Table of Contents

Meth Production in Minnesota: Cooking Methods

Most methamphetamine (meth) used in Minnesota is imported from Mexico or the southwestern U.S. In recent years, some Minnesota residents have been manufacturing approximately 15 to 20 percent of meth in small home-based labs. Small lab operations manufacture amounts of approximately an ounce of meth or less per “cook” as compared to the “factory labs” of the southwest. Minnesota legislation of 2005 placed restrictions on sales of the precursor drugs, ephedrine and pseudoephedrine, required to make meth. The number of labs found in Minnesota has since fallen.

Minnesota labs typically use variations of the method called the Anhydrous Ammonia Method (also called the Birch Reduction method or “Nazi” method). Although also found in Minnesota, lab operations using the Red Phosphorous method are currently less common. The method(s) used in a particular lab cannot be identified with certainty, as the meth cooks arrested may not know or be truthful about “cooks” done in the past. Physical evidence at a lab may indicate only the most recent method used, therefore, all persons involved with any potential meth lab must be vigilant for the potential hazards posed by each of the current meth cooking methods.

The popularity of the Anhydrous Ammonia Method in Minnesota is due to the cook’s ability to produce small quantities of meth in a short period of time; these operations are commonly called "user labs." This process involves the extraction of ephedrine/pseudoephedrine from various pharmaceutical products with organic solvents. Once extracted, the ephedrine/pseudoephedrine is reduced using lithium or sodium metal in anhydrous ammonia to create methamphetamine base. Subsequent acidification with hydrochloric acid (HCl) generates the desired methamphetamine-HCl product – a process referred to as "salting out".

The other common method is the Red Phosphorous method (commonly called the "Red P" method). These labs also use extracted ephedrine/pseudoephedrine as their chemical precursor. However in this method, the reduction of ephedrine/pseudoephedrine occurs through a series of chemical substitutions using hydroiodic acid and red phosphorus. Due to the nature of this chemical process, the “Red P” method often generates more side products and impurities that increase the production hazards. Like the anhydrous ammonia method, the final methamphetamine-hydrogen chloride (HCl) precipitation step involves a "salting out" process with HCl gas. For possible chemicals used and wastes produced in each phase of meth production by each method, see Appendix A “Methamphetamine Manufacturing Processes.”

Although much concern is warranted in an *active* meth lab environment, the *former* meth lab environment presents less exposure risk. The risk is decreased due to reduction of chemical type as well as quantity of production chemicals as volatilization and chemical reactions have occurred. For example, the various solvents, acid gases, phosphine gas, and other volatile materials will be removed by ventilating the structure.

However, some dangers may remain in the former meth lab and must be removed, including:

- Containers with any raw material product, liquid or solid by-products, or wastes
- Any container that may contain anhydrous ammonia (e.g., propane cylinder, thermos, fire extinguisher)
- Areas where acids or bases may have been spilled
- Methamphetamine residue that has entered porous building materials and contents

- Needles, drug paraphernalia, and other physical hazards
- By-products of meth production may be present, although the existence of by-products is currently unknown.

See Appendix B, "Meth Production Chemicals – Chemicals Present in Active vs. Former Meth Labs," for comparison of chemicals of an active meth lab and those that may remain once cooking ceases.

IMPORTANT: This guidance is intended for sites of the smaller "user-labs" typically found in Minnesota. Discovery of a "factory lab" or new methods should be brought to the attention of the local health authority, Minnesota Department of Health (MDH), and Minnesota Pollution Control Agency (MPCA) to discuss investigation and cleanup protocols of this guidance as appropriate and sufficient for the site.

Outdoor Contamination due to Meth Lab Waste Disposal: Assessment and Cleanup

This document provides sampling guidance to identify possible outdoor contamination due to disposal of meth lab-related wastes at the meth lab site. If contamination is found, this document also gives basic cleanup guidance. This outdoor cleanup guidance should be used in conjunction with the Minnesota Department of Health's (MDH) Clandestine Drug Lab Cleanup Guidance for interior cleanup of structures. The MDH Cleanup Guidance is found at *http://health.state.mn.us/divs/eh/meth/lab/labcleanup.html#guidance* .

