

## **Forsmark site investigation**

### **Acquisition of geological information from Forsmarksverket**

#### **Information from the Vattenfall archive, Råcksta**

Mikael Keisu, Hans Isaksson  
GeoVista AB

May 2004

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*Keywords:* Refraction seismics, Slingram, VLF, Magnetometry, Borehole, Core log, Fracture log, Water loss measurements, Drill core, Percussion drilling, Georeference, GIS, Overview maps, Tunnel mapping, Geotechnical, Sounding, Shaft wall, Surface geology, AP PF-400-02-48, Field note: Forsmark 118.

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

A pdf version of this document can be downloaded from [www.skb.se](http://www.skb.se)

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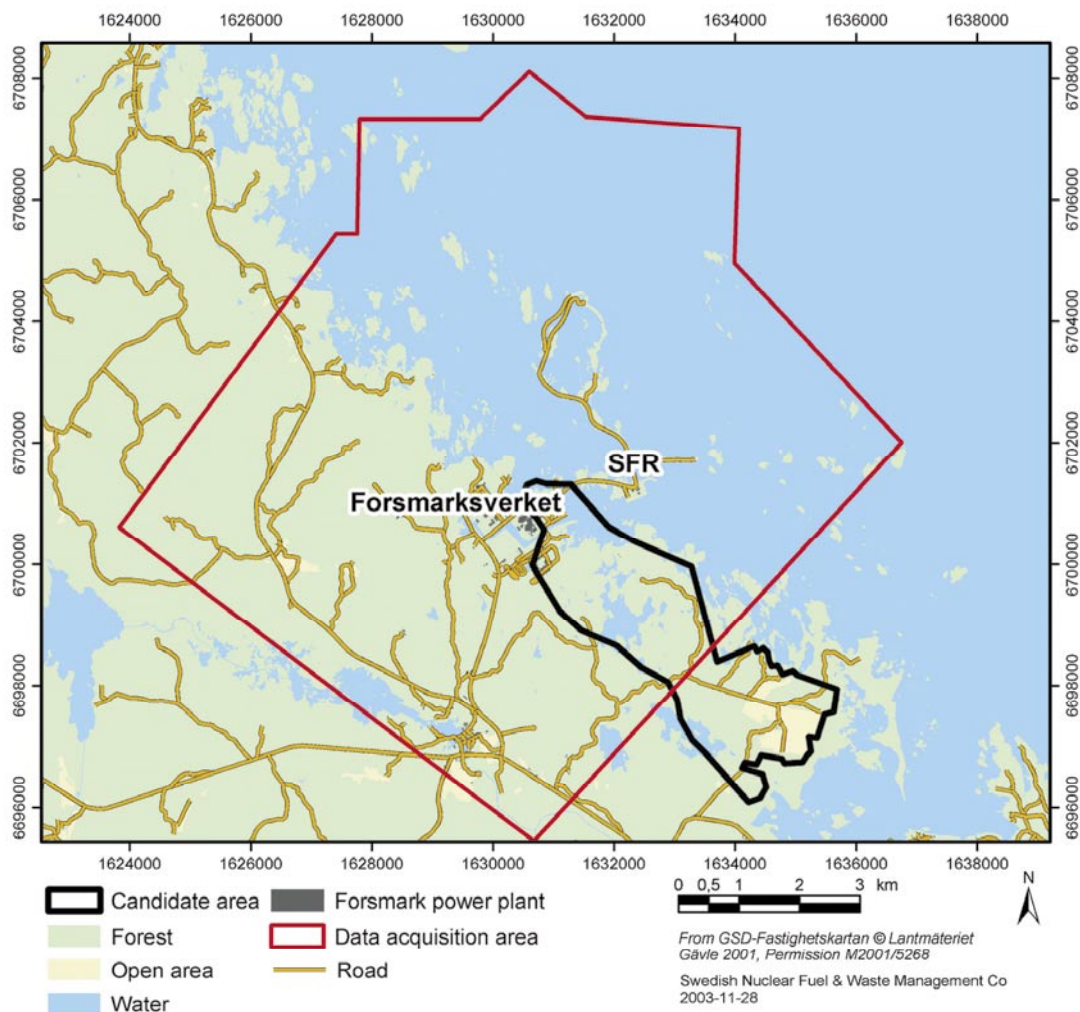
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# 1 Introduction

This document reports the information gained in the project *data acquisition of historic geological information from Forsmarksverket*, which is one of the activities performed within the site investigation at Forsmark.

A prior data inventory in the project Forsmark – Site descriptive model version 0 /1/ indicated that much of the primary geological information from the feasibility investigations, planning and construction of the Forsmark nuclear power plant and SFR are stored in the archives of Vattenfall (the Swedish State power board) in Råcksta and Forsmark. It is important to locate and retrieve this first-hand material in order to gain knowledge about the geology in the Forsmark area.

The data acquisition has been performed in the area shown in Figure 1-1. The work was conducted by GeoVista AB according to the activity plan AP PF-400-02-48 (SKB internal controlling document).



**Figure 1-1.** Data acquisition area.

## 2 Objective and scope

The objective of this activity is to take care of geological information from the Vattenfall archive, evaluate and structure it, and store the data according to SKB's data base structures. The basis for the work has been the database constructed in the project Forsmark – Site descriptive model version 0 /1/. The database has been categorised into subgroups and information considered valuable has been ordered from Vattenfall. All delivered information from Vattenfall has been overhauled by GeoVista AB, and in co-operation with SKB re-evaluated in order to arrive at a decision whether to collect and store the information or not.

The focus of the activity has been to find and store geological information collected during the feasibility study and construction of the nuclear reactors at Forsmarksverket. This information is mainly stored in the Vattenfall archive in Råcksta. Information from the feasibility study and construction of SFR is mainly stored in the Forsmark archive and has had lower priority in this activity. Although the focus has been on the primary information from the Råcksta archive, complementary sources have been examined for some specific information like tunnel mapping, deep boreholes, refraction seismic and detailed geological mapping. When applicable, reference to these complementary sources are noted in the text.

### ***Subgroup valuation***

The following categories of information, subgroups, have been judged to be of primary value for the site investigation:

- Cored and percussion borehole information.
  - Fracture frequency.
  - Core logs.
  - Water loss measurements.
  - Borehole identities.
- Geological mapping in tunnels and shafts.
- Refraction seismics.
- Ground-based geophysical measurements except refraction seismics (slingram, VLF, magnetometry).
- Overview maps of geological investigations.
- Rock mechanics.
- Soil mechanics.

The following categories of information, subgroups, have been judged to be of secondary value for the site investigation and is not prioritised in this work:

- Echo-sounding information.
- Construction data.
- Ecosystem.

***Other valuation criteria***

- Reports and maps do not contain significant information. That is, no information covers the primary subgroups, the information covers a very small area or a single location already covered by other data-sets, or the data is too obscure to be judged.
- Data or maps do not contain significant information for georeferencing.
- Information regarding the SFR area has had a lower priority and is therefore, in general, not included.

## 3 Execution and results

The process of acquiring data is described in the activity plan according to which the work has been performed, although with some minor changes.

### 3.1 Preparations

The preparatory work included structuring of the database constructed in the Forsmark – Site descriptive model version 0 /1/, ordering of data, digitising of information, reporting, and delivery of digital information, reports and maps.

The information from the Vattenfall archive, listed in the previous data inventory /1/ has been further categorised into subgroups with similar content to facilitate the selection and ordering of information from the archive. The information has been ordered with the id-number for each individual report as a key. The Vattenfall staff has then copied the reports (two paper copies) and scanned larger maps. The scanned maps have been stored in tiff-format with 300 dpi resolution and delivered on CD. The received reports and digital maps have been re-evaluated as regards the relevance for the site investigation.

The data acquisition of the geological data is divided into two different activities. One activity covers cases where the information is stored in reports and demand manual work where the data is read from the report and typed into a table structure (Microsoft Excel) in accordance with SICADA. The other activity covers cases where the digital information, like scanned maps in tiff-format, need to be georeferenced by means of a GIS-program (ArcMap 8, ESRI Inc.). The georeferenced maps are in some cases also used for the identification and insertion of geological investigation objects found in the area.

Out of totally 215 archive identities, 153 (72%) have been ordered and evaluated. Information from 97 archive identities or 45% of the total number has been digitized. Appendix 1 includes a more detailed description of the current data acquisition status for each individual archive identity. The appendix is classified according to the applied index card system for the Vattenfall archive.

### 3.2 Coordinate systems in Forsmark

Two local coordinate systems have been used in the Forsmark area. One is called the T-U system and the other is called the D-K system. The T-U system covers the whole area and most of the information related to Forsmarksverket uses this coordinate system. The D-K system is used only in the easternmost part of the SFR-tunnel.

#### *The T-U system*

The relation between the local T-U system and the national RT 90 2.5 gon V is presented by Stigsson /2/. Metria has investigated the relation between the coordinate systems for the project SAFE. The T-U system is related to RT 38 0 gon and does not use the same ellipsoid

as RT 90 2.5 gon V. The T-U system is also askew (the coordinate axis are not perfectly perpendicular) and, therefore, the transformation relation between the systems gives different accuracy in different parts of the area.

Metria used four points for the calculation of the transformation relation, giving the following equations (1–5) showing the relation between the coordinate systems.

$$T = \cos(230.5882) \cdot (X-6700000) + \sin(230.5882) \cdot (Y-1630000) + 6704.312 \quad (1)$$

$$U = -\sin(230.5882) \cdot (X-6700000) + \cos(230.5882) \cdot (Y-1630000) + 2087.350 \quad (2)$$

$$X = \cos(230.5882) \cdot (T-6704.312) - \sin(230.5882) \cdot (U-2087.350) + 6700000 \quad (3)$$

$$Y = \sin(230.5882) \cdot (T-6704.312) + \cos(230.5882) \cdot (U-2087.350) + 1630000 \quad (4)$$

The absolute error due to askew and different ellipsoids is  $< \pm 0.4$  metre inside the co-ordinates  $T = 2000-5000$  and  $U = 0-3000$ . Outside this area, the error will increase with increasing distance.

Concerning the topographic relief, the local system is related to RH70:

$$Z_{\text{Local}} = Z_{\text{RH70}} + 100 \quad (5)$$

RH70 is the current levelling system in Sweden.

### ***D-K system***

This system has only been found on maps over the depository sections in the SFR tunnel. This is a rather small area and is also covered by the T-U system. No transformation relation between the T-U system and the RT 90 2.5 gon V has been found. The existence of the T-U system in the area and the limited use of the D-K system make the need of a transformation relation limited /3/.

## **3.3 Description of subgroups**

This section describes the different subgroups into which the information is divided and the procedure for ordering the information from the Vattenfall archive in Råcksta. For a quick overview of the information, the first order included only a few reports from each subgroup. The second order included refraction seismics, magnetometry, slingram and VLF measurements. The third order included information related to boreholes and other geological information, whereas the fourth order included overview maps and geotechnical information. Information on rock mechanics has been sparse and is limited to the geological tunnel mapping, see Section 3.3.3.

### **3.3.1 Refraction seismics**

Refraction seismic surveys were commonly performed from the early 1970's to the beginning of the 1980's. Most surveys relate to the construction area of Forsmarksverket, Figure 3-1. The data are well structured in the survey reports and most of the data fit well with the table structure in SICADA. However, a new table has been added to SICADA (in agreement with the SICADA administrator) to store data when there are more than one interpreted velocity in soil and/or rock.



Numerical information listed in the reports has been manually typed into Excel work sheets. Profile locations have been picked from geo-referenced maps. An example of the information content in the refraction seismic data is shown in Table 3-1.

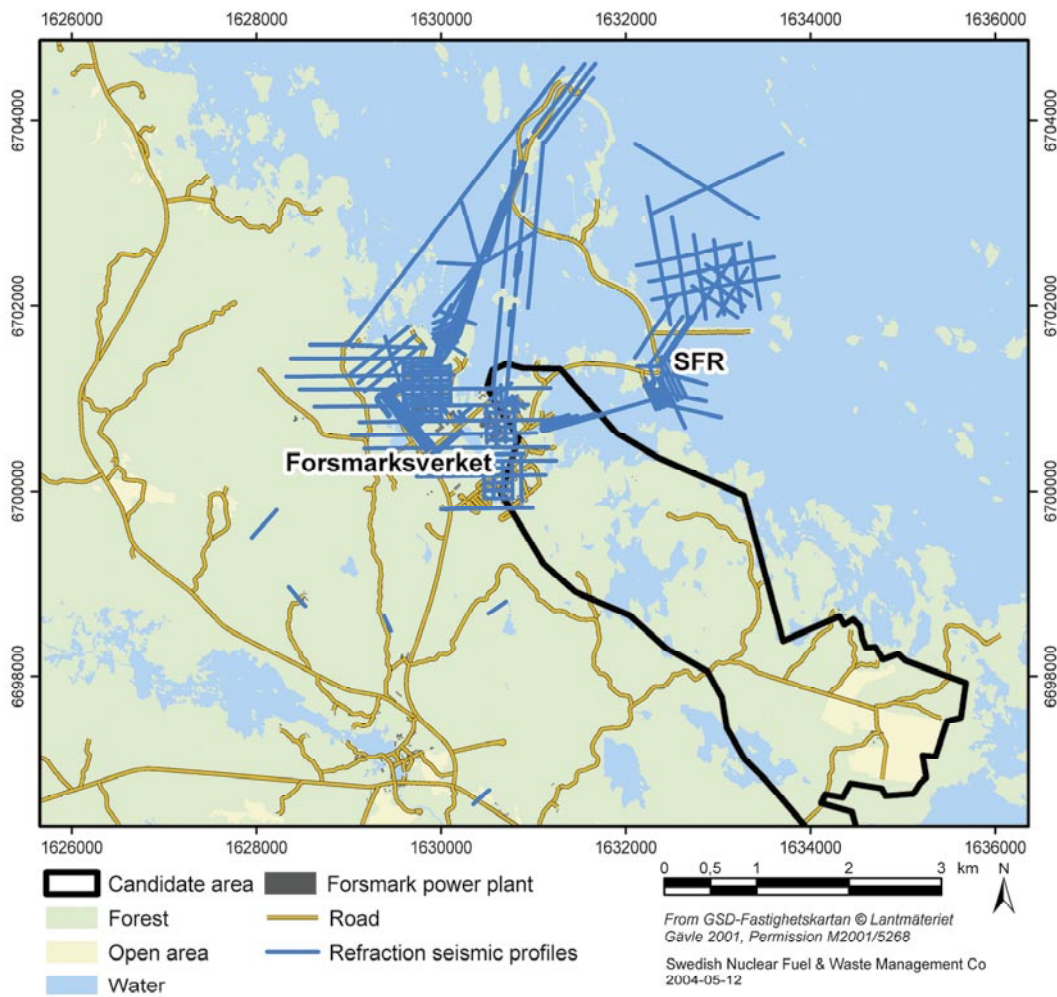
Refraction seismic data stored in Excel, contain six sheets that describe different survey parameters. Below follows a description of the information in the different sheets. The sheets are named in the following way:

- “Activity” according to the SICADA nomenclature.
- “Add activity” describes when the survey was performed and by whom, the report identity, where the data was located and its previous identity.
- “Surface elevation” contains ground elevation, rock elevation and depth to rock surface.
- “Traveltime rock” contains travel time in rock.
- “Traveltime sev layers” contains the travel time in the defined layers of soil and rock as well as the depth of the different layers (“sev” = several).
- “Line surveying” contains the start and end coordinates of the profile.

Most of the refraction seismic data have been collected for the feasibility studies and construction of the nuclear power plants and SFR. A few profiles were measured during the KBS epoch /1/. In total, 188 lines of refraction seismic data, to the extent of about 108 line-kilometres, have been recovered. 140 of these lines are located around Forsmarksverket, 16 lines are located between Forsmarksverket and Forsmarks bruk and finally, 32 lines are located within the SFR area. Of these 32 lines 17 have been found in complementary sources. 15 profiles were found in the SKB library report SFR 81-13 /4/ and 2 profiles were found in a Hagconsult report, ALMA 9091185 /5/. The data acquisition has also identified an additional 18 profiles (about 3.5 line kilometres) on georeferenced maps without corresponding data.

