UPPSALA VATTEN

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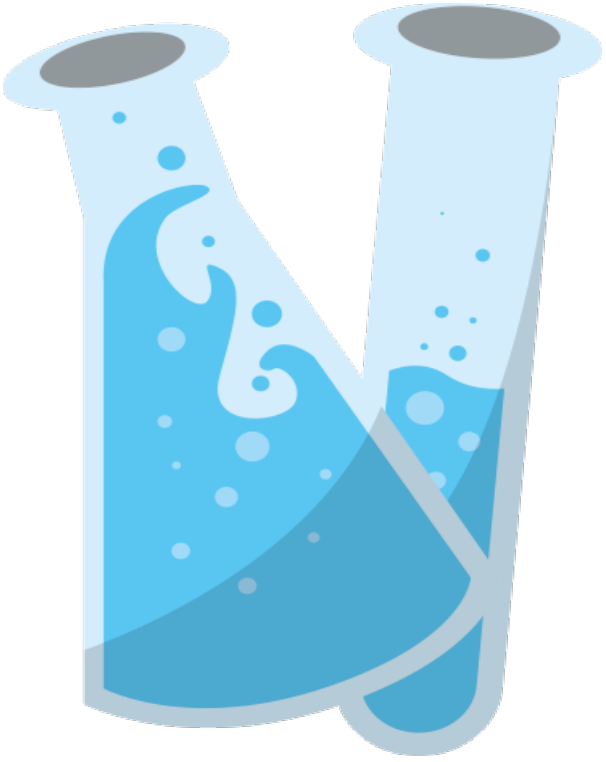
Restrictions on periodic discharges of liquid waste and residues to the sewerage in Uppsala municipality



The need of guidelines

The wastewater treatment plants are mainly built to treat wastewater from households. A condition to collect other types of wastewaters is that it does not contain unwanted substances, have damaging properties on the sewerage or negatively affect the treatment processes, sludge or recipients.

Uppsala Vatten has, together with other municipalities, drafted guidelines for discharging wastewater from industries and other organisations. It is titled ”Riktlinjer för utsläpp av avloppsvatten från industrier och andra verksamheter” (nicknamed ”Näckrosen”) and is published on Uppsala Vatten’s website: Riktlinjer för utsläpp av avloppsvatten. It describes the highest permissible levels of metals and substances affecting the pipes and permissible levels for nitrification inhibiting substances at the access point to the municipal wastewater treatment plant. The groups of bacteria that transforms ammonium to nitrate (nitrification) are especially sensitive to toxic substances. There are however no specified limits on organic substances, which relatively often can disrupt the nitrification process in municipal wastewater treatment plants.

A need for a more tangible guidelines complementing ”Näckrosen” was raised regarding, among others, Uppsala’s many laboratories. These guidelines are an attempt to fulfil this request.

The target groups are organisations where it sometimes develops liquid waste or residues. Regular discharge of wastewater is assessed according to other guidelines in consultation with Uppsala Vatten.

The first version of this document was issued in 2008. This is a revised version adapted to new guidelines to meet the demands in Revaq[1] – the sludge certification system.

Uppsala Vatten’s sludge production at Kungsängsverket (the wastewater treatment plant in Kungsängen) got certified by Revaq in January 2013. See appendix 1 for more information about the treatment process at Kungsängsverket. Uppsala Vatten strives to close the nutrient cycle by using sludge from the municipality’s wastewater treatment plants as fertilizer on agricultural land. To receive a sustainable cycle it is important that the sludge is of high quality and that the wastewater arriving at the treatment plant is free from substances harming the environment.

The purpose of these guidelines is to highlight that liquid waste and residues with *treatable* and *harmless substances* should be discharged into the sewage, while unwanted substances should be prevented to reach the wastewater system, e.g. by disposal as waste. Hopefully, with time, there will be a successive improvement of discharge into the wastewater system if the efforts can focus on the substances causing the main problems (e.g. cadmium, chlorinated hydrocarbon and non-degradable toxic organic substances).

[1] *Aktivt uppströmsarbete med Revaq-certifiering - Svenskt Vatten*

Guidelines

The purpose of these guidelines is to advise on how liquid waste and residues from for example laboratories should be handled in a suitable way. The guidelines are mainly meant to be used for small amounts of liquid chemical residues and unconsumed solutions. There might be occasional need of disposing relatively large volumes of bulk liquids, which is described in a section further down.

If a substance is missing in the lists, it does not mean that it can be disposed of in the sewage. If this occurs, or if there are other uncertainties, please contact Uppsala Vatten for advice.

Unwanted substances (toxic, non-degradable or in other way unsuitable for treatment in the wastewater treatment plant) at low levels, where water volumes are so high that collection and disposal are unrealistic (e.g. in dish water) are, for practical reasons, usually led to the sewerage. If possible, an environmentally friendly component should be used instead. However, if the discharge with undesired substances is large and frequent, it may be necessary to perform local treatment (e.g. biological treatment, ozone treatment or carbon filtration) before discharging into the sewerage. Chemicals in original packaging should normally be disposed of as waste. If required, pH must be adjusted for the diluted solution so that the pH is within the range of 6.5-11.

