

Waste Determination and Recordkeeping

Guidance on Hazardous Waste Requirements



Introduction

Wisconsin businesses and institutions are required by federal and state laws to determine if the waste materials they generate are hazardous waste. A person who generates a solid waste, as defined in s. NR 661.0002, Wis. Adm. Code, must make an accurate determination as to whether that waste is a hazardous waste to ensure wastes are properly managed under Wisconsin's hazardous waste requirements. As part of the hazardous waste determination, the generator must identify all applicable hazardous waste codes. [s. NR 662.011, Wis. Adm. Code]

In addition, small or large quantity generators must maintain records supporting their hazardous waste determinations. These records must be maintained for at least 3 years from the date that the waste was last sent to an on-site or off-site treatment, storage or disposal (TSD) facility. The records associated with the waste determinations must be available during compliance inspections. The DNR strongly encourages waste generators to also maintain records for waste determined to be non-hazardous.

Failure to accurately identify a hazardous waste may result in mismanagement of wastes and damage to human health and the environment. It can also result in increased financial liability. This guidance document contains information to help generators understand the various waste types, categories and processes used to make and document an accurate waste determination.

Hazardous Waste regulations are found in [chs. NR 660-679](#) of the Wisconsin Administrative Code.

Generators may choose to manage their nonhazardous wastes as hazardous waste. Even if the waste is nonhazardous, "over managing" the waste is acceptable and meets the accuracy requirement in s. NR 662.011, Wis. Adm. Code, because the generator has made a determination intended to ensure proper and protective management of the waste within Wisconsin's hazardous waste regulatory program [81 FR 85750].

Solid waste streams that have no potential to be a hazardous waste do not require a hazardous waste determination. Examples include food waste, office-generated paper wastes and bathroom waste. Refer to the *Conditional Exemptions and Exclusions* section in this document for more information.

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Definitions

Solid waste: Discarded materials that are not excluded or granted a variance from the regulatory definition of solid waste. [s. NR 661.0002, Wis. Adm. Code]

The term “solid waste” does not refer to the physical state of the waste. Solid wastes can be solid, liquid, or containerized gas.

- Discarded materials include materials that are abandoned, recycled or considered inherently waste-like.
- Abandoned materials are solid wastes if they are disposed of, burned or incinerated, accumulated, stored or treated but not recycled, or sham recycled.

If a material is not a solid waste, it cannot be considered a hazardous waste. Materials that are excluded from being a solid waste when recycled are listed in s. NR 661.0002 and s. NR 661.0004(1), Wis. Adm. Code. **It is important for waste generators to document the reasoning behind any exclusions they rely on in the waste determination process.** Certain hazardous wastes that are recycled become excluded from the definition of a solid waste.

Hazardous waste: A hazardous waste is a solid waste that is not excluded under s. NR 661.0004(2), Wis. Adm. Code, and meets any of the criteria in the following table.

Criteria for Hazardous Waste	Wis. Adm. Code
Exhibits any of the characteristics of hazardous waste	subch. C of ch. NR 661
Has been named as a hazardous waste and listed as such in the regulations	subch. D of ch. NR 661
Is a mixture containing a listed hazardous waste and non-hazardous waste	s. NR 661.0003(1)(b)4
Is derived from the treatment, storage, or disposal of listed hazardous waste	s. NR 661.0003(3)(b)1 s. NR 661.0003(4)(b)

Understanding the definitions and descriptions of hazardous waste, both characteristic and listed, will help with navigating the waste determination flow chart provided in this document. A hazardous waste determination for each solid waste must be made at the point of generation, before any dilution, mixing or other alteration of the waste occurs. Note that waste properties may change due to environmental exposures and other factors, which may result in a change in the waste classification.

Acceptable knowledge: The term “acceptable knowledge” means that knowledge-based determinations are based on relevant and reliable (i.e., verifiable) information from any source that indicates that the waste is either hazardous or non-hazardous under subchapters C and D of ch. NR 661, Wis. Adm. Code, and that such information is organized or presented in a logical way that illustrates how it supports the generator’s conclusion.

Making a waste determination using acceptable knowledge may include any of the following:

1. Process knowledge, which describes information about chemical feedstocks and other inputs to the production process.
2. Knowledge of products, byproducts and intermediates produced by the manufacturing process.
3. Chemical or physical characterization of wastes.
4. Information on the chemical and physical properties of the chemicals used or produced by the process or otherwise contained in the waste.
5. Testing that illustrates the properties of the waste; or other reliable and relevant information about the properties of the waste or its constituents.

Representative sample: A sample of a larger whole (e.g., waste pile, lagoon, groundwater) which can be expected to exhibit the average properties of the whole. In other words, every individual in the population has an equal chance of being sampled (i.e., sampling off the top of a drum or pile is not representative sampling as the populations in the middle or bottom have no chance of being sampled). An incremental sampling method, described in detail below, is used to meet this requirement.

Point of generation (POG): The point at which the material first becomes a solid waste under the federal Resource Conservation and Recovery Act (RCRA), before any dilution, mixing, or other alteration of the waste occurs.

