HIS document 7

Using the HIS server interface DASH (version 1.0)

A Tutorial

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Distribution

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1.0 Introduction

DASH is a software system that enables you to query networks of hydrologic observation sites and extract hydrologic observation data from them in the form of time series of measurements at individual sites or collections of them. The National HIS Server provides access to observation data sources such as the USGS National Water Information System (NWIS) and the EPA Storage and Retrieval System (Storet). Regional HIS Servers provide additional information about observation networks for state, local or academic investigator observation data sources in particular areas. Development of DASH is a joint effort between the CUAHSI (Consortium of Universities for the Advancement of Hydrologic Science, Inc) Hydrologic Information System project and the ESRI Water Resources Applications group in Redlands, CA. A prototype version of DASH is operational at http://river.sdsc.edu/DASH/ . The national version of DASH will eventually operate from the San Diego Supercomputer Center, and regional versions will operate at 11 testbed site locations in academic institutions that the National Science Foundation is supporting as part of the WATERS Network Information System, and at similar water research centers at other locations.

An *observation data source*, such as the USGS, may operate one or more observation networks (e.g. streamflow, water quality, groundwater); each *observation network* is represented by a map of point observation site locations; each *observation site* may have data on one or more variables; each *variable* is represent by a collection of values; each *value* is a number that has associated with it a time of measurement and possibly a qualifier (such as <) to help interpret the value. The time series of values may be recorded regularly or irregularly in time, within a *time range* from a beginning date and time to an ending date and time. The observation sites are indexed by a *SiteID* and the variables by a *VariableID*. The definition of variables is consistent across all sites in a particular network, but differs from one network to the next. For example, the USGS NWIS and EPA each have a set of more than 9000 parameter codes that describe the data they contain but these codes are not compatible with one another (see http://nwis.waterdata.usgs.gov/usa/nwis/pmcodes and http://www.epa.gov/STORET/legacy/ref_tables.htm for details). The attached VariableCode.xls file contains the parameter codes for NWIS and Storet.

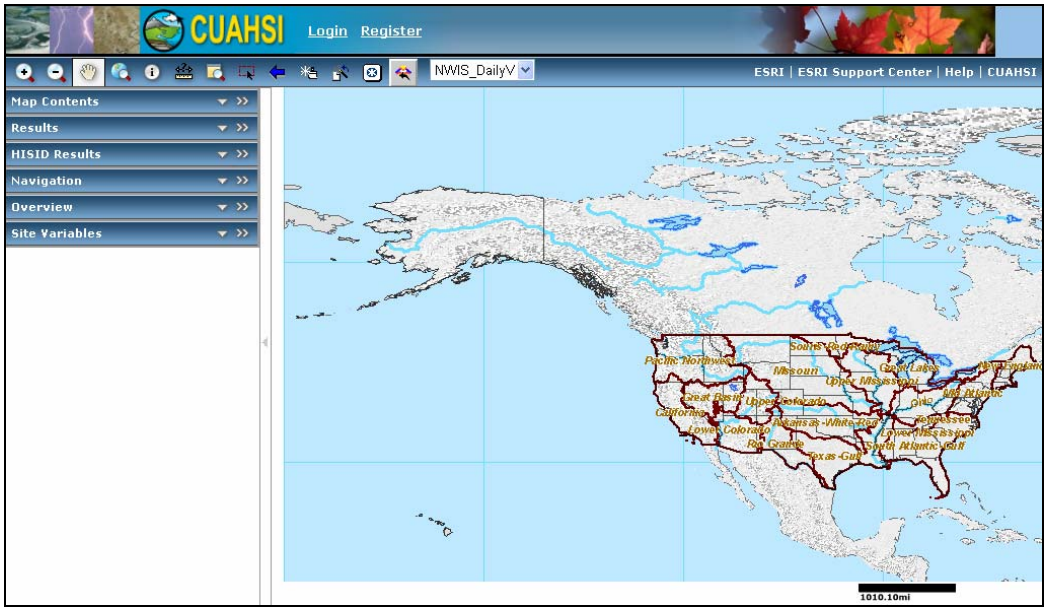
2.0 Computer Requirements

- Working internet connection
- Mozilla Firefox or Microsoft Internet Explorer
- Microsoft Access

Important: DASH conveys some information with popups. In order for DASH to work properly, make sure that you turn off popup blockers, or set your browser to allow popups from the DASH website.