Hazardous waste

According to The Swedish Environmental Code, waste should be handled without the risk of damaging human health or the environment. The waste regulation states that hazardous waste should not be mixed or diluted with other kinds of hazardous waste or other kinds of waste, substances or materials. It is therefore not allowed to dispose hazardous waste in the sewerage, instead it should be taken care of at a special facility.

Phase-out substances

Substances listed on The Swedish Chemical Agency's PRIO-list (prioritized substances to be phased out), the SIN-list (Substitute It Now!) and under "Tillkommande kemiska ämnen" (Eng. Added chemical substances) according to appendix 4 in the Revaq-rules cannot be released to the sewerage at all. Laboratories using such substances should contact Uppsala Vatten to agree on an action plan on how to substitute these substances or how to otherwise terminate these discharges.

Pharmaceutical products

Pharmaceutical product residues from the production of active substances cannot be released to the sewerage according to Revaq's rules. Laboratories using such substances should contact Uppsala Vatten to agree on an action plan on how to terminate these discharges.

Handling of different substances

Inorganic substances

Metals

All liquids containing cadmium, mercury and thallium shall be collected and disposed as hazardous waste. Small amounts of water (<a few litres) containing >1 mg/l of lead, nickel, chromium, bismuth, tungsten or silver shall also be collected and handled as hazardous waste. Small amounts of other commonly used metals in diluted form can be allowed to be

discharged to the sewerage. The following metals can normally be discharged in limited quantities without any problems: Na, K, Li, Mg, Ca, Ti (IV), Mn (IV), Fe and Al (Note: not Mn (VII) oxide). The permissible levels as specified in ”Näckrosen” for metals cannot be exceeded.

Other inorganic substances
In ”Näckrosen” there are permissible levels (momentary levels) for corrosive and other unwanted substances at the municipality’s sewerage access point, where there probably already has been a substantial dilution. There is however a great risk for the buildings own pipelines to be damaged by high levels of some undiluted inorganic substances. The most common acids (hydrochloric acid, sulfuric acid and phosphoric acid) and bases (lye, soda, ammonia, lime) should be neutralized (to pH 6,5-11) locally and then diverted to the sewerage to avoid this. Nitric acid should not be neutralized due to the risk of forming harmful gases and should therefore be treated as hazardous waste. Solutions of hydrofluoric acid and hexafluorosilicic acid should be treated as hazardous waste regardless of the concentration. Water solutions with carbonates and silicates are considered harmless in this context.

Organic substances

Organic substances have been divided into five groups. The specified amounts refer to 100% concentration of the actual substance for a workplace or laboratory unit. The following conditions are based on amounts per unit of time and thus independent of the level of dilution. Note: Consider the risk of ignition, explosion or poor working environment during handling.

Conditions (Swe: “villkor”) for discharge to the sewerage

Villkor 0	Only traces of the subject in question (max 1 g / day) may be in large volumes, e.g. in dish water. Concentrated substances and solutions shall be handled separately, e.g. as hazardous waste.
Villkor 1	Discharges of max 10 g / day may occur.
Villkor 2	Discharges of max 1.0 kg / day may occur.
Villkor 3	Discharges of max 10 kg / day may occur.
Villkor 4	Discharges of max 100 kg / hour may occur (Note: In this case per hour).

In the table of organic substances below, compounds containing more elements than carbon, hydrogen and oxygen have been placed in a subgroup. Example: A compound containing carbon, hydrogen, oxygen, nitrogen and sulphur has probably been placed in the subgroup "Sulphur compounds" and not in the significantly larger group "Nitrogen compounds". One may therefore need to look for several places for a certain organic substance. Liquids with halogenated hydrocarbons should as much as possible be collected and handled as waste.

Substances classified as risk reduction (Swe. riskminskning) or phase-out (Swe. utfasning) substances in the Swedish Chemicals Agency’s PRIO database are listed in the table entitled *rm* and *uf*, respectively. Substances from the SIN list (SIN = Substitute It Now!) are labelled *sin*. Substances found in REACH are labelled *can* (candidate list), *re* (restriction list) and *au* (authorization list). Substances found in the Water Framework Directives list of priority substances are labelled *v*.

