

**Field Collection Standard
Operating Procedures
(SOPs) for an EPA Pilot
Study Evaluating Personal,
Housing, and Community
Factors Influencing Children's
Potential Exposures to Indoor
Contaminants at Various
Lifestages**
*(EPA Pilot Study Add-On
to the Green Housing Study)*

Field Collection Standard Operating Procedures (SOPs) for an EPA
Pilot Study Evaluating Personal, Housing, and Community Factors
Influencing Children’s Potential Exposures to Indoor Contaminants
at Various Lifestages

(EPA Pilot Study Add-On to the Green Housing Study)

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Disclaimer

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The standard operating procedures (SOPs) appended to this report are NOT official EPA methods and have not been validated. They have been reviewed and approved internally by EPA to meet data quality objectives associated with the work herein described.

The EPA add-on to the Green Housing Study was cleared by the Office of Management and Budget (OMB, control number #[0920-1107](#)) on March 18, 2016. It received institutional review board (IRB) approval from both CDC (#5587, approved 2/26/2016) and Tulane University (#14-624114MOU, approved 2/17/2016).

Abstract

This compilation of field collection standard operating procedures (SOPs) was assembled for the U.S. Environmental Protection Agency's (EPA) Pilot Study add-on to the Green Housing Study (GHS). A detailed description of this add-on study can be found in the peer reviewed research protocol entitled "An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages – Research Protocol"¹. Briefly, the Centers for Disease Control and Prevention's (CDC) Green Housing Study (GHS) follows changes in environmental measurements [pesticides, volatile organic compounds (VOCs), particulate matter (i.e., PM_{2.5} and 1.0), indoor allergens, and fungi] in both U.S. Department of Housing and Urban Development (HUD) green-renovated and comparison (no renovation) homes and relates these changes to asthma morbidity in children ages 7-12 years. Green-renovations include (but are not limited to) use of low VOC materials, use of energy efficient appliances, and integrated pest management. The EPA has leveraged this opportunity to collect additional multimedia measurements and questionnaire data from the index children actively participating in the GHS and a sibling in order to characterize personal, housing, and community factors influencing children's potential exposures to indoor contaminants at various lifestages.

The Executive Summary that follows describes the purpose of this document, background on why such a study was undertaken, the specific objectives of the study, and the information required to meet those objectives. The Executive Summary lays the foundation and gives context to the SOPs that were used in the GHS Pilot Study add-on. The general approach to collecting the samples and data is subsequently described and includes: the target agents relevant to this study, a synopsis of sample collection SOPs used in the study (reproduced in full in appendices), and the sampling timeline.

The SOPs included in the appendices contain details that the field team and caregiver/participants used to collect ten sample and information types from each home, six sample and information types from each index child (already enrolled in the main GHS), seven sample and information types from each index child's enrolled sibling, and six additional sample types for a nested sub-study for enrolled younger siblings. A detailed list of the sample types/information collected is shown in Figure 1. The SOPs described here use a combination of well documented and tested methods, and new methods for comparison to traditional methods.

¹ U.S. EPA, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages – Research Protocol*, October 5, 2015; Appendix C at https://www.reginfo.gov/public/do/PRAViewDocument?ref_nbr=201508-0920-005.

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Acronyms and Abbreviations

2,4-DCP	2,4-Dichlorophenol
3-PBA	3-Phenoxybenzoic Acid
CDC	Centers for Disease Control and Prevention
DEP	Diethyl Phthalate
DETP	Diethyl Thiophosphate
DNA	Deoxyribonucleic Acid
ECAB	Environmental Characterization and Apportionment Branch
EDC	Electrostatic Dust Collection
EPA	Environmental Protection Agency
FTP	File Transfer Protocol
GHS	Green Housing Study
GPS	Global Positioning System
HUD	Department of Housing and Urban Development
IA	Interagency Agreement
IRB	Institutional Review Board
OMB	Office of Management and Budget
ORD	Office of Research and Development
PBO	Piperonyl Butoxide
PII	Personally Identifiable Information
PIRB	Participant Instruction and Record Book
PM	Particulate Matter
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure
TCPy	3,5,6-Trichloropyridinol
U.S.	United States
VOC	Volatile Organic Compound

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The main Green Housing Study is a collaboration between the CDC and the United States (U.S.) Department of Housing and Urban Development (HUD). The field collection portion of the study was completed via a grant between CDC and Tulane University. The EPA Pilot Study add-on to the Green Housing Study was conducted by the U.S. Environmental Protection Agency's Office of Research and Development (ORD). The research team acknowledges EPA employees, grantees, and contractors for SOP testing, review and scientific support, including but not limited to: Lillian Alston, Michael Breen, Maribel Colón, Tamira Cousett, Marc Duchatelier, Kim Gaetz, Jennifer Griggs, Stacy Henkle, Herb Jacumin, Ali Kamal, Kim Lichveld, Jia Liu, Larry McMillan, Myriam Medina-Vera, Jeffrey Morgan, John Misenheimer, Mark Modrak, Monica Nees, Clay Nelson, Seth Newton, Karen Oliver, Kim Rogers, Sania Tong-Argao, Richard Walker, Paul Wargo, and Ron Williams. The team also acknowledges the contributions of our collaborators from CDC and Tulane University: Mary Jean Brown, Kathleen Caldwell, Ginger Chew, Alonsina De León Navarro, Robert Jones, Felica Rabito, Cynthia Weekfall, Nikikita Wells, Derek Werthmann, and Nikia White-Spots. EPA also acknowledges William Foreman from United States Geological Survey (USGS) for review comments. These SOPs would not have been compiled and executed without the support from everyone involved.

Executive Summary

Purpose

The purpose of this document is to publish the methodology EPA used for a specific study for reference and use by other scientists both within the Agency and externally. While the SOPs detailed here are specific to the EPA Pilot Study add-on to the Green Housing Study and have not been validated, they can easily be modified for other studies collecting similar samples and information.

Background

The CDC Green Housing Study follows changes in environmental measurements [pesticides, VOCs, particulate matter (i.e., PM_{2.5} and 1.0), indoor allergens, and fungi] in both HUD green-renovated and comparison (no renovation) homes and relates these changes to asthma morbidity in children ages 7-12 years. The EPA has leveraged this opportunity to collect additional multimedia measurements and questionnaire data in order to characterize personal, housing, and community factors influencing children's potential exposures to indoor contaminants at various lifestages.

Children's physiological characteristics may influence their exposures to chemical and biological agents found in their everyday environment either by affecting their rate of contact with various media or altering the exposure-uptake relationship. Children's behaviors and interactions with their environment may also influence their exposures to chemical and biological agents in their environment. Developmental stage, physical activity, diet and eating habits, sex, socioeconomic status, and race/ethnicity are factors that have been identified as potentially impacting a child's exposure. Understanding exposure factors is essential in evaluating a child's aggregate and cumulative exposure to environmental chemicals and biological agents and identifying those factors that most influence a child's potential exposure.

In addition to a child's physiological and behavioral characteristics, the physico-chemical characteristics of a chemical, activities in the household, and housing factors may also influence a child's potential exposure to various chemicals. There is growing recognition that the most important pathways of exposure involve direct interaction with chemicals originating from consumer products². Direct exposure among users may be accompanied by indirect exposure among non-users, including children³. Consumer products, household furnishings and appliances, and building materials can contribute to chemical exposures in residential environments. Given the large number of products and their chemical constituents, relatively

² Jayjock MA, Chaisson CF, Franklin CA, Arnold S, Price PS. 2009. Using publicly available information to create exposure and risk-based ranking of chemicals used in the workplace and consumer products. *Journal of Exposure Analysis and Environmental Epidemiology* 19(5):515-524.

³ Rudel RA, Perovich LJ. 2009. Endocrine disrupting chemicals in indoor and outdoor air. *Atmospheric Environment* 43(1):170-181.

little information is available about exposures correlated with the presence or use of these products in the home.

Community exposure factors are defined as characteristics and components of the community's natural and built environments (including non-chemical stressors) that influence children's health and well-being (e.g., proximity to school/day care and pollution sources; availability of nutritious food choices and health care; rural, urban, or suburban environments). The natural environment encompasses climate, weather, and natural resources that affect human survival and economic activity and includes all living and non-living things occurring naturally on Earth. The built environment refers to the man-made surroundings that provide the setting for human activity, including but not limited to, buildings and infrastructure, land use, transportation, waste and materials management, water supply, energy needs, healthy food access, community gardens, walkability, and bikability. The natural and built environments affect health and well-being through the interactions that people have with their environment, including exposure to chemicals, activity patterns and active lifestyles, access to ecosystem goods and services (e.g., walking trails, parks, mountains, clean air and water), and access to other services perceived as important for a high quality of life.

This report compiles the field collection SOPs used specifically for the EPA Pilot Study add-on to the Green Housing Study. Samples collected from the home included dust (electrostatic, Swiffer, participant- and technician-collected), air (active, passive tube, and passive silicone band), surface wipes (kitchen and bathroom, floor and elevated hard surfaces), and soil. Information collected at each home included housing and community information, a consumer product inventory, and questionnaire data. Samples collected from enrolled index children included hand wipes for organic chemicals, silicone band passive samplers, and socks. Information collected from each index child included time-activity measures [global positioning system (GPS) and accelerometer] and questionnaire data. Samples and information collected from enrolled siblings included the same as for the index child, but added urine. Additional samples were collected from younger siblings (and their homes) enrolled in a nested sub-study to better understand the mass balance for metals exposures. Those samples included blood, drinking water, duplicate diet, hand wipes for metals, nail clippings, and stool. A detailed list of the sample types/information collected is shown in Figure 1. The objectives of this Pilot Study add-on using the samples and information collected are listed in Table 1. Additional information and samples collected during the main GHS are also used to address objectives of the EPA's Pilot Study add-on. To understand children's exposure, it is important to include all elements of their surroundings and characterize interactions with their surroundings. Thus, integration of personal, housing, and community factors from the built, natural, and social environment that impact exposure to chemical and non-chemical stressors within one research study is critical.

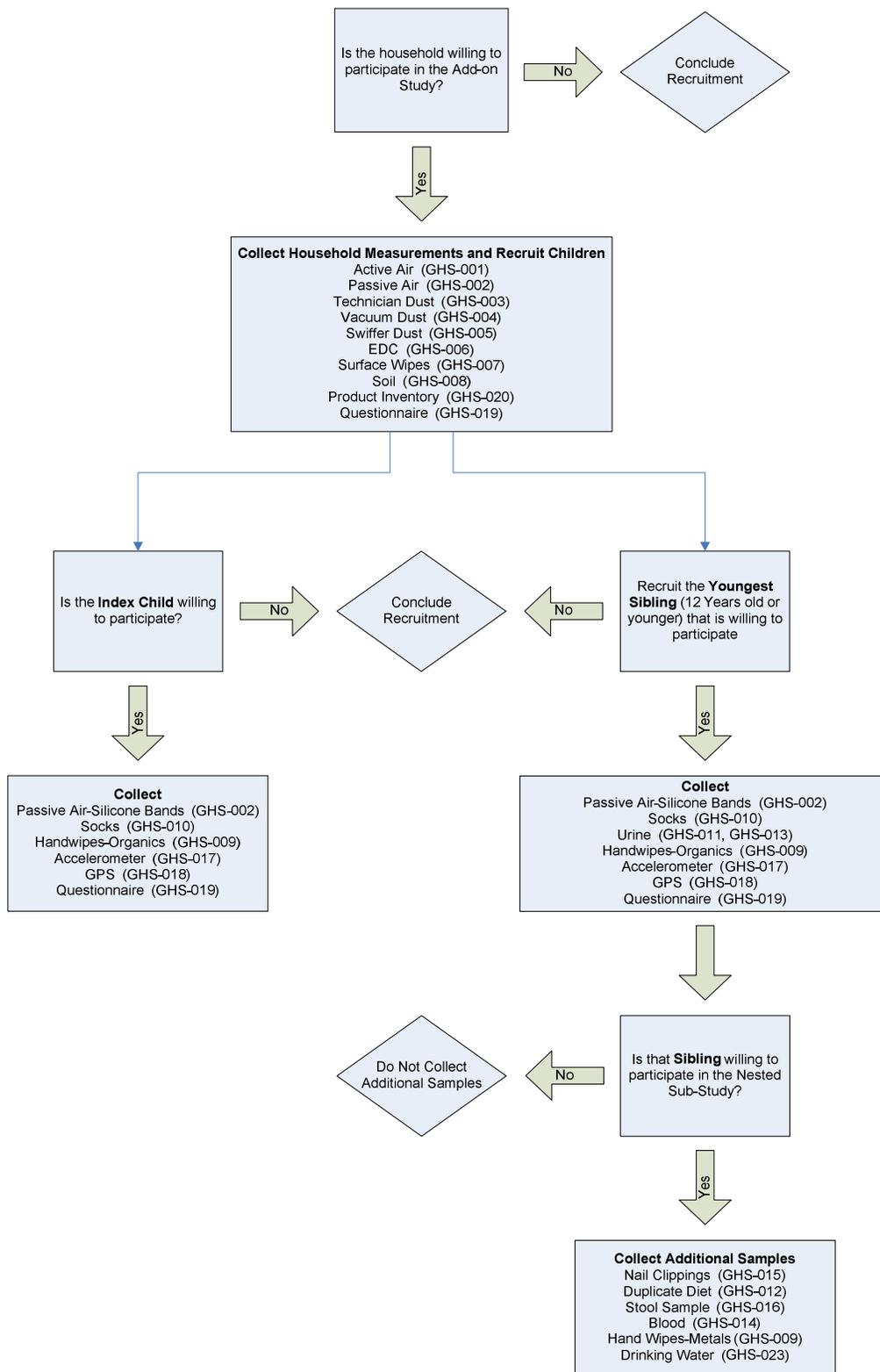


Figure 1. EPA Pilot Study add-on sample collection by participant type (replicated from reference ⁴).

Objectives

Table 1. Summary of the data analysis plan for the EPA Pilot Study add-on primary objectives (1-3) and secondary objectives (4-11) (replicated from reference ¹).

Objective	Measurements Required	Description
1) Identify and characterize factors affecting children’s exposures to chemical ingredients from consumer products found in their everyday environment in order to support the data and modeling needs of the exposure components of EPA’s national research programs	Hand wipe, socks, house dust, air, soil, urine, and blood measurements for target analytes; questionnaire and activity data	Examine how influential personal, housing, and community factors are in determining children’s exposures. Results will directly compare siblings and determine how personal and housing factors vary.
2) Evaluate the Pilot Study data metrics for incorporation in and enhancement of CDC’s ability to understand the relationship between environmental exposures and asthma in green versus traditional low-income housing	Survey responses from questionnaire; GPS; accelerometer data; housing data; multimedia measurement concentrations; QA/QC data for measurements and data collection; CDC measurement data	Evaluate the Pilot Study methods and approaches for measuring exposures to consumer product chemicals and identifying exposure factors. Suitable methods may be incorporated in future GHS sites and allow improved evaluation of relationships between environmental exposures and asthma.
3) Compare multimedia measurements and survey data between pre- and post-renovation time points in green and traditional low-income housing to assess exposure-related changes in the residence and participants due to renovation activities	Chemical concentrations in available media; mold information; activity information; all time points of data available from renovated and non-renovated homes; pre- and post-renovation information	Examine how exposure changes throughout the renovation period and differences between renovated and non-renovated homes. All multimedia measurements, activity pattern information, and survey data will be used to evaluate changes in exposure over time.

Objective	Measurements Required	Description
4) Evaluate exposure to chemicals in household cleaning and personal care products as a modifying factor in interpreting the effectiveness of green housing renovations on reducing the incidence of asthma-like symptoms	Number of asthma-like symptoms reported by each participant; renovation status; total dust loading/air concentrations of measured cleaning product ingredients	Examine the association between the primary risk factor (renovation status) and the outcome (symptom incidence) to evaluate possible modifying effects due to chemicals emitted from consumer products, controlling for medication use.
5) Examine the relationships between consumer products in a residence, environmental concentrations, and exposure to active ingredients found in consumer product chemicals to support development and evaluation of models for predicting exposure to these chemicals	Household consumer product inventories, target analyte concentrations in house dust, surface wipes, air, blood, urine	Development and evaluation of models for predicting exposure to consumer product chemicals is needed because of their prevalence in the indoor environment and possible asthma morbidity in young children from potential exposures.
6) Measure biomarkers of consumer product chemicals for young children in conjunction with environmental measurements to evaluate exposure and dose models	Target analyte concentrations in house dust, air, duplicate diet, blood, urine; activity information; survey information	To evaluate exposure and dose models, chemical concentrations (parent and metabolite(s)) need to be measured in both environmental and biological matrices in order to serve as data inputs.
7) Assess rapid, low burden, low cost methods for characterizing consumer product use in the residential environment to predict exposure to chemicals	Photographs of storage locations for household cleaning products and personal care products; barcode scanner inventory of products	Evaluate a novel method for rapidly characterizing consumer product inventories in the residential environment. The results from this effort will then be used to predict exposures to chemicals.

Objective	Measurements Required	Description
8) Use low burden techniques and survey instruments to collect current information on children's activities, locations, and dietary habits to support exposure models and databases	Survey responses from questionnaire; GPS; accelerometer data	Improve current information on children's activities, locations, and dietary habits. In combination with GHS multimedia measurements, results from this objective will be used to estimate aggregate and cumulative exposures.
9) Use settled dust to identify and classify indoor fungal populations and functions overrepresented among fungal biota	Fungal DNA extracted from dust samples	DNA from electrostatically collected molds will be extracted and analyzed using high throughput DNA sequencing. The DNA of dust samples will be used to identify genes and functions that are overrepresented among the fungal biota.
10) Evaluate the feasibility of using a simplified mass balance approach to estimate chemical exposure and dose rates incorporating children's toenail clippings, other multimedia measurements, and activity information	Target analyte concentrations in house dust, soil, hand wipe, surface wipe, duplicate diet, urine, blood, feces, toenail clipping	Evaluate associations between potential sources, exposure pathways, and indoor/outdoor concentrations, toenail clippings and blood concentrations. This approach could be applied to future studies to generate additional data on chemical exposure and dose rates.

Objective	Measurements Required	Description
11) Examine the feasibility of obtaining extant community-level data and prepare draft approaches for using such data for children's community exposure factor assessment and multiple stressor effects on estimates of health risks	Domains of interest include: demographics, socio-economics, households, education/schools, safety/social disorder, birth outcomes, medical access, land use/built environment, playgrounds/greenspace, food access/utilization, transit/transportation, pollutant sources; indicators within each domain will be developed based on availability of extant data at the study location	Understand the feasibility of collecting extant data on community exposure factors and how these factors may be applicable to other types of exposures and outcomes.

Approach

Target analytes

Table 2 lists the target chemicals, biological agents, and media sampled by this study. Because of different physical-chemical properties, sterilization requirements, and extraction requirements, different procedures were required to sample for the variety of target compounds, microbes, and metal elements in these media. If the sampling SOPs used in this study are adapted for use in other studies, it is highly recommended that the study's requirements for target analytes are considered, as our approaches may not be amenable for all chemical or biological targets.

Table 2. Targeted chemical and biological agents for the EPA Pilot Study add-on to the Green Housing Study (replicated from reference ¹).

Target Compound Class	Target Chemical/Biological	Media	Biomarkers
Consumer Product Active Ingredients	Linalool	Indoor air, dust, surface wipe, urine, duplicate diet	- ^a
	Limonene	Indoor air, dust, surface wipe, urine, duplicate diet	- ^a
	Methyl paraben	Indoor air, dust, surface wipe, urine, duplicate diet	Methyl paraben conjugates, <i>p</i> -hydroxybenzoic acid and conjugates
	Propyl paraben	Indoor air, dust, surface wipe, urine, duplicate diet	Propyl paraben conjugates, <i>p</i> -hydroxybenzoic acid and conjugates
	Butyl paraben	Indoor air, dust, surface wipe, urine, duplicate diet	Butyl paraben conjugates, <i>p</i> -hydroxybenzoic acid and conjugates
	Triclosan	Indoor air, dust, surface wipe, urine, duplicate diet	Triclosan conjugates, 2,4-dichlorophenol (2,4-DCP)
Metals	Aluminum	Dust, surface wipe, soil, hand wipe, urine, blood, toenail clippings, duplicate diet, feces, drinking water	- ^a
	Arsenic	Dust, surface wipe, soil, hand wipe, urine, blood, toenail clippings,	- ^a

Target Compound Class	Target Chemical/Biological	Media	Biomarkers
		duplicate diet, feces, drinking water	
	Cadmium	Dust, surface wipe, soil, hand wipe, urine, blood, toenail clippings, duplicate diet, feces, drinking water	- ^a
	Silicon	Dust, surface wipe, soil, hand wipe, urine, blood, toenail clippings, duplicate diet, feces, drinking water	- ^a
	Titanium	Dust, surface wipe, soil, hand wipe, urine, blood, toenail clippings, duplicate diet, feces, drinking water	- ^a
Pesticides	Chlorpyrifos	Indoor air, dust, surface wipe, soil, hand wipe, socks, urine, blood, duplicate diet	DEP, DETP, 3,5,6-trichloropyridinol (TCPy)
	Fipronil	Indoor air, dust, surface wipe, soil, hand wipe, socks, urine, blood, duplicate diet	Fipronil sulfone, desulfinyl fipronil, fipronil sulfide
	Permethrin	Indoor air, dust, surface wipe, soil, hand wipe, socks, urine, blood, duplicate diet	3-PBA, 3-PBA glucuronide/glycine conjugates, <i>cis/trans</i> -DCCA
	Piperonyl butoxide (PBO)	Indoor air, dust, surface wipe, soil, hand wipe, socks, urine, blood, duplicate diet	- ^a
Molds^b	<i>Alternaria alternata</i>	Dust	Not applicable
	<i>Aureobasidium pullulans</i>	Dust	Not applicable
	<i>Cladosporium sphaerospermum</i>	Dust	Not applicable
	<i>Penicillium crustosum</i>	Dust	Not applicable
	<i>Scopulariopsis brevicaulis</i>	Dust	Not applicable
	<i>Stachybotrys chartarum</i>	Dust	Not applicable
	<i>Trichoderma viride</i>	Dust	Not applicable
<i>Wallemia sebi</i>	Dust	Not applicable	

^aDenotes biomarker is parent compound.

^bList includes, but is not limited to, molds found in the indoor environment and associated with asthma.

Summary of sample and information collection

Twenty-three standard operating procedures and one participant instruction record book were developed and used for the EPA Pilot Study add-on. Full text of these documents follows in appendices as indicated in Table 3. The standard operating procedures appended to this report are NOT official EPA methods and have not been validated. A synopsis of each SOP follows Table 3.

Table 3. EPA Pilot Study add-on field collection SOPs.

Appendix number	SOP/Document title	Objectives supported	Study Specific SOP Number
I.	Standard Operating Procedure (SOP) for Collection of Indoor Air Samples using Polyurethane Foam Sampling Media and Active Samplers	1,2,3,4,5,6	GHS-001
II.	SOP for Collection of Indoor Air Samples using Passive Samplers (Includes “SOP ECAB 152.1 Standard Operating Procedure for Carbo-pack X Sorbent Tube Handling: Field Deployment and Shipping”)	1,2,3,4,5,6	GHS-002
III.	SOP for Technician Collected House Dust Samples	1,2,3,4,5,6,9,10	GHS-003
IV.	SOP for Participant Collected House Dust Samples	1,2,3,4,5,6,9,10	GHS-004
V.	SOP for Collecting Dust Samples with Swiffer™ Dusters	3,9	GHS-005
VI.	SOP for Dust Collection using an Electrostatic Dust Collector (EDC)	3,9	GHS-006
VII.	SOP for Collection of Wipe Samples from Hard Surfaces	2,3,5,10	GHS-007
VIII.	SOP for the Collection of Soil Samples	1,2,3,10	GHS-008
IX.	SOP for Collection of Hand Wipe Samples	1,2,3,10	GHS-009
X.	SOP for Collecting Sock Samples	1,2,3,6	GHS-010
XI.	SOP for Collection of Urine Samples	1,2,3,5,6,10	GHS-011
XII.	SOP for Collection of Duplicate Diet Samples	2,3,6,10	GHS-012
XIII.	SOP for Collecting Diaper Samples for Urine Analysis	1,2,3,5,6,10	GHS-013
XIV.	SOP for Collecting Blood Samples	1,2,3,5,6,10	GHS-014
XV.	SOP for Collecting Nail Clippings for Metals Analysis	10	GHS-015
XVI.	SOP for Collecting Stool Samples	10	GHS-016
XVII.	SOP for Collection of Activity Data using Actical™ Activity Monitors	1,2,3,5,6,8	GHS-017
XVIII.	Collection of Activity Data using the QSTARZ BT-Q1000XT GPS Travel Recorder	2,3,6,8	GHS-018
XIX.	SOP for Administering the Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaire	1,2,8	GHS-019
XX.	SOP for Collection of Household Cleaning Products and Personal Care Products Inventory	5,7	GHS-020

Appendix number	SOP/Document title	Objectives supported	Study Specific SOP Number
XXI.	Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples	All	GHS-021
XXII.	Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer	All	GHS-022
XXIII.	SOP for the Collection of Drinking Water Samples for Metals Analysis	10	GHS-023
XXIV.	Participant Instruction Record Book	1,2,3,4,5,6,8,10	NA

Indoor Air – Active (pp 29)

Active indoor air samples were initiated on Day 1, ended and collected from the homes on Day 5. The sample was collected from the room of primary occupancy by the participant. The active air sampling methodology used low volume air samplers placed in a childproof, sound reducing enclosure. The pump flow rate was sufficiently low to ensure that the pump could run for 5 consecutive days with minimum disruption to the study participants. A polyurethane foam (PUF; 22 mm × 7.6 cm) filled glass tube was used to collect target compounds of interest. Additional information may be found in SOP GHS-001 in Appendix I.

Indoor Air – Passive (pp 44)

Passive air collection was performed by deploying a stainless steel tube filled with Carbopack X and a silicone band in the same location and for the same collection period as the active air sampler (room of primary occupancy) on Day 1. The passive air samplers were co-located on a ring stand at a height of 15-20” with the active air sampler where they remained for the duration of the sampling period. The passive samplers collected volatile target organic analytes. A diffusive sampling cap was installed on the first day of sampling and replaced with a storage cap when sampling concluded on Day 5. Personal air samplers (identical to stationary silicone bands) were placed on the index child’s and sibling’s wrist or ankle and worn for the 5-day duration without removal. Additional information may be found in SOP GHS-002 in Appendix II.

Household Dust – Technician- and Participant-Collected Vacuum Samples (pp 86 and 105)

Household dust was collected on Day 5 using two approaches. The first type of house dust sample was collected by the field staff (technician) using a forensic vacuum equipped with an in-line filter to collect and trap surface dislodgeable particles. The samples were collected from a demarcated area on a floor with a preference for the primary area where the child spends time, followed by another room where the child spends time. The preference for the sampling surface was to collect the house dust sample from a carpeted floor in the house. If no carpeted area was available, then a non-carpeted surface was sampled. The sampled area was measured, marked, and recorded to ensure the accurate documentation of the total surface area vacuumed. The second house dust sample came from collecting the dust from a participant’s household vacuum cleaner. Vacuum bags or vacuum cleaner dust catch trap contents were placed in labeled plastic bags. Additional information may be found for technician-collected dust in SOP GHS-003 in Appendix III and for participant-collected dust in SOP GHS-004 in Appendix IV.

Surface Dust Swiffer™ Appendix V 134)

A Swiffer™ brand dry Sweeper duster cloth was used to collect settled dust from the tops of door jambs and bookcases on Day 5. The dusters are removed from a zip-top bag and are used to wipe the tops of structures that are not often cleaned. This sample was analyzed only for mold. Additional information may be found in SOP GHS-005 in Appendix V.

Electrostatic Dust Collection (EDC) (pp 125)

The passive collection of settled dust samples was conducted in the same area as the active air sample (primary area where the child spends time) using an electrostatic dust collector (EDC) starting on Day 1. Two EDCs were placed horizontally on surfaces at least 1.5 meters above the floor and exposed for five days. This sample was analyzed only for mold. Additional information may be found in SOP GHS-006 in Appendix VI.

Hard Surface Wipes (pp 134)

Surface wipe samples were collected from impervious surfaces in a location where the children may spend time and/or locations where consumer products were stored and used (e.g., kitchen, bathroom) on Day 1 of the sampling period. Surface wipes were collected for metals and organic chemicals (pesticides and consumer product active ingredients) analyses from adjacent surface areas within a collection location. Surface wipes for metals utilized Ghost wipe media that dissolves during the digestion process. These commercially available media come prepackaged and pre-wetted with water. The second wipe for organics used Twill wipe media, which is a pre-cleaned cotton fabric material. The Twill wipe media was provided to the field team who allocated three wipes into respective jars prior to field deployment. Three Twill wipes were wetted together in the field with a premeasured, 9-mL aliquot of analytical grade isopropanol. Samples were collected by wiping within a 144 square inch aluminium template placed on the impervious surface. Additional information may be found in SOP GHS-007 in Appendix VII.

Soil (pp 148)

Soil samples were collected from an outdoor location in closest proximity to where the children spent time playing outdoors. Soil samples were collected on Day 1 for each sampling period. A pre-cleaned stainless steel scoop was used to collect approximately 5-10 sub-samples giving at least 10 g of soil when aggregated. Soil samples consisted of scrapings collected to a depth of 1 cm using the scoop that were placed into 4 oz. amber glass jars. The scoop was cleaned between each sample collection interval by wiping with an isopropanol wetted wipe. Additional information may be found in SOP GHS-008 in Appendix VIII.

Hand Wipe (pp 159)

Hand wipe samples were collected from all participants' hands in order to measure organics (pesticides) on the skin on Day 5 of each sampling visit. Hand wipe samples for metals were collected from those participating in the nested sub-study on Day 1. The field staff measured the hand wipe surface area by tracing the participant's hands. The wipes for organics were pre-cleaned and then wetted with 50% isopropanol in distilled or deionized water prior to sampling. The wipes used for metals collection were pre-packaged Ghost wipes. Additional information may be found in SOP GHS-009 in Appendix IX.

Socks (pp 168)

Organic cotton socks were provided to and worn alone (uncovered by anything, such as shoes or sandals) following cleaning of the child's feet, by the index child and sibling for a two-hour period during the study on Day 1 while the field staff were present. Sock samples were placed

into clean bags for transport from the field, and were used to estimate the child's dermal exposure to pesticides and metals. Additional information may be found in SOP GHS-010 in Appendix X.

Urine (Toilet-Trained) (pp 177)

The EPA Pilot Study add-on collected urine from siblings on Days 3 and 4 of the sampling period for the analysis of metals and biomarkers of pesticides and consumer product active ingredients. Urine samples were collected in acid-washed polyethylene bottles as first morning voids for toilet-trained siblings. Additional information may be found in SOP GHS-011 in Appendix XI.

Duplicate Diet (pp 187)

The duplicate diet was only collected from younger siblings enrolled in the nested sub-study to minimize study burden. Preference was given to homes where drinking water, blood, nail clippings, hand wipe (metals), and stool samples could all be collected from the same participant. Duplicate diet included both food and drink for a 24-hour period collected on Day 2. Each participant was provided with clean containers for the food and drink collection, and was asked to complete a food diary. Samples were maintained under reduced temperature conditions (plug-in cooler provided or participant's refrigerator) until picked up by the field staff. Additional information may be found in SOP GHS-012 in Appendix XII.

Diaper Urine (pp 196)

Disposable diapers were used for urine collection. Only non-stool containing diapers were collected for non-toilet trained siblings on Days 3 and 4 of the sampling period, with a preference for first morning voids, followed by a convenience sample. Huggies® diapers were provided to the participants by the field staff. Field staff provided instructions to caregivers. The diapers were collected by a caregiver for subsequent retrieval by a field staff member. Additional information may be found in SOP GHS-013 in Appendix XIII.

Blood (pp 204)

The blood samples were collected from younger siblings enrolled in the nested sub-study on Day 5 of the sampling period after collection of duplicate diet, drinking water, nails, hand wipe (metals), and stool samples. On Day 5 of the home visit, a certified pediatric phlebotomist drew blood via venipuncture, heel or finger stick depending on the age of the child and ease of finding veins. Blood drawing protocols, are not covered in detail in this SOP; instead, it focuses on how the field team obtains needed supplies, collects blood samples after they are drawn using CDC protocols, and then ships the samples to CDC. Additional information may be found in SOP GHS-014 in Appendix XIV.

Nail Clippings (pp 212)

The nail samples were collected from younger siblings enrolled in the nested sub-study on Day 1 of the sampling period. Preference was given to homes where duplicate diet, drinking water,

blood, hand wipe (metals), and stool samples could all be collected from the same participant. The clipping of nails was performed using stainless steel toenail clippers, fingernail clippers, or nail scissors by the caregiver after receiving instructions from a field staff member. A field staff member assisted the caregiver by providing support to “catch” the clipping so that it did not fall onto surfaces or get lost. Additional information may be found in SOP GHS-015 in Appendix XV.

Stool (pp 220)

The stool samples were collected from younger siblings enrolled in the nested sub-study on Day 3 of the sampling period. Preference was given to homes where duplicate diet, drinking water, blood, hand wipe (metals), and nail clipping samples could all be collected from the same participant. Stool was collected by the caregiver, stored in U.S. EPA prepared and provided collection packets (containing collection bottle, zip-lock bag with sorbent material, nitrile gloves, and plastic wrap) and maintained at reduced temperatures in the EPA provided plug-in cooler. Additional information may be found in SOP GHS-016 in Appendix XVI.

Activity monitors- Accelerometer and GPS (pp 229 and 249)

Activity and location data was collected from both the index child and sibling on Days 1-5 of the study using a waistband-mounted accelerometer-based activity monitor (Actical™) and a GPS data logger (Qstarz model Q1000XT). Field staff prepared the devices for data collection and instructed participants on placement and use of the devices. Both devices were worn by study participants during awake periods for all collection days. The Actical™ required no recharging during the data collection period; the BT-Q1000XT Data Logger required recharging by the study participant’s caregiver each evening. The devices were collected by the field staff on Day 5. Additional information may be found for the Accelerometer in SOPs GHS-017 in Appendix XVII and for the GPS in GHS-018 in Appendix XVIII.

Questionnaire (pp 264)

A set of EPA-developed questionnaires queried participants on location, transportation, activity, diet, and consumer products use. Questionnaires were administered to the parent/caregiver and covered information about the index child and sibling separately and a household inventory. A final questionnaire was completed by field staff to record home observations. Questionnaires administered to the parent/caregiver were primarily recall questions covering activities the day prior to each field visit on Day 5 of the sampling period. Additional information may be found in SOP GHS-019 in Appendix XIX.

Consumer Product Inventory- Cleaning and Personal Care Products (pp 304)

The generation of a product inventory from homes involved two steps on Day 1 of the sampling period. First, the field staff photographed the primary locations where the participants indicated that household cleaning products and personal care products were stored. Photographs were taken of the storage locations in their natural, undisturbed state, and did not include any humans. The field coordinator sent the pictures to EPA investigators (who identified the products in the picture). Second, the field staff inventoried the products using a barcode scanner. The image-

based inventory was evaluated against the barcode-based inventory to assess collection accuracy. Additional information may be found in SOP GHS-020 in Appendix XX.

Storage/Shipping (pp 324)

All samples were transported from the participant's home to the field team's facility at 4 °C in coolers with frozen ice packs. Once in the facility, all samples were stored at reduced temperatures, with blood/serum and drinking water stored at 4°C, urine at -80°C, and all other sample types at -20°C. Samples were transported to the EPA laboratories at reduced temperatures, with air and urine samples shipped on dry ice, and all other samples types using super-cooled ice packs. Additional information may be found in SOP GHS-021 in Appendix XXI.

Data (pp 340)

Hardcopy forms were scanned by the field team. Scanned and study generated electronic files were stored in two locations, with personally identifiable information (PII) kept on a secure device with password protection and 16+ bit encryption. Paper forms containing PII were kept in a locked file cabinet with limited access. It was suggested that all study documents be stored as if they were PII. Data were transferred to the EPA at least monthly to a secure file transfer protocol (FTP) site or by secure email. Documents stored at EPA followed the same requirements as storage at the field team's facility. Additional information may be found in SOP GHS-022 in Appendix XXII.

Drinking Water (pp 349)

The drinking water samples were collected from the homes of younger siblings enrolled in the nested sub-study on Day 1 of the sampling period. Preference was given to homes where duplicate diet, nails, blood, hand wipe (metals), and stool samples could all be collected from the same participant. Field staff collected cold tap water or bottled water depending on the primary source of drinking water. Tap water was collected for metals analysis in polyethylene bottles with 5-10% headspace. Samples were acidified with nitric acid immediately after arrival in the field staff's facility for preservation. The caregiver was asked to provide an estimated amount of water consumed by their child. Additional information may be found in SOP GHS-023 in Appendix XXIII.

Participant Instruction and Record Book (PIRB) (pp 358)

The PIRB contains instructions and record sheets for the caregiver to collect additional samples while the field team was not present on Days 2-4. Instructions for silicone band personal samplers, duplicate diet, urine, and stool samples were included. Additionally, instructions to charge the GPS unit, and placement/removal of the accelerometer were included. Additional information may be found in Appendix XXIV.

Environmental samples, biological samples, and information were collected from participating homes, index children, and siblings during the 5-day collection period. The timeline for each

sample and information collection (organized by household, index child, sibling, and nested sub-study) is listed alphabetically in Table 4.

Table 4. Timeline for collection of field samples (replicated from reference ⁴).

Information/Sample	Day 1	Day 2	Day 3	Day 4	Day 5
<i>Household measurements</i>					
Consumer product inventory	Collect				
Electrostatic dust collector	Setup/Start Collection				Complete Collection/Retrieve
Household vacuum bag					Collect (if available)
Housing and community information ^a	Collect				
Indoor air – active	Setup/Start Collection				Complete Collection/Retrieve
Indoor air – passive	Setup/Instructions ^b /Start Collection				Complete Collection/Retrieve
Questionnaire					Collect
Soil	Collect				
Surface dust by Swiffer					Collect
Surface wipes (kitchen & bathroom, n=8)	Collect				
Technician vacuum sample					Collect
<i>Index child</i>					
GPS and accelerometer	Instructions ^b /Start Collection	Collect	Collect	Collect	Complete Collection/Retrieve
Hand wipe – organics					Collect
Passive air – silicone wristband	Setup/Instructions ^b /Start Collection				Complete Collection/Retrieve
Questionnaire					Collect
Socks	Collect				
<i>Sibling</i>					
GPS and accelerometer	Instructions ^b /Start Collection	Collect	Collect	Collect	Complete Collection/Retrieve

Information/Sample	Day 1	Day 2	Day 3	Day 4	Day 5
Hand wipe – organics					Collect
Passive air – silicone wristband	Setup/Instructions ^b /Start Collection				Complete Collection/Retrieve
Questionnaire					Collect
Socks	Collect				
Urine (cup or diaper)	Instructions ^b		Collect	Collect	Retrieve

Additional samples for younger siblings participating in nested sub-study^a (optional)

Blood					Collect
Drinking Water	Collect				
Duplicate diet	Instructions ^b	Collect			Retrieve
Hand wipe – metals	Collect				
Nail clippings	Collect				
Stool	Instructions ^b		Collect		Retrieve

^aThese sample types will only be collected at the first of four potential visits.

^bInstructions will be given to the caregiver for the use/collection of silicone bands, duplicate diet, GPS, accelerometer, urine (cup or diaper), and stool on Day 1. During Days 1-5, the caregiver will complete the associated tasks as described in the Participant Instruction Record Book to allow for retrieval of these data, items, and samples on Day 5.

Quality Assurance Summary

The EPA Pilot Study add-on was conducted under an approved Quality Assurance Project Plan ⁴ (QAPP). All standard operating procedures and the Participant Instruction Record Book were reviewed and approved by an EPA Branch Chief and Quality Assurance Manager. Prior to approval, each SOP was reviewed and field tested with dry runs at EPA and at Tulane by the field staff. These reviews and dry runs were used to ensure that the instruction steps could be followed and performed consistently as intended. Additionally, two EPA team members conducted training on the SOPs for two days with the Tulane field staff. Each SOP contains a quality control and quality assurance section specific to the samples and information being collected. The standard operating procedures appended to this report are NOT official EPA methods and have not been validated. They have been reviewed and approved internally by EPA to meet data quality objectives associated with the work herein described.

⁴ D-EMMD-PHCB-005-QAPP-01, “An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study) Quality Assurance Project Plan.”

Conclusions

Data are limited on the interrelationships between exposure factors, housing factors, and community factors and their combined impact on children's exposures from chemical and biological agents in their indoor environment. Using the SOPs included in the appendices of this document, the EPA Pilot Study add-on to the GHS collected samples and information to determine children's exposures, locations, and activities. These data can be used to assess chemical exposures to a range of consumer product chemicals using both traditional and novel methods to advance the field of exposure science. A complete listing of the SOPs is shown in Table 3. While the SOPs detailed here are specific to the EPA Pilot Study add-on and have not been validated, they can easily be modified for other studies collecting similar samples and information.

Appendix I. Standard Operating Procedure (SOP) for Collection of Indoor Air Samples using Polyurethane Foam Sampling Media and Active Samplers

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Indoor Air Samples using Polyurethane Foam Sampling Media and Active Samplers

Number: EMAB-165.0

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SOP was Developed

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Extramural

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Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

Standard Operating Procedure (SOP) for
Collection of Indoor Air Samples using Active Samplers

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting fixed site indoor air samples using active samplers to measure for selected pesticides and consumer product active ingredients for the EPA pilot study add-on to the Green Housing Study (GHS). This is suitable for the collection of chemicals present as vapors and associated with particles.

2.0 SUMMARY OF THE METHOD

This procedure lists the steps taken by field staff to collect indoor air sampled with an active sampling system. On day 1 of the sampling period, the field staff will place a pre-cleaned polyurethane foam (PUF) plug into a URG-2000 sampling cartridge (or equivalent) and calibrate and document the pump flow. The pump will then pull air through the sampling cartridge for the five-day sampling period. When the field staff terminate sampling on day 5, they will measure and record the pump flow prior to turning the pump off and carefully package the sampling cartridge for transport and storage.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

PUF – Polyurethane foam

URG-2000 sampler: The sampler consisting of a housing and PUF sampling media is used to collect the pesticides and consumer product active ingredients present in indoor air.

QC – Quality Control

COC – Chain-of-custody

RTP – Research Triangle Park

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

FD – Field Duplicate

FS – Field Spike

4.0 CAUTIONS

4.1 Field personnel should take care that all electrical connections are secure and protected from moisture.

4.2 All loose cables (power cords) should be properly secured (e.g., taped on the floor).

4.3 Use masking tape for the indoor floor cover and duct tape for outdoor (concrete) ground cover to secure extension cords and minimize trip hazards.

5.0 RESPONSIBILITIES

5.1 EPA staff will purchase and prepare the sample collection materials including the PUF plugs and samplers and deliver them to the field coordinator.

5.2 The field coordinator will receive the sample collection materials from EPA and keep records of receipt and distribution in their field record book. The field coordinator will create a sampling schedule to deploy or collect the appropriate percentage of each type of quality control samples. The field coordinator will communicate the schedule for quality control (QC) samples to the field staff and distribute any additional quality control sample materials. The field coordinator will distribute the sample collection materials to the field staff. Upon collection of the air sample, the field coordinator will be responsible for returning the samples with their collection record and COC sheets to the EPA laboratory in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the pre-cleaned PUF plugs, samplers, and sample collection materials from the field coordinator, collection of the air sample, entering relevant information on the sample collection sheet and/or in the field record books, and returning collected air samples to the field coordinator.

6.0 MATERIALS AND EQUIPMENT

6.1 Pre-cleaned PUF Plugs, Supelco Part No. 20600-U (or equivalent)

6.2 Teflon tape

6.3 Disposable nitrile gloves

6.4 URG-2000 model numbers 25A, 25AA, 25AB samplers (or equivalent) with maximum flow rates of 5 LPM are acceptable. The sampler consists of a Delrin cap with inlet hole, Teflon O-ring, split Delrin sleeve/filter holder with ¼" exit tube, and glass sorbent tube. Housings are modified in that the Delrin cap (also designated as Split Housing/Inlet) with the cut point inlet is removed in its entirety when in use (Figure 1). The sampler is used with an open face and no particle size exclusion.

6.5 SKC universal XR pumps model number PCXR8 (or similar). Must be capable of flow rates between 1 and 5 L/min.

6.6 Flow meter: Dry-Cal DC-lite high flow (or equivalent). Must be capable of measuring flow rates of 5 L/min.

6.7 Tygon Tubing (R-3603 or equivalent) - 5/16" ID X 1/2" OD" and 3/32" wall thickness. Tygon tubing is cut to 3-ft lengths with one length required for each pump assembly.

6.8 Ink pen

6.9 Chilled ice packs (or equivalent)

6.10 Dichloromethane rinsed aluminum foil for wrapping URG sampling devices. Cartridges will be wrapped in this foil for shipment.

6.11 Metal sampling box 12" (W) × 8" (D) × 4" (H) equipped with holes for power cord, sampling tube, exhaust, and locking clasp, and box key

- 6.12 Power strip
- 6.13 Standard laboratory ring stand with vertical support of 100 cm
- 6.14 3” wide painters tape (or similar)
- 6.15 Sample ID label
- 6.16 Sample collection record sheets
- 6.17 Fixed position two pronged clamp to hold URG sampling device
- 6.18 10’ extension cord
- 6.19 Field record book(s)
- 6.20 Polyethylene bags, 6” X 6” minimum dimension (zip-top or equivalent)
- 6.21 Permanent marker (Sharpie or equivalent)
- 6.22 Flow rate adapter – a modified device that tightly attaches to the Dry-Cal and the open face URG cartridge. Device consists of Delrin inlet section (similar to the Split Housing/Inlet) of URG-2000. Modifications include the removal of all internals such as the screen and impactor and the widening of the cut point portal.
- 6.23 Zip tie to secure Tygon tubing to housing outlet and pump inlet and all other tubing attachments
- 6.24 Digital timer such a personal watch

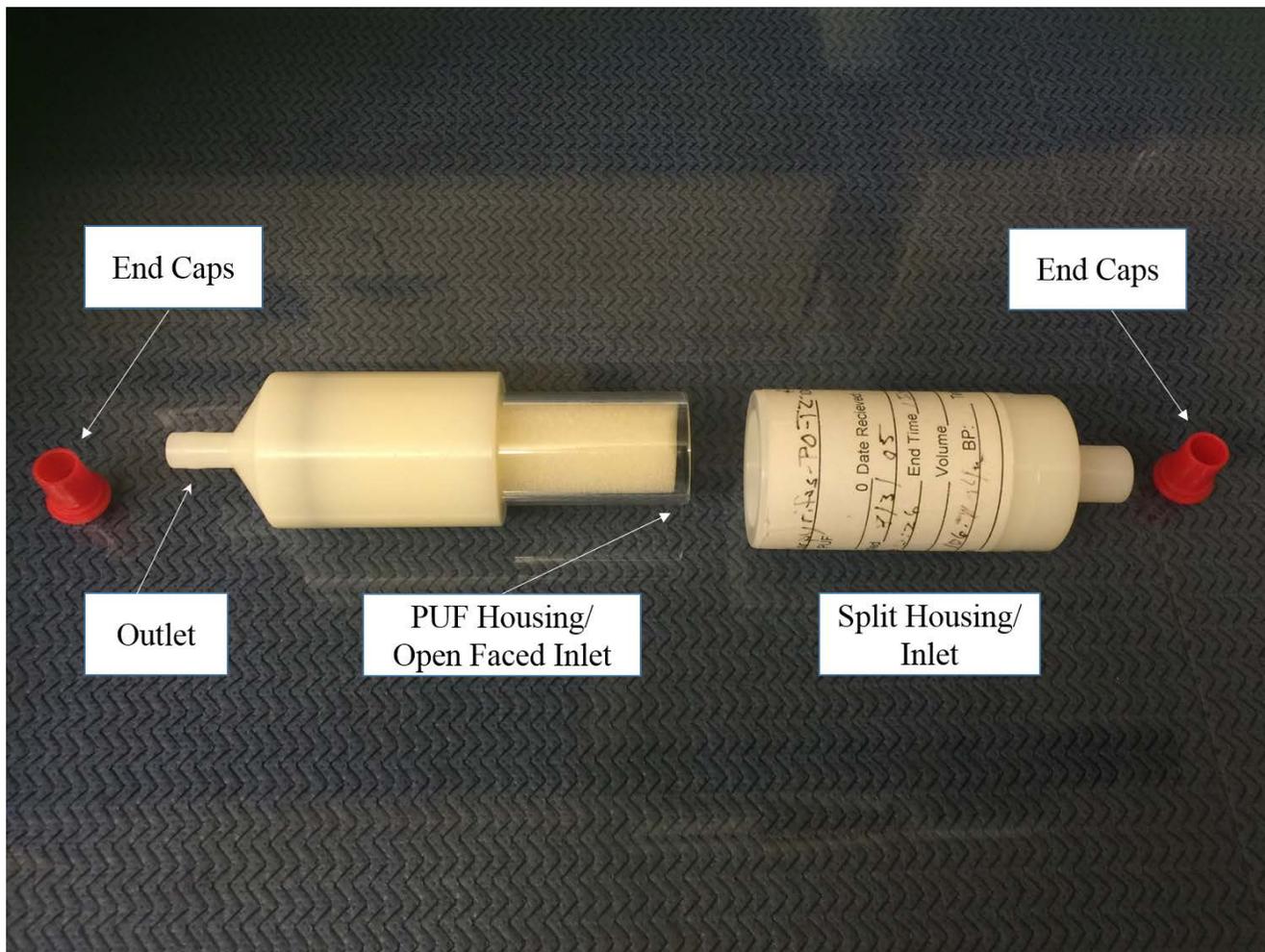


Figure 1. Shows the URG-2000 with red removable end caps, the separated inlet exposing the glass encased PUF filter and the ¼” outlet (on left in figure).

7.0 PROCEDURES

7.1 PROCEDURE TO ASSEMBLE SAMPLER FOR COLLECTION

7.1.1 Consideration should be given by the field staff to the location of the active air sampler within the home. The first priority is selecting the room of primary occupancy by the participant (the room where the participant spends most of his/her time throughout the day other than a bedroom). The room of primary occupancy is likely to include the den or living room. When the primary room is unavailable, then select a secondary room such as a bathroom, bedroom or kitchen to locate the sampling device. Record the room identity in ink on the Sample Collection Record (Appendix A).

7.1.2 Following the room selection, the field staff identifies the location where the indoor sampler will be placed. Pumps are typically placed in out-of-the-way locations away from the center of the room in order to present as little interference to the participants as possible. Factors contributing to location selection include: the dimension of the room and its furnishings, the presence of children or pets who

might tamper with the device, occupant activity in the room, ventilation, potential disturbance to the occupants by the noise generated by the pump, location of outlets and trip hazards associated with the stretching of extension cords. When collecting field duplicate samples, collocate the sampling pumps within their boxes by placing each in adjacent positions at the base of the ring stand. Both sampling cartridges can be located on the same horizontal support (Figure 2). Collect a field duplicate if required. Record the sampler location within the room in ink on the Sample Collection Record (Appendix A).

7.1.3 Retrieve a metal sampling box (designed to tamper proof the pump and provide sound deadening). Each box contains a sampling pump with power cord. Make sure a 3 foot length of Tygon tubing connected to the sample pump inlet extends through the hole on the side of the sampling box.

7.1.4 If more than a single wall outlet is required, plug the power strip into the nearest outlet. Run an extension cord from the nearest electrical outlet to provide power to the sampling equipment. Plug the extension cord into the power strip. Make sure that the sampling pump is plugged into the power strip. Insure that all electrical connections are secure. Using 3" wide painters tape, secure the cord(s) in such a manner as to ensure it does not pose a trip hazard to the occupants or those involved in the sampling event.

7.1.5 Don a pair of disposable nitrile gloves.

7.1.6 Retrieve a foil-wrapped URG-2000 sampler cartridge equipped with glass housing and pre-cleaned PUF plug from its respective plastic bag. Carefully unwrap the foil, fold it, and place it back into the plastic bag for reuse later. If collecting a collocated QC sample, prepare the duplicate URG-2000 and sampling pump at this time (see steps 7.1.3-7.1.6).

7.1.7 Remove the Split Housing/Inlet portion of the URG cartridge (Figure 1) and place it in the plastic bag. Now the face of the PUF plug is exposed. Remove red end cap from the outlet end of the housing (Figure 1). Connect the URG-2000 outlet to the 5/16" Tygon tubing that is connected to the inlet of the sampling pump mentioned in 7.1.3. Secure both tubing attachments with a zip tie (Figure 2).

7.1.8 Hook a horizontal clamp assembly to the upright post of the ring stand (Figure 2). Place the sampling box next to the base of the ring stand. Attach the URG sampler to the clamp with the open inlet facing down (Figure 2). URG-2000 inlets should be located 75 cm above the floor. The passive samplers will be attached to the same ring stand on the same bar as the URG sampler.

