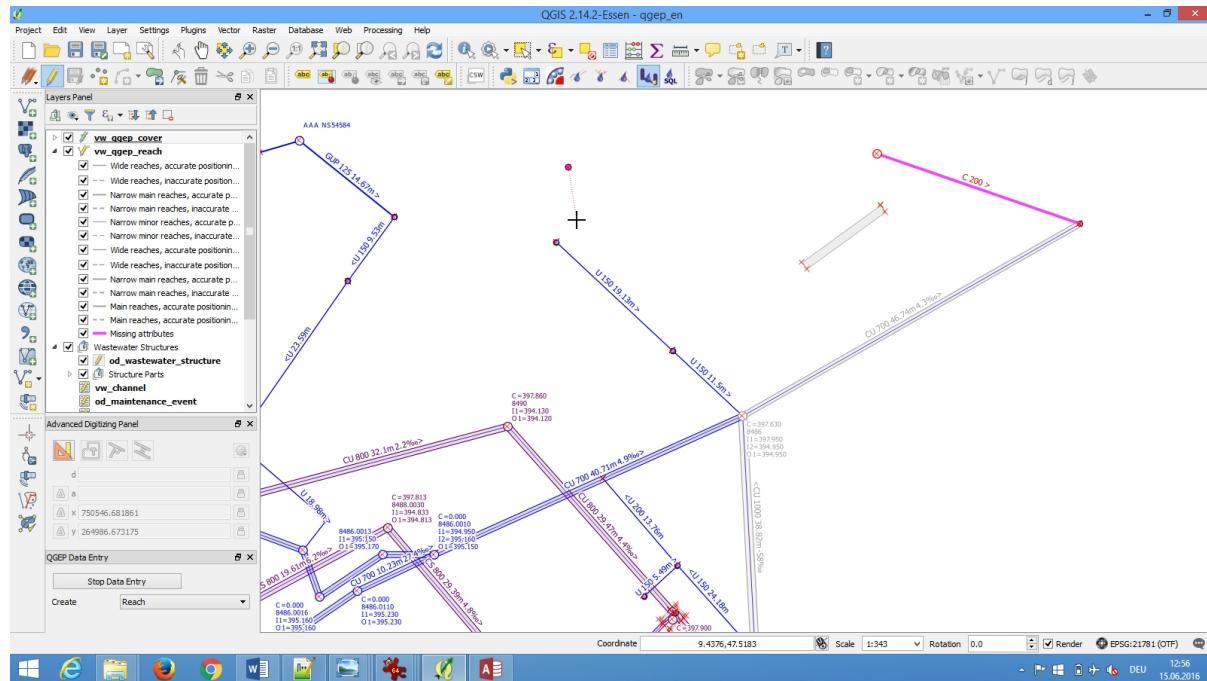
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**Nota:** There is no tool yet to change the flow direction (topology), so try to make it right from the beginning.

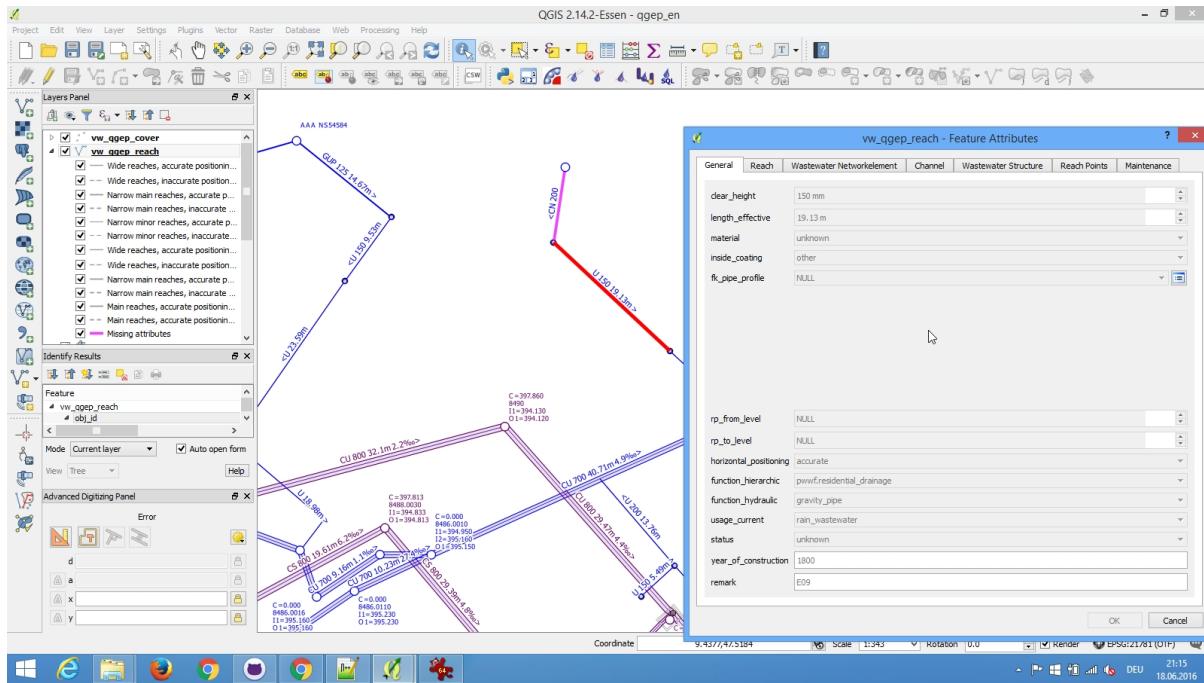
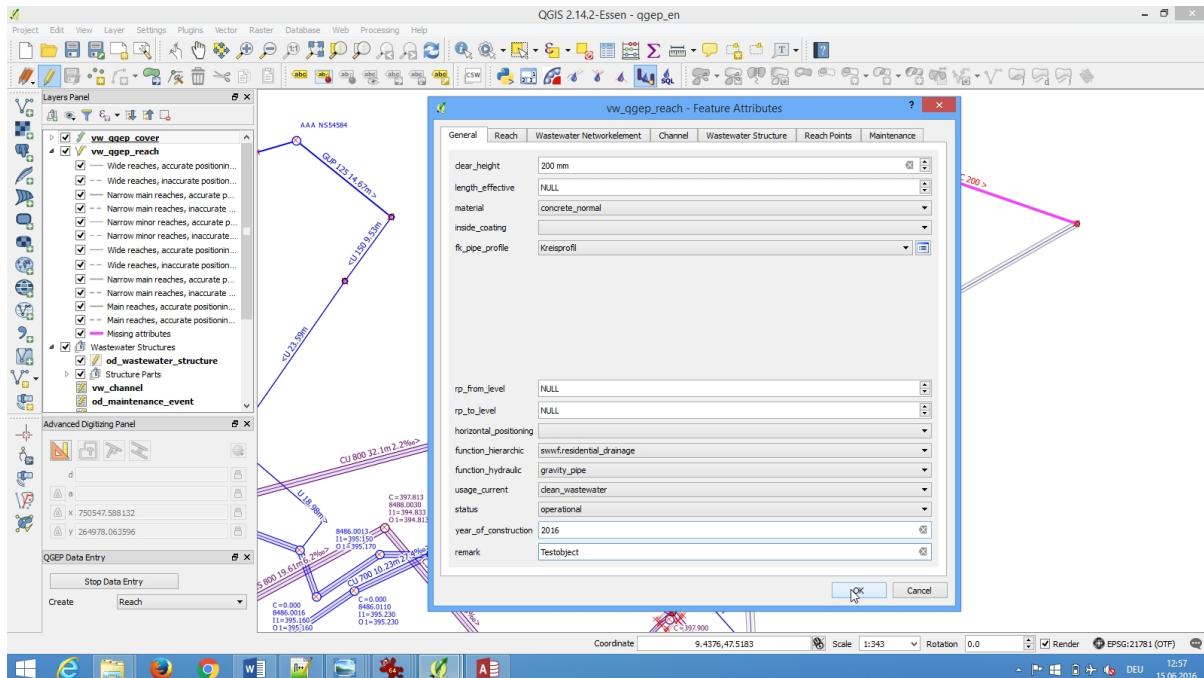
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#### Digitizing

- When digitizing the cursor will automatically snap to the nearest cover or reach. When clicking a line starts to draw.
- With further left clicks anywhere you can define intermediary points of the reach progression. Or you directly select another manhole to draw a straight channel.
- With right click you finish digitizing and the reach form will appear.
- Add the attributes on the general tab. For the profile type you will get a list of defined profiles. To edit those do so in the table pipe\_profile.
- When finished, then click the OK button.
- Save the information of this layer by stopping the data entry wizard
- You can re-edit your point object selecting the edit mode and then click with the info cursor on the object you want to edit.
- If you do not select the edit mode, you can just look add the existing data.
- For detailed information about editing see the edit chapter (*Editing of existing data*).



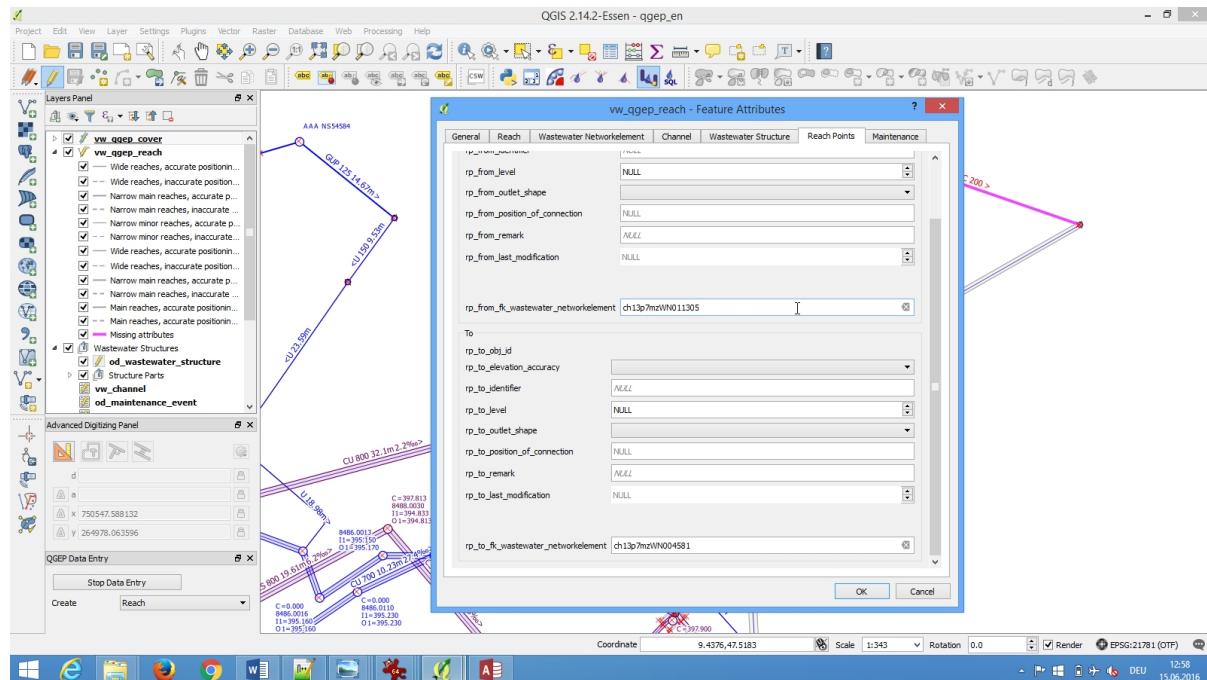




## Further attributes and classes

When a line object is digitized a series of steps take place in the background in the QGIS database:

