# Requirements QGIS Web Client II (QWC II)

## Motivation

QGIS Web Client (QWC) is a Web-GIS client based on OpenLayers 2 and ExtJS and tailored to use special extensions of QGIS Server, such as QGIS Project settings, extended GetFeatureInfo Requests, GetPrint and DXF export. It uses standard WMS/WFS commands, but extends them where needed.

There are four main reasons why QWC needs to be overhauled:

1. The code structure is not very modular and should be better structured - it grew from an in house project to a much bigger project with more interested organizations and multiple developers.
2. QWC only works for Desktops. While there is touch navigation support, the GUI is not responsive and mobile friendly. While there is a separate mobile web client based on OpenLayers 3 and jQuery Mobile. For maintenance reasons we need a new web client that uses responsive design and works for Desktop and mobile devices.
3. The base libraries ExtJS 3.4 and Openlayers 2 have been phased out and there are newer versions available. However, the upgrade to the newer versions is not trivial, since both projects fully broke their APIs. Both libraries will eventually have problems with more modern web browsers.
4. Have a more modern foundation based on newer web technologies, like more HTML5 modules, SVG, modern CSS, Web-GL, Canvas.

This document describes requirements of a successor project which we call QGIS Web Client II (QWC II).

## Legal requirements

### Code repository on GitHub

The code should be part of the main QGIS github project page at https://github.com/qgis/ - the group active around QWC II decides who will get commit rights to this repository.

### License

Planned license MIT, same as OpenLayers III.

## Technical Requirements for QWC II

### Browser support

QWC II must support all modern Desktop and mobile web browsers, such as

- Chromium/Google Chrome
- Firefox
- Safari
- Internet Explorer (>= 11)
- Microsoft Edge

- Opera

### Responsive design and device support

QWC II must run on Desktop PCs, tablets and mobile phones without any code changes. The user interface must adapt to the different screen sizes and resolutions. It must be possible to hide UI and functions on smaller devices, such as mobile phones, where the presence of some functions is not required. Not all modules have to be responsive.

### Modular structure

Use modular structure so it will be easier for a user to add functionality without interfering core functionality. See also modularity of OpenLayers 3.

### Usage of QGIS Server extensions

QWC II should be optimized towards OWS extensions of QGIS server. It should support at least the following QGIS server extensions:

- GetProjectSettings to get information about a QGIS project. If necessary for QWC II, the content of this server command can be extended or the XML format replaced by another format. Another option would be to have a separate project cache for better project loading performance.
- GetPrint with the option to select an existing QGIS print layout and dynamically overwrite text labels with user specified content
- GetLegendGraphic with the ability to custom-style the legend of a layer
- DXF-Export through GetMap
- DPI parameter for devices with higher resolution

Potentially, during the project timeframe there will be more QGIS server extensions that should be supported by QWC II, so this list could potentially be extended

### Support for other OWS

The administrator must be able to add layers from other OWS following OGC-standard. This layer must also be printable. In the future it would be nice if the user could add an OWS-service.

### Multilanguage support

The standard language of QWC II should be english, but there should be localizations for other languages. Depending on how the translations are organized, there should be a utility that allows to select which languages should be exposed. There should be a possibility for the user to switch the language. Deploy script should allow to pull out the languages of interest.

### Performance

When designing think of performance and lightweight. Fast startup. Nobody likes a slow map on the device. Deploy script should allow for code-optimizations (combining CSS and script, and minify).

### Configuration and Deployment

The UI and content should be easy to configure to get different “products” or versions for different use cases. Layers and modules (tools) should be configurable. Layers from a

service should be reusable in many configurations. How does this work with themes and print layouts?

### Global configuration file (P1)
The global configuration and the configuration of available projects (themes) is stored in configuration files. Settings are stored globally, but can be overridden by projects/themes.

### QGIS project is automatically a Web-GIS topic (P1)
Like it used to be with QWCI. Doesn't require extra configuration.

### QWC II configuration plugin (P2)
A QGIS plugin should be provided that allows to view and change the global configuration and list of available themes of QWC II.

Assignment of user rights (see item "login/authentication") to certain projects/layers must be handled by this plugin.

### Deployment Script (P2)
A deployment script (preferably Python) allows to generate optimized versions for deployment. The script pulls in necessary javascript files according to the selected modules (functionality) in the global configuration file. The script includes necessary language/translation information for the selected languages to be deployed. The script combines multiple javascript files into one javascript file and generates optimized (minimized) javascript code for faster loading.

QWC II configuration plugin should be able to start the deployment script.

### Login/authentication (P2)
It should have a login functionality. Login is optional.

The following user rights should be distinguished:

- display and print certain layers
- query certain layers
- export or
- edit certain data.

If unspecified, display and query should be possible, but export and edit not.

Therefore a user management is needed where these rights can be assigned to users and/or user groups.

Authentication should be either directly against a QWC user-password database or via AD/LDAP. All communication (QWC - login server and login server - LDAP-Server) needs to be encrypted.

## Design issues / User Interface (P1)
Good looking. Easy, intuitive to understand and use. Fast. See separate document on design study:

https://drive.google.com/file/d/0B0h3PAH5uoY6UG82Y19BdW9IR0U/view?usp=sharing

### Minimum configuration for design / CSS (P1)

It should be possible to define a main color and a logo. CSS classes should be well-structured.