Note: All the different lists are updated regularly. The original lists will take precedence:
Search in the Prio Database - Kemikalieinspektionen
SIN List (chemsec.org)
Candidate List of substances of very high concern for Authorisation - ECHA (europa.eu)
Priority substances - Water - Environment - European Commission (europa.eu)

(Names and classifications are in Swedish, "Villkor" = condition, "som avfall" = as waste)

Substance (CAS-number)	Formula	Classification	Note
Aldehydes			
Formaldehyd (50-00-0)	HCHO	Villkor 0	uf, sin
Acetaldehyd (75-07-0)	CH_3CHO	Villkor 0	uf sin
Acrolein (107-02-8)	CH_2CHCHO	Villkor 0	rm
Glutaraldehyd (111-30-8)	$C_3H_6(CHO)_2$	Villkor 2	rm
Bensaldehyd (100-52-7)	$C_6H_5(CHO)$	Villkor 1	
Paraformaldehyd (30505-89-4)	$(HCHO)_x$	Villkor 2	
Malondialdehyd (542-78-9)	$CH_2(CHO)_2$	Villkor 1	
Glyoxal (107-22-2)	CHOCHO	Villkor 2	rm
Metylglyoxal (78-98-8)	$CH_2CHOCHO$	Villkor 2	
Ftalaldehyd (643-79-8)	$C_6H_4CHOCHO$	Villkor 0	
Ketones			
Aceton (dimetylketon) (67-64-1)	$(CH_3)_2CO$	Villkor 2	
Metylvinylketon (78-94-4)	$CH_3COC_2H_3$	Villkor 1	
MEK (metyletylketon) (78-93-3)	$CH_3COC_2H_5$	Villkor 2	
MIBK (108-10-1) (metylisobutylketon)	$(CH_3)_2CHCH_2COCH_3$ eller $C_6H_{12}O$	Villkor 2	
Cyklohexanon (108-94-1)	$C_6H_{10}O$	Villkor 1	
Aliphatic compound (only carbon and hydrogen)			
Pentan (109-66-0)	C_5H_{12}	Villkor 1	
Hexan	C_6H_{14}	Som avfall	sin
Heptan (142-82-5)	C_7H_{16}	Villkor 1	rm
Aromatic compound (without nitrogen)			
Bensen (71-43-2)	C_6H_6	Som avfall	uf, v, sin, re
Toluen (108-88-3)	$C_6H_5CH_3$	Villkor 1	re
Xylen (1330-20-7)	$C_6H_4(CH_3)_2$	Villkor 1	
Hexan (110-54-3)	C_6H_{14}	Villkor 0	
Cyklohexan (110-82-7)	C_6H_{12}	Villkor 0	rm, re
Naftalen (91-20-3)	$C_{10}H_8$	Som avfall	rm, v, sin
Antron (90-44-8)	$C_{14}H_{10}O$	Villkor 0	
Fenol (108-95-2)	C_6H_5OH	Villkor 1	rm
Difenyl (92-52-4)	$C_{12}H_{10}$	Villkor 1	rm
Kresoler (1319-77-3)	C_7H_8O	Villkor 1	

Xylenoler (1300-71-6)	$C_8H_{10}O$	Villkor 1	
Difenyloxid (101-84-8)	$C_{12}H_{10}O$	Villkor 0	
Hydrokinon (123-31-9) (parahydroxyfenol)	$C_6H_4(OH)_2$	Villkor 1	rm
Tetrahydrofuran (109-99-9)	C_4H_8O	Villkor 0	
Nonylfenol (104-40-5)	$C_{15}H_{24}O$	Som avfall	uf, sin, can
Nonylfenoletoxilater	$(C_{15}H_{23}O)_nH$	Som avfall	Vissa är uf
Oktylfenol (140-66-9)	$C_{14}H_{22}O$	Som avfall	uf, v, sin, can
Oktylfenoletoxilater	$C_{14}H_{21}(OCH_2CH_2)_nOH$	Som avfall	uf, sin
Benzylbensoat (120-51-4)	$C_{14}H_{12}O_2$	Villkor 0	
Kumarin (91-64-5)	$C_9H_6O_2$	Villkor 2	

Acetates

Etylacetat (141-78-6)	$CH_3COOC_2H_5$	Villkor 2	
n-Butylacetat (123-86-4)	$CH_3COOC_4H_9$	Villkor 2	
Amylacetat (628-63-7)	$CH_3COOC_5H_{11}$	Villkor 2	

Alcohols

Metanol (67-56-1)	CH_3OH	Villkor 4	rm, re
Etanol (64-17-5)	C_2H_5OH	Villkor 4	
Propanol (71-23-8)	C_3H_7OH	Villkor 4	
Isopropanol (67-63-0)	C_3H_7OH	Villkor 3	
n-Butanol (71-36-3)	C_4H_9OH	Villkor 3	
Isobutanol (78-83-1)	C_4H_9OH	Villkor 3	
sek-Butanol (78-92-2)	C_4H_9OH	Villkor 1	
tert-Butanol (75-65-0)	C_4H_9OH	Villkor 0	
n-Pentanol (71-41-0)	$C_5H_{11}OH$	Villkor 3	
tert-Pentanol (75-85-4)	$C_5H_{11}OH$	Villkor 1	
Glycerol (56-81-5)	$C_3H_5(OH)_3$	Villkor 4	
Mannitol (87-78-5)	$C_6H_8(OH)_6$	Villkor 2	
Brij 35 (alkoholetoxilat) (9002-92-0)	$C_{12}H_{26}O(C_2H_4O)_{1-3}$	Villkor 1	
Alkohol, etoxilerad	$C_nH_nO_n$	Villkor 2	
2-fenoxietanol	$C_8H_{10}O_2$	Villkor 2	

Note: For alcohols, also view the section "Waste from various bulk liquids". They are often heavily contaminated with metals and contain corrosion inhibitors.

