# UCD CSN Technical Information #801D

# CSN Data Delivery

*Chemical Speciation Network*
*Air Quality Research Center*
*University of California, Davis*

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## DOCUMENT HISTORY

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# 1. PURPOSE AND APPLICABILITY

The subject of this technical information document (TI) is delivery of the resultant data from the CSN network. The collected results from the previous steps in the data generation and validation processes are formatted into a DART-formatted file for delivery to DART. After the 30 day validation period, a revised DART results file will be returned to UC Davis. The user will review this file and reformat it for delivery to the EPA's AQS database.

# 2. DEFINITIONS

**datvalCSN:** A custom software package in the R language that contains the data validation code used to collect, compare, and flag the final results.

**CSN database:** A SQL Server database that is the central warehouse of CSN preliminary and final data at UC Davis.

**AQS:** A database that is the central warehouse of EPA air quality data.

**DART:** Data Analysis and Reporting Tool, a web application for environmental data visualization and validation procedures.

**STI:** Sonoma Tech, Inc. Contractor developing and operating the DART interface.

# 3. PROCEDURES

Data delivery is performed using the *datvalCSN* R package, which is developed and maintained by UC Davis specifically for data processing, monitoring, and validation of the CSN data. Data delivery is performed by the UC Davis data management team on monthly batches of data (a calendar month of sample start dates). Delivery occurs in three step:

1. Format data and submit to DART;
2. Receive and review returned data from DART;
3. Reformat data and submit to AQS.

## 3.1 Format data for DART Submission

In the previous step, results for elements, ions and carbon fractions are validated using the tools of the *datvalCSN* package. This package can also be used to produce the output file for submission to DART. Using the main function,

*[allData] <- datvalCSN::csn_validate(['MM'], ['YYYY'])*

the analyst will produce data frames with the resultant data for the specified month for a final review. Additionally, a timestamped output file will be written to the CSN/QA folder of the networked U drive. This file is by default in DART format.

If the analyst has already run the *csn_validate* function without writing the output file and later wishes to do so, the analyst can execute the *write.table* command from base R[1]:

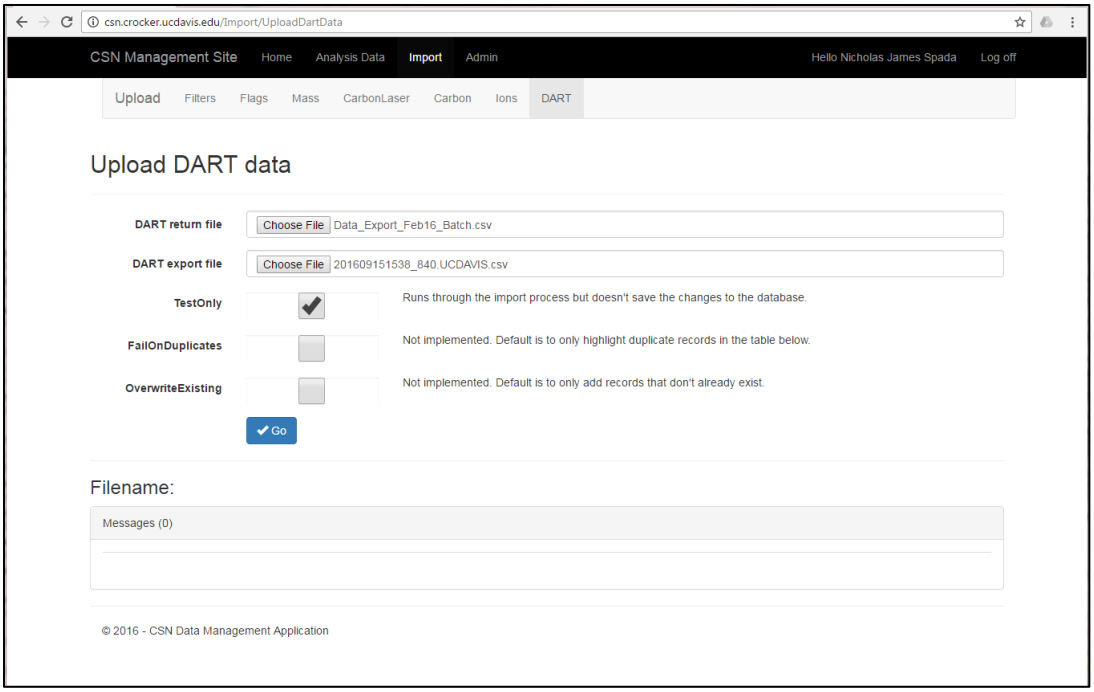
```
[output] <- allData@output.DF
[out.dir] <- 'U:/CSN/QA/'
[filename] <- paste0(format(Sys.time(), '%Y%m%d%H%M'),
                     '_840.UCDAVIS.csv')
write.csv([output], paste0([out.dir], [filename]),  row.names = F, na='',
          fileEncoding = 'UTF-8')
```

