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REMEDIATION OF PAST POLLUTION FROM EX-MILITARY BASES AND INDUSTRIAL ZONES

Feasibility Study
Site Specific Report
Moonaküla groundwater pollution – JRK no. 38

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Table of contents

Summary

Moonaküla groundwater pollution has been entered in to the database of past pollution sites under the serial number of 38. The territory of Moonaküla groundwater pollution has been and will be used as private households' area at Rakvere town.
The groundwater at Moonaküla is polluted with volatile aromatic hydrocarbons, (e.g. benzene, xylene, toluene, ethylbensene), monophenols (phenol), aromatic hydrocarbons (PAH-s various naphthalenes and pyrenes) and naphtha products.
The groundwater contamination exceeds the limit values on area 17.2 ha in near surface karst aquifer (Nabala-Rakvere aquifer).
Situation at Moonaküla groundwater pollution is stable (contamination was not decreased or the area of contaminated water increased compared with historical data available).
Provided assessment of current situation shows that the spreading of contamination with groundwater is relatively limited, both horizontally and vertically. Near surface karst aquifer (Nabala-Rakvere aquifer) is polluted, the second from ground aquifer (Keila-Kukruse groundwater aquifer) is little less impacted. Aquifers are not usable for drinking water abstraction. It is recommended add an additional safety distance ca 300 m to the outlined contaminated groundwater area (17.2 ha). On this safety area the groundwater abstraction for drinking water purposes from near surface karst aquifer (Nabala-Rakvere aquifer) and Keila-Kukruse groundwater aquifer is not safe due exceeding of limits for drinking water.
There is no danger of the spreading of the contaminated groundwater into the existing water supply wells abstracting water from Ordovician-Cambrian and Cambrian-Vendian aquifer systems.
The polluted groundwater flows towards the Soolikaoja Brook not far from the eastern part of the Moonaküla district. Even though the water in the Soolikaoja brook and drainage ditches did not contain hazardous substances over limits, at time to time it is possible the spreading of small amounts of hazardous substances into the Soolikaoja Brook (with groundwater outflow during snowmelt and heavy rains).
In year 2003 there were established water supply and sewage water pipes for all Moonaküla district of Rakvere Town. Existing private wells are not closed, lot of them are used continiousluy.
The existing private households' wells at contaminated area are recommended to close. They could spread contamination into downward aquifers and serve as risk sources for human health (water usage in households, for irrigation, also as drinking water).
The first groundwater cleanup works proposal was rejected at 1997 due expensivity and small risk to other water supply wells in Rakvere Town. Today the clean-up works possibilities are biological

remediationin situ and collecting of groundwater outflow on low area on left side of Soolikaoja Brook. In practice the responsibility about Moonaküla groundwater pollution belongs to State and Rakvere Town Government.

The soil contamination at Moonaküla was not investigated as the contaminated groundwater table is generally in bedrock limestones.

Two monitoring wells have been entered into the State Cadastral Register.

1 Introduction

Moonaküla groundwater pollution is situated in Rakvere Town, only small hypothetical area maybe located also at Tõrremäe Village at Rakvere Parish (see Figure 38 in Annex 1).

The future vision for this area stays same as today, pivate living household's area.

Nowadays Moonaküla district was built 40-50 years ago. At the beginning of 1980-s there the private dug or borewell (depth ca 20 m) for water supply was common in most of households.

First information about groundwater contamination at Moonaküla dated at mid 1970-s.

Estonian Institute of Geology made field investigations and at the end of 1970-s, contour lines of the potentiometric levels of uppermost groundwater at Moonaküla were presented on map. As the groundwater contamination source, the Kullaaru State Farm green- and boilerhouse were highlighted. There is no information about soil and water contamination investigations and cleanup works made at Soviet time and also not information about incident(s) in Kullaaru boilerhouse. By memories of local citizens, contamination started at western part of Moonaküla.

2 Description of the area

2.1 Land ownership and borders of the cadastral unit

Moonaküla groundwater pollution is situated in Rakvere Town, only small hypothetical area maybe located also at Tõrremäe Village of Rakvere Parish (see Figure 38 in Annex 1).

Almost whole territory of Moonaküla groundwater pollution land is private; land belongs to more than 100 houseseholds. Borders of cadastral units (yellow lines) of are shown on figure below.

Figure 2-1 Borders of cadastral units (yellow lines) at Moonaküla

2.2 Nearby settlement

Moonaküla groundwater pollution is located in northwest part of Rakvere Town, nearby Tõrremäe Village of Rakvere Parish.

2.3 Present activities at the site

The territory of Moonaküla district of Rakvere Town has been and will be used mainly as private houses area at Rakvere Town (today only Lääne Street 36 there are small garages and car service). At east from Näituse Street is located small industrial area, at south is railway, at west and north is Tõrremäe Village of Rakvere Parish. The water supply and sewage water pipes for all Moonaküla district of Rakvere Town were established at 2003. Existing private wells are not closed, lot of them are used continiousluy.

2.4 Prognosis for the future

The future vision for this area stays same as today, pivate living household's area.

2.5 Historical data about groundwater contamination

Moonaküla groundwater pollution was caused 30 years ago by Kullaaru State Farm green- and boilerhouse (todays OÜ Kullaaru Agro). We have no written information about soil and water analysis, cleanup works and about contamination incident(s) in boilerhouse from Soviet time. Probably in boilerhouse was also used some oil shale oil, at the time causing most of known leakages (oil shale oil is more agressive to rubber seilings and concrete storages).

2.6 Former investigations and findings

At Soviet time, the Board of Geology and Mineral Wealth Protection discussed groundwater contamination at Moonaküla district caused by Kullaaru State Farm greenhouses boilerhouse. Kullaaru State Farm asked at 1974 permission for drilling of new well for greenhouses boilerhouse. Groundwater contamination is not highlighted as reason for new well, but taking into account posterior events, we can suppose some groundwater contamination as one argument. From year 1979 exist letter for Estonian Broadcasting (likely answer to complaints from the citizens of Moonaküla) describing groundwater contamination at Moonaküla and referring investigations made 1978 by Estonian Institute of Geology. By this letter, as the source of

contamination primarily is described the leakage of heating oil storage at greenhouses boilerhouse and also mentioned some waste oil contaminated area at forest ca 500 m northeast from Moonaküla (later this hypothesis fall off).

In year 1991 the Environmental Department of Lääne-Viru County made visual mapping of contaminated wells (oil products) and the contaminated area was roughly outlined (no documents remained for today).

First remained and available investigation reports about Moonaküla groundwater pollution is "The explanatory letter for map of contour lines of the potentiometric levels of uppermost groundwater at Moonaküla" prepared by Estonian Institute of Geology.
In this explanatory letter dated 02.10.1990 is remark that presented map of contour lines of the potentiometric levels of uppermost groundwater at Moonaküla is compiled more than 10 years ago (probably 1978). Therefore we can date Moonaküla groundwater contamination event 1974-1977. From 4 potential contamination sources, the explanatory letter highlight as most liable the Kullaaru State Farm (greenhouses) boilerhouse. The contour lines of the potentiometric levels of uppermost groundwater at Moonaküla are presented also on figure 38-3
"Hydrogeological and geo-ecological investigations of Rakvere Town", Estonian Institute of Geology, 1994.
By this report from year 1989 the Estonian Institute of Geology made field investigations, questioning of 39 private wells owner at Moonaküla and abovementioned map of contour lines of the potentiometric levels of uppermost groundwater at Moonaküla was presented again.
„The additional report of environmental injuries at Rakvere air defence missile unit territory", Estonian Geological Survey, 1994.
About Moonaküla this report generally refers above presented information of Estonian Institute of Geology.
„Remediation plan of oil contamination at Moonaküla district at Rakvere town", AS Maves, 1997.
Questioning of 40 private wells owner at Moonaküla, water sample from Põhja Street 26/28 (lot of phenols, PAH and oil products, volatile organic compounds were not detected). As result ca 27 ha area assessed as being contaminated over groundwater limits, on 5 ha area outlined free phase of oil products on groundwater (also in wells). Proposal for clean-up works to Rakvere Town Government, as minimum removing of free phase of oil products from groundwater using abstraction wells and skimmers, discussion about possibilities of bio ventilation of aquifer with compressed air (after free phase will be removed). Provided simplified risk assessment highlights PAH as most dangerous from detected contaminants. High content of PAH in groundwater and presence of phenols indicates that some oil shale oil is also used in boilerhouse. The cleanup works proposal was rejected due expensivity, little risk to other water supply wells in Rakvere and there still remains immediate necessity for establishing of water network at Moonaküla.
„Control and studies of past pollution sites" and "Surveillance and control of dangerous past pollution sites" AS Maves, 2002-2004.
Situation at Moonaküla is same as in 1997. Free phase of oil products on groundwater is stabile; risk of spreading of contamination plume is assessed as small. In drainage ditch to Soolikaoja were detected (report 2003) small amounts of oil products (54 µg/l) and phenols (20 µg/l). Water sample from Soolikaoja indicates trace level phenols and trichloroethene, tetrachloroethene and biphenyl.

Opinion that detected contaminants At Soolikaoja Brook may origin also from other sources than Moonaküla. Conclusion is that monitoring is enough and no cleanup measures needed. Recommendation not to use contaminated water for irrigation in gardens, avoid establishing of new wells on contaminated area and its immediate closeness.

2.7 Topographical and climatic conditions

Moonaküla groundwater pollution is situated on wavy plain in the northern side of the Pandivere upland. The absolute heights of the ground are between 75-84.6 m. The highest area is in centre of Moonaküla, and the general slope of the gro und is in the direction from west to northeast.

There are the drainage ditches about 150 meters east from Moonaküla and draining the storm- and groundwater outflow, water flows to the Soolikaoja brook and thereafter to the Selja River.

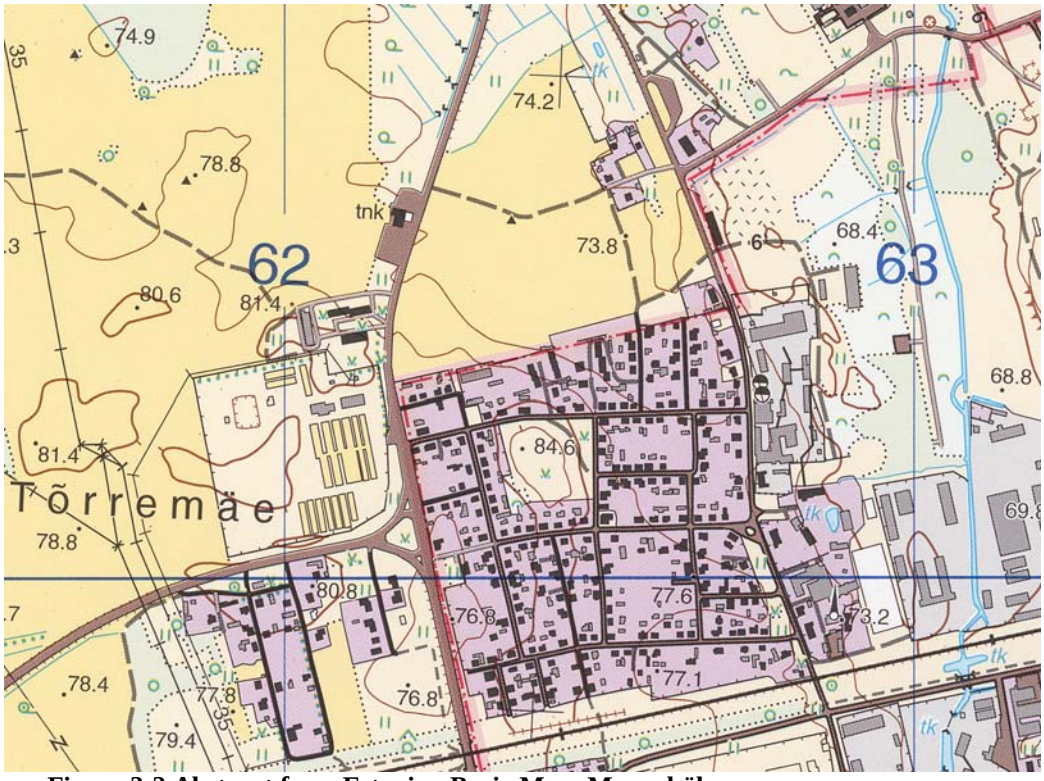


Figure 2-2 Abstract from Estonian Basic Map, Moonaküla area

The climatic conditions are typical for the inland area of Estonia, the average annual temperature is 4.2º C, the coldest month is February (-6.7º C), the warmest month is July (16.8º C). The average annual rainfall is 655 mm, 450 mm of which falls during the warm period. On average, the permanent cover of snow starts in the middle of December and lasts an approximate of 108 days, the average thickness of the snow is 30 cm. The prevailing winds blow from south-west.

2.8 Characterization of the surface water bodies

The nearest of surface water body is the Soolikaoja Brook (code 107530), the water of which flows north into the Selja River (code 107460). The Soolikaoja Brook and drainage ditches receive also some groundwater outflow from Moonaküla area. Water from the drainage ditches, situated 150 m west from the Moonaküla flow into the Soolikaoja Brook.

2.9 Geological and hydrogeological conditions

The thickness of the overburden, in the surveyed area of the Moonaküla is 4-7 m. The most common types of soil are clayey silt moraine and gravel, less sand and clayey silt.
The Middle-Ordovician Rakvere (O_2rk) and Oandu (O_2on) stages bedrock limestones are detected below overburden at depth 4-7 m from the ground level on the absolute heights 72-75 m. General correlation of geological structure, lithology and hydrogeological units is presented on figure 2-3.

The Ordovician aquifer system consists of limestones and dolomites with clayey interlayer lenses. Groundwater in the fissure systems and karst cavities of the carbonate bedrock flows relatively fast. The hydrogeological properties divide the water-bearing formations in Ordovician age limestones into aquifers and relative aquitards. The individual limestone aquifers are weakly separated from each other by clayey limestones and marl. The deeper groundwater horizons in limestone, where water storage and flow is limited to fractures, are generally poor aquifers and in places they may even be weak aquitards. The vertical conductivity of clayey layers separating the water-bearing zones is 10^{-5}-10^{-2} m/day, therefore these layers serve as relative aquitards dividing the Ordovician limestone in many local aquifers of different vertical and horizontal extent.
Near surface karst aquifer (also known as Nabala-Rakvere aquifer**,** thickness ca 10 m) cuts across the stratigraphic units. According to the collected data the groundwater of this aquifer is used by most of private wells at Moonaküla. These shallow wells are not registered in State Cadastral Register because in Soviet time there was not permanent requirement to register wells with depth less than 20 m (sometime this requirement was, sometime not). Near surface aquifer groundwater is recharged by percolation of rain and snowmelt water through the unsaturated topsoils. The aquifer is unprotected from pollution from the ground level.

Oandu stage clayey limestones and marl (thickness 8-10 m) separate near surface karst aquifer and next aquifer in Keila-Kukruse stages limestones.

Keila-Kukruse groundwater aquifer thickness is approximately 20-30 meters. Abovelying Oandu stage clayey limestones and marl form only weak aquitard, insufficient to protect firmly the Keila-Kukruse groundwater aquifer used by some private wells (40-50 m deep, Cadastral numbers 19320, 2698 and 2680) nearby and on Moonaküla area. The aquifer groundwater is recharged by leaks downward through the Oandu weak aquitar. Keila-Kukruse groundwater aquifer is weakly protected from pollution from the ground level. As the abovelying near surface karst aquifer (Nabala-Rakvere aquifer) is polluted, there exists risk of contamination nearby Moonaküla district located wells of Keila-Kukruse groundwater aquifer.

Uhaku stage clayey limestones and marl (thickness ca 10 m) separate Keila-Kukruse aquifer and next aquifer in Lasnamäe-Kunda stages limestones. Uhaku stage clayey limestones and marl form better aquitard than abovementioned Oandu stage aquitard.

Lasnamäe-Kunda groundwater aquifer (thickness is approximately 20 meters) lies below Uhaku medium aquitard. The aquifer groundwater is recharged by leaks downward through the Uhaku medium aquitard. Lasnamäe-Kunda aquifer groundwater is used in Arkna intake at 2.5 km northeast from Moonaküla and with some wells in Rakvere Town, but not close to Moonaküla. The aquifer is medium protected from pollution from the ground level. By calculations and taking into account historical data, the risk of contamination of Lasnamäe-Kunda groundwater aquifer wells is small but needed is throughgoing monitoring of these water supply wells.

Lower-Cambrian Volhovi, Latorpi, Varangu and Pakerordi stages clayey shale, clayey sandstone and clay form the Ordovician aquitard (thickness 5-10 m) separating the Ordovician aquifer system and the Ordovician–Cambrian aquifer.

