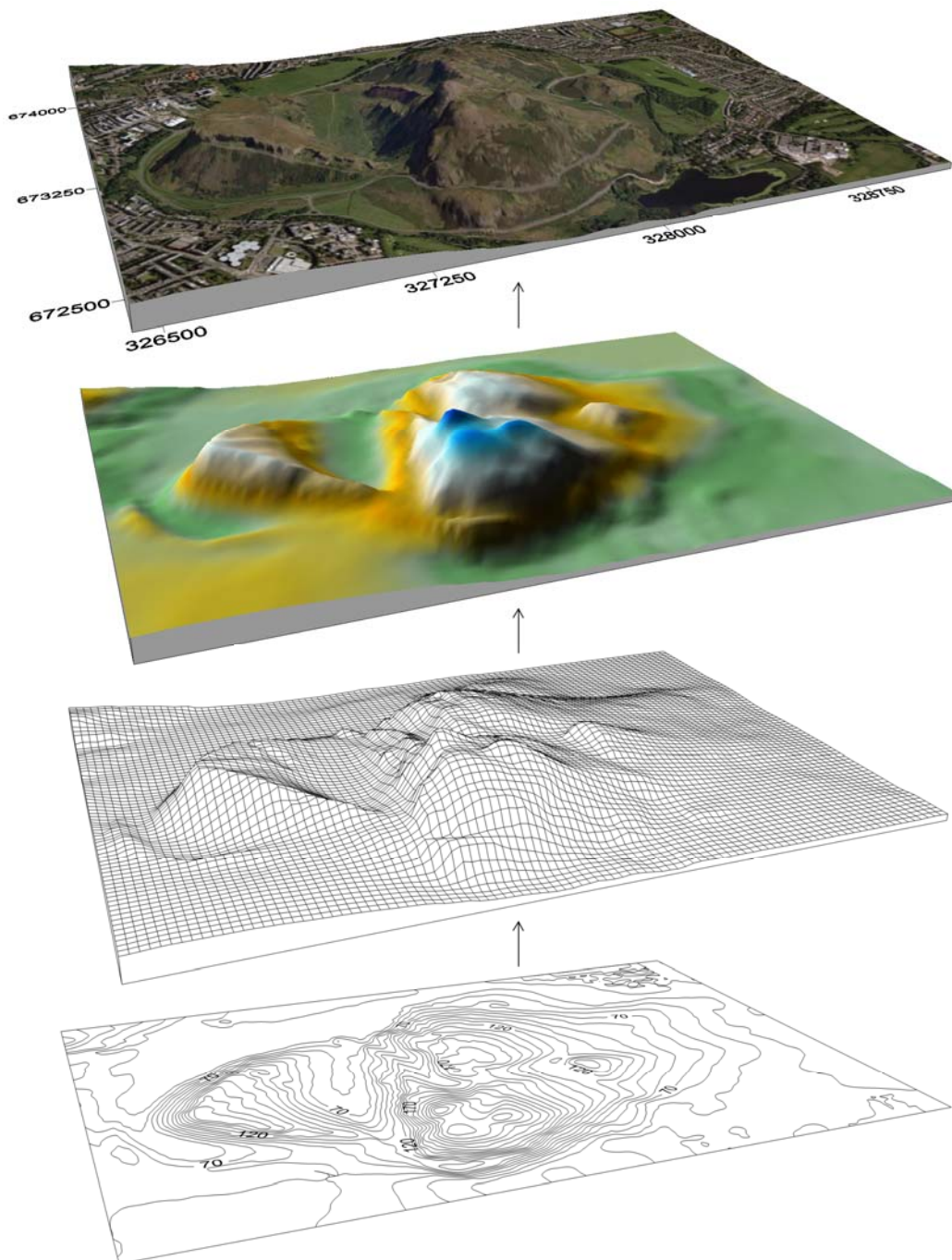# Archaeological Illustration: Portfolio 1

Landscape Mapping and Interpretation Project

Archaeological Illustration: Portfolio 1

Landscape Mapping and Interpretation Project

The area between Arthur's Seat and Dunsapie was chosen as the focus of this mapping exercise. Initially a total station survey was planned but this was abandoned in favour of a Global Positioning System (GPS) approach. As this was to be a landscape survey the accuracy of the Garmin 60CSx was deemed sufficient. The survey was delayed for several days due to appalling weather conditions, but was eventually completed on an overcast drizzly day when there was a light covering of snow on the ground, which no doubt obscured certain features in the landscape but at the same time allowed some, such as terraces, to be highlighted.

From the outset of the project it was decided to graphically enhance the results of the survey by generating a digital terrain model (DTM) of Arthur's Seat (see Figure 1).

The DTM was produced before fieldwork was undertaken and was constructed in several programs and with data from differing sources. Initially EDINA Digimap was used to download Ordnance Survey 1:25,000 and 1:10,000 maps of Edinburgh and Arthur's Seat. Contour lines were also downloaded at intervals of 2m in autocad format (.dxf)and all this georeferenced data was then imported into ArcGIS. The steps involved in then producing the DTM will be discussed below.

Figure 1. Garmin 60CSx.

