Sewage Sludge Contents / Tip of Iceberg

Heavy Metals, Pathogens, Synthetic Chemicals, Hydrocarbons, Petrochemicals & Organochlorines, Pharmaceuticals, Steroids & Hormones.

This list of contents represents only the "tip of the iceberg" of toxics concentrated in sewage sludge. Federal and most state and local land application regulations limit concentrations of only nine heavy metals and one "indicator" pathogen in land applied sewage sludge (in **BOLD**).

Heavy Metals [1, 2]

Aluminum,
Antimony,
ARSENIC,
Barium,
Beryllium,
Bismuth,
Boron,
Bromine,
CADMIUM,
Cerium,
Cesium,
Chromium,
COPPER,
Cobalt,
Dysprosium,
Erbium,
Europium,
Gadolinium,
Germanium,
Gold,
Hafnium,
Holmium,
Iron,
Lanthanum,
Lutetium,
LEAD,
Magnesium,
Manganese,
MERCURY,
MOLYBDENUM,
NICKEL,
Niobium,
Palladium,
Praseodymium,
Rhodium,
Rubidium,
Ruthenium,
Samarium,
Scandium,
SELENIUM,
Silver,
Strontium,
Tantalum,
Tellurium,
Terbium,
Thallium
Thorium,
Thulium,
Tin,
Titanium,
Tungsten,
Uranium,
Vanadium,
Yttrium,
Ytterbium,
ZINC

Pathogens [3, 4, 5, 11, 15]

Bacteria

FECAL COLIFORM, Salmonella (2,000 types), Shigella (4 spp.), E. coli 0157:H7, Staphylococcus aureus, Enteropathogenic E. coli, Yersinia enterocolitica, Campylobacter jejuni, Vibrio cholera, Leptospira, Listeria, Helicobacter, Mycobacteria, Aeromonas, Legionella, Burkholderia, Endotoxins, antibiotic resistant bacteria,

Viruses

Adenovirus, Astrovirus, Calcivirus, Coronavirus, Enterovirus (Poliovirus, Coxsackie A, Coxackie B, Echovirus, Enterovirus 68-72), Hepatitis A virus, Hepatitis E virus, Norwalk virus, Reovirus, Rotavirus

Protozoa

Cryptosporidium, Entamoeba histolytica, Giardia lamblia, Balantidium coli, Toxoplasma gondii

Helminths (Parasites)

Ascaris lumbicoides (roundworm), Ancylostoma duodenale (hookworm), Necator americanus (hookworm), Tainia saginata (tapeworm), Trichuris (whipworm), Toxocara (roundworm), Strongyloides (threadworm), Ascaris suum, Toxocara canis, Taenia solium, Hymenolepis nana

Fungi

Aspergillus fumigatus, Candida albicans, Cryptococcus neoformans, Epidermophyton spp., Trichophyton spp., Trichosporon spp., Phialophora spp.,

Prions (spongiform encephalopathy)

While Federal law and regulations limit none of contents below, they allow localities to set more restrictive limits on sewage sludge and soil contamination. Some states do so &/or permit precautionary local control, and others do neither.

Once spread on land, the contaminants above and below persist for centuries - to decades - to months affecting soil, water, plants, air, animals and people.

Unlike pesticides (distinct chemicals subject to specific analysis), sewage sludge is a very complex, variable and concentrated mixture of the vast multitude of unstudied and unregulated hazardous wastes dumped into sewer systems.

Synthetic Chemicals [2, 6, 7, 8, 9, 12, 16]

Dioxins & Furans

Dioxins, Octachlorodibenzo-P-Dioxin, 1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin, Octachlorodibenzo Furan, 1,2,3,4,6,7,8-Heptachlorodibenzo-Furan (71), 2,3,7,8-Tetrachlorodibenzo-Furan, 1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin, 1,2,3,4,7,8-Hexachlorodibenzo-Furan , 1,2,3,7,8,9- Hexachlorodibenzo-P-Dioxin, 1,2,3,6,7,8-Hexachlorodibenzo-Furan, 2,3,4,6,7,8- Hexachlorodibenzo-Furan, 1,2,3,4,7,8,9-Heptachlorodibenzo-Furan, 2,3,4,7,8-Pentachlorodibenzo-Furan, 1,2,3,4,7,8- Hexachlorodibenzo-P-Dioxin, 1,2,3,7,8- Pentachlorodibenzo-Furan, 1,2,3,7,8- Pentachlorodibenzo-P-Dioxin, 1,2,3,7,8,9- Hexachlorodibenzo-Furan, 2,3,7,8- Tetrachlorodibenzo-P-Dioxin, Polychlorinated Dibenzodioxin/Polychlorinated Dibenzofuran (PCDD/PCDF), Tetrahydrofuran, 2,4-D, 2,4,5-T, dioxin (TCDD),