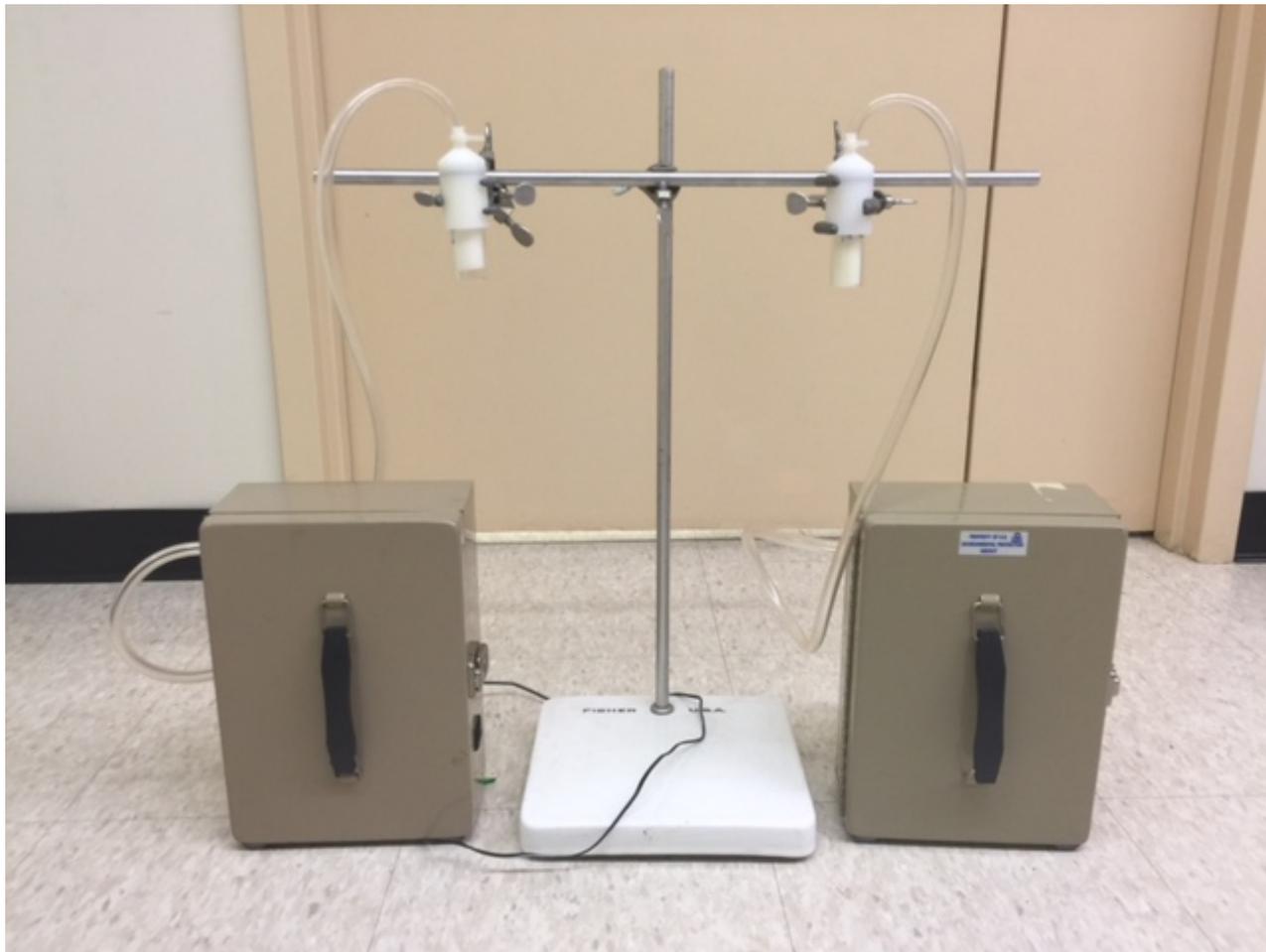


Figure 2. Shows the completed assembly with position of collocated pump assembly for the collection of the duplicate QC sample. In addition, note the downward direction of the URG open-faced inlets.

7.2 CALIBRATION

7.2.1 Activate the pump contained in the protective sampling box by turning the ON/OFF switch on the power strip to the ON position. Record the start date and time on the sample collection sheet.

7.2.2 Connect the flow meter to the open faced cartridge inlet using the flow rate adapter (Figure 3). The flow rate adapter, connected in-line to the flow meter, simply slides onto the glass housing of the open faced cartridge prior to calibration procedures.

7.2.3 Press the On button to turn on the flow meter and an initializing screen will display. Press and hold the Read button until a reading starts, then release. This will begin an automatic continuous read session. The display will indicate the current flow reading (shown as Flow on the left upper corner of the LCD screen), average flow reading up to 10 readings (shown as Avg on the left bottom corner of the LCD screen), and number of readings up to 10 times. The flow rate should be established in the 3.9-4.1 L/min range. If the flow rate is outside this range, adjust the bypass valve (labeled as “FLOW ADJ”) on the sampling pump to bring it back into the proper range by turning clockwise for higher

flow rate and counterclockwise for lower flow rate (Figure 4).

7.2.4 Once the flow rate is set in the proper range, let the pump run for 2 min. Press and hold the Read button on the flow meter to initiate multiple readings (refer to 7.2.3), then release. Record the average flow measurement (the average flow value of the 10 readings as provided as a readout on the device) and sample ID on the sample collection record.

7.2.5 Repeat steps 7.2.1-7.2.4 in section 7.2 for collocated sampling pumps.

7.2.6 Remove the flow meter from the cartridge inlet.

7.2.7 Latch and lock the metal sampling box.

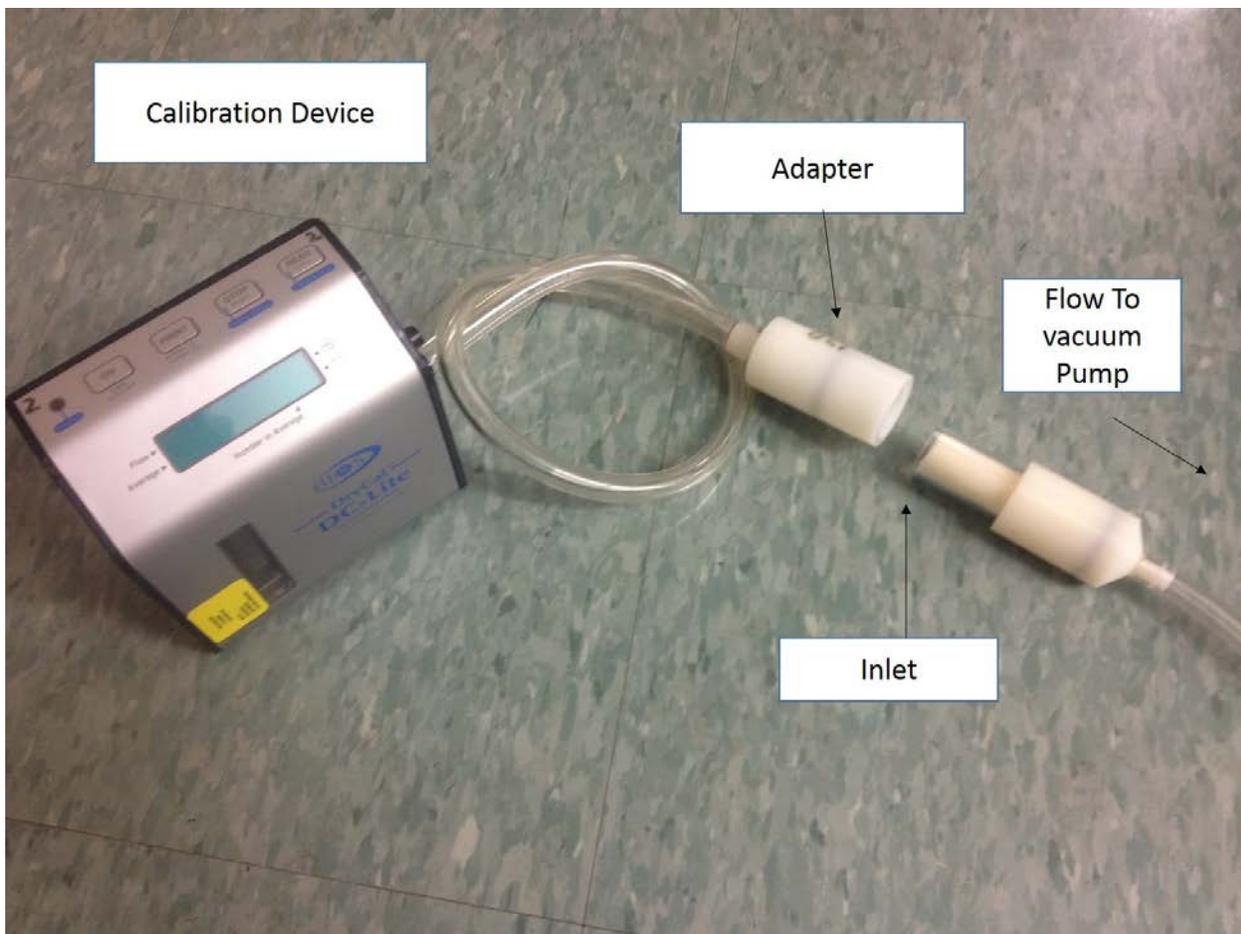


Figure 3. Shows the flow rate adapter (a modified inlet) in line between the calibration device and the vacuum pump (not shown). NOTE: This photo is for illustrative purposes only. The flow rate should be calibrated while the URG cartridge is clamped to the ring stand.

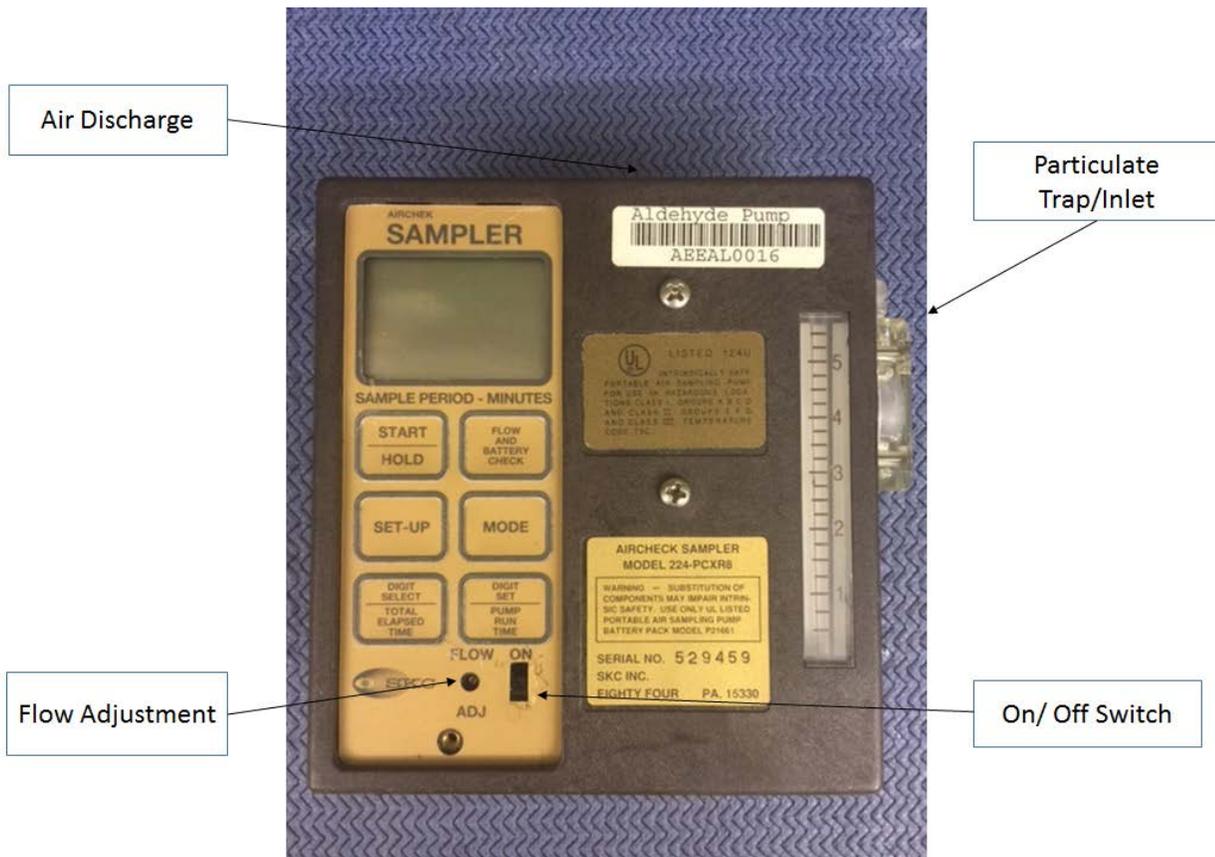


Figure 4. Shows SKC pump with labeling of key parts.

7.3 PROCEDURE TO TERMINATE SAMPLING

7.3.1 After the 5-day sampling period, the field staff (using nitrile gloved hands) will reconnect the flow meter to the inlet of the cartridge. No adjustments to the pump is required at this step and only flow estimates are collected. The average flow measurement (average flow value in 10 readings) will be recorded on the sample collection sheet. See step 7.2.4.

7.3.2 Turn off the sample pump at the ON/OFF switch on the power strip. Record the sample end date and time on the sample collection sheet.

7.3.3 Replace the Split Housing/Inlet from the plastic bag onto the URG-2000 cartridge and place the red plastic end caps on both ends (inlet and outlet) of the cartridge. Place a self-adhesive, previously prepared label on the URG sample housing. The identifying label should include the unique sample code and the collection date.

7.3.4 Using the aluminum foil that was previously removed from the cartridge prior to sampling, wrap

the cartridge in aluminum foil (Figure 5). Place the aluminum foil wrapped cartridge in a zip-top plastic bag.

7.4 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.4.1 Samples will be transported from the sampling location in a cooler with ice packs.

7.4.2 Samples will be stored under freezer conditions (no higher than -4°C) until they are shipped to the EPA Laboratory in Research Triangle Park, NC.

7.4.3 For transport to the EPA laboratory, samples will be packed with dry ice in an insulated shipping container and shipped via next day air.

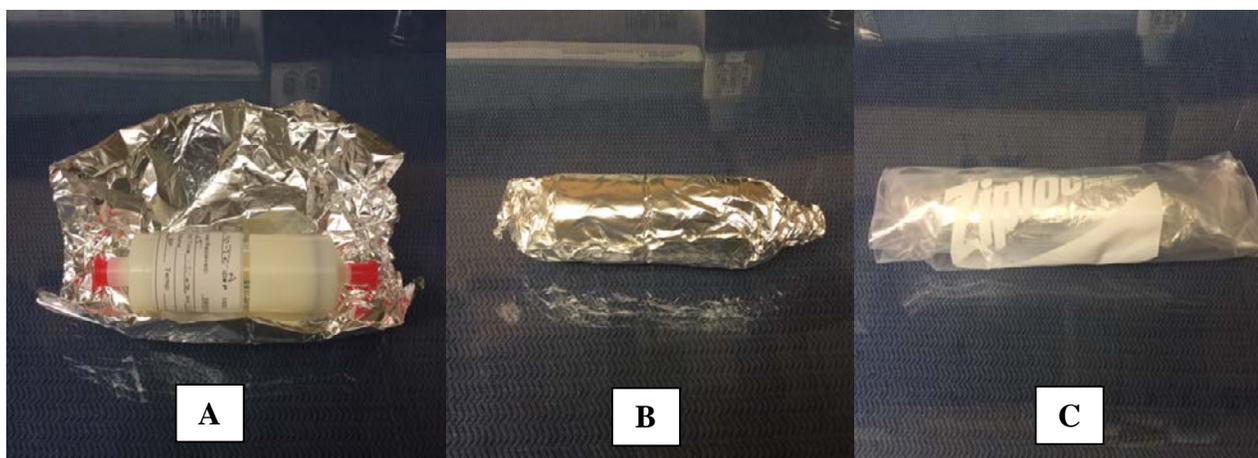


Figure 5. Capped URG Cartridge sample is placed into original foil (A), wrapped tightly (B) and placed into closed zip-top bag (C) for transport and storage at reduced temperatures.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the active air samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, flow calibration information (at initiation of sampling and following sampling), location and description of the sampler location, the date and time sampling began and ended, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at*

Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB), field duplicate (FD), and field spike (FS) samples will be prepared and used (see Quality Assurance Project Plan (QAPP) section *1.4.2.1 Indoor Air – Active* and *Table 5. Sample QC on per household basis*). Field blanks, duplicates, and spikes shall constitute 5-10% of the active air samples collected or no less than three of each type over the total duration of the study. For storage, shipping, analysis and quantitation procedures, field blank, duplicate, and spike samples will be prepared and treated in the same manner as the active air samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of a clean polyurethane foam filled glass tube taken to the field in its respective container which will remain unopened and returned to the EPA laboratory. (Do not attach to pump.)

9.3 FD are used to estimate sampling and laboratory analysis precision. The FD samples will be collocated to the sampling media, ring stand and pumps used to collect field samples (Fig. 2).

9.4 FS will be deployed to assess recovery of target analytes from the air sampling media under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to a clean PUF plug which is stored in a sealed glass container or in its respective URG-2000 housing. If the sample is contained in the URG-2000 housing, then prepare the QC spike similar to a field sample (Figure 4). The QC sample is transported to the field and returned with the field collected samples, undergoing the same conditions as all other collected samples.

9.5 A minimum of three FB, FD, and FS should be included with the active air samples shipped to the EPA laboratory in RTP, NC.

10.0 REFERENCES

J. C. Chuang, C. Lyu, Y-L Chou, P. J. Callahan, M. Nishioka, K. Andrews, M. A. Pollard, L. Brackney, C. Hines, D. B. Davis, and R. Menton, "Evaluation and Application of Methods for Estimating Children's Exposure to Persistent Organic Pollutants in Multiple Media." EPA/600/R-98/164a (Volume I), 1999.

SOP: EMAB-165.0
Alt ID: GHS-001
Date: June 14, 2016
Page: 13 of 14

HEASD SOP EMAB—008.1E (CTEPP 2.12), Version 1, Standard Operating Procedure (SOP) for the Collection of Fixed Site Indoor and Outdoor Air Samples for Persistent Organic Pollutants.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A. Sample Collection Record for Active Air Sample

EPA Pilot Study Add-On to the Green Housing Study Active Air Sample			
Participant ID:		Sample ID:	
Collection Start Date:	___ / ___ / ___	Collection Start Time:	____:____ am/pm
Collection Stop Date:	___ / ___ / ___	Collection Stop Time:	____:____ am/pm
Flow Start:	_____ Average L/min	Flow Stop:	_____ Average L/min
Location of sampler:			
Description of sampler location area:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix II. SOP for Collection of Indoor Air Samples using Passive Samplers

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Indoor Air Samples Using Passive Samplers

Number: EMAB-166.0

Effective Date: 11/10/2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-002

SOP Steward

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Date:

For Use by QA Staff Only:

SOP Entered into QATS:

_____ Initials

_____ Date

Standard Operating Procedure (SOP) for Collection of Indoor Air Samples using Passive Samplers

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting fixed site indoor air samples using passive air samplers to measure for selected pesticides and consumer product active ingredients for the EPA pilot study add-on to the Green Housing Study (GHS). This is suitable for the collection of chemicals present in the vapor phase.

2.0 SUMMARY OF THE METHOD

This procedure is used for the collection of air samples to measure for selected pesticides and consumer product active ingredients using two different passive air samplers. Both Carbopack X sorbent tubes and silicone bands will be co-located with an active air sampling pump (clipped to a stand beside the active sampling cartridge). Silicone band samplers will also be placed on the index child and sibling during the 5 day sampling period. After the 5 day period, the Carbopack X tubes are capped and placed back into their protective tubes. The silicone band samplers are removed from the sampling stand, index child and sibling, and are placed into individual appropriately labelled amber glass jars. All samples are then transported to the field team facility. At the field team's facility, the silicone band samples are stored in a freezer until transfer to the EPA Laboratory. The Carbopack X tubes are stored in a VOC-free environment at room temperature and will be shipped to the EPA lab as soon as possible for analysis.

3.0 DEFINITIONS

Passive air sampler – A device for capturing gaseous agents (analytes) that relies on the unassisted molecular diffusion of those agents through a diffusive surface onto an adsorbent rather than on actively moving air through a filter using a pump.

SOP – Standard Operating Procedure

GHS – Green Housing Study

QA/QC – Quality Assurance/Quality Control

RTP – Research Triangle Park

COC – Chain-of-Custody

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

FD – Field Duplicate

FS – Field Spike

4.0 CAUTIONS

4.1 Passive samplers must be sealed tightly in their containers after sample collection is completed.

4.2 For Carbopack X tubes, the following precautions should be taken.

- 4.2.1 The operator should handle the tubes and caps only while wearing clean cloth or nitrile gloves so that the tubes do not become contaminated with body oils, hand lotions, perfumes, etc.
- 4.2.2 To maintain sample integrity, labels should not be attached to the tubes, and ink markings should not be made on the tubes.
- 4.2.3 Only combined (one-piece) PTFE ferrules should be used with the 0.25-in. brass storage caps as other types of ferrules might not seal adequately or might score the tube.
- 4.2.4 A CapLok tool should be used to tighten the brass fittings one-quarter turn past finger tight so that they are neither too tight nor too loose.
- 4.2.5 The laboratory area in which the tubes are handled should be free of VOCs to prevent any possibility of contamination.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will purchase the passive samplers, filled with sorbent where applicable, and ship to the field team for sampling.

5.2 The field coordinator will receive the passive air sampling materials from EPA and keep records of receipt and distribution in their field record book. The field coordinator will distribute sampling materials to the field staff. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff along with any additional quality control sample materials. Upon collection of passive air samples, the field coordinator will be responsible for returning the samples with their sample collection records and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 Field staff will be responsible for set-up of passive air samplers in the field, placing (or instruction on placement) of the silicone band samplers on the index child and sibling and clipped on a stand next to the active sampler, and instructing the participants in regards to wearing the silicone bands as well as answering any questions that may arise. The field staff will be responsible for implementing the appropriate quality assurance/quality control (QA/QC) action plans for field blanks. The field staff will be responsible for entering relevant information on the sample collection record sheet for each sample and for removing the samplers from sampled locations.

6.0 MATERIALS AND EQUIPMENT

6.1 Sampling tube holder for 2 co-located sampling tubes (U.S. EPA)

6.2 Supelco FLM Carbopack X deactivated 89-mm stainless steel TD tube part no. 28686-U, passivated stainless steel diffusive sampling tubes fitted with 0.25-in. brass Swagelok fittings with combined (one-piece) PTFE ferrules) (Sigma-Aldrich Co. LLC, St. Louis, MO)

6.3 Diffusive sampling caps (part no. L4070207, PerkinElmer)

6.4 CapLok tool (part no. C-CPLOCK, Markes International)

6.5 Silicone Bands (<https://24hourwristbands.com/shop/custom-silicone-wristbands/blank-wristbands>)

6.6 Sampling Stand (ring stand, 24"-36") with 15-20" crossbar and sample clips

6.7 Zip ties (6"-10") and a wire cutter (or similar) for cutting the zip tie

6.8 Disposable nitrile gloves

6.9 Adhesive label

6.10 Amber glass jars, 2 oz. (IChem Part # 340-0060 or equivalent)

6.11 Participant Record and Instruction Book

6.12 Sample collection record sheet and Declarations Form

6.13 Cooler

6.14 Ice packs (chilled)

7.0 PROCEDURES

Samplers will be deployed on Day 1 of the home visit and will be collected at the end of the 5 day sampling period. The samplers will be located on the sampling stand using the attached clips in an elevated, out-of-the-way area in the child's main play area. Co-locate passive samplers with the active air sample collection cartridge (Figure 1). Procedures are described for both the Carbopack X tubes and the silicone bands.



Figure 1. Passive samplers clipped onto the sampling stand.

7.1 Carbopack X Tubes

7.1.1 Remove the shipping canisters from the cooler. See SOP ECAB-152.1 (Appendix C) section 9.0 for details on how tubes are shipped to the field location.

7.1.2 Unpack the tubes from the shipping canister by opening the lid of the can with a flathead screwdriver or paint can opener if necessary.

7.1.3 Remove the foam pieces from the top of the can, and remove the bound inner unit of tubes from the can.

7.1.4 Check the tubes one by one, verifying that the glass vials are not cracked, that the caps are on the glass vials, and that the brass tube end caps are still in place on the tubes. In addition to tubes to be used for collection of field samples and duplicates, a shipment may also contain spare tubes for use in case a tube is compromised and field blank(s) and field spike(s). The field operator may want to segregate the QA samples (FBs and FSs) from the tubes to be used for sample collection so that endcaps are not inadvertently removed from the QA samples at any point in the deployment process.

7.1.5 Inspect all diffusion caps prior to use. Do not deploy any diffusion caps that have rust present, are missing screens, or have debris on the screens. Spare diffusion caps are provided in every shipment and should be used in these instances. Rusted or compromised caps should be returned by field staff to the VOC laboratory along with notes detailing concerns or problems regarding suspect diffusion caps.

7.1.6 List any observations on the field monitoring data and sample collection record sheet (Appendix A) that accompanied the tube shipment. If any of the tubes have brass end caps that have slipped off or if the glass vials are broken or cracked, the field operator should select a different tube for field

deployment. (Note: Since the glass vials provide secondary containment, if a situation arises where all of the spare diffusive sampling tubes are used, then a tube can be selected for which the glass vial was broken or cracked. However, this information must be recorded on the field monitoring data sheet.)

7.1.7 While wearing clean cloth or nitrile gloves, uncap the glass vial and check the vial cap to be sure that the Teflon liner and septum are in place. Replace if necessary.

7.1.8 Using tweezers or forceps, remove the two protective Teflon tubing strips one strip at a time so as not to crack or break the glass vial (Figure 2).



Figure 2. Removing protective Teflon tubing strips.

7.1.9 Remove the diffusive sampling tube from the vial, as shown in Figure 3, and perform the tug test explained here to ensure that the brass storage end caps are not loose. Before storing, before and after shipping, and before and after sample collection, the brass end caps on the sorbent tubes should be checked for tightness by tugging simultaneously on each of the end caps in opposite directions to verify that the tubes are properly sealed. (Note: If an end cap is found to be loose, the operator should select another tube for sample collection and report this information on the field monitoring COC sheet that arrived with the tube shipment.)



Figure 3. Removing the sample tube from the vial.

7.1.10 Next remove the brass storage end caps of the sampling tubes only. Do not uncap the field blanks and field spikes. Use the CapLok tool to loosen the end cap from the grooved end of the tube (Figure 4). Place the open-end tool on the nut and the closed-end tool on the end cap and twist to loosen and slide the fitting off the tube.

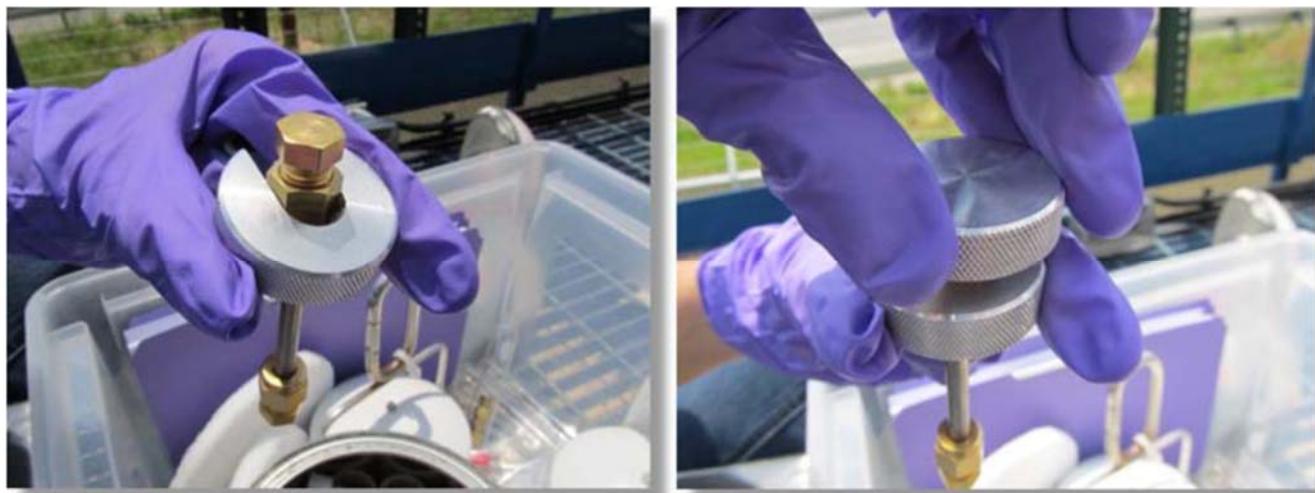


Figure 4. Loosening the end cap with the CapLok tool. Open-end tool on the nut (left), closed-end tool over end cap (right)

7.1.11 Place a diffusive sampling cap on the grooved end of the tube, pressing firmly to ensure that the cap is properly seated (Figure 5). The caps have a double O-ring seal that needs to be secured before sampling. This is most easily done by placing the cap on a flat surface and pushing the sampling end of the tube gently but firmly onto the diffusion cap.

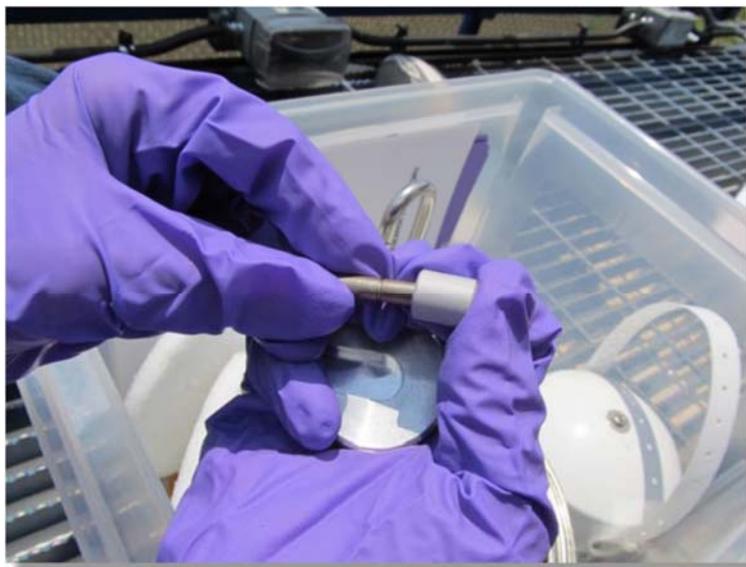


Figure 5. Securing the diffusive sampling cap on the grooved end of the tube.

7.1.12 Install the sampling tubes in the tube holder on the sampling stand with the diffusive end cap facing down (Figure 6). For the configuration shown here, the tube must fit firmly in the groove on the holder and a zip tie must be used to secure the tube to the tube holder. Alternatively, Velcro may also be used.

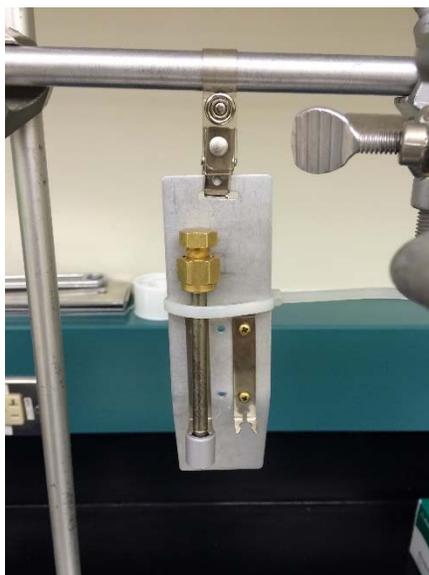


Figure 6. Sampling tubes installed on tube holder with diffusive cap facing down.

7.1.13 Record the sampling tube numbers on the sample collection sheet (Appendix A). For each tube,

place one of the preprinted sample ID labels on the sample collection sheet and the other on the glass culture tube.

7.1.14 Record the start time and additional sampling details on the sample collection sheet.

7.1.15 Place the protective Teflon tubing chip and strips and brass storage end cap (as applicable) back into the glass storage vial and cap the vial.

7.1.16 At the end of the sampling cycle, remove the sampling tube from the tube holder. The zip tie, if used, can be cut using wire cutters to facilitate removal (Figure 7).



Figure 7. Removing the zip tie with wire cutters.

7.1.17 Remove the diffusive sampling cap and seal the tube with the brass storage end cap using the CapLok tool to tighten the brass fittings one-quarter turn past finger tight so that they are neither too tight nor too loose, perform the tug test to check end cap tightness and place the tube in the glass vial with the appropriate sample ID label.

7.1.18 Record the stop time and additional sample collection data on the sample collection sheet.

7.1.19 Prepare the tubes for return shipment to the laboratory according to the procedure outlined in section 7.3.1. Field staff can also refer to the “Field Procedure for Diffusive Sample Collection Using Carbopack X Sorbent Tubes – Deployment and Shipping” in Appendix C of SOP ECAB-152.1. A laminated version of this procedure will be shipped to field sites prior to the start of a study. A YouTube video detailing tube deployment activities can also be requested to assist with field staff training.

7.2 Silicone Band

7.2.1 Bands Co-Located With Active Samplers

7.2.1.1 Remove a silicone band from the glass jar.

7.2.1.2 Clip the silicone band samplers on the sampling stand (Figure 8).

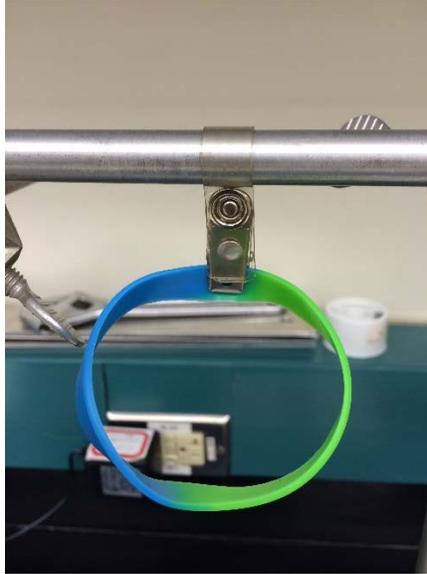


Figure 8. Silicone band clipped on the sampling stand.

7.2.1.3 Re-cap the jar and save for sample retrieval. Record the sample ID and start time and date on the sample collection sheet.

7.2.1.4 After the 5 day sampling period, return the band to the amber jar and place a sample ID label on the jar.

7.2.1.5 Record the stop time and date on the sample collection sheet.

7.2.2 Bands Used as Personal Samplers

7.2.2.1 Remove a silicone band from the glass jar for each participant.

7.2.2.2 With assistance from the caregiver, place a silicone band on the wrist or ankle of both the index child and sibling depending on how well the band fits the wrist. On young children, it may be preferable to place the band on the ankle where it is less likely to fall off. Record the start time and date on the sample collection sheet.

7.2.2.3 If the child is not available, instruct the caregiver on correct placement and to deploy the band as soon as possible, recording the time in the Participant Instruction and Record Book.

7.2.2.4 Instruct the participants to not remove the bands for the entire 5 day sampling period. This includes times when sleeping, swimming and bathing. If the band is removed, have the participant document the time and reason it was removed in the Participant Instruction and Record Book.

7.2.2.5 After the 5 day sampling period, return the band to the amber jar and place a sample ID label on the jar.

7.3 HANDLING AND PRESERVATION (FIELD STAFF)

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.3.1 Carbopack X tubes

7.3.1.1 To prepare the sorbent tube shipment to the laboratory, check to see that the Teflon tubing chip is in the bottom of each glass vial to prevent the sorbent tube from bouncing around and possibly breaking the glass and place the sorbent tube into the glass vial.

7.3.1.2 Use tweezers/forceps to insert two Teflon tubing strips into each glass vial beside the sorbent tube to prevent the sorbent tube from bumping the sides of the glass vial and cracking or breaking the glass.

7.3.1.3 Screw the vial cap onto the glass vial after checking the vial cap to be sure that the liner and septum are in place. Replace with a spare liner or septum if necessary.

Note: Be sure that all tubes from a deployment period are included in the shipment – field samples and duplicates, unused spare tubes, field blanks and field spikes, and that sheets documenting each tube in the shipment (even unused tubes) are prepared and included in the return shipment. All diffusion caps should be returned as well – both used and unused and these should be segregated and labelled appropriately.

7.3.1.4 Place the glass vial(s) into the metal can(s) loaded with cardboard protection sleeves to cushion the glass vials. Insert the piece of foam that is cut roughly the size of a cardboard sleeve into the metal can to ensure that the protection sleeves fit snugly inside the metal can. Place the center tube holder insert into the middle of the can.

7.3.1.5 Place the two pieces of round foam in the top of the metal can and seal the metal can with the lid.

7.3.1.6 Place the metal cans in the same shipping box or container that they were originally shipped in and fill the container with bubble wrap or other packaging material to cushion the contents.

7.3.1.7 Fill out the COC form and return it along with the field data sheets in this shipment. *Note:*

Make a photocopy of these documents for retention at the field office prior to shipping. Seal the box securely for shipment, attach the return shipping label for delivery, and be sure that the package will not be in transit over a holiday or weekend.

7.3.2 Silicone Bands

7.3.2.1 Silicone band samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2.2 The silicone band samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.

7.3.2.3 For transport to the EPA laboratory, silicone band samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the passive air samples, the sample collection information to be recorded will include the following, at a minimum: the sample ID, the participant ID, the date and time of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). For all Carbopack X tubes, the tube serial number must be recorded on the COC forms. Other relevant information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit #; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 - 58 - B 1001 - V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

Field blanks and field spikes will be prepared by the EPA lab and sent to the field team as documented

in the SOP *EMAB-185.0, Storage and Shipping of Multimedia Samples* for the EPA pilot study add-on to the Green Housing Study.

9.1 Field blank (FB), field duplicate (FD), and field spike (FS) samples will be prepared and used (see QAPP section *1.4.2.2 Indoor Air – Passive* and *Table 5 Sample QC on per household basis*). Field blanks, duplicates, and spikes shall constitute 5-10% of the passive air samples collected. For storage, shipping, analysis and quantitation procedures, field blank, duplicate, and spike samples will be prepared and treated in the same manner as the passive air samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of a clean sampler taken to the field in its respective container which will remain unopened and returned to the laboratory.

9.3 FD are used to estimate sampling and laboratory analysis precision. The FD samples will match as best possible the sampling location, time, and duration to create a matched pair for direct comparison.

9.4 FS will be deployed to assess recovery of target analytes from the air sampling media under the same storage and transportation conditions as the field samples. FS will be prepared in the EPA laboratory by adding known amounts of target compounds to a clean passive sampler, shipped to the field, and returned to the EPA laboratory without being opened.

9.5 At least one FB, FD, and FS for each type of sampler should be included with each batch of air samples shipped to the EPA laboratory in RTP, NC.

10.0 REFERENCE

SOP ECAB-152.1 Standard Operating Procedure for Carbopack X Sorbent Tube Handling: Field Deployment and Shipping

Silicone Wristbands as Personal Passive Samplers, Steven G. O'Connell, Laurel D. Kincl, and Kim A. Anderson, *Environmental Science & Technology*, 2014, 48 (6), 3327-3335

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015

Appendix A. Sample Collection Record for Silicone Band Passive Air Samples

EPA Pilot Study Add-On to the Green Housing Study Passive Air Sample – Silicone Band			
Participant ID:		Sample ID:	
Collection Start Date:	___ / ___ / ___	Collection Start Time:	___:___ am/pm
Collection Stop Date:	___ / ___ / ___	Collection Stop Time:	___:___ am/pm
Location of passive air samplers (room/personal):			
Description of sampler location area:			
Field Staff Initials & Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			

Appendix B. Sample Collection Sheet for Carbopack X Tubes

FIELD MONITORING DATA AND COC SHEET									
		Deployment		Recovery					
Study Name:		Date							
Tube Batch#:		Operator							
				Sample Chain of Custody					
				Shipped to EPA, RTP		Received & Stored at EPA, RTP		Analyzed	
Sample ID Code	Tube No.	Start Time	Stop Time	Initials	Date	Initials	Date	Initials	Date
		Field notes:							
		Receipt notes:							
		Analysis notes:							
		Field notes:							
		Receipt notes:							
		Analysis notes:							
		Field notes:							
		Receipt notes:							
		Analysis notes:							
		Field notes:							
		Receipt notes:							
		Analysis notes:							

SOP: EMAB-166.0
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Page: 17 of 17

Appendix C. SOP ECAB 152.1: Standard Operating Procedure for Carbopack X Sorbent Tube
Handling: Field Deployment and Shipping

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory

Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

**Title: Standard Operating Procedure for Carbopack X Sorbent Tube
Handling: Field Deployment and Shipping**

Number: ECAB-152.1

Effective Date:

SOP was Developed

In-House

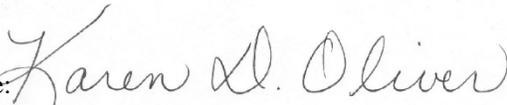
Extramural

Alternative Identification: Carbopack X Field Deployment

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Date: 9/29/2015

Approval

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Signature:

Date:

Concurrence*

Name:

Title:

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

*Optional field
NERL-SOP.2(11/2005)

Standard Operating Procedure for Carbopack X Sorbent Tube Handling: Field Deployment and Shipping

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1.0 Scope and Application

This standard operating procedure (SOP) describes sample handling techniques for Carbopack X sorbent tubes that are used for diffusive sample collection of volatile organic compounds (VOCs) in ambient air. Direction is provided for field deployment and shipping.

2.0 Summary of Method

Conditioned tubes are sealed with 0.25-in. brass Swagelok caps with combined PTFE ferrules and are stored in a refrigerator until needed. Prior to sending sorbent tubes to the field, the tubes are sealed in glass culture tubes with Teflon-lined caps. The culture tubes are then placed in protective sleeves in a metal can and stored in a refrigerator until the time of shipment. In the field, the Carbopack X tubes are fitted with diffusive sampling caps and deployed for sampling for a designated time period. Samples are then retrieved and prepared for return shipment to the analytical laboratory where they are analyzed according to ECAB-154.1, "Standard Operating Procedure for Desorbing Volatile Organic Compounds from Carbopack X Sorbent Tubes Using the PerkinElmer TurboMatrix ATD," and ECAB-151.1, "Standard Operating Procedure for Determination of Volatile Organic Compounds Desorbed from Carbopack X Diffusive Sampling Tubes Using the Agilent 6890N/5975 GC-MSD."

3.0 Definitions

COC	chain of custody	mL	milliliter
DI	deionized	o.d.	outer diameter
DQO	data quality objective	PE	PerkinElmer
FEP	fluorinated ethylene propylene	PTFE	polytetrafluoroethylene
h	hour	PVC	polyvinyl chloride
i.d.	inner diameter	QAPP	quality assurance project plan
in.	inch	SOP	standard operating procedure
min	minute	VOC	volatile organic compound

4.0 Health and Safety Warnings

Glass vials might occasionally break during shipment. The field and laboratory staff should exercise caution when packing and unpacking the glass vials from the shipping containers.

5.0 Cautions/Interferences

- 5.1** The operator should handle the tubes and caps only while wearing clean cloth or nitrile gloves so that the tubes do not become contaminated with body oils, hand lotions, perfumes, etc. When the cloth gloves are washed, perfumed detergent or dryer sheets should not be used as this could lead to contamination of the tubes during handling.
- 5.2** To maintain sample integrity, labels should not be attached to the tubes, and ink markings should not be made on the tubes (see section 9.4).

- 5.3 Only combined (one-piece) PTFE ferrules should be used with the 0.25-in. brass storage caps as other types of ferrules might not seal adequately or might score the tube.
- 5.4 A CapLok tool should be used to tighten the brass fittings one-quarter turn past finger tight so that they are neither too tight nor too loose.
- 5.5 Although uncommon, sorbent material can sometimes “dribble” from a tube, most likely due to an improperly installed retaining screen inside the tube. Laboratory and field personnel should watch for any significant loss of sorbent material when end caps are changed. Any suspect tube should be removed from the sampling/analysis queue.
- 5.6 The tubes should be shipped in an airtight, non-VOC-emitting container to minimize their exposure to possible contaminants in the ambient air.
- 5.7 The refrigerator in which the tubes are stored should be free of solvents and chemicals to prevent possible contamination of the tube samples.
- 5.8 The laboratory in which the tubes are handled should be free of VOCs to prevent any possibility of contamination.
- 5.9 Depending on the data quality objectives (DQOs) for a particular study, a diffusion cap can be dedicated for use with a particular sorbent tube and cleaned at specified time intervals during the study in a vacuum oven at 40 °C to minimize any chance of buildup of contaminants on the diffusion cap.

6.0 Personnel Qualifications

Field study personnel should have experience handling sorbent tubes and collecting trace-level VOC samples using sorbent tubes.

7.0 Equipment and Supplies

Generally all equipment and supplies, excluding the VOC-free refrigerator and vacuum oven, are shipped to sampling sites in packaged field kits prepared by the VOC laboratory. The following equipment and supplies are needed:

- Refrigerator, VOC free
- Precision vacuum oven (model 19, Precision Scientific Inc., Chicago, IL)
- Supelco FLM Carbopack X deactivated 89-mm stainless steel TD tube for fenceline monitoring (part no. 28686-U, Sigma-Aldrich Co. LLC, St. Louis, MO) and passivated stainless steel diffusive sampling tubes packed with Carbopack X and fitted with 0.25-in. brass Swagelok fittings with combined (one-piece) PTFE ferrules (*Note:* All tubes must be conditioned before use. See ECAB-153.0 [CDS 9600] or ECAB-156.0E [Markes TC-20] for tube conditioning procedures.)
- Diffusive sampling caps (part no. L4070207, PerkinElmer [PE] Life and Analytical Sciences, Shelton, CT)
- 4.5-in. o.d. PVC caps for sheltering tubes in the field (available at local hardware stores)
- Tube holders for mounting sampling tubes in PVC shelters during field sampling (wire hangers or custom-machined part, U.S. EPA)
- Clean cloth gloves (part no. 11-462-26B, Thermo Fisher Scientific, Waltham, MA) or nitrile gloves (part no. 55091, 55092, or 55093, Kimberly-Clark, Neenah, WI)

- CapLok tool (part no. C-CPLOK, Markes International, Pontyclun, UK)
- Glass culture tubes (part no. 45066A-25150, Kimble/Kontes, Vineland, NJ)
- Unlined caps for glass culture tubes (custom order, Scientific Specialties Service, Inc., Randallstown, MD)
- Septer Seal Septa and Teflon liners for culture tube caps (part no. B69800-24 and B68800-24, Scientific Specialties Service, Inc.)
- Clean, unused gallon metal cans with lids (part no. 5501-07B, SKS Bottle and Packaging, Inc., Mechanicville, NY)
- Cooler (example part no. 5248-5286-5296, Coleman Outdoor Products, Inc., Wichita, KS)
- Foam inserts for coolers (Instapack quick foam packaging, Sealed Air Corporation, Danbury, CT)
- Rex protective sleeves, 1.021-in. i.d. by 5.750-in. length with wall thickness of 0.125 in. (custom order, Yazoo Mills, Inc., New Oxford, PA)
- Closed cell foam, assorted thicknesses
- Assorted tools, including but not limited to metal forceps or tweezers, wrenches of various sizes, and paint can openers
- Fluorinated ethylene propylene (FEP) Teflon tubing, 0.25-in. o.d.
- 600-mL Pyrex beaker (part no. 1000)
- Tech Wipes, three-ply tissue (part no. 350/50353, Horizon Industries, Tyler, TX)
- Slider zip bags, 5- × 7-in. 3 mil (model #S-14444, 100/carton, Uline, Pleasant Prairie, WI) – used to store and ship the diffusion caps
- Slider zip bags, 16- × 16-in. 3 mil (model #S-10835, 100/carton, Uline, Pleasant Prairie, WI) – to contain COC forms, data sheets, and labels when shipped to the field)
- Aluminum foil, food service grade (Western Plastics, Calhoun, GA) – for baking out diffusion caps
- Cable ties
- Bubble wrap
- Paper tape and sample ID labels
- Shipment chain of custody (COC) forms (Appendix A), field data and COC sheets (Appendix B), and laminated field deployment procedure (Appendix C)

8.0 Quality Control/Quality Assurance

- 8.1** Before storing, before and after shipping, and before and after sample collection, the brass end caps on the sorbent tubes should be checked for tightness by tugging simultaneously on each of the end caps in opposite directions to verify that the tubes are properly sealed.
- 8.2** Never pack diffusion caps inside incoming or outgoing metal canisters containing sorbent tubes because the canisters are stored in the refrigerator. Condensation that forms on diffusion caps upon removal from the refrigerator makes the caps susceptible to rust, which in turn compromises their integrity.

9.0 Procedures

9.1 Preparing Tubes for Shipment to or from the Field

1. Prior to preparing a shipment of tubes, wash all metal shipping cans that will be used to ship samples with soap and deionized (DI) water. Wipe them down with Tech Wipes and let them air dry.
2. Insert a short piece of 0.25-in. FEP Teflon tubing as a protective chip in the bottom of a culture tube to prevent the sorbent tube from bouncing around and possibly breaking the glass. Perform the tug test (see section 8.1), and then place the sealed sorbent tube into the glass culture tube.
3. Use forceps or tweezers to insert two 5.5-in. pieces of 0.25-in. o.d. FEP Teflon tubing strips into the culture tube beside the sorbent tube to prevent the sorbent tube from bumping the sides of the culture tube and cracking or breaking the glass (Figure 1).

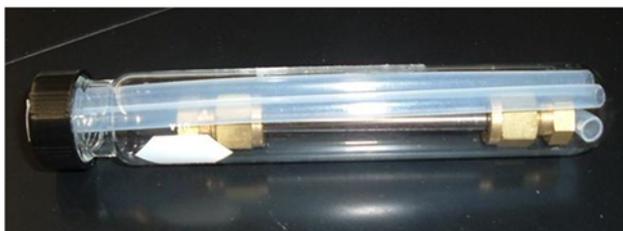


Figure 1. Protective Teflon tubing inserted into culture tube.

4. Screw the cap, which is fitted with a septum and Teflon liner, onto the culture tube.
5. Line the bottom of a metal can with a 6-in.-diameter foam disk, and then insert 19 cardboard protective sleeves (1.021-in. i.d. by 5.75-in. length) to cushion the glass vials.
6. Place the culture tube(s) into the metal can inside the protective sleeves, and insert a piece of foam cut roughly the size of a cardboard sleeve into the metal can to ensure that the protection sleeves fit snugly inside the can, as shown in Figure 2. (*Note:* The seven protection sleeves in the center are preassembled with bubble wrap and bound together with cable ties, which allows for easy insertion or removal of the outer band of tubes, as shown in Figure 3.)



Figure 2. Tubes packed in metal can.



Figure 3. Tubes packed in inner protective sleeve.

7. Place two pieces of round foam (6.5-in. and 6-in. diameter) in the top of the metal can and seal the metal can with the lid (Figure 4).
8. Store the metal can in a refrigerator at 4 °C until the tubes are to be sent to the field for sample collection or back to the laboratory for analysis.

9.2 Preparing Diffusion Caps for Shipment to the Field

Laboratory personnel should clean diffusion caps and inspect them for rust and overall integrity prior to each shipment to the field using the following procedure. Rusted or compromised caps should be discarded by VOC laboratory staff. When handling diffusion caps, both field and laboratory personnel must wear cotton or nitrile gloves at all times to ensure the caps are not contaminated with body oils. Use the following procedure to clean the diffusion caps:

1. Place no more than 22 diffusion caps into a clean 600-mL beaker.
2. Add approximately 250 mL of DI water to the beaker to completely submerge the caps.
3. Gently swirl the contents of the beaker manually for approximately 5 min, alternating between a clockwise and a counterclockwise motion to ensure that any debris or contaminant buildup is rinsed from the diffusion caps.
4. Pour out the spent DI water from the beaker. (*Note:* A clean lint-free paper towel can be used to hold the diffusion caps in place while pouring out the spent DI water.)
5. Remove the diffusion caps and place them screen-side up onto a clean piece of foil. Laying the diffusion caps screen-side up ensures no excess water pools inside the caps during the baking process.
6. Place the foil holding the clean diffusion caps into a vacuum oven at 40 °C to bake out overnight.
7. Upon removal of the diffusion caps from the oven, inspect each cap for rust and overall integrity before storing with other clean diffusion caps.
8. Store the clean caps in a covered environment such as clean foil or zip-lock bags.

9.3 Packaging and Shipping Tubes

1. Retrieve the conditioned sorbent tubes, previously packed in glass vials as described in Section 9.1, from the refrigerator.
2. Use paper tape on the outside of the appropriate glass vials to clearly label “Field Spikes” and “Field Blanks” (Figure 5). (Refer to the project-specific QAPP to determine how field spikes and field blanks are prepared and used for the current project.)



Figure 4. Metal shipping can with foam pieces and lid.



Figure 5. Labeled field blank and field spike.

3. Record the tube number of all outgoing tubes in the designated laboratory notebook.
4. Record the conditioning date next to each outgoing tube and the exposure dates next to the field spikes.
5. Make a copy of the laboratory notebook page to be sent to the field (Figure 6).

