

National Human Exposure Assessment Survey (NHEXAS)

Arizona Study

Quality Systems and Implementation Plan for Human Exposure Assessment

The University of Arizona
Tucson, Arizona 85721

Cooperative Agreement CR 821560

Standard Operating Procedure

SOP-UA-F-28.0

Title: Collection of Fixed Site Indoor and Outdoor Air Samples for
Analysis of Pesticides and PAHs

Source: The University of Arizona

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

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Collection of Fixed Site Indoor and Outdoor Air Samples for Analysis of Pesticides and PAHs

1.0 Purpose and Applicability

This standard operating procedure (SOP) describes the procedures for collecting fixed site indoor and outdoor air samples for the NHEXAS AZ project, the AZ Border Project (BORDER AZ) and other Health and Environment projects. The SOP details sampler set-up, calibration and initial checks of the system, termination of sampling, and sample shipment

2.0 Definitions

- 2.1 AZ Border = The US border region is defined as 100 km north of the border. In this study, we define the border as 40 km north of the border. The Arizona Border Study or "Border AZ" is an alias for "Total Human Exposure in Arizona: A Comparison of the Border Communities and the State" conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.
- 2.2 BUCKET = A plastic container with a buckle top or tight-fitting lid. One bucket is assigned to each household to be sampled. Household identification and stage numbers are listed on the outside of the container. The bucket contains all paperwork and questionnaires to be completed by field staff or household respondents. It serves as the primary vehicle for securing and transporting forms, data and samples to and from the field through the course of the study.
- 2.3 CHAIN OF CUSTODY RECORD (Fig.1) = A vital data tracking and quality assurance document which accompanies every sample and documents custody, receipt and transfer. The record documents a unique sample identification number assigned to the samples by the Materials Technician through entry of the filter into the Tracking System.
- 2.4 DATA COORDINATOR = The employee of the research project who supervises data batching, entry and verification.
- 2.5 FIELD COORDINATOR = The employee of the research project who supervises field data collection and operations. The Field Coordinator collates individual data into HH packets, and upon completion of all visits, sampling and QA checks, forwards the packet to the Data Coordinator.
- 2.6 FIELD KIT = A sampling tool-box containing appropriate collection and storage utensils. For active airborne Pesticide/PAH it contains adapters for non-grounded outlets, electrical

ground-check units, a heavy duty electrical extension cord, an electrical 3 way split device, extra PM Sampling Data Forms (Fig. 2), a calibrated electronic mass flow meter, power surge protector, measuring tape, thermometer / psychrometer / hygrometer, and aluminum foil wrap.

- 2.7 FIELD STAFF = The Field Coordinator, the Team Leader and the Team Members.
- 2.8 HRP OFFICE = The Health Related Professions building, currently located at 1435 North Fremont Avenue, Tucson, AZ 85719. This is an annex of the Arizona Prevention Center and the primary headquarters for operations in support of NHEXAS Arizona, BORDER AZ, and other Health and Environment projects.
- 2.9 HOUSEHOLD (HH) = The residence occupied by study respondent(s).
- 2.10 HOUSEHOLD IDENTIFICATION NUMBER (HHID) = A unique number and character combination which is assigned to each household for identification purposes. This number must be recorded on all data (forms, samples, questionnaires and correspondence) collected from the household.
- 2.11 LAB SUPERVISOR = The employee of the research project who supervises laboratory analyses.
- 2.12 MATERIALS TECHNICIAN (Materials Tech) = The employee of the research project who is responsible for assembling and assigning field forms, questionnaires and equipment for field use. The Materials Technician also assigns unique sample identification numbers to all samples upon receipt from the manufacturer (UA-G-5.X).
- 2.13 N/A = Not Applicable.
- 2.14 NHEXAS Arizona = Acronym for National Exposure Assessment Survey, a research project conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.
- 2.15 PACKET = A sturdy, envelope-like container that can be fully closed and is large enough to hold the physical data forms generated from sampling and surveying a study household.
- 2.16 QUALITY ASSURANCE (QA) = All those planned and systematic actions necessary for ensuring the accuracy, validity, integrity, preservation and utility of collected data.
- 2.17 QUALITY CONTROL (QC) = Those quality assurance actions providing a means to control and measure the characteristics of a datum, process or the adherence to established parameters.

- 2.18 RESPONDENT = A person in the study population of NHEXAS Arizona, BORDER AZ and other Health and Environment projects. Each household is assigned an HHID. All the family respondents are assigned an Individual Respondent Number (IRN). Each respondent can be uniquely identified by a combined HHID and IRN designator.
- 2.19 SAMPLE = The dust and chemical deposit left on the filter (or XAD-2 Cartridge) after sampling is complete. Sample may also refer to the filter (or XAD-2 Cartridge) before it is exposed, while sampler refers to the pumping unit (SKC Pump) and / or impactors.
- 2.20 SAMPLE IDENTIFICATION NUMBER = A numeric code that uniquely identifies every sample. It is generated by the NHEXAS tracking system by the Materials Technician and assigned to each filter by the Materials Technician or the Lab Supervisor.
- 2.21 SKC PUMP (figure 3) = The pumping and control unit used to collect PM Pesticide and PAH samples. This unit is manufactured by SKC Inc. The pump is programmable and a needle valve regulates the flow in liters per minute (LPM).
- 2.22 TEAM LEADER = The member of the field team who is primarily responsible for respondent contact, data collection, field form and questionnaire completion, and site QC checks of all data.
- 2.23 TEAM MEMBER = Member of a field team responsible for assisting the Team Leader in the collection of data and quality control checks in the field.
- 2.24 TRACKING SYSTEM = A database system containing information about the custody, transfer and storage of hard copy data, electronic data, field samples, and field sample aliquot.
- 2.25 URG-2000 SAMPLER (figure 4) = The sampler that is used for collection of the Pesticide/PAH sample. The sampler consists of a Delrin cap with inlet hole and 10 μ m cut-point impactor plate, Teflon O-ring, stainless steel filter holder screen, Delrin sleeve/ filter holder, and glass sorbent tube with 1/4" exit tube.
- 2.26 VISIT = A scheduled appointment with participating respondents at their place of residence (HH) for the collection of samples, questionnaires and other data.