Process of generating a digital terrain model of Arthur's Seat
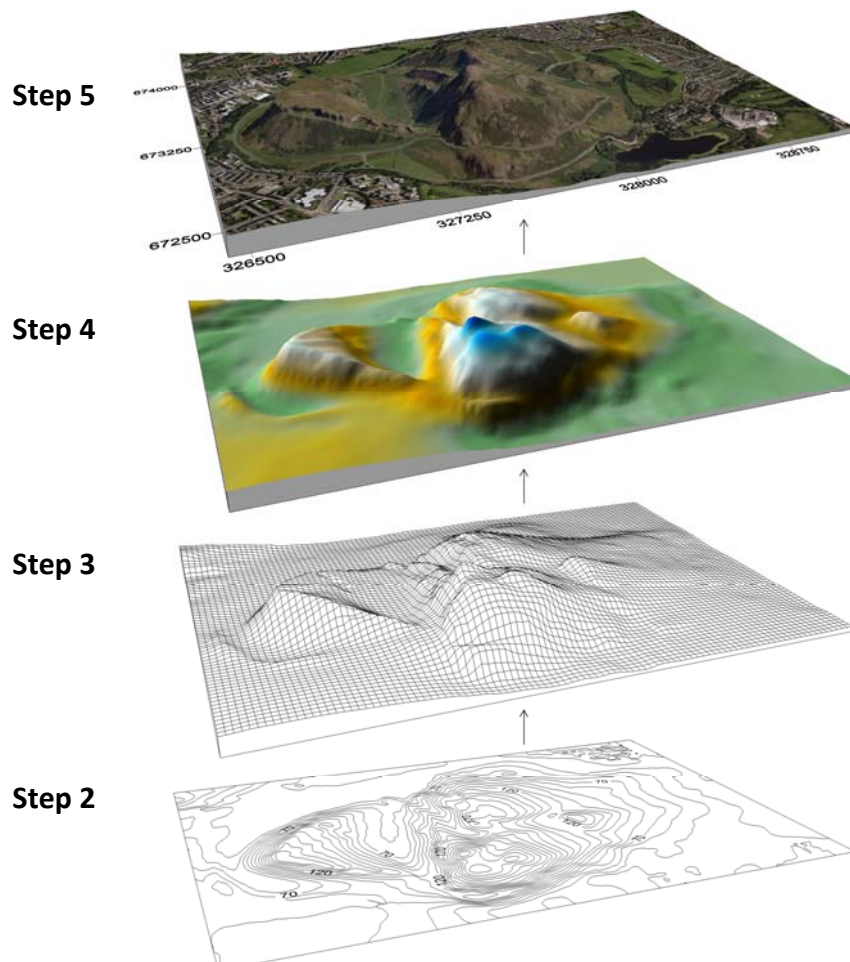

Step 5

Step 4

Step 3

Step 2

Figure 1. Steps (see below) involved in producing a digital terrain model (DTM) of Arthur's Seat.

Step 1

Examination of the imported data showed that the contour lines, whilst georeferenced correctly, did not have any elevations values assigned digitally. The contours were given their correct value, in the attribute table of ArcGIS, by comparing them to the contours illustrated on the 1:25,000 Ordnance Survey map (see Figure 2).
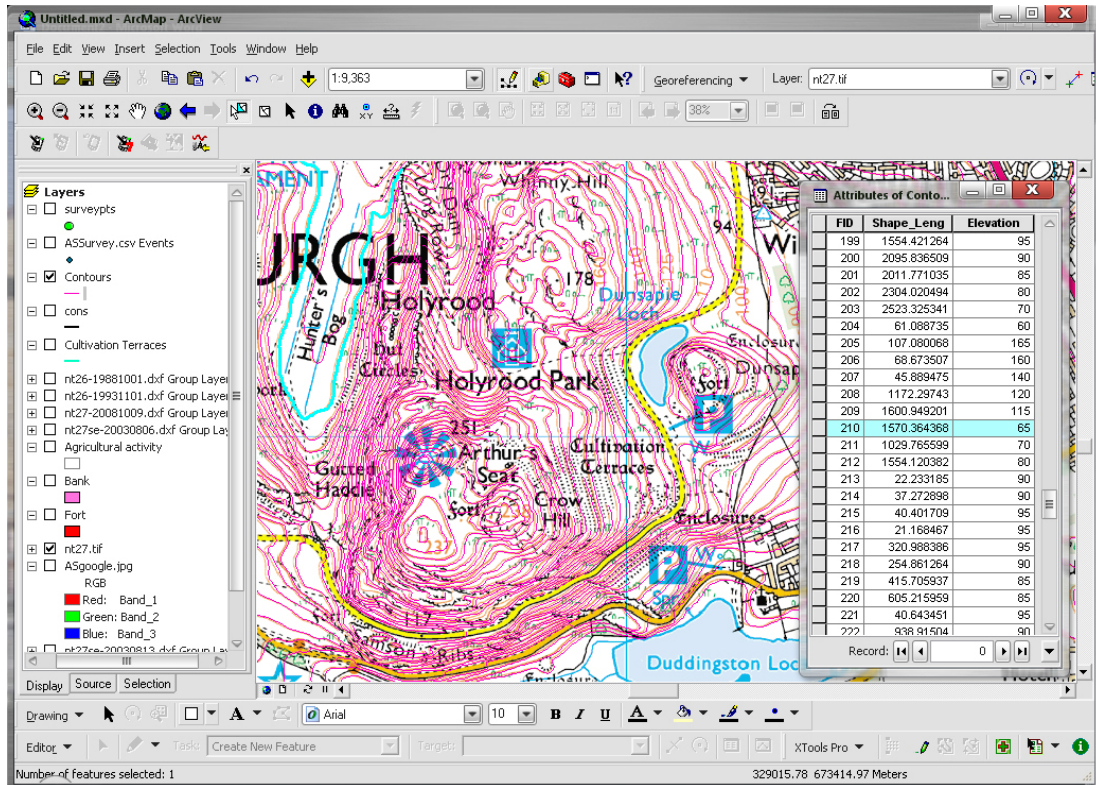

Figure 2. Showing the process of assigning elevation values to contour lines in ArcGIS.