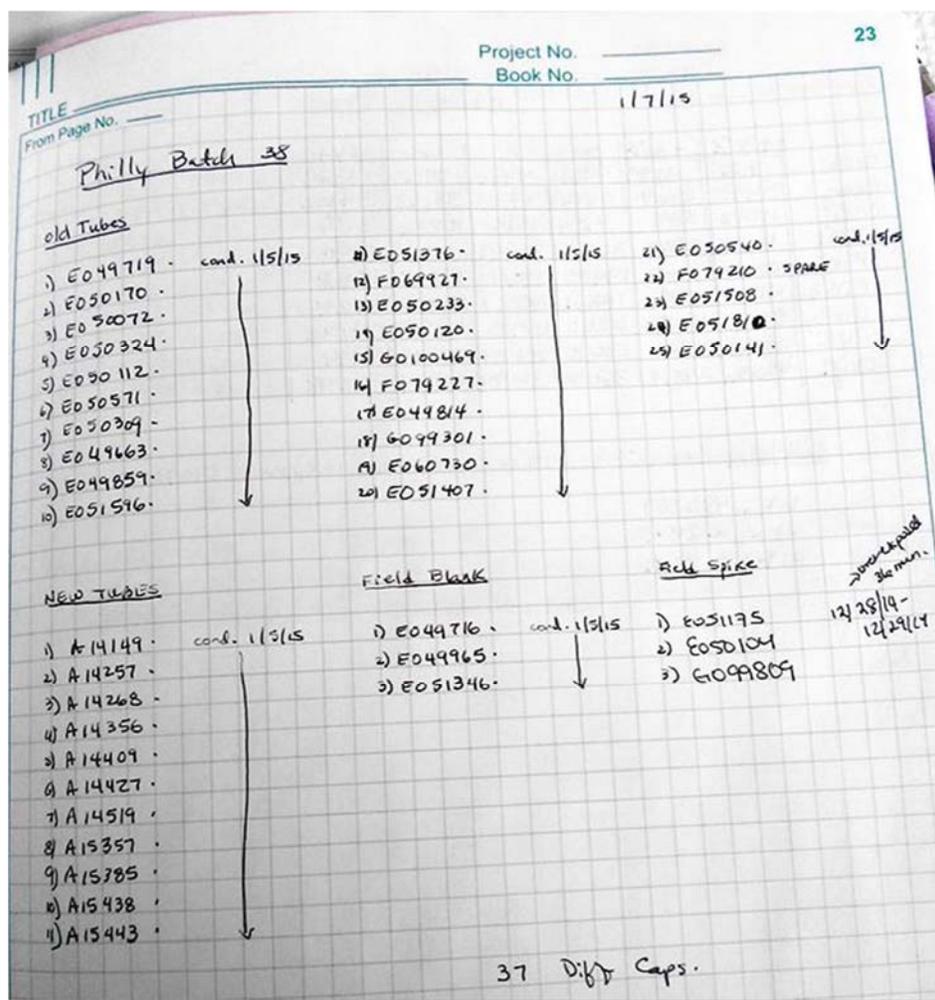


Figure 6. Laboratory notebook entries.

6. Ensure that any tubes that were removed from the metal canisters are repackaged as described in section 9.1 and that all procedures in section 9.1 for packing and sealing the metal cans are followed.
7. Pack the diffusion caps in a zip-lock bag and place it inside a metal shipping canister.
8. Place the metal cans in coolers (three cans per cooler) fitted with foam packaging, as shown in Figure 7.

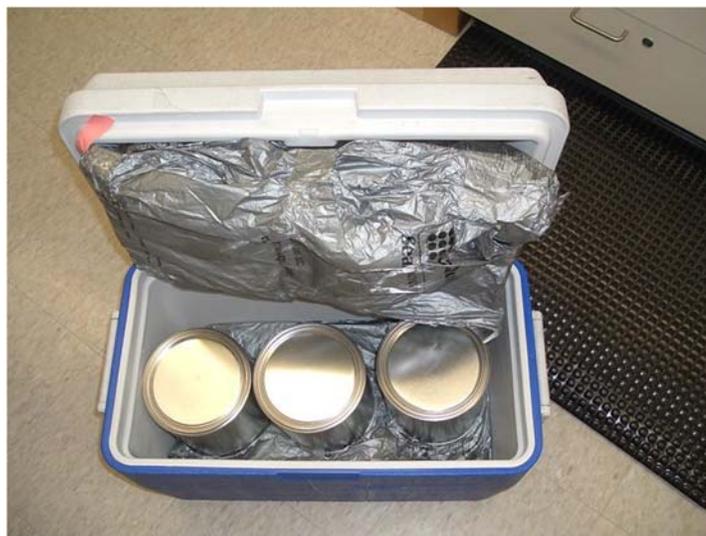


Figure 7. Metal cans packed in cooler for shipment.

9. Pack field data sheets and COC forms, preprinted sample ID labels, and return shipping labels inside a large (16 in. × 16 in.) zip-lock storage bag and place inside the cooler before shipping. Be sure to sign and date the COC form prior to shipping the cooler to the field.

9.4 Diffusive Sampling

1. Remove the shipping canisters from the cooler.
2. Unpack the tubes from the shipping canister by opening the lid of the can with a flathead screwdriver or paint can opener if necessary.
3. Remove the foam pieces from the top of the can, and remove the bound inner unit of tubes from the can.
4. Check the tubes one by one, verifying that the glass vials are not cracked, that the caps are on the glass vials, and that the brass tube end caps are still in place on the tubes.
5. Inspect all diffusion caps prior to use. Do not deploy any diffusion caps that have rust present, are missing screens, or have debris on the screens. Spare diffusion caps are provided in every shipment and should be used in these instances. Rusted or compromised caps should be returned by field staff to the VOC laboratory along with notes detailing concerns or problems regarding suspect diffusion caps.
6. List any observations on the field monitoring data and COC sheet (Appendix B) that accompanied the tube shipment. If any of the tubes have brass end caps that have slipped off or if the glass vials are broken or cracked, the field operator should select a different tube for field deployment. (**Note:** Since the glass vials provide secondary containment, if a situation arises where all of the spare diffusive sampling tubes are used, then a tube can be selected for which the glass vial was broken or cracked. However, this information must be recorded on the field monitoring data sheet.)

7. If the tubes have been stored in a refrigerator, allow them to come to room temperature (~ 30 min to 1 h) before using them for sample collection.
8. While wearing clean cloth or nitrile gloves, uncap the glass vial and check the vial cap to be sure that the Teflon liner and septum are in place. Replace if necessary.
9. Using tweezers or forceps, remove the two protective Teflon tubing strips one strip at a time so as not to crack or break the glass vial (Figure 8).



Figure 8. Removing protective Teflon tubing strips.

10. Remove the diffusive sampling tube from the vial, as shown in Figure 9, and perform the tug test (section 8.0) to ensure that the brass storage end caps are not loose. (*Note:* If an end cap is found to be loose, the operator should select another tube for sample collection and report this information on the field monitoring COC sheet that arrived with the tube shipment.)



Figure 9. Checking tightness of brass caps on sampling tubes.

11. Next remove the brass storage end caps of the sampling tubes only. Do not uncap the field blanks and field spikes. Use the CapLok tool to loosen the end cap from the grooved end of the tube (Figure 10). Place the open-end tool (A) on the nut (A) and the closed-end tool (B) on the end cap and twist to loosen and slide the fitting off the tube.

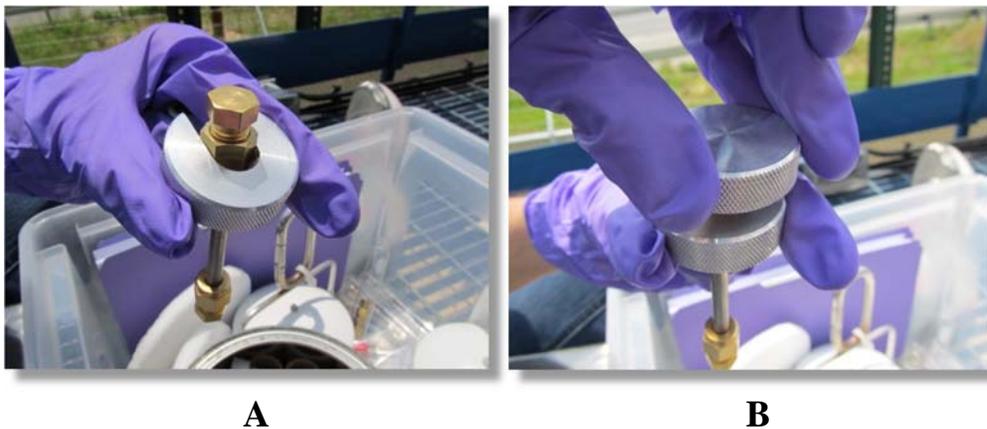


Figure 10. Loosening the end cap with the CapLok tool.

12. Place a diffusive sampling cap on the grooved end of the tube, pressing firmly to ensure that the cap is properly seated (Figure 11). The caps have a double O-ring seal that needs to be secured before sampling. This is most easily done by placing the cap on a flat surface and pushing the sampling end of the tube gently but firmly onto the diffusion cap.

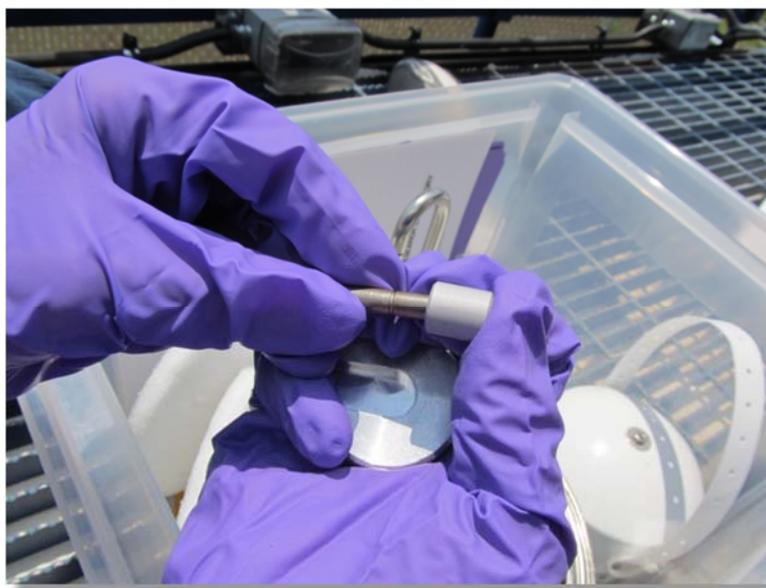


Figure 11. Securing the diffusive sampling cap on the tube.

13. Install the sampling tubes in the tube shelter with the diffusive end cap facing down (Figure 12). For the configuration shown here, the tube must fit firmly in the groove on the holder that is installed in the tube shelter, as shown in Figure 13.



Figure 12. EPA-designed sampling shelter for regional monitoring programs.

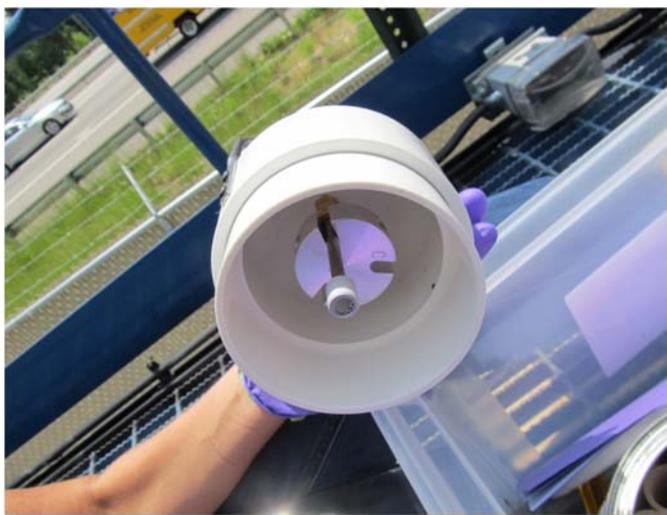


Figure 13. Securing the sampling tube in the sampling holder.

14. Install the field blanks and field spikes in the same manner as the sampling tubes but with both of the brass storage end caps sealing the tube. (*Note:* This procedure might vary depending on the design of a particular study; some studies might specify that the field blanks and field spikes travel to the field and then are returned to the field office for storage during the sampling period rather than being deployed with the sampling tubes.)

15. Record the sampling tube numbers on the field monitoring data sheet (Appendix B). For each tube, place one of the preprinted sample ID labels on the field data sheet and the other on the glass culture tube.
16. Record the tube number(s) of the field blank(s) and field spike(s) on the field data sheet. For each tube, place one of the preprinted sample ID labels on the field data sheet and the other on the glass culture tube.
17. Once the appropriate number of tubes for a particular study, as outlined in the quality assurance project plan (QAPP), have been secured in the tube shelter, secure the shelter to the monitoring site sampling stand using a carabineer and cable ties to prevent the tube holder from falling (Figure 14). (*Note:* This is only one example of how the tube shelter can be mounted. Use of alternative mounting hardware selected as appropriate for a particular field site is acceptable.)
18. Record the start time and additional sampling details on the field monitoring data sheet. An example data sheet entry is shown in Figure 15. (*Note:* The sample ID code will vary according to the design of a particular field study.)



Figure 14. Tube holder attached to sampling stand.

FIELD MONITORING DATA AND COC SHEET											
Study Name:		Deployment		Recovery		Sample Chain of Custody					
Philadelphia		Date		Date		Shipped to EPA, RTP		Received & Stored at EPA, RTP		Altered	
Tube Batch:		Operator		Operator		Initials		Date		Initials	
3P		EE		EE		EE		2/21/2015		1-30-15	
Sample ID Code	Tube No.	Start Time	Stop Time	Initials	Date	Initials	Date	Initials	Date		
Philadelphia Study	E050309	8:44 AM	11:20 AM	EE	2/21/2015	EE	1-30-15				
01-38-SA-PHL		Field notes:									
Field Sample		Receipt notes:									
		Analysis notes:									
Philadelphia Study	E049663	8:44 AM	9:20 AM	EE	2/21/2015	EE	1-30-15				
01-38-D1-PHL		Field notes:									
Field Duplicate 1		Receipt notes:									
		Analysis notes:									
Philadelphia Study	E051376	9:43 AM	10:04 AM	EE	2/21/2015	EE	1-30-15				
02-38-SA-PHL		Field notes:									
Field Sample		Receipt notes:									
		Analysis notes:									
Philadelphia Study	E051596	9:46 AM	10:04 AM	EE	2/21/2015	EE	1-30-15				
02-38-D1-PHL		Field notes:									
Field Duplicate 1		Receipt notes:									
		Analysis notes:									

Figure 15. Enter sample ID code and tube number on data sheet.

19. Place one of the preprinted sample ID labels on the field data sheet next to its corresponding tube number, and place the duplicate sample ID label on the glass vial containing the tube with that number for shipment to the laboratory.
20. Place the protective Teflon tubing chip and strips and brass storage end cap (as applicable) back into the glass storage vial and cap the vial.
21. At the end of the sampling cycle, remove the diffusive sampling cap and seal the tube with the brass storage end cap using the CapLok tool and place the tube in the glass vial with the appropriate sample ID label.
22. Record the stop time and additional sample collection data on the field data sheet.
23. Record tube numbers for any spare or unused tubes. In the comments section of the field data sheet indicate if the tube was a spare and/or was unused. (**Note:** All tubes shipped from the field must be documented on the field data sheet by field staff.)
24. Prepare the tubes for return shipment to the laboratory according to the procedure outlined in section 9.1. Field staff can also refer to the “Field Procedure for Diffusive Sample Collection Using Carbopack X Sorbent Tubes – Deployment and Shipping” in Appendix C. A laminated version of this procedure will be shipped to field sites prior to the start of a study. A YouTube video detailing tube deployment activities can also be requested to assist with field staff training (see section 11.1).

10.0 Data and Records Management

- 10.1** Details of the tube deployment (start/stop times, date, sample ID code, tube serial number, and operator’s name) are listed on the field deployment data sheet (Appendix B).
- 10.2** Data sheets are returned to the laboratory with samples for analysis where they are placed in designated three-ring binders.
- 10.3** For large studies, field staff might be asked to populate electronic versions of field data sheets and send them to the laboratory manager.
- 10.4** Information from the field data sheets is combined with the corresponding analytical data in either Excel format or by a data manager as appropriate to a particular study and outlined in that study’s QAPP.
- 10.5** Laboratory staff should refer to Field Packing Checklist (Appendix D) and Incoming Field Sample Checklist (Appendix E) when preparing outgoing field shipments and checking in incoming field samples.

11.0 References and Supporting Documentation

11.1 YouTube Video

A supplemental YouTube video has been created to assist with training field staff on tube deployment. Those wishing to view the video will need to provide an email address to the VOC laboratory manager. Laboratory staff will add received email addresses to the list of approved viewers of the video and inform field staff members when the video is accessible via email.

11.2 References

- ECAB-151.1. 2015. Standard Operating Procedure for Determination of Volatile Organic Compounds Desorbed from Carbopack X Diffusive Sampling Tubes Using the Agilent 6890N/5975 GC-MSD. U.S. Environmental Protection Agency, National Exposure Research Laboratory.
- ECAB-153.0. 2013. Standard Operating Procedure for Carbopack X Sorbent Tube Conditioning using CDS Analytical Model 9600 Tube Conditioners. U.S. Environmental Protection Agency, National Exposure Research Laboratory.
- ECAB-154.1. 2015. Standard Operating Procedure for Desorbing Volatile Organic Compounds from Carbopack X Sorbent Tubes Using the PerkinElmer TurboMatrix ATD. U.S. Environmental Protection Agency, National Exposure Research Laboratory.
- ECAB-156.0E. 2013. Standard Operating Procedure for Carbopack X Sorbent Tube Conditioning Using the Markes International Model TC-20 Sample Tube Conditioner. U.S. Environmental Protection Agency, National Exposure Research Laboratory.

Appendix A: Shipment Chain of Custody Form

 CHAIN-OF-CUSTODY DECLARATION FORM					
GENERAL INFORMATION	Monitoring Project: _____ Date of Initiation: _____ Sample Collection Date: _____ Total No. of Samples for Custody Transfer: _____ <p style="text-align: center;">THE FOLLOWING TRANSFER OF CUSTODY DECLARATIONS APPLY TO ALL SAMPLES THAT ARE LISTED DIRECTLY IN EACH DESCRIPTION AND ONLY TO THOSE SAMPLES.</p>				
TO THE FIELD	DESCRIPTION OF SHIPMENT (Number and type of samples covered by this declaration): _____ _____ _____ _____ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time) </td> <td style="width: 50%; padding: 5px;"> Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time) </td> </tr> <tr> <td colspan="2" style="padding: 5px;"> Condition Acceptable? ___ Yes ___ No </td> </tr> </table>	Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time)	Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time)	Condition Acceptable? ___ Yes ___ No	
Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time)	Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time)				
Condition Acceptable? ___ Yes ___ No					
FROM THE FIELD	DESCRIPTION OF SHIPMENT (Number and type of samples covered by this declaration): _____ _____ _____ _____ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time) </td> <td style="width: 50%; padding: 5px;"> Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time) </td> </tr> <tr> <td colspan="2" style="padding: 5px;"> Condition Acceptable? ___ Yes ___ No </td> </tr> </table>	Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time)	Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time)	Condition Acceptable? ___ Yes ___ No	
Relinquished by : _____ (Print Name and Organization) _____ (Signature, Date and Time)	Received by: _____ (Print Name and Organization) _____ (Signature, Date and Time)				
Condition Acceptable? ___ Yes ___ No					

Appendix B: Passive Tube Field Monitoring Data and Chain of Custody Sheet

FIELD MONITORING DATA AND COC SHEET										
Study Name:		Deployment	Recovery							
Date										
Tube Batch#:		Operator		Sample Chain of Custody						
				Shipped to EPA, RTP		Received & Stored at EPA, RTP		Analyzed		
Sample ID Code	Tube No.	Start Time	Stop Time	Initials	Date	Initials	Date	Initials	Date	
	Field notes:									
	Receipt notes:									
	Analysis notes:									
	Field notes:									
	Receipt notes:									
	Analysis notes:									
	Field notes:									
	Receipt notes:									
	Analysis notes:									
	Field notes:									
	Receipt notes:									
	Analysis notes:									

Appendix C: Field Procedure for Diffusive Sample Collection Using Carbopack X Sorbent Tubes – Deployment and Return Shipping

Health and Safety Warnings

Glass vials containing sorbent tubes might occasionally break during shipment. Exercise caution when packing and unpacking the glass vials from the shipping containers.

Cautions/Interferences

- The operator should handle the sorbent tubes and diffusion caps only while wearing clean cloth or nitrile gloves.
- Labels should not be attached to the sorbent tubes, and ink markings should not be made on the sorbent tubes. Markers should not be used around the tubes.
- A CapLok tool should be used to tighten the brass storage caps one-eighth to one-quarter turn past finger tight so that they are neither too tight nor too loose. A tug test should be performed to ensure adequate end cap tightness.
- The laboratory/area in which the sorbent tubes are stored and handled should be free of VOCs to prevent any possibility of contamination.

Procedure

1. Diffusive Sample Collection

Note: Steps 1 through 5 are usually performed in the lab/office upon receipt of the sampling media to facilitate organization of the field deployment of the sorbent tubes. Steps 6 through 15 are performed in the field.

1. Unpack the sorbent tubes from the shipping can by opening the lid of the can with a screwdriver as necessary, remove the foam pieces from the top of the can, remove the inner tube holder of glass vials from the can, and remove the remaining glass vials from the shipping can if applicable.
2. Check in the sorbent tubes one by one by verifying that the glass vials are uncracked and that the caps are on the glass vials. Verify that the brass storage caps are still in place on the sorbent tubes and then check the tube serial number against the COC form. If any of the sorbent tubes have brass end caps that have slipped off or if the glass vials are broken, the operator should select a different tube for field deployment.
3. While wearing clean nitrile gloves, uncap the glass vial and remove the two Teflon tubing strips using tweezers, forceps, or small pliers one strip at a time so as not to crack or break the glass vial.
4. Remove the sorbent tube from the vial and perform the tug test to ensure the brass storage caps are not loose. If a problem is noted, choose a different tube for field deployment. Return the tube to the glass vial being sure that the protective Teflon chip is still on the bottom of the vial. Slide the Teflon strips into the glass vial, cap the vial, and place the glass vial holders in the shipping can. Repeat these steps for each sorbent tube that has been received and then place the foam pieces and lid on the can and seal.

5. Store the container(s) of sorbent tubes, tools, spare supplies, pens, diffusion caps, and a notebook containing the field data sheets in a storage box that can be transported easily to the field site.

Note: Perform the following steps at the field site beginning immediately prior to deployment of the Carbopack X tubes while wearing clean gloves and working steadily:

6. Following the procedures above, remove a sorbent tube from a glass vial and use a CapLok tool to loosen and remove the brass storage cap from the sampling end of the tube. Place the Teflon chip and strips, and brass storage cap (as applicable) back into the glass storage vial and cap the glass vial. Store the glass vial as appropriate.
7. Place a diffusion cap on the sampling end of the sorbent tube, pressing firmly to ensure that the cap is properly seated. There are two O-rings in the diffusion cap, and the operator will feel the sorbent tube slide across each O-ring in the diffusion cap until it is properly seated.
8. Slide the sorbent tube into a slot on the aluminum disk/block in the tube shelter with the diffusion cap facing down. Be careful to position the tube number facing out so the sides of the slot do not scratch the tube number.
9. Attach the appropriate field sample ID label to the field data sheet and record the sorbent tube serial number on the field data sheet.
10. Follow steps 7 through 9 for each sorbent tube to be deployed for sample collection.
11. Do not uncap the field blanks or field spikes, but instead hang them in place with both of the brass storage caps still sealing the sorbent tube. Attach the appropriate field sample ID label(s) to the field data sheet and record the sorbent tube serial number for the field blank(s) and field control(s) on the field data sheet. (*Note: This deployment procedure will depend on the design of a particular study; some studies might specify that the field blank(s) and field spike(s) travel to the field and then are returned to the field office for storage during the sampling period.*)
12. Once all sorbent tubes are positioned, mount the tube shelter as appropriate at the site. Record the start time and additional sampling details and/or comments on the sample data sheet.

Note: Perform the following steps at the field site at the end of the sampling cycle.

13. Remove the tube shelter from its location and remove each tube from the aluminum disk/block.
14. Working steadily with one sorbent tube at a time, remove the diffusion cap and seal the sorbent tube with the brass storage cap using the CapLok tool. Complete this step for all sorbent tubes. Next, perform the tug test to ensure end cap tightness. Place each sorbent tube in a glass vial with a protective Teflon chip in the bottom of the vial, cap the vial, and attach the appropriate field sample ID label to the glass vial. Verify that the field sample ID label and tube number on the vial match those recorded on the field data sheet. Record the stop time and any additional sample collection data on the field data sheet beside the appropriate field ID label/tube serial number.
15. Return all sorbent tubes and supplies to the storage box for return to the field office.

2. Shipment to the Laboratory

1. To prepare the sorbent tube shipment to the laboratory, check to see that the Teflon tubing chip is in the bottom of each glass vial to prevent the sorbent tube from bouncing around and possibly breaking the glass.
2. Use tweezers/forceps to insert two Teflon tubing strips into each glass vial beside the sorbent tube to prevent the sorbent tube from bumping the sides of the glass vial and cracking or breaking the glass.
3. Screw the vial cap onto the glass vial after checking the vial cap to be sure that the liner and septum are in place. Replace with a spare liner or septum if necessary.
4. Place the glass vial(s) into the metal can(s) loaded with cardboard protection sleeves to cushion the glass vials. Insert the piece of foam that is cut roughly the size of a cardboard sleeve into the metal can to ensure that the protection sleeves fit snugly inside the metal can. Place the center tube holder insert into the middle of the can.
5. Place the two pieces of round foam in the top of the metal can and seal the metal can with the lid.
6. Place the metal cans in the same shipping box or container that they were originally shipped in and fill the container with bubble wrap or other packaging material to cushion the contents.
7. Fill out the COC form and return it along with the field data sheets in this shipment. *Note:* Make a photocopy of these documents for retention at the field office prior to shipping.

Seal the box securely for shipment, attach the return shipping label for delivery, and be sure that the package will not be in transit over a holiday or weekend.

Appendix D: Field Packing Checklist for Laboratory Staff

It is helpful to perform these activities a week or two before the next shipment.

Activity	Performed
Count how many old and new tubes are in the fridge and ready for deployment. This will give you an idea of how many batches you might need to analyze this week to free up tubes for the next shipment.	<input type="checkbox"/>
Count how many glass vials and vial caps are currently available for field use.	<input type="checkbox"/>
Be sure you have enough coolers.	<input type="checkbox"/>
Make sure you have enough tubes for the field spike exposures. It is always a good idea to ask if there is a need for any additional field spikes outside the norm before starting the field spike exposures.	<input type="checkbox"/>
Check to see if you have enough hang tag packets for shipping the coolers. The sooner you know the better in case more need to be ordered.	<input type="checkbox"/>
Make sure you have enough protective Teflon strips and chips to pack into each vial. You might need to check incoming shipments stored in the fridge for extra Teflon strips/chips if you do not have enough for outgoing shipments.	<input type="checkbox"/>
Before you start packing, check to see if any additional sites have been added or if sites have been removed for each field location. It is also helpful to pass this information along to the staff member who is preparing the sample ID labels	<input type="checkbox"/>
Make sure you have enough clean diff caps. Write down how many you pack per shipment and inspect caps to ensure there is no rust or any missing/loose screens.	<input type="checkbox"/>
Always write down the tubes packed in each batch in the designated lab notebook. Include the exposure date for field spikes and lab controls and the conditioning dates for all other tubes packed.	<input type="checkbox"/>
QA packed shipments and any inventory forms that are shipped to ensure tube numbers are typed correctly. Templates for inventory sheets are on the desktop of the spare computer in D260 in the folder labeled "Packing Lists".	<input type="checkbox"/>
Always pack field spikes and field blanks in vials labeled with paper tape: "Field Spike", "Field Blank", or "Spare".	<input type="checkbox"/>
Store outgoing shipments on the top shelf on the right-hand side of the refrigerator.	<input type="checkbox"/>
Copy outgoing COC signature pages and tube inventory lists and store in designated field study COC binders.	<input type="checkbox"/>
Store all emails/correspondence relevant to a particular batch with copies of the COC.	<input type="checkbox"/>

Appendix E: Incoming Field Sample Checklist for Laboratory Staff

Activity	Performed
<p>Make sure all check-in notes, signatures, and date are recorded on the original COC in permanent waterproof black pen.</p>	<input type="checkbox"/>
<p>Sign and date the signature page of the COC as well as the boxes next to each received sample.</p>	<input type="checkbox"/>
<p>If any additional tubes are received that are not listed on the COC by field operators, record those tube numbers on the COC and initial/date receipt of those tubes as well.</p>	<input type="checkbox"/>
<p>In general one unused/unexposed tube is sent back with each shipment. This tube is considered the shipping blank.* Write "shipping blank" in the "Receipt Comments" section and assign the appropriate Sample ID to this tube on the COC in the box where the sample ID label is placed according to the format designated in the associated QAPP. Examples of recently used Sample ID number formats for shipping blanks are shown below:</p> <p><u>For Regional Shipping Blank/Spare Tube</u> Region-Site-Week-Type ##-99-##-SB Example: 06-99-12-SB Region 6, Site 99, Week 12, Shipping Blank Note: The designated site for the shipping blank sample is 99. The newly assigned sample ID should also be written on paper tape and placed on the vial that the tube is stored in.</p> <p><u>For Philly Shipping Blank/Spare Tube</u> Site-Week-Type-PHL 99-##-SB-PHL Example: 99-25-SB-PHL Site 99, Week 25, Shipping Blank, Philly Note: The designated site for the shipping blank sample is 99. The newly assigned sample ID should also be written on paper tape and placed on the vial that the tube is stored in.</p> <p>Label the glass vial with the shipping blank sample code before storing. *If multiple spare/unused tubes are shipped back, select only one as the shipping blank and assign an appropriate Sample ID. The remaining unused tubes should be conditioned prior to reuse.</p>	<input type="checkbox"/>
<p>Cross-check tube numbers and Sample IDs on the tubes against those on the COC.</p>	<input type="checkbox"/>
<p>Note any observations in the "Receipt Comments" section. The following are some suggestions of the info to enter so that everyone checking in samples is making the same types of check-in comments, which helps when flagging data in the database.</p> <ul style="list-style-type: none"> • "SE loose" – the sampling end cap on the grooved end of the tube is loose; tightened • "RE loose" – the rear end cap is loose; tightened 	<input type="checkbox"/>

Activity	Performed
<ul style="list-style-type: none"> • "Vial cracked" • "Cap off vial" • "SE end cap off"/ "SE end cap nut off" • "RE end cap off"/ "RE end cap nut off" • "Tube dirty" • "SE ferrule missing/RE ferrule missing" • "Tube number incorrect"; "Correct tube number is" • "Sample ID is incorrect"; "Correct sample ID is...." • "Tubes switched in vial; switched tubes to match COC" • "Tube invalid no analysis" 	
<p>Remove all protective Teflon tubing strips and chips to ensure they are available for the next outgoing shipments. If any strips or chips are dirty, they can be wiped off with lint-free Kimwipes, and in extreme cases can be rinsed with DI water and dried with house air. Never use solvents.</p>	<input type="checkbox"/>
<p>Remove white lined vial caps/black lined vial caps and replace them with white vial caps that are not shipment-ready before they are stored.</p>	<input type="checkbox"/>
<p>Set all tubes to the side that are considered invalid and will not be analyzed. These are usually tubes that are found on the ground. Inform the VOC lab manager of these tubes and verify that they will not be analyzed.</p>	<input type="checkbox"/>
<p>Store all checked-in tubes inside their glass vials, place them in a cardboard box, and place them in the fridge. Labels from the incoming canisters can be placed on the cardboard box to identify the samples in the box.</p>	<input type="checkbox"/>
<p>Remove used diffusion caps from incoming shipments and inspect caps for rust/loose mesh screens.</p>	<input type="checkbox"/>
<p>Remove any caps that have loose, rusted, or missing screens and report findings to the VOC lab manager.</p>	<input type="checkbox"/>
<p>Gently swirl diffusion caps in DI water for approximately 5 minutes. Note if diffusion caps are unusually dirty in the designated lab notebook. Drain water, place caps on foil, and bake overnight at 40 °C (0.5 oven setting).</p>	<input type="checkbox"/>
<p>Copy the COC after check-in is complete and place the original COC in the designated binder with any correspondence regarding that particular batch. Place the copy aside in the designated space so that the Excel tube tracking sheet can be updated. In addition, store a copy of the COC with the tubes that are refrigerated for future analysis.</p>	<input type="checkbox"/>
<p>Acknowledge receipt of all incoming shipments for the day and any important notes/findings in the designated laboratory notebook.</p>	<input type="checkbox"/>

Appendix III. SOP for Technician Collected House Dust Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Technician-Collected House Dust Samples

Number: EMAB-167.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-003

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

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Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

Standard Operating Procedure (SOP) for Technician-Collected House Dust Samples

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for field staff to collect house dust samples for the EPA pilot study add-on to the Green Housing Study (GHS). House dust samples will be collected from floors where the child may play or spend time. House dust will be collected using a forensic vacuum equipped with an in-line filter to collect and trap surface dislodgeable particles. The sampled area will be measured, marked, and recorded to ensure accurate documentation of the amount of available dust for chemical and biological analyses. Photos of the sampled area should be taken, if possible.

2.0 SUMMARY OF THE METHOD

This procedure will be used by field staff to collect house dust in the participant's homes in the EPA pilot study add-on to the Green Housing Study. The field staff will prepare for the sampling event by cleaning the forensic vacuum and identifying the area to be sampled. The field staff will then measure, mark and record the sampling area in the sample collection record (Appendix A). The forensic vacuum is then assembled and the area is vacuumed to collect a representative sample while collecting as much dust as possible from the area. The dust is then carefully transferred to an appropriately labelled amber jar with polytetrafluoroethylene (PTFE)-lined lid for transport and storage.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

PTFE – Polytetrafluoroethylene

QC – Quality Control

COC – Chain-of-custody

RTP – Research Triangle Park

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

4.0 CAUTIONS

4.1 Electrically-powered hand-held vacuums will be used to collect samples. The procedures employed must be performed in a manner to reduce the likelihood of generating airborne particulate matter into the immediate environment.

4.2 Disposable nitrile protective gloves will be worn during sample collection and handling to minimize dermal contact with the materials, and to avoid potential cross-contamination of samples.

4.3 Eye protection should be worn during sample collection.

4.4 Extension cords must be of sufficient gauge and length to minimize potential overload conditions. They must be laid/secured in such a manner so as not to present a trip hazard to others. Extension cords must not be used in areas where extensive foot traffic is expected to occur.

4.5 Field waste, such as used alcohol wipes and gloves, must be double bagged and clearly marked as "Waste". No liquid should be evident in the waste bag.

4.6 Photos should not include any humans.

4.7 There is likelihood that while performing this procedure, field staff collecting dust may experience dust exposure through inhalation. It is recommended that appropriate personal protective equipment (e.g., N95 respirator) be used per the field team's safety protocols.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the sample collection materials and deliver them to the field coordinator.

5.2 The field coordinator will receive the sample collection materials from EPA and keep records of receipt and distribution in their field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional quality control sample materials. The field coordinator will distribute the sample collection materials to the field staff. Upon collection of the dust sample, the field coordinator will be responsible for returning the samples with their sample collection and COC record sheets to the EPA laboratory in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the sample collection materials from the field coordinator, pre-cleaning sampling materials/equipment, collection of the dust sample, entering relevant information on the sample collection record sheet and/or in field record books, and returning collected dust samples to the field coordinator.

6.0 MATERIALS AND EQUIPMENT

6.1 Large and small polyethylene bags (zip-top or equivalent)

6.2 3M Trace Evidence Collection Vacuum (part # 4-3005 or equivalent) and pre-cleaned Trace evidence collection filters (Sirchie part# 619E2) (or equivalent)

6.3 Electrical tape (or equivalent) for sealing collection filters

6.4 25' extension cord

6.5 Disposable nitrile gloves

6.6 Plastic bags for field waste

6.7 Pre-packaged alcohol wipes

- 6.8 Sample collection record sheet
- 6.9 Sample ID label
- 6.10 Digital camera (optional)
- 6.11 25' metal tape measure
- 6.12 Wide tape (suggest ≥ 3 " masking tape or similar)
- 6.13 Velcro power cord retainers
- 6.14 Field record book(s)
- 6.15 Pen
- 6.16 Permanent marker (Sharpie or similar)
- 6.17 Knee pads (optional, field staff provided)
- 6.18 N95 respirator or similar (optional, field staff provided)
- 6.19 Ice packs (chilled)
- 6.20 Cooler

7.0 PROCEDURES

Follow the timelines for Day 5 to collect dust sample as shown in the Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study) Section 1.3.2 and Table 4.*

7.1 PREPARATION OF EQUIPMENT

Pre-Cleaning the Vacuum Hose & Unit (Field Staff Facility)

7.1.1 Between each use, the inside of the vacuum hose must be cleaned by disconnecting and holding in a U-shape. Run warm tap water into one end of the hose which should be held a few inches higher than the end where the water will exit. Expand the flexible tubing by hand during this procedure to get the areas inside the flexible coils clean. Allow the water to run through the hose for ~30 seconds and repeat by running water through the other end. If a large amount of dust build-up is observed that cannot be removed by washing with water, either a scrub brush or ultrasonic cleaner can be used to aid the cleaning process. Hang the hose vertically and allow to dry thoroughly before use (at least overnight).

7.1.2 Using a pre-packaged isopropanol wipe, remove any fibers, dust, hair, etc. from the surfaces of the unit.

7.1.3 Repack the hose in the vacuum box lid, close the box and secure the latches.

Onsite Preparation of Vacuum Unit (Participant's Home)

7.1.4 At the sampling location, open the 3M Trace Evidence Collection vacuum box by disengaging



Figure 1. Closed 3M Trace Evidence Collection vacuum box.

the two latches on the front of the box (Figure 1, latches highlighted by red arrows). Tip the lid back to expose the contents (Figure 2).



Figure 2. Open 3M Trace Evidence Collection vacuum box.

7.1.5 Lift the Velcro (indicated by blue arrow in Figure 2) holding the flap down in the lid portion of the box. Locate the pre-cleaned flexible hose (~33" in length) and remove it from the vacuum box. You may need to remove other contents to locate the hose.

7.1.6 Clean the interior and exterior of both the flexible hose ends with a pre-packaged isopropanol wipe. Set the hose in the lid of the vacuum box for later use. Used wipes should be discarded into a zip-top plastic bag used for field waste.

Preparation of Sample Collection Filters

7.1.7 Secure the ends of the sample collection filters with electrical tape (or a similar flexible tape) where the clear collection canister attaches to the white hose adapters. This will be performed at the EPA laboratory prior to shipment to the field staff facility.

7.2 SAMPLE COLLECTION PROCEDURE

Knee pads may be worn during these steps to improve field staff comfort during extended periods working on hands and knees. Knee pads must be cleaned with isopropanol wipes prior to use at the sampling site. Hose extenders may also be used to aid in sample collection as long as they are not used in front of the collection filter.

7.2.1 Identify the area where the sample will be collected. Since housing conditions may vary, collect samples in the following preferred areas. If little dust is collected, increase the sampling area by moving to the next preferred area.

1. Carpeted floor in the primary area where the child spends time.
2. Non-carpeted areas (including rugs) in the primary area where the child spends time.
3. Carpeted areas in another room where the child may spend time (child's or caregiver's bedroom, for example).
4. Non-carpeted areas where the child may spend time.

Collect from the largest area possible without moving furniture. Measure and demark the area (using wide tape, furniture, household objects, and/or walls) (Figure 3), and record the sampling area size and description in the sample collection form (Appendix A). If possible, take a digital photo of the area to be sampled.

IMPORTANT NOTE: Do NOT take photos with any participants or human subjects in the frame. If a photo contains any image of a person, it must be deleted immediately.



Figure 3. Marking and measurement of sampling area. Note photos do not include people.

7.2.2 Don personal protective equipment including a fresh pair of disposable gloves, eye protection (glasses or goggles), and respirator (if desired).

7.2.3 Remove the black sampling nozzle (Figure 4 left) and white forensic vacuum filter cassette (Figure 4 right) from their zip-top bags. Set these pieces on top of the empty zip-top bags.



Figure 4. Left: Black sampling nozzle. Right: White forensic vacuum filter cassette with red end caps removed.

7.2.4 Remove the red end caps from the white forensic vacuum filter cassette. Firmly grasp the center chamber to apply counter-pressure (Figure 5). *Do not hold the opposite short white tube while removing the end caps.* Also, be careful not to break the two red integrity seals. Doing so may disassemble the entire apparatus and waste the collection cartridge. Set the caps and the cassette on top of the zip-top bag that previously contained the filter.



Figure 5. Proper hand placement to remove red end caps from forensic vacuum filter cassette.

7.2.5 Remove the red cap covering the vacuum inlet, located on the left side of the 3M Forensics vacuum box (highlighted by light blue arrow in Figure 6). The cap is near the top and front of the bottom (not lid) portion of the box. Place the cap on top of the zip-top bag that previously contained the filter.



Figure 6. Left side of 3M Forensics vacuum showing cap covering vacuum inlet.

7.2.6 Remove the pre-cleaned flexible hose from the lid of the box and attach it to the vacuum inlet that was just uncovered.

7.2.7 Attach the filter to the flexible hose. Ensure that the cassette is attached in such a manner that the filter side (Figure 7) of the cassette is closest to the end of the flexible hose connected to the vacuum inlet. The filter end does not have a black gasket as seen in Figure 8.

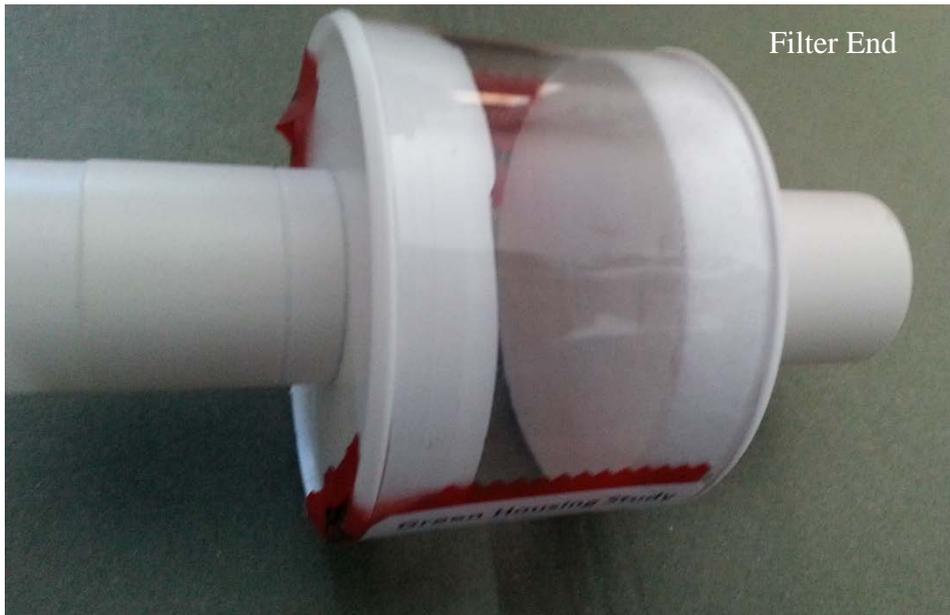


Figure 7. Filter end of the forensic vacuum filter cassette (without the black gasket).

7.2.8 Attach the black sampling nozzle to the white forensic vacuum filter. The open end (with black gasket, Figure 8) must be attached to the sampling nozzle. All of these components fit using insertion and compression fitting. Give each component a firm inward push to seat them together. It may be helpful to tape these connections. Set the assembled hose across the top of the box with the nozzle past the end of the box so it is not touching anything.

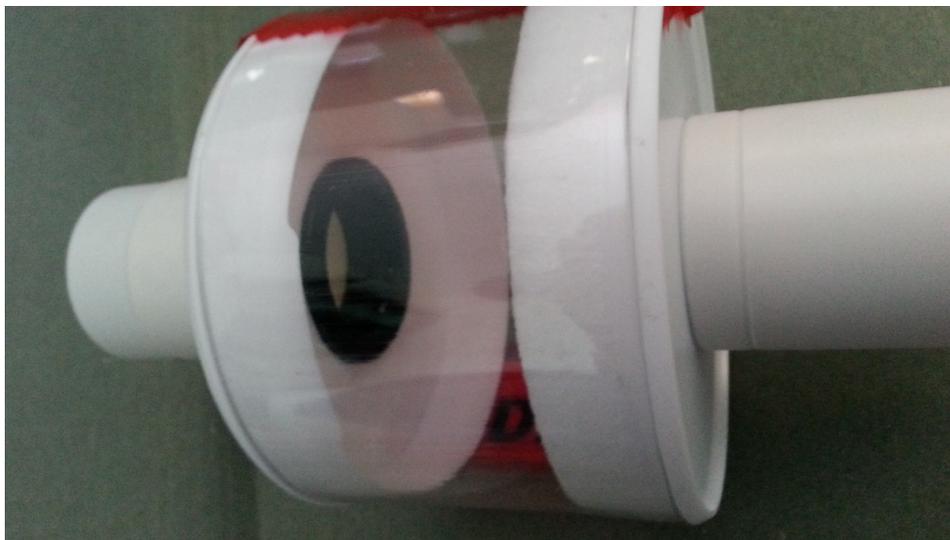


Figure 8. Open/non-filter end of the forensic vacuum filter cassette (with black gasket).

7.2.9 Remove the black power cord from the lid of the vacuum box. Plug the female end of the power cord into the box's power outlet, located on the right side of the 3M Forensics vacuum box (Figure 9). The power outlet is near the top and back of the bottom (not lid) portion of the box.

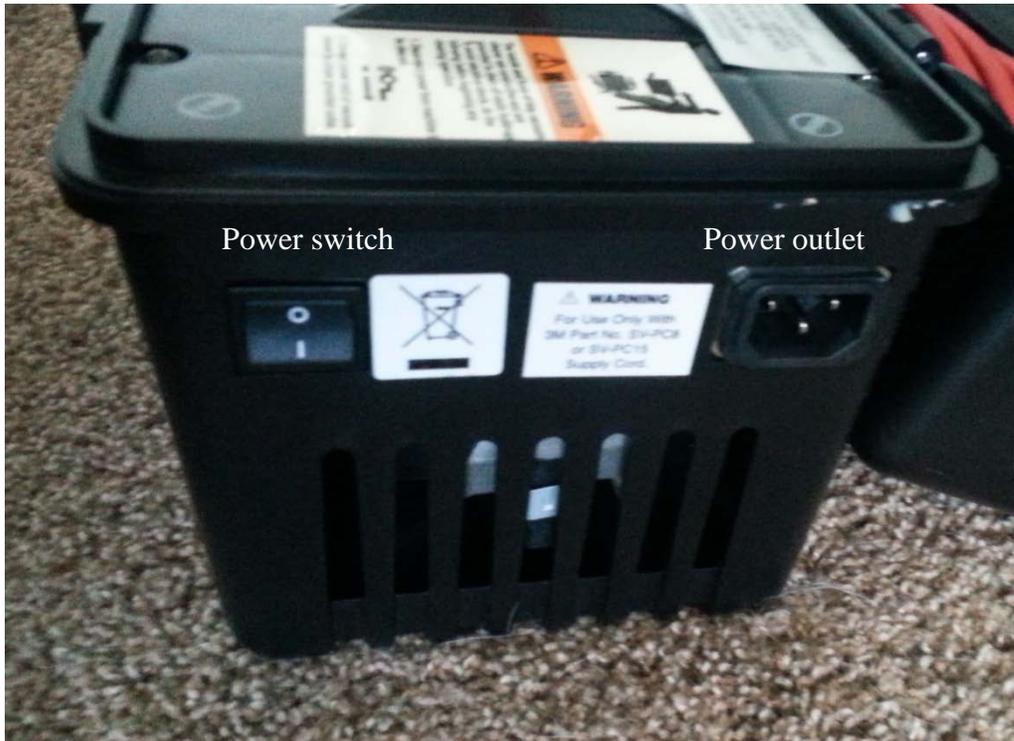


Figure 9. Right side of 3M Forensics vacuum showing the Power switch and Power outlet.

7.2.10 Plug the male end of the power cord into the wall with or without an extension cord. Secure the cord using wide tape in such a manner as to ensure it is not a trip hazard to those involved in the sampling event.

7.2.11 Point the exhaust from the vacuum (near the power cord) away from the area to be sampled to reduce the potential for exhaust air to disturb the sampling area.

7.2.12 Turn on the vacuum using the switch near the box's power outlet on the right side of the 3M Forensics vacuum box (Figure 9).

7.2.13 Firmly grasp the hose/cartridge connection and the black sampling nozzle and move it across the surface to be sampled (Figure 10). On carpeted surfaces, use the nozzle to agitate the surface by applying firm pressure and moving the nozzle quickly back and forth across the area in short strokes. Take care to ensure that the collection filter and nozzle remain firmly attached during this process.



Figure 10. Proper grasp of forensic vacuum filter nozzle and cassette for sampling.

7.2.14 In the event during sampling that the pitch of the unit's motor changes because of excessive pressure drop, install a new filter cartridge and continue with sample collection until you have completed the area of interest or sufficient dust has been collected. The white filter should be visibly grayed with dust accumulated (Figure 11). Make a notation in the field log/sample collection record that multiple cartridges were used in collecting the specimen.

7.2.15 Continue with the vacuum collection in the marked sampling area until a representative sample containing the maximum amount of fine particle dust has been collected (i.e., no additional dust appearing/accumulating in the filter cassette). The white filter should be visibly grayed with dust accumulated (Figure 11). Invert the nozzle into an upright position to facilitate the last of the dust being recovered and gently tap the nozzle to help accomplish this action.



Figure 11. Forensic vacuum filter cassette containing dust.

7.2.16 Turn off the vacuum system using the power switch (Figure 9) and keep the filter cassette in an upright position.

7.2.17 While keeping the cassette in an upright position, carefully remove the nozzle and place a red end cap over the exposed filter cassette opening.

7.2.18 Remove the vacuum filter cassette from the flexible hose and place the other end cap on the filter.

7.2.19 Remove any tape that was securing the hose/nozzle/cassette assembly. Dispose of tape in the field waste bag.

7.2.20 Place a sample label onto the vacuum filter cassette housing and place the filter into the inner/smaller zip-top bag. Discard the label backs into the field waste bag.

7.2.21 Gently force the excess air out of the polyethylene bag before sealing it.

7.2.22 Write the sample ID code (Section 8.0) on the outside of a secondary containment zip-top bag with a permanent marker.

7.2.23 Place the nozzle and the inner bag with filter cassette in the outer/larger secondary containment zip-top bag.

7.2.24 Remove the disposable gloves and place them in the field waste bag.

7.2.25 Immediately record the sample ID number on the Sample Collection Record sheet (Appendix A). Add the appropriate sample collection information to the Sample Collection Record. The sample location should be as descriptive as possible, and include the room of the house, and relative position of the sampling area within the room.

7.2.26 Unplug the vacuum (and/or extension cord) from the wall and the 3M Forensic vacuum box (Figure 9). Wind the cords and secure them with Velcro retainers.

7.2.27 Replace the vacuum inlet cap (Figure 6).

7.2.28 Repackage the cords and hoses inside the box lid, secure contents in the lid of the box with Velcro (Figure 2), close the lid, and fasten the two latches (Figure 1).

7.2.29 Remove any tape from securing cords or marking the sampling area. Place the tape into the field waste bag.

7.3 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.3.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2 Samples will be stored under freezer conditions (no higher than -4°C) and protected from light until they are shipped to the EPA Laboratory in Research Triangle Park, NC.

7.3.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the field staff collected house dust samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the measured

area sampled, the location sampled, the date and time of the sample collection, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.



9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 QC samples will consist of blank inline filters transported to the field where they will accompany field collected samples during transport procedures (see Quality Assurance Project Plan (QAPP) *section 1.4.2.3 Household Dust – Vacuum Bag and Technician Vacuum Samples* and *Table 5. Sample QC on per household basis*). Field blanks (FB) shall constitute 5-10% each of the technician vacuum samples collected.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of blank inline filters taken to the field in its container which will remain unopened and returned to the EPA laboratory along with the technician vacuum samples.

9.3 At least one FB should be included with each batch of technician vacuum samples shipped to the EPA laboratory.

10.0 REFERENCES

Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*, Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

3M, Trace Evidence Collection Vacuum Operating Instructions, 78-6970-5484-5 Rev B or newer, 1997

Appendix A: Sample Collection Record for a Technician Collected Dust Sample

EPA Pilot Study Add-On to the Green Housing Study Technician Collected Dust Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection Time:	____:____ am/pm
Measured Area(s) Sampled:			
Location(s) Sampled:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix IV. SOP for Participant Collected House Dust Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Participant Collected House Dust Samples

Number: EMAB-168.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-004

SOP Steward

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Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
PARTICIPANT COLLECTED HOUSE DUST SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting house dust samples from participant vacuum cleaners for the EPA pilot study add-on to the Green Housing Study (GHS). Samples will be used to measure the concentrations of metals, insecticides, and active ingredients in consumer use products.