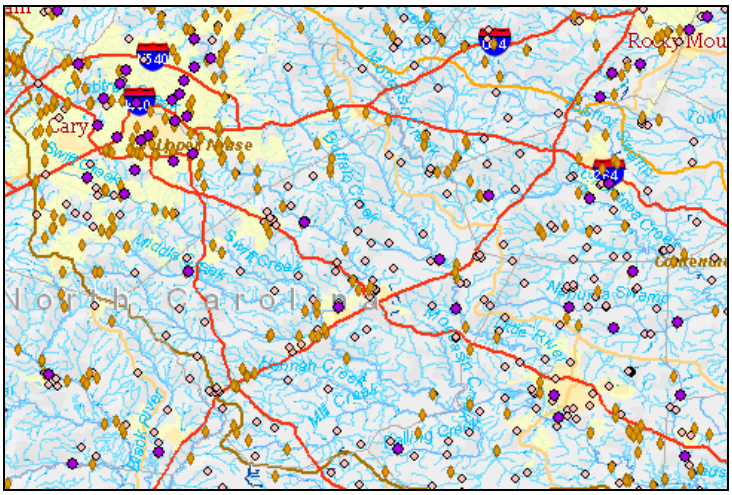
3.0 Using DASH

Open a web browser and go to the URL http://river.sdsc.edu/DASH/. You will see an overview map of the nation as shown below:



Use the Zoom In button  at the left hand end of the map window and zoom in to a local region around Raleigh, North Carolina. The resulting map has lots of dots representing site locations.

- purple dots are USGS NWIS Daily Value sites
- gold elongated diamonds are EPA Storet sites
- pink smaller diamonds are USGS NWIS Instantaneous Irregular Data sites

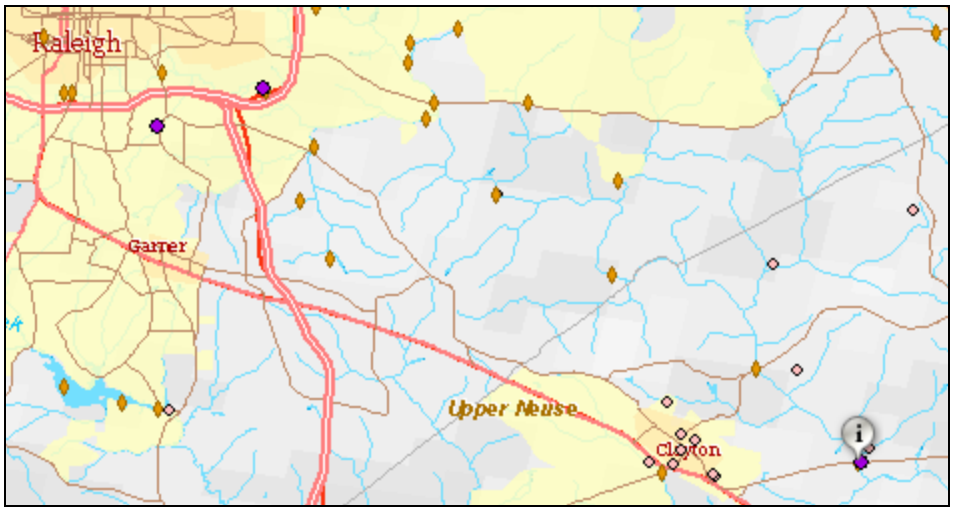


If you zoom in to the wrong place and want to get back to the whole map, you can use the **Full Extent** button to get back the map of the whole nation. If you want to get a slightly larger view of map, you can use the **Zoom Out** button. If you want to just move the map around on the screen, you can use the **Pan** button. Now, lets zoom in a bit more around Raleigh and you see more detail – the maps in the server have a scale-dependant display that increases the degree of detail as you view smaller areas.

4.0 Identifying Sites

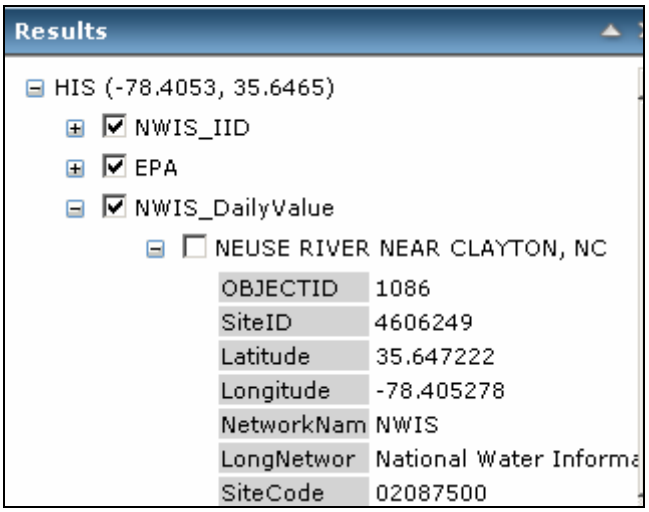
We want to obtain data for the Neuse River near Clayton, North Carolina, which is the site with the longest flow record in the Neuse basin. Use the **Identify** button on the map toolbar (this can also be invoked using **Control-Mouse Click**) to click on NWIS Daily Value sites until you find the Neuse River near Clayton. Its located just to the South-East of Raleigh. You'll see a little icon show up over the site that you click. Pretty cool!

