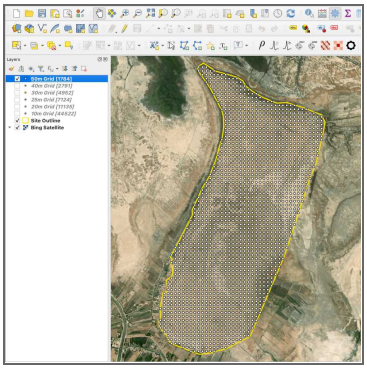

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Protocol status: Working
We use this protocol and it's working

Created: Feb 02, 2023

Lagash Archaeological Survey and Recording System (LASRS) - Rectangular Survey Grid Creation with QGIS

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ABSTRACT

Tools available in the open-source GIS program QGIS can be used to create a rectangular grid for archaeological surveys within irregularly-shaped boundaries. This protocol describes the steps necessary for generating the grid, trimming it to the desired survey area, and uniquely labeling the nodes generated.

MATERIALS

This protocol was developed with QGIS 3.28, but earlier and later versions should function similarly (though perhaps with minor differences in the QGIS interface).

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PROTOCOL integer ID: 76296

Keywords: Archaeology, Survey, GIS

Create Your QGIS Project

1 Launch QGIS and select the **New Empty Project** template.

2 Click the **project CRS button** in the lower right of the window and select the appropriate EPSG with UTM coordinates for your survey.

- For most of Iraq, this will be *WGS 84 / UTM zone 38N (EPSG:32638)*.

3 Download background imagery.

3.1

Locate the QuickMapServices button in the QGIS toolbar.

Note

If the **QuickMapServices** button isn't in the QGIS toolbar, install it with the **QGIS Plugin Manager**.

1. Next, click the **QuickMapServices** button and choose **Settings** to open the QuickMapServices settings window.
2. In the QuickMapServices settings window, switch to the **More Services** panel and click the **Get contributed pack** button.

3.2 Click the **QuickMapServices** button in the QGIS toolbar and choose the appropriate background map for your survey.

Note

For Southern Iraq, *Bing Satellite* is usually the best.

4 Save your QGIS project before proceeding.

Define the Survey Area

5 Zoom to your survey area.

6 Create a new shapefile layer.

6.1 Choose **Layer** > **Create Layer** > **New Shapefile Layer…** to open the New Shapefile Layer window.

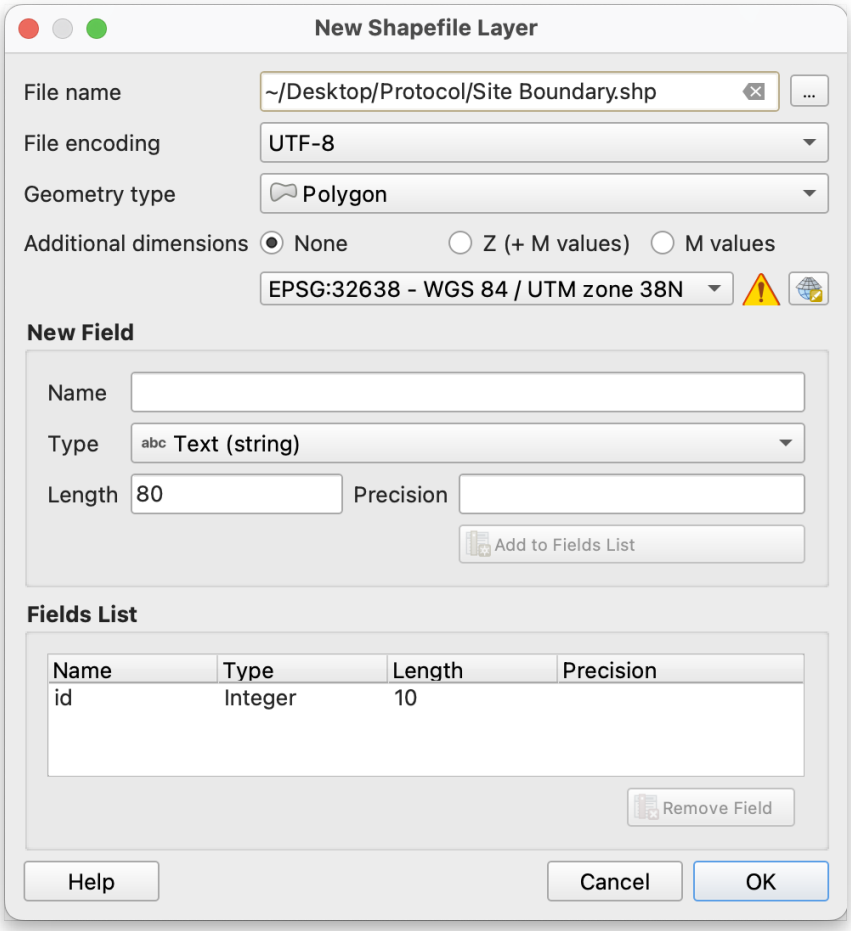
6.2 Next to the **File name** field click the **three dots** button to choose the location where the new

