ANALYTICAL CHEMISTRY DATA MANAGEMENT AND REVIEW FOR AIRNET

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the process for receiving, uploading, and archiving analytical chemistry data; evaluating analytical chemistry quality; checking the resulting chemistry data packages for completeness and usability; and conducting validation/verification of both electronic and hardcopy data from both current and historical (pre-1996) sources.

Scope

This procedure applies to the analytical chemistry coordinator assigned to evaluate AIRNET analytical data.

In this procedure

Signatures

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04/14/06

GENERAL INFORMATION ABOUT THIS PROCEDURE

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	AIRNET Analytical Data Verification and Validation Checklist	1
3	QC Evaluations Performed	1
4	Data Parameters	2

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description of Changes
0	02/06/98	New document.
1	12/7/99	Extensive revision of process, inclusion of steps formerly in MAQ-208.
2	4/14/06	Describe blank corrections to calculated air concentrations, add formulas for calculating net air concentration and its uncertainty, and describe confirming chemical analysis process. Add calculation for decay correction of tritium spike. Update of data transfer to WWW.

Who requires training to this procedure?

The following MAQ personnel require training before implementing this procedure:

- Analytical chemistry data reviewers
- Analytical Chemistry Coordinator

Training method

The initial training method for this procedure is **mentoring** by a previously trained individual, and is documented in accordance with the procedure for training (MAQ-024).

Annual retraining is required and will be by self-study (“reading”) training.

General information, continued

Prerequisites

In addition to training to this procedure, the following training is also recommended prior to performing this procedure:

- Education and/or experience in compliance-oriented analytical chemistry
- Familiarity with Microsoft Access
- Familiarity with the operation of the AIRNET database (see user's manual)

Definitions specific to this procedure

Statement of Work (SOW): A list of specifications and requirements which analytical laboratories must meet in order to do work for MAQ.

Data Package: A hardcopy report from an analytical laboratory on a single set of chemical analyses, which contains the material specified in the SOW and sufficient documentation to allow an appropriate professional, at a substantially different time and location, to ascertain:

- what analyses were performed, and what results were obtained
- that the data had acceptable properties (such as accuracy, precision, MDA)
- where, when, and by whom the analyses were performed
- that the analyses were done under acceptable conditions (such as calibration, control, custody, using approved procedures, and following generally approved good practices)
- that the MAQ SOW was otherwise followed.

Completeness: A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under ideal conditions.

Usability: A qualitative decision process whereby the decision-makers evaluate the achievement of data quality objectives and determine whether the data may be used for the intended purpose. Three levels or classes of data quality are used:

- Accepted: Data conform to all requirements, all quality control criteria are met, methods were followed, and documentation is complete.
- Qualified: Data conform to most, but not all, requirements, critical QC criteria are met, methods were followed or had only minor deviations, and critical documentation is complete.

General information, continued

Definitions, continued

- Rejected: Data do not conform to some or all requirements, critical QC criteria are not met, methods were not followed or had significant deviations, and critical documentation is missing or incomplete.

Electronic Data Deliverable (EDD): The computer-compatible file that is delivered to MAQ from the analytical laboratory, in the SOW-specified format, via Internet, e-mail, or diskette from which analytical chemistry data may be uploaded directly into the databases.

Validation: A systematic process for reviewing a body of data or a report against a set of criteria to provide assurance that the data or report are adequate for their intended use. Validation consists of data reviewing, screening, checking, auditing, verification, certification, and review.

Verification: The act of reviewing, inspecting, testing, checking, auditing, or otherwise determining and documenting whether items, processes, services or documents conform to specified requirements.

References

The following documents are referenced in this procedure:

- MAQ-024, "Personnel Training"
- MAQ-026, "Deficiency Reporting and Correcting"
- MAQ-036, "Preparing Statements of Work for Analytical Chemistry"
- MAQ-208, "Evaluation of Biweekly AIRNET Data"
- MAQ-AIRNET, "QA Project Plan for Radiological Air Sampling Network (AIRNET)"
- AIRNET Database Users Guide
- Memo ESH-17:99-104, "Absolute Humidity Calculations and Reporting by the Meteorology Project," Jeff Baars to Distribution, March 10, 1999

Note

Actions specified within this procedure, unless preceded with "should" or "may," are to be considered mandatory guidance (i.e., "shall").

