

# Australian Hydrological Geospatial Fabric (Geofabric) Tutorial

Calculate an upstream drainage  
area with ArcHydro

Version 2.1 – November 2012



**Australian Government**  
**Bureau of Meteorology**





## Contact details

Geospatial Data Unit

Bureau of Meteorology  
GPO Box 2334 CANBERRA ACT 2601

Phone: 02 6232 3502  
Email: [ahgf@bom.gov.au](mailto:ahgf@bom.gov.au)

**Contents**

- 1 Introduction..... 5
- 2 Tutorial ..... 6
  - 2.1 Download the Geofabric Surface Network File Geodatabase ..... 6
  - 2.2 Install ArcHydro..... 7
    - 2.2.1 ArcGIS 9.3 ..... 7
    - 2.2.2 ArcGIS 10.0 (SP3)..... 8
  - 2.3 Set Target Locations ..... 8
    - 2.3.1 ArcGIS 9.3 ..... 8
    - 2.3.2 ArcGIS 10 (SP3)..... 10
  - 2.4 Calculate the total upstream drainage area for each node ..... 12
    - 2.4.1 ArcGIS 10 (SP 3) ..... 14
  - 2.5 Check the total drainage upstream area ..... 15

## 1 Introduction

This tutorial replaces Accumulate attributes with ArcHydro but retains the same content as well as steps for ArcGIS 10 (SP 3).

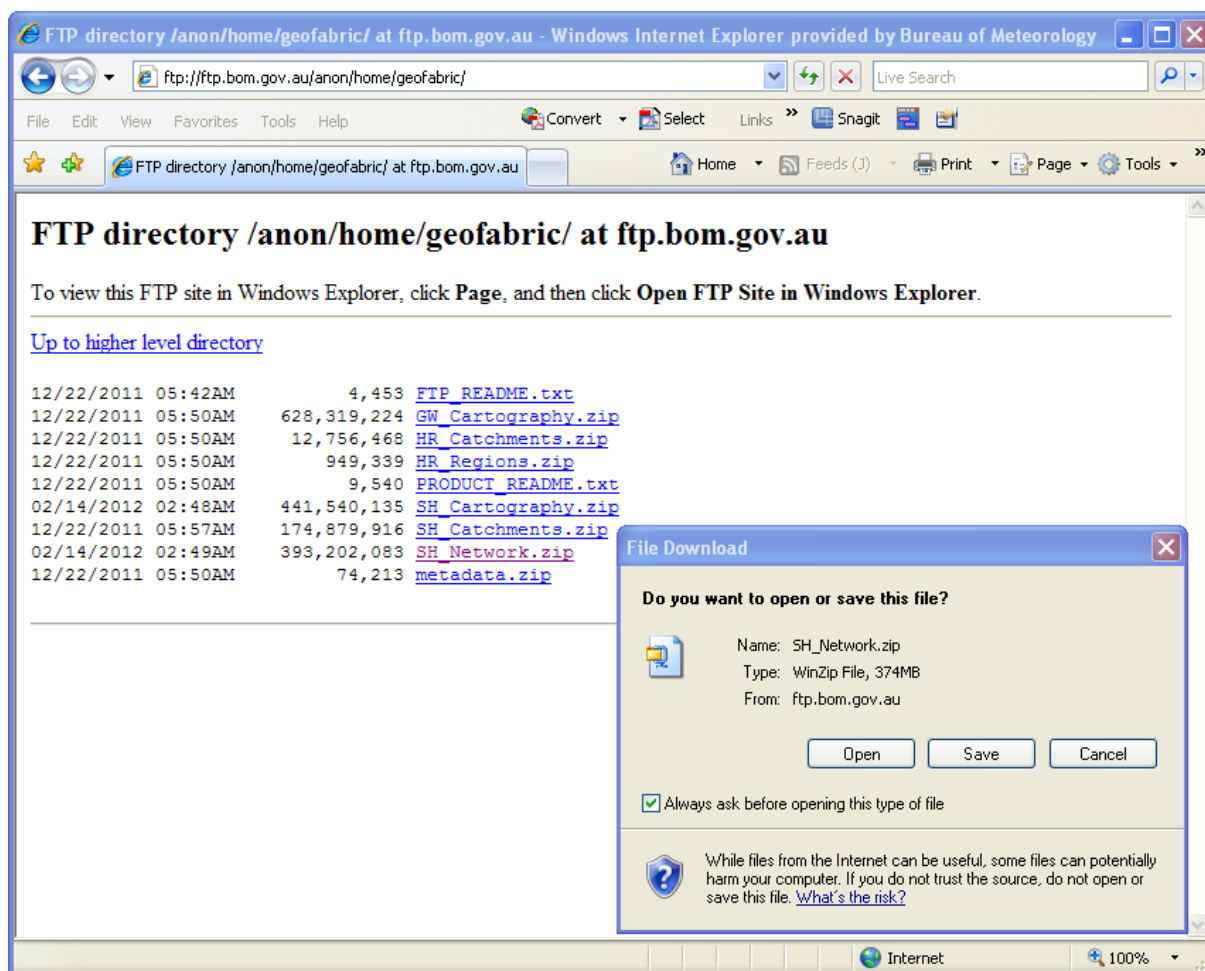
Geofabric Surface Network is intended to be used in stream flow tracing operations, which utilises the product's full topological connection. This product is also designed to be largely compatible with ESRI's ArcHydro for Surface Water toolset.