- a new object in the class wastewater structure is added
- a new object in the subclass channel is added and linked
- two new reach point objects are added and linked to the reach (rp\_from, rp\_to\_node)



- a new reach object is generated in wastewater network elements and its subclass wastewater nodes

## TO DO Documentation

- Kanal/Haltung (Digitalisierrichtung, Schnappen)
- Weitere verknüpfte: Eigentümer, Rohrprofil, Hydraulische Geometrie, Hydraulische Einbauten
- evtl. Verknüpfungen erfassen
- take more from GEPView-Howto 1.2. Chapter 4.2)

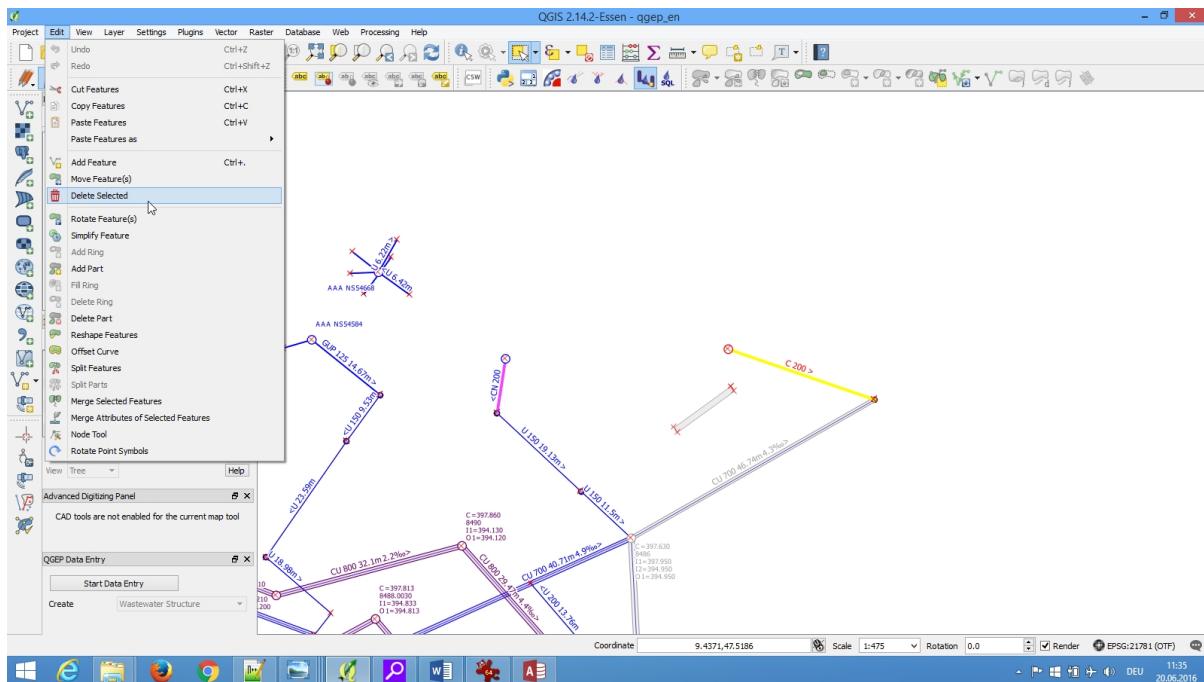
## Deleting objects

You can delete point or line objects through the vw\_qgep layers (cover / reach) with all associated objects. Or you can pick a specific object and only delete that one (e.g. cover)

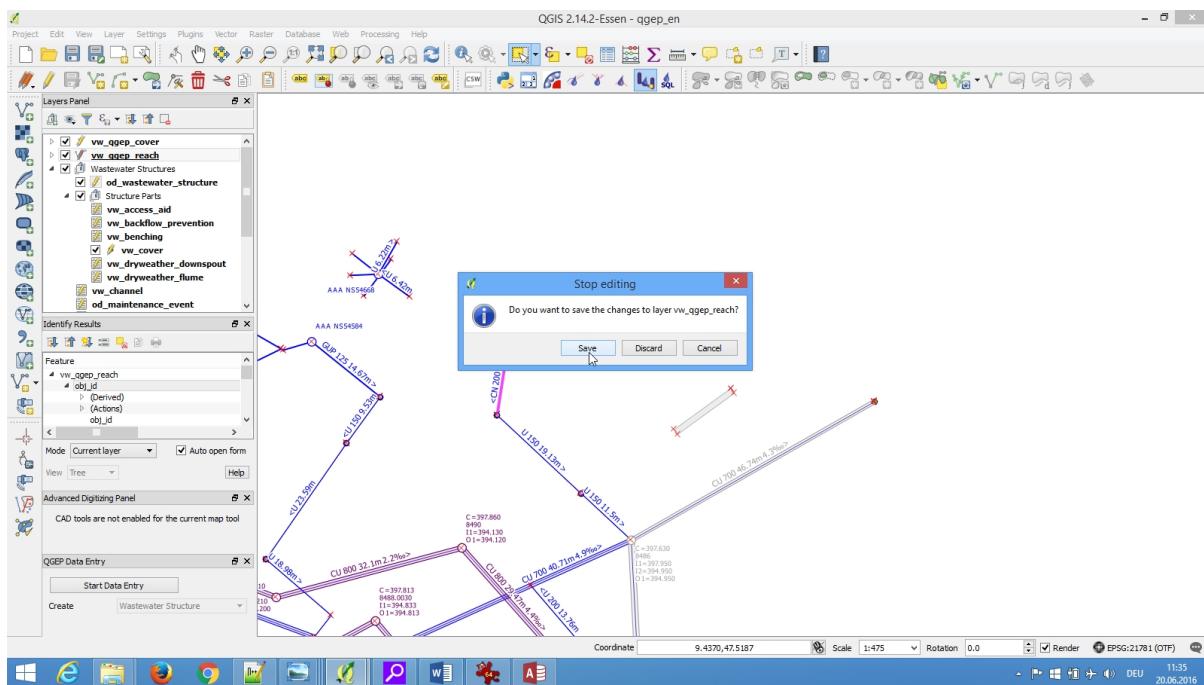
### Delete Reaches

- Select vw\_qgep\_reach and change to edit mode
- Select the reach(es) you want to delete. You can click on an object or draw an area





- Use Menu / Delete Selected to delete.
- Deselect the edit mode and confirm changes to layer. All changes will be saved to database.

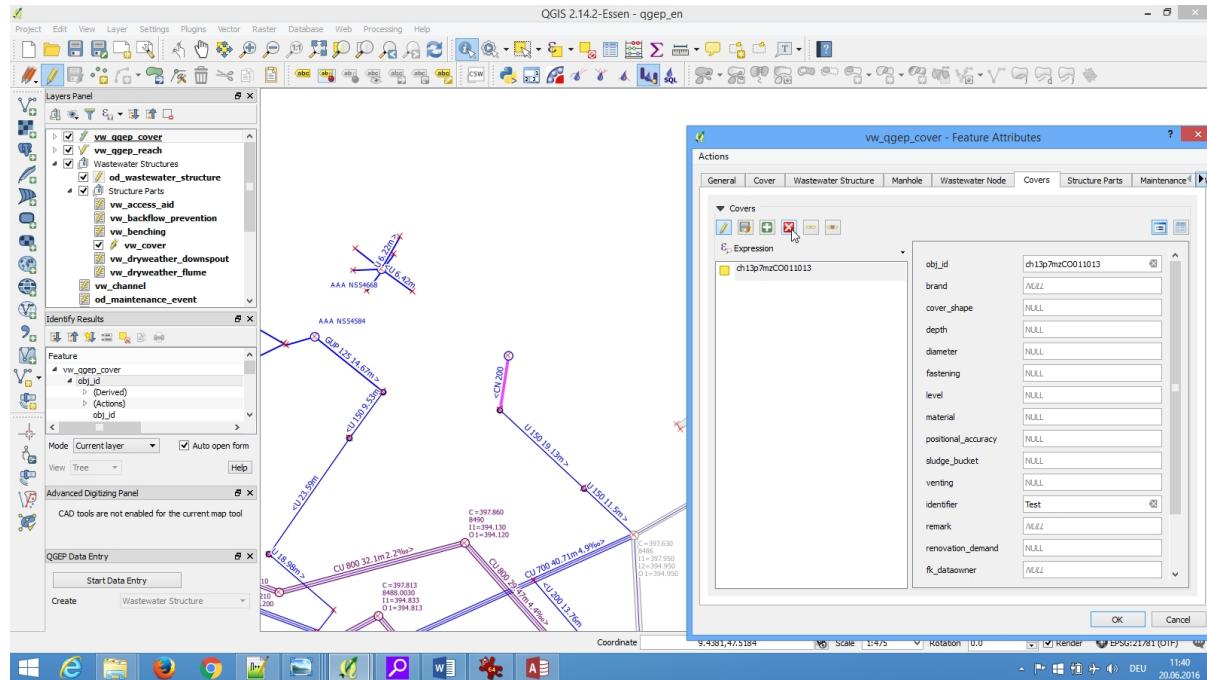


## Delete Manholes and other Waste water Structures

- Select vw\_qgep\_cover and change to edit mode
- Select the objects (manholes, special structures etc) you want to delete
- Use Menu / Delete Selected to delete.
- Deselect the edit mode and confirm changes to layer. All changes will be saved to database.

## Delete Covers

- Select vw\_qgep\_cover and change to edit mode
- Select the object (manholes, special structures etc) you want to delete the cover
- Use the info tool to open the form
- Switch to the covers tab
- Select the cover(s) you want to delete
- Click the red x button to delete the covers



- Click save on the form
- Deselect the edit mode and confirm changes to layer. All changes will be saved to database.

## Delete Structure parts

- Select vw\_qgep\_cover and change to edit mode
- Select the object (manholes, special structures etc) you want to delete the cover
- Use the info tool to open the form
- Switch to the structure parts tab
- Select the structure part you want to delete
- Click the red x to delete the covers
- Click save on the form
- Deselect the edit mode and confirm changes to layer. All changes will be saved to database.