Step 2

These contours were then imported into Surfer 9 (see Figure 3), a program produced by Golden Software, which is specifically designed to create 3D surfaces.
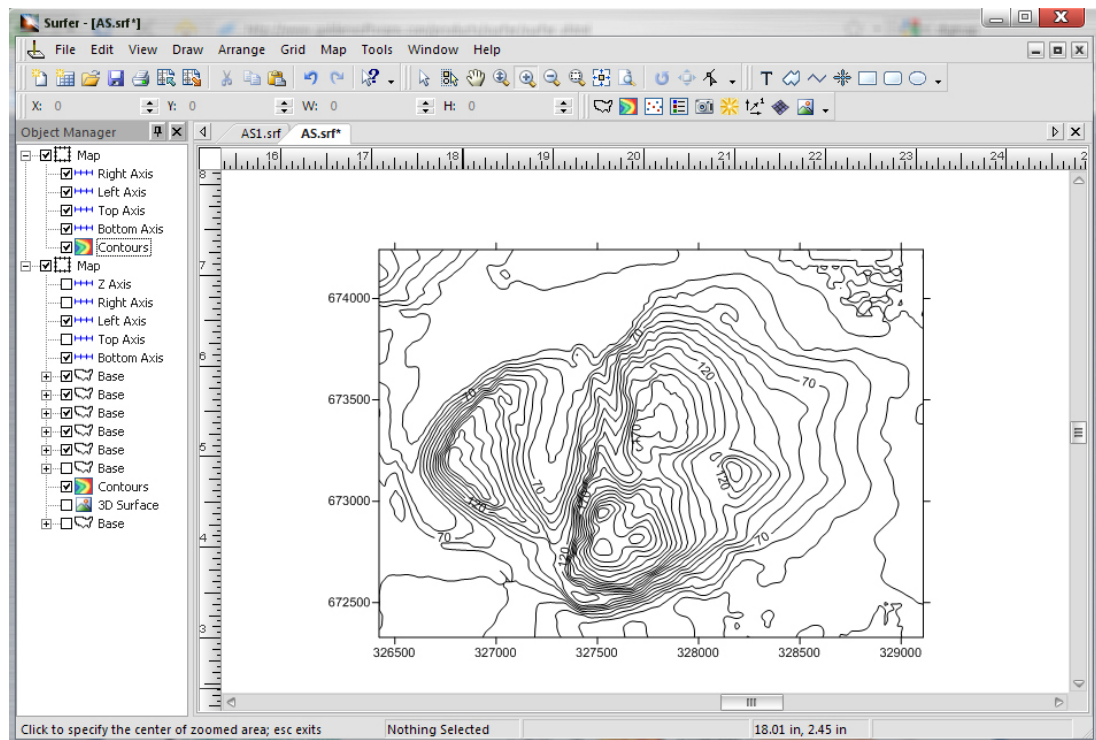

Figure 3. Surfer 9 with the imported contours lines from Arthur's Seat shown.

Step 3

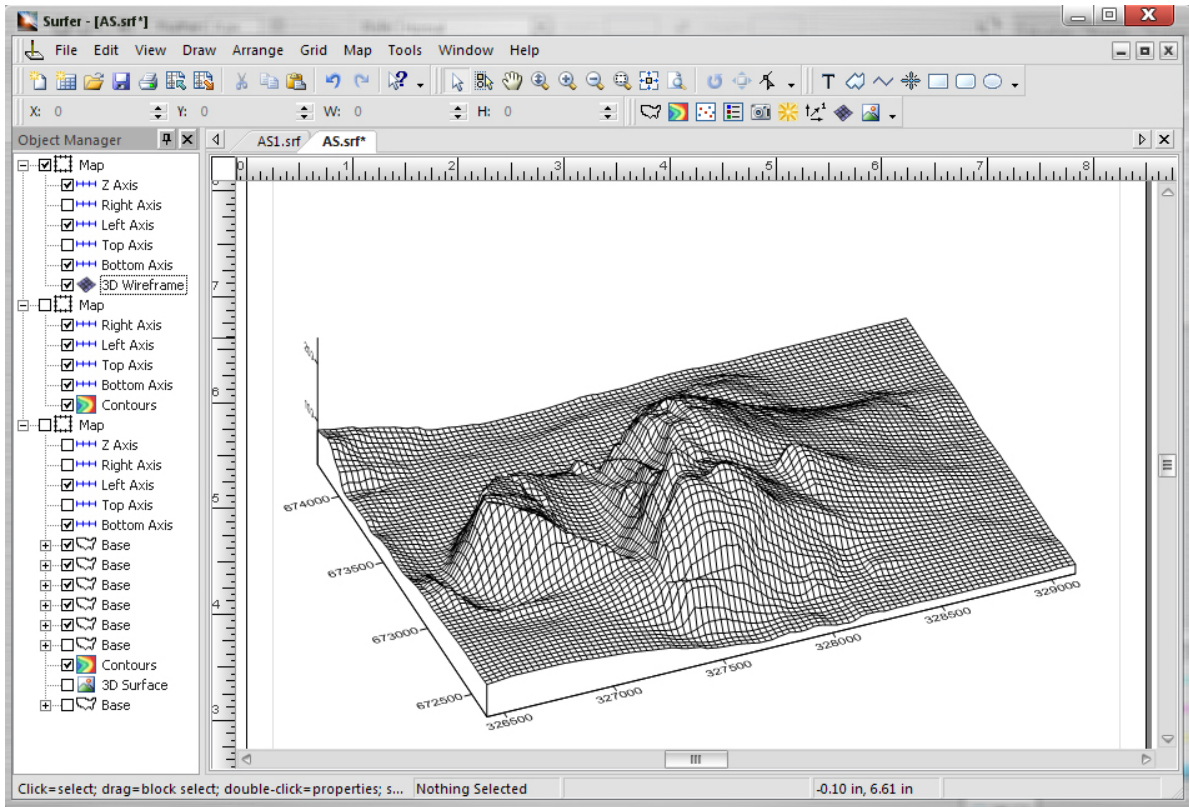A 3D wireframe was now created from these contours within Surfer 9.

