Introduction to QGIS for Lidar Analysis

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Pre-requisites

You should have completed the tasks in workshop 1 Intro to QGIS before beginning this workshop.

Aims

The aim of this lab is familiarise yourself with drawing profiles and digitising data QGIS. In this session you will undertake the following tasks:

- draw height profiles of your terrain model
- add and create shapefiles
- map archaeological features from a terrain model to a shapefile
- add a satellite image layer

Each of these tasks stand alone as useful GIS tools but together they provide a workflow for visualising lidar and other airborne data.

Outcomes

At the end of the lab you will submit a printed map of your feature mapping data in pdf form to demonstrate your completion of the technical exercises.

How to use this booklet

Illustrations in this booklet show the icons on screen for each task. The full menu options are notated as follows: File > Open.

Task 1 – Drawing Profiles

The lidar DSM contains 3D height data but the GIS interface is of only 2D. To better visualise the height data we can draw a profile across the raster image.

1. To use the tool select a layer in the navigation menu on the left and then click on the profile icon. Draw a profile across an archaeological feature (click once to begin a line and twice to end it). The profile will be drawn in the lower portion of the screen. Add your Lidar DSM layer and one hillshade model to the map.

2. Go to Go to Plugins> Fetch Python Plugins. In the search box type "profile". Click install and then close the dialogue. A new Icon will now be available on your tool bar.
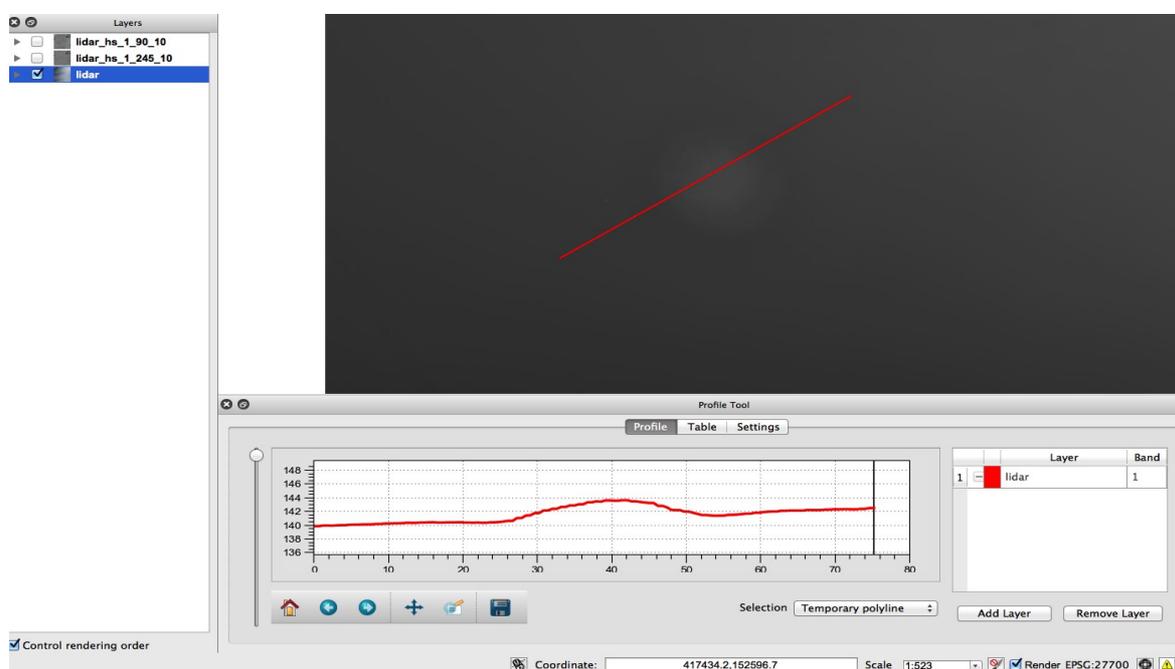
3. Switch to the Table view in the Profile Tool window. Notice that height values extracted from the raster along the profile are recorded in a table and can be exported to a spreadsheet for further analysis using the Copy to Clipboard button.

