CatchmentsUK™

Defining catchments in the UK

User Guide

WHS Wallingford HydroSolutions Ltd

CatchmentsUK™

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April 2011

WHS

Development team

Wallingford HydroSolutions Ltd (WHS) software development team are responsible for the development of the CatchmentsUK™ software.

Document history

V1.0

April 2011

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Technical Specification

Minimum recommended specification

Base computer

Intel or equivalent PC with CD drive

Chip

Pentium IV or equivalent

RAM

1Gb

Free drive space

2Gb

Operating system

Windows XP, Windows Vista, Windows 7
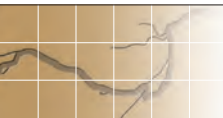
Contents

Licence terms and conditions

The use of the CatchmentsUK™ software is governed by the Terms and Conditions of
the Licence Agreement between Wallingford HydroSolutions Limited and the User. The
User is required to accept the licence terms and conditions of use prior to installation
and at runtime. These terms and conditions can be viewed at the login screen of the
software and on the Licence Certificate. Your attention is particularly drawn to clauses
relating to your responsibilities and licence termination.
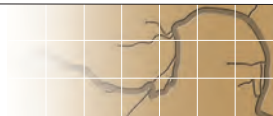
1 Overview

A catchment boundary defines the area of land which drains to a given point (the catchment outlet). The ability to identify the boundary of a catchment is fundamental to many hydrological and environmental applications. Catchment boundaries can be digitised manually from paper maps and then used in a variety of geographic information system (GIS) applications. This process can be laborious for large and/or high resolution catchment boundaries.

CatchmentsUK enables boundaries to be generated automatically for catchments in the United Kingdom. Benefits of the system include:

- Fast, reliable and reproducible catchment boundaries produced as ESRI ShapeFiles (.shp) and comma separated files (.csv).
- Boundary definition routines underpinned by Ordnance Survey elevation data.
- Ability to overlay raster contextual layers to assist in verifying boundaries.
- Identification of catchments greater than 0.5km^2.

WHS make no guarantees regarding the accuracy of the catchment boundaries derived by CatchmentsUK. Errors in the underlying elevation data, the size of the catchment and the location of the outlet may all introduce uncertainty into the delineation of a boundary. It is recommended that all boundaries generated by CatchmentsUK are compared with contour data mapped at a suitable scale. The ability to browse in contextual data sets, such as Ordnance Survey 1:50,000 and 1:25,000 raster data, has been provided specifically to assist in this process.

2 How to use this guide

This User Guide describes how to install CatchmentsUK and outlines the functionality of the system, including adding contextual data layers. The guide is arranged in the following manner:

- **3 Getting started** How to install and run CatchmentsUK and the functionality of the main window.
- **4 Adding contextual data** How to add contextual raster data sets to the map pane to assist in navigation and enable catchment boundaries to be verified.
- **5 Defining catchment boundaries** How to undertake a catchment *climb* and define a catchment boundary from a catchment outlet selected on the river network. The process culminates in the export of the catchment boundary as an ESRI ShapeFile (.shp) and/or comma separated file (.csv).

The table below shows the conventions used in the text.

Convention	Explanation
Bold grey	Text name appearing in the window currently displayed.

3 Getting started

3.1 Installing the software

To install the CatchmentsUK software, place the CD in your CD drive and run the **setup.exe** file.

The installation will prepare to install the software, displaying the **Preparing to install…** screen. This will take several minutes due to the size of the data files within the software. The Installation **Welcome** screen will then be displayed. Continue with the installation to the **Licence Agreement** screen, Figure 3.1. You must read and accept the licence terms and conditions of the software prior to continuing with the installation.

Figure 3.1 Licence agreement screen

The **Destination Folder** screen will then be displayed, Figure 3.2. You will be asked to specify where the software should be located; a default location is supplied.
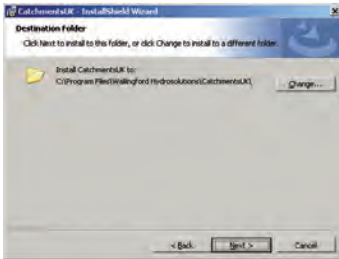
Figure 3.2 Destination folder screen

The **Database Folder** screen will then be displayed, Figure 3.3.
This indicates the location in which the data files associated with
CatchmentUK will be installed. A default location is suggested which
you may edit.