Figure 4. Surfer 9 with the generated 3D wireframe shown.

Step 4

Once a wireframe was generated a 3D surface could be produced.
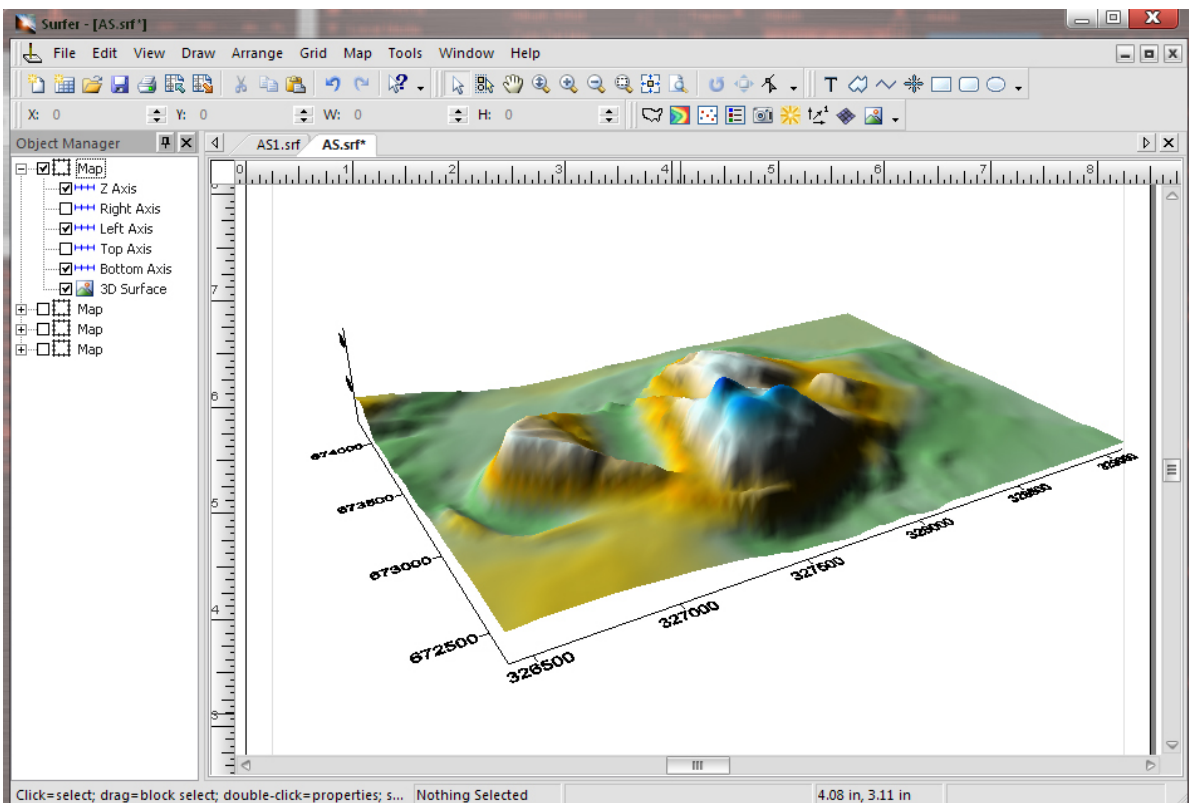

Figure 5. Surfer 9 with the 3D surface of Arthur's Seat shown.

