



Completion of work tasks 7.4 and 7.5 of  
phase I in the groundwater contamination  
study project No:894.200

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**Greinargerð HTul-TJ-88-03**

## COMPLETION OF WORK TASKS 7.4 AND 7.5 OF PHASE 1 IN THE GROUNDWATER CONTAMINATION STUDY PROJECT NO:894.200.

### 1. INTRODUCTION

The National Energy Authority has now completed work tasks 7.4 and 7.5 of phase 1 in the Groundwater Contamination Study; Project no:894.200. The work tasks consist of data reduction and generation of contour maps of groundwater level on the Rosmhvalanes peninsula from hourly recordings of water level in 18 wells.

The recording was performed from 18th of October to 15th of November 1988. The maps are presented on paper and as a video animation recorded from the screen of an IBM-PC compatible computer.

### 2. MAPS AND FIGURES

Enclosed with this report are 671 hourly contour maps of the water level, spanning the time interval 10/18/88 at 17:00h to 11/15/88 at 15:00h.

The daily average of the water level (29 days total) was calculated and mapped. The average water level for the entire period and for the first 14 days of the period were also mapped. Thus a total of 31 maps of averaged water level are enclosed with this report.

The measurements in each well were plotted on separate sheets. Before plotting the data was edited in order to fill gaps and correct for well loss due to pumping (see table I).

Pressure and precipitation during the period were plotted on the same time scale as the water level measurements in order to facilitate the interpretation of the data. The pressure and precipitation measurements were made at the Keflavík airport weather

monitoring station and they were obtained from the Icelandic Meteorological Office.

A total of 20 time plots of water level, pressure and precipitation are enclosed with this report.

### 3. DESCRIPTION OF DATA PROCESSING

The water pressure in the wells was recorded every hour with differential pressure gauges. The water level was calculated from the water pressure using the elevation of a nearby surveying point and a measurement of the depth of the pressure transducer with respect to the surveying point. Water level was calculated in meters. It was transformed to feet before plotting and contouring.

The elevation of the surveying points is given in the local coordinate system of Njarðvík (Gunnar Þorbergsson; Work Task 7.1, Location and elevation of wells). This elevation was converted to elevation above mean sea level by subtracting 24 cm.

The location of the wells was given in Lambert's coordinates (Gunnar Þorbergsson; Work Task 7.1, Location and elevation of wells). The contour maps cover the area  $721000 < X < 730500$ ,  $390000 < Y < 402000$ .

#### 3.1 DATA EDITING

The water level data was corrected for well loss and all gaps were interpolated using either linear interpolation or cubic Bessel interpolation. In order to be able to plot comparable maps for all measuring times, the data for some of the wells was extrapolated either forward or backward in time so that the time series for all the wells cover

the same time interval. Table I lists all editing of the data and available information on pumps and pumping in each well.

### 3.2 CONTOURING

The contour maps were generated by the program DDD originally developed at the Computer Science Centre of the Department of Energy, Mines and Resources, Canada, running on the HP 9000/840 computer of the National Energy Authority. The program grids the irregularly distributed data onto a rectangular grid (49x39 points) using a two-dimensional spline surface without smoothing. Contours were not drawn outside the area covered by the wells.

In order to aid the interpolation of the contouring program, four off-shore points near Keflavík and Njarðvík with water level zero were added. These points are indicated with circles on the map of the average water level. Close to well NS (data logger sn0226) 3 points were added in order to limit the influence of this well on the map. This well is most likely influenced by inflow of spent fluids from Hitaveita Suðurnesja and dominates the computer-generated maps in the nearby area if this is not done. The data for these points is the average of the surrounding wells (wells NN, 34, 8, and 36) and well NS.

### 3.3 PLOTTING

The plots were generated on A4 paper using an HP-II+ Laser printer (1200x1650 pixel resolution). The contours are labelled in feet and the contour interval is 0.5".

### 3.4 ANIMATION

The video animation was recorded from the screen of an IBM-PC compatible computer (Hercules graphics, 720x350 pixel resolution). The maps were produced with the program DDD on the HP 9000/840 computer and saved on disk. They were transferred to the disk of the PC computer. The animation was generated by reading the plots from a RAM disk in memory in order to make the animation smoother.

The video recording was performed by the firm Sýn hf, Brautarholti 8, IS-105 Reykjavík. Two recordings with different speeds were made. One with approximately 2 frames pr. second, lasting approximately 6 minutes, and another one with approximately 1 frame pr. second, lasting approximately 11 minutes. The first one is without contour labels in feet, the latter one has contour labels. The video cassette enclosed with this report is in NTSC VHS format and contains both recordings.



TABLE I. DATA EDITING

Well	Datalogger	Comments
1770	170	Pump in well, pumping unknown; data not changed; 4 points added at the end, linearly using the last 11 points as reference.
36	171	Constant pumping; spikes removed; 19 points added at the beginning (well 8 used as reference -0.04987 m); 3 points added at the end, linearly using the last 11 points as reference.
8	172	Pump in well, no pumping; data not changed 4 points added at the end, linearly using the last 11 points as reference.
38	173	Unsteady pumping, not possible to correct; data from well 36 used instead.
34	174	Constant pumping except for 6 hours, data moved up to remove well effects; 4 points added at the end, linearly, using the last 11 points as reference.
AF	176	No pumping; data not changed; Gaps (10/21/17 -10/22/11) filled in using Bessel interpolation; 4 points added at the end, linearly, using the last 11 points as reference.
41	177	Constant pumping except two short intervals; date moved up to remove well effects; 4 points added at the end, linearly, using the last 11 points as reference.
R	178	Pump in well; pumping not known; data not changed 1 point added at the end - same as the last one.
S	179	No pump in well; data not changed 19 points added at the beginning; constant (same as the first data point); 3 points added to the end (same as the last one).
MW-1	180	No pump in well; data not changed; 1 point added at the end; same as the last one.
1632	181	Pump in well; most likely not used during monitoring; data not changed; Gap (10/21/18-10/22/05) filled in using Bessel interpolation; 3 points added to the end (same as the last one).
MW-8	182	No pump in well; data not changed; 1 point added at the end, same as the last one.
39	184	Pump in well, used for short intervals; data corrected for well effects; 19 points added at the beginning; constant (same as the first point); 3 points added to the end (same as the last one).
NE	0222	Pump in well, not known if in use, most likely not; data not changed.
NS	0226	Constant pumping, inflow; data not changed; gap (10/20/13-10/21/16) filled in linearly; 5 points deleted at the beginning.
KN	1210	Constant pumping except for 6 hours; data moved up to remove well effects; 1 point added at the end; same as the last one.
NN	1211	No pump in well; data not changed.
KS	1216	Constant pumping except for 6 hours; data moved up to remove well effects. 1 point added at the end; same as the last one.