file will be saved. Name the new shapefile something sensible like *Site Boundary* or *Survey Area*.

6.3 From the **Geometry type** menu choose **Polygon**.

6.4 Verify that the CRS shown is the same as the project CRS, correcting this if it's different.

6.5



Click **OK** to create the new layer.

7 Draw the outline of your study area.

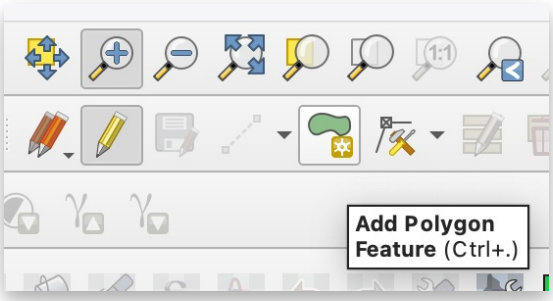
7.1 In the **Layers** panel, double-click the newly-created polygon layer to open its **Properties** window.

7.2 Select the **Symbology** panel and click on the **Simple Fill** symbol layer.

7.3 From the **Symbol layer type** menu choose **Outline: Simple Line**.

7.4 Change the line color and stroke width to values that will show clearly on your background imagery.

7.5



Click the **Toggle Editing** (pencil) button then the **Add Polygon Feature** button.

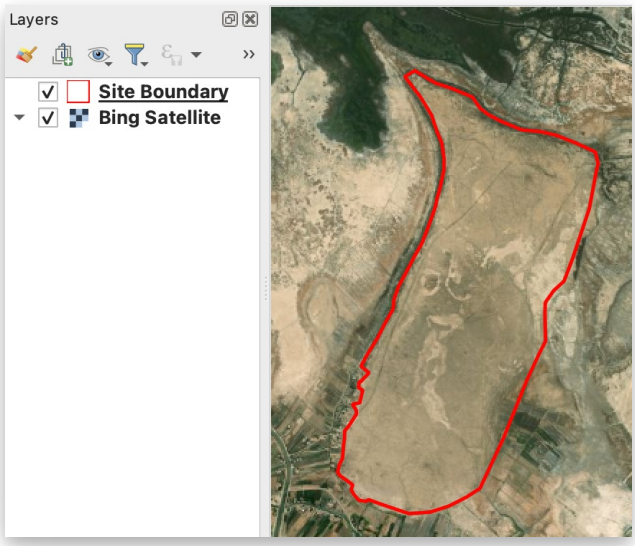
7.6 Left-click to place vertices that define the polygon bounding the survey area. Use the scroll wheel on your mouse to zoom in and out as necessary and the spacebar to pan. When finished, right-click to finish the polygon.

7.7 When it pops up, dismiss the **Feature Attributes** window by clicking OK, leaving the id null.

7.8 If necessary, use the **Vertex Tool** edit the newly-created survey boundary polygon by moving, adding, or removing its vertices.

8 Click the **Toggle Editing** button, and save your changes.

9 Save your QGIS project before proceeding.



Final result of steps *5–8*.

Generate the Unlabeled Survey Grid

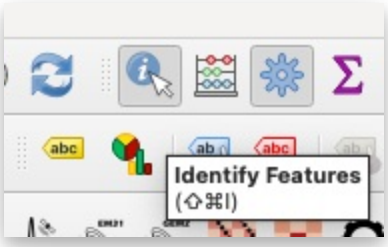
10 Create the base grid

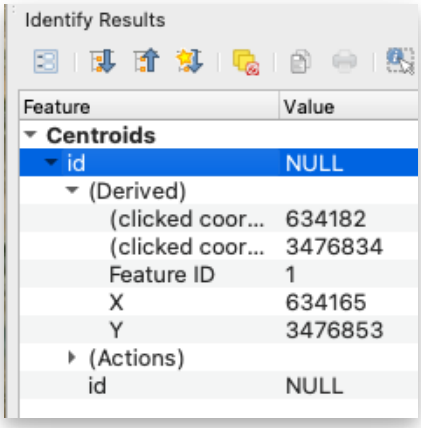
10.1 Choose **Vector** > **Geometry Tools** > **Centroids…** to open the Centroids algorithm settings.

