Guidelines for Environmental Sampling at Illegal Drug Manufacturing Sites

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The following guidelines describe recommended procedures for collecting, handling, and transporting septic, soil, methamphetamine wipe, and caustic samples. Standard operating procedures (SOPs) are required to ensure collection of samples that are representative, accurate, and defensible. Modification of procedures may be acceptable and the guidelines are intended to allow flexibility. However, any deviation from the SOP outlined in these guidelines should be documented in the sampling plan as to the extent of and reason for the deviation. Deviations from the SOP should be pre-approved by local health staff before sampling is conducted.

Sampling shall be conducted only by qualified personnel as defined in WAC 246-205-531(2)

> "Collection of samples shall be performed by Department of Ecology staff; Department of Health certified CDL supervisors; or local health officers…"

I. GENERAL RECOMMENDATIONS:

A. EQUIPMENT AND SUPPLIES*:*

OBJECTIVE: Equipment and supplies needed to conduct scientifically defensible environmental sampling.

Equipment Purchased from either a Certified Laboratory or Laboratory Supply Company:
Filter papers
Sample collection containers
Analytical grade methanol
Disposable templates
Sludge judge
Disposable plastic pipette
Squeeze bottle
pH Indicator paper
Laboratory grade distilled water (ASTM Type II)
Cooler
Analytical Request/Chain of Custody form
Chain of Custody seals

Supplies Purchased from Retail Stores:
Field notebook
Stainless steel spoon
Large stainless steel container
Disposable templates
Disposable gloves
Thumbtacks
Masking tape
Permanent ink marking pen
Permanent ink ball-point pen
Labels for collection containers
2 Equipment storage containers*
Caddy
Pre-moistened hand wipes
Zip lock bags
Ice or frozen ice packs**
Camera
Distilled water
Paper towels
Trash bags
Person Protective Equipment (PPE)
* One storage container for off-site and one for on-site.
** Must be able to maintain 4° C.

A. EQUIPMENT AND SUPPLIES (continued)

1. Use equipment from either a certified laboratory or a laboratory supply company. Supplies can be purchase at retail stores, laboratory supply companies, and some analytical laboratories.
2. Equipment and supplies should be clean (sterilized if required) and in proper working condition before using.
3. Store equipment/supplies in a clean, secure storage container designated for only sampling media/supplies. Storage container is kept in a limited access area to avoid contamination and is never taken to a drug lab site.
    a) Decontamination contractors are responsible for the safe custody of all sampling equipment from the time they receive it from the analytical laboratory until the time they use it and relinquish it back to the laboratory.
        (1) Signed or initialed chain of custody seals should be maintained on appropriate equipment/supplies.
4. Store and transport sampling equipment/supplies separate from PPE and all other equipment used to decontaminate properties.
5. Use equipment/supplies only one time and properly dispose of them upon completion of the sampling project.
    a) Exceptions to this rule exist and include supplies such as the caddy, "on-site" equipment storage container and stainless steel tools, which may be reused after proper decontamination.
6. Whatman 40 filter paper is recommend, although the following have equivalent performance and can also be used; Whatman 41, 42, 43, 44, 540, 541, Ahlstrom 54, VWR 454 and S&S WH Medium.
7. Sample collection containers consist of standard laboratory 4-ounce containers and 40ml vials. All containers have Teflon-lined lids.
8. Templates should be thin (less than 3mm), capable of lying flat on a surface and stiff enough to maintain their shape. Area sampled is 100 cm^2 (10cm by 10 cm) for single (discrete) samples, and four 25 cm^2 (5 cm by 5 cm) areas for composite samples.
9. Gloves should be powderless.

B. OFF-SITE SAMPLING PREPARATION

OBJECTIVE: To minimize contamination of sampling equipment and supplies and increase sampling efficiency while on-site.

1. Verify that the sampling plan has been pre-approved by the local health department. Sampling plan should include detailed descriptions of sampling techniques for each matrix being sampled (surface wipes, soil, surface water, drinking water, and septic tanks), sample location and type (single or composite).
2. Review approved sampling plan and determine what equipment/supplies are needed for the sampling project. Bring extras for unexpected occurrences and store them in the on-site storage container until needed. Note that the on-site storage and mailing containers are not brought into the contaminated/decontaminated area.
3. Conduct sampling preparation before going on site.

B. OFF-SITE SAMPLING PREPARATION (continued)

4. Lay out a disposable surface cover (such as a plastic tablecloth) in an area free from contamination to use as your preparation site.
5. Put on gloves.
6. Pre-label sampling collection containers using permanent ink. Each container must have a securely affixed label containing the following information.
    a) Site ID--record the facility (ex. Use the address number)
    b) Sample ID--assign a number
7. Prepare a blank. (Note: For composite samples, the blank should consist of 4 filter papers).
8. Place sampling equipment and supplies needed for the sampling project into the on-site storage container.

C. ON-SITE SAMPLING PROCEDURES

OBJECTIVE: To collect representative samples in a consistent manner that can be replicated.

1. Eating, drinking, smoking, or other activities that may introduce contamination is prohibited during on-site sampling procedures.
2. Conduct sampling with two people; one person as the "Sampler," and the other person as the "Record Keeper." It is recommended that both the "Sampler" and the "Record Keeper" meet the qualifications of WAC 246-205-531(2) and be certified CDL Supervisors.
3. Put on appropriate PPE.
4. Conduct a walk-through to ensure site is ready to sample.
5. Transfer equipment/supplies from on-site storage container to caddy. Do not bring storage container into the contaminated area.
6. Continue with additional steps, outlined below, for on site sampling procedures for methamphetamine, VOCs and caustics.

D. FIELD QUALITY CONTROL (QC)

OBJECTIVE: To evaluate precision of the sampling process.

1. Field quality control (QC) samples typically consist of blank, duplicate and equipment rinsate samples. It is at the discretion of the local health staff to determine which QC samples are taken. Often staff will waive the collection of duplicates or rinsates for soils or septic sampling since, at the initial stage of investigation, sampling is being conducted to determine the presence of contamination only. Depending upon the initial sampling results, and at the discretion of local health staff, additional sampling, including QC samples, may be required.
2. MEDIA BLANK: A media blank is taken for methamphetamine wipe samples. The media blank is prepared off-site by the contractor and consists of placing a filter paper into a sample collection container, wetting it with methanol and tightly securing the lid. The container is carried on site, never opened and returned to the laboratory for analysis.