To record assessment, sampling results and other information recommended in this guidance when the property is being assessed for outdoor contamination only, use the document "Contractors' Procedural Report for Outdoor Contamination due to Meth Lab Waste Disposal" (Outdoor Contamination Procedural Report) *http://www.pca.state.mn.us/cleanup/meth.html* or similar report format. If the assessment and cleanup also includes interior cleanup of structures, use the MDH's "Clandestine Lab Contractors' Procedural Report" at *http://health.state.mn.us/divs/eh/meth/lab/contractorreport.pdf* .

Waste from meth labs at the production site are typically disposed of in the following ways: dumped into indoor plumbing drains that drain either into a city sewer system or individual sewage treatment system (ISTS); dumped into plumbing that drains directly onto the soil; and/or disposed into burn or burial pits.

The primary environmental hazard is possible contamination of groundwater by volatile organic compounds (VOCs) used in the meth cooking process. In limited samplings to date, the Minnesota Pollution Control Agency (MPCA) has not yet identified levels of concern in groundwater due to meth lab-related wastes.

NOTE: If any containers with chemical or precursor drug materials, partially finished drug product, or drug paraphernalia are found, contact the lead criminal investigator. Be especially cautious of containers that may contain anhydrous ammonia such as pressurized cylinders, insulated coolers, and fire extinguishers. Also be aware of containers that may contain hydrochloric or sulfuric acids, for example, gallon gas cans with a hose taped to the spout.

If the lead criminal investigator does not take possession of small containers of waste found in a former meth lab, the contractor or owner may be able to dispose of this waste as household hazardous waste or as Very Small Quantity Generator (VSQG) waste. Contact the local household hazardous waste program for guidance.

A. Plumbing

Outdoor contamination due to meth lab waste dumping into plumbing may affect the individual sewage treatment system (ISTS). Corrosive or flammable chemicals may have been dumped into a plumbing system during a police raid or on-going basis during production. Meth production-related chemicals put down the drain may present safety hazards as plumbing may contain concentrated chemicals in the traps of sinks and other drains. Attempting to pump out substances or remove the traps may result in chemical exposure and possible serious injury.

Before pumping contents from the septic tank, the Project Manager or Site Supervisor, equipped with chemical resistant protective disposable clothing, chemical-resistant gloves, and face-splash protection, should first thoroughly flush all plumbing traps with cold water. Every plumbing trap should then be checked with a photoionization detector (PID) or similar organic vapor meter by holding the testing equipment probe in the plumbing pipe above the trap for at least 60 seconds. Also, use a long handled tongs and cotton gauze to collect substances in the trap to check pH.

B. Individual Sewage Treatment System (ISTS): Septic Tank, Cesspool, and Drain fields

In rural and other areas, living structures are often serviced by an on-site individual sewage treatment system (ISTS) with a cesspool, septic tank, and/or drain field. Dumping wastes into these systems may create problems in the groundwater and ISTS. The primary environmental hazard is possible contamination of groundwater by volatile organic compounds (VOCs) used in the meth cooking process. Examples of VOCs include acetone, toluene, and ether. These compounds, in great enough quantities, may injure or kill the bacterial growth that provides sewage treatment in a drain field. Meth and precursor drugs are unlikely to cause contamination leading to impacts on public health, or interfere with sewage treatment in a drain field.

Diagram the locations of the septic tank, cesspool, cleanout, drain field, and related components in relation to the dwelling and other structures, and to on-site wells. Gather available information regarding construction, age, condition of septic tank/drain field, and last known use from the owner, local records, and a walk-around site inspection. Summarize or reference evidence of meth lab waste disposal into drains noted in available police records.

Each septic tank, cesspool or similar equipment must be sampled with a bailer or pump suitable for volatile organic compounds (VOCs) sampling. Samples can typically be collected through the pump out access hole. Samples must be collected and analyzed for VOCs using MDH Method 498 (EPA 8260B).

If **total VOCs** in any cesspool or septic tank are between **2000 µg/liter and 10,000 µg/liter**, the septic tank or cesspool should be agitated to suspend solids and to begin aeration of VOCs. Then the **contents should be pumped and disposed** at a permitted wastewater treatment or permitted sewage disposal facility. Make arrangements with the facility operator for this waste before transporting waste to the facility.