## General map functionality

### Start the application with settings (P1)

All of these parameters can be used as a startup option. The startup options can be provided as http GET parameters.

- Map extent/map center
- Selected theme
- Visible map layers
- Visible base map layer
- Search as start parameter (e.g. address, parcel-nr, coordinate)
- Custom layer order (P2)
- Selected elements (e.g. an address that is active) (P2)
- Redlining objects (P2)
- Additional WMS layers added by the user (P2)

### URL permanently up-to-date (P1)

All changes in map parameters (see above) are immediately reflected in the URL and can be copied as a permalink.

### Start dialog (P2)

Show information and welcome screen with HTML content at startup. Checkbox for don't show again. News in the map could be presented here. Potentially display content with iframe.

### Theme Switcher (P1)

A control that allows to switch to a different QGIS project (.qgs file). With thumbnails, keywords, filtering and at least one hierarchy for grouping. Same functionality as QWC I.

### Base Layers (P1)

These are available for all themes and potentially tiled layers, for performance reasons. Examples are topographic base map, ortho or satellite images, hill-shading of terrain, etc.

Configurable in the global options. Only one base map can be displayed at the same time. An easy, intuitive base layer switcher control.

For printing, the WMTS or tile sources are replaced by a corresponding WMS server. QGIS server should be enhanced to allow additionals WMS as background map.

### Layer controls (P1)

The layer tree should support the following functionality

- Layer grouping (fold and unfold)
- Visibility control
- Transparency
- Visibility presets (requires an improvement in GetProjectSettings) (P2)
- Show legend
- Show metadata  (combined window with metadata and legend, as in QWCI) (P2)
- Symbol showing if layer is identifiable
- Layer reordering (Separation of logical grouping and layer drawing order, separate panel for layer order) (P2)

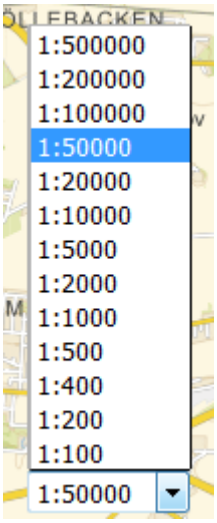
Integrate it with permalink functionality.
Example of legend behavior: Small image, sometimes unreadable, shows bigger on mouseover. Full image size in metadata and on click.


### Navigation (P1)

Buttons for panning and zooming in the map. Scroll to zoom. Drag to pan. Shift key +  drag to make zoombox. Configurable - separate for larger and smaller screens. Global options what navigation tools are available.

### Show scale (P1)

Show scale in the map. Dropdown to select different scale. Central configuration of available map scales, minimum scale and maximum scale. Can be overridden per project, if specified. QGIS already provides a way to have global and per projects scales. These settings should be used by the QWC II client. How to deal with tiles that don’t match round map scales? Deal with it in the mapcache level.




### Scale bar (P1)

Show scale bar in map. Placement of scalebar should be configurable (corners).

### Mouse position / Coordinate Display (P1)

Shows the mouse position in the selected CRS. Allow to switch to other CRS (e.g. national grid/lat-lon). See proj4js project. → Add Screenshot. 


### Geolocalization (P1)

For web browsers that support geolocalization (GPS or otherwise), there should be a tool to center and highlight the current location. The map should follow the movement of the user and always display the current location in the center of the map, as long as the geolocalization function is enabled.

### Geolocalization accuracy indicator (P2)

If possible, and supported by the device, there should be an indication of the accuracy of the positioning (e.g. GPS, Wireless, Antenna, or accuracy in metres). Accuracy should be indicated by the size of the positioning circle.

### Copyright text (P2)

Visualize copyright text associated to specific layers in the map.
Copyright notes globally and per layer.

### Selection Overlay Layer (P1)

Selected features are added to this layer. Objects in this layer can be unselected (unhighlighted). Layer can contain multiple geometry types (POINT, LINESTRING, POLYGON). A new search or selection clears the current contents.

### Feature Info and selection(P1) - potentially split up in two parts

Feature info should be displayed for all queryable layers at once. The identify tool is on by default, unless there is a conflict with some other tool.

There are two modes: single click for points and draw rectangle for a rectangular selection. The queried features should be selected and highlighted with vector geometry above the map.

Ctrl is a modifier to add/substract from selection.

It should be configurable if a tooltip is displayed on mouseover (layer's maptip).

It should honor the "Identifiable" property of the QGIS project. (e.g. if an orthoimage isn't queryable in QGIS desktop it shouldn't be in QGIS server either).

Query result is displayed in a separate resizable window.

Features of the selection are ordered by layers

In the result list, there should be a button to highlight a feature and show detailed information about the feature. If only one feature is queried the feature gets highlighted and detailed information is shown automatically without the list.

### Feature Info should be printable (P3)

Discuss: should feature info result be printable? Could be printed via layout (given that enhancements are driving QGIS layouts towards reporting).