3.0 References

- 3.1 Lebowitz, M.D. 1993. Study Design (Revision of 31 Dec. 1993). EPA NHEXAS Cooperative Agreement.
- 3.2 SKC, Operating instructions, Universal Flow Sample Pump, Catalog number 224-PCXR8

- 3.3 R.W. Whitmore, F.W. Immerman, D.E. Camann, A.E. Bond, R.G. Lewis, and J.L. Schaum, "Non-Occupational Exposures to Pesticides for Residents of Two U.S. Cities," Arch. Environ. Contam. Toxicol. **26**, 47-59 (1994).

4.0 Discussion

- 4.1 This procedure describes the collection of airborne pesticides and PAHs using a single impactor (URG-2000). There is much similarity between the procedures described in this SOP and those of UA-F-3.X (Collection of Airborne Particulate Samples for Metals and Pesticides Analysis). There are two main components to the sampler - the pumping and control unit (i.e. the SKC pump), and the pesticide and PAH impactor.
- 4.2 The pumping unit (SKC Pump) is adjusted to pull in a sample of air at a constant flow rate (4 SLPM, Standard Liters Per Minute of volumetric flow) during pre-set time periods. The SKC pump is a single sample line sampler that does not have a built in mass flow sensor to adjust the speed or cycles of the pump as temperature or pressure vary. Flow rates are established using a calibrated electronic mass flow meter
- 4.3 Samples for pesticide and PAH analysis are collected using an URG-2000 impactor with PM₁₀ cut point and a 25 mm Teflon coated glass fiber filter and XAD-2 Cartridge (see Figure 4). The flow rate will be set at 4 LPM over a sampling duration of 3 days. For non-smokers' homes, the sampler is programmed to sample air for 2 min. out of every 3 min., to give an integrated 48 h sample for 72 hours of operation. For smokers' homes, the sampler is programmed to sample air for 2 min. out of every 4 min., to give an integrated 36 hour sample for 72 hours of operation.

5.0 Responsibilities

- 5.1 The Project Field Coordinator (or delegate) will be responsible for:
- (1) Training the Field Staff on how to properly collect and handle Pesticide/PAH samples.
 - (2) Training the Field Staff on how to properly record field observations and data on the field data sheets.
 - (3) Training the Materials Technician how to properly assign impactors and equipment for field sampling.
 - (4) Providing the Staff with the Project's SOPs pertaining to this procedure and its methods.
 - (5) Insuring SOP procedures are followed by all Field Staff.
 - (6) Communicating with the Lab Supervisor and the Materials Technician to insure that field sampling occurs smoothly.
 - (7) Performing a QA Field audit on one out of ten HH sampled to insure PM setup,

operation, tear down and sample transportation are accomplished according to protocol.

- (8) QA check of all field records upon receipt from the Team Leader

5.2 The Field Staff will be responsible for:

- (1) Knowing and following the procedures described in this SOP for collection of airborne pesticide/ PAH samples.
- (2) Insuring proper labeling techniques of equipment and impactors.
- (3) Insuring that filter ID #'s specified on the PM Sampling Data Form (Figure 2) correspond to the appropriate impactor:
- (4) Recording the sampling information as directed in this SOP including:
 - (a) Measuring and recording the set-up and take-down values as measured by the mass flow meter and other instruments;
 - (b) Recording the preset 'sample' and the 'pump' run times and verifying that the elapsed times are equal to the preset values.
- (5) Notifying the Project Field Coordinator regarding equipment failure (SOP# UA-G-2.X) and field supply needs.

5.3 The Team Leader will be responsible for:

- (1) Knowing the procedures described in this SOP and insuring that they are followed by the Team Members,
- (2) Arranging sampling dates and times with the HH,
- (3) Obtaining the impactors, and the SKC pumps from the Materials Technician,
- (4) Collaborating with the Team Member(s) to select the appropriate sampling sites at each HH,
- (5) Ensuring the integrity and custody of the sample and field forms collected,
- (6) Quality control checks in the field,
- (7) Properly transporting the impactors to and from the field on blue ice with the glass portion of the impactor covered with aluminum foil,
- (8) Forwarding individual QC checked field forms to the Field Coordinator for QA checks.

5.4 The Materials Technician will be responsible for:

- (1) The proper documentation and assignment of filters and impactors to HH.
- (2) Stocking the HH Bucket with appropriate field sampling forms,
- (3) Including Field Blanks with impactor assignment as appropriate.
- (4) Maintaining the loaded impactors at -20°C before and after sampling is conducted.
- (5) Shipment of the samples to Battelle for analysis on blue-ice.

5.5 Personnel at Battelle will be responsible for:

- (1) The purchase of the filters and XAD-2 resin.
- (2) Cleaning, preparing, and loading the URG-2000 Impactors with the filters and XAD-2 resin in accordance with BCO-L-29.X
- (3) Shipping the pre-loaded (filter and XAD-2 Cartridge) impactors to the UofA.

6.0 Materials and Reagents

6.1 Materials

- (a) Pre-cleaned filter/XAD-2 cartridges in assigned URG-2000 impactors.
- (b) Two ring stands with adjustable clamp.
- (c) Teflon tape.
- (d) Small Kim-Wipes (4" x 4").
- (e) Disposable non-sterile, non-powdered latex gloves.
- (f) SKC Personal Sampler Pumps (Model 224-PCXR8).
- (g) Sierra Electronic Mass Flow Meter.
- (h) Disposable glass pipettes.
- (i) ¼" Tygon tubing in 2-ft lengths.
- (j) Bubble wrap and aluminum foil..
- (k) Dry ice.
- (l) Adapters for non-grounded outlets and Three-way splitter.
- (m) Outdoor Heavy Duty Extension cord.
- (n) PM Sampling Data Sheet (Figure 2).
- (o) Calibrated digital mass flow meter.
- (p) Power surge protector.
- (q) Measuring Tape.
- (r) Thermometer(Celsius or Centigrade), or psychrometer / hygrometer.
- (s) Outdoor PM stand set-up.
- (t) Pocket Calculator.