2.0 SUMMARY OF THE METHOD

A used vacuum bag or the contents of a bagless collection container from the participant's primary home vacuum cleaner will be collected as a house dust sample from the residence.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

RTP – Research Triangle Park

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

Standard laboratory protective gloves and eye protection are required for removal of the vacuum cleaner bag or dust container from the vacuum cleaner. Be sure the vacuum cleaner is unplugged before attempting to remove the dust sample.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the sample collection containers and deliver them to the field coordinator.

5.2 The field coordinator will receive the sample collection containers from EPA and keep records of receipt and distribution in their field record book. The field coordinator will distribute the sample collection containers to the field staff. Upon collection of the dust sample, the field coordinator will be responsible for returning the samples with their collection record and COC sheets to the EPA laboratory in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the sample collection containers from the field coordinator, for collection of the dust sample, entering relevant information on the collection record sheet and/or in field record books, and returning collected dust samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Nitrile gloves

6.2 Safety glasses

6.3 Large zip-closure Polyethylene bags (13"x18" or similar)

6.4 Participant's primary vacuum cleaner containing previously collected dust in a replaceable bag or removable bagless container

6.5 Cooler

6.6 Ice packs (chilled)

6.7 Field record book(s)

6.8 Pen

6.9 Permanent marker (Sharpie or similar)

6.10 Sample ID label

6.11 Sample collection record sheet

7.0 PROCEDURES

7.1 IDENTIFICATION OF VACUUM UNIT

7.1.1 Participant collected dust will be collected on the 5th day of each sampling time period.

7.1.2 Query the parent/caregiver about whether they have and use a vacuum cleaner(s) in the residence. Examples of various vacuum cleaner types are shown in Figure 1. If a vacuum unit does not exist or hasn't been used, do not collect this sample type. If this sample type is not collected, document the reason and what would have been the sample's ID code in a field record book.

Figure 1. Example Vacuum Cleaner Types

Vacuum cleaner type	Example image
Hand Held/ Cordless	
Upright	 <p>Bagless</p> <p>Bagged</p>

Canister



Stick/Broom



Robotic	
Wet/Dry	

7.1.3 If there are multiple vacuums in the house, select the one that is primarily used for routine cleaning (rather than spot cleaning of spills).

7.1.4 If the vacuum is bagless, inspect the contents of the catch container. If the contents are primarily larger or identifiable objects (e.g., cereal, potting soil, fragments of broken plastic), do not collect this sample type. If this sample type is not collected, document the reason and what would have been the sample's ID code in a field record book.

7.1.5 If the participant will not agree to collection of a vacuum bag without a replacement, record the vacuum cleaner and/or bag type in a field record book. Report this information to EPA for possible bag replacements at future visits. If this sample type is not collected, document the reason and what would have been the sample's ID code in a field record book.

7.2 SAMPLE COLLECTION

7.2.1 Ensure that the unit is unplugged before collecting the dust sample.

7.2.2 Take a suitably large clean zip-closure polyethylene bag and apply the Sample ID label that contains the specified unique sample code directly to the outside (see Section 8.0).

7.2.3 Put on nitrile gloves and safety glasses.

7.2.4 Bagged Dust Collection - If the unit has a vacuum bag, carefully remove the used vacuum bag and its contents and place them in the pre-labeled zip-closure polyethylene bag. Take care not to spill any of the contents in the participant's home. Reassemble the vacuum cleaner. If a replacement bag exists in the home, assist with replacement as desired by the participant.

7.2.5 Bagless Dust Collection - If the unit is the bagless type, carefully remove the dust container and pour/empty the contents into the pre-labeled zip closure polyethylene bag. Take care not to spill any of the contents in the participant's home. Reassemble the dust container into the vacuum unit.

7.2.6 If a spill occurs during sample collection, discuss cleanup with the parent/caregiver and follow their instructions to the extent possible and reasonable.

7.2.7 Gently force the excess air out of the polyethylene bag before sealing it or tighten the lid on the jar.

7.2.8 Remove the nitrile gloves and dispose of them in the household trash or a field sampling trash bag.

7.2.9 With the help of the participant, complete the collection record for the sample in pen (Appendix A).

7.2.10 Write the sample ID code (see Section 8.0) on the outside of a secondary containment zip-top bag with a permanent marker. Place the dust sample and sample collection record in the bag. Gently force the excess air out of the polyethylene bag before sealing it.

7.3 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.3.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2 Samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.

7.3.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the home vacuum bag samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, the approximate length of time that the vacuum bag has been in the vacuum, the date that the vacuum cleaner was last used, the type and brand/model of vacuum cleaner, dust collector type, and any

comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

$$\overbrace{09-58}^{\text{a}} - \overbrace{B}^{\text{b}} \overbrace{1001}^{\text{c}} - \overbrace{V1}^{\text{d}} \overbrace{F}^{\text{e}} \overbrace{S}^{\text{f}} \overbrace{1}^{\text{g}}$$

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

Because dust samples collected from household vacuums will vary by participant, sampling period, and equipment, it is impossible to use field quality control samples such as field blanks, duplicates, or spikes (see QAPP section *1.4.2.3 Household Dust – Vacuum Bag and Technician Vacuum Samples* and *Table 5. Sample QC on per household basis*).

10.0 REFERENCES

Quality Systems and Implementation Plan - Exposure Assessment Pilot Study Agricultural Health Study, Volumes 1 and 2, Appendix 51. EPA Contract No. 68-DO-0106, April 11, 1994.

Quality Assurance Project Plan, Agricultural Health Study/Pesticide Exposure Study 9-Farm Pilot Study, EPA Contract 68-D-99-011, Human Exposure Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., August 1999.

Standard Operating Procedure for the Collection of the Home Vacuum Cleaner Bag Sample, EPA/NERL SOP EMAB-072.0E (HEAB AHS-SOP-51) r.0.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for a Participant Collected Vacuum Dust Sample

EPA Pilot Study Add-On to the Green Housing Study Participant Collected Vacuum Dust Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Dust collector type:	Bag Bagless
Length of time the bag has been in the vacuum:		_____	days/ months
Date of last use of vacuum cleaner: ___ / ___ / ___			
Type of vacuum: Upright Canister Hand-held Stick Wet/Dry Robotic			
Brand and model of vacuum:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix V. SOP for Collecting Dust Samples with Swiffer™ Dusters

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collecting Dust Samples with Swiffer™
Dusters

Number: EMAB-169.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-005

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Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTING DUST SAMPLES WITH SWIFFER™ DUSTERS

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting dust samples with a Swiffer™ duster to measure mold contamination in homes for the EPA pilot study add-on to the Green Housing Study (GHS).

In order to standardize the quantification of mold contamination, the Environmental Relative Moldiness Index (ERMI) metric was created. The ERMI scale was based on a random national sampling of homes conducted by the Department of Housing and Urban Development (HUD). During the 2006 HUD American Healthy Homes Survey (AHHS), a standard dust sample was obtained in the living room and bedroom from 1083 randomly selected homes across the U.S. (Vesper et al., 2007). The dust from these homes was analyzed by U.S. Environmental Protection Agency (EPA) researchers using a DNA-based technology called mold specific quantitative PCR (MSQPCR) for 36 indicator mold species in each sample (Vesper et al., 2007).

These 36 molds include 26 Group 1 molds that indicate water-damage and 10 Group 2 species that are commonly found, even without water damage. Using equation 1, the ERMI values were calculated by taking the sum of the logs of the concentrations of the Group 1 molds (s_1) and subtracting the sum of the logs of the concentrations of Group 2 molds (s_2).

$$(Eq.1) \quad ERMI = \sum_{i=1}^{26} \log_{10}(s_{1i}) - \sum_{j=1}^{10} \log_{10}(s_{2j})$$

The ERMI scale ranges from approximately -10 to 20 (low to high) and even higher in highly contaminated homes. The upper quartile (highest mold contamination quartile) starts at an ERMI value of approximately 5. This analysis has been used in many studies of mold exposure and asthma (Reponen et al., 2011, 2012; Vesper et al., 2013; Bolaños-Rosero et al., 2013) and will be used for dust samples from the EPA pilot study add-on.

2.0 SUMMARY OF THE METHOD

This method describes the proper preparation, handling and collection of house dust using a Swiffer™ duster. The dusters are removed from a zip-top bag and are used to wipe the tops of structures that are not often cleaned. The Swiffer™ dusters are then returned to the zip-top bag and transferred by the field staff to the field coordinator for shipment to the EPA laboratory for analysis.

3.0 DEFINITION

SOP – Standard operating procedure

GHS – Green Housing Study

ERMI – Environmental Relative Moldiness Index

HUD – U.S. Department of Housing and Urban Development

AHHS – American Healthy Homes Survey

MSQPCR – Mold specific quantitative PCR

PCR – Polymerase chain reaction

QC – Quality Control

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

4.0 CAUTIONS

This protocol should be followed at the pre-renovation and post-renovation visits. Nitrile gloves, shipped with the duster, are required for removal of the Swiffer™ duster from the storage bag and subsequent sampling.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will deliver the Swiffer™ dusters in zip-top bags to the field coordinator.

5.2 The field coordinator will receive the Swiffer™ dusters from EPA and document records of receipt and distribution in their field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute the dusters to the field staff. Upon dust sampling completion, the field coordinator will be responsible for returning the Swiffer™ dusters with their collection record and COC sheets to the EPA laboratory in Cincinnati, OH for analysis.

5.3 The field staff will be responsible for obtaining the Swiffer™ dusters from the field coordinator, for conducting the dust sampling, entering relevant information on the collection record sheet (Appendix A) and/or in field record books and returning collected Swiffer™ dust samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Swiffer™ Sweeper duster cloth (dry sweeping refills – unscented, see Figure 1 and <http://tinyurl.com/nfx9hq7>)

6.2 Quart size zip-top bags

6.3 Disposable nitrile gloves

6.4 Cooler

6.5 Ice packs (chilled)

6.6 Sample ID label

6.7 EPA laboratory record notebook

6.8 Field record book(s)

6.9 Pen

6.10 Permanent marker (Sharpie or similar)

6.11 Sample collection record sheet

7.0 PROCEDURES

7.1. PACKAGING AND SHIPMENT (EPA project staff)

7.1.1 Place Swiffer™ duster and disposable gloves in quart size zip-top bag.

7.1.2 Ship Swiffer™ duster samplers to designated Field Coordinator.

7.2 SAMPLE COLLECTION (Field Staff)

7.2.1 At the home to be sampled, open one of the zip-top bags and put on the disposable gloves.

7.2.2 In the bedroom (child's, if possible) and the living room, wipe the tops of structures not often cleaned (e.g., tops of doorways and doors, tops of bookshelves, sconces) and anywhere dust settles.

7.2.3 Continue wiping surfaces until the Swiffer™ duster is noticeably grayed from the collection of accumulated dust (see Figure 1).



Figure 1. (left) Unused Swiffer™ duster; (right) Swiffer™ duster grayed from collected dust.

7.2.4 Return the Swiffer™ duster to the zip-top bag, gently force the excess air out of the bag, and seal.

7.2.5 Apply the Sample ID label that contains the specified unique sample code directly to the outside of the bag containing the Swiffer™ duster (see Section 8.0).

7.2.6 Remove and dispose of the gloves in the household trash or a field sampling trash bag.

7.2.7 With the help of the participant, complete the collection record for the sample in pen (Appendix A).

7.2.8 Write the sample ID code (see Section 8.0) on the outside of a secondary containment zip-top bag with a permanent marker. Place the dust sample bag and sample collection record in the bag. Gently force the excess air out of the bag before sealing it.

7.3 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.3.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2 Samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in Cincinnati, OH.

7.3.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

Records of the preparation of Swiffer™ dusters for dust samples, and Swiffer™ duster blanks for QC (see Section 9.0) will be retained in an EPA laboratory record book and will be kept by the individual conducting the analysis on the dust samples.

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the Swiffer™ dust samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date and time of the sample collection, sampled location(s), the initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B̃ 1001 – Ṽ1 F̃ S̃ 1̃

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) samples will be prepared and used (see QAPP section *1.4.2.5 Surface Dust Swiffer™* and *Table 5 Sample QC on per household basis*). Field blanks shall constitute 5-10% of the Swiffer™ samples collected. For storage, shipping, analysis and quantitation procedures, field blank samples will be prepared and treated in the same manner as the Swiffer samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of a Swiffer™ taken to the field, exposed to air while sitting on top of its zip-top container during sampling with separate collector, re-sealed in its respective container, labeled, and returned to the EPA laboratory in the same manner as the Swiffer samples.

9.3 At least one FB should be included with each batch of Swiffer™ samples shipped to the EPA laboratory.

10.0 REFERENCES

Bolaños-Rosero B, Betancourt D, Dean T, Vesper S. Pilot study of mold populations inside and outside of Puerto Rican residences. *Aerobiologia*. 2013;doi. 10.1007/s10453-013-9301-7.

Reponen T, Vesper S, Levin L, Johansson E, Ryan P, Burkle J, Grinspun SA, Zheng S, Berstein DI, Lockey J, Villareal M, Hershey GKK, LeMasters G. High Environmental Relative Moldiness Index during infancy as a predictor of age seven asthma. *Annals of Allergy, Asthma and Immunology*. 2011;107:120-126.

Reponen T, Lockey J, Berstein DI, Vesper SJ, Levin L, Zheng S, Ryan P, Grinspun SA, Villareal M, Hershey GKK, LeMasters G. Infants Exposed to Specific Molds Correlated with Age Seven Asthma. *Journal of Allergy and Clinical Immunology*. 2012; 130:639-644.

Vesper SJ, McKinstry C, Haugland RA, *et al.* Development of an environmental relative moldiness index for homes in the U.S. *J Occup Environ Med* 2007; 49: 987-90.

Vesper S, Barnes C, Ciaccio CE, *et al.* Higher Environmental Relative Moldiness Index (ERMI) values measured homes of asthmatic children in Boston, Kansas City and San Diego. *J Asthma* 2013; 50: 155–161.

EPA/NERL SOP #MERB-054.1 (or newer), Standard Operating Procedure (SOP) for Collecting Dust Samples for ERMI (Using SWIFFER™ Sweeper Cloth)

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestyles (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for a Swiffer™ Dust Sample

EPA Pilot Study Add-On to the Green Housing Study Swiffer™ Dust Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection Time:	____:____ am/pm
Sampled location(s):			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

**Appendix VI. SOP for Dust Collection using an Electrostatic Dust Collector
(EDC)**

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Dust Collection Using an Electrostatic Dust Collector (EDC)

Number: EMAB-170.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-006

SOP Steward

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Signature:

Date:

Approval

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Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP)
FOR DUST COLLECTION USING AN ELECTROSTATIC DUST COLLECTOR (EDC)

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes a method for the collection of settled dust samples using an electrostatic dust collector (EDC). This document is designed to guide a competent field worker in the proper use of the EDC for the EPA pilot study add-on to the Green Housing Study (GHS).

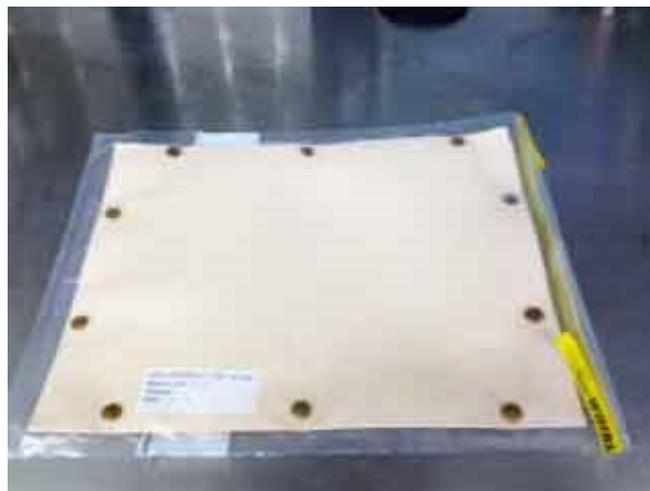
2.0 SUMMARY OF THE METHOD

This method describes the proper preparation and handling of EDCs for the collection of settled house dust. EDCs are opened and placed on a surface above the floor and left for a 5-day sampling period by field staff. The EDCs are then closed prior to packaging and returned to the field coordinator for shipment to the EPA National Risk Management Research Laboratory/Air Pollution Prevention and Control Division (NRMRL/APPCD) in Research Triangle Park (RTP), NC for analysis.

3.0 DEFINITIONS

3.1 EDC - electrostatic dust collector. One EDC (Figure 1) consists of a 40 × 30 cm cardboard folder with two electrostatic cloths, each cloth having an area of 26.5 × 20.3 cm. Each sterile EDC is individually placed in a sterile zip-top bag to prevent contamination prior to and immediately following exposure at the sampling site

Figure 1. EDC ready for field use (left) and prepared EDC in zip-top bag (right).



3.2 Chain-of-Custody (COC) label and COC record log book - A total of four COC labels will accompany each EDC bag. An EDC log book will be kept at the NRMRL/APPD lab and the field sampling site to ensure the integrity of the sample and to maintain a timely and traceable transfer of samples. (Refer to the COC protocol in Section 8.0 Records.)

SOP – Standard operating procedure

GHS – Green Housing Study

NRMRL/APPD – National Risk Management Research Laboratory/Air Pollution Prevention and Control Division

RTP – Research Triangle Park

LRB – Laboratory record book

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

4.0 CAUTIONS

This protocol should be followed at the pre-renovation and post-renovation visits. Disposable nitrile gloves are required for placement and removal of the EDC from the sampling site. The EDC must be opened horizontally (without touching the cloths) to expose the cloths to the air. The EDC should be placed on top of a surface at least 1.50 meters above the floor. Two EDCs will be placed at the sampling site; these should be placed 10 cm apart. If the surface area is limited, the EDCs may be placed closer together, keeping edges from touching or overlapping.

5.0 RESPONSIBILITIES

5.1 The EPA/NRMRL project staff will provide the EDCs to the field coordinator and keep a COC tracking record in a laboratory record book (LRB).

5.2 The field coordinator will receive the unexposed sterile EDCs and keep records of receipt and distribution in their field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute the EDCs to the field staff. Upon completion of the EDCs exposure period, the field coordinator will be responsible for returning the exposed EDCs with their sample collection records and COC sheets to the EPA/NRMRL laboratory in RTP, NC for analysis.

5.3 The field staff will be responsible for obtaining the EDCs from the field coordinator, for placement and removal of the EDC from the sampling area, entering relevant information on the sample

collection record (Appendix A) and/or in field record books and returning exposed EDCs to the field coordinator.

6.0 MATERIALS

6.1 Two sterile EDCs each individually wrapped in a sterile zip-top bag with a COC label

6.2 Disposable nitrile gloves

6.3 Cooler

6.4 Ice packs (chilled)

6.5 Sample ID labels

6.6 EPA laboratory record notebook

6.7 Field record book(s)

6.8 Pen

6.9 Permanent marker (Sharpie or similar)

6.10 Sample collection record sheet

7.0 PROCEDURES

This protocol should be followed at the pre-renovation and post-renovation visits. Locate the EDCs in the same room as the air samplers if possible, followed by a room where the child spends the most time.

7.1 SAMPLE COLLECTION

7.1.1 Put on nitrile gloves. These are required for placement and removal of the EDC from the sampling area.

7.1.2 Remove an EDC from its zip-top bag.

7.1.3 Open the EDC horizontally (as you would open a book) without touching the cloths to expose the cloths to the air.

7.1.4 Place the bag for the first EDC on top of a flat surface at least 1.5 meters (4.5 feet) above the floor and completely out of the reach of children who may interfere with collection. Place the EDC on top of the bag.

7.1.5 Remove the second EDC from its bag, open and place it in the same fashion as the first EDC. The two EDCs should be placed 10 cm apart. If the surface area is limited, the EDCs may be placed closer together, keeping edges from touching or overlapping. Once placed on the sampling area, they should remain exposed and undisturbed for 5 days.

7.1.6 Remove the nitrile gloves and dispose in the household trash or a field sampling trash bag.

7.2 SAMPLE RETRIEVAL

7.2.1 Put on nitrile gloves. These are required for placement and removal of the EDC from the sampling area.

7.2.2 Remove the EDC from the sampling location and close the EDC without touching the cloths.

7.2.3 Retrieve the sterile plastic zip-top bag from where the EDC was located and place the EDC into the bag.

7.2.4 Gently force the excess air out of the polyethylene bag before sealing.

7.2.5 Repeat steps 7.2.2-7.2.4 with the second EDC and bag.

7.2.6 Remove the nitrile gloves and dispose in the household trash or a field sampling trash bag.

7.2.7 Apply the Sample ID labels that contain the specified unique sample code directly to the outside of the zip-top bags (see Section 8.0).

7.2.8 With the help of the participant, complete the sample collection record for the sample in pen (Appendix A).

7.2.9 Write the sample ID code (see Section 8.0) on the outside of a secondary containment zip-top bag with a permanent marker. Place the EDC sample bags and sample collection record in the bag. Gently force the excess air out of the polyethylene bag before sealing it.

7.3 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed COC records must accompany all samples during storage and shipment.

7.3.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2 Samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.

7.3.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

Records of the preparation of sterile EDCs for dust samples, and EDCs blanks for QA (see Section 9.0) will be retained in an EPA laboratory record book and will be kept by the individual conducting the analysis on the EDC samples.

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the EDC samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date and time of the start and end of sample collection, description of sample collection location, the initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A).

Other information shall be collected as needed to ensure successful collection and interpretation of data. In particular for the EDC sample, make notes if it appears that the EDCs were disturbed during the collection period, or if the parent/caregiver reports that they were disturbed. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

$$\overbrace{09-58}^a - \overbrace{B}^b \overbrace{1001}^c - \overbrace{V1}^d \overbrace{F}^e \overbrace{S}^f \overbrace{1}^g$$

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) samples will be prepared and used (see QAPP section *1.4.2.4 Electrostatic Dust Collection (EDC)* and *Table 5 Sample QC on per household basis*). Field blanks shall constitute 5-10% of the EDC samples collected. For storage, shipping, analysis and quantitation procedures, FB will be prepared and treated in the same manner as the EDC samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. In general, the FB will consist of an EDC collector taken to the field, handled only with gloved hands, exposed to air during the time while separate sampling EDCs are placed (i.e., unzip the bag containing the field blank EDC and set the EDC on top of its zip-top bag but do not open the folder or expose the cloths), re-sealed in its respective bag, and returned to the EPA laboratory.

9.3 At least one FB should be included with each batch of EDC samples shipped to the U.S. EPA laboratory.

10.0 REFERENCES

Noss I, Wouters IM, Visser M, Heederick DJ, Thorne PS, Brunekreef B, Doekes G. 2008. Evaluation of a low cost electrostatic dust fall collector for indoor air endotoxin exposure assessment. *Applied and Environmental Microbiology* 74(18):5621-5627.

Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*, Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for an EDC Sample

EPA Pilot Study Add-On to the Green Housing Study EDC Sample			
Participant ID:		Sample ID:	
Collection Start Date:	___ / ___ / ___	Collection Start Time:	____:____ am/pm
Collection Stop Date:	___ / ___ / ___	Collection Stop Time:	____:____ am/pm
Collection Location:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix VII. SOP for Collection of Wipe Samples from Hard Surfaces

U.S. Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for the Collection of Wipe Samples from Hard Surfaces

Number: EMAB-171.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-007

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTION OF WIPE SAMPLES FROM HARD SURFACES

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1.0 SCOPE AND APPLICATION

This protocol describes the method for the collection of surface wipes from impervious surfaces. The samples will be analyzed for consumer product active ingredients (CP-AI), pesticides, and metals.

2.0 SUMMARY OF THE METHOD

Wipe samples from impervious surfaces will be collected for the EPA pilot study add-on to the Green Housing Study (GHS) from bathrooms and kitchens of participants. Surface wipes will be collected on Day 1 for each of four sampling periods. Cotton Twill wipes will be used to collect organic target analytes and Ghost wipes will collect metals. Three separate moistened wipes will wipe an area of approximately 144 square inches and combined into one sample.

3.0 DEFINITIONS

SOP – Standard operating procedure

CP-AI – Consumer product active ingredients

GHS – Green Housing Study

QC – Quality Control

RTP – Research Triangle Park

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

FB – Field Blank

FS – Field Spike

4.0 CAUTIONS

4.1 Nitrile gloves and eye protection should be worn during sample collection.

4.2 Field staff should keep the sampling materials and the samples out of the reach of children.

4.3 Isopropyl alcohol may degrade lacquer and vinyl finishes found on some surfaces (i.e., furniture, walls, some flooring). When in doubt do not sample the surface. All surfaces do not need to be evaluated. Polyurethane coated and vinyl plastic surfaces are generally acceptable to sample.

4.4 Do not wipe the masking tape or template demarcating a sampling area.

4.5 Do not wipe areas (counters or floors) near the stove as grease can interfere with chemical analysis.

4.6 Photos should not include any humans.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the surface wipe sample collection packets and deliver them to the field coordinator.

5.2 The field coordinator will receive the surface wipe sample collection packets and keep collection records in a field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute surface wipe sample collection packets to the field staff. Upon collection of the surface wipe samples, the field coordinator will be responsible for returning the samples with their collection record and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, collection of the surface wipe sample, entering relevant information on the sample collection record sheet and in field record books and returning collected surface wipe samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Wipe media for organics (M.G. Chemicals, Cleanroom Twill wipes, 4 inch × 4 inch, cotton, pre-cleaned)

6.2 Wipe media for metals (Environmental Express SC 4210 (or similar) Ghost Wipes, 15 cm × 15 cm, packaged pre-moistened with deionized water)

6.3 Amber glass jars with Teflon-lined lids, 2 oz. straight-sided (Thermo I-Chem Part No. 340-0060 or equivalent)

6.4 Plastic digestion cups, (50 mL, Environmental Express P/N SC475 or equivalent)

6.5 Masking tape

6.6 Disposable nitrile gloves

6.7 Safety glasses

6.8 Frozen ice packs

6.9 Cooler

6.10 Stainless steel template (with 12" × 12" wiping area)

6.11 Plastic or wooden ruler and/or 25' measuring tape

6.12 Field record book

6.13 Ink pen

6.14 Isopropyl alcohol (ACS reagent grade or better)

6.15 Disposable pre-wetted isopropanol wipes for cleaning sampling equipment

6.16 Stainless steel tray (10x13 or similar)

6.17 Borosilicate glass vials (3-dram multi-purpose glass threaded vials with Teflon-lined closures or equivalent, certifiable clean) containing 9 mL of isopropanol

6.18 Glass petri dishes (130mm-150mm Pyrex)

6.19 Sample collection and COC record sheets (eight needed, one for each of 4 locations and 2 analysis types)

6.20 Sample ID labels

6.21 Field waste bag

7.0 PROCEDURES

Follow the timeline for Day 1 to collect samples as shown in the quality assurance project plan (QAPP) entitled *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*, Table 4. The ideal sampling area for each wipe is 144 square inches inside a template. An area of 144 square inches \pm 10% (14 square inches) is acceptable if using a template is not possible. **Do not wipe the template or masking tape demarcating the sampling area.** Be mindful that different wipe media will be used to collect samples for separate organic and inorganic analyses. The two areas wiped should be close to one another and of the same size/dimensions (as best as possible).

7.1 IDENTIFICATION OF KITCHEN FLOOR SAMPLING LOCATION

7.1.1 The ideal sampling location will have the following characteristics (in preference order):

- a) Bare floor with an impervious surface such as linoleum, tile, hardwood, laminate, painted concrete, etc. Small rugs can be relocated to expose bare floor.
- b) Near the middle of the room (high traffic area).
- c) An area where two 12" \times 12" templates can be laid side by side.
- d) An area where two 144 square inch areas within 2" can be demarcated and wiped.
- e) An area where two 144 square inch areas can be demarcated and wiped.

7.1.2 Do not sample the following:

- f) Carpeted areas.
- g) Areas that require moving large or heavy objects.
- h) The area just in front of the stove, as grease can interfere with chemical analysis.

7.1.3 Based on the criteria in 7.1.1 and 7.1.2, select the best location to sample the kitchen floor and be sure to record the description of the location on the sample collection record sheet (Appendix A).

7.2 IDENTIFICATION OF KITCHEN COUNTER SAMPLING LOCATION

7.2.1 The ideal sampling location will have the following characteristics (in preference order):

- a) Bare counter with an impervious surface such as metal, laminate, tile, glass, stone (granite, marble), painted or sealed concrete, painted or sealed wood, etc. Ask if small objects can be relocated to expose bare counter.
- b) An area near the sink (prefer one template on each side).
- c) Areas where the two 12"× 12" templates can be laid side by side.
- d) An area where two 144 square inch areas within 2" can be demarcated and wiped.
- e) An area where two 144 square inch areas can be demarcated and wiped.

7.2.2 Do not sample the following:

- f) Areas that require moving large or heavy objects.
- g) Areas near the stove, as grease can interfere with chemical analysis.

7.2.3 Based on the criteria in 7.2.1 and 7.2.2, select the best location to sample the kitchen countertop and be sure to record the description of the location on the sample collection record sheet (Appendix A).

7.3 IDENTIFICATION OF BATHROOM FLOOR SAMPLING LOCATION

7.3.1 The ideal sampling location will have the following characteristics (in preference order):

- a) Bare floor with an impervious surface such as linoleum, tile, hardwood, laminate, painted concrete, etc. Small rugs can be relocated to expose bare floor.
- b) Near the middle of the room.
- c) An area where two 12"× 12" templates can be laid side by side.
- d) An area where two 144 square inch areas within 2" can be demarcated and wiped.
- e) An area where two 144 square inch areas can be demarcated and wiped.

7.3.2 Do not sample the following:

- f) Areas that will be damaged by isopropanol or water.
- g) Carpeted areas.
- h) Areas that require moving large or heavy objects.

7.3.3 Based on the criteria in 7.3.1 and 7.3.2, select the best location to sample the bathroom floor and be sure to record the description of the location on the sample collection record sheet (Appendix A).

7.4 IDENTIFICATION OF BATHROOM ELEVATED SURFACE SAMPLING LOCATION

7.4.1 The ideal sampling location will have the following characteristics (in preference order):

- a) Bare counter with an impervious surface such as metal, laminate, tile, glass, stone (granite, marble), painted or sealed concrete, painted or sealed wood, etc. Ask if small objects can be relocated to expose bare counter.
- b) Areas where the 12"× 12" templates can be laid side by side.
- c) An area where two 144 square inch areas within 2" can be demarcated and wiped.
- d) An area where two 144 square inch areas can be demarcated and wiped.
- e) An area next to the sink(s).
- f) A long skinny area in front of double sinks.
- g) The lid and sides of a toilet tank.
- h) The side of an easily accessible cabinet.
- i) Flat surface directly around a sink, bathtub, or shower, excluding the faucet area.

7.4.2 Do not sample the following:

- j) Areas that require moving large or heavy objects.

7.4.3 Based on the criteria in 7.4.1 and 7.4.2, select the best location to sample the bathroom countertop and be sure to record the description of the location on the sample collection record sheet (Appendix A).

7.5 DEMARCATION, MEASUREMENTS AND RECORDING

7.5.1 Clean the 12" x 12" templates (if used) with a disposable isopropanol wipe.

7.5.2 Lay the two templates or demarcate the two 144 square inch sampling areas with masking tape. Repeat this for each location (i.e., kitchen floor, kitchen counter, bathroom floor, bathroom elevated surface) to be sampled.

7.5.3 If using tape demarcations, measure the inside lines of the tape.

7.5.4 Sketch, photograph, and/or describe the selected sampling area with measurements in the sample collection and COC record sheet and/or field record book. Photos should not include any humans.

7.5.5 If taking photographs of non-templated areas, lay a ruler or tape measure next to the longest side for perspective.

7.6 WIPING PATTERN

7.6.1 Select either an "S" or "Z" wiping pattern to collect the sample. The wiping patterns shown in Figures 1 and 2 can be performed as shown (right-handedly) or in mirror image (left-handedly),

beginning the wiping motion at the opposite top corner. Regardless of the wiping pattern selected, the final pass is just inside the edge of the template or demarcated area.

7.6.1.1 The “S” pattern is performed as shown in Figure 1. At each turn, the wipe is rotated so that the same edge of the wipe is always leading (moving forward).

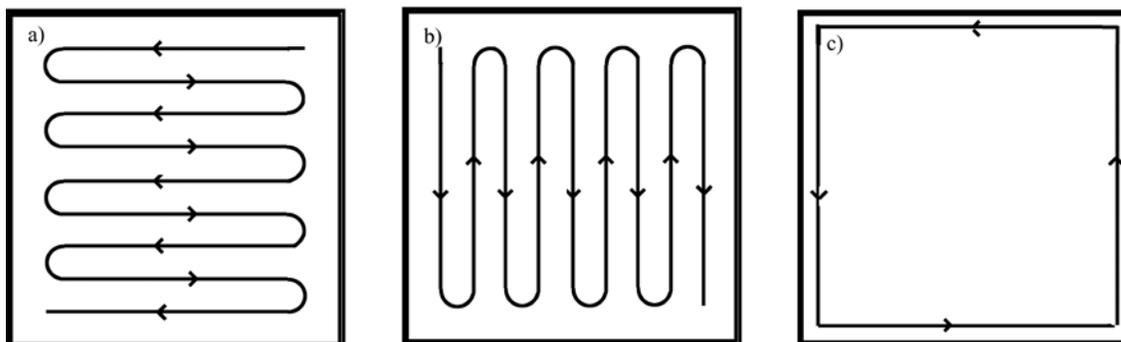


FIGURE 1: Schematic of a side-to-side overlapping “S” wiping pattern. Only the center of the wipe path is shown, not the entire wiping width. Panel a) shows the first “S” wipe pattern; panel b) shows the second “S” wipe pattern; panel c) shows the final pattern that concentrates on the edges and corners.

7.6.1.2 The “Z” pattern is performed as shown in Figure 2 and the wipe is not rotated at each turn.

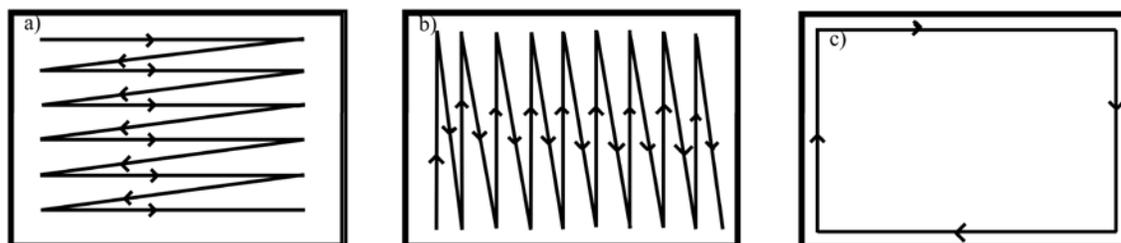


FIGURE 2: Schematic of a side-to-side overlapping “Z” wiping pattern. Only the center of the wipe path is shown, not the entire wiping width. Panel a) shows the first “Z” wipe pattern; panel b) shows the second “Z” wipe pattern; and panel c) shows the final pattern that concentrates on the edges and corners.

7.7 WIPE SAMPLE COLLECTION

Three 4”×4” cotton Twill wipes (organics) or three 15 cm × 15 cm Ghost wipes (inorganics) will be collected from each of the demarcated areas marked in Section 7.5. In each room (kitchen, bathroom), two areas should be demarcated on both the floor and an elevated surface (e.g., counter) totaling eight areas to wipe (four for organics, four for inorganics).

7.7.1 ORGANICS

7.7.1.1 Place a sample ID label on the glass sample jar containing the pre-cleaned cotton Twill wipes.

7.7.1.2 Don nitrile gloves and safety glasses.

7.7.1.3 Clean the inside of the stainless steel tray with a disposable isopropanol wipe. Discard the wipe in the field waste bag.

7.7.1.4 Place the stainless steel tray near the sampling area to serve as a staging area. Using a nitrile gloved hand, open the glass petri dish so that the two halves are face-up on the tray surface. Clean the petri dishes with the disposable isopropanol wipes. Discard the wipe in the field waste bag. Allow the petri dish to air dry before use.

7.7.1.5 Open the glass jar containing three cotton Twill wipes. Remove the pre-cleaned Twill wipes from the jar with a clean nitrile gloved hand and place three wipes onto one half of the open petri dish. Add a 9-mL aliquot of isopropanol onto the entire surface of all three wipes. The wipes should now be thoroughly wetted with isopropanol. (Note: Pre-measured 9-mL aliquots of isopropanol in vials will be used while in the field.)

7.7.1.6 Remove one wetted cotton Twill wipe from the petri dish, and open the wipe to a 4" × 4" square. Using the pattern selected in Section 7.6 WIPING PATTERN, wipe the designated area with the Twill wipe (4" x 4") in a single direction as shown in panel a) (Figure 1 or 2).

7.7.1.7 Fold the pad in half along the 4" length so that the exposed (contacted) surface is on the inside. The wipe is now a 2" × 4" rectangle.

7.7.1.8 Repeat the wiping motion perpendicular to the first direction as shown in panel b) (Figure 1 or 2).

7.7.1.9 Fold the pad in half again with the exposed (contacted) surface on the inside. The pad is now its original 2" × 2" size.

7.7.1.10 Wipe just inside the edge of the demarcated area as shown in panel c) (Figure 1 or 2). Take care not to wipe the template or masking tape.

7.7.1.11 Place the exposed wipe in the previously labeled glass sample container.

7.7.1.12 Repeat steps 7.7.1.4 – 7.7.1.11 with the second wipe in the same location.

7.7.1.13 Repeat steps 7.7.1.4 – 7.7.1.11 with the third wipe in the same location.

7.7.1.14 After the third wipe has been added to the sample container, seal the glass jar with the lid.

7.7.1.15 Remove the template or masking tape.

7.7.1.16 Discard any masking tape and nitrile gloves in the field waste bag.

7.7.1.17 Repeat steps 7.7.1.1 – 7.7.1.16 for the remaining 3 sampling areas.

7.7.2 INORGANICS

7.7.2.1 Place a sample ID label on the digestion cups that will contain the Ghost wipes.

7.7.2.2 Don nitrile gloves and safety glasses.

7.7.2.3 Remove one pre-wetted Ghost wipe from its packaging, and open the wipe to a 15cm × 15cm

square.

7.7.2.4 Using the pattern selected in Section 7.6 WIPING PATTERN, wipe the designated area with the Ghost wipe (15cm × 15cm) in a single direction as shown in panel a) (Figure 1 or 2).

7.7.2.5 Fold the pad in half along the 15cm length so that the exposed (contacted) surface is on the inside. The wipe is now a 7.5cm × 15cm rectangle.

7.7.2.6 Repeat the wiping motion perpendicular to the first direction as shown in panel b) (Figure 1 or 2).

7.7.2.7 Fold the pad in half again with the exposed (contacted) surface on the inside. The pad is now 7.5cm × 7.5cm size.

7.7.2.8 Wipe just inside the edge of the demarcated area as shown in panel c) (Figure 1 or 2). Take care not to wipe the template or masking tape.

7.7.2.9 Place the exposed wipe in the previously labeled digestion cup sample container.

7.7.2.10 Repeat steps 7.7.2.1 – 7.7.2.9 with the second wipe in the same location.

7.7.2.11 Repeat steps 7.7.2.1 – 7.7.2.9 with the third wipe in the same location.

7.7.2.12 After the third wipe has been added to the sample container, seal the digestion cup with the lid.

7.7.2.13 Remove the template or masking tape.

7.7.2.14 Discard the masking tape and nitrile gloves in the field waste bag.

7.7.2.15 Repeat steps 7.7.2.1 – 7.7.2.14 for the remaining 3 sampling areas.

7.8 HANDLING AND PRESERVATION

7.8.1 Complete the sample collection record for the samples (Appendix A).

7.8.2 After collection and during transport from the collection site, store the surface wipe samples in a cooler with ice packs.

7.8.3 Follow the procedures in SOP EMAB-185.0 *Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples* for post-collection handling, storage, and shipment of surface wipe samples.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the surface wipe samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the sampling location, the dimensions of each area sampled, a description of the area wiped, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding

collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see QAPP section 1.4.2.9 *Surface Wipes – Kitchen and Bathroom* and *Table 5. Sample QC on per household basis*). FB and FS shall constitute 5-10% of the wipe samples collected. For storage, shipping, analysis and quantitation procedures, FB and FS samples will be prepared and treated in the same manner as the wipe samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. FB samples will be prepared by opening the container with wipe, wetting with isopropanol (for organics), unfolded, folded, and places in a labeled sample container. FB samples shall otherwise be treated in the same manner as the surface wipe samples.

9.3 FS will be deployed to assess recovery of target analytes from the wipe medium under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to matrix blanks which is stored in a sealed container. The container is shipped to the field team facility where it is stored under the same conditions as field collected samples.

9.5 At least one FB and FS should be included with each batch of wipe samples shipped to the EPA laboratory.

10.0 REFERENCES

Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*, Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

SOP: EMAB-171.0
Alt ID: GHS-007
Date: November 13, 2015
Page: 12 of 13

Stout II, Daniel M., TenBrook, Patti L. DRAFT Combined Workplan/Quality Assurance Project Plan (WP/QAPP); Development of a Simple Approach to Check for Pesticide Drift at Schools. v2. 2014.

Procedure for the Field Collection of Surface Wipe Samples from Hard Flooring, HUD, 2004.

Appendix A. Sample Collection Record for a Surface Wipe Sample

EPA Pilot Study Add-On to the Green Housing Study Surface Wipe Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	<input type="checkbox"/> Metals	<input type="checkbox"/> Organics
<input type="checkbox"/> Kitchen	<input type="checkbox"/> Bathroom	<input type="checkbox"/> Floor	<input type="checkbox"/> Elevated/Counter
Dimensions of wiped area:			
Description of wiped area :			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix VIII. SOP for the Collection of Soil Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for the Collection of Soil Samples

Number: EMAB-172.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-008

SOP Steward

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Approval

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Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR THE
COLLECTION OF SOIL SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting soil samples for the analysis of pesticides and metals for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Soil samples will be collected for the EPA pilot study add-on to the Green Housing Study (GHS) from an outdoor play area near the home of the participants. Soil samples will be collected on Day 1 for each sampling period. A stainless steel scoop will be used to collect approximately 5-10 sub-samples, giving at least 10 g of soil after combining the sub-samples.

3.0 DEFINITION

SOP – Standard operating procedure

GHS – Green Housing Study

COC – chain-of-custody

QC – Quality Control

RTP - Research Triangle Park

cm – centimeter

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

FD – Field Duplicate

FS – Field Spike

4.0 CAUTIONS

4.1 Nitrile gloves and eye protection should be worn during sample collection.

4.2 Field staff should be aware of their surroundings to ensure personal safety while working outdoors. It is recommended that the field staff work in pairs during the collection of these samples.

4.3 Photos should not include any humans.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the soil sample collection materials and deliver them to the field coordinator.

5.2 The field coordinator will receive the soil sample collection packets and keep records of receipt

and distribution in their field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute the soil sample collection materials to the field staff. Upon collection of the soil sample, the field coordinator will be responsible for returning the samples with their collection record and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, cleaning the stainless steel scoops between samples, collection of the soil sample, entering relevant information on the collection record sheet (Appendix A) and/or in field record books and returning collected soil samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Stainless steel scoop (Wheaton #885540 or equivalent)

6.2 Zip-top polyethylene bags

6.3 Plastic or wooden ruler with inch and cm markings

6.4 Nitrile gloves

6.5 Pre-moistened isopropanol wipes

6.6 Waste bag

6.7 Ice packs (chilled)

6.8 Cooler

6.9 Tap water

6.10 Laboratory wipes (Kimwipe or similar)

6.11 Paper towels

6.12 25' tape measure

6.13 4 oz. Amber Jars with lids (certified) (Thermo Scientific Part # 141-120 or equivalent)

6.14 Digital camera (optional)

6.15 Field record book(s)

6.16 Safety glasses

6.17 Pen

6.18 Sample ID label

6.19 Comparison Sample Container (see 6.13) with 10 g of laboratory sand (or other soil like material)

6.20 Permanent marker (Sharpie or similar)

6.21 Sample collection record sheet

7.0 PROCEDURES

Follow the timeline for Day 1 to collect samples as shown in the Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages Section 1.3.2 Schedule, Table 2.*

7.1 PRE-FIELD ACTIVITIES

7.1.1 Using gloved hands and fingers, check the scoop for stuck-on soil particles and remove them. Laboratory wipes may be used for scrubbing. Then thoroughly rinse the stainless steel scoop with tap water (at least 1 min). Do not use soap.

7.1.2 Dry the scoop with paper towels.

7.1.3 Place the scoop into a new zip-closure bag for transport to the field.

7.2 IDENTIFICATION OF SAMPLING LOCATION

7.2.1 Prior to leaving the participant's home, discuss the nearby outdoor locations where children play or congregate.

7.2.2 Once outside, locate the areas where children play or congregate.

7.2.3 Priority for sampling locations are (with ideal location listed first):

- 1) Bare soil in the play areas
- 2) Bare soil near the play areas
- 3) Soil under removable ground cover (grass, mulch, etc.) in the play area.
- 4) Soil under removable ground cover (grass, mulch, etc.) near the play area.

7.2.4 Sketch, photograph, and/or describe the selected sampling area in the Sample Collection Record (Appendix A) and/or field record book. NOTE: Photos should not include any humans.

7.3 SOIL SAMPLING

7.3.1 Don nitrile gloves and safety glasses.

7.3.2 Under ideal circumstances, samples will be collected along an X-shaped grid as shown in Figure 1 in or near the play area. Each sub-sampling spot should be at least 1-foot distance from the other, and spaced so that as much of the play area is covered as possible (see Figure 1). Use the ruler or tape measure to measure these distances.

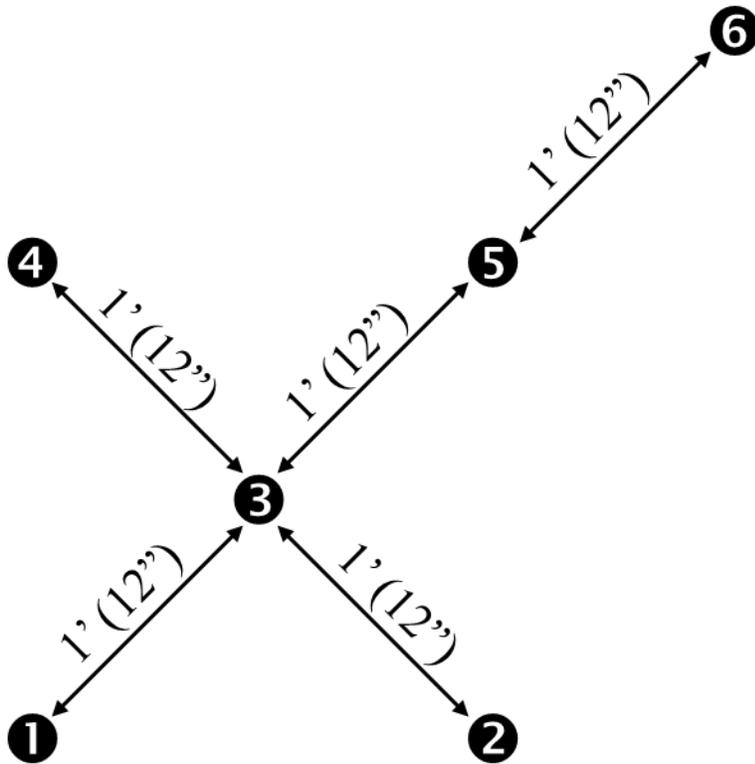


Figure 1. X-Shaped sampling scheme for play area soil sampling. The numbered circles are examples of where soil samples should be taken along the grid.

7.3.3 If there is only a small bare soil area, or the play area has unconnected bare spots, collect the sub-samples as shown in Figure 2. There should be a small distance between each sub-sample, covering as much of the play area as possible and with no particular pattern. It is not necessary to sub-sample in an X-shaped pattern (see Figure 2).

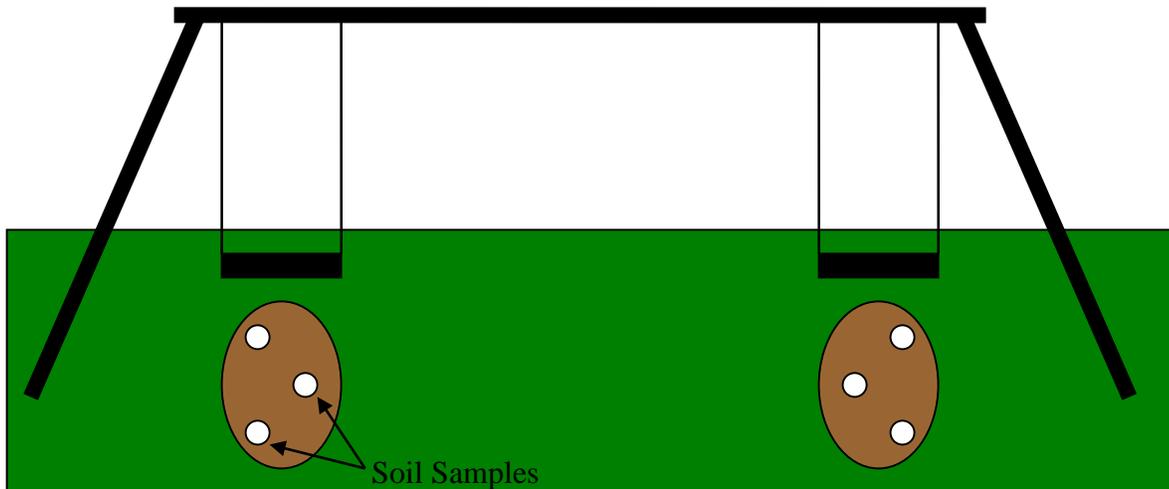


Figure 2. Disconnected bare soil areas in a single play area. The brown circles represent bare soil, the green area is grass covered. The white circles are examples of where and how soil samples should be collected in such a situation. This soil sampling scenario can also be applied to similar situations.

7.3.4 If the sampling area has impermeable ground cover or is in an area where ground cover cannot be removed (grass, play turf, etc.) do not sample those areas.

7.3.5 Just prior to sampling, wipe the scoop with a pre-moistened isopropanol wipe. Discard the wipe in the waste bag.

7.3.6 Open the glass jar. Place the lid facing up on a zip-top plastic bag.

7.3.7 Scoop the soil down to a depth of approximately 1 cm (and no more). Use the ruler as a guide if necessary. Do not include any above root zone vegetation (e.g., grass blades) in the sample.

7.3.8 Place the soil in the glass jar.

7.3.9 Continue collecting scoops of soil in an X-shaped pattern (see Figure 1) or small area random pattern (see Figure 2) until 5 to 10 soil sub-samples are taken (depending on the size of the sampling area) totaling at least 10 g of soil. Use the comparison sample container described in 6.19 as a reference. Place all soil in the same glass jar.

7.3.10 Close the glass jar with its lid.

7.3.11 Apply the Sample ID label that contains the specified unique sample code directly to the outside of the jar (not the lid, see Section 8.0).

7.3.12 Complete the collection record for the sample in pen (Appendix A). Describe the sub-sampling

pattern (including measurements between sampling locations) along with sketches and/or photographs in the Sample Collection Record and/or field record book. NOTE: Photos should not include any humans.

7.3.13 Write the sample ID code (see Section 8.0) on the outside of a secondary containment zip-top bag with a permanent marker. Place the soil sample jar and Sample Collection Record in the bag. Gently force the excess air out of the polyethylene bag before sealing it.

7.3.14 Return any displaced ground cover.

7.3.15 Using a laboratory wipe, clean the sampling scoop, removing as much soil as possible. Place the used wipe in the waste bag and pack the scoop with other field sampling materials.

7.4 HANDLING AND PRESERVATION

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.4.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.4.2 Samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.

7.4.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the soil samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, description, photograph, or drawing of the general sample collection location, description of any ground cover that was removed, number of sub-samples collected, description, photograph, or drawing of the sub-sample pattern, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B̄ 1001 – V̄1 F̄ S̄ 1̄

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB), field duplicate (FD), and field spike (FS) samples will be prepared and used (see QAPP section *1.4.2.18 Soil* and *Table 5. Sample QC on per household basis*). FB, FD, and FS shall constitute 5-10% of the soil samples collected. For storage, shipping, analysis and quantitation procedures, FB, FD, and FS samples will be prepared and treated in the same manner as the soil samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of clean sand taken to the field in its respective container which will remain unopened and returned to the EPA laboratory.

9.3 FD are used to estimate sampling and laboratory analysis precision. The FD samples will match as best as possible the sampling location, time, and duration to create a matched pair for direct comparison.

9.4 FS will be deployed to assess recovery of target analytes from the soil media under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to sand which is stored in a sealed container. The container is shipped to the field team facility where it is stored under the same conditions as field collected samples.