**Table 3-1. A typical example with refraction seismic data. In this case with two soil layers and two rock layers. The depth figures refer to the local levelling system (RH70+100 m).**

ACTIVITY	IDCODE	LENGTH	FROM_DEPTH	TO_DEPTH	TRAVELTIME	MEDIUM
Profile, Refraction seismics	LFK000137	252,5	96,1	95,1		mud
Profile, Refraction seismics	LFK000137	252,5	95,1	85,1	2550	soil
Profile, Refraction seismics	LFK000137	252,5	85,1		3700	rock
Profile, Refraction seismics	LFK000137	277,5	96,1	95,3		mud
Profile, Refraction seismics	LFK000137	277,5	95,3	88,1	2550	soil
Profile, Refraction seismics	LFK000137	277,5	88,1	72,5	4700	rock
Profile, Refraction seismics	LFK000137	277,5	72,5		5500	rock
Profile, Refraction seismics	LFK000137	302,5	95,8	94,8		mud
Profile, Refraction seismics	LFK000137	302,5	94,8	88,2	2550	soil
Profile, Refraction seismics	LFK000137	302,5	88,2	75,2	3500	rock
Profile, Refraction seismics	LFK000137	302,5	75,2		4000	rock



*Figure 3-1. Refraction seismic profiles in the Forsmark area.*

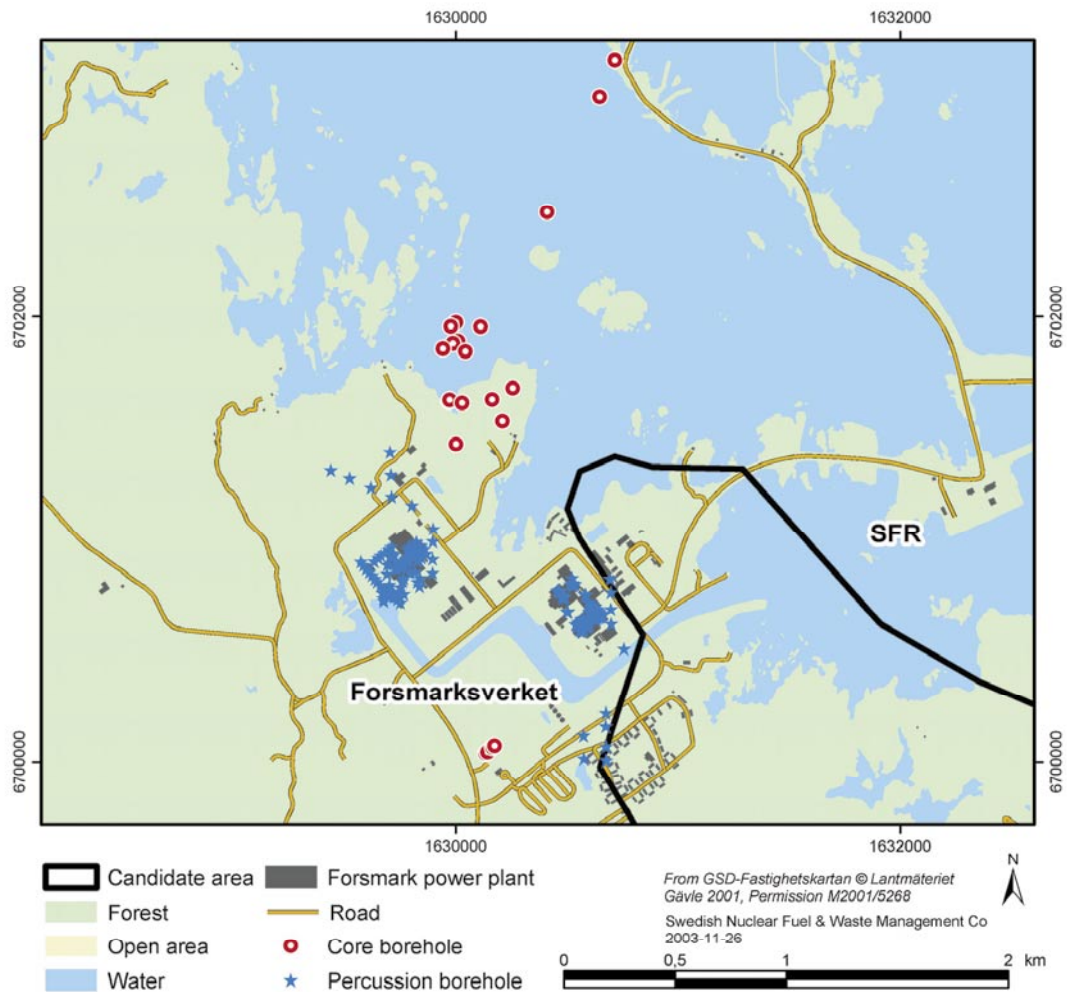
### 3.3.2 Cored and percussion boreholes

This chapter describes information related to cored boreholes and percussion boreholes. The information available for each borehole can be seen in Table 4-2.

#### **Recovered borehole identities**

Previous studies /1, 3/ have indicated borehole identities in the Forsmark area, which are not recorded in the SICADA database. A specific search was directed towards finding information regarding these boreholes. In cases where no original drilling documentation was found, coordinates have been picked from georeferenced maps, however, with lower precision. Borehole identities already existing in SICADA have then been used as control points.

For the area around Forsmarksverket, this data acquisition has identified 55 cored and 207 percussion borehole identities, which now are stored in SICADA, in addition to the previously existing, 121 cored and 40 percussion borehole identities. Collection of



**Figure 3-2.** Cored and percussion borehole identities, recovered to SICADA.

information from cored boreholes in the SFR area was performed in an earlier activity /3/, and no collection of percussion boreholes has been done in this project. Figure 3-2 shows the location of cored and percussion boreholes recovered in this project.

### Core logs

The data acquisition has identified 135 drill core logs in the area. Core logs have been found both for boreholes identities recovered as well as identities already existing in Sicada. The total length of recovered core logs is about 6890 metres. An example of a typical core log is shown in Table 3-2. The structure of the core logs is:

- Idcode assigned identity.
- Secup section up value [m].
- Seclow section low value [m].
- Description a text description of the rock.

**Table 3-2. Example of a typical core log.**

<b>Idcode</b>	<b>Secup</b>	<b>Seclow</b>	<b>Description</b>
KFK124	0	1.60	Rödgrå smått medelkornig intermediär gnejsgranit.
KFK124	1.60	1.65	Gröngrå lerig krosszon, i anslutning här till sek. rödfärgning.
KFK124	1.65	13.25	Rödgrå smått medelkornig intermediär gnejsgranit.
KFK124	13.25	16.60	Rödgrå smått medelkornig intermediär gnejsgranit. Sek. rödfärgning.
KFK124	16.60	17.20	Rödgrå pegmatit.
KFK124	17.20	19.25	Rödgrå smått medelkornig intermediär gnejsgranit. Sek. rödfärgning.
KFK124	19.25	20.45	Rödgrå smått medelkornig intermediär gnejsgranit.
KFK124	20.45	23.12	Rödgrå halvsalisk till salisk gnejsgranit.
KFK124	23.12	23.28	Rödgrå pegmatit.
KFK124	23.28	27.58	Rödgrå halvsalisk till salisk gnejsgranit.

The structure and the nomenclature used are not similar to the structure in SICADA but the information has been digitized and delivered in the original form to SKB. The lithology standard used in the core logs is purely descriptive and not coded in any way. In order to be able to use the data in a rational way, a new code based on the old rock type description was added. This coding was performed by site geologists Allan Strähle and Jesper Petersson in a most standardized way, only based on the rock type descriptions. The new codes that were assigned to the cores follow the code standard used in the ongoing site investigation project. The original descriptive information has also been inserted in SICADA. However, for a more qualified use of the data and if the cores are available, the lithology needs to be verified.

Table 4-2 summarises the data acquisition regarding cored boreholes. Of the 135 core logs 12 have been found in complementary sources. The core log for the deep borehole KFK001 has been found in Research and development report 5:1 /6/. Core logs for 11 boreholes running along the tunnel 3 were found in an original document provided by Rolf Christiansson 2003-08-28 /7/.

### ***Geological data in percussion boreholes***

The data acquisition has not identified any lithological mapping of percussion boreholes. However, many percussion boreholes have been examined with a TV-equipment and the reports contain information about fractures, their orientation and characteristics. This information has, so far, not been digitized. Reports containing this information have been assigned the value "TV-documentation" in column "comment" in Appendix 1.

### ***Fracture logs***

Fracture frequency protocols have been identified for 129 boreholes. The total length of fracture logs recovered is 6080 metres. An example of the fracture frequency information is shown in Table 3-3. The table structure for the fracture frequency is:

- Idcode      assigned identity.
- Secup      section up value [m].
- Seclow     section low value [m].
- fraqfreq    the number of fractures in that section.

**Table 3-3. Example of a typical fracture log.**

<b>Idcode</b>	<b>Secup</b>	<b>Seclow</b>	<b>fracfreq</b>
KFK081	23.50	24.00	4
KFK081	24.00	25.00	14
KFK081	25.00	26.00	16
KFK081	26.00	27.00	11
KFK081	27.00	28.00	10

The table structure is in accordance with the SICADA structure. Table 4-2 shows for which boreholes fracture log information have been found. Of the 129 fracture logs, 11 have been found in complementary sources. Fracture logs for 11 boreholes running along the tunnel 3 were found in an original document provided by Rolf Christiansson 2003-08-28 /7/.

### ***Water loss measurements***

Water loss measurements have been identified for 119 unique boreholes (88 cored and 31 percussion boreholes). In total, 125 individual water loss measurements have been recovered. Table 4-2 shows for which boreholes water loss information have been found. An example of the water loss measurement data is shown in Table 3-4. The table structure for water loss measurements is:

- Test date date for the measurement.
- Idcode assigned identity.
- Level E = single cuff (manschett), D = double cuff and a number.
- Sec sequence number.
- Seclow section up value [m].
- Secup section low value [m].
- H diff elevation difference [m], (Seclow – Secup).
- Press measured pressure [atm].
- Time measured time [min].
- Loss water loss [litre].
- Spec loss specific loss calculated according to following equation:  
Loss/(H diff \* Press \* Time).
- Set measurement number.
- Comments comments to the measurement.

**Table 3-4. An example of a typical water loss protocol.**

Test_date	Idcode	Level	Seq	Secup	Seclow	H diff	Press [atm]	Time [min]	Loss [litre]	Spec loss	Set	Comment	
1975-10-23	KFK040	D 1		1	4	3	1.5	1	0	0.00			
		D 2		2	5	3	2.5	1	0	0.00			
		D 3		5	8	3	5.5	1	0.5	< 0.10			
		D 4		8	11	3	1.5	1	14	3.1			
								2	1	24	4.00		
								1.5	1	14	3.1		
		D 5		11	14	3	5.5	1	0	0.00			
		D 6		14	17	3	1.5	1	5	1.10		Begränsade läckvägar	
								3.5	1	12	1.1		
								1.5	1	1	0.22		
		D 7		17	20	3	5.5	1	0	0.00			
		D 8		20	23	3	5.5	1	0	0.00			
		D 9		23	26	3	5.5	1	0	0.00			
		E 1		23	45.9	22.9	5.5	1	3	< 0.10			
		E 2		2	45.9	43.9	1.5	1	16	0.24			
								2	1	23	0.26		

### ***Drill core photos and core storage***

The data acquisition has identified drill core photos from 36 cored boreholes. The originals have been scanned and stored as tiff-images and delivered to the SKB's file archive.

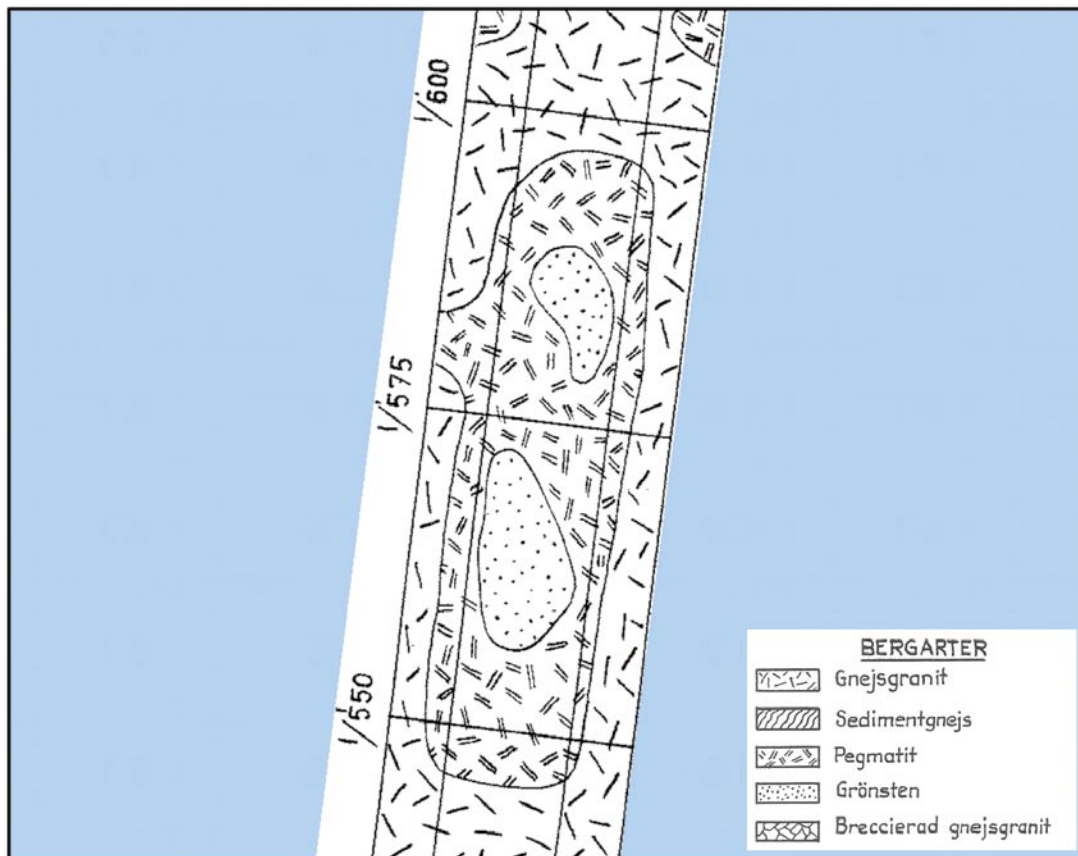
A list of boreholes of which the core is preserved was received from the Geological Survey of Sweden (the Malå office) during the data inventory for the site descriptive model version 0 /1/.

Table 4-2 shows for which boreholes, drill core photos and intact core have been identified.

### **3.3.3 Geological mapping of tunnels and shafts**

Geological mapping of tunnels and shafts is important for the site investigations since the different tunnels cover a large area and contain much valuable information about the geology. Much of the original information has been difficult to locate in the archives. However, different copies have been found and taken care of. In total, about 3900 metres of tunnel mapping and 5 shaft walls to a total length of 775 metres has been digitized.

- The outlet of cooling water for Forsmarksverket, reactor 1 and 2, is joined in one tunnel “tunnel 1+2”. The geological mapping for this tunnel has been found as originals in the Råcksta archive. The mapping is made at different scales and in vertical and horizontal sections. The information at the scale 1:500 and 1:2000, has been scanned and cropped into subgroups, which have been georeferenced and put into separate GIS-layers. The subgroups in horizontal sections are; rock type, fracture and rock reinforcement (scale 1:500). The vertical sections of the tunnels show information on rock type and rock-engineering parameters (scale 1:2000). All sections and subgroups have a matching legend. In this stage, no real 3-dimensional information has been created and hence, the horizontal projection is set to the ground surface. An example of the rock types in horizontal projection is shown in Figure 3-3.