Note that approximately 2Gb of data will be installed in the database
folder and accessed by the software from this location on a regular basis.

Figure 3.3 Database folder screen

The **Ready to Install** screen enables you view the installation details.
Continue by selecting **Install** which will begin the installation. This will
take several minutes. Following completion select **Finish**, after which you
should restart your PC.

3.2 Activating the software licence and logging in

CatchmentsUK is protected by a licence held on the USB dongle which is supplied with the software. You must insert the dongle into the computer whenever you run the software.
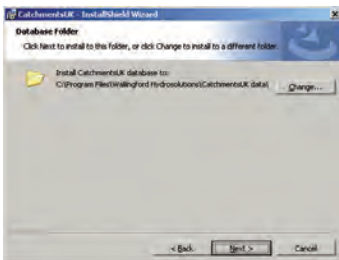
The first time you use the software, you need to click **Browse licence...** in the login screen (Figure 3.4) and browse to the **CatchmentsUK.lic** file on the USB dongle. During subsequent uses the software will automatically look for the licence in the same place, however, if the drive letter of the dongle changes (when you are using it on another computer) you may need to browse to the file again.

If the licence file is valid you will see a message on the login screen confirming that you have a valid licence for the software.

Figure 3.4 Login screen

You must agree to the Licence Terms and Conditions before running the software. Click **Accept** to confirm that you have read and accepted the Licence Terms and Conditions presented in the login screen. The software will then start and you will see the Main window displayed.

3.3 Using the main window

When the software is first run the Main window displays a map showing

regions of the United Kingdom for quick reference (Figure 3.5). The key features on the Main window are described below.

- Available raster layers are listed on the right of the map pane. This list will be blank until contextual data is added, see Section 4.
- A zoom slider is located to the left of the map pane. This enables zooming functionality to the centre of the current map.
- The **Climb** button begins the definition of a catchment boundary, see Section 5.
- The **Import Raster** button enables you to import a contextual raster layer to be displayed in the map pane, see Section 4.
- The **Pan**, **Zoom In**, **Zoom Out** and **Full Extent** buttons enable panning and zooming to be applied with the mouse button. Note that each of these functions will stay active until you de-select the button by L-clicking on it a second time.
- The scale bar displays the current map scale.
- The coordinates of the current mouse position are shown both in metric XY format and as National Grid References.
- A **Snapshot** icon enables the current map to be copied to the clipboard.
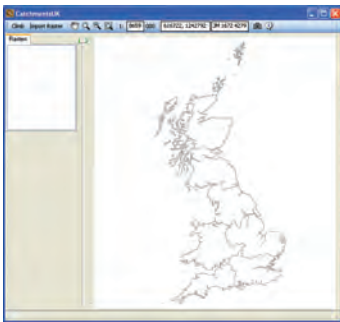- The **About** icon provides access to software documentation.

Figure 3.5 Main window

4 Contextual data

4.1 Adding contextual data

The **Import Raster** button begins the process of adding contextual raster data to the Main window map pane. You can select a single file or multiple files (which will be displayed as a single layer of map tiles).

Add File(s) button on the Import Layers window allows you to browse in multiple files (multiple select using the CTRL key).

The files are then displayed in a map pane which can be navigated by L-Mouse Click to zoom in and R-Mouse Click to zoom out.

L-Clicking on a filename in the list provided will highlight the area covered by this file on the map pane.

R-Clicking on a filename in the list provided will enable the tile to be removed from the list.

You must supply a layer name and press the **Save** button to complete the process. If the layer name already exists you will be asked to confirm if the new files should be added to the existing layer (as map tiles) or to supply a new layer name.