Once the data have been written, the analyst will submit this data to DART. Currently, files are emailed directly to STI via Jennifer DeWinter. Eventually, a FTP service will be set up to handle CSN data delivery and return.

## 3.2 Receive and Review Returned Data from DART

The state and local agencies have 30 days to review their associated data and perform validation. Upon completion, the entire dataset is returned to UC Davis with a change log. The data are ingested using the DART import tool in the CSN Management Site web application (csn.crocker.ucdavis.edu). The analyst will navigate to the “Import” tools (top menu bar), then to the “DART” upload tool (far right option near top of screen). The “DART return file” is the comma-separated value (CSV) file containing the dataset that was validated in DART while the “DART export file” is the CSV file that we delivered previously. The import tool compares the delivered and returned files to create an informative change log.

Figure 1. Returned DART datasets can be imported into the CSN database with this custom upload tool.




[1] Text in [brackets] indicates values that can be changed by the user. Other values should be typed as written.

As with the other data upload processes, use the "Go" button to begin ingestion. It is advisable to first run the import with the "TestOnly" box checked and review any error or warning messages. The ingested data appear in the *analysis.DartReturn* table.

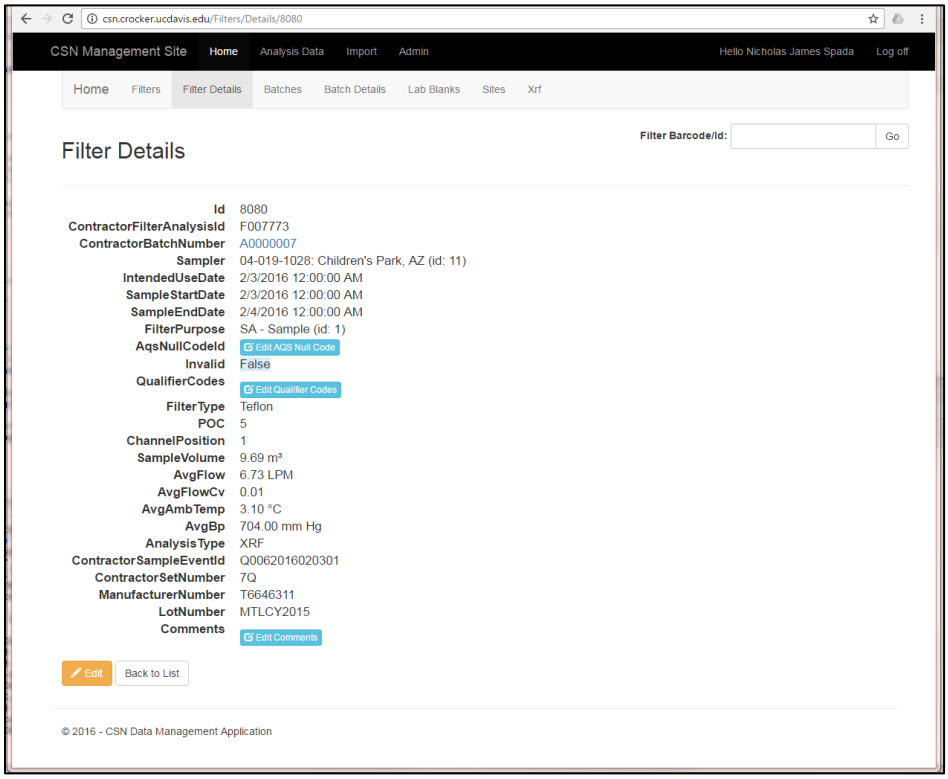
The analyst will review the change log from STI, including comments, and verify that all changes are consistent with the DART users' comments. To collect and review the changes made during DART validation, the analyst can run

*[dartChanges] <- datvalCSN::get_changes([startdate], [enddate])*

where both the *startdate* and the *enddate* parameters are entered as *'YYYY-MM-DD'*. Typically, this process is being performed on the most recent dataset. If this is the case, only the start date needs to be entered.