The Ordovician–Cambrian aquifer underlies the Ordovician aquitard, the water bearing portion consists of fine-grained sandstone and siltstone of the Lower-Ordovician Pakerort Stage and the Lower-Cambrian Pirita Regional Stage. The thickness of the aquifer is 11-22 m. The hydraulic conductivity is 1-3 m/day and the aquifer transmissivity is in the range 20-50 m²/day. The main recharge area of aquifer is the Pandivere Upland, where Ordovician groundwater leaks downward through the Ordovician regional aquitard and disperses in radial directions as confined filtration flows. Ordovician–Cambrian aquifer groundwater is used in Rakvere Town on large areas, also in closeness to Moonaküla district. The Ordovician Cambrian aqyifer is the second important source of public water supply for Rakvere Town (ca 25%). The aquifer is protected from pollution from the ground level. By calculations there is no danger of the spreading of the

contaminated groundwater into the existing water supply wells taking water from Ordovician-Cambrian aquifer.

Lower-Cambrian Lontova stage clay ("blue clay") forms the Lükati-Lontova regional aquitard (thickness 30-40 m) separating The Ordovician–Cambrian aquifer and Cambrian-Vendian aquifer system.

Cambrian Vendian aquifer system underlies Lükati-Lomtova regional aquitard ("blue clay"). The water bearing are sand- and siltstones with interlayers of clay. The hydraulic conductivity is typically 5 m/day, the aqyifer transmissivity is 100-300 m²/day and the specific capacity of wells 0.3-1.0 l/sec/m drawdown. The groundwater in the Cambrian–Vendian aquifer is old and replenished very slowly due to the large thickness of the Cambrian "blue clay". Cambrian-Vendian aquifer groundwater is used in Rakvere Town on large areas by several intakes. The Cambrian–Vendian aquifer system is the most important source of public water supply for Rakvere Town (ca 70%). The aquifer is protected from pollution from the ground. By calculations there is no any danger of the spreading of the contaminated groundwater into the existing water supply wells taking water from Cambrian-Vendian aquifer systems.

By established monitoring wells data the groundwater level was in the bedrock limestone 5.3-9.59 m from the ground (14.07.2006), at an absolute height of 69.9-70.53 m. The groundwater table drops at general towards east. The Soolikaoja brook and drainage ditches east from Moonaküla drain the groundwater. At general the groundwater gradient in the east direction is 0.003-0.005.

The more widely spread soils hydraulic conductivities at Moonaküla area are as follows:

Soil	Hydraulic conductivity, m/d
Gravel and gravely sand	5-10
clayey silt moraine	0.1-0.5
Limestone at near surface karst aquifer	10 (horizontal direction) 1 (vertical direction)
Lower Ordovician aquitard (clayey shale, clayey sandstone and clay)	0.000002-0.000005
The Ordovician–Cambrian aquifer sandstone and siltstone	1.5 (horizontal direction) 0.5 (vertical direction)
Lükati-Lontova regional aquitard ("blue clay")	0.000001-0.000004
Cambrian Vendian aquifer	5 (horizontal direction) 1 (vertical direction)

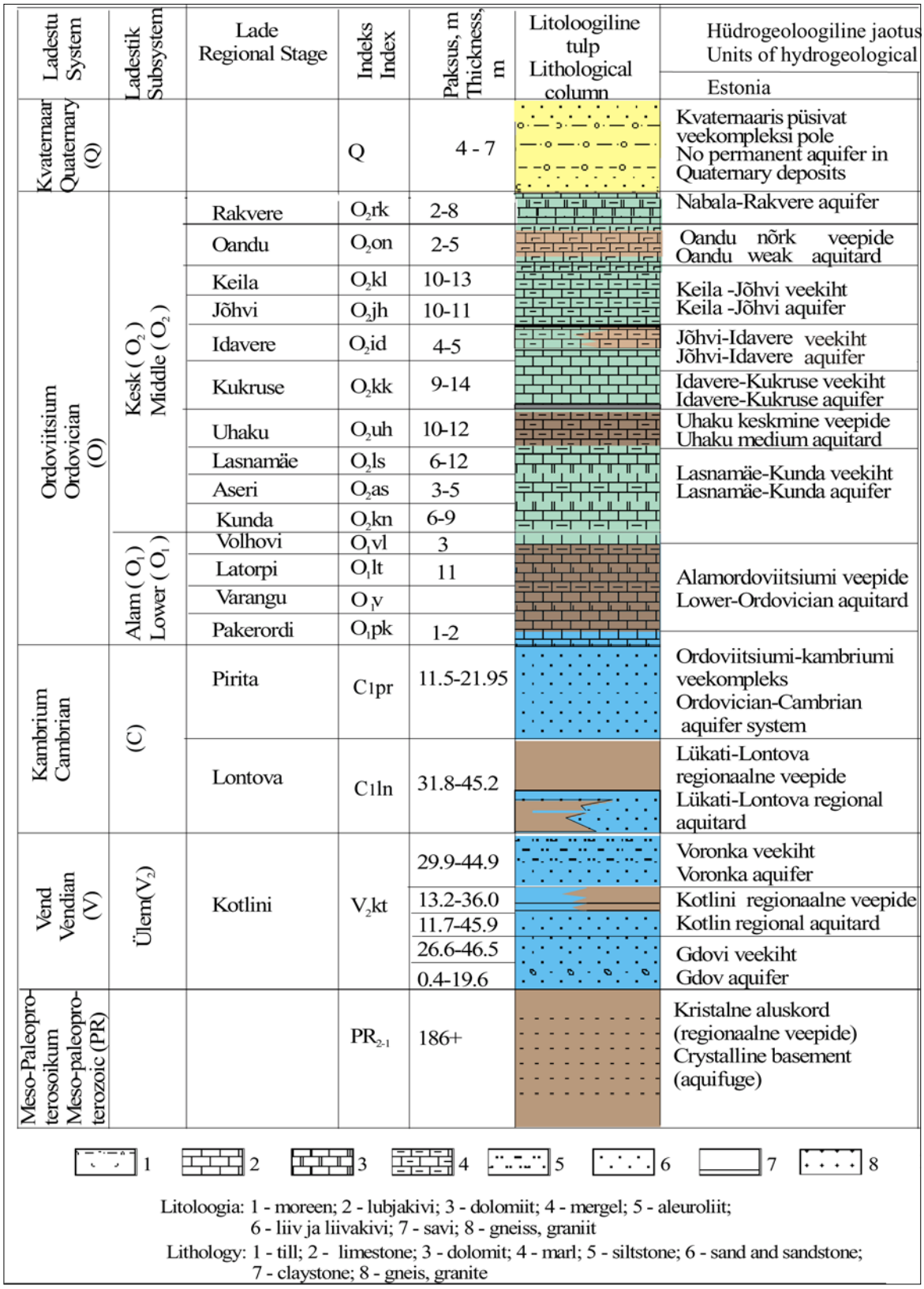


Figure 2-3 General correlation of geological structure, lithology and hydrogeological units

3 Existing facilities

3.1 Present storage conditions of the pollutants

By data available from all previous investigations and also by current survey, on there was not detected ground and underground storage containers causing groundwater contamination at Moonaküla district. On private households at Moonaküla may exist some small heating oil storages, but they have not been under suspiction as the contamination sources of Moonaküla groundwater pollution.

3.2 Technical condition of existing treatment facilities

There are no treatment facilities at Moonaküla district. Wastewater treatment plant of Rakvere Town is situated 600 m northeast from Moonaküla district of Rakvere Town.
There is no stormwater drainage system on area, the rainfall infiltrates into unsaturated topsoil (where the level of hydraulic conductivity is enough high).

3.3 Conditions of other facilities in the area

Wastewater and water supply pipelines were established or renovated at 2003. There are only nearby eastern side of Moonaküla some small industry enterprices.

4 Extent of the fieldworks

4.1 Sampling methodology

Water samples have been taken according to the methods described in Part 1 of the report.

At 2006 investigated private households wells data (also available collected previous investigations historical data) and established monitoring wells drill logs are presented at Annex 2.

4.2 Analysed parameters

Components of hazardous substances, detected in the samples, correspond to the list, given in Part 1 of the report.

4.3 Groundwater and surface water sampling

Groundwater samples were taken from established monitoring wells and private household's wells. By established monitoring wells data, the groundwater level (14.07.2006) was in the bedrock limestone 5.3-9.59 m from the ground level, at an absolute height 69.9-70.5 m. Groundwater samples were also taken from the drainage ditch, which is situated northeast from the Moonaküla district. The groundwater from the contaminated area flows towards east. Sampling points locations are presented on Annexes 1 on figure 38-1.

5 Identification of pollution

5.1 Amounts and types of pollutants

Volatile organic compounds, monophenols, polycyclic aromatic hydrocarbons (PAH) and naphtha products were detected in the groundwater samples over limits. Causing groundwater pollution these hazardous substances are portion of list of substances described in Part 1 of the report. The results of the analyses are shown in Tables 5.1.1-5.1.2 and in Annex 3.

Table 5.1.1 Contents of hazardous substances found in grundwater being over the detection limits

Dangerous substances	Maximum limits in groundwater		Groundwater sampling points and wells depths (m)								
			3801	3802	Lina 10	Kesk põik 4	Põhja 10	Põhja 18	Põhja 22	Põhja 23	Välja 5
	Target value	Reference value	8.6m	13.2m	10m	10m			22m	25m	> 35m
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Volatile Organic Compounds											
Benzene	0.2	5		***7***				***4***		***7***	
Toluene	0.5	50		***5***				***2***		***20***	
Xylene	0.5	30		**136**		***3***		***12***	***1***	***27***	
Ethylbenzene	0.5	50		***4***						7	
Styrene	0.5	50		***1***						***15***	
Isopropylbenzene	-	-		180		1					
Propylbenzene	-	-		31						6	
1,3,5-trimethylbenzene	-	-		59		9		3		12	
tert-butylbenzene	-	-		2						2	
1,2,4-trimethylbenzene	-	-		230		14		7		60	
sec-butylbenzene	-	-		22		2				4	
p-isopropylbenzene	-	-		18		5				5	
Butylbenzene	-	-		60							
Extractive compounds											
Aliphatics >C5-C8	-	-								82	
Aliphatics >C8-C10	-	-		35		230		100		32	
Aliphatics >C10-C12	-	-		3100		150		70		1600	
Aliphatics >C12-C16	-	-		5300		460		400		2400	
Aliphatics >C16-C35	-	-		2900		450		530		2000	
Aromatics >C8-C10	-	-		780		770		150		760	
Aromatics >C10-C35	-	-		29800000		2000		2850000		7700000	
Monophenols	1	100						7.4		99.9	6.7

Dangerous substances	Maximum limits in groundwater		Groundwater sampling points and wells depths (m)								
			3801	3802	Lina 10	Kesk põik 4	Põhja 10	Põhja 18	Põhja 22	Põhja 23	Välja 5
	Target value	Reference value	8.6m	13.2m	10m	10m			22m	25m	> 35m
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Phenol	0.5	50								**82**	
m-cresol	0.5	50								4.1	
o-cresol	0.5	50								4.5	
p-cresol	0.5	50								4.2	
2.3-dimethylphenol	0.5	50						***7.4***		5.1	6.7
Polycyclic aromatic hydrocarbons (PAH)	0.2	10	***1.28***	**30908**	***2.21***	**269.64**	***0.54***	**4674.8**	***2.01***	**3638.3**	***4.7***
Anthracene	0.1	5		**1400**	***0.11***	**22**		**150**		**190**	
Phenanthrene	0.05	2		**6800**		**76**	***0.1***	**570**	***0.1***	**310**	
Pyrene	1	5		**550**	0.11	**15**		**57**		**110**	
Acenaphthene	1	30		**1900**	0.95	***23***		**540**	0.14	**490**	0.68
Chrysene	0.01	1		**190**	***0.26***	**7.4**		**19**		**35**	
Naphthalene	1	50	0.87	**7900**		***7***		**1300**	0.92	**1300**	
a-methylnaphtalene	1	30	0.19	**5100**		**34**		**820**	0.27	**310**	***3.7***
b-methylnaphtalene	1	30	0.22	**5400**		***29***	0.34	**820**	0.4	**400**	0.32
Acenaphtalene	-	-		480		12	0.1	120	0.18	200	
Benzo(a)pyrene	0.01	1		**92**	***0.4***	**4.2**		**8.8**		**18**	
Benzo(a)anthracene	-	-		120		5.4		15		28	
Benzo(b,k)fluorantene	-	-		92	0.38	4		8.6		20	
Indeno(1,2,3,c,d)pyrene	-	-		20		1		1.6		4.6	
Dibenzo(a,h)anthracene	-	-		8		0.25		0.6		1.4	
9H-Fluorene	-	-		510		21		210		140	
Fluoranthene	-	-		330		7.9		33		77	
Benzo(g,h,i)perylene	-	-		16		0.49		1.2		4.3	

Dangerous substances	Maximum limits in groundwater		Groundwater sampling points and wells depths (m)								
			3801	3802	Lina 10	Kesk põik 4	Põhja 10	Põhja 18	Põhja 22	Põhja 23	Välja 5
	Target value	Reference value	8.6m	13.2m	10m	10m			22m	25m	> 35m
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Dibenzofuran	-	-		530		1		6.8		15	
Carbazole (Diphenylenimine)	-	-		36				36.2			
Heavy metals and other inorganic compounds											
Cadmium (Cd)	1	10			0.022		0.029				
Lead (Pb)	10	200					0.11			1.4	
Strontium (Sr)	-	-	130	160	200	0.18	0.17	0.37	0.2	0.39	1.2
Arsenic (As)	5	100	0.23	0.57	0.36	0.85	0.28	0.23	0.27	0.38	
Copper (Cu)	15	1000	1.2	0.58	2.2	0.63	21	0.39	1.1	0.53	1.1
Nickel (Ni)	10	200	1.8	3.9		0.94				1.6	
Zinc (Zn)	50	5000	2.8	1.3	***260***	2.6	***610***	***200***	11	***2900***	2.2
Aromatic hydrocarbons	1	100	0	**755**	0	***34***	0	***28***	1	**165**	0
Oil products total	20	600	0	**29812115**	0	**4060**	0	**2851250**	0	**7706874**	0

In Table 5.1.1 the contents of hazardous substances exceeding the target values of the groundwater is written in bold italics and the contents exceeding the reference values in bold and highlighted blue. The detected compounds are more or less toxic and carcinogenic.

Table 5.1.2 Contents of hazardous substances found in water being over the detection limits

Dangerous substances	Maximum limits in groundwater		Groundwater sampling points, wells depths (m)				Maximum limits in surface water	Surface water sampling points		
			Näituse 31	Lääne 8	Lääne 22	Koidu 24		Soolikaoja downstream from railroad	Soolikaoja downstream from road	Moonaküla ditch
	Target value	Reference value	14m	20m	16m	20m				
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Monophenols	1	100			3.3		1			
2.3-dimethylphenol	0.5	50			3.3					
Polycyclic aromatic hydrocarbons (PAH)	0.2	10			***2.77***					
Phenanthrene	0.05	2			***0.11***					
Acenaphthene	1	30			1					
a-methylnaphtalene	1	30			0.36		1			
b-methylnaphtalene	1	30			0.2		1			
9H-Fluorene	-	-			1.1					
Heavy metals and other inorganic compounds										
Cadmium (Cd)	1	10		0.024		0.083	5	0.048		
Lead (Pb)	10	200		0.92			25			
Strontium (Sr)	-	-	0.11	0.21	0.19	130		91	100	220
Arsenic (As)	5	100		0.023	0.26	0.27	50	0.27	0.35	0.31
Copper (Cu)	15	1000	1.2	***130***	1.6	7.6	15	1.4	0.84	0.46
Nickel (Ni)	10	200					5			
Zinc (Zn)	50	5000	19	***110***	***110***	***100***	50	2.8	2.4	1.4

In Table 5.1.2 the contents of hazardous substances exceeding the target values of the water is written in bold italics and the contents exceeding the reference values in bold and highlighted blue. The detected compounds are more or less toxic and carcinogenic.

On the basis of visual assessment, the overburden and bedrock of monitoring wells 3801 was not polluted with oil products. According to drill log of monitoring well 3802, the overburden was not polluted with oil products, but the fissure in limestone (at depth 11.3 m one meter below groundwater level, 14.07.2006) contains oil products.
Free phase oil was detected at some sampling points (well 3802, Põhja 18, Põhja 23, Põhja 26/28, Põhja 6 and Söödi 2/Lääne 29).
The water samples taken show that the groundwater at Moonaküla is polluted with: volatile aromatic hydrocarbons, (e.g. benzene, xylene, toluene, ethylbensene), monophenols (phenol), aromatic hydrocarbons (PAH-s various naphthalenes and pyrenes) and naphtha products. The detected compounds are more or less toxic and carcinogenic.
The contents of other hazardous substances (also heavy metals) detected in the samples, does not exceed the respective reference values in the regulation of the Minister of the Environment number 12 (Maximum Limits for Dangerous Substances in Soil and Groundwater). Noticeable are only strontium and zinc concentrations in some samples.
It is important to take into account, that **drinking water requirements** (regulation of Minister of Social Affairs of 02.01.2003 number 1 "Quality and control requirements for surface and groundwater intended for the water supply" and regulation of Minister of Social Affairs of 31.07.2001 number 82 "Quality and control requirements for potable water and methods for analyses") **are more strict than reference values in regulation no 12.** At general the limit values at regulations of Minister of Social Affairs are close to target values in regulation of the Minister of the Environment.
The water samples taken from the drainage ditch east from the polluted area and also from two points from Soolikaoja brook did not contain hazardous substances, only heavy metals on trace level below the maximum limits for surface water.
In previous studies ("Control and studies of past pollution sites" and "Surveillance and control of dangerous past pollution sites" AS Maves, 2002-2004) in drainage ditch was detected (2003) small amounts of oil products (54 µg/l) and phenols (20 µg/l) which probably originate from Moonaküla groundwater pollution. Water sample from Soolikaoja (2003) indicates trace level phenols and trichloroethene, tetrachloroethene and biphenyl but most of these substances cannot originate from Moonaküla groundwater pollution.