lidar

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0	0.591665	1.18333	1.775	2.36666	2.95833	3.54999	4.14166	4.73332	5.32499	5.91665	6.50832	7.09998	7.69165	8.28331	8.87498	9.46664
2	139.925	139.925	140.007	140.007	139.991	140.03	140.055	140.055	140.122	140.122	140.132	140.162	140.169	140.169	140.236	140.236	140.293

Copy to clipboard

4. Return to the Profile view and add your hillshade layer using the Add Layer button. Change the colour of this layer by clicking on the box to the left of the layer name.
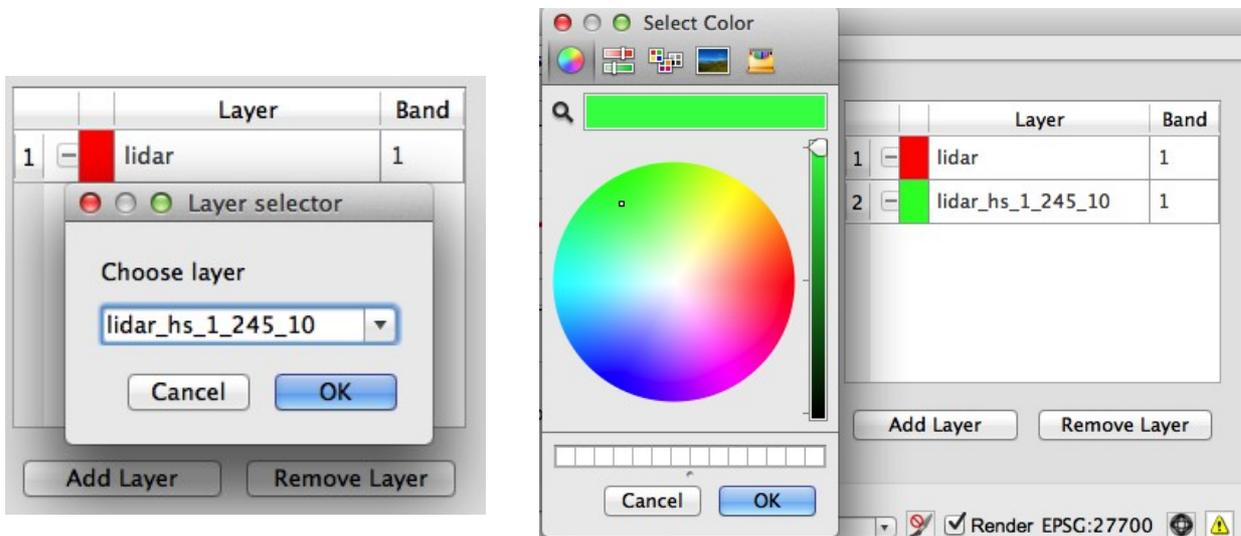
5. Now redraw your profile. What do you notice about the scale?

6. Remove the Lidar DSM from the profile tool window using the Remove Layer button. Use the Pan and Zoom to rectangle icons to examine the archaeological feature profile more closely. When you are happy, save the profile as an image using the Save icon.

7. 6. When you are finished use the x to close the profile window. Save your project.

Task 2 – Creating a vector file in QGIS

1. For this task you are going to create a simple shapefile in QGIS that provides a boundary for the area covered by the airborne data. From the toolbar select the create new vector layer icon to open the window below

2. Select the type of file you want to create (point / line / polygon). We want to define an area so a polygon will be most appropriate.