Currently, the changes made in DART are not automatically updated in the database. The analyst will need to review any null code changes and make the appropriate updates using the CSN Data Management web application. Null codes can be updated on the "Filter Details" page of the web application using the "Edit AQS Null Code" button (mid-screen in Figure 2). All changes require a comment explaining the reasoning for the change. It has become common practice to include the DART reviewer's comment in these types of code changes. Qualifier code changes made in DART are not updated at this time.

Figure 2. Filter details page in the CSN Data Management web application.



## 3.3 Reformat Data and Submit to AQS

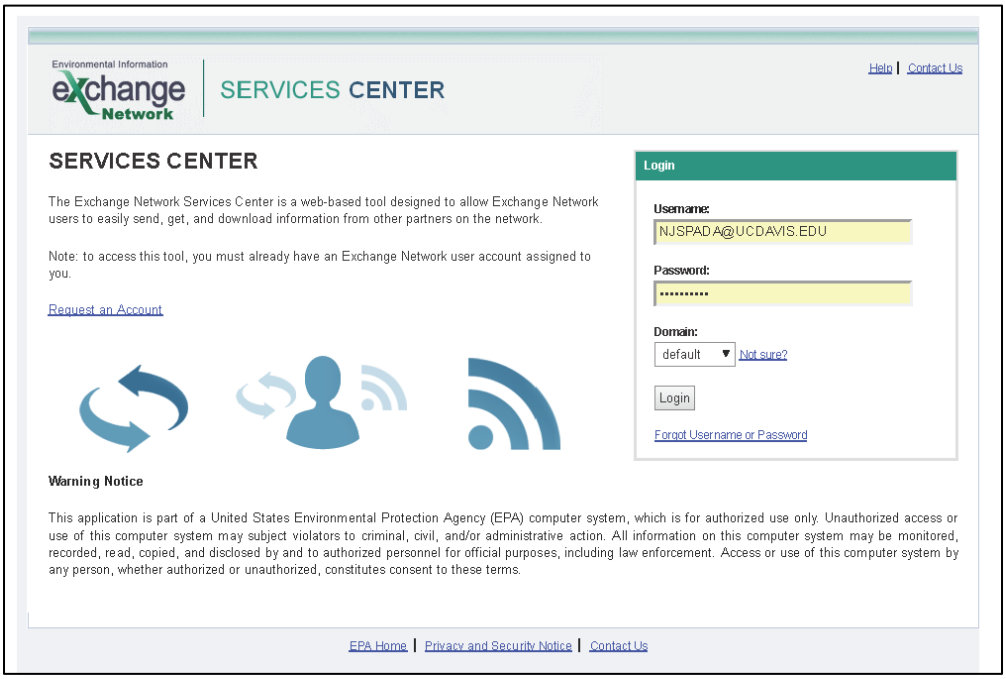
Once the new file has been validated, the analyst will convert it from DART to AQS format using the function,

*[aqs] <- dart2aqs(['MM'], ['YYYY'])*

with the appropriate month and year of data. This function automatically generates a new file in AQS format in the CSN/QA folder with the current date in the filename. The analyst should review the output dataset for accuracy and consistency with AQS formatting rules. AQS reference documents are conveniently located in U:/CSN/Documentation/Reference.

Once the AQS file is ready for delivery, the analyst will use a web browser of their choice and navigate to the EPA's Exchange Network Services website (https://enservices.epa.gov/login.aspx).