Immediately report an ISTS with **VOCs greater than 10,000 µg/liter** to the MPCA Emergency Response Team through the Minnesota Duty Officer at 651-649-5451 or 1-800-422-0798. Also notify the local oversight authority.

If total VOCs in any cesspool or septic tank are **greater than 2,000 µg/liter**, at least three groundwater samples must be collected from under or at the perimeter of the drain field, using push probe technology or monitoring wells, and analyzed for VOCs. The contractor using this equipment or installing wells must have an MDH well driller's license. Samples collected should be analyzed for VOCs using MDH Method 498 (EPA 8260B). The local authority may require additional analytical parameters from any well.

C. Sanitary Sewer

Putting waste chemicals from meth cooks down a drain connected to a sanitary sewer is illegal. The waste chemicals can create immediate safety hazards in the sewer system, neighboring buildings, and potentially at the wastewater treatment plant. Typically, the hazards in a sanitary sewer will be gone within minutes or hours of the disposal. However, if the connection is on a very low flow line the chemicals could remain in the line longer. The city sewer department may want to assess conditions in the sewer lines and flush the line with water.

D. Groundwater

If any VOC result in a groundwater sample collected from under or near a drain field is greater than its Health Risk Limits (HRL), a groundwater investigation plan may be required. Contact the MPCA Emergency Response Team through the Minnesota Duty Officer at 651-649-5451 or 1-800-422-0798, and notify the local authority.

HRLs represent a concentration of a groundwater contaminant or mixture of contaminants that poses little or no risk to health, even if consumed daily over a lifetime. The current HRLs were promulgated in 1993/94 and can be found at *http://www.health.state.mn.us/divs/eh/groundwater/current.html* .

The Minnesota Department of Health is in the process of revising the HRL Rule. Draft HRLs can be found at *http://www.health.state.mn.us/divs/eh/groundwater/hrlgw/chemfinal.html* . The draft values represent values derived during the on-going revision of the HRL rule, reflecting new methodology and most recent intake information.

If a contaminant is found in ground water that is not on either list or more than one chemical affects the same toxic endpoint, contact Helen Goeden, 651-201-4904 or helen.goeden@health.state.mn.us

E. Wells

Diagram locations of all wells on the property, including all sand point, dug, or drilled wells. In addition, **diagram locations** of all wells on properties **within 250 feet** of any septic system, drain field, meth cooking and/or meth waste disposal areas on the subject property. For each well, record the following information:

Diagram Well # ____ Owner ____________________________ Phone ___________
Address ____
Well use _________________________

If available, please record:

Unique Well # ____________________________
Depth/construction ____________________________

Collect and analyze samples from all wells **within 100 feet** of septic systems, drain fields, meth cooking, or disposal areas for VOCs per MDH Method 498 (EPA Method 8260B). Report the analytical data on the *Outdoor Contamination Procedural Report* *http://www.pca.state.mn.us/cleanup/meth.html* or other site report, and to the property owner.

If any sample is positive for a VOC from Method 498, contact the MPCA Emergency Response Team through the Minnesota Duty Officer at 651-649-5451 or 1-800-422-0798 with the detected value and corresponding Health Risk Limit (HRL). HRLs represent a concentration of a groundwater contaminant, or a mixture of contaminants, that poses little or no risk to health, even if consumed daily over a lifetime. The current HRLs were promulgated in 1993/94 and can be found at can be found at *http://www.health.state.mn.us/divs/eh/groundwater/current.html*

The rule is now under revision. Draft HRLs have been developed with new methodology and most recent intake information. Draft HRLs can be found at *http://www.health.state.mn.us/divs/eh/groundwater/hrlgw/chemfinal.html* .

If a contaminant is found that is not on either list or more than one chemical affects the same toxic endpoint, contact Helen Goeden, 651-201-4904 or helen.goeden@health.state.mn.us

F. Surface Water

If any meth lab wastes have been directly disposed into surface water, including wetlands, seasonally flooded areas, ponds, streams, and lakes, contact the MPCA Emergency Response Team through the Minnesota Duty Officer at 651-649-5451 or 1-800-422-0798.