Safety Data Sheets: SDSs can provide useful information regarding ignitability (flash point), corrosivity (pH) or reactivity of the material going into the process. However, they tend to be less useful when it comes to identifying the toxic characteristics of waste generated from that process. The SDS only lists ingredients that make up greater than 1% of the total constituents (0.1% if they are carcinogens). Ingredients that are less than 1% by mass can equal up to 10,000 parts per million (ppm). This means that a material used in a process may contain a toxic constituent that is not listed on the SDS, but which contributes to the generation of a hazardous waste. Additionally, the process itself may chemically or physically change the properties of the materials such that the generated waste is hazardous waste.

Waste profiles: A documented waste profile is typically generated by a TSD facility as a means to standardize and categorize information regarding wastes they intend to accept. The waste profile is generated from the waste determination. The information outlined in the waste profile regarding waste characterization needs to be supported by either laboratory analysis or acceptable knowledge. Waste profiles are not standardized forms and may not adequately characterize the waste. The generator will likely have a better understanding of the waste materials they generate and should work with the TSD facility to ensure adequate characterization.

If no documentation is available during a facility inspection, both the DNR and the U.S. Environmental Protection Agency (EPA) can require a generator to perform a waste determination to support the facility's findings that a waste of concern is not a hazardous waste.

Waste Determination Process

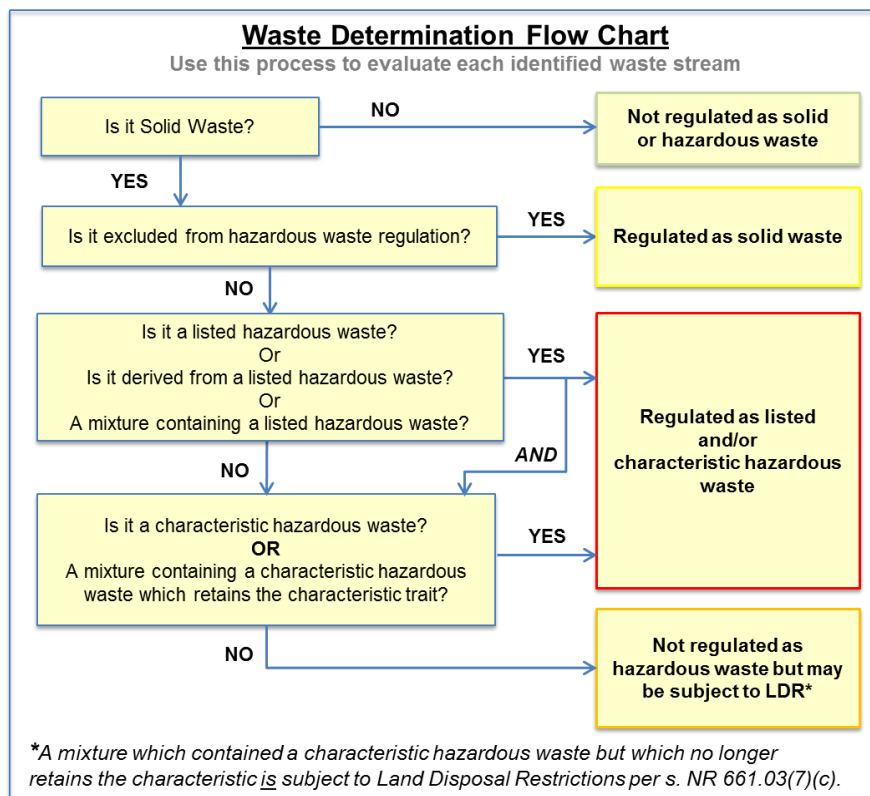
The waste determination process has five principal steps that require knowledge of facility processes, hazardous waste classifications and hazardous waste regulations:

1. **Identify the facility's waste streams:** Make a list of all waste streams, describe how the waste is generated, and identify the POG. Any waste stream being generated at a facility has the potential to be a hazardous waste based on how it was generated.

2. **Determine whether the waste stream is a solid waste:** Check to see if each waste meets the definition of “solid waste” as found in s. NR 661.0002, Wis. Adm. Code.
3. **If it is a solid waste, determine if the solid waste is excluded** from regulation under s. NR 661.0004, Wis. Adm. Code.
4. **Determine whether the solid waste is a hazardous waste** under s. NR 662.011, Wis. Adm. Code.
5. **Create records of the waste determination by documenting steps 1-4:** Written documentation is a required step in the hazardous waste determination process. These documents must be kept for at least 3 years as part of the facility recordkeeping requirements. Compile the information used to make the waste determination, including a statement on whether the waste is a hazardous waste. An example waste determination record is provided at the end of this document.

The waste generation rates for a facility will determine the correct generator status and applicable regulations. Monthly waste tracking records can assist with this determination. For more information on waste counting and regulatory requirements, see the DNR guidance, *Quick Reference Guide for Hazardous Waste Generators (WA-1821)*.

This document provides information on exclusions and definitions, which may be helpful to review prior to using the flowchart below. It may also be necessary to refer the waste descriptions and lists in ch. NR 661, Wis. Adm. Code, to make the waste determination.



The Waste Determination Summary form the end of this document can be used for the waste determination documentation. The form is provided for convenience and is not required.

