TITLE: Database Operations for the Chemical Speciation Network

Effective Date: _____

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1.0 Procedures

1.1   Scope and Applicability

This operating procedure covers database operation activities performed by program data processing staff. Data entry activities, such as Filter Shipping and Handling (FiSH) unit sample processing, are included in the FiSH standard operating procedures (SOP). It does not include information related to entry of gravimetric mass data into Wood Environment & Infrastructure Solution, Inc.'s (Wood) laboratory information management system (LIMS) Element. Information on data entry with respect to mass measurements can be found in sections 3 and 6.7 of SOP GLM3180-009 and in SOP GLO-3180-035.

1.2   Personnel Qualifications

This procedure assumes a familiarity with general database concepts and the use of Microsoft (MS) Access.

1.3   Definitions

CF   compact flash memory module
CSV   comma separated value
CSN   Chemical Speciation Network
FiSH   Filter Shipping and Handling Unit
IT   Information Technology department
LIMS   laboratory information management system
MS   Microsoft corporation
RAID   Redundant Array of Independent Disks
WAN   wide area network

1.4   Equipment and Supplies

File Server – Wood maintains a secure file server for use with the $PM_{2.5}$ Chemical Speciation Network (CSN) Program. This server houses the MS Access database front-ends that are used to enter data for the shipping and handling requirements of the CSN program and to perform quality assurance (QA) activities associated with entry of data from the field and delivery of data to the contract analytical laboratory. The laboratory information management system (LIMS) Element used to store gravimetric data and the back-end tables used to store CSN data run on MS SQL Server 2012 on a MS Windows Server virtual server. A separate server is used to host MS SQL Server 2012.

1.5   Procedures

1.5.1   Request Domain Account for a New Non- Wood Employee

1.5.1.1 Summary of Task

In order to access the CSN MS Access database, users must have an Wood Domain account. Domain accounts can only be created by Information Technology (IT) domain administrators. This procedure describes how to make a request to have a domain account created for a new FiSH service employee. Note that all Wood employees have a domain account created as part of the hiring procedure; therefore, this procedure is only required for non- Wood workers (e.g. subcontractor staff from Akea, Inc. who work in the FiSH).

1.5.1.2 Procedure

- The Program Manager notifies Wood IT staff that a new non- Wood account is required.

- IT processes the account request.

- IT creates a new domain account and notifies the Program Manager by e-mail.

- The Program Manager communicates the account information to the new non-Wood employee.

1.5.2 Request Deletion of Domain Account for Terminated Non-Wood Temporary Employee

1.5.2.1 Summary of Task

Domain accounts may only be deleted by IT domain administrators. This procedure describes how to make a request for deleting the domain account of a non- Wood worker after his or her termination. Note that domain accounts for Wood workers are automatically deleted as part of their termination process; therefore, this procedure is only needed for non-Wood workers.

1.5.2.2 Procedure

The Program Manager notifies the IT Department about the appropriate domain account to be deleted. Because all file and server access is through this account, this effectively removes the terminated employee's file and server access.

1.5.3 Add Employee or Non-Employee to the FiSH Directory Users Group

1.5.3.1 Summary of Task

The MS Access database front-end used to enter and access the data for the shipping and handling component of the CSN is housed in a limited access directory on Wood's Gainesville file server. Access to this directory is granted by an IT administrator on an as needed basis, based on requests initiated by the Wood CSN contract Program Manager. This task is performed for employees and non-employees who need database access. This procedure requires administrative rights on Wood's file server. Only people who

have domain accounts may be added to the FiSH directory users group. New non- Wood workers must have their domain account assigned (see Section 2.0) before they can be added to the users group.

1.5.3.2 Procedure

- The Program Manager notifies Wood IT staff that a new Wood or non- Wood FiSH staff member needs access to the FiSH directory on the file server.

- The Program Manager provides the IT Department with the name and domain account of the person to be granted access to the FiSH database and the Windows File Server domain group(s) into which he or she should be placed.

- IT processes the request and grants access rights to the staff member.

- IT notifies the Program Manager that access rights have been granted.

- The Program Manager communicates the access to the staff member and works with them to install the front end access to the database.

1.5.4 Process Delivery Order and Schedule Associated Sampling Events

1.5.4.1 Summary of Task

This procedure describes the operations necessary to process an incoming delivery order and to process any required gravimetric mass analyses and to develop the required information used to create sampling events.

1.5.4.2 Procedure

- Receive delivery order information from the EPA Contracting Officer.

- Determine the information needed for delivery order processing from information provided by the EPA Contracting Officer and the EPA Contracting Technical Representative.

- Forward delivery order paperwork to contracts and accounting staff for entry into Wood's project management system.

- Identify each site affected by the delivery order and determine if it appears in Wood's Sites table in the CSN database and if it includes EPA Air Quality System information.

- Enter the site information required to provide shipments, determine the sample frequency and other required information into the Sites database table, if necessary.

- Based on the beginning and end dates for sampling at each site, the InService field in the Sites table is set to "Yes". This field is used to control whether or not a site is active and should receive shipments. If gravimetric mass measurements are required for a new site, the Wood laboratory manager is notified and the number of

expected filters for mass determination are provided, along with the Wood internal site identification number.

- Once the site details have been entered and the start date verified, sample events can be generated using the Sample Event Creation form (see SOP GLO3110-002 section 6.2.1) in the MS Access front-end. Sample events are created just prior to shipping, typically a week or two before shipment. Any required blank sample events (e.g., field, trip or gravimetric MDL) should be created at the same time.