Background

Background

Requirements for chemical analyses are described in the data quality objectives (DQO) section of the AIRNET sampling and Analysis Plan (MAQ-AIRNET). Data quality objectives are translated into procurement needs and related Statements of Work (SOW) according to MAQ-036. Data received from all internal and external chemistry laboratories under these SOWs are uploaded electronically and inspected to determine if they meet MAQ specifications. This inspection includes checking the data package received from the laboratory to ensure that:

- the data package contains the components specified in statements of work,
- all of the requested analyses were performed for all samples, and
- the data are of a quality adequate for the use which MAQ intended.

The analytical data are evaluated to ensure usability and electronic forms are verified against hardcopy data packages, and then archived to protect their integrity. This is our overall verification and validation process (V&V). At this stage these data may be transferred to the WWW in static HTML tables.

The analytical chemistry coordinator prepares checklists of the items to address when checking data packages from laboratories after analyses have been completed. Data are either manually entered into the Microsoft Access AIRNET (ambient air) database or uploaded from Electronic Data Deliverables specified in the SOWs. All data (100%) are verified against the hard copy to ensure exact reproduction of the analytical concentrations, and the data usability is evaluated for acceptance, qualification, or rejection. Initial gross air concentrations, net air concentrations (corrected for filter blank), bound water corrected tritium net air concentrations, and evaluation against action levels are performed and sent to the project technical reviewer, along with summaries of all analytical QC data. When documented data review and proposed actions are received back from the technical reviewer and project leader, these actions are posted to the Access databases. Ultimately, all electronic data are archived into limited-access tables to ensure their integrity. All stages of the process are tracked electronically within the AIRNET database.

Preparing checklists for deliverables

When to prepare completeness checklist

The MAQ **analytical chemistry coordinator** prepares checklists as needed to evaluate the completeness of any deliverables when new services are procured. Base the checklists on the SOWs, EDDs, electronic database designs, and professional judgment. Tailor the checklist formats to allow easy checking of analyses purchased frequently (such as biweekly gross alpha/beta, tritium or gamma analyses, and quarterly composite analyses for alpha isotopes). As such, the sequence of components may be different in the checklist and SOW, but include general requirements of the SOW. It is most convenient to include the checklist as an appendix to each SOW, so that anytime the SOW is modified, the revisions may be immediately incorporated into the completeness checklist.

Examples of checklists are attached to this procedure as Attachments 1 and 2.

Steps to prepare a checklist

Follow these steps to prepare checklists:

Step	Action
1	Consult the relevant SOW, EDD, and AIRNET database design specifications to identify the supporting documentation required.
2	Consult an existing checklist, if available, matching requirements as closely as possible.
3	Obtain a sample package for the analyses from the lab.
4	Prepare the new checklist by modifying an existing checklist to match current requirements and package sequence. Ensure the data reviewers have the current versions.

Processing and evaluating the EDD for AIRNET analytical chemistry data

Upload EDD

EDDs may be received from both internal and external analytical chemistry laboratories. Format and content requirements are specified in each individual Statement of Work prepared according to MAQ-036. Each EDD requires specific software to enable it to be incorporated into the existing databases. The uploading process is described in detail in the Chemistry and AIRNET Database Users Guides. Upload these EDDs according to these detailed processes as soon after receipt as practical.

Evaluate against SOW requirements

After uploading data received electronically into the Chemistry database, perform referential integrity checking before moving these data on into the AIRNET database. Continue the evaluation of these deliverables using software described in detail in the AIRNET Database Users Guide to ensure that the major components are the same as those usually received or required by the SOW.

Resolution

When expected components are missing or errors are detected, contact the lab immediately and request that a revised EDD be sent expeditiously. Also document the problem by preparing a deficiency report according to MAQ-026.

Steps to calculate preliminary air concentrations for AIRNET

The staff who verify and validate the field data and analytical chemistry data are in the best position to know when both are completed for each biweekly or quarterly composite sample group. Follow the steps below to run the Microsoft Access software that produces these reports and forward them to the technical reviewer responsible for routine review of these data. The actual equations used are given in Attachment 4.

Step	Action
1	Ensure that AIRNET field data have been loaded, verified and validated, and that air volumes have been calculated (via database query) for each field record. Ensure that all analytical data have been uploaded, although the verification and validation process need not yet be complete.
2	Run appropriate queries, using the detailed procedures documented in the AIRNET Database Users Guide, to perform combined blank, initial gross air concentration, net air concentration (blank corrected), and bound water corrected tritium calculations. See the block below for more detail regarding the calculation and application of blank corrections.

Steps continued on next page.