Characteristic Hazardous Wastes

Characteristic hazardous wastes are hazardous wastes that exhibit a characteristic of ignitability, corrosivity, reactivity or toxicity under subchapter C of ch. NR 661, Wis. Adm. Code. Characteristic hazardous waste codes begin with the letter 'D' followed by three numbers. For example, D008 is a hazardous waste due to a lead value equal to or greater than 5.0 micrograms per liter (toxicity). See detailed example in the *Toxics* section below.

These waste codes are used to identify the wastes at the point of generation through transportation, treatment, storage and disposal.

Four Types of Characteristic Wastes

Ignitable wastes consist of solid wastes that are:

- A liquid (other than an aqueous solution containing less than 24 percent alcohol by volume) and have a flash point below 140° F using one of the test methods specified in s. NR 661.0021, Wis. Adm. Code. Examples include gasoline, xylene, toluene, acetone, benzene, methanol and isopropyl alcohol.
- A non-liquid capable under standard temperature and pressure of causing fire through friction, absorption of moisture or spontaneous chemical changes. Examples include sulfur, oily rags containing drying oils (e.g., linseed oil, soybean oil, Tung oil), wetted titanium powder, aluminum powder, magnesium powder and alkali metals. There is currently no specified analytical test method to determine if this waste type is a D001 hazardous waste. Instead, the generator must evaluate the applicability of the D001 designation for these wastes based on best engineering judgment and on operational experience.
- A flammable gas as defined in 49 CFR 173.115(a) and as determined by the test methods described in that regulation or equivalent test methods approved by the DNR under ss. NR 660.20 and 660.21, Wis. Adm. Code. Examples include propane, acetylene, butane, hydrogen and methane.
- An oxidizer as defined in 49 CFR 173.127(a) and as determined by the test methods described in that regulation or equivalent test methods approved by the DNR under ss. NR 660.20 and 660.21, Wis. Adm. Code. Examples include chlorates, permanganates, inorganic peroxides, organic peroxides and nitric acid in concentrations from 65% to 70%.

Characteristic of ignitability (waste code D001) is defined in s. NR 661.0021, Wis. Adm. Code.

Corrosive wastes consist of solid wastes that are:

- Aqueous (>50% water) and have a pH less than or equal to 2, or greater than or equal to 12.5, using the test method specified in s. NR 661.0022, Wis. Adm. Code. Examples include muriatic (i.e., HCL) acid, sodium hydroxide and nitric acid.
- Liquid and can corrode steel by more than one-quarter inch per year as determined by the test method specified in s. NR 661.0022, Wis. Adm. Code. An example is ferric chloride.

Characteristic of corrosivity (waste code D002) is defined in s. NR 661.0022, Wis. Adm. Code.

Reactive wastes consist of solid wastes that:

- Are normally unstable and readily undergo violent change without detonating.
- React violently with water.
- Form potentially explosive mixtures with water.
- Are mixed with water and generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
- Are cyanide or sulfide bearing wastes which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
- Are capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement.
- Are readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
- Are a forbidden explosive as defined in 49 CFR 173.54, or are a Division 1.1, 1.2 or 1.3 explosive as defined in 49 CFR 173.50 and 173.53, incorporated by reference in s. Trans 326.01.

Characteristic of reactivity (waste code D003) is defined in s. NR 661.0023, Wis. Adm. Code.

Examples of reactive wastes include hydrogen sulfide, cyanide or sulfide-bearing wastes, lithium-sulfur batteries, nitroglycerin formulations, ethylene oxide, sodium azide and phosphorus. There are no codified test methods in ch. NR 661, Wis. Adm. Code, that must be used to determine if a waste is a D003 hazardous waste. Even though there are no codified test methods, that does not preclude the use of testing to supplement a generator's D003 knowledge-based determination.

The U.S. EPA's May 2, 1980, D003 Background Document discusses various tests that the generator may use when making these D003 knowledge-based determinations. These tests do not, by themselves, provide definitive results. The generator must evaluate this D003 criterion based on a combination of available test methods, best engineering judgment and operational experience.

Toxic wastes consist of solid wastes that include one or more of 39 chemicals that exceed regulatory thresholds in an analytical test method known as TCLP (Toxicity Characteristic Leaching Procedure). The 39 chemicals consist of the following:

- Heavy metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.
- Volatile organics: benzene, carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichloroethane, 1,1-dichloroethylene, methyl ethyl ketone, tetrachloroethylene, trichloroethylene and vinyl chloride.
- Semi-volatile organics: o-cresol, m-cresol, p-cresol, cresol, 1,4-dichlorobenzene, 2,4-dinitrotoluene, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, nitrobenzene, pentachlorophenol, pyridine, 2,4,5-trichlorophenol and 2,4,6-trichlorophenol.
- Pesticides: Endrin, lindane, methoxychlor, toxaphene, 2,4-D, 2,4,5-TP Silvex, chlordane and heptachlor (and its epoxide).

Characteristic of toxicity (waste code D004 – D043) is defined in s. NR 661.0024, Wis. Adm. Code.

