

Best practice guidelines - digitising in Google Earth

Creating vector boundaries

These best practice guidelines are intended to provide the necessary information to creating digital boundaries using Google Earth. At the time of writing this tutorial, the most current release of Google Earth (build version 4.0.2737) is available from

<http://earth.google.com/download-earth.html>

Google Earth will run on a minimum system specification (not recommended) of

- Operating System: Windows 2000 or Windows XP
- CPU: Pentium 3, 500Mhz
- System Memory (RAM): 128MB
- Hard Disk: 400MB free space
- Network Speed: 128 Kbits/sec
- Graphics Card: 3D-capable with 16MB of VRAM
- Screen: 1024x768, "16-bit High Color"

The following specifications for your PC are recommended

- Operating System: Windows XP or Windows Vista
- CPU: Pentium 4 2.4GHz+ or AMD 2400xp+
- System Memory (RAM): 512MB
- Hard Disk: 2GB free space
- Network Speed: 768 Kbits/sec
- Graphics Card: 3D-capable with 32MB of VRAM
- Screen: 1280x1024, "32-bit True Color"

Prior to this release, digitising polygons was only available with Google Earth Plus and Google Earth Pro. This release has provided an extremely useful tool for the creation of digital boundary data. **Cautionary note however, you can only install the free version of the software on a home PC, not on a company PC.** You will need Google Earth Pro to install on a work PC.

This tutorial provides information on how to create vector boundaries for Important Bird Areas. The process is the same for other types of data such as species range maps, although the associated attributes will differ.

The process of creating vector boundaries within a geographical information system is called *digitising*. It is the creation of polygons, lines and point data. The process is not dissimilar to creating graphical objects in a computer graphics package such as

CorelDraw, but what is fundamentally different is the use of a coordinate system to reference the objects to the Earth.

There are several important considerations that need to be addressed before the actual process of digitising can begin and these are listed below.

- Data collection

A wide variety of data can be collected to assist with digitising vector boundaries. Commonly used supplementary data are scanned maps (you must be aware and careful not to infringe upon copyright laws), and satellite imagery has become more easily obtainable from sources such as Landsat Geocover. Alternatively, Google Earth images can be saved and then georeferenced for your projects.

- Data preparation

Scanned maps, aerial photographs and images need to be georeferenced to “locate” them on the surface of the earth before you start work, otherwise your digitised data will not relate to the right location. You need to determine what projection you are going to need and use. A recommended projection for creating digital boundaries within a GIS such as ArcGIS is the Universal Transverse Mercator (UTM) projection. The Universal Transverse Mercator projection is designed to provide a single grid system that can be applied to the surface of the earth. In this projection, the world is divided into 60 north-south zones, each covering a strip 6° wide in longitude. These zones are numbered consecutively beginning with Zone 1, between 180° and 174° west longitude, and progressing eastward to Zone 60, between 174° and 180° east longitude.

Google Earth uses Simple Cylindrical projection with a WGS84 datum for its imagery base. Typically, the data you import into the Google Earth application is created with a specific geographic coordinate system, such as a Universal Transverse Mercator (UTM) projection and a NAD27 datum (North American Datum of 1927). Each geographic coordinate system may assign slightly different coordinates to the same location on the earth. When you import data into Google Earth, your data is interpreted according to the Google Earth coordinate system.

- Scale

Scale greatly affects the accuracy of digitised boundaries e.g. the same digital boundary created using map at 1:5,000 and 1:100,000 scales will vary greatly in quality. In general, the more detail you can see, the greater the accuracy of the boundary.

- Digitising quality

The process of digitising features can produce unwanted artefacts within the vector data structure such as self-intersecting polygons, one that crosses over itself (looking similar to a bow tie). It is highly recommended that these artefacts are avoided. “Bad topology” as these errors are called will cause problems later when you want to do analyses. It is a good idea to practice the process of digitising before working on final

polygon data. The following illustration provides an example of a self-intersecting polygon.