9.5 At least one FB, FD, and FS should be included with each batch of soil samples shipped to the EPA laboratory.

10.0 REFERENCE

Standard Operating Procedure for Collecting Soils for PCB Analysis, EPA/NERL SOP EMAB-144.0 Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for a Soil Sample

EPA Pilot Study Add-On to the Green Housing Study Soil Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	# of sub-samples:	
Description of general sample collection location (drawing may be included):			
Description of sub-sample pattern (drawing may be included):			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix IX. SOP for Collection of Hand Wipe Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Hand Wipe Samples

Number: EMAB-173.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-009

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTION OF HAND WIPE SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting a hand wipe sample from a participant's hands in order to measure organics (pesticides) and metals on the skin for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Hand wipe samples will be collected for organics analysis for the EPA pilot study add-on to the Green Housing Study (GHS) on Day 5 of each sampling visit. In addition to the sample collection on Day 5 for all homes, a subset of samples will also be collected for metals analysis on Day 1 from approximately 9 homes. The field staff will measure the hand wipe surface area by tracing the participant's hands and recording the information on the sample collection sheet (Appendix A). The wipes used for metals collection will be pre-packaged ghost wipes. The wipes for organics will be pre-cleaned and then wetted with 50% isopropanol in distilled water or deionized water prior to sampling.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

CDC – Centers for Disease Control and Prevention

QC – Quality Control

RTP – Research Triangle Park

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

FB – Field Blank

FS – Field Spike

4.0 CAUTIONS

4.1 Field staff will keep all sampling materials out of reach of children.

4.2 Standard laboratory protective gloves are required for this procedure to eliminate transfer of chemicals from the technician's hands onto the wipe media.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide wipe media, digestion cups, and glass jars (collection materials) and deliver them to the field coordinator.

5.2 The field coordinator will receive the collection materials and keep collection records in a field record book. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute the collection materials to the field staff. Upon collection of the hand wipe sample, the field coordinator will be responsible for returning the samples with their collections records and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, for collection of the hand wipe samples, entering relevant information on the sample collection record (Appendix A) and/or in field record books and returning collected hand wipe samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Organics wipe media (M.G. Chemicals, Cleanroom Twill wipes, 4 inch × 4 inch, cotton)

6.2 Isopropanol, ACS Reagent Grade

6.3 Deionized water

6.4 Transfer Pipettes, disposable, 1 mL

6.5 Plastic digestion cups, (50 mL, Environmental Express P/N SC475 or equivalent)

6.6 Glass jars with Teflon-lined lids (2 oz. Straight-sided amber glass jars, I-Chem Part # 340-0060 or equivalent)

6.7 Inorganics wipe media (Environmental Express SC 4210 or similar – Ghost wipes, 15cm × 15cm, pre-moistened with deionized water)

6.8 Disposable gloves (nitrile)

6.9 Cooler

6.10 Frozen ice packs

6.11 8.5" × 11" paper

6.12 Ink pens

6.13 Field Record Book(s)

6.14 Sample collection record sheet

6.15 Sample ID labels

7.0 PROCEDURES

7.1 SAMPLE COLLECTION

Approximately 9 homes will follow the procedures for 7.1.1 “metals” collection during the first visit

on Day 1 followed by the procedures for 7.1.2 “organics” collection on Day 5. All other homes and time points will follow 7.1.2 “organics” collection only on Day 5.

7.1.1 First visit (Day 1), collection for **metals** for select homes:

7.1.1.1 Duplicate diet, feces, toenail clippings, and blood samples must be collected from the same participant. If collecting all of these samples from a participant, also collect a “metals” hand wipe on Day 1 prior to toenail and blood samples.

7.1.1.2 Put on nitrile gloves.

7.1.1.3 Remove one pre-wetted Ghost wipe from its packaging, and open the wipe to a 15cm × 15cm square.

7.1.1.4 Hold the wipe and, with moderately firm pressure, wipe the child’s dominant hand (if known), including the back, front, and sides of the hand, fingers, and thumb.

7.1.1.5 Fold the wipe inside out along the 15 cm length, with the exposed (contacted) surface now on the inside. The wipe is now a 7.5 cm × 15 cm rectangle.

7.1.1.6 With the 7.5 cm × 15 cm rectangle, wipe the same areas of the child’s other hand.

7.1.1.7 Fold the pad in half again with the exposed (contacted) surface now on the inside. The wipe is now 7.5 cm × 7.5 cm square.

7.1.1.8 Place the wipe into an appropriately labelled (with Sample ID) 50 mL digestion cup.

7.1.1.9 Record the sample collection information on the sample collection sheet (Appendix A).

7.1.1.10 Using a sheet of paper and ink pen, trace the child’s hands. Gently squeeze the fingers together to avoid tracing the individual fingers. Stop the trace where the wrist bends. Both sides of the paper may be used if necessary. Write the participant ID and date along with the field technicians initials on the paper.

7.1.2 Collection for **organics** on Day 5 for all homes:

7.1.2.1 Follow the timeline for Day 5 to collect samples as shown in Section 1.3.2, Table 4 Timeline for collection of field samples as detailed in the quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*).

7.1.2.2 Vials containing 1:1 isopropanol:water will be prepared for the field team staff for transport to the field location.

7.1.2.3 Prior to collecting hand wipe samples, put on nitrile gloves.

7.1.2.4 Remove one Twill wipe from the jar and open the wipe to a 4” × 4” square.

7.1.2.5 Evenly wet the wipe with 3 mL of a 1:1 isopropanol:deionized water solution using a transfer

pipette.

7.1.2.6 Hold the wipe and, with moderately firm pressure, wipe the child's dominant hand (if known), including the back, front, and sides of the hand, fingers, and thumb.

7.1.2.7 Fold the wipe inside out along the 4" length, with the exposed (contacted) surface now on the inside. The wipe is now a 2" × 4" rectangle.

7.1.2.8 With the 2" × 4" rectangle, wipe the same areas of the child's other hand.

7.1.2.9 Fold the wipe in half again with the exposed (contacted) surface now on the inside.

7.1.2.10 Place the wipe back into the appropriately labelled (with Sample ID) glass jar.

7.1.2.11 Record the sample collection information on the sample collection sheet (Appendix A).

7.1.2.12 Using a sheet of paper and ink pen, trace the child's hands. Gently squeeze the fingers together to avoid tracing the individual fingers. Stop the trace where the wrist bends. Both sides of the paper may be used if necessary. Write the participant ID and date, along with the field technician's initials on the paper. (This step may be skipped if a metal sample was collected on Day 1 of the same sampling period).

7.2 HANDLING AND PRESERVATION

7.2.1 After collection and during transport from the collection site, store the hand wipe samples in a cooler with ice packs.

7.2.2 Follow the procedures in the SOP *EMAB-185.0 SOP for Storage and Shipping of Multimedia Samples*, for post-collection handling, storage, and shipment of hand wipe samples.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the technician collected hand wipe samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the tracing of the hand, the date and time of the sample collection, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by CDC for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B̂ 1001 – V̂1 F̂ Ŝ 1̂

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see QAPP section 1.4.2.19 *Hand Wipes* and *Table 5. Sample QC on per household basis*). FB and FS shall constitute 5-10% of the hand wipe samples collected. For storage, shipping, analysis and quantitation procedures, FB and FS samples will be prepared and treated in the same manner as the hand wipe samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of clean wipes in a sample collection container which will remain unopened in the field and returned to the EPA laboratory.

9.3 FS will be deployed to assess recovery of target analytes from the wipe media under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to wipe media, sealed in a sample container which will remain unopened in the field and returned to the EPA laboratory.

9.4 At least one FB and FS should be included with each batch of hand wipe samples shipped to the EPA laboratory.

10.0 REFERENCES

R. A. Fenske and C. Lu, "Determination of Handwash Removal Efficiency: Incomplete Removal of the Pesticide Chlorpyrifos from Skin by Standard Handwash Techniques." *J Am Ind Hyg Assoc*, 55, 1994.

J. C. Chuang, C. Lyu, Y-L Chou, P. J. Callahan, M. Nishioka, K. Andrews, M. A. Pollard, L. Brackney, C. Hines, D. B. Davis, and R. Menton, "Evaluation and Application of Methods for Estimating Children's Exposure to Persistent Organic Pollutants in Multiple Media." EPA/600/R-98/164a (Volume I), 1999.

Standard Operating Procedure for the Collection of Dermal Wipe Samples for Persistent Organic Pollutants, EPA/NERL SOP EMAB-011.1E (CTEPP 2.15) v1.

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Appendix A: Sample Collection Record for a Hand Wipe Sample

EPA Pilot Study Add-On to the Green Housing Study Hand Wipe Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Sample Type:	<input type="checkbox"/> Organics OR <input type="checkbox"/> Metals
Collection Time:	_____AM / PM	Hand Tracing Completed?	<input type="checkbox"/> YES <input type="checkbox"/> NO If No, explain in comments.
Length of time since last hand washing event: _____(hours:minutes)			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix X. SOP for Collecting Sock Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collecting Sock Samples

Number: EMAB-174.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-010

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR COLLECTING SOCK SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting sock samples in order to measure pesticides and metals used in estimating a child's dermal exposure for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Sock samples will be collected for the EPA pilot study add-on to the Green Housing Study from the index child and sibling on Day 1 of the sampling period while the field team is present. The caregiver (preferred) or field staff will clean the child's feet prior to the child(ren) wearing the supplied socks for 1-2 hours.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

RTP – Research Triangle Park

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

FB – Field Blank

FS – Field Spike

4.0 CAUTIONS

4.1 Hands of the caregiver or person handling the socks must be washed and dried prior to handling.

4.2 The child's feet must be cleaned and dried prior to the beginning of the sampling period.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the sock sample collection materials and deliver them to the field coordinator.

5.2 The field coordinator will receive the sock sample collection packets from EPA and keep records of receipt and distribution in their field record book. The field coordinator will distribute field collection materials to the field staff. Upon collection of the sock sample, the field coordinator will be responsible for returning the samples with their collection record and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, administration of the sock sample collection, and entering relevant information on the Sample collection record (Appendix A) and/or in field record books and returning collected sock samples to

the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Hirsch Natur Pure organic cotton socks (Little Spruce Organics) (or equivalent)

6.2 Two pair nitrile gloves

6.3 Insulated cooler

6.4 Ice packs (chilled)

6.5 Baby wipes or participant provided soap and water for hand/feet washing

6.6 Paper towels for hand/feet drying

6.7 Pen

6.8 Sharpie marker

6.9 Sample collection record sheet

6.10 Participant's time keeping device (watch, clock, timer)

6.11 Sample ID labels

6.12 One larger (gallon size) zip-top plastic bag

6.13 One smaller (quart size for sample collection) zip-top plastic bag

7.0 PROCEDURES

7.1 SAMPLE COLLECTION FOR EACH CHILD (PARENT/CAREGIVER)

Though written for the caregiver to perform, the procedures below can be performed by either the caregiver or field technician as long as all necessary information is recorded.

7.1.1 Remove any shoes and/or socks that the child might be wearing.

7.1.2 The caregiver must thoroughly wash his/her hands with soap and water, dry them using paper towels, or alternatively, put on disposable nitrile gloves supplied by the technician.

7.1.3 Wash the child's feet with a baby wipe or soap and water if baby wipes are not available. Thoroughly rinse, and dry with clean paper towels.

7.1.4 Place the provided socks on the child's clean feet. Additional layers (e.g., shoes, slippers) should not be worn over the provided socks.

7.1.5 Record the time that the child began wearing the socks in the sample collection record (Appendix A).

7.1.6 Have the child resume normal activities for 1 to 2 hours, preferably active indoor play. Because the child will only be wearing socks, outdoor play is strongly discouraged.

- 7.1.7 After the child wears the socks for 1 to 2 hours, the caregiver washes and dries his/her hands (or put on gloves) prior to handling the socks.
- 7.1.8 Open the smaller zip-top sample collection bag and set aside.
- 7.1.9 Flatten a larger zip-top bag on a table or counter.
- 7.1.10 Carefully remove the socks after the child has worn the garments for 1 to 2 hours.
- 7.1.11 Turn the socks inside out. Do not shake the socks as part of this process.
- 7.1.12 Place the socks into the smaller zip-top bag.
- 7.1.13 Remove excess air from the smaller bag and seal tightly.
- 7.1.14 Place the sample ID label on the outside of the smaller bag.
- 7.1.15 Record the time the socks were removed and a general description of the child's activities in the sample collection record.
- 7.1.16 Write the sample ID on the larger plastic bag with Sharpie marker (or adhesive label if available).
- 7.1.17 Place the smaller sample collection plastic bag (containing the socks) inside the larger zip-top bag.
- 7.1.18 Remove excess air from the larger bag and seal tightly.
- 7.1.19 Dispose of single use sampling kit items (nitrile gloves, label backing paper, paper towels, etc.) in regular household trash.

7.2 HANDLING AND PRESERVATION (FIELD STAFF)

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

- 7.2.1 Remove the plastic bags containing socks from the portable plug-in cooler, and store the sock samples in a cooler with ice packs after collection and during transport from the collection site.
- 7.2.2 Samples will be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.
- 7.2.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the sock samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the start

and stop time for sock wearing, a general description of the child's activity while wearing the socks (active, quiet play, meal/snack, nap, etc.), initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit #; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see QAPP section *1.4.2.10 Socks* and *Table 5. Sample QC on per household basis*). FB and FS samples shall constitute 5-10% each of the sock samples collected. For storage, shipping, analysis, and quantitation procedures, FB and FS samples will be prepared and treated in the same manner as the sock samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of a clean sock taken to the field in its respective container which will remain unopened in the plug in cooler and returned to the EPA laboratory.

9.3 FS will be deployed to assess recovery of target analytes from the sock medium under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to a clean sock which is stored in a sealed container. The container is shipped to the field team facility where it is stored under the same conditions as field collected samples.

9.4 At least one FB and FS should be included with each batch of sock samples shipped to the EPA laboratory.

10.0 REFERENCES

Nicolle S Tulve, Peter P Egeghy, Roy C Fortmann, Donald A Whitaker, Marcia G Nishioka, Luke P Naeher and Aaron Hilliard, "Multimedia measurements and activity patterns in an observational pilot study of nine young children" *Journal of Exposure Science and Environmental Epidemiology* (2008) 18, 31–44.

Standard Operating Procedure for Collection of Cotton Garment Samples for Estimation of Dermal

SOP: EMAB-174.0
Alt ID: GHS-010
Date: November 13, 2015
Page: 7 of 8

Loading of Pesticides, EPA/NERL SOP EMAB-141.0.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for a Sock Sample

EPA Pilot Study Add-On to the Green Housing Study			
Sock Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___		
Time socks were put on: _____ am/pm			
Time socks were taken off: _____ am/pm			
General description of the child's activities while wearing the socks:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XI. SOP for Collection of Urine Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Urine Samples

Number: EMAB-175.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-011

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR COLLECTION OF URINE SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting urine samples for the analysis of biomarkers for metals, pesticides, and consumer product active ingredients (CP-AI) for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

First morning void urine samples will be collected on two days (Sampling days 3 & 4) during each sampling period. The entire void for each sampling day will be collected in a 16 oz. plastic bottle and frozen prior to sample collection pick up by the field staff.

3.0 DEFINITIONS

SOP – Standard operating procedure

CP-AI – Consumer product active ingredients

CDC – Centers for Disease Control and Prevention

GHS – Green Housing Study

COC – Chain-of-custody

QC – Quality Control

PIRB – Participant Instruction and Record Book

QAPP – Quality Assurance Project Plan

FB – Field Blank – A urine substitute consisting of ultrapure DI water, free of target analytes, used to identify errors or contamination in sample collection, storage, and transport.

FS – Field Spike – A urine substitute consisting of ultrapure DI water, fortified with target analytes, used to assess potential problems in sample collection, storage and transport.

4.0 CAUTIONS

4.1 Do not touch the inside of the cup or cap at any time.

4.2 Keep the sampling materials and the samples out of the reach of children.

4.3 Do not remove the cap from the collection container until ready to collect the void.

4.4 Place the cap face up while voiding.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide sample collection materials, measure the total urine volume, and perform any needed post-collection urine sample processing as described by CDC in their protocol (see CDC 2009-0058 and associated log sheet),

5.2 The field coordinator will receive the urine sample collection materials and keep a COC tracking record for all samples. The field coordinator will also review and maintain field record books used for sample collection. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional QC sample materials. The field coordinator will distribute the collection materials to the field staff. Upon collection of the urine samples, the field coordinator will be responsible for delivering the urine samples with their collection records and COC sheets to the EPA lab in RTP, NC.

5.3 The field staff will be responsible for obtaining the urine sample collection materials from the field coordinator, labelling and distributing the urine sample collection materials to the participants' parent/caregiver, providing instructions to and collecting urine samples from the participants' parent/caregiver, entering relevant information on the sample collection record (Appendix B) and/or in field record books, and returning collected urine samples to the field coordinator.

5.4 The parent/caregiver is responsible for helping the child collect the urine samples, storing the samples in the plug-in cooler until transferred to the field staff, and recording requested information in the appropriate places in the Participant Instruction and Record Book.

6.0 MATERIALS

6.1 Nalgene® 2104-0016 High Density Wide Mouth leak-proof bottles (Fisher 02-893-5E or equivalent) 16 oz. (473 mL) capacity; made of high-density polyethylene with polypropylene screw closure

6.2 Polyethylene zip closure bags, suitable size for storage of 500-mL collection bottle

6.3 Cooler

6.4 Cold packs

6.5 Portable plug-in cooler

6.6 Reminder note (see Appendix A)

6.7 Nitrile gloves

6.8 Pens

6.9 Field record book(s)

6.10 Sample ID label

6.11 Absorbent material (Pig Mat or equivalent)

6.12 Participant Instruction and Record Book (PIRB)

6.13 Sharpie markers

6.14 Sample collection record sheet

7.0 PROCEDURES

7.1 MATERIALS DELIVERY AND INSTRUCTION (FIELD STAFF)

7.1.1 Instruct the parent by reviewing each of the steps in section 7.2 using the Participant Instruction and Record Book (PIRB).

7.1.2 Set-up the portable plug-in cooler and instruct the participant to put samples in it after collection.

7.1.3 Give the parent a urine sample collection packet including their PIRB, nitrile gloves, sample containers, zip closure bags, and reminder notes.

7.1.4 Answer any questions that arise.

7.2 SAMPLE COLLECTION (PARENT/CAREGIVER)

First morning voids are the most concentrated and preferred sample. However, if a first morning void sample is not available, a convenience sample may instead be collected. Urine samples will be collected on two days (Sampling Days 3 & 4) during each sampling period.

7.2.1 Place the reminder note on the toilet or other prominent location on the night before the scheduled collection (Appendix A). There is one reminder note for each sampling day or the same reminder note can be reused.

7.2.2 Remember or note the time of the void immediately (likely a bedtime void) before the one being collected. The time of or time since the last void will be recorded in the appropriate place the Participant Instruction and Record Book.

7.2.3 Have the child rinse their hands with water and air or towel dry them.

7.2.4 Rinse hands or don gloves if desired.

7.2.5 When the child is ready to void, remove the cap from the collection container and place the cap **face up** on a flat surface where it is unlikely to be disturbed or bumped while collection occurs. **Do not touch the inside of the container or cap at any time.**

7.2.6 Have the child collect the entire void in the collection container and assist as necessary.

7.2.7 Recap the collection container. If the container is wet, wipe it down with toilet paper or a paper towel.

7.2.8 Place the collection container in the appropriately labeled zip closure bag with absorbent material.

7.2.9 Remove excess air from the bag and close it.



7.2.10 Remove gloves (if worn) and dispose of the gloves in the trash.

7.2.11 Record the time of collection in the PIRB.

7.2.12 Place the bag and sample in the plug-in cooler as soon as possible.

7.3 HANDLING AND PRESERVATION (FIELD STAFF/FIELD COORDINATOR)

7.3.1 After collection and during transport from the collection site, store the urine sample in a cooler with ice packs.

7.3.2 Follow the procedures in *SOP EMAB-185.0, SOP for Storage and Shipping of Multimedia Samples* for post-collection handling, storage, and shipment of urine samples.

7.3.3 Complete the sample collection record for the sample (Appendix B).

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the urine samples, the sample collection information to be recorded will include the following, at a minimum: the sample ID, the participant ID, the date and time of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, whether the sample is a first morning void or convenience sample, time of or since last void, % of void that was collected, void volume, and any comments regarding collection (Appendix B). Other relevant information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by CDC for the main study. Those codes will capture the specific sample types

and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit #; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B̂ 1001 – V̂1 F̂ Ŝ 1̂

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see Quality Assurance Project Plan (QAPP) section *1.4.2.13 Urine* and *Table 5. Sample QC on per household basis*). FB and FS samples shall constitute 5-10% of the urine samples collected. For storage, shipping, analysis and quantitation procedures, FB and FS samples will be prepared and treated in the same manner as the urine samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of ultraclean distilled water in a sample collection container taken to the field which will remain unopened and returned to the EPA laboratory.

9.3 FS will be deployed to assess recovery of target analytes from the substitute urine media under the same storage and transportation conditions as the field samples. FS will be prepared by adding known amounts of target compounds to ultraclean distilled water and placed in a sample collection container. The container will remain unopened in the field and returned to the EPA laboratory.

9.4 At least one FB and FS should be included with each batch of urine samples shipped to the EPA laboratory.

10.0 REFERENCES

Standard Operating Procedure for the Collection of Urine Samples, EPA/NERL SOP EMAB-076.1E (HEAB-AHS-SOP-62), 1999.

CDC Green Housing Study Urine Collection. CDC 2009-0058.

CDC Green Housing Study Blood and Urine Log Sheet, 2012.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

REMINDER!

Collect first morning
void Urine Sample

REMINDER!

Collect first morning
void Urine Sample

Appendix B: Sample Collection Record for a Urine Sample

EPA Pilot Study Add-On to the Green Housing Study Urine Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection Time:	____:____ AM/PM
<input type="checkbox"/> First morning void?		<input type="checkbox"/> Convenience sample?	
Time of previous void ____:____ am/pm OR Time since last void ____ hr ____ min			
% of void collected _____		Volume of void collected _____ mL/oz.	
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XII. SOP for Collection of Duplicate Diet Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Duplicate Diet Samples

Number: EMAB-176.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-012

SOP Steward

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Signature:

Date:

Approval

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Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTION OF DUPLICATE DIET SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting food and beverage (duplicate diet) samples from the study participants in the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Duplicate diet samples will be obtained by collecting duplicate servings of all foods (both solid and liquid) that the child has eaten over a 24-hour period on sampling Day 2. Samples will only be collected for the sibling of the index child for which blood, nail clippings and stool samples are also collected. Detailed instructions will be provided to the participant in the Participant Instruction and Record Book, which includes a food diary to enter information about the food that was consumed. In the post-monitoring visit, the caregiver will be asked to describe the food sample contents and confirm the food diary information. Solid food and liquid food will be collected separately in Nalgene certified high density polyethylene (HDPE) jars. Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant.

3.0 DEFINITIONS

SOP – Standard operating procedure

Duplicate Diet Sample – Duplicate servings in both quantity and identity of all foods (both solid and liquid) that the participant eats or drinks during the 24-hr sampling period.

GHS – Green Housing Study

HDPE – High density polyethylene

QC – Quality Control

RTP – Research Triangle Park

PIRB – Participant Instructions and Record Book

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blank

FS – Field Spike

L – liter

4.0 CAUTIONS

Field staff should place the cooler which contains sample containers out of the reach of children. The goal of this sample collection is to have an exact replica of what the child eats and drinks during the 24-hour period. However, under no circumstances should food/beverage be taken away from a

child to make up the duplicate portion of food/beverage for the sample collection. If duplicate food/beverage or quantity is not available for any reason (e.g., school provided), take whatever steps possible to accurately record what was not provided in duplicate (e.g., description of item and quantity, photo, school lunch menu, restaurant location obtained).

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the sample collection materials and deliver them to the field coordinator.

5.2 Caregivers of the index child and sibling will be responsible for collecting the samples.

5.3 The field coordinator will receive the duplicate diet samples and keep records of receipt and distribution in their field record book. The field coordinator will distribute the sample collection materials to the field staff. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff along with any additional quality control sample materials. Upon collection of duplicate diet samples, the field coordinator will be responsible for returning the samples with their collections records and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.4 Field staff will provide training to the study participants on the procedures for collecting and documenting the food samples. The field staff will also provide and deliver all of the materials to the participants. Relevant information will also be documented on the sample collection record sheet (Appendix A).

6.0 MATERIALS

6.1 Solid food containers, 2 x 1L wide mouth Nalgene certified HDPE jar part # 311-1000 (or equivalent)

6.2 Liquid food containers, 2 x 1L wide mouth Nalgene certified HDPE jar part # 311-1000 (or equivalent)

6.3 Large coolers

6.4 Ice packs (chilled)

6.5 Participant Instruction and Record Book

6.6 Sample collection record sheet

6.8 Field record book(s)

7.0 PROCEDURES

Field staff will determine the eligibility of the child. Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant. If the child/caregiver is unwilling or unable to provide this complete set of four samples, do not collect this sample type.

7.1 WHEN TO COLLECT (CAREGIVER)

If determined eligible, collect the food samples during the 24-hr sampling period on Day 2 beginning at 12:00 AM (midnight) and ending at 12:00 AM at the beginning of Day 3.

7.2 WHAT TO COLLECT (CAREGIVER)

7.2.1 The goal of this sample collection is to have an exact replica of what the child eats and drinks during the 24-hour period. However, under no circumstances should food/beverage be taken away from a child to make up the duplicate portion of food/beverage for the sample collection. If duplicate food/beverage or quantity is not available for any reason (e.g., school provided), take whatever steps possible to accurately record what was not provided in duplicate (e.g., description of item and quantity, photo, school lunch menu, restaurant location obtained). Food items should also be prepared in the same manner as what is consumed by the child.

7.2.2 Collect any food items, both solid food and beverages (except water) that are given to the participant child during the above period of time. No water should be collected from any source or location.

7.2.3 Whenever possible, the caregivers will remove the inedible part of the food sample (such as paper wraps, lollipop sticks, orange peel, chicken bones). Collect food samples for each eligible child.

7.3 HOW MUCH OF EACH FOOD SAMPLE TO COLLECT (CAREGIVER/FIELD STAFF)

7.3.1 Collect the exact same amount of food and drink (except water) as the child consumes. For example, if the child eats a hamburger for lunch, collect one hamburger. If the child eats half a hamburger for lunch, collect half a hamburger. If the child drinks one glass of liquid (except water), collect the exact same amount of liquid for the sample.

7.4 WHERE TO STORE THE SAMPLES AND INFORMATION (CAREGIVER)

7.4.1 The caregiver will place all solid foods (such as bread, meat, vegetables) in the jar labeled with a sample ID code and "Solid Food." Place all liquid foods (such as milk, juice) in the jar labeled with a sample ID code and "Beverages." Any food item that becomes a liquid at room temperature (such as popsicles) should be stored in the "Beverages" container.

7.4.2 The caregivers will store the food samples in their refrigerator (or in a cooler provided by the sampling team) between additions of food/beverages, and after all collection is complete. Caregivers can call the Field Coordinator with any questions about the food sample collection.

7.4.3 Food menu/food diary: Caregivers will record the food samples collected during the 24-hour period in the Participant Instruction and Record Book. If duplicate food/beverage or quantity is not available for any reason (e.g., school provided), take whatever steps possible to accurately record what was not provided in duplicate (e.g., description of item and quantity, photo, school lunch menu, restaurant location obtained).

7.5 HANDLING AND PRESERVATION (FIELD STAFF/FIELD COORDINATOR)

7.5.1 After collection and during transport from the collection site, store the food and beverage samples in a cooler with ice packs.

7.5.2 Follow the procedures in *SOP EMAB-185.0, SOP for Storage and Shipping of Multimedia Samples* for post-collection handling, storage, and shipment of duplicate diet samples.

7.5.3 Complete the sample collection record for each sample. (Appendix A).

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the duplicate diet samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the instructions to participants containing the food diary, and initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
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9.0 QUALITY CONTROL AND QUALITY ASSURANCE

Field staff will examine the food samples at the sampling site and ask the participants about any potential problems during the sample collection.

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see Quality Assurance Project Plan (QAPP) section *1.4.2.11 Duplicate Diet* and *Table 5. Sample QC on per household basis*). Since it will be difficult to replicate the food actually consumed by the participants, an alternative food

consisting of cooked brown rice will be used for both blank media and preparing spiked media. Field blanks and spikes shall constitute 5-10% of the duplicate diet collected. For storage, shipping, analysis and quantitation procedures, field blank and spike samples will be prepared and treated in the same manner as the duplicate diet samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. Since it will be difficult to replicate the food actually consumed by the participants, an alternative food consisting of cooked brown rice will be used for blank media. The FB will consist of a sealed food collection container which will remain unopened in the field and returned to the EPA laboratory.

9.3 FS will be deployed to assess recovery of target analytes from the alternative food sampling media under the same storage and transportation conditions as the field samples. Since it will be difficult to replicate the food actually consumed by the participants, an alternative food consisting of cooked brown rice will be used for spiked media. The FS will be prepared by adding known amounts of target compounds to matrix blanks. The sealed food collection container housing the FS will remain unopened in the field and returned to the EPA laboratory.

9.4 At least one FB and FS should be included with each batch of duplicate diet samples shipped to the EPA laboratory.

10.0 REFERENCES

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestyles (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

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J. C. Chuang, P. J. Callahan, C. W. Lyu, Y.-L. Chou, and R. G. Menton, "Characterization of Polycyclic Aromatic Hydrocarbons Exposure Among Children of Low-Income Families from Inner Cities and Rural Areas." EPA/600/R-98/163a (Volume I) and EPA/600/R-98/163b (Volume II), 1999.

J. C. Chuang, C. Lyu, Y-L Chou, P. J. Callahan, M. Nishioka, K. Andrews, M. A. Pollard, L. Brackney, C. Hines, D. B. Davis, and R. Menton, "Evaluation and Application of Methods for Estimating Children's Exposure to Persistent Organic Pollutants in Multiple Media." EPA/600/R-98/164a (Volume I) and EPA/600/R-98/164b (Volume II), 1999.

EPA SOP EMAB-009.1E (CTEPP 2.13), Version 1, "STANDARD OPERATING PROCEDURE (SOP) FOR THE COLLECTION OF FOOD SAMPLES"

Appendix A: Sample Collection Record for a Duplicate Diet Sample

EPA Pilot Study Add-On to the Green Housing Study Duplicate Diet Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___		
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XIII. SOP for Collecting Diaper Samples for Urine Analysis

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure for Collecting Diaper Samples for Urine Analysis

Number: EMAB-177.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-013

SOP Steward

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Date:

Approval

Name: Kim Rogers

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Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field

NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE FOR
COLLECTING DIAPER SAMPLES FOR URINE ANALYSIS

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting urine samples using disposable diapers. This method is intended for the collection of urine samples from non-toilet trained siblings in the EPA pilot study add-on to the Green Housing Study (GHS). Samples containing only urine will be collected with a preference for first morning voids. If a first morning void collection is not possible, a convenience sample of the first diaper containing only urine will be collected.

2.0 SUMMARY OF THE METHOD

For non-toilet trained siblings, disposable diapers will be used for collection of urine samples.

3.0 DEFINITIONS

SOP – Standard operating procedure

Diaper Urine Sample – A diaper collected from a non-toilet trained sibling that contains only urine.

GHS – Green Housing Study

QC – Quality Control

CDC – Centers for Disease Control and Prevention

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

FB – Field Blank

FS – Field Spike

4.0 CAUTIONS

The field staff should discuss the brand of diaper used to determine from the caregiver if the child may have an allergic reaction to the diapers provided when they agree to collect the samples.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the diaper sample collection packets, record the dry weight for each diaper, and deliver them to the field coordinator.

5.2 The field coordinator will receive the diaper urine samples and keep records of receipt and distribution in their field record book. The field coordinator will distribute diaper urine collection materials to the field staff. The field coordinator will create a strategy and schedule to deploy or collect the appropriate percentage of each type of quality control (QC) samples. The field coordinator will communicate the schedule for QC samples to the field staff along with any additional QC sample materials. Upon collection of the diaper urine samples, the field coordinator will be responsible for

shipping the samples with their collection records and COC sheets to the EPA lab in RTP, NC.

5.3 Field staff will provide training and instructions to the caregiver for collection and storage of the diaper samples until the field staff returns to collect the samples. The field staff will ensure the samples are correctly labelled and stored properly until sent to the EPA lab. The field staff will also be responsible for collecting any supporting documentation, including the date and time of the sample collection, and completing a sample collection record sheet.

5.4 The caregiver will be responsible for collection and storage of the diaper sample until transferred to the field staff. The caregiver is also responsible for recording the date and time the sample was collected in the Participant Instruction and Record book.

6.0 MATERIALS AND REAGENTS

6.1 Zip-top bags, 1 gallon and 13"x18" sizes

6.2 Large coolers

6.3 Blue ice packs

6.4 Participant Instruction and Record Book

6.5 Field record notebook(s)

6.6 Sample collection record sheet

6.7 Portable plug-in cooler

6.8 Diapers (Huggies Snug and Dry, sized to fit participant)

6.9 Sample ID labels

7.0 PROCEDURES

7.1 MATERIALS DELIVERY AND INSTRUCTION (FIELD STAFF)

7.1.1 Instruct the parent by reviewing each of the steps in section 7.2 using the Participant Instruction and Record Book (PIRB).

7.1.2 Ensure portable plug-in cooler is set up and running.

7.1.3 Obtain the diaper size needed from the caregiver and provide the appropriate supplies (5 diapers, PIRB, zip-top bags with Sample ID labels), along with the instructions for collecting the samples.

7.1.4 Answer any questions that arise.

7.2 SAMPLE COLLECTION (PARENT/CAREGIVER)

First morning voids are the most concentrated and preferred sample. However, if a first morning void sample is not available, or if that diaper contains feces, a convenience sample may instead be collected. Urine samples will be collected on two days (sampling Days 3 & 4) during each sampling period.

7.2.1 On Days 2 and 3, the caregiver will place a disposable diaper (provided by EPA) on the non-toilet trained sibling just before bedtime. That wet diaper, removed the following morning (Day 3 and 4) contains the urine sample. If this diaper also contains feces, the caregiver should place a fresh EPA-provided diaper on the child and the next diaper containing only urine should be collected. Do not place baby wipes or other materials inside the soiled diaper.

7.2.2 Each diaper sample should be rolled and taped closed (with the existing diaper tape), placed in a separate Sample ID labelled zip-top bag, and stored in the cooler until transferred to the field staff.

7.2.3 The caregiver will document the date and time the diapers were installed, removed, and placed into cold storage in the Participant Instruction and Record Book.

7.2.4 The field staff will collect the diaper samples and the accompanying documentation from the participant.

7.3 HANDLING AND PRESERVATION (FIELD STAFF)

7.3.1 After collection and during transport from the collection site, store the diaper urine sample in a cooler with ice packs.

7.3.2 Follow the procedures in *SOP EMAB-185.0, SOP for Storage and Shipping of Multimedia Samples* for post-collection handling, storage, and shipment of diaper urine samples.

7.3.3 Complete the sample collection record for the sample (Appendix A).

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the diaper urine samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date and time of the sample collection, whether the sample is a first morning void or convenience sample, time of or since last void, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by CDC for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Field blank (FB) and field spike (FS) samples will be prepared and used (see Quality Assurance Project Plan (QAPP) section *1.4.2.14 Urine Diaper* and *Table 5. Sample QC on per household basis*). FB and FS samples shall constitute 5-10% of the urine samples collected. For storage, shipping, analysis and quantitation procedures, FB and FS samples will be prepared and treated in the same manner as the urine samples.

9.2 FB will be deployed to monitor background contamination during storage and analysis. The FB will consist of a diaper containing ultraclean deionized water and placed in a sealed zip-top bag which is contained within an outer bag. The bag will remain unopened at the field team facility and will be stored under the same conditions as the samples.

9.3 FS will be deployed to assess recovery of target analytes from the diaper urine media under the same storage and transportation conditions as the field samples. FS samples will be prepared by adding known amounts of target compounds to ultraclean distilled water applied to a diaper and placed in a zip-top bag. The bag will remain unopened at the field team facility and will be stored under the same conditions as samples.

9.4 At least one FB and FS should be included with each batch of diaper urine samples shipped to the EPA laboratory.

10.0 REFERENCES

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

APPENDIX A: Sample Collection Record for a Diaper Urine Sample

EPA Pilot Study Add-On to the Green Housing Study Diaper Urine Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection Time:	____:____ am/pm
<input type="checkbox"/> First morning void?		<input type="checkbox"/> Convenience sample?	
Time of previous void/diaper change ____:____ am/pm OR			
Time since last void/diaper change ____ hrs ____ mins			
Diaper Number: _____			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XIV. SOP for Collecting Blood Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collecting Blood Samples

Number: EMAB-178.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-014

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTING BLOOD SAMPLES

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1.0 SCOPE AND APPLICATION

The Centers for Disease Control and Prevention's (CDC's) blood drawing protocols, including the use of a certified pediatric phlebotomist for drawing blood from child participants, are not covered in detail in this standard operating procedure (SOP). Instead, this SOP focuses on how the field team obtains needed supplies, collects blood samples after they are drawn using CDC protocols, and then ships the samples to CDC for the analysis of biomarkers for pesticides and metals. These blood samples are being collected for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Blood will be collected on Day 5 during one sampling visit, preferably the first (baseline) visit. Duplicate diet, feces, nail clippings, and blood samples must be collected from the same participant prior to drawing blood. Blood should be collected where possible regardless of participation with the other sample types. A total of 10 mL of blood will be collected in two tubes. The first tube will be for metals analysis and it MUST be filled first before the serum tube in order to not contaminate the metals tube. The tube for metals is a 5 mL ethylenediaminetetraacetic acid (EDTA, designed to collect 3 mL blood) purple top tube and the serum tube is a 5 mL serum separating tube (SST). Blood will be drawn according to CDC protocols and best phlebotomy practices (CDC 2015).

3.0 DEFINITIONS

CDC – Centers for Disease Control and Prevention

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

EDTA – Ethylenediaminetetraacetic acid (This is an anticoagulant used to prevent clot formation. It is commonly added to collection tubes to maintain blood in the fluid state).

SST – Serum separating tube

QAPP – Quality assurance project plan

4.0 CAUTIONS

4.1 Nitrile gloves and eye protection will be worn during sample collection.

4.2 Field staff will keep the sampling materials and samples out of the reach of children.

5.0 RESPONSIBILITIES

5.1 The CDC project staff are responsible for preparing the blood sample collection materials, delivering them to the field coordinator, and receipt and storage of blood samples until analysis.

5.2 The field coordinator will receive the blood sample collection materials and keep records of receipt and distribution in their field record book. The field coordinator will distribute blood sample collection materials to the field staff. Upon collection of the drawn blood samples, the field coordinator will be responsible for returning the samples with their sample collection record and COC sheets to CDC in Atlanta, GA for analysis.

5.3 The field staff (includes certified pediatric phlebotomist) will be responsible for obtaining the collection materials from the field coordinator, collection of the blood sample, post collection sample processing as described by CDC, entering relevant information on the sample collection record sheet (Appendix A) and/or in field record books and returning collected blood samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Phlebotomy supplies

- a. SST Blood Collection Tube (5 mL BD Vacutainer Ref #368013)
- b. EDTA Blood Collection Tube (3 mL BD Vacutainer Ref #367856)
- c. BD Vacutainer Butterfly needles (23 gauge) Ref #367283
- d. Alcohol pad (pre-screened for metals)
- e. Sterile gauze
- f. Tourniquet
- g. Sharps container

6.2 CDC blood collection protocols (see 10.0 References)

6.3 Field record book

6.4 Pens

6.5 Ice packs (chilled)

6.6 Cooler

6.7 Nitrile gloves

6.8 Safety glasses

6.9 Sample ID label (labels provided by CDC's Sample Logistics group)

6.10 Sample collection record sheet

7.0 PROCEDURES

7.1 BLOOD COLLECTION

7.1.1 Duplicate diet, feces, nail clippings, and blood samples must be collected from the same participant. Blood should be collected where possible regardless of participation with the other sample types.

7.1.2, Blood samples should be collected during the home visit on Day 5 as shown in the Quality Assurance Project Plan (QAPP), *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages*, in Table 4 of Section 1.3.2 Schedule. Blood samples are only to be collected at one observation point, preferably during the initial baseline visit.

7.1.3 CDC blood collection protocols and phlebotomy best practices should be followed to collect blood samples from children using the CDC Green Housing Study Blood Specimen Collection protocol (CDC, 2015).

7.1.4 **Fill the EDTA tube FIRST (purple top), and then fill the serum tube afterwards.**

7.1.5 Mix both of the tubes several times by inversion.

7.1.6 Label both tubes with the Sample ID labels.

7.1.7 Complete the sample collection record sheet for the sample in pen (Appendix A).

7.1.8 Allow the serum tubes to clot for 30 minutes and then centrifuge the tube to separate the serum. Then aliquot this tube into microcentrifuge tubes and refrigerate at 4°C (CDC, 2015).

7.1.9 After mixing well, label and place the EDTA tube containing collected blood in one of the storage boxes provided by CDC. Do NOT centrifuge the EDTA tubes. STORE in a refrigerator at 4°C. Then, send tubes to CDC Sample Logistics within 30 days of collection.

7.2 HANDLING AND PRESERVATION

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment. There are storage boxes provided for each container type. These should be used for storage of samples and when samples are shipped to CDC.

7.2.1 After collection and during transport from the collection site, store the blood/serum samples in a cooler with ice packs.

7.2.2 Blood/serum samples will be stored under refrigerator conditions (4°C) at Tulane University until they are shipped to the CDC in Atlanta, GA.

7.2.3 For transport to the CDC laboratory, samples will be packed with ice packs in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the blood samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date and time of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by CDC for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
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9.0 QUALITY CONTROL AND QUALITY ASSURANCE

No QC samples such as field blanks, duplicates, or spikes are required for this sample (see Quality Assurance Project Plan (QAPP) section *1.4.2.17 Blood* and *Table 5. Sample QC on per household basis*). Quality control procedures includes accuracy checks for sample identification and labeling, general record keeping and maintenance of the chain-of-custody. In addition, emphasis is placed on using clean collection materials, the timely transfer of samples from participants to the field coordinator, rigorous storage and transport procedures to maintain sample integrity.

10.0 REFERENCES

CDC Green Housing Study Blood Specimen Collection, CDC 2009-0058e, 2015.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015

Appendix A: Sample Collection Record for a Blood Sample

EPA Pilot Study Add-On to the Green Housing Study Blood Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection Time:	____:____ am/pm
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XV. SOP for Collecting Nail Clippings for Metals Analysis

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collecting Nail Clippings for Metals Analysis

Number: EMAB-179.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-015

SOP Steward

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Name: Kim Rogers

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Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
COLLECTING NAIL CLIPPINGS FOR METALS ANALYSIS

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting nail samples for the EPA pilot study add-on to the Green Housing Study (GHS). Samples will be used to measure the concentrations of metals.

2.0 SUMMARY OF THE METHOD

The nails of an index child or sibling participant in the EPA pilot study add-on will be trimmed and collected as a biological sample. Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

RTP – Research Triangle Park

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

Nitrile laboratory protective gloves may be worn during nail trimming if they do not interfere with sample collection. Be aware that clippers can launch the nails to unpredictable locations. Since the nails are being collected, it is recommended to employ a “spotter” and to find a dark, uniform surface such as a table to trim from so that launched nails can be more easily located.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the nail sample collection materials and deliver them to the field coordinator.

5.2 The field coordinator will receive the nail sample collection materials and keep records of receipt and distribution in their field record book. The field coordinator will distribute sample collection materials to the field staff. Upon collection of the nail sample, the field coordinator will be responsible for returning the samples with their sample collection records and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the sample collection materials from the field coordinator, for collection of the nail sample, entering relevant information on the sample collection record sheet (Appendix A) and/or in field record books, and returning collected nail samples to the

field coordinator.

6.0 MATERIALS AND REAGENTS

- 6.1 New pair of nail trimmers (stainless steel toenail clippers, fingernail clippers, or nail scissors)
- 6.2 Quart sized zip-closure polyethylene bag
- 6.3 Dark, uniform surface (such as a table) as trimming platform
- 6.4 Pen
- 6.5 Nitrile laboratory gloves (optional)
- 6.6 Sample ID label
- 6.7 50 mL polypropylene tube with lid
- 6.8 Permanent marker (Sharpie or similar)
- 6.9 Sample collection sheet

7.0 PROCEDURES

7.0.1 Follow the timeline for Day 1 to collect samples as shown in the Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages Section 1.3.2 Schedule, Table 4*. Nail samples are only to be collected at the Day 1 visit.

7.0.2 Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant. If the child/caregiver is unwilling or unable to provide this complete set of four samples, do not collect this sample type. The child's nails must be of sufficient length to be trimmed without injuring the child.

7.1 SAMPLE COLLECTION

7.1.1 Prepare the plastic 50 mL tube by applying the label that contains the specified unique sample ID code (Section 8.0) directly to the outside of the tube (not to the lid).

7.1.2 Write the sample ID code (see Section 8.0) on the outside of a zip-top bag with a permanent marker.

7.1.3 Depending on the age and ability of the child, either the parent/caregiver or child (in preferential order) will trim both the finger and toenails.

7.1.4 Clippers can launch nails to unpredictable locations. Since the nails are being collected, it is recommended to employ a "spotter" and to find a dark, uniform surface such as a table to trim from so that launched nails can be more easily located.

7.1.5 Remove the lid from the plastic 50 mL polypropylene tube. Place the lid face up on the zip-top bag labeled in step 7.1.2.

7.1.6 Using a new nail trimmer (stainless steel toenail clippers, fingernail clippers, or nail scissors depending on the size of the nails), trim approximately 1-3mm of nail from each digit on both hands and feet. (Note: nail clippers should NOT be shared, use a separate pair for each participant). It is preferable to collect all 20 nails; however, if a young child is not tolerant of this activity, collect no fewer than 5 nails.

7.1.7 Trim a nail, collecting as much material as possible without injuring the child. Carefully transfer each nail into the labeled plastic 50 mL tube. Check the area to ensure that no nails are lost. Use caution that the tube is not spilled: either have a person hold it or re-cap it between additions.

7.1.8 Once all nails are collected, close the plastic 50 mL tube with its lid.

7.1.9 With the help of the parent/caregiver, complete the sample collection record (Appendix A).

7.1.10 Place the plastic 50 mL tube in the zip-top bag.

7.1.11 Gently force the excess air out of the polyethylene bag before sealing it.

7.1.12 Discard used gloves and label backing paper in household trash.

7.2 HANDLING AND PRESERVATION

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.2.1 After collection, samples should be transported to the field team's facility in coolers with ice packs.

7.2.2 Samples will then be stored under freezer conditions at -20°C and protected from light until they are shipped to the EPA Laboratory in RTP, NC.

7.2.3 For transport to the EPA laboratory, samples will be packed with blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the nail samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, the ID or role indicator of the person who trimmed the nails (technician, parent/caregiver, child), the approximate length of time since or date the nails were last trimmed, location from which nails were collected, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestyles (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

Because nails cannot be replicated or substituted, it is impossible to use field quality control samples such as field blanks, duplicates, or spikes (see Quality Assurance Project Plan (QAPP) section *1.4.2.16 Toenail Clipping* and *Table 5. Sample QC on per household basis*).

10.0 REFERENCES

Recommended Operating Procedure for Nail Collection, ROP-NHEERL/HSD/EBB/JI/06-002-000.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A. Sample Collection Record for a Nail Clipping Sample

EPA Pilot Study Add-On to the Green Housing Study Nail Clipping Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Nail Trimmer: (e.g., parent/caregiver or child)	
Time since last fingernail trim: _____ days OR Date of last fingernail trim: ___ / ___ / ___			
Time since last toenail trim: _____ days OR Date of last toenail trim: ___ / ___ / ___			
Circle nails collected:	left foot	right foot	left hand right hand
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XVI. SOP for Collecting Stool Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory

Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

Title: Standard Operating Procedure (SOP) for Collecting Stool Samples

Number: EMAB-180.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-016

Name: M. Scott Clifton

Signature:

Date:

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP) FOR COLLECTING STOOL SAMPLES

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting stool samples in order to measure metals used in estimating a child's exposure through ingestion.

2.0 SUMMARY OF THE METHOD

Stool samples from an index child or sibling participant in the EPA pilot study add-on to the Green Housing Study (GHS) will be collected as a biological sample. Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

RTP – Research Triangle Park

PIRB – Participant Instruction and Record Book

Stool Sample – Also referred to as Fecal Tissue

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

4.1 Nitrile gloves will be worn during sample collection and handling.

4.2 Do not flush plastic wrap down the toilet.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the stool sample collection packets and deliver them to the field coordinator.

5.2 The field coordinator will receive the stool sample collection materials and keep a COC tracking record in a field record book. The field coordinator will distribute the materials to the field staff. Upon collection of the stool sample, the field coordinator will be responsible for returning the samples with their collection records and COC sheets to the EPA in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, distribution of the stool sample collection packets and Participant Instruction and Record Book (PIRB)

to the participant's parent/caregiver, entering relevant information on sample collection record sheet and in field record books and returning collected stool samples to the field coordinator.

5.4 The parent/caregiver is responsible for collection of the stool samples, cold storage of the samples in the plug-in cooler until transferring the samples to the field staff, and recording requested information in the appropriate place in the PIRB.

6.0 MATERIALS AND REAGENTS

- 6.1 Plastic wrap, heavy duty (Saran Premium Wrap)
- 6.2 Diaper (Huggies Snug and Dry, size selected by participant)
- 6.3 1L wide mouth Nalgene certified HDPE jar part # 311-1000 (or equivalent)
- 6.4 Plastic zip-lock bag, 1 gallon and 18"x13" sizes
- 6.5 Absorbent Material (Pig mat or equivalent)
- 6.6 Soap and water for hand washing
- 6.7 Paper towels
- 6.8 Participant Instruction and Record Book (PIRB)
- 6.9 Cooler
- 6.10 Ice packs (chilled)
- 6.11 Portable plug-in cooler

7.0 PROCEDURES

Follow the timeline for Day 3 to collect samples as shown in the quality assurance project plan (QAPP) entitled *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestyles (EPA Pilot Study Add-On to the Green Housing Study)* section 1.3.2, Table 4. The participant follows the instructions and records the requested information in the PIRB.

7.1 SAMPLER DELIVERY (FIELD STAFF)

7.1.1 Determine the eligibility of the child. Duplicate diet, stool, nail clippings, and blood samples must be collected from the same participant. If the child/caregiver is unwilling or unable to provide this complete set of four samples, do not collect this sample type.

7.1.2 Instruct the parent by reviewing the procedure for stool sample collection detailed in the PIRB.

7.1.3 Give the parent a stool sample collection packet which contains the sample collection bottle and a zip-lock bag lined with absorbent material. Also provide two pairs of nitrile gloves, and a roll of plastic wrap.

7.1.4 Answer any questions that arise.

7.2 SAMPLE COLLECTION (PARENT/CAREGIVER)

Stool samples will be collected by the parent on the day after the duplicate diet samples are collected (scheduled Day 3). If the stool sample is not collected on Day 3, it can be collected any time before the field staff returns on Day 5.

7.2.1 *Diapers (Non-toilet trained children)*

7.2.1.1 When a diaper is found to contain stool, retrieve the stool sample collection packet which contains two zip-lock bags.

7.2.1.2 Remove the diaper as usual. Fold the diaper in half to cover the contents. Set aside until a new diaper is in place and the child is returned to a safe location and activities. Do not place any baby wipes inside the soiled diaper.

7.2.1.3 Place the diaper into the pre-labeled (with Sample ID) small zip-lock bag and seal.

7.2.1.4 Place the small bag containing the diaper into the larger bag and seal.

7.2.1.5 Record the sample collection information in the PIRB.

7.2.1.6 Place the zip-lock bag in the plug-in cooler until pickup by the field staff.

7.2.2 *Toilet-trained children*

7.2.2.1 Since bowel movements in children can be unpredictable, the stool sample collection materials should be located in the bathroom.

7.2.2.2 With the child's help, determine when a bowel movement is imminent.

7.2.2.3 If possible, have the child urinate first.

7.2.2.4 Lift the lid and seat on the toilet.

7.2.2.5 Pull 2 feet or so of plastic wrap from the roll. Place the loose plastic wrap on the floor and hold with your foot as you loosely cover the toilet bowl, leaving a hand-width opening at the front for toilet paper disposal. Leave plenty of wrap on the sides to make the following instructions easier to implement.

7.2.2.6 Lower the seat onto the plastic wrap to hold it in place.

7.2.2.7 Have the child relieve as normal.

7.2.2.8 Ensure that soiled toilet paper is disposed of into the toilet through the opening in the plastic you left. If possible, any urine in the plastic wrap should be disposed of through the opening either now or in step 7.2.2.11.

7.2.2.9 Don nitrile gloves.

- 7.2.2.10 Retrieve the stool sample collection packet; remove and open the pre-labeled (with Sample ID) sample collection bottle.
- 7.2.2.11 Carefully lift the plastic wrap using the extra amount from the outside of the bowl and loosely wrap the stool sample as if you are forming a bag.
- 7.2.2.12 Place the stool sample wrapped in the plastic wrap inside the collection jar.
- 7.2.2.13 Close the lid on the sample jar.
- 7.2.2.14 If the outside of the jar or lid is soiled, use toilet paper to remove any fecal material.
- 7.2.2.15 Remove the gloves and dispose of them in the household trash.
- 7.2.2.16 Record the sample collection information in the PIRB.
- 7.2.2.17 Place the collection jar back into the zip-lock bag lined with absorbent material. Remove excess air from the bag before sealing.
- 7.2.2.18 Place the zip-lock bag in the plug-in cooler until pickup by the field staff.

7.3 HANDLING AND PRESERVATION

- 7.3.1 After collection and during transport from the collection site, store the stool sample in a cooler with ice packs.
- 7.3.2 Follow the procedures in the Storage and Shipping SOP EMAB-185.0, “Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples” for post-collection handling, storage, and shipment of stool samples.
- 7.3.3 With the help of the participant, complete the sample collection record for the sample (Appendix A).