- Once all sample events are created for a set, the Measurement Request forms for the sample events for each set are generated. Measurement Request Forms are generated using the Generate/Print Measurement Requests form (described in *SOP GLO3110-002 Field Shipping and Handling*).

1.5.5 Prepare Monthly Analytical Data Report

1.5.5.1 Summary of Task

This procedure describes the preparation of the analytical (gravimetric mass) data report, which is sent to the EPA contract analytical laboratory each month.

1.5.5.2 Procedure

- Transfer of the gravimetric mass to the contract analytical laboratory is accomplished by using the CSN MS Access QA front-end. The user initiates the procedure by opening the MS Access QA front-end. This is accomplished by double-clicking on the QA front-end icon located on the user's computer desktop.

- Once the front-end is opened, the user then clicks on the "Misc Tool" tab of the dashboard form.

- The user then clicks on the "Open Data File Export Form" button. This launches the "Data File Export" form.

- The user then selects the appropriate Analytical Batch ID from the Analysis Batch ID dropdown box. Once the Analytical Batch ID is chosen, the user then selects the "UC Davis Mass Concentration File Transfer" radio button. After selecting the radio button, a default file storage location and filename are provided. The user can modify either of these parameters by clicking in the appropriate text boxes and modifying the storage path and/or file name. The file name extension should be CSV to ensure that the file is a comma separated value (CSV) file. The default file name automatically adds the CSV extension.

- Once the file has been exported, notify the Wood QA officer that the draft reports are ready for review.

- After approval from the Wood QA officer, the files are transmitted to the contract analytical laboratory. Other operational data (start and end times, flow, etc.) as well as all null and validity flags will have already been transferred to the contract

analytical laboratory when the filters are shipped to the laboratory for chemical analysis.

- Transmit the data in the CSV file via email to the contract analytical laboratory

- Any Tribal or specialty site mass data is generated using the same method by selecting the appropriate radio button for each type of mass transfer on the "Data File Export" form. In some cases the data may be exported to spreadsheets rather than CSV files.

The Mass Transfer query performs the following calculations:
1. Ambient concentration = mass/sampler volume (for appropriate sampler channel), where sampler volume is from the Field FSCOC form.
2. Sample concentration uncertainty

$$= \sqrt[2]{(Anal.Uncertainty^2 + (Mass * Vol.Uncertainty)^2}$$

Notes:
1. Concentrations and concentration uncertainties are not defined for field and trip blanks because there are no sample volumes.
2. The sampler volume uncertainty (Vol.Uncertainty) is currently assumed to be 5% for all sampler channels.

1.5.6 Database Backup

1.5.6.1 Summary of Task

Office servers on the Wood WAN are maintained and managed solely by Wood IT staff, which continually evaluates the hardware configuration of the office servers. Office servers are routinely backed up offsite to our datacenter utilizing Symantec NetBackup software. A full back-up is performed every Friday and daily back-up's are run on Monday through Thursday to capture the changes made on those days. Windows updates are installed on all systems every quarter or more frequently as determined by Wood IT staff. This happens over the weekend outside of normal business hours and a notification is always sent out ahead of time. Should a disaster occur that renders the server inoperable, the software will be rapidly re-loaded onto another server, and the data restored from the archived backup files. Wood estimates that the data management system could be redeployed within 24 hours following a server failure or catastrophic event and, depending on the age of the backups, the database could be fully repaired and in production mode within 24 hours to 1 week.

The MS Access front-ends and the SQL Server back end tables are housed on the Gainesville main file server and a dedicated database server, respectively. The file server is backed up as described above. The database server with the current version of the database tables is backed up as follows:

- Full database backup weekly;
- Differential database backups during week nights (4 times per week);
- Database transaction log backups during week days (hourly between 0700 and 2200 each work day);
- Files associated with database backups are stored locally on the GNV-CASTNET server and are copied weekly to an external hard drive to enable offsite storage;
- The most recent four full weekly backups are retained on the local hard drive; and
- Database update and delete transactions are captured as XML and stored in an audit table. The audit table records include information on user, date and time and table for each transaction.

Commercial-off-the-shelf software is available either on an installation CD/DVD or can be downloaded from the vendor. Therefore, server failure or a catastrophic event will have minimal effect on these applications. Documents and reports and data transfer files prepared for CSN on the Gainesville Wood file server and are subject to the same file server backup procedure described above.

Although not strictly a data backup system, a Redundant Array of Independent Disks (RAID) subsystem is included in the servers at Wood. A RAID subsystem increases performance and/or provides greater fault tolerance and provides protection against data loss from physical drive failure. The servers that host the SQL and database use RAID5, which provides a striped set with distributed parity. In some limited cases, the server uses RAID1.

2.0 References

Wood Environment & Infrastructure Solutions, Inc. (Wood). 2017. *Standard Operating Procedure (SOP) GLO3110-002*, *Revision 0, Field Shipping and Handling*

Wood Environment & Infrastructure Solutions, Inc. (Wood). 2017. *Standard Operating Procedure (SOP) GLM3180-009, Revision 1, Determination of Particulate Matter (PM) Gravimetric Mass for the Chemical Speciation Network*

Wood Environment & Infrastructure Solutions, Inc. (Wood). 2017. *Standard Operating Procedure (SOP) GLO-3180-035, Revision 7, Element Batch Preparation*