6.2 Reagents - N/A

7.0 Procedure

7.1 Preparation

7.1.1 Samples.

- (a) The URG-2000 impactors used for pesticide and PAH sampling are prepared by personnel at Battelle (see BCO-L-29.X).

- (b) 50% of the impactors loaded at Battelle will be prepared for combined Pesticide and PAH sampling. The remainder will be used for PAH sampling only. Personnel at Battelle will clearly identify those impactors to be used for airborne PAH collection only, and those to be used for combined Pesticide and PAH monitoring.
- (c) The impactors are shipped on blue or dry ice to the HRP facility and stored at minus 20°C before use.
- (d) Upon receipt, the Materials Technician will assign one sample-ID to those pre-loaded impactors that are designated as PAH Sampling Only.
- (e) Two sample-IDs (one for the pesticide sample, and a second for the PAH sample) will be assigned to impactors that will be used for combined pesticide and PAH monitoring.
- (f) Impactors are transported to and from the field on blue ice.
- (g) Two (1 indoors and 1 outdoors) pre-loaded URG-2000 impactors for pesticide and or PAH sampling will be assigned to each household by the Materials Technician. The XAD-2 and / or pesticide filter sample-ID numbers will be clearly visible as bar-codes affixed to the impactor.
- (h) Two SKC pumps will be assigned to each HH by the Materials Technician.
- (i) Impactors for pesticide and or PAH collection must be stored at -20°C with appropriate custody documentation until the Team Leader removes them to take them into the field.

7.1.2 Field Site Selection Criteria.

Indoor Site Selection

- (a) Sampler sites are chosen by the Team Leader. Samplers are to be located in the main room where the HH members spend the majority of their time when indoors. This is frequently the room where the television is located. Never sample in a bedroom or private area where the sampler motor may disturb respondents. The impactors must be placed between 4 and 6 feet in height ("average breathing space" of subjects).
- (b) Avoid sampler set-up under fans, air circulation ducts or next to windows or doors.
- (c) The safety of HH members and their pets must be considered when placing the sampler and attaching the sample-lines to the impactor.
- (d) Locate the equipment near an available grounded electric outlet which is not controlled by a wall switch.
- (e) Insure that the exhaust of the SKC pump is not obstructed. Any obstruction may cause a flow fault.
- (f) The impactor must be placed approximately 2 feet from any wall to avoid concerns regarding laminar or sheet flow aberrations.
- (g) Efforts should be made to avoid overhangs and 'dead-air' spaces

- (h) The sampler should be at least 10 feet from the active or passive samplers (see UA-F-3.X, UA-F-11.X X and UA-F-12.X) or obvious sources of contamination such as a fireplace or chair where a respondent habitually sits to smoke tobacco.
- (i) However, due to limited space, access to power outlets or other situational considerations, active and passive samplers may need to be located within 10 feet of each other.
- (j) Once a suitable site is chosen, confer with the HH respondents and insure that the selected location is acceptable to the participants. Explain your location decision as necessary and find a mutually agreeable site.

Outdoor Site Selection

- (k) The PM set-up should be placed outdoors on the North side of the HH, ten feet from the midpoint of the wall. Placement on the north side of the home is intended to protect the sampler from direct sunlight.
- (l) If the North side of the HH faces a street or places the sampler at risk for theft or vandalism, place the sampler in a more secure part of the HH property. Indicate the location on the Field Sheet (Fig. 2)
- (m) The SKC pump makes a noise that is slightly louder than a fish tank or aquarium pump. The pump should be kept away from sleeping quarters where possible.
- (n) The sampler requires an outside outlet for electric power which is fully grounded. Check the outlet to be used with a ground tester. If the outlet fails to be adequately grounded, try another outlet /location on the property. If a grounded outlet cannot be found, protect the sampler with a surge protector and connect to the non-grounded outlet.
- (o) Do not locate the sampler under trees, near pools of standing water, near animal cages or under tables, etc.
- (p) Do not locate the sampler near obvious sources of contamination such as roads, alleys, sand-pits, etc.
- (q) The sampler should be at least 10 feet from the active or passive samplers (see UA-F-3.X, UA-F-11.X X and UA-F-12.X) or obvious sources of contamination such as a fireplace or chair where a respondent habitually sits to smoke tobacco.
- (r) However, due to limited space, access to power outlets or other situational considerations, active and passive samplers may need to be located within 10 feet of each other.

7.1.3 Reagents - N/A

7.1.4 Standards and Blanks

- (a) One impactor from each batch of twenty received from Battelle will be randomly assigned as a field "blank".

- (b) The Field Blank will undergo the same preparation, transportation, site setup, collection and post-field storage handling as the accompanying active sampler, but the blank will not be connected to the sampler and will not be exposed.
- (c) The Field Blank will be analyzed with the exposed 'live' samples.
- (d) Personnel at Battelle will spike one out of twenty impactors they prepare and ship it to the HRP facility for use in the field. This spiked sample will be clearly identified to avoid mishandling.
- (e) The Field Spike will undergo the same preparation, transportation, site setup, collection and post-field storage handling as the accompanying active sampler, but the spiked sample will not be connected to the sampler and will not be exposed.
- (f) The Field Spike will be analyzed with the exposed 'live' samples.