### Search (P1)

A single search input box with immediate feedback (live search) after two characters/numbers have been typed. Result list grouped by categories. It should be possible to combine several search tables, depending on the chosen theme. Selected result should be selected and thus highlighted and zoomed to. If the layer of the search result is in the theme and not visible, the visibility is enabled automatically.

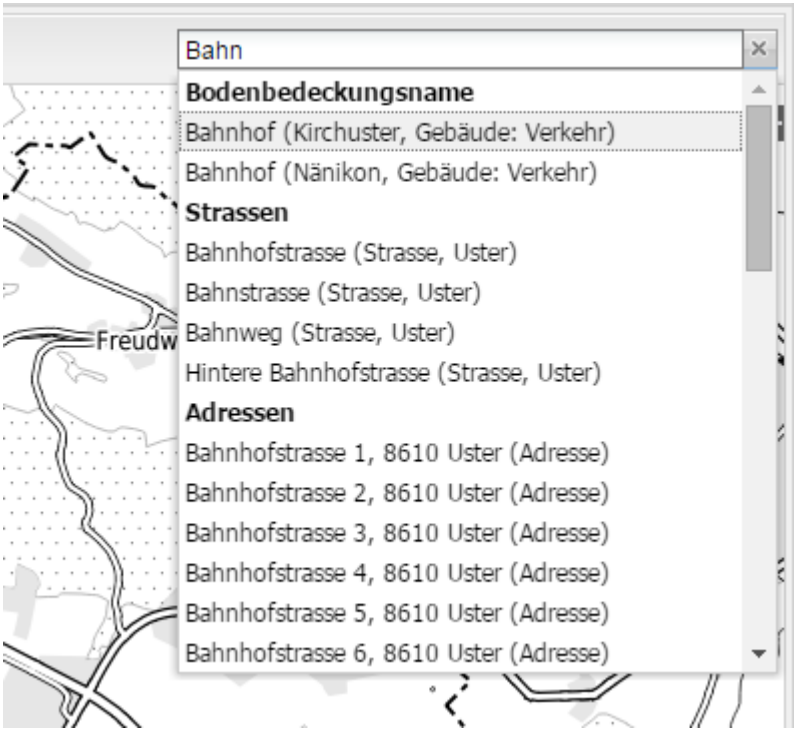


Fig. xx: Search example from QWC I (City of Uster)

### Search result also shows the attributes (P2)

If there is a single result, the attributes windows should automatically display. Should be controlled by an option to enable/disable this behavior.

### Multiple selection of search results (P2)

The user can select multiple result items and the application zooms to the bounding box of all items and selects and thus highlights them all.

### Coordinates in Search box (P1)

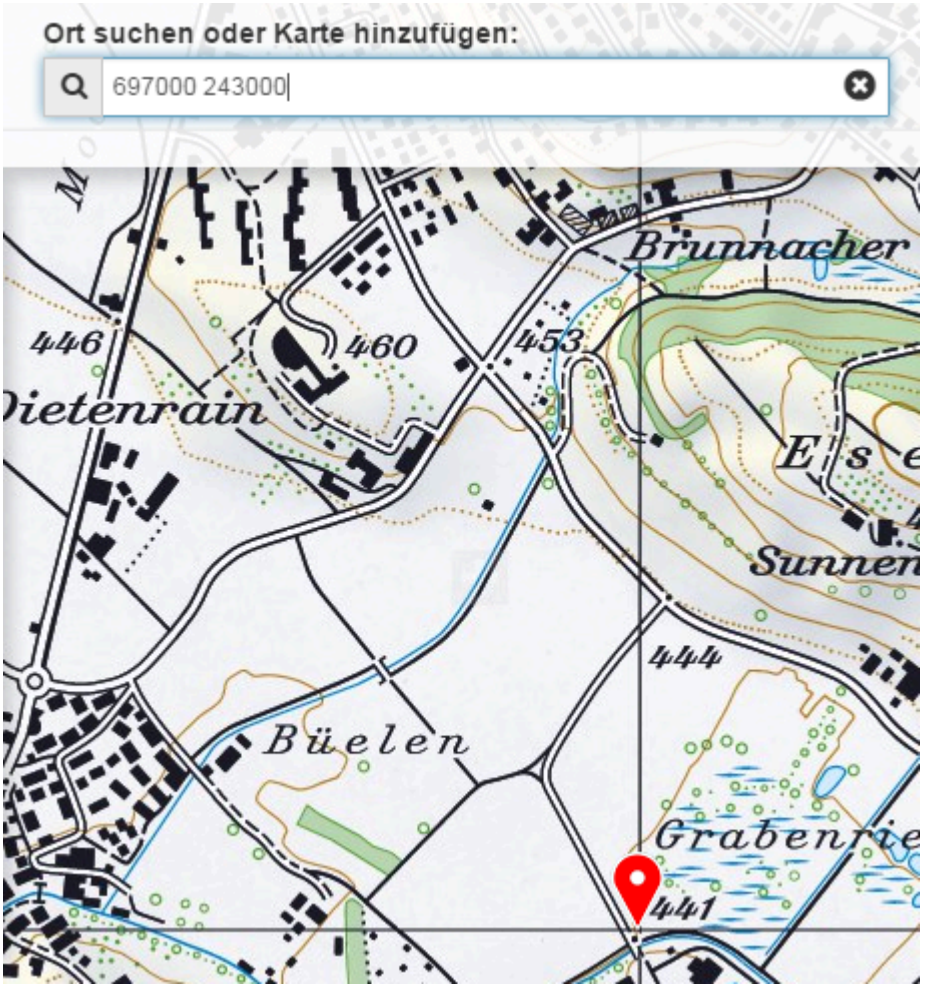
If the user enters a coordinate in the search box, the application will center the map and highlight the coordinate. The local coordinate system can be used, but also lat/lon (WGS 84).