Each one of the above chemicals has a regulatory level, and when the results of the TCLP test are at or above the regulatory level then the waste is a hazardous waste. For example, lead's regulatory level is 5 mg/l. If the TCLP test results show lead is at 6.7 mg/l, then the waste is a toxic hazardous waste for lead. Conversely, if the TCLP test result shows lead is at 3.9 mg/l, then the waste is not a toxic hazardous waste for lead.

Listed Hazardous Wastes

Listed hazardous wastes are hazardous wastes that are specifically listed under subchapter D of ch. NR 661, Wis. Adm. Code. Listed hazardous waste codes begin with one of the following letters: F, K, P, or U, followed by 3 numbers (for example, F006).

F-listed Hazardous Wastes

The F-listed hazardous wastes (F001 to F019) consist of solid waste from non-specific sources.

- F001 to F005 are the spent solvents (e.g., paint thinners, brake and carburetor cleaners, vapor degreasing and dry cleaning fluids).
- F006 to F019 are electroplating and heat-treating wastes.
- F020 to F023 and F026 to F028 are wastes that contain dioxin or dioxin precursors.
- F024 and F025 are process wastes from the production of chlorinated aliphatic hydrocarbons by free radical catalyzed processes.
- F032, F034, and F035 are wood preserving wastes.
- F037 and F038 are primary and secondary sludges produced in wastewater treatment systems at petroleum refineries.
- F039 is for multisource leachate produced by land disposal facilities.

F-listed wastes from non-specific sources (waste codes F001 - F039) are described in s. NR 661.0031, Wis. Adm. Code.

U.S. EPA listing background documents are available for every F-listed hazardous waste. The listing background documents are available at <https://www.regulations.gov/>. Enter "RCRA-2004-0016" in the search field to obtain the results for the F-listing background documents.

K-listed Hazardous Wastes

The K-listed hazardous wastes (K001-K178) consist of solid wastes from specific industry sources. The K-listed hazardous wastes are subdivided into the following industrial categories: wood preservation, inorganic pigments, organic chemicals, inorganic chemicals, pesticides, explosives, petroleum refining, iron and steel, primary aluminum, secondary lead, veterinary pharmaceuticals, ink formulation and coking.

K-listed wastes from specific sources (waste codes K001 -K178) are described in s. NR 661.0032, Wis. Adm. Code.

To use the K-list, the generator should determine if their operation meets any of the above categories. If a category is met, then the generator should review the K-listed hazardous wastes within that category to determine if their waste meets the listing description. The U.S. EPA has listing background documents for every K-listed hazardous waste. The listing background documents are available at <https://www.regulations.gov/>. Enter "RCRA-2004-0017" in the search field to obtain the results for the K-listing background documents.

P- and U-listed Hazardous Wastes

Commercial chemical products, manufacturing intermediates and off-specification products that contain any of the compounds listed in s. NR 661.0033(5) or (6), Wis. Adm. Code, are potential 'P' or 'U' listed hazardous wastes and are defined under RCRA as materials which contain either the pure or technical grade of the 'P' or 'U' listed chemical as the sole active ingredient.

Technical grade: All commercial grades of a chemical, which in some cases may be marketed in various stages of purity. There are no exact criteria, such as percent purity, to define a technical grade of a substance. The technical purity of a chemical substance will vary from compound to compound and may range from highly purified to very impure. When two or more compounds listed in s. NR 661.0033(5) or (6), Wis. Adm. Code, are present as an active ingredient in a formulation, the formulation is not 'P' or 'U' listed hazardous waste when disposed of.

Active ingredient: A compound or mixture that performs the function of the product (e.g., has the pesticide effect). For example, the fillers, solvents, propellants and other components in a pesticide with no pesticidal role are functionally inert with regard to pesticide formulations and therefore are not active ingredients. It is possible for a hazardous constituent from s. NR 661.0033(5) or (6), Wis. Adm. Code, to be a functionally inert component of a commercial chemical product (for example, a solvent carrier). In these cases, its presence does not prevent the formulation containing other 'P' or 'U' listed constituent as the sole active ingredient from being a 'P' or 'U' listed hazardous waste.

The P-listed hazardous wastes consist of unused and discarded commercial chemical products, off-specification species, and container and spill residues. The P-listed hazardous wastes are acute hazardous wastes and are extremely dangerous to human health and the environment in very small doses or short-term exposure.

P-listed wastes (waste codes P001 – P205) are described in s. NR 661.0033(5), Wis. Adm. Code.

Note: A person generating more than 2.2 lbs. per month or accumulating more than 2.2 lbs. of acute hazardous waste is a large quantity generator (LQG), per s. NR 662.013, Wis. Adm. Code

The U-listed hazardous wastes consist of unused and discarded commercial chemical products, off-specification species, and container and spill residues. The U-listed hazardous wastes are also dangerous to human health and the environment.

U-listed wastes (waste codes U001 – U411) are described in s. NR 661.0033(6), Wis. Adm. Code.

Making a Waste Determination

The hazardous waste determination for each solid waste must be made at the POG, i.e., before any dilution, mixing or other alteration of the waste occurs. The generator must also make a documented determination as to whether the waste is excluded as a solid waste, which would make the waste determination unnecessary.

To make an accurate waste determination, per s. NR 662.011(3) and (4), Wis. Adm. Code, the generator must use either testing or acceptable knowledge.