"Organics" (carbon-based)

Acetone, Chloroform, Cyclohexanone, Bis(2-ethylhexyl) Phthalate, Bis(2-ethylhexyl) tetrabromophthalate, Di-n-undecyl phthalate, Alkyl benzyl Phthalate, Di-(2-Ethylhexyl) Phthalate (DEHP), Butyl Benzyl Phthalate, Toluene, 2-Propanone, Methylene Chloride, Hexanoic Acid, 2-Butanone, Methyl Ethyl Ketone, Alcohol Ethoxylate, Alkylphenolethoxylates, Phenol, Nonylphenol, 2,2'-methylenebis[4-methyl-6- nonyl-Phenol, p-Nonylphenol, 4,4'-butylidenebis[2-(1,1-dimethylethyl)-5-methyl-, 4-Methylphenol, Phenol, 4,4'-(1-methylethylidene)bis[2-(1,1-dimeth, Phenol, 4,4'-(1-methylethylidene)bis[2-(1,1-dimeth, 2,4-dicumylphenol, p-Dodecylphenol, 2,4,5-Trichlorophenol, N-Hexacosane, N-Tetracosane, N-Dodecane, N-Tetradecane, N-Triacontane, N-Eicosane, N-Hexadecane, N-Octacosane, Carbon Disulfide, N-Decane, N-Docosane, N-Octadecane, P-Cymene, Benzo(B)fluranthene, Fluoranthene, P-Chloroaniline, Pyrene, Tetrachloromethane, Trichlorofluoromethane, 2-Hexanone, 2-Methylnaphthalene, 4-Chloroaniline, Benzo(a)pyrene

Pesticides & Insecticides

Aldrin, Chlordane, Cyclohexane, Heptachlor, Endosulfan, Endosulfan-II, Lindane, Dieldrin, Endrin, DDT, DDD, DDE, 2,4,5-Trichlorophenoxyacetic Acid, Acetic Acid (2,4-Dichlorophenoxy), 2,4,5-Trichlorophenoxypropionic Acid, Pentachloronitrobenzene, Chlorobenzilate, Beta-BHC, Kepone, Mirex, Methoxychlor,

PCBs (PolyChlorinated Biphenyls)

PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, PCB-1260

PBDEs (PolyBrominated Diphenyl Ethers)

BDE-28, BDE-47, BDE-66, BDE-85, BDE-99, BDE-100, BDE-138, BDE-153, BDE-154, BDE-183, BDE-209,

Hydrocarbons, Petrochemicals, Organochlorines [7, 8, 9, 10, 12, 16]

PCBs, PCT, PBB, PBT, Anthracene, Pentachlorophenol, Benzo(g,h,i)perylene, Benzene, Benzene, C14-C24-branched, Polyethylbenzene residue, Octane, Hexachlorobenzene, Ethylbenzene, Chlorinated Benzenes, Naphtha (petroleum), turpentine-oil, Hydrotreated kerosene, Hydrocarbon oils, Hydrocarbons, C10 and C12, Distillates (petroleum), Fuel oil, Creosols, P-Cresol, O-Cresol, 2-(2H-Benzotriazol-2-yl)-p-cresol, Hexachlorobutadiene, N-Nitrosodimethylamine, Toxaphene, Trichloroethane, Tetrachloroethane, Hexachloroethane, Carbon Tetrachloride, Dichloroethylene, Trichioroethylene, Tetrachloroethylene, Xylene,

Pharmaceuticals [2, 12, 16]