D. FIELD QUALITY CONTROL (QC) (continued)

3. FIELD DUPLICATE (REPLICATE): A field duplicate is an independent sample that is collected at the same time and as close as possible to the sample it is replicating. The site environmental sample and the duplicate sample are taken separately from the same location or source, stored in separate containers, and analyzed independently.
    a) Methamphetamine: Historically, duplicate wipe samples were collected as "back up" samples in case a sample container were to break during transport or for potential legal proceedings. However, since methamphetamine's holding time has not been established, duplicate samples are no longer taken for this purpose. If for some reason, duplicate meth wipe samples are taken, they are submitted to and stored by the analytical lab. Normally, CDL Contractors should not keep duplicates due to lack of ability to maintain conditions necessary to preserve sample integrity.
    b) Methamphetamine: Duplicates are not taken to evaluate precision of sampling process due to the variability of sampling media (the non-uniform dispersion of methamphetamine residue).
4. EQUIPMENT RINSATE: An equipment rinsate consists of rinsing the sampling equipment with laboratory grade distilled water (ASTM Type II) after the equipment has been decontaminated and prior to sampling. The rinse water is collected and analyzed.

E. CHAIN OF CUSTODY RECORD

OBJECTIVE: To provide accountability for and documentation of sample integrity from the time the contractor receives sample equipment until the samples are transferred to a courier or analytical laboratory.

1. Use a custody record supplied by the analytical laboratory.
2. Chain of custody begins when contractor receives equipment from the analytical laboratory or other supplier. The CDL contractor is responsible for the care and custody of sampling equipment. Chain of custody seals should be maintained on stored equipment. Each time a seal is broken, it shall be initialed, dated and recorded. A new custody seal is placed on remaining equipment being stored for future use.
3. The assigned field sampler is responsible for care and custody of samples from the time they are collected until they are properly transferred by signature to a courier or laboratory.
4. As few people as possible should handle samples.
5. Use permanent ink to enter the following information:
    a) Project Name
    b) Sampling Site Address
    c) Sample Number (#125-1) (Do not put down location of the sample)
    d) Sample Date (Date sample was taken)

E. CHAIN OF CUSTODY RECORD (continued)

e) Sample Time (Time sample was taken)
f) Sample Type (Single, composite)
g) Sampled area (100 cm^2)
   (1) For Media Blank Sample: Record an area that is consistent with the area you typically sample and the number of wipes submitted with the media blank sample (100 cm^2 wipe).
h) Analysis Requested (Methamphetamine, VOC)
i) Field Notes (example: suspect high concentration in sample # 125-1, noted strong solvent odor)
j) Number of Containers
k) Report In: (Keep analytical results consistent with area sampled. Since discrete and composite sample areas are currently both 100cm^2, results would be reported in100 cm^2).
l) Turnaround Time
m) Signatures of sampling personnel
n) Signatures of all personnel handling and receiving samples
o) Date and Time samples received

F. TRANSPORTATION OF SAMPLES

OBJECTIVE: To preserve integrity of samples during transportation.

1. Place methamphetamine and VOC samples in a cooler, filled with ice, immediately after collecting the sample. Temperature of 4ºC must be maintained.
2. Package containers in cooler in a manner that prevents breakage.
3. Complete analytical request and chain of custody form.
4. Place form inside a waterproof, zip lock bag and include it with the mailing.
5. Attach chain of custody seal to outside of cooler.
   a) Sign and date custody seal.
6. Deliver samples to analytical lab within 24 hrs of completing sampling, by mail courier service or personal delivery.
7. Retain shipping receipts.

G. DECONTAMINATION PROCEDURE FOR EQUIPMENT/SUPPLIES

OBJECTIVE: To avoid cross contamination through proper decontamination of equipment and supplies.

1. Decontaminate using the following procedure:
   a) Wash the item thoroughly with soap and water. Recommended soaps are Liquinox or Alconox.
   b) Rinse the item thoroughly with distilled water.
   c) Rinse stainless steel equipment with analytical grade methanol.
   d) Air dry.
   e) Wrap stainless steel supplies in aluminum foil.

H. SITE CLEAN UP AND PERSONNEL DECONTAMINATION:

OBJECTIVE: To avoid cross contamination through proper waste disposal and personnel decontamination.

1. Dispose of used and unused sampling equipment into trash bags.
    a) Properly dispose of trash bags.
2. Remove PPE and dispose of in trash bags.
3. Decontaminate PPE that will be reused.
4. Store PPE separate from sampling equipment/supplies.
5. Wash hands with pre-moistened hand wipes or soap and water.

I. SAMPLE LOG FORM OR FIELD NOTEBOOK:

OBJECTIVE: To sufficiently document field sampling activities to allow review of all aspects of sampling.

1. Document all field-sampling activities on a sample log form or in a bound all weather notebook with sequentially numbered pages.
2. New field notebooks are required for each sampling project to avoid cross contamination between projects.
3. Use permanent ink and record information in a legible manner.
4. Correct errors by drawing a single line through the error so it remains legible, and adjacent to the error, have the responsible individual date and sign the correction.
5. Document any deviation from approved procedures in the sampling plan.
6. Maintain field book in an accessible location that protects it from damage and loss.
7. Record the following standard information in field notebook:
    a) Project Name
    b) Project Address
    c) Date of Project
    d) Name of personnel and tasks they performed
    e) Purpose of Project
    f) Arrival and Departure Times
    g) Field instruments used
    h) Instrument calibrations
    i) Sample Number
    j) Sample Location
    k) Surface Type
    l) Time each sample was taken
    m) Weather
    n) Pertinent conversations
    o) Sign each page

J. HANDLING AND STORAGE OF METHANOL

OBJECTIVE: To reduce risk of personal injury and cross contamination of methanol.

1. Methanol is a toxic and flammable liquid and must be handled and stored with all safety precautions related to toxic and flammable liquids.
2. Store small amounts of methanol and frequently replenish supply.