Close the Import Layers window to cancel the import process at any time.
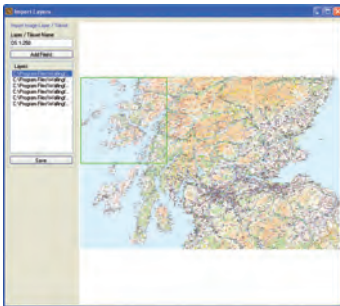

Figure 4.1 Importing contextual data

Once a contextual layer is added to CatchmentsUK it is shown in the list to the left of the map pane.

Note To remove a layer from this list you must R-click on the layer name and confirm you intend to remove the layer.

4.2 Ready-installed contextual data

A number of contextual raster layers are provided with CatchmentsUK. These are installed to a location selected by you during the installation process. These layers need to be added to the software interface using the **Import Raster** button as described in Section 4.1. The layers currently supplied CatchmentsUK are:

- **OS MiniScale** MiniScale™ is part of the Ordnance Survey (OS) OpenData catalogue and has been designed primarily for use within desktop graphic applications, where simple backdrop topographic mapping of Great Britain is required. It shows the landscape features relevant to its scale including boundaries, settlements, main communications and physical features.
    - **Format** single tile
    - **Filename** OSMiniScale.tif
    - **Size** 91Mb (approx.)
- **OS 1:250k** the 1:250 000 Scale Colour Raster is part of the OS OpenData catalogue and is a small-scale, digital, raster mapping product giving a regional view, similar in content and appearance to a typical road atlas. It shows the landscape features relevant to its scale including cities, towns, many villages, motorways, A and B class roads, railways, rivers and some woodlands.
    - **Format** multiple tiles (ie. can be browsed as tiles to form a single map layer)
    - **Filenames** NN.tif etc for NGR squares. Total of 56 tiles
    - **Size** Total size 116Mb (approx.)
- **British Isles** Coarse level display of topography for the British Isles.
    - **Format** single tile
    - **Filename** BritIsles.bmp
    - **Size** 5Mb (approx.)

4.3 Other map resources

You can import additional contextual data layers into the software. CatchmentsUK currently enables raster (not vector) data sets to be added as contextual data.

In the UK, Ordnance Survey (OS) provides access to a number of freely downloadable data sets for Great Britain including;

- OS Street View™ is a 1:10 000 (nominal) scale colour map.
  Coverage: England, Scotland and Wales.
- OS VectorMap™ District is a 1:25 000 (nominal) scale colour map.
  Coverage: England, Scotland and Wales.

Further information and downloads can be found at
http://www.ordnancesurvey.co.uk

Note The addition of many large contextual data sets will require higher specification computing hardware to enable the software to access and display these rapidly.

5 Defining a catchment boundary

The term catchment *climb* refers to the process by which the extents of the catchment boundary are identified by *climbing* the digital elevation dataset from the catchment outlet to the catchment boundary. CatchmentsUK includes a catchment climb algorithm which delineates the catchment boundary automatically.

Prior to selecting the **Climb** button on the Main window you should zoom in to a suitable scale to enable the start point for the climb to be identified on the current map.

Upon selecting the **Climb** button the **Set Catchment Outlet** panel is displayed.

Note Once the **Climb** button has been selected the **Pan**, **Zoom In** and **Zoom Out** buttons can still be used to navigate around the map. However, these buttons must be de-selected (a second L-click on the button) prior to beginning a climb.

A number of tools are provided to assist in the identification of the correct catchment outlet and hence the correct catchment boundary.

- Contextual data layers can be used for orientation.
- The tool-tip of the Mouse location shows the catchment area (km^2) which drains to this point.
- A L-Click on the map will highlight the first (approx.) 1km^2 of catchment immediately upstream of the outlet, thus showing the direction of the lower reaches of the catchment. This enables choices of catchment outlet to be made in the vicinity of river confluences.