### Layer visibility support in Search box (P2)

It should be possible to search for a layer name (of the current theme) and make it visible, by selecting the layer name in the search result.

### Theme support in Search box (P3)

It should be possible to change the theme by searching for a theme name in the search box.


Ort suchen oder Karte hinzufügen:
697000 243000
Brunnacher
446
460
453
Sunnen
444
Büelen
441

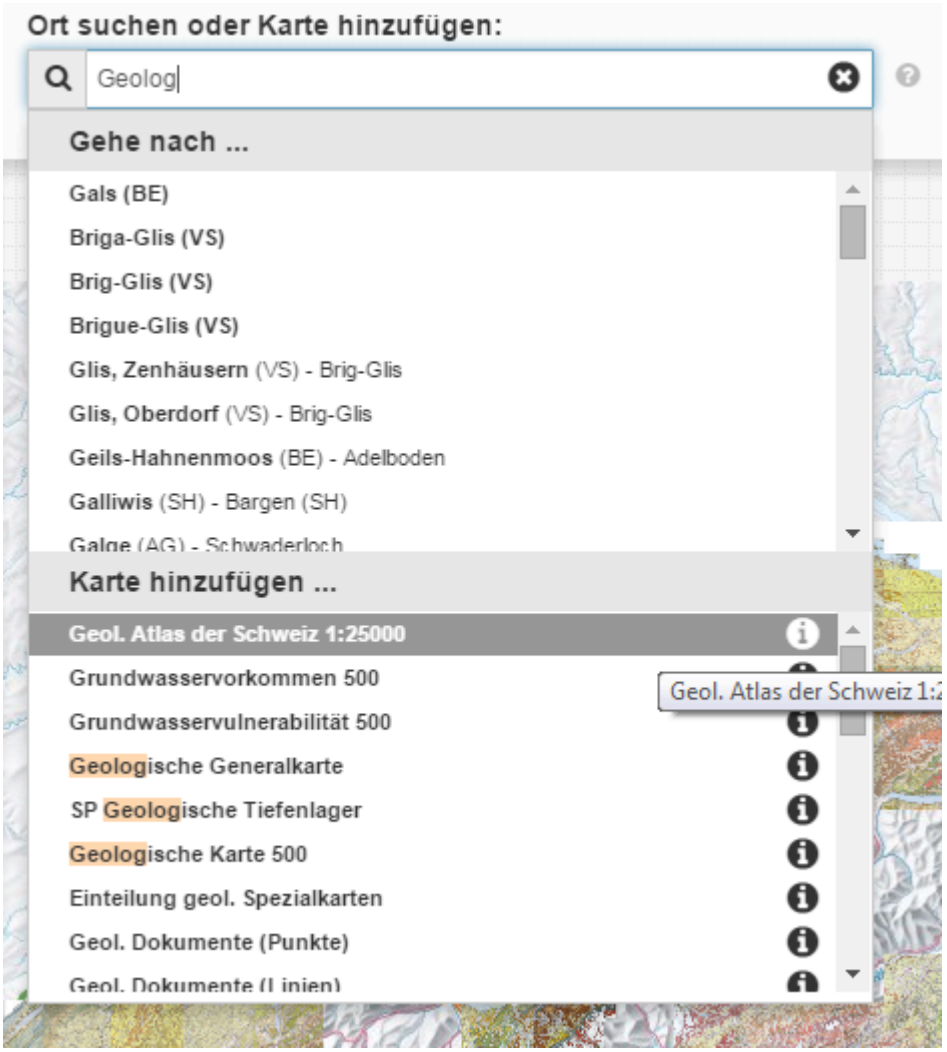



Fig. xx: Intelligent search box - add/change theme from searchbox (example map.geo.admin.ch)

Fig. xx: Intelligent search box - search and display of coordinates (Source: map.geo.admin.ch)

## Tools

### Tool menu (P1)

A responsive tool menu to hold most tools. Allow foldable groups of tools. Allow to restrict functionality for mobiles. (Detect browser functionality and link available functionality with it.)

### Measuring tool (P1)

Ability to measure distances, area and angles. Result in separate small window. Result for last leg/vertex and current mouse position. Measuring points results in coordinates in selected coordinate reference system.