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2003-10-01

**Figure 3-3.** Rock type in section 1500–1600 metre, in Forsmark tunnel 1+2.



- The geological tunnel mapping for Forsmarksverket, reactor 3, (tunnel 3) was not found as originals in the Vattenfall archives. However, this information has been used in previous work in the feasibility study Östhammar /8/, and a paper copy provided by SGU (Torbjörn Bergman) was used for the data acquisition. The tunnel mapping is similar to the ones made for tunnel 1+2, and has been digitized and stored in the same manner. An example of a vertical section of the tunnel 3 is shown in Figure 3-4.
- The geological tunnel mapping concerning SFR was found in a report in the SKB library as a paper copy, Byggnadsgeologisk uppföljning, SFR 87-03 (working material) /9/. From this report, overview maps with geological information have been scanned. The information in these maps has not been structured in the same way as tunnel 1+2 and 3 and there are some differences regarding subgroups. The subgroups are rock type, fracture and water conductive zones. For each subgroup there is a legend to the georeferenced GIS-layer. An example of fractures is shown in Figure 3-5.
- Material containing geological mapping of shaft walls has been found in Striae 11 /10/. Figures with lithological and structural mapping has been scanned and georeferenced for two shaft walls in the water intake channel and for three shaft walls in the construction area at Forsmark reactor 3. For each shaft wall there is a legend to the georeferenced GIS-layer.



Figure 3-4. A vertical section of section 1450–1700 metre in Forsmark tunnel 3.



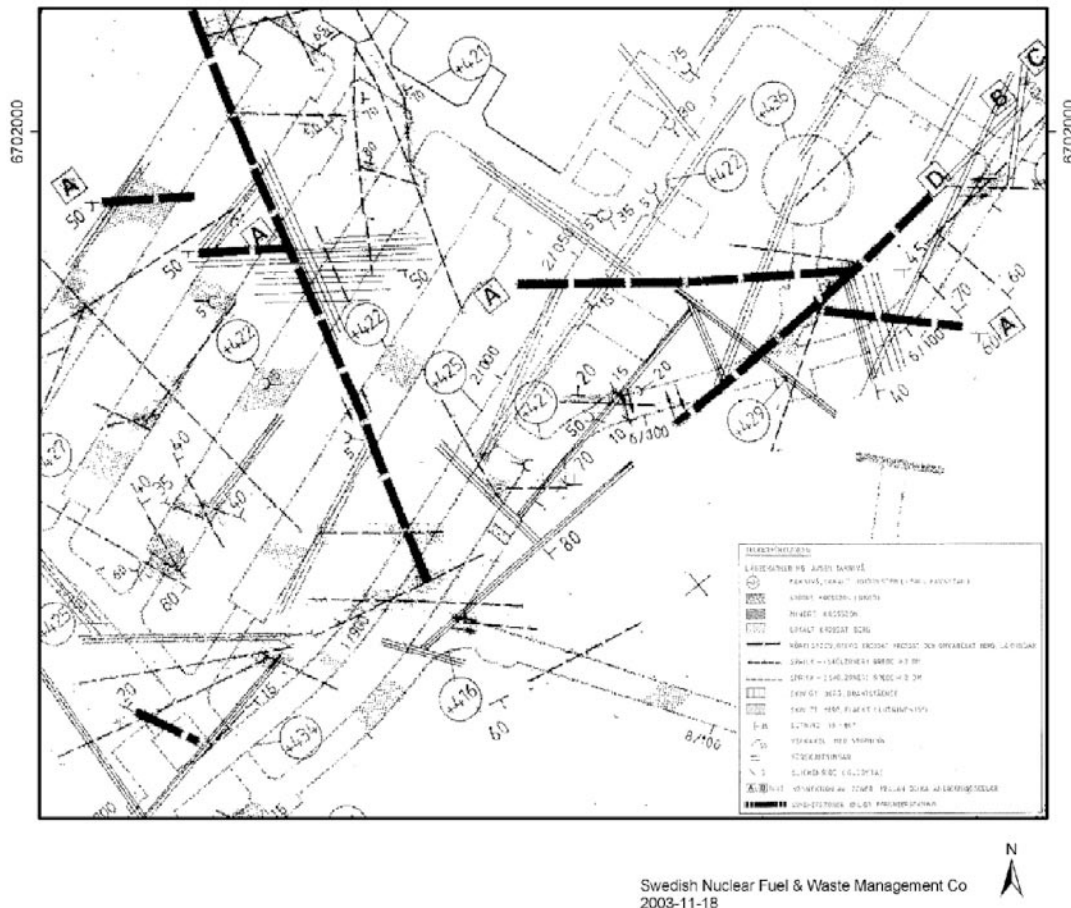


Figure 3-5. A georeferenced map showing fractures in the SFR-tunnel.

### 3.3.4 Ground geophysics except refraction seismics

The data acquisition also came across other ground geophysical measurements than the refraction seismics. Slingram, VLF and magnetic survey data have been identified in the received reports. The table structure for the VLF and slingram data fitted the SICADA structure whereas the magnetic table structure demanded modification for the Z-anomaly. Modification has been done on the magnetic data tables (in agreement with the SICADA administrator).

A magnetic and slingram survey in two directions have been recovered for an area around Forsmark reactor 3 and the cape further to the NW, see blue coloured profiles in Figure 3-6. The survey was conducted in the T-U coordinate system, during the feasibility study for the nuclear power plant and comprises 34 profiles with a total length of 21.5 line-kilometres /1/.

6 VLF and 4 VLF + slingram profiles were measured during the KBS epoch /1/, in the area between Forsmarks bruk and Forsmarksverket and comprise a total length of 5.5 line-kilometres. The overview maps, see section 3.3.5, were used to pick the start and end coordinates of the geophysical profiles.

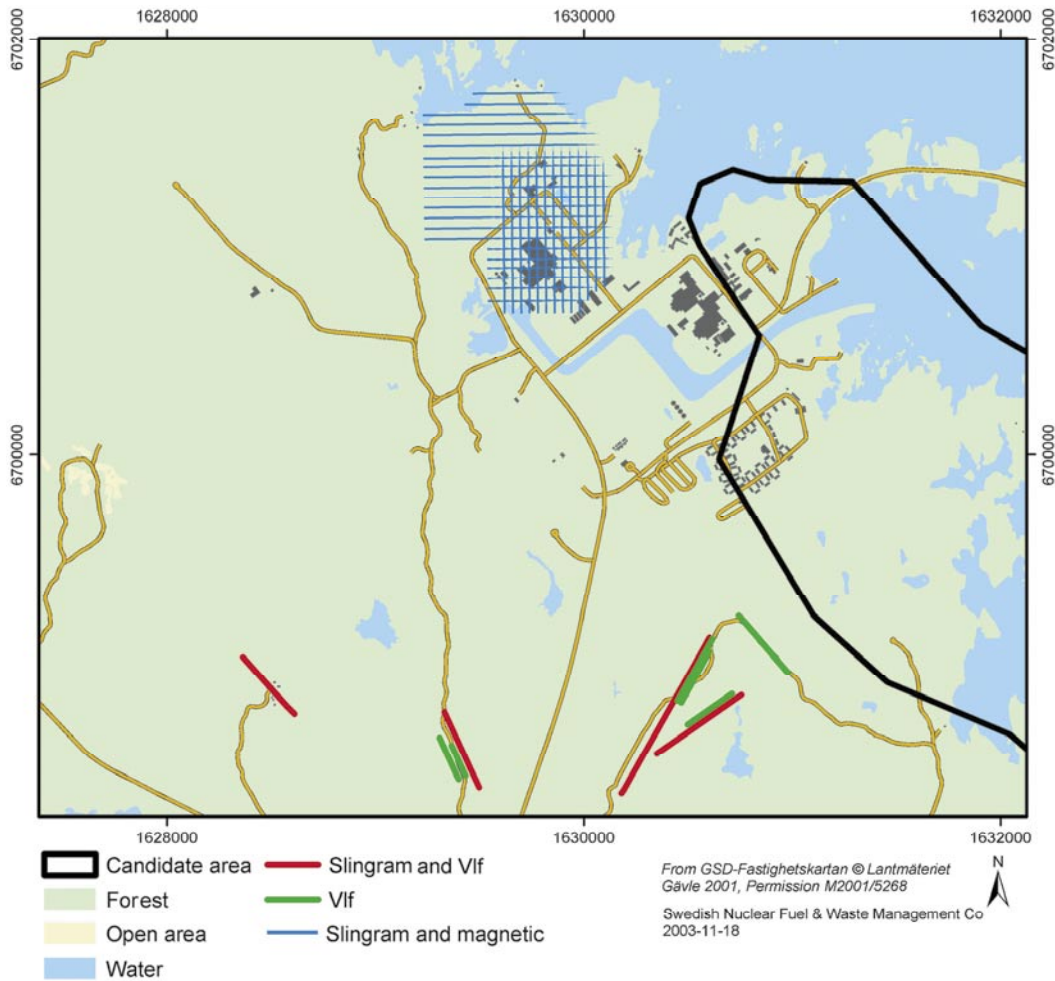


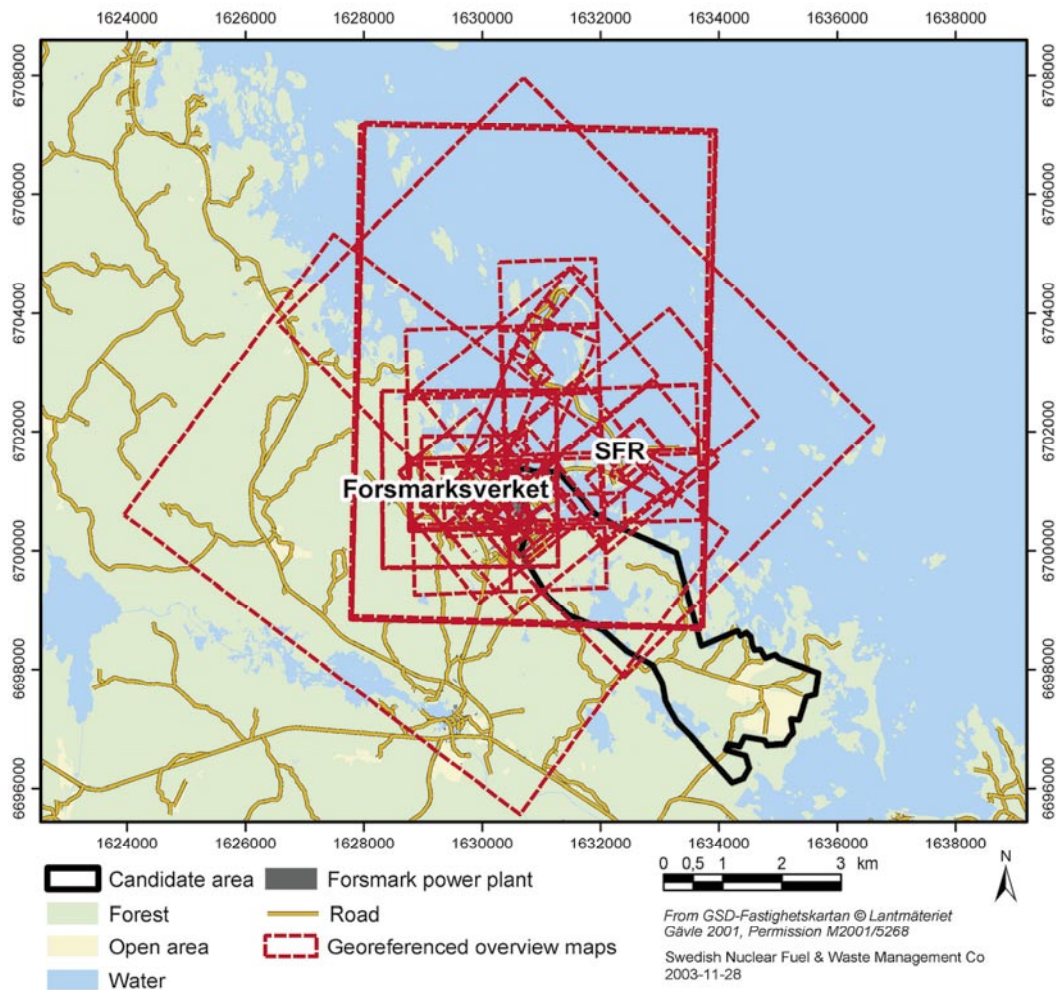
Figure 3-6. Ground geophysical surveys, excluding refraction seismic surveys.

### 3.3.5 Overview maps

All larger maps (size A0 and A1) in the reports collected from the Vattenfall archive have also been obtained as tiff-images. Maps considered important for the site investigation have been georeferenced and put into GIS-layers. A minor change compared to the activity plan is that the overview maps have not been georeferenced to the local co-ordinate system T-U due to the rather small utility for the site investigation. The basis for georeferencing maps has been the transformation relation, see Section 3.2, between the local co-ordinate T-U system and the national RT 90 2.5 gon V. On every map at least four points have been assigned a coordinate in RT 90 2.5 gon V. The tool for the work has been ArcMap 8.

Only a few detailed maps have been georeferenced because of its valuable information about geology. These maps give detailed information about surface geology and rock-surface level.

Some of the georeferenced overview maps have been used when picking coordinates of retrieved boreholes as well as start and end coordinates of ground geophysical profiles. A meta-database, and a shape file showing the actual boundaries for all georeferenced overview maps, has been created, see Figure 3-7. Clicking on a geographical spot gives information about the maps covering that spot. These maps will be listed as shown in

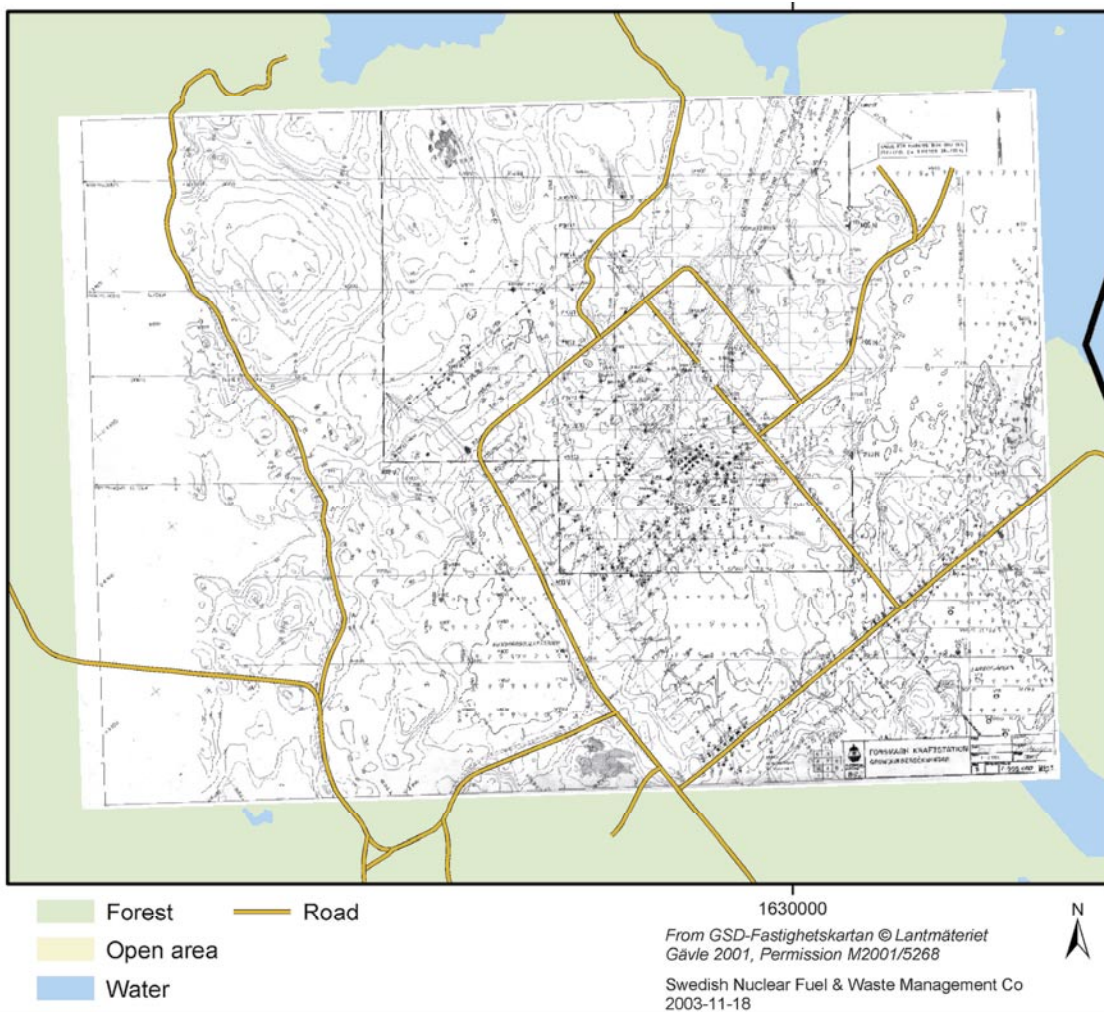
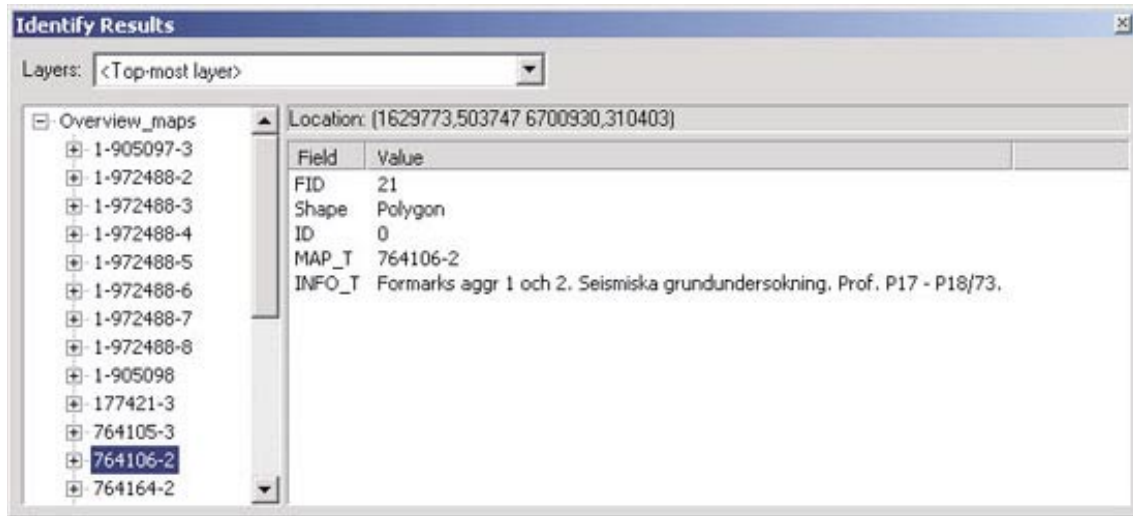


