Wastes forbidden from sink/sewer disposal

The following wastes must **NEVER** be discharged to the sanitary sewer in ANY concentration. These wastes must be collected and managed as hazardous waste.

1. Raw Chemical Waste.

Unused, pure, or concentrated chemicals.

2. Chlorinated Hydrocarbon Waste.

Chlorinated hydrocarbons are compounds that contain chlorine, hydrogen, and carbon. Examples of chlorinated hydrocarbons include but are not limited to:

a. Chloromethanes:

Specific examples:

- Methylene chloride
- Trichloromethane (chloroform)
- Trichlorofluoromethane
- b. Chloroethanes:

Specific examples:

- 1,1-Dichloroethane
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Hexachloroethane
- c. Chloroethylenes:

Specific examples:

- Vinyl chloride
- Trichloroethylene
- Tetrachloroethylene
- d. Chloropropanes, chlorobutanes, chlorobutenes:

Specific examples:

- Dichlorobutadiene
- Hexachlorobutadiene
- e. Chlorinated paraffins;
- f. Chlorinated pesticides

Specific examples:

- Aldrin
- Heptachlor epoxide
- Chlordane
- Hexachloride
- DDT
- Hexachlorobenzene
- 2,4-D
- Lindane
- Dieldrin
- Methoxychlor
- Endrin
- Mirex
- Heptachlor
- Toxaphene
- g. Nucleus-chlorinated aromatic hydrocarbons

- Dichlorobenzene
- Dichlorotoluene
- Chlorobenzene
- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- Chlorinated biphenyls (including PCBs)

- Chlorinated naphthalenes
- Pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- h. Side-chain chlorinated aromatic hydrocarbons

Specific examples:

- Chloromethyl benzene (benzyl chloride)
- Dichloromethyl benzene (benzal chloride)
- Trichloromethyl benzene (benzotrichloride).
- 3. Chlorofluorcarbon Waste
- 4. Brominated Hydrocarbon Waste

Specific examples:

- a. Bromoform
- b. Bromomethane
- 5. Cyanide Waste.

Includes cyanide, cyanate (OCN-), and thiocyanate (SCN-) compounds.

Specific examples:

- a. Potassium cyanide
- b. Sodium cyanide
- c. Hydrogen cyanide
- d. Zinc cyanide
- e. Copper cyanide
- f. Nickel cyanide.
- 6. Heavy Metal Waste.

Specific examples:

- a. Antimony
- b. Mercury
- c. Arsenic
- d. Nickel
- e. Barium
- f. Selenium
- g. Cadmium
- h. Silver
- i. Chromium
- j. Thallium
- k. Copper
- 1. Zinc
- m. Lead

7. Corrosive Waste.

Corrosive wastes are wastes that could cause corrosive structural damage to the sink/sewer piping. All wastes with a pH lower than 5.0 Standard Units (S.U.) or higher than 9.0 S.U. are considered corrosive wastes. Laboratories must not neutralize corrosive wastes to comply with this requirement unless it is part of a written protocol for the laboratory process generating the waste and the neutralization process is carried out by trained, qualified personnel.

8. Solvent Waste.

Wastes containing any of the following solvents in any concentration:

- a. Acetone
 - Please note that acetone used to wash glassware falls into this category.
- b. Ethyl Ether
- c. Benzene
- d. Isobutanol
- e. n-Butyl Alcohol
- f. Methanol
- g. Carbon Disulfide
- h. Methyl Ethyl Ketone (MEK)
- i. Carbon Tetrachloride

- j. Methyl Isobutyl Ketone
- k. Cresols
- 1. Nitrobenzene
- m. Cyclohexanone
- n. 2-Nitropropane
- o. Cresylic Acid
- p. Pyridine
- q. 2-Ethoxyethanol
- r. Toluene
- s. Ethyl Acetate
- t. Xylene
- u. Ethyl Benzene

9. Oil and Grease Wastes.

Waste oils and grease, including vacuum pump oil, must be collected and managed as hazardous wastes. Wastes that are contaminated with oil or grease in concentrations greater than 50 mg/L must also be collected and managed as hazardous waste.