Processing and evaluating the EDD for AIRNET analytical chemistry data, continued

Step	Action
3	Perform initial QC sample evaluations using the detailed procedures documented in the AIRNET Database Users Guide. See Attachment 3 for a description of the evaluation criteria employed by these queries.
4	Prepare a detailed internal memo that includes detailed reports of QC evaluations performed and an overall data usability conclusion. The details on the content and preparation of this document may be found in the AIRNET Database Users Guide. Transmit these results to the project technical reviewer and project leader for their evaluation and review. The technical review will be performed according to MAQ-208.

Blank corrections

Using appropriate database queries, calculate individual mean blanks for each of the following matrix types: Process Blank (PB), Trip Blank (TB), Matrix Blank (MB), and Laboratory Matrix Blank (LMB). Use professional judgement to evaluate to determine if any of these samples appears to be not representative of the true matrix blank. Flag such eliminated samples in the Archive table prior to calculating a Combined Matrix Blank (CMB) using all remaining values from the TB, MB and LMB categories (PB is already included in each of these so it is not added again). Subtract the CMB from the sample concentration PRIOR to calculating the Net Air Concentration. Propagate the standard deviation of the CMB onto the Sample uncertainty and report as the Net Air Concentration Uncertainty. Net Air Concentration units should be identical to the Air Concentration Units.

Apply combined matrix blank correction

When a CMB can be determined, apply it to all data (generally alpha/beta, tritium and quarterly isotopics and inorganics). In the case where the sample result is a “less-than” value, no blank correction is appropriate and no Net Air Concentrations will be reported. In the event that the CMB is itself a “less-than” value, do not apply a blank correction and do not report a Net Air Concentration. Calculate additional uncertainty and report as Net Air Concentration uncertainty only where sample uncertainties have been reported and CMB standard deviation is > 0.

Processing and evaluating the EDD for AIRNET analytical chemistry data, continued

Apply bound water correction to tritium collected on silica gel

Atmospheric water vapor collected on silica gel and then thermally distilled for tritium analysis requires further correction. We and others have discovered that the collected water exchanges hydrogen atoms with geologically bound water in the silica matrix, thereby effectively diluting the collected tritium. This exchange appears fairly rapid. We determine the amount of bound water in each batch of silica gel and make an additional correction to the tritium net air concentrations to reflect this reservoir of tritium-free water. We call the result the "RevisedH-3 Net Air Concentration" and "RevisedH3 Net Air Concentration Uncertainty." We use these values for air dose calculations. More details and the specific equation used are given in LANL memorandum RRES-MAQ:02-296 (Aug. 8, 2002) and in the AIRNET Database Users Guide.

Apply decay correction to tritium spike sample results

Three samples per period consist of a known concentration of tritiated water evaporated onto silica gel. This tritium standard decays in time and therefore the expected analytical result will decrease in time. In order to compensate for this, the standard activity will be decay corrected prior to comparison to the analytical result. The current activity of the standard (A_T) at any given time (T) will be calculated from the original activity of the standard (A_0) with the following equation: $A_T = A_0 * e^{-(\ln 2/ 12.32)*T}$ where 12.32 is the half life of tritium.

Calculation of completeness parameters

Run-time requirements

The FFCA stations must meet 95% run-time per calendar year and several specific stations are required to be operated to the same standards as the FFCA stations. The Air Quality group's goal is to achieve 90% run time for all other stations. (See "Completeness" in the AIRNET Sampling and Analysis Plan, MAQ-AIRNET.) This corresponds to no more than 438 hours and 877 hours, respectively, down-time per year, or on average about 17 hours and 34 hours, respectively, per sampler per sample period. The actual equations used are given in Attachment 4.

Calculating sampler run-time

Calculate the cumulative run-time for the calendar year (as a percentage of total possible annual hours) using MS Access queries designed specifically for that purpose. Then generate and attach this report to the technical review and QC evaluation biweekly memo for gross alpha/beta only. These queries are documented in the AIRNET Database Users Guide. The actual equations used are given in Attachment 4.

Completeness requirements

FFCA data must meet 80% annual completeness requirements (see "Completeness" in the AIRNET Sampling and Analysis Plan). Several specified stations are required to be operated to the same standards as the FFCA stations. The Air Quality group's goal is to achieve 80% sample completeness for all AIRNET stations. For biweekly results, this corresponds to no more than 5 samples lost, not analyzed, or rejected during a calendar year.

Calculating sample completeness

Calculate the completeness for the year to date by dividing the total number of usable biweekly concentration values by the total number of sampling periods to date in the year, using MS Access queries designed specifically for that purpose. Then generate and attach this report to the HP Review and QC Evaluation bi-weekly memo for each analysis group. These queries are documented in the AIRNET Database Users Guide. The actual equations used are given in Attachment 4.