The **Show Rivers** option will display a representation of the river network in the vicinity of the climb point that is consistent with the underlying digital elevation data, see Figure 5.1. There may be discrepancies between the location of rivers on this layer and those on contextual layers due to differences in data provenance and the mapping resolution.
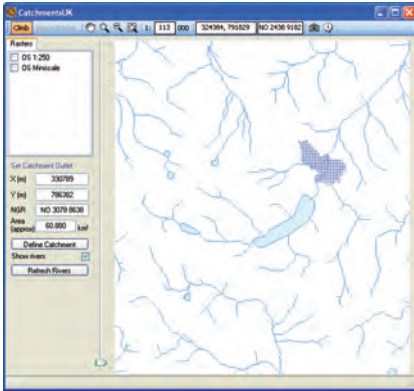
Figure 5.1 Identification of a catchment outlet using L-Mouse Click to identify the lowest 1km² of catchment and a display of the rivers network

A climb is initiated by selecting the **Define Catchment** button; the catchment boundary is then displayed and the estimated catchment area returned in the **Basin Details** panel, as illustrated on Figure 5.2 and Figure 5.3.

You may then save the catchment boundary using the **Save to File** button or you may select **Reset** to define a new catchment.

Choosing **Save to File** enables the boundary to be saved as a ShapeFile (.shp) or as a comma separated file (.csv) holding a series of coordinate pairs. Note that the default filename includes the catchment outlet XY coordinates.
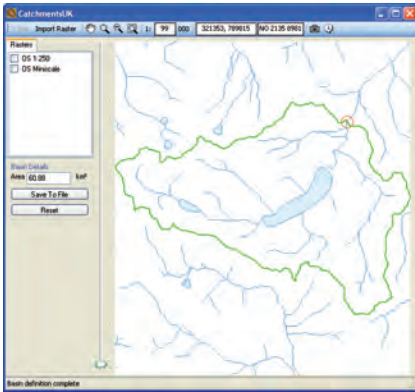
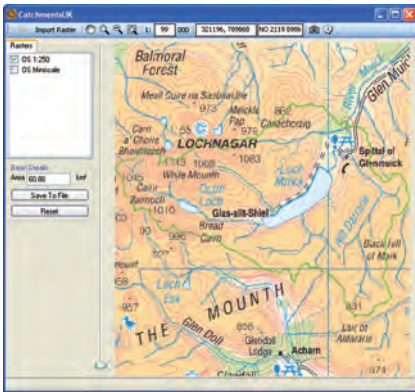Figure 5.2 Catchment boundary definition complete

Figure 5.3 Catchment boundary definition complete with contextual data layer shown
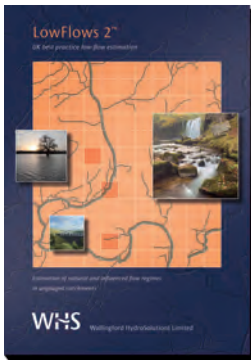
5.1 Tips for defining catchments

Some general notes regarding definition of catchments are
included below:

■ The boundaries drawn by CatchmentsUK are dependent on the
accuracy of the underlying digital terrain model. You should always
inspect the final catchment boundary before accepting a boundary
as valid.

■ It may not be possible to define a catchment above every point shown
on the river network. This is due to inconsistencies in the underlying
digital terrain model. Nearby points should be tested and the final
boundary checked for suitability.

■ Discrepancies are known to exist between the digital terrain
model and contextual data layers. Therefore, it will not be possible
to complete climbs from every river stretch identified on an OS
contextual layer.

■ Definition of catchments in very flat areas may be problematic due to
the lack of relief in the underlying digital terrain model.

■ If a catchment for a lake is required then you should select a
catchment outlet point downstream of the lake to begin the climb.

■ The definition of very large catchments may take some time
(depending on the computing hardware used).

6 Allied software

The catchment boundaries produced by the CatchmentsUK software are in ESRI ShapeFile format or CSV file format. These formats are flexible and allow the import and use in most Geographical Information System software packages.

CatchmentsUK boundaries can be imported directly into the WHS LowFlows river flow estimation software. Please see our website for further details.

WHS

www.hydrosolutions.co.uk