Tip: You may want to turn off some map layers in the Map Contents window to make it easier to spot the NWIS site.

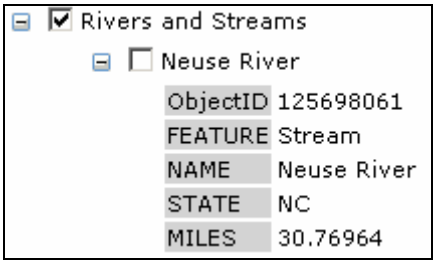


Note: Symantec Client Firewall is known to interfere with the data response from the DASH. If Internet Explorer fails to respond (freezes) after clicking on the map with the Identify tool, please disable the firewall. See section 6 (Troubleshooting) for more information.

In the Results window, click on the NWIS_DailyValue layer and expand the information for the selected site. You'll see quite a lot of data about this site, and in particular, its SiteCode of **02087500**, which is the USGS identifier for this NWIS site.



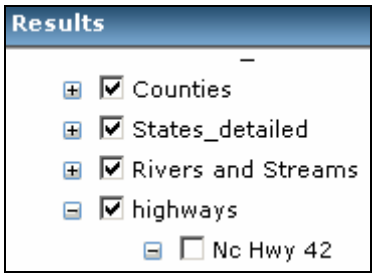
If you expand the Rivers (under Basemap) layer, you'll see that the river by that site is the Neuse River.



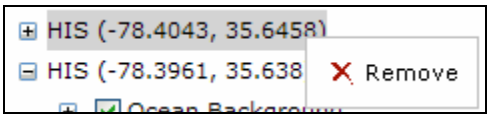
If you expand the EPA Storet theme, you'll see that this is also an EPA Storet Site – if you click on the identified feature, you'll see it selected as blue  in the map and its attributes are identified – it is EPA Storet site J4170000 in Johnston County, NC. This is also an NWIS Water Quality Site with the same site characteristics as it has in the NWIS Daily Values theme.

Ok, this is cool, we are getting some sense of where stations are and what they measured. Daily Values stations in NWIS are those for which daily statistics have been calculated. This includes stream gaging stations because the values reported for them by the USGS are daily averages of the "unit values" of discharge that are recorded usually every 15 minutes at the streamflow gaging sites. The water quality sites, by contrast, have irregularly sampled data that are time stamped with whatever measurement time and date at which they were collected.

If you click on the Highways layer, you'll see that this site is located on North Carolina Highway 42. Ok, this is useful information if you wanted to go and visit this site (and something that you most likely could not find out just from querying tabular information about the site).

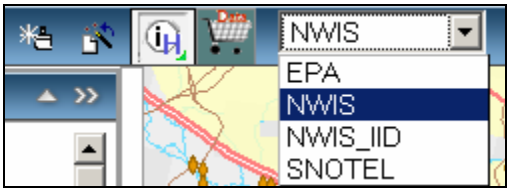


As you do each query, you'll find the results indexed under the Results window according to the Latitude and Longitude of the point you selected defined in decimal degrees. This is neat because it gives you a sense of your geographic location as you move around the map and also you can check this against the latitude and longitude of the site attributes to make sure that the location of the site is correct on the map. Each new Identify query creates a new display record and after you make a few of these, they pile up. To remove one the identify inquiries, right click on it and select **Remove**:

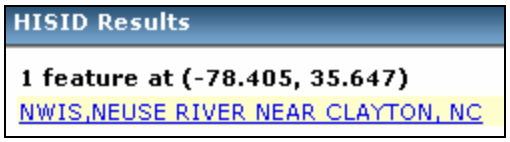


5.0 Site Variables

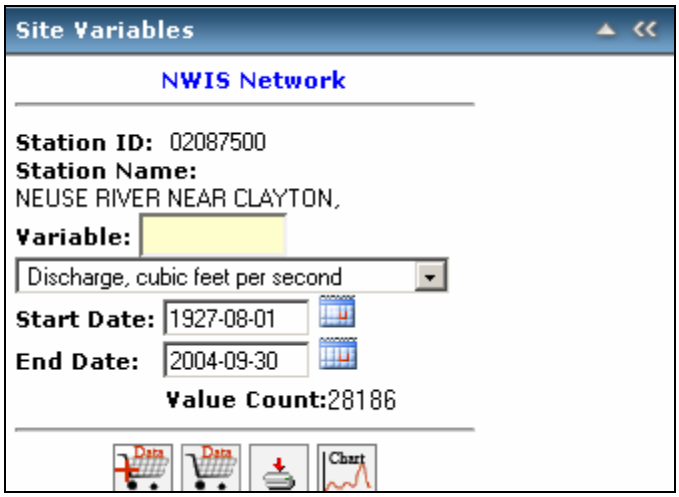
So, we know that our site on the Neuse River near Clayton, North Carolina, has NWIS SiteCode of **02087500**. Let's find out some more about what observations this database contains at this site. Instead of just doing general map attribute queries as we did before, we are going to look into the characteristics of the HIS networks in detail. What we are actually doing now is querying the underlying *Observations Catalogs* for this site, which are stored in a relational database format called the *Observations Data Model* (see http://www.cuahsi.org/his/documentation.html for details). Make sure that the **Active Layer** is the **NWIS** network:



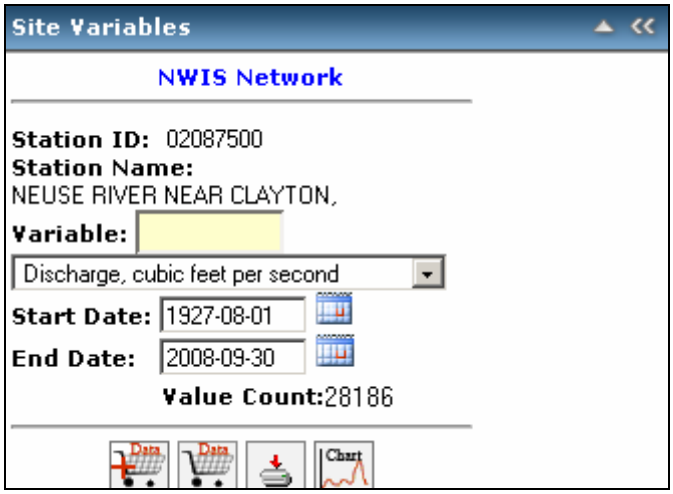
and click on the **HIS Identify** tool  , and again select the site for the Neuse River near Clayton, NC. You'll see the little  identify icon show up again, but now expand the HISID Results window and you'll see link to the NWIS Neuse River Near Clayton, NC.



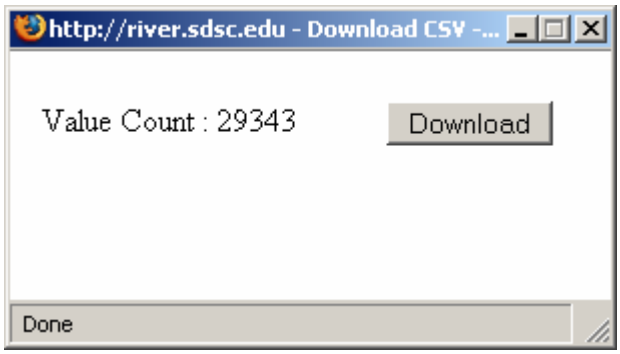
If you click on this link, and expand the Site Variables window, you'll get some more detailed information about the site.



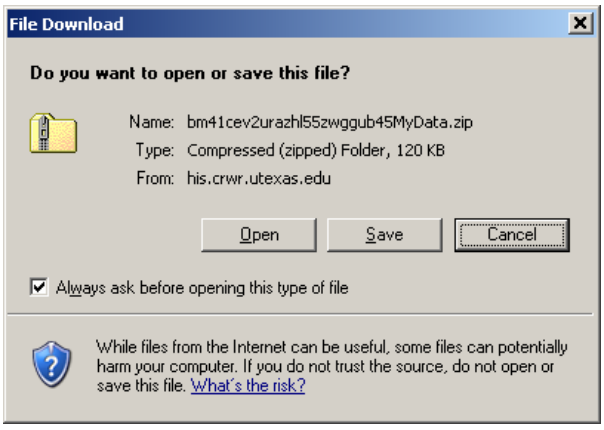
As you can see, this site provides one variable, Discharge. The catalog indicates that the site has data form 1927 to 2004. Actually, this site may have more recent data, so to capture data for the entire period of record, change the End Date to any date later than today's date.



