

Annex IX. Results of the ecotoxicity tests

Table 1. Results on the wastewater toxicity (samples of April-June 2006), expressed as toxic units (TU) based on the data of separate biotests Thamnotox, Rotox, Charatox, Algaltox and Microtox and integral indices: average toxicity, toxic print and the PEEP-index, potential ecotoxic effect of the effluent considering effluent flow (Q, m³/h), or effluent toxic load (TU*m³/h).

Wastewater	Sam ple No	Thamnotox	Thamnotox	Thamnotox	Rotox ¹ TU	Charatox ¹ TU	Algaltox ² TU	Microtox ² TU	Average toxicity ⁵ TU	Toxic print ⁶ TU	Class of toxicity	Q, m ³ /h	Toxic load TU*m ³ /h	Share of toxic load %	PEEP ⁸	Class of toxicity
		(1) ¹ TU ⁴	(2) ² TU	(average) ³ TU												
1. WWTP "Kėdainių vandenys"	(5)	0.00	0.00	0.00	–	0.79	0.00	0.00	0.26	0.26	st	270	71	0.15	1.86	NT
2. WWTP "Kauno vandenys"	(6)	1.16	1.39	1.27	0.00	3.11	0.46	0.00	1.46	2.92	t	2766	8076	17.33	3.91	T
3. WWTP "Jonavos vandenys"	(7)	1.03	1.22	1.12	0.00	2.42	0.00	0.00	1.18	2.36	t	229	541	1.16	2.73	ST
4. WWTP "Dzūkijos vandenys" (Alytus)	(1)	1.70	1.61	1.66	–	5.41	–	0.00	2.35	4.71	t	430	2024	4.34	3.31	T
5. WWTP "Varėnos vandenys"	(2)	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	nt	53	0	0.00	0.00	NT
6. WWTP "Birštono vandentiekis"	(3)	0.00	0.00	0.00	–	0.00	0.00	0.86	0.29	0.29	st	91	26	0.06	1.43	NT
7. WWTP of Marijampolė	(18)	0.00	0.00	0.00	0.00	1.75	–	1.52	1.09	2.18	t	501	1090	2.34	3.04	T
8. WWTP of Vilkaviškis	(19)	0.00	7.52	3.76	1.73	2.18	1.67	2.06	2.67	8.00	t	54	432	0.93	2.64	ST
9. WWTP of Šakiai	(20)	2.89	0.60	1.75	–	7.35	0.00	1.23	3.44	10.33	vt	33	341	0.73	2.53	ST
10. WWTP of Kazlų Rūda	(21)	0.00	1.35	0.68	0.00	0.44	–	0.00	0.37	0.74	st	30	22	0.05	1.37	NT
11. WWTP "Šiaulių vandenys"	(27)	0.00	0.44	0.22	0.00	0.45	–	0.72	0.46	1.39	t	925 ^T	1289	2.77	3.11	T
12. WWTP of "Mažeikių nafta"	(30)	2.14	0.87	1.50	0.00	5.03	–	0.00	2.18	4.35	t	639 ^T	2780	5.97	3.44	T
13. WWTP "Plungės vandenys"	(32)	0.00	0.53	0.27	–	0.00	–	0.85	0.37	0.75	st	53 ^T	40	0.08	1.61	NT
14. WWTP "Radviliškio vandenys"	(33)	3.97	5.88	4.93	1.81	6.94	–	0.00	3.96	7.91	t	66 ^S	522	1.12	2.72	ST
15. WWTP "Rokiškio vandenys"	(24)	0.00	0.00	0.00	–	0.44	–	0.00	0.15	0.15	st	53 ^T	8	0.02	0.94	NT
16. WWTP "Aukštaitijos vandenys" (Panevėžys)	(23)	1.30	0.00	0.65	0.00	2.23	–	0.00	0.96	1.92	t	537 ^S	1030	2.21	3.01	T
17. WWTP "Šilutės vandenys"	(11)	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	nt	188	0	0.00	0.00	NT
18. WWTP "Klaipėdos vanduo"	(14)	0.00	0.73	0.37	–	0.00	–	3.13	1.16	2.33	t	1865	4340	9.32	3.64	T
19. WWTP "Tauragės vandenys"	(15)	1.83	1.47	1.65	–	4.59	–	2.63	2.96	8.87	t	208	1845	3.96	3.27	T
20. WWTP "Anykščių vandenys"	(25)	0.00	0.87	0.43	–	0.00	–	0.72	0.38	0.77	st	53	41	0.09	1.62	NT
21. WWTP "Utenos vandenys"	(26)	0.00	0.40	0.20	–	0.00	–	0.00	0.07	0.07	st	361	24	0.05	1.40	NT
22. WWTP of Pabradė	(36)	0.00	0.00	0.00	–	0.00	–	0.86	0.29	0.29	st	5	1	0.00	0.39	NT
23. WWTP "Vilniaus vandenys"	(37)	1.72	2.50	2.11	0.53	4.63	–	0.00	2.25	4.49	t	4800	21573	46.30	4.33	VT
24. WWTP of Švenčionėliai	(38)	1.34	2.35	1.85	–	3.86	–	2.79	2.83	8.50	t	35	298	0.64	2.48	ST
25. WWTP "Ukmergės vandenys"	(34)	0.00	1.57	0.79	0.00	0.00	–	1.12	0.64	1.27	t	138	175	0.38	2.25	ST
													Total toxic load of wastewater: 46590		100.00	