This tutorial describes the steps required to use the ArcHydro Accumulate Attributes tool to calculate the total upstream drainage area at each node in the stream network. This operation provides just one example of the potential opened up by using geometric networks together with relationship classes in an ESRI Geodatabase environment.

## 2 Tutorial

### 2.1 Download the Geofabric Surface Network File Geodatabase

1. From the [Bureau of Meteorology Geofabric](#) website browse to Downloads and select [Download the Geofabric data from the Geofabric FTP site](#). Select Geofabric Surface Network's SH\_Network ZIP file and save this to disk.



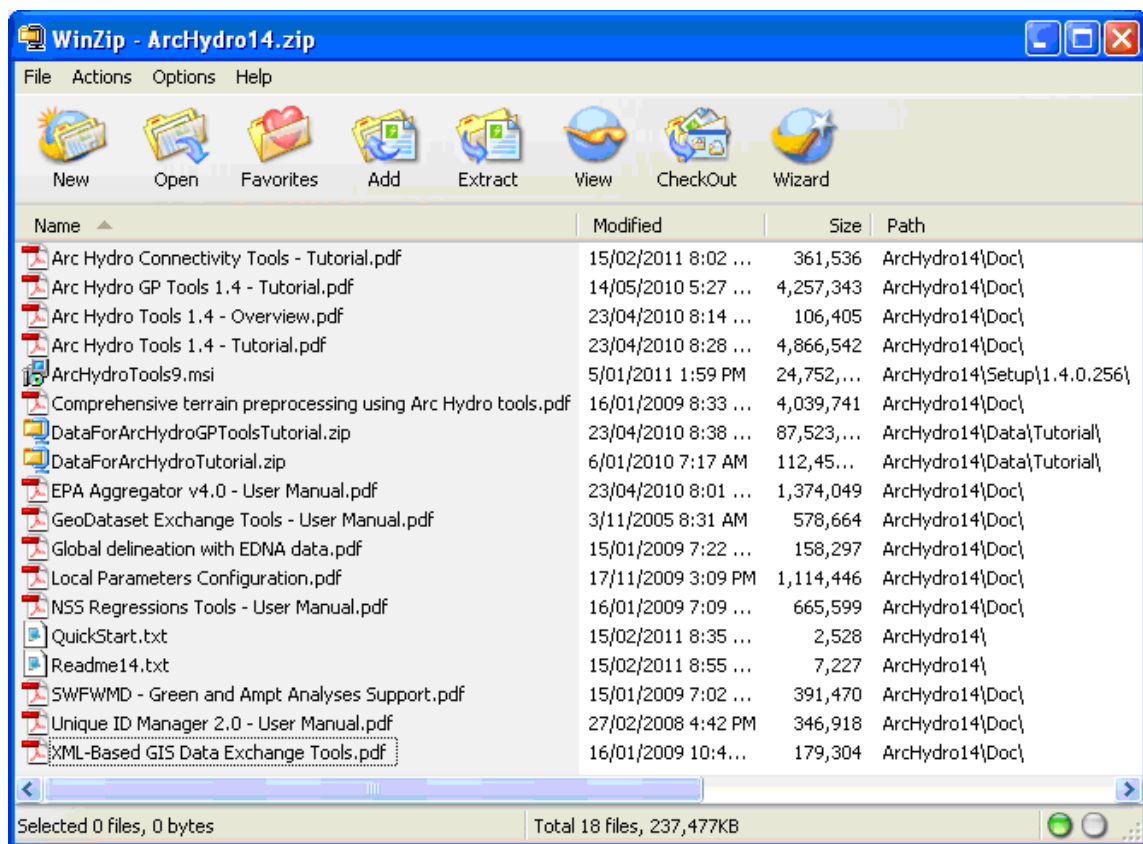
2. Unzip the downloaded file, making sure that the resulting folder ends with gdb (e.g. the contents of the SH\_Network ZIP file should be unzipped to a folder called SH\_Network\_GDB).