3. Specify the CRS of the shapefile (ESPG 27700). Notice that the CRS of the project is available for quick selection.

4. Each shapefile has an attribute table where data about the features can be stored. Add the attribute fields you want in the New Attribute section. In this case we will make a text field called "Name". Click add to attributes list to save the attribute field then click OK
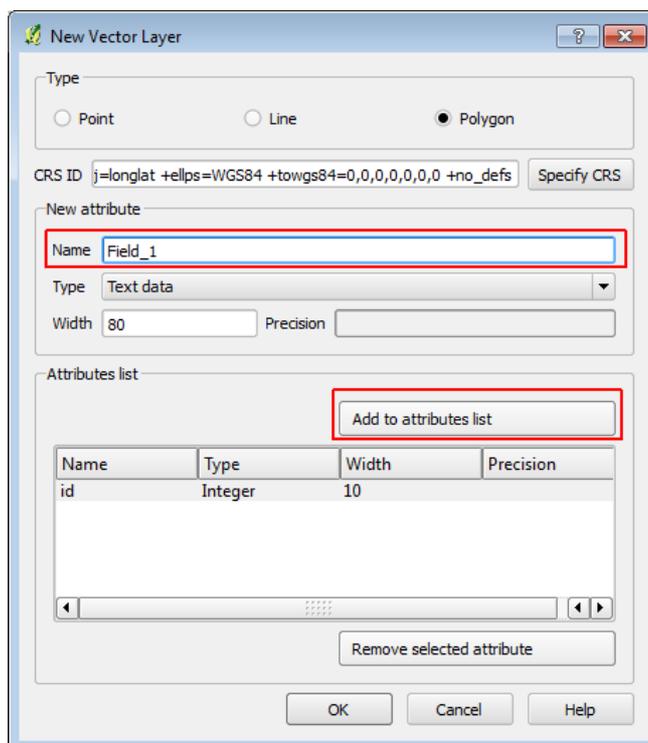