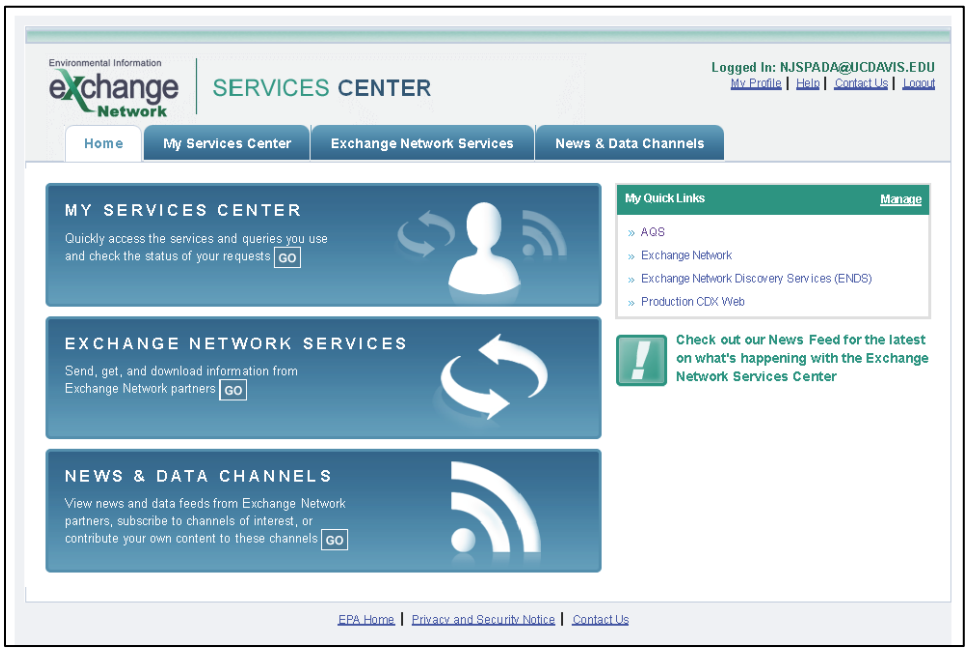
Figure 3. Login screen for the EPA's Exchange Network Services website.




After logging in, the analyst will be presented with the home screen. The AQS service can be added to the analyst's home screen in the "My Quick Links" bar, or the analyst can search for the AQS submission form. To search, the analyst will need to click on the "Go" button of the Exchange Network Services bar, seen in

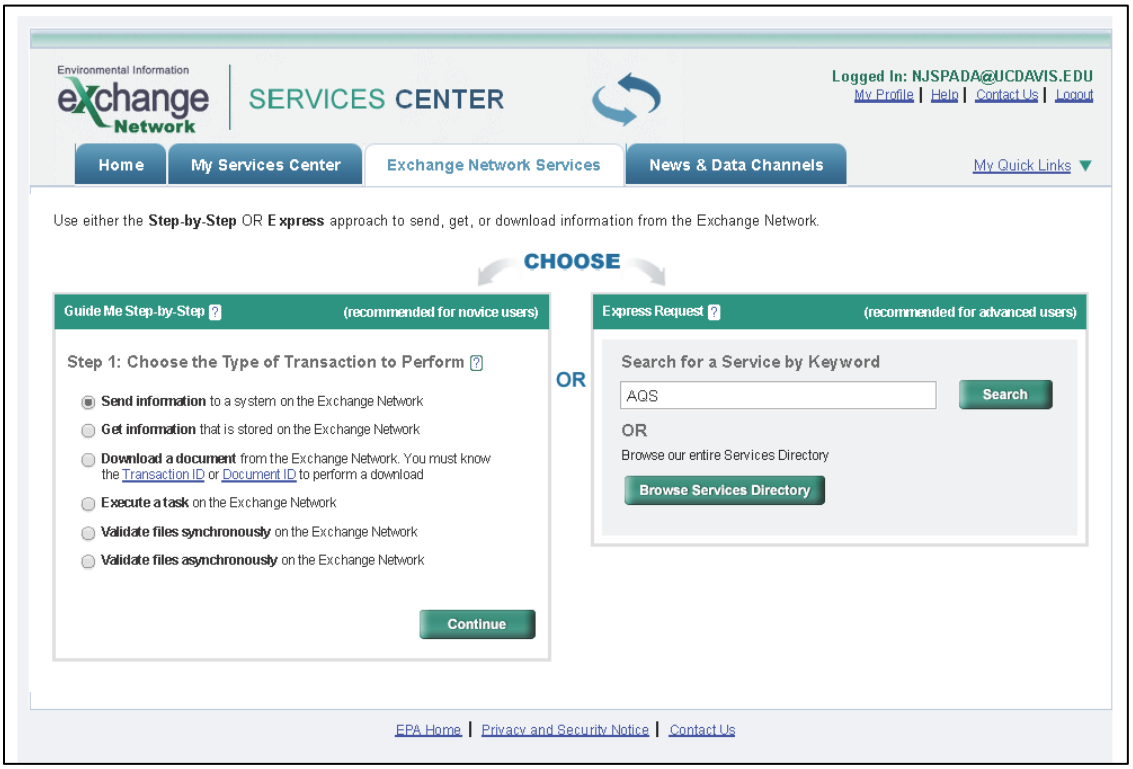
Figure **4.**

Figure 4. Home screen of the Exchange Network Services website.