Occasionally, a sampler will not have operated for the complete (biweekly) sample period (common occurrences include power outages or pump failure), but the samples are collected and analyzed. Use best professional judgment to determine if the sample results are representative of the sample period. Calculate sample completeness correspondingly. The **project technical reviewer**, the field team leader, and the **analytical chemistry coordinator**/data base manager decide jointly to reject or qualify data on these bases.

Calculation of completeness parameters, continued

Evaluate data package completeness against completeness checklist

After receiving the final hard-copy data package and while the technical reviewer is reviewing the preliminary air concentration calculations and QC evaluations, use the appropriate completeness checklist (prepared as described in the chapter *Preparing checklists for deliverables*) to evaluate the deliverable. If the data are of a frequently purchased type, review to ensure that the major package components are the same as those usually received.

Resolution

When expected components are missing, contact the lab immediately and request that the missing components be sent expeditiously. Also document the problem by preparing a deficiency report according to MAQ-026.

Custody errors

Custody errors are those which make it difficult to demonstrate that the samples that were shipped by MAQ were the same as those analyzed by the lab. Examples include:

- MAQ or lab staff not signing and dating chain of custody forms
- Loss or miscounting by MAQ or the lab
- Misidentifying by MAQ or the lab
- Lost samples
- Delivery to the wrong site or person

Document all custody errors with an MAQ Deficiency Report (MAQ-026). Resolution will require coordination with the lab. If new analyses are necessary, ship the new samples under a new chain of custody.

Purpose of AIRNET analytical chemistry data evaluation

The data evaluation process determines whether chemical analyses data meet the data quality objectives specified in the quality plan (MAQ-AIRNET). All data will be evaluated for one of three outcomes: *accept*, *qualify*, or *reject*. For qualified and rejected data, an explanation must be included in the database.

Calculation of completeness parameters, continued

Evaluate data

Follow the steps below to evaluate the AIRNET data:

Step	Action
1	Using the appropriate sample checklist(s) prepared according to the chapter *Preparing checklists for deliverables*, evaluate for completeness. Each analytical data element should have a value. • For all missing data, ensure an explanation is recorded in the database and label the record as "rejected." If a missing datum can be located, enter the correct value, label the datum "qualified" in the database, and enter the reason for qualification. • If data errors are identified, contact the lab and negotiate for a corrected report. Label data as "rejected" pending resolution with the laboratory.
2	Using the appropriate sample checklist(s) prepared according to the chapter *Preparing checklists for deliverables*, look for values within the expected range. For example, the expected range might be a nominal value with a range of possible values or an MDA which represents a particular dose cutoff (e.g., 0.1 mrem). The AIRNET Sampling and Analysis Plan lists some of the expected values for data elements. Use historical ranges for air concentrations at each station to identify potentially suspect data points for further inspection and validation. The MDA should also be evaluated against the requirements in the SOW to ensure contractual compliance.
3	As a result of step 2, if the element is outside its range of normal values or significantly above the required MDA, further validation and verification may be required. Consult with the vendor to determine what conditions at their laboratory may have resulted in the data value reported. Examine field records to identify possibilities of contamination during handling. If investigation warrants, label analytical records as "qualified" (enter a "Q" in the analytical data qualification field) and describe in the table's comment field the issue affecting the data quality. Prepare and reference a separate memo if necessary to provide sufficient detail.
4	If the data quality is seriously affected, then the data point may be labeled as "rejected" (enter a "R" in the analytical data qualification field) and the reasons for rejection must be provided in the table's comment field. Prepare and reference a separate memo if necessary to provide sufficient detail. Rejected data will not be used for any purposes.

Calculation of completeness parameters, continued

Technical reviewer action implementa-tion, final data archiving and public release for AIRNET

The technical reviewer responsible for routine review of these data conducts review according to MAQ-208, documents the outcome, and approves the data for use. Changes in acceptance outcomes are implemented and both field and analytical data are archived in limited access tables for protection from inadvertent modification.

Occasionally the data for certain stations and/or certain analytes in a data set may be so different from normal or seem suspect based upon professional judgment. With Project Leader concurrence, confirming analysis(es) may be requested from the analytical laboratory,

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Steps to implement technical review input

Perform the following steps to implement the recommendations and changes from the technical reviewer:

Step	Action
1	After the technical reviewer returns a formal memo listing the changes to be made, implement the recommended actions in the database and document the reasons in the comment field.
2	When both the validation and verification and technical review process are complete, archive both field and analytical chemistry data using the detailed procedures documented in the AIRNET Database Users Guide. These become the official data for use in published compliance or surveillance reports and for release to the public.
3	Publish fully approved data to the MAQ WWW homepage using the detailed procedures documented in the AIRNET Database Users Guide.

