United States Environmental Protection Agency

Office of Research and Development

National Human Exposure Assessment Survey (NHEXAS)

Region 5 Study

Quality Systems and Implementation Plan for Human Exposure Assessment

Research Triangle Institute
Research Triangle Park, NC 27079

Cooperative Agreement CR 821902

Field Operations Protocol **RTI/ACS-AP-209-090**

Title: Handling Quality Control Samples in the Field

Source: Research Triangle Institute

U.S. Environmental Protection Agency
Office of Research and Development
Human Exposure & Atmospheric Sciences Division
Human Exposure Research Branch

TITLE: HANDLING QUALITY CONTROL SAMPLES IN THE FIELD

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STATUS:		
	IN PROGRESS:	☐
	DRAFT:	☐
	FINAL VERSION:	☒

REVISIONS:

No.	Date	No.	Date
0	4/23/96	6	
1	‡	7	
2		8	
3		9	
4		10	
5		11	

‡ Effective date of this version is the date of the last approval signature; revision 0 is the original version.

HANDLING QUALITY CONTROL SAMPLES IN THE FIELD

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1.0 SCOPE AND APPLICATION

Quality control samples will be used to assess sample collection and analysis precision, the potential for sample contamination, and recovery of target analytes from some sample media. This protocol describes how each type of quality control sample should be handled in the field during the NHEXAS Pilot Study.

2.0 SUMMARY AND DEFINITION OF QC SAMPLE TYPES

2.1 Duplicate Samples

Duplicate (or collocated) samples will be collected for most sample media to assess sample collection and analysis precision. Duplicate samples are collected by collection of a second sample along with or next to the collection of the original sample. Duplicate samples will be collected for a small percentage of the total number of samples. In some cases (i.e. dust samples) there will also be a sample homogeneity component in the precision measurement. Some samples are not amenable to duplicate sample collection and will not be scheduled in this study.

2.2 Field Blanks

Field blanks are used to assess the potential for sample contamination during collection, storage, shipment, processing, and analysis. Blank materials are prepared in the lab and shipped to the field site. They are then returned along with the samples. Field blanks will be used for most sample media, with the blanks deployed for a small percentage of the study participants. In some cases there may not be a suitable blank sample matrix, so field blanks will not be collected.

2.3 Field Controls

Field controls are used assess recovery of target analytes from a sample media during storage, shipment, processing, and analysis. Field controls are prepared by fortifying a suitable background-free matrix identical or similar to the sample being collected. Controls are prepared in the labs and shipped to the field site. They are then returned along with the samples. Field controls will be used for some sample media, with the controls deployed for a

small percentage of the study participants. In several cases there may be not suitable media or means of fortification, so field controls will not be collected.

2.4 Container Blanks

In those cases where suitable background-free sample matrix is not available for field blanks, container blanks may be substituted. Container blanks are simply empty containers of the same type as used for sample collection or storage. These are shipped to the field site and returned with along with the samples. The container then may be extracted or digested to assess the potential for sample contamination.

2.5 Specific Quality Control Samples

Field handling procedures for specific types of quality control samples are described in Sections 3.0 through 12.0. These sections are designed as a quick reference source for the field staff.

3.0 AIR VOLATILES

3.1 Duplicate Samples

3.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

3.1.2 Deploy a second VOC charcoal badge along with and next to the originally scheduled sample.

3.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

3.2 Field Blanks

3.2.1 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

3.2.2 Take the VOC badge designated as the field blank to the participant home on the first or last visit to the scheduled home. (If necessary, the blank may be used at the last visit to the scheduled participant home.)

3.2.3 While in the home, open the badge can, label the badge, remove the diffusion screen, and cap the badge in the same manner as the samples are capped. Return the badge to the can, and put the top on the can.

3.2.4 Document the field blank use in the sample collection and custody software.

3.2.5 Store the badge in the same refrigerator or cooler that will be used for samples.

3.2.6 Transport the field blank along with the rest of the samples.

3.3 Field Controls

3.3.1 Check the QC page from the sample collection and custody software file for each participant to determine if field controls are scheduled.

3.3.2 Upon receipt at the field site, store the VOC field control badge in it's can in a refrigerator or cooler.

3.3.3 Take the field control VOC badge to the participant home during the first visit to the scheduled home. (If necessary, the control may be used at the last visit to the participant home.)