1,7-Dimethylxanthine,
4-Epianhydrochlortetracycline,
4-Epianhydrotetracycline,
4-Epichlortetracycline,
4-Epioxytetracycline,
4-Epitetracycline,
Acetaminophen,
Albuterol,
Anhydrochlortetracycline,
Anhydrotetracycline,
Azithromycin,
Caffeine,
Carbadox,
Carbamazepine,
Cefotaxime,
Chlortetracycline,
Cimetidine,
Ciprofloxacin,
Clarithromycin,
Clinafloxacin,
Cloxacillin,
Codeine,
Cotinine,
Dehydronifedipine,
Demeclocycline,
Digoxigenin,
Digoxin,
Diltiazem,
Diphenhydramine,
Doxycycline,
Enrofloxacin,
Erythromycin-Total,
Flumequine,
Fluoxetine,
Gemfibrozil,
Ibuprofen,
Isochlortetracycline,
Lincomycin,
Lomefloxacin,
Metformin,
Miconazole,
Minocycline,
Naproxen,
Norfloxacin,
Norgestimate,
Ofloxacin,
Ormetoprim,
Oxacillin,
Oxolinic Acid,
Oxytetracycline,
Penicillin G,
Penicillin V,
Ranitidine,
Roxithromycin,
Sarafloxacin,
Sulfachloropyridazine,
Sulfadiazine,
Sulfadimethoxine,
Sulfamerazine,
Sulfamethazine,
Sulfamethizole,
Sulfamethoxazole,
Sulfanilamide,
Sulfathiazole,
Tetracycline,
Thiabendazole,
Triclocarban,
Triclosan,
Trimethoprim,
Tylosin,
Virginiamycin,
Warfarin,

Steroids & Hormones [2,12, 16]

17 Alpha-Dihydroequilin,
17 Alpha-Estradiol,
17 Alpha-Ethinyl-Estradiol,
17 Beta-Estradiol,
Androstenedione,
Androsterone,
Beta Stigmastanol,
Campesterol,
Cholestanol,
Cholesterol,
Coprostanol,
Desmosterol,
Epicoprostanol,
Equilenin,
Ergosterol,
Estriol,
Estrone,
Ethinylestradiol,
Norethindrone,
Norgestrel,
Progesterone,
Stigmasterol, Sitostanol,
Beta-Estradiol 3-Benzoate,
Beta-Sitosterol,
Equilin,
Testosterone,

"Acceptable" levels of exposure to sewage sludge contaminants are based on obsolete and faulty scientific data and processes. In 2002 and 2010, the National Academy of Sciences and National Institutes of Health established those facts [13, 14].

The risk assessments upon which these levels are based neglected dietary impacts on children; multi-pathway exposure; synergistic impacts; infectious organism exposure; ecological, wildlife, food chain, soil microorganism & forest soil impacts; long-term heavy metal accumulation; and used a cancer risk safety factor 100 times less protective than used for air and water pollution.

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A partial list of chemicals recently found in sewer sludge applied to land. By Dr Richard Honour