10.2 Set the **Input Layer** to the layer created in steps *5–9*.

10.3 Leave the other values at their defaults and click the **Run** button.

10.4 Use the **Identify Features** tool to get the coordinates of the centroid that you just created. Write these values down separately, as you will need to refer to them again later.





10.5 Use the Measure Line tool to find the distance from the centroid to the furthest edge of the survey area boundary created in steps *5–9*. This measurement doesn't have to be exact, so

round up to be sure that the entire boundary falls within the distance measured.

Note

In the example shown below, with Lagash as the site, I measure roughly 2050 meters from the centroid to the farthest northwest corner of the site boundary. I will round this number up to 2200 for the next step.

10.6 Choose **Vector** > **Geoprocessing Tools** > **Buffer** to open the Buffer algorithm settings.

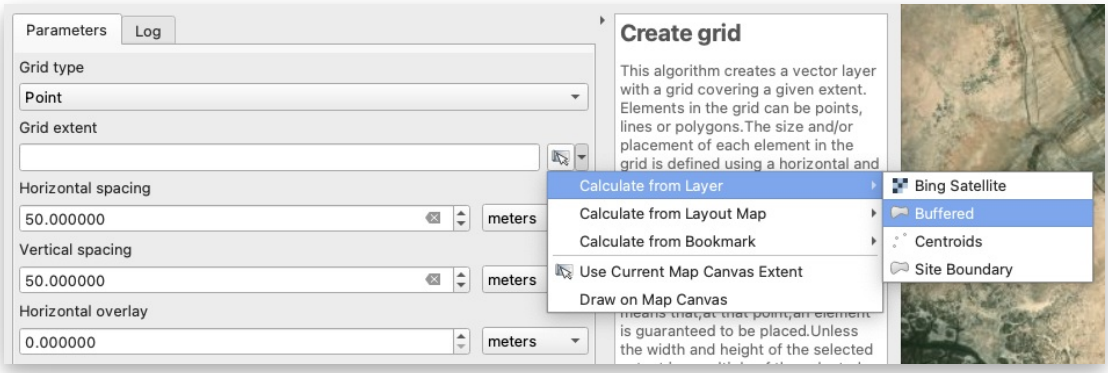
10.7 Set the **Input Layer** to the Centroids layer.

10.8 Set the **Distance** to the value determined in step *10.5*.

10.9 Leave the other values at their defaults and click the **Run** button.

10.10 Choose **Vector** > **Research Tools** > **Create Grid…** to open the Create Grid algorithm settings.

10.11 Leave **Grid type** at **Point**.

10.12 

Set the **Grid extent** by clicking the **down arrow** > **Calculate from Layer** > **Buffered**

10.13 Set **Horizontal spacing** and **Vertical spacing** to the intended spacing of your survey grid.

10.14 Set the **Grid CRS** to the same value as the project CRS.

10.15 Leave the other values at their defaults and click the **Run** button.

10.16 In the **Layers** pane, right-click on the newly-created *Grid* layer and select **Open Attribute Table**.

10.17 Click the **Toggle editing mode** (pencil) button in the upper left of the Attribute Table window to enable editing.

10.18 Click the **Open field calculator** (abacus) button to open the Field Calculator window.

10.19 Make sure that the **Only update *n* selected feature(s)** option is unchecked and that **Create a new field** is checked.

10.20 Enter *transect* for the **Output field name**.

10.21 In the **Expression** field enter the following formula, then click the **OK** button.

```
(("left" - minimum("left")) / ceil((maximum("left") -
minimum("left")) / count_distinct("left"))) + 1
```

10.22 Click the **Toggle editing mode** (pencil) button in the upper left of the Attribute Table window and then click **Save** to save the edits.

11 Rotate the grid to the alignment required by the survey.

> **Note**
>
> There may be reasons why a N-S aligned grid is acceptable for your survey, but even so the following steps need to be performed in order to label the grid nodes consistently.