**Figure 3-7.** Metadata showing the coverage of the georeferenced overview maps.

Table 3-5. The column “map\_t” in the GIS-layer corresponds to the column “report-id” in the database (see Appendix 1), and is therefore the key column in the GIS-layer. By marking a “report-id”, a description of the content for the selected report identity will be displayed. All scanned maps, including also those that are not georeferenced, are marked in column “scanned” in database (see Appendix 1) in case of a future demand on georeferencing.

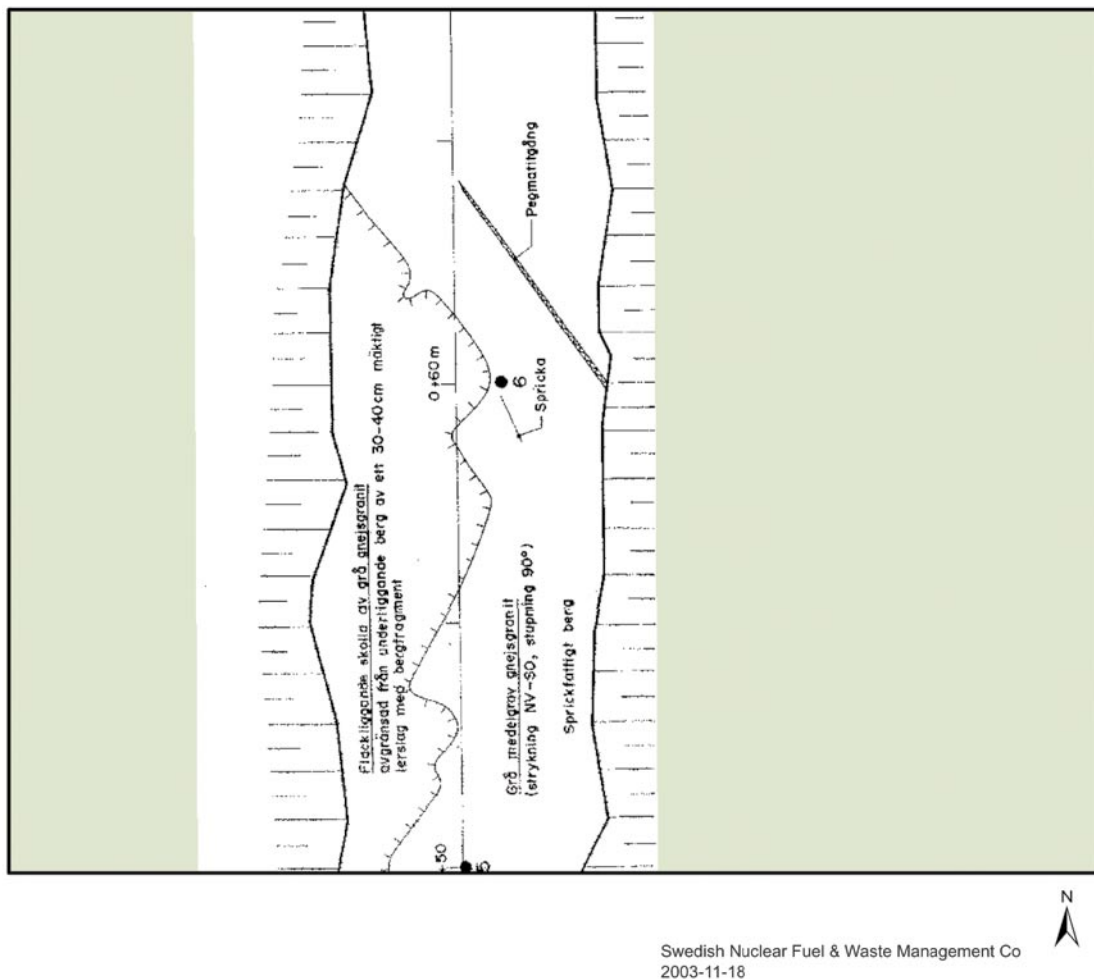
In total, 90 out of 158 scanned maps have been considered important for the site investigation and georeferenced. Figure 3-8 shows an example of an overview map. Figure 3-9 shows an example of a map containing detailed surface geology.

**Table 3-5.** A segment of the metadata found in the above shown Figure 3-7 when clicking on a spot within the shape boundary.



**Figure 3-8.** An overview map over the area that later became the construction area for the Forsmark III, power plant.





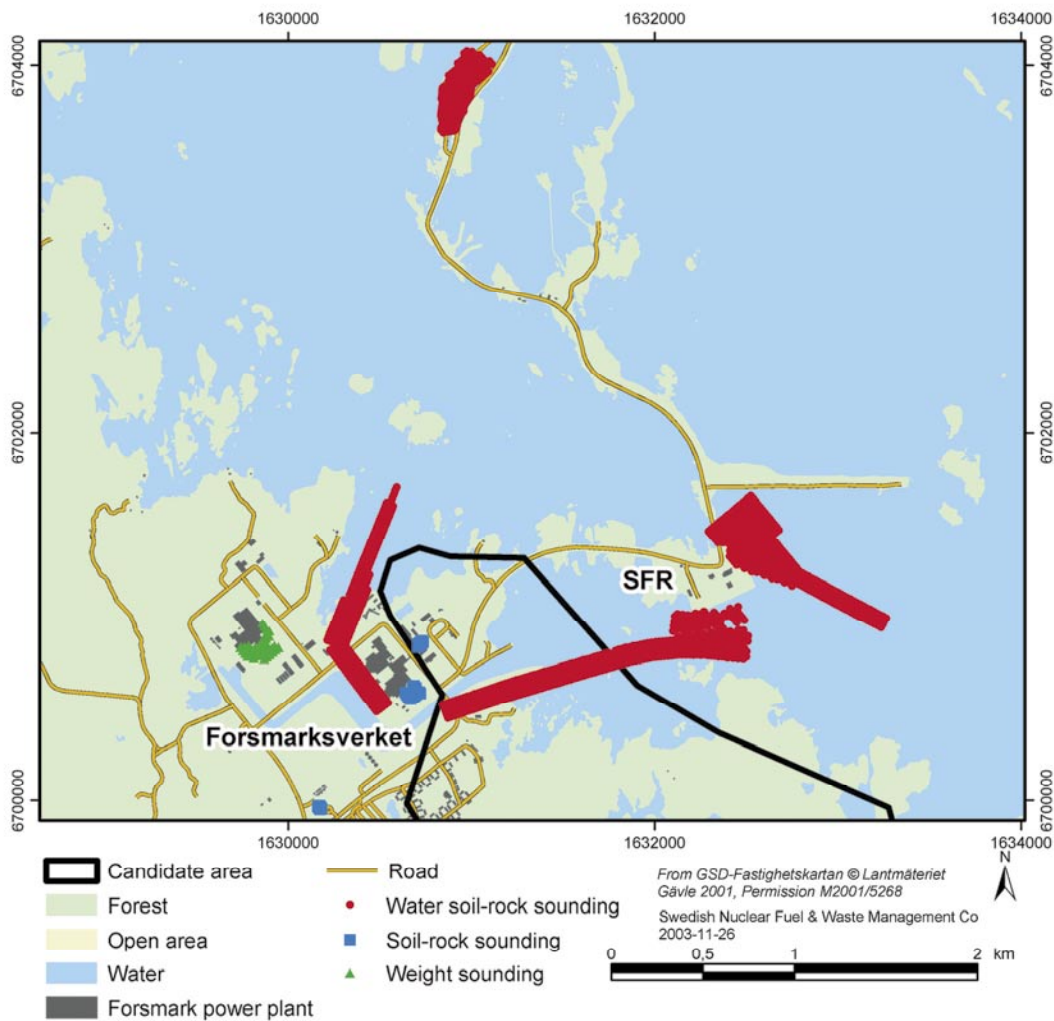
*Figure 3-9. Surface geology in a profile across an excavation “T10”. The excavation has exposed the extension of a horizontal, clay-filled fissure. This profile runs in a north-south direction in the construction area for the Forsmark reactors 1 and 2.*

### 3.3.6 Soil mechanics data

The categorising of the database into subgroups indicated a large amount of information from soil mechanics investigations. However, much of the information does not contain significant primary data and has therefore not been digitized. Nevertheless, the information found about performed soundings has been stored in three GIS-layers. One contains soil-rock soundings, the second contains soil-rock sounding in water and the third contains weight soundings. In total, 1872 geotechnical soundings performed during 9 surveys have been recovered. The coverage of the three GIS-layers is shown in Figure 3-10. The purpose of storing information in a GIS-layer is not only to present where soundings have been performed but also to facilitate the use of the geotechnical information in the analogue reports. The GIS-layers have the following general meta-database structure:

- id (if given),
- co-ordinates in the T-U system (not default),
- coordinates in RT90 2.5 g V (not default),
- ground level,

- rock surface level,
- source of information,
- purpose of the sounding,
- date (if given),
- water level (only for “water soil-rock sounding”),
- water depth (only for “water soil-rock sounding”),
- soil depth (only for “water soil-rock sounding”),
- drilling penetration rate (only for “water soil-rock sounding”),
- drilling depth in solid rock (only for “soil-rock sounding”),
- drilling penetration rate (only for “weight sounding”),
- maximum weight used (only for “weight sounding”).



*Figure 3-10. Different soil mechanics soundings performed in the Forsmark area.*

### **3.4 Uncertainties in the digitized information**

The digitized information has been produced in the 1970's and the beginning of 1980's. In those days, the documentation of for example ground geophysical measurements differed from how things are performed nowadays. For example, none of the ground geophysical measurements have coordinate information for the profiles start and end points documented in the reports. This information has therefore been taken from georeferenced maps.

The user of this information must be aware of the following remarks when working with the material:

- The accuracy in positions for this work depends on the map scale and the quality of the maps T-U system, the accuracy of the digitizing, the relation between the different coordinate systems and the fact that the T-U system is askew.
- All coordinates picked from georeferenced maps of for example boreholes and ground geophysical profiles have an error due to the above described factors.
- Typing errors can occur in the manual work when data was read from report and typed into a table structure. The possibility for quality assurance of the data has been very limited.

The recommendation to the user is to be careful and aware of the fact that the position accuracy and data quality assurance is lower for this information than for modern information.

### **3.5 Information that remains to be digitized or is considered less valuable for the site investigation**

Some information that was ordered from the archive was considered less valuable for the current site investigation. This decision was based on the following criteria:

- Some reports and maps do not contain significant information. That is, no information covers the first priority subgroups given in Chapter 2, the information covers a small area or a single location already covered by other data-sets, or the data is too obscure to be judged.
- Data or maps do not contain significant information for georeferencing.
- Information regarding the SFR area has had a lower priority and is therefore generally not included (exceptions were made for 32 refraction seismic profiles and the SFR-tunnel).

This information has not been digitized. However, all the copied reports and scanned maps are delivered to SKB for storage and the information will hereby be available in analog format.

Acquisition and/or digitizing of priority information has not been carried out in some cases. Some data have, after examination, been given a lower priority, some data is difficult to digitize and finally, some information has not been found and other probable sources than the Räcksta archive at Vattenfall have to be investigated.

Examples of information that remains to be digitized (and/or localized) are:

- Fractures; their orientation and characteristics documented in TV-investigations, mainly in percussion boreholes.
- Borehole information from the oldest drilling campaigns.
- Echo-sounding (bathymetric) data in strategic locations.
- Additional overview maps.

Information that has been identified and remains to be digitized is denoted in the column “comment” in Appendix 1.

It should be noted that the source of this work has been the primary data in the Vattenfall archives. Complementary information of value for the site investigation can probably be collected from other compilations and reports. Important sources to examine would be the SKB archives in general, data from the SAFE project for information around SFR, and reports from the rock mechanics research projects performed mainly around the Forsmark 3 power plant /1/. Additional primary information can probably also be found in compilation reports published in the Vattenfall report series.



## 4 Data delivery

All data, raw data as well as processed data, have been delivered to SKB and the processed data have been stored in SICADA. The SICADA reference to the activity is Field note no 118.

A detailed specification of the delivery status is enclosed in Appendix 1, which shows the reports stored in the Vattenfall archive. The table has been created to follow-up delivered information from the archive and document how it has been evaluated, collected and stored.

In total, 153 report identities out of 215 have been ordered and evaluated. Information from 97 report identities has been digitized.

All information gained from the Vattenfall archive is delivered to SKB for storage. Reports are delivered as two paper copies. Scanned information that has not been georeferenced, for example drillcore photos, is delivered as tiff-images to the file archive.

### 4.1 Refraction seismics

A total of 188 profiles with refraction seismic data have been digitized. 140 of these are close to Forsmarksverket and are given the identity code LFK000001–LFK000085 and LFK000097–LFK000151. 16 of the profiles were measured in the area between Forsmarks bruk and Forsmarksverket and are given the identity code LFK000086–LFK000096 and LFK000152–LFK000156. 32 profiles are within the SFR area and are given the identity code LFR000001–LFR000032. See Table 4-1 for more information about the refraction seismic profiles.