https://encore.org/story/richard-honour/

2,2',4,4'-tetrabromodiphenyl ether (BDE-47)
2,2',3,4,4'-pentabromodiphenyl ether (BDE-85) *
2,2',4,4',6-pentabromodiphenyl ether (BDE-100) *
2,2',4,4',5-pentabromodiphenyl ether (BDE-99) *
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)
2,2',3,4,4',5',6-heptabromodiphenyl ether (BDE-183)
Decabromodiphenyl ether (BDE-209)
2-ethylhexyl 2, 3, 4, 5-tetrabromobenzoate (TBB)
2-ethylhexyl 2, 3, 4, 5-tetrabromophthalate (TBPH)
Decabromodiphenyl ethane (DBDPE)
Tris (1-chloro-2-propyl) phosphate (TCPP)
Tris (1,3-dichloro-2-propyl) phosphate (TDCPP)
Acetaminophen, Azithromycin, Caffeine, Carbadox, Carbamazepine, Cefotaxime, Ciprofloxacin, Clarithromycin, Clinafloxacin, Cloxacillin, Dehydronifedipine, Digoxigenin, Digoxin, Diltiazem, 1,7-Dimethylxanthine, Diphenhydramine, Enrofloxacin, Erythromycin-H20, Flumequine, Fluoxetine, Lincomycin, Lomefloxacin, Miconazole, Norfloxacin, Norgestimate, Ofloxacin, Ormetoprim, Oxacillin, Oxolinic acid, Penicillin G, Penicillin V, Roxithromycin, Sarafloxacin, Sulfachloropyridazine, Sulfadiazine, Sulfadimethoxine, Sulfamerazine, Sulfamethazine, Sulfamethizole, Sulfamethoxazole, Sulfanilamide, Sulfathiazole, Thiabendazole, Trimethoprim, Tylosin, Virginiamycin, Anhydrochlortetracycline, Anhydrotetracycline, Chlortetracycline, Demeclocycline, Doxycycline, Epianhydrochlortetracycline, 4-Epianhydrotetracycline, 4-Epioxytetracycline, 4-Epitetracycline, Isochlortetracycline, Minocycline, Oxytetracycline, Tetracycline, Bisphenol A, Furosemide, Gemfibrozil, Glipizide, Glyburide, Hydrochlorothiazide, 2-Hydroxy-ibuprofen, Ibuprofen, Naproxen, Triclocarban, Triclosan, Warfarin, Albuterol, Amphetamine, Atenolol, Atorvastatin, Cimetidine, Clonidine, Cocaine *, Codeine, Cotinine, Enalapril, Hydrocodone, Metformin, Oxycodone, Ranitidine, Triamterene, Alprazolam, Amitriptyline, Amlodipine, Benzoylecgonine, Benztropine, Betamethasone, DEET, Desmethyldiltiazem, Diazepam, Fluocinonide, Fluticasone propionate, Hydrocortisone, 10-hydroxy-amitriptyline, Meprobamate, Methylprednisolone, Metoprolol, Norfluoxetine, Norverapamil, Paroxetine, Prednisolone, Prednisone, Promethazine, Propoxyphene, Propranolol, Sertraline, Simvastatin, Theophylline, Trenbolone, Trenbolone acetate, Valsartan, Verapamil,
Triclosan, Triclocarban, Co-planar PCBs, Halogenated furans, Atrazine, Hexabromocyclododecane (HBCD), Tetrabromobisphenol-A (TBBPA), Polybrominated diphenyl ethers (PBDEs, with Penta-BDE constituents, Octa-BDE constituents, Deca-BDE constituents)
2-ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB), bis(2-ethylhexyl)-2,3,4,5-

tetrabromophthalate (TBPH), Decabromodiphenyl ethane or 1,2-bis(pentabromodiphenyl)ethane (DBDPE), 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE), Tetrabromobisphenol A-bis(2,3-dibromopropylether) (TBBPABDPE), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB), Bis(2-ethylhexyl)-3,4,5,6-tetrabromophthalate (TBPH)

Perfluoroalkyl substances (PFAS), which are typically broken down into: Long-chain perfluoroalkyl carboxylic acids (PFCAs) with eight or more carbons, including perfluorooctanoic acid (PFOA), Perfluoroalkane sulfonates (PFSAs) with six or more carbons, including perfluorohexane sulfonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS)

Table C-1. List of unassessed pollutants found in biosolids that appear on a hazardous or priority pollutant list