7.2 Field Procedures

7.2.1 Standards and Blanks Deployed

- (a) The Field Blank for PAH and/or pesticide analysis will undergo similar preparation, transportation, site setup, collection and post-field storage conditions as the accompanying active sampler, but the blank will not be connected to the SKC pump and will not be exposed.
- (b) Field Blank impactors will otherwise be treated the same as a 'live' sample.
- (c) This blank impactor will be labeled as a 'blank' in the appropriate section of the PM Sampling Data Sheet (Fig. 2).
- (c) Duplicate sampling will be accomplished by running a duplicate set-up 'side by side' with the actual sampler.

7.2.2 Sample Set-up

A: INITIAL

- (1) Verify sample site suitability with the Team Leader and note any potential point sources. Record potential sources within 10 feet on the Field Sheet.
- (2) Open the box and feed the electrical cord and then the sampling line (Tygon tubing) through the holes in the side of the box where the pump is located.
- (3) Make sure that there is a small unobstructed piece of Tygon tubing connected to the exhaust jet of the SKC pump that runs through a hole to the outside the box.
- (4) Place the sample line where:
 - (a) There will be no obstruction to flow through the tube i.e., the tube must not be stepped on or crushed during set-up or while sampling,
 - (b) There will be no chance of anyone tripping over a tube or cord,
 - (c) Dust and dirt will not be pulled into the pump when it is not connected to an impactor (off the floor or ground).

- (5) Plug the cord from the SKC pump into an electrical outlet that is not controlled by a wall switch.
 - (a) Test to whether the electrical outlet is grounded using a 'ground tester'. If the outlet is not grounded, find another outlet to use (if possible).
 - (b) If the electrical outlet is already full, use a three-way splitter to plug in the box.
 - (c) If there is no outlet nearby the selected sampling location, use the extension cord to connect to an outlet.
- (6) Unscrew the anti-tamper cover from the front of the pump. Turn on the SKC pump from the ON/OFF switch using the screw driver tip. The pump will start running.
- (7) Press the START/HOLD button to put the pump on hold.
- (8) Don a pair of non-sterile, non-powdered disposable latex gloves. Remove an impactor from the cooler and unwrap the bubble-wrap protecting the glass components of the impactor. DO NOT remove the aluminum foil wrap. Save the bubble-wrap for use on teardown.
- (9) Verify that the impactor has the correct sample-ID label(s) affixed to the outside of the impactor, and that these sample identification numbers reflect those listed in the Chain of Custody documentation (Fig. 1).
- (10) Connect a piece of Tygon tubing (approx. 2 feet long) to the base of the impactor.
- (11) Obtain an ambient temperature and relative humidity reading for the sample site using a psychrometer or digital hygrometer.

B: FLOW RATE VERIFICATION

- (12) Connect the mass flow meter to the inlet of the impactor.
- (13) The flow meter must be attached to the inlet jet of the URG-2000 impactor with a swage-lok fitting. Do not over-tighten this fitting! Tighten the fitting to 'hand-tight' only. Over-tightening will bow URG inlet jet.
- (14) Seal the URG impactor with Teflon tape at the point where the glass housing slides into the delrin cap as necessary.
- (15) The pump is currently on hold (see SETUP step 7). Press the FLOW AND BATTERY CHECK button. The pump will start again. Wait between one to three minutes for the flow to stabilize once you have connected the flow meter.
- (16) Be sure the flow meter and the impactor are on a level surface. Verify that the inlet of the flow meter is not obstructed.
- (17) Read the flow-rate directly from the digital display on the flow meter. The flow rate has to be as close to 4 LPM as possible. A minimum flow rate of 3.8 and a maximum of 4.2 is needed.
- (18) Use the small SKC screw driver to turn the flow adjustment control screw as needed to bring the flow rate to the proper range.
- (19) Wait for one minute and repeat steps 17 and 18 as needed.

- (20) Record the flow rates in the 'start' column of the PM Sampling Data Sheet (Fig. 2) on set-up, and the 'stop' column on tear-down. Record the flow meter ID on the Field Sheet. Once the flow-rate has been recorded, press the FLOW AND BATTERY CHECK button to set the pump on hold again.
- (21) Verify that each impactor flow rate indicates a mass flow of 4 liters per minute plus or minus 5% (200 mL/min.) on set-up (3.8 to 4.2 LPM).
- (22) If an SKC pump fails to meet in field set-up specifications, indicate the failure and return it to the field area for testing.

C: TIMER SETUP

Record the times described below in the "START" column of the PM Sampling Data Sheet (Figure 2) when setting up the PM sampler, and in the "STOP" column when retrieving the samplers. There are three set-up times that may be entered in the pump. The delayed start, the sample period (time that pump is active) and the pump period (time that pump is actually sampling). To scroll through the different time options press the MODE button. To scroll through the digits on the pump's display press the DIGIT SELECT button, and to change a digit press the DIGIT SET button. **Time is measured in minutes on the SKC Pump.** Any of the times programmed may not be greater than 9999 minutes since there are only four digits on the display.

Due to concerns over filter loading and sample breakthrough in the homes of individuals who smoke, Pesticide/PAH sample collection programming varies according to the following schedule:

Table 1. Timer Settings when Using an SKC Pump for Pesticides and PAH Sampling.

Sampling Environment	Delayed Start	Sample Period	Pump Period
Smoking Household	5	4320	2160
Non-Smoking Household	5	4320	2880

To program the pump:

- (23) Press the SET-UP button.
- (24) The indication 'set up delayed start' will appear at the bottom of the pump's display and four zeros will appear. Enter the desired delayed start value in minutes using the SELECT and SET DIGIT keys (see Table 1 above). Record this value on the Field Sheet.
- (25) Press the MODE button.
- (26) The indication 'set up sample period' will appear at the bottom of the display. Enter the desired sample period value in minutes using the SELECT and SET DIGIT keys (see Table 1 above). Record this value on the Field Sheet.