J. HANDLING AND STORAGE OF METHANOL (cont'd)

3. Place a signed or initial chain of custody seal over bottle top and neck.
4. Inhalation of methanol vapors must be avoided. Containers must be handled in a ventilated area.
5. Protective gloves should be worn when handling containers with methanol.
6. Methanol should be stored away from open flames, areas of extreme heat and other ignition sources.

II. METHAMPHETAMINE WIPE SAMPLES

OBJECTIVE: Using methanol-moistened filter papers to collect wipe samples from hard, non-porous surfaces from areas of 100 cm^2 (10 cm x 10 cm) for single, discrete samples and 25 cm^2 (5 cm x 5 cm) for composite samples. Samples are taken from dry or relatively dry surfaces.

A. OFF-SITE SAMPLE PREPARATION

1. Follow steps described in "I-B" (OFF-SITE SAMPLING PREPARATION), and continue as described below:
2. Remove lids from sample collection containers, placing them top down on a contamination-free surface.
3. Put on clean pair of gloves.
4. Fold filter papers into quarters and place into sample collection containers. Only one filter paper per container.
5. Saturate filter papers with methanol until wet but not dripping (approximately 40 drops, or 2 milliliters). Excess methanol should be poured onto a paper towel and properly disposed of.
6. Secure lids tightly on containers and replace into shipping box.
7. Pre-label templates to match with labels on sample collection containers.
8. Place other equipment/supplies in zip lock bags that are then placed in the on-site storage container. Take only the equipment/supplies needed for the sampling job to the drug lab site.
9. Prepare sample log form/field notebook.

B. ON-SITE SAMPLING PROCEDURE FOR SINGLE SURFACE (DISCRETE) WIPES

1. Proceed to first sampling location;
    a) Wash hands with pre-moistened hand wipes.
    b) Sampler and Record Keeper put on clean gloves.

B. ON-SITE SAMPLING PROCEDURE FOR SINGLE SURFACE (DISCRETE) WIPES (cont'd)

c) Record Keeper hands a template to the Sampler.
d) Sampler attaches template to pre-designated sampling location. Caution should be taken so as not to touch the area within the template.
e) Proceed to the next sampling locations and repeat procedure. When finished securing templates, have the Record Keeper take a photo of each template that includes a reference point.
f) Sampler and Record Keeper put on clean gloves.
g) Record Keeper removes the corresponding sample collection container and fills in required information on container label.
h) Information consists of the date and time the sample was taken.
i) Record Keeper unscrews the container lid (always keeping the lid in their hand).
j) Sampler removes the filter paper from the container and inspects the filter paper to ensure that it is still wet. If it has dried out, do not use it. Use one of the extra sample collection containers you brought for unexpected occurrences.
k) Keep the filter paper folded in quarters.
l) Grasp the folded filter paper between the thumb and fingers. Place the filter paper on the surface to be sampled. Press down firmly, but not excessively, with the fingers, being careful not to touch the sample surface with thumb.
m) First Wipe: Using firm pressure, horizontally wipe the surface within the template side to side in an overlapping "Z" pattern. Wipe so that the entire selected surface area is covered. End with a scooping motion. Avoid wiping the template.
n) Second Wipe: Open the wipe and fold the sampled side in. With a clean quarter section exposed, vertically wipe the surface within the template side to side in overlapping "N" pattern. Wipe so that the entire selected surface area is covered. End with a scooping motion. Avoid wiping the template.
o) Fold the filter paper so the sampled side is folded in.
p) Rough surfaces should be "blotted" uniformly, rather than wiped.
q) Sampler inserts the folded filter paper into sample collection container.
r) Record Keeper secures lid and places container back into cooler with ice (cooler is not brought into the contaminated/decontaminated area).
s) Repeat sampling procedures outlined above at each sampling location, making sure to change gloves.
t) Follow steps I-E, Chain of Custody Record through I-I, Sample Log Form.

C. ON-SITE SAMPLING PROCEDURE FOR COMPOSITE SURFACE WIPES

1. A composite sample is the collection of multiple samples taken from different locations that are combined and analyzed as a single sample. The sample area of each of the four wipe samples that comprise the composite sample is 25 cm^2 (5 cm x 5 cm). Thus, the total area for each composite sample group equals 100 cm^2.

   To collect a composite sample that accurately represents the condition of the drug lab, the sample consists of four discrete samples collected from:
   - Four surface areas each measuring 25 cm^2.
   - Similar surfaces or media.
   - An area where contamination is expected to be relatively evenly dispersed.

   It is at the discretion of the local health staff to determine where to collect the composite samples.

2. A separate filter paper is used for each sample location. Thus, each composite sample group will include four filter papers. Before sampling, each filter paper is stored in individual containers to prevent wetted filter papers from sticking together and tearing.

3. Follow the same sampling procedures outlined for discrete surface wipe samples with the following exceptions:
   a) The same pair of gloves may be used to collect each of the four samples that comprise the composite sample group. However, each set of composite sample groups will require use of a new pair of gloves.
   b) Use the same side of the filter paper to horizontally and vertically wipe the surface:
      1. Keep the filter paper folded in quarters, and horizontally wipe the selected surface.
      2. Use the same side of the filter paper used to horizontally wipe to also vertically wipe the surface.
   c) Upon completion of each composite sampling group, all four of the filter papers used to collect the composite sample are placed into a single sample collection container.
      Only one sample collection container shall be used to store the four used composite wipes.

D. FIELD QUALITY CONTROL

1. Trip Blank:
   a) A trip blank is defined in the CDL Program as a quality control check to verify that methamphetamine was not introduced during sample preparation and transport. The trip blank is taken onto the sampling site where it is carried *unopened* throughout the

sampling process. It is not used to wipe surfaces. The trip blank sample is transported, along with the wipe samples, to the analytical laboratory for analysis.

b) Trip blank samples should be consistent with the actual site surface wipe samples which they accompany. For example, if all samples are composites, the accompanying trip blank should consist of four filter papers. In the "area sampled" part of the chain of custody form, for a trip blank, you would write "100 cm^2." The sampler should treat blank samples just like regular meth wipe samples so that the lab will not be able to distinguish them from actual site environmental meth wipe samples.