Pollutant	Chemical Abstracts Service Registry Number	Category	RCRA Hazardous Waste - Acutely Hazardous (P) or Toxic (U) List Number	Priority-Pollutant List X = on the list	NIOSH Hazardous Drugs List X = on the list
2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN	1746-01-6			X	
2-Propanone	67-64-1		U002		
Antimony	7440-36-0	Metals		X	
Benz(a)anthracene	56-55-3	PAHs	U018	X	
Benzo(a)pyrene	50-32-8	PAHs	U022	X	
Benzo(b)fluoranthene	205-99-2	PAHs		X	
Benzo(k)fluoranthene	207-08-9	PAHs		X	
Beryllium	7440-41-7	Metals	P015	X	
Bis (2-ethylhexyl) phthalate	117-81-7	SVOCs	U028	X	
Carbamazepine	298-46-4	Other drugs			X
Carbon tetrachloride	56-23-5	Organics	U211	X	
Chloroaniline, 4-	106-47-8	SVOCs	P024		
Chloroform	67-66-3	Organics	U044	X	
Chloronaphthalene, 2-	91-58-7	Organics	U047	X	
Cresol, p- (4-methylphenol)	106-44-5	Preservative	U052		
Chrysene	218-01-9	PAHs	U050	X	
Cyanide	57-12-5	Organics		X	
Cyclophosphamide	50-18-0	Other drugs	U058		X
Dichlorobenzene, 1,3-	541-73-1	Pesticides	U071	X	
Dichlorobenzene, 1,4-	106-46-7	Pesticides	U072	X	
Dimethoate	60-51-5	Pesticides	P044		
Dimethyl phthalate	131-11-3	Organics	U102	X	
Di-n-butyl phthalate (Butoxyphosphate ethanol, 2-)	84-74-2	Plasticizers	U069	X	
Di-n-octyl phthalate	117-84-0	Organics	U107	X	
Endosulfan, α	959-98-8	Pesticides		X	
Endosulfan, β	33213-65-9	Pesticides		X	
Estradiol, 17α-	57-91-0	Hormones			X
Estradiol, 17β-	50-28-2	Hormones			X
Estradiol-3-benzoate, β-	50-50-0	Hormones			X
Estriol (estradiol)	50-27-1	Hormones			X
Estrone	53-16-7	Hormones			X
Ethylbenzene	100-41-4	Organics		X	
Ethynyl estradiol, 17α-	57-63-6	Hormones			X
Fluoranthene	206-44-0	PAHs	U120	X	

Pollutant	Chemical Abstracts Service Registry Number	Category	RCRA Hazardous Waste - Acutely Hazardous (P) or Toxic (U) List Number	Priority-Pollutant List X = on the list	NIOSH Hazardous Drugs List X = on the list
Heptachlor epoxide	1024-57-3	Pesticides		X	
Mestranol	72-33-3	Other drugs			X
Methylene Chloride	75-09-2		U080	X	
Napthalene	91-20-3	PAHs	U165	X	
Nitrophenol, p-	100-02-7	Organics	U170	X	
N-nitrosodibutylamine (NDBA) 924-16-3	924-16-3	Nitrosamines	U172		
N-nitrosodiethylamine (NDEA) 55-18-5	55-18-5	Nitrosamines	U174		
N-nitrosodimethylamine (NDMA) 62-75-9	62-75-9	Nitrosamines	P082	X	
N-nitroso-di-n-propylamine (NDPA) 621-64-7	621-64-7	Nitrosamines	U111	X	
N-nitrosodiphenylamine (NDPhA) 86-30-6	86-30-6	Nitrosamines		X	
N-nitrosopiperidine (NPIP) 100-75-4	100-75-4	Nitrosamines	U179		
N-nitrosopyrrolidine (NPYR) 930-55-2	930-55-2	Nitrosamines	U180		
Norethindrone (norethisterone)	68-22-4	Hormones			X
Norgestimate	35189-28-7	Other drugs			X
Norgestrel (levonorgestrel)	797-63-7	Hormones			X
Pentachloronitrobenzene	82-68-8	Pesticides	U185		
Phenanthrene	85-01-8	PAHs		X	
Progesterone	57-83-0	Hormones			X
Pyrene	129-00-0	PAHs		X	
Silver	7440-22-4	Metals		X	
Sodium valproate	1069-66-5	Other drugs			X
Testosterone	58-22-0	Hormones			X
Tetrachloroethylene	127-18-4	Solvents	U210	X	
Thallium	7440-28-0	Metals		X	
Toluene	108-88-3	Solvents	U220	X	
Trichlorophenol, 2,4,5-	95-95-4	Antimicrobial	On U list with note to see F027		
Warfarin	81-81-2	Other drugs			X
Total: 61		**Count -->**	32	35	16

Source: OIG review of EPA's 352 unassessed biosolids pollutants, RCRA hazardous list, EPA priority pollutants, and NIOSH hazardous drugs list.

