

Chemical composition of groundwater in wells around the Hellisheidi Power Plant in 2017

Well			HK-24	HK-24	HK-07	HK-25	HK-12	HK-26	HK-31	KH-11	KH-50	KH-50	HK-13	LK-1	KH-06	HU-1	HK-14
Groundwater flow			Selvogsstraumur										Ellidaár-straumur	Thingvallastraumur			
Sample no.	17-5074	17-5277	17-5253	17-5255	17-5278	17-5286	17-5281	17-5252	17-5061	17-5167	17-5254	17-5211	17-5213	17-5212	17-5256		
Date	7.2.2017	29.8.2017	19.7.2017	19.7.2017	29.8.2017	31.8.2017	30.8.2017	14.7.2017	26.1.2017	8.5.2017	19.7.2017	7.6.2017	7.6.2017	7.6.2017	1.8.2017		
Chemical properties	Unit	Max. recommended value															
Acidity	pH		7.79	6.85	7.61	8	8.43	8.45	9.18	7.93	7.34	7.19	7.1	7.65	7.05	7.72	7.86
T (pH)	°C		22.4	22.9	23.2	23.2	23.1	23	22.9	23	22.2	22.5	23.2	22.5	23.1	21.9	22.9
Conductivity	µS/cm	2,500	130	161.5	166.2	173.1	154.1	375	264	191	133	188	119.5	93	89.5	85.2	69.8
T (Conductivity)	°C		22.3	22.5	22.5	22.5	22.5	22.6	22.5	22.5	22.2	22.3	22.5	22.4	22.4	22.4	22.3
CO ₂	mg/kg	*	29.4	41.0	54.4	60.9	41.3	145.0	75.1	70.3	20.4	61.2	38.0	17.6	35.6	27.2	22.7
F	mg/kg	1,5	0.105	0.08	0.10	0.08	0.08	0.57	0.82	0.08	0.12	0.08	0.04	0.07	0.08	0.07	0.02
Cl	mg/kg	*	8.84	9.22	8.17	9.30	8.52	8.15	7.75	7.78	7.68	9.92	12.33	13.86	6.63	6.94	6.10
SO ₄	mg/kg	200	13.76	12.29	13.75	10.32	13.67	10.55	8.62	17.74	18.44	23.49	5.90	4.35	2.73	2.15	1.31
Ca	mg/kg	100	7.82	9.06	9.07	10.93	10.13	5.008	1.726	16.88	4.42	8.699	5.841	3.768	4.30	4.81	2.997
Fe	mg/kg	0,2	0.01	0.06	0.01	0.02	0.01	0.02	<0.005	0.02	0.01	<0.005	<0.005	0.03	0.03	<0.005	0.04
K	mg/kg	12	1.02	1.06	0.96	1.40	1.07	5.27	1.38	1.24	1.04	1.26	1.11	0.99	0.60	0.88	0.72
Mg	mg/kg	50	4.23	4.59	8.49	7.21	4.83	4.98	0.16	8.98	4.66	10.72	3.49	2.23	3.92	2.80	2.16
Na	mg/kg	200	8.69	9.27	9.12	11.63	9.50	71.12	59.09	8.77	7.67	10.23	10.29	8.14	5.61	6.22	5.94
SiO ₂	mg/kg	*	19.22	19.82	32.57	24.95	21.43	33.37	57.24	28.34	27.78	40.31	20.44	15.26	17.56	24.07	16.04
Al	µg/kg	200	3.17	6.17	9.50	9.66	6.04	12.10	96.50	9.72	1.95		21.60	9.70	1.86	1.09	16.40
As	µg/kg	10	<0.05	<0.05	<0.05	<0.05	<0.05	0.429	1.04	<0.05	0.06		<0.05	<0.05	<0.05	0.0538	<0.05
Ba	µg/kg	700	0.77	1.41	0.33	1.17	1.18	5.10	0.51	0.25	0.44		0.59	0.35	0.65	0.47	0.21
Cd	µg/kg	5	<0.002	0.007	0.003	<0.002	<0.002	0.002	<0.002	0.002	<0.002		0.00359	0.00543	0.003	0.00507	<0.002
Co	µg/kg	*	0.0	0.3	0.0	0.0	0.0403	0.00805	<0.005	0.018	0.015		0.0193	0.007	0.1	0.006	0.016
Cr	µg/kg	50	0.90	0.70	0.68	0.73	1.64	0.06	0.10	0.07	0.99		1.20	0.18	0.19	0.55	0.38
Cu	µg/kg	2,000	0.745	0.50	0.53	0.40	0.24	0.12	0.12	0.31	0.63		0.43	0.77	0.63	0.28	0.27
Hg	µg/kg	1	<0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.04		<0.002	<0.002	<0.002	<0.002	<0.002
Mn	µg/kg	50	12.40	267.00	2.54	0.76	4.02	12.70	0.86	12.40	1.30		1.22	0.79	5.69	0.171	0.59
Mo	µg/kg	*	0.51	0.99	0.44	0.44	0.30	3.07	2.39	0.17	0.33		0.31	0.13	0.14	0.18	0.11
Ni	µg/kg	20	1.24	4.32	1.49	0.64	1.56	1.15	0.12	2.23	0.22		0.95	0.96	2.66	0.313	0.31
P	µg/kg	5,000	19.1	14.9	57.1	35.3	26.4	27.7	14.6	66.2	32.7		26.7	14.9	8.8	40.9	19.5
Pb	µg/kg	10	0.379	0.024	0.037	0.092	<0.01	0.221	<0.01	0.024	0.016		0.024	0.268	0.0753	<0.01	0.023
Se	µg/kg	10	<0.5	0.03	0.571	<0.5	0.0104	<0.01	0.0127	<0.5	1.11		1.1	<0.5	<0.5	<0.5	<0.5
Sr	µg/kg	*	15.9	<0.5	19.1	19.5	0.6	<0.5	0.9	29.7	9.4		16.5	7.6	8.0	9.3	6.8
Ti	µg/kg	*	0.039	19.600	0.387	0.254	19.800	30.500	5.330	0.098	0.044		2.150	0.148	0.019	0.023	0.252
V	µg/kg	*	12.9	0.223	21.7	15.2	0.0903	0.214	0.0633	17.6	9.58		6.48	8.6	2.75	6.17	6.34
Zn	µg/kg	3.000		11.60	38.90	30.60	19.50	0.95	32.30	32.00	2.99		33.70	242.00	22.20	21.90	30.90