## 2.2 Install ArcHydro

### 2.2.1 ArcGIS 9.3

The ArcHydro for Surface Water toolset needs to be installed in ArcGIS 9.3.

1. Download the latest version of the ArcHydro Tools for surface water from the ESRI ArcGIS [ArcHydro Resource Centre](#) website.
2. Unzip the contents of the downloaded zip file (ArcHydro14.zip) to an appropriate directory.



3. Follow the instructions for installing the ArcHydro tools included in the download.

### 2.2.2 ArcGIS 10.0 (SP3)

The ArcHydro for Surface Water toolset needs to be installed in ArcGIS 10.

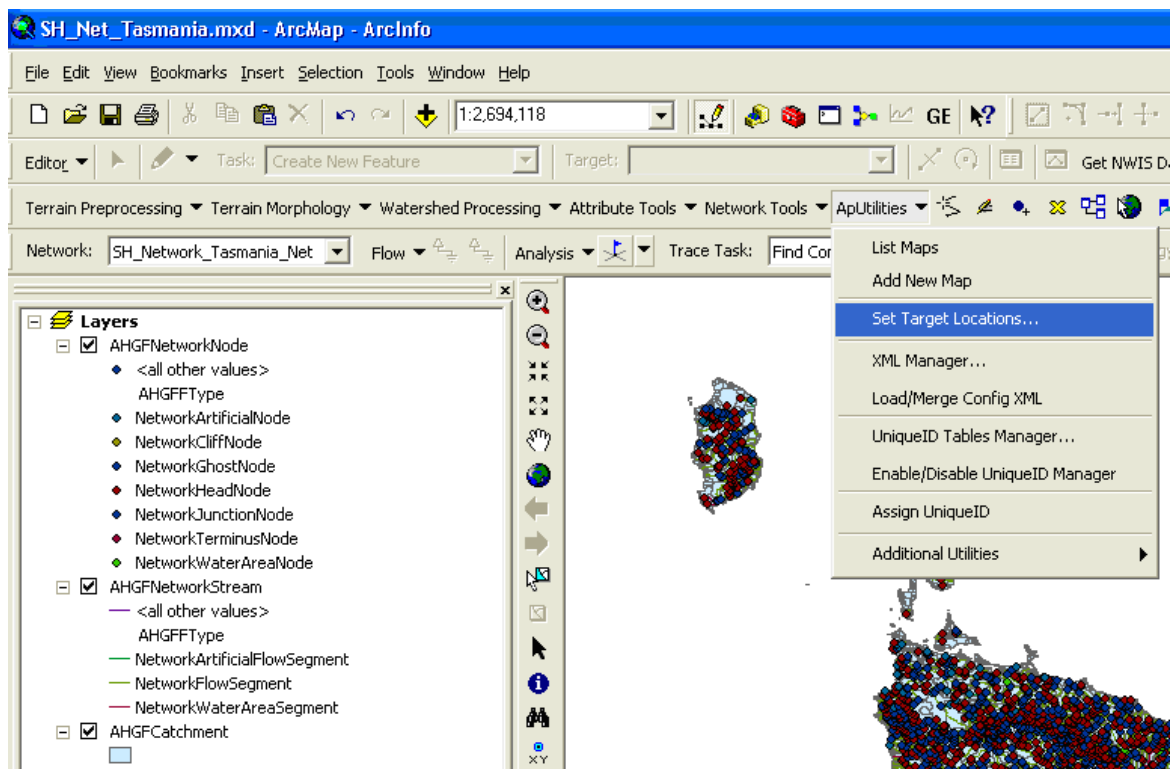
1. Download the latest version of the ArcHydro Tools for surface water from the ESRI [ArcGIS Resources](#) website.
2. Unzip the contents of the downloaded zip file (ArcHydroTools\_2\_0.zip) to an appropriate directory.
3. Follow the instructions for installing the ArcHydro tools included in the download.
4. Go to Customize > Toolbars > ArcHydro Tools to add the toolbar.