Target Nation Survey of Sewage Sludge”residuals” Chemical List

Table 5. Primary Target Analytes for the TNSSS, by Analyte Class

Analyte Class	Analyte	
Metals	Aluminum	**Manganese**
	Antimony	Mercury*
	Arsenic*	Molybdenum*
	Barium	Nickel*
	Beryllium	Phosphorus
	Boron	Selenium*
	Cadmium*	**Silver**
	Calcium	Sodium
	Chromium*	Thallium
	Cobalt	Tin
	Copper*	Titanium
	Iron	Vanadium
	Lead*	Yttrium
	Magnesium	Zinc*
Polycyclic aromatic hydrocarbons (PAHs)	Benzo(a)pyrene	2-Methylnaphthalene
	Fluoranthene	**Pyrene**
Other semivolatile organics	bis (2-Ethylhexyl) phthalate	**4-Chloroaniline**
Inorganic anions	Fluoride	Water-extractable phosphorus
	Nitrate	**Nitrite**
Polybrominated diphenyl ethers (PBDEs), including the Tetra, Hexa, Penta, and Deca congeners	2,4,4'-TrBDE (BDE-28)	2,2',3,4,4',5'-HxBDE (BDE-138)
	2,2',4,4'-TeBDE (BDE-47)	2,2',4,4',5,5'-HxBDE (BDE-153)
	2,3',4,4'-TeBDE (BDE-66)	2,2',4,4',5',6-HxBDE (BDE-154)
	2,2',3,4,4'-PeBDE (BDE-85)	2,2',3,4,4',5',6-HpBDE (BDE-183)
	2,2',4,4',5-PeBDE (BDE-99)	2,2',3,3',4,4',5,5',6,6'-DeBDE (BDE-209)
	2,2',4,4',6-PeBDE (BDE-100)	

The 9 pollutants in **bold** are those selected in the December 2003 Biennial Review

Table 6. Pharmaceuticals, Steroids, and Hormones Included in the TNSSS

Analyte Class	Analyte	
Antibiotics and their degradation products, disinfectants, and other antimicrobials	Anhydrochlortetracycline	Ofloxacin
	Anhydrotetracycline	Ormetoprim
	Azithromycin	Oxacillin
	Carbadox	Oxolinic acid
	Cefotaxime	Oxytetracycline
	Chlortetracycline	Penicillin G
	Ciprofloxacin	Penicillin V
	Clarithromycin	Roxithromycin
	Clinafloxacin	Sarafloxacin
	Cloxacillin	Sulfachloropyridazine
	Demeclocycline	Sulfadiazine
	Doxycycline	Sulfadimethoxine
	Enrofloxacin	Sulfamerazine
	4-Epianhydrochlortetracycline	Sulfamethazine
	4-Epianhydrotetracycline	Sulfamethizole
	4-Epichlortetracycline	Sulfamethoxazole
	4-Epioxytetracycline	Sulfanilamide
	4-Epitetracycline	Sulfathiazole
	Erythromycin	Tetracycline
	Flumequine	Triclocarban
	Isochlortetracycline	Triclosan
	Lincomycin	Trimethoprim
	Lomefloxacin	Tylosin
	Minocycline	Virginiamycin
	Norfloxacin	
Other drugs	1,7-Dimethylxanthine	Diphenhydramine
	Acetaminophen	Fluoxetine
	Albuterol	Gemfibrozil
	Caffeine	Ibuprofen
	Carbamazepine	Metformin
	Cimetidine	Miconazole
	Codeine	Naproxen
	Cotinine	Norgestimate
	Dehydronifedipine	Ranitidine
	Digoxigenin	Thiabendazole
	Digoxin	Warfarin
	Diltiazem	
Steroids	Campesterol	Epi-coprostanol
	Cholestanol	Ergosterol
	Cholesterol	β-Sitosterol
	Coprostanol	β-Stigmastanol
	Desmosterol	Stigmasterol
Hormones	Androstenedione	Estriol
	Androsterone	Estrone
	17α-Dihydroequilin	17α-Ethynyl estradiol
	Equilenin	Norethindrone
	Equilin	Norgestrel
	17α-Estradiol	Progesterone
	17β-Estradiol	Testosterone
	β-Estradiol-3-benzoate	