5.2 Soil pollution

Soil contamination was not investigated. Eastward from Moonaküla groundwater pollution at vicinity of outlined contaminated groundwater area some lower part of overburden may contain little amounts of dangerous substances spreaded by groundwater flow years ago. On this small industrial area located at east from Näituse Street, the reference values of hazardous substances in soil cannot be exceeded due groundwater outflow.

5.3 Water pollution

The water samples taken show that the groundwater at Moonaküla is polluted with: volatile aromatic hydrocarbons, (e.g. benzene, xylene, toluene, ethylbensene), monophenols (phenol), aromatic hydrocarbons (PAH-s various naphthalenes and pyrenes) and naphtha products.

The contaminated groundwater spreads within the area outlined at figures 38-1 …38-3, the polluted groundwater flows towards the drainage ditches in the eastern and northeastern direction. According to the lab results, the polluted water had not spread into the drainage ditch when the samples were taken, but it vary by years. *At year 2003 small amounts of oil products (54 µg/l) and phenols (20 µg/l) were detected.*

Assessment of contamination situation shows that the spreading of contamination with groundwater is relatively limited, both horizontally and vertically. Results of spill spreading will depend of dilution of different substances and not exactly known natural degradation and adsorption processes in soil and groundwater. Most of the impact occurs in near surface karst aquifer (Nabala-Rakvere aquifer) and also in Keila-Kukruse groundwater aquifer in the vicinity of outlined contaminated groundwater area.

Therefore is reasonabele add to outlined contaminated groundwater area (17.2 ha) an additional safety distance ca 300 m, as the area where groundwater abstraction for drinking water purposes is not safe from near surface karst aquifer (Nabala-Rakvere aquifer) and Keila-Kukruse groundwater aquifer.

On outlined contaminated groundwater area (17.2 ha) there is still remained by calculations up to 50 ton of oil products in groundwater and in limestone fissure systems and fractures.

5.4 Description of the existing monitoring network

The existing network of comprises of two monitoring wells – 3801 and 3802. Monitoring well 3801 is located on the norteastern border of the Moonaküla groundwater pollution territory; the soil and groundwater in this area are not contaminated. The monitoring well opens the first groundwater aquifer from the surface (near surface karst aquifer, Nabala-Rakvere aquifer). The well part which works as a filter is in depth 4.5-8.6 meters from the ground. The monitoring well has been secured with a metal casing, which is closed with a metal cap, which can also be locked. The groundwater level in the monitoring well was at a depth of 5.3 m from the ground level (14.07.2006).

Monitoring well 3802 is located in the middle of Moonaküla Moonaküla groundwater pollution territory. The monitoring well opens the first groundwater aquifer from the surface (near surface karst aquifer, Nabala-Rakvere aquifer). The well part which works as a filter is in depth 5.22-13.2 meters from the ground. The monitoring well has been secured with a metal casing, which is closed with a metal cap, which can also be locked. The water level in the monitoring well was at a depth of 9.59 meters from the ground level (14.07.2006).

Third suitable monitoring point is the drainage ditch northeast from Moonaküla.
Existing wells with Cadastral numbers no 19320, no 2698 and no 2680 could be also used for monitoring purposes nearby and on Moonaküla area.
The existing private households wells, not registered in State Cadastral Register, is recommended to close, they could spread contamination into downward aquifers and serve as risk sources for human life (water usage in households, for irrigation, also as drinking water).

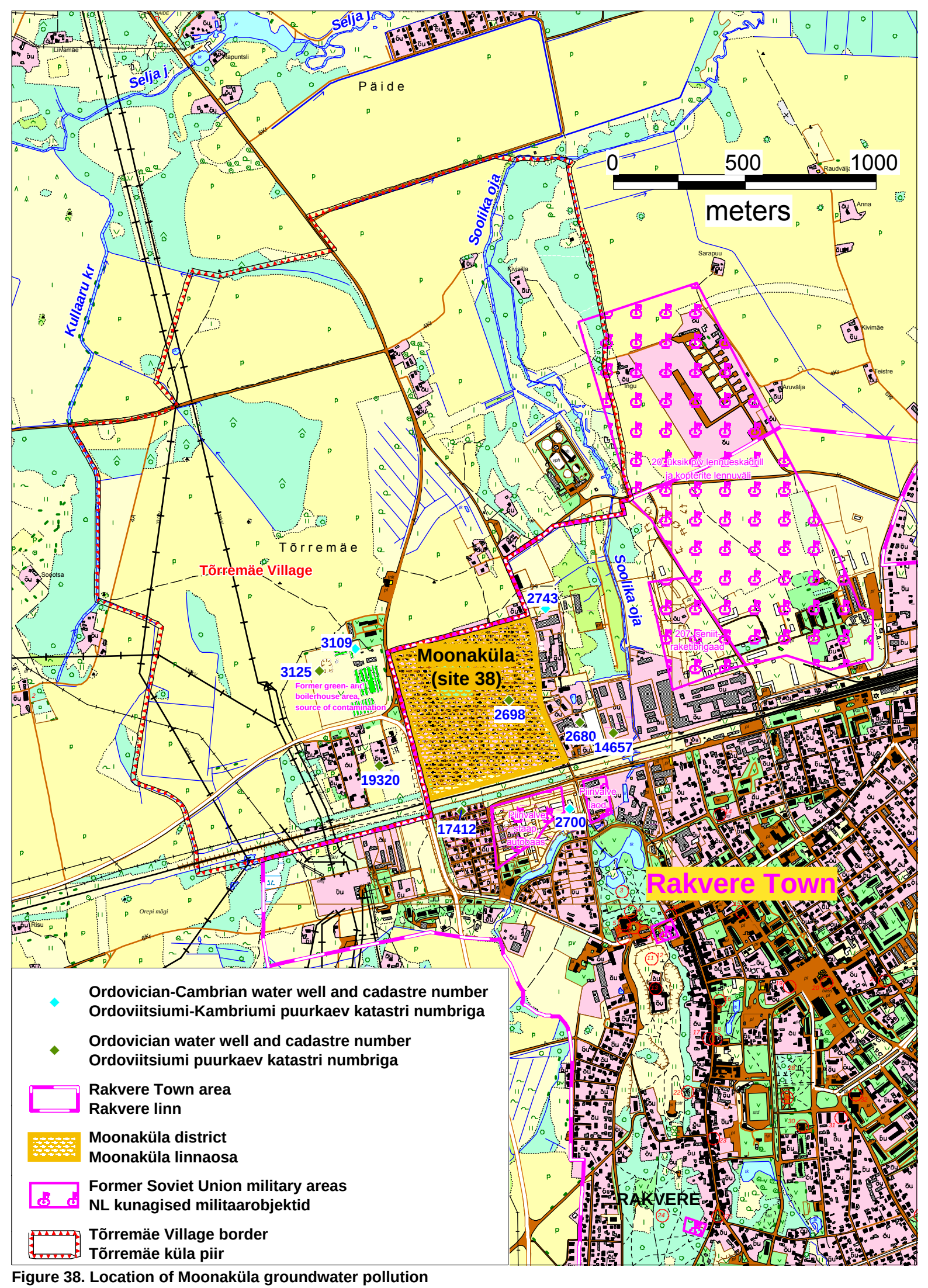
6 Conclusion, simplified risk assessment

6.1 Risks for environment

The groundwater is contaminated within the territory of Moonaküla. Hazardous substances in small amounts at time to time continue to spread to the Soolikaoja brook with groundwater outflow. Hazardous substances amounts are small and their spreading by Soolikaoja brook into the Selja River will be not detectable because of the distance and the existing dilution factor.

6.2 Risks for residents

There is a real danger for citizens of Moonaküla district: usage of contaminated groundwater in households, for irrigation, also as drinking water is source of risk to human health. There is no real danger of the spreading of the contaminated groundwater into the existing water intakes of Rakvere Town.



Ordovician-Cambrian water well and cadastre number
Ordoviitsiumi-Kambriumi puurkaev katastri numbriga

Ordovician water well and cadastre number
Ordoviitsiumi puurkaev katastri numbriga

Rakvere Town area
Rakvere linn

Moonaküla district
Moonaküla linnaosa

Former Soviet Union military areas
NL kunagised militaarobjektid

Tõrremäe Village border
Tõrremäe küla piir

Figure 38. Location of Moonaküla groundwater pollution
Joonis 38. Moonaküla põhjaveereostse paiknemine

Ordovician-Cambrian water well and cadastre number
Ordoviitsiumi-Kambriumi puurkaev katastri numbriga

Ordovician water well and cadastre number
Ordoviitsiumi puurkaev katastri numbriga

Former Soviet Union military areas
NL kunagised militaarobjektid

2006 surface water analyse, limit values not exceeded
2006 a pinnavee proov, vesi vastab nõuetele

2004 surface water analyse, limit values not exceeded
2004 a pinnavee proov, vesi vastab nõuetele

2006 monitoring well, groundwater is not contaminated
2006 a seirepuurauk, vesi pole reostunud

1994-1997 investigated well, water not contaminated
1994-1997 uuritud kaev, vesi polnud reostunud

2006 investigated well, water not contaminated
2006 uuritud kaev, vesi polnud reostunud

1994-1997 investigated well, water was contaminated
1994-1997 uuritud reostunud veega kaev

2006 investigated well, contaminants are > drinking water limits and < groundwater limits
2006 uuritud kaev, ohtlikke aineid < põhjavee piirarvude kuid üle joogivee piirsisalduste

2006 investigated well, contaminants are > groundwater limits
2006 uuritud kaev, ohtlikke aineid üle põhjavee piirarvude

2006 monitoring well, contaminants are > groundwater limits
2006 a seirepuurauk, ohtlikke aineid on üle põhjavee piirarvude

Contaminated groundwater area 17.2 ha at year 2006
Reostubud põhjaveega ala 17.2 ha aastal 2006

Former green- and boilerhouse area, source of contamination

Monitoring well 3802

Monitoring well 3801

0 100 200 meters

Figure 38-1. Sampling map of Moonaküla groundwater pollution
Joonis 38-1. Moonaküla põhjaveereostse uuringupunktide paiknemine

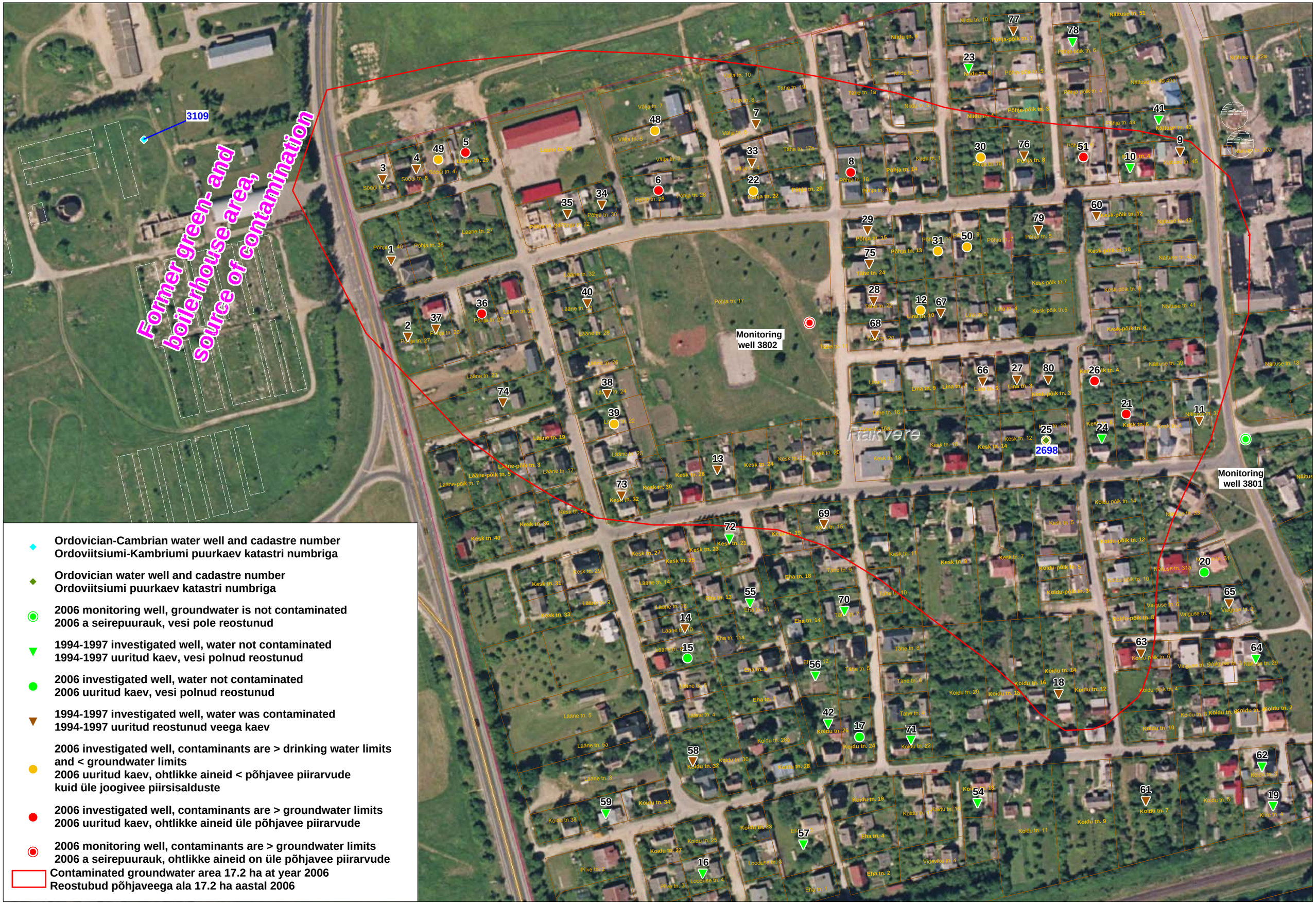


Figure 38-2. Sampling and information map of Moonaküla groundwater pollution

Joonis 38-2. Moonaküla põhjaveereostse teabe- ja uuringupunktide paiknemine

Ordovician-Cambrian water well and cadastre number
Ordoviitsiumi-Kambriumi puurkaev katastri numbriga

Ordovician water well and cadastre number
Ordoviitsiumi puurkaev katastri numbriga

2006 surface water analyse, limit values not exceeded
2006 a pinnavee proov, vesi vastab nõuetele

2004 surface water analyse, limit values not exceeded
2004 a pinnavee proov, vesi vastab nõuetele

2006 monitoring well, groundwater is not contaminated
2006 a seirepuurauk, vesi pole reostunud

1994-1997 investigated well, water not contaminated
1994-1997 uuritud kaev, vesi polnud reostunud

2006 investigated well, water not contaminated
2006 uuritud kaev, vesi polnud reostunud

1994-1997 investigated well, water was contaminated
1994-1997 uuritud reostunud veega kaev

2006 investigated well, contaminants are > drinking water limits and < groundwater limits
2006 uuritud kaev, ohtlikke aineid < põhjavee piirarvude kuid üle joogivee piirsisalduste

2006 investigated well, contaminants are > groundwater limits
2006 uuritud kaev, ohtlikke aineid üle põhjavee piirarvude

2006 monitoring well, contaminants are > groundwater limits
2006 a seirepuurauk, ohtlikke aineid on üle põhjavee piirarvude

Contaminated groundwater area 17.2 ha at year 2006
Reostubud põhjaveega ala 17.2 ha aastal 2006

The contour lines of the potentiometric levels of uppermost groundwater at Moonaküla (data ca 1980)
Põhjaveetaseme isohüpsid ca 1980 a alguses

Soolika

Kivisilla

Sarapu

Ingu

Soolika oja

Tõrremäe

Orepi mägi

3109

3125

19320

2743

2698

2680

14657

17412

2700

Monitoring well 3802 water level abs. 70.5 m

Monitoring well 3801 water level abs. 69.9 m

69

69.5

70

70.5

71

71.5

72

72.5

0 100 200 meters

Figure 38-3. Groundwater information map of Moonaküla groundwater pollution
Joonis 38-3. Moonaküla põhjaveeteave