Step 5

Finally shadows were added and the axis scale altered before a georeferenced Google map was draped over the top.
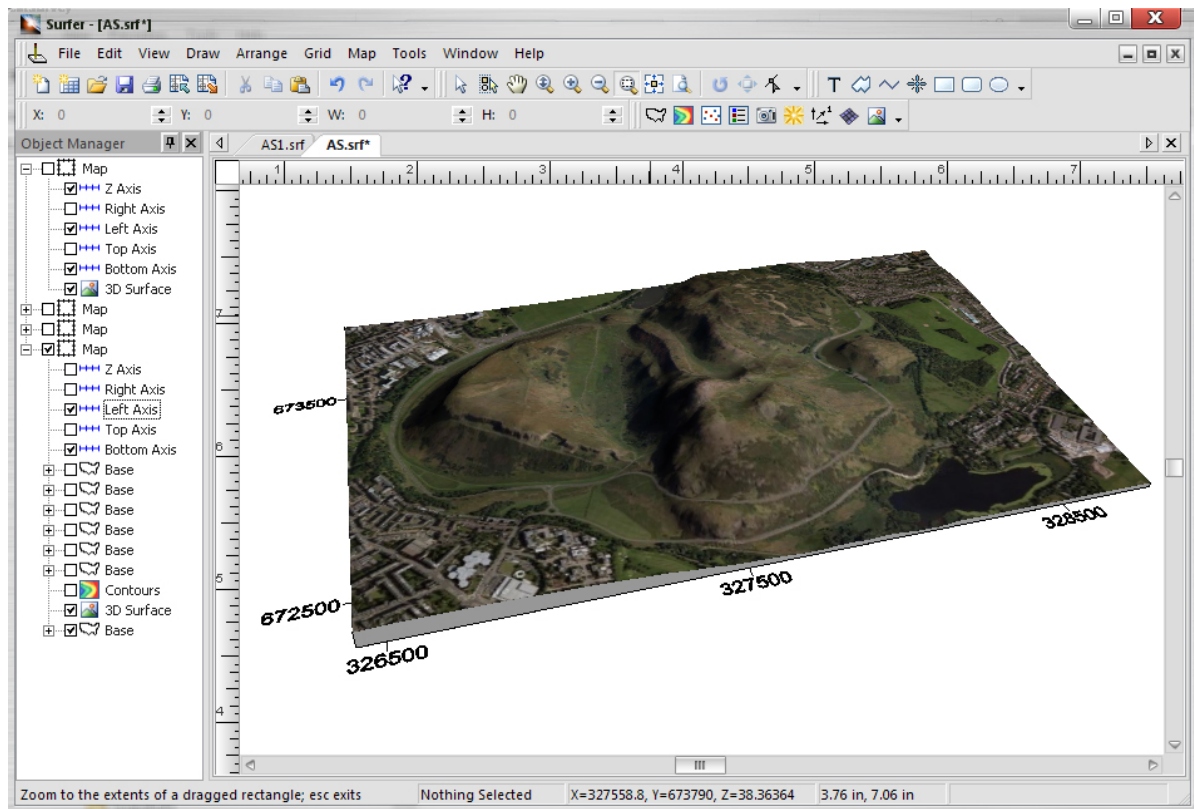

Figure 6. Surfer 9 with a Google satellite image draped over the 3D surface of Arthur's Seat.

The creation of digital terrain models is a way of engaging the public, as well as professionals, in archaeological illustrations. Conventional illustrations can seem rather exclusive to those not within the archaeological world, as symbols such as hachures are rarely used in other professions these days so many people are unaware of how to interpret them. The combination of a 3D image, which people can immediately understand, with a recognisable google satellite image allows for much greater interaction.

The Survey

The area between Arthur's Seat and Dunsapie was surveyed in the space of a day in March 2010. The GPS survey was undertaken to try and record any visible archaeological remains. Initially the fort at Dunsapie was located and numerous points taken around what was believed to b its mound. A large bank, some 0.5m high by 2m wide, ran downslope in a south-easterly direction for c.140 before turning sharply north and continuing for c.40m. At the end of the south-easterly bank there was a gap of c.10m before another bank could be seen running east to west for c.50m.

Conditions were not great but cultivation terraces, on the western slope down from Arthur's Seat, were particularly clear with snow resting on their edges. Less clear but nevertheless visible were cultivation terraces to the north and east of these, level with Dunsapie fort but located on the other side of the road and Dunsapie loch. An area of agricultural activity was also noticed to the south of the cultivation terraces SE of Arthur's Seat. An assumption was made that this was rig and furrow, but the height of these seemed very low. A series of survey points were taken around this potential area to form a rectangular zone highlighting their position.

Whilst points were being recorded with the GPS a written record on what each point related to on the ground was kept so that in the processing phase it would be known which point belonged to which archaeological feature.

Processing the survey data

Step 1

The British national grid coordinates recorded by the Garmin GPS were input by hand into an excel spreadsheet (see Figure 7). In all 106 points were taken during the survey.

ID	Easting	Northing	Description
105	328172	673158	DunsapieFort
106	328172	673158	DunsapieFort
107	328178	673169	DunsapieFort
108	328170	673180	DunsapieFort
109	328154	673178	DunsapieFort
110	328153	673163	DunsapieFort
111	328185	673199	Bank1
112	328185	673198	Bank1
113	328207	673182	Bank2
114	328228	673164	Bank2
115	328240	673155	Bank2
116	328264	673135	Bank2
117	328278	673125	Bank2
118	328292	673120	Bank2
119	328305	673108	Bank2
120	328302	673103	Bank2
121	328294	673096	Bank2
122	328278	673093	Bank2
123	328297	673138	Terrace
124	328299	673129	Terrace
125	328284	673124	Terrace
126	328274	673130	Terrace

Figure 7. Survey data, in excel, as it was being input by hand.