- (27) Press the MODE button.
- (28) The indication 'set-up pump period' will appear at the bottom of the display. Enter the desired pump period value in minutes using the SELECT and SET DIGIT keys (see Table 1 above). Record this value on the Field Sheet.
- (29) Scroll through the different set-up values by depressing the MODE button to verify that you have entered the correct times.
- (30) Press the START/HOLD button. The pump will start after the programmed delayed start minutes have elapsed.
- (31) Screw the anti-tamper cover back on the pump.

D: SAMPLER SET-UP COMPLETION

- (32) Push any excess air tubes and electrical cords into the box, and arrange them so that the hoses are not crushed or crimped when the box is closed.
- (33) Make sure that no cords or wires are pinched when the cover of the box is closed.
- (34) Shield the box from rain using a rain-hood in outdoor set-ups.
- (35) In households where a mid-sampling-week visit is not planned (see Figure 5), the respondents are instructed to remove the impactors from the sampling train and cap both ends after the sampling period has elapsed.
- (36) The Team Leader provides the respondent with the caps and schedules a follow-up phone call with the respondent to remind them to cap the impactors and to place them carefully in the Ziploc Freezer bag (provided) and then in their refrigerator pending the return of the Field crew.

E: SAMPLE RETRIEVAL

- (37) Return to the home after the sampling period is over with an additional SKC pump and samples to be used if the original pump setup fails any quality control checks upon tear down.
- (38) In cases where a mid-week visit was not conducted, the samplers will have to be retrieved from the respondents refrigerator and reattached to the sampling train. Allow the samplers to warm to room temperature, then connect them to the sampling train. Observe and document whether the ends were capped, or the samplers were enclosed in their Ziploc bags.
- (39) Open the box.
- (40) The display of the pump should be on. Record the time (sample period) that is displayed in the 'Total box run time' section of the field form.
- (41) Press the PUMP RUN TIME button and hold it down. Record the time displayed in the 'Sample Period' portion of the field form.
- (42) Check the flow rates as described previously.
- (43) Turn the pump off.
- (44) Disconnect the impactor from the sample line. Cap both ends of the impactor.

- (45) Verify that the glass bottom of the pesticide URG impactor is still covered with aluminum foil. Wrap the impactor in bubble wrap. Place the sample in a Freezer Ziploc bag and return it to the field office on blue-ice.
- (46) Unplug the SKC Pump. If used, remove the grounded plug adapter and extension cord.
- (47) Pull the sample lines and electrical cord into the box.
- (48) Close and latch the box.
- (49) Team Members must complete the appropriate sections on the PM Sampling Data Sheet (Fig.1) and on the Chain of Custody Record (Fig.6).
- (50) Once back from the field, the Pesticide and /or PAH Sampler is stored at -20 degrees Celsius.
- (51) If the SKC Pump fails any quality control checks upon tear down repeat sampling as outlined in 7.2.2 with the extra SKC Pump and samples that have been taken into the field.

7.3 Calculations - None.

7.4 Quality Control

- (a) 10 percent of all samples will be used for QA/QC purposes.
- (b) Field teams consist of 2 - 3 Team members assigned to different tasks when in the HH. On the PM Sampling Data Sheet (Figure 2), there are double check points at many critical data entry/recording moments. These opportunities serve as an independent verification of the data and the readings recorded. The Team Member independently verifies the values recorded by their team-mate and records an "✓" in the appropriate box.
- (c) Once the Field Team Member has completed the set-up in either the indoor or outdoor environment, she or he switches with a second Field Team Member and verifies the readings recorded for the alternate location.

7.4.1 Tolerance limits

- (a) The measured flow rate through the sample line should be within 5% (0.2 LPM) of the 4.0 LPM target when the sampler is set up, and within 10% (0.4 LPM) of 4.0 LPM after sampling has occurred.
- (b) Sampler site location is flexible within the bounds of safety and security. Whenever site criteria are not met the field team must document the Field Sheet appropriately.

7.4.2 Detection Limits - N/A

7.4.3 Corrective Actions

- (a) If a mass flow meter reading is out of its specified 0.2 LPM tolerance limit (after attempted adjustment) when setting up the sampler, the SKC Pump will not be used. Label the unit and return it to the lab for testing and recalibration.
- (b) If a mass flow meter reading is out of its specified 10% (0.4 LPM) limit after sampling, the sample will be flagged as suspect. If the deviation exceeds 15% (0.6 LPM), the sample will be killed. In both cases the SKC Pump should be labeled and returned to the lab. The Field Coordinator must be notified.
- (c) Apparent mis-labeling problems detected in the field may be corrected by the Team Members when appropriate and in accordance with SOP #UA-C-2.X.

8.0 Records

8.1 Chain of Custody Record. (Figure 1)

8.1.1 This Record (Fig. 1) will serve as the primary record of sample custody. The Team Leader and the Field Team are responsible for the thorough completion of this form.

8.1.2 The completed original Chain of Custody Record will remain with the data sample except when the filters are left at a HH while sampling is taking place. The Chain of Custody Record will be stored with the appropriate field sampling sheet in the HH Bucket until the impactor is collected from the field. The custody record will then be reunited with the sample by the Team Leader.

8.2 PM Sampling Data Sheet (Fig. 2)

This sampling sheet records critical field operation and tracking information regarding the collection of airborne pesticide and PAH samples. This data sheet (Fig.2) will serve as the primary record of field sampling and activities. The Team Member operating the sampler is responsible for the thorough completion of this form.

8.3 Sample

8.3.1 The impactor will also have the Sample/Filter ID recorded on it.

8.3.2 The original Chain of Custody Record will remain with the sample (except while the sampler is left at the HH).

Figure 1. Chain of Custody Record

Chain of Custody Record NHEXAS Arizona Project (CR-821560) Respiratory Sciences 1435 N. Fremont Ave Tucson, AZ 85719 (520) 626 - 4226				
Sample Type: _____			page ____ of ____.	
Generated by: _____ / _____				
<i>print name</i>		<i>signature</i>		
Date Generated	Time	Sample ID	# of Containers	Remarks
//_/___	_:_:___			
History of Sample Handling and Custody				
Relinquished or Received	Signature	Date <small>mo / day / yr</small>	Time	Action
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	
[Rel] or [Rec]		_/_/_/___	_:_:___	

Figure 2. PM Sampling Data Sheet (page 1 of 2).