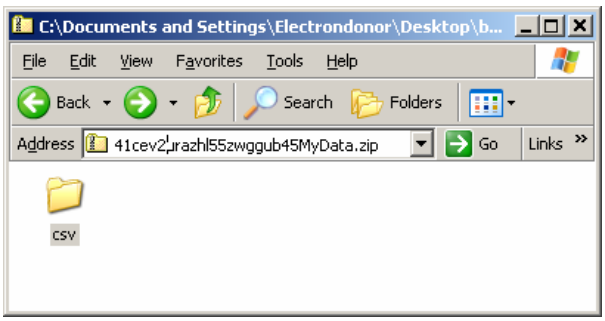
Click the **Get CSV** button  . DASH will now access USGS's data banks in Reston, Virginia to grab the data requested. Once completed, the following popup window appears.

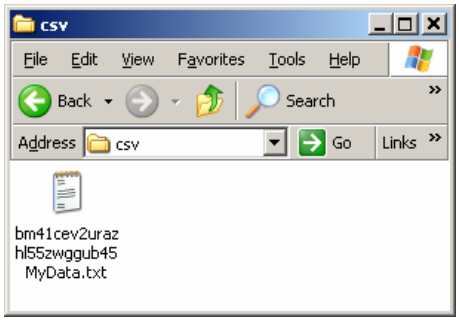


Click **download**.

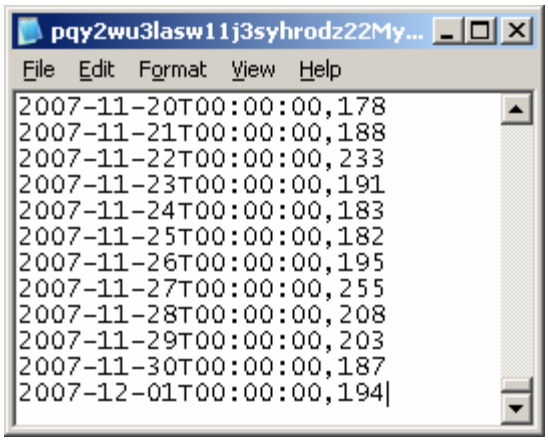


Download and open the zip file. You will find a folder named **csv.** The csv file is inside and is named in the format: XXXXXXXMyData.txt.