## Digitizing Catchment Areas

### General

Catchments can be digitized with QGIS standard tools.



They should not overlap. So enable the ‘Advanced digitizing toolbar’ in the View/Toolbars Menu

### Digitizing

- Set the layer ‘od\_catchment\_area’ into the edit mode.
- Use the ‘add feature tool to digitize a new area.
- Select the ‘Enable tracing’ button before starting to digitize
- TO DO - add next points

### Editing

- With ‘identify features’ you can edit existing areas.

## 1.2.2 Editing in QGEP

This represents a guide on how to add and edit data in QGEP.

### Editing of existing data

This represents a guide on how to edit existing data in QGEP.

### Demo project

- Make sure you have imported the demo project with pgAdminIII (*Database initialization*)
- Open the demoproject with Menu Project/Open
- Login to the database
- You should now have the demoproject loaded
- The project consists of different layers. Depending on your task what to edit or add you choose the layer.

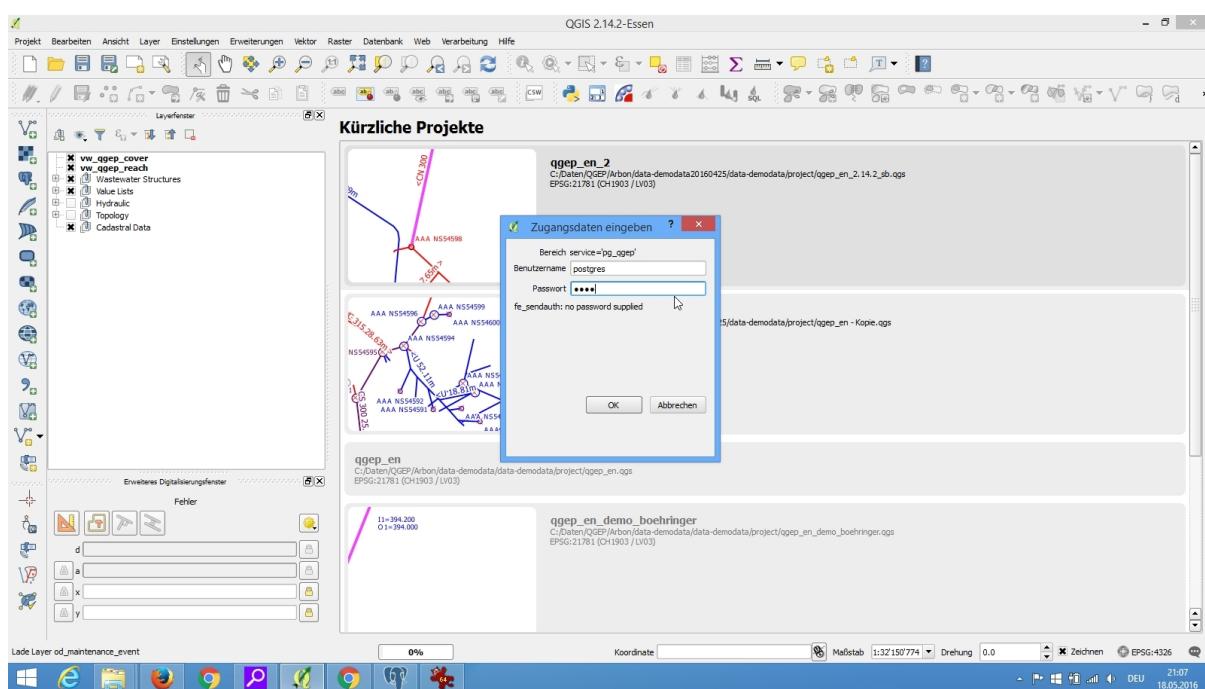
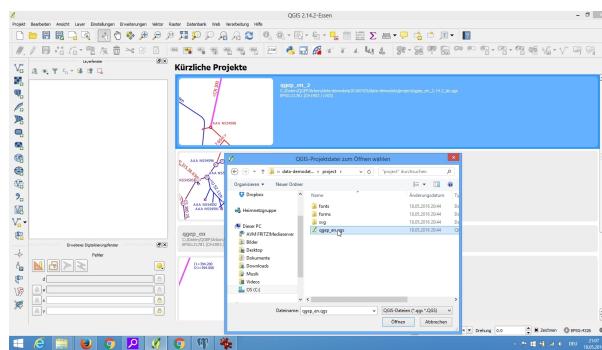
### Layers

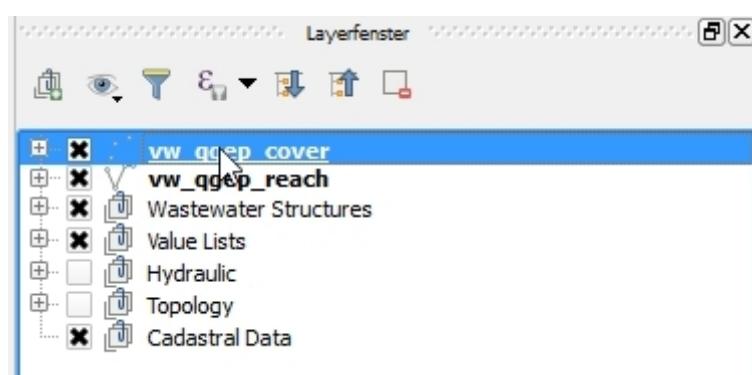
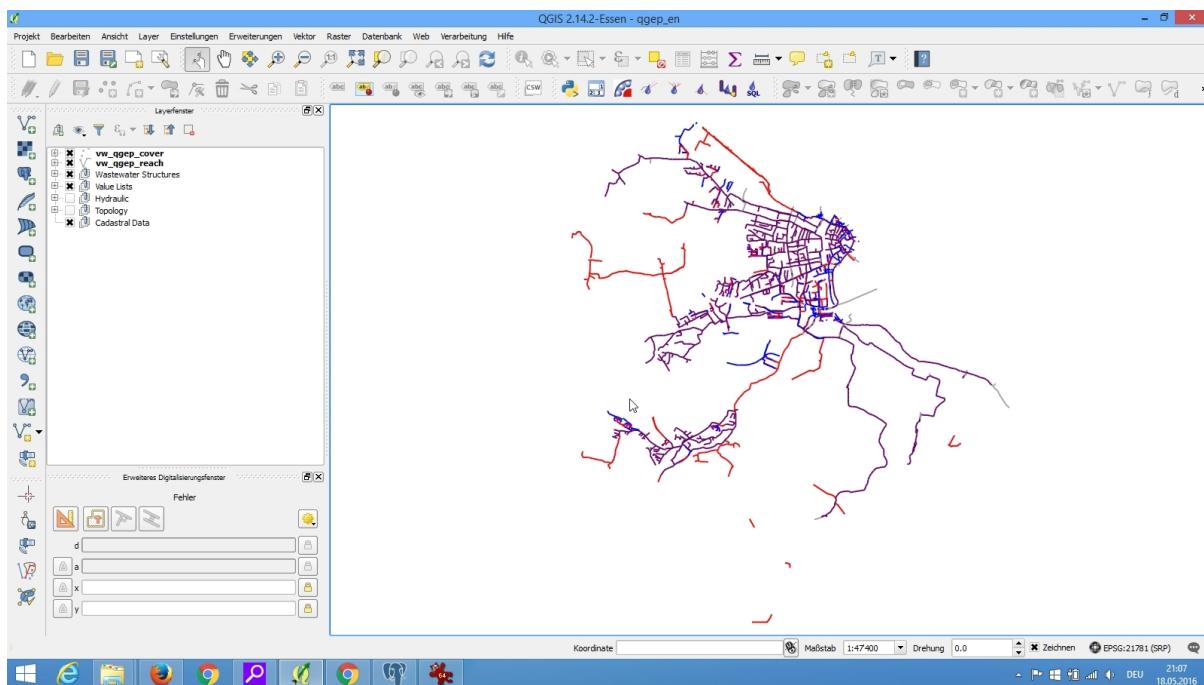
- QGEP has different predefined layers:

### Layer vw\_qgep\_cover

- The layer vw\_qgep\_cover allows to edit all point elements. This are the wastewater structures such as manholes, special structures, discharge points and infiltration installation (not supported yet are wwtp\_structures, which is also a wastewater structure), but not the channels.







## Layer vw\_qgep\_reach

- The layer vw\_qgep\_reach allows to edit all linear elements of the wastewater network (reaches / channels).

## Layer Waste water structures

- This layer contains various sublayers related to the waste water structure. It also contains links to the mainntenance events, the relation table between waste water structures and maintenance events and the organisation table (where owners, dataowners, etc. are stored)

## Layer Value lists

- Here you can see various value lists that are related to the sewer network classes.

## Layer Hydraulic

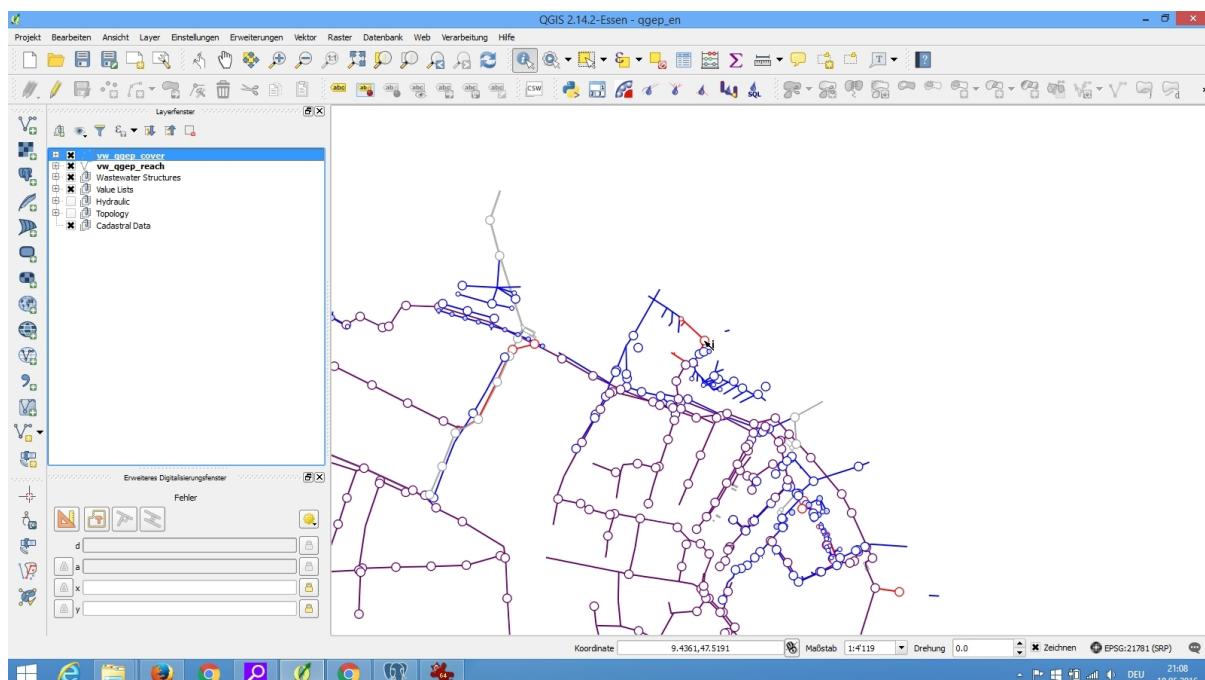
- This layer allows to select and edit waste water nodes. Select the layer, then choose the info tool and double click on a node.