Glycols

Monoetylenglykol (107-21-1)	$C_2H_4(OH)2$	Villkor 3	
Dietylenglykol (111-46-6)	$C_4H_{10}O_3$	Villkor 2	
Propylenglykol (57-55-6)	$C_3H_8O_2$	Villkor 4	
Dipropylenglykol (110-98-5)	$C_6H_{14}O_3$	Villkor 2	
Dipropylenglykolmetyleter	$C_7H_{16}O_3$	Villkor 2	

(DPMGE, 34590-94-8)

Note: For glycols, also view the section "Waste from various bulk liquids". They are often heavily contaminated with metals and contain corrosion inhibitors.

Sugars

Glukos (50-99-7)	$C_6H_{12}O_6$	Villkor 4	
Stärkelse (9005-25-8)	$(C_6H_{10}O_5)_n$	Villkor 4	
Dextran (9004-54-0)	$H(C_6H_{10}O_5)_xOH$	Villkor 4	
D-sorbitol (50-70-4)	$C_6H_{14}O_6$	Villkor 3	
Chitosan (9012-76-4)	$C_6H_{11}NO_4$	Villkor 3	
Pektin (9000-69-5)	$(C_6H_8O_6)n$	Villkor 3	

Sulfuric substances

Koldisulfid (75-15-0)	CS_2	Som avfall	rm, sin
Dimetylsulfoxid (DMSO) (67-68-5)	C_2H_6OS	Villkor 0	
Guanidiniumtiocyanat (593-84-0)	$C_2H_6N_4S$	Villkor 1	
Merkaptoetanol (60-24-2)	C_2H_6OS	Villkor 0	
Sulfaminsyra (5329-14-6)	H_3NO_3S	Villkor 2	
Natriumlaurylsulfat (151-21-3)	$C_{12}H_{25}NaO_4S$	Villkor 2	
Disulfiram (antabus) (97-77-8)	$C_{10}H_{20}N_2S_4$	Villkor 0	rm
Sulfanilamid (63-74-1)	$C_6H_8N_2SO_4$	Villkor 0	
Tiosemikarbazid (79-19-6)	CH_5N_3S	Villkor 0	
Kathon (55965-84-9)		Villkor 0	rm
1,2-benzisotiazol-3(2H)-on (2634-33-5)	C_7H_5NSO	Villkor 0	rm

Warning: Many organic sulphur compounds are highly toxic for bacterial oxidation of ammonium to nitrate (nitrification) in biological nitrogen removal from wastewater.

Phthalates

Dimetylftalat (131-11-3)	$C_{10}H_{10}O_4$	Villkor 2	
Dietylftalat (84-66-2)	$C_{12}H_{14}O_4$	Som avfall	sin
Dibutylftalat (DBP) (84-74-2)	$C_{16}H_{22}O_4$	Som avfall	uf, sin, can, au, re
Bensylbutylftalat (85-68-7)	$C_{19}H_{20}O_4$	Som avfall	uf, v, sin, can, au, re
Dietylhexylftalat (DEHP) (117-81-7)	$C_{24}H_{38}O_4$	Som avfall	uf + sin
Dioktylftalat (117-84-0)	$C_{24}H_{38}O_4$	Villkor 1	sin, re
Kaliumväteftalat (877-24-7)	$C8H_5KO4$	Villkor 1	

Nitrogen substances

Natriumazid (26628-22-8)	NaN_3	Villkor 0	rm
Formamid (75-12-7)	CH_3NO	Som avfall	uf, sin, can
Dimetylformamid, DMF	C_3H_7NO	Som avfall	uf, sin, can