III. WASTEWATER SAMPLING

Objective: To collect wastewater samples from septic tanks for waste characterization using methods that minimizeVOC losses.

A. OFF-SITE SAMPLE PREPARATION

1. Conduct Off-Site Sampling Preparation outlined in "I-B".
2. Prior to sampling, the septic tank must have been sufficiently excavated to indicate whether the tank consists of one or two chambers.
3. Transfer sampling equipment/supplies from on-site storage container to sampling caddy.

B. ON-SITE SAMPLING PROCEDURES

1. Remove access cover from the first (or only) chamber and locate outlet baffle.

   SAMPLING LOCATION IN TANKS WITH ONE CHAMBER:
   a) Samples are collected from the baffle on the outlet end of the chamber.

   SAMPLING LOCATION IN TANKS WITH TWO CHAMBERS:
   a) Samples are collected from the baffle on the outlet end of chamber one.

2. Move any floating surface matter away from the insertion point of the sludge judge. Do not collect any matter in the sludge judge.
3. Follow instructions for correct usage of a sludge judge.
4. Insert the sludge judge into the tank, lowering it until you hit the bottom.
5. Trap the sample inside the sludge judge.
6. Remove the sludge judge and fill two 40ml vials.
7. Samples may be taken without preservative (procedure "a") or with preservative (procedure "b") in the vial. Sampling procedure is determined by the sampler's confidence and ability to maintain sample integrity.

a) FIELD SAMPLE TAKEN WITHOUT A PRESERVATIVE IN THE VIAL
   (1) Notify and coordinate with the analytical laboratory that you will be submitting unpreserved samples.
   (2) Empty the collected sample into a stainless steel or glass container that is large enough to hold the entire amount.
   (3) Use a pipette, or stainless steel cup to fill vial to the top, leaving no headspace.
   (4) Secure the lid. Check for air bubbles by slapping the vial's side against the palm of your hand and turning the vial upside down. If there is an air bubble larger than a pea, remove the lid and add more sample. Repeat until no air bubbles larger than a pea exist.
   (5) Place sample containers in cooler with enough ice or ice packs to maintain temperature of 4° C.
   (6) Samples with no preservatives must be immediately delivered or mailed to the laboratory.

b) FIELD SAMPLE TAKEN WITH A PRESERVATIVE IN THE VIAL
   (1) Empty the collected sample into a stainless steel or glass container that is large enough to hold the entire amount.
   (2) Use a pipette, or stainless steel cup to fill vial to the top, leaving no headspace. Take extra precaution not to cause overflow, resulting in loss of the preservative.
   (3) Secure lid. Check for air bubbles by slapping the vial's side against the palm of your hand and turning the vial upside down. If there is an air bubble larger than a pea, remove the lid and add more sample. Repeat until no air bubbles larger than a pea exist. Take extra precaution not to cause overflow, resulting in loss of the preservative.

13. Place sample containers in cooler with enough ice or ice packs to maintain temperature of 4° C.
14. Follow steps I-E, "Chain of Custody Record" thru I-I, "Sample Log Form."
15. Replace access cover.

C. FIELD QUALITY CONTROL

1. It is at the discretion of the local health staff to determine which QC samples are taken. Often staff will waive the collection of duplicates or rinsates wastewater sampling. The reason for this is that at the initial stage of investigation, sampling is being conducted to determine if potential contamination exists. Based upon initial sample results, additional sampling, including QC samples, may be required at the discretion of the local health staff.

IV. COLLECTING SOIL SAMPLES

Objective: To collect soil samples for volatile organic compounds (VOC) analysis using EPA Method 5035A. This method was developed to minimize the loss of VOCs during the collection and handling of soil samples, and replaces the previous "jar-packing" method.

EPA Method 5035A establishes specific procedures for preparation and analysis for low and high soil VOC concentration samples, and for field and laboratory sample handling and preservation. Although the Method provides numerous options for collecting and handling soil samples for VOC analysis, Washington State Department of Health is requiring that certified CDL decontamination contractors abide by the following collection procedures:

1) Request the analytical laboratory to use the high soil VOC concentration method *
2) Collect unpreserved soil samples and immediately submit to the laboratory**
3) Use a zero headspace coring tool to collect the soil samples***
4) Collect a minimum of one sample per location****
5) Collect a dry weight sample*****

* Although the high concentration method is applicable to most of the commonly-encountered drug lab chemicals, it should be noted that for some chemicals, such as benzene that have soil cleanup levels below 200 ppb, the low concentration method will be necessary.

** It is crucial that you communicate and coordinate with your analytical laboratory *prior* to collecting any soil samples to assure that the lab is prepared to receive, store, and analyze the samples.

*** Zero headspace samplers are airtight coring devises that provide for the collection, storage and delivery of unpreserved soil samples, while minimizing VOC losses.

**** At sites where you suspect the presence of chemicals that have cleanup levels above and below 200 ppb, two or more samples from the same sampling location will be required.

***** A dry weight sample of soil must be collected to allow for a determination of moisture content, and the normalization of data to a dry-weight basis. Use approximately 10 grams of soil for the dry weight sample.

The specific Method 5035A soil sampling and handling procedures being required by DOH are described in detail below. In some situations, and only with the approval and oversight of the local health officer, other 5035A procedures, such as on-site sample preservation and use of non-zero headspace sample collection devices might be allowed. If site-specific situations arise that are more suited to these or other soil sampling methods, the CDL contractor will first need to discuss

these alternate methods with the local health officer and receive approval to use them.

A. CONDUCT OFF-SITE SAMPLE PREPARATION as OUTLINED IN "I-B (OFF-SITE SAMPLING PREPARATION")

B. ON-SITE SAMPLING PROCEDURES

Using a zero headspace sampler, the field sampler needs to:

1. Collect, cap, and label the sample.
2. Place the sample(s) on ice to maintain the sample(s) at a temperature of 4 degrees Celsius, plus or minus 2 degrees (4° C ± 2°).
3. Deliver the sample to the lab immediately after collection.