Steps to implement confirming chemical analysis

Perform the following steps to implement the recommendations and changes from the technical reviewer:

Step	Action
1	After the technical reviewer or other AIRNET project staff determines the desirability/need for confirming analysis(es), consult among the team to design the additional analytical request. Obtain Project Leader approval for analytical design and for pursuing negotiations with the analytical laboratory.

Steps continued on next page.

Calculation of completeness parameters, continued

Step	Action
2	Contact the analytical laboratory manager and negotiate costs and turnaround requirements for the confirming analyses. With Project Leader concurrence, submit these samples using the normal process. In many cases the residual portion of the samples involved will probably already be at the analytical laboratory. In that event, be sure to send the official cover letter detailing the reanalysis request.
3	Database actions If the samples for confirming analysis have never been analyzed for the requested analytes, then continue using the original PeriodID. Simply add requested new analyses to the Tracking_ChemData table using this original PeriodID. (e.g. breaking up a clump for individual gamma counting or doing Po-210 and Pb-210 in addition to gross alpha/beta due to high alpha and or beta results) Create new PeriodID in the AIRNET PeriodID table consisting of original samples' PeriodID with an "a" suffix added (e.g. 02Q4 becomes 02Q4a). Use the same date range and composite group. Add requested new analyses to the Tracking_ChemData table using this new PeriodID. In either case it is very helpful to add something about "Confirming analyses requested for …" to the Comment field of the appropriate PeriodID in the AIRNET_PeriodID table.
4	Process EDD and data package(s) similarly to routine samples as described above.

WWW publication of AIRNET data

Posting of AIRNET data

Results from the ambient air monitoring network (AIRNET) are posted to the MAQ external web page once they have received approval by a health physicist (HP). This is monitored with a checkbox field in a tracking table within the AIRNET database. Check with the Analytical Chemistry Coordinator/Data Base Curator and attend biweekly AIRNET meetings to determine if new data have been approved and are ready to be posted to the web. Generally, data are HP approved every two weeks for biweekly measurements and every three months for quarterly composites.

MAQ is in the process of verifying historical data against the available hardcopy analytical reports and posting these data to the web page, as time permits. Data as far back as 1978 are currently posted.

Steps to post AIRNET data

Perform the following steps to complete the electronic publication of AIRNET data to the WWW:

Step	Action
1	Project personnel produce data reports for each open station and analyte group measured at that station using MS Internet Wizard. By selecting the proper destination subdirectory (Projects\WebDraft\GreenWeb\AirNetData\xx, where xx is the analyte specific subdirectory) on the MS Access form, the files are published directly to the local network version of the MAQ External Web Page. This process is described in detail in the AIRNET Database Users Guide.
2	The reports are now ready to be moved to the CLEANAIR server via FTP, making them available to the public. Send an email to the external website webmaster informing them the reports are ready to be posted to the external website. Once the reports are live, access the Active Sites Switchboard on the internet (currently http://www.airquality.lanl.gov/AirConc_AllData.htm) and execute the links to ensure that the FTP process was successful.
3	Project personnel also produce summary plots using MS Access and MS Excel. The plots must be converted into PDF files and then moved to the appropriate subdirectory (Projects\WebDraft\GreenWeb\NewPlots). This process is described in detail in the AIRNET Database Users Guide.

Steps continued on next page.

WWW publication of AIRNET data, continued

Step	Action
5	Follow step 3 above, substituting the local network and live versions of the Plots Switchboard (currently http://www.airquality.lanl.gov/AirConcHistoryPlots.htm) for the Active Sites Switchboard.
6	Send E-mail announcing the availability of new data and plots to selected members of the AIRNET team.
7	When new stations are opened, the webmaster adds links to the Active Sites Switchboard. Conversely, when stations are closed the webmaster moves the links for that station to the Inactive Sites Switchboard.

Evaluation of AIRNET pre-1996 field and analytical data

Purpose of data evaluation

Data collected prior to 1996 were not procured to the same standards, did not have the same data package documentation, and cannot be reviewed to the same level as 1996 and later data. As part of an on-going process, these data are being reviewed to the extent practical and made available electronically in the AIRNET database. Since data are being loaded from a variety of sources using both electronic and manual means, all data must undergo verification and validation to ensure the correctness of the electronic record.