Step 2

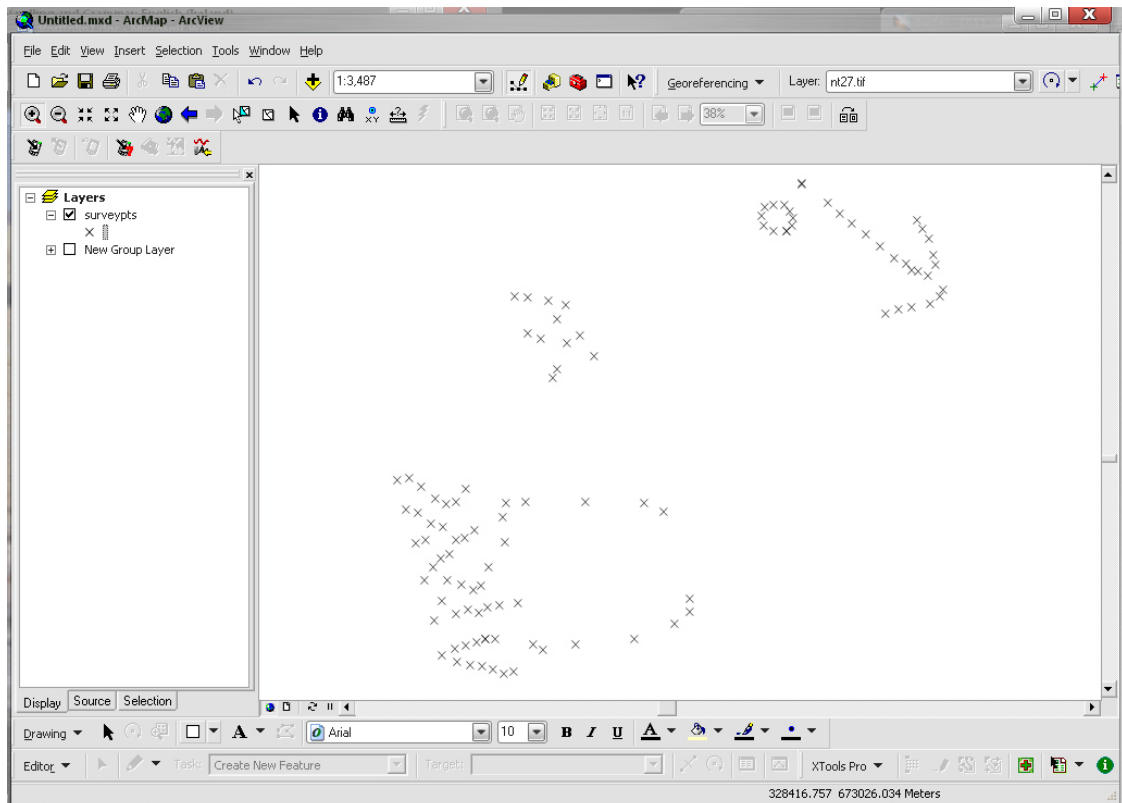The excel sheet was added to ArcGIS, where it was then turned into a shapefile (see Figure 8).

Figure 8. Spread of gathered survey points in ArcGIS.

5

Step 3

Features were the drawn, from the survey points recorded, as shapefiles in ArcGIS. Polylines were used to show the terraces whilst polygons were used for the fort and for its associated bank (see Figure 9).
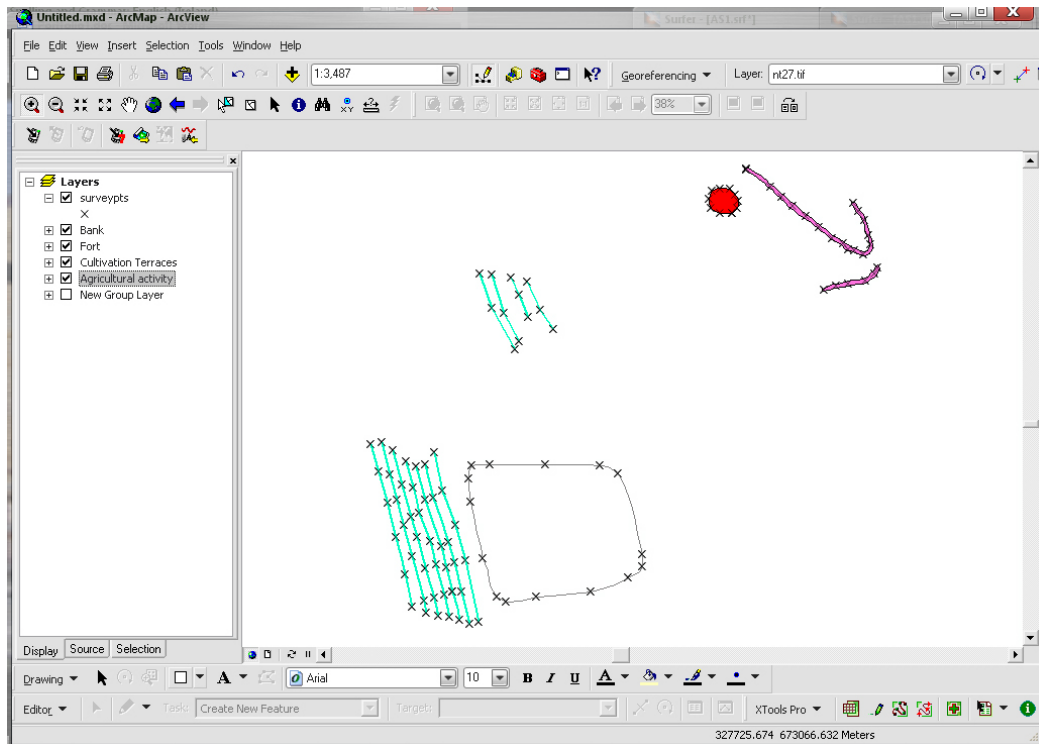

Figure 9. Features have been digitised based upon the location of the survey points.