Zero Headspace Sample Collection for High Level Analysis (≥ 200 µg/kg)

Each sample point requires a minimum of:

- One 5 gram zero-headspace sampling device, designed to be used only one time.
- One dry weight sampling container (4-ounce jar, 40 ml vial, or similar container).
- Soil sampling coring device, such as a T-handle.
- Paper toweling.

Sampling procedure:

1. Designate one person as the sampler and the other as the record keeper.
2. Transfer the sampling equipment/supplies from the on-site storage container to the sampling caddy.
3. Take care to not overly disturb the soil in order to minimize the loss of VOCs.
4. Collect sample from a freshly exposed surface by scraping away the top inch of soil. Carefully remove organic debris, such as twigs, rocks, leaves, etc., from the sampling location before collecting the sample.
5. Use an EPA-approved zero headspace sampling device to collect 5 grams of soil. Upon approval by the LHJ, 25 grams of soil may be collected if extra sample volume is needed for special circumstances, such as the presence of peat moss or the need for additional laboratory analysis.
6. Remove the sampling device and sampling cap from the package and slide the plunger rod up and down to ensure plunger moves freely.
7. Push plunger rod down until the small o-ring rests against the tabs
8. Attach the T-handle to the sampling device by depressing the locking lever on the T-handle.
9. Align the slots on the sampling body with the locking pins on the T-handle and insert the sampling body into the T-handle.

10. Turn the sampling body in a clockwise direction to secure it
11. After the sampling body is secured in the T-handle, push the sampling device into the freshly exposed soil until the coring body is completely full. When full, the small o-ring will be centered in the T-handle viewing hole.
12. Remove sampler from the soil.
13. Use paper toweling to wipe excess soil from the sampling device coring body exterior.
14. Cap coring body while it is still on the T-handle.
15. Push the cap over flat area of ridge and twist to lock cap in place. Cap must be seated to seal sampler.
16. Remove the capped sampler from the T-handle by depressing the locking lever on the T-handle while twisting and pulling sampler from T-handle.
17. Lock the plunger by rotating extended plunger rod fully counter-clockwise until wings rest firmly against the tabs.
18. Attach completed tear-off label from the sampler bag to the cap on the sampling device coring body.
19. Place sampling device into the mailing pouch.
20. Place the mailing pouch in a zip-lock baggie
21. Place the sample on ice in a cooler at 4°C ± 2°.

Dry Weight Sample:

At least one dry weight sample must be collected for each location sampled. The dry weight sample is used by the lab for moisture content analysis so that it can normalize the soil VOC concentration to a dry-weight basis.

22. Collect dry weight sample by collecting soil adjacent to where you collected the first sample.
23. Collect sample from a freshly exposed surface by scraping away the top inch of soil with a stainless steel spoon. Carefully remove organic debris, such as twigs, rocks, leaves, etc., from the sampling location before collecting the sample.
24. Use a stainless steel spoon to fill the dry weight container with approximately 10 grams of soil. The dry weight sample container can be a 4-oz. wide mouth glass jar, a 40-ml VOA vial, or other suitable container.
25. Store sampling device with soil sample and dry weight sample container with soil sample at 4°C ± 2°.
26. Follow steps I-E, “Chain of Custody Record” through I-I, Sample Log Form.”
27. Deliver sample containers to the lab immediately after sampling. Include sufficient ice to maintain the samples at 4°C ± 2°.

<u>Cemented soils, course, or rocky soils</u>: Most zero head space sampling devices cannot be used for sampling these types of soils.

Consult with your local health officer to discuss other sampling options when these types of soil conditions are present.
Non-cohesive, sandy soils: Zero head space sampling devices can be used for these types of soils by carefully scooping the soil into the sampling device and quickly capping it.

For Low Level Analysis (< 200 µg/kg): Two samples are required. Follow same procedure as outlined for High Level Analysis except collect an additional sample.

C. FIELD QUALITY CONTROL:

Quality control (QC) samples are used to evaluate precision of the sampling process. Field quality control samples typically consist of blank, duplicate and equipment rinsate samples. It is at the discretion of the local health staff to determine whether QC samples are needed, and if so, what kind. LHJ staff will often waive the collection of duplicate or rinsate QC samples. The reason for this is that at the initial stage of CDL site investigation, sampling is being conducted to determine the presence of contamination. The results of these initial samples will dictate whether additional samples, including QC samples, will be required by local health staff.

References on Soil Sampling:

1. Collecting and Preparing Soil Samples for VOC Analysis. Implementation Memorandum #5. Washington State Department of Ecology. June 17, 2004.
2. Soil VOC Sampling for EPA Method 5035A Analysis. Course ID: CHEM – 501. Northwest Environmental Training Center, Seattle, Washington.
3. D6418-04 Standard Practice for Using the Disposable En Core Sampler for Sampling and Storing Soil for Volatile Organic Analysis. American Society for Testing and Materials (ASTM).
4. D4547-98 Standard Guide for Sampling Waste and Soils for Volatile Organic Compounds. American Society for Testing and Materials (ASTM).
5. Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. Draft Revision 1, July 2002. U.S. Environmental Protection Agency.

V. SAMPLING FOR CORROSIVES

OBJECTIVE: To collect samples from hard, non-porous surfaces to identify caustic areas that need to be neutralized or designated as dangerous waste.

A. ON-SITE SAMPLING PROCEDURE

1. Put on a clean pair of gloves.
2. Pour a small amount of deionized water onto indicator strip.
3. Place the indicator strip on the surface to be sampled.
4. Remove the indicator strip and compare the resultant color with the kit‘s color key.
5. Repeat steps 1-4 as necessary.

VI. WATER SAMPLING

A. LAKES, STREAMS AND OTHER SURFACE WATER SAMPLES

A common method for collecting water from ponds, lakes and streams is by dipping the sample bottle to obtain water at or near the surface. This technique is effective because many chemicals remain on the water surface. If physical conditions preclude the dip method or if subsurface samples are needed, alternate methods are available using a sampling jar attached to a telescoping pole, hand pumps, or weighted water samplers.

1. **SAMPLING PROCEDURE**
   a). Collect at least one liter of water into a certified clean glass jar and secure with a Teflon-lined lid. Avoid collecting sediments.
   b). Label jar, attach custody seal, and prepare sample for transport to the laboratory.