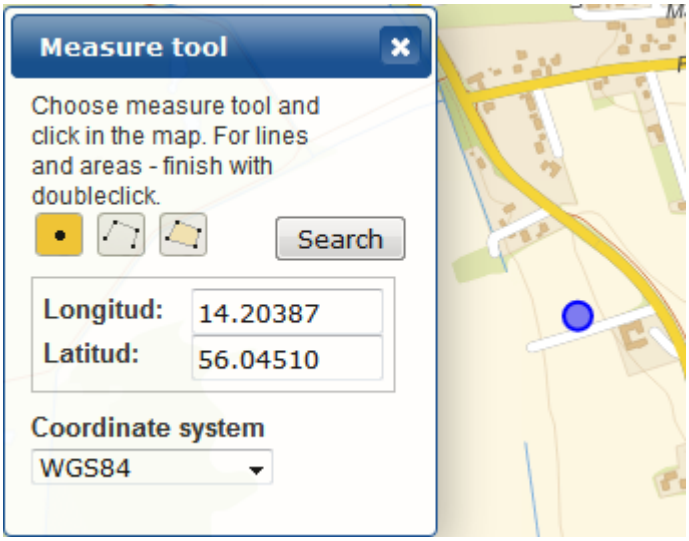


Fig. xx Example of measuring a point (City of Kristianstad)

### Snapping in the measuring tool (P3)

### Redlining (P2)

A simple tool to digitize points, lines, polygons, arrows and text must be provided. Result should be printable and sendable with permalink/sharing tool. See also section on “Permalink/Sharing”. Objects must be selectable, movable, editable and deletable. There must be a tool to copy selected features to the redlining layer. Color selector to define fill and stroke color of lines and polygons. Basic symbols for point symbology (circle, rectangle, triangle, star). Selection of symbol size. For text elements, there should be size and color as text properties.

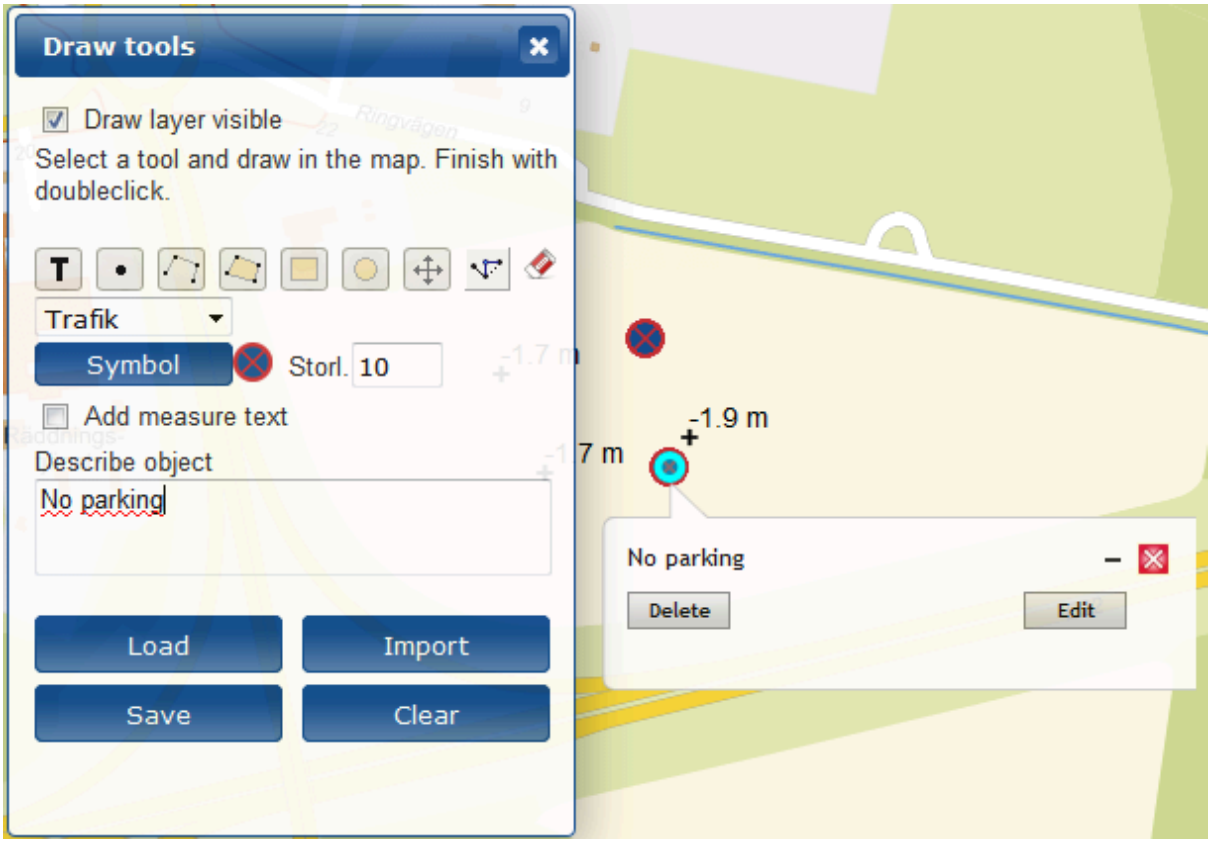


Fig xx. Example of functionality in redlining (Kristianstad)