(68-12-2)			
Hydrazin (302-01-2)	H_4N_2	Som avfall	uf, sin
Acetamid (60-35-5)	CH_3CONH_2	Villkor 2	
Anilin (62-53-3)	$C_6H_5NH_2$	Som avfall	rm, sin
Acetonitril (75-05-8)	C_2H_3N	Villkor 2	
Metylamin (74-89-5)	CH_5N	Villkor 2	
Etanolamin (141-43-5)	C_2H_7NO	Villkor 2	
Etylendiamin (107-15-3)	$C_2H_8N_2$	Som avfall	uf, sin, can
Dimetylamin (124-40-3)	C_2H_7N	Villkor 2	
Dietanolamin (111-42-2)	$C_4H_{11}NO_2$	Villkor 2	
Propylamin (107-10-8)	C_3H_9N	Villkor 2	
Trimetylamin (75-50-3)	C_3H_9N	Villkor 2	
Trietylamin (121-44-8)	$C_6H_{15}N$	Villkor 1	
Pyridin (110-86-1)	C_5H_5N	Villkor 2	
Trietanolamin (102-71-6)	$C_6H_{15}NO_3$	Villkor 2	
Tripyridyltriazin (TPTZ) (3682-35-7)	$C_{18}H_{12}N_6$	Villkor 0	
Pikrinsyra (trinitrofenol) (88-89-1)	$C_6H_2OH(NO_2)_3$	Villkor 0	
4-nitrofenol (100-02-7)	$C_6H_5NO_3$	Som avfall	sin
Akrylamid, monomer (79-06-1)	C_3H_5NO	Som avfall	uf, sin, can, re
Polyakrylamid (9003-05-8)	$(C_3H_5NO)_x$	Villkor 3	
Metylpyrrolidon (872-50-4)	C_5H_9NO	Som avfall	uf, sin, can, re
Dimetylaminopyridin (1122-58-3)	$C_7H_{10}N_2$	Villkor 0	
Cyklohexylamin (108-91-8)	$C_6H_{13}N$	Villkor 2	
Bensotriazol (95-14-7)	$C_6H_5N_3$	Villkor 1	
Tolytriazol (29385-43-1)	$C_7H_7N_3$	Villkor 1	
Glycidamid (126-93-2)	$C_8H_{15}NO_2$	Villkor 2	
Dimetylanilin (DMA) (121-69-7)	$(CH_3)_2C_6H_3NH_2$	Villkor 1	
Urea (57-13-6))	$(NH_2)_2CO$	Villkor 2	
Fenidon (92-43-3) (1-fenyl-3-pyrozolidinon)	$C_9H_{10}N_2O$	Villkor 0	
Bronopol (52-51-7)	$C_3H_6BrNO_4$	Villkor 0	
DAB (7411-49-6)	$C_{12}H_{18}Cl_4N_4$	Villkor 0	
Natriumdikloroisocyanurat (51580-86-0)	$C_3HCl_2N_3O_3$	Villkor 0	rm
Imidazol (288-32-4)	$C_3H_4N_2$	Som avfall	uf, sin
Niacin (nikotinsyra) (59-67-6)	$C_6H_5NO_2$	Villkor 1	
Hydroxylammoniumklorid (5470-11-1)	NH_4OCl	Villkor 0	rm
Bensidin och dess derivat (92-87-5)	$C_{12}H_{14}N_4$	Som avfall	uf, sin, re
Diaminonaftalen (2243-62-1)	$C_{10}H_{10}N_2$	Villkor 0	rm

Tiourea (62-56-6)	CH_4N_2S	Som avfall	

Ethers

Etylenoxid (75-21-8)	C_2H_4O	Som avfall	uf, sin
Dietyleter, Eter (60-29-7)	$(C_2H_5)_2O$	Villkor 0	
Etylvinyleter (109-92-2)	C_4H_8O	Villkor 1	
Dioxan (123-91-1)	$C_4H_8O_2$	Som avfall	sin
Acetyleter (108-24-7)	$C_4H_6O_3$	Villkor 2	
Tetrahydrofuran (109-99-9)	C_4H_8O	Villkor 0	
Difenyleter (101-84-8)	$C_{12}H_{10}O$	Villkor 0	
Etylenglykolmonoetyleter (Cellosolve, 110-80-5)	$C_2H_5OCH_2CH_2OH$	Som avfall	uf, sin, can
Dietylenglykolmonoetyl--eter (Karbitol, 111-90-0)	$C_2H_5(OCH_2CH_2)_2OH$	Villkor 2	
Dietylenglykolmonobutyl-(eter, Butylkarbitol, 112-34-5)	$C_4H_9(OCH_2CH_2)_2OH$	Villkor 2	re