**Table 4-1. Description of refraction seismic profiles.**

<b>Idcode</b>	<b>Old id</b>	<b>File source</b>	<b>Geographical coverage</b>	<b>Year</b>
LFK000001	P1/70	783716-0917	Forsmarks kraftstation	1970
LFK000002	P2/70	783716-0917	Forsmarks kraftstation	1970
LFK000003	P3/70	783716-0917	Forsmarks kraftstation	1970
LFK000004	P3A/70	783716-0917	Forsmarks kraftstation	1970
LFK000005	P4/70	783716-0917	Forsmarks kraftstation	1970
LFK000006	P5/70	783716-0917	Forsmarks kraftstation	1970
LFK000007	P6/70	783716-0917	Forsmarks kraftstation	1970
LFK000008	P7/70	783716-0917	Forsmarks kraftstation	1970
LFK000009	P8/70	783716-0917	Forsmarks kraftstation	1970
LFK000010	P9/70	783716-0917	Forsmarks kraftstation	1970
LFK000011	P10/70	783716-0917	Forsmarks kraftstation	1970
LFK000012	P11/70	783716-0917	Forsmarks kraftstation	1970
LFK000013	P12/70	783716-0917	Forsmarks kraftstation	1970
LFK000014	P13/70	783716-0917	Forsmarks kraftstation	1970
LFK000015	P14/70	783716-0917	Forsmarks kraftstation	1970
LFK000016	P15/70	783716-0917	Forsmarks kraftstation	1970
LFK000017	P16/70	783716-0917	Forsmarks kraftstation	1970
LFK000018	P17/70	783716-0917	Forsmarks kraftstation	1970
LFK000019	P18/70	783716-0917	Forsmarks kraftstation	1970
LFK000020	P19/70	783716-0917	Forsmarks kraftstation	1970
LFK000021	P20/70	783716-0917	Forsmarks kraftstation	1970
LFK000022	P21/70	783716-0917	Forsmarks kraftstation	1970
LFK000023	P22/70	783716-0917	Forsmarks kraftstation	1970
LFK000024	P23/70	783716-0917	Forsmarks kraftstation	1970
LFK000025	P24/70	783716-0917	Forsmarks kraftstation	1970
LFK000026	P25/70	783716-0917	Forsmarks kraftstation	1970
LFK000027	P26/70	783716-0917	Forsmarks kraftstation	1970
LFK000028	P27/70	783716-0917	Forsmarks kraftstation	1970
LFK000029	P28/70	783716-0917	Forsmarks kraftstation	1970
LFK000030	P1/71	783769-0917	Forsmarks kraftstation	1971
LFK000031	P20/71	783772-0917	Forsmarks kraftstation	1971
LFK000032	P21/71	783772-0917	Forsmarks kraftstation	1971
LFK000033	P22/71	783772-0917	Forsmarks kraftstation	1971
LFK000034	P23/71	783772-0917	Forsmarks kraftstation	1971
LFK000035	P24/71	783772-0917	Forsmarks kraftstation	1971
LFK000036	P25/71	783772-0917	Forsmarks kraftstation	1971
LFK000037	P26/71	783772-0917	Forsmarks kraftstation	1971
LFK000038	P27/71	783772-0917	Forsmarks kraftstation	1971
LFK000039	P28/71	783790-0917	Forsmarks kraftstation	1971
LFK000040	P29/71	783790-0917	Forsmarks kraftstation	1971
LFK000041	P30/71	783790-0917	Forsmarks kraftstation	1971
LFK000042	P31/71	783790-0917	Forsmarks kraftstation	1971
LFK000043	P32/71	783790-0917	Forsmarks kraftstation	1971
LFK000044	P33/71	783800-0917	Forsmarks kraftstation	1971
LFK000045	P34/71	783800-0917	Forsmarks kraftstation	1971
LFK000046	P35/71	783786-0917	Forsmarks kraftstation	1971
LFK000047	P36/71	783786-0917	Forsmarks kraftstation	1971

<b>Idcode</b>	<b>Old id</b>	<b>File source</b>	<b>Geographical coverage</b>	<b>Year</b>
LFK000048	P37/71	783786-0917	Forsmarks kraftstation	1971
LFK000049	P1/72	783787-0917	Forsmarks kraftstation	1972
LFK000050	P2/72	783787-0917	Forsmarks kraftstation	1972
LFK000051	P3/72	783787-0917	Forsmarks kraftstation	1972
LFK000052	P4/72	783787-0917	Forsmarks kraftstation	1972
LFK000053	P5/72	905001-0917	Forsmarks kraftstation	1972
LFK000054	P5A/72	905001-0917	Forsmarks kraftstation	1972
LFK000055	P5B/72	905001-0917	Forsmarks kraftstation	1972
LFK000056	P6/72	905001-0917	Forsmarks kraftstation	1972
LFK000057	P7/72	905001-0917	Forsmarks kraftstation	1972
LFK000058	P1/73	764105-0917	Forsmarks kraftstation	1973
LFK000059	P2/73	764105-0917	Forsmarks kraftstation	1973
LFK000060	P3/73	764105-0917	Forsmarks kraftstation	1973
LFK000061	P4/73	764105-0917	Forsmarks kraftstation	1973
LFK000062	P5/73	764105-0917	Forsmarks kraftstation	1973
LFK000063	P6/73	764105-0917	Forsmarks kraftstation	1973
LFK000064	P7/73	764105-0917	Forsmarks kraftstation	1973
LFK000065	P8/73	764105-0917	Forsmarks kraftstation	1973
LFK000066	P9/73	764105-0917	Forsmarks kraftstation	1973
LFK000067	P10/73	764105-0917	Forsmarks kraftstation	1973
LFK000068	P11/73	764105-0917	Forsmarks kraftstation	1973
LFK000069	P12/73	764105-0917	Forsmarks kraftstation	1973
LFK000070	P13/73	764105-0917	Forsmarks kraftstation	1973
LFK000071	P14/73	764105-0917	Forsmarks kraftstation	1973
LFK000072	P15/73	764105-0917	Forsmarks kraftstation	1973
LFK000073	P16/73	764105-0917	Forsmarks kraftstation	1973
LFK000074	P17/73	764106-0917	Forsmarks kraftstation	1973
LFK000075	P18/73	764106-0917	Forsmarks kraftstation	1973
LFK000076	P1/74	764122-0917	Forsmarks kraftstation	1974
LFK000077	P2/74	764122-0917	Forsmarks kraftstation	1974
LFK000078	P3/74	764122-0917	Forsmarks kraftstation	1974
LFK000079	P4/74	764122-0917	Forsmarks kraftstation	1974
LFK000080	P5/74	764122-0917	Forsmarks kraftstation	1974
LFK000081	PP1/74	764122-0917	Forsmarks kraftstation	1974
LFK000082	PP2/74	764122-0917	Forsmarks kraftstation	1974
LFK000083	PP3/74	764122-0917	Forsmarks kraftstation	1974
LFK000084	P1/75	764164-0917	Forsmarks kraftstation	1975
LFK000085	P2/75	764164-0917	Forsmarks kraftstation	1975
LFK000086	P1/75	764181-0917	Forsmarks Bruk	1975
LFK000087	P2/75	764181-0917	Forsmarks Bruk	1975
LFK000088	P3/75	764181-0917	Forsmarks Bruk	1975
LFK000089	P4/75	764181-0917	Forsmarks Bruk	1975
LFK000090	P5/75	764181-0917	Forsmarks Bruk	1975
LFK000091	P6/75	764181-0917	Forsmarks Bruk	1975
LFK000092	P7/75	764181-0917	Forsmarks Bruk	1975
LFK000093	P8/75	764181-0917	Forsmarks Bruk	1975
LFK000094	P9/75	764181-0917	Forsmarks Bruk	1975
LFK000095	P10/75	764181-0917	Forsmarks Bruk	1975

<b>Idcode</b>	<b>Old id</b>	<b>File source</b>	<b>Geographical coverage</b>	<b>Year</b>
LFK000096	P11/75	764181-0917	Forsmarks Bruk	1975
LFK000097	P1/76	764409-0917	Forsmarks kraftstation	1976
LFK000098	P1A/76	764409-0917	Forsmarks kraftstation	1976
LFK000099	P2/76	764409-0917	Forsmarks kraftstation	1976
LFK000100	P3/76	764409-0917	Forsmarks kraftstation	1976
LFK000101	P4/76	764409-0917	Forsmarks kraftstation	1976
LFK000102	P5/76	764409-0917	Forsmarks kraftstation	1976
LFK000103	P6/76	764409-0917	Forsmarks kraftstation	1976
LFK000104	P7/76	764409-0917	Forsmarks kraftstation	1976
LFK000105	P8/76	764409-0917	Forsmarks kraftstation	1976
LFK000106	P9/76	764409-0917	Forsmarks kraftstation	1976
LFK000107	P10/76	764409-0917	Forsmarks kraftstation	1976
LFK000108	P11/76	764409-0917	Forsmarks kraftstation	1976
LFK000109	P12/76	764409-0917	Forsmarks kraftstation	1976
LFK000110	P13/76	764409-0917	Forsmarks kraftstation	1976
LFK000111	P14/76	764409-0917	Forsmarks kraftstation	1976
LFK000112	P15/76	764409-0917	Forsmarks kraftstation	1976
LFK000113	P16/76	764409-0917	Forsmarks kraftstation	1976
LFK000114	P17/76	764409-0917	Forsmarks kraftstation	1976
LFK000115	P18/76	764409-0917	Forsmarks kraftstation	1976
LFK000116	P19/76	764409-0917	Forsmarks kraftstation	1976
LFK000117	P20/76	764409-0917	Forsmarks kraftstation	1976
LFK000118	P21/76	764409-0917	Forsmarks kraftstation	1976
LFK000119	P22/76	764409-0917	Forsmarks kraftstation	1976
LFK000120	P23/76	764409-0917	Forsmarks kraftstation	1976
LFK000121	P24/76	764409-0917	Forsmarks kraftstation	1976
LFK000122	P25/76	764409-0917	Forsmarks kraftstation	1976
LFK000123	P26/76	764409-0917	Forsmarks kraftstation	1976
LFK000124	P27/76	764409-0917	Forsmarks kraftstation	1976
LFK000125	P28/76	764412-0917	Forsmarks kraftstation	1976
LFK000126	P29/76	764412-0917	Forsmarks kraftstation	1976
LFK000127	P30/76	764412-0917	Forsmarks kraftstation	1976
LFK000128	P31/76	764412-0917	Forsmarks kraftstation	1976
LFK000129	P32/76	764412-0917	Forsmarks kraftstation	1976
LFK000130	P33/76	764412-0917	Forsmarks kraftstation	1976
LFK000131	P34/76	764412-0917	Forsmarks kraftstation	1976
LFK000132	P35/76	764412-0917	Forsmarks kraftstation	1976
LFK000133	P36/76	764412-0917	Forsmarks kraftstation	1976
LFK000134	P37/76	764412-0917	Forsmarks kraftstation	1976
LFK000135	P38/76	764412-0917	Forsmarks kraftstation	1976
LFK000136	P39/76	764412-0917	Forsmarks kraftstation	1976
LFK000137	D40/76	764412-0917	Forsmarks kraftstation	1976
LFK000138	D41/76	764412-0917	Forsmarks kraftstation	1976
LFK000139	D42/76	764412-0917	Forsmarks kraftstation	1976
LFK000140	D43/76	764412-0917	Forsmarks kraftstation	1976
LFK000141	D44/76	764412-0917	Forsmarks kraftstation	1976
LFK000142	D45/76	764427-0917	Forsmarks kraftstation	1976
LFK000143	D46/76	764427-0917	Forsmarks kraftstation	1976

<b>Idcode</b>	<b>Old id</b>	<b>File source</b>	<b>Geographical coverage</b>	<b>Year</b>
LFK000144	P45/76	764416-0917	Forsmarks kraftstation	1976
LFK000145	P46/76	764416-0917	Forsmarks kraftstation	1976
LFK000146	P47/76	764416-0917	Forsmarks kraftstation	1976
LFK000147	10177	177421-0917	Forsmarks kraftstation	1977
LFK000148	10377	177421-0917	Forsmarks kraftstation	1977
LFK000149	10577	177421-0917	Forsmarks kraftstation	1977
LFK000150	10677	177421-0917	Forsmarks kraftstation	1977
LFK000151	D0177	764445-0917	Forsmarks kraftstation	1977
LFK000152	W0177	764446-0917	Forsmarks bruk	1977
LFK000153	W0277	764446-0917	Forsmarks bruk	1977
LFK000154	W0377	764446-0917	Forsmarks bruk	1977
LFK000155	W0477	764446-0917	Forsmarks bruk	1977
LFK000156	W0577	764446-0917	Forsmarks bruk	1977
LFR000001	P103/70	783730-0917	Forsmark SFR	1970
LFR000002	P104/70	783730-0917	Forsmark SFR	1970
LFR000003	P105/70	783730-0917	Forsmark SFR	1970
LFR000004	P106/70	783730-0917	Forsmark SFR	1970
LFR000005	P107/70	783730-0917	Forsmark SFR	1970
LFR000006	P108/70	783730-0917	Forsmark SFR	1970
LFR000007	P109/70	783730-0917	Forsmark SFR	1970
LFR000008	P110/70	783730-0917	Forsmark SFR	1970
LFR000009	P112/70	783730-0917	Forsmark SFR	1970
LFR000010	P113/70	783730-0917	Forsmark SFR	1970
LFR000011	P114/70	783730-0917	Forsmark SFR	1970
LFR000012	P115/70	783730-0917	Forsmark SFR	1970
LFR000013	DS8201	799546-0917	Forsmark SFR	1982
LFR000014	DS8202	799546-0917	Forsmark SFR	1982
LFR000015	DS8203	799546-0917	Forsmark SFR	1982
LFR000016	S8101	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000017	S8102	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000018	S8105	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000019	S8106	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000020	DS8107	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000021	S8108	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000022	S8109	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000023	S8110	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000024	S8111	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000025	S8112	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000026	S8113	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000027	S8114	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000028	S8115	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000029	S8116	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000030	S8117	SFR 81-13, SKB library	Forsmark SFR	1981
LFR000031	P1/80	ALMA report 9091185	Forsmark SFR	1980
LFR000032	P2/80	ALMA report 9091185	Forsmark SFR	1980

## 4.2 Information from cored and percussion boreholes

### 4.2.1 Cored boreholes

Information from 51 cored boreholes about the position and in some cases regarding the geometry has been digitized. These boreholes have been assigned the identity code KFK122–KFK172. 135 core logs, 129 fracture frequency protocols and 94 different water loss measurements have been digitized. Information related to the boreholes is summarized in Table 4-2. The Table 4-2 has the following structure:

- Idcode (both old and new),
- Engineering; position and geometry of the drillhole (Y = data stored , empty = no data found, In Sicada = already stored since earlier),
- Core log (Y = data stored, empty = no data found),
- Fracture log (Y = data stored, empty = no data found),
- Water loss (Y = data stored, empty = no data found),
- Photos (Y = photos stored (number of photos), empty = no photos found),
- Core stored (Malå = place were the core is stored)

Information from cored boreholes in the SFR area has not been digitized in this work. However, a similar table has been compiled describing the information available for cored boreholes in SFR, see Appendix 2. In 1997 a compilation of core logs and fracture logs was done for cored boreholes from both Forsmarksverket and SFR. This information resulted in a report 4825-1 found in Vattenfall archive in Forsmark /11/.