For explanations see Table 3.

Table 2. Results on the wastewater toxicity (samples of October 2006), expressed as toxic units (TU) based on the data of separate biotests Thamnotox, Rotox, Charatox, Algaltox and Microtox and integral indices: average toxicity, toxic print, and the PEEP-index, the latter includes effluent flow (Q, m³/h) or effluent toxic load (TU*m³/h).

Wastewater	Sample No	Tham notox (1)	Tham notox (2)	Tham notox (average)	Rotox	Charatox	Average toxicity	Toxic print	Class of toxicity	Q, m ³ /h	Toxic load TU*m ³ /h	Share of toxic load %	PEEP	Class of toxicity	
		TU	TU	TU	TU	TU	TU	TU	TU						
1. WWTP "Kauno vandenys"	(6)	0.00	0.00	0.00	0.00	2.16	0.72	0.72	st	2766 ^r	1987	32.75	3.30	VT	
2. WWTP "Klaipėdos vanduo"	(46)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nt	1835	0	0.00	0.00	NT	
3. WWTP "Vilniaus vandenys"	(2)	0.00	0.67	0.34	0.00	0.00	0.11	0.11	st	5030	562	9.26	2.75	ST	
4. WWTP "Ukmergės vandenys"	(5)	0.00	1.04	0.52	0.00	1.52	0.68	1.36	t	159	216	3.56	2.34	ST	
5. WWTP "Dzūkijos vandenys" (Alytus)	(4)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nt	53	0	0.00	0.00	NT	
6. WWTP of Kazlų Rūda	(29)	0.00	0.93	0.47	0.00	0.00	0.16	0.16	st	30 ^r	5	0.08	0.75	NT	
7. WWTP of Vilkaviškis	(33)	0.00	1.52	0.76	0.00	2.76	1.17	2.35	t	55	129	2.13	2.11	ST	
8. WWTP of Šakiai	(37)	0.00	0.53	0.27	0.00	0.00	0.09	0.09	st	34	3	0.05	0.60	NT	
9. WWTP "Šiaulių vandenys"	(47)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nt	925	0	0.00	0.00	NT	
10. WWTP of "Mažeikių nafta"	(48)	0.47	0.00	0.24	0.00	0.45	0.23	0.46	st	639	292	4.81	2.47	ST	
11. WWTP "Aukštaitijos vandenys" (Panevėžys)	(19)	3.45	3.39	3.42	0.00	4.61	2.68	5.35	t	537	2875	47.37	3.46	VT	
<i>Total toxic load of wastewater.</i>												6068	100.00		

For explanations see Table 3.