Organic acids

Citronsyra (77-92-9)	$C_6H_8O_7$	Villkor 4	
Myrsyra (64-18-6)	$HCOOH$	Villkor 4	
Ättiksyra (64-19-7)	CH_3COOH	Villkor 4	
Perättiksyra	CH_3COOOH	Villkor 2	
Glykolsyra (79-14-1)	CH_3OCOOH	Villkor 3	
Propionsyra (79-09-4)	C_2H_5COOH	Villkor 3	
Smörsyra (107-92-6)	C_3H_7COOH	Villkor 2	
Mjölksyra (50-21-5)	$C_2H_4(OH)COOH$	Villkor 3	
Palmitinsyra (57-10-3) (hexadekansyra)	C16:0 dubbelbindningar	Villkor 2	
Stearinsyra (57-11-4) (oktadekansyra)	C18:0	Villkor 2	
Oljesyra (112-80-1) (oktadekensyra)	C18:1	Villkor 2	
Linolsyra (60-33-3) (oktadekadiensyra)	C18:2	Villkor 2	
Cyanoättiksyra (372-09-8)	$C_3H_3NO_2$	Villkor 0	
Trifluorättiksyra (76-05-1)	$C_2HF_3O_2$	Villkor 0	
Trifluormetansulfonsyra (1493-13-6)	CHF_3O_3S	Villkor 0	
Maleinsyra (110-16-7)	$C_3H_4O_4$	Villkor 2	rm
Askorbinsyra (50-81-7)	$C_6H_8O_6$	Villkor 3	
Glutaminsyra (L: 56-86-0, D: 6893-26-1)	$C_5H_9NO_4$	Villkor 2	
Bärnstenssyra (110-15-6)	$C_4H_6O_4$	Villkor 3	
Bensoesyra (65-85-0)	$C_7H_6O_2$	Villkor 3	

Note: Large amounts of unsaturated C-18 fatty acids can give rise to problems in the treatment plant's active sludge step (brown foam and poor sinking properties for the biosludge).

Chelating agents

EDTA (60-00-4)	$C_{10}H_{16}N_2O_8$	Villkor 0	
NTA (139-13-9)	$C_6H_9NO_6$	Villkor 1	
Fosfonater	$OP(OR)_2R$	Villkor 1	

Siloxane

Polydimetylsiloxan (63148-62-9)	$(C_2H_6SiO)_n$	Villkor 1	
Cykliska siloxaner (D4-D6)	$(C_2H_6SiO)_n$	som avfall	uf, sin, can, re
Natriumsilikat (1344-09-8)	$NaSiO_3H$	Villkor 1	
Kaliumsilikat (1312-76-1)	$KSiO_3H$	Villkor 1	
Hexadecyltrimetoxisilan (16415-12-6)	$C_{19}H_{42}O_3Si$	Villkor 1	
Trietoxyoktylsilan (2943-75-1)	$C_{14}H_{32}O_3Si$	Villkor 1	

Various organic substances

Tributylfosfat (126-73-8)	$C_{12}H_{27}O_4P$	Villkor 1	
Metylaminofenolsulfat (55-55-0)	$C_{14}H_{20}N_2O_6S$	Villkor 0	rm
Natriumcyanoborhydrid (25895-60-7)	$NaBH_3CN$	Villkor 0	
Borsyra (11113-50-1)	$B(OH)_3$	Som avfall	uf, sin, can
Triklormetan (67-66-3)	$CHCl_3$	Som avfall	rm, re
Jodmetan (74-88-4)	CH_3I	Som avfall	
Isobutylkloroformat (543-27-1)	$C_5H_9ClO_2$	Som avfall	

Waste from various bulk liquids (relatively large volumes on occasional occasions)
Liquids from heating and cooling systems can have a very heterogenous composition. The most common combinations are listed here:

- Coolant and heat-transfer liquid based on monoethylene glycol
- Coolant and heat-transfer liquid based on propylene glycol
- Coolant and heat-transfer liquid based on ethanol
- Coolant and heat-transfer liquid based on formiates and/or acetates
- Coolant and heat-transfer liquid based on glycerol
- Coolant and heat-transfer liquid based on calcium chloride
- Coolant and heat-transfer liquid without any antifreeze agent

When draining heating and cooling systems, the liquid usually contains some antifreeze agent (e.g. glycol), some corrosion inhibitor (e.g. benzotriazole or tolyltriazole) and metal residue. Measurements done in Stockholm have shown that particularly liquids with antifreeze agents can contain a very high metal content and strongly inhibit the nitrification process. Four out of ten analysed liquids had more than 60 % inhibition at 0,3 % mixture. The variation for the inhibition was large and probably dependent on which corrosion inhibitor used (usually not specified).

Larger amounts of bulk solutions cannot be disposed in the sewerage. A dispose of some cubic meter of a strongly nitrification inhibited wastewater with an antifreeze agent during a short time can disturb the treatment processes at the wastewater treatment plant.

From chemical industry and pharmaceutical manufacturing there are relatively large amounts of liquid waste with mainly degradable substances, e.g. ethanol. Normally there are also small amounts of unwanted contaminations. Consumed glycol can also emerge from defrosting at airfields. The levels of cadmium are often high in defrost liquids from airplanes.

Amounts
Depending on the amount of solution to be disposed in the individual case, there are different requirements for analyses. This is mainly regarding liquids from heating and cooling systems if disposal to the wastewater system is considered.

Small amounts (e.g. <10 litre) are suitable for liquid waste.