Steps to evaluate data

Perform the following steps to evaluate field sampling and analytical chemistry data:

Step	Action
1	Collect available hard-copy field sampling and analytical chemistry data records for the sampling period being evaluated. Obtain access to a computer terminal connected to the MAQ group server.
2	Evaluate for completeness to the extent permitted by the existing records. Each field or analytical data element should have a value. Ensure an explanation is recorded in the database for all missing data. • If a missing datum is without an acceptable explanation, attempt to determine the reason; label the datum "qualified" in the database and enter the reason for qualification. • If unable to determine a reason, leave the field blank and enter "R" in the qualifier field.
3	Evaluate for expected range of values, to the extent permitted by the existing records. For example, the expected range might be a nominal value with a range of possible values. Project quality plans often list some of the expected values for data elements.
4	As a result of step 3, if the element is outside its range of normal values or some field event renders the data potentially suspect, identify the record as "qualified." Perform further validation and verification by consulting with the field sampling technicians to determine what conditions at a site may have resulted in the data value reported. Label any amended field records as "qualified" (enter a "Q" in one of the field data qualification fields - timer, filter or gel) and describe in the table's comment field the amendments made.
5	If the data were not used in prior year's calculations or reports, label the data record as "rejected" (enter a "R" in one of the filed data qualification fields) and provide the reasons for rejection in table's comment field.

Steps continued on next page.

Evaluation of AIRNET pre-1996 field and analytical data, continued

Step	Action
6	Move the validated and verified data into the Archive tables within the AIRNET database for use in published reports and for release to the public. Specific procedures are documented in the AIRNET Database Users Guide.

Records resulting from this procedure

Records

The following records generated as a result of this procedure should be submitted **within 3 weeks of their receipt or generation** as records to the records coordinator:

- AIRNET Field Data Validation and Verification Database inspection form; completed, signed and dated.
- AIRNET Analytical Data Verification and Validation Checklist form; completed, signed and dated.
- Copy of final laboratory data package
- Deficiency reports resulting from chain-of-custody problems, if created
- MAQ internal memos documenting data quality evaluation, data validation, and initial air concentration or emissions calculations

The following electronic records generated as a result of this procedure are to be contained within their respective Microsoft Access databases:

- entries in AIRNET database for all accepted, qualified and rejected data from both field and analytical processes.

AIRNET Analytical Data Verification and Validation Checklist

AIRNET Sample Group:______________ Analysis: Gross Alpha/Beta or Gamma

Data Inspection Criterion	Criterion Met?	Comments
Case narrative for each sample group in cover letter or memo?	Y N NA	
Copy of chain of custody form?	Y N NA	
Data received for each sample on C-O-C?	Y N NA	
Field sample results and QA/QC samples results include:		
LANL sample ID and laboratory ID	Y N NA	
LANL sample delivery group, request number, or period ID, and laboratory work order	Y N NA	
Isotope or analysis, preparation and analysis method, analyte concentration, analyte uncertainty (noted as two sigma) and MDA in the same appropriate units	Y N NA	
Counting time, and dates of preparation and analysis	Y N NA	
QA/QC samples including a minimum of one of each of the following for every 20 field samples: a Laboratory Control Sample (LCS), a duplicate analysis, and a matrix blank.	Y N NA	
Known values for all QA/QC samples?	Y N NA	
Individual field sample and QA/QC sample raw data?	Y N NA	
Individual detector efficiencies and backgrounds?	Y N NA	
Laboratory bench sheets?	Y N NA	
Evidence of traceability for calibration standards?	Y N NA	
Calibration records?	Y N NA	

AIRNET Database Inspection Criterion	Criterion Met?	Comments
Inspection of Chem_Archive table:		
100% verification of analytical results in EDD vs. data package	Y N NA	
100% verification of AIRNET sample ID vs. laboratory ID	Y N NA	
Inspection of Tracking_ChemData table:		
Date of sample submission	Y N NA	
Date of data package receipt	Y N NA	
Laboratory work order number	Y N NA	
Laboratory preparation and analysis method	Y N NA	
Filter fraction analyzed	Y N NA	
Precision of uncertainty measurement and MDA	Y N NA	