### Additional Redlining Tools (P3)

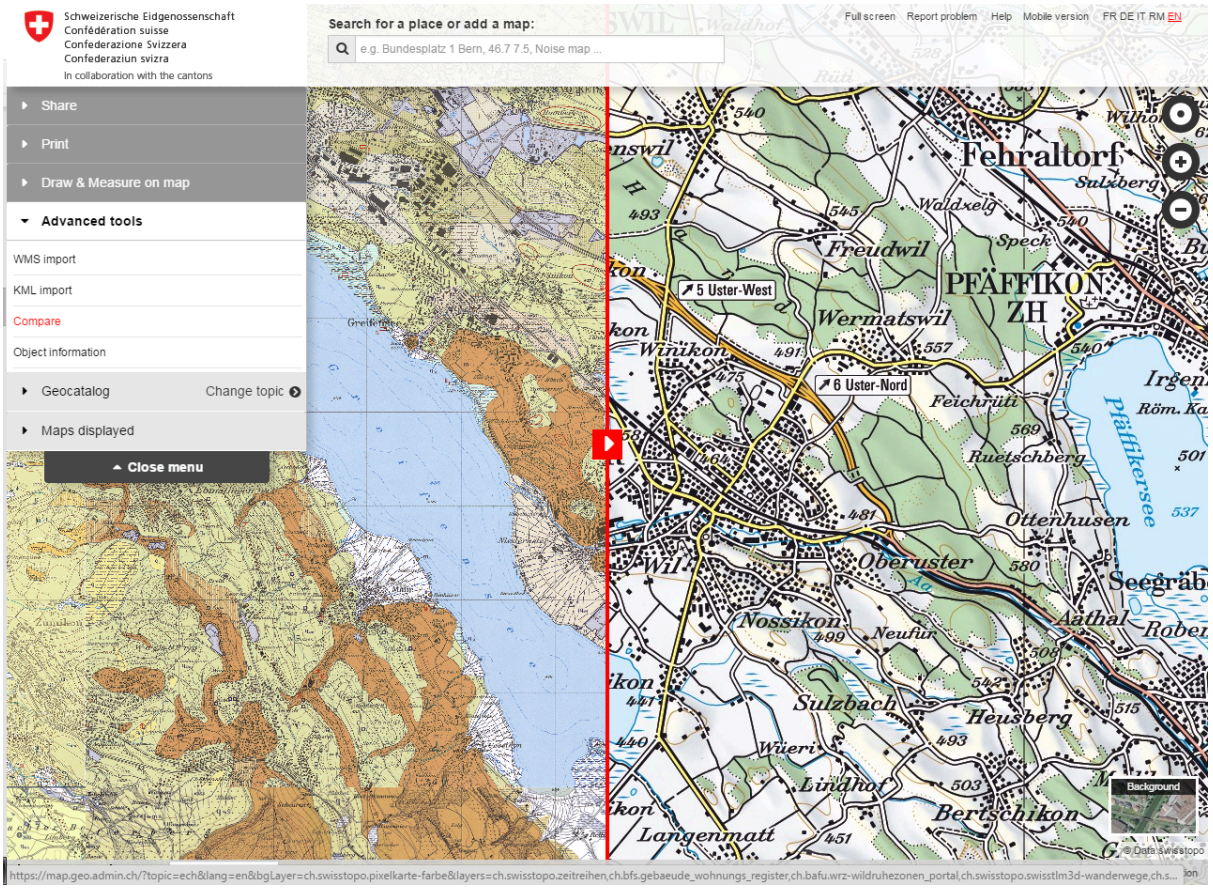
Draw box, draw circle with radius in map units. More complex symbol support (SVG or font symbols).

### Editing (P3)

A simple editing tool for at least points but also lines and polygons if possible. Stored in PostGIS. Attribute forms from QGIS? Security and authorization? Needs better specification.

### Theme Comparison (P3)

It should be possible to have a split screen where two themes can be compared. QWC II should allow to select another theme. It should be possible to change the vertical and/or horizontal split border.




### Attribute Table (P3)

Specification later. Show selected only features or visible features? Or All?

### Elevation tool (P2)

Tool that picks elevations from a DEM and presents them as points with labels and a simple exportable list. Level 2: Show the interpolated z from a DEM in the mouse position tool.

Fig. xx Example of measuring a ground elevation (City of Kristianstad)

### Profile tool (P3)

After finishing a measure line, it should be possible to query elevation data for a profile. This can be a separate Script on the server that queries the data. Result transferred with JSON to client and interactive display, e.g. with SVG.

### Printing (P1)

Ability to see printed area in map with a frame. Ability to rotate the map for printing. Choice of layout/size, round scales.

Ability to overwrite text labels with IDs (e.g. titles, subtitles, remarks). (P2)