**Table 4-2.** A table summarising the data acquisition result regarding cored boreholes at Forsmarksverket.

<b>Idcode</b>	<b>Old_id</b>	<b>Engineering</b>	<b>Core log</b>	<b>Fracture log</b>	<b>Water loss</b>	<b>Photos</b>	<b>Core stored</b>
KFK001	DBT 1	In Sicada	Y		Y		
KFK002	DBT 2	In Sicada					
KFK003	DBT 3	In Sicada	Y		Y		Malå
KFK004	D 1+410V	Y	Y	Y		Y (2)	
KFK005	D 2+723	Y	Y	Y		Y (3)	
KFK006	D 2+766	Y	Y	Y		Y (4)	
KFK007	D304	In Sicada	Y	Y			
KFK008	D305	In Sicada	Y	Y			
KFK009	D306	In Sicada	Y	Y			
KFK010	D309	In Sicada	Y	Y			
KFK011	D311	In Sicada	Y	Y			
KFK012	D312	In Sicada	Y	Y			
KFK013	D330	In Sicada	Y	Y			
KFK014	D331	In Sicada	Y	Y			
KFK015	D332	In Sicada	Y	Y			
KFK016	D333	In Sicada	Y	Y			
KFK017	D334	In Sicada	Y	Y			
KFK018	D335	In Sicada	Y	Y			
KFK019	D336	In Sicada	Y	Y			
KFK020	D337	In Sicada	Y	Y			
KFK021	D338	In Sicada	Y	Y			
KFK022	D339	In Sicada	Y	Y			
KFK023	D340	In Sicada	Y	Y			
KFK024	D341	In Sicada	Y	Y			
KFK025	D342	In Sicada	Y	Y			
KFK026	D343	In Sicada	Y	Y			
KFK027	D344	In Sicada	Y	Y			
KFK028	D345	In Sicada	Y	Y			
KFK029	D346	Y	Y	Y			
KFK030	D347	In Sicada	Y	Y			
KFK031	D348	In Sicada	Y	Y			
KFK032	D349	In Sicada	Y	Y			
KFK033	D350	In Sicada	Y	Y			
KFK034	D 351	In Sicada	Y	Y	Y	Y (2)	
KFK035	D 352	In Sicada	Y	Y	Y	Y (2)	
KFK036	D 353	In Sicada	Y	Y	Y	Y (2)	
KFK037	D 354	In Sicada	Y	Y	Y	Y (2)	Malå
KFK038	D 355	In Sicada	Y	Y	Y	Y (2)	
KFK039	D 356	In Sicada	Y	Y	Y	Y (2)	
KFK040	D 357	In Sicada	Y	Y	Y	Y (2)	Malå
KFK041	D 358	In Sicada	Y	Y		Y (3)	Malå
KFK042	D 359	In Sicada	Y	Y	Y	Y (2)	
KFK043	D 360	In Sicada	Y	Y	Y	Y (2)	
KFK044	D 361	In Sicada	Y	Y	Y	Y (2)	Malå
KFK045	D 362	In Sicada	Y	Y	Y	Y (2)	

<b>Idcode</b>	<b>Old_id</b>	<b>Engineering</b>	<b>Core log</b>	<b>Fracture log</b>	<b>Water loss</b>	<b>Photos</b>	<b>Core stored</b>
KFK046	D 363	In Sicada	Y	Y	Y	Y (2)	
KFK047	D 364	In Sicada	Y	Y	Y	Y (2)	
KFK048	D 365	In Sicada	Y	Y	Y	Y (2)	
KFK049	D 366	In Sicada	Y	Y		Y (2)	Malà
KFK050	D 369	In Sicada				Y (1)	
KFK051	D 370	In Sicada				Y (1)	
KFK052	D 371	In Sicada			Y	Y (1)	Malà
KFK053	D 372	In Sicada			Y	Y (1)	Malà
KFK054	D 373	In Sicada			Y	Y (1)	Malà
KFK055	D 374	In Sicada			Y	Y (1)	Malà
KFK056	D 375	In Sicada			Y		
KFK057	D 376	In Sicada			Y		
KFK058	D 381	In Sicada	Y	Y			Malà
KFK059	D 382	In Sicada	Y	Y			Malà
KFK060	D 383	In Sicada	Y	Y			Malà
KFK061	D 392	Y	Y	Y			Malà
KFK062	D 395	Y	Y	Y			Malà
KFK063	DR 3-1	In Sicada	Y	Y	Y		Malà
KFK064	DR 3-2	In Sicada	Y	Y	Y		Malà
KFK065	DR 3-3	In Sicada	Y	Y	Y		
KFK066	DR 3-4	In Sicada	Y	Y	Y		Malà
KFK067	DR 3-5	In Sicada	Y	Y	Y		
KFK068	DR 3-6	In Sicada	Y	Y	Y		Malà
KFK069	DC1	In Sicada	Y	Y	Y		
KFK070	D 201	In Sicada	Y	Y	Y		
KFK071	D 31	In Sicada	Y	Y	Y	Y (2)	
KFK072	D 32	In Sicada	Y	Y	Y	Y (2)	
KFK073	D 33	In Sicada	Y	Y	Y	Y (1)	
KFK074	D 41	In Sicada	Y	Y	Y	Y (2)	Malà
KFK075	D 42	In Sicada	Y	Y	Y	Y (2)	Malà
KFK076	D 43	In Sicada	Y	Y	Y	Y (2)	Malà
KFK077	D 44	In Sicada	Y	Y	Y	Y (2)	Malà
KFK078	D 61	In Sicada	Y		Y		
KFK079	D 62	In Sicada	Y	Y	Y		Malà
KFK080	D 62A	In Sicada		Y	Y		Malà
KFK081	D 63	In Sicada	Y	Y	Y		Malà
KFK082	D 64	In Sicada	Y	Y	Y		
KFK083	D 65	In Sicada	Y	Y		Y (12)	Malà
KFK084	D 66	In Sicada	Y	Y		Y (11)	Malà
KFK085	D 67	In Sicada	Y	Y		Y (7)	Malà
KFK086	D 68	In Sicada		Y		Y (7)	
KFK087	D 71	In Sicada	Y		Y		Malà
KFK088	D 72	In Sicada	Y		Y		Malà
KFK089	D 73	In Sicada	Y		Y		
KFK090	D 74	In Sicada	Y				
KFK091	HT3-1	In Sicada					
KFK092	HT3-2	In Sicada					
KFK093	HT3-3	In Sicada					



<b>Idcode</b>	<b>Old_id</b>	<b>Engineering</b>	<b>Core log</b>	<b>Fracture log</b>	<b>Water loss</b>	<b>Photos</b>	<b>Core stored</b>
KFK094	HT3-4	In Sicada					
KFK095	HT3-5	In Sicada					
KFK096	HT3-6	In Sicada					
KFK097	HT3-7	In Sicada					
KFK098	HT3-8	In Sicada					
KFK099	HT3-9	In Sicada					
KFK100	HT3-10	In Sicada					
KFK101	HT3-11	In Sicada					
KFK102	HT3-12	In Sicada					
KFK103	DR1:1	Y					
KFK104	DR1:2	Y					
KFK105	DR1:3	Y					Malå
KFK106	DR1:4	Y					Malå
KFK107	DR2:1	In Sicada					Malå
KFK108	DR2:2	In Sicada					Malå
KFK109	DR2:3	In Sicada					Malå
KFK110	D 104	In Sicada	Y	Y	Y		
KFK111	D 105	In Sicada	Y	Y	Y		
KFK112	D 106	In Sicada	Y	Y	Y		
KFK113	D 108	In Sicada	Y	Y	Y		
KFK114	D 111	In Sicada	Y	Y	Y		
KFK115	D 112	In Sicada	Y	Y	Y		
KFK116	D 4	In Sicada	Y	Y	Y		Malå
KFK117	D 5	In Sicada	Y	Y			Malå
KFK118	D 6	In Sicada	Y	Y	Y		Malå
KFK119	D 8	In Sicada	Y	Y	Y		Malå
KFK120	D 11	In Sicada	Y	Y	Y		Malå
KFK121	D 12	In Sicada	Y	Y	Y		
KFK122	D384	Y	Y	Y			
KFK123	D385	Y	Y	Y			
KFK124	D386	Y	Y	Y			
KFK125	D387	Y	Y	Y			
KFK126	D388	Y	Y	Y			
KFK127	D389	Y	Y	Y			
KFK128	D390	Y	Y	Y			
KFK129	D391	Y	Y	Y			
KFK130	D393	Y					
KFK131	D394	Y					
KFK132	D396	Y	Y	Y			
KFK133	D397	Y	Y	Y			
KFK134	D398	Y	Y	Y			
KFK135	D399	Y					
KFK136	D401	Y					
KFK137	D1	Y					
KFK138	D2	Y					
KFK139	D3	Y					
KFK140	D4	Y					
KFK141	DT 351-1		Y	Y	Y		

<b>Idcode</b>	<b>Old_id</b>	<b>Engineering</b>	<b>Core log</b>	<b>Fracture log</b>	<b>Water loss</b>	<b>Photos</b>	<b>Core stored</b>
KFK142	DT 351-2		Y	Y	Y		
KFK143	DT 351-3		Y	Y	Y		
KFK144	DT 351-4		Y	Y	Y		
KFK145	DT 352-1		Y	Y	Y		
KFK146	DT 352-2		Y	Y	Y		
KFK147	DT 352-3		Y	Y	Y		
KFK148	DT 352-4		Y	Y	Y		
KFK149	DT 361-1		Y	Y	Y		
KFK150	DT 361-1A		Y	Y	Y		
KFK151	DT 361-2		Y		Y		
KFK152	DT 361-2AVK		Y	Y	Y		
KFK153	DT 361-3		Y	Y	Y		
KFK154	DT 361-3AHK		Y	Y	Y		
KFK155	DT 361-3AVK		Y	Y	Y		
KFK156	DT 361-3H		Y	Y	Y		
KFK157	DT 361-3V		Y	Y	Y		
KFK158	DT 361-4		Y		Y		
KFK159	DT 361-5		Y		Y		
KFK160	DT 361-5H		Y	Y	Y		
KFK161	DT 361-5V		Y	Y	Y		
KFK162	DT 362-1		Y	Y	Y		
KFK163	DT 362-1AHK		Y	Y	Y		
KFK164	DT 362-1AVK		Y	Y	Y		
KFK165	DT 362-1H		Y	Y	Y		
KFK166	DT 362-1V		Y	Y	Y		
KFK167	DT 362-2		Y		Y		
KFK168	DT 362-2AHK		Y	Y	Y		
KFK169	DT 362-3		Y		Y		
KFK170	DT 362-3H		Y	Y	Y		
KFK171	DT 362-3V		Y	Y	Y		
KFK172	DT 362-4		Y		Y		

#### **4.2.2 Percussion boreholes**

The data acquisition has detected 207 percussion boreholes not previously stored in SICADA. These boreholes have been given the identity code HFK041–HFK247. All position and geometrical information found has been stored. 31 of the percussion boreholes have protocols with water loss measurements. This is valid for the following identity codes: HFK045, HFK054, HFK056–HFK058, HFK066, HFK068–HFK074, HFK077–HFK079, HFK081–HFK084, HFK176–HFK180, HFK182–HFK187.

### **4.3 Geological mapping of tunnels and shaft**

Information about the geology in tunnel 1+2, tunnel 3 and the SFR tunnel have been georeferenced. Shaft walls with lithological and structural information from the water intake channel and the construction area at Forsmark 3 have been georeferenced.

### **Tunnel 1 + 2**

For tunnel 1 + 2, the primary information contains all the earlier mentioned subgroups (see Section 3.3.3) in one document in sections of 250 metres. The georeferenced tunnel information has been named in the following way:

“tunnelname\_subgroup\_fromsection\_tosection”, with the following values for:

- tunnelname: B1&2,
- subgroup: r = rock type, f = fracture, d = reinforcement and v = vertical section.

Example of file name: B1&2\_r\_1000\_1500.tif

For tunnel 1+2 geological mapping exits from section 1000 to 2975 metre.

### **Tunnel 3**

For tunnel 3, the primary information contains all the earlier mentioned subgroups (Section 3.3.3) in one document in sections of 250 metres. The georeferenced tunnel information has been named in the same way as for tunnel 1+2.

Example of file name: B3\_r\_1000\_1500.tif

For tunnel 3, geological mapping exist from section 1000 to 3517 metre.

### **The SFR-Tunnel**

The primary information on geology for the SFR tunnel has not been structured in the same way as the information from tunnel 1, 2 and 3 (Section 3.3.3). The subgroups used for the SFR tunnel are rock type, fracture and water conductive zones. The information is denominated according to the report and drawing identity (“Reportnumber\_mapnumber”).

Example of file name: SFR\_87\_03\_Ritnr104.tiff

The SFR tunnel information is documented in GIS-layers with the following map numbers:

- 1 Information on fractures and water conductive zones.
- 101, 102 Information on rock type.
- 103 Information on fractures.
- 104 Information on water conductive zones.

### **Shaft wall**

Georeferenced information with lithological and structural mapping of the water intake channel is found in GIS-layers named: Shaft\_wall\_CE.jpg and Shaft\_wall\_CW.jpg

Georeferenced information with lithological and structural mapping of the construction area at Forsmark reactor 3 is found in GIS-layers named: Shaft\_wall\_A.jpg, Shaft\_wall\_G.jpg and Shaft\_wall\_L.jpg

## **4.4 Ground-based geophysical measurements**

Three different geophysical data sets, except for refraction seismics, have been digitized. Slingram measurements are given the identity code: LFK000157–LFK000160. VLF measurements are given the identity code: LFK000157–LFK000166. The combined magnetic and slingram measurements are given the identity code: LFK000167–LFK000200.

## **4.5 Georeferenced maps**

Overview maps have been named according to their report number in the Vattenfall archive, which is the same as the identity number in the database for the site descriptive model, version 0 /1/. If a report contains several large maps the georeferenced map also have a suffix in the filename, which points at each individual map sheet.

Example of file name: 741337.tiff

Detailed georeferenced information with lithological and structural mapping of surface geology is found in GIS-layers named: 799506, 799510, 799526 and 799551.

## **4.6 Soil mechanics**

Information on soil mechanics investigations performed are compiled in three GIS-layer named; “FM\_soil\_rock\_sounding\_point”, “FM\_weight\_sounding\_point” and “FM\_water\_soil\_rock\_sounding\_point”. The content of the GIS-layers is described in Section 3.3.6. All the files are in ArcMap, shape format.

## 5 References

- /1/ **SKB, 2002.** Forsmark – site descriptive model version 0. SKB R-02-32, Svensk Kärnbränslehantering AB.
- /2/ PM angående transformationssamband mellan lokalt system runt SFR och system RT 90 2.5 gon V. 1998-09-17, Martin Stigsson, Golder Associates AB.
- /3/ Sammanställning av koordinatsystem, tunnlar i Forsmarksverket samt borrhål i SFR. PM 2002-03-01, Mikael Keisu, GeoVista AB.
- /4/ **SKBF/KBS, 1982.** Geologiska undersökningar och utvärderingar för lokalisering av SFR till Forsmark, del 2. Arbetsrapport SFR 81-13. Hagconsult AB.
- /5/ **Hagconsult, 1980.** ALMA – Slutförvar i berg. Översiktliga bergundersökningar för förstahandsalternativ i Forsmark, Studsvik och Simpevarp. Rapport 1. 9091185.
- /6/ **The Swedish State Power Board, 1982.** Characterization of deep seated rock masses by means of borehole investigations. Research and development report 5:1.
- /7/ Forsmark 3, A-tunneln, Kärnkartering sammanställning. Original manuscript 1971. Provided by Rolf Christiansson, SKB, 2003-08-28.
- /8/ **Bergman T, Ekman L, Isaksson H, Larsson H, Leijon B, 1996.** Förstudie Östhammar. Samlingsrapport avseende bergtekniska erfarenheter i regionen, sammanställning av geoinformation vid Forsmarksverket och data från kärnborrhål KFO01 vid Formark. SKB PR D-96-025.
- /9/ **SKB, 1987.** Byggnadsgeologisk uppföljning. Arbetsrapport SFR 87-03, Svensk Kärnbränslehantering AB.
- /10/ **Carlsson A, 1980.** Characteristic features of a superficial rock mass in the southern central Sweden. Striae volume 11. Sveriges Geologiska Undersökning.
- /11/ **Hardenby C, 1997.** Forsmarks kraftstation / SFR. Borrkärneinventering. Rapportnummer 4825-1. Vattenfall Hydropower AB.

# Appendix 1

## Delivery status of the Vattenfall archive information

**Information headline** = Describes the information.

**Report-id** = The information identity in the Vattenfall archive. Key column for the ordering. This table has been classified according to the applied index card system for the Vattenfall archive.

**Ordered** = The number indicates in which subgroup the information was ordered. 1 = test order, 2 = ground geophysics and tunnel mapping, 3 = boreholes and 4 = overview maps, geological and geotechnical information. "Blank" cells have not been ordered and cells marked in red indicate that the report was not found in the archive.

**Scanned** = Number of scanned maps with this "report-id"

**Info-type** = Information valued by GeoVista AB. B = Borehole, G = Geology, M = Magnetometry, N = No valuable information, O = Overview, R = Refraction seismic, S = Soil mechanics/undring, Sl = Slingram and V = VLF.