No	Address	Well description	Situation description
1	Põhja 40	Borewell, 24 m depth	1997 Contamination starts 1977-78. Water is black on and with free oil. 2003 No information achieved. 2006 No information achieved.
2	Põhja 27	Borewell	1997 Waterlevel 8,88 m from casing tube. Used for irrigation. 2006 No information achieved.
3	Söödi 8	Borewell	1997 Waterlevel 5,8 m from casing tube. Water is not used, smells by oil products, no free phase on water. 2006 well is not in use, casing topp is in ground level, covered with concrete plate.
4	Söödi 6	Borewell	1997 Well is abandoned, water was not usable due oil products. 2006 no information achieved, living house under renovation
5	Söödi 2/ Lääne 29	Borewell	1997 Smells and free oil phase on water 2006 Groundwater not in use, strong oil smell and taste, there were lawn damages if used for irrigation.
6	Põhja 26/28	Borewell, 21 m depth	1997 by analysis there were lot of naphta, PAH and phenols over limit. 2003 Situation same as 1997 2006 Situation same as 1997, its planned to close the well
7	Välja 6	Borewell, 40 m depth	1997 Waterlevel 9,62 m from ground. No smell and film on water but bäd taste. 2006 Well is not in use
8	Põhja 18	Borewell	1997 Oily water 2003 Situation same as 1997 2006 Situation same as 1997, watersample V019309-06
9	Näituse 45	Borewell 21m depth	1997 Well is closed today, because water smells and taste by oil products, no free oil phase on water. 7 year aga water was drinkable. 2006 Well is not in use
10	Põhja 4	Dug well, 5,3 m depth	1997 Waterlevel 4,8 m from ground. Not much water, but no oil detetcted. 2006 Well is closed, well location nowadays under garage
11	Näituse 37	Borewell	1997 Smells and free oil phase on water
12	Lina 10	Borewell, 10 m depth	1997 Smells and free oil phase on water 2006 Well is not in use, casing 6m, waterlevel 5.8 m, some free oil and smells by oil products. 2004 lot of oil. Water sample V019306-06
13	Kesk 26	Borewell, 25 m depth	1997 Well is not in use, free phase and smells by oil products, not usable for irrigation.
14	Lääne 10	Borewell, 20 m depth	1997 Smells and taste, no free oil phase on water.
15	Lääne 8	Borewell, 20 m depth	1997 Smells and taste, no free oil phase on water. Some othes film on water. 2006 By owners opinion contamination decreases, smells by oil products. Usage for irrigation and in sauna. Water sample V019314-06
16	Looduse 4	Borewell, 22 m depth	1997 Water clean and drinkable.
17	Koidu 24	Borewell, ca 20 m depth	1997 Water clean and drinkable. 2003 Situation same as 1997 2006 Visually clean and no oil products smell, 5-6 years ago free phase of oil. Used for irrigation and for domestic needs (not for drinking). Water sample V019316-06
18	Koidu 14	Borewell, ca 20 m depth	1997 Water clean and drinkable. 2 years ago was oily, sometimes also up today oil film on water.
19	Kiire 4	Borewell	1997 Water is clean and drinkable always.
20	Näituse 31	Borewell 14 m depth	1994 Lot of oil. 1997 Vesi sogane, õli maitse ja lõhnaga. Kastmiseks sobib, ei jooda. 2006 Visually clean and no oil products smell, used for irrigation and for domestic needs (attempts to use for drinking). Water sample V019313-06
21	Kesk 6	Borewell 11m depth	1997 Smells and free oil phase on water 2003 Situation same as 1997
22	Põhja 22	Borewell 20m depth	1994 Oily water, at Põhja street always oily, afterward at Lina street. 2006 Situation same as 1997, well not used, pump is out. Water sample V019310-06
23	Niidu 6	Borewell	1997 Water clean and drinkable.
24	Kesk 8	Borewell	1997 Water clean and drinkable, well is not in use
25	Kesk 10	Borewell nr 2698	1997 Smells and free oil phase on water, used for irrigation. 2003 Situation same as 1997, well is not in use 2006 Opinion that in central water supply was also some oil during pipelines building.
26	Kesk-põik 4	Borewell, 10,5 m depth	1997 Smells and free oil phase on water. Casing tube 7.5m 2003 By ownmer opinion groundwater contamination begins from Tõrremäe direction 2006 Situation same as 1997. Water sample V019307-06

No	Address	Well description	Situation description
27	Lina 3	Borewell, 12 m depth	1997 Waterlevel 6,8 m from ground. Oil in water since 80-ies. Well is not in use, no oil fil detected. 2006 Well is not in use
28	Tähe 22	Borewell	1997 Well is closed, smells and free oil phase on water.
29	Põhja 15	Borewell	1997 Well is closed, smells and free oil phase on water.
30	Põhja 10	Borewell	1997 Oily water. 2003 Smells by oil products, owner opinion that at northside houses groundwater is drinkable. 2006 Very old well, summertime little smell of oil products, water used for irrigation. Water sample V019308-06
31	Põhja 11	Borewell	1997 Little smell and taste of oil products, no free phase of oil on water. Used for irrigation. 2006 Some free oil and smells by oil products, used for irrigation.
33	Välja 4	Borewell	1997 Well is closed, smells and free oil phase on water.
34	Põhja 30	Borewell	1997 Well is closed 10 years, smells and free oil phase on water.
35	Põhja 32	Borewell	1997 Water smells and free oil phase on water. 2006 Well is closed, well location nowadays under concrete pavament
36	Põhja 23	Borewell, 25 m depth	1997 Extremely contaminated by oil. 2006 Situation same as 1997, free oil on groundwater. Water sample V019311-06
37	Põhja 25	Borewell	1997 Oily water, used for irrigation. 2006 Visually clean and no oil products smell, used for irrigation.
38	Lääne 24	Borewell	1997 Well is closed, smells and free oil phase on water.
39	Lääne 22	Borewell, 16 m depth	1997 Smells and free oil phase on water. Used for irrigation. 2003 Situation same as 1997 2006 Situation same as 1997. Water sample V019315-06
40	Lääne 30	Borewell, 29 m depth	1997 Water black, smells and free oil phase.
41	Näituse 47	Borewell 32m depth	1997 Water always drinkable.
42	Koidu 26		1997 Water clean and drinkable.
48	Välja 5	Borewell deep	2006 Waterlevel 10.5 m, no free oil and no smell of oil products. Water used in garage at adress Lääne 36. Water sample V019312-06
49	Söödi 4	Borewell	2006 Well is not in use
50	Põhja 9	Borewell	1994 Oil products in water 8 mg/l 2006 Sometimes free oil and little smells by oil products, used for irrigation.
51	Põhja 6	Borewell 12 m depth	1994 Smells by oil products 2006 Groundwater not in use, free oil, strong oil smell and taste, lawn damages if was used for irrigation.
54	Koidu 13		1994 No oil products detected
55	Eha 11	Borewell 27 m depth	1994 No oil products detected
56	Eha 12	Borewell 14 m depth	1994 No oil products detected
57	Eha 3	Borewell 18 m depth	1994 No oil products detected
58	Koidu 32	Borewell 22 m depth	1994 Sometimes oil film on water.
59	Koidu 36	Borewell 15 m depth	1994 No oil products detected
60	Kesk-põik 12		1994 Contaminated by oil products since spring 1991.
61	Koidu 7	Borewell 10 m depth	1994 Oily water.
62	Koidu 3	Borewell 20 m depth	1994 No oil products detected
63	Koidu-põik 6	Borewell 20 m depth	1994 Sometimes oily water.
64	Näituse 29	Borewell 11 m depth	1994 No oil products detected
65	Valguse 2	Borewell 11 m depth	1994 Lot of oil at winter
66	Lina 5		1994 Free oil on warter
67	Lina 8	Borewell 20 m depth	1994 Sometomes oily since mid eighties.
68	Tähe 20	Borewell 13 m depth	1994 Water is not in use, some years ago was oily.
69	Kesk 15	Borewell 20m depth	1994 Sometimes oily water.
70	Tähe 7	Borewell 16 m depth	1994 Sometimes dry well, if water exists its clean.
71	Koidu 22	Borewell 14 m depth	1994 No oil products detected
72	Kesk 21	Borewell	1994 No oil products detected
73	Kesk 32	Borewell 20m depth	1994 Since 1989 oil in well
74	Lääne 21	Borewell 15 m depth	1994 Oil in well lot of years.
75	Tähe 24		1994 Since end of eighties oil in well
76	Põhja 8	Borewell	1994 Oily water.
77	Põhja-põik 7	Borewell 21 m depth	1994 Since 1990 oil in well
78	Põhja-põik 6	Salvkaev	1994 No oil products detected
79	Põhja 5	Borewell 19m depth	1994 Old well contaminated 1992.
80	Kesk-põik 3		1994 Water is not usable for nothing.

PUURAUGU VÕI PUURKAEVU ARVESTUSKAART

Arvestuskaardi number:	……..……	Riiklik katastrinumber:	……..……
PUURAUGU VÕI PUURKAEVU ANDMED			
Passi number:	……..……	Puurimise aeg:	**11.07.2006**
Asukoht:	**Lääne Virumaa, Rakvere linn, Näituse 14** *maaüksuse tunnus/ tänav/ asula/ vald/ linn/ maakond*		
Koordinaadid: **Lambert Euref EST 92** Keskkonnaministri "….."…… 2006. a	Nurgakoordinaadid: x= 633346.2 m, y= 6582320.8 m ……6582320.8……..….. p. l. ……633346.2……..i. p.		
Lisa: puuraugu või -kaevu asukoha joonis mõõtkavas 1:500 kuni 1:1 000 ja 1:10 000 kuni 1:150 000			
PUURAUGU VÕI PUURKAEVU PROJEKTEERIJA ANDMED			
Hüdrogeoloogiliste tööde litsentsi omaniku nimi:	**AS Maves**		
Hüdrogeoloogiliste tööde litsentsi number:	**136**		
Hüdrogeoloogiliste tööde litsentsi andmise kuupäev:	**01.11.2005**		
Puuraugu või puurkaevu projekti number:	**Monitoring well 3801**		
Kontaktandmed:	aadress: **Marja 4d, Tallinn, 10617** ……..……..……. telefon: **6565428**……. e-post: …**maves@online.ee**……..		
PUURAUGU VÕI PUURKAEVU PUURIJA ANDMED			
Hüdrogeoloogiliste tööde litsentsi omaniku nimi:	**AS Maves**		
Hüdrogeoloogiliste tööde litsentsi number:	**136**		
Hüdrogeoloogiliste tööde litsentsi andmise kuupäev:	**01.11.2005**		
Kontaktandmed:	aadress: **Marja 4d, Tallinn, 10617** ……..……..……. telefon: **6565428**……. e-post: …**maves@online.ee**……..		
PUURAUGU VÕI PUURKAEVU ANDMED			
Sanitaarkaitseala ulatus:	……..**10**…….. meetrit		
Vee kasutamise otstarve:	……**reostuskolde seire**…...…….		
Sügavus: ……..…**8.6**…….. meetrit		Pinna absoluutne kõrgus:	**75.23 m** meetrit
Põhjaveekiht:	……..……S-O……..……...……		

Geoloogline läbilõige:

Nr	Litoloogiline kirjeldus	Geoloogline indeks	Kihi paksus (m)	Kihi lamami sügavus (m)	Veekihi lasuvussügavus intervall (m)
1.	Muld	QIV	0.2	0.2	
2.	Saviliiv, pruun, sitkeplastne	QIII lgl	0.3	0.5	
3.	Saviliivmoreen, pruun, sitkeplastne, jmp 25%	QIII gl	2.2	2.7	

4.	Peenliiv, pruunikashall, kesktihe, niiske	QIII fgl	0.7	3.4	
5.	Saviliivmoreen, pruun, kõvaplastne, jmp 30%	QIII gl	0.9	4.3	
6.	Lubjakivi hall kõva, lõheline, lõhed 6.3 m ja 7.4 m (vesi)	O_2rk-O_2on	4.3	8.6	5.3

Tootlikkus:	……10…….. m^3 ööpäevas
Puurimise tehnika:	……URB 2A2……..

Konstruktsioon:

Jrk nr	Puurauk		Manteldus			
	Puurimise diameeter mm	Vahemik (m)	Manteltoru diameeter (mm)	Algus (m)	Lõpp (m)	Pikkus (m)
1.	132	0-4.5	108	+0.52	4.5	5.02
2.	93	4.5-8.6				

Puurkaevu töötav osa:	..… Lubjakivis filtrita 4.5-8.6m ……..
Filtri konstruktsioon ja paigutus:	..……filtrit pole……..
Tihendid:	..……pole……..
Tamponaaž:	..……savitamponaaz…….. …….
Pumpamise tehnika ja kestvus:	..…sukelpump……..

Deebit (l/s)	Alanemine (m)	Erideebit (l/s)	Staatiline veetase (m)
0.3	0.05	1.5	5.25

PÕHJAVEE ANALÜÜSID

Veeproovide võtmise kuupäev:	…… **14.07.20006**……..
Labori nimi ja registrikood:	…… **Lantmännen Analycen AB, Rootsi**……..
Bakterioloogiline analüüs:	..……**EI**……
Termotolerantsed coli-laadsed bakterid:	…… pesa/100 cm^3
Coli-laadsed bakterid:	…… pesa/100 cm^3
Heterotroofsed bakterid:	…… pesa/cm^3

Üldkeemilised veeanalüüsid: **vaid ohtlikud ained, vaata tabel järgmisel lehel**

Labori nimi ja registrikood:	…… **Lantmännen Analycen AB, Rootsi** …..

Kuiv-jääk	Na^+	K^+	NH_4^+	Ca^{2+}	Mg^{2+}	Mn^{2+}	$Fe^{üld}$	Cl^-	SO_4^{2-}	NO_3^{2-}	NO_2^-	HCO_3^-	Fl^-	Üldka-redus	pH	mgO/l
mg/l														mg-ekv		
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Arvestuskaardi täitja nimi:	..……Indrek Tamm……
Arvestuskaardi täitja allkiri:	 ……

Arvestuskaardi täitmise kuupäev:	……5.detsember 2006……

Puurkaevu vesi vastab määratud komponentide osas Keskkonnaministri 2. aprilli 2004. a määrus nr 12 „Pinnases ja põhjavees ohtlike ainete sisalduse piirnormid" nõuetele, sotsiaalministri 31. juuli 2001. a. määruse nr 82 „Joogivee kvaliteedi- ja kontrollinõuded ning analüüsimeetodid*" nõuetest on ületatud polütsükliliste aromaatsete süsivesinike (PAH) sisaldused.

Kuna seirekaev paikneb põhjaveereostuse vahetus läheduses ja sisaldab joogiveena kasutamisel ülemääraselt polütsüklilisi aromaatseid süsivesinikke on vesi joogiks kõlbmatu.

Seirekaev on suletud veevõtu vältimiseks metallist lukustatava päisega.

Puurkaevu akti tellija: Keskkonnaministeeriumi veeosakond

Kaevu valdaja esindaja: Argo Sakkool, Keskkonnaministeeriumi veeosakond

AS Maves juhatuse liige  Indrek Tamm

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		Linnaosa Näituse 14	Linnaosa Põhja 17
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
Group 1 Volatile Organic Compounds			
Benzene	µg/l	<0.2	7
Toluene	µg/l	<1	5
Xylene	mg/l	<0.001	0,136
Ethylbenzene	µg/l	<1	4
Sum TEX	mg/l	<0.001	0,145
Styrene	µg/l	<1	1
MTBE	µg/l	<0.01	<0.01
Chloroorganic aromatics			
Chlorobenzene	µg/l	<1	<1
2-Chlorotoluene	µg/l	<1	<1

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		Linnaosa Näituse 14	Linnaosa Põhja 17
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
4-Chlorotoluene	µg/l	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1
1,2-dichloroethane	µg/l	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10
Chloroform	µg/l	<1	<1
Auxiliary volatile organic compunds			
Isopropylbenzene	µg/l	<1	180
Propylbenzene	µg/l	<1	31
1,3,5-trimetylbenzene	µg/l	<1	59
Tert-butylbenzene	µg/l	<1	2
1,2,4-trimetylbenzene	µg/l	<1	230
Sec-butylbenzene	µg/l	<1	22
p-isopropylbenzene	µg/l	<1	18
Butylbenzene	µg/l	<1	60
Fluortrichloromethane	µg/l	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1
1,1-dichloroethene	µg/l	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1
Tetrachloroethene	µg/l	<1	<1
Dichloromethane	µg/l	<1	<1
1,3-dichloropropane	µg/l	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1
Dibromchloromethane	µg/l	<1	<1
1,1-dichloroethane	µg/l	<1	<1
1,2-dibromoethane	µg/l	<1	<1
2,2-dichloropropane	µg/l	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1
Bromoform	µg/l	<1	<1
Bromobenzene	µg/l	<1	<1
1,1,1-trichlorethane	µg/l	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1
Tetrachloromethane	µg/l	<1	<1
1,1-dichloropropane	µg/l	<1	<1
Trichloroethene	µg/l	<1	<1
1,2-dichloropropane	µg/l	<1	<1
Dibrommethane	µg/l	<1	<1
Bromchloromethane	µg/l	<1	<1
Bromodichloromethane	µg/l	<1	<1
Hexachlorobutadien	µg/l	<1	<1
1,3-Dichloropropene	µg/l	<1	<1
Group 2 Extractive compounds			