Combined total volume up to 1000 litre: Analyse of metals (Ag, Cd, Cr, Cu, Hg, Ni, Pb, Zn) is required. If the levels of metal are acceptable according to permissible levels in the guidelines (table 2 in ”Näckrosen”) a maximum of 100 l/h can be diverted to the wastewater system. If the levels of metal are exceeding permissible levels it should be disposed as liquid waste.

Combined total volume over 1000 litre: Both metal analyses and determination of nitrification inhibition is required. Approved levels according to permissible levels in the guidelines (table 2 in ”Näckrosen”) a maximum of 100 l/h can be diverted to the wastewater system. If the levels of metal are exceeding permissible levels it should be disposed as liquid waste. Always contact Uppsala Vatten before discharging this amount.

Various mixtures of chemicals
The table below refers primarily to small volumes of used solutions, e.g. from laboratories and hospitals. For very diluted solutions not considered hazardous waste under the Waste Regulation (unwanted substance <0.1% concentration, e.g. in dishwashing water), see the section "Practical advice".

Residues in original packaging should always be disposed of as waste if they contain unwanted substances. Other residues can be handled according to the list below.

NOTE: Do not forget dilution and subsequent flushing when emptying via the sink.
The list is in Swedish (“Villkor” = condition, “som avfall” = as waste).

Product	Classification	Note
Acetonsprit (avfärgningsmedel vid mikroskopering)	Villkor 2	
Bensin (rengöringsmedel, ej vattenlösligt!)	Som avfall	
Bioclear (lösnings- och rengöringsmedel)	Som avfall	
Cidex (desinfektionsmedel för bl a endoskop)	Som avfall	
Clumskys lösning (tänder, pulpa- och rotbehandling)	Som avfall	
Dibutyldikarbonat (reagens vid organiska synteser)	Som avfall	
Efrane (en anestesi- eller narkosgas)	Som avfall	
Eugenol (används vid tandvård)	Som avfall	
Eosin (färgämne vid mikroskopering)	Som avfall	
Fluothane (en anestesi- eller narkosgas)	Som avfall	
Forene (en anestesi- eller narkosgas)	Som avfall	

Fosfatbuffert (med DMSO, lab-kemikalie)	Villkor 2	
Fosfatbuffert (med rester av etidiumbromid)	Som avfall	
Boratbuffert, borsyra m.fl	Som avfall	uf, sin
Fotogen (rengöringsmedel, ej vattenlösligt!)	Som avfall	
Framkallare (färgfoto eller svartvitt foto)	Som avfall	
Färgkopplare (fotoverksamhet)	Som avfall	
Färgämnen för bl.a DNA och nukleinsyror		
Alcianblått (33864-99-2)	Villkor 0	
Alizarinrött S (72-48-0, 130-22-3)	Villkor 0	
Azur A (531-53-3)	Villkor 0	
Bismarckbrunt (10114-58-6, 5421-66-9)	Villkor 0	
Brilliantblått (3844-45-9)	Villkor 1	
Etidiumbromid (1239-45-8)	Som avfall	rm
Hematoxylin (517-28-2)	Villkor 0	
Kristallviolett (548-62-9)	Som avfall	uf, sin, can
Metylenblått (61-73-4)	Villkor 0	
Natriumnitroprussid (13755-38-9)	Villkor 0	
Nilblåsulfat (3625-57-8)	Villkor 0	
Ruteniumrött (11103-72-3)	Villkor 0	
Safranin O (477-73-6)	Villkor 0	
Tiazinfärger	Villkor 0	
Toluidinblått (92-31-9)	Villkor 0	
Tymolftalein (125-20-2)	Villkor 0	
Genetiskt modifierade bakterier (inaktiverade)	Villkor 2	
Genetiskt modifierad jäst (inaktiverad)	Villkor 2	
Genetiskt modifierade bakterier (levande)	Som avfall	
Genetiskt modifierad jäst (levande)	Som avfall	
Glavamin (infusionsvätska eller -lösning)	Villkor 2	
Glykol (förbrukad från kylare eller verkstäder)	Som avfall	
Hartskloroform (5 %, klister vid tandrotfyllning)	Som avfall	
HPLC-avfall (utan halogener och låg metallhalt)	Villkor 2	
Intralipid (infusionsvätska eller -lösning)	Villkor 2	
Jodjodkaliumlösning (5 %, ytdesinfektion)	Som avfall	
Jodopax (ytdesinfektion)	Som avfall	
Jodsprit (ytdesinfektion)	Villkor 1	
Kabimix (infusionsvätska eller -lösning)	Villkor 2	
Kaliumpersulfat (desinficering)	Villkor 1	rm
Klorhexidin (”Desivon”, huddesinfektion)	Villkor 1	
Klorin (desinfektionsmedel)	Villkor 1	
Kromsyra (för etsning mot näsblödning)	Som avfall	uf
Kromtrioxid (mot näsblödning)	Som avfall	uf
Kvartära ammoniumföreningar	Villkor 1	
Lacknafta (lösnings- och rengöringsmedel)	Som avfall	
Lapislösning (10 % silvernitrat, sårvård)	Som avfall	
Lugols lösning (jodlösning, diagnosprodukt)	Som avfall	
Läkemedelsrester	Som avfall	
Macrodex (infusionsvätska eller -lösning)	Villkor 2	
Merbrominlösning (antiseptisk lösning)	Som avfall	
Metylrosanilinlösning (<0,1 %, mot svampinfektion)	Som avfall	
M-sprit (etanol + denatureringsmedel, t ex Bitrex)	Villkor 2	