10. Ignitable Wastes.

Ignitable wastes are: 1) Liquid wastes with a flashpoint less than 60 degrees C (140 degrees F); 2) Non-liquid wastes that are capable of causing fire through friction, reaction with moisture, or spontaneous chemical changes; 3) Ignitable compressed gases; or 4) Oxidizers. Ignitable wastes include most waste solvents found in laboratories, ignitable compressed gases such as hydrogen, and oxidizers such as nitrates/nitrites (sodium nitrate, potassium nitrite, etc.) and chlorates and perchlorates (magnesium perchlorate, etc.). Ignitable wastes include mixtures of ignitable chemicals with other materials if the mixture still exhibits the ignitability characteristic (i.e., flashpoint less than 60 degrees C).

11. Reactive Wastes.

Reactive wastes: 1) Are normally unstable and readily undergo violent change; 2) React violently or form explosive mixtures with water; 3) Can generate toxic gases, vapors or fumes when mixed with water or exposed to extreme pH conditions; or 4) Are capable of detonation or explosive reaction under certain conditions. Common reactive wastes found in laboratories include certain cyanides, sulfides, and silanes or any mixtures of multiple wastes that exhibit reactivity characteristics.

12. Solid or Viscous Wastes.

Solid or viscous wastes that may coat, clog, or otherwise cause obstruction to the flow of sewer pipes must never be discharged to the sewer. Examples of prohibited solid or viscous waste include sand, animal tissues, bones, plastics, rubber, glass, wood chips, wood shavings, plaster, paint, etc. in such quantity, concentration, or form that may cause interference with proper sewer flow. Depending on the nature of the waste, it may be discharged to the normal trash or collected and managed as hazardous waste.

13. Nuisance Waste.

Wastes that may cause a discoloration or that may cause interference in the Metro wastewater treatment plant must not be discharged to the sewer. Wastes that are noxious or malodorous to the extent that a nuisance may be created at the Metro wastewater treatment plant or in other laboratories must not be discharged to the sewer.

14. Untreatable Waste.

Wastes that contain any element or compound that cannot be adequately treated or removed by the Metro wastewater treatment plant (biological activated sludge treatment) and that is known to be an environmental hazard must not be discharged to the sewer.

15. Hot Liquid or Vapor Wastes.

Liquid or vapor wastes with a temperature above 65.5 oC (150 oF) must not be discharged to the sewer.

16. Ethidium Bromide and Acrylamide Waste.

Buffer solutions and other solutions containing ethidium bromide or acrylamide in any concentration and ethidium bromide and acrylamide gels.

17. **Priority Pollutant Wastes.**All wastes containing any of the following priority pollutant compounds in any concentration must be collected and managed as hazardous waste:

a. Volatiles

Benzene	Bromoform
Chlorobenzene	Chlorodibromomethane
2-Chloroethylvinyl ether	Chloroform
Dichlorodifluoromethane	1,1-Dichloroethane
1,1-Dichloroethylene	Dichloromethane
1,2-Dichloropropylene	1,3-Dichloropropylene
Ethylbenzene	Methyl bromide
Methylene chloride	1,1,2,1-Tetrachloroethane
Tetrachloroethylene	Tetrachloromethane
Trans-dichloroethylene	1,2-Trans-dichloroethylene
1,1,2-Trichloroethane	Trichloroethylene
Trichloromethane	Vinyl chloride
	Chlorobenzene 2-Chloroethylvinyl ether Dichlorodifluoromethane 1,1-Dichloroethylene 1,2-Dichloropropylene Ethylbenzene Methylene chloride Tetrachloroethylene Trans-dichloroethylene 1,1,2-Trichloroethane