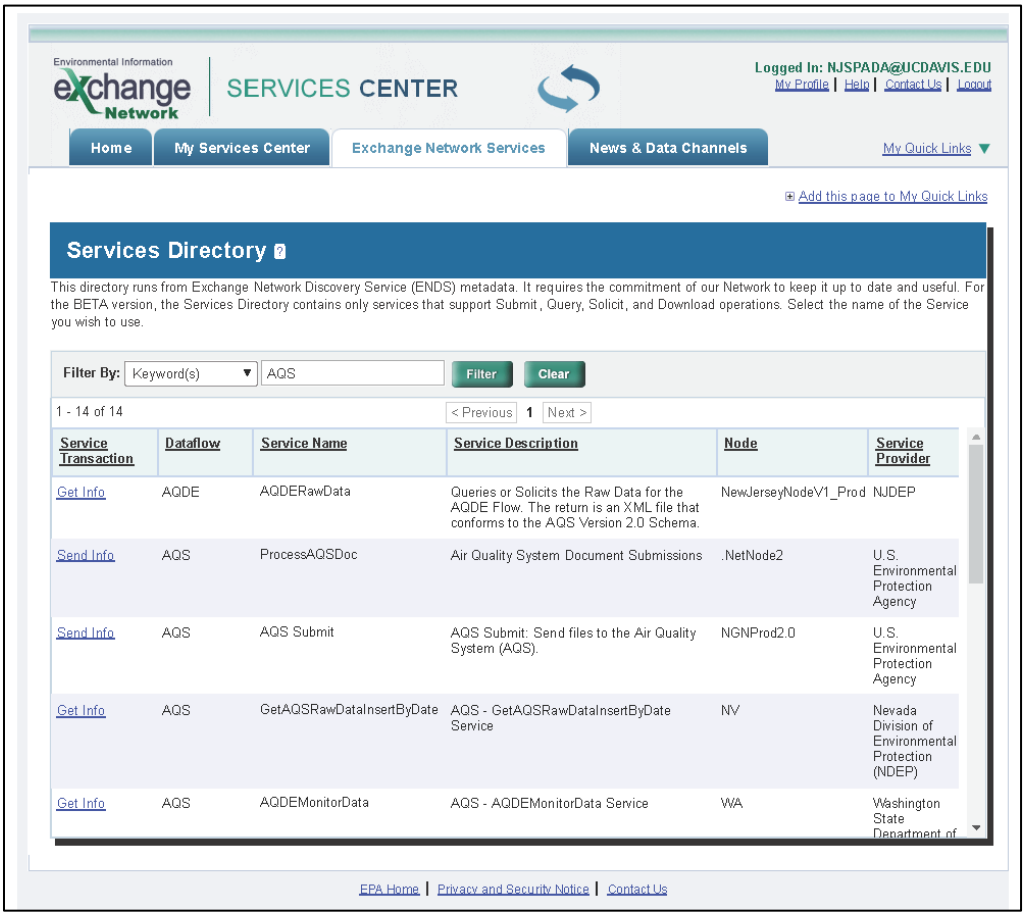

The analyst will then be presented with a choice between a Step-by-Step guide and a search bar. It is faster to type “AQS” into the search bar as shown in Figure 5.