1. Testing a representative sample of the solid waste with the test methods set forth in subchapter C of ch. NR 661, Wis. Adm. Code: When a representative sample is properly

collected and the specified test method is properly performed, then the results of the test are definitive for determining the regulatory status of the solid waste. For more information on representative sampling, see the following section.

2. Using knowledge of the processes and of the materials used in the process, among other types of information: **Generators can only use knowledge of their process and knowledge of the materials used in the production process to determine whether their waste meets any of the F-, K-, P- and U-waste listings.** Additionally, to support a generator's knowledge-based determination for a characteristic hazardous waste, the generator may use an equivalent test method. Use of the equivalent test method must be approved by the DNR under s. NR 660.21, Wis. Adm. Code. However, such tests do not, by themselves, provide definitive results.

Most generators use knowledge to make their waste determinations, and this is appropriate provided the generator's knowledge-based determination is based on acceptable knowledge. Where a generator's knowledge-based determination is inconclusive or uncertain, then testing of a representative sample of the waste must be used to make the determination, as described in subchapter C of ch. NR 661, Wis. Adm. Code.

Examples of documentation to support knowledge include: Safety Data Sheets (SDSs), published information, process flow diagrams, chemical reaction diagrams, identified breakdown products and other process reaction or chemical information. Typically, none of these documents are acceptable as stand-alone documentation for a waste determination, as most do not state conclusively whether the waste is hazardous or non-hazardous. Therefore, multiple document sources may be needed to support a knowledge-based determination.

Common waste determination violations of hazardous waste regulations include:

- Failure to conduct a waste determination. Waste examples: filters, wipes, fluff, floor sweepings, mop water, grinding dusts and shot blast.
- Failure to document the waste determination.
- Relying solely on "generator knowledge" with no data or documented information.
- Misclassifying waste as non-hazardous, which leads to improper shipment and disposal violations.

Recharacterization of Waste

A new hazardous waste determination, known as a recharacterization, will be needed if:

- there are changes to the raw materials, process, or operation that produces the waste;
- there are changes to the properties of the waste changed due to the environment or other factors; or
- the original hazardous waste determination was inadequate.

Additionally, a subsequent hazardous waste determination may be needed when:

- the waste is highly variable;
- the waste is sent to a different TSD facility for the first time;
- the TSD facility requests an updated hazardous waste determination; or
- the waste determination regulatory requirements change.

The DNR recommends a recharacterization of each waste stream be conducted every 1 to 3 years. **It is the responsibility of the generator to make a correct waste determination and retain the supporting documentation.**

Recordkeeping

A small or large quantity generator must maintain records supporting its hazardous waste determinations. These records must be maintained for at least 3 years from the date that the waste was last sent to an on-site or off-site TSD facility. These records must comprise the generator's knowledge of the waste and support the generator's determination, as described in ss. NR 662.011(3) and (4), Wis. Adm. Code. The records must include the following types of information:

These recordkeeping requirements do not apply to VSQGs but are highly recommended.

- The results of any tests, sampling, waste analyses, or other determinations made in accordance with s. NR 662.011, Wis. Adm. Code.
- Records documenting the tests, sampling and analytical methods used to demonstrate the validity and relevance of such tests.
- Records consulted in order to determine the process by which the waste was generated, the composition of the waste and the properties of the waste.
- Records which explain the knowledge basis for the generator's determination, as described in s. NR 662.011(4)(a), Wis. Adm. Code.

The periods of record retention referred to in this section are extended automatically during any unresolved enforcement action, or as requested by the DNR. [s. NR 662.011(6), Wis. Adm. Code] During a hazardous waste generator inspection, the inspector will request waste determination records to verify compliance with hazardous waste regulations, and it is recommended that this information be kept organized and readily accessible.

Land Disposal Restrictions (LDR)

Section NR 668.07(1)(a), Wis. Adm. Code, requires small and large quantity generators of a hazardous waste to determine if the hazardous waste needs to meet the LDR treatment standards prior to land disposal^[2]. For TSD facilities this requirement can be found in s. NR 664.0013(1)(a), Wis. Adm. Code.

This determination should be done concurrently with the hazardous waste determination procedure under s. NR 662.011, Wis. Adm. Code. It is at the POG that the LDR treatment standard is attached to the hazardous waste (51 FR 40620, November 7, 1986, and 52 FR 25766, July 8, 1987).

In other words, LDR treatment standards only apply to wastes that are a hazardous waste at the POG. If the hazardous waste is also a characteristic hazardous waste, the generator must comply with s. NR 668.09(1), Wis. Adm. Code, which requires a generator to determine the underlying hazardous constituent^[3] of the hazardous waste. The LDR requirements do not apply to very small quantity generators when they operate in compliance with the VSQG requirements.

Important factors to consider when managing a hazardous waste:

- **Dilution** of hazardous waste to remove hazardous characteristics is generally prohibited.
- **Treatment or mixing** of hazardous waste requires a thorough understanding of the hazardous waste rules and is only allowed in very limited circumstances (e.g., elementary

^[2] The term "land disposal facility" is not codified; however, the term "land disposal" is defined under s. NR 668.02(3), and means placement in or on the land, except in a corrective action management unit or staging pile, and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, salt dome formation, salt bed formation, underground mine or cave, or placement in a concrete vault, or bunker intended for disposal purposes.