b. Base/Neutral

Acenaphthene	Acenaphthylene	Anthracene
Benzidine	Benzo(a)anthracene	Benzo(a)pyrene
3,4-Benzofluoranthene	Benzo(ghi)perylene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether	Bis(2-chloromethyl)ether	Bis (2-ethylhexyl)phthalate
4-Bromophenyl phenyl ether	Butylbenzyl phthalate	2-Chloronaphthalene
4-Chlorophenyl phenyl ether	Chrysene	Dibenzo(a,h)anthracene
1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene
3,3'-Dichlorobenzidine	Di-n-ethyl phthalate	Diethyl phthalate
Di-c-methyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate
2,4-Dinitrotoluene	2,6-Dinitrotoluene	Di-n-octyl phthalate
1,2-Diphenylhydrazine	Fluroranthene	Fluorene
Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene
Hexachloroethane	Indeno(1,2,3-cd)pyrene	Naphthalene
Nitrobenzene	N-nitrosodimethylamine	N-nitrosodi-n-propylamine
N-nitrosodiphenylamine	Phenanthrene	Pyrene
1,2,4-Trichlorobenzene		

c. Pesticides

Acrolein	Aldrin	BHC, alpha
BHC, beta	BHC, delta	BHC, gamma
Chlordane	4,4'-DDT	4,4'-DDE
4,4'-DDD	Dieldrin	Endosulfan, alpha
Endosulfan, beta	Endosulfan sulfate	Endrin
Endrin aldehyde	Heptachlor	Heptachlor epoxide
Isophorone	PCB-1016	PCB-1221
PCB-1232	PCB-1242	PCB-1248
PCB-1254	PCB-1260	TCDD (Dioxin)
Toxaphene		

d. Inorganics, Metals, Phenols, and Cresols

Antimony	Arsenic	Asbestos
Beryllium	Cadmium	Chromium
Copper	Lead	Mercury
Nickel	Selenium	Silver
Thallium	Zinc	Cyanide
2-Chlorophenol	Cresols	2,4-Dichlorophenol
2,4-Dimethylphenol	4,6-Dinitro-o-cresol	2,4-Dinitrophenol
2-Nitrophenol	4-Nitrophenol	P-chloro-m-cresol
Pentachlorophenol	Phenols	2,4,6-Trichlorophenol

18. Rinseate

Empty containers that are being rinsed should be triple rinsed with a minimal amount of liquid and the rinseate collected and managed as hazardous waste, if the container held any of the wastes described above in Sections 1, 2, 3, 4, 5, 6, or 8. Subsequent rinses may be discharged to the sewer. Depending on the waste, fewer rinses may be required to be collected. Contact VEHS for evaluation of specific waste containers. Rinseate from empty containers that held other types of waste may be discharged to the sewer if the rinseate does not exhibit the hazardous characteristic of the waste (for example, rinseate from a container that held ignitable waste may be sewer disposed if the rinseate is not ignitable).

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Wastes with limited sink/sewer disposal

1. Radioactive Wastes.

A radioactive waste that is water soluble or readily dispersible in water and not prohibited from sewer disposal based on the criteria described in the previous section may be disposed via the sanitary sewer system. The disposal limit is 200 µCi per laboratory per day. Records of sewer disposal must be maintained on the Radioactive Material Usage Log.

2. Biological Materials.

Biological waste must not be discharged to the sewer unless it has been properly treated. Please refer to Proper Disposal of Biological Waste in the Guide to Biosafety at Vanderbilt for biological waste disposal policies and procedures (VEHS website). Biological waste intended for sewer disposal must not be prohibited from sewer disposal based on the criteria described in the previous section.