PM SAMPLING									
Form Type: <div style="border: 1px solid black; padding: 2px; display: inline-block;">102</div> FORM UA-F-3.0-1.0	Study: <input type="radio"/> 1. NHexas <input type="radio"/> 2. Border <input type="radio"/> 3. _____ <input type="radio"/> 4. _____ <input type="radio"/> 5. _____	Stage # <div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div> Collapsed? Y <input type="radio"/> N <input type="radio"/> 8 <input type="radio"/>	Team Leader: Init. _____ Tech ID <div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>	HHID <div style="border: 1px solid black; width: 60px; height: 20px; margin: 0 auto;"></div> F.S. <input type="checkbox"/> Visit <input type="checkbox"/> Sampling Date <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div> <div style="display: flex; justify-content: space-around; font-size: 8px;"> MODAYYR </div>	Set up QC: <input type="checkbox"/> Take down QC: <input type="checkbox"/>				
1. Sample Type: <input type="radio"/> Real <input type="radio"/> Replicate <input type="radio"/> N/A						Set up QC: <input type="checkbox"/> Take down QC: <input type="checkbox"/>			
2. Site Criteria Met: <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A						If no, how and why: _____			
3. Nearest Source = <div style="border: 1px solid black; width: 20px; height: 20px;"></div> ft.						Source Description: _____			
4. PM Box Location: <input type="radio"/> Indoors <input type="radio"/> Outdoors <input type="radio"/> N/A						5. PM Box #: <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> <div style="border: 1px solid black; width: 10px; height: 20px;"></div> <div style="border: 1px solid black; width: 10px; height: 20px;"></div> <div style="border: 1px solid black; width: 10px; height: 20px;"></div> </div>			
ITEM	START	STOP	Set up QC:	Take down QC:					
Date	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <small>MO DAY YR</small>	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <small>MO DAY YR</small>	<input type="checkbox"/>	<input type="checkbox"/>					
Time	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> : <div style="border: 1px solid black; width: 20px; height: 20px;"></div>	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> : <div style="border: 1px solid black; width: 20px; height: 20px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>					
Dial: Actual = Set	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	<input type="checkbox"/>	<input type="checkbox"/>					
DVM ID #	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>					
Flowmeter ID #	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>					
Flowmeter Cal. Date	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <small>MO DAY YR</small>	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <small>MO DAY YR</small>	<input type="checkbox"/>	<input type="checkbox"/>					
Flowmeter Accuracy	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> %	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> %	<input type="checkbox"/>	<input type="checkbox"/>					
PSY/HYG ID#	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>					
Temperature	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> <input type="radio"/> °C <input type="radio"/> °F	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> <input type="radio"/> °C <input type="radio"/> °F	<input type="checkbox"/>	<input type="checkbox"/>					
RH%	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> %	<div style="border: 1px solid black; width: 20px; height: 20px;"></div> %	<input type="checkbox"/>	<input type="checkbox"/>					
Comments: _____ _____ _____									
Met. Sample <input type="checkbox"/> Pest. Sample <input type="checkbox"/> Blank Sample <input type="checkbox"/>									

Data Use Only:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Figure 2. PM Sampling Data Sheet (page 2 of 2).

PAGE 2
PM Sampling

ITEM	START	STOP	Set up QC:	Take down QC:
METALS				
Impactor ID #	<div style="border: 1px solid black; padding: 2px;">3 1</div>	<div style="border: 1px solid black; padding: 2px;">3 1</div>	[]	[]
Filter ID #	<div style="border: 1px solid black; padding: 2px;">3 1</div>	<div style="border: 1px solid black; padding: 2px;">3 1</div>	[]	[]
DVM: Actual = Set	+/- 5% <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	+/- 10% <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	[]	[]
Flow	<div style="border: 1px solid black; padding: 2px;">Lpm</div>	<div style="border: 1px solid black; padding: 2px;">Lpm</div>	[]	[]
PESTICIDES				
Impactor ID #	<div style="border: 1px solid black; padding: 2px;">3 2</div>	<div style="border: 1px solid black; padding: 2px;">3 2</div>	[]	[]
Filter/PUF ID #	<div style="border: 1px solid black; padding: 2px;">3 2</div>	<div style="border: 1px solid black; padding: 2px;">3 2</div>	[]	[]
DVM: Actual = Set	+/- 5% <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	+/- 10% <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	[]	[]
Flow	<div style="border: 1px solid black; padding: 2px;">Lpm</div>	<div style="border: 1px solid black; padding: 2px;">Lpm</div>	[]	[]
T1 Timer	<div style="border: 1px solid black; padding: 2px;">. </div>	<div style="border: 1px solid black; padding: 2px;">. </div>	[]	[]
T2 Timer	<div style="border: 1px solid black; padding: 2px;">. </div>	<div style="border: 1px solid black; padding: 2px;">. </div>	[]	[]
Tech. ID	<div style="border: 1px solid black; padding: 2px;">_ _</div>	<div style="border: 1px solid black; padding: 2px;">_ _</div>		
A). T1 Stop - T1 Start =	<div style="border: 1px solid black; padding: 2px;">. </div>	= Total Box Run Time	[]	[]
B). T2 Stop - T2 Start =	<div style="border: 1px solid black; padding: 2px;">. </div>	= Pesticide Sample Time	[]	[]
C). A - B =	<div style="border: 1px solid black; padding: 2px;">. </div>	= Metals Sample Time	[]	[]
Blank or Spike Assigned:				
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A			If yes: Impactor ID # <div style="border: 1px solid black; padding: 2px;">_ _ _</div> Filter ID # <div style="border: 1px solid black; padding: 2px;">_ _ _ _ _</div> [] 25 microliter Vol. or [] N/A	[]
Office Use Only				
Form Status:	<input type="radio"/> 1. Cmp <input type="radio"/> 2. N Cmp <input type="radio"/> 3. P Cmp <input type="radio"/> 4. Re-col <input type="radio"/> 5. Ref <input type="radio"/> 7. Dest <input type="radio"/> 8. N/A <input type="radio"/> 9. Miss			
	Tech. ID MO DAY YR QC: <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> Init. <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div>			
	Tech. ID MO DAY YR DE: <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> Init. <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div> / <div style="border: 1px solid black; padding: 2px;">_ _</div>			
	DP Batch: <div style="border: 1px solid black; padding: 2px;">_ _ _</div> QXV: <div style="border: 1px solid black; padding: 2px;">F P M A 1</div>			
Chain of custody initiated _____ Consigned to packet on [] / [] / [] Box UA G4-2.0				
Data Use Only: <div style="border: 1px solid black; padding: 2px;">0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J</div>				