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the stool samples, the sample collection information to be recorded will include the following, at a minimum: the sample ID, the participant ID, the date and time of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, time of or since last void, and any comments regarding collection (Appendix A). Other relevant information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b)

Study Location, (c) Subject ID; (d) Home Visit #; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 No QC samples are required for this sample.

10.0 REFERENCES

Seattle Children’s Hospital. Stool Test. www.seattlechildrens.org/pdf/PE810.pdf

MedlinePlus. Fecal culture. <http://www.nlm.nih.gov/medlineplus/ency/article/003758.htm>.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A. Sample Collection Record for a Stool Sample

EPA Pilot Study Add-On to the Green Housing Study Stool Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Collection time:	__:__ am/pm
Approximate time of last bowel movement (date/time) OR:			
Approximate time since last bowel movement (days/hours):			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Field Staff ID/Initials:			

Appendix XVII. SOP for Collection of Activity Data using Actical™ Activity Monitors

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Activity Data using Actical™ Monitors

Number: EMAB-181.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-017

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

Standard Operating Procedure (SOP) for Collection of Activity Data using Actical™ Monitors

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1.0 SCOPE AND APPLICATION

Actical™ is an activity monitor designed for long-term monitoring of gross motor activity in human or animal subjects. The monitor contains an omnidirectional accelerometer with a force resolution of 0.01 g. The Actical™ requires programming with a series of commands and identification information prior to data collection. Collected data are downloaded to a personal computer (PC) for analysis and storage via an RS-232 Serial Port connected to the Actiwatch Reader®.

The accelerometer within the unit generates a variable, proportional electrical current dependent on the speed and degree of motion. The electrical current data is stored as activity counts based on the oscillation frequency of the sensor. The maximum sampling frequency is 32 Hz.

No two accelerometers of any type will give exactly the same reading for the same motion. This variation, in addition to variation in device location, makes the comparability of Acticals inconsistent. However, each unit is programmed with a calibration coefficient to normalize data between Acticals, and will be calibrated during a resting and high movement period for each participant. This will remove most of the variation between devices due to sensor differences. Regardless, the manufacturer recommends using the activity levels as subjective measures, not as absolute values for comparison between units.

2.0 SUMMARY OF THE METHOD

For the EPA pilot study add-on to the Green Housing Study (GHS), the Actical™ monitor is worn on the participant's waist for personal monitoring to provide the greatest oscillation difference between movement and basal activities. Although greater sensitivity may be achieved by wearing the monitor on the ankle, the Actical™ will be worn on the waist of children participating in the EPA pilot study add-on to the GHS due to privacy concerns and greater comfort, thereby reducing participant burden. In addition, activity levels measured on the waist are more highly correlated with total energy expenditure than activity levels measured on extremities of the body.

3.0 DEFINITIONS

SOP – Standard operating procedure

PC – Personal Computer

GHS – Green Housing Study

CD – Compact disk

V – Volt

mAmp – milliAmpere

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

The Actical™ is packaged in a water-resistant case. The sensor is not packaged to withstand pressures greater than 1 atmosphere or depths greater than 1 meter. However, avoid submerging the Actical™ in water or other fluids.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the Actical materials and deliver them to the field coordinator.

5.2 The field coordinator will receive the Actical materials from EPA and keep records of receipt and distribution in their field record book. The field coordinator will prepare each unit for activity collection and distribute to the field staff, including replacing batteries if required. Upon collection of the Actical™ unit back from the field staff, the field coordinator will be responsible for downloading the collected data with appropriate documentation as to participant and date of collection. The field coordinator will also return the downloaded electronic data and sample collection record sheets to the EPA in Research Triangle Park (RTP), NC for analysis. Upon completion of the study, the field coordinator will return all Actical™ units and peripherals to EPA project staff.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, distribution and collection of the Actical materials to the participant's parent/caregiver, entering relevant information on the sample collection record sheet and/or in field record books, and returning collected Actical™ units to the field coordinator.

5.4 The parent/caregiver is responsible for placing the Actical™ unit on the study participant at the designated data collection times, transferring the used Actical™ units to the field staff, and recording requested information in the Participant Instruction and Record Book.

6.0 MATERIALS

6.1 Actical™ with waist band

6.2 Spare 3V, 150 mAmp Lithium-Manganese battery (CR 2025)

6.3 Spare Actical waist bands

6.4 ActiReader® (power cable also required for some versions of this unit)

6.5 Actiware Program® CD (alternately, program may be downloaded from ftp://ftp1.respironics.com/downloads/minimitter/Actical_2_12.zip)

6.6 RS-232 cable

6.7 Personal computer w/ CD drive or internet connection and Windows OS (software verified on XP and 7)

6.8 9- or 25-pin RS-232 serial communications port or USB port

6.9 Small flat-head screwdriver

6.10 Actical™ instruction manual

6.11 Participant Instruction and Record Book

6.12 RS-232 to USB converter

6.13 Participant's time keeping device (watch, clock, timer, etc.)

6.14 Sample Collection Record sheet

7.0 PROCEDURES

7.1 PREPARATION FOR ACTIVITY DATA COLLECTION (FIELD COORDINATOR)

Actiware Software Installation for Actical

7.1.1 Using the Actiware CD or Zip file downloaded

from ftp://ftp1.respironics.com/downloads/minimitter/Actical_2_12.zip, install Actical v2.12.0002 program on PC.

7.1.1.1 Select Run CDMENU.EXE from either the CD or zip file.

7.1.1.2 Select Install Actical® (first choice) from the CDMENU popup window.

7.1.1.3 If desired, change the directory where the program will be installed (click the Change Directory button highlighted in purple in Figure 1). Once you are satisfied with the location, click the button to begin installation (highlighted in light blue in Figure 1).

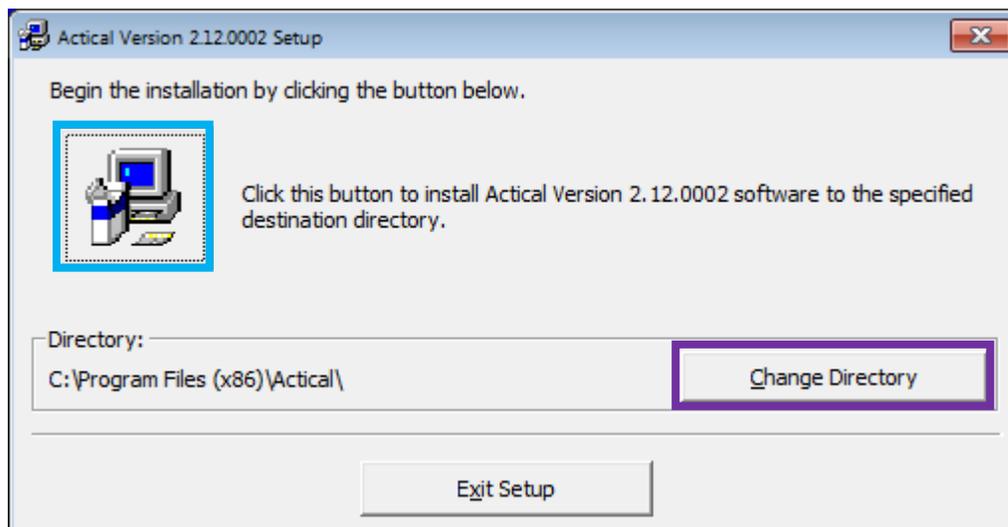


Figure 1. Actical Setup screen used to change install directory and begin installation.

7.1.1.4 Follow onscreen instructions clicking OK, Continue, etc. until the popup window shown in Figure 2 appears.

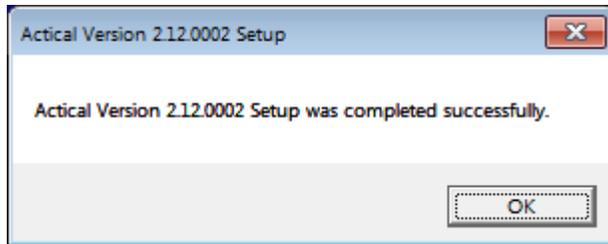


Figure 2. Actical Setup complete popup window.

Actical Configuration

7.1.2 Open Actical 2.12 program on PC. A menu option should appear on the Start Menu as shown in Figure 3.

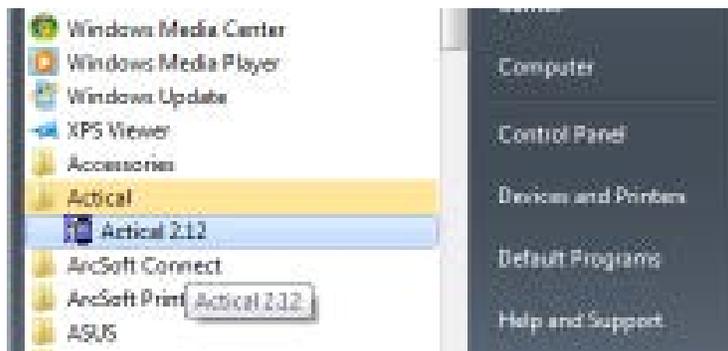


Figure 3. Screen shot of Start Menu containing folder and shortcut to start Actical software.

7.1.3 Connect the ActiReader power cable to the right side of the device as shown in Figure 4B.

7.1.4 Turn the ActiReader on using the power switch on the back of the device as shown in Figure 4A.

7.1.5 Connect the RS-232 cable to the ActiReader unit as shown in Figure 4B. Connect the RS-232 cable to the computer's RS-232 port (COM1) or USB port through a RS-232 to USB converter.

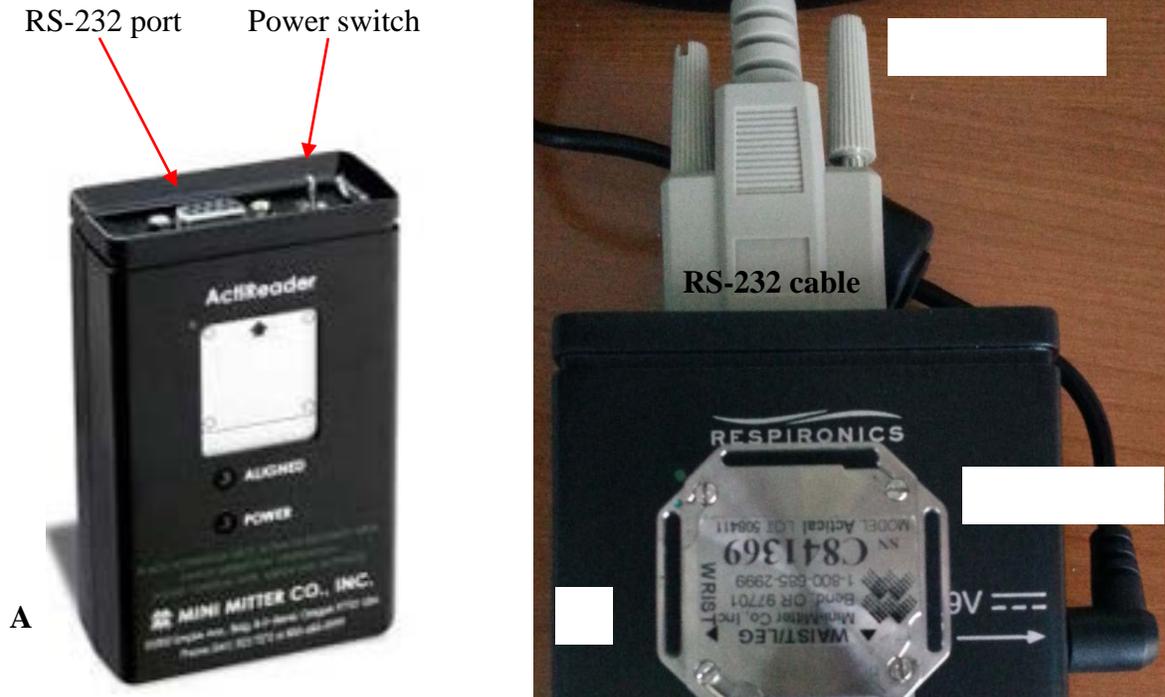


Figure 4. (A) ActiReader unit showing RS-232 port (top left) and power switch (top right). (B) ActiReader unit showing RS-232 cable (top) and power cable (right) connections.

7.1.6 If using a USB connection, a window such as that shown in Figure 5 may appear the first time the ActiReader is connected. If it does, take note of the Comm Port displayed.

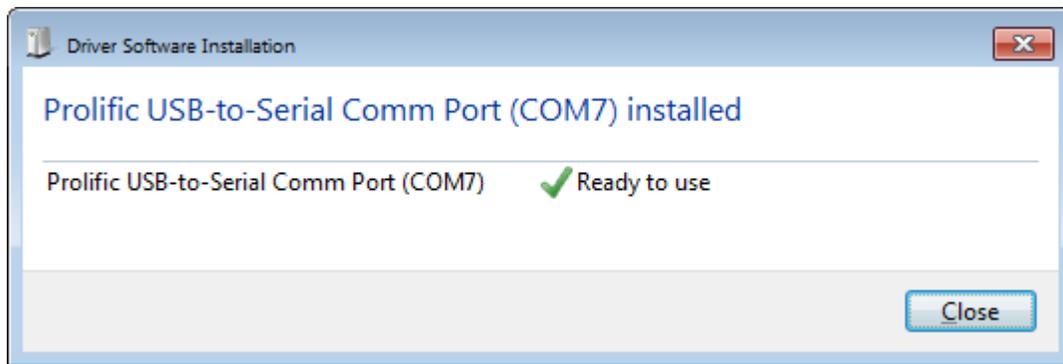


Figure 5. Popup window showing Comm Port for ActiReader connected through USB connection.

7.1.7 Select correct COM port in Actiware® program's READER menu. If using a RS-232 connection, select COM1. If using a USB connection, select the COM# determined in the previous step (e.g., COM7 as noted in Figure 5). If unknown, trial and error selecting different COM#s may be required.

Once this has been selected, setup should not be required again.

7.1.8 In the main Actical software window, select the **READER** option on the top header menu then select the **WRITE** option.

7.1.9 Place the Actical™ face down on the ActiReader® unit with the green dot on the ActiReader aligned with the small green dimple on back plate of the Actical™ as shown in Figure 6. The Actical™ must be perfectly flat. A green “Ready” light will illuminate when properly aligned. If light will not illuminate, try switching power switch on the ActiReader unit to “Battery” (usually for laptops). Otherwise, check Section 7.6 Troubleshooting.

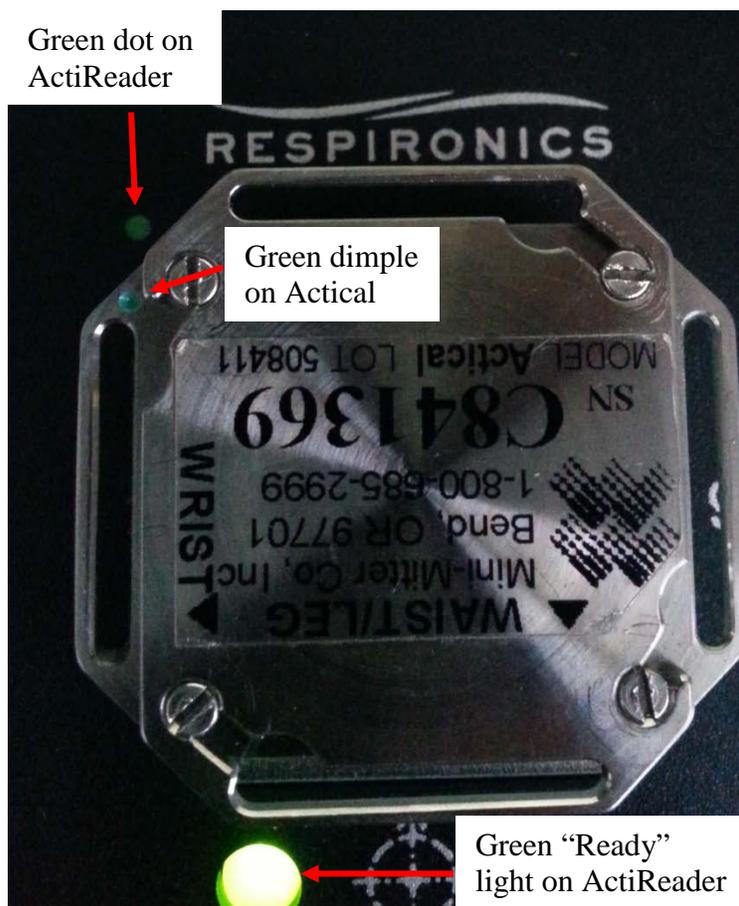


Figure 6. Actical™ unit correctly positioned on the ActiReader.

7.1.10 Follow on-screen instructions until current set-up for Actical™ appears. Edit the set-up as specified below (See red entries in Figure 7) in order to configure the Actical device.

- a) Enter Identity as the specific Participant ID number assigned to each participant. Note that “Participant ID” is used as a placeholder in Figure 7, but the actual Participant ID number should be entered here.

- b) Enter the appropriate start date and start time.
- c) Make sure the EPOCH Length equals 00.25.
- d) Check approximate battery life and replace if the battery life is less than 10 days. See Section 7.5 Battery Replacement for battery replacement instructions.
- e) Enter the participant's gender, age, height (in cm or inches) and weight (in kg or pounds). Height and weight will be converted to the other unit of measure automatically.
- f) Click SEND (highlighted in purple in Figure 7) when finished entering data to configure the Actical device.

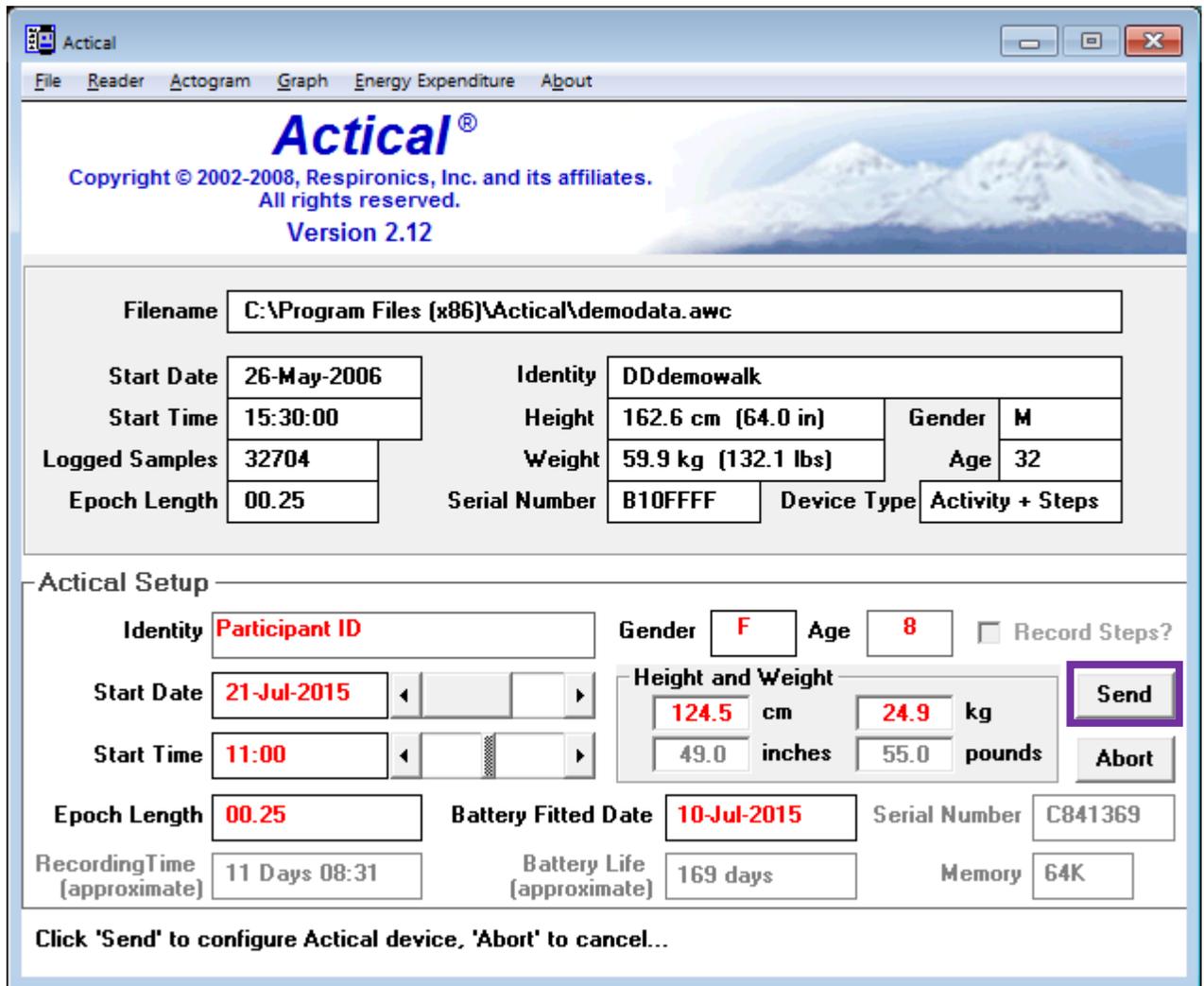


Figure 7. Actical setup screen.

7.1.11 Do not remove Actical™ unit after clicking SEND until computer says configuration is complete as shown in Figure 8.

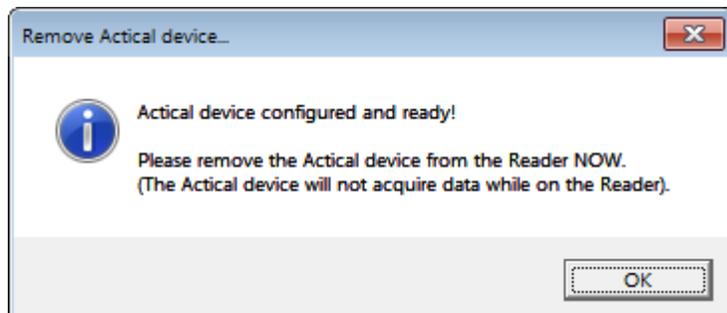


Figure 8. Popup window indicating Actical device is configured and it is safe to remove the device.

7.1.12 Record the Participant ID and Actical Serial Number (SN: C841369 is shown in Figures 4B, 6, and 9) on the Sample Collection Record (Appendix A).

7.1.13 Deliver the Actical collection materials and Sample Collection Record to field staff. Record distribution of Actical collection materials in field record book.

7.2 ACTICAL™ SAMPLER DELIVERY TO PARTICIPANT (FIELD STAFF & PARENT/CAREGIVER)

7.2.1 Follow the timelines for Day 1 to instruct parent/caregiver and Days 2-4 to collect Activity data as shown in the Quality Assurance Project Plan, *An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages Section 1.3.2*. The Actical™ may continue to be worn on Day 1 after placement by the field staff and initial calibration.

7.2.2 Confirm the Actical serial number and Participant ID on the Sample Collection Record. Copy this information to the Participant Instruction and Record Book.

7.2.3 Place the waist band on the Actical™ device using the slot labeled “Waist/Leg” (highlighted in purple in Figure 9) and the one opposite the labeled slot (see red arrows in Figure 9).



Figure 9. Slots used for waist band installation.

7.2.4 If the child is present, place the Actical™ device on the child. If the child is not present, instruct/show the parent/caregiver the correct placement of the device and calibration procedures.

The device should sit just above the child's hip bone, with the arrow on the device pointing up (toward the child's head, see Figure 10). The device does not have to touch the skin and may be worn under or over clothing. It should be placed out of sight to not attract attention to the child or the device. It should also be comfortable for the child so he/she will not notice the device and not disturb it. Belt loops may be used to attach the waist band. As appropriate, consult with the child to determine comfort and appropriate location for the least disturbance to the child.



Figure 10. Front of Actical™ device showing arrow that should point up towards the participant's head after correct deployment.

7.2.5 Calibrate the device to the child using the following steps and a field staff or participant's time keeping device.

7.2.5.1 As appropriate, instruct the child (may require assistance from the parent/caregiver) to sit still for at least 5 minutes to calibrate for low movement (minimum) activity. During this time, continue to discuss Actical instructions with the parent/caregiver. A small toy, book, or game that does not inspire significant body movements may be used to encourage the child to remain still. Turning pages or similar hand movements are acceptable, but should be noted on the Sample Collection Record. Record the date and start/end times of this quiet period on the Sample Collection Record in pen.

7.2.5.2 As appropriate, instruct the child (may require assistance from the parent/caregiver) to continuously perform a high movement (maximum) activity for 5 minutes. This high movement activity must be age and ability appropriate. Record the activity(ies) performed, date, and start/end times of this high movement period on the Sample Collection Record in pen. Examples of "high movement activities" are listed below by general age groups.

- a) For non-mobile infants, this may require the parent to help the child move their arms/legs (as if shaking a rattle and kicking).
- b) For older infants, crawling is likely their highest movement activity.
- c) For toddlers, walking is likely their highest movement activity.
- d) For older children, running, marching with vigorous arm movements, or jumping jacks would be appropriate high movement activities.

7.2.6 Give the parent/caregiver an Actical™ sample collection packet to include the Actical device, a spare waist band, and Participant Instruction and Record Book.

7.2.7 The Actical™ may continue to be worn on Day 1 after placement by the field staff and initial calibration.

7.2.8 Answer any questions that arise.

7.2.9 On day 5 of the sample collection timeline, collect all items provided to the participant and parent/caregiver including the Actical, waist bands, Participant Instruction and Record Book. Deliver all materials back to the field coordinator.

7.3 ACTICAL™ SAMPLER DEPLOYMENT (PARENT/CAREGIVER)

7.3.1 At the beginning of each data collection day (Days 2-4), strap the Actical™ to the child's waist and adjust the strap as instructed by the field staff (see step 7.2.4). It is very important that the arrow on the Actical™ be pointed UP towards the child's head (see Figure 10). Note the date and start time in the Participant Instruction and Record Book.

7.3.2 At the end of the data collection day (bedtime), remove the Actical™ unit and record the end time in the Participant Instruction and Record Book.

7.3.3 If the unit is not worn by the child for periods of longer than 30 minutes, notify the field staff of

the days, times, and activities when it was not with the child. It is recommended to ask the child about this at the conclusion of each day.

7.3.4 Do **NOT** get the Actical™ wet. If the child will be in the water (swimming, showering, etc.), remove the Actical™ and record the times the unit was not worn in the Participant Instruction and Record Book and their activities during that time. Note: The device should withstand small amounts of liquid such as drink spills or sweat, but should not be submerged, immersed, or soaked.

7.3.5 Record any additional unique activity information in the Participant Instruction and Record Book.

7.4 ACTIVITY DATA DOWNLOAD PROCEDURES (FIELD COORDINATOR)

7.4.1 Remove the waist strap from the Actical™ device.

7.4.2 Ensure the ActiReader is properly connected and turned on (see steps 7.1.3 through 7.1.5).

7.4.3 Place the Actical™ unit on the ActiReader with the green dots aligned. Verify the green LED illuminates to indicate proper alignment (see Figure 6).

7.4.4 Open Actical software program (see step 7.1.2). Select READER > Read from header menu.

7.4.5 Program will retrieve set-up information and download data directly.

7.4.6 Do **NOT** remove Actical™ from Reader® until download is complete as indicated by a popup window. You will not lose the data, but you'll need to start the download process over again. Data is maintained in internal memory until you WRITE to the Actical™ or TEST the Actical™ or ActiReader®.

7.4.7 Once download is complete, select SAVE to save data. Enter filename using the Sample ID code described in Section 8.0. The file extension should be .AWC. It is recommended that a file folder strategy be employed (e.g., one folder per sampling time, participant).

7.4.8 Select Energy/Expenditure from the header menu bar. Select the location where the device was worn (choices: Wrist, Hip, Ankle; Note that the hip/waist should be used in this study.) and click OK. The screen will show a view similar to that depicted in Figure 11.

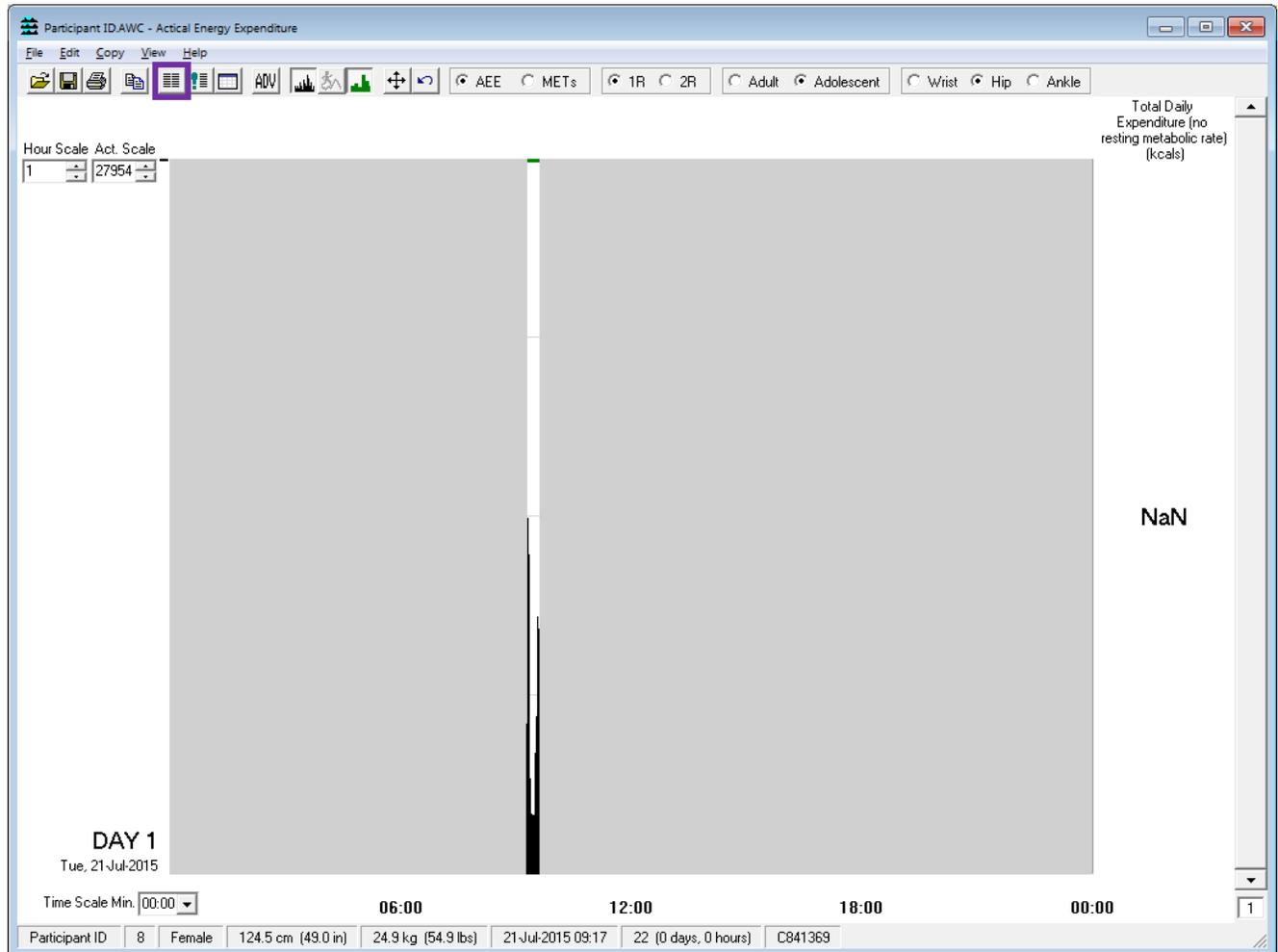


Figure 11. Actical Energy Expenditure screen.

7.4.9 Click on the Epoch-by-Epoch list button (highlighted at the top in purple in Figure 11) and save the Epoch-by-Epoch list by selecting File > Export. Enter filename using the Sample ID code described in Section 8.0. The file extension should be .CSV.

7.4.10 Using the computer's directory listing (e.g., Computer or My Documents), confirm that the data just downloaded has been saved and can be accessed by opening up the newly created .CSV file.

7.4.11 Make a backup copy of the downloaded Actical data to a designated location on permanent media or a separate computer system.

7.4.12 Note this download and backup activity in the Sample Collection Record (Appendix A).

7.5 BATTERY REPLACEMENT (FIELD COORDINATOR)

7.5.1 Use a flat-head screwdriver to loosen each of the 4 screws in the slots (see Figure 12). The screws do not need to be removed, only loosened (2-3 turns).



Figure 12. Loosening screws for battery replacement.

7.5.2 Carefully press downward and rotate the Actical™ back clockwise to remove the back of the Actical device for access to the battery (see Figure 13).

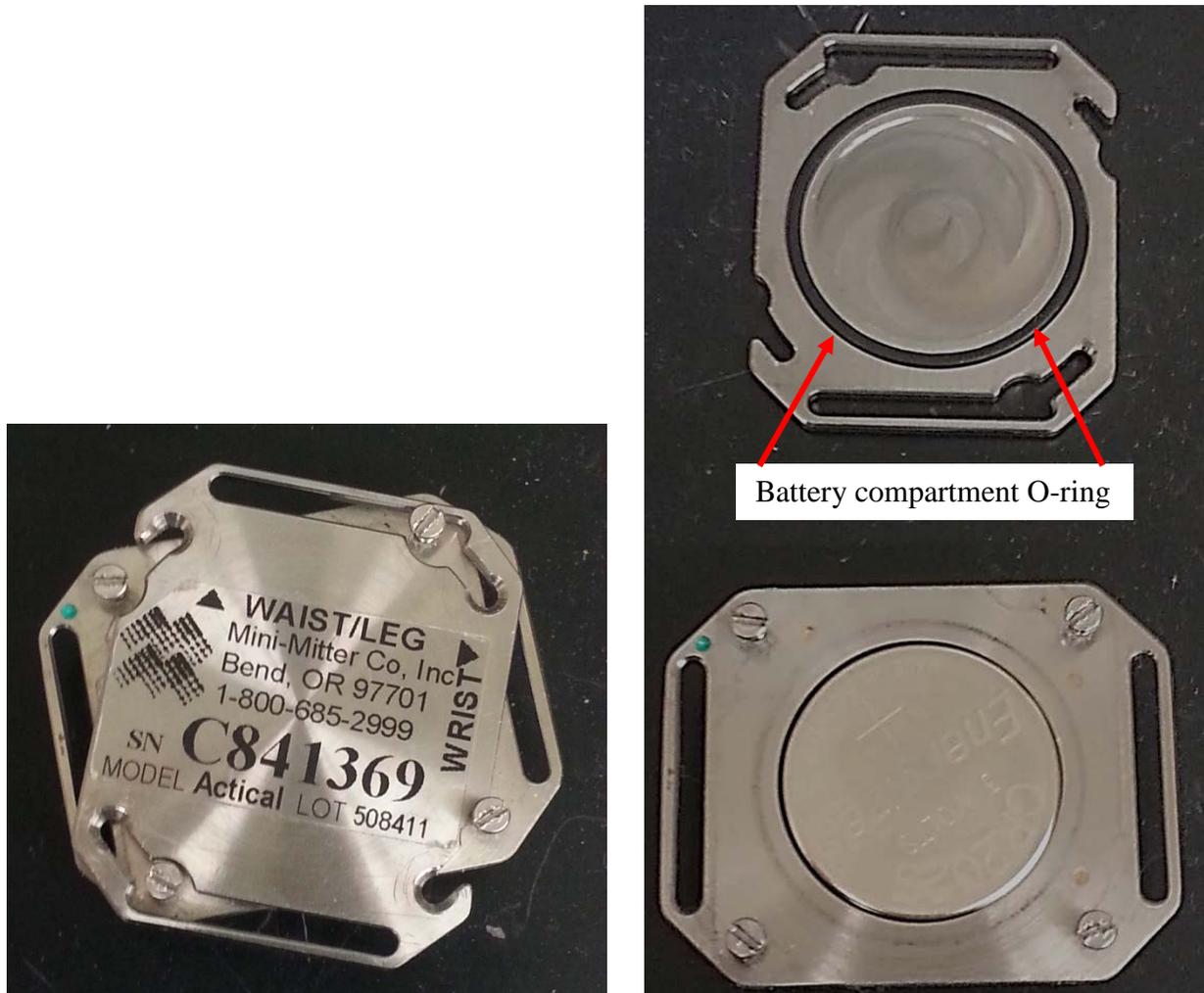


Figure 13. Removal of the back of the Actical™ device to expose battery compartment.

7.5.3 Remove the battery and recycle if possible.

7.5.4 Inspect O-ring (highlighted by red arrows in Figure 13) for cracks, tears, or other damage. Replace if necessary and make sure it is properly seated.

7.5.5 Install new CR 2025 battery, positive (+) side up as shown in the bottom right of Figure 13.

7.5.6 Replace battery cover. Rotate the cover counterclockwise until the slots in the back are firmly seated around the screws and the back is square with the case. Replace screws in non-slotted holes as required. Lightly tighten all 4 screws and then snugly tighten screws in an “X” pattern.

7.5.7 Test Actical™ following procedure listed in Section 7.6 TROUBLESHOOTING – Testing the Actical, and update the Battery Fitted Date.

7.6 TROUBLESHOOTING

Testing the Actical

7.6.1 The Actical™ operation may be tested after battery replacement and to check for proper communication with the device by following the procedure below.

- a) Open Actiware program on computer (see step 7.1.2). Place Actical™ on ActiReader unit so the green LED illuminates to indicate proper alignment (see Figure 6).
- b) IF ACTICAL™ CONTAINS DATA THAT HAS NOT BEEN DOWNLOADED TO A COMPUTER, FOLLOW INSTRUCTIONS IN SECTION 7.4 BEFORE PROCEEDING.
- c) Select READER > Test Actical™ device from header menu.
- d) Follow instructions on computer monitor. Actical™ will be tested automatically.
- e) If unit passes test, select READER > Write from menu and then follow steps 7.1.10-7.1.11 to configure the Actical. Change “Battery Fitted” date if battery changed. Change other information as necessary and follow the remaining instructions in Section 7.1 Preparation for Activity Data Collection (steps 7.1.12-7.1.13).
- f) If unit fails test, consult Appendix C and D of the Actical instruction manual.

Testing the ActiReader

7.6.2 The ActiReader® unit may be tested after battery replacement or if there is difficulty communicating with the Actical device by following the procedure below.

- a) Open Actiware® program on computer (see step 7.1.2). Place Actical™ on Reader® unit so the green LED illuminates to indicate proper alignment (see Figure 6).
- b) IF ACTICAL™ CONTAINS DATA THAT HAS NOT BEEN DOWNLOADED TO A COMPUTER, FOLLOW INSTRUCTIONS IN SECTION 7.4 BEFORE PROCEEDING.
- c) Select READER > Test Reader from menu.
- d) Follow instructions on computer monitor. ActiReader® unit will be tested automatically.
- e) If unit fails test, consult Appendix D of Actical instruction manual.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the Actical™ activity data, the sample collection information to be recorded by the field coordinator/staff will include the following, as a minimum: the sample ID, the participant ID, Actical™ serial number, calibration information to include date and minimum/maximum activity calibration start/stop times (if collected by field staff), initials or ID number of the field staff member responsible for the sample collection, and any comments regarding calibration (Appendix A). Information to be recorded by the field staff or parent/caregiver in the Participant Instruction and

Record Book will include the following, as a minimum: the Actical™ serial number, Participant ID, location worn, calibration data (if not collected by field staff), dates and start/stop times when Actical™ was worn, dates/time when the Actical™ was not worn, reasons for when it was not worn, and activities during time not worn. Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B̄ 1001 – V̄1 F̄ S̄ 1̄

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Because the accelerometer records data only, it is impossible to use field quality control samples such as field blanks, duplicates, or spikes (see Quality Assurance Project Plan (QAPP) *section 1.4.2.12 GPS and Accelerometer* and *Table 5. Sample QC on per household basis*).

9.2 Quality control will focus on ensuring device functionality, data transfer and transcription, maintenance of privacy, and data storage. Controls will include routine inspection and maintenance of the Actical™ device, particularly for battery performance and accessibility to backup device should failure occur. In addition, the field coordinator will ensure that routine data transfers are complete and secure.

10.0 REFERENCES

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015

Respironics, ActiCal Physical Activity Monitoring System: ActiCal Software, ActiReader Instruction Manual, 2010.

Appendix A: Sample Collection Record for an Actical™ Sample

EPA Pilot Study Add-On to the Green Housing Study Actical™ Sample			
Participant ID:		Sample ID:	
Actical™ Serial Number:		Field Staff ID/Initials:	
Calibration Date:	___ / ___ / ___		
Minimal activity Start Time:	____:____ am/pm	Minimal activity Stop Time:	____:____ am/pm
Maximum activity Start Time:	____:____ am/pm	Maximum activity Stop Time:	____:____ am/pm
Calibration notes (include type of low/high movement activities performed):			
Day 1 Date: _____ Time on: _____ Time off: _____			
Day 2 Date: _____ Time on: _____ Time off: _____			
Day 3 Date: _____ Time on: _____ Time off: _____			
Day 4 Date: _____ Time on: _____ Time off: _____			
Day 5 Date: _____ Time on: _____ Time off: _____			
Dates and times unit was not with child:			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			

Appendix XVIII. Collection of Activity Data using the QSTARZ BT-Q1000XT GPS Travel Recorder

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Collection of Activity Data using the QSTARZ BT Q1000XT GPS Travel Recorder

Number: EMAB-182.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-018

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

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Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

COLLECTION OF ACTIVITY DATA USING THE
QSTARZ BT Q1000XT GPS TRAVEL RECORDER

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1.0 SCOPE AND APPLICATION

The QSTARZ BT-Q1000XT GPS Travel Recorder provides time-resolved latitude, longitude, elevation, and speed information determined by the Global Positioning System (GPS). The unit is capable of storing information for subsequent download and analysis. The unit will be worn by study participants in the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

The unit is best operated outdoors, though it will acquire data in buildings or parts of buildings without large amounts of metal in the walls or ceiling. When it is turned on, several minutes are required for the unit to compare GPS signals and compute the location. The Mode switch should be set to “LOG” in order to acquire data. The unit does not have a display screen.

3.0 DEFINITIONS

SOP – Standard operating procedure

GPS – Global positioning system

GHS – Green Housing Study

RTP – Research Triangle Park

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

Do not get the GPS wet.

For best results, the unit should be fully charged and then worn in a pocket, backpack, or attached to clothing using the belt clip provided by the manufacturer.

The NAV setting on the GPS should not be used because it is not acquiring data in the NAV mode.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the GPS collection packets and deliver them to the field coordinator.

5.2 The field coordinator will receive the GPS collection packets and keep a COC tracking record in a field record book. The field coordinator will distribute the GPS collection packet to the field staff. Upon collection of the GPS unit, the field coordinator will be responsible for downloading the GPS files, clearing the data from the unit, and returning the information to the EPA in Research Triangle

Park (RTP), NC for analysis. The field coordinator is also responsible for ensuring that the sample collection records and COC sheets are completed and accompany the data to the EPA.

5.3 The field staff will be responsible for obtaining the collection materials from the field coordinator, distribution and collection of the GPS collection packets to the participant's parent/caregiver, entering relevant information on the sample collection record and in field record books and returning the GPS collection packets to the field coordinator.

5.4 The parent/caregiver is responsible for deploying the GPS data collection unit as instructed, transferring the unit to the field staff, and recording requested information on the sample collection record sheet.

6.0 MATERIALS

6.1 QSTARZ BT-Q1000XT GPS Travel Recorder

6.2 QSTARZ BT-Q1000XT GPS Quick Guide

6.3 QSTARZ software (QTravel) mini-CD

6.4 Belt clip

6.5 Car charger

6.6 Li ion Battery

6.7 USB cable

6.8 USB Wall Adapter

6.9 Sample collection record sheet

7.0 PROCEDURES

7.1 FOR FIELD STAFF AND PARTICIPANTS

7.1.1 *Orientation with the QSTARZ Travel Recorder Unit*

Point of Interest Button: The red button on the front of the unit (Figure 1) is called the Point of Interest (POI) button. Pressing it does not affect data acquisition. It should be ignored.

Figure 1. Front panel of QSTARZ BT-Q1000XT GPS Travel Recorder



Surrounding the POI button are three lights (these may be difficult to see when turned off).

Power LED Light: To the right of the POI button is the Power LED light. It will be red when the battery charge is low, green while charging, and off when the battery is fully charged.

Bluetooth Status LED: To the left of the POI button is the Bluetooth status LED light. It will glow blue when the unit is communicating with another device via Bluetooth. It is not recommended that the Bluetooth capabilities of the unit be used, so this light should be ignored.

GPS Status LED: Above the POI button is the GPS status LED light. It will glow yellow-orange when the unit is acquiring satellites to calculate its location. It will flash yellow-orange when the unit has acquired satellites and is ready to be used. It will flash red when the unit's memory is nearly full.

Mode Switch: The Mode switch is the black switch on the left-hand side of the unit (Figure 2). There are three settings: LOG (data logging), NAV (navigating), and OFF. When set to OFF, the unit is turned off. When set to LOG, the unit is turned on and acquiring data. When set to NAV, the unit is turned on, but is not acquiring data. The NAV setting should not be used.

Figure 2. Side panel showing Mode switch of QSTARZ BT-Q1000XT GPS Travel Recorder



7.1.2 Data Collection by Participants

When collecting data for study participants, the Mode switch should always be set to “LOG”. A piece of black tape may be wrapped around the device to cover up the Mode Switch and battery door latch on the bottom. Alternately or additionally, the protective sleeve should be used.

The unit should be set to “LOG” after reviewing these instructions with the field staff on Day 1 of the study. The unit should remain in this mode until the field staff returns on Day 5. The field staff will switch the unit “OFF” prior to leaving the participant’s location.

The unit must be kept with the child at all times during data collection (the entire 5 day period). Physically locate the unit with the child in a pocket, attached to a belt, or similar. If this is not possible or practical, place the unit in something that will always be near the child, at least within the same structure or vehicle (e.g., stroller, diaper bag, backpack). Have the child abide by school policies (e.g., locker activities, personal belongings).

Do not allow the unit to get wet. During bathing, swimming or other water-related activities, locate the unit in a nearby but safe place.

If the unit is not kept with the child (within the same structure or vehicle) for periods of longer than 30 minutes, notify the field staff of the days and times it was not with the child. It is recommended to ask the child about this at the conclusion of each day.

7.1.3 Battery Life and Charging

The unit is charged by plugging it into a standard USB port, by using the USB cord and wall adapter, or a car’s power/lighter port. Adapters for all are included with the unit. The socket for the adapters is located on the right side of the device.

Make sure that the battery is fully charged before use. Charging should take approximately 3 hours. When turned on, a fully-charged unit should have enough power for 32-38 hours of data acquisition (NOTE: this time will decrease when frequent re-acquiring of satellites is needed).

The unit **MUST** be charged each night to ensure continuous collection of data. Plug the unit into the wall near the child. The unit should stay on (in LOG mode) while charging. If overnight charging does not occur, plug the unit in near the child as much as possible the following day. If the battery light is blinking red, plug the unit in immediately.

7.2 FOR FIELD STAFF

7.2.1 *Installing and Charging the Battery*

Open the battery compartment (Figure 3) to check if the battery is installed. To open battery compartment, pull upwards on the small lever on the bottom of the unit and remove the back cover. If the battery has not been installed, locate and unwrap the Li ion battery. **DO NOT REMOVE OR PULL ON the small piece of clear tape labeled PULL.** Place the battery in the compartment so that the three gold plates on the side of the battery line up with the leads at the bottom of the compartment. Close the battery compartment.

Figure 3. Battery access for the QSTARZ BT-Q1000XT GPS Travel Recorder



The unit is charged by plugging it into a standard USB port on a personal computer, by using the USB cord and wall adapter, or a car's power/lighter port. Adapters for all are included with the unit. The socket for the adapters is located on the right side of the device.

Make sure that the battery is fully charged before use. Charging should take approximately 3 hours. When turned on, a fully-charged unit should have enough power for 32-38 hours of data acquisition (NOTE: this time will decrease when frequent re-acquiring of satellites is needed).

The battery is rechargeable and does not need to be changed. However, if a new battery is required, the old battery may be accessed by pulling upwards on the small lever on the bottom of the unit and removing the back cover.

7.2.2 *Google Earth Installation*

The QSTARZ software (QTravel) will be used by the field coordinator to download data and clear the GPS units. The software cannot be installed on a personal computer without Google Earth. These are the directions for installing Google Earth:

- 1) Make sure your computer is connected to the internet.
- 2) Open a web browser and type "earth.google.com" into the address field. The following instructions assume the browser used is Internet Explorer. Click the "Explore" Button under the "Google Earth" heading (NOT "Google Earth Pro").

- 3) Click the button above “Desktop”.
- 4) Press the button labeled “Download Google Earth”.
- 5) Uncheck box for “Include Google Chrome, a fast new browser for Windows and Mac”.
- 6) Press the button labeled “Agree and Download”.
- 7) Click “Save File” and save the executable googleupdatesetup.exe to the hard drive.
- 8) Navigate to the location of the executable and double-click.
- 9) A window entitled “Google Earth Installer” pops up. After a few moments Google Earth should open.
- 10) If the “Start-up Tip” window appears, press the “Close” button.
- 11) Exit Google Earth by pressing the red “X” in the upper right-hand corner of the browser.

7.2.3 QSTARZ Software (QTravel) Installation

After Google Earth has been installed, the QTravel software can then be installed. It is assumed that the reader is using the Windows XP operating system. Windows 7 or Vista should be similar. The software will not work on Linux or Mac. These are the directions for installing the QTravel software:

- 1) Place the QSTARZ mini-CD that comes with the unit in the CD-ROM drive of your personal computer.
- 2) Double-click on the “My Computer” icon on your desktop.
- 3) When the “My Computer” menu appears, double-click on “QSTARZ GPS CD”.
- 4) If a list of folders and files appears, starting with “Doc”, “GPS Photo”, “Tools”, etc..., double-click on the file “autorun.exe”.
- 5) A QSTARZ graphic appears, asking you to “Select your model”.
- 6) Click on the picture labeled “BT-Q1000XT” (the leftmost picture).
- 7) Click on “Install QTravel”.
- 8) A pop-up box appears labeled “QTravel V1 Setup”. Press the “Next>” button.
- 9) Check the box labeled “I accept the terms in the License Agreement”. Press the “Next>” button.
- 10) Press “Next>” again on the “Choose Components” menu.
- 11) Press “Next>” again on the “Choose Install Location” menu.
- 12) Press “Next>” again on the “Choose Start Menu Folder” menu.
- 13) A pop-up window appears labeled “Silicon Laboratories CP210x USB to UART Bridge Drive Installer”. Press the “Install” button.

- 14) If a “Notice” box appears saying “These drivers are already current and up to date, to remove these go the Add/Remove Programs in the Control Panel”, press the “OK” button.
- 15) Select “Reboot Now” and press the “Finish” button.
- 16) The computer will reboot, and the QTravel software will be installed.

7.2.4 *Initializing the Unit (Note: No internet connection needed)*

Before deployment, the unit must be initialized so that it acquires the correct data. The instructions for initialization are:

- 1) Plug the small end of the USB cable into the unit and the large end into a USB port on a personal computer.
- 2) Set the Mode switch to LOG.
- 3) Double click on the “QTravel” desktop icon to run the program.
- 4) A box will appear labeled “Welcome to Import Wizard”. Press the “Cancel” button.
- 5) Click on the “File” menu. Select the “Config GPS” button, and a window will appear labeled “Configure GPS module”.
 - a) Under “GPS Log Setting”, select “General” (do not select icon of car, bicycle, or people walking).
 - b) Under “GPS Log Setting”, select topmost box “Log every” under “Log Criteria” and enter “10” seconds.
 - c) Under “Data Log Memory”, select “Stop log” when data logger memory is full.
 - d) Uncheck “Turn on Buzzer”. Press the “OK” button.
- 6) Click on the “File” menu. Select the “Config GPS” button. (*Note: This is a repeat of Step 5 but this is needed to save settings in Steps 5a-5d before “Advanced” settings are saved in Steps 6a-6b*).
 - a) Press the “Advanced” button at the bottom of the window, and a new window will appear labeled “Advanced Setting”.
 - b) Make sure that all the boxes are checked. Press the “OK” button.
- 7) Click on the “Tools” menu, and select “Options”, and a window will appear labeled “Options”.
 - a) Under “Unit and Coordination”, make sure the “distance unit” is set to “Metric”, and that “Lat/Long” is set to “Degrees, Minutes, Seconds” rather than just “Degrees”.
 - b) Under “Photo”, make sure that “Photo Time Zone” is set to “Eastern Time (US & Canada)” and that the “Daylight Saving Time” box is checked.
 - c) Press the “OK” button at the bottom of the window.

7.2.5 Clear Data Log Memory for Initial Use (*Note: No internet connection needed*)

To clear the GPS data log memory, the instructions are:

- 1) Click on the “File” menu. Select “Clear Device Log”.
- 2) A pop-up window will appear asking “Are you sure you want to clear all data?” Press the “Yes” button.
- 3) A window with a green status bar will appear to track progress.
- 4) When the green status bar fills up, a notification window will appear saying “Data log storage is now empty!” Press the “OK” button.