B. SURFACE SLICK SAMPLES

If water depth prevents dipping a bottle to collect a slick on the water surface, the preferred method is the —saturation“ pad technique. It may be appropriate to composite several pads for a single sample. Do not re-dip a pad or use both sides to collect a surface slick. Collected material can be washed away if the pad is re-dipped.

1. SAMPLING PROCEDURE
   a. Fold an 11 cm filter paper (Whatman 40 ashless or equivalent) or gauze pad into a 2.5 cm square.
   b. Grasp the pad firmly with stainless steel forceps and saturate the pad with the slick. Roll the pad into a cylinder and place into a glass jar and secure with a Teflon-lined lid.
   c. Label jar, attach custody seal, and prepare sample for transport to the laboratory.

C. WELL WATER SAMPLES

Purging the Well – “Purging the well“ means removing the volume of water standing in the well casing and/or in the water distribution system and replacing that water with new water from the aquifer. The purpose is to insure that a representative sample of the aquifer is collected.

1. SAMPLING PROCEDURE
   a. If there is no tap at the well head, use the closest tap to the well head.
   b. Purging is not necessary on wells which are pumped continuously, but measurements of temperature, conductivity (the ability to conduct an electric current) and pH should still be recorded. If a well is pumped dry during the purging process, it may be considered adequately purged and the sample can be collected as soon as the well casing is recharged.
   c. Flow may be diverted with a hose during the purging process, but the hose must be removed before samples are collected.

C. WELL WATER SAMPLES (continued)

One of the following methods should be used:

Method One: Open the tap all the way and allow water to flow into a catch bucket. Water should flow for approximately five minutes before readings are taken for conductivity, temperature, and pH. After five minutes and while water continues to flow, conductivity, temperature and pH should be measured at approximate one minute intervals until three consecutive readings indicate that parameters have stabilized. Readings may be considered stable when temperature measurements vary by no more than + 0.5^0 C, conductivity readings vary by no more than + 1% and pH readings vary by no more than + 0.1 pH unit. It may be assumed that the source is adequately purged when stable readings for two parameters are obtained. After readings have stabilized, remove the hose and begin sampling.

Method Two: Three to five well casing water volumes (storage volumes) should be purged from the well.

The storage volume is calculated as follows:

1). Volume (V) = 3.14 x R^2 x D x 7.48 gal/ft^3
V = Borehole volume (gallons)
R = Radius of the well bore (feet)
D = Depth of well (feet)

2). Flow should be measured using a five-gallon bucket and a stopwatch. Record readings in the field notebook.

3). Calculate the amount of time (in minutes) that the well should be purged in order to remove the required 3-5 times the well volume:

Time = 3 (or 5) x Volume of borehole (in gal) required flow rate (in gal/min) in minutes

4). After the required minimum volume has been purged and while water continues to flow, conductivity, temperature and pH should be measured at approximately one minute intervals until three consecutive readings indicate that parameters have stabilized. These measurements should be recorded in the field notebook. Samples should be collected after the required well volume has been purged and readings for conductivity, temperature, and pH have stabilized.

2. FIELD MEASUREMENTS

Specific conductivity, pH and temperature should be measured on-site and during purging of the well. Well water should be

pumped continuously into a bucket or other container until three consecutive readings taken at one minute intervals indicate the three parameters have stabilized.

a) Conductivity - The conductivity of a water sample gives an indication of the concentration of dissolved solids in the water. Conductivity should be measured with a temperature-compensated instrument, reading directly in micromhos/cm at 25°C. The cell should be checked before initial use and unless otherwise stated by the manufacture. The instrument should be calibrated daily during regular use against a 0.00702 N potassium chloride (KCl) solution with a specific conductivity of 1,000 micromhos/cm at 25°C. Routine checks are made by using a standard solution within the anticipated conductivity range of the sample at ambient temperature.

b). Temperature - Temperature should be recorded by an electronic reading thermometer or mercury thermometer accurate to + 0.5° C.

c). Hydrogen Ion Concentration (pH) - The pH of a solution is a measure of the effective hydrogen ion concentration. It should be measured with an instrument having an accuracy of 0.1 units. Since pH is temperature sensitive, it is important that pH calibration standards be within +1°C of the sample solution for precise determinations.

3. SAMPLE COLLECTION

a. Samples should be collected as close to the well as possible, from a tap located before the water has passed through any pressure or water storage tanks or treatment systems. If it is not possible to collect a sample from the water system before the well water storage tank, then the volume of water in the storage tank must be taken into account when purging the system.

b. There should be sufficient space to place the bottle under the tap without grazing the neck interior against the faucet.

c. Leaking taps which allow water to flow out from around the stem of the valve handle and down the outside of the faucet, or taps in which water tends to run up on the outside of the lip, should be avoided as sampling locations.

d. Aerator, strainer, and hose attachments on the tap should be removed before sampling. If a steady stream of water cannot be obtained from the tap after removing such devices, a more suitable tap should be sought.

C. WELL WATER SAMPLES (continued)

e. Water flow should be steady to avoid dislodging material lining the inside of the pipe. A smooth-flowing stream at moderate pressure without splashing should be obtained. Water flow should not be adjusted immediately prior to or during actual sample collection.

f. Excessive flow and the resulting turbulence can affect metals, volatile organics, and many other chemicals. Samples should be disturbed as little as possible (e.g., turbulence, agitation, and exposure of water sample and containers to the atmosphere).

g. During sample collection, the bottle cap should not be placed on the ground or in a pocket. The bottle should be held in one hand and the cap in the other, keeping the bottle cap right side up (threads down) using care not to touch the inside of the cap. Be careful to avoid losing the Teflon liner in certain bottle caps. Avoid contaminating the sample bottle with fingers or permitting the faucet to touch the inside of the bottle. When filling any container, care should be taken that splashing drops of water from the ground or sink do not enter either the bottle or cap. A clean polyethylene sheet placed on the ground may be helpful in maintaining a clean work area.

h. Samples should be labeled and held on ice, if required, immediately after collection.

i. Samples should be collected in the following order:
#1) Volatile Organic Compounds (VOC)
#2) Other Organic Compounds, Metals and Inorganics

4. Volatile Organic Compounds (VOC)

a. Samples to be analyzed for purgeable organic compounds should be taken in 40 ml vials and secured with screw caps containing a Teflon septum.

b. Two vials should be filled for each sample.

c. The investigator should determine if the water to be sampled contains chlorine. If the water contains no chlorine, two 40 ml vials, each containing 2 drops of 1:1 HCl, should be filled with the sample and labeled. If the sample contains no chlorine **and only if** the sample will be analyzed within 24 hours, preservation with HCl is not necessary.

d. Samples should be collected before chlorination or other pre-treatment if at all possible. If this is not possible and the sample contains chlorine, the following procedure for sample collection and preservation should be followed:

e. Fill a 40 ml vial, containing 10 mg sodium thiosulfate, to the shoulder (where the vial necks down to the top) with sample,

C. WELL WATER SAMPLES (continued)

add 2 drops of 1:1 HCl, then fill completely with sample. Label the vial.