G. Burn Pits, Burial Pits, and Other Disposal Sites

At properties where clandestine methamphetamine labs were operated, waste from the lab may be dumped into burial or burn pits. MPCA judges that the primary hazard of ash and soils from meth lab burn and burial pits is the possible presence of volatile solvents, such as lantern fuel, toluene, brake cleaner, and ether. These solvents may or may not have volatilized from the soil after being dumped into the burn or burial pit.

Other meth production materials may be in the soil, for example drain cleaner, cold medicine capsules, or small residues of methamphetamine drug. MPCA judges that these other meth lab materials in soil or ash would not pose significant hazards in the soil or in a waste stream.

As listed above, meth lab-related wastes are primarily fuels and solvents like those used at home for activities such as cleaning, hobbies, and automobile work. Soils contaminated by disposal of these meth lab-related wastes are considered by MPCA to be similar to petroleum contaminated soils commonly dealt with in the remediation programs of the agency. A number of solid waste facilities have placed petroleum contaminated soils into their "Industrial Solid Waste Management Plans" (ISWMP) with proper procedures for management and disposal.

Properly assessed soil and ash may be disposed at municipal solid waste (MSW) and industrial landfills, waste combustor facilities or soil treatment facilities, if the facility has petroleum contaminated soil included in their ISWMP. The owner or consultant must contact the facility management prior to disposal. The facility management could seek a case-by-case approval from MPCA or the facility could propose amendment of their ISWMP for properly screened meth lab site ash, contaminated soil, and contaminated debris and soils. Demolition landfills will not be considered for such disposal.

G1. Media Assessment and Documentation

Review the accompanying flow chart in Appendix C, "Soil, Burn Pile and Burial Pit Screening," to assist understanding of the following guidance. This guidance seeks to screen soils and ash with vapor monitoring instruments to identify significant contamination by solvents or fuel. Meth lab contaminated materials will be managed on a case-by-case basis between the property owner, the owner's consultant, and MPCA. Other improper waste disposal may be discovered during assessment and need specific or additional remediation.

Follow these steps in documenting assessment of possibly contaminated soils.

- Diagram and describe the locations, dimensions, and types of meth lab-related wastes (e.g., glassware, meth pipes, toluene cans, tubing) and other wastes found at all burn pits and suspected burial pits. Also diagram and describe other suspected meth lab waste or other waste disposal sites on the subject property. Show the location of each feature in relation to structures and wells.

Be aware and cautious of containers that may contain anhydrous ammonia such as pressurized cylinders, insulated coolers, and fire extinguishers. If any containers with chemical or precursor drug materials, partially finished drug product, or drug paraphernalia are found, contact the lead criminal investigator.

- Separate **solid waste** such as empty solvent containers, hoses, pans and meth pipes. Dispose of as municipal solid waste. Obtain approval from and make specific arrangements with the facility before disposal.

- Excavate and remove **ash** from burn pits.
    - Screen with PID. (For PID screening protocol, see "Soil Sample Collection and Analysis Procedures Appendix _I. Field Screening Procedure" at *http://www.pca.state.mn.us/publications/c-prp4-04.pdf* .
        - If the PID reading is less than 40 parts per million (ppm), dispose of ash at a municipal solid waste (MSW) or industrial landfill with other solid waste.
        - If the PID reading is greater than 40 ppm, handle ash with soil. Obtain approval from and make specific arrangements with the facility before disposal.

- Excavate contaminated **soil** from all burn and burial pits.
    - Stockpile all contaminated soil on a plastic or impervious surface and cover with plastic.
    - Field screen soil samples using PID headspace measurements.
    - Screen soils with PID at 12 inch depth.
        - If PID reading is **less than 40 ppm**, rake and aerate soil.
        - If PID reading is **greater than 40 ppm**, remove contaminated soils until PID reading is at or below 40 ppm per PID headspace analysis. Call MPCA if excavation becomes very deep to request guidance.

- **After excavation** of the contaminated soils is complete, collect **a bottom grab** sample 12 inches below the surface at each disposal location.
    - Collect an additional sample if the area is greater than 100 square feet.
    - Submit soil sample(s) to laboratory in an appropriate container for VOC sediment analysis MDH 466 (EPA 8260B). If other waste streams are found, additional sampling and laboratory analysis may be necessary to evaluate the effectiveness of the excavation – contact the MPCA Emergency Response Team.