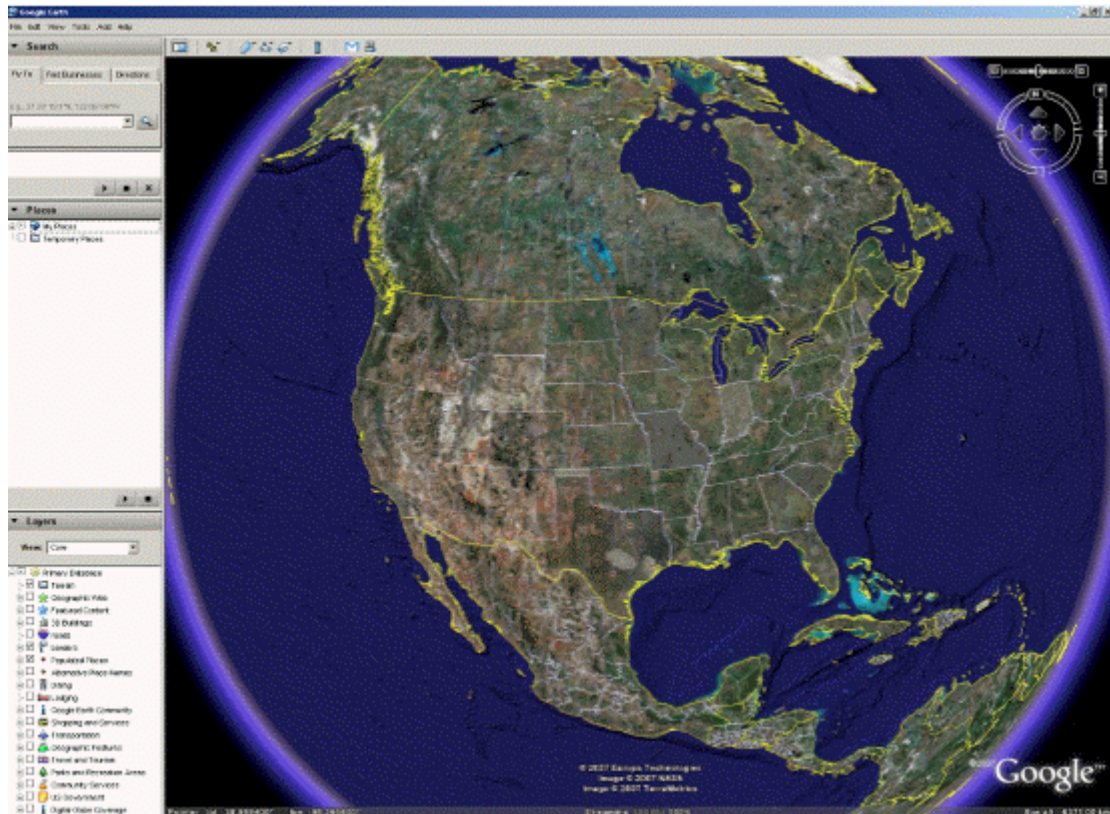


Notice the black arrows indicate the direction of digitising, note that in this example, the polygon intersects itself. It is these errors that cause problems later on within a GIS such as ArcGIS; with a bit of care and attention to the digitising process these errors are easily avoided.

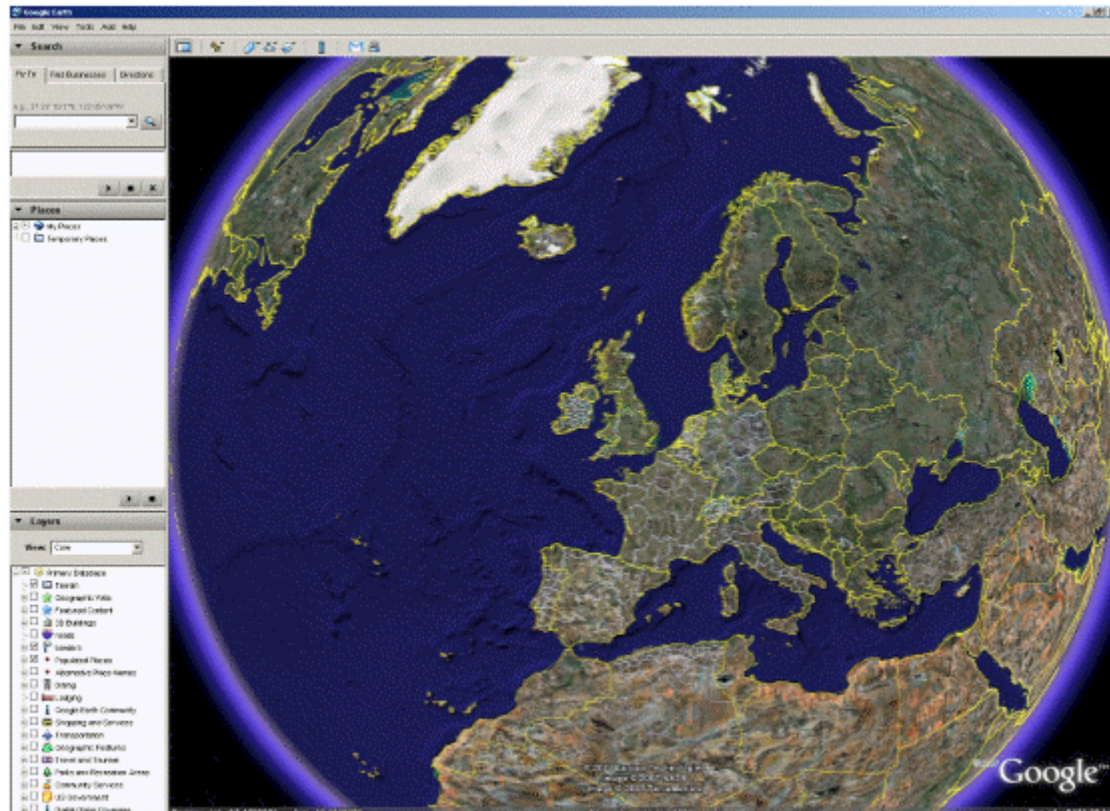
Tutorial 1

Digitising in Google Earth

From your Start Menu, select Google Earth from your Programs menu, you will see something similar on your screen;



Scroll to your country by clicking your left mouse button on the earth and moving your mouse to spin the globe to your location and then releasing the left mouse button (notice that the mouse cursor changes to a hand when in the 3D viewer). In this tutorial, a polygon boundary will be digitised in the UK. Notice the various data displayed in the 3D Viewer. These layers can be turned on or off by selecting or deselecting them from the Layers Panel (located on the bottom left).