3. Specific Organic Chemicals in Concentrations of One Percent or Less.

Organic chemicals suitable for sink/sewer disposal are described below. Only those organic compounds that are reasonably soluble in water are suitable for sink/sewer disposal. A compound is considered water soluble if it dissolves to the extent of at least three percent. Chemicals listed below must be in concentrations of approximately one percent or less to be suitable for sink/sewer disposal. If the total volume of waste to be disposed is greater than four liters per day, approval by VEHS is required. Sewer discharges of these chemicals must not be prohibited in the previous section. Any chemicals that fall into categories described below but are specifically prohibited from sink/sewer disposal in the previous section must NOT be discharged to the sewer.

- a. Alkanols with 4 or fewer carbon atoms.
 - Specific examples:
 - 2-Butanol
 - 2-Propanol
 - Tert-butanol
 - Ethanol 1-Propanol
- b. Alkanediols with 7 or fewer carbon atoms.

Specific examples:

- Butanediol and isomers
- Butylene glycol
- Ethylene glycol
- Heptamethylene glycol
- Heptanediol and isomers
- Hexanediol and isomers
- Hexylene glycol
- Pentanediol and isomers
- Pentylene glycol
- Propylene glycol
- c. Sugars and sugar alcohols (polyols).

Specific examples:

- Dithioerythritol
- Dithiothreitol
- Erythritol
- Glycerol
- Lactitol
- Maltitol
- Mannitol
- Molasses
- Sorbitol
- Xylitol
- d. Alkoxyalkanols with 6 or fewer carbon atoms.

- Butoxyethanol
- Ethoxyethanol

- Methoxyethanol
- e. Aliphatic aldehydes with 4 or fewer carbon atoms.

Specific examples:

- Acetaldehyde
- Butyraldehyde (butanal)
- Formaldehyde
- Glutaraldehyde
- Isobutyraldehyde
- Propionaldehyde (propanal)
- f. RCONH2 and RCONHR with 4 or fewer carbon atoms and RCONR2 with 10 or fewer carbon atoms.

Specific examples:

- Acetamide
- Butanamide
- Butyramide
- Formamide
- Isobutyramide
- N,N-Diethyl formamide
- N,N-Dimethyl acetamide
- N,N-Dimethyl propionamide
- N-Ethyl acetamide
- N-Ethyl formamide
- N-Methyl acetamide
- N-Methyl formamide
- N-Methyl propionamide
- Propionamide
- g. Aliphatic amines with 6 or fewer carbon atoms.

Specific examples:

- Amylamine
- Isobutylamine
- Butylamine
- Dimethylpropylamine
- Ethylamine
- 1-Ethylpropylamine
- Hexylamine
- Isobutylamine
- Isopropylamine
- Methylamine
- Methylbutylamine
- N-Ethylbutylamine
- N-Ethylmethylamine
- N-Methylpropylamine
- Trimethylamine
- Iso-amylamine
- Diethylamine
- h. Aliphatic diamines with 6 or fewer carbon atoms.

- Ethylene diamine
- Hexamethylene diamine and isomers
- Pentamethylenediamine and isomers
- Piperazine
- 1,2-Propanediamine
- 1,3-Propanediamine
- Triethylenediamine

- i. Alkanoic acids with 5 or fewer carbon atoms and the ammonium, sodium, and potassium salts of these acids with 20 or fewer carbon atoms.
 - Specific examples:
 - Acetic acidButyric acid
 - Formic acid
 - Isobutyric acid
 - Isovaleric acid
 - Propionic acid
 - Valeric acid
- j. Alkanedioic acids with 5 or fewer carbon atoms and the ammonium, sodium, and potassium salts of these acids with 20 or fewer carbon atoms.
 Specific examples:
 - Fumaric acid
 - Glutaric acid (1,5-pentanedioic acid)
 - Malic acid
 - Malonic acid (1,3-propanedioic acid)
 - Oxalic acid (1,2-ethanedioic acid)
 - Succinic acid (1,4-butanedioic acid)
 - Tartaric acid
- k. Hydroxyalkanoic acids with 5 or fewer carbon atoms and the ammonium, sodium, and potassium salts of these acids with 20 or fewer carbon atoms.
 - Specific examples:

 Glycolic acid
 - 3-Hydroxybutyric acid
 - 2-Hydroxyisobutyric acid
 - Lactic acid (2-hydroxypropanoic acid)
- 1. Aminoalkanoic acids with 6 or fewer carbon atoms and the ammonium, sodium, and potassium salts of these acids with 20 or fewer carbon atoms.
 - Specific examples:
 - 3-Amino butyric acid
 - 4-Amino butyric acid
 - Amino isobutyric acid
 - 5-Amino pentanoic acid and isomers
 - 3-Amino propanoie acid
- m. Esters with 4 or fewer carbon atoms.

Specific examples:

- Ethyl formate
- Isopropyl acetate
- Isopropyl formate
- Methyl acetate
- Methyl formate
- Methyl propionate
- Propyl formate
- n. Nitriles.

Specific examples:

- Acetonitrile
- Butyronitrile
- Isobutylnitrile
- Propionitrile
- o. Sulfonic acids and sodium and potassium salts of the acids.

- Methane sulfonic acid
- Ethane sulfonic acid
- 1-Propane sulfonic acid
- 1-Butane sulfonic acid

- 1-Pentane sulfonic acid
- 1-Hexane sulfonic acid
- 1-Heptane sulfonic acid
- 1-Octane sulfonic acid
- 1-Decane sulfonic acid
- 1-Dodecane sulfonic acid
- 1-Tetradecane sulfonic acid
- 1-Hexadecane sulfonic acid

4. Specific Inorganic Chemicals in Concentrations of One Percent or Less.

Inorganic chemicals suitable for sink/sewer disposal are described below. Only those inorganic compounds that are reasonably soluble in water are suitable for sink/sewer disposal. A compound is considered water soluble if it dissolves to the extent of at least three percent. Chemicals listed below must be in concentrations of approximately one percent or less to be suitable for sink/sewer disposal. If the total volume of waste to be disposed is greater than four liters per day, approval by VEHS is required. Sewer discharges of these chemicals must not be prohibited in the previous section. Any chemicals that fall into categories described below but are specifically prohibited from sink/sewer disposal in the previous section must NOT be discharged to the sewer.

a. Inorganic salts cations and anions:

Cations	Anions
Aluminum, Al3+	Borate, BO33-, B4O72-
Ammonium, NH4+	Bromide, Br-
Calcium, Ca2+	Carbonate, CO32-
Cesium, Cs+	Chloride, Cl-
Hydrogen, H+	Bisulfite, HSO3-
Lithium, Li+	Hydroxide, OH-
Magnesium, Mg2+	Oxide, O2-
Potassium, K+	Iodide, I-
Sodium, Na+	Nitrate, NO3-
Strontium, Sr2+	Phosphate, PO43-
Tin, Sn2+	Sulfate, SO42-
Titanium, Ti3+, Ti4+	
Zirconium, Zr2+	

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References

- 1. Tennessee Department of Environment and Conservation (TDEC) Rule 1200-1-11.
- 2. Metropolitan Government of Nashville and Davidson County Code of Laws Title 15.60.
- 3. Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, D.C., 1981.
- 4. <u>Prudent Practices for Disposal of Chemicals from Laboratories</u>, National Academy Press, Washington, D.C., 1983.
- 5. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy Press, Washington, D.C., 1995.

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Summary of specific chemicals forbidden from sewer disposal

The following chemicals must not be discharged to the sanitary sewer in any concentration. This list contains examples of specific chemicals and does NOT include all chemicals that are forbidden from sewer disposal. For more information on whether a chemical not listed below can be discharged to the sewer, refer to the detailed sections in this guide or contact VEHS.