**Sicada-data** = Information stored in Sicada. C = Cored borehole, M = Magnetometry, P = Percussion borehole, R = Refraction seismic, Sl = Slingram and V = VLF.

**GIS-data** = Information stored in the GIS-database. G = Georeferenced information.

**Comment** = Comments to the material, and given and/or existing identity codes. Also information that remains to be digitized have been marked in this column

Information headline	Report-id	Ordered	Scanned	Info-type	Sicada-data	GIS-data	Comment
Minikraftverk i Forsmarksån Plan och sektioner förslag	2-75068						
Minikraftverk i Forsmarksån situationsplan förslag	4-75069						
Avloppstunnel. Kämborrhål. D1-410 V . Resultatssamt.	42-139734	3		B	C		KFK004-006
Forsmark 3. Plan över turbinben	1-139755						
Forsmark 3. Turbinben T 61 Kämborrhål DT 361-1-5. Bergarter och sprickor m m.	1-139756	3	1	B	C		KFK141-172
Forsmark SFR1, Kämborrhål DS101/2 uppåt. Resultatssamtställning + översikt.	45-141132						Already stored in SICADA
Forsmark SFR1, Kämborrhål DS102/2 uppåt. Resultatssamtställning och resultat.	142913, Bl. 1-2						Already stored in SICADA
Rotorförädl 1985. Provgropar o. Sondering. Markundesökn.	43-153062 Bl. 1-3	4		N			No valuable information
Viktsondering V1-V10. Hammarboorming H1-H16. Diagram	3-155163 Bl. 1-4	4		N			SFR, Out of area

Information headline	Report-id	Ordered	Scanned	Info-type	Sica-data	GIS-data	Comment
Ovanjordsbyggnader och utfyllnadsområde. Grundundersökningar, planlägg, sekt. H	3-155164						
Ovanjordsbyggnader och utfyllnadsområde. Grundundersökningar. Sektion A-G.	43-155165 Blad 1-2						
Område: Stora Sandgrund - Biotestsjön. Ekolodning maj 85. Bottenmivåkurvor	1-158384	4	1	O		G	Overview, echo-sounding
Område: Stora Sandgrund - Biotestsjön - Sondering 85. Planlägg.	1-158385	4	1	N			No valuable information
Forsmarks kraftstn aggr. 3-4. Lutning o. avvikelsemåtn. Borrhål DBT1-DBT3	Mapp 177408	3		B			No new information
Forsmark CLAB. Seismik. Prof. 101. 103. 105. 10677.	Mapp 177421	2	1	R	R	G	LFK000147-000150
Forsmarks Kraftstation. Plan över stommät.	1-177497 Blad 1-4	4	4	O		G	Overview
Bruksdammen. Högsta och lägsta vattenstånd per månad under 30 år. (1903-1922, 1952-1961)	3-196039						
Pejlingskarta för kylvattenanläggning mellan fastlandet och Svalören	1-196077	4	1	O		G	Overview
Vatten- och avloppsnät vid bruket, Etapp I	730866						
Bruksdammen. Uppmätning av dammar, kvarn mm.	730874 a-i						
Kylvatteninlopp, plan och sekt före uppbyggnad	Mapp 730876	4		O			Sounding without georeference information
Vattentornet, plan o sektioner före uppbyggnad	Mapp 730891	4		N			No valuable information
Ekolodning vid tunnelutlopp, plan och sifferplan + nivåkarta + sekt.	Mapp 741337	4	3	O		G	Overview, echo-sounding
Vägprofil. Hamnen -Höggrundet	741392 a-c	4		N			No valuable information
Nivåkarta över holmar vid utloppet ur Biotestsjön	741395	4		N			No valuable information
Prel redovisning av berg- och markundersökning	Mapp 744247 a-b	4		N			No valuable information
Sötvatten-försörjningen	744269 a-b	4		N			No valuable information
Forsmarks kraftstation. Forsmarksån. Bruksdammens nederbördsområde	Mapp 744271						
Plan och profil av vattenledn. från Bruksdammen	744298 a-d	4		S			Sounding without georeference information
Block 3. Mark- och bergnivåkarta	1-748291	4	1	O		G	Overview
Forsmarks kraftstn, industrivattenanlägg. Grundundersökn för tillbyggnad	Mapp 764447	4		S		G	Soil mechanics
Forsmarks kraftstn. Inpasseringsbyggnad. Grundundersökningar.	Mapp 764448						
Forsmarks bruk. Plan visande dammar och tekniska anordningar	749230						

Information headline	Report-id	Ordered	Scanned	Info-type	Stada-data	GIS-data	Comment
Forsmark. Undersökning för bro och färledsränna vikt sondborrhålen 1-3. med plan.	Mapp 764102	4		S			Sounding without georeference information, 2 points
Forsmark aggr 3 och 4. Seism-grundundersökning.	Mapp 764105	2	1	R	R	G	LFK000058-000073
Forsmarks aggr 1 och 2. Seismiska grundundersökning. Prof. P17 - P18/73.	Mapp 764106	2	1	R	R	G	LFK000074-000075
Forsmark Kraftstation, Grundundersökningar. Intagskanal.	Mapp 764116	1, 4		S		G	Overview 1-905097-5
Sondborrhål A, B, C, D. Bruksdammen. Råvatten. Pumpstation. Protokoll +prof.	Mapp 764118						
Prof. P1-P5/74. Seismik. Grundundersökningar. Profiler 1, 2/74, 3-5/74.	Mapp 764122	2		R	R		LFK000076-000083
Forsmark Kraftstation. Administrationsbyggnad. Grundundersökning.	764123						
Sonderingar för utlopp av biotesjö	Mapp 764138						
Forsmark 1 o 2. Grundundersökn för avfallbyggn.	Mapp 764149	4	1	S		G	Soil mechanics
Forsmark 3 o 4. Grundundersökn. Viktsondering hålen 1-39	Mapp 764150	4		S		G	Soil mechanics
Grundundersökningar	1-764154	4	1	O		G	Overview
Forsmarks kraftstation aggr 3-4. Seismik prof. 1-2/75	Mapp 764164	2	1	R	R	G	LFK000084-000085
Forsmark. Marka Grustäkt. Seismik. Profilema P1-P20/75	Mapp 764173	2	1	R			Out of area
Bruksdammarna. Grundundersökningskarta	1-764179	4	1	N			No valuable information
Forsmark Bruksdammarna seismik. Prof. 1-1/75	Mapp 764181	2	1	R	R		LFK000086-000096
Grundundersökning för biotessthus	1-764402						
Forsmark 1976. Seismik. Prof. 1-27/76	Mapp 764409	2	1	R	R	G	LFK000097-000124
Innehåll. 4 st profiler + 6 blad borrtokoll. Pump och reningsverk	Mapp 764410	3		S			Sounding without georeference information
Nivåkarta över grustäkten. Marka grustäkt	1-764411						
Forsmark kraftstation. Avloppstunnel. Seismisk Profiler 28-44/76	Mapp 764412	2		R	R		LFK000125-000141
Innehåll. Plan + profiler av seismiska mätningar AB. Tillfartsväg. Seismik. Prof 45-47/76	Mapp 764416	2		R	R		LFK000144-000146
Rapport över TV. Granskningen från Hagsconsult. Borrhål DR1-4. TV. Granskning.	Mapp 764417	3		B			TV-documentation
Forsmark kraftstation Block II. Borrhålsundersökningar av DR2. 1-3	Mapp 764423	3		B			TV-documentation
Kylvattentumlar. Block 3. Bergundersökning.	Mapp 764424	3		B			TV-documentation



Information headline	Report-id	Ordered	Scanned	Info-type	Stada-data	GIS-data	Comment
Forsmarks kraftstn. Administrationsbyggnad. Grundundersökningar. Jord och bergsöndring av 13 hål.	Mapp 764426	1		S		G	Soil mechanics
Forsmarks kraftstation agr 3-4. Avloppstunneln. Seismik prof. D45-46. Plan + profiler av seismiska mätningar.	764427	2		R	R		LFK000142-000143
Forsmarks Kraftstation agr 3. Avloppskanal I. Sandgrund Havet grundundersökningar	43-764436 blad 1-2	4	2	O,S		G	Overview. soil mechanics
Forsmarks kraftstn agr 3-4. Avloppstunneln. Seismik. Prof. 0177	Mapp 47-764445	2		R	R		LFK000151
Forsmarks kraftstn, Seismik för Vattentäkt. Prof. W0177-W0577	Mapp 45-764446	2		R	R		LFK000152-000156
Forsmark 3. Sondering av väg	43-764454						
Forsmark kraftstn agr 3. Jord-bergsöndring för värmekulvertar	mapp 764481						
Rensning i Asphällsfjärden för kylvattenanläggning 1977.	1-775110						
Biotestsjön, nivåkartor med 0.5 m ekv.	0-775111			O			Not found in archive
Forsmarksån. Avbördningskurva för pegel 55.	4-777773						
Forsmark. Vattenstånd i Bruksdammen. Vattenföring nedst och i Vattenholmsån, åren 1972-1974	3-777774 BI 1-3						
Frekvens av erfoderlig magasinsavsänkning i Bruksdammen vid ett vattenutlag om 310 L/s (100 +200 L) se ann.	4-777775						
Seismiska grundundersökningar för Forsmark, Stockholms län, maj 1970	Mapp 783716	2	1	R	R		LFK000001-000029
Diamant- och hammarborring i rutorna 1-4. Grundundersökningar. Borrningar.	783724 a-1	3		B	P		New HFK-identities
Seismiska grundundersökningar. Hamnen mätupdrag 2-70	Mapp 783730	2	1	R	R		SFR, LFR000001-000012
Forsmark Diamant borring	Mapp 783758			B			Not found in archive.
Seismiska grundundersökningar för tunnelsträckning. Prot 1/71	783769 a-d	2		R	R		LFK000030
Seismiska mätningar. Profiler P20-P27/71. Uppdrag 5.	Mapp 783772	2		R	R		LFK000031-000038
Seismiska mätupdrag 7. Profiler P35-P37 /71	Mapp 783786	2		R	R		LFK000046-000048
Seismiska mätupdrag 8. Profiler P1-P4 /72	Mapp 783787	2		R	R		LFK000049-000052
Seismiska mätupdrag 6. Profiler P28-P32 /71	Mapp 783790	2		R	R		LFK000039-000043
Seismiska mätupdrag 9. Profiler P33-P34	Mapp 783800	2		R	R		LFK000044-000045
Bruksdammen Utskov Hammaren. Förslag till ombyggnad	792328						
Verkstadsdammen, Utskov Kvarnslutaren. Förslag till ombyggnad	792329						

Information headline	Report-id	Ordered	Scanned	Info-type	Stada-data	GIS-data	Comment
Forsmark kraftstation -slagborrning	799306	4		N			No valuable information
Grundundersökning för kontorsbyggnad. Provgropar	799308	4		N			No valuable information
Sondering för hamm och färdel	799315	4	1	O, S		G	Overview, soil mechanics. See report 911768
Forsmark kraftstn - Sondering för hamm	799316	4		S			Out of area, SFR
Forsmark kraftstation. Tillöpsbassäng. Markundersökning	799321	3	1	O		G	Overview
Forsmark. Industrivattenledning. Grundundersökning	799325	4		S			Sounding without georeference information
Forsmarks kraftstn. Avfallsbyggnad. Grundundersökning	Mapp 799326	4		N			No valuable information
Forsmark. Grundundersökn. Hargs Jvstn	Mapp 799329						
Forsmark kraftstation. Grundundersökning i hammabassäng	Mapp 799331	4	1	O		G	Overview
Forsmark-Bruket. Grundundersökning. Unders. Av invallning nedströms kvatnen	Mapp 799332	4		N			No valuable information
Forsmark III. Tättråd. Grundundersökning	Mapp 799347	4	1	O		G	Overview
Forsmarks bruk. Jord-bergsondering nedströms. Kvarnslutaren.	Mapp 799352						
Fastighetsförädl. Grundundersökn. Utlåtande. Tabell. Karta i skala 1:500	Mapp 4-799356 bl 1-3						
Gunnarbo-Lillfjärden vinkelstolpar. Grundundersökning	3-799360						
Redovisning av hammar borrhålen H51-H53 och H61-H64 inkl. TV-granskning av borrhålsväggarna juni-juli 1971	Mapp 799503	1, 3		B	P		TV-documentation
Redovisning av kärnborrhål D31-D33 och D41-D44	Mapp 799505	3		B	C		KFK071-077
Provschakt o spränggrup T10	Mapp 799506	4	1	G		G	Surface geology
Forsmark aggr 1 o 2 Grundundersökningar. Provgropar o borrhål t.o.m april 1972	42-799507	3	1	O		G	Overview
Diamantborrhålen D4, D5, D6, D8, D11, D12	Mapp 799508	3		B	C		KFK116-121
Hammarborrhålen H7, H10, H14, 15, H20, H21	799509	3	1	B	P		New HFK-identities
Provschakt och spränggrup R 10	Mapp 799510	4	1	G		G	Surface geology
Hammarborrhålen H107, H114, H115, H120 och H121.	799511	3	1	B	P		New HFK-identities
Hammarborrhålen H201-H207	799512	3	1	B	P		New HFK-identities
Hammarborrhålen H307, H310, H314, H315, H320 och H321	799513	4	1	B	P		New HFK-identities

Information headline	Report-id	Ordered	Scanned	Info-type	Stacda-data	GIS-data	Comment
Bergsöndering för vattentorn. Plan och sekt.	799515	4		S		G	Soil mechanics
TV-granskning av borrhål för turbinfundament	Mapp 799516	3		B			TV-documentation
Diamantborrhålen D104, D105, D106, D108, D111, D112	Mapp 799518	1, 3		B	C		KFK110-115
Forsmark aggr 1. TV-granskade borrhål för reaktortorbyggen	Mapp 799521	3		B			TV-documentation
Forsmark aggr 1. Spränggrupp i reaktortorget 1972 (Hagconsult)	Mapp 799526	4	1	G		G	Surface geology
Diamantborrhål D61-D64	Mapp 799527	3		B	C		KFK078-082
Forsmark 1 o 2 1972. Diamantborrhålen D71- D74	Mapp 799528	3		B	C		KFK087-090
Forsmark 1972. Bergeologiskt besiktningsskikt utåtande jämte foton	799530	4		N			No valuable information
Forsmark aggr 1 o 2. Avloppstunneln, geologisk- teknisk översikt.	799542 a, b	3		N			No valuable information
Avloppstunneln. Grundundersökn. Seism. prof + kärnborrhål	799546 a, b	2		R	R		SFR, LFR000013-000015
Forsmark aggr 1 o 2. Avloppstunneln. Bergeologiskt utlåtande av fil dr Walter Larsson med bil. 1-8	Mapp 799547	3		B	C		KFK078-086
Forsmark aggr 1 o 2. Provschakt och spränggrupp T11	Mapp 799551	1, 4	1	G		G	Surface geology
Forsmark aggr 2. Bergeologisk besiktning samt TV-granskning av borrhål i reaktortorget	Mapp 799561	3		B			TV-documentation
Forsmark 3 o 4 (läge 1). Bergeologiskt utlåtande m bil. 1-3	Mapp 799563	3		B	C		KFK007-033
Forsmark aggr 2. Turbinfundament 21 och 22. Grundundersökning. (TV-granskning o vattenförlustmätning)	Mapp 799573	3		B			TV-documentation
Forsmark aggr 1 o 2. Lågreservoar, grundundersökning (bergsöndering och vattenförlustmätning)	Mapp 799573	3		B			TV-documentation
Reaktortorget. TV-granskning av kärnborrhålen DR 1-1-4.	Mapp 799576	3		B	C		TV-documentation
Forsmark 1977. Mellanlager för aktivt avfall i berggrum (Hagconsult 1977)	Mapp 799577	4	1	O		G	Overview
Forsmarks kraftstation block 3 1977. Bergundersökning för CLAB inkl kärnborrhålet DC1	Mapp 799580	3	2	B	C	G	Overview, KFK069
Forsmarks kraftstation block 3. Kärnborrhål D201	Mapp 700581	4		B	C		KFK070
Forsmark block 3. Efterkontroll av utförd injektering 1977-78	Mapp 799582	4		B	C		KFK063-068
Forsmarks kraftstation block 3. Bergundersökning för turbinfundament	Mapp 799588	4		B			TV-documentation
Forsmarks kraftstation block 3. VLF- och slingarmätningar utförda i Forsmarksområdet	Mapp 799589	2		S,V	S,V		LFK000157-000166
Forsmark aggr 1 o 2. Kärnborrhålen D65-D68.	Mapp 799594	3		B	C		
SFR 1 1983. Hammarborrhålen H 17/60 - H39/60 vattenförlustmätning	44-799598						