## 2.3 Set Target Locations

Start a new ArcMap session and add in the AHGFNetworkStream, AHGFNetworkNode and AHGFCatchment feature classes from the data downloaded in step 2.1.

### 2.3.1 ArcGIS 9.3

1. Ensure that the ArcHydro toolbar is visible (if not, choose View>Toolbars>ArcHydro Tools X) and choose Set Target Locations from the ApUtilities menu:

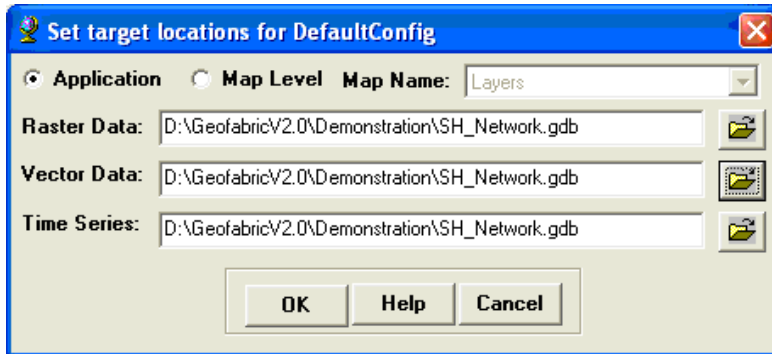




## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial - Calculate an upstream drainage area with ArchHydro

2. Set the default target workspace in HydroConfig to configure the ArchHydro project (this list may depend upon the version of ArchHydro tools installed).

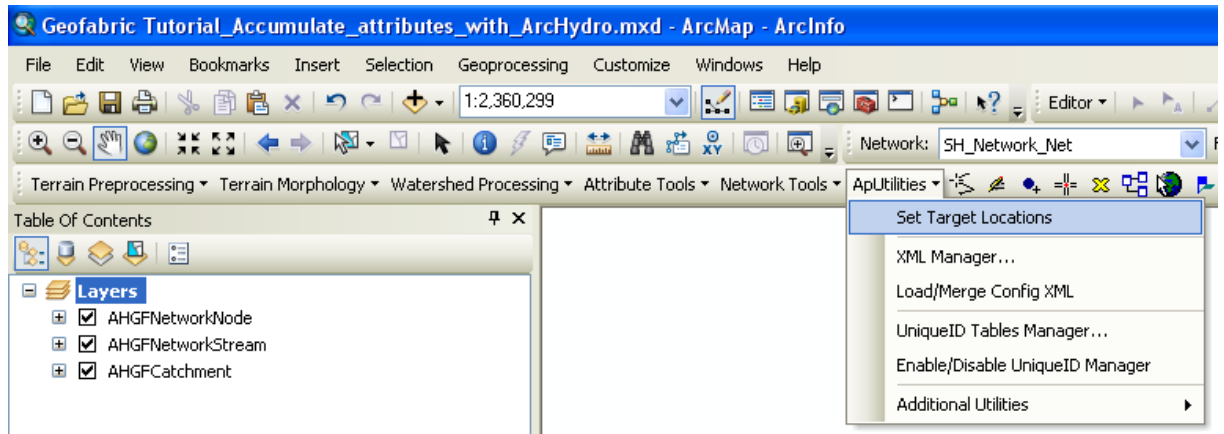
Note: this step isn't strictly necessary for the purposes of this tutorial; however, it is good practice to perform this step each time a new ArchHydro project is created.