Step 4

The next step is to digitise elements from the Ordnance Survey maps (see Figure 10). If time had permitted a more detailed survey could have been achieved in which all the features needed for a final publication illustration would have been captured.
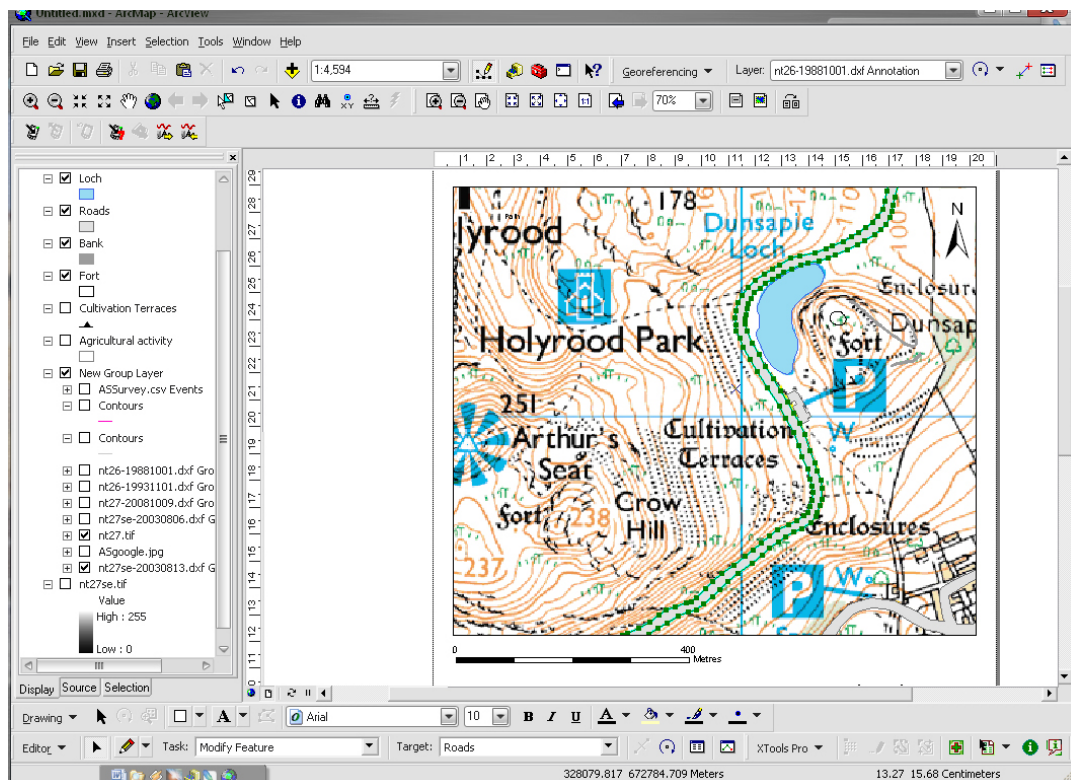

Figure 10. Digitising of Queen's Road around Arthur's Seat in ArcGIS.

Step 5

To produce a conventional illustration of the survey suitable for publication, hachures were added to the terraces and banks, with general annotations also applied. A legend, scalebar and north arrow were also necessary. Contours were added faintly in the background.
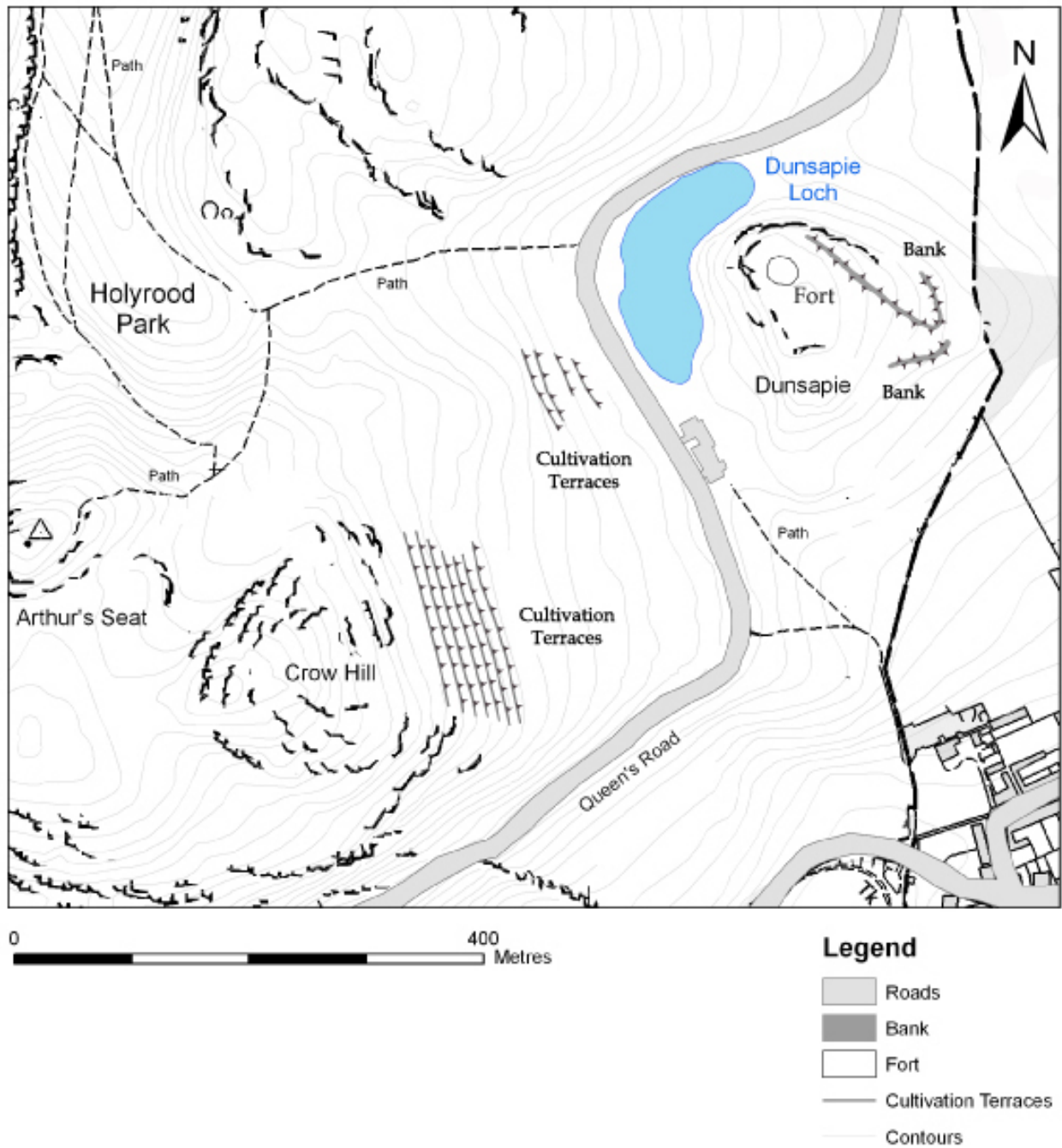