^[3] "Underlying hazardous constituent" means any constituent listed in s. NR 668.48, Table UTS—Universal Treatment Standards, except fluoride, selenium, sulfides, vanadium and zinc, which can reasonably be expected to be present at the point of generation of the hazardous waste at a concentration above the constituent-specific UTS treatment standards.

neutralization or precipitation of metals). Prior to treating or mixing hazardous waste at a facility, generators are strongly encouraged to contact their DNR hazardous waste specialist to determine what rules apply and if a hazardous waste treatment license is required.

- **Mixtures of listed hazardous waste due to toxicity** with other solid wastes will result in the entire mixture becoming a listed hazardous waste.
- **Mixtures of characteristic hazardous waste** with other solid wastes will result in the entire mixture becoming a hazardous waste if the characteristic continues to be exhibited by the mixture.
- **Waste derived or generated** from treatment, storage or disposal of a listed hazardous waste, including sludge, spill residues, air emission control dust or leachate, is a listed hazardous waste.

Sampling

Representative sample means a sample of a larger whole (e.g., waste pile, lagoon, groundwater) which can be expected to exhibit the average properties of the whole. It takes some preparation and understanding of the process and waste stream to develop an adequate plan for collecting a representative sample. Failure to capture a representative sample could lead to an inaccurate waste determination. [s. NR 660.10 (101), Wis. Adm. Code]

Note: When working with the DNR's Remediation and Redevelopment Program on environmental cleanup projects under ch. NR 716, soil samples collected during the field investigation for defining degree and extent of contamination must be discrete samples (not composite or representative samples).

Understanding Representative Sampling

Consider a 55-gallon drum of sludge. To determine the "true concentration" of chromium in the sludge, the entire contents of the drum would need to be tested. In other words, the 55-gallon drum would be the sample. This would be extremely expensive and is not required under RCRA, because representative sampling – when done correctly – can give a very close approximation of the true concentration of chromium in the sludge.

Now consider a bag that contains 1,000 marbles: 900 marbles are black, and 100 marbles are white. To characterize the bag, or to know the proportion of the black to white marbles in the bag, the absolute minimum number of marbles that would need to be sampled (i.e., a grab sample) from the bag is 10 – assuming 9 black marbles and 1 white marble would be grabbed. However, the odds are very low that given 10 grabs, one would grab 9 black marbles and 1 white marble.

In the above sludge scenario, a typical statistical recommendation would be to collect 30 grab samples. However, this does not require sending in each grab sample for analysis as this would cost \$4,500. Instead, these incremental samples, perhaps as little as a tablespoon in volume, are placed into the same sample collection container which results in only one sample container being sent to the lab for analysis. This type of sampling is called Incremental Sampling Methodology or ISM.

ISM is a structured sampling protocol that reduces data variability and increases sample representativeness. The objective of ISM is to obtain a **single sample** for analysis that has an analyte concentration representative of the decision unit (e.g., 55-gallon drum, tank, waste pile).

When done properly, ISM significantly improves the reliability and reproducibility of sample data and can minimize well as the time and cost. For more information on incremental sampling go to www.itrcweb.org.

Consider the following scenario:

To determine if a 55-gallon drum of chromium sludge (a solid) is a characteristic hazardous waste for chromium, a generator hires a consultant. The consultant collects three grab samples from the top of the drum and places each grab sample into three separate collection containers. The consultant then delivers the three samples to a state certified lab for analytical testing. The lab then takes 100 grams from each collection container for conducting the TCLP analysis. The consultant then averages the TCLP values to determine if the 55-gallon drum of chromium sludge is a characteristic hazardous waste for chromium. The consultant charged \$500 for their services and \$450 (three samples at \$150 each) for the TCLP test conducted by the lab. For a total cost of \$950.

Two mistakes were made during the collection of the sample:

- The samples were collected only from the top of the 55-gallon drum, which biased the sample results because the sludge in the middle and bottom of the drum had no chance of being sampled.
- Second, the consultant collected too few grab samples. A good rule of thumb to satisfy collecting a representative sample would be to collect at least 30 grab samples throughout the drum.

Making either one of these mistakes, results in failure to collect a representative sample. This is important because every individual in the sampling population must have an equal chance of being sampled.

As demonstrated by the marble example, numerous grab samples are needed to account for the waste's heterogeneity. Wastes – especially those wastes that are solids – are often extremely heterogeneous (i.e., highly variable). There are two types of heterogeneity to be concerned with:

- Spatial heterogeneity is how the **waste varies within the unit** (e.g., drum, tank, waste pile),
- Temporal heterogeneity is how the **waste varies over time**. Addressing temporal heterogeneity may require collecting the grab samples over days, week, or even months.

Both spatial heterogeneity and temporal heterogeneity need to be addressed when collecting a representative sample.

The 55-gallon drum of the chromium sludge used in the above scenario only addressed spatial heterogeneity, which is acceptable when determining if the contents of that drum are a hazardous waste. However, the chromium sludge is generated from a wastewater treatment unit's filter press on an ongoing basis and therefore there is likely variability in the chromium sludge generated by the filter press. To make a waste determination on the chromium sludge the sampling will also need to address temporal heterogeneity.