If any contaminants are detected in a laboratory analysis, provide a copy of the laboratory data to the local authority and the MPCA Emergency Response Team through the Minnesota State Duty Officer at 651-649-5451 or 1-800-422-0798.

If the **soil volume** is **less than 10 cubic yards**, contact a member of MPCA Emergency Response Team through the Minnesota Duty Officer at 651-649-5451 or 1-800-422-0798 for verbal approval before thin spreading on site. For guidance on thin spreading, see "Thin-spreading small quantities of petroleum-contaminated soils" at *http://www.pca.state.mn.us/publications/c-er4-04.pdf* .

If the excavated contaminated soil is **greater than 10 cubic yards**, or the site conditions are determined to not be suitable for thin spreading, contact the MPCA Emergency Response Team *before* disposal is arranged or done.

G2. Contaminated Soil Disposal

The following disposal options in Minnesota may exist for volumes greater than 10 cubic yards: landfill, thermal treatment, mass burners, or land farming at land treatment sites.

Each disposal facility may have specific sampling and analysis requirements, therefore, disposal facilities should be contacted directly for approval and protocols.

Municipal and Industrial Solid Waste Facilities may modify their "Industrial Solid Waste Management Plan" to allow acceptance of meth lab contaminated soil. Thermal treatment facilities and mass burners may be able to accept this waste for treatment or incineration. Land treatment facilities may accept contaminated soil for land application. The MPCA maintains lists of various disposal facilities found on MPCA's web site.

H. Waste Characterization and Disposal

All **meth-making chemical equipment or waste**, including precursor pharmaceuticals, drug cooking or use paraphernalia, non-empty containers of potential precursor chemicals, sludges, suspicious propane cylinders or fire extinguishers, and other potential evidence must be reported to the lead criminal investigator.

The contractor or property owner may prepare **household hazardous waste** for safe transport to the local household hazardous waste (HHW) program. The contractor or property owner should contact the local HHW program for information on safe transport and pre-approval of materials from a clandestine lab property. If approval is not granted, the materials must be managed as hazardous waste.

Contaminated structural materials such as furniture, carpeting, wall paper and contaminated drywall, household furnishings and personal property may be handled as municipal solid waste. Materials may be disposed of in a properly permitted sanitary landfill or waste-to-energy facility. All furniture, carpeting, clothing, and personal property should be cut apart or otherwise rendered unattractive to scavenging.

The gloves, cartridge respirators, protective clothing, and other **Personal Protective Equipment**, and cleaning materials used at a site may be disposed of as municipal solid waste.

Wash and rinse waters may be disposed to a municipal wastewater collection system, or into a properly functioning septic system (individual sewage treatment system, ISTS). Pump and dispose of septic tank contents at a permitted wastewater treatment or permitted sewage disposal facility after cleaning of the structure(s) is completed. If drains to an ISTS do not empty into septic tank, call local oversight authority for determination of wastewater fate based on site location (e.g., near wetlands, waterways).

All **structures that are to be demolished** in lieu of cleaning should be carefully inspected for meth lab materials and hazardous materials. Normal demolition and disposal rules apply. In all cases a property owner is responsible for assessment and proper removal and disposal of asbestos, lead, and mercury containing materials. For general information, see the "Pre-Demolition Environmental Checklist and Guide" on the MPCA website at *http://www.pca.state.mn.us/publications/w-sw4-20.pdf* . For more detailed information, call the MPCA demolition team at 800-657-3864 or 651-296-6300.

Burning a meth-contaminated structure for fire service training in lieu of remediation is strongly discouraged. Safety of firefighter entry into a former meth lab structure and effectiveness of decontamination of firefighter equipment cannot be assured. In all cases of a practice or training burn, the burn must be done in accordance with demolition and asbestos regulations. A Department of Natural Resources (DNR) burn permit must be obtained prior to a training or practice burn.

Appendix A
Methamphetamine Manufacturing Processes

Extracting Precursor Drug

Use: Cold tablets, solvents and coffee filters

Wastes: Solvent vapors, ephedrine or pseudoephedrine, binder from tablets, and coffee filters.