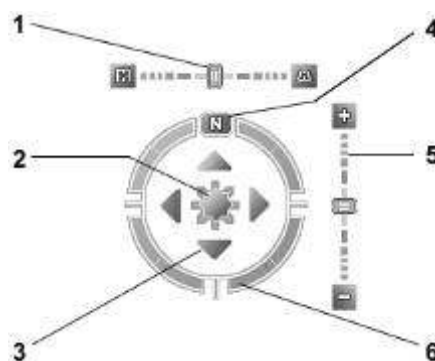


Now that we have the correct geographic location, we need to zoom in closer. There are several ways to do this;

- Mouse Navigation

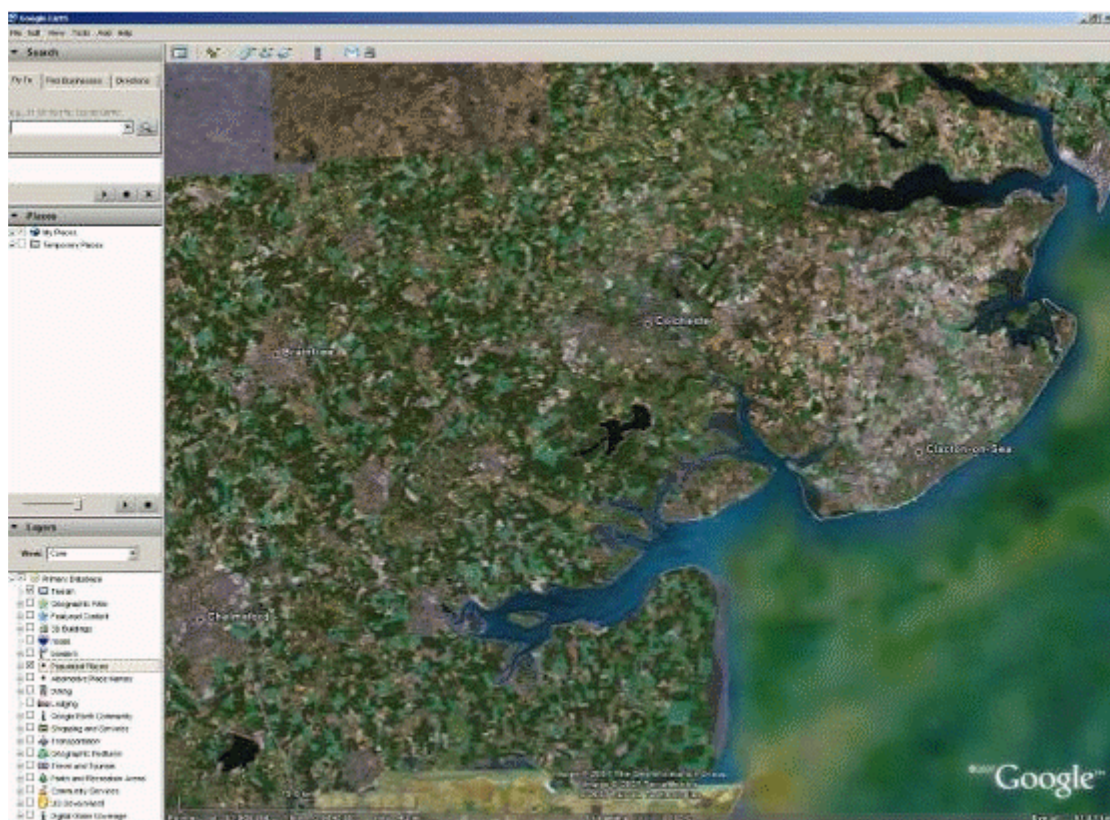
Zoom in and out using the mouse scroll wheel.

- Google Earth Navigation



1. Use the tilt slider to tilt the terrain toward a horizon view. Move the slider to the left for a top-down view or to the right for a horizon view. Double click the icons at the end of the slider to reset the tilt all the way to a top-down view or to a horizon view.