## Layer Topology

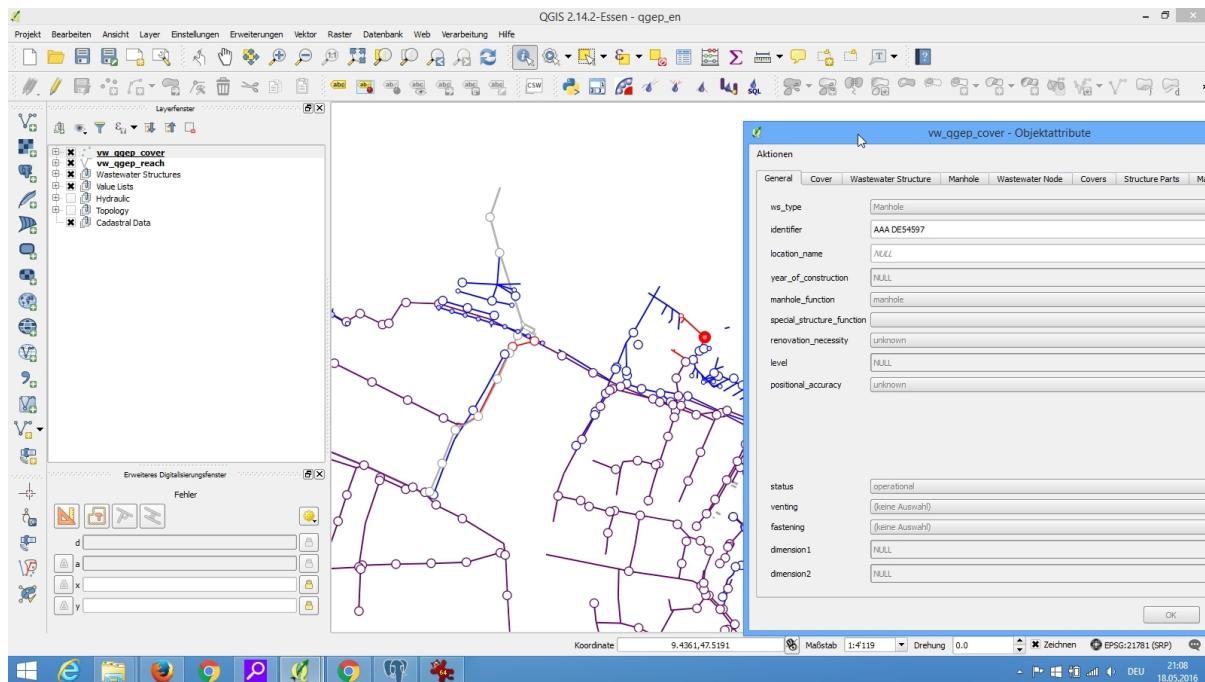
- Here you can find all needed information about the topology of the network

### Changing attributes of point elements (manholes / special structures)

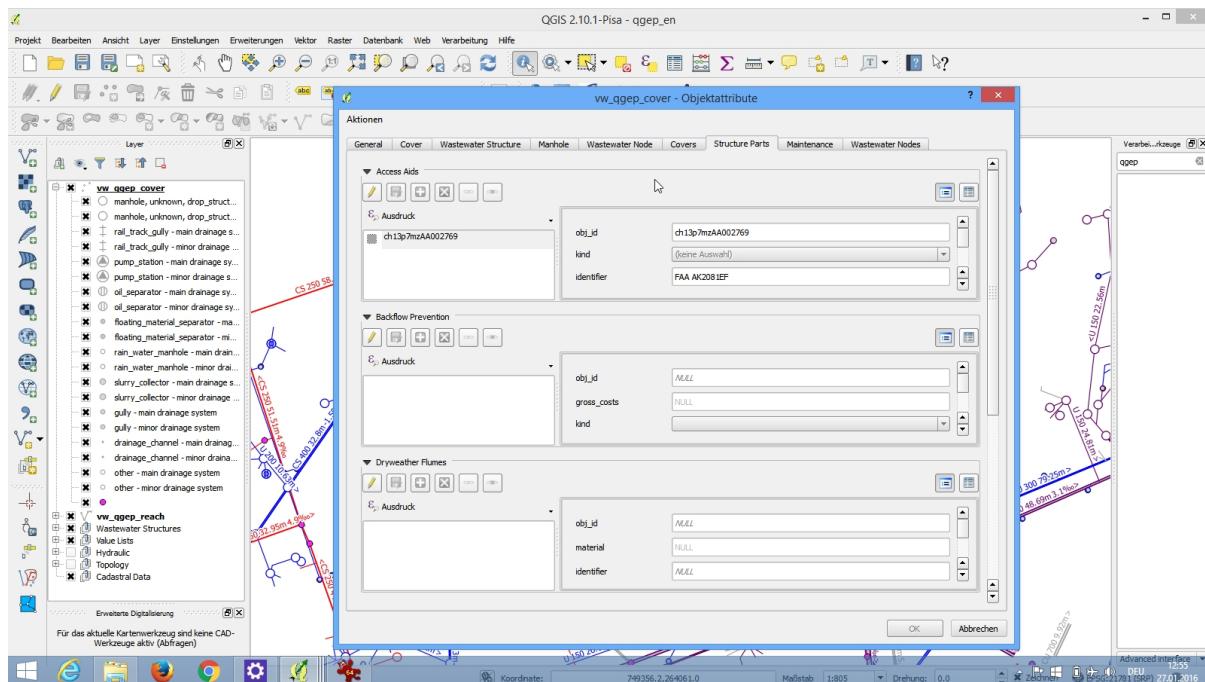
- To change an attribut first select the vw\_qgep\_cover layer and switch to the edit mode
- Or start the QGEP Wizard and click on Start Data entry
- Then click on the info button and choose the element you want to edit by double-clicking



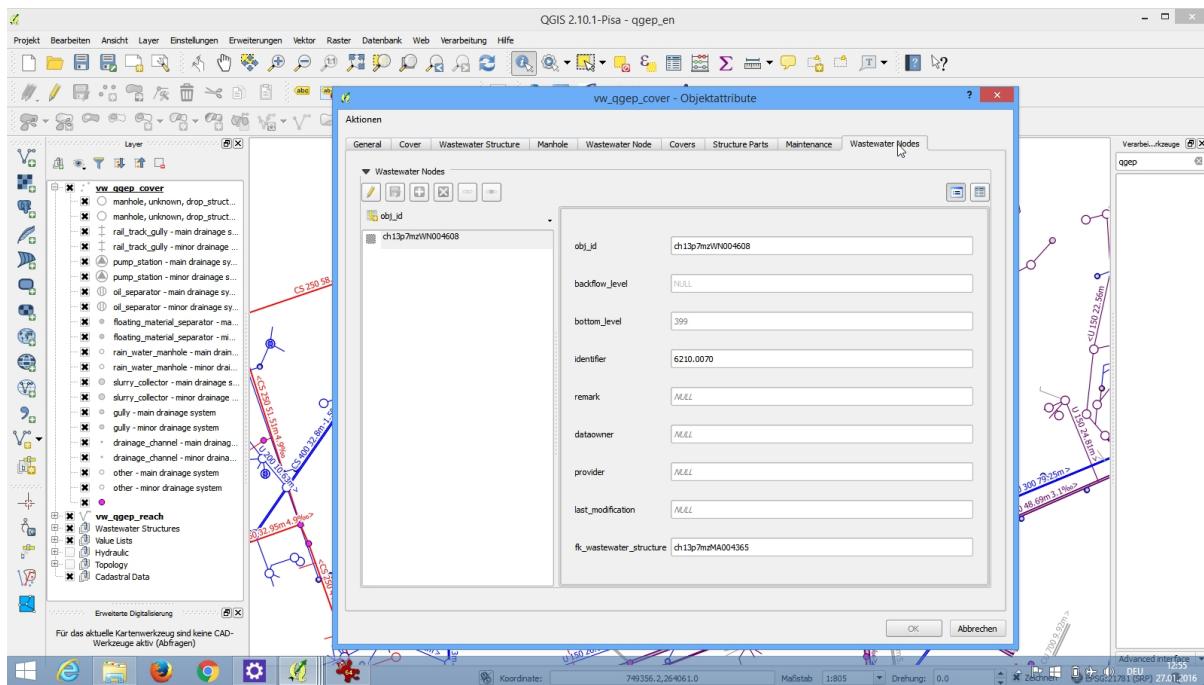
- The form of the vw\_qgep\_cover will open
- On the first tab you can change the most common attributes



- To change attributes of related tables such as the cover select that tab. Depending on the kind of wastewater structure you can edit additional attributes in the respective tab (special structure, manhole).
- The tab “covers” allows you to add additional covers.
- In “Structure parts” you can add also further parts such as acces aids, backflow prevention, dryweather flume etc.