3.3.4 Do not remove the badge from its can while it is taken to the home.

3.3.5 Document the field control use in the sample collection and custody software.

3.3.6 Store the badge in the same refrigerator or cooler that will be used for samples.

3.3.7 Transport the field control along with the rest of the samples.

3.4 Container Blanks

No container blanks will collected for VOC badges.

4.0 AIR PARTICLES

4.1 Duplicate Samples

4.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

4.1.2 Collect a second aerosol sample along with and next to the originally scheduled sample. Note that duplicate personal aerosol samples will not be collected.

4.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

4.2 Field Blanks

4.2.1 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

4.2.2 Take the filter assembly designated as the field blank to the participant home on the first visit to the scheduled home. (If necessary, the blank may be taken to the home at the final visit.)

4.2.3 Document the field blank use in the sample collection and custody software.

4.2.4 Store the field blanks along with the samples.

4.3 Field Controls

No air particle field controls are scheduled.

4.4 Container Blanks

No air particle container blanks will be scheduled.

5.0 WATER SAMPLES

5.1 Duplicate Samples

5.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

5.1.2 Collect a second water sample immediately after the originally scheduled sample. Note that standing water duplicate samples will not be collected. Instead, when scheduled, the participant will be instructed to collect the second standing water sample from the hot water side of their kitchen tap.

5.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

5.2 Field Blanks

5.2.1 Upon receipt in the field, store the field blanks in a refrigerator or cooler with ice.

5.2.2 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

5.2.3 Take the container filled with clean water that has been designated as the field blank to the participant home on the second visit to the scheduled home. For

water VOC samples, take an empty sample collection vial to the home, along with clean water in second container.

5.2.4 For water VOC samples only, while at the home open the vial, add the ascorbic acid, and add clean water from the second container. Fill so that there is no headspace.

5.2.5 Document the field blank use in the sample collection and custody software.

5.2.6 Store the field blanks in the same refrigerator or cooler that will be used for samples.

5.3 Field Controls

5.3.1 Upon receipt in the field, store the field controls in a refrigerator or cooler with ice.

5.3.2 Check the QC page from the sample collection and custody software file for each participant to determine if field controls are scheduled.

5.3.3 Take the field controls to the participant home on the second visit to the scheduled home.

5.3.4 Document the field control use in the sample collection and custody software.

5.3.5 Store the field controls in the same refrigerator or cooler that will be used for samples.

5.4 Container Blanks

No water sample container blanks will be scheduled.

6.0 DUST WIPE

6.1 Duplicate Samples

6.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

6.1.2 Collect a second wipe sample along with and next to the originally scheduled sample.

6.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

6.2 Field Blanks

6.2.1 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

6.2.2 Open the blank wipes and insert in LWW samplers.

6.2.3 Take the wipes designated as the field blank to the participant home on the second visit to the scheduled home.

6.2.4 Document the field blank use in the sample collection and custody software.

6.2.5 Wet two of the wipes, then return all three to the foil packets.

6.2.6 Dry the blanks along with the samples.

6.2.7 Store the field blanks along with the samples.

6.3 Field Controls

No dust wipe field controls are scheduled.

6.4 Container Blanks

No dust wipe container blanks will be scheduled.

7.0 SETTLED DUST

7.1 Duplicate Samples

7.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

7.1.2 Deploy a second plate or carpet segment along with and next to the originally scheduled sample.

7.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

7.2 Field Blanks

7.2.1 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

7.2.2 Take the plate or carpet designated as the field blank to the participant home on the scheduled visit.

7.2.3 Document the field blank use in the sample collection and custody software.

7.2.4 Store the field blanks at the field lab or staging area until it is time to ship samples.

7.3 Field Controls

No settled dust field controls are scheduled.

7.4 Container Blanks

No settled dust container blanks will be scheduled.

8.0 SOIL

8.1 Duplicate Samples

No soil duplicate samples will be collected.

8.2* Field Blanks

8.2.1 Check the QC page from the sample collection and custody software file for each participant to determine if a field blank is scheduled.