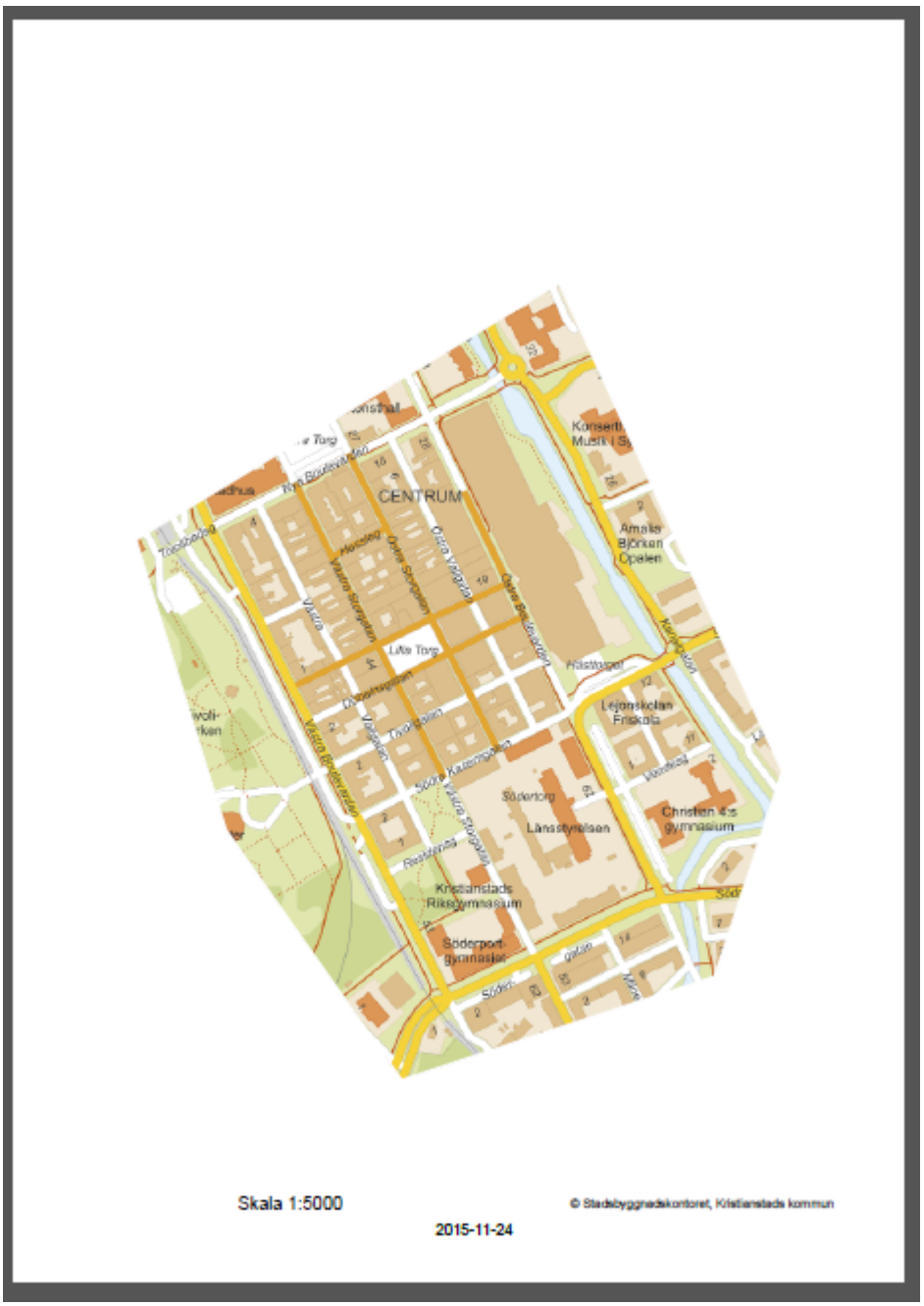
Redlining overlays should be sent to QGIS server and rendered on top of the printed map. (P2)

### Printing of base map layers (P1)

Make sure that base map layers also print (external services, like tiled maps, WMS, etc.). A dictionary should be stored in the global options to map tiled base map layers to WMS services in order to print at higher resolutions. (Check with Sourcepole/Kanton Glarus/Solothurn).

### Polygon mask for printing (P3)

Option to define a custom print area, a polygon that mask everything outside. Scale and printed area is automatically set for this polygon. (Similar to atlas feature?)




### Permalink for print (P2)

Create a copyable link to the the print request. Ideal for dynamic documents, always new, on a homepage.

### Export tool (P2)

High-DPI raster with world file or GeoTiff (dpi choice). DXF export. Define export area with box. Option to send extent, CRS, layers, features to a custom web service.

Proposal to use WFS and potentially allow other formats beside GML - or alternatively allow external services like ogr/FME through a script.