5. Name the shapefile "Study Area" and save it to your workspace (you may wish to create a new folder to store shapefiles together). Click OK to create the shapefile. It will automatically be added to the navigation menu on the left of your screen.
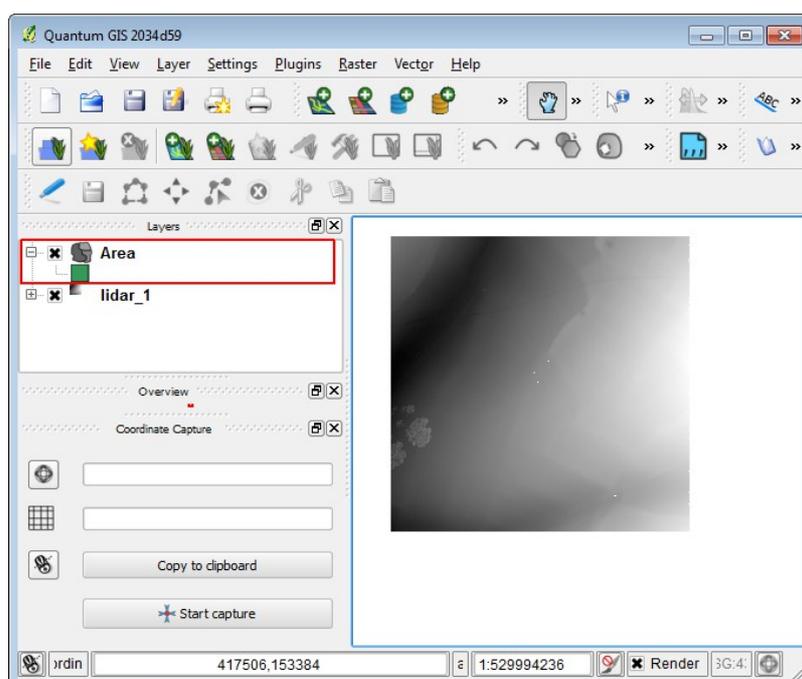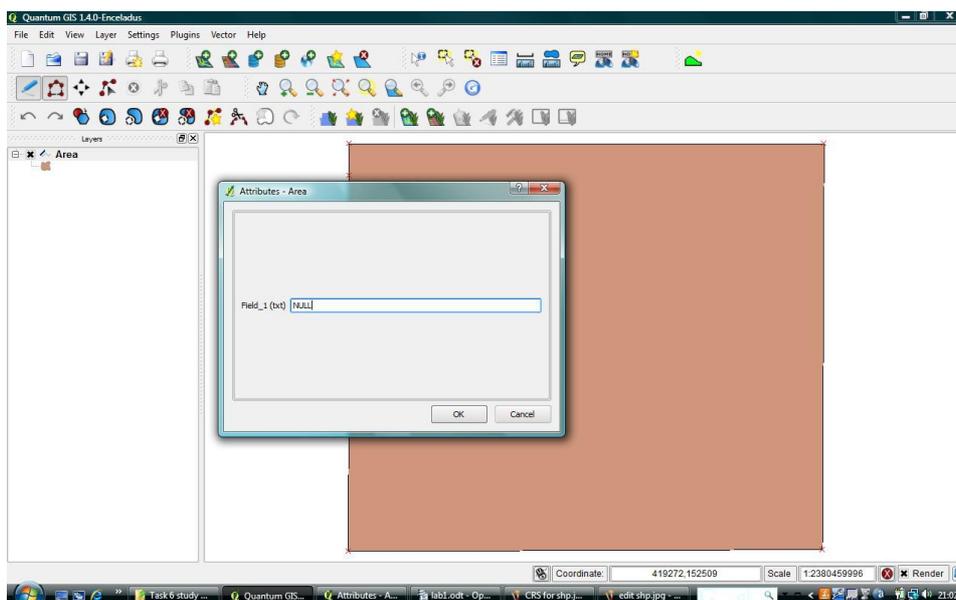
6. To edit the shapefile highlight its name in the menu and click on the Toggle Edit icon in the toolbar.
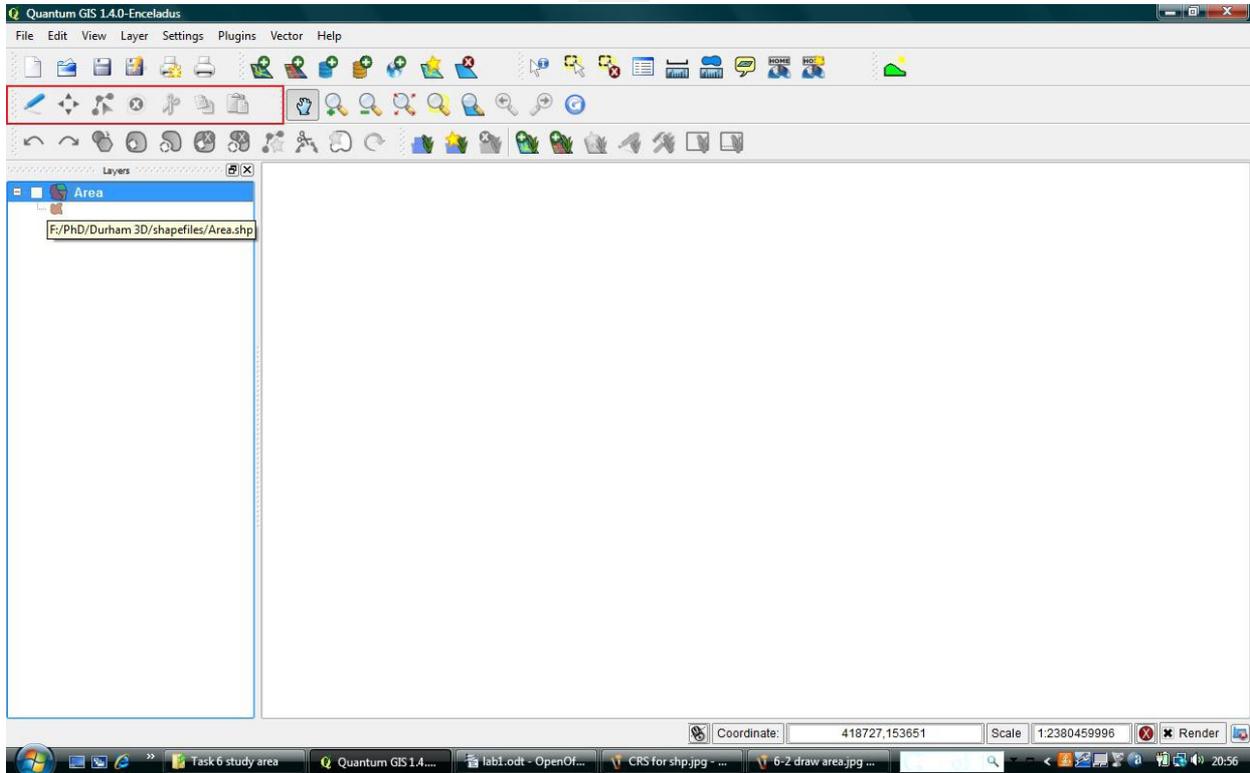