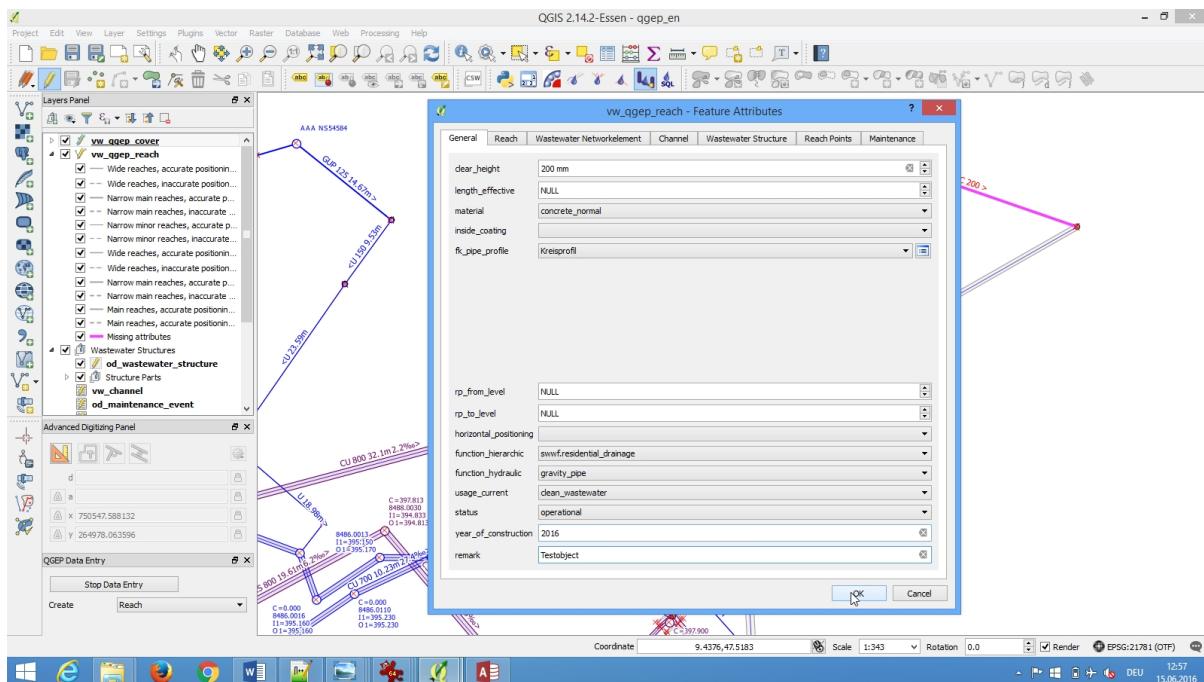


- In “Wastewater nodes parts” you can edit or add all attributes of this class or add a second element

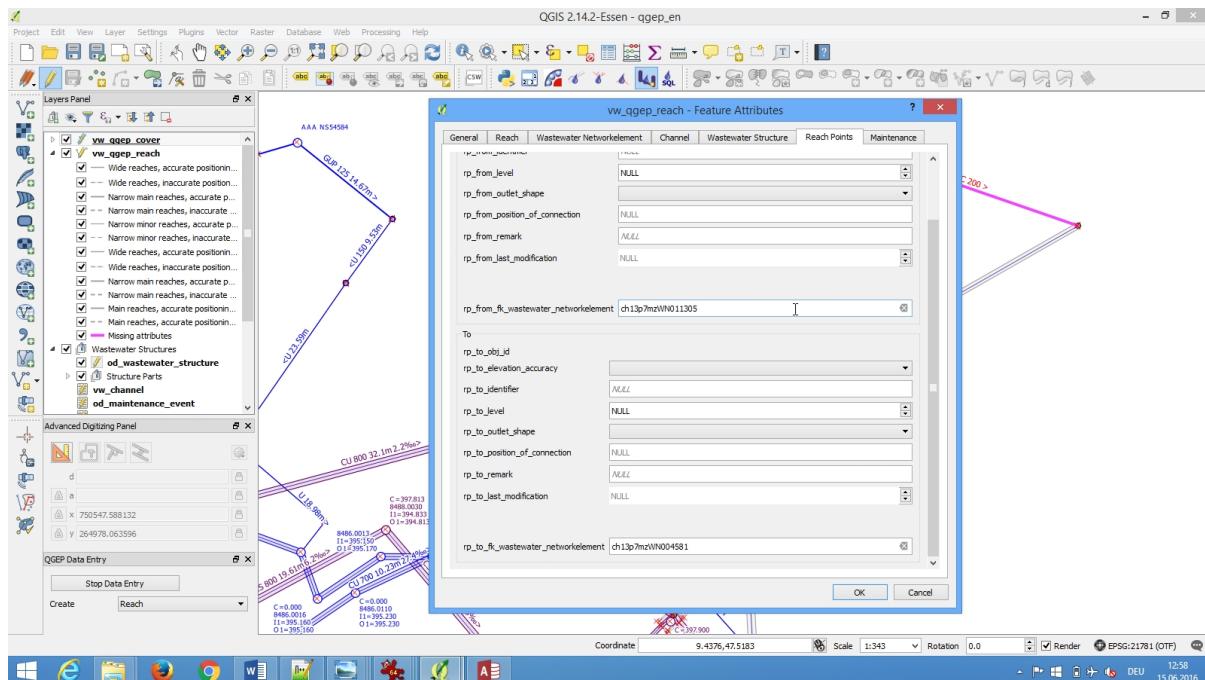


### Changing attributes of linear elements (channels)

- To change an attribut first select the `vw_qgep_reach` layer and switch to the edit mode
- Then click on the info button and choose the element you want to edit by double-clicking a channel
- The form of the `vw_qgep_reach` will open

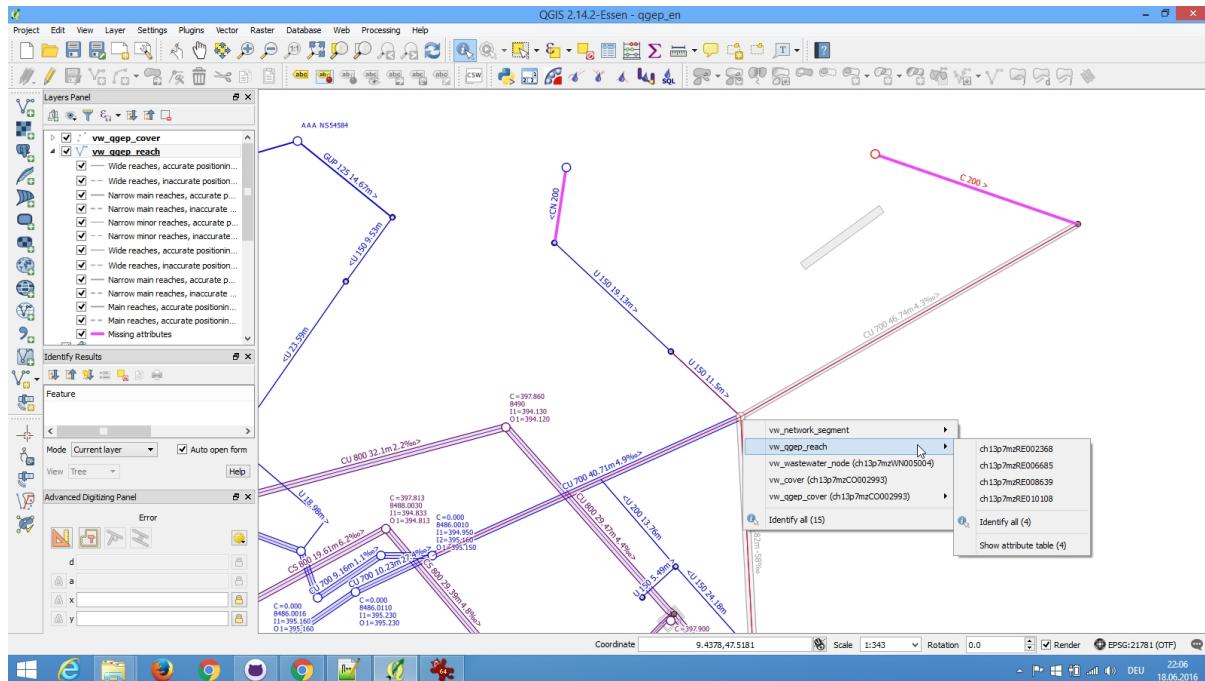


- On the first tab you can change the most common attributes
- To change attributes of related tables e.g. such as reach points select that tab.



## Changing attributes of hydraulic elements

- If you right click on an element, you get a selection of all existing objects



- You then can select the object you want and you will get the respective form to see the details.

## Saving changes

- Click save and then deselect the edit mode or click on stop data entry, if you have worked with the QGEP Data entry Wizard.

**..\* TO DO:**

- Changing relations (Verknüpfungen ändern)
- Change ws\_type (Subklasse eines Abwasserbauwerkes ändern (ObjektID ändert dann auch!))
- Split channels into different reaches (Kanäle unterteilen)

Link to the Homepage of the Swiss Waste Water Association - Datamodel VSA-DSS:

### **Moving Covers with Reaches and Wastewater Nodes**

This represents a guide on how to move covers with reaches and wastewater nodes compared to just moving the cover in QGEP.

#### **General**

- This feature allows to move the whole manhole or special structure with all the connected reaches and wastewater nodes.
- In comparison you can also only move the cover or the wastewater node

#### **Moving**

- See [this video tutorial](#) to see the details and compare:

### **Adding or Editing of Maintenance Events**

This represents a guide on how to add or edit maintenance event data in QGEP.

#### **General**

- Maintenance events can be connected only to one structure or to many. Therefore QGEP uses a intermediary RE\_table to model the n:m relationship (re\_maintenance\_event\_wastewater\_structure)

#### **Adding (for single events that just belong to one structure)**

- Enable the edit mode
- With the ‘Identify Features Tool’ you can select Manholes or Reaches, depending which layer you selected (vw\_qgep\_cover or vw\_qgep\_reach).
- The respective form will open - change to the tab Maintenance Event
- Create a new maintenance event
- Or link with an already existing maintenance event
- Close the form with OK and turn off the edit mode to save changes

#### **Adding (for many events that can belong to many structures)**

- to do



## Editing

- Do as described in adding - but just edit existing maintenance events.

## Connect Wastewater Network Elements

This represents a guide on how to connect wastewater network elements in QGEP.

### General

- QGEP has a tool to connect wastewater network elements



### Connecting

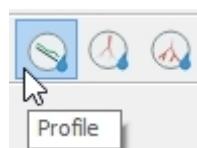
- See [this video tutorial](#) to see how it works:

## 1.2.3 Length profiles

This represents a guide on how to choose a section and display a length profile.

### General

QGEP has a unique function to display lenght profiles. Choose the lengt profile button to start.



The lenth profile window opens

Select the vw\_qgep\_cover layer to select a start point.