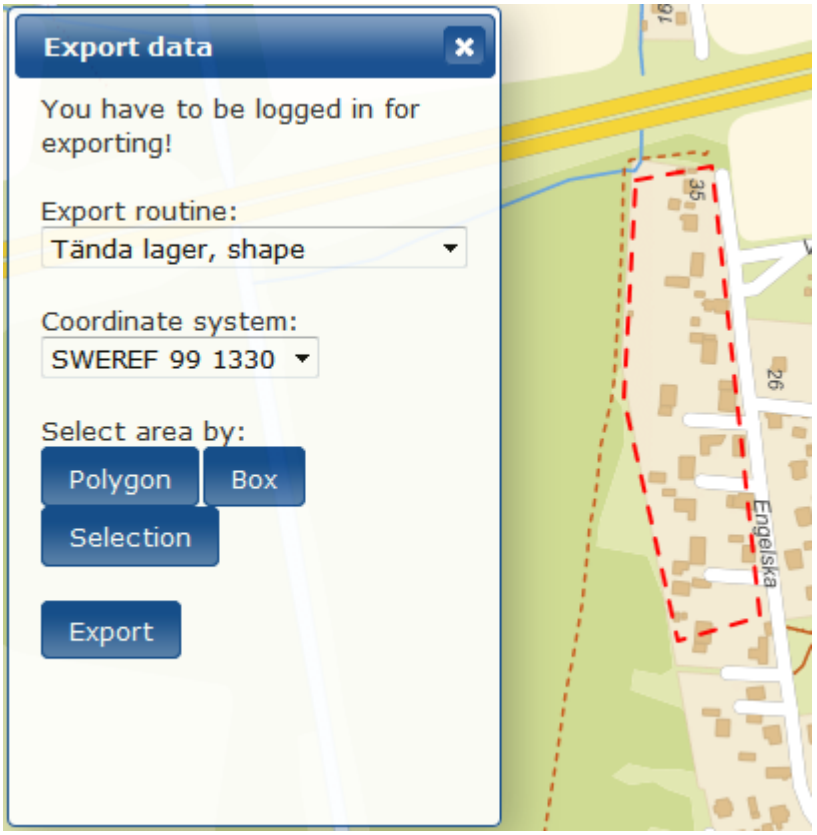


Fig xx. Example export (Kristianstad)

### Allow to save user defined settings (P2)

User browser storage mechanism and link it to authentication

### Add additional external WMS services (P3)

Add layer from another WMS service. Permalink should include the external service.

### Permalink / Sharing (P1)

It must be possible to store and retrieve the current map view in a database (Postgis). A serverside python script stores/retrieves the information and shorten the URL - the WSGI scripts at https://github.com/qgis/QGIS-Web-Client/tree/master/wsgi could be reused and extended (createShortPermalink.wsgi and webgisLauncher.wsgi). Same parameters as specified above in “Start the application with settings”.
Permalinks in existing QWC I installations should work seamlessly in QWC II **or** a conversion tool (SQL-Script) to convert them to QWC II should be provided.

### Sharing (P1)

The shortened URL should be copyable. Shortcuts to common web services (such as Email, Twitter, Google+, etc.) should be provided, but configurable.

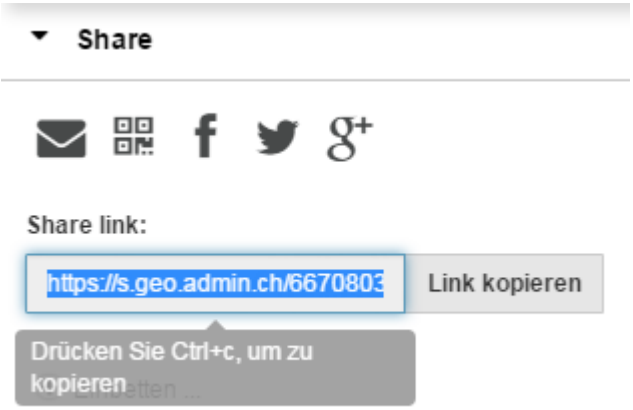



Fig xx: example for sharing functionality (Source: map.geo.admin.ch)

### Offline (P3)

If used in a mobile device without connection you can use the map with pre cached data.

## API to access QWC II functionality from other web pages (P2)

The idea is to be able to embed QWC II in another webpage (e.g. CMS of city administration) in an iframe. The outside webpage should be able to influence QWC II with javascript calls. List see below.

### Set map center (setCenter)

- argument are center coordinates or WKT POINT geometries
- optionally also combined with scale (second optional argument)

### Set map scale (setScale)

- argument is new scale

### Set zoom level (setZoomLevel)

- argument is new zoom level

### Set map extent (setExtent)

- argument is extent or WKT Polygon geometry

### Toggle layer visibility (setLayerVisibility)

- arguments are layer name and boolean for visibility (or integer for transparency)

### Set base layer (setBaseLayer)

- arguments is base layer name
- Or is this included in previous parameter?

### Highlight Geometry (setHighlight)

- Geometry in WKT format: first argument
- optionally combined with zoomToGeometry: second argument (boolean)

### Search (search)

- trigger a search from javascript

- integration with search functionality of QWC: usage of same service and same search tables

### Change Topic (setTopic)

- argument is topic name
- Is general configuration included in topic? As which modules that are enabled etc.

## Documentation (P1)

### For developers (P1)

### For administrators setting up a QWCII (P?)

## Organizational Issues

### Members

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### Communication

Regular telcon meetings (e.g. weekly or monthly, depending on the project phase/progress) are proposed to coordinate among members. During the first phase, during which the requirements are defined, these meetings are only among the parties defining the

requirements and participating in the project financially. Later on in the project, after we decided which company will get the contract, also the developer(s) of the company doing the implementation work should be included.

### Decision Process

Group is in general looking for consensus.

### Rules for offers / contracts

Company should have a proven track-record and involvement with QGIS and web technologies, esp. OpenLayers. Ask for references and links to github contributions.

Potential companies to ask for offer

- Sourcepole: http://www.sourcepole.ch/
- Camptocamp: http://www.camptocamp.com/
- Sweco Position? http://www.sweco.se
- ItOpen: http://www.itopen.it
- Lutra Consulting http://www.lutraconsulting.co.uk