7. Select the draw polygon tool

8. Draw your study areas around the DSM, right click to finish the square.
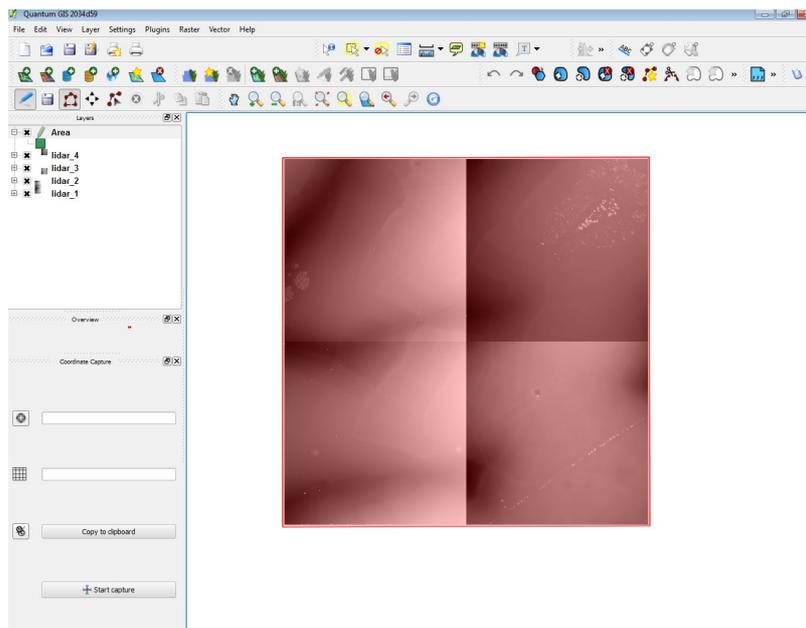
9. You will be given the option to record attribute data for "Name". Enter the name of the study area.

10. Click on the Toggle Edit icon again to finish drawing and save your edits.

11. Make the vector file editable again and experiment with moving the area using the move feature icon   and   editing the nodes using the node tool

12. Save your edits, making sure that the area still represents the coverage of the lidar raster.

13. By right clicking on the name of the file in the navigation bar and selecting Properties you can edit the symbology. Experiment with different display options for your shapefile.
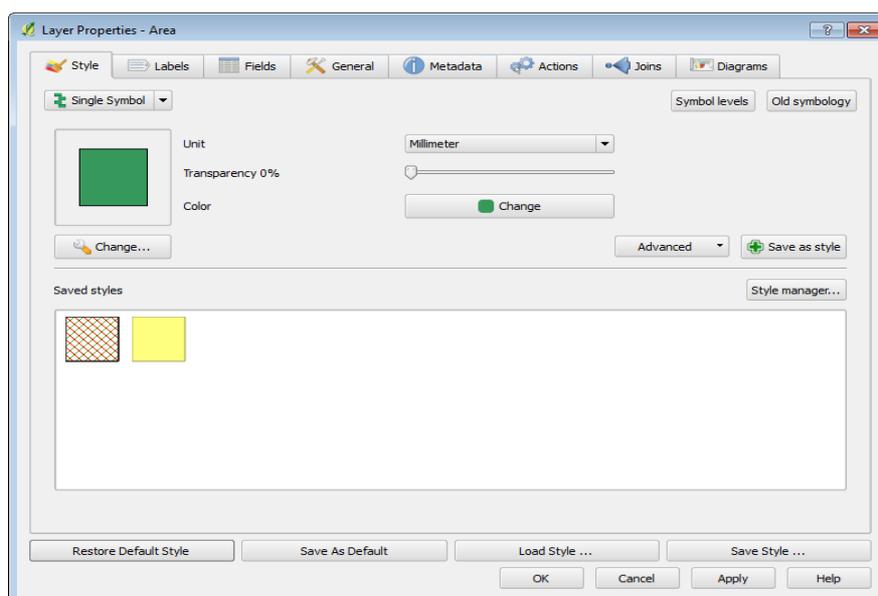
Task 3 – Mapping features from the lidar data.

We are now going to look at how you might record archaeological features from lidar data. This task is technically quite simple, repeating the vector file creation and editing we undertook in task 2 but requires you to plan what exactly you wish to record about a feature.