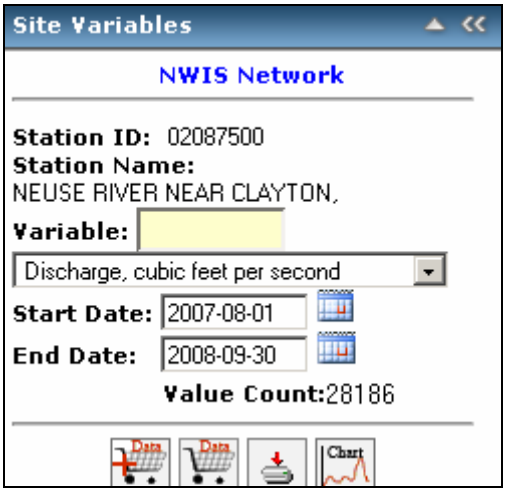


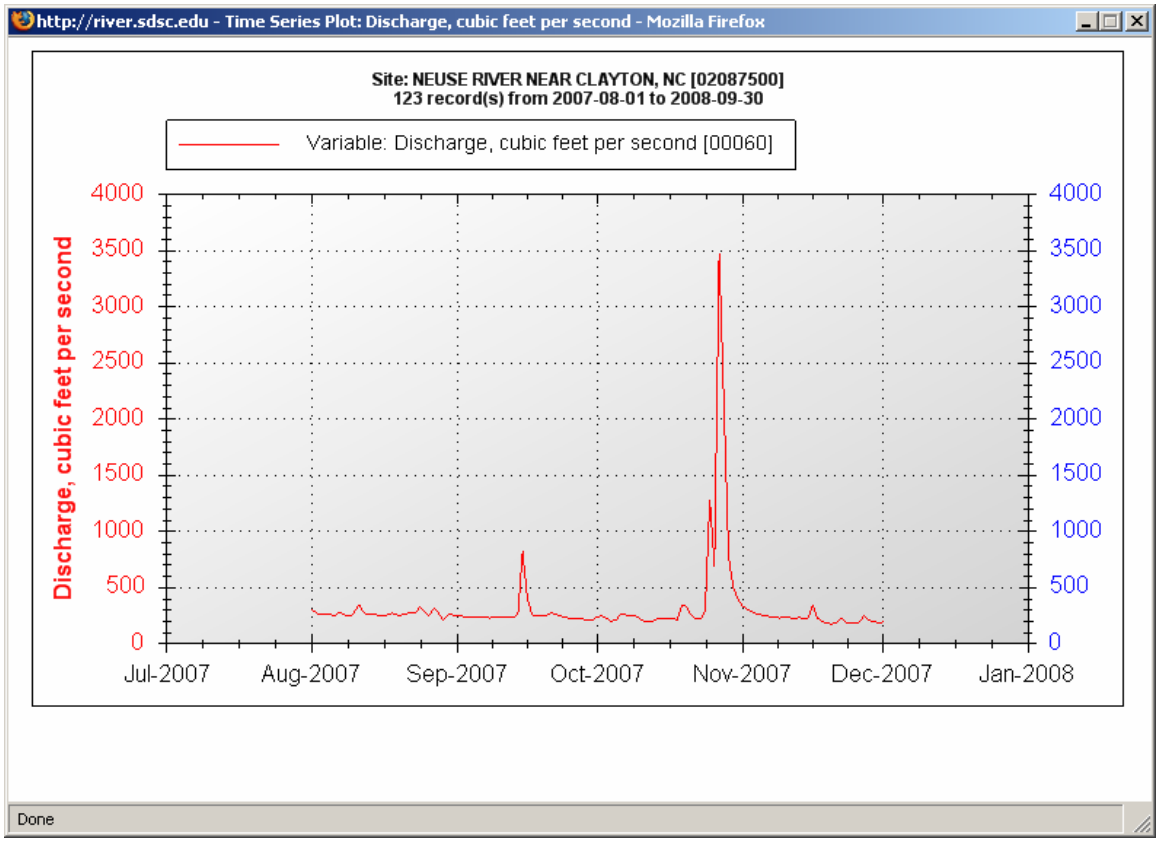
Let's open up the .csv file and scroll down to the very last line.



Indeed, the csv file contains data up to the writing of this document.

Next let's get a graph of the data. First change the **start date** to 2007-08-01 and then click the **Show Chart** button  in the Site Variables window.

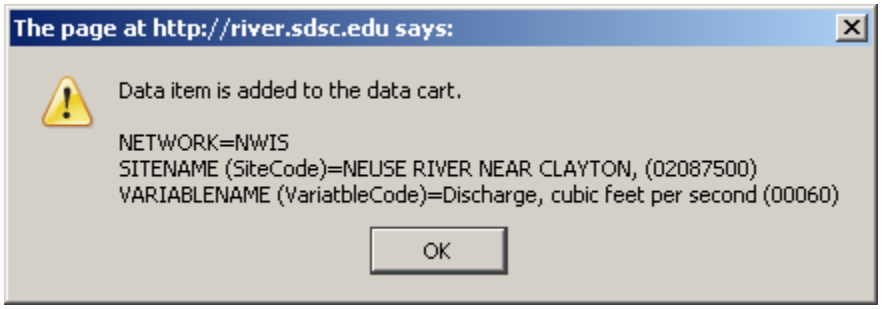




What a nice chart!

Now let's add the data you have viewed to a cart. This is similar to shopping at Amazon.com. This cart allows you to keep on selecting stations and their data without having to wait and download each time. Let's go back to the **Site Variables** window and click on the **Add to Cart** button  for the same period of interest.

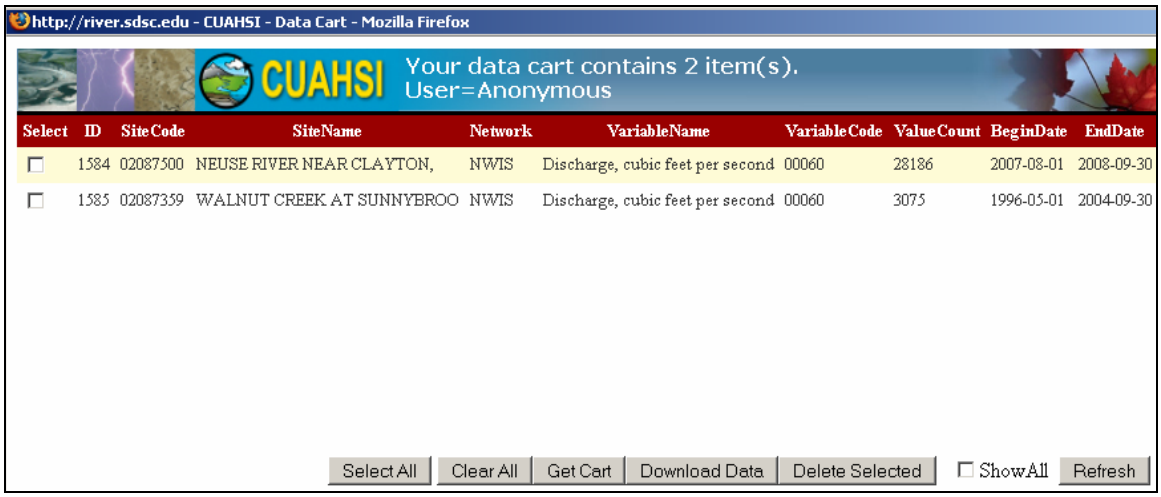
Dismiss the message box about the item being added to the cart.