Acenaphthene	Acenaphthylene
Acetone	Acrolein
Acrylamide	Acrylonitrile
Aldrin	Anthracene
Antimony	Arsenic
Asbestos	Barium
Benzene	Benzidine
Benzo(a)anthracene	Benzo(a)pyrene
Benzo(b)fluoranthene	Benzo(ghi)perylene
3,4-Benzofluoranthene	Benzo(k)fluoranthene
Beryllium	BHC, alpha
BHC, beta	BHC, delta
BHC, gamma	Bis (2-ethylhexyl)phthalate
Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether	Bis(2-chloromethyl)ether
Bromoform	Bromoform
Bromomethane	4-Bromophenyl phenyl ether
Butylbenzyl phthalate	Cadmium
Carbon Disulfide	Carbon Tetrachloride
Chlordane	2-Chloroethylvinyl ether
Chlorinated biphenyls (including PCBs)	Chlorinated naphthalenes
Chlorobenzene	Chlorodibromomethane
Chloroethane	Chloroform
Chloromethyl benzene (benzyl chloride)	2-Chloronaphthalene
2-Chlorophenol	4-Chlorophenyl phenyl ether
Chromium	Chrysene
Соррег	Copper cyanide
Cresols	Cresylic Acid
Cyanide	Cyclohexanone
2,4-D	DDT
4,4'-DDD	4,4'-DDE
4,4'-DDT	Dibenzo(a,h)anthracene

Dichlorobenzene	1,2-Dichlorobenzene
1,3-Dichlorobenzene	1,4-Dichlorobenzene
3,3'-Dichlorobenzidine	Dichlorobromomethane
Dichlorobutadiene	Dichlorodifluoromethane
1,1-Dichloroethane	1,2-Dichloroethane
1,1-Dichloroethylene	1,2-Trans-dichloroethylene
Dichloromethane	Dichloromethyl benzene (benzal chloride)
2,4-Dichlorophenol	1,2-Dichloropropane
1,2-Dichloropropylene	1,3-Dichloropropylene
2,4-Dichloropropylene	Dichlorotoluene
Di-c-methyl phthalate	Dieldrin
Diethyl phthalate	2,4-Dimethylphenol
Dimethyl phthalate	2,4-Dinitrophenol
Di-n-butyl phthalate	Di-n-ethyl phthalate
Di-n-octyl phthalate	4,6-Dinitro-o-cresol
2,6-Dinitrotoluene	1,2-Diphenylhydrazine
Endosulfan sulfate	Endosulfan, alpha
Endosulfan, beta	Endrin
Endrin aldehyde	Ethidium Bromide
2-Ethoxyethanol	Ethyl Acetate
Ethyl Benzene	Ethyl Ether
Ethylbenzene	Fluorene
Fluroranthene	Heptachlor
Heptachlor epoxide	Hexachloride
Hexachlorobenzene	Hexachlorobutadiene
Hexachlorocyclopentadiene	Hexachloroethane
Hydrogen cyanide	Indeno(1,2,3-cd)pyrene
Isobutanol	Isophorone
Lead	Lindane
Mercury	Methanol
Methoxychlor	Methyl bromide
Methyl chloride	Methyl Ethyl Ketone (MEK)
Methyl Isobutyl Ketone	Methylene chloride
Mirex	Naphthalene
n-Butyl Alcohol	Nickel
Nickel cyanide	Nitrobenzene
2-Nitrophenol	4-Nitrophenol
2-Nitropropane	N-nitrosodimethylamine

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N-nitrosodi-n-propylamine	N-nitrosodiphenylamine
PCB-1016	PCB-1221
PCB-1232	PCB-1242
PCB-1248	PCB-1254
PCB-1260	P-chloro-m-cresol
Pentachlorophenol	Phenanthrene
Phenols	Potassium cyanide
Pyrene	Pyridine
Selenium	Silver
Sodium cyanide	TCDD (Dioxin)
1,1,2,1-Tetrachloroethane	1,1,2,2-Tetrachloroethane
Tetrachloroethylene	Tetrachloromethane
Thallium	Toluene
Toxaphene	Trans-dichloroethylene
1,2,4-Trichlorobenzene	1,1,1-Trichloroethane
1,1,2-Trichloroethane	Trichloroethylene
Trichlorofluoromethane	Trichloromethane (chloroform)
Trichloromethyl benzene (benzotrichloride)	2,4,5-Trichlorophenol
2,4,6-Trichlorophenol	Vinyl chloride
Xylene	Zinc
Zinc cyanide	