NOTE: Sodium thiosulfate and acid preservatives should be added in this order and in two separate steps because HCl reacts with sodium thiosulfate.

f. Vials should be completely filled, with no air bubbles. Extreme caution should be exercised when filling a vial, to avoid any turbulence which could also produce volatilization. The sample should be carefully poured down the side of the vial to minimize turbulence. As a rule, it is best to gently pour the last few drops into the vial so that surface tension holds the water in a "convex meniscus". The cap is then applied and some overflow may be lost, but air space in the bottle is eliminated. After capping, turn the bottle over and tap it to check for bubbles; if any are present, discard the sample and sample bottle and repeat the procedure with a new bottle.

5. Other Organic Compounds, Metals, and Inorganics

a. All containers and tubing, used for collection of samples for other organic compounds, metals and inorganic analysis, should be prepared as provided by standard cleaning procedures.

b. When possible, the sample should be collected directly into the appropriate sample container. If this cannot be physically accomplished, an intermediate collection device may be used, such as a smaller sampling bottle, which has been cleaned according to standard procedures.

REFERENCES

1. American Society for Testing and Materials D4840 œ99 Chain-of-Custody Procedures
2. American Society for Testing and Materials E 1728-99 Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques
3. American Society for Testing and Materials D 4547 Sampling Waste and Soils for Volatile Organic Compounds
4. United States Department of Housing and Urban Development Lead Wipe Sampling for Contaminated Dust
5. United States Environmental Protection Agency EPA SW 846-5035 EPA 600482029 Handbook for Sampling and Sample Preservation of Water and Wastewater

APPENDIX A

Rationale for the Establishment of the **Washington State Department of Health's Clandestine Drug Lab Program Decontamination Standards**

July 2005

Washington State passed legislation in 1990 mandating the cleanup of properties contaminated by illegal clandestine drug lab (CDL) activity in order to protect the health of future occupants of the properties[1] The legislation authorized the Washington State Department of Health (DOH) to develop numeric decontamination standards and certify cleanup contractors to evaluate and clean up illegal drug labs. The goal of the decontamination standards is to provide protection for all people, particularly for infants and children, who are thought to be the most susceptible to the toxic effects of residual chemicals. This susceptibility is a result of numerous factors, including the young child's developing physiology, higher intake of food, air, and fluids in proportion to their body weight compared to adults, and their unique behavior patterns. The decontamination standards must be attained before local health jurisdictions (LHJs) can clear a residence for reoccupancy.

The standards were developed to address chemicals associated with the manufacture of methamphetamine, since these types of labs represent the majority of illegal drug labs in Washington State. As new illegal drug manufacturing methods and processes are developed, and different chemicals and byproducts are produced, additional standards may need to be incorporated in the regulation. Although a large variety of chemicals may be found at illegal methamphetamine manufacturing labs, DOH selected four of primary concern commonly associated with these types of labs; methamphetamine, total volatile organic compounds (VOCs), lead, and mercury. The decontamination standards are listed in section 541 of Chapter 246-205 WAC, and are as follows:

Chemical	Type of sample	Decontamination standard
Methamphetamine (1)	Surface area wipe	≤ 0.1 μg/100cm^2
Total Volatile Organic Compounds (VOCs) (2)	Air	1 ppm
Lead (total) (3)	Surface area wipe	≤ 20 μg/ft^2
Mercury (4)	Air	≤ 50 ng/m^3

(1) Units are in micrograms of methamphetamine per one hundred square centimeters of surface area.
(2) Units are in parts per million.
(3) Units are in micrograms of lead per square foot of surface area.
(4) Units are in nanograms of mercury per cubic meter of air.
(one thousand nanograms equals one microgram).

Methamphetamine Standard

DOH reviewed the scientific literature on the health effects of methamphetamine and other amphetamine-related drugs. These studies focused primarily on prenatal exposure during pregnancy in humans and on high dose studies in animals. Studies on the health effects associated with chronic exposures to low concentrations of methamphetamine are not available.

Human and Animal studies

The effect of methamphetamine on the development of the nervous system is known from studies of fetuses exposed in the womb of female methamphetamine users. No studies have evaluated the health effects of children directly exposed to methamphetamine in illegal drug labs. The studies have shown significantly lower intelligence testing scores compared to infants not exposed in the womb, and that those exposed may be at risk later in life for subtle neurological abnormalities.[2] Numerous physical malformations resulting from prenatal exposure to amphetamine and methamphetamine have been reported including cleft lip, cardiac defects, low birth weight, reduced head circumference, biliary atresia, cerebral hemorrhage, low body fat, systolic murmur, and undescended testes.[3]

Numerous animal studies have been conducted to evaluate the health effects of methamphetamine exposure. Studies conducted on rats and monkeys have demonstrated the adverse effects of methamphetamine on the central nervous system, selective reductions in brain serotonin and dopamine concentrations, and neurological damage. [4] In a 1998 study, rats exposed to methamphetamine were observed to have increased occurrences of retinal hemorrhages compared to control groups.[5] In another 1998 study conducted on baboons, methamphetamine produced long-term decreases on brain dopamine axonal markers at all doses tested.[6] In a 1994 rat study, methamphetamine-treated groups exhibited reduced locomotor activity compared to untreated groups.[7] A 2003 rat study supported the position that neonatally methamphetamine-exposed animals may exhibit hypoactivity.[8] In other studies, reduced body weights were observed in rats exposed to methamphetamine.