Before we create a new file we need to decide the attributes that it should have and how to standardise our recording so that we can mine the data for our own research aims and crucially so that others can understand it. There is a lot of information on this topic mostly relating to Historic Environment Records. A good starting point for ensuring compatibility are the FISH INSCRIPTION wordlists which can be found here http://www.fish-forum.info/i_lists.htm.

Use the space below to think about the type of information you would like to record about a feature from the lidar. Think about both its metric properties and its interpretation. Each of these pieces of information will become an attribute.

Once you have decided what you wish to record you need to think about how you will map it. There are three digitising options here - point, line and polygon (though of course you can map features in more than one file to take advantages of different types if you wish). Think carefully about the aims of your research before choosing - if you will need to record the area of a feature this will not be possible with a point or line.

Armed with these decisions you are now ready to start digitising!

14. From the toolbar select the create new vector layer icon to open the window below. Pick the type of shapefile you want to create and select the CRS.


15. Add the attributes you want to record for each feature by typing them into the Name field. You will need to define their type (text, whole number, decimal number) then click Add to Attributes List. When you have all the attributes, save the shapefile

16. Make the shapefile editable and begin to digitise the archaeological features. Use the profile tool to help you interpret their topography.

Task 4 – Add a Web-based Mapping Layer

We will start this task with a new project as we need to change the CRS. Click the new project icon. Then open the project properties and change the CRS to Google Mercartor 900913 and allow on the fly projection.

1. To add an OpenStreetMap or Google layer we will need to add another plugin to QGIS. Go to Plugins> Fetch Python Plugins. In the search box type "openlayers". Select the openlayers plugin and click install. Close the dialogue box.
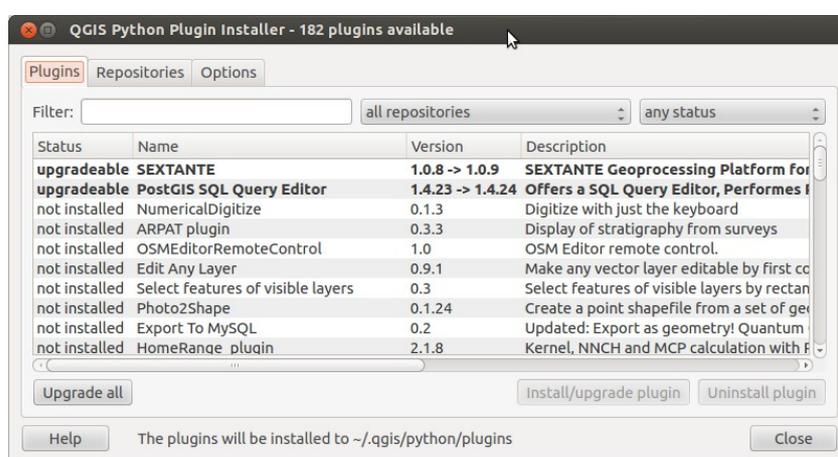
2. Go to Plugins > Openlayers plugin> Add Google Satellite layer. You can also check the OpenLayers Overview.
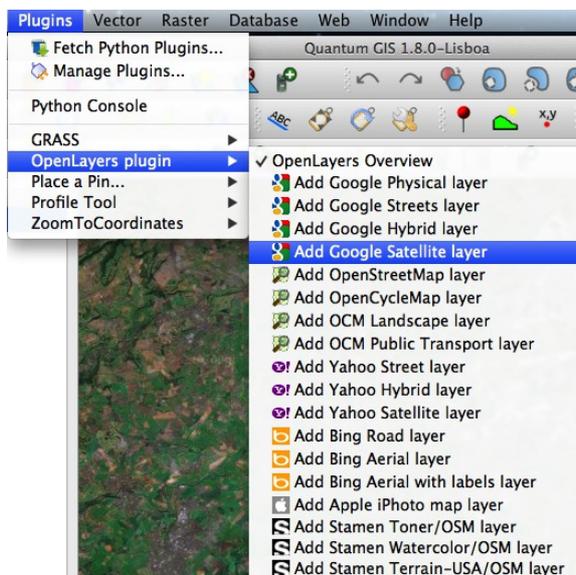
3. Now add your lidar raster data and feature shapefile to the map. Try to identify some of the archaeological features you have mapped in the satellite image.