**Figure 5. Enter "AQS" into the search bar.**



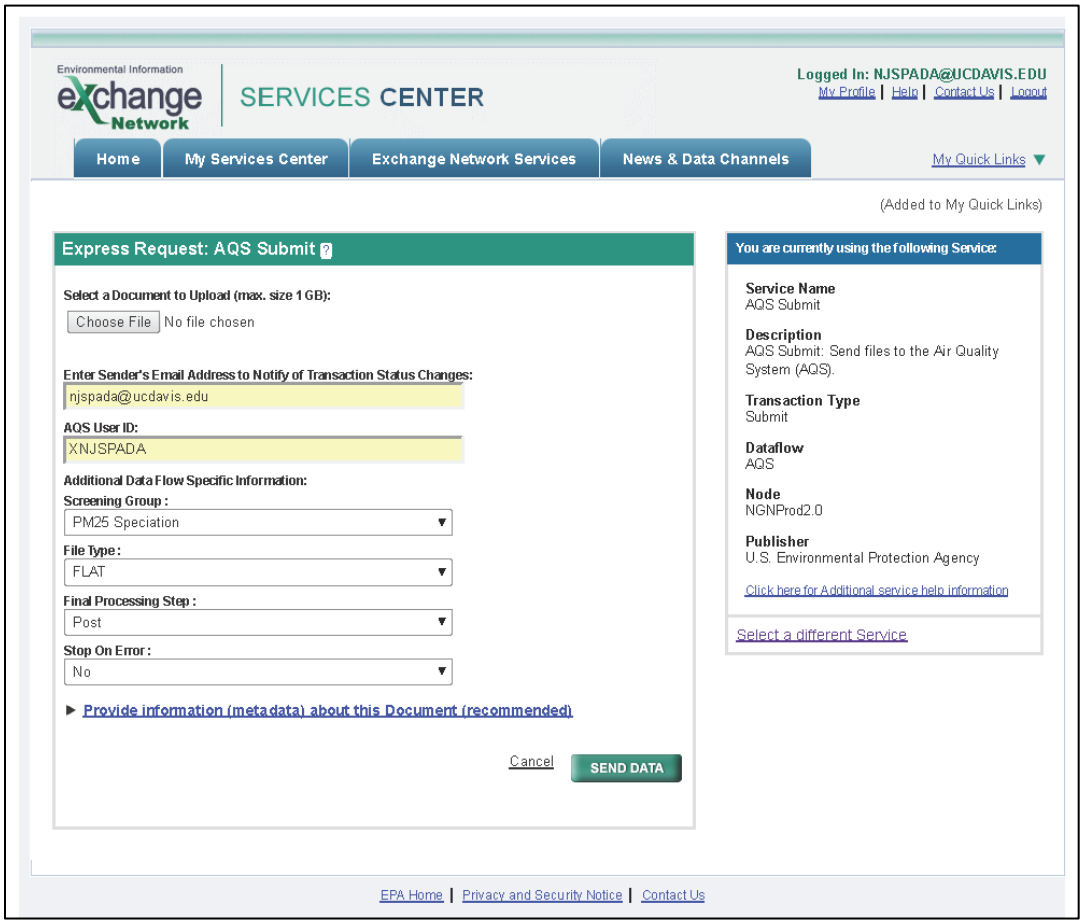

The search results will show all available processes associated with the AQS system. The analyst should choose the Service that has “AQS Submit” specified. This is typically the third choice in the list, as in Figure 6, but may vary. This will take the analyst to the AQS submission form. Note that it is more efficient to add this service to the analyst’s quick links on the home screen.

Figure 6. Search results from "AQS". The analyst should choose the Service named "AQS Submit".




Finally, the analyst will fill out the submission form with the analyst's email address, AQS user ID, screening group (PM2.5 Speciation), the file type (FLAT), the final processing step (LOAD), and whether or not to stop on errors (NO). See Figure 7 for an example. Use the "Choose File" button to select the file generated from the previous step. Press the "SEND DATA" button to submit the form. The progress of the data submission can be monitored through the same web portal.

Figure 7. AQS data submission form.




# 4. DATA DELIVERY

This section describes the data flow through the data delivery process used to execute all CSN validation checks. Figure 8 outlines the flow of data from the UC Davis validation results to final delivery to AQS. The wrapper function *csn_validate* is executed by the analyst to generate the initial data set for DART review (see **Error! Reference source not found.**). Then upon receipt of the validated data from DART, the data is re-ingested in the UC Davis database into the *DARTreturn* table. The analyst may then execute the dart2aqs function to reformat the data into AQS format. The data is reviewed again and submitted to AQS through the Exchange Network Services web portal (see 3.3). Source code for the functions shown in **Error! Reference source not found.** is stored in the Crocker source repository.

Figure 8. Flow diagram of the data delivery process. Rectangles represent data files, diamonds represent R functions, circles represent databases, and lines represent inputs and outputs.