Table 8. Selected Ion Monitoring Parameters for Organic Analytes

Type	Analyte	Quantitation Mass	Approximate Retention Time (min)*
Target Analytes	4-Chloroaniline	127	9.71
	2-Methylnaphthalene	142	10.49
	Fluoranthene	202	15.04
	Pyrene	202	15.32
	bis (2-Ethylhexyl) phthalate	149	16.61
	Benzo(a)pyrene	252	18.12
Surrogates	Nitrobenzene-d_5	82	8.67
	2-Fluorobiphenyl	172	10.94
	p-Terphenyl-d_{14}	244	15.49
Internal Standards	1,4-Dichlorobenzene-d_4	152	7.90
	Naphthalene-d_8	136	9.59
	Acenaphthene-d_{10}	164	11.77
	Phenanthrene-d_{10}	188	13.57
	Chyrsene-d_{12}	240	16.63
	Perylene-d_{12}	264	18.18

Table 9. Frequency of Estimated Maximum Possible Concentrations (EMPCs)

Analyte	# of EMPCs Reported	Analyte	# of EMPCs Reported
Campesterol	50	Androstenedione	3
Estrone	21	β-Stigmastanol	3
Testosterone	11	Equilin	3
Stigmasterol	10	17 α-Dihydroequilin	1
Ergosterol	6	Androsterone	1
Desmosterol	5	β-Estradiol 3-benzoate	1
β-Sitosterol	4	Equilenin	1
Norethindrone	4	Progesterone	1
Norgestrel	4		

Table 11. Summary of Results for Metals, Anions, Organics, and PBDEs

Class	Analyte	Units	# Detects	Observed Dry-weight Concentration	
				Minimum	Maximum
Solids	Percent Solids	%	84	0.43	93.5
Anions	Fluoride	mg/kg	84	7.6	234
	Nitrate/Nitrite		84	1.6	6,120
	Water-extractable phosphorus		84	11.0	9,550
	WEP ratio	unitless	84	0.00065	0.33920
Metals	Aluminum	mg/kg	84	1400	57,300
	Antimony		72	0.45	26.6
	Arsenic*		84	1.18	49.2
	Barium		84	75.1	3,460
	Beryllium		83	0.04	2.3
	Boron		80	5.70	204.0
	Cadmium*		84	0.21	11.8
	Calcium		84	9,480	311,000
	Chromium*		84	6.74	1160
	Cobalt		84	0.87	290
	Copper*		84	115	2,580
	Iron		84	1,575	299,000
	Lead*		84	5.81	450
	Magnesium		84	696	18,400
	Manganese		84	34.8	14,900
	Mercury*		84	0.17	8.3
	Molybdenum*		84	2.51	132
	Nickel		84	7.44	526
	Phosphorus		84	2,620	118,000
	Selenium*		84	1.10	24.7
	Silver		84	1.94	856
	Sodium		84	154	26,600
	Thallium		80	0.02	1.7
	Tin		78	7.50	522
	Titanium		83	18.50	7,020
	Vanadium		84	2.04	617
	Yttrium		84	0.70	26.3
	Zinc*		84	216	8,550

Table 11. Summary of Results for Metals, Anions, Organics, and PBDEs

Class	Analyte	Units	# Detects	Observed Dry-weight Concentration	
				Minimum	Maximum
Organics (PAHs and Semi-volatiles)	4-Chloroaniline	µg/kg	63	51	5,900
	2-Methylnaphthalene		39	10	4,600
	Fluoranthene		77	45	12,000
	Pyrene		72	44	14,000
	bis (2-Ethylhexyl) phthalate		84	657	310,000
	Benzo(a)pyrene		64	63	4,500
PBDEs	BDE-28	ng/kg	84	2,200	160,000
	BDE-47		84	73,000	5,000,000
	BDE-66		84	1,800	110,000
	BDE-85		84	3,200	150,000
	BDE-99		84	64,000	4,000,000
	BDE-100		84	13,000	1,100,000
	BDE-138		56	1,900	40,000
	BDE-153		84	9,100	410,000
	BDE-154		84	7,700	440,000
	BDE-183		84	2,100	120,000
	BDE-209		83	150,000	17,000,000