Verified by: ____ Date: _____________________

ATTACHMENT 3

QC EVALUATIONS PERFORMED

Type of Data	Evaluation Performed	Acceptance Criteria
All	Laboratory Control Standard (LCS) recovery check	100 ±10%
All except Alpha/Beta	Process Blank (PB)	See Control Criteria below
All	Matrix Blank (MB)	See Control Criteria below
All	Trip Blank (TB)	See Control Criteria below
Alpha, Beta, and H-3	Matrix Replicate evaluation	For analytically significant, positive results, similar to control criteria below.
Gamma	Matrix Replicate evaluation	Qualitative agreement (within a factor of 5) for analytically insignificant results (i.e. less-than values).
H-3	Matrix Spike	100 ±10% of added spike
All	MDA achieved	All samples below SOW specification
All	Missing Field or Analytical data	No missing data for actual field samples
Tritium	Collection efficiency	Between 50 and 130 % of theoretical
Gamma	"Naturals"	All should have positive results
Gamma	"Artificials"	Compare calculated dose to 0.5 mrem target
Each bi-weekly period, reported with alpha/beta	Sampling Station Run Time completeness	95% up-time for FFCA and Consent Decree stations, 90% up-time for all others
All	Analytical Completeness	80% successful analysis of valid samples
Alpha/beta, H-3, alpha isotopics	Action Level Comparison	< 100% of target value

General Control criteria:
“Under control” is within <= 2s of annual mean for that QC type
“Warning” is between 2s and 3s of annual mean for that QC type
“Out of control” is >= 3s of annual mean for that QC type

DATA PARAMETERS

This table lists important equations used to calculate critical AIRNET data parameters. These equations are implemented in queries in the AIRNET MS Access database. The complete data evaluation process is described in the AIRNET Sampling and Analysis plan (MAQ-AIRNET), this procedure, and procedure MAQ-208.

Parameter	Description	Equation
Alpha and beta air concentration	Average concentration of alpha and beta in the air for the actual sampling period.	C (fCi/m^3) = A (pCi) *10^3 / V (m^3) where A is the sample activity reported by the analytical laboratory.
Am, Pu, and U air concentration	Average concentration of Am, Pu, and U in the air for the actual sampling period.	C (aCi/m^3) = A (pCi) *10^6 / [V (m^3)*(filter fraction)]
Tritium air concentration	Average concentration of tritium in the air for the actual sampling period.	C (pCi/m^3) = A (pCi/ml) * AH (ml/m^3)
Absolute humidity[1]	Average of weekly absolute humidity (gm/m^3) measured by MAQ's The Weather Machine during each week of sampling period.	AH_1 , AH_2 = average humidity for 1st and 2nd weeks of period AH = (AH_1 + AH_2) / 2 (for 3-week sample periods, average 3 weekly AH_n values)
Possible run hours	Total hours within current sample year between start and stop of sample collection.	$T_{f,p}$, $T_{t,p}$ = [(stop date of current sampling period in CY) - (start date of initial sampling period in CY)] * 24 (Normally the same for both filter and tritium samples.)
Actual run hours	Actual hrs the samplers collected particles or tritium during current sample year.	$T_{f,a}$, $T_{t,a}$ = Sum of $T_{f,a}$, $T_{t,a}$ over all sampling periods to date within current CY (Normally the same for both filter and tritium samples.)
Runtime percentage	The percent of total possible runtime that the sampler actually collected sample; for both the filter and tritium.	RT_t = ($T_{t,a}$ / $T_{t,p}$) * 100 RT_f = ($T_{f,a}$ / $T_{f,p}$) * 100 (Normally the same for both filter and tritium samples.)
Actual filter air volume	Volume, in m^3, of air sampled by the station.	V_f = $T_{f,a}$ * [(start filter flow + end filter flow) / 2] x 0.02832 (m^3/ft^3) x 60 (min/hr)
Actual tritium air volume	Volume, in m^3, of air sampled by the station.	V_t = $T_{f,a}$ * [(start gel flow + end gel flow) / 2] x 1e-6 (m^3/cc)
Sample completeness	The percent of total possible samples taken that were analyzed successfully.	C% = Sum of (number of sample data by analysis reported from lab) / (number of sampling periods in current sampling year)
Mean Process Blank (PB)	Mean of all individual process blanks reported by the analytical laboratory for each analysis	PB (mean) = Mean of PB ± StDev of PB
Mean Trip Blank (TB)	Mean of all individual trip blanks reported by the analytical laboratory for each analysis and not rejected by professional judgment	TB (mean) = Mean of TB ± StDev of TB