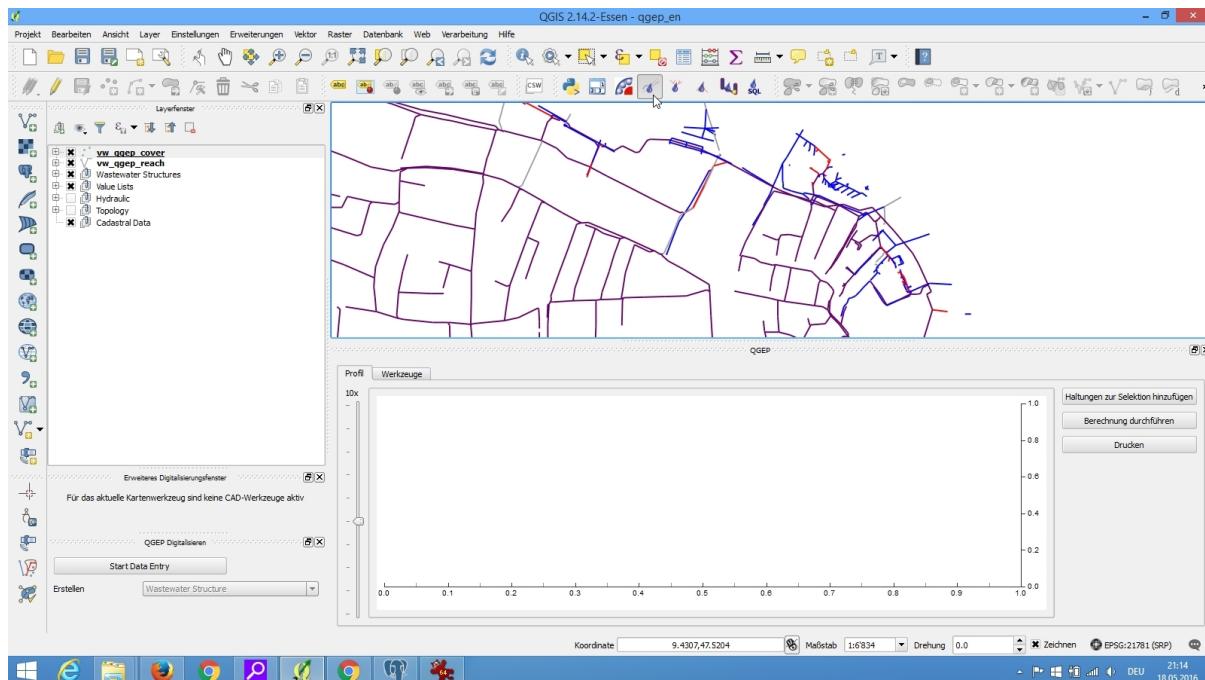
Then select a next manhole - it is not needed to be the direct next one. The tool automatically selects the manholes in between. You can repeat this several times. If there is no continuity you will get a warning. Right click to finish your selection.

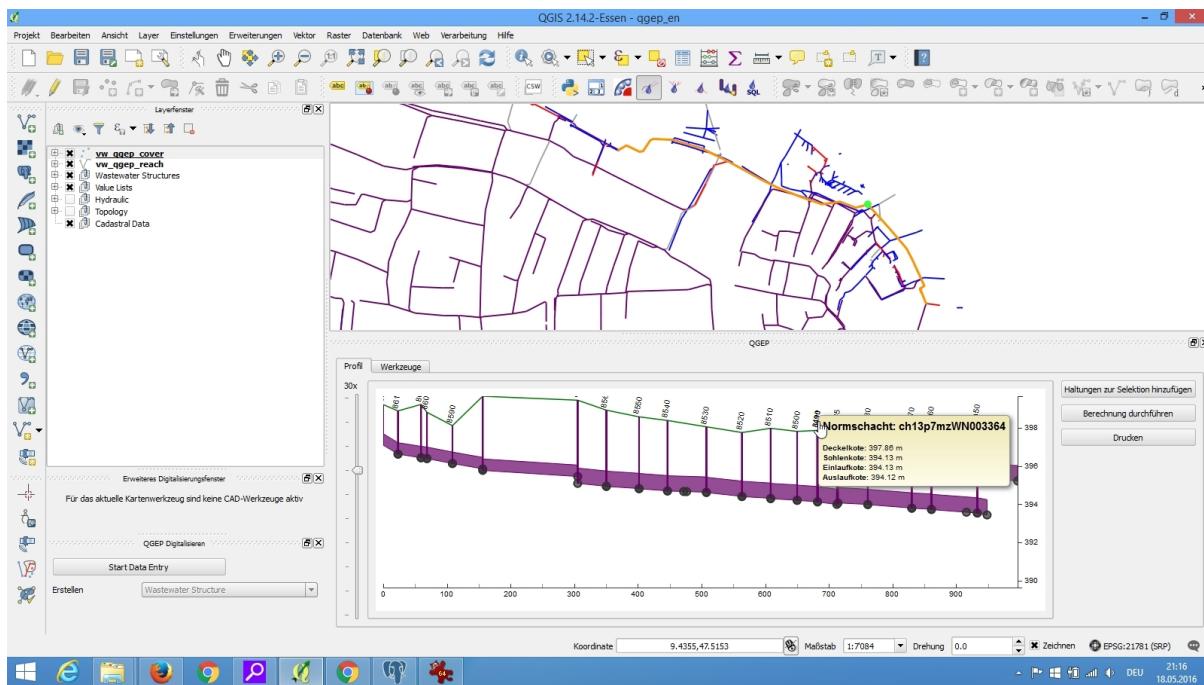
In the profile window you now have the length profile. You can see detail info about manholes. When hovering, you can see with a green highlighting the manhole you currently touch.

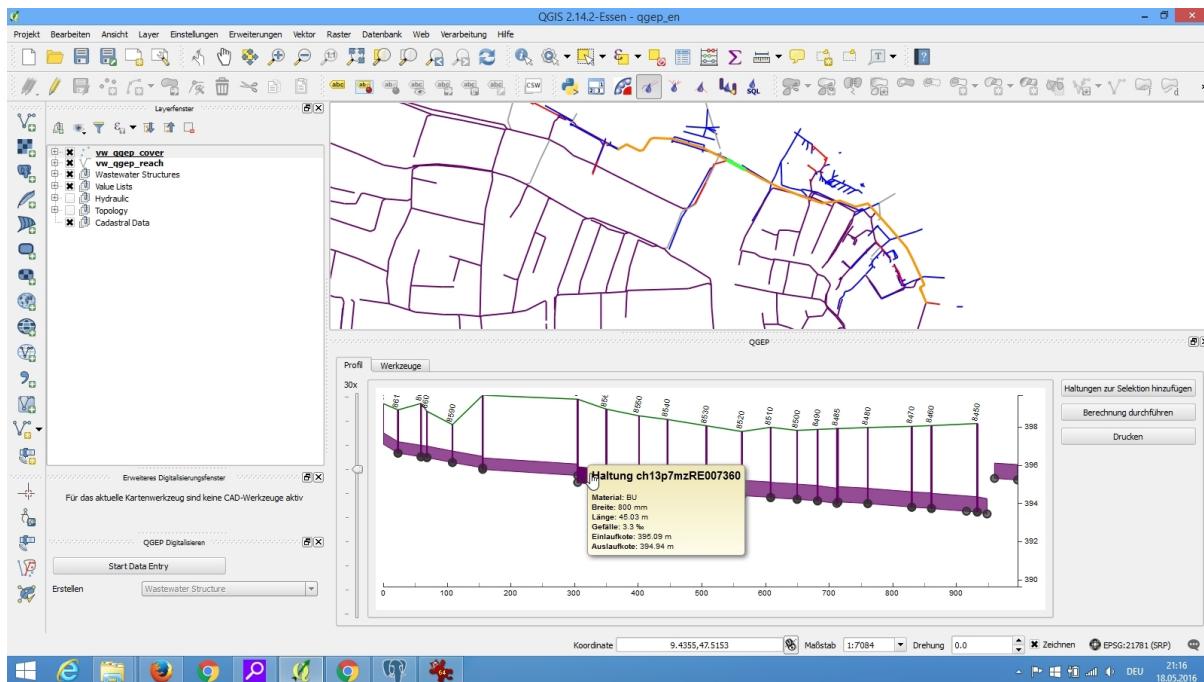
The same is also implemented for reaches

### Printing

Select the print button to send the profile to your selected printer. If you have installed a pdf Printer you can save it as Adobe pdf File.







### 1.2.4 Network following tools

This represents a guide on how to use the network following tools in QGEP.

#### Downstream

- To start downstream network following select the QGEP button “downstream”



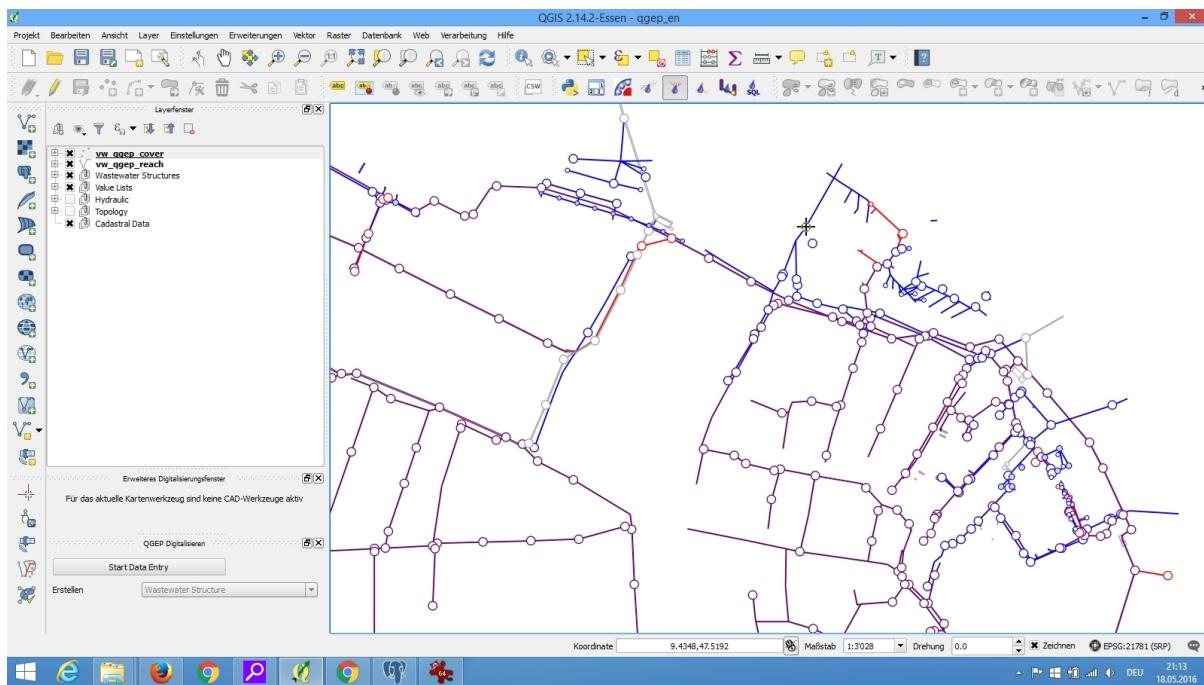
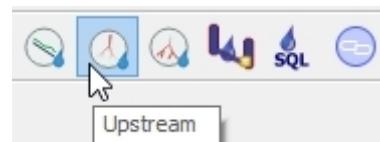
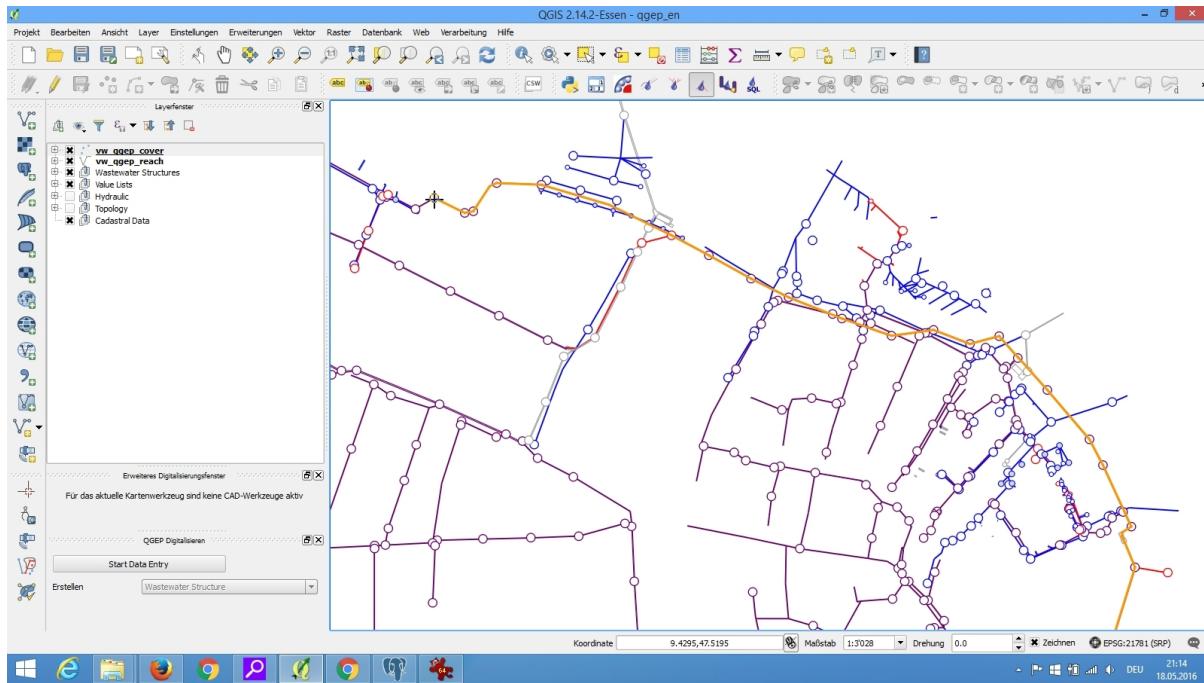
- After a few seconds all downstream reaches will be highlighted and you can see, where the water is going to.
- Use this to check whether the topology of your network is correct. Or to find out, where you could intervene in case of an accident.