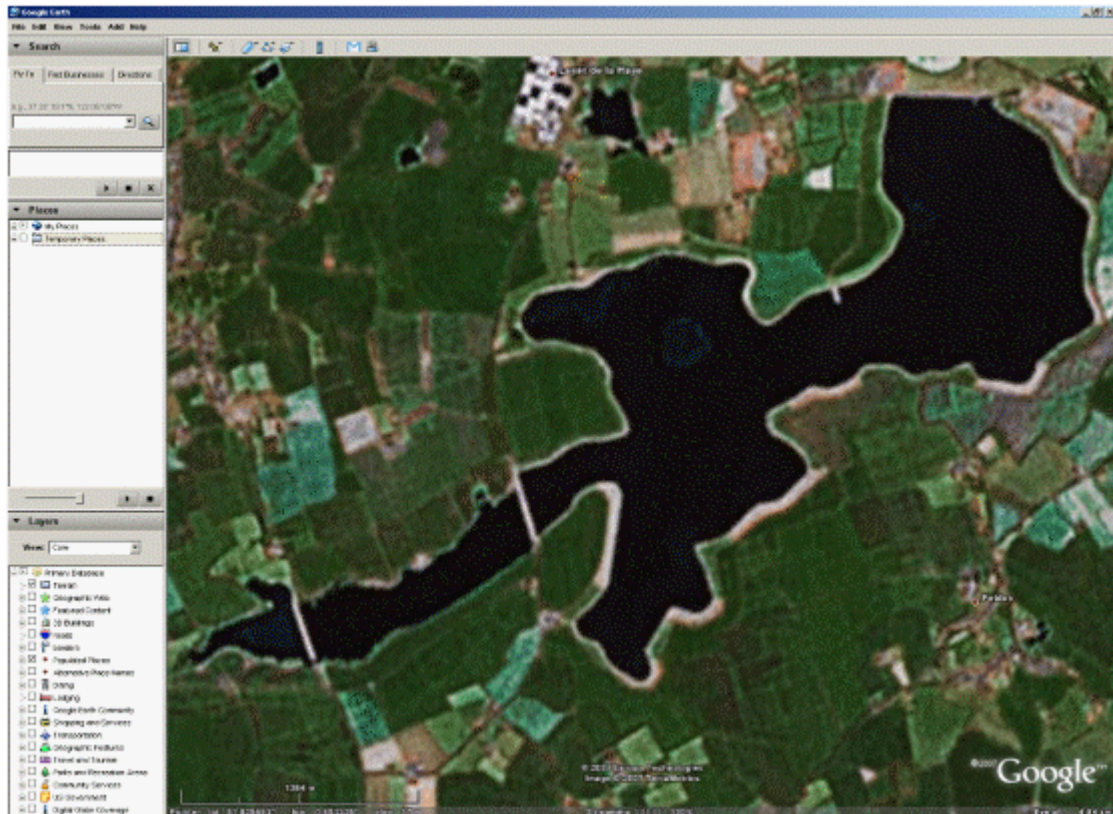
2. Use the joystick to move the center point of the view down, up, right or left. Click the center, hold the mouse button, and move in any direction.
3. Click the direction arrows to move the view in the direction you wish.
4. Click the north up button to reset the view so that north is at the top of the screen.
5. Use the zoom slider to zoom in or out (+ to zoom in, - to zoom out). Double click the icons at the end of the slider to reset the zoom all the in or out.
6. Click and drag the navigation ring to rotate the view.




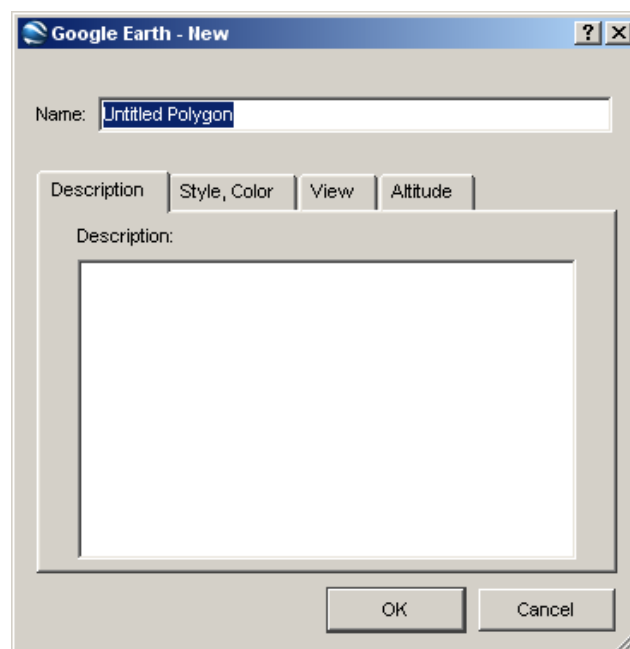
Notice the level of detail increases as you zoom in. The feature in the middle of the 3D Viewer is a UK IBA – Abberton Reservoir (UK001). This is located in the South East of the UK, just to the south of Colchester in Essex. The tutorial will now provide details of how to create a polygon boundary using Google Earth.

Step 1. Zoom to the IBA feature

- Zoom as close to the identified IBA as you can (remember that scale is fundamental here), use the mouse scroll wheel or the Navigation tool.