Now click on another one of the purple NWIS dots in the map. Then click on the item in the HISID Results window. This refreshes the Site Variables window. Click the Add to Cart button again in the Site Variables window, to add the default data series that appeared when you refreshed the Site Variables window.

You should now have two items in your data cart. View the cart by clicking the **Show Data Cart** button  on the Site Variables window.

The following window opens.



At the bottom of the window, you have the following commands:

- Select All – selects all items in data cart for download
- Clear All – unselects all items in data cart
- Get Cart – downloads the table shown in the data cart, which serves as a record of what time series were identified in DASH, but not the actual time series data itself
- Download Data – downloads a database of time series data specified by the items in the data cart
- Delete Selected – removes the selected items from the data cart
- Refresh – refreshes the window

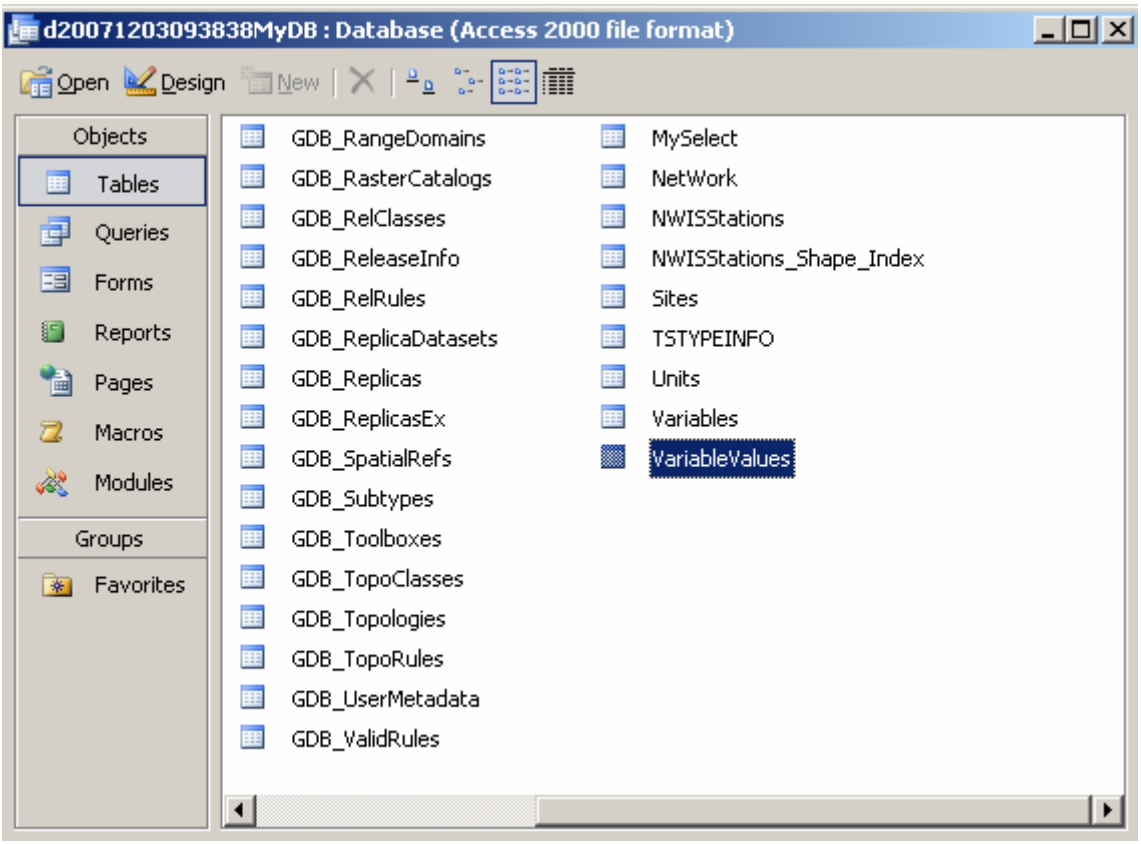
Click Select All, and then lick Download Data.