Heterogeneity is significantly more of an issue when dealing with wastes that are a physical solid rather than liquids that are a mixture or a solution. Liquids that are mixtures tend to be much more homogeneous because these liquids are capable of evenly distributing their mixture. Because of this a single grab sample may be used as a representative sample in sampling a drum of liquid when using a drum thief or COLIWASA (Composite Liquid Waste Sampler). When used correctly, these sampling tools are able to collect a representative sample of a liquid with one grab. Although liquids

may separate into layers within a drum or tank, sampling to the bottom with the drum thief or COLIWASA will provide a representative sample.

Prior to collecting a representative sample, the generator should **develop a sampling and analysis plan using U.S. EPA's data quality objectives**. The sampling and analysis plan can provide direction to the generator on collecting the correct type, quantity, and quality of data needed to support a waste characterization, so that the waste characterization is scientifically valid and defensible. U.S. EPA reference documents and web pages are provided in the *Resources and Contact Information* section.

Selecting a Laboratory

Before collecting the representative waste sample, a waste generator should select a lab and discuss the following:

- sample volumes,
- required containers,
- sample collection methods, and
- correct analytical test methods.

Visit dnr.wi.gov and search for 'accredited labs' to find a list of commercial state certified labs.

The laboratory should be certified for the specific test methods and analytical parameters that the lab will be using. A lab may be certified for certain test methods and not others, and labs can lose DNR certification, so it is important to verify the current certification status.

If technical assistance is needed regarding test methods or lab analysis, contact the regional DNR hazardous waste inspector assigned to a facility or county, or the DNR's Laboratory Certification Program at 608-267-7633 or DNRLabCert@Wisconsin.gov.

Conditional Exemptions and Exclusions

Conditional exemptions and exclusions from solid waste or hazardous waste regulations can be found in the following codes and guidance documents. These conditions are typically specific to the waste type and use, and may have testing, handling, and recordkeeping requirements. Contact the regional Waste and Materials Management Program or Remediation and Redevelopment Program staff for assistance.

Waste and Materials Management Program

- Solid waste exclusions (s. NR 661.0004, Wis. Adm. Code)
- Universal waste (s. NR 661.0009, ch. NR 673, Wis. Adm. Code)
- Used oil (ch. NR 679, Wis. Adm. Code)

Remediation and Redevelopment Program

- *Guidance for Hazardous Waste Remediation* (RR-705)
- Management of contaminated soil or solid wastes excavated during response actions (ch. NR 718, Wis. Adm. Code)

Guidance for Hazardous Waste Remediation (RR-705) provides direction on making waste determinations for remediation hazardous wastes.

Resources and Contact Information

Sampling Resources

Listed below are several resources to assist the generator in collecting a representative sample and developing a sampling and analysis plan.

Title	Document Location
Chapters 1 and 9 of SW 846	https://www.epa.gov/hw-sw846/sw-846-compendium
RCRA Waste Sampling Draft Technical Guidance Planning, Implementation and Assessment	https://www.epa.gov/sites/production/files/2015-10/documents/rwsdtg_0.pdf
Guidance on Systematic Planning Using the Data Quality Objectives Process	https://www.epa.gov/quality/guidance-systematic-planning-using-data-quality-objectives-process-epa-qag-4
Sampling and Analysis Plan Guidance and Template	https://19january2017snapshot.epa.gov/quality/sampling-and-analysis-plan-guidance-and-template-v4-general-projects-042014_.html
Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes	https://www.epa.gov/hwgenerators/guidance-manual-waste-analysis-facilities-generate-treat-store-and-dispose-hazardous
NR 600 information on sampling and test methods	<ul style="list-style-type: none"> • Subchapter C of ch. NR 661. • Appendix I -Representative sampling methods. • Appendix II Method 1311 Toxic Characteristic Leaching Procedure (TCLP). • Appendix III Chemical Analysis Test Methods.

For more information including [publications, inspection forms, and administrative codes and statutes](#), go to dnr.wi.gov and search “hazardous waste resources.” Use the *Additional Resources* menu to navigate to specific topics. For staff contact information, go to the [staff directory](#) and enter “hazardous waste requirements” in the subject field and choose the appropriate county contact.

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Mailing address: DNR Waste and Materials Management Program, PO Box 7921, Madison, WI 53707

Email: DNRWasteMaterials@Wisconsin.gov

Disclaimer: This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Equal Opportunity Employer and Americans with Disabilities Act Statement: The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Chief, Public Civil Rights, Office of Civil Rights, U.S. Department of the Interior, 1849 C. Street, NW, Washington, D.C. 20240.

This publication is available in alternative format (large print, Braille, etc.) upon request. Please call 608-266-2111 for more information. Note: If you need technical assistance or more information, call the Accessibility Coordinator at 608-267-7490 / TTY Access via relay – 711.