Nutriflex (infusionsvätska eller -lösning)	Villkor 2	
Olja (smörjmedel mm., ej vattenlösligt!)	Som avfall	
Oliclinomel (se Nutriflex)	Villkor 2	
Paraffinolja (används på lab, ej vattenlösligt)	Som avfall	
Perform (1 – 2 %, för ytdesinfektion)	Villkor 2	
Promiten (infusionsvätska eller -lösning)	Villkor 2	
RBS 25 (lab-diskmedel för bl a glas)	Villkor 2	
Ryggsprit/Alsolsprit (antiseptiskt medel)	Villkor 2	
Sevorane (anestesi- eller narkosgas)	Som avfall	
Soluvitblandning (infusionsvätska eller -lösning)	Villkor 2	
Stieves lösning (används på patologlab)	Som avfall	
Suprene (anestesi- eller narkosgas)	Som avfall	
Tiomersal (54-64-8, konservering av vacciner)	Som avfall	uf
Tracel (infusionsvätska eller -lösning)	Villkor 2	
Tribonat (infusionsvätska eller -lösning)	Villkor 2	
Triton X-serien (emulgerings- och rengöringsmedel)	Som avfall	
Vamin (infusionsvätska med aminosyror)	Villkor 2	
Vaminolac (infusionsvätska eller -lösning)	Villkor 2	
Virkon (1 - 2 %, för ytdesinfektion)	Villkor 2	
Vitalipid (infusionslösning)	Villkor 2	
Vitrimix (infusionslösning)	Villkor 2	
Voluven (infusionslösning)	Villkor 2	
Väteperoxidlösning (desinfektion, sårvård)	Villkor 2	
Ättiksyralösning (sårvård)	Villkor 2	

Comments: The infusion fluids and solutions included in the list are usually given intravenously to patients for the transmission of nutrition, electrolytes, vitamins or trace elements. Normally, this type of product can be considered harmless when discharged into the sewerage. When drugs are also included in the infusion solution, the situation becomes different.

Radioactive substances

The Swedish Radiation Safety Authority (SSM) regulates and supervises operations in industry in which ionising radiation occurs. The regulations contain detailed rules on the handling and disposal of these substances.

Appendix 1: Separation of organic substances for the treatment of wastewater in Kungsängsverket

At Kungsängsverket (the wastewater treatment plant in Kungsängen) wastewater is treated with mechanical, biological and chemical methods. The mechanical treatment removes various objects and heavier particles out of the water. The biological purification is done using active sludge - a brown-coloured culture of microorganisms - circulating between unventilated and ventilated basins and returned from sedimentation basins as return sludge. The purpose of Kungsängsverket's biological step is to decompose loose organic material and convert ammonium nitrogen into nitrogen gas through nitrate as an intermediate stage. In the chemical step, phosphorus is separated by chemical precipitation with iron, which is added in the form of iron (III) chloride both in the mechanical step and in a separate step after the biological purification. In all purification steps, sludge is formed and thickened, stabilized (retting) and dewatered into solid consistency.

Organic substances that come to the treatment plant can basically behave in four different ways:

- Complete degradation in the biological treatment step (e.g. methanol and ethanol)
- Evaporating (“stripping”) to air from ventilated basins (e.g. volatile solvents)
- Binding to sludge in unaffected form (e.g. PCB and other persistent fat-soluble substances)
- Passage unaffected through all treatment steps (e.g. EDTA, NTA and some drug residues)

In reality, more than one of these options are plausible. A substance that is not completely degraded can therefore cause environmental impact in water (via treated wastewater), in air (via evaporation) or on land (via sludge). Unfortunately, most chemicals do not degrade completely in a municipal sewage treatment plant. This risk of environmental impact is therefore important to remember when considering adding chemicals to the sewage.

Drift disturbances in the treatment processes may arise from the release of toxic substances into the sewerage. The most common disturbance is for the conversion of ammonium to nitrate (nitrification) during nitrogen removal. The reaction becomes slower than normal due to interfering substances in the drain and for that reason it cannot be completed within the available basin volume. Some organic substances (e.g. organic sulphur compounds) are extremely toxic to the bacteria performing nitrification during nitrogen removal. As little as 100 grams of allylthiourea (C3H5NHCSNH2, CAS 109-57-9) released is sufficient to significantly disturb the nitrification at Kungsängsverket.