DASH now uses web services to retrieve the time series data you asked for. It then assembles the data into a Microsoft Access database, and delivers the data as a zip file.

Download the zip file, and extract the database (.mdb file) from the zip file.

Open the database by double clicking it.

Inside Access, open the **VariableValues** table.



You will find all the requested data neatly packaged into an access table.

VariableValues : Table

OBJECTID	SiteID	VariableID	FeatureID	TSTypeID	TSDATETIME	TSVALUE
1	02087359	00060	0	1	5/1/1996	70
2	02087359	00060	0	1	5/2/1996	31
3	02087359	00060	0	1	5/3/1996	22
4	02087359	00060	0	1	5/4/1996	21
5	02087359	00060	0	1	5/5/1996	18
6	02087359	00060	0	1	5/6/1996	23
7	02087359	00060	0	1	5/7/1996	27
8	02087359	00060	0	1	5/8/1996	20
9	02087359	00060	0	1	5/9/1996	18
10	02087359	00060	0	1	5/10/1996	17
11	02087359	00060	0	1	5/11/1996	27

Congratulations! You have learned how to use DASH to query hydrologic observations data.

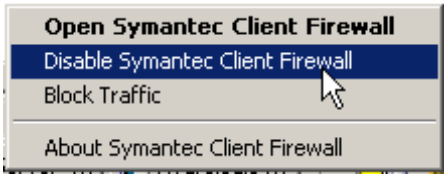
This concludes the exercise.

6.0 Troubleshooting

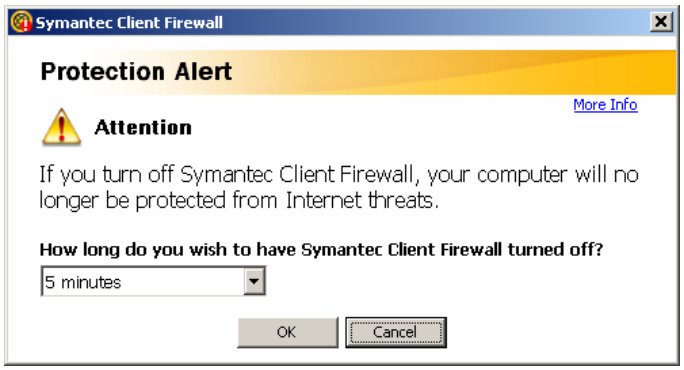
HIS Session freezes

Symantec Client Firewall may interfere with the data response issued from the DASH. One common symptom is that the internet browser fails to respond (freezes) after clicking the map interface with the **Identify**  tool. While the exact reason for this is not known yet, the user can use the following work around for the problem:

1. Close the Internet Explorer window.
2. Temporarily disable Norton Firewalll by right-clicking on the Norton Firewall icon button  in the bottom right hand corner of the Windows screen and select **Disable Symantec Client Firewall**.



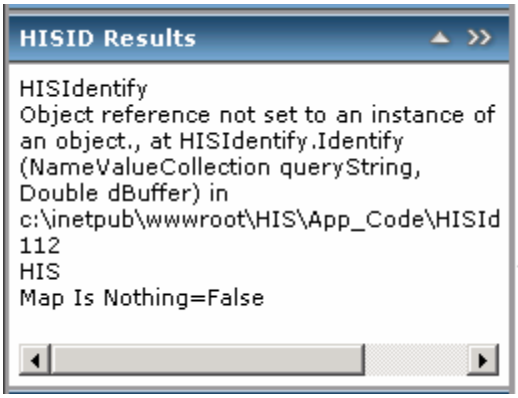
3. Based on how long you want to use DASH, select how long you want the Firewall turned off and then click **OK**.



4. Open Internet Explorer and navigate to http://river.sdsc.edu/DASH/.

HISIdentify Tool malfunctions

Sometimes, switching the active layer (e.g. from NWIS to EPA) causes the HISIdentify tool to malfunction. An error message (see below) would display in the table of contents.



The user is advised to close and restart Internet Explorer and then navigate back http://river.sdsc.edu/DASH/. Because this starts a new session with the DASH, the previous map extents, carts, etc. will be lost. Therefore, it is recommended that the user downloads the information (carts, csv, graphs, etc) he needs before switching active layers.

Map shifting without updating display

If you realize that you are getting information from the DASH for a location that is different from where you clicked on the map, chances are the underlying map interface has shifted without updating the display. Please hit F5 to refresh the display. This problem is being investigated.