Solvent evaporates or may be reused.

Red Phosphorus

Use: Iodine, red phosphorus, filters, **heat**, sodium hydroxide, and ether or other solvent
(e.g., hexane, toluene).

Wastes: Iodine, red phosphorus, sodium hydroxide, coffee filters, and solvent. Gases and possible other by-products. Solvent vapors. Iodine sublimation.

Anhydrous Ammonia (NAZI) Method
(Most often used in MN)

Use: Sodium, potassium, or lithium metal, anhydrous ammonia, water, ether or other solvent. Exothermic reaction can cause gaseous by-products.

Heat may be used to expedite solvent evaporation.

Wastes: Coffee filters, excess metal.

"Salting Out"

Use: Rock salt or table salt, sulfuric or muriatic acid, filters.

Wastes: Excess salt, sulfuric or muriatic acid, hydrochloric acid, hydrogen chloride gas, coffee filters, meth, solvent from above phases, possibly acetone.

Appendix B
Meth Production Chemicals - Chemicals Present in Active vs. Former Meth Labs

The former meth lab environment is much less hazardous than the active lab environment. As indicated in the last column, the solvents have dissipated and the reactive materials have been depleted; existence of either is far less in the former meth lab.

	Chemical	Common Source	Properties of Chemicals in Active Meth Lab	Presence (Y/N) of Residual Contaminant in Former Meth Lab
Precursor Reagents	Pseudoephedrine	Cold medicines	Irritant, stimulant	Yes
	Ephedrine	Cold medicines	Irritant, stimulant	Yes
Extraction / Reaction Solvents	Acetone	Fingernail polish remover	Volatile irritant, flammable	No
	Benzene	Thinners, lacquers	Volatile irritant, flammable	No
	Ethanol	Grain alcohol	Volatile irritant, flammable	No
	Ether	Starter fluid	Volatile irritant, flammable	No
	Freon	Refrigerant	Volatile irritant	No
	Hexane	Thinners, lacquers	Volatile irritant, flammable	No
	Isopropanol	Rubbing alcohol	Volatile irritant, flammable	No
	Methanol	Gasoline additives, Heet	Volatile irritant, flammable	No
	Naptha			
	Petroleum Distillates	Mineral Spirits	Volatile irritant, flammable	No
	Toluene	Toluol	Volatile irritant, flammable	No
	Trichloroethane	Gun cleaning solvent	Volatile irritant	No
	Xylene			
Reaction Materials	Sodium Hydroxide	Lye, Drain cleaner	Corrosive	Yes
	Hydrochloric Acid	Muriatic Acid, Concrete cleaner	Corrosive	Yes
	Sulfuric Acid	Battery Acid, Drain cleaner	Corrosive	Yes
	Red P Method Specific			
	Iodine	Antiseptic, Tincture of Iodine	Inhalation irritant	Staining
	Red Phosphorus	Matchbook strikers, flares	Flammable and explosive	No
	Hydroiodic Acid			Yes
	Anhydrous Ammonia Method Specific			
	Anhydrous Ammonia	Fertilizer	Corrosive	No
	Lithium Metal	Li Batteries	Corrosive, Explosive with H_2O	No
	Sodium Metal		Corrosive, Explosive with H_2O	No
Production Side Products and Contaminates	Solid waste		Misc health hazards	No
	Solvent Mixtures		Volatile irritant, flammable	No
	Red P Method Specific			
	Phosphine gas		Toxic gas, Explosive with air	No
	Phosphorous Acid		Irritant	Yes
	Iodine vapor		Inhalation irritant	Staining
	Hydroiodic Acid		Corrosive	Yes
	Anhydrous Ammonia Method Specific			
	Ammonia Vapor		Corrosive	No
	Lithium Hydroxide		Corrosive	Yes
	Sodium Hydroxide		Corrosive	Yes

NOTE: Not all chemicals will be found in every meth lab. Reaction materials used depend upon the method of production. The solvent(s) used per cook may vary due to availability, cook's preference, etc.

Appendix C – Soil, burn pile and burial pit screening – assessing possible meth lab waste contamination of ash and soils