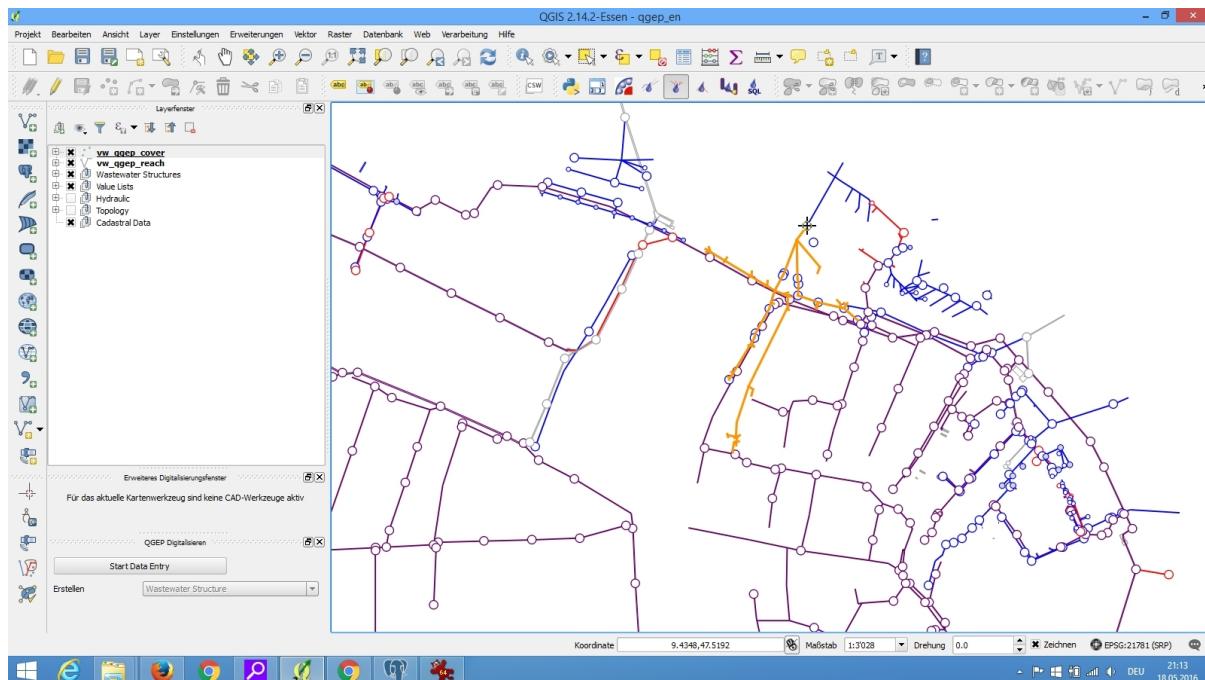
#### Upstream

- To start upstream network following select the QGEP button “upstream”.
- Then select the manhole.
- After a few seconds all upstream reaches will be highlighted and you can see, where the water is coming from.
- Use this to check whether the topology of your network is correct.

### 1.2.5 Plan plotting

This represents a guide on how to do plan plotting in QGEP.





## General

- You can define a title page and legends
- You can define, maintain and do serial plotting (“Rahmenpläne”)

For further instructions see [QGIS manual Creating Detailed Maps with the Atlas Tool](#)

## 1.3 Admin Guide

This represents a guide on how to administrate the database, install a Virtual machine, import and export data

### 1.3.1 pgAdmin

PgAdminIII is a Desktop tool that permits to access and manage the database server. This chapter represents a guide on how to do basic PostgreSQL management using pgAdmin.

#### Install pgAdmin

##### Windows

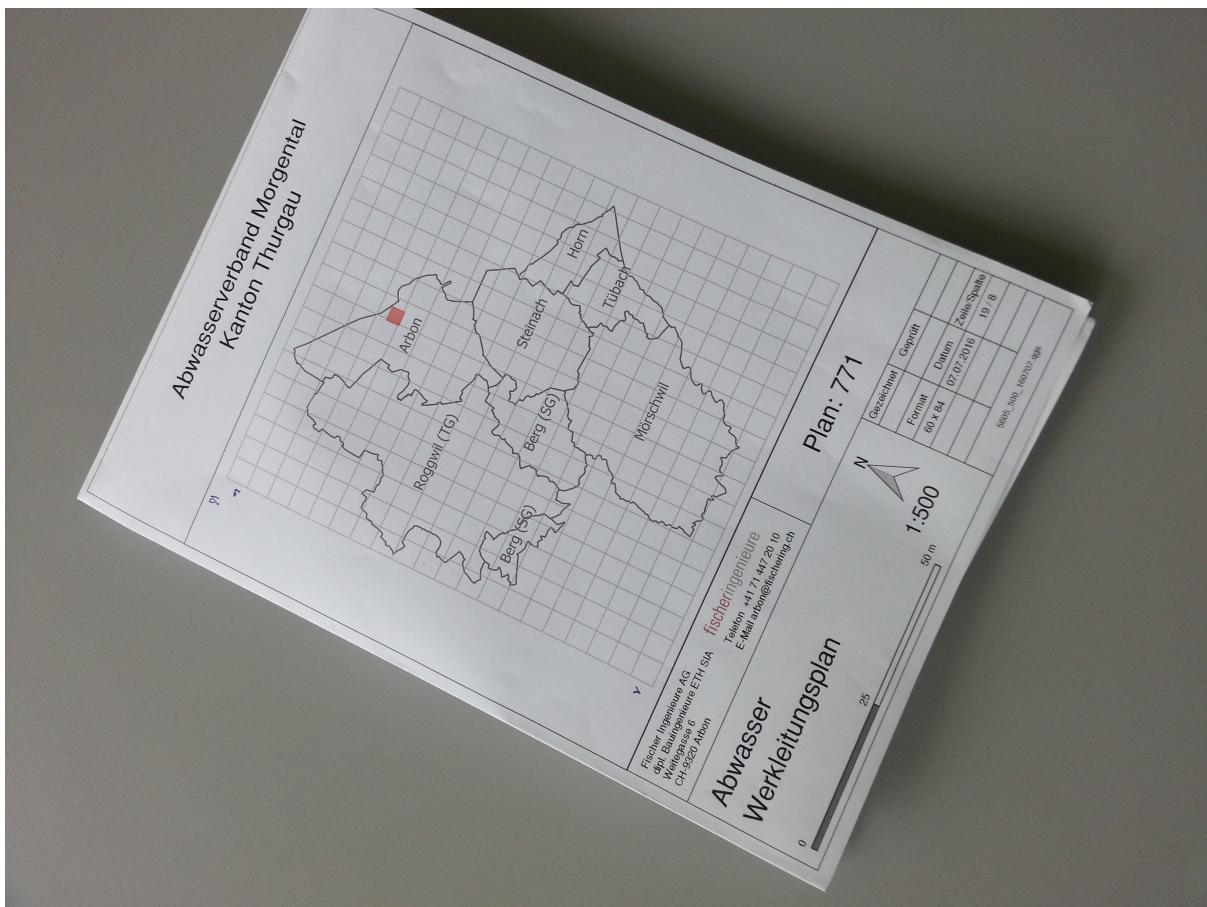
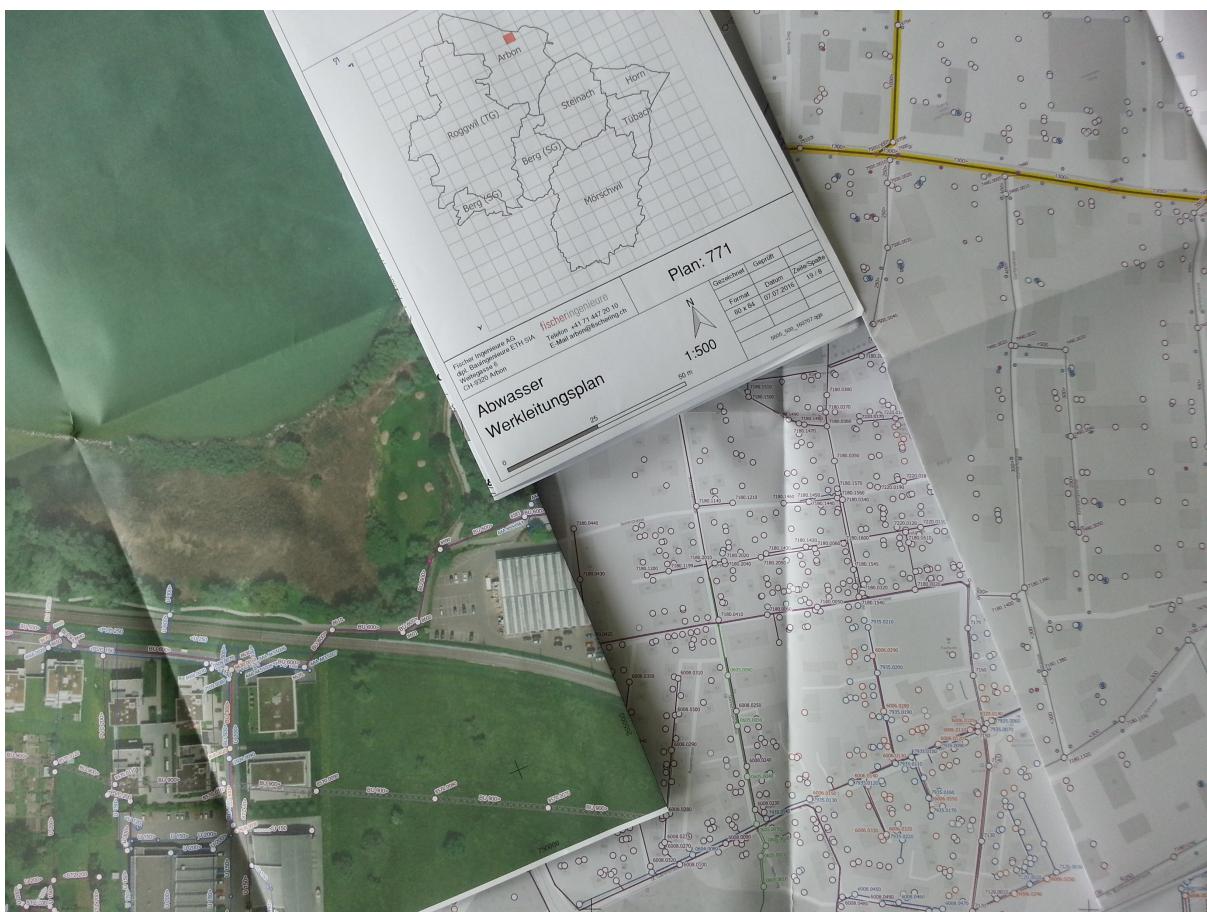
pgAdmin should be automatically installed if you used the EnterpriseDB installer.