8.2.2 Take the Zip-loc bag with the clean silica matrix to the participant home on the scheduled visit.

8.2.3 Document the field blank use in the sample collection and custody software.

8.2.4 Store, transport, and ship the blank sample along with the other soil samples.

8.3 Field Controls

No soil field controls are scheduled.

8.4* Container Blanks

No container blanks will be scheduled.

9.0 URINE

9.1 Duplicate Samples

9.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

9.1.2 Instruct the selected participants to collect two samples of urine at both collection times, according to the instructions in RTI/ACS-AP-209-087.

9.1.3 Store, transport, and document the duplicate sample in the same way as the original sample.

9.2 Field Blanks

9.2.1 Upon receipt in the field, store the urine field blanks in the freezer until use.

9.2.2 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

9.2.3 Take the urine or urine surrogate designated as the field blank in a cooler on ice to the participant home on the second visit to the scheduled home.

9.2.4 Document the field blank use in the sample collection and custody software.

9.2.5 Store the field blanks in a freezer along with the samples.

9.3 Field Controls

9.3.1 Upon receipt in the field, store the urine field controls in the freezer until use.

9.3.2 Check the QC page from the sample collection and custody software file for each participant to determine if field controls are scheduled.

9.3.3* Add the urine control material to a prelabeled sample cup, working in the staging area. Do not bring this material to a participant home.

9.3.4 Document the field control use in the sample collection and custody software.

9.3.5 Store the field controls in a freezer along with the samples.

9.4 Container Blanks

No urine container blanks are scheduled.

10.0 BLOOD

10.1 Duplicate Samples

10.1.1 Check the QC page from the sample collection and custody software file for each participant to determine if duplicate samples are scheduled.

10.1.2 Collect a second blood sample along with the originally scheduled sample. There will only be one type of blood duplicate collected for each participant to minimize the total number of tubes that will be used.

10.1.3 Collect, store, transport, and document the duplicate sample in the same way as the original sample.

10.2 Field Blanks

10.2.1 Upon receipt in the field, store the blood field blanks in a refrigerator or cooler until use.

10.2.2 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

10.2.3* Follow the CDC procedures in Appendix A for preparing blood VOC and blood metal field blanks.

10.2.4 Document the field blank use in the sample collection and custody software.

10.2.5 Store the field blanks in a refrigerator or cooler along with the samples.

10.3 Field Controls

10.3.1 Upon receipt in the field, store the blood field controls in a refrigerator or cooler until use.

10.3.2 Check the QC page from the sample collection and custody software file for each participant to determine if field controls are scheduled.

10.3.3* Follow the CDC procedures in Appendix A for preparing blood metal field controls. Blood field controls are not to be taken to participant homes.

10.3.4 Document the field control use in the sample collection and custody software.

10.3.5 Store the field controls in a refrigerator or cooler along with the samples.

10.4* Container Blanks

Container blanks are scheduled only for blood archival samples.

11.0 HAIR

11.1 Duplicate Samples

No duplicate samples are scheduled.

11.2 Field Blanks

No hair field blanks will be scheduled.

11.3 Field Controls

No hair field controls will be scheduled.

11.4 Container Blanks

11.4.1 Check the QC page from the sample collection and custody software file for each participant to determine if container blanks are scheduled.

11.4.2 Take the empty container to the participant home on the third visit to the scheduled home.

11.4.3 Document the container blank use in the sample collection and custody software.

11.4.4 Store and transport the container blanks along with the hair samples.

12.0 DIETARY

12.1 Duplicate Samples

No duplicate dietary samples will be collected.

12.2 Field Blanks

12.2.1 Upon receipt in the field, store the dietary field blanks in a freezer, refrigerator or cooler until use.

12.2.2 Check the QC page from the sample collection and custody software file for each participant to determine if field blanks are scheduled.

12.2.3 Document the field blank use in the sample collection and custody software.

12.2.4 Store the field blanks in a freezer, refrigerator or cooler along with the samples.

12.3 Field Controls

No dietary field controls will be scheduled.