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		Linnaosa Näituse 14	Linnaosa Põhja 17
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
Aliphatics >C5-C8	mg/l	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	0,035
Aliphatics >C10-C12	mg/l	<0.02	3,1
Aliphatics >C12-C16	mg/l	<0.02	5,3
Aliphatics >C16-C35	mg/l	<0.05	2,9
Aromatics >C8-C10	mg/l	<0.1	0,78
Aromatics >C10-C35	mg/l	<0.1	29800
Poly Chlorinated Biphenyls PCBs			
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10
Group 3 Phenols and Cresols			
Phenol	µg/l	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	<1.00
3,4-dimethylphenol	µg/l	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0
Group 5 PAH			
	Units		
Anthracene	µg/l	<0.10	1400
Phenanthrene	µg/l	<0.10	6800
Pyrene	µg/l	<0.10	550
Acenaphthene	µg/l	<0.10	1900
Chrysene	µg/l	<0.10	190
Naphtalene	µg/l	0,87	7900
α-methylnaphtalene	µg/l	0,19	5100
β-methylnaphtalene	µg/l	0,22	5400
Acenaphtalene	µg/l	<0.10	480
Benzo(a)pyrene	µg/l	<0.10	92
Benzo(a)anthracene	µg/l	<0.10	120
Benzo(b,k)fluorantene	µg/l	<0.10	92
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	20
Dibenzo(a,h)anthracene	µg/l	<0.10	8
9H-Fluorene	µg/l	<0.10	510

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		Linnaosa Näituse 14	Linnaosa Põhja 17
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
Fluorantene	µg/l	<0.10	330
Benzo(g,h,i)perylene	µg/l	<0.10	16
Dibenzofuran	µg/l	<0.10	530
Carbazole	µg/l	<0.10	36
Sum carcinogenic PAH	µg/l	<0.30	430
Sum other PAH	µg/l	0,87	20000
Group 7 Metals			
Cadmium	mg/l	<0.00002	<0.00002
Lead	mg/l	<0.00005	<0.00005
Strontium	mg/l	0,13	0,16
Arsenic	mg/l	0,00023	0,00057
Copper	mg/l	0,0012	0,00058
Chromium	mg/l	<0.0002	<0.0002
Nickel	mg/l	0,0018	0,0039
Zinc	mg/l	0,0028	0,0013
Lantmännen Analycen AB			
2006-10-31			
Caroline Karlsson			


21
Näituse tn. 37
11
Kesk tn. 6
Kesk tn. 4
Rajatud seirekaev
Monitoring well 3801
Näituse tn. 14
Näituse tn. 14b
Näituse tn. 33
Näituse tn. 12
Näituse tn. 31
20
Näituse tn. 31a
65
Valguse tn. 6
Valguse tn. 2

M 1:1000

KESKKONNAMINISTEERIUM
Lääne-Virumaa Keskkonnateenistus

AS Maves
Marja 4D
10617 Tallinn

Teie: 10.11.2005 nr 4-4/110

Meie:06.12.2005 nr 36-12-3/2735

Pinnase- ja põhjaveeuuringutest

Oleme tutvunud Teie poolt esitatud taotlusega pinnase- ja põhjaveeuuringute toestamiseks “”Jääkreostus likvideerimise projekti ettevalmistus militaar- ja industriaalaladel” töö raames.

Keskkonnateenistus annab nõusoleku uuringute läbiviimiseks taotluses kirjeldatud mahus järgmistel tingimustel:

- Uuringu teostajal on maaomaniku ja omavalitsuse nõusolek uuringu läbiviimiseks;
- Keskkonnateenistusele esitatakse andmed puuraukude asukohtade ning rajamise ja likvideerimise aja kohta.

Lugupidamisega

Aivar Lamjärv
Juhataja

Kristi Pobbul 32 58411

Narva mnt 7a
15172 Tallinn
Reg nr 70001231
telefon 325 8401
faks 325 8403
keskkonnateenistus@l-viru.envir.ee
Postiaadress:
Kunderi 18
44307 RAKVERE

Saadud 9.12.2005

RAKVERE
LINNAVALITSUS

AS Maves
Marja 4d
10617 TALINN

Teie: 14.11.2005 nr 4-4/114

Meie:16.01.2006 nr 9-2.2/05/4878

Luba põhjaveeuuringute tegemiseks

Saadame Teile Rakvere Linnavolikogu otsuse nr 2 11.01.2006.a. loa andmise kohta põhjaveeuuringute tegemiseks Rakvere linnas Moonaküla põhjaveereostusega alal.

Lugupidamisega

Andres Jaadla
Linnapea

Lisad: Rakvere Linnavolikogu otsus nr 2 11.01.06.

Jüri Eljas tel 322 5825 527 9347

Saadud
18.01.2006

Tallinna 5
44306 RAKVERE

Tel +372 322 5870
Faks +372 322 5871
e-post: linnavalitsus@rakvere.ee

reg 75025064
a/a 10502003419005
Eesti Ühispank kood 401

KAEVETÖÖDE TEATIS/LUBA Nr_____

Teatise esitaja

AS MAVES (Mati Salu)
(nimi)
Marja 4d Tallinn 10617
(aadress)
65 76 300 (51 85 395)
(sidevahendid)

Jrk Nr.	Tööde läbiviimise koht	Tööde nimetus ja hulk	Kaevatava katte hulk ja liik	Töö algus	Töö lõpp
1	Põhja ja Tähe tn nurgal	1 seirepuurauk	Haljasala 0,03 m^2	10.07.2006	28.07.2006
2	Näituse ja Kesk tn nurgal	1 seirepuurauk	Haljasala 0,03 m^2	10.07.2006	28.07.2006

Kohustun:

1. **Täpselt täitma Rakvere linna kaevetööde eeskirja;**
2. **Esitama projekti, mis on koostatud geodeet-maakorraldaja või Lääne-Viru maakonna peageodeedi poolt välja antud geodeetilisel alusplaanil M 1:500;**
3. **Täitma kõiki teatisel märgitud tingimusi;**
4. **Vastutama tehnovõrkude ja geodeetiliste märkide rikkumise eest;**
5. **Tööd lõpetama (k.a. teekatte taastamine) määratud tähtajaks;**
6. **Esitama Rakvere Linnavalitsuse geodeet-maakorraldajale 10 päeva jooksul peale tööde lõpetamist paigaldatud tehnovõrgu digitaalselt mõõdistatud teostusjoonised.**

Kaevetööde teatise originaal asub Rakvere linnavalitsuses ja koopia Teataja käes

Tööde läbiviija AS MAVES; Marja 4d, Tallinn, 10617; tel 65 67 300
(nimi) (aadress) (sidevahendid)

Teatise esitaja ____________ (allkiri)
(allkiri)

Kooskõlastused:

Rakvere linna peaarhitekt / Tallinna 5 / tel. 3225826	☐

Eesti Energia AS Jaotusvõrk Virumaa piirkond / Kreutzwaldi 26 / 7150819	☐
Kooskõlastatud 07.07.06 /H. Olev/	

AS Eltel Networks Kreutzwaldi 5^C / tel. 3224431	☐
Enne tööde algust kohale kutsuda 07.07.2006 /A. Vene/	

AS Eesti Gaas / Rägavere 43^B / tel. 3223621	☐
Kooskõlastatud 07.07.2006.a.	

AS Rakvere Vesi /Tallinna 5^{A} /tel. / 3223317 ☐

Kooskõlastatud. 6.07.2006.
Aivar Kotri [signature]

AS Rakvere Soojus / Lembitu 7 / tel. 5298054 ☐

Muinsuskaitseinspektsiooni Virumaa talitus / Kreutzwaldi 5^{A} /tel. 3258039 ☐

Lääne-Virumaa Päästeteenistus / Tallinna 38 / tel. 3225847 ☐

Rakvere linna keskkonnainsener / Tallinna 5^{A} / tel 3225825 5279347 ☐

Kooskõlastatud. 07.07.2006 [signature]

Rakvere linna haljastusinsener / Tallinna 5^{A} / tel. 3225826 ☐

Kooskõlastatud. 07.07.2006 [signature]
Olemasolev olukord peale kaevetöid taastada.

Rakvere linna projekteerija-planeerimisspetsialist / Tallinna 5^{A} / tel. 3225828 ☐

Rakvere linna ehitusjärelevalve insener / Tallinna 5^{A} / tel. 3225827 ☐

Signaal Rakvere OÜ / Võidu 2 / tel. 3223488 5132394 ☐

Rakvere linna teedeinsener / Tallinna 5^{A} / tel. 32 25824 5053361 ☐

PUURAUGU VÕI PUURKAEVU ARVESTUSKAART

Arvestuskaardi number:	……..……	Riiklik katastrinumber:	……..……
PUURAUGU VÕI PUURKAEVU ANDMED			
Passi number:	……..……	Puurimise aeg:	**11.07.2006**
Asukoht:	**Lääne Virumaa, Rakvere linn, Põhja 17** *maaüksuse tunnus/ tänav/ asula/ vald/ linn/ maakond*		
Koordinaadid: **Lambert Euref EST 92** Keskkonnaministri "….."…… 2006. a	Nurgakoordinaadid: x= 633064.2 m, y= 6582400.0 m ……6582400.0……..….. p. l. ……633064.2……..i. p.		
Lisa: puuraugu või -kaevu asukoha joonis mõõtkavas 1:500 kuni 1:1 000 ja 1:10 000 kuni 1:150 000			
PUURAUGU VÕI PUURKAEVU PROJEKTEERIJA ANDMED			
Hüdrogeoloogiliste tööde litsentsi omaniku nimi:	**AS Maves**		
Hüdrogeoloogiliste tööde litsentsi number:	**136**		
Hüdrogeoloogiliste tööde litsentsi andmise kuupäev:	**01.11.2005**		
Puuraugu või puurkaevu projekti number:	**Monitoring well 3802**		
Kontaktandmed:	aadress: **Marja 4d, Tallinn, 10617** ……..……..…… telefon: **6565428**……. e-post: …**maves@online.ee**……..		
PUURAUGU VÕI PUURKAEVU PUURIJA ANDMED			
Hüdrogeoloogiliste tööde litsentsi omaniku nimi:	**AS Maves**		
Hüdrogeoloogiliste tööde litsentsi number:	**136**		
Hüdrogeoloogiliste tööde litsentsi andmise kuupäev:	**01.11.2005**		
Kontaktandmed:	aadress: **Marja 4d, Tallinn, 10617** ……..……..…… telefon: **6565428**……. e-post: …**maves@online.ee**……..		
PUURAUGU VÕI PUURKAEVU ANDMED			
Sanitaarkaitseala ulatus:	……..**10**…….. meetrit		
Vee kasutamise otstarve:	……**reostuskolde seire**…...…….		
Sügavus: ……..…**13.2**…….. meetrit		Pinna absoluutne kõrgus:	**80.12** meetrit
Põhjaveekiht:	……..……**S-O**……..……...……		

Geoloogline läbilõige:

Nr	Litoloogiline kirjeldus	Geoloogline indeks	Kihi paksus (m)	Kihi lamami sügavus (m)	Veekihi lasuvussügavus intervall (m)
1.	Muld	QIV	0.1	0.1	
2.	Kruus hallikaskollane, tihe niiske	QIII fgl	4.7	4.8	
3.	Lubjakivi hall kõva, lõheline, lõhe 11.3 m (vesi õline)	O_2rk-O_2on	8.4	13.2	9.59

Tootlikkus:	……10…….. m^3 ööpäevas
Puurimise tehnika:	……URB 2A2……..

Konstruktsioon:

Jrk nr	Puurauk		Manteldus			
	Puurimise diameeter mm	Vahemik (m)	Manteltoru diameeter (mm)	Algus (m)	Lõpp (m)	Pikkus (m)
1.	132	0-5.2	108	+0.68	5.2	5.88
2.	93	5.2-13.2				

Puurkaevu töötav osa:	..… Lubjakivis filtrita 5.2-13.2 m ……..
Filtri konstruktsioon ja paigutus:	..……filtrit pole……..
Tihendid:	..……pole……..
Tamponaaž:	..……savitamponaaz…….. ..……..
Pumpamise tehnika ja kestvus:	..…sukelpump……..

Deebit (l/s)	Alanemine (m)	Erideebit (l/s)	Staatiline veetase (m)
0.3	0.05	1.5	0.54

PÕHJAVEE ANALÜÜSID

Veeproovide võtmise kuupäev:	..…… **14.07.20006**……..
Labori nimi ja registrikood:	..…… **Lantmännen Analycen AB, Rootsi**……..
Bakterioloogiline analüüs:	..……**EI**……
Termotolerantsed coli-laadsed bakterid:	…… pesa/100 cm^3
Coli-laadsed bakterid:	…… pesa/100 cm^3
Heterotroofsed bakterid:	…… pesa/cm^3

Üldkeemilised veeanalüüsid: **vaid ohtlikud ained, vaata tabel järgmisel lehel**

Labori nimi ja registrikood:	…… **Lantmännen Analycen AB, Rootsi** …..

Kuiv-jääk	Na^+	K^+	NH_4^+	Ca^{2+}	Mg^{2+}	Mn^{2+}	$Fe^{üld}$	Cl^-	SO_4^{2-}	NO_3^{2-}	NO_2^-	HCO_3^-	Fl^-	Üldka-redus	pH	mgO/l
mg/l														mg-ekv		
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Arvestuskaardi täitja nimi:	..……Indrek Tamm……
Arvestuskaardi täitja allkiri:	..……
Arvestuskaardi täitmise kuupäev:	..……5.detsember 2006……

Puurkaevu vesi ei vasta määratud komponentidest lenduvate orgaaniliste ühendite, polütsükliliste aromaatsete süsivesinike (PAH) ja naftasaaduste sisalduse tõttu Keskkonnaministri 2. aprilli 2004. a määrus nr 12 „Pinnases ja põhjavees ohtlike ainete

sisalduse piirnormid" ja sotsiaalministri 31. juuli 2001. a. määruse nr 82 „Joogivee kvaliteedi- ja kontrollinõuded ning analüüsimeetodid*" nõuetele.

Kuna seirekaev paikneb põhjaveereostuse keskmes ja sisaldab palju ohtlikke aineid on vesi joogiks kõlbmatu.

Seirekaev on suletud veevõtu vältimiseks metallist lukustatava päisega.

Puurkaevu akti tellija: Keskkonnaministeeriumi veeosakond

Kaevu valdaja esindaja: Argo Sakkool, Keskkonnaministeeriumi veeosakond

AS Maves juhatuse liige  Indrek Tamm

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		linnaosa	linnaosa
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
Group 1 Volatile Organic Compounds			
Benzene	µg/l	<0.2	7
Toluene	µg/l	<1	5
Xylene	mg/l	<0.001	0,136
Ethylbenzene	µg/l	<1	4
Sum TEX	mg/l	<0.001	0,145
Styrene	µg/l	<1	1
MTBE	µg/l	<0.01	<0.01
Chloroorganic aromatics			
Chlorobenzene	µg/l	<1	<1
2-Chlorotoluene	µg/l	<1	<1
4-Chlorotoluene	µg/l	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1
1,2-dichloroethane	µg/l	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10
Chloroform	µg/l	<1	<1
Auxiliary volatile organic compunds			
Isopropylbenzene	µg/l	<1	180
Propylbenzene	µg/l	<1	31

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		linnaosa	linnaosa
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
1,3,5-trimetylbenzene	µg/l	<1	59
Tert-butylbenzene	µg/l	<1	2
1,2,4-trimetylbenzene	µg/l	<1	230
Sec-butylbenzene	µg/l	<1	22
p-isopropylbenzene	µg/l	<1	18
Butylbenzene	µg/l	<1	60
Fluortrichloromethane	µg/l	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1
1,1-dichloroethene	µg/l	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1
Tetrachloroethene	µg/l	<1	<1
Dichloromethane	µg/l	<1	<1
1,3-dichloropropane	µg/l	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1
Dibromchloromethane	µg/l	<1	<1
1,1-dichloroethane	µg/l	<1	<1
1,2-dibromoethane	µg/l	<1	<1
2,2-dichloropropane	µg/l	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1
Bromoform	µg/l	<1	<1
Bromobenzene	µg/l	<1	<1
1,1,1-trichlorethane	µg/l	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1
Tetrachloromethane	µg/l	<1	<1
1,1-dichloropropane	µg/l	<1	<1
Trichloroethene	µg/l	<1	<1
1,2-dichloropropane	µg/l	<1	<1
Dibrommethane	µg/l	<1	<1
Bromchloromethane	µg/l	<1	<1
Bromodichloromethane	µg/l	<1	<1
Hexachlorobutadien	µg/l	<1	<1
1,3-Dichloropropene	µg/l	<1	<1
Group 2 Extractive compounds			
Aliphatics >C5-C8	mg/l	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	0,035
Aliphatics >C10-C12	mg/l	<0.02	3,1
Aliphatics >C12-C16	mg/l	<0.02	5,3
Aliphatics >C16-C35	mg/l	<0.05	2,9
Aromatics >C8-C10	mg/l	<0.1	0,78
Aromatics >C10-C35	mg/l	<0.1	29800
Poly Chlorinated Biphenyls PCBs			
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		linnaosa	linnaosa
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10
Group 3 Phenols and Cresols			
Phenol	µg/l	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	<1.00
3,4-dimethylphenol	µg/l	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0
Group 5 PAH			
	Units		
Anthracene	µg/l	<0.10	1400
Phenanthrene	µg/l	<0.10	6800
Pyrene	µg/l	<0.10	550
Acenaphthene	µg/l	<0.10	1900
Chrysene	µg/l	<0.10	190
Naphtalene	µg/l	0,87	7900
α-methylnaphtalene	µg/l	0,19	5100
β-methylnaphtalene	µg/l	0,22	5400
Acenaphtalene	µg/l	<0.10	480
Benzo(a)pyrene	µg/l	<0.10	92
Benzo(a)anthracene	µg/l	<0.10	120
Benzo(b,k)fluorantene	µg/l	<0.10	92
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	20
Dibenzo(a,h)anthracene	µg/l	<0.10	8
9H-Fluorene	µg/l	<0.10	510
Fluorantene	µg/l	<0.10	330
Benzo(g,h,i)perylene	µg/l	<0.10	16
Dibenzofuran	µg/l	<0.10	530
Carbazole	µg/l	<0.10	36
Sum carcinogenic PAH	µg/l	<0.30	430
Sum other PAH	µg/l	0,87	20000
Group 7 Metals			
Cadmium	mg/l	<0.00002	<0.00002
Lead	mg/l	<0.00005	<0.00005
Strontium	mg/l	0,13	0,16
Arsenic	mg/l	0,00023	0,00057
Copper	mg/l	0,0012	0,00058
Chromium	mg/l	<0.0002	<0.0002