##### Linux

**Debian/Ubuntu based distros** You can install pgAdmin by running the following command:

```
sudo apt-get install pgadmin3
```

**Fedora based distros** sudo yum install pgadmin3



**Suse based distros**    `sudo zypper install pgadmin3`

---

**Nota:** All the commands presented above assume that you are logged in as a user with sudo (admin) privileges. On certain systems it may be required to use the command `su` to become the `root` user and then issue the above command without the `sudo` prefix.

---

### Using Pgadmin

#### SQL query

```
.. figure::: images/001_roles.jpeg
```

#### Running SQL commands in PgAdminIII

---

**Nota:**

- Clicking the highlighted icon at location 1 opens the SQL Window. The SQL icon is active only when you're connected to a database.
  - Clicking the icon at 2 runs the written SQL commands.
- 

#### Database dump

---

**Nota:**

- Open pgAdminIII and connect to the database
  - Right click the Schema that you want to backup (in the tree structure below “Schemas”)
  - Enter the filename where the dump should be stored
  - Check the following options
- 

```
.. figure::: images/Screenshot-from-2015-01-22-102152.png
.. figure::: images/Screenshot-from-2015-01-22-102155.png
.. figure::: images/Screenshot-from-2015-01-22-102159.png
.. figure::: images/Screenshot-from-2015-01-22-102218.png
```

---

**Nota:**

- After running the process, the exit code 0 indicates that everything went ok
- 

```
.. figure::: images/Screenshot-from-2015-01-22-102222.png
```

### 1.3.2 Demo Virtual Machine

This represents a guide on how to download and install a virtual machine (VM) that has a working QGEP installation with a preinstalled demo dataset.

#### About

The VM is based on Debian Jessie with Cinnamon Desktop.

Installed software:

- PostgreSQL 9.4.4 with Postgis 2.1.7
- QGIS Master 2.11

Settings that are changed from a default software install:

- pg\_hba.conf has **trust** for local connections
- QGIS is setup with **multithreaded rendering enabled**
- QGIS is setup with **postgres server side expression compiler enabled**

---

**Nota:** The users `web` and `root` have the password `qgis`

---

**Nota:** If you decide to use the VM in production, it is recommended to:

- change the passwords
- regenerate the ssh keys by running in a terminal `sudo rm /etc/ssh/ssh_host_*` && `sudo dpkg-reconfigure openssh-server`

## Install

### Download

Download the vm from here

---

**Nota:** The size of the VM is around 2GB compressed and around 7GB uncompressed.

---

### Extract

The virtual disk is archived using XZ compression.

To extract the archive:

- **Windows:** you can use [7-Zip](#) to extract the archive.
- **Linux:** cd to the download directory and run `xz -d qgisplatform.vdi.xz`

You can run the VM as you would do with any VirtualBox VM.

---

**Nota:** As the VM is based on Linux it is fairly simple to convert the image to a raw disk and put it on a USB stick (minimum 8GB) or a faster storage. This would enable you to run the app without the virtualization penalty and enjoy the full speed of your hardware.

---

## QGIS Server

The VM has working installations of [QGIS Server](#) and [QGIS Web Client \(QWC\)](#).

### Access the Web Services

The Apache server is setup to respond to requests pointing to the `http://qgisplatform.demo`. Accessing the above link with the Internet Browser of the VM will take you to the starting page of QWC depicted in the above image.

If you want to access the web services outside the VM, you need to edit the `hosts` file on your machine and point `qgisplatform.demo` to the IP of the VM.

---

**Nota:** If you've setup the VM with the network adapter in NAT mode only the VM host will be able to access the services. If you want all the devices on your LAN to do it, you need to setup the network adapter in bridge mode.

---

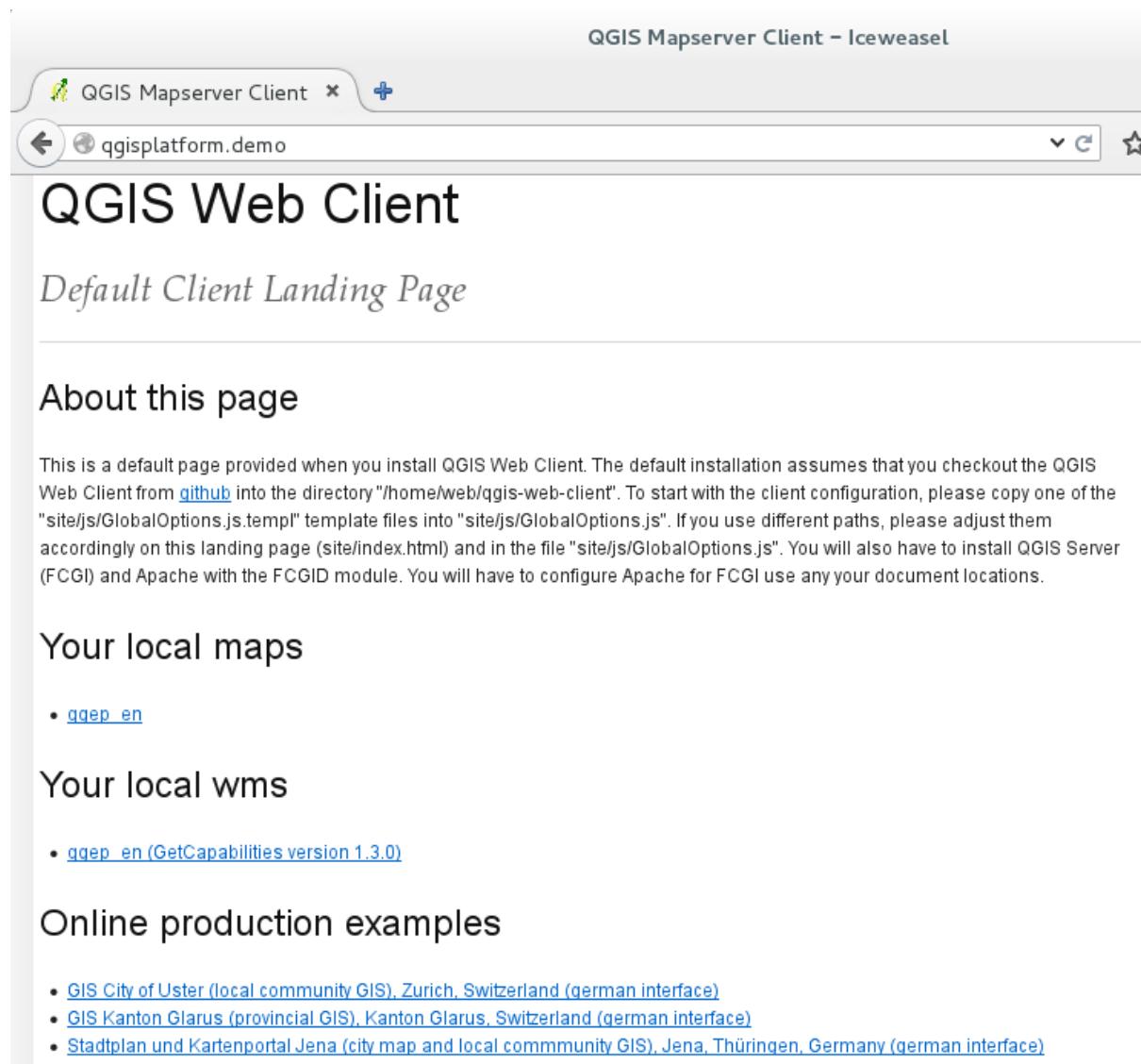


Fig. 1.2: QGIS Web client starting page

### 1.3.3 Data import

This represents a guide on how to import data from QGEP.

#### Import formats

- INTERLIS (in progress)
- dxf (in progress)
- Shape
- MOUSE / MikeUrban
- other

#### INTERLIS

INTERLIS Import can be done using the ili2pg tool. For further information contact the developer team.

### 1.3.4 Data export

This represents a guide on how to export data from QGEP.

#### Export formats

- INTERLIS (in progress)
- dxf (in progress)
- Shape
- MOUSE / MikeUrban
- other

#### INTERLIS

INTERLIS Export can be done using the ili2pg tool. For further information contact the developer team.



## **Indices and tables**

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- genindex
- search