Figure 11. Conventional illustration of the completed survey, with hachures and contours.

Step 6

The survey data in the form of shapefiles from ArcGIS could now be imported into Surfer and overlaid onto the digital terrain model (see Figure 12). Vivid colours such as cyan were used for the features because it is possible to 'emphasise certain data by using very high chroma colours' (Brown and Feringa 2003, p139)

Figure 12. Survey data overlaid onto the DTM with a google satellite image draped ontop.

Research

Research after the survey revealed that this zone of agricultural activity is in fact rig and furrow and is described as such in the Royal Commission's records (site number NT27SE 3968) as;

'*An area of rig-and-furrow cultivation overlies the SE margin of the cultivation terraces below Arthur's Seat (NT27SE 76 and 135). The rigs are aligned from NE to SW and measure between 6m and 7.5m in breadth by up to 0.2m in height*.'
(http://canmore.rcahms.gov.uk/en/site/157282/details/edinburgh+holyrood+park+arthur+s+seat/)

The cultivation terraces surveyed within the area are also recorded by the Royal Commission (site number NT27SE 76) and their description is as follows;

"A flight of at least twenty cultivation terraces extends across the eastern slopes of Arthur's Seat, below the ramparts of the fort on Crow Hill……The terraces are most impressive on the steeper ground to the N, where they are also at their narrowest, measuring between 7.5m and 9m in breadth and up to 1.8m in height. As they descend the slope, the terraces broaden and become less well-defined, but they can still be traced over a distance of 370m. To the SE, the lower terraces are overlain by a plot of rig-and-furrow cultivation."
(http://canmore.rcahms.gov.uk/en/site/52542/details/edinburgh+holyrood+park+arthur+s+seat/)

The oblique aerial accompanying these records spectacularly show the fort at Dunsapie as well as the cultivation terraces and rig and furrow (see Figure 13).

Figure 13. Oblique aerial view of Holyrood Park centred on the remains of cultivation terraces and rig, taken from the NNE. RCAHMS Aerial Photography Date 21/1/1999 Copyright RCAHMS (http://www.scotlandsplaces.gov.uk/search_item/index.php?service=RCAHMS&id=157282 Accessed March 2010).

Figure 14. The generated DTM can be rotated to mimic the oblique angle at which the aerial photograph was taken.

Figure 14 shows how the DTMs generated in Surfer can be manipulated to reflect any view point or lighting angle. In this way an attempt has been made to mimic the angle at which the oblique photo from RCAHMS was taken so that a comparison between the survey and the clear locations of the features on the photo can be made.

Whilst not suitable for all archaeological applications, at this project scale the GPS, with c.6m accuracy, was sufficient. If excavation was to be undertaken or a more detailed survey at a greater resolution then a total station or DGPS unit would need to be used.

As recently as 1995 excavations were carried out on Arthur's Seat, by the Centre for Field Archaeology (CFA), in advance of construction of a path to the summit (Alexander, 1997). The heavy use of the area by both tourists and local residents does mean that this area is prone to erosion and indeed other risks. Whilst surveying Dunsapie Fort it was apparent that very recently a fire had spread across the eastern face of the hill removing all the heather and scrub. Its close proximity to the car park may help when attempting to explain the cause of fire, with either a deliberate attempt being made to set the hill alight possible or an accidental one in the form of a discarded cigarette butt. Traprain Law, which shares similarities with the rampart and fort on Arthur's Seat, was damaged when an accidental fire burnt much of its vegetation in autumn 2003 (Armit *et al*. 2005).

Utilising modern technology may help in preserving archaeological features such as those found on Arthur's Seat. By studying detailed changes in satellite imagery, through remote sensing, or by analysing lidar data, potentially areas which are at most risk can be identified and ultimately protected without the need for continuous survey in the field.

References

Alexander, D. (1997) Excavation on Arthur's Seat fort, Edinburgh, 1995. *Proc Soc Antiq Scot*, 127, p595-600.

Armit, I., Andrew, D., Hunter, F. and E. Nelis. (2005) Traprain Law: Archaeology From The Ashes. *Past*, The Newsletter of the Prehistoric Society (49), University College London.

Brown, A. and W, Feringa. (2003) *Colour Basics for GIS Users*. Prentice Hall, England.

Resources Used

EDINA Digimap   -   http://edina.ac.uk/digimap/

RCAHMS   -   http://canmore.rcahms.gov.uk/

Computer Programs Used

Surfer 9 (Golden Sofware)   -   http://www.goldensoftware.com/products/surfer/surfer.shtml

ArcGIS (ESRI)   -   http://www.esriuk.com/