3. Save the ArchHydro project by naming and saving the MXD file:
4. Select Save from the File menu.
5. Enter an appropriate name for the MXD file (e.g. SH\_Net\_Tasmania.mxd) and click [OK].

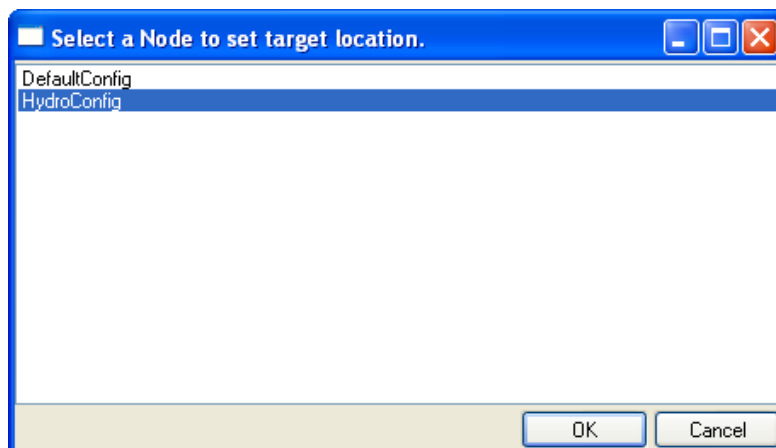
### 2.3.2 ArcGIS 10 (SP3)

1. From the ArcHydro Toolbar, select ApUtilities > Set Target Locations



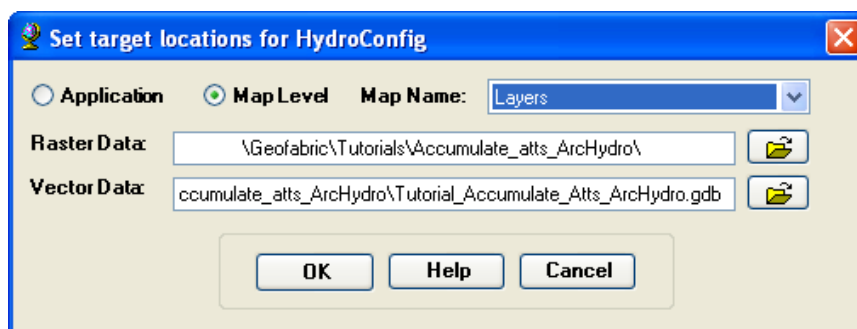
2. Select the HydroConfig Node as this corresponds to ArcHydro tools.

Note: this step isn't strictly necessary for the purposes of this tutorial; however, it is good practice to perform this step each time a new ArcHydro project is created.



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial - Calculate an upstream drainage area with ArcHydro

3. Set the default target locations for HydroConfig
  - Select MapLevel to modify the target locations of the current dataframe
  - The Map Name will default to the name of the Data Frame, eg Layers
  - Select Show of Type: Shapefile/Raster Workspaces. Select a directory for the Target Location of Raster Data, the default will be the directory in which the MXD is stored.
  - Select Show of Type: Personal/File Geodatabases. Select the GDB where the Vector Data is to be saved.
  - Click [OK] to save the locations