11.1 In the **Processing Toolbox** find **Vector geometry** > **Rotate** and double-click it to open the Rotate algorithm settings.

Note

If the **Processing Toolbox** isn't open in QGIS, open it by choosing **View** > **Panels** > **Processing Toolbox**.

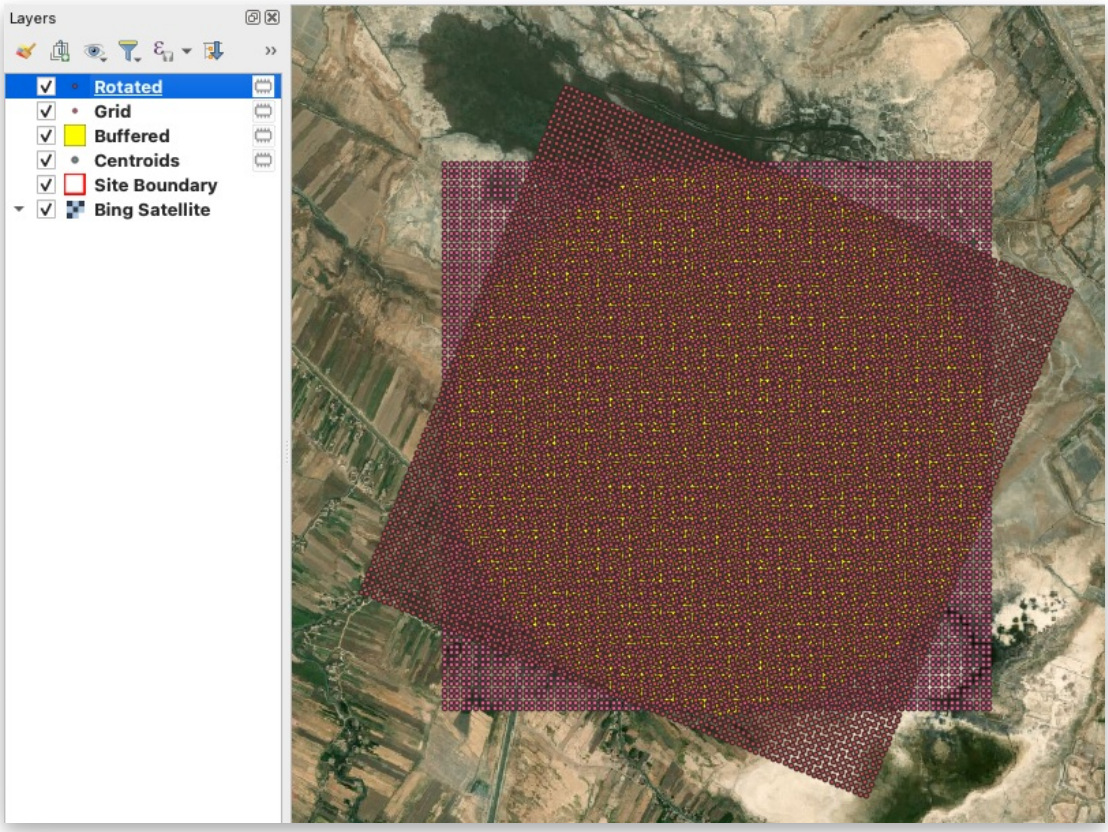
11.2 Set the **Input layer** to the grid created in step *10*.

11.3 Set the **Rotation (degrees clockwise)** field to the appropriate value *plus* 270.

Note

In this example, I want to rotate the grid to 22° clockwise, to match the longitudinal axis of the site of Lagash, so I will enter *292* into the **Rotation (degrees clockwise)** field.

11.4 Set the Rotation anchor point field to the X and Y coordinates of the centroid, as recorded in step *10.4*, separated with a comma.



The example project so far, with temporary *Centroids*, *Buffered*, *Grid*, and *Rotated* layers.