AnalyCen

Sampling person		Mati Salu AS Maves	Mati Salu AS Maves
Sample Point		Moonaküla	Moonaküla
		linnaosa	linnaosa
Sample		V019317-06	V019318-06
Sample name		Borehole 3801	Borehole 3802
Sampling method		A209:34	A209:34
Sample Date	Units	2006-07-14	2006-07-14
Nickel	mg/l	0,0018	0,0039
Zinc	mg/l	0,0028	0,0013
Lantmännen Analycen AB			
2006-10-31			
Caroline Karlsson			


Tähe tn. 24
28
Tähe tn. 22
Põhja tn. 17
Rajatud seirekaev
Monitoring well 3802
68
Tähe tn. 20
Tähe tn. 11
Lina tn. 11
24
Tähe tn. 16
tn. 22
Tähe tn. 16a
äne tn. 20
Kesk tn. 20
Kesk tn. 22
Kesk tn. 18
13
Kesk tn. 24
Kesk tn. 28
73
Kesk tn. 30

M 1:1000

KESKKONNAMINISTEERIUM
Lääne-Virumaa Keskkonnateenistus

AS Maves
Marja 4D
10617 Tallinn

Teie: 10.11.2005 nr 4-4/110

Meie:06.12.2005 nr 36-12-3/2735

Pinnase- ja põhjaveeuuringutest

Oleme tutvunud Teie poolt esitatud taotlusega pinnase- ja põhjaveeuuringute toestamiseks “”Jääkreostus likvideerimise projekti ettevalmistus militaar- ja industriaalaladel” töö raames.

Keskkonnateenistus annab nõusoleku uuringute läbiviimiseks taotluses kirjeldatud mahus järgmistel tingimustel:

- Uuringu teostajal on maaomaniku ja omavalitsuse nõusolek uuringu läbiviimiseks;
- Keskkonnateenistusele esitatakse andmed puuraukude asukohtade ning rajamise ja likvideerimise aja kohta.

Lugupidamisega

Aivar Lamjärv
Juhataja

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Saadud 9.12.2005

RAKVERE
LINNAVALITSUS

AS Maves
Marja 4d
10617 TALINN

Teie: 14.11.2005 nr 4-4/114

Meie:16.01.2006 nr 9-2.2/05/4878

Luba põhjaveeuuringute tegemiseks

Saadame Teile Rakvere Linnavolikogu otsuse nr 2 11.01.2006.a. loa andmise kohta põhjaveeuuringute tegemiseks Rakvere linnas Moonaküla põhjaveereostusega alal.

Lugupidamisega

Andres Jaadla
Linnapea

Lisad: Rakvere Linnavolikogu otsus nr 2 11.01.06.

Jüri Eljas tel 322 5825 527 9347

Saadud
18.01.2006

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reg 75025064
a/a 10502003419005
Eesti Ühispank kood 401

KAEVETÖÖDE TEATIS/LUBA Nr_____

Teatise esitaja

AS MAVES (Mati Salu)
(nimi)
Marja 4d Tallinn 10617
(aadress)
65 76 300 (51 85 395)
(sidevahendid)

Jrk Nr.	Tööde läbiviimise koht	Tööde nimetus ja hulk	Kaevatava katte hulk ja liik	Töö algus	Töö lõpp
1	Põhja ja Tähe tn nurgal	1 seirepuurauk	Haljasala 0,03 m^2	10.07.2006	28.07.2006
2	Näituse ja Kesk tn nurgal	1 seirepuurauk	Haljasala 0,03 m^2	10.07.2006	28.07.2006

Kohustun:

1. **Täpselt täitma Rakvere linna kaevetööde eeskirja;**
2. **Esitama projekti, mis on koostatud geodeet-maakorraldaja või Lääne-Viru maakonna peageodeedi poolt välja antud geodeetilisel alusplaanil M 1:500;**
3. **Täitma kõiki teatisel märgitud tingimusi;**
4. **Vastutama tehnovõrkude ja geodeetiliste märkide rikkumise eest;**
5. **Tööd lõpetama (k.a. teekatte taastamine) määratud tähtajaks;**
6. **Esitama Rakvere Linnavalitsuse geodeet-maakorraldajale 10 päeva jooksul peale tööde lõpetamist paigaldatud tehnovõrgu digitaalselt mõõdistatud teostusjoonised.**

Kaevetööde teatise originaal asub Rakvere linnavalitsuses ja koopia Teataja käes

Tööde läbiviija AS MAVES; Marja 4d, Tallinn, 10617; tel 65 67 300
(nimi) (aadress) (sidevahendid)

Teatise esitaja ___M Salu___
(allkiri)

Kooskõlastused:

Rakvere linna peaarhitekt / Tallinna 5 / tel. 3225826	☐

Eesti Energia AS Jaotusvõrk Virumaa piirkond / Kreutzwaldi 26 / 7150819	☐
Kooskõlastatud 07.07.06 [signature] /H. Olev/	

AS Eltel Networks Kreutzwaldi 5^C / tel. 3224431	☐
Enne tööde algust kohale kutsuda 07.07.2006 /A. Vene/ [signature]	

AS Eesti Gaas / Rägavere 43^B / tel. 3223621	☐
Kooskõlastatud 07.07.2006.a. [signature]	

AS Rakvere Vesi /Tallinna 5^A /tel. / 3223317 ☐

Kooskõlastatud. 6.07.2006.
Aivar Kotie' [signature]

AS Rakvere Soojus / Lembitu 7 / tel. 5298054 ☐

Muinsuskaitseinspektsiooni Virumaa talitus / Kreutzwaldi 5^A /tel. 3258039 ☐

Lääne-Virumaa Päästeteenistus / Tallinna 38 / tel. 3225847 ☐

Rakvere linna keskkonnainsener / Tallinna 5^A / tel 3225825 5279347 ☐

Kooskõlastatud. 07.07.2006 [signature]

Rakvere linna haljastusinsener / Tallinna 5^A / tel. 3225826 ☐

Kooskõlastatud. 07.07.2006 [signature]
Olemasolev olukord peale kaevetöid taastada.

Rakvere linna projekteerija-planeerimisspetsialist / Tallinna 5^A / tel. 3225828 ☐

Rakvere linna ehitusjärelevalve insener / Tallinna 5^A / tel. 3225827 ☐

Signaal Rakvere OÜ / Võidu 2 / tel. 3223488 5132394 ☐

Rakvere linna teedeinsener / Tallinna 5^A / tel. 32 25824 5053361 ☐

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
		Moonakula	Moonakula	Moonakula	Moonakula
Sample Point		pohjaveereostu	pohjaveereostu	pohjaveereostu	pohjaveereostu
Sample		V019306-06	V019307-06	V019308-06	V019309-06
Sample name		Lina 10	Kesk poik 4	Pohja 10	Pohja 18
Sample depth					
Sampling method		A209:34		GC	A209:35
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
Group 1 Volatile Organic Compounds					
	Units				
Benzene	µg/l	<0.2	<0.2	<0.2	4
Toluene	µg/l	<1	<1	<1	2
Xylene	mg/l	<0.001	0,003	<0.001	0,012
Ethylbenzene	µg/l	<1	<1	<1	<1
Sum TEX	mg/l	<0.001	0,003	<0.001	0,014
Styrene	µg/l	<1	<1	<1	<1
MTBE	µg/l	<0.01	<0.01	<0.01	<0.01
Chloroorganic aromatics					
Chlorobenzene	µg/l	<1	<1	<1	<1
2-Chlorotoluene	µg/l	<1	<1	<1	<1
4-Chlorotoluene	µg/l	<1	<1	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichloroethane	µg/l	<1	<1	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10	<0.10	<0.10
Chloroform	µg/l	<1	<1	<1	<1
Auxiliary volatile organic compunds					
Isopropylbenzene	µg/l	<1	1	<1	<1
Propylbenzene	µg/l	<1	<1	<1	<1
1,3,5-trimetylbenzene	µg/l	<1	9	<1	3
Tert-butylbenzene	µg/l	<1	<1	<1	<1
1,2,4-trimetylbenzene	µg/l	<1	14	<1	7
Sec-butylbenzene	µg/l	<1	2	<1	<1
p-isopropylbenzene	µg/l	<1	5	<1	<1
Butylbenzene	µg/l	<1	<1	<1	<1
Fluortrichloromethane	µg/l	<1	<1	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1	<1	<1
1,1-dichloroethene	µg/l	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1	<1	<1
Tetrachloroethene	µg/l	<1	<1	<1	<1
Dichloromethane	µg/l	<1	<1	<1	<1
1,3-dichloropropane	µg/l	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Dibromchloromethane	µg/l	<1	<1	<1	<1
1,1-dichloroethane	µg/l	<1	<1	<1	<1
1,2-dibromoethane	µg/l	<1	<1	<1	<1
2,2-dichloropropane	µg/l	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Bromoform	µg/l	<1	<1	<1	<1
Bromobenzene	µg/l	<1	<1	<1	<1

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
		Moonakula	Moonakula	Moonakula	Moonakula
Sample Point		pohjaveereostu	pohjaveereostu	pohjaveereostu	pohjaveereostu
Sample		V019310-06	V019311-06	V019312-06	V019313-06
Sample name		Pohja 22	Pohja 23	Välja 5	Näituse 31
Sample depth					
Sampling method		A209:34	A209:34	SS-EN 12673	A 209:9
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
Group 1 Volatile Organic Compounds					
	Units				
Benzene	µg/l	<0.2	7	<0.2	<0.2
Toluene	µg/l	<1	20	<1	<1
Xylene	mg/l	0,001	0,027	<0.001	<0.001
Ethylbenzene	µg/l	<1	7	<1	<1
Sum TEX	mg/l	0,001	0,054	<0.001	<0.001
Styrene	µg/l	<1	15	<1	<1
MTBE	µg/l	<0.01	<0.01	<0.01	<0.01
Chloroorganic aromatics					
Chlorobenzene	µg/l	<1	<1	<1	<1
2-Chlorotoluene	µg/l	<1	<1	<1	<1
4-Chlorotoluene	µg/l	<1	<1	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichloroethane	µg/l	<1	<1	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10	<0.10	<0.10
Chloroform	µg/l	<1	<1	<1	<1
Auxiliary volatile organic compunds					
Isopropylbenzene	µg/l	<1	<1	<1	<1
Propylbenzene	µg/l	<1	6	<1	<1
1,3,5-trimetylbenzene	µg/l	<1	12	<1	<1
Tert-butylbenzene	µg/l	<1	2	<1	<1
1,2,4-trimetylbenzene	µg/l	<1	60	<1	<1
Sec-butylbenzene	µg/l	<1	4	<1	<1
p-isopropylbenzene	µg/l	<1	5	<1	<1
Butylbenzene	µg/l	<1	<1	<1	<1
Fluortrichloromethane	µg/l	<1	<1	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1	<1	<1
1,1-dichloroethene	µg/l	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1	<1	<1
Tetrachloroethene	µg/l	<1	<1	<1	<1
Dichloromethane	µg/l	<1	<1	<1	<1
1,3-dichloropropane	µg/l	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Dibromchloromethane	µg/l	<1	<1	<1	<1
1,1-dichloroethane	µg/l	<1	<1	<1	<1
1,2-dibromoethane	µg/l	<1	<1	<1	<1
2,2-dichloropropane	µg/l	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Bromoform	µg/l	<1	<1	<1	<1
Bromobenzene	µg/l	<1	<1	<1	<1

Sampling person		Mati Salu	Mati Salu
		JRK 38	JRK 38
		Moonakula	Moonakula
Sample Point		pohjaveereostu	pohjaveereostu
Sample		V019314-06	V019315-06
Sample name		Lääne 8	Lääne 22
Sample depth			
Sampling method		A209:34	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
Group 1 Volatile Organic Compounds			
	Units		
Benzene	µg/l	<0.2	<0.2
Toluene	µg/l	<1	<1
Xylene	mg/l	<0.001	<0.001
Ethylbenzene	µg/l	<1	<1
Sum TEX	mg/l	<0.001	<0.001
Styrene	µg/l	<1	<1
MTBE	µg/l	<0.01	<0.01
Chloroorganic aromatics			
Chlorobenzene	µg/l	<1	<1
2-Chlorotoluene	µg/l	<1	<1
4-Chlorotoluene	µg/l	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1
1,2-dichloroethane	µg/l	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10
Chloroform	µg/l	<1	<1
Auxiliary volatile organic compunds			
Isopropylbenzene	µg/l	<1	<1
Propylbenzene	µg/l	<1	<1
1,3,5-trimetylbenzene	µg/l	<1	<1
Tert-butylbenzene	µg/l	<1	<1
1,2,4-trimetylbenzene	µg/l	<1	<1
Sec-butylbenzene	µg/l	<1	<1
p-isopropylbenzene	µg/l	<1	<1
Butylbenzene	µg/l	<1	<1
Fluortrichloromethane	µg/l	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1
1,1-dichloroethene	µg/l	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1
Tetrachloroethene	µg/l	<1	<1
Dichloromethane	µg/l	<1	<1
1,3-dichloropropane	µg/l	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1
Dibromchloromethane	µg/l	<1	<1
1,1-dichloroethane	µg/l	<1	<1
1,2-dibromoethane	µg/l	<1	<1
2,2-dichloropropane	µg/l	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1
Bromoform	µg/l	<1	<1
Bromobenzene	µg/l	<1	<1

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
Sample Point		JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus
Sample		V019306-06	V019307-06	V019308-06	V019309-06
Sample name		Lina 10	Kesk poik 4	Pohja 10	Pohja 18
Sample depth					
Sampling method		A209:34		GC	A209:35
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
1,1,1-trichlorethane	µg/l	<1	<1	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1	<1	<1
Tetrachloromethane	µg/l	<1	<1	<1	<1
1,1-dichloropropane	µg/l	<1	<1	<1	<1
Trichloroethene	µg/l	<1	<1	<1	<1
1,2-dichloropropane	µg/l	<1	<1	<1	<1
Dibrommethane	µg/l	<1	<1	<1	<1
Bromchloromethane	µg/l	<1	<1	<1	<1
Bromodichloromethane	µg/l	<1	<1	<1	<1
Hexachlorobutadien	µg/l	<1	<1	<1	<1
1,3-Dichloropropene	µg/l	<1	<1	<1	<1
Group 2 Extractive compounds					
Aliphatics >C5-C8	mg/l	<0.02	<0.02	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	0,23	<0.02	0,1
Aliphatics >C10-C12	mg/l	<0.02	0,15	<0.02	0,07
Aliphatics >C12-C16	mg/l	<0.02	0,46	<0.02	0,4
Aliphatics >C16-C35	mg/l	<0.05	0,45	<0.05	0,53
Aromatics >C8-C10	mg/l	<0.1	0,77	<0.1	0,15
Aromatics >C10-C35	mg/l	<0.1	2	<0.1	2850
Poly Chlorinated Biphenyls PCBs					
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
Group 3 Phenols and Cresols					
Phenol	µg/l	<1.00	<1.00	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	<1.00	<1.00	7,4
3,4-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0	<3.0	<3.0