DOH's Approach

A quantitative exposure/risk assessment was not conducted during development of the methamphetamine standard, since studies about the potential long-term health risks associated with chronic, low-level exposure to methamphetamine are not available, controlled human exposure studies are unlikely for ethical reasons, and available toxicity data are limited. Washington State adopted a preventative approach that recognized the potential of the magnitude of childhood exposures and associated health risks because of the number of children found living in residential CDLs. Because of the extent of the CDL problem in Washington State, DOH did not want to wait for the derivation of methamphetamine-specific toxicity factors and the completion of a quantitative risk assessment before establishing a decontamination standard for methamphetamine. DOH chose to adopt a feasibility-based approach when establishing the current methamphetamine standard. This approach was based on the following primary considerations:

1. Analytical limitations and;
2. A cleanup level to which methamphetamine could reasonably be achieved.

Currently, other states, private researchers, and the National Alliance for Model State Drug Laws are working towards the assessment of appropriate indicator chemicals and the development of health-based decontamination standards that state and local drug lab programs can choose to adopt when assessing and remediating illegal drug labs. In addition, federal legislation is being introduced to address site assessment and remediation issues, and to identify new methamphetamine detection technologies, research needs, and other data gaps. DOH will continue to use its current methamphetamine decontamination standard until additional research demonstrates the appropriateness of a different standard.

In February 2005, the Colorado Department of Public Health (CDPH) prepared a paper that attempted to correlate existing states' detection-based cleanup standards for methamphetamine to known health-effect-based concentrations.[9] In doing so, CDPH estimated residential methamphetamine exposures using standard exposure assumptions. Using these standard exposure assumptions, the estimated dose for an infant exposed to 0.1ug/100 cm^2 methamphetamine (the Washington State decontamination standard) was 50 times lower than the most protective reference dose derived by CDPH. The reference dose was based on reproductive toxicity. What this indicates is that the current Washington State methamphetamine decontamination standard appears to be well below levels that would be expected to cause adverse noncancer health effects, such as reproductive toxicity, for persons chronically exposed to methamphetamine at the 0.1 ug/100cm^2 decontamination standard.

Total Volatile Organic Compounds (VOC) Standard

Volatile Organic Compounds (VOCs) were recognized as being common to all CDL sites. VOCs include many different chemical compounds, a number of which are used in the manufacture of illegal drugs including toluene, acetone, methanol, petroleum distillates, and ethers, among others. DOH believed it was most practical and cost-effective to test for total VOCs, rather than require testing for dozens of individual VOCs in air. Using the portable photoionization detector (PID), total VOCs can routinely be detected at the 1 part per million (ppm) level.

When establishing the VOC standard, DOH also recognized that by the time the remediated residences are reoccupied, levels of VOCs are expected to be lower as a result of the removal of the primary sources of the VOCs, such as the bulk chemicals and porous household materials. Additionally, volatilization of residual VOCs to significantly lower levels will likely have occurred. DOH also recognized the fact that studies have documented the presence of "background" levels of VOCs in ambient and indoor air.[10] Sources of these background VOCs include industrial and automobile emissions, consumer products, and building materials, among others. For this reason, it was not realistic for DOH to require VOC levels to be zero or below reasonable background levels.

Lead (Pb) Standard

DOH recommends testing for lead only at residences where it is evident that the amalgam (P2P) method or other methods involving lead were used. Currently, methods involving lead are rarely seen at drug lab sites in Washington State.

The health effects from chronic exposure to lead, and its particular health implications for fetuses, infants, and toddlers are well documented. Young children and the developing fetus are more vulnerable to lead poisoning than adults. Lead can affect almost every organ and system in the body, the most sensitive being the central nervous system. Lead also damages kidneys and the reproductive system.[11]

DOH considered existing health and toxicity information when establishing the decontamination standard for lead. DOH also considered the presence of background levels of lead often found in older homes, since lead-based paint is frequently present in such homes where many illegal drug labs are found. The current 20 micrograms per square foot (20 $\mu g/ft^2$) lead wipe standard is one half of the U.S. Department of Housing and Urban Development's (HUD) current floor wipe clearance standard and one half of the U.S. Environmental Protection Agency's (EPA) lead hazard standard. DOH also considered the growing body of scientific data that indicates the blood lead threshold for adverse health effects, including nervous system effects, is lower than the CDC's current 10 micrograms of lead per deciliter of blood lead level of concern. Given this data, DOH believed it was prudent to establish a lower lead wipe standard than the current HUD and EPA standards.

Mercury (Hg) Standard

DOH recommends testing for mercury only at residences where it is evident that the amalgam (P2P) method, or other methods involving mercury were used. Currently, methods involving mercury are rarely seen at drug lab sites in Washington state.

Exposure to mercury can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Short-term exposure to high levels of metallic mercury vapors may cause lung damage, increases in blood pressure or heart rate, skin rashes, and eye irritation. Inhalation of mercury vapor is particularly harmful. Fetuses and young children are more sensitive to mercury's health effects than adults. Mercury's effects upon the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. A nursing infant can also be exposed to mercury from breast milk. High levels of mercury in the bloodstream of the fetus and young child may harm the developing nervous system.[12]

The mercury decontamination standard is more protective than current Washington State Department of Ecology and federal health/risk-based screening levels for mercury. Because of the severity of health effects associated with mercury exposure, DOH chose to use the lowest measurable amount using standard sampling and analytical methods as the basis of the standard. DOH also established a lower mercury standard than existing state and federal health-based screening levels to account for cumulative exposures from other sources of mercury, such as from diet, air, dental amalgams, and some commercial paints. For example, ambient background concentrations of mercury in air have been documented, and are reported to average approximately 10-20 ng/m^3, with higher

concentrations in industrialized areas.[13] To account for these background exposures or "body burdens", DOH set the mercury decontamination standard below existing health-based screening levels.

References

[1] Chapter 246-205 WAC – Decontamination of Illegal Drug Manufacturing or Storage Sites, June 18, 2003 Update.

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[13] U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury, March 1999.