7.2.6. Read and Map Data

After acquiring data for a particular study participant, the data in the unit needs to be read into the computer before saving. Storage space will not be an issue for 3-4 days of data collection at a 10 sec interval. The following instructions detail how to download the data into the computer and to map it:

- 1) Plug the small end of the USB cable into the unit and the large end into a USB drive on a personal computer.
- 2) Set the Mode switch to LOG.
- 3) Double click on the “QTravel” desktop icon to start the QTravel software.
- 4) A box will appear labeled “Welcome to Import Wizard”. Press the “Next>” button.
- 5) Select “Import tracks and photos into new trip”.
- 6) Enter a Sample ID into the “New trip name” field. The Sample ID must follow the format indicated in Section 8.0 Records. Press the “Next>” button.
- 7) A countdown window will appear, saying “Please connect to data logger and turn on the switch before read log data”. Click the OK button. If an error occurs, make sure the unit is correctly plugged into the PC and that the Mode switch is set to LOG.
- 8) A green loading bar will fill as the data are extracted.
- 9) If the unit has not acquired data an error box will pop-up saying “No data in device”. Press the “OK” button. The most likely reason for this error is that the Mode switch was not set to LOG. If, on the other hand, the unit has acquired data correctly, a window labeled “Select Track” will appear with a list of Tracks bearing date/time stamps. Click the “Next” button.
- 10) A window labeled “Select Photo Folder” will appear. Do not write anything in the field provided. Click on the “Finish” button.
- 11) To map and check the data, click on the Track time/date stamp of the desired trip in the central window (**Note: Internet connection needed to run Google Earth to map data**). A colored line should appear in the Google Earth window on the right, though it may require zooming in/out to see it clearly. Click on the “Satellite” button in the Google Earth window to see buildings and other surface features.

7.2.7 *Save Data in Two Separate Files*

After data for a particular study participant has been read into the QTravel software, the data needs to be saved. Two datasets need to be saved: (1) a proprietary format (read by the QTravel software) and (2) a text format (read by other software such as Microsoft Excel). The following instructions explain how to save these two files:

- 1) Click on the words “Save Trip” written in blue letters on the bottom left-hand-side of the screen. You will not see anything change after clicking.
- 2) Click on the “File” menu from the upper-left corner of the screen. Select “Export Wizard”.
- 3) Select “ITM File (Proprietary Format)” under “4. Project File (Whole Trip)”. Press the “Next>” button.
- 4) The “Save As” window will appear. Select a file folder from the file browser, and name the new file using the same identifiers and dates used in Step 7.2.6.6 above (in Read and Map Data). The name must follow the format indicated in Section 8.0 Records. Press the “Save” button. This saves the data in a proprietary format (*.itm).
- 5) Click on the “File” menu from the upper-left corner of the screen. Select “Raw Data Manager”.
- 6) A new window will appear labeled “Raw Data Manager”. Press the “Save” button.
- 7) A new window will appear labeled “Select fields to output”. Check every available box. Press the “OK” button.
- 8) The “Save As” window will appear. Select a file folder from the file browser, and name the new file using the same identifiers and dates used in Step 7.2.6.6 above (in Read and Map Data). Press the “Save” button. This saves the data in a text format (*.csv).
- 9) Press the “Close” button on the Raw Data Manager window.

7.2.8 *Clear Data Log Memory After Confirming Data Download*

To clear the GPS data log memory for future use and between participants, first **verify all relevant data was downloaded and saved** (see 7.2.7 Save Data in Two Separate Files). It is recommended that you use the computer’s file browser for this confirmation of data download task to ensure data has been captured. Once this is done, the instructions to clear the data log memory are:

- 1) Click on the “File” menu. Select “Clear Device Log”.
- 2) A pop-up window will appear asking “Are you sure you want to clear all data?” Press the “Yes” button.
- 3) A window with a green status bar will appear to track progress.
- 4) When the green status bar fills up, a notification window will appear saying “Data log storage is now empty!” Press the “OK” button.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the GPS samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the start and stop date of the information collection, the start and stop time of the information collection, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B̂ 1001 – V̂1 F̂ Ŝ 1̂

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Because GPS records data only, it is impossible to use field quality control samples such as field blanks, duplicates, or spikes (see Quality Assurance Project Plan (QAPP) *section 1.4.2.12 GPS and Accelerometer* and *Table 5. Sample QC on per household basis*).

9.2 Quality control will focus on ensuring device functionality, data transfer and transcription, maintenance of privacy, and data storage. Controls will include routine inspection and maintenance of the GPS device, particularly for battery performance and accessibility to backup device should failure occur. In addition, the field staff will ensure that routine data transfers are complete and secure.

10.0 REFERENCES

EPA SOP EMRB-010.0, QSTARZ BT-Q1000XT GPS Travel Recorder.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community

SOP: EMAB-182.0
Alt ID: GHS-018
Date: June 14, 2016
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Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A. Sample Collection Record for a GPS Sample

EPA Pilot Study Add-On to the Green Housing Study GPS Sample			
Participant ID:		Sample ID:	
QSTARZ Serial Number:		Field Staff ID/Initials:	
Collection Start Date:	___ / ___ / ___	Collection Start Time:	____:____ am/pm
Collection Stop Date:	___ / ___ / ___	Collection Stop Time:	____:____ am/pm
Dates and times unit was not with child:			
Data Collection Comments:			
Data Download Comments:			
Data Transfer Comments:			

Appendix XIX. SOP for Administering the Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaire

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure for Administering the Location,
Transportation, Activity, Diet, Consumer Products, and Home Observation
Questionnaire

Number: EMAB-183.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-019

SOP Steward

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Signature:

Date:

Approval

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Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

Standard Operating Procedure for Administering the Location, Transportation, Activity,
Diet, Consumer Products, and Home Observation Questionnaire

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1.0 SCOPE AND APPLICATION

The Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaire is a set of questionnaires administered to the parent/caregiver about the index child, younger sibling, and household to collect supporting information needed to interpret the multimedia samples for the EPA pilot study add-on to the Green Housing Study (GHS).

2.0 SUMMARY OF THE METHOD

Recording the Questionnaire can be done in electronic format or on paper records. The field staff administers the Location, Transportation, Activity, Diet, and Consumer Products sections of the questionnaire to the parent/caregiver of the participant, by completing each multiple choice, multiple selection, or short answer question appropriately. The field staff then completes the Housing Observation questions independently (without burdening the participant). The field staff then saves the completed questionnaire in a secure location, and if necessary, scans the paper documents to produce a PDF.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

PDF – Portable Document Format

RTP – Research Triangle Park

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

4.0 CAUTIONS

The questionnaire responses must be kept secure at all times.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide the questionnaires and deliver them to the field coordinator.

5.2 The field coordinator will receive the questionnaires and keep records of receipt and distribution in their field record book. The field coordinator will distribute the questionnaires to the field staff. The field coordinator will be responsible for securing the completed questionnaires (paper and electronic) and its sample collection and chain of custody (COC) record sheet until returned to EPA in Research Triangle Park (RTP), NC.

5.3 The field staff will be responsible for obtaining the answers to the questionnaires from the parent/caregiver, completing the Housing Observation section independently, and entering relevant information on the sample collection and COC record sheet and/or in field record books. The field staff is responsible for securing the responses in the completed questionnaires, scanning the paper survey into a PDF document, and returning the questionnaires (paper and electronic) to the field coordinator in a secure manner.

6.0 MATERIALS

6.1 Copy of questionnaire set

6.2 Pen

6.3 Field record book(s)

6.4 Sample Collection Record Sheet (Appendix A)

7.0 PROCEDURES

7.1 *Administration of Questionnaire (See Appendix B)*

7.1.1 Field staff completes the Survey identification information at the top of the page (e.g., Household ID#, Child's Age, Child's Gender, Date, and Interviewer's Initials) for each section. All responses should be recorded in pen.

7.1.2 Field staff administers Appendix B1 questions 2-20 about the index child and Appendix B2 questions 1-20 about the sibling to their parent/caregiver, selecting the appropriate responses in the space provided in the questionnaire. Questions 1-20 are to be completed by the field staff and parent/caregiver. Unless otherwise specified, questions refer to the previous day. References to "Mother" are equivalent to parent/caregiver.

7.1.3 Appendix B3 questions 21-25 are to be completed by the field staff, with input from the caregiver/parent as needed.

7.1.4 Appendix B4 questions 26-31b are to be completed by the field staff only. In question 28, the "floor" is equivalent to the level of the structure.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the questionnaires, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of questionnaire administration, the initials or ID number of the field staff member who administered the questionnaire, and any comments regarding questionnaire administration (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated

Appendix A. Sample Collection Record for a Questionnaire Sample

EPA Pilot Study Add-On to the Green Housing Study Questionnaire			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___		
Questionnaire Collection Comments:			
Questionnaire Storage Comments:			
Questionnaire Shipping Comments:			
Field Staff ID/Initials:			

Appendix B1 (Questionnaire about Index child)

Appendix B1 (Questionnaire about Index child)

Form Approved OMB No. 0920-15AFJ Exp. Date xx/xx/20xx

Household ID#

Child's Age

Child's Gender

 F M

Date

Interviewer's Initials

Public reporting burden of this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Information Collection Review Office, 1600 Clifton Road NE, MS D-74, Atlanta, Georgia 30333; ATTN: PRA (0920-XXXX).

Appendix B1 (Questionnaire about Index child)

A. Introductory Questions (To be completed by field technician and participant)
(*numbering starts with question #2 because index child already is known to have asthma)

2. Did your child experience any asthma symptoms yesterday (e.g., wheezing, shortness of breath, tightness in chest, dry cough)?

- Yes
- No
- Don't Know/Refused to answer

Appendix B1 (Questionnaire about Index child)

B. Location Questions (To be completed by field technician and participant)

3. For each approximate time period given below, indicate where your child was located. Select any locations that apply to the time period.

	Home	Outdoor area at home	Other residence (ex. babysitter's house)	Store	Restaurant	Church	Other indoor location	Park	Bus/train stop	On or near street	Parking garage	Other outdoor location	In vehicle	Don't know/Refused to answer
5:00 am - 5:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5:30 am - 5:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:00 am - 6:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:30 am - 6:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:00 am - 7:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:30 am - 7:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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8:30 am - 8:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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11:30 am - 11:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12:00 pm - 12:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12:30 pm - 12:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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1:30 pm - 1:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2:00 pm - 2:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B1 (Questionnaire about Index child)

	Home	Outdoor area at home	Other residence (ex. babysitter's house)	Store	Restaurant	Church	Other indoor location	Park	Bus/train stop	On or near street	Parking garage	Other outdoor location	In vehicle	Don't know/Refused to answer
2:30 pm - 2:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3:00 pm - 3:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3:30 pm - 3:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Appendix B1 (Questionnaire about Index child)

4. Look back at the answers to question 3. Based on yesterday's day of the week, do these locations represent a fairly typical or normal day for your child? For example, if yesterday was a weekday, is this a typical weekday schedule for your child?

- Yes
- No
- Don't know/Refused to answer

Appendix B1 (Questionnaire about Index child)

C. Activity Questions (To be completed by field technician and participant)

5. For each approximate time period given below, indicate activities your child performed. Select all that apply for the time period.

	Dress, groom or bathe	Eat	Watch TV	Play	Use computer or play video games	Read or do school work	Take care of younger children	Chores	Exercise	Play with pet	Arts and crafts	Sleep	Don't know/Refused to answer	None of these
5:00 am - 5:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:30 am - 5:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
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8:30 am - 8:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
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2:00 pm - 2:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Appendix B1 (Questionnaire about Index child)

	Dress, groom or bathe	Eat	Watch TV	Play	Use computer or play video games	Read or do school work	Take care of younger children	Chores	Exercise	Play with pet	Arts and crafts	Sleep	Don't know/Refused to answer	None of these
2:30 pm - 2:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3:00 pm - 3:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3:30 pm - 3:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4:00 pm - 4:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4:30 pm - 4:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:00 pm - 5:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:30 pm - 5:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
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7:00 pm - 7:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
7:30 pm - 7:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
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9:30 pm - 9:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:00 pm - 10:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:30 pm - 10:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:00 pm - 11:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:30 pm - 11:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Appendix B1 (Questionnaire about Index child)

6. When at home, which room does your child sleep in?

- Child's bedroom
- Mother's bedroom
- Living room
- Other room in the home
- Don't know/Refused to answer

7. When indoors at home and awake, where does your child spend the most time?

- Living room/family room
- Child's bedroom
- Mother's bedroom
- Kitchen
- Other room in the home
- Don't know/Refused to answer

8. When at home, how much time per day does your child spend sitting/playing/lying on the floor?

- Less than 30 minutes
- 30 minutes
- 1 hr
- 1.5 hrs
- 2 hrs
- 2.5 hrs
- 3 hrs
- More than 3 hrs
- Don't know/Refused to answer

9. Is the floor she or he plays on carpeted?

- Carpeted
- Not carpeted
- Partially carpeted
- Child does not play/sit/lie on the floor -
- Don't know/Refused to answer -

10. Typically, how much time per day does your child play outside at home (yard, common area, playground)?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -

Appendix B1 (Questionnaire about Index child)

Don't know/Refused to answer

11. Typically, how much time per day does your child play outside at school/daycare?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -
- Don't know/Refused to answer -

12. How much time per day does your child play at local parks?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -
- Don't know/Refused to answer -

13. How often does your child's sleep get interrupted (e.g., by noise or other disturbance in the community)?

- Never
- Once a month
- Once a week
- More than once a week
- Don't know/Refused to answer

14. How many times did your child wash his/her hands yesterday?

- 1
- 2
- 3
- 4
- 5
- 6
- 7 -
- More than 7 -
- Don't know/Refused to answer -

15. How many times a week does your child bathe?

- 1

Appendix B1 (Questionnaire about Index child)

- 2
- 3
- 4
- 5
- 6
- 7
- More than 7 -
- Don't know/Refused to answer -

D. Diet Questions (To be completed by field technician and participant)

16. How many meals did your child eat yesterday (e.g., breakfast, lunch, dinner), not counting snacks?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- More than 7 -
- Don't know/Refused to answer -

17. For each MEAL your child ate, what best describes the meal? If your child ate more than 4 meals, just answer for the first 4.

	Meal prepared by school	Meal made at home from ready-made frozen or canned food	Fast food meal	Restaurant meal (not fast food)	Meal made at home from scratch	Don't know/Refused to answer
Meal 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix B1 (Questionnaire about Index child)

18. On average, how often does your child eat/drink the following foods and beverages?

	Once a month or less	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	Once a day	2-3 times per day	4-5 times per day	6 or more times per day
Poultry	<input type="radio"/>								
Beef	<input type="radio"/>								
Pork	<input type="radio"/>								
Fish	<input type="radio"/>								
Shellfish	<input type="radio"/>								
Rice	<input type="radio"/>								
Other dairy products (not milk)	<input type="radio"/>								
Leafy green vegetables	<input type="radio"/>								
Other vegetables (not potatoes)	<input type="radio"/>								
Potatoes	<input type="radio"/>								
Breads	<input type="radio"/>								
Fruit	<input type="radio"/>								
Snack Foods	<input type="radio"/>								
Milk	<input type="radio"/>								
Fruit juice	<input type="radio"/>								
Soda	<input type="radio"/>								
Tap water or beverage made with tap water	<input type="radio"/>								

Appendix B1 (Questionnaire about Index child)

19. How often do you purchase food at each of these types of stores? (Field Technician: If Appendix B2 has been completed for the sibling, please copy those answers here, do not ask the question a second time.) -

	Never	Once a month	Once a week	2 times a week	3 times a week	More than 3 times a week
Supermarket or large grocery store	<input type="radio"/>					
Small grocery store (e.g., small store in your neighborhood that mainly sells food)	<input type="radio"/>					
Farmer's or outdoor market	<input type="radio"/>					
Store in a gas station	<input type="radio"/>					
Discount store (e.g., a dollar store, Big Lots)	<input type="radio"/>					

20. How often does your child eat at each of these types of restaurants?

	Never	Once a month	Once a week	2 times a week	3 times a week	More than 3 times a week
Fast food	<input type="radio"/>					
Sit - down restaurant	<input type="radio"/>					
Food truck or stand	<input type="radio"/>					

Appendix B2 (Questionnaire about sibling)

Appendix B2 (Questionnaire about sibling)

Form Approved OMB No. 0920-15AFJ Exp. Date xx/xx/20xx

Household ID#

Child's Age

Child's Gender

F

M

Date

Interviewer's Initials

Public reporting burden of this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Information Collection Review Office, 1600 Clifton Road NE, MS D-74, Atlanta, Georgia 30333; ATTN: PRA (0920-XXXX).

Appendix B2 (Questionnaire about sibling)

A. Introductory Questions (To be completed by field technician and participant)

1. Has your child been diagnosed with asthma by a doctor?

- Yes
- No
- Don't Know/Refused to answer

2. Did your child experience any asthma symptoms yesterday (e.g., wheezing, shortness of breath, tightness in chest, dry cough)?

- Yes
- No
- Don't Know/Refused to answer

Appendix B2 (Questionnaire about sibling)

B. Location Questions (To be completed by field technician and participant)

3. For each approximate time period given below, indicate where your child was located. Select any locations that apply to the time period.

	Home	Outdoor area at home	Other residence (ex. babysitter's house)	Store	Restaurant	Church	Other indoor location	Park	Bus/train stop	On or near street	Parking garage	Other outdoor location	In vehicle	Don't know/Refused to answer
5:00 am - 5:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5:30 am - 5:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:00 am - 6:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:30 am - 6:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:00 am - 7:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:30 am - 7:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8:00 am - 8:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8:30 am - 8:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9:00 am - 9:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9:30 am - 9:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10:00 am - 10:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10:30 am - 10:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11:00 am - 11:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11:30 am - 11:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12:00 pm - 12:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12:30 pm - 12:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1:00 pm - 1:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1:30 pm - 1:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2:00 pm - 2:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B2 (Questionnaire about sibling)

	Home	Outdoor area at home	Other residence (ex. babysitter's house)	Store	Restaurant	Church	Other indoor location	Park	Bus/train stop	On or near street	Parking garage	Other outdoor location	In vehicle	Don't know/Refused to answer
2:30 pm - 2:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3:00 pm - 3:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3:30 pm - 3:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4:00 pm - 4:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4:30 pm - 4:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5:00 pm - 5:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5:30 pm - 5:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:00 pm - 6:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6:30 pm - 6:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:00 pm - 7:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7:30 pm - 7:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8:00 pm - 8:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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9:00 pm - 9:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9:30 pm - 9:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10:00 pm - 10:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10:30 pm - 10:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11:00 pm - 11:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11:30 pm - 11:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B2 (Questionnaire about sibling)

4. Look back at the answers to question 3. Based on yesterday's day of the week, do these locations represent a fairly typical or normal day for your child? For example, if yesterday was a weekday, is this a typical weekday schedule for your child?

- Yes
- No
- Don't know/Refused to answer

Appendix B2 (Questionnaire about sibling)

C. Activity Questions (To be completed by field technician and participant)

5. For each approximate time period given below, indicate activities your child performed. Select all that apply for the time period.

	Dress, groom or bathe	Eat	Watch TV	Play	Use computer or play video games	Read or do school work	Take care of younger children	Chores	Exercise	Play with pet	Arts and crafts	Sleep	Don't know/Refused to answer	None of these
5:00 am - 5:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:30 am - 5:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6:00 am - 6:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6:30 am - 6:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
7:00 am - 7:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
7:30 am - 7:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
8:00 am - 8:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
8:30 am - 8:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
9:00 am - 9:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
9:30 am - 9:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:00 am - 10:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:30 am - 10:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:00 am - 11:29 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:30 am - 11:59 am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
12:00 pm - 12:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
12:30 pm - 12:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
1:00 pm - 1:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
1:30 pm - 1:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
2:00 pm - 2:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Appendix B2 (Questionnaire about sibling)

	Dress, groom or bathe	Eat	Watch TV	Play	Use computer or play video games	Read or do school work	Take care of younger children	Chores	Exercise	Play with pet	Arts and crafts	Sleep	Don't know/Refused to answer	None of these
2:30 pm - 2:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3:00 pm - 3:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3:30 pm - 3:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4:00 pm - 4:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4:30 pm - 4:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:00 pm - 5:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5:30 pm - 5:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6:00 pm - 6:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6:30 pm - 6:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
7:00 pm - 7:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
7:30 pm - 7:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
8:00 pm - 8:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
8:30 pm - 8:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
9:00 pm - 9:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
9:30 pm - 9:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:00 pm - 10:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
10:30 pm - 10:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:00 pm - 11:29 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
11:30 pm - 11:59 pm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Appendix B2 (Questionnaire about sibling)

6. When at home, which room does your child sleep in?

- Child's bedroom
- Mother's bedroom
- Living room
- Other room in the home
- Don't know/Refused to answer

7. When indoors at home and awake, where does your child spend the most time?

- Living room/family room
- Child's bedroom
- Mother's bedroom
- Kitchen
- Other room in the home
- Don't know/Refused to answer

8. When at home, how much time per day does your child spend sitting/playing/lying on the floor?

- Less than 30 minutes
- 30 minutes
- 1 hr
- 1.5 hrs
- 2 hrs
- 2.5 hrs
- 3 hrs
- More than 3 hrs
- Don't know/Refused to answer

9. Is the floor she or he plays on carpeted?

- Carpeted
- Not carpeted
- Partially carpeted
- Child does not play/sit/lie on the floor -
- Don't know/Refused to answer -

10. Typically, how much time per day does your child play outside at home (yard, common area, playground)?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -

Appendix B2 (Questionnaire about sibling)

Don't know/Refused to answer

11. Typically, how much time per day does your child play outside at school/daycare?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -
- Don't know/Refused to answer -

12. How much time per day does your child play at local parks?

- 0-15 minutes
- 15-30 minutes
- 30 minutes to 1 hour
- 1-2 hours -
- 2-3 hours -
- More than 3 hours -
- Don't know/Refused to answer -

13. How often does your child's sleep get interrupted (e.g., by noise or other disturbance in the community)?

- Never
- Once a month
- Once a week
- More than once a week
- Don't know/Refused to answer

14. How many times did your child wash his/her hands yesterday?

- 1
- 2
- 3
- 4
- 5
- 6
- 7 -
- More than 7 -
- Don't know/Refused to answer -

15. How many times a week does your child bathe?

- 1

Appendix B2 (Questionnaire about sibling)

- 2
- 3
- 4
- 5
- 6
- 7
- More than 7 -
- Don't know/Refused to answer -

D. Diet Questions (To be completed by field technician and participant)

16. How many meals did your child eat yesterday (e.g., breakfast, lunch, dinner), not counting snacks?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- More than 7 -
- Don't know/Refused to answer -

17. For each MEAL your child ate, what best describes the meal? If your child ate more than 4 meals, just answer for the first 4.

	Meal prepared by school	Meal made at home from ready-made frozen or canned food	Fast food meal	Restaurant meal (not fast food)	Meal made at home from scratch	Don't know/Refused to answer
Meal 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meal 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix B2 (Questionnaire about sibling)

18. On average, how often does your child eat/drink the following foods and beverages?

	Once a month or less	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	Once a day	2-3 times per day	4-5 times per day	6 or more times per day
Poultry	<input type="radio"/>								
Beef	<input type="radio"/>								
Pork	<input type="radio"/>								
Fish	<input type="radio"/>								
Shellfish	<input type="radio"/>								
Rice	<input type="radio"/>								
Other dairy products (not milk)	<input type="radio"/>								
Leafy green vegetables	<input type="radio"/>								
Other vegetables (not potatoes)	<input type="radio"/>								
Potatoes	<input type="radio"/>								
Breads	<input type="radio"/>								
Fruit	<input type="radio"/>								
Snack Foods	<input type="radio"/>								
Milk	<input type="radio"/>								
Fruit juice	<input type="radio"/>								
Soda	<input type="radio"/>								
Tap water or beverage made with tap water	<input type="radio"/>								

Appendix B2 (Questionnaire about sibling)

19. How often do you purchase food at each of these types of stores? (Field Technician: If Appendix B1 has been completed for the index child, please copy those answers here, do not ask the question a second time).

	Never	Once a month	Once a week	2 times a week	3 times a week	More than 3 times a week
Supermarket or large grocery store	<input type="radio"/>					
Small grocery store (e.g., small store in your neighborhood that mainly sells food)	<input type="radio"/>					
Farmer's or outdoor market	<input type="radio"/>					
Store in a gas station	<input type="radio"/>					
Discount store (e.g., a dollar store, Big Lots)	<input type="radio"/>					

20. How often does your child eat at each of these types of restaurants?

	Never	Once a month	Once a week	2 times a week	3 times a week	More than 3 times a week
Fast food	<input type="radio"/>					
Sit - down restaurant	<input type="radio"/>					
Food truck or stand	<input type="radio"/>					

Appendix B3 (Household inventory)

Appendix B3 (Household inventory)

Form Approved
OMB No. 0920-15AFJ
Exp. Date xx/xx/20xx

Household ID#

Date

Interviewer's Initials

Public reporting burden of this collection of information is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Information Collection Review Office, 1600 Clifton Road NE, MS D-74, Atlanta, Georgia 30333; ATTN: PRA (0920-XXXX).

Appendix B3 (Household inventory)

***Note to Field technician: If this is the first time administering this questionnaire to the participant, ask all questions, otherwise, ask the gateway question before each question.**

E. Household Cleaning Products (To be completed by field technician and participant)

Gateway question for #21: Did the type or frequency of use of cleaning products change from the last time we visited your home? **Yes** **No** **Don't know**

If YES, then ask #21

21. Please select use frequency for each product type inside your home

	Daily	Weekly	Monthly	Yearly/Never
All-purpose cleaner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Glass cleaner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Floor cleaner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toilet bowl cleaner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carpet cleaner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Polish or wax	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Air freshener	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disinfectant Spray	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laundry detergent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dryer sheets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stain/spot remover	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

F. Personal Care Products (To be completed by field technician and participant)

Gateway question for #22: Did the type or frequency of use of personal care products change from the last time we visited your home? **Yes** **No** **Don't know**

If YES, then ask #22

22. Please select use frequency for each product type inside your home

	Daily	Weekly	Monthly	Yearly/Never
Shampoo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Liquid hand soap	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hand sanitizer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix B3 (Household inventory)

Hand/body lotion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facial moisturizer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fragrance/perfume	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hair styling products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sunscreen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

G. Consumer Product Classes (To be completed by field technician and participant)

Gateway question for #23: Did the type or frequency of use of any of these products change from the last time we visited your home?

Yes No Don't know

If YES, then ask #23

23. Please select use frequency for each product type inside/near your home

	Daily	Weekly	Monthly	Yearly/Never
Arts and Crafts Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Automotive Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home Maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleaning Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal Care Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pesticides	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pet Care Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home Office	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Landscape and Yard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

H. Home Observations (To be completed by field technician with input from participant as needed)

Gateway question for #24a and #24b: Did the type of floor covering change from the last time we visited your home?

Yes No Don't know

If YES, then ask #24a and #24b

24a. Select the answer(s) that best describe the percentage of total floor area in the home.

	0	1-20	21-40	41-60	61-80	81-100
% Covered by carpet or rug	<input type="radio"/>					

Appendix B3 (Household inventory)

% Exposed linoleum or linoleum tile	<input type="radio"/>					
% Exposed wood or wood laminate	<input type="radio"/>					
% Exposed ceramic or stone tile	<input type="radio"/>					
% Exposed other	<input type="radio"/>					

24b. If a percentage of the floor was "Other," what was the material?

Gateway question for #25a & #25b: Did the type or number of furniture pieces change from the last time we visited your home? **Yes** **No** **Don't know**

If YES, then ask #25a & #25b

25a. Select the answer(s) that best describe the home's furniture.

	0	1	2	3	4	5 or more
Number of upholstered sofas	<input type="radio"/>					
Number of upholstered chairs	<input type="radio"/>					
Number of other upholstered furniture	<input type="radio"/>					
Number of twin beds w mattresses	<input type="radio"/>					
Number of	<input type="radio"/>					

Appendix B3 (Household inventory)

double beds
w
mattresses

Number of
queen beds
w
mattresses

Number of
king beds w
mattresses

25b. Select the answer(s) that best describe the percentage of upholstery material for the home's furniture.

0 1-20 21-40 41-60 61-80 81-100

% Fabric
covering

% Vinyl
covering

% Leather
covering

% Other

Appendix B4 (Field technician report)

Appendix B4 (Field technician report)

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Exp. Date xx/xx/20xx

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Appendix B4 (Field technician report)

I. Indoor Cleanliness (To be completed by field technician)

Whole House Rating for Indoor Residential Cleanliness

26. Select one cleanliness rating for each category, where 1 is low (most clean) and 5 is high (least clean). These ratings apply to the whole house. To be completed by technician observation.

	1 (Low)	2	3	4	5 (High)
Clutter on floor, tables, counters, furniture	<input type="radio"/>				
Extent and thickness of dust on surfaces	<input type="radio"/>				
Dirt/mold on floor, - walls, ceiling -	<input type="radio"/>				
Peeling interior paint -	<input type="radio"/>				
Visible pet hair on - floor and furniture	<input type="radio"/>				
Visible food/crumbs on counters and tables	<input type="radio"/>				
Insect/Rodent problem	<input type="radio"/>				

27. Select one overall rating of cleanliness for the home. Select a value from a range of 1, Cleanest, to 5, Least Clean.

	1	2	3	4	5	
Cleanest	<input type="radio"/>	Least Clean				

J. Outdoor Housing Information (To be completed by field technician)

28. Residence door is on floor

- Below ground
- Ground
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- >=10

29. Primary residence door opens to

- Interior Hallway
- Exterior Walkway
- Individual or duplex porch
- Individual or duplex stoop
- Other:

30. Is there a designated playground or play area (not including basketball courts)?

- Yes
- No

31a. If there is a designated playground or play area, what is the composition of its surface?

	0	1-20	21-40	41-60	61-80	81-100
Grass	<input type="radio"/>					
Bare soil	<input type="radio"/>					
Natural mulch or bark -	<input type="radio"/>					
Crumb rubber mulch -	<input type="radio"/>					
Rubber mats	<input type="radio"/>					
Concrete	<input type="radio"/>					
Asphalt	<input type="radio"/>					

Appendix B4 (Field technician report)

Other



31b. If "Other" was selected above, please describe the surface. -

**Appendix XX. SOP for Collection of Household Cleaning Products and
Personal Care Products Inventory**

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Collection of Household Cleaning Products and Personal Care Products Inventory

Number: EMAB-184.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-020

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP) FOR COLLECTION OF HOUSEHOLD
CLEANING PRODUCTS AND PERSONAL CARE PRODUCTS INVENTORY

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1.0 SCOPE AND APPLICATION

The presence of household cleaning products and personal care products inside the home will be assessed through one or two photographs of the primary storage locations for a) household cleaning and b) personal care products. The photographs will be taken in the homes of all study participants by a trained field staff. The field staff will also collect inventories with barcode readers using the methods described in this standard operating procedure (SOP) to assess the accuracy of a photograph-based inventory.

2.0 SUMMARY OF THE METHOD

This method describes the techniques for inventorying household cleaning products and personal care products inside the home using photography combined with a handheld barcode scanner for the EPA pilot study add-on to the Green Housing Study (GHS). The photographs and stored barcode data are then sent to the EPA laboratory by secure file transfer protocol (FTP) site for analysis.

3.0 DEFINITIONS

Household cleaning products include: all-purpose cleaners such as abrasive cleaners (powders, liquids, scouring pads) and non-abrasive cleaners (powders, liquids, sprays); specialty cleaners such as kitchen, bathroom, glass and metal cleaners (bleaches, disinfectants and disinfectant cleaners, drain openers, glass cleaners, glass and multi-surface cleaners, hard water mineral removers, metal cleaners and polishes, oven cleaners, shower cleaners, toilet bowl cleaners, tub and tile cleaners) and floor and furniture cleaners (carpet and rug cleaners, dusting products, floor care products, furniture cleaners and polishes, upholstery cleaners); and other cleaning aids such as ammonia, vinegar, and baking soda.

Personal care products or toiletries are consumer products used for personal hygiene and for beautification and include products as diverse as cosmetics, dental products, deodorants, hair care products, hand soap, perfume and cologne, shaving products, skin care products, cleansing pads and wipes, etc.

SOP – Standard operating procedure

GHS – Green Housing Study

FTP – File Transfer Protocol

USB – Universal Serial Bus

EPA – Environmental Protection Agency

CDC – Centers for Disease Control and Prevention

COC – Chain-of-custody

QAPP – Quality Assurance Project Plan

RTP – Research Triangle Park

4.0 CAUTIONS

The barcode reader will not lose barcode data if the batteries of the barcode reader become completely drained; however, it is possible that the internal clock will be reset. Ensure that the batteries do not become completely drained by periodically charging the device (at least weekly, at most between each participant) through a standard USB port.

Selecting Delete Barcodes from the OPN200x software will remove all barcodes from the scanner so be sure to confirm that the data has been downloaded before this step is completed.

Be sure that no participants or their parents/caregivers are included in any study photographs. This includes photos that may have captured participant photographs that are located around the home.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will provide three handheld barcode scanners with batch capability and memory (i.e., Opticon OPN 2004 Pocket Memory Scanner) to the field coordinator.

5.2 The field coordinator will distribute the barcode scanners to the field staff. Upon inventory completion, the field coordinator will be responsible for returning the barcode scanners to the EPA. The field coordinator will create a strategy and schedule to collect the appropriate percentage of each type of quality control samples. The field coordinator will communicate the schedule for QC samples to the field staff and distribute any additional quality control sample materials.

5.3 The field staff will be responsible for obtaining the barcode scanners from the field coordinator; conducting the product inventory; entering relevant information in field record books and sample collection and chain-of-custody (COC) records; returning barcode scanners, sample collection information records, and product inventory photographs to the field coordinator.

6.0 MATERIALS

6.1 Digital Camera (preferably a smart phone camera)

6.2 Handheld barcode scanner with batch capability and memory (i.e., Opticon OPN 2004 Pocket Memory Scanner) and associated USB to mini-USB cable

6.3 Sample Collection Record sheet (Appendix A)

6.4 Barcode Sheet of Participant Identification, Location/Command, and Numeric Identifier Codes (Appendix C)

6.5 Generic Barcode Sheet (Appendix D)

6.6 Computer

7.0 PROCEDURES

7.1 PHOTOGRAPHY OF PRODUCT STORAGE LOCATIONS

7.1.1 Ask the parent/caregiver for the participant to identify locations of household cleaning and personal care products. The parent/caregiver should be prompted to identify locations such as under kitchen sink, under bathroom sinks, in laundry room, and in closet.

7.1.2 Use camera (or smart phone) to photograph (one or two photos) the primary storage location for household cleaning products (Figure 1), and the primary storage location for personal care products in their natural state (products should not be moved). An effort should be made to photograph from an angle allowing individual items to be clearly observed (i.e., products not completely blocked). Be sure that no humans are included in any photographs.



Figure 1. Example photograph of under sink household cleaning product storage.

7.1.3 Document location information for each storage area photographed using the Sample Collection Record sheet (Appendix A).

7.2 PRODUCT SCANNING

7.2.1 Press the scan button (see Appendix B for diagram of scanner) to scan the appropriate barcode from Appendix C: BARCODE SHEET OF LOCATION, COMMAND AND NUMBER CODES that corresponds to the Subject ID (see Section 8) for the participant being inventoried. [Note: When a barcode is successfully read, a good-read beep is sounded and a green good-read LED is shown.]

7.2.2 Scan the “START” barcode from Appendix C, then scan the barcode for the type of room (e.g., “BATH ROOM”), and a numeric identifier if required (i.e., scan “2” for the second bathroom).

7.2.3 Scan the “COMPARTMENT” barcode from Appendix C and a numeric identifier if required (i.e., if more than one cabinet/pantry will be scanned).

7.2.4 Scan all non-food consumer items. If multiple quantities of the same item are found then scan each one (barcodes are automatically stored with a quantity indicator).

7.2.5 Products with no barcodes (or with non-scanning barcodes) should be inventoried using generic product-type barcodes provided in Appendix D. If possible, take a picture of items with no barcodes

and document those items in the Sample Collection record sheet (Appendix A). Also include the generic product-type barcode category chosen for each item.

7.2.6 To delete a previous entry, either delete using the “delete” button on the scanner or scan the “undo last” barcoded entry from Appendix C.

7.2.7 When the specific compartment is complete for a specific room, scan the “END” barcode, then the “COMPARTMENT” barcode, and if applicable, the barcode for the numeric identifier for that compartment. Proceed to the next compartment starting with step 7.2.3. When all products from in a particular room have been scanned, scan the “END” barcode, then the room barcode (e.g., “LIVING ROOM,” “KITCHEN”), and if applicable, the barcode for numeric identifier for that specific room.

7.2.8 Repeat steps 7.2.2 – 7.2.7 for the primary storage location for a) household cleaning products and b) personal care products. When finished scan “END”, “END”, “END”.

7.2.9 Download barcode information (and pictures) to computer using a USB to mini-USB cable and send to EPA investigators using information from SOP *EMAB-190.0 “Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer.”* See Appendix E for data download instructions. Download of photographs will depend on the device used (see SOP EMAB-185.0). Photo file names should include “Photo#” (# will be replaced with a sequence number for multiple photos for that sample type) and storage location information (room and compartment) corresponding to barcode scans in addition to the sample ID code.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. The sample collection information to be recorded for photography of storage locations will include the following, as a minimum: the participant ID, the storage location information, number of photographs, the date and time, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection. Please note that each photograph must have a unique identifier code and a date and time stamp, usually generated by the device. The sample collection information to be recorded for product scanning will include the following, as a minimum: the participant ID, the storage location information, number of barcode scans, initials or ID number of the field staff member responsible for the sample collection, and any comments regarding collection. Please note that each barcode scan has a date and time stamp. Other information shall be collected as needed to ensure successful collection and interpretation of data. Section 2.2.1 in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

$\overbrace{09 - 58}^a - \overbrace{B}^b \overbrace{1001}^c - \overbrace{V1}^d \overbrace{F}^e \overbrace{S}^f \overbrace{1}^g$

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

One storage compartment in 5-10% of the households shall be photographed in its natural state and inventoried twice by two different field staff. Products in photographs will be independently identified by two EPA staff members and a consensus list will be produced by those two individuals to assess the accuracy of the photographing/barcode scanning method.

10.0 REFERENCES

Quick Start Guide, OPN-2004 (Electronic Data Collection Scanner), Product Number OPN20049062-0-00, Opticon Inc., Renton, VA <https://wiki.opticonusa.com/techsupport/en/OPN-2004>.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Barcodes generated from <http://generator.barcoding.com/>

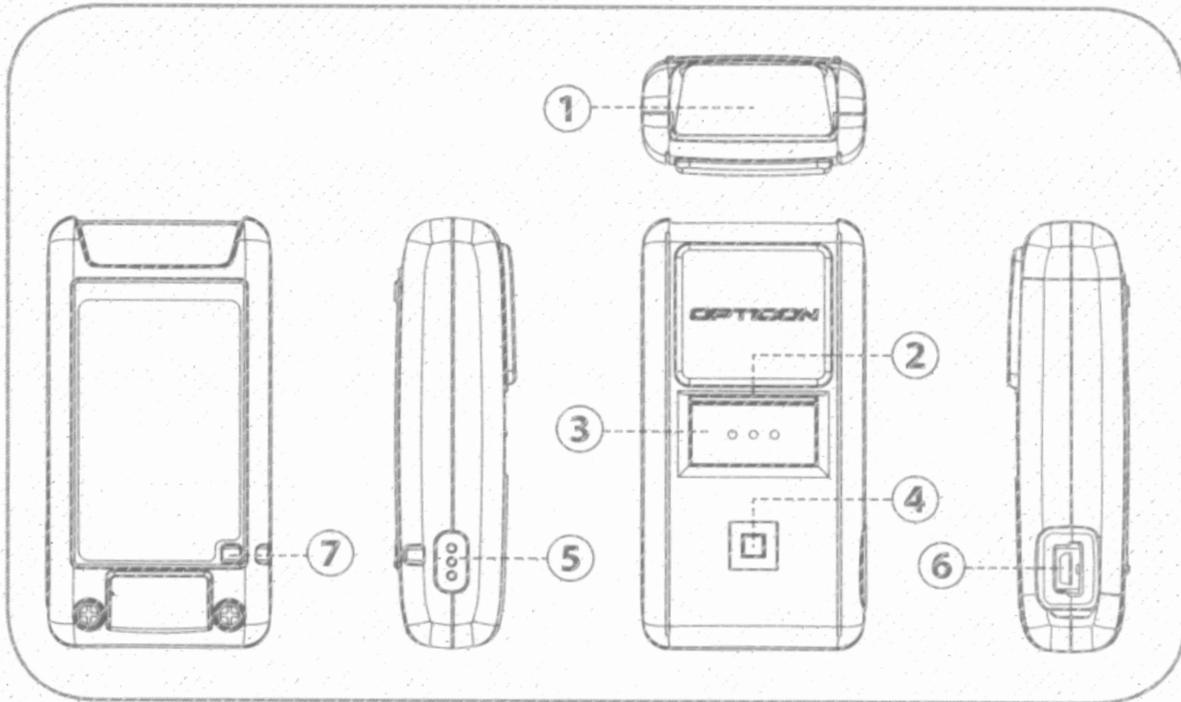
APPENDIX A: Sample Collection Record for the Consumer Product Inventory

EPA Pilot Study Add-On to the Green Housing Study Consumer Product Inventory			
Participant ID:		Sample ID:	
Collection Date:	___/___/___	Collection Start Time:	___:___ am/pm
Location #1 (Type of Room):			
Primary storage location for (check one): <input type="checkbox"/> household cleaning products OR <input type="checkbox"/> personal care products			
Compartment Description:			
No. of Photos:	No. of Scans:	End Time: ___:___ am/pm	
Sample Collection Comments:			
Location #2 (Type of Room):			
Primary storage location for (check one): <input type="checkbox"/> household cleaning products OR <input type="checkbox"/> personal care products			
Compartment Description:			
No. of Photos:	No. of Scans:	End Time: ___:___ am/pm	
Sample Collection Comments:			

Duplicate inventory of storage location (Type of Room):		
Primary storage location for (check one): <input type="checkbox"/> household cleaning products OR <input type="checkbox"/> personal care products		
Compartment Description:		
No. of Photos:	No. of Scans:	End Time: ____:____ am/pm
Sample Collection Comments:		
Field Staff ID/Initials:		

APPENDIX B: DETAILED VIEW OF BARCODE SCANNER

■ Detailed View



No.	Part	Function
1	Optical Window	The scanner emits a laser beam through the optical window while scanning barcode.
2	Status LED	The Status LED indicates the status of the scanning/clearing operation and charging
3	Scan Button	To scan barcodes and add items to the memory point to the barcode and press this button. To switch the buzzer on or off, press and hold this button for at least 10 seconds.
4	Clear Button	To remove a barcode, point to the applicable barcode and press this button. To remove all items from the memory, press and hold this button for at least 6 seconds.
5	Buzzer Hole	Buzzer sounds through the buzzer hole.
6	USB	Interface for USB communication and charging.
7	Strap Hook	Fix the neck strap to this hook.

APPENDIX C: BARCODE SHEET OF LOCATION, COMMAND AND NUMBER CODES

LOCATION / COMMAND CODES:

 START	 END	 UNDO LAST
 LIVING ROOM	 BED ROOM	 DINING ROOM
 KITCHEN	 BATH ROOM	 OTHER ROOM
 COMPARTMENT		

NUMBER CODES:

 0	 1	 2	 3
 4	 5	 6	 7
 8	 9	 10	 100

APPENDIX D: GENERIC BARCODES FOR INVENTORYING PRODUCTS WITH NON-SCANNING BARCODES

(Barcodes generated from <http://generator.barcoding.com/>)

CLEANING PROUDUCTS:



CLEANING PROUDUCTS (continued):


HAND CLEANER


SPOT CLEANER


HOUSEPLANT CARE


STARCH


LAMP OIL/LIGHTER FLUID


SURFACE CLEANER


LAUNDRY DETERGENT


UPHOLSTERY CLEANER


LAUNDRY STAIN REMOVER


WASHING MACHINE CLEANER


LAUNDRY STARCH


WAX REMOVER


LEATHER CLEANER


WOOD POLISH


LIME REMOVER


METAL POLISH


OVEN CLEANER


PRODUCE CLEANER


SHOE POLISH OR PROTECTANT


SILVER CLEANER

PERSONAL CARE PRODUCTS:


AFTERSHAVE


BODY WASH


BABY CONDITIONER


BODY WIPES


BABY LOTION


BUBBLE BATH


BABY POWDER


CLIPPER LUBRICANT


BABY SHAMPOO


CONDITIONER


BABY WASH


CONTACT CLEANER


BABY WIPES


DENTURE PRODUCTS


BAR SOAP


DEODORANT


BATH OIL


DEPILATORY


BODY HAIR BLEACH


DIAPER CREAM


BODY LOTION


EYE MAKEUP


BODY MAKEUP


EYE PRODUCTS, OTHER


BODY POWDER


FACE CREAM

PERSONAL CARE PRODUCTS (continued):


FACE MAKEUP


FACE WASH


FOOT LOTION


FRAGRANCES


HAIR COLOR


HAIR RELAXER


HAIR SPRAY


HAIR STYLING


HAND LOTION


HAND SANITIZER


HAND SOAP


JEWELRY CLEANER


KID'S FRAGRANCE


LICE SHAMPOO


LINIMENT


LIPS


MOUTHWASH


NAIL POLISH


NAIL POLISH REMOVER


SHAMPOO


SHAVING CREAM


SUNSCREEN


TEETH WHITENER


TONER


TOOTHPASTE

PEST AND PET RELATED PRODUCTS:



ANIMAL REPELLENT



FUNGICIDE



INSECT REPELLENT



INSECT REPELLENT, EXTERIOR



INSECT REPELLENT, SKIN



INSECTICIDE, EXTERIOR



INSECTICIDE, INTERIOR



RODENTICIDE



AQUARIUM



CAT LITTER



OTHER PET TREATMENTS



PESTICIDE, PET



PET SHAMPOO

APPENDIX E: DOWNLOADING BARCODE RECORDS

E.1 INSTALLING SOFTWARE

E.1.1 From the provided flash drive, open the folder “Opticon OPN-2004” and select “OPN200x Setup.exe”. Follow the onscreen instructions to install the software.

E.1.2 From the same location, select “USB Drivers Installer.exe”. Follow the onscreen instructions to install the drivers.

E.2 DOWNLOADING BARCODE RECORDS

E.2.1 Open the OPN200x Companion application from the computer desktop.

E.2.2 Connect the OPN-2004 barcode scanner to the computer via a USB to mini-USB cable.

E.2.3 The status indicator in the dialog box should turn from red to green (see Figure 2), indicating that the scanner is connected and is communicating properly. If the indicator does not turn green, make sure the USB drivers have been installed and check the cable connections.

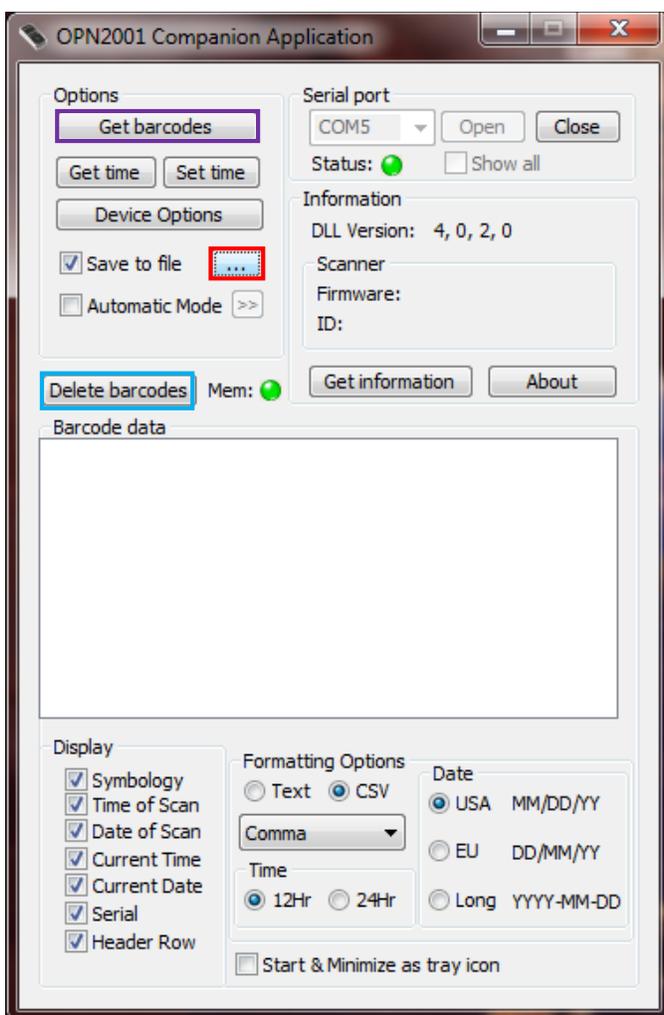


Figure 2. OPN2001 Companion Application window.

E.2.4 Verify that the “Save to file” box is checked and click the button beside it marked “...” which is highlighted in red in Figure 2.

E.2.5 Enter the sample ID code as the file name and click save so that the file will be saved as a .csv file (see Figure 3). *Please note that barcodes are not downloaded until the next step!*

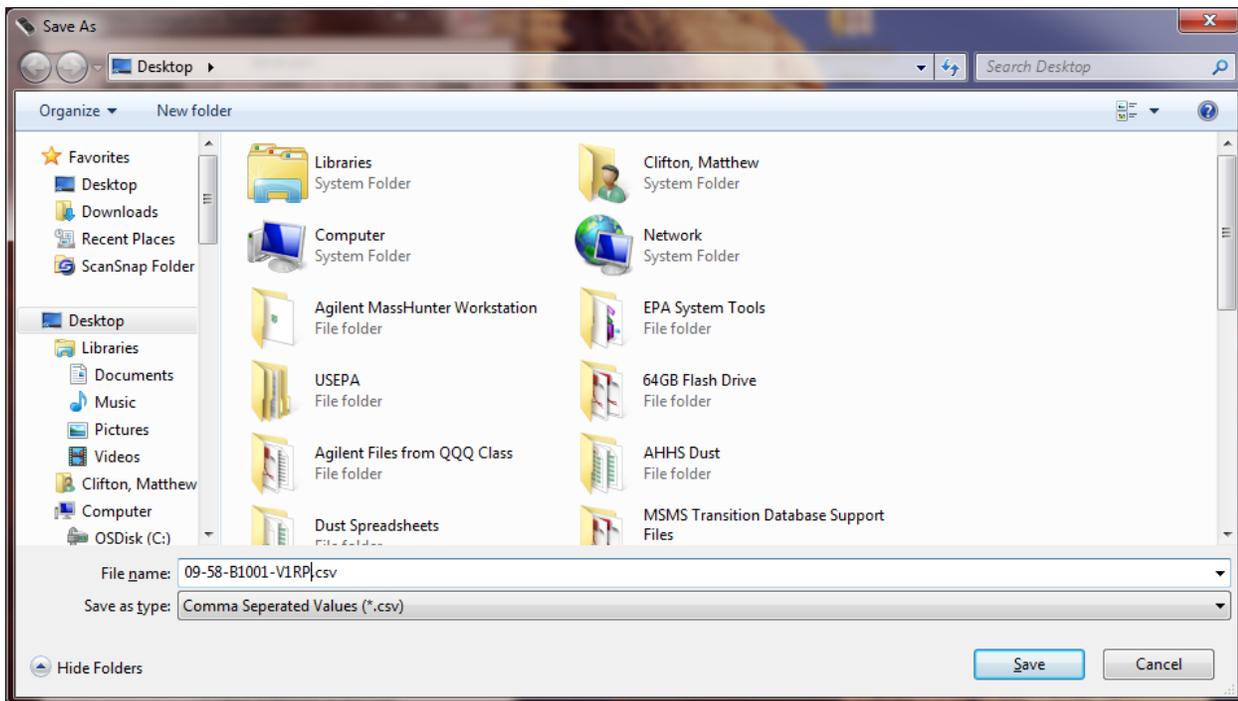


Figure 3. OPN2001 save as window.

E.2.6 Click the “Get Barcodes” button (highlighted in purple in Figure 2) to download the recorded barcodes. This will generate a .csv file named with the sample ID code entered in Step E.2.5.

E.2.7 Open the .csv file and verify that the content in the .csv file (Figure 4 left) matches the data displayed in the OPN2001 Companion application in the Barcode data section (Figure 4 right).