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Figure 3. SKC Pump Diagrams and Part Description.

Diagrams/Part Description

Figure 1 – Model 224-PCXR8

No. Part Name and Description

1. **LCD Display.** Indicators for all sampler functions.
2. **Flow and Battery Check Key.** Allows setting flow rate and testing battery condition.
3. **Start/Hold Key.** Used when ready to begin the sampling cycle, pause the sampling cycle and restart the cycle after pause.
4. **Mode Key.** During set-up allows changing between delayed start, pump run time and total elapsed time.
5. **Set-up Key.** Allows setting the delayed start, pump run time and total elapsed time desired.
6. **Digit Set/Pump Run Time Key.** Allows setting the flashing digit to the desired value or viewing the actual pump run time during the actual sampling cycle.
7. **Digit Select/Total Elapsed Time Key.** Allows selecting which time digit is being set when in set-up mode or viewing total elapsed time during the actual sampling cycle.
8. **On/Off switch.** Allows the pump to be shut down completely for long periods of storage (over 30 days).
9. **Anti-tamper cover.** Protects controls from accidental contact or tampering.
10. **Cover screw.** Fastens anti-tamper cover.
11. **Flow adjustment control.** Adjusts flow from 750–5000 ml/min.
12. **Accessory mounting screws (2).** Secure accessories such as impinger and trap holders.
13. **Filter housing (Intake).** Air intake port and trap.
14. **Filter housing screws (4).** Secure Filter housing
15. **Filter O-ring.** Leak seal for filter in housing.
16. **Filter (10 micron nylon).** Filters particulates before entering pump.
17. **Built-in flowmeter.** Monitors for flow changes.
19. **Regulator shut-off cap screw.** Accesses regulator shut-off valve screws.
20. **Discharge air cap screw.** Accesses exhaust port.
21. **Battery pack screws (2).** Secures pack to pump.
22. **Battery pack assembly.** Provides power to pump.
23. **Charging jack.** Connector for battery charger.
24. **Belt clip.** Secures pump to worker.
- A. **Compensation pot A.** Adjusts pump compensation which is factory set. Access screw guards against accidental contact or tampering.
- B. **Compensation pot B.** Adjusts pump compensation which is factory set. Access screw guards against accidental contact tampering.