Parameter	Description	Equation
Mean Matrix Blank (MB)	Mean of all individual matrix blanks sent with sample batch from MAQ, reported by the analytical laboratory for each analysis and not rejected by professional judgment	MB (mean) = Mean of MB ± StDev of MB
Mean Laboratory Matrix Blank (LMB)	Mean of all individual laboratory matrix blanks (filter material sent from MAQ in bulk and kept at analytical laboratory), reported by the analytical laboratory for each analysis and not rejected by professional judgment	LMB (mean) = Mean of LMB ± StDev of LMB
Combined Matrix Blank (CMB)	Mean of individual TB, MB and LMB that have not been rejected by professional judgment.	CMB (mean) = Mean of (LMB, MB and TB) ± StDev of (LMB, MB and TB)
Gel Water Content (WC)	Mass (in g) of water bound in silica gel.	WC = final silica gel weight – initial silica gel weight
Net Air Concentration	Air concentration calculated from blank corrected results for filter samples.	NAC_f = (A (pCi) – CMB)/([filter air volume]*[filter fraction])
Net Air Concentration (tritium only)	Air concentration calculated from blank corrected results for tritium samples.	NAC_t = (A (pCi/ml) - CMB)*AH
Net Air Concentration Uncertainty	Propagated uncertainty calculated from uncertainty of result and uncertainty of CMB used to blank correct result for filter samples.	$NACU_f$ = Square root (squared sample result uncertainty + squared [2*StDev of CMB])/([filter air volume] *[filter fraction])
Net Air Concentration Uncertainty (trit)	Propagated uncertainty calculated from uncertainty of result and uncertainty of CMB used to blank correct result for tritium samples.	$NACU_t$ = Square root (squared sample result uncertainty + squared [2*StDev of CMB])*AH
RevisedH3Net Air Concentration	Bound-water corrected Net Air concentration [2]	$RevNAC_t$ = NAC_t*1.03*((WC + [bound water in silica gel (g)])/WC)
RevisedH3Net Air ConcentrationUncertainty	Bound-water corrected Net Air concentration uncertainty (NO propagation of additional uncertainty from bound water measurement) [2]	$RevNACUnc_t$ = $NACUnc_t$*1.03*((WC + [bound water in silica gel (g)])/WC)

Equation subscripts: f = filter; t = tritium; a = actual; p = possible

[1] AH calculations are documented in memo ESH-17:99-104.

[2] Constants are defined and bound water determination method is described in memo ESH-17:02-296.

Air Quality Group

PROCEDURE TRAVELER

This form is from ESH-17-022

Part 1 (completed by any group employee)

Procedure number: ESH-17-033 Revision: 2→3

Procedure title: Analytical Chemistry Data Management and Review for AIRNET

Action Requested: ☐ New procedure ☒ Major revision of existing procedure ☐ Deletion of existing procedure

Description of and reason for action: ☐ Quick-change revision of existing procedure (parts 3 and 5 N/A)

Add formula for calculating the uncertainty for the CMB and net air conc.

Terry Morgan — Signature | Terry Morgan — Name (print) | 12/3/01 — Date

Part 2 (completed by appropriate manager)

I agree with the action requested: ☐ Yes ☐ No If No, enter reasons below

If Yes, assigned preparer: ~~Ernie Gladney~~ Karen Schultz Paige . Affected teams, programs, groups, or individuals required to review this procedure and others who should review it (see procedure page 5):

Required reviewers: ~~A. Luedeker~~ K. Greene D. Young Optional reviewers: ~~J. Lochamy~~

[signature] 10/20/04

Craig F. Eberhart — Signature | Craig F. Eberhart — Name (print) | 12/03/2001 — Date

Part 3 (completed by preparer or other qualified safety reviewer)

I have evaluated, according to ESH-17-035 and LIR300-00-01.0, the risks inherent in performing this procedure and have documented them on the Hazard Control Plan form, or referred to a plan that covers this type of work.

[signature] — Preparer | Karen Schultz Paige — Name (print) | 11/16/04 — Date

Draft prepared and sent for formal review on: 10/26/04. Comments resolved on: 4/12/06. After comments have been resolved with each reviewer, obtain signatures of the reviewers in part 5.

Part 4 (signed by safety officer or group leader)

I agree that the appropriate safety-related activities and appropriate risk level were identified during the hazard evaluation:

[signature] — Safety officer or group leader | ~~Jean Dewart~~ Dianne Wilburn — Name (print) | 4/13/06 — Date

Part 5 (signed by required reviewers: NA for quick-change revisions)

I attest that all my comments and concerns have been satisfactorily discussed, resolved, and/or incorporated into the final version of the procedure.

Signature	Name (print)	Date
Daniel Young	Daniel Young	11/16/04
Keith Greene	[signature]	11/17/04

Preparer: After all reviewers have signed above section, submit this form with copy of draft and final procedure to records coordinator.