Table 3. Results on the surface water toxicity (samples of April-June (Nr. 1-9) and October 2006 (No. 10-15)), expressed as toxic units (TU) based on the data of separate biotests Thamnotox, Rotox, Charatox, Algaltox and Microtox and integral indices: average toxicity and toxic print.

Surface water	Sam ple No	Thamnotox (1) ¹ TU ¹	Thamnotox (2) ¹ TU	Thamnotox (average) ¹ TU	Rotox ¹ TU	Charatox ¹ TU	Microtox ² TU	Average toxicity ⁴ TU	Toxic print ⁵ TU	Class of toxicity
1. Nemunas at Belorussia	(4)	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	nt
2. Harbor territory at the gates	(8)	0.87	1.45	1.16	1.90	0.83	0.00	0.97	2.92	t
3. Nemunas at Rusnė	(9)	0.00	0.46	0.23	–	0.00	0.69	0.31	0.61	st
4. Nemunas below Sovietsk	(10)	0.00	0.73	0.37	–	0.00	0.00	0.12	0.12	st
5. Šventoji at the border	(12)	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	nt
6. Harbor territory at JSC "Klaipėdos kartonas"	(16)	1.56	1.18	1.37	1.94	1.01	0.40	1.18	4.71	t
7. Malkų bay at Klaipėda	(17)	0.00	1.04	0.52	–	0.53	0.00	0.35	0.70	st
8. Neris at Buivydyžiai	(39)	0.00	0.00	0.00	–	0.00	0.70	0.23	0.23	st
9. Nemunas below Kaunas	(7)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nt
10. Harbor territory at JSC "Klaipėdos kartonas"	(44)	0.40	–	0.40	1.42	0.73	–	0.85	2.55	t
11. Nemunas at Belorussia	(3)	0.00	0.00	0.00	0.00	0.00	0.63	0.16	0.16	st
12. Siesartis below Šakiai	(21)	0.00	0.46	0.23	0.00	0.00	0.00	0.06	0.06	st
13. Nevėžis below Panevėžys	(13)	0.00	0.46	0.23	0.00	1.24	0.00	0.37	0.74	st
14. Šventoji below Anykščiai	(39)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nt

¹ Analysis performed by the laboratory on water toxicology, Institute of Botany.

² Analysis performed by the ecotoxicological laboratory of EPA.

³ Average result of two tests of Thamnotoxkit FTM

⁴ TU – Toxic Unit; toxicity is expressed by toxic units based on formula $[TU] = 100 (\%) / E(L)C_{50} (\%)$;

⁵ Average toxicity – average of the results of Thamnotox, Charatox, Microtox biotests expressed as TU;

⁶ Toxic print – calculated multiplying average toxicity value with the number of testing organisms reacted to the wastewater (positive toxicity signal is when the observed parameter for non-diluted sample changes more than 20% comparing with the control).

⁷ Toxic load = Q x (Toxic print);

⁸ PEEP – Potential Ecotoxic Effect Probe [Costan et al., 1993] = $\text{Log}_{10}[1 + (\text{Toxic print})]$;

* - for the classification of wastewater samples according to their Toxic print the scale of 5 gradations was used [Persoone et al., 2003]: 0 TU (not toxic, nt), <1 TU (slightly toxic, st), 1-10 TU (toxic, t), >10-100 TU (very toxic, vt) and >100 TU (especially toxic, et).

** - for the classification of wastewater according to PEEP-index, the scale of 5 gradations was used [Ronco et al., 2005]: <1.99 TU (practically non-toxic, NT), 2-2.99 TU (slightly toxic, ST), 3-3.99 TU (toxic, T), 4-4.99 TU (very toxic, VT) and >5 TV (especially toxic, ET);

[§] - data of Manusadžianas et al., 1998;

^γ - approximate data;

“–” not analysed.