* Metals currently regulated at 40 CFR 503

Table 12. Summary of Results for Pharmaceuticals

Analyte	Units	# Detects	Observed Dry-weight Concentration	
			Minimum	Maximum
Percent Solids	%	84	0.14	94.9
Acetaminophen	µg/kg	2	1,120	1,300
Albuterol		1	23.2	23.2
Anhydrochlortetracycline		1	125	125
Anhydrotetracycline		52	94.3	1,960
Azithromycin		80	10.2	6,530
Caffeine		39	65.1	1,110
Carbadox		0	NA	NA
Carbamazepine		80	8.74	6,030
Cefotaxime		0	NA	NA
Chlortetracycline		1	1,010	1,010
Cimetidine		74	7.59	9,780
Ciprofloxacin		84	74.5	47,500
Clarithromycin		45	8.68	617
Clinafloxacin		0	NA	NA
Cloxacillin		0	NA	NA
Codeine		20	9.59	328
Cotinine		39	11.4	690
Dehydronifedipine		19	3.48	24.6
Demeclocycline		3	96	200
Digoxigenin		0	NA	NA
Digoxin		0	NA	NA
1,7-Dimethylxanthine		4	1,130	9,580
Diltiazem		69	1.39	225
Diphenhydramine		84	36.7	5,730
Doxycycline		76	50.8	5,090
Enrofloxacin		14	12.1	66
4-Epianhydrochlortetracycline		0	NA	NA
4-Epianhydrotetracycline		31	126	2,160
4-Epichlortetracycline		1	974	974
4-Epioxytetracycline		8	35.7	54.9
4-Epitetracycline		80	47.2	4,380
Erythromycin-total		77	3.1	180
Flumequine		0	NA	NA
Fluoxetine		79	12.4	3,130
Gemfibrozil	µg/kg	76	12.1	2,650

Ibuprofen		54	99.5	11,900
Isochlortetracycline		1	3,140	3,140
Lincomycin		3	13.9	33.4
Lomefloxacin		2	33.3	39.8
Metformin		6	550	1,160
Miconazole		80	14.2	9,210
Minocycline		32	351	8,650
Naproxen		44	20.9	1,020
Norfloxacin		29	99.3	1,290
Norgestimate		0	NA	NA
Ofloxacin		83	73.9	58,100
Ormetoprim		1	5.91	5.91
Oxacillin		0	NA	NA
Oxolinic Acid		1	39.4	39.4
Oxytetracycline		29	18.6	467
Penicillin G		0	NA	NA
Penicillin V		0	NA	NA
Ranitidine		46	3.83	2,250
Roxithromycin		3	14.3	22.8
Sarafloxacin		2	179	1,980
Sulfachloropyridazine		2	35.9	58.7
Sulfadiazine		3	22.9	140
Sulfadimethoxine		5	3.58	62.2
Sulfamerazine		1	5.61	5.61
Sulfamethazine		2	21.5	23.2
Sulfamethizole		0	NA	NA
Sulfamethoxazole		30	3.91	651
Sulfanilamide		8	191	15,600
Sulfathiazole		1	21	21
Tetracycline		81	38.3	5,270
Thiabendazole		58	8.42	239
Triclocarban		84	187	441,000
Triclosan		79	430	133,000
Trimethoprim		24	12.4	204
Tylosin		0	NA	NA
Virginiamycin		15	43.5	469
Warfarin		0	NA	NA

Table 13. Summary of Results for Steroids and Hormones

Analyte	Units	# Detects	Observed Dry-weight Concentration	
			Minimum	Maximum
Percent Solids	%	84	0.14	94.9
Androstenedione	µg/kg	32	108	1,520
Androsterone		50	21.3	1,030
Campesterol		84	2,840	524,000
Cholestanol		84	3,860	4,590,000
Cholesterol		81	18,700	5,390,000
Coprostanol		84	7,720	43,700,000
Desmosterol		58	2,730	94,400
17 α-Dihydroequilin		1	98.4	98.4
Epicoprostanol		83	868	6,030,000
Equilenin		1	60.6	60.6
Equilin		15	22.3	107
Ergosterol	µg/kg	53	4,530	91,900
17 α-Estradiol		5	16.1	48.8

17 β-Estradiol		11	22	355
β-Estradiol 3-benzoate		18	30.2	1850
17 α-Ethinyl-estradiol		0	NA	NA
Estriol		18	7.56	232
Estrone		60	26.7	965
Norethindrone		5	21	1,360
Norgestrel		4	43.8	1,300
Progesterone		19	143	1,290
β-Sitosterol		73	24,400	1,640,000
β-Stigmastanol		83	3,440	1,330,000
Stigmasterol		76	11,000	806,000
Testosterone		17	30.8	2,040