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
Sample Point		JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus
Sample		V019310-06	V019311-06	V019312-06	V019313-06
Sample name		Pohja 22	Pohja 23	Välja 5	Näituse 31
Sample depth					
Sampling method		A209:34	A209:34	SS-EN 12673	A 209:9
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
1,1,1-trichlorethane	µg/l	<1	<1	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1	<1	<1
Tetrachloromethane	µg/l	<1	<1	<1	<1
1,1-dichloropropane	µg/l	<1	<1	<1	<1
Trichloroethene	µg/l	<1	<1	<1	<1
1,2-dichloropropane	µg/l	<1	<1	<1	<1
Dibrommethane	µg/l	<1	<1	<1	<1
Bromchloromethane	µg/l	<1	<1	<1	<1
Bromodichloromethane	µg/l	<1	<1	<1	<1
Hexachlorobutadien	µg/l	<1	<1	<1	<1
1,3-Dichloropropene	µg/l	<1	<1	<1	<1
Group 2 Extractive compounds					
Aliphatics >C5-C8	mg/l	<0.02	0,082	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	0,032	<0.02	<0.02
Aliphatics >C10-C12	mg/l	<0.02	1,6	<0.02	<0.02
Aliphatics >C12-C16	mg/l	<0.02	2,4	<0.02	<0.02
Aliphatics >C16-C35	mg/l	<0.05	2	<0.05	<0.05
Aromatics >C8-C10	mg/l	<0.1	0,76	<0.1	<0.1
Aromatics >C10-C35	mg/l	<0.1	7700	<0.1	<0.1
Poly Chlorinated Biphenyls PCBs					
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
Group 3 Phenols and Cresols					
Phenol	µg/l	<1.00	82	<1.00	<1.00
m-cresol	µg/l	<1.00	4,1	<1.00	<1.00
o-cresol	µg/l	<1.00	4,5	<1.00	<1.00
p-cresol	µg/l	<1.00	4,2	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	5,1	6,7	<1.00
3,4-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum cresols	µg/l	<3.0	12,8	<3.0	<3.0

Sampling person		Mati Salu	Mati Salu
Sample Point		JRK 38 Moonakula pohjaveereostus	JRK 38 Moonakula pohjaveereostus
Sample		V019314-06	V019315-06
Sample name		Lääne 8	Lääne 22
Sample depth			
Sampling method		A209:34	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
	Units		
1,1,1-trichlorethane	µg/l	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1
Tetrachloromethane	µg/l	<1	<1
1,1-dichloropropane	µg/l	<1	<1
Trichloroethene	µg/l	<1	<1
1,2-dichloropropane	µg/l	<1	<1
Dibrommethane	µg/l	<1	<1
Bromchloromethane	µg/l	<1	<1
Bromodichloromethane	µg/l	<1	<1
Hexachlorobutadien	µg/l	<1	<1
1,3-Dichloropropene	µg/l	<1	<1
Group 2 Extractive compounds			
Aliphatics >C5-C8	mg/l	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	<0.02
Aliphatics >C10-C12	mg/l	<0.02	<0.02
Aliphatics >C12-C16	mg/l	<0.02	<0.02
Aliphatics >C16-C35	mg/l	<0.05	<0.05
Aromatics >C8-C10	mg/l	<0.1	<0.1
Aromatics >C10-C35	mg/l	<0.1	<0.1
Poly Chlorinated Biphenyls PCBs			
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10
Group 3 Phenols and Cresols			
Phenol	µg/l	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	3,3
3,4-dimethylphenol	µg/l	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
Sample Point		Moonakula pohjaveereostu	Moonakula pohjaveereostu	Moonakula pohjaveereostu	Moonakula pohjaveereostu
Sample		V019306-06	V019307-06	V019308-06	V019309-06
Sample name		Lina 10	Kesk poik 4	Pohja 10	Pohja 18
Sample depth					
Sampling method		A209:34		GC	A209:35
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
Group 5 PAH					
	Units				
Anthracene	µg/l	0,11	22	<0.10	150
Phenanthrene	µg/l	<0.10	76	0,1	570
Pyrene	µg/l	0,11	15	<0.10	57
Acenaphthene	µg/l	0,95	23	<0.10	540
Chrysene	µg/l	0,26	7,4	<0.10	19
Naphtalene	µg/l	<0.10	7	<0.10	1300
α-methylnaphtalene	µg/l	<0.10	34	<0.10	820
β-methylnaphtalene	µg/l	<0.10	29	0,34	820
Acenaphtalene	µg/l	<0.10	12	0,1	120
Benzo(a)pyrene	µg/l	0,4	4,2	<0.10	8,8
Benzo(a)anthracene	µg/l	<0.10	5,4	<0.10	15
Benzo(b,k)fluorantene	µg/l	0,38	4	<0.10	8,6
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	1	<0.10	1,6
Dibenzo(a,h)anthracene	µg/l	<0.10	0,25	<0.10	0,6
9H-Fluorene	µg/l	<0.10	21	<0.10	210
Fluorantene	µg/l	<0.10	7,9	<0.10	33
Benzo(g,h,i)perylene	µg/l	<0.10	0,49	<0.10	1,2
Dibenzofuran	µg/l	<0.10	1	<0.10	6,8
Carbazole	µg/l	<0.10	<0.10	<0.10	36,2
Sum carcinogenic PAH	µg/l	0,64	18,1	<0.30	44,8
Sum other PAH	µg/l	1,2	180	<0.50	3000
Group 7 Metals					
Cadmium	mg/l	0,000022	<0.00002	0,000029	<0.00002
Lead	mg/l	<0.00005	<0.00005	0,00011	<0.00005
Strontium	mg/l	0,2	0,18	0,17	0,37
Arsenic	mg/l	0,00036	0,00085	0,00028	0,00023
Copper	mg/l	0,0022	0,00063	0,021	0,00039
Chromium	mg/l	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/l	<0.0002	0,00094	<0.0002	<0.0002
Zinc	mg/l	0,26	0,0026	0,61	0,2

Lantmännen Analycen AB
2006-10-31

Caroline Karlsson

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
Sample Point		Moonakula pohjaveereostu	Moonakula pohjaveereostu	Moonakula pohjaveereostu	Moonakula pohjaveereostu
Sample		V019310-06	V019311-06	V019312-06	V019313-06
Sample name		Pohja 22	Pohja 23	Välja 5	Näituse 31
Sample depth					
Sampling method		A209:34	A209:34	SS-EN 12673	A 209:9
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
Group 5 PAH					
	Units				
Anthracene	µg/l	<0.10	190	<0.10	<0.10
Phenanthrene	µg/l	0,1	310	<0.10	<0.10
Pyrene	µg/l	<0.10	110	<0.10	<0.10
Acenaphthene	µg/l	0,14	490	0,68	<0.10
Chrysene	µg/l	<0.10	35	<0.10	<0.10
Naphtalene	µg/l	0,92	1300	<0.10	<0.10
α-methylnaphtalene	µg/l	0,27	310	3,7	<0.10
β-methylnaphtalene	µg/l	0,4	400	0,32	<0.10
Acenaphtalene	µg/l	0,18	200	<0.10	<0.10
Benzo(a)pyrene	µg/l	<0.10	18	<0.10	<0.10
Benzo(a)anthracene	µg/l	<0.10	28	<0.10	<0.10
Benzo(b,k)fluorantene	µg/l	<0.10	20	<0.10	<0.10
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	4,6	<0.10	<0.10
Dibenzo(a,h)anthracene	µg/l	<0.10	1,4	<0.10	<0.10
9H-Fluorene	µg/l	<0.10	140	<0.10	<0.10
Fluorantene	µg/l	<0.10	77	<0.10	<0.10
Benzo(g,h,i)perylene	µg/l	<0.10	4,3	<0.10	<0.10
Dibenzofuran	µg/l	<0.10	15	<0.10	<0.10
Carbazole	µg/l	<0.10	<0.10	<0.10	<0.10
Sum carcinogenic PAH	µg/l	<0.30	89	<0.30	<0.30
Sum other PAH	µg/l	1,3	2800	0,68	<0.50
Group 7 Metals					
Cadmium	mg/l	<0.00002	<0.00002	<0.00002	<0.00002
Lead	mg/l	<0.00005	0,0014	<0.00005	<0.00005
Strontium	mg/l	0,2	0,39	1,2	0,11
Arsenic	mg/l	0,00027	0,00038	<0.0002	<0.0002
Copper	mg/l	0,0011	0,00053	0,0011	0,0012
Chromium	mg/l	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/l	<0.0002	0,0016	<0.0002	<0.0002
Zinc	mg/l	0,011	2,9	0,0022	0,019

Lantmännen Analycen AB
2006-10-31

Caroline Karlsson

Sampling person		Mati Salu	Mati Salu
		JRK 38	JRK 38
		Moonakula	Moonakula
Sample Point		pohjaveereostu	pohjaveereostu
Sample		V019314-06	V019315-06
Sample name		Lääne 8	Lääne 22
Sample depth			
Sampling method		A209:34	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
	Units		
Group 5 PAH			
	Units		
Anthracene	µg/l	<0.10	<0.10
Phenanthrene	µg/l	<0.10	0,11
Pyrene	µg/l	<0.10	<0.10
Acenaphthene	µg/l	<0.10	1
Chrysene	µg/l	<0.10	<0.10
Naphtalene	µg/l	<0.10	<0.10
α-methylnaphtalene	µg/l	<0.10	0,36
β-methylnaphtalene	µg/l	<0.10	0,2
Acenaphtalene	µg/l	<0.10	<0.10
Benzo(a)pyrene	µg/l	<0.10	<0.10
Benzo(a)anthracene	µg/l	<0.10	<0.10
Benzo(b,k)fluorantene	µg/l	<0.10	<0.10
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	<0.10
Dibenzo(a,h)anthracene	µg/l	<0.10	<0.10
9H-Fluorene	µg/l	<0.10	1,1
Fluorantene	µg/l	<0.10	<0.10
Benzo(g,h,i)perylene	µg/l	<0.10	<0.10
Dibenzofuran	µg/l	<0.10	<0.10
Carbazole	µg/l	<0.10	<0.10
Sum carcinogenic PAH	µg/l	<0.30	<0.30
Sum other PAH	µg/l	<0.50	2,2
Group 7 Metals			
Cadmium	mg/l	0,000024	<0.00002
Lead	mg/l	0,00092	<0.00005
Strontium	mg/l	0,21	0,19
Arsenic	mg/l	0,00023	0,00026
Copper	mg/l	0,13	0,0016
Chromium	mg/l	<0.0002	<0.0002
Nickel	mg/l	<0.0002	<0.0002
Zinc	mg/l	0,11	0,11

Lantmännen Analycen AB
2006-10-31

Caroline Karlsson

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
Sample Point		Moonaküla linnaosa	Moonaküla linnaosa	Moonaküla linnaosa	Moonaküla linnaosa
Sample		V019316-06	V019317-06	V019318-06	V019323-06
Sample name		Koidu 24	Bore hole 3801	Bore hole 3802	Soolikaoja downstream
Sample depth					
Sampling method		A 209:9	A209:34	A209:34	A209:34
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
Group 1 Volatile Organic Compounds					
	Units				
Benzene	µg/l	<0.2	<0.2	7	<0.2
Toluene	µg/l	<1	<1	5	<1
Xylene	mg/l	<0.001	<0.001	0,136	<0.001
Ethylbenzene	µg/l	<1	<1	4	<1
Sum TEX	mg/l	<0.001	<0.001	0,145	<0.001
Styrene	µg/l	<1	<1	1	<1
MTBE	µg/l	<0.01	<0.01	<0.01	<0.01
Chloroorganic aromatics					
Chlorobenzene	µg/l	<1	<1	<1	<1
2-Chlorotoluene	µg/l	<1	<1	<1	<1
4-Chlorotoluene	µg/l	<1	<1	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1	<1	<1
1,2-dichloroethane	µg/l	<1	<1	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10	<0.10	<0.10
Chloroform	µg/l	<1	<1	<1	<1
Auxiliary volatile organic compunds					
Isopropylbenzene	µg/l	<1	<1	180	<1
Propylbenzene	µg/l	<1	<1	31	<1
1,3,5-trimetylbenzene	µg/l	<1	<1	59	<1
Tert-butylbenzene	µg/l	<1	<1	2	<1
1,2,4-trimetylbenzene	µg/l	<1	<1	230	<1
Sec-butylbenzene	µg/l	<1	<1	22	<1
p-isopropylbenzene	µg/l	<1	<1	18	<1
Butylbenzene	µg/l	<1	<1	60	<1
Fluortrichloromethane	µg/l	<1	<1	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1	<1	<1
1,1-dichloroethene	µg/l	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1	<1	<1
Tetrachloroethene	µg/l	<1	<1	<1	<1
Dichloromethane	µg/l	<1	<1	<1	<1
1,3-dichloropropane	µg/l	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Dibromchloromethane	µg/l	<1	<1	<1	<1
1,1-dichloroethane	µg/l	<1	<1	<1	<1
1,2-dibromoethane	µg/l	<1	<1	<1	<1
2,2-dichloropropane	µg/l	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1	<1	<1
Bromoform	µg/l	<1	<1	<1	<1
Bromobenzene	µg/l	<1	<1	<1	<1

Sampling person		Mati Salu	Mati Salu
		JRK 38	JRK 38
		Moonaküla	Moonaküla
Sample Point		linnaosa	linnaosa
Sample		V019324-06	V019325-06
		Soolikaoja	
Sample name		downstream	Moonakula ditch
Sample depth			
Sampling method		SS-EN 12673	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
Group 1 Volatile Organic Compounds			
	Units		
Benzene	µg/l	<0.2	<0.2
Toluene	µg/l	<1	<1
Xylene	mg/l	<0.001	<0.001
Ethylbenzene	µg/l	<1	<1
Sum TEX	mg/l	<0.001	<0.001
Styrene	µg/l	<1	<1
MTBE	µg/l	<0.01	<0.01
Chloroorganic aromatics			
Chlorobenzene	µg/l	<1	<1
2-Chlorotoluene	µg/l	<1	<1
4-Chlorotoluene	µg/l	<1	<1
1,3-dichlorobenzene	µg/l	<1	<1
1,4-dichlorobenzene	µg/l	<1	<1
1,2-dichlorobenzene	µg/l	<1	<1
1,2,4-trichlorobenzene	µg/l	<1	<1
1,2,3-trichlorobenzene	µg/l	<1	<1
1,2-dichloroethane	µg/l	<1	<1
Hexachloroethane	µg/l	<0.10	<0.10
Chloroform	µg/l	<1	<1
Auxiliary volatile organic compunds			
Isopropylbenzene	µg/l	<1	<1
Propylbenzene	µg/l	<1	<1
1,3,5-trimetylbenzene	µg/l	<1	<1
Tert-butylbenzene	µg/l	<1	<1
1,2,4-trimetylbenzene	µg/l	<1	<1
Sec-butylbenzene	µg/l	<1	<1
p-isopropylbenzene	µg/l	<1	<1
Butylbenzene	µg/l	<1	<1
Fluortrichloromethane	µg/l	<1	<1
1,1,2-trichloroethane	µg/l	<1	<1
1,1-dichloroethene	µg/l	<1	<1
1,1,1,2-Tetrachloroethane	µg/l	<1	<1
Tetrachloroethene	µg/l	<1	<1
Dichloromethane	µg/l	<1	<1
1,3-dichloropropane	µg/l	<1	<1
Trans-1,2-dichloroethene	µg/l	<1	<1
Dibromchloromethane	µg/l	<1	<1
1,1-dichloroethane	µg/l	<1	<1
1,2-dibromoethane	µg/l	<1	<1
2,2-dichloropropane	µg/l	<1	<1
Cis-1,2-dichloroethene	µg/l	<1	<1
Bromoform	µg/l	<1	<1
Bromobenzene	µg/l	<1	<1

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
Sample Point		JRK 38 Moonaküla linnaosa	JRK 38 Moonaküla linnaosa	JRK 38 Moonaküla linnaosa	JRK 38 Moonaküla linnaosa
Sample		V019316-06	V019317-06	V019318-06	V019323-06
Sample name		Koidu 24	Bore hole 3801	Bore hole 3802	Soolikaoja downstream from railroad
Sample depth					
Sampling method		A 209:9	A209:34	A209:34	A209:34
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
1,1,1-trichlorethane	µg/l	<1	<1	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1	<1	<1
Tetrachloromethane	µg/l	<1	<1	<1	<1
1,1-dichloropropane	µg/l	<1	<1	<1	<1
Trichloroethene	µg/l	<1	<1	<1	<1
1,2-dichloropropane	µg/l	<1	<1	<1	<1
Dibrommethane	µg/l	<1	<1	<1	<1
Bromchloromethane	µg/l	<1	<1	<1	<1
Bromodichloromethane	µg/l	<1	<1	<1	<1
Hexachlorobutadien	µg/l	<1	<1	<1	<1
1,3-Dichloropropene	µg/l	<1	<1	<1	<1
Group 2 Extractive compounds					
Aliphatics >C5-C8	mg/l	<0.02	<0.02	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	<0.02	0,035	<0.02
Aliphatics >C10-C12	mg/l	<0.02	<0.02	3,1	<0.02
Aliphatics >C12-C16	mg/l	<0.02	<0.02	5,3	<0.02
Aliphatics >C16-C35	mg/l	<0.05	<0.05	2,9	<0.05
Aromatics >C8-C10	mg/l	<0.1	<0.1	0,78	<0.1
Aromatics >C10-C35	mg/l	<0.1	<0.1	29800	<0.1
Poly Chlorinated Biphenyls PCBs					
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10	<0.10	<0.10
Group 3 Phenols and Cresols					
Phenol	µg/l	<1.00	<1.00	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
3,4-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0	<3.0	<3.0