	A	B	C	D	E	F	G
1	START	Code-128	8:01:17 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
2	LIVING ROOM	Code-128	8:01:25 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
3	88969542915	UPC-A	8:01:35 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
4	77711058002	UPC-A	8:01:38 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
5	71503218667	UPC-A	8:01:47 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
6	BATH ROOM	Code-128	8:01:52 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
7	SD4795	Code-39	8:01:57 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
8	B19276	Code-39	8:01:59 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
9	SD4694	Code-39	8:02:03 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
10	SD4698	Code-39	8:02:05 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
11	END	Code-128	8:02:07 AM	6/30/2015	12:58:50 PM	6/30/2015	104685
12							

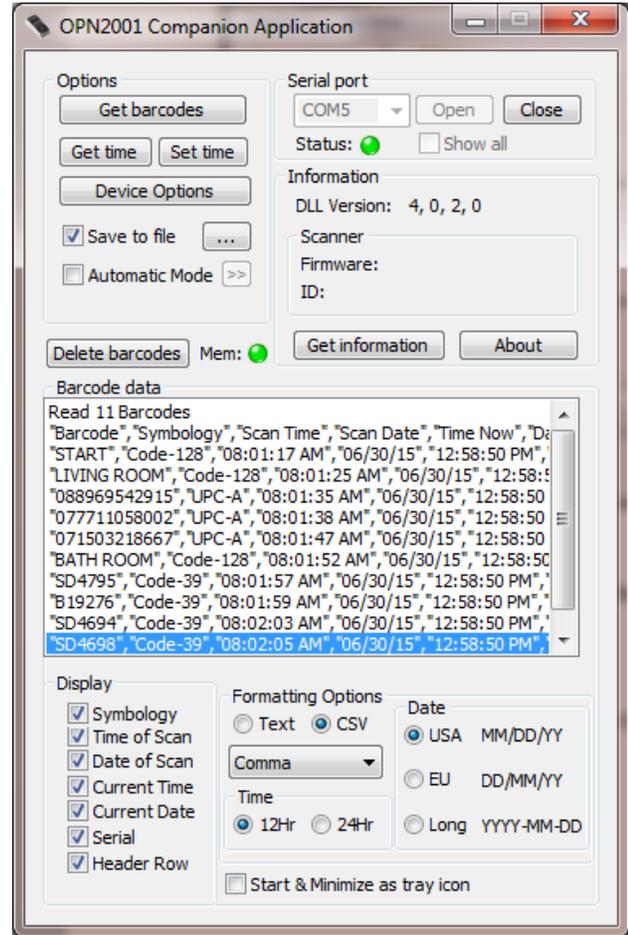


Figure 4. Matching .csv data (left) to barcode scanner data (right).

E.2.8 Only AFTER data have been verified as downloaded as stated in Step E.2.7, close the .csv file and click the “Delete barcodes” button (highlighted in bright blue in Figure 2) in the OPN2001 Companion application.

IMPORTANT NOTE: This will remove all barcodes from the scanner so be sure to confirm that the data has been downloaded before this step is completed.

Appendix XXI. Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples

Number: EMAB-185.0

Effective Date: November 13, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-021

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

* Optional Field
NERL-SOP.1 (7/2003)

STANDARD OPERATING PROCEDURE (SOP) FOR
STORAGE AND SHIPPING OF MULTIMEDIA SAMPLES

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1.0 SCOPE AND APPLICATION

Samples collected for the Environmental Protection Agency's (EPA's) pilot study add-on to the Green Housing Study (GHS) are a combination of physical samples for chemical and biological analyses and data contained in paper and electronic format. This SOP addresses the storage of applicable samples by the participant in their homes during the sampling period, collection and transport by the field team to their facility, storage in the field team's facility until shipping, and finally shipping information and conditions.

2.0 SUMMARY OF THE METHOD

For the EPA pilot study add-on to the GHS, there is a 5-day sampling period for each participant and time point (four time points: pre-renovation through 12 months post-renovation). On the first day, there are a series of field staff collected samples which include data and physical samples for chemical analysis. The field staff also provide instructions and a plug-in cooler to participants/caregivers for collection of samples on the second through fourth days. On the fifth day, the field staff return to collect the remainder of the samples, including the data and physical samples collected by the participant/caregiver.

Samples that undergo chemical or biological analyses, including those collected by the participant, are transported at 4°C in a cooler with frozen ice packs from the participant's home to the field team's facility. After the samples arrive at the field team's facility, they are stored at a reduced temperature in an appropriate secured freezer until shipment to either an EPA or Centers for Disease Control and Prevention (CDC) laboratory. During storage, the temperature of the storage locations must be monitored and documented at least once per day with corrective actions for non-compliant conditions. Samples are shipped to one of four addresses for further processing and analysis. Chain-of-custody (COC) records must accompany all samples shipped.

3.0 DEFINITIONS

SOP – Standard operating procedure

EPA – Environmental Protection Agency

GHS – Green Housing Study

Data – Information contained on all paper and in electronic formats

CDC – Centers for Disease Control and Prevention

COC – Chain-of-custody

EMAB – EPA Exposure Measurements and Analysis Branch

min – Minutes

mL – Milliliter

hr – Hours

USB – Universal Serial Bus

PDF – Portable Document Format

FTP – File Transfer Protocol

CD – Compact Disk

GPS – Global Positioning System

HEASD –EPA Human Exposure and Atmospheric Sciences Division

APPCD – EPA Air Pollution Prevention and Control Division

MCEARD – EPA Microbiological and Chemical Exposure Assessment Research Division

RTP – Research Triangle Park

USB – Universal Serial Bus

PDF – Portable Document Format

PII – Personally Identifiable Information

Courier Service – UPS, FedEx, et al.

SCR- Sample Collection Record

4.0 CAUTIONS

4.1 Samples must be maintained at the required temperature. If the storage temperature increases by more than 10°C and cannot be returned to the required storage temperature within an hour, efforts should be made to relocate samples to a new storage location with the required temperature.

4.2 Because much of the electronically collected study information is sensitive, strict control of the data must be maintained. The requirements for storage and control of electronic data at EPA will be addressed in a separate EPA SOP EMAB-190.0 “Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer.”

5.0 RESPONSIBILITIES

5.1 The field coordinator receives all samples and information collected for the EPA pilot study add-on to the GHS and will coordinate the proper storage, COC documentation, and shipment of these samples.

5.2 The field staff are responsible for returning collected samples and data to the field coordinator.

5.3 The EPA project staff receive the samples/data and inform the field coordinator of any issues with any of the shipments.

5.4 The CDC project staff receive the samples/data and inform the field coordinator and EPA of any issues with any of the shipments.

6.0 MATERIALS AND REAGENTS

- 6.1 Field collected environmental samples
- 6.2 Field collected biological samples
- 6.3 Sample collection records
- 6.4 Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaire
- 6.5 Consumer Product Inventory Barcode Data Files
- 6.6 Field sampling photographs
- 6.7 Cooler
- 6.8 Chilled ice packs
- 6.9 -20°C freezer
- 6.10 -80°C freezer
- 6.11 Thermometers for monitoring storage temperatures
- 6.12 Chain-of-custody (COC) records (paper or electronic)
- 6.13 Secure computer for data storage
- 6.14 Device to computer USB cables for Actical, GPS, barcode scanner
- 6.15 PDF capable scanner
- 6.16 Locked storage location
- 6.17 CDC protocols (see 10.0 References) and associated materials
- 6.18 EasyLog USB temperature data logger
- 6.19 Plug-in cooler (used for storing samples collected by parent/caregiver on days 2-4)
- 6.20 95 kPa approved shipping (e.g., Saf-T-Pak STP 730 or STP 740)
- 6.21 Absorbent material (pigmat or similar)
- 6.22 Packing tape
- 6.23 Styrofoam lined shipping container

7.0 PROCEDURES

7.1 REQUIRED NOTIFICATION PRIOR TO SHIPPING

Prior to shipping samples/data to EPA or CDC, the field coordinator should contact the appropriate contact person as noted in each section below by email or phone to ensure that the shipment can be received. Email shipping container dimensions and weight to Scott Clifton, who will provide a shipping label for all sample types. Do not ship the samples or data until the respective contact person

has confirmed they are ready to receive a shipment, and they have received the tracking number for the specific shipment they will be receiving.

7.2 SHIPPING FREQUENCY

Sample shipping frequency for blood follows the CDC shipment schedule. All environmental samples and biological samples other than blood and air samples are shipped to EPA locations at least every three months or when three coolers are full. More frequent shipping due to storage constraints may be required. Active and passive air samples are shipped to EPA on a more frequent, but changing schedule as communicated by EPA to the Field Coordinator. Data should be transmitted/shipped to EPA at least monthly.

7.3 ENVIRONMENTAL SAMPLES

Transport all environmental samples from the participant's home to the field team's facility at 4°C in coolers with frozen ice packs. Once in the field team's facility, store all samples (except drinking water samples) in a freezer at -20°C until they are shipped. Drinking water samples are stored at 4°C until they are shipped. Environmental samples that do not have a glass storage container may be stored at -80°C. An electronic copy of the sample collection records must be transferred via secure FTP server to Nicolle Tolve (as indicated in Table 3) prior to shipping the corresponding samples. A COC (Appendix A) must be shipped with the samples and samples should be shipped at least every three months (or more often if necessary). Specific storage and shipping details are included in Table 1. Environmental samples should be shipped to the following contact person as indicated and then stored at -20°C prior to analysis.

Ship Electrostatic Dust Collector Samples to:

Dr. Doris Betancourt
US EPA/NRMRL/APPCD
Chemical Services, Room E-178, Bldg E Loading Dock
109 TW Alexander Drive
Research Triangle Park, NC 27709
(919) 541-9446
Betancourt.Doris@epa.gov

Ship Swiffer Dust Collector Samples to:

Dr. Stephen Vesper
US EPA/NERL/MCEARD
26 West M. L. King Drive
Mail Stop 587
Cincinnati, OH 45268
(513) 569-7367
Vesper.Stephen@epa.gov

Ship All Other Environmental Samples to:

Mr. M. Scott Clifton
US EPA/NERL/HEASD
Chemical Services, Room E-178, Bldg E Loading Dock
109 TW Alexander Drive
Research Triangle Park, NC 27709
(919) 541-4612
Clifton.Matthew@epa.gov

7.4 BIOLOGICAL SAMPLES

Transport all biological samples from the participant's home to the field team's facility at 4°C in coolers with frozen ice packs. An electronic copy of the sample collection records must be transferred via secure FTP server to Nicolle Tolve (as indicated in Table 3) prior to shipping the corresponding samples. A COC (Appendix A) must be shipped with the samples. Specific storage and shipping details are included in Table 2.

Blood/Serum Samples: Place each box of blood/serum specimens inside a 95 kPa approved shipping bag along with some absorbent material. An acceptable bag is the Saf-T-Pak STP 730 or STP 740. Each of these is made up of an inner leak-proof poly bag and a Tyvek outer envelope. Seal each bag and envelope using the printed instructions on each bag. Place the sealed bags inside a Styrofoam lined shipping container. **Ship these samples in containers with icepacks [no wet ice]**. Add additional packing material to insure that the sample boxes will be secure in the box and will not be moving around. Place the Styrofoam lid on the box. Close the outer cardboard flaps and tape using either nylon reinforced filament tape or heavy duty packing tape (e.g., Scotch Premium Heavy Duty 3750-RD Packaging Tape).

Biological samples should be shipped to the following contact person as indicated and then stored under the same conditions as when stored at the Tulane field team's facility.

Ship Blood Samples to:

Sample Logistics
Centers for Disease Control and Prevention
4770 Buford Hwy
Building 110, Room 1211
Atlanta, GA 30341
(770) 488-4305
wcd1@cdc.gov

Ship Diaper, Stool, Urine, and Nail Samples to:

Mr. M. Scott Clifton
US EPA/NERL/HEASD
Chemical Services, Room E-178, Bldg E Loading Dock
109 TW Alexander Drive
Research Triangle Park, NC 27709
(919) 541-4612
Clifton.Matthew@epa.gov

7.5 DATA

Transmit data to EPA at least monthly. USB temperature loggers will use the Easy Log USB program (provided on a flash drive) to begin and end data logging, as well as transferring to .txt file (Appendix B). Download and store data from QStarz GPS recorders (EPA SOP EMAB-182) and Actical accelerometers (EPA SOP EMAB-181) as described in their respective SOPs. Store paper records in a secured location and retain until electronic receipt of the document is confirmed by EPA and according to EPA record retention schedules. Refer to EPA SOP EMAB-190.0 “Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer” and Table 3 in this SOP for specific storage, shipping and data transmission conditions.

8.0 RECORDS

Use a data collection system (paper or electronic) to capture information associated with the collection of all samples, processing, and COC record. Enter any comments regarding sample storage or transfer on the COC (Appendix A). A copy of the COC must be shipped with all samples.

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

9.1 STORAGE TEMPERATURES FOR ENVIRONMENTAL & BIOLOGICAL SAMPLES

Sample storage temperatures in the provided portable, plug-in coolers in the participant’s home will be monitored with a USB temperature logger located inside the cooler for the 5-day period. At the field team’s facility, storage temperatures will be monitored and documented at least on a daily basis. If temperatures increase more than 10°C above the required storage temperature for more than one hour, it should be noted on the sample collection record for all affected samples. If the samples cannot be returned to the required storage temperature within an hour, efforts should be made to relocate them to a new storage location with the required temperature.

9.2 SAMPLE SECURITY

Maintain samples in a locked storage location between collection and shipment to the EPA. The locked location may be at the storage device/container, room, or building level. Access to the samples will be limited to those who have need for access and have entered information onto the COC forms.

9.3 DATA SECURITY

Because much of the electronically collected study information is sensitive, strict control of the data must be maintained. The requirements for storage and control of information collected for EPA are addressed in a separate SOP EMAB-190.0 “Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer.” CDC protocols must also be followed.

10.0 REFERENCES

Green Housing Study Urine Collection. CDC 2009-0058

Green Housing Study Blood and Urine Log Sheet, 2012.

Green Housing Study Blood Specimen Collection, CDC 2009-0058, 2011.

File “Media Storage and transport (Ginger’s edits 1-11-12).xls

EPA SOP EMAB-190.0 “Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer”

Table 1. Storage and shipping conditions for environmental samples.

Sample Type	Storage at Home After Collection ^{a, b}	Shipping Conditions to Destination	Shipping Destination
Air (active, passive)	NA	Dry ice ^c	Mr. M. Scott Clifton US EPA/NERL/HEASD Chemical Services, Room E-178, Bldg E Loading Dock 109 TW Alexander Drive Research Triangle Park, NC 27709 (919) 541-4612 Clifton.Matthew@epa.gov
Household dust (technician, participant collected)	NA	Super-cooled ice packs ^c	
Wipes (surface, dermal)	NA	Super-cooled ice packs	
Socks	NA	Super-cooled ice packs	
Duplicate diet	Participant's refrigerator or cooler, 40°C below ambient	Super-cooled ice packs	
Drinking water	NA	Super-cooled ice packs	
Soil	NA	Super-cooled ice packs	
Electrostatic dust collector	NA	Super-cooled ice packs	Dr. Doris Betancourt US EPA/NRMRL/APPCD Chemical Services, Room E-178, Bldg E Loading Dock 109 TW Alexander Drive Research Triangle Park, NC 27709 (919) 541-9446 Betancourt.Doris@epa.gov
Swiffer™ dust collector	NA	Super-cooled ice packs	Dr. Stephen Vesper US EPA/NERL/MCEARD 26 West M. L. King Drive, Mail Stop 587 Cincinnati, OH 45268 (513) 569-7367 Vesper.Stephen@epa.gov

^a NA = Not Applicable due to sample not being stored at the home after collection.

^b All environmental samples are transported from the home to the field team's facility at 4°C in coolers with ice packs then stored at the facility in a freezer at -20°C until they are shipped except for drinking water, which will be stored at the facility at 4°C prior to shipping.

^c Dry ice = loose or block dry ice, temperature -78.5°C; super-cooled ice pack = ice packs frozen in a -80°C freezer prior to shipping

Table 2. Storage and shipping conditions for biological samples.

Sample Type	Storage at Home After Collection ^a	Storage at Field Team Facility ^b	Shipping Conditions to Destination ^c	Shipping Destination ^d
Blood/Serum	NA	Refrigerate, 4°C	Super-cooled ice packs	Sample Logistics Centers for Disease Control and Prevention 4770 Buford Hwy Building 110, Room 1211 Atlanta, GA 30341 (770) 488-4305 wcd1@cdc.gov
Urine (toilet or diaper)	Cooler, 40 °C below ambient	Freezer, -80°C	Dry ice	Mr. M. Scott Clifton US EPA/NERL/HEASD Chemical Services, Room E-178, Bldg E Loading Dock 109 TW Alexander Drive Research Triangle Park, NC 27709 (919) 541-4612 Clifton.Matthew@epa.gov
Stool (toilet or diaper)	Cooler, 40 °C below ambient	Freezer, -80°C	Dry ice	
Nail	NA	Freezer, -20°C	Super-cooled ice packs	

^aNA = Not Applicable due to sample not being stored at the home after collection.

^bAll biological samples are transported from the home to the field team's facility in coolers with ice packs at 4°C then stored at the facility as specified in this table until they are shipped.

^cDry ice = loose or block dry ice, temperature -78.5°C; super-cooled ice pack = ice packs frozen in a -80°C freezer prior to shipping

^dShipping frequency for blood is per CDC protocol. Shipping frequency for stool, urine, nail samples is at least every 3 months or when three coolers are full.

Table 3. Storage and shipping conditions for data.

Information Type ^a	Collection Method/Media	Field Staff Transfer to Field Coordinator ^b	Transfer Method to EPA by Field Coordinator	Transfer Method and Contact Person
Sample Collection Records (SCR)	Paper Hardcopy	Scan and save all records as PDF files; exclude PII	Secure FTP site on EPA Server (preferred) or Email	Electronic via secure FTP; contact Nicolle Tulve OR Email: Tulve.Nicolle@epa.gov
Photographs (Product Inventory & Field Sampling)	Digital Camera (Smartphone or other)	Download to Field Team Computer via USB cable, SD card, or phone cable		
Product Inventory Barcode Scans	Opticon Barcode reader	Download to Field Team Computer via USB to mini-USB cable as .csv file		
Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaires	Paper Hardcopy	Scan and save as PDF	Secure FTP site on EPA Server (preferred) or Email	Electronic via secure FTP; contact Kristin Isaacs OR Email: Isaacs.Kristin@epa.gov
GPS	QSTARZ GPS unit	Download to Field Team Computer via USB cable as QTravel format (.itm) and text format (.csv)		
Accelerometer	Actical™ unit	Download to Field Team Computer via ActiReader® as ActiReader format (.awc) and text format (.csv)		

^a Note: All data should be delivered on a monthly basis at a minimum.

^b All paper hardcopies are delivered to and maintained by the field coordinator. Field coordinator is responsible for maintaining a backup copy of all electronic documents and files at a second remote location.

GPS = Global Positioning System; USB – Universal Serial Bus; PDF – Portable Document Format; PII – Personally Identifiable Information; FTP – File Transfer Protocol; CD – Compact Disk

Appendix B: Instructions for using EasyLog USB (EL-USB) Temperature Data Loggers

B.1 START THE DATA LOGGER PRIOR TO VISITING THE PARTICIPANT'S HOME.

B.1.1 Put a new half-size AA battery in the data logger (consult the case for battery direction). To remove the case, depress the tab and slide the case to expose the battery. After inserting the battery, slide the case back and ensure that the tab engages.

B.1.2 Plug the data logger into a USB drive on a PC with the EasyLog USB software installed and running.

B.1.3 Click "Set-up and start the USB data logger".

B.1.4 In the "Logger name" field, enter the 4 digit Subject ID code, home visit and date as indicated in the example below.

example: 1001-V1-052615

Where: 1001 is the Subject ID

V1 is the home visit

052615 is the date "May 26, 2015"

B.1.5 Select temperature scale in °C.

B.1.6 Select 1 Min for the frequency the data logger will take a reading.

B.1.7 Click "Next". Leave the alarms unchecked and click "Next" again.

B.1.8 Select the start date and time if the logger will not be deployed immediately. Otherwise select "Immediate start" and click "Finish". Unplug the data logger from the PC.

The green light on the temperature logger should flash every 10 seconds, which indicates the logger has begun logging.

B.2 DEPLOY THE DATA LOGGER AT THE PARTICIPANT'S HOME

B.2.1 Place the logger in a 50 mL Falcon tube. Place the cap on the tube and tighten.

B.2.2 Place the plug-in cooler at the participant's home near an outlet, where it is unlikely to be disturbed, and is out of reach of children.

B.2.3 Plug in the cord. If the cord crosses a walking path in the home, tape the cord down with masking tape to minimize the trip hazard.

B.2.4 Place the Falcon tube containing the data logger inside the cooler and zip the cooler closed.

B.3 RETRIEVE LOGGER, STOP THE LOGGER, AND DOWNLOAD DATA.

B.3.1 Remove samples and data logger from the plug-in cooler and place them into a -4°C cooler with ice packs.

- B.3.2 Unplug the plug-in cooler. Remove and discard any masking tape holding down the cord.
- B.3.3 Transport the coolers to the field staff facility and place samples in cold storage at the appropriate temperature (see Tables 1 and 2).
- B.3.4 Plug the data logger into a USB drive on a PC with the EasyLog USB software installed and running.
- B.3.5 Click “Stop the USB data logger and download data”.
- B.3.6 Click OK and select the storage location where the temperature log files will be stored. The filename will consist of the code used in Step B.1.4 of the startup procedure and will not need to be edited unless the filename does not match the Subject ID, home visit or date indicated.

**Appendix XXII. Standard Operating Procedure (SOP) for Data Storage,
Handling, and Transfer**

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for Data Storage, Handling, and Transfer

Number: EMAB-190.0

Effective Date: November 16, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-022

SOP Steward

Name: M. Scott Clifton

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

STANDARD OPERATING PROCEDURE (SOP) FOR DATA STORAGE,
HANDLING, AND TRANSFER

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1.0 SCOPE AND APPLICATION

Data collected for the EPA pilot study add-on to the Green Housing Study (GHS) include information contained in paper and electronic format. This SOP addresses the storage of data by the field team at their facilities and/or on their data systems, transfer of data to the EPA study team, and storage of data at EPA facilities and/or on EPA data systems.

2.0 SUMMARY OF THE METHOD

This method describes the required storage and transfer protocols to maintain personal information in a secure manner once the data is collected as part of the EPA pilot study add-on to the GHS. Paper forms will be scanned into electronic format by the field team and checked for readability by EPA staff. Paper documentation will be kept in a locked file cabinet in which there is limited access. All electronic data that contains personally identifiable information (PII) will be encrypted and kept on a secure server or device that is password protected. Electronic data containing PII will be transferred from the field team to EPA by secure FTP site; non-sensitive electronic data can be transferred by email. Electronic data at EPA will be stored at a secure government facility and on secured government drives.

3.0 DEFINITIONS

Data – Information contained on all paper and in electronic formats

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

CDC – Centers for Disease Control and Prevention

PDF – Portable Document Format

FTP – File Transfer Protocol

GPS – Global Positioning System

EPA – Environmental Protection Agency

RTP – Research Triangle Park

IT – Information Technology

PC – Personal Computer

SCR – Sample Collection Record

PII – Personally identifiable information; any information about an individual maintained by an agency, including, but not limited to, education, financial transactions, medical history, and criminal or employment history and information which can be used to distinguish or trace an individual's identity, such as their name, social security number, date and place of birth, mother's maiden name, biometric records, etc., including any other personal information which is linked or linkable to an individual. For

this study, GPS data collected and the names of participants are considered PII.

Encryption – the process of encoding information in such a way that only authorized parties can read it. 16+ bit encryption is required for PII.

Courier Service – Includes fast delivery service, tracking, and insurance: UPS, FedEx, et al.

4.0 CAUTIONS

Computer systems storing personally identifiable information must be kept up-to-date with vendor supplied patches, antivirus software and definitions and use the Federal image.

16 bit encryption (or stronger) is required for PII.

Be sure that no participants or their parents/caregivers are included in any study photographs. This includes photos that may have captured participant photographs that are located around the home.

5.0 RESPONSIBILITIES

5.1 All staff shall be trained on IT security.

5.2 The EPA project staff will provide devices and information gathering paperwork to the field coordinator. EPA staff will review scanned documents for completeness and readability, and will request re-scans if necessary. The EPA staff will inform CDC and Tulane immediately upon the departure of any staff who had access to sensitive data, and encryption passwords will be changed within 24 hours of any staff departures.

5.3 The field coordinator shall provide an IT security certificate and SOP on how they will ensure integrity, confidentiality, and availability of the data. The field coordinator (or a designee) will inform CDC and EPA immediately upon the departure of any staff who had access to sensitive data, and encryption passwords will be changed within 24 hours of any staff departures. The field coordinator receives all information collected for the EPA pilot study add-on to the GHS, coordinates the proper storage of information, completes and maintains COC documentation, and completes transfer of information to the EPA. The field coordinator will download GPS data, accelerometer data, photographs, and product inventory barcode scans from the corresponding devices.

5.4 The field staff will be responsible for collecting information (GPS, accelerometer, barcode scans, photographs (field and product inventory), questionnaires, sample collection records (SCR) from and with participants. Field staff will ensure that no humans are included in photographs, scan paper documents to produce a PDF file and return all collected documents and information to the field coordinator.

6.0 MATERIALS

6.1 Contractor computer systems using the standard federal PC configuration, maintained with updates/patches and antivirus software

6.2 EPA computer systems using the Federal image and level 3 security installed, maintained with

updates/patches and antivirus software

6.3 Encryption software (e.g., Microsoft Office, encrypted zip, encrypted folders) with 16+ bit keys

6.4 Scanner that converts hardcopy to PDF

6.5 Devices, data and forms produced during the EPA pilot study add-on to the GHS

6.6 Field record notebook(s)

6.7 Locked file cabinet

6.8 Field collection SOPs for the EPA pilot study add-on to the GHS

7.0 PROCEDURES

7.1 FIELD DATA STORAGE

As much as feasible, the data will be collected in electronic format. File organization will not be prescribed in this SOP, but must be logical, quickly understood by EPA staff familiar with the study design, fully documented in a field record notebook, and shared with EPA staff.

7.1.1 Field staff will scan all hardcopy forms (e.g., Electronic Location, Transportation, Activity, Diet, Consumer Products, and Home Observation Questionnaire & Sample Collection Records) after censoring any personal identifiable information into the secure field team's computer. Censoring data may include deletion or physical covering/blocking. Scans will be saved as a PDF file and follow the file naming format described in Section 2.2.1 in the QAPP for sample ID codes (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study)*). Sample collection records should be identified with "SCR" in the file name in addition to the sample ID code. Sample collection records and COC sheets will accompany their respective samples during transport.

7.1.2 All paper forms that contain personally identifying information will be kept in a locked file cabinet in which there is limited access controlled by the field coordinator. It is also suggested paper forms not containing PII also be stored in this manner.

7.1.3 After collection of electronic data by the field staff, the field coordinator will download electronic data files to a secure location (e.g., field team's computer). This data will include a) GPS data in .ITM and .CSV formats (SOP EMAB-182.0), b) accelerometer data in .AWC and .CSV formats (SOP EMAB-181.0), c) product inventory photographs and barcode scan files in .CSV format (SOP EMAB-184.0), and d) field sampling photographs (SOP EMAB-167.0, EMAB-171.0, EMAB-172.0, EMAB-176.0). Detailed instructions for this download and file naming system are included in corresponding field collection SOPs and *Table 3* in SOP EMAB-185.0, "*Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples.*" Download of photographs will depend on the device used (see SOP EMAB-185.0). Photos should be identified with "Photo#" (# will be replaced with a sequence number for multiple photos for that sample type) in the file name in addition to the sample ID code.

7.1.4 All electronic forms and data files that contain PII must be kept on a secure server or device that

is password protected and the files will be encrypted (16+ bit). It is also suggested that electronic information from this study that does not contain PII also be stored in this manner.

7.1.5 All electronic data must be backed up on an external location (for PII, this must be a secure backup) to ensure accessibility of data.

7.1.6 The field coordinator (or a designee) will inform CDC and EPA immediately upon the departure of any staff who had access to sensitive data, and encryption passwords will be changed within 24 hours of any staff departure.

7.2 DATA TRANSFER

Information should be transmitted to EPA at least monthly. Table 3 in SOP EMAB-185.0, “*Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples*” contains additional details for data transfer.

7.2.1 Most electronic data (see *EMAB-185.0 Table 3*) will be uploaded to a secure FTP site (address to be determined) by the field coordinator. The site will have limited access and will be password protected and is the preferred method of data transfer. File organization structure and file names must be maintained during and after the data transfer. File upload information (including file organization structure and file names) will be transmitted via email to Nicolle Tolve (tolve.nicolle@epa.gov) or Kristin Isaacs (isaacs.kristin@epa.gov) at EPA within 24 hours of data transfer to the FTP site (or emailing of data). *NOTE: Each chain of custody record should contain the file organization structure information and file names associated with each sample set.*

7.2.2 Photographs and product inventory barcode scan files will be transmitted to Nicolle Tolve via secure FTP site (preferred method; address to be determined) or email (tolve.nicolle@epa.gov).

7.3 EPA DATA STORAGE

At EPA, data and computer systems are located on a secure government facility. Access to the site is limited by armed guards and identification credentials are required to enter the facility. Access to network drives is controlled by system administrators employed by the agency. Agency computers require an ID card with a smart chip and PIN for access.

7.3.1 Data will be downloaded from the secure FTP site to an EPA local access network (LAN).

7.3.2 EPA staff will check each electronic document scan for exclusion of PII, good readability, and completeness. If the image does not meet these criteria, a new scan will be requested (suggest increasing image resolution if readability is a problem).

7.3.3 Data that contains possible PII (e.g., GPS information) will be moved to and stored in an encrypted folder. Only those who need access to the data (for cleaning, verification, or analysis) will know the password to the encrypted folder.

7.3.4 All electronic data must be backed up on an external location (for PII, this must be a secure backup) to ensure accessibility of data. After confirmation of a successful backup, data will be deleted from the FTP site.

7.3.5 The EPA staff will inform CDC and Tulane immediately upon the departure of any staff who had access to sensitive data and encryption passwords will be changed within 24 hours after any staff departure.

8.0 RECORDS

The information and forms will be maintained in accordance with the EPA's records management schedule regardless of whether they are paper or electronic. All data will be backed up on an external location (for PII, this must be a secure backup) so that a minimum of two separate copies are available to prevent loss of information. File upload information (COC to include file organization structure and file names) will be transmitted via email to Nicolle Tulve (tulve.nicolle@epa.gov) or Kristin Isaacs (isaacs.kristin@epa.gov) at EPA within 24 hours of data transfer.

Section 2.2.1 in the QAPP (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestyles (EPA Pilot Study Add-On to the Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by CDC for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
— — — — —
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

EPA staff reviews scanned documents for readability.

The field staff ensures that no humans (or pictures of humans) are included in photographs.

The field coordinator shall provide an IT security certificate and a SOP on how they will ensure integrity, confidentiality, and availability of the data.

10.0 REFERENCES

SOP EMAB-167.0, "Standard Operating Procedure (SOP) for Technician-Collected House Dust Samples"

SOP EMAB-171.0, "Standard Operating Procedure (SOP) for the Collection of Wipe Samples from Hard Surfaces"

SOP EMAB-172.0, "Standard Operating Procedure (SOP) for the Collection of Soil Samples"

SOP EMAB-176.0, "Standard Operating Procedure (SOP) for Collection of Duplicate Diet Samples"

SOP EMAB-181.0, "Standard Operating Procedure (SOP) for Using Actical Activity Monitors in The EPA/CDC Green Housing Study (GHS) Pilot."

SOP EMAB-182.0, "STANDARD OPERATING PROCEDURE (SOP) FOR GPS Data Collection"

with the QSTARZ BT-Q1000XT GPS Travel Recorder.”

SOP EMAB-184.0, “Standard Operating Procedure (SOP) for collection of Household Cleaning Products and Personal Care Products Inventory.”

SOP EMAB-185.0, “Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples.”

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children’s Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

**Appendix XXIII. SOP for the Collection of Drinking Water Samples for
Metals Analysis**

U.S. Environmental Protection Agency
Office of Research and Development

National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Standard Operating Procedure (SOP) for the Collection of Drinking Water Samples for Metals Analysis

Number: EMAB- 193.0

Effective Date: November 16, 2015

SOP was Developed

In-house

Extramural

Alternative Identification: GHS-023

SOP Steward

Name: Daniel M. Stout II

Signature:

Date:

Approval

Name: Kim Rogers

Title: Acting Branch Chief, EMAB

Signature:

Date:

Concurrence*

Name: Sania W. Tong Argao

Title: HEASD QA Manager

Signature:

Date:

For Use by QA Staff Only:

SOP Entered into QATS:

Initials

Date

Standard Operating Procedure (SOP) for the Collection of Drinking Water Samples for Metals
Analysis

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1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the method for collecting drinking water samples for the EPA pilot study add-on to the Green Housing Study (GHS). Samples will be used to measure the concentrations of metals found in ordinary tap water.

2.0 SUMMARY OF THE METHOD

An aliquot of tap water will be collected by the field team from the participant's primary source of drinking water on the first visit (Day 1). Samples will be collected in acid washed, certifiably clean containers and acid stabilized immediately upon return to the field team's laboratory facilities. If bottled water is noted as the primary source of drinking water, then unopened bottle water samples will be requested. Participants will be asked to record the amount of water consumed each day of the study from all sources.

3.0 DEFINITIONS

SOP – Standard operating procedure

GHS – Green Housing Study

COC – Chain-of-custody

RTP – Research Triangle Park

QAPP – Quality Assurance Project Plan

CDC – Centers for Disease Control and Prevention

FB – Field Blanks

FD – Field Duplicates

FS – Field Spikes

4.0 CAUTIONS

Gloves and eye protection are required for handling acids. When opening a preservative bottle exercise caution to minimize spills and splashes. Have acid/base neutralization supplies (baking soda) on hand in the event of a spill.

5.0 RESPONSIBILITIES

5.1 The EPA project staff will prepare the water sample collection containers and deliver them to the field coordinator.

5.2 The field coordinator will receive the water sample collection containers and keep a chain-of-custody (COC) tracking record in a field record book. The field coordinator will distribute the water

sample collection containers to the field staff. Upon collection of the drinking water sample, the field coordinator will be responsible for returning the samples with their collection records and COC sheets to the EPA laboratory in Research Triangle Park (RTP), NC for analysis.

5.3 The field staff will be responsible for obtaining the sample collection containers from the field coordinator, for collection of the drinking water sample, entering relevant information on the sample collection record sheet and/or in field record books, and returning collected drinking water samples to the field coordinator.

6.0 MATERIALS AND REAGENTS

6.1 Nitrile gloves

6.2 Safety glasses

6.3 Large zip-closure Polyethylene bags

6.4 500 mL HDPE Narrow-Mouthed Boston Round bottles, acid washed certifiable clean (Thermo 319-0500) or similar

6.5 Concentrated Nitric Acid (HNO₃), preservative

6.6 Coolers

6.7 Ice packs (chilled)

6.8 Field record book(s)

6.9 Pen

6.10 Permanent marker (Sharpie or similar)

6.11 Sample ID label

6.12 Sample collection and chain of custody (COC) record sheet

6.13 pH meter (maintained at field team's laboratory).

6.14 Paper towels to wipe up spills in homes.

6.15 Baking soda to neutralize acid spills.

6.16 Plastic 12 oz. cup or equivalent.

7.0 PROCEDURES

7.1 IDENTIFICATION OF DRINKING WATER SOURCE

The field technician collects the drinking water samples. Samples will be taken from the participant's house on the first and last day of sampling.

7.1.1 Query the parent/caregiver about their primary source of drinking water. If they indicate the household tap then note that as the sampling source. Insure the tap is of sufficient height to place the

sampling container under the faucet without contacting the opening of the sample container. Drinking water taps must be free of devices such as screens, aeration devices, hoses, or purification devices. These devices must be removed prior to sample collection and then reinstalled after sample collection. Faucets should be relatively clean and in good repair. If not in good repair or devices can't be removed, select another household faucet. If the participant indicates bottled water is their primary source, request a sample of unopened bottled water from each type of bottled water used. Document the response in the field record book associated with the sample's ID code.

7.2 SAMPLE COLLECTION

7.2.1 Samples are collected on Day 1 only. Prepare the collection materials near the location where the sample will be collected.

7.2.2 Don nitrile gloves and safety glasses. Open the collection jar and place the lid in a convenient location. Do not touch the inside of the lid or the jar with your hand or other object (including the tap or resting surface).

7.2.3 Turn on the cold water tap to a high flow position and allow to flush for 2 to 3 minutes. Turn down the flow to a level where splashing is minimal.

7.2.4. Rinse the bottle three times with the tap water prior to collecting the sample ensuring that all interior surfaces are rinsed. Collect the sample by filling the bottle, while leaving a 5 to 10% headspace in the bottle. The preservative (HNO_3) will be added immediately upon returning the sample to the field team's laboratory. Ideally, the sample in the bottle with preservative will be filled to within 2 to 3 inches of the top.

7.2.5 Similarly, rinse the lid of the bottle 3 times with the tap water and tightly cap the sample.

7.2.6 If bottled water is provided, simply pour the contents of the bottle into the sample container. Note the source of water as bottled water on the sample collection record and proceed as described for tap samples.

7.2.7 Apply the Sample ID label that contains the specified unique sample code (see Section 8.0) directly to the outside of the 500 mL HDPE Narrow-Mouthed Boston Round bottles.

7.2.8 Place the sample bottle in a zip-lock plastic bag to establish secondary containment. Write the sample ID code (as indicated on the Sample ID label placed on the bottle in step 7.2.6) on the outside of a zip-top bag with a permanent marker. Gently force the excess air out of the polyethylene bag before sealing it.

7.2.9 Remove the nitrile gloves and dispose of them in the household trash or a field sampling trash bag. Wipe down the area with paper towels to remove any splashed water.

7.2.10 With the help of the participant, complete the questionnaire information regarding the estimated amount of water consumed that day for the index child and sibling. Provide the caregiver with a reference glass (12 oz.) to assist in the estimation of the volume consumed. Complete the sample collection record for the sample in pen (Appendix A). Complete COC for samples.

7.3 SAMPLE STORAGE AND TRANSPORT

See also *SOP EMAB-185.0, "Standard Operating Procedure (SOP) for Storage and Shipping of Multimedia Samples"* for additional details. Completed sample collection records and COC must accompany all samples during storage and shipment.

7.3.1 Samples will be transported to and from the sampling location in a cooler with ice packs.

7.3.2 Immediately upon arrival at the field team's facility, the drinking water samples will be acidified with HNO₃ to a pH of <2 (estimated addition of about 5 mL) and confirmed with a pH meter or equivalent. Date and record acidification in sample log. Samples will be stored at 4°C and have a holding time of up to 6 months.

7.3.3 For transport to the EPA laboratory, samples will be packed with chilled blue ice packs (or equivalent) in an insulated shipping container and shipped via next day air.

8.0 RECORDS

A data collection system will be used to capture information associated with the collection of all samples. Recording the sample collection information can be done in electronic format or on paper records. For the drinking water samples, the sample collection information to be recorded will include the following, as a minimum: the sample ID, the participant ID, the date of the sample collection, the initials or ID number of the field staff member responsible for the sample collection, the source of the sample (bathroom tap, kitchen tap, bottled water, etc.), and any comments regarding collection (Appendix A). Other information shall be collected as needed to ensure successful collection and interpretation of data. *Section 2.2.1* in the associated quality assurance project plan (QAPP) (*An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the CDC Green Housing Study)*) details the sample code information.

Sample codes used for the EPA pilot study add-on to the Green Housing Study will follow the general naming scheme used by the Centers for Disease Control and Prevention (CDC) for the main study. Those codes will capture the specific sample types and sampling periods that will be collected for the EPA pilot study add-on. The current CDC scheme for sample coding includes: (a) CDC Study ID; (b) Study Location, (c) Subject ID; (d) Home Visit; (e) Sample Type; (f) Sample Subtype; and (g) Sample number as shown in the following example.

a b c d e f g
09 – 58 – B 1001 – V1 F S 1

9.0 QUALITY CONTROL AND QUALITY ASSURANCE

Quality control samples will constitute no more than 5% of the total drinking water samples collected and will consist of field blanks (FB), field duplicates (FD), and field spikes (FS) (see QAPP section 1.4.2.20 *Drinking Water* and *Table 5. Sample QC on per household basis*).

9.1 FB and FS will be prepared in the EPA laboratory and consist of distilled water contained in identical 500 mL HDPE bottles used to collect field samples and acid preserved with HNO₃. FB and FS will be transported to the field team's laboratory and subsequently transported to the field location undergoing similar conditions as the field collected samples. The FS will be fortified with a volume of standard solution formed with known concentrations of select metals. Both QA sample types will be acid preserved with HNO₃ to a pH of <2 at the same time as field sample acidification.

9.2 FD will be collected using identical procedures as referenced in section 7.2-7.3 of this document.

10.0 REFERENCES

Quick Guide to Drinking Water Sample Collection. US EPA, Region 8. April, 2005.

HEADS SOP EMAB-009.1E (CTEPP 2.13), Version 1, Standard Operating Procedure for the Collection of Food and Drinking Water Samples.

Quality Assurance Project Plan, An EPA Pilot Study Evaluating Personal, Housing, and Community Factors Influencing Children's Potential Exposures to Indoor Contaminants at Various Lifestages (EPA Pilot Study Add-On to the CDC Green Housing Study), Exposure Measurements and Analysis Branch, National Exposure Research Laboratory, Research Triangle Park, N.C., 2015.

Appendix A: Sample Collection Record for Drinking Water Sample

EPA Pilot Study Add-On to the Green Housing Study Drinking Water Sample			
Participant ID:		Sample ID:	
Collection Date:	___ / ___ / ___	Drinking Water Type:	Faucet Bottle
Source:	Well	Municipal	Filtered
Length of time faucet was run: _____ minutes			
Was faucet clean and in good repair: Yes _____ No _____			
Was removal of aerator, screens, etc. required: Yes _____ No _____			
Item(s) removed prior to sampling: _____			
Location of faucet (room):			
Sample Collection Comments:			
Sample Storage Comments:			
Sample Shipping Comments:			
Estimated amount of daily drinking water consumed for participating children:			
Field Staff ID/Initials:			

Appendix XXIV. Participant Instruction Record Book

EPA Add-On
to the
Green Housing Study

Participant Instruction and
Record Book

Day 2

Blank

Page

Day 2

Day 2 Checklist

Use this checklist to mark the completed activities for Day 2

- Silicone Band Kept On Child
- Sock Samples Collected and Stored
- Duplicate Diet Samples Collected and Food Diary Completed
- Activity Monitors Placed for the Day and Removed Prior to Sleep
- End of Day Activities Completed

Day 2

Blank

Page

Day 2

Silicone Band

1



Please leave the silicone band on your child until the field team returns on Day 5.

2



If the band has to be removed or placed on a different location (wrist to ankle etc.), write what was done below.

Day 2

Blank

Page

Day 2

Duplicate Diet

We need to get a matching amount of food and drink from you. How much children eat varies. Please try to collect exactly the same amount of food your child eats.

1



You need to collect the same amount of food and drink as your child eats and drinks on the day after we visited you.

2



Include exactly the same amount of food as your child eats, prepared in the same way. Remove the peels, wrappers, bones, etc. just like you would for your child. If your child only ate part of the food, only place the same amount of the food in the container.

3



For example, if your child eats two slices of orange, place only two slices of orange in the container.

4



Put the food in the container marked as "Solid Food" and drinks in the container marked "Beverages".

Day 2

Activity Monitors

1



Place the belt with the activity monitor on your child's waist. Make sure the arrow on the monitor is pointing up toward their head.

2



Remove the charging plug from the QSTARZ travel recorder.

3



Please keep the QSTARZ travel recorder on your child all day. If that is not possible, place it on something that is always near your child (for example a stroller, diaper bag, backpack).

Write what time it is now in the box below.

Start Time: AM / PM

4



Keep the device dry. During bathing, swimming or other water-related activities, remove the device and keep it nearby.

If the unit is not kept with your child, please write the reason and times below.

Time	Reason

Day 2

Blank

Page

Day 2

End of the Day

1



At the end of the day, remove the belt with the activity monitor from your child. Record the time it is now in the box below.

End Time:

AM / PM

2



Re-connect the QSTARZ travel recorder to the plugged-in charger.

3



REMINDER!

Collect first morning void Urine Sample

Place the reminder note on the toilet or other prominent location. **Write the time of the last void before the morning void is collected tomorrow in the box below.**

Time:

AM / PM

4



If your child is not toilet trained, please put one of the diapers from the sample kit on your child before he or she goes to bed. **Record the time of the last wet diaper in the box below.**

Time:

AM / PM

Day 2

Blank

Page

Day 3

Day 3 Checklist

Use this checklist to mark the completed activities for Day 3

- Silicone Band Kept on Child
- Urine Collection Completed and Stored
- Activity Monitors Placed for Day and Removed Prior to Sleep
- Stool Sample Collected and Stored
- End of Day Activities Completed

Day 3

Blank

Page

Day 3

Silicone Band

1



Please continue to leave the silicone band on your child until the field team returns.

2



If the band has to be removed or placed on a different location (wrist to ankle etc.), write what was done below.

Day 3

Blank

Page

Day 3

Urine Collection (Toilet Trained First Morning Void)

1



Have your child rinse his or her hands with water and air or towel dry them.

2



Put on a pair of purple gloves from the sample kit.

3



When your child is ready to urinate, remove the cap from the DAY 3 URINE collection container and place the cap with the inside up in a safe place where it is unlikely to be knocked over. Do not touch the inside of the container or cap at any time.

4



Have your child urinate into the collection container. Collect the entire amount of urine and assist as necessary.

Is this a First Morning Void?

YES

NO

Day 3

Urine Collection (Toilet Trained First Morning Void- continued)

5



Recap the collection container. If the container is wet, wipe it down with toilet paper or a paper towel.

6



Place the collection container in the zip-lock bag with absorbent material. Remove excess air from the bag and seal it.

7



Remove the gloves and throw them away. **Write the time the sample was collected in the box below.**

Time: **AM / PM**

8



Place the bag containing the sample in the cooler as soon as possible after sample collection.

Day 3

Diaper Urine Collection

1



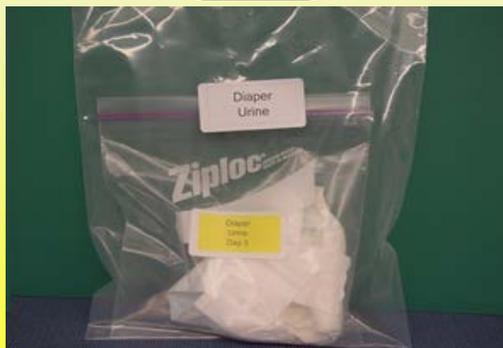
Collect the first wet diaper of the morning. If the diaper is dirty (contains stool), use that as the stool sample (If collected) and place a clean diaper on your child and collect the next wet diaper.

2



Put the diaper inside of the zip-lock bag labeled "Diaper Urine Day 3" and seal the bag.

3



Place that bag inside the larger bag labeled "Diaper Urine". Store the bag in the cooler until it is collected by the field team.

4



Please write the time the diaper was collected in the box below.

Is this a First Morning Void?

YES

NO

Time:

AM / PM

Day 3

Activity Monitors

1



Place the belt with the activity monitor on your child's waist. Make sure the arrow on the monitor is pointing up toward their head.

2



Remove the charging plug from the QSTARZ travel recorder.

3



Please keep the QSTARZ travel recorder on your child all day. If that is not possible, place it on something that is always near your child (for example a stroller, diaper bag, backpack).

Write what time it is now in the box below.

Start Time: AM / PM

4



Keep the device dry. During bathing, swimming or other water-related activities, remove the device and keep it nearby.

If the unit is not kept with your child, please write the reason and times below.

Time	Reason

Day 3

Blank

Page

Day 3

Stool Sample (Toilet Trained)

1

With your child's help, determine when a bowel movement is imminent. If possible, have the child urinate first.

Note: If the stool sample cannot be collected on this day, it can be collected any day before the Field Team returns.

2



Lift the lid and seat on the toilet and pull a 2 feet or so of plastic wrap from the roll. Place the loose plastic wrap on the floor and hold with your foot as you loosely cover the toilet bowl, leaving a hand-width opening at the front for toilet paper disposal.

3



Leave plenty of plastic wrap on the sides of the bowl to make collection easier.

4



Lower the seat onto the plastic wrap to hold it in place and have your child use the toilet.

Day 3

Stool Sample (Toilet Trained - continued)

5



Ensure that soiled toilet paper is disposed of into the toilet through the opening in the plastic you left. If possible, any urine in the plastic wrap should be disposed of through the opening either now or in step 8.

6



Put on a pair of purple gloves from your sample kit.

7



Open the sample collection jar labelled Stool Sample.

8



Carefully lift the plastic wrap using the extra amount from the outside of the bowl and loosely wrap the stool sample as if you are forming a bag.

Day 3

Stool Sample (Toilet Trained - continued)

9



Place the plastic wrapped stool sample inside the collection jar.

10



Close the lid on the sample jar. If the outside of the jar or lid is soiled, use toilet paper to remove any stool material. Place the sample jar inside of the labeled zip-lock bag and seal. Place that bag inside of another zip-lock bag and seal.

11



Remove the gloves and dispose of them with household trash. Place the bags containing the stool sample jar in the cooler until the sample is collected by the field team.

12



Is this the first bowel movement after the duplicate diet collection? Yes No

If known, please record the date and time of your child's last bowel movement in the box below.

Date:

Time:

AM / PM

Please record the date and time of the stool sample collection in the box below.

Date:

Time:

AM / PM

Day 3

Blank

Page

Day 3

Stool Sample (Diaper Collection)

1



When a diaper is found to be dirty (contain stool), retrieve the stool sample collection packet which contains two zip-lock bags.

2



Remove the diaper as usual. Fold the diaper in half to cover the contents. Set aside until a new diaper is in place and the child is returned to a safe location and activities. Do not place any baby wipes inside the soiled diaper.

3



Place the diaper in the small labeled zip-lock bag and seal. Place the small zip-lock bag inside of the larger zip-lock bag and seal.

4



Place the bags containing the stool sample in the cooler until the sample is collected by the field team.

Day 3

Stool Sample (Diaper Collection - continued)

5



Is this the first bowel movement after the duplicate diet collection? Yes No

If known, please record the date and time of your child's last bowel movement in the box below.

Date:

Time: AM / PM

Please record the date and time of the stool sample collection in the box below.

Date:

Time: AM / PM

Day 3

End of the Day

1



At the end of the day, please remove the belt with the activity monitor from your child.

Time: AM / PM

2



Please re-connect the QSTARZ travel recorder to the plugged-in charger.

3



REMINDER!

Collect first morning void Urine Sample

Place the reminder note on the toilet or other prominent location. **Write the time of the last void before the morning void is collected tomorrow in the box below.**

Time: AM / PM

4



If your child is not toilet trained, please put one of the diapers from the sample kit on your child before he or she goes to bed. **Record the time of the last wet diaper in the box below.**

Time: AM / PM

Day 3

Blank

Page

Day 4

Day 4 Checklist

Use this checklist to mark the completed activities for Day 4

- Silicone Band Kept on Child
- Urine Collection Completed and Stored
- Activity Monitors Placed for the Day and Removed Prior to Sleep

Day 4

Blank

Page

Day 4

Silicone Band

1



Please leave the silicone band on your child until the field team returns.

2



If the band has to be removed or placed on a different location (wrist to ankle etc.), write what was done below.

Day 4

Blank

Page

Day 4

Urine Collection (Toilet Trained First Morning Void)

1



Have your child rinse his or her hands with water and air or towel dry them.

2



Put on a pair of purple gloves from your sample kit.

3



When your child is ready to urinate, remove the cap from the Day 4 Urine collection container and place the cap with the inside up in a safe place where it is unlikely to be knocked over. Do not touch the inside of the container or cap at any time.

4



Have your child urinate into the collection container. Collect the entire amount of urine and assist as necessary.

Is this a First Morning Void?

YES

NO

Day 4

Urine Collection (Toilet Trained First Morning Void- continued)

5



Recap the collection container. If the container is wet, wipe it down with toilet paper or a paper towel.

6



Place the collection container in the zip-lock bag with absorbent material. Remove excess air from the bag and seal it.

7



Remove the gloves and throw them away. **Write the time the sample was collected in the box below.**

Time: **AM / PM**

8



Place the bag containing the sample in the cooler as soon as possible after sample collection.

Day 4

Diaper Urine Collection

1



Collect the first wet diaper of the morning. If the diaper is dirty (contains stool), and a stool sample was not collected on Day 3, use that as the stool sample and place a clean diaper on your child and collect the next wet diaper.

2



Put the diaper inside of the zip-lock bag labeled "Diaper Urine Day 4" and seal the bag.

3



Place that bag inside the larger bag labeled "Diaper Urine". Store the bag in your freezer until it is collected by the field team.

4



Please write the time the diaper was collected in the box below.

Is this a First Morning Void?

YES

NO

Time:

AM / PM

Day 4

Blank

Page

Day 4

Activity Monitors

1



Place the belt with the activity monitor on your child's waist. Make sure the arrow on the monitor is pointing up toward their head.

2



Remove the charging plug from the QSTARZ travel recorder.

3



Please keep the QSTARZ travel recorder on your child all day. If that is not possible, place it on something that is always near your child (for example a stroller, diaper bag, backpack).

Write what time it is now in the box below.

Start Time: **AM / PM**

4



Keep the device dry. During bathing, swimming or other water-related activities, remove the device and keep it nearby.

If the unit is not kept with your child, please write the reason and times below.

Time	Reason
<input type="text"/>	<input type="text"/>

Day 4

End of the Day

1



At the end of the day, remove the belt with the activity monitor from your child. Record the time it is now in the box below.

End Time:

AM / PM

2



Please re-connect the QSTARZ travel recorder to the plugged-in charger.



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SCIENCE