APPENDIX A

PREPARATION OF QC MATERIAL FOR NHEXAS
RESEARCH TRIANGLE INSTITUTE CONSORTIUM

Quality control material with known concentrations for each analyte being collected in the study as well as blank material (milli-Q water) should be prepared and shipped according to the schedule determined by each consortium. The analytes are as follows with a suggested method for preparing the specimen:

1. Blood VOC's
   - a. Blanks: Purified water contained in sealed ampules which was previously provided for preparing blanks for VOC. See separate instructions for procedure using the provided syringe.
   - b. Fortified: None available.

2. Blood Metals
   - a. Blanks: Purified water contained in 3 mL purple top tubes should be transferred to another 3 mL purple top tube by taking one of the collection needles and attaching to a needle holder. Insert the needle into the tube containing the water. Place an empty 3 mL purple top tube into the needle holder over where the needle enters the collection tube (the same setup as if collecting blood from a participant's arm). Push the new tube onto the port until the vacuum is broken and the purified water fills the second tube (at least 1 mL). Label, store and ship the same as if it were a blood specimen.
   - b. Fortified: Known concentration of blood contained in 3 mL purple top tubes. DO NOT OPEN THIS VIAL OR TRANSFER TO A SECOND 3 ML PURPLE TOP. This vial should be taken into the field and returned labelled with appropriate identifier in the same 3 mL tube.

Contamination with Cadmium can occur if the tube is opened and transferred the same way as the water blank. Also, if this is transferred to a second 3 mL purple top tube and since this blood is already anticoagulated, it would further dilute the concentration of the known with the liquid anticoagulant that is contained in the new tube.

3. Urine Metals:

a. Blanks: Purified water contained in large bottle. Pour 10-15 mLs of water into an empty urine collection cup and process the same as if it were a urine specimen. Label, freeze and store.

b. Fortified: Urine with known concentrations contained in 15 mL plastic conical tubes with blue caps. Thaw and transfer to a urine collection cap. Label, freeze and store.

Date - 11/01/95

STANDARD OPERATING PROCEDURE

Volatile Organic Compounds in Blood

Field Blank QCs

Materials

Hamilton Model 81620 airtight syringe

10 mL ampule of VOC blank water

18 gauge luerlock needle

Gray-top VOC vacutainer

Sharps container

Broken glass disposal container

Procedure

1. Assemble syringe by pushing plunger into barrel.

   Note: When the syringe is new, this requires significant effort. This can be eased by opening an ampule of VOC blank water and allowing a small amount of the water to coat the inside of the barrel. Then the plunger can be inserted more easily. Do not use non-blank water for this purpose since it will contaminate the syringe.

2. Attach the luerlock needle to the syringe.

3. Open a fresh ampule of VOC blank water and insert the syringe into the water in the ampule.

4. Pull approximately 1 mL into the ampule and remove the needle from the water.

5. Holding the needle up and the plunger down, pull the plunger to at least the 10 mL mark so that blank water washes the inside of the syringe barrel.

6. Eject this water from the syringe.

7. Pull approximately 10 mL of blank VOC water into the syringe.

8. Carefully, plunge the needle into the gray-top vacutainer.

9. If the vacuum does not pull the water into the vacutainer, place pressure on the plunger until the syringe is empty.

10. Remove the syringe from the vacutainer and discard the needle in an appropriate sharps container.

11. Place the syringe back into its storage box.

12. Discard the ampule into a broken glass disposal container.

13. Store this sample at refrigerator temperatures or on ice along with blood samples collected at the same time.

14. Ship the sample along with other blood samples to:

Dr. David L. Ashley
Centers for Disease Control and Prevention
Bldg 17 Loading Dock
4770 Buford Highway, NE
Atlanta, GA 30341-3724

EXPLANATION OF REVISIONS

Revisions Made 4/96; Denoted by *

Sections 8.2 and 8.4

EOHSI located a clean silica material suitable for use as a soil field blank matrix. Therefore, field blanks will be used and container blanks will not be used.

Section 9.3.3

CDC provides the urine control material in a 15 mL tube. The contents of the tube are to be thawed and added to a urine sample container in the field. The transfer will be performed in the staging area, not in a participant home.

Sections 10.2.3 and 10.3.3

CDC has provided procedures for VOC and metals blood field blanks, and for metals blood field controls.

Section 10.4

Container blanks will be used for archival blood samples since the analysis is unknown and a suitable blank matrix cannot be selected for a field blank.