Waste Determination Summary

Waste Name/Type: _____ **Date:** _____

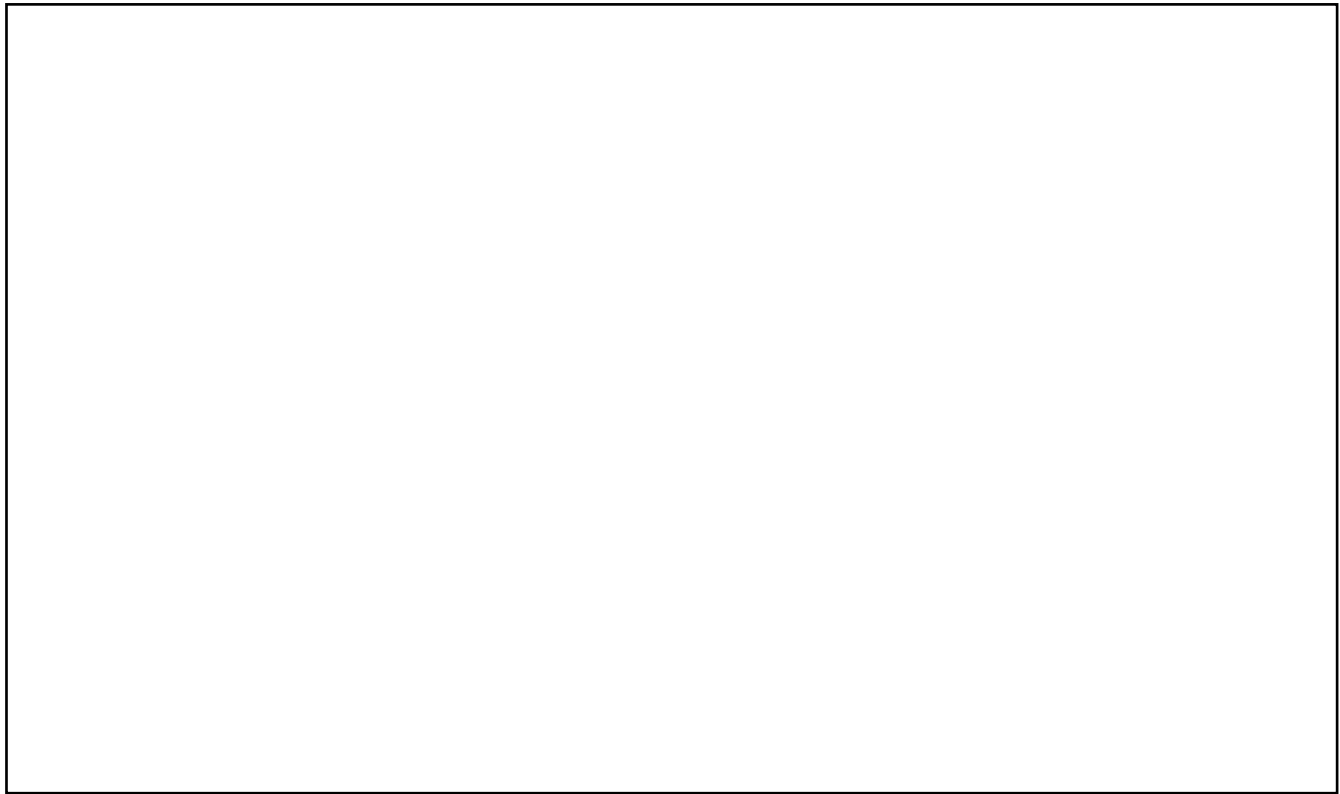
Waste Information		
Description of process generating the waste:		
Amount of waste generated per month (lbs)		
Does the waste meet the definition of solid waste? <i>See ch. NR 661.0002, Wis. Adm. Code and Secs. 289.01(33), Wis. Stats.</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If no, explain why:
Is the solid waste a hazardous waste? <i>See NR 661.0003 Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If no, attach supporting documentation
Is the hazardous waste excluded from regulation as a solid waste? <i>See NR 661.0004(1) Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, explain why:
Is the hazardous waste excluded from regulation as a hazardous waste? <i>See NR 661.0004(2) Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, explain why/ provide code citation:
Is the hazardous waste a listed hazardous waste? <i>See subch. D of ch. NR 661 Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, list waste code(s):
Is the hazardous waste a characteristic hazardous waste? <i>See subch. C of ch. NR 661 Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, list waste code(s):
Is the waste a universal waste? <i>See subch. A of ch. NR 673 Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, list waste type:
Is the waste used oil? <i>See subch. B of ch. NR 679 Wis. Adm. Code</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Supporting Documentation - Attach copies of supporting documents to this sheet		
Was laboratory analysis used to make this decision?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, Laboratory/DNR certification #: _____
Was acceptable knowledge of the material and process used to make this determination?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, Name and date of supporting documents:
Safety Data Sheet (SDS):	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, attach the SDS to this sheet.
Process Flow Diagram:	<input type="checkbox"/> On reverse of this form <input type="checkbox"/> Attached	
If hazardous waste, has the land disposal restriction document been prepared?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, attach LDR
Research Data:		
Other:		

Facility Information	
Name of Facility / Business	
EPA ID # / Facility ID # (FID)	
Name/Title of Person making determination:	
Signature:	Date:

Use the reverse side to include additional information and/or process flow diagram.

Additional Information/Explanation

Process Flow Diagram:



Note: This checklist is provided for general use by the DNR. It is not a required form.