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Summary of specific chemicals with limited sewer disposal

The following chemicals may be discharged to the sewer in concentrations of approximately one percent or less. If the percentage is greater than one percent, approval by VEHS is required. If the total volume of waste to be disposed is greater than four liters per day, approval by VEHS is required. Sewer discharges of these chemicals must not be prohibited for any other reason. Specifically, solutions containing these chemicals must not also contain chemicals specifically forbidden from sewer disposal. This list contains examples of specific chemicals and does NOT include all chemicals with limited discharge to the sewer. For more information on whether a chemical not listed below can be discharged to the sewer, refer to the detailed sections in this guide or contact VEHS.

Acetaldehyde	Acetamide
Acetic acid	Acetonitrile
3-Amino butyric acid	4-Amino butyric acid
Amino isobutyric acid	5-Amino pentanoic acid and isomers
3-Amino propanoic acid	Amylamine
Butanamide	Butanediol and isomers
1-Butane sulfonic acid	2-Butanol

Butoxyethanol	Butylamine
Butylene glycol	Butyraldehyde (butanal)
Butyramide	Butyric acid
Butyronitrile	1-Decane sulfonic acid
Diethylamine	Dimethylpropylamine
Dimethyl sulfoxide (DMSO)	Dithioerythritol
Dithiothreitol	1-Dodecane sulfonic acid
Erythritol	Ethane sulfonic acid
Ethanol	Ethoxyethanol
Ethyl formate	Ethylamine
Ethylene diamine	Ethylene glycol
1-Ethylpropylamine	Formaldehyde
Formamide	Formic acid
Fumaric acid	Glutaraldehyde
Glutaric acid (1,5-pentanedioic acid)	Glycerol
Glycolic acid	Heptamethylene glycol
Heptanediol and isomers	1-Heptane sulfonic acid
1-Hexadecane sulfonic acid	Hexamethylene diamine and isomers
1-Hexane sulfonic acid	Hexanediol and isomers
Hexylamine	Hexylene glycol
3-Hydroxybutyric acid	2-Hydroxyisobutyric acid
Iso-amylamine	Isobutylamine
Isobutylamine	Isobutylnitrile
Isobutyraldehyde	Isobutyramide
Isobutyric acid	Isopropyl acetate
Isopropyl formate	Isopropylamine
Isovaleric acid	Lactic acid (2-hydroxypropanoic acid)
Lactitol	Malic acid
Malonic acid (1,3-propanedioic acid)	Maltitol
Mannitol	Methane sulfonic acid
Methoxyethanol	Methyl acetate
Methyl formate	Methyl propionate
Methylamine	Methylbutylamine
Molasses	N,N-Diethyl formamide
N,N-Dimethyl acetamide	N,N-Dimethyl propionamide
N,N-Dimethyl acetamide	N,N-Dimethyl propionamide

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N-Methyl propionamide	N-Methylpropylamine
1-Octane sulfonic acid	Oxalic acid (1,2-ethanedioic acid)
Pentamethylenediamine and isomers	Pentanediol and isomers
1-Pentane sulfonic acid	Pentylene glycol
Piperazine	1,2-Propanediamine
1,3-Propanediamine	1-Propane sulfonic acid
1-Propanol	2-Propanol
Propionaldehyde (propanal)	Propionamide
Propionic acid	Propionitrile
Propyl formate	Propylene glycol
Sorbitol	Succinic acid (1,4-butanedioic acid)
Tartaric acid	Tert-butanol
1-Tetradecane sulfonic acid	Triethylenediamine
Trimethylamine	Valeric acid
Xylitol	