12 Remove points that lie outside the survey area.

12.1 Choose **Vector** > **Geoprocessing Tools** > **Clip…** to open the Clip algorithm settings.

12.2 Set the **Input layer** to the rotated grid created in step *11*.

12.3 Set the **Overlay layer** to the polygon created in step *6*.

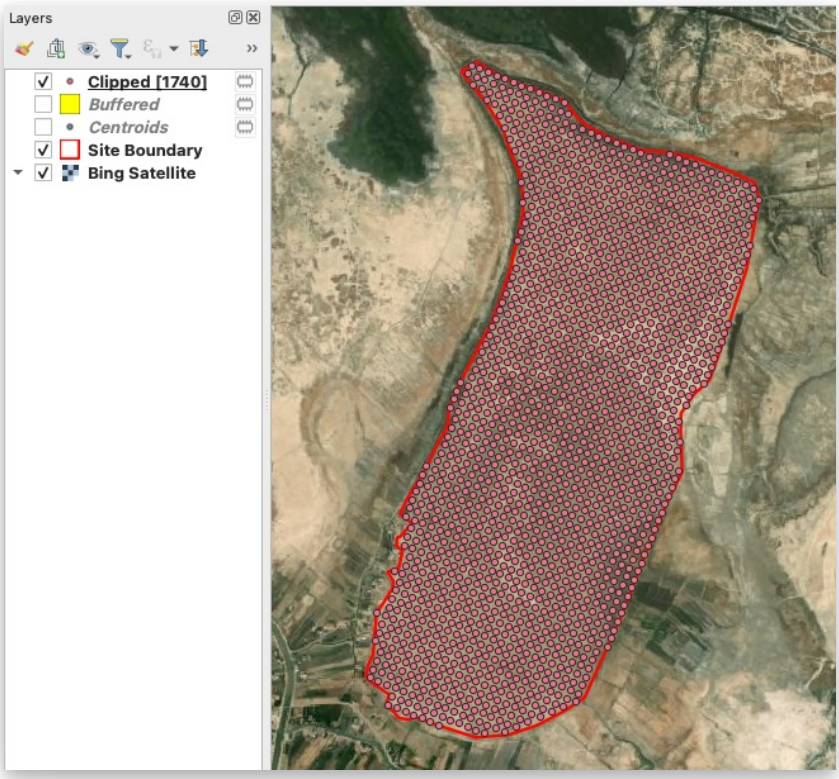
12.4 Click the **Run** button.

12.5 In the **Layers** pane, select the grid layers created in steps *10* and *11* and remove them.

> Note
>
> You may also want to uncheck the *Centroids* and *Buffered* layers in order to hide them. Don't delete them yet, however, in case you need to create a new grid with a different spacing (see step *13*, below).

12.6 In the **Layers** pane, right-click on the newly-created *Clipped* layer and select **Show Feature Count** to reveal the number of grid nodes within the survey area, from which you can calculate

the overall coverage and make estimations of project duration, cost, or any other pertinent constraints directly influenced by the number of survey units.



Final result for steps *10–12*, showing the number of grid nodes within the survey area (1740, in this example).

13 Repeat steps *10–12* with different grid spacings and/or rotations to achieve the objectives of the survey. When done you can remove the *Centroids* and *Buffered* layers.

Create the Labeled Survey Grid

14 In order to easily identify the grid nodes, they should be given unique labels, which will be assigned in the QGIS *Attribute Table* for the layer.

Note

In the example given, nodes are labeled from south to north and from west to east, starting with 1 for the southernmost row, and 1 for the westernmost node on each row. Each row is conceived of as a surveying transect, though the survey itself does not necessarily have to proceed by transects. Thus, the node labeled *50m/26-4* would be the 4th node from the west on the 26th row from the south of the 50m survey grid.

14.1 In the **Layers** pane, right-click on the newly-created *Clipped* layer and select **Open Attribute Table**.

14.2 Click the **Toggle editing mode** (pencil) button in the upper left of the Attribute Table window to enable editing.

14.3 Click the **Open field calculator** (abacus) button to open the Field Calculator window.

14.4 Make sure that the **Only update *n* selected feature(s)** option is unchecked and that **Create a new field** is checked.

14.5 Enter *node* for the **Output field name**.

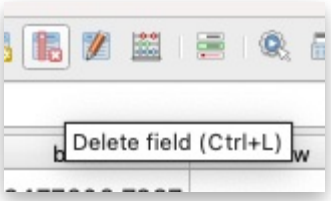
14.6 Set the **Output field type** to **Text (string)**.