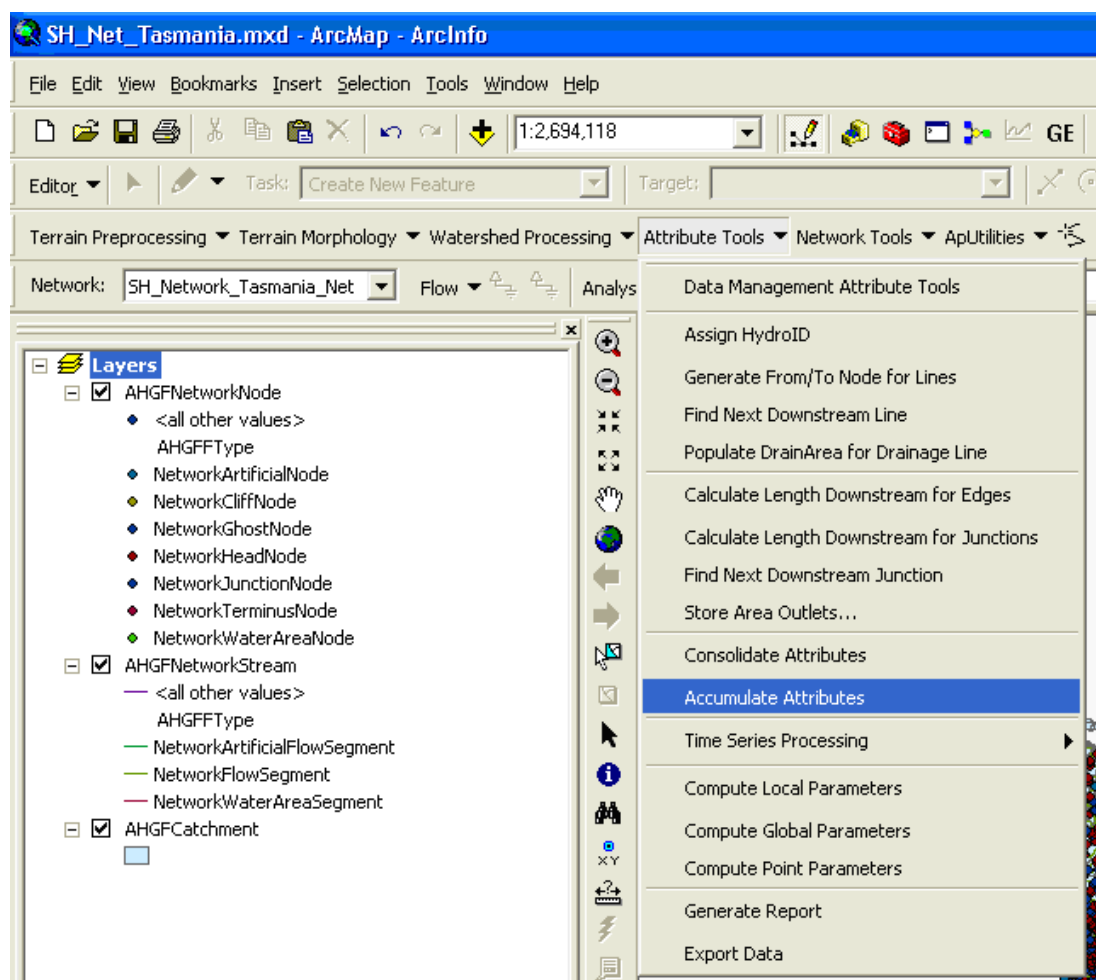


4. Two new tables will be created in the GDB which are used by the ArcHydro tools to populate the HydroID field:
  - APUNIQUEID
  - LAYERKEYTABLE

## 2.4 Calculate the total upstream drainage area for each node

This section will configure the parameters for the Accumulate Attributes tool to calculate the total upstream drainage area for each node in the stream network and assign this value to a new attribute field in AHGFNetworkNode:

1. Close ArcCatalog to avoid potential locking problems.
2. In the ArcMap Utility Network Analyst toolbar, set the Network Layer to SH\_Network\_Net
3. From the ArcHydro Attribute Tools menu, choose the Accumulate Attributes tool.



4. For Trace Type, select Network Layer: AHGFNetworkNode.
5. For Source for Accumulation, set the Source Feature Layer to AHGFCatchment and Source Field to AlbersArea.  
Note: Any feature classes that are related (via a relationship class) to the feature

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial - Calculate an upstream drainage area with ArcHydro

class selected under Network Layer will automatically be available in the drop-down list under Source Feature Layer.

6. Choose the Sum option for Accumulation Type.
7. Select AHGFNetworkNode for Target Features Layer and type the name of a new field to be added (e.g. TotDArea) in the Target Field box (i.e. the target field can be created dynamically in ArcGIS 9.3).
8. Click [OK] to execute the Accumulate Attributes tool.  
Note: This operation may take a while to run to completion, especially if the dataset chosen for Network Layer contains many features. Alternatively, the tool can also be configured to run on selected features only.