* Maximum value not found in Icelandic

The impact of Hellisheidi Power Plant's on groundwater is closely monitored in surveillance wells at and around the plant. Samples are collected to analyse overall chemical content and trace elements, in addition to measuring their temperature, conductivity and acidity. The concentration of dissolved solids is far below the limits set for potable water. However, the concentration of sulphate has risen considerably above background limits in well KH-7 (north of Hellisheidi power plant) and in wells HK-7 and KH-50 without any substantial increase in silica, sodium and chlorine. Sulphate is created from the oxidation process of hydrogen sulphide which follows the steam released from the plant. Up until 2016, when the gas abatement unit at Hellisheidi was relaunched after its capacity was increased, the bulk of the hydrogen sulphide filtered through the cooling towers, along with condensate water, where the oxidation occurs. Approximately 10 kg of water per second goes into each cooling tower's overflow before it's released into shallow wells at the plant. This release was stopped in 2016 and this water is currently injected back into the geothermal reservoir. Moreover, trace elements, which are mostly in gas form, have been measured in well KH-50 (selenium and mercury, although both well below the limits set for potable water), while other substances which mostly follow separated water, e.g. arsenic, have not been detected in the same well. These impacts are likely to be reduced with the ongoing operation of the gas abatement unit and the reinjection of hydrogen sulphide. The chemical composition will continue to be monitored in the surveillance well to gain a better picture of groundwater flows and the release of geothermal water from the Hellisheidi Geothermal Power Plant.