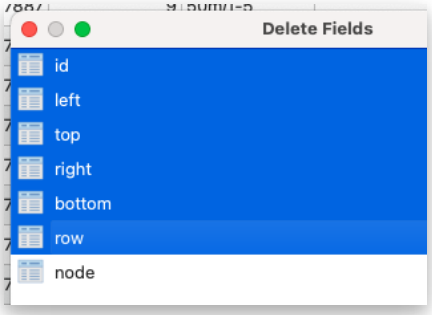
14.7 In the **Expression** field enter the following formula, replacing *<survey identifier>* with an appropriate prefix to identify the survey being planned, and ensure that the Output field length

value is sufficient to accommodate the longest expected result. Then click the **OK** button.

```
'<survey identifier>' || '/' || ("row" - minimum("row") + 1) ||
'-' || ("id" - minimum("id", "row") + 1)
```

14.8 Click the Delete field button and remove all the fields except for the newly-created *node* field because they are no longer useful or accurate.





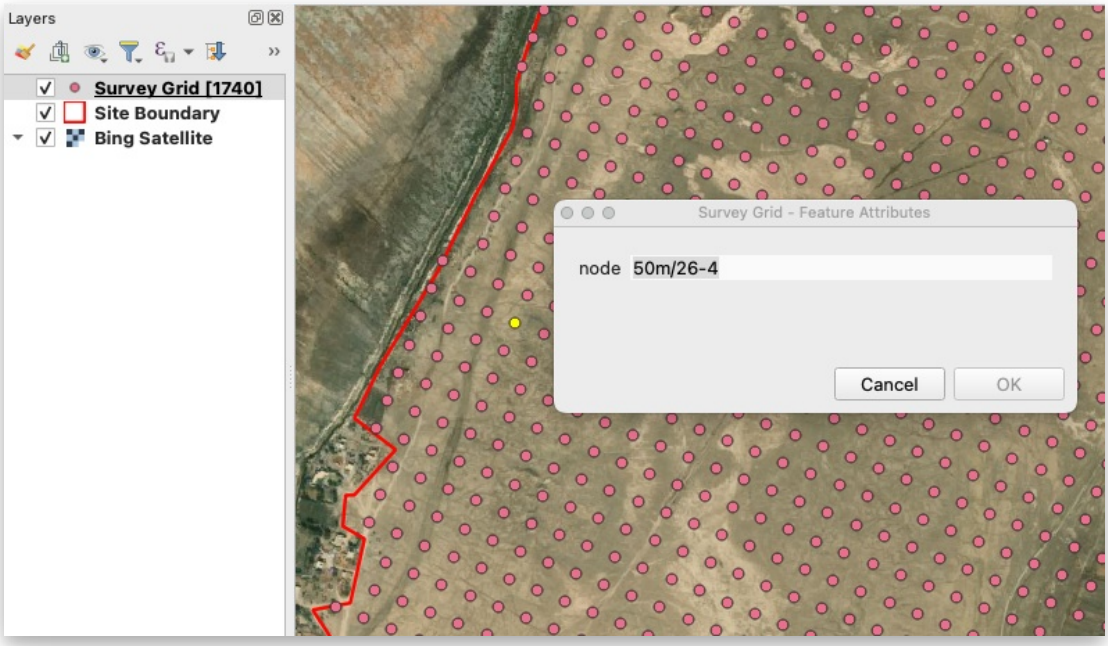
14.9 Click the **Toggle editing mode** (pencil) button in the upper left of the Attribute Table window and then click **Save** to save the edits.

14.10 In the **Layers** pane, right-click on the *Clipped* layer and select **Make Permanent…**

14.11 From the **Format** menu, choose **ESRI Shapefile**.

14.12 Next to the **File name** field click the **three dots** button to choose the location where the new file will be saved. Name the new shapefile something sensible like *Survey Grid*, then click **OK** to save the shapefile.

14.13 In the **Layers** pane, right-click on the *Clipped* layer and select **Rename Layer** then type the name that you used in the previous step.



Detail of the grid generated above, with node *50m/26-4* highlighted in yellow.

14.14 Save your QGIS project.

Next Steps

15 Depending on the intended use of survey grid created, one may wish to alter the point symbology, or add labels (using the *node* field generated in step *14*).

16 Finally, when you are satisfied that the grid meets the project's needs, find the Survey Grid shapefile and zip all its components together to upload to ArcGIS Online (see the Creating

Collection Forms with ArcGIS Field Maps protocol).

Note

When zipping the shapefile, be sure to include all its components: cpg, dbf, prj, shp, and shx.