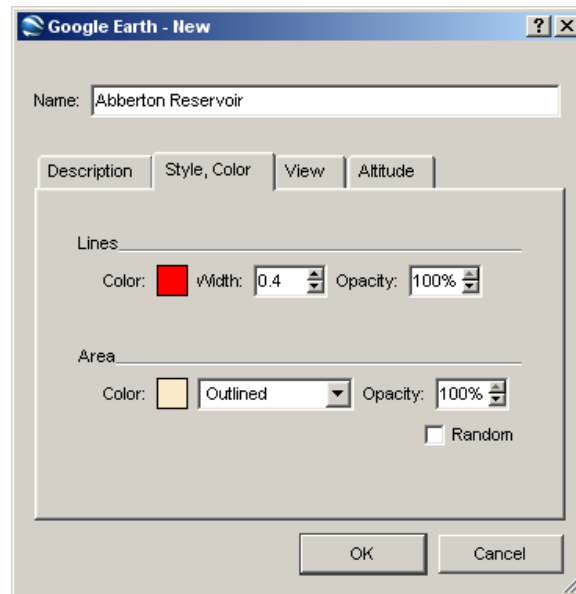
- Click the left mouse button on the Add Polygon tool . This will open a dialog box:



Unlike using a GIS like ArcGIS, this dialog box allows you to enter only one attribute. The recommended attribute to add here is the National Name for the IBA. Make sure that this name matches to the IBA National Name entry in the WBDB. In this example, replace **Untitled Polygon** with **Abberton Reservoir**. Do not close the dialog box just yet. Notice that there are several other tabs

- Style, Colour


This tab enables you to change the appearance of your digitised boundaries, for this tutorial a red outline is chosen (it is best to have only an outline and no fill colour so you can see what you are digitising).



- View
You do not have to do anything in this tab
- Altitude
You do not have to set any values in this tab

NOTE: You need to keep this dialog box open whilst you digitise, so do not click on OK until after you have finished.

Step 2. Digitise the IBA feature

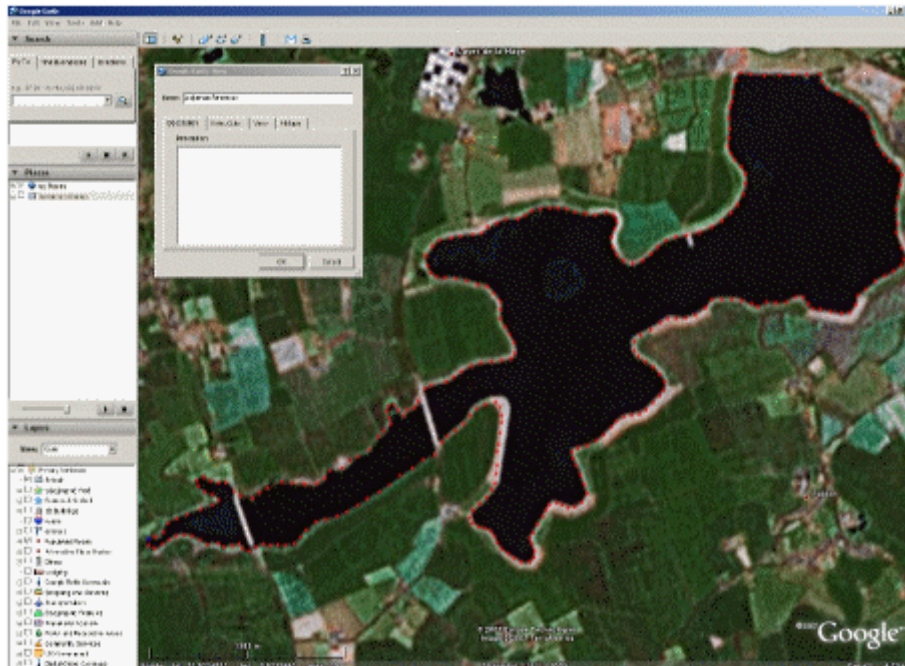
- Notice the cursor changes to a white square box - , this indicates that you are now ready to digitise your feature.
- Decide where you want to start digitising (in this example, the bottom left of the feature). The idea here is to click a series of points (vertices) that best represent the boundary as illustrated. The current vertex is indicated with a blue point on your screen with prior vertices indicated in red.



If you make a mistake with a vertex and wish to move it, simply move the mouse cursor over any previous vertex which turns green (notice the cursor changes to a pointing finger). You can then relocate the vertex to its rightful position.



Continue adding vertices until you have finished e.g. you end up close to where you started



Notice the last vertex in this example is indicated in blue. You can now click OK to close the dialog box. Notice the **Places Panel** to the left above the **Layers Panel**. You should see a folder called **My Places** and underneath this a sub folder called **Temporary Places**. In this folder you should see the newly created polygon called Abberton Reservoir.



To finish the digitising process, click the right mouse button on the layer named Abberton Reservoir and select Save As to open the Save As dialog box



Navigate to a folder where you want to save the file and give it a meaningful name e.g. UK_IBAs.kml. You have a choice of two formats

- **KML**
This is the standard Google Earth file format
- **KMZ**
This is a compressed Google Earth file format (useful for large files)

You can choose either of these formats and then click on Save.