The screenshot shows the 'Accumulate Attributes' dialog box with the following settings:

- Trace Type:**
  - Network Layer: AHGFNetworkNode
  - Feature Layer with NextDownID: AHGFNetworkNode
  - Next Down ID Field: OBJECTID
  - Use selected features only
- Source for Accumulation:**
  - Source Feature Layer: AHGFCatchment
  - Source Field: AlbersArea
- Accumulation Type:**
  - Sum
  - Average
  - Min
  - Max
  - Count
  - Median
  - Mode
  - Standard Deviation
  - Weighted Average by Field: OBJECTID
- Target for Accumulation:**
  - Target Feature Layer: AHGFNetworkNode
  - Target Field: TotDArea

Buttons at the bottom: OK, Help, Cancel.



### 2.4.1 ArcGIS 10 (SP 3)

If an error message appears that ArcHydro can't find the new Target Field:

1. Select all the nodes which require the total upstream drainage value using either the Select Features tool on the Tools toolbar or the Select by attributes function within the AHGFNetworkNode's attribute table.
2. Complete the above steps again.

If an error persists, make sure that the feature classes aren't in a group layer in the Table of Contents as this can also prevent the AHGFNetworkNode from being correctly populated.

## 2.5 Check the total drainage upstream area

1. When the tool has finished running:
2. Zoom in to locate an area of interest.
3. Right-click on the AHGFCatchment layer, choose Open Attribute Table and scroll to the end to display the content of the AlbersArea field.
4. Choose a node at some point on the stream network.  
Note: the chosen node in the figure below is marked with a Junction Flag (green box). This has been done for visualisation purposes only (see the accompanying Tutorial - Create a subset of Geofabric data or ESRI documentation for more information on Utility Network Analyst tools).
5. Whilst holding down the [Shift] key, use the Select Features tool () to in turn select each of the AHGFCatchment features which drain to the chosen node. Alternatively, use the CatchmentDrainsToSegment relationship class between the features of AHGFNetworkStream and AHGFCatchment in order to automatically select the related records: Click on the [Options] button and select CatchmentDrainsToSegment: drains from the Related Tables menu option.
6. Click on the [Selected] button at the bottom of the AHGFCatchment attribute table to switch the display to the currently selected features.
7. Click on the chosen node with the Identify tool () active to display the node's attributes.
8. By manual or other means, sum the values of the AlbersArea column of the AHGFCatchment attribute table and compare the value stored in the new field added by the Accumulate Attributes tool in step 2.4 e.g. TotDArea. The two values should be approximately equal.

# Australian Hydrological Geospatial Fabric (Geofabric) Tutorial - Calculate an upstream drainage area with ArchHydro

The screenshot shows the ArcMap interface with the following components:

- Layers Panel:** Shows the 'AHGFNetworkNode' layer selected, with a legend listing various node types like 'NetworkArtificialNode', 'NetworkCliffNode', etc.
- Identify Window:** Displays the attributes of the selected node (ObjectID: 9304). The 'CatchmentArea' attribute is highlighted with a value of 55163126.787022.
- Selected Attributes of AHGF Catchment Table:**

SourceID	FeatureReliability	FeatureSource	AttributeReliability	AttributeSource	PlanimetricAccuracy	Symbol	TextNote	Shape_Length	Shape_Area	AlbersArea
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.14502	0.000769	7057254.516911
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.199974	0.001025	9409711.038767
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.225006	0.001656	15207741.551638
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.039986	0.000069	629917.443635
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.165001	0.000962	8830744.724765
<Null>	1/07/2005	GEOSCIENCE AUSTRALIA	1/01/2003	GEOSCIENCE AUSTRALIA	125	<Null>	<Null>	0.205002	0.001531	14047757.511307





**Water Information**  
DATA › INFORMATION › INSIGHT

Through the *Water Act 2007*, the Australian Government has given the Bureau of Meteorology responsibility for compiling and delivering comprehensive water information across Australia.

**For more information**

Visit our website at [www.bom.gov.au/water](http://www.bom.gov.au/water)

Send an email request to [waterinfo@bom.gov.au](mailto:waterinfo@bom.gov.au)



**Australian Government**  

---

**Bureau of Meteorology**