Figure 1

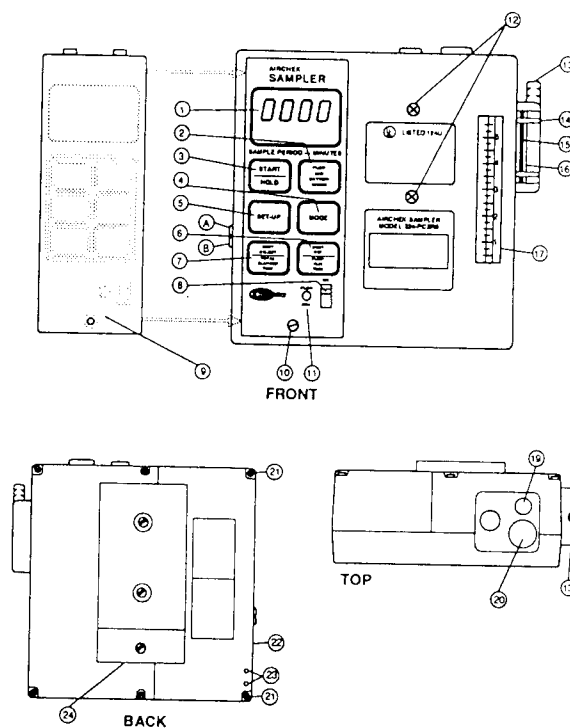


Figure 4. URG-2000 Sampler for combined Pesticide and PAH Collection

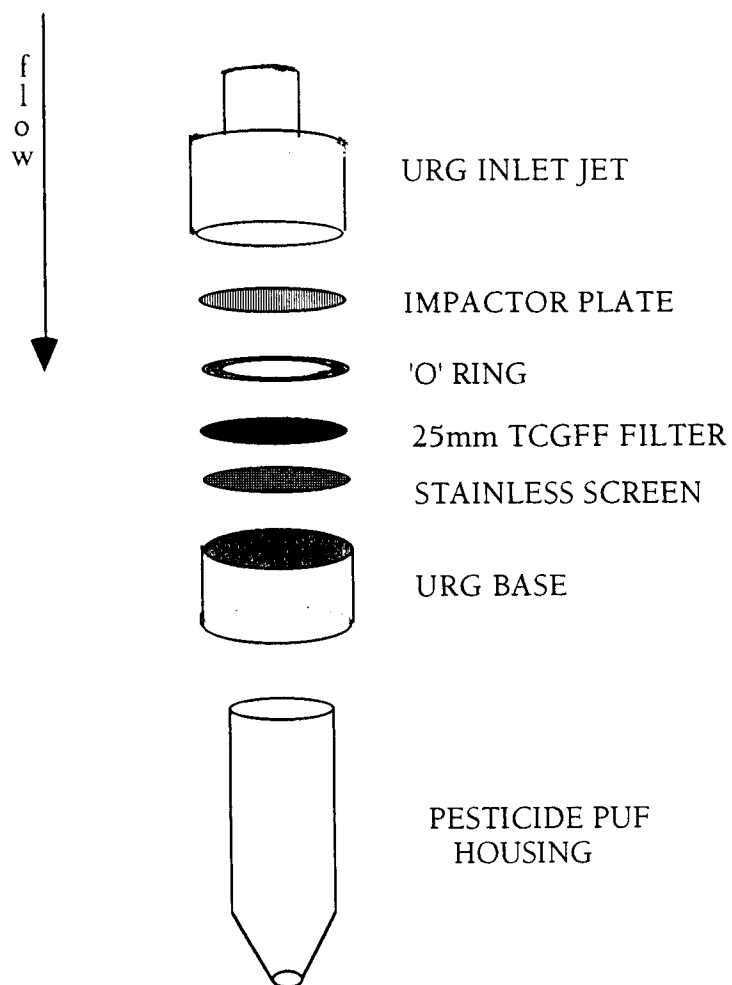


Figure 5. Relative Timing of Sample Collection (page 1 of 3).

Sample Collection: Relative Timing

Stage 1 (n=300)

Questionnaires:

Descriptive

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
-------	-------	-------	-------	-------	-------	-------

Stage 2 (n=125)

Questionnaires:

Descriptive Update
Baseline
Diet Diary *
Time / Activity *
Technician
Supplement

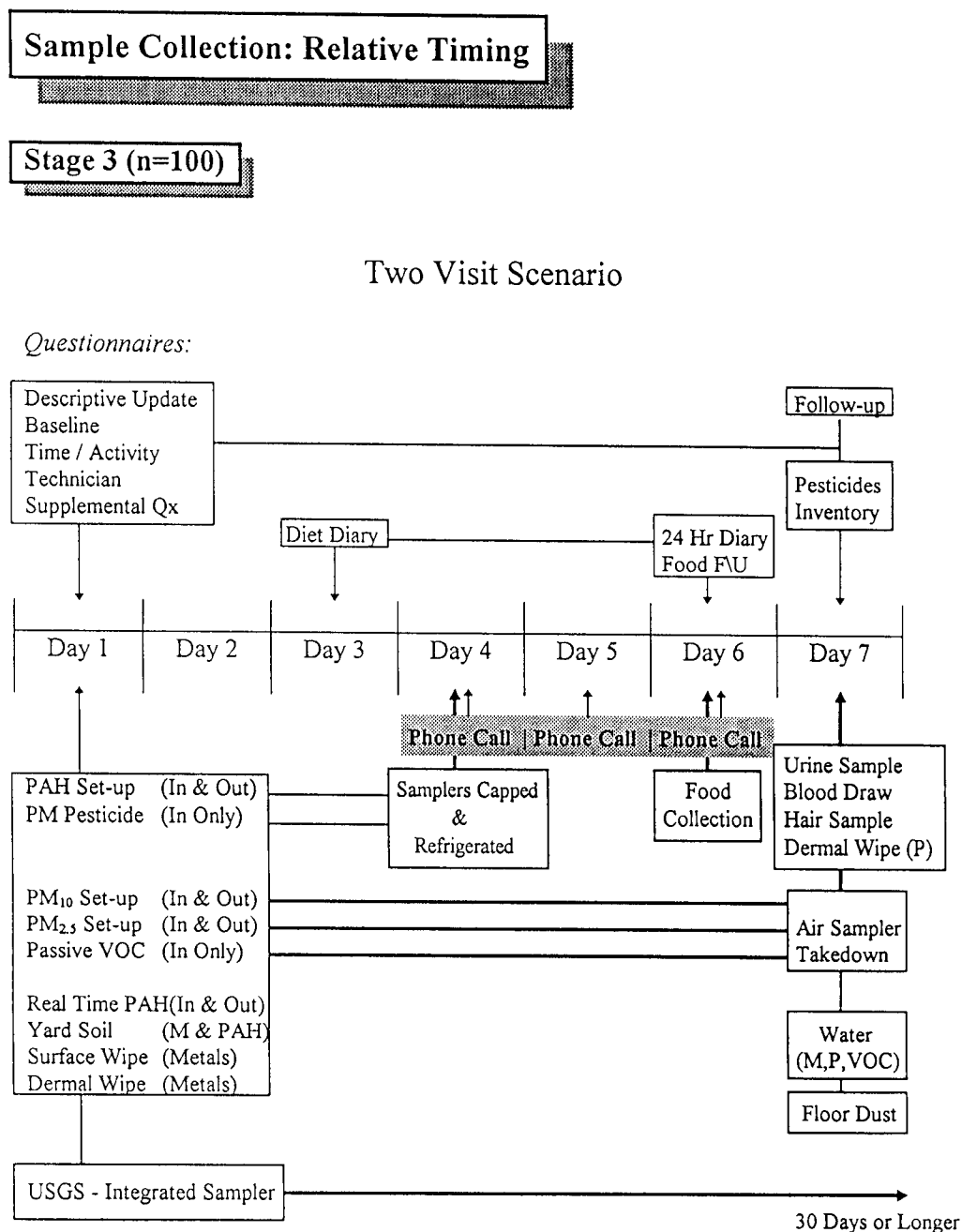
* One day recall

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
-------	-------	-------	-------	-------	-------	-------

Sample Collection:

Yard Soil
Floor Dust

Figure 5. Relative Timing of Sample Collection (page 2 of 3).



* Active VOC is collected in a subset of 25 homes only

Figure 5. Relative Timing of Sample Collection (page 3 of 3).