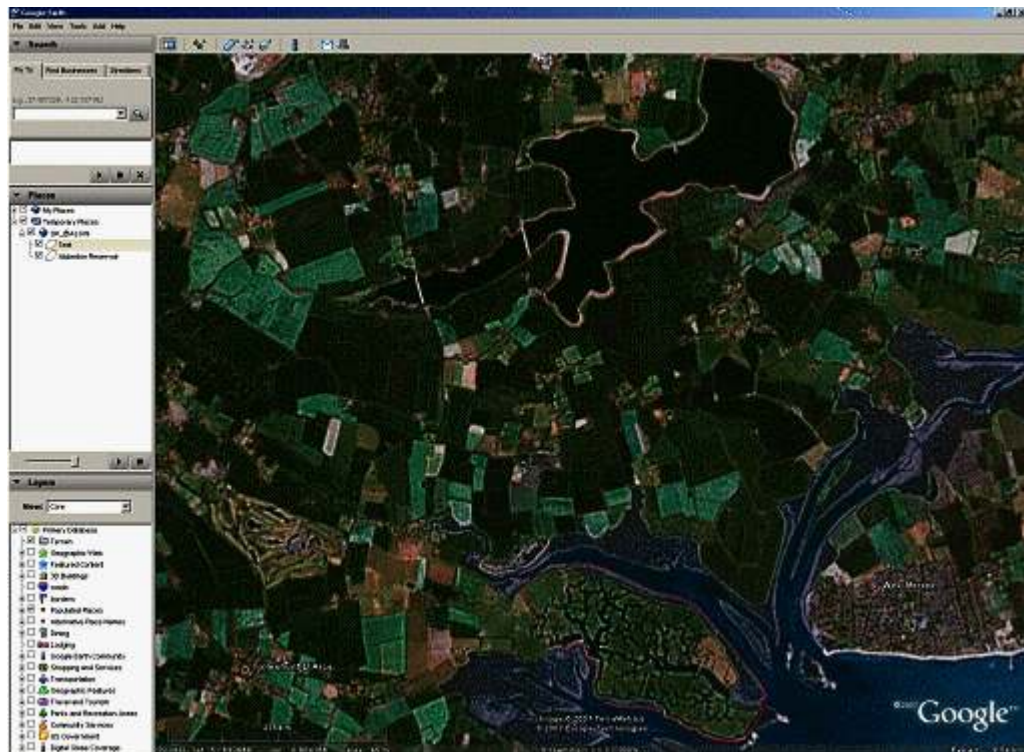
You have now successfully created an IBA boundary. Depending on how you want to continue digitising other IBAs for your country, you can do each boundary individually by repeating these steps or you can add to the existing one you have just created.

Step 3. Adding another IBA boundary

- If you want to add more IBA boundaries to your existing new boundary layer, open the file you have just saved by selecting **File** and then **Open** from the Google Earth menu. From the Open Dialog box, navigate to the folder and select the file. Click on **Open**. You should now see the IBA boundary file in the 3D Viewer and also in the Places Panel;



- Click the right mouse button on your file and then select Add Polygon. This will open the Google Earth New dialog box as before. To add another polygon, repeat the previous steps. Remember to add the IBA National Name. In this example, another polygon called Test has been digitised south of the reservoir;



When you have finished digitising additional boundaries, click the right mouse button on the layer and then select Save As. In the Save dialog box, navigate to your folder select the existing file and click on Save. You will be presented with an Overwrite file dialog box, click on OK.

NOTE: When you double click on the new boundary under Places, you will notice that you zoom to the boundary.