Sampling person		Mati Salu	Mati Salu
		JRK 38	JRK 38
		Moonaküla	Moonaküla
Sample Point		linnaosa	linnaosa
Sample		V019324-06	V019325-06
Sample name		Soolikaoja downstream from road	Moonakula ditch
Sample depth			
Sampling method		SS-EN 12673	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
	Units		
1,1,1-trichlorethane	µg/l	<1	<1
1,2,3-trichloropropane	µg/l	<1	<1
Tetrachloromethane	µg/l	<1	<1
1,1-dichloropropane	µg/l	<1	<1
Trichloroethene	µg/l	<1	<1
1,2-dichloropropane	µg/l	<1	<1
Dibrommethane	µg/l	<1	<1
Bromchloromethane	µg/l	<1	<1
Bromodichloromethane	µg/l	<1	<1
Hexachlorobutadien	µg/l	<1	<1
1,3-Dichloropropene	µg/l	<1	<1
Group 2 Extractive compounds			
Aliphatics >C5-C8	mg/l	<0.02	<0.02
Aliphatics >C8-C10	mg/l	<0.02	<0.02
Aliphatics >C10-C12	mg/l	<0.02	<0.02
Aliphatics >C12-C16	mg/l	<0.02	<0.02
Aliphatics >C16-C35	mg/l	<0.05	<0.05
Aromatics >C8-C10	mg/l	<0.1	<0.1
Aromatics >C10-C35	mg/l	<0.1	<0.1
Poly Chlorinated Biphenyls PCBs			
2,4,4'-Trichlorobiphenyl	µg/l	<0.10	<0.10
2,2',5,5'-Tetrachlorobiphenyl	µg/l	<0.10	<0.10
2,2',4,5,5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,3',4,4',5'-Pentachlorobiphenyl	µg/l	<0.10	<0.10
2,4,5,2',4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5'-Hexachlorobiphenyl	µg/l	<0.10	<0.10
2,2',3,4,4',5,5'-Heptachlorobiphenyl	µg/l	<0.10	<0.10
Group 3 Phenols and Cresols			
Phenol	µg/l	<1.00	<1.00
m-cresol	µg/l	<1.00	<1.00
o-cresol	µg/l	<1.00	<1.00
p-cresol	µg/l	<1.00	<1.00
2,3-dimethylphenol	µg/l	<1.00	<1.00
3,4-dimethylphenol	µg/l	<1.00	<1.00
2,6-dimethylphenol	µg/l	<1.00	<1.00
Sum dichlorophenol	µg/l	<1.0	<1.0
Sum trichlorophenol	µg/l	<1.0	<1.0
Sum tetrachlorophenol	µg/l	<1.0	<1.0
Chlorophenol	µg/l	<1.0	<1.0
Sum cresols	µg/l	<3.0	<3.0

Sampling person		Mati Salu	Mati Salu	Mati Salu	Mati Salu
		JRK 38	JRK 38	JRK 38	JRK 38
		Moonaküla	Moonaküla	Moonaküla	Moonaküla
Sample Point		linnaosa	linnaosa	linnaosa	linnaosa
Sample		V019316-06	V019317-06	V019318-06	V019323-06
Sample name		Koidu 24	Bore hole 3801	Bore hole 3802	Soolikaoja downstream from railroad
Sample depth					
Sampling method		A 209:9	A209:34	A209:34	A209:34
Sample Date		2006-07-14	2006-07-14	2006-07-14	2006-07-14
Concentrations are reported per Dry Weight					
	Units				
Group 5 PAH					
	Units				
Anthracene	µg/l	<0.10	<0.10	1400	<0.10
Phenanthrene	µg/l	<0.10	<0.10	6800	<0.10
Pyrene	µg/l	<0.10	<0.10	550	<0.10
Acenaphthene	µg/l	<0.10	<0.10	1900	<0.10
Chrysene	µg/l	<0.10	<0.10	190	<0.10
Naphtalene	µg/l	<0.10	0,87	7900	<0.10
α-methylnaphtalene	µg/l	<0.10	0,19	5100	<0.10
β-methylnaphtalene	µg/l	<0.10	0,22	5400	<0.10
Acenaphtalene	µg/l	<0.10	<0.10	480	<0.10
Benzo(a)pyrene	µg/l	<0.10	<0.10	92	<0.10
Benzo(a)anthracene	µg/l	<0.10	<0.10	120	<0.10
Benzo(b,k)fluorantene	µg/l	<0.10	<0.10	92	<0.10
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	<0.10	20	<0.10
Dibenzo(a,h)anthracene	µg/l	<0.10	<0.10	8	<0.10
9H-Fluorene	µg/l	<0.10	<0.10	510	<0.10
Fluorantene	µg/l	<0.10	<0.10	330	<0.10
Benzo(g,h,i)perylene	µg/l	<0.10	<0.10	16	<0.10
Dibenzofuran	µg/l	<0.10	<0.10	530	<0.10
Carbazole	µg/l	<0.10	<0.10	36	<0.10
Sum carcinogenic PAH	µg/l	<0.30	<0.30	430	<0.30
Sum other PAH	µg/l	<0.50	0,87	20000	<0.50
Group 7 Metals					
Cadmium	mg/l	0,000083	<0.00002	<0.00002	0,000048
Lead	mg/l	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/l	0,13	0,13	0,16	0,091
Arsenic	mg/l	0,00027	0,00023	0,00057	0,00027
Copper	mg/l	0,0076	0,0012	0,00058	0,0014
Chromium	mg/l	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/l	<0.0002	0,0018	0,0039	<0.0002
Zinc	mg/l	0,1	0,0028	0,0013	0,0028

Lantmännen Analycen AB
2006-10-31

Caroline Karlsson

Sampling person		Mati Salu	Mati Salu
		JRK 38	JRK 38
		Moonaküla	Moonaküla
Sample Point		linnaosa	linnaosa
Sample		V019324-06	V019325-06
Sample name		Soolikaoja downstream from road	Moonakula ditch
Sample depth			
Sampling method		SS-EN 12673	A209:34
Sample Date		2006-07-14	2006-07-14
Concentrations are reported per Dry Weight			
	Units		
Group 5 PAH			
	Units		
Anthracene	µg/l	<0.10	<0.10
Phenanthrene	µg/l	<0.10	<0.10
Pyrene	µg/l	<0.10	<0.10
Acenaphthene	µg/l	<0.10	<0.10
Chrysene	µg/l	<0.10	<0.10
Naphtalene	µg/l	<0.10	<0.10
α-methylnaphtalene	µg/l	<0.10	<0.10
β-methylnaphtalene	µg/l	<0.10	<0.10
Acenaphtalene	µg/l	<0.10	<0.10
Benzo(a)pyrene	µg/l	<0.10	<0.10
Benzo(a)anthracene	µg/l	<0.10	<0.10
Benzo(b,k)fluorantene	µg/l	<0.10	<0.10
Indeno(1,2,3,c,d)pyrene	µg/l	<0.10	<0.10
Dibenzo(a,h)anthracene	µg/l	<0.10	<0.10
9H-Fluorene	µg/l	<0.10	<0.10
Fluorantene	µg/l	<0.10	<0.10
Benzo(g,h,i)perylene	µg/l	<0.10	<0.10
Dibenzofuran	µg/l	<0.10	<0.10
Carbazole	µg/l	<0.10	<0.10
Sum carcinogenic PAH	µg/l	<0.30	<0.30
Sum other PAH	µg/l	<0.50	<0.50
Group 7 Metals			
Cadmium	mg/l	<0.00002	<0.00002
Lead	mg/l	<0.00005	<0.00005
Strontium	mg/l	0,1	0,22
Arsenic	mg/l	0,00035	0,00031
Copper	mg/l	0,00084	0,00046
Chromium	mg/l	<0.0002	<0.0002
Nickel	mg/l	<0.0002	<0.0002
Zinc	mg/l	0,0024	0,0014

Lantmännen Analycen AB
2006-10-31

Caroline Karlsson

Maximum Limits for Dangerous Substances in Soil and Groundwater

Regulation of the Minister of the Environment No. 12 of 2 April 2004
(RTL 2004, 40, 662),
entered into force 19 April 2004.

This Regulation is established pursuant to § 12 of the "Chemicals Act" (RT I 1998, 47, 697; 1999, 45, 512; 2002, 53, 336; 61, 375; 63, 387; 2003, 23, 144; 51, 352; 75, 499; 88, 591).

I. General Provisions

§ 1. Maximum limits for dangerous substances

(1) The maximum limits for dangerous substances serve as the basis for assessing the condition of soil and groundwater and for planning measures necessary to improve the condition of soil and groundwater.

(2) For the purposes of this Regulation, the maximum limits for dangerous substances are expressed as reference values and target values for these substances. The reference values for dangerous substances in soil are expressed in micrograms per dry mass of soil.

§ 2. Reference value

(1) A reference value is the concentration of a dangerous substance in soil or groundwater above which the soil or groundwater is polluted and dangerous to human health and the environment.

(2) The reference value for a group of dangerous substances is the total of the reference values for the individual substances in the group, unless determined otherwise.

(3) The concentration of dangerous substances for which reference values are not established by this Regulation shall be assessed on the basis of expert assessments of the condition of soil and groundwater. An expert assessment shall be conducted if previous use of the area under assessment has created a risk of contamination from such dangerous substances.

(4) Depending on the purpose of land use, this Regulation shall implement different reference values for industrial and residential zones. The purpose of land use shall be determined based on Government of the Republic Regulation No. 36 of 24 January 1995 "Approval of the Intended Purposes of Cadastral Units and of the Bases of their Designation" (RT I 1995, 13, 150; 1996, 32, 636).

(5) For the purposes of this Regulation, the following are industrial zones:

1) land used for production facilities, except cold storages, grain storages, vegetable storages and warehouse complexes;
2) land used for repair shops for agricultural machinery and forging shops that belong to agricultural production facilities;
3) land used for mining;
4) land used for landfills;
5) land used for transportation;
6) national defence land, except land under and needed to service buildings used for accommodation and rendering services to people;
7) polluted technogenic soil and other wasteland resulting from human activity, which is not designated for a specific purpose;
8) commercial land used for petrol stations;
9) land used for mass communication networks and utility works;

(6) The categories of land use not listed in subsection (5) belong to residential zones.

(7) The suitability of groundwater as a source of potable water cannot be determined on the basis of the reference values set out in this Regulation.

§ 3. Target value

A target value is a concentration of a dangerous substance in soil or groundwater at or below which the condition of the soil or groundwater is good, that is, safe for humans and the environment.

§ 4. Satisfactory condition of soil or groundwater

The condition of soil or groundwater is satisfactory if the concentration of dangerous substances is between the reference values and target values for soil or groundwater.

II. Maximum limits of dangerous substances in soil and groundwater

No	Dangerous substance	CAS No.	Maximum limits				
			In soil, (mg/kg)			In groundwater, µg/l	
			Target value	Reference value in residential zone	Reference value in industrial zone	Target value	Reference value
I. Heavy metals							
1.	Mercury (Hg)	–	0,5	2	10	0,4	2
2.	Cadmium (Cd)	–	1	5	20	1	10
3.	Lead (Pb)	–	50	300	600	10	200
4.	Zinc (Zn)	–	200	500	1500	50	5000
5.	Nickel (Ni)	–	50	150	500	10	200
6.	Chromium (Cr)	–	100	300	800	10	200
7.	Copper (Cu)	–	100	150	500	15	1000
8.	Cobalt (Co)	–	20	50	300	5	300
9.	Molybdenum (Mo)	–	10	20	200	5	70
10.	Tin (Sn)	–	10	50	300	3	150
11.	Barium (Ba)	–	500	750	2000	50	7000
12.	Selenium (Se)	–	1	5	20	5	50
13.	Vanadium (V)	–	50	300	1000	–	–
14.	Antimony (Sb)	–	10	20	100	–	–
15.	Thallium (Tl)	–	1	5	20	–	–
16.	Beryllium (Be)	–	2	10	50	–	–
17.	Uranium (U)	–	20	50	500	–	–
II. Other inorganic compounds							
18.	Fluoride (as F-ion, total)	–	450	1200	2000	1500	4000
19.	Arsenic (As)	–	20	30	50	5	100
20.	Boron (B)	–	30	100	500	500	2000
21.	Cyanides (as CN-ion, free)	–	1	10	100	5	100
22.	Cyanides (CN-total)	–	5	50	500	100	200
III. Aromatic hydrocarbons							
23.	Benzene	71-43-2	0,05	0,5	5	0,2	5
24.	Ethylbenzene	100-41-4	0,1	5	50	0,5	50
25.	Toluene	108-88-3	0,1	3	100	0,5	50
26.	Styrene	100-42-5	1	5	50	0,5	50
27.	Xylenols	–	0,1	5	30	0,5	30
28.	Aromatic hydrocarbons (total)	–	1	10	100	1	100
29.	Monophenols (total concentration of cresols and dimethyl phenols)	–	1	10	100	1	100
30.	Biphenols (total concentration of pyrocatechol, resorcinol and hydroquinone)	–	1	10	100	1	100

No	Dangerous substance	CAS No.	Maximum limits				
			In soil, (mg/kg)			In groundwater, µg/l	
			Target value	Reference value in residential zone	Reference value in industrial zone	Target value	Reference value
31.	Phenols (each following compound)		0,1	1	10	0,5	50
	o-cresol	95-48-7					
	m-cresol	108-39-4					
	p-cresol	106-44-5					
	2.3-dimethyl phenol	526-75-0					
	2.4-dimethyl phenol	105-67-9					
	2.5-dimethyl phenol	95-87-4					
	2.6-dimethyl phenol	576-26-1					
	3.4-dimethyl phenol	95-65-8					
	3.5-dimethyl phenol	108-68-9					
	pyrocatechol	120-80-9					
	resorcinol	108-46-3					
	beta naphthol	135-19-3					
	hydroquinome	123-31-9					
32.	Chlorophenols (each compound)	–	0,05	0,5	5	0,3	30
33.	MTBE	1634-04-4	1	5	100	0,5	10
34.	Oil products total	–	100	500	5000	20	600
IV. Polycyclic aromatic hydrocarbons (PAH)							
35.	Anthracene	120-12-7	1	5	50	0,1	5
36.	Chrysene	218-01-9	0,5	2	20	0,01	1
37.	Phenanthrene	85-01-8	1	5	50	0,05	2
38.	Naphthalene	91-20-3	1	5	100	1	50
39.	Pyrene	129-00-0	1	5	50	1	5
40.	α-methylnaphthalene	90-12-0	1	4	40	1	30
	β-methylnaphthalene	91-57-6					
41.	Dimethylnaphthalene (each following compound)		1	4	40	1	30
	1.2-dimethylnaphthalene	573-98-8					
	1.2-dimethylnaphthalene	575-41-7					
	1.4-dimethylnaphthalene	571-58-4					
	1.5-dimethylnaphthalene	571-61-9					
	1.6-dimethylnaphthalene	575-43-9					
	1.7-dimethylnaphthalene	575-37-1					
	1.8-dimethylnaphthalene	569-41-5					
	2.3-dimethylnaphthalene	581-40-8					
	2.6-dimethylnaphthalene	581-42-0					
	2.7-dimethylnaphthalene	582-16-1					

No	Dangerous substance	CAS No.	Maximum limits				
			In soil, (mg/kg)			In groundwater, µg/l	
			Target value	Reference value in residential zone	Reference value in industrial zone	Target value	Reference value
42.	Acenaphtene	83-32-9	1	4	40	1	30
43.	Benzo(a)pyrene	50-32-8	0,1	1	10	0,01	1
44.	PAH (total)	–	5	20	200	0,2	10
V. Chlorinated aliphatic hydrocarbons							
45.	1.2-dichloroethane	107-06-2	0,1	2	50	0,1	5
46.	Chloroform	67-66-3	0,1	1	25	0,1	2
47.	Hexachloroethane	67-72-1	1	10	100	1	10
48.	Chlorinated aliphatic hydrocarbons, each compound, except the compounds in this list		0,1	5	50	1	70
VI. Chlorinated aromatic hydrocarbons							
49.	PCB	1336-36-3	0,1	5	10	0,5	1
50.	Chlororganic aromatic compounds (each compound, except the compounds in this list)	–	0,1	0,5	30	0,1	5
51.	Chlororganic aromatic compounds (total)	–	0,2	5	100	0,5	5
VII. Amines							
52.	Aliphatic amines (total)	–	50	300	700	1	20
VIII. Pesticides							
53.	2.4-D	94-75-7	0,05	0,5	2	0,05	1
54.	Aldrin	309-00-2	0,1	1	5	0,01	1
55.	Dieldrin	60-57-1	0,05	0,5	2	0,01	1
56.	Endrin	72-20-8	0,1	1	5	0,005	0,5
57.	Isodrin	465-73-6	0,1	1	5	0,005	0,5
58.	DDT	50-29-3	0,1	0,5	5	0,1	1
59.	Hexachlorocyclohexane (each isomer)	–	0,05	0,2	2	0,01	1
60.	Trichlorobenzene	–	2	5	50	0,01	5
61.	Hexachlorobenzene	118-74-1	2	5	25	0,5	5
62.	Pesticides (total)	–	0,5	5	20	0,5	5