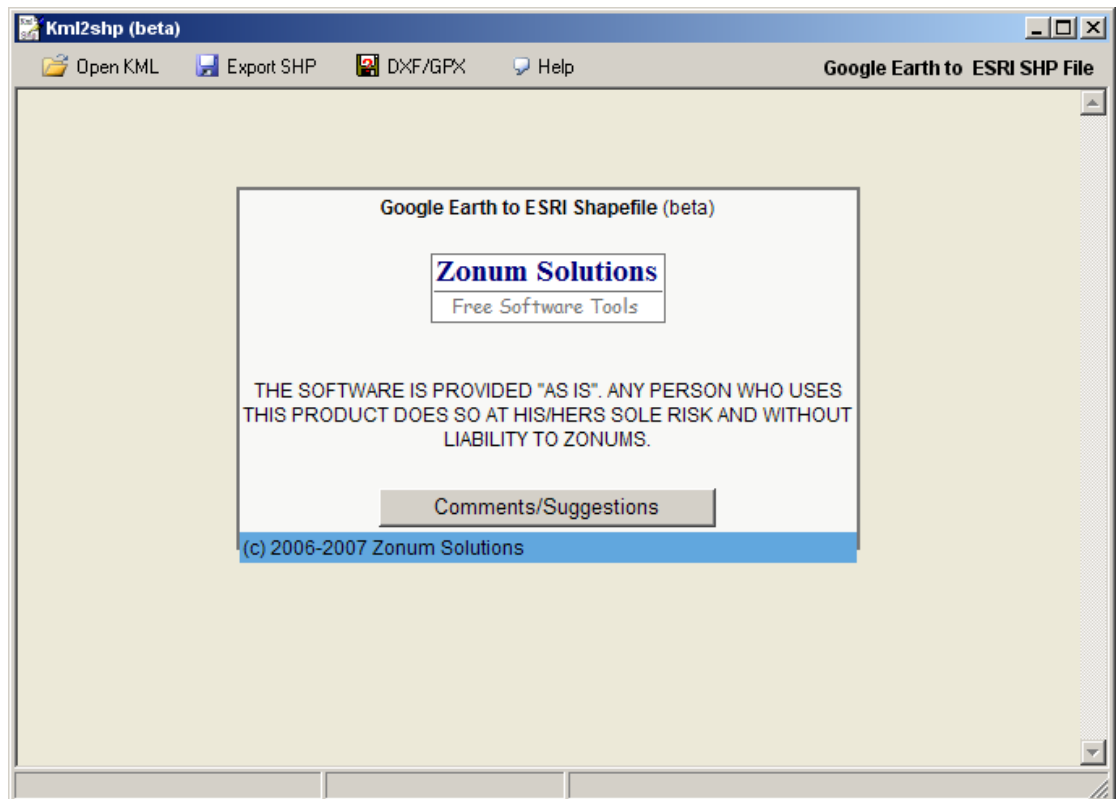
For a more in-depth discussion about kml files, the users are encouraged to look at the following;

<http://earth.google.com/kml/index.html>

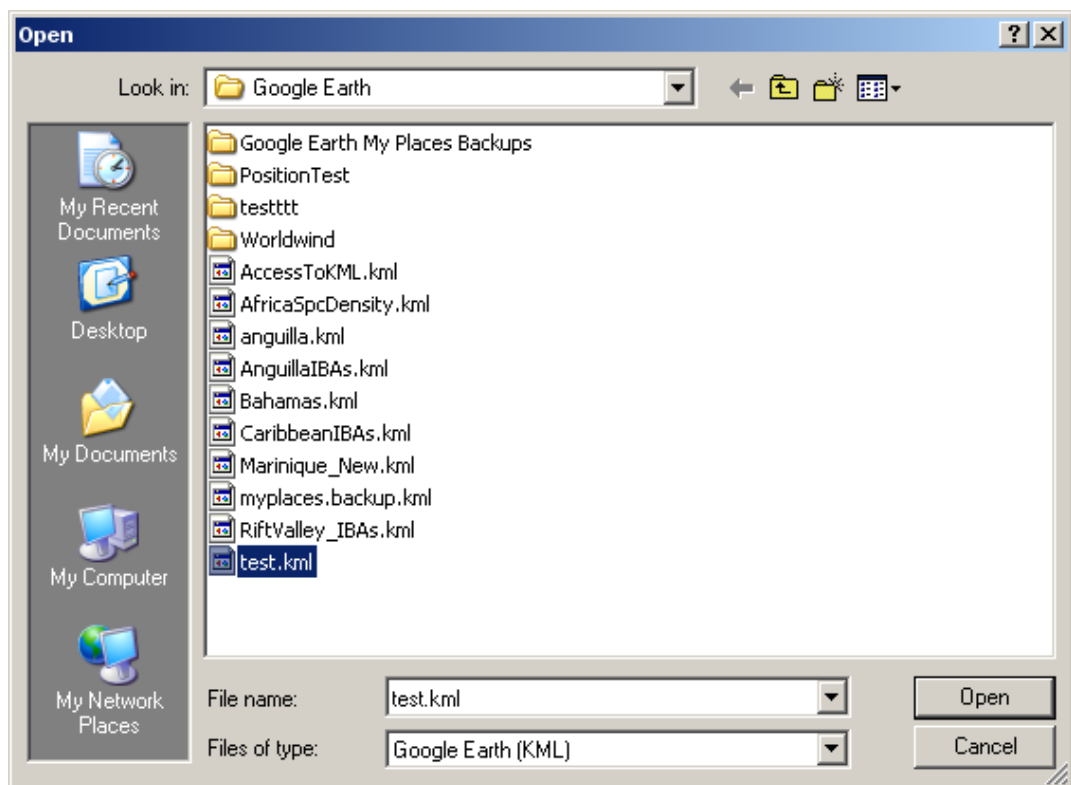
For those who need to convert this new boundary into a shapefile you may be interested in a free tool called *kml2shp* available from:

<http://www.zonums.com/kml2shp.html>

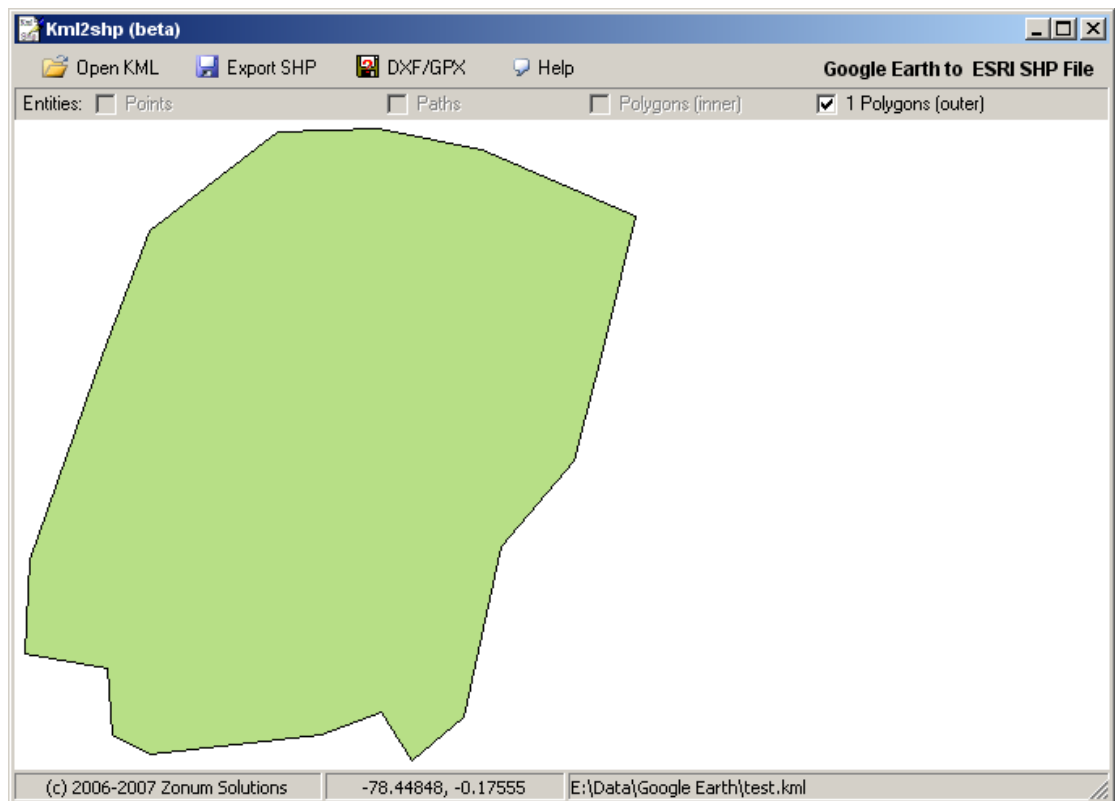
Install this by downloading the file and extracting the program using winzip or (other compression program) to a folder of your choice. To run the program, just double click the kml2shp.exe file. The interface should look like the following:



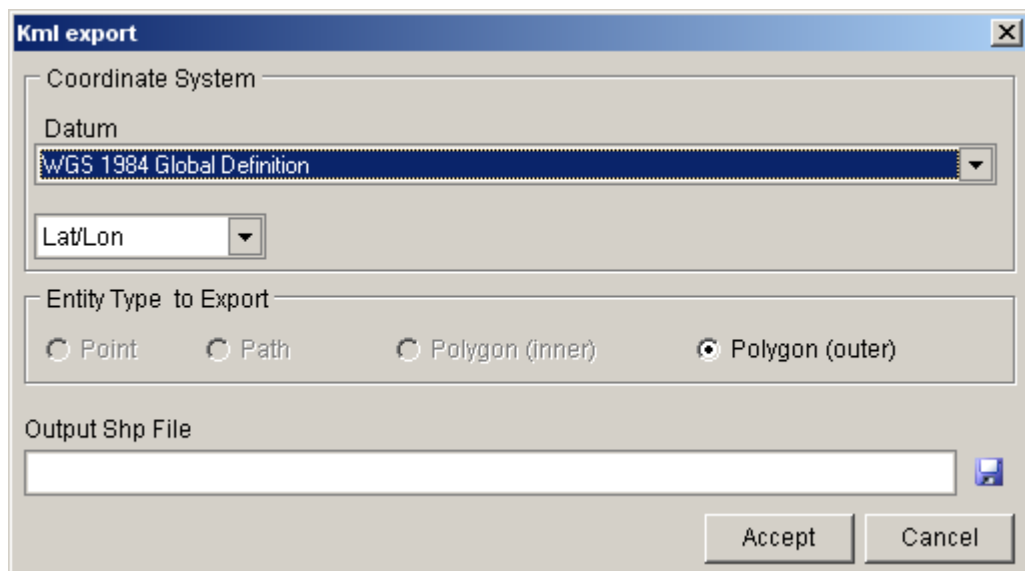
To use the program, click on the Open KML file icon at the top left. With the Open dialog box, navigate to where you stored your kml file, select the file and then click Open.




The program should open the kml file and display it



The next step is to click on Export SHP to open the Kml export dialog box:



You need to provide a name and location for the shapefile, click on the  icon to open the Save As dialog box. Enter a name and location for the new shapefile. Click on Accept to start the conversion. If everything has worked ok, you should now be able to open the shapefile in your GIS and add more attributes.