Information headline	Report-id	Ordered	Scanned	Info-type	Sicada-data	GIS-data	Comment
Forsmarks kraftstation aggr 3. Avloppstunneln grundundersökningar 1971-1978	0-799599	3	2	O		G	Overview
Ekolodningar. Vågar runt biotesjön och mot färleden. Bottennivåkartor	0-799689 Blad 1-2	4	2	O		G	Overview, echo-sounding
Fotogrammetrisk grundkarta. 1965 års bildmaterial	Mapp 799690 BI 1-49	4	49	N			No valuable information
1 blad 1970 års bildmaterial. Grundkarta, centrala arbetsområdet	0-799691						Not found in archive.
Grundkarta, centrala byggnadsområdet. Aggr 1 o 2. 1970 års bildmaterial	0-799692	4	1	O		G	Overview
Grundkarta Hamnområdet 1970 års bildmaterial	0-799693	4	1	O		G	Overview
Seismik. Mätuppdrag 10. Profiler P5, P5A, P5B, P6, P7	Mapp 905001	2a		R			LFK000053-000057
Seismisk grundundersökning. Översikt	905010	2	1	O,R		G	Overview
Grundundersökning och bergnivåer. Karta i 9 blad med inlagda grundundersökningar o bergnivåer	905014 a-i	2	9	O		G	Overview
Grundundersökning o bergnivåer. Karta med inlagda grundundersökningar och bergnivåer samt anläggningens huvuddrag inritade	905015	4	1	O		G	Overview
Grundundersökning. Profiler S1-S6 med vikt och kolvborrhål	905087	1		N			Sounding without georeference information
Grundundersökning för väg Hammen-Biotesjön med plan. Profiler = 1-31	905988						
Grundundersökningar	1-905097	2	11	O		G	Overview
Översikt med bladindelning och anläggning	1-905098	2	1	O		G	Overview
Forsmark. Bruk. Dammar med tekniska anordningar	911701						
Forsmark kraftstation. Sondering för kylvattenvägar. Tillloppskanal. Plan i 2 blad med my och stopp angivet. Utgångshöjd = + 100.00	911705 bl. 1-2	4	2	O,S		G	Overview, soil mechanics
Forsmark kraftstation, vikt o cobrasondering för verkstadsbyggn. Plan & borrprofiler	911714						
Forsmark. TV-granskade borrhål nr HRI33-HRI53	911727	3		B		P	New HFK-identities
Sondering för ställverksområde. Plan + 14 blad profiler mellan U 1940- U2480	Mapp 911728						Not found in archive
Forsmarks kraftstation. Sondering för hamn och färled.	42-911768	4	1	O,S		G	Overview, soil mechanics
Aggr 1 o 2. Vikt- och kolvborring i Labbofjärden	1-911770	4	1	O		G	Overview
Plankarta + 10 st profilblad. Sondering för intagskanal sektT4140 - T4500	911783	4		S		G	Soil mechanics
Servicebyggnad. Grundundersökning	3-961261						
Forsmarks bruk. Pejlingar i bruksdammen för råvattenpumpstation	2-961264	4		N			No valuable information

Information headline	Report-id	Ordered	Scanned	Info-type	Sicada-data	GIS-data	Comment
Turbinfundament Kämborrhål	42-970801	3		B	C		
Forsmark 3 1979. Dokumentation av sprängning för turbinpelare T11, T12, T21, T22	970805						Not found in archive
Forsmark kämborrhål DI +410V, D2+723 och D2 +766, Fotonegativ	4-970809	3		B			Photos stored in the file archive
Hamnvägen. Plan med tvärsnitt	Mapp 43-970860	3		N			No valuable information
Utfyllnad. Grundundersökn. Söndering V11-V16	43-970865	3	2	N			SFR, Out of area
Ställverksområde. Grundundersökningar	2-972415						
Kämborrhål DBT1-3. Plan. Sekt A-A. Mätområdena 1-11 samt Nej till horrkärnsfoto	3-972436	3		B	C		KFK001-KFK003
Ekolodning i Öregrundsgrepen 1970. Sifferplan.	0-972464	4					Not found in archive, echo-sounding
Forsmark. Slingram o magnetometermätningar	1-972488 bl. 1-9	2b	9	M,SI	M,SI	G	Overview
Forsmark SFR, tunnelsträckning. Borrhål DS1-DS7 o H1-H6	1-972492						
Forsmark, fotogrammetrisk grundkarta RAK-70. Stationsområde.	972499 bl. 1-7	4	7	O		G	Overview
Reläbyggnad. Ställverksområde. Jord-bergsondering	4-973516						
Forsmark SFR, tunnelsträckning. Seismisk grundundersökning DS 8201-DS8203	1-973530	2	2	R	R	G	SFR, LFR00012-000015
Forsmark. Stationsområdet. Grundkarta kompl med bottennivåkartan	973531 bl 1-3	4	3	O		G	Overview
Forsmark. Bruksdammarna och vattendraget uppströms bruket. 1974 års bilder	973532 bl 1-2						
Forsmark. Bottennivåkartan efter 1889 års pejlingar. Redovisat på avdrag av E.k.	973533 bl 1-3	4	3	N			No valuable information
Forsmark. Karta över Loven, Terrester	973534 bl 1-2	4	2	O		G	Overview, echo-sounding
Avfallsbyggnad. Grundundersökning i läge för bufferttankar	1-973549	4	1	N			No valuable information
Tillfartstunnlar. Bergtekniskt utlåtande	1-973550						
Hammarborrhål H40 - H64 Resultatsammanställning, vattenförlostmätning. Plan o sektion	1-980915						
Hammarborrhål H40 -H64. Resultatsammanställning	43-980938 bl 1-15						
Grundundersökning	1-980947 bl 1-3	4	3	O		G	Overview
FSU och FSB. Jord-bergsondering och provtagning. Situationsplan - mark behandl.	1-1024418						
Forsmark. Sjöledning Finland-Sverige. Ekolodning	1-1029064 bl. 1-9	4	1	O		G	Overview, echo-sounding
Fågelsundet ekolodning sektioner	43-1029085 b.1-6	4		N			Out of area

Information headline	Report-id	Ordered	Scanned	Info-type	Stada-data	GIS-data	Comment
Fågelundet ekolodning plan	42-1029086	4	1	N			Out of area
Utfloppstunnel grundundersökningar	48-1033980	4		N			Overview 0-799599
Ställverksområdet. Grundundersökning	5008 FA:1	4		N			No valuable information
Industrivattenledning. Grundundersökning	5008 FA:2						
Gunnarbo Lillfjärden. Vinkelstolpar. Grundundersökning	5008 FA:3						
Informationsbyggnad. Tillbyggnad. Grundundersökning	5008 FA:4						
Reläbyggnad. Ställverksområde. Jord-bergsondering	5008 FA:5						
Kärnbronning DBT1-3. FUD. Borrhålsprotokoll över vattenförlostmätning samt borkärnfoto	5009 FA:6	3		B	C		KFK001-003
Skyddsrum. Jordbergsondering	5010 FA:7						
Avloppstunnel. Kärnborrhål D1 + 410 v. D2 + 273 och D2 + 766. Resultatsammansställning. Grundundersökningar	5010 FA:8	3		B	C		KFK004-006
Skyddsrum. Jord-bergsondering	5010 FA:9						
Tunnelsträckning. Borrhål DS1-DS7 och H1-H6	5011 FA:10	4		B			SFR, Out of area
Byggnadsområdet. Slingsram och magnetometermätningar	5011 FA:11	2		M,SI	M,SI		LFK000167-000200
Tunnelsträckning. Seismik DS 8201-8203. Grundundersökning	5011 FA:12	2		R	R		SFR, LFR000012-000015
Avfallsbyggnad. Bufferttankar. Grundundersökning	5011 FA:13						
Tillfartstunnlar. Bergtekniskt utlåtande. Grundundersökning	5012 FA:14						
Tunnelsträckning. Jordborrhål Jb1 samt tätjord	5012 FA:15	4		N			SFR, Out of area
Planerad tunnelnedfart. Utfyllnad av vik. Sondering V11-V16. Grundundersökning	5012 FA:16	4		N			SFR, Out of area
Hammarborrhålen H17/60 grader - H39/60 grader. Vattenförlostmätning. Grundundersökningar	5012 FA:17						
Hammarborrhål H40 - 64/60 grader. Vattenförlostmätningar. Grundundersökningar	5012 FA:18						
Kärnborrhål DS 101/2 grader uppåt. Grundundersökningar	5013 FA:19						
Kärnborrhål DS 102/2 grader uppåt. Grundundersökningar	5013 FA:20						
Turbinben T 51, T52, T61 och T62. Kärnbronning 1980. Grundundersökningar	5014 FA:21	3		B	C		KFK141-172
Fiskodlingen. Område: Stora Sandgrund-Biotestsjön. Sonderingar 1985. Grundundersökningar	5015 FA:22	4		N			No valuable information
70 kV-ledning vid Labbofjärden. Provgrop för jordartsbedömning vid stolplats. Grundundersökningar	5015 FA:23	1		N			No valuable information

Information headline	Report-id	Ordered	Scanned	Info-type	Sicada-data	GIS-data	Comment
Rotoförråd. Sondering och markundersökning 1985. Grundundersökningar	5015 FA.24						
Rotoförråd, utbyggnad 2. Provgrop och bergsondering. Rapport med protokoll. Grundundersökningar	5015 FA.25	4		S			Soundings without georeference information
Kämborrhål, protokoll, avvikelsemätning. Grundundersökning	5015 FA.26	4		B			Already stored in SICADA
FSU och FSB. Jord- bergsondering och provtagning. Grundundersökningar	5015 FA.27						
Kämborrhål D300-serien (D351-D376). Negativ. Se fotoarkiv	5015 FA.28	3		B	C		KFK034-058
Kämborrhål D300-serien (D351-D376). Grundundersökning	5016 FA.29	3		B	C		KFK034-058
Finavvagningslinje sträckan: Hermansbo (P40:137) - Huvudfixen för Forsmarks kraftstation år 1972. Fix- och koordinatförteckningar	5017 FB.1	4		N			No valuable information
Stommat "System 0 gon 38". Byggnät "System T och U". Precisionsnät. Fix- och koordinatförteckningar	5017 FB.2	4		O			Description of t-u and RT 38 0 gon
Avloppstunneln. Grundundersökn. Seism prof + kämborrhål	799546 a, b						
Forsmark aggr 3 o 4. Kämborrhål i läge I (D304-D350)	Mapp 799565	3		B	C		KFK007-KFK033

### Other sources than Vattenfall archive, Räcksta

Information headline	Report-id	Source	Content	Sitka-data	GIS-data	Comment
Characterization of deep-seated rock masses by means of borehole investigations	Research and development report 5:1	Rolf Christiansson	Core log DBT 1 and DBT 3	C		KFK001, KFK003
Core logs written on paper, D381-398	No report. Original manuscript	Rolf Christiansson	Core logs Shaft walls in block 3 and water inlet channel	C		KFK122-134
Characteristic features of a superficial rock mass in southern central Sweden	Striae 11	SGU library			G	Georeferenced shaft walls
Geologiska undersökningar och utvärderingar för lokalisering av SFR till Forsmark, del 1	SFR 81-13	SKB library	Overview, selection		G	Overview
Geologiska undersökningar och utvärderingar för lokalisering av SFR till Forsmark, del 2	SFR 81-13	SKB library	Refraction seismic	R		LFR000016-LFR000030
Byggnadsgeologisk uppföljning	SFR 87-03	SKB library	SFR tunnel		G	Georeferenced SFR-tunnel
ALMA-Slutförvar i berg. Översiktliga bergundersökningar för förstahandsalternativ i Forsmark, Studsvik och Simpevarp	9091185	GeoVista	Refraction seismic	R		LFR000031-LFR000032
Borrkärneinventering Kraftstation/SFR	4825-1	Vattenfall archive in Forsmark	Core and fracture logs	C		Both Forsmarksverket and SFR



## Appendix 2

### A table summarising the data available for boreholes in the SFR area

The table has the following structure:

- Idcode (both old and new),
- Engineering; position and geometry of the drillhole (Y = data stored , empty = no data found, In Sicada = stored earlier),
- Core log (Y = data exist but not stored, empty = no data found),
- Fracture log (Y = data exist but not stored, empty = no data found),
- Water loss (Y = data exist but not stored, empty = no data found),
- Photos (Y = photos stored (number of photos), empty = no photos found),
- Core stored (Malå = place were the core is stored)

Information on core and fracture logs can be found in report number 4825-1, Forsmarks kraftstation / SFR Borrkärneinventering /11/.

Idcode	Old idcode	Engineering	Core log	Fracture log	Water loss	Photos	Core stored
KFR01	HK1	In Sicada	Y				
KFR02	HK2	In Sicada	Y				Malå
KFR03	HK3	In Sicada	Y				Malå
KFR04	HK4	In Sicada	Y				Malå
KFR05	HK5	In Sicada	Y	Y, diagram			Malå
KFR06	HK6	In Sicada	Y				Malå
KFR08	HK8	In Sicada	Y				Malå
KFR09	HK9	In Sicada	Y				Malå
KFR10	HK10	In Sicada	Y				Malå
KFR11	HK11	In Sicada	Y				Malå
KFR12	HK12	In Sicada	Y				Malå
KFR13	HK13	In Sicada	Y				Malå
KFR14	HK14	In Sicada	Y				Malå
KFR19	KB19	In Sicada	Y				Malå
KFR20	KB20	In Sicada	Y				Malå
KFR21	KB1	In Sicada					
KFR22	KB2	In Sicada					
KFR23	KB3	In Sicada					
KFR24	KB4	In Sicada					
KFR25	KB5	In Sicada					
KFR27	KB7	In Sicada					
KFR31	KB11	In Sicada	Y, diagram	Y, diagram			Malå
KFR32	KB12	In Sicada					Malå

<b>Idcode</b>	<b>Old idcode</b>	<b>Engineering</b>	<b>Core log</b>	<b>Fracture log</b>	<b>Water loss</b>	<b>Photos</b>	<b>Core stored</b>
KFR33	KB13	In Sicada					
KFR34	KB14	In Sicada	Y, diagram	Y, diagram			Malâ
KFR35	KB15	In Sicada	Y, diagram	Y, diagram			Malâ
KFR36	KB16	In Sicada	Y, diagram	Y, diagram			Malâ
KFR37	KB17	In Sicada	Y, diagram	Y, diagram			Malâ
KFR38	KB18	In Sicada	Y, diagram	Y, diagram			Malâ
KFR51	KB21	In Sicada	Y, diagram	Y, diagram			Malâ
KFR52	KB22	In Sicada	Y				Malâ
KFR53	KB23	In Sicada	Y				
KFR54	KB24	In Sicada	Y				Malâ
KFR55	KB25	In Sicada	Y				Malâ
KFR56	KB26	In Sicada	Y				
KFR57	KB27	In Sicada	Y				Malâ
KFR61	DS1	In Sicada	Y		Y		Malâ
KFR62	DS2	In Sicada	Y		Y		Malâ
KFR63	DS3	In Sicada	Y		Y		Malâ
KFR64	DS4	In Sicada	Y		Y		Malâ
KFR65	DS5	In Sicada	Y		Y		Malâ
KFR66	DS6	In Sicada	Y		Y		Malâ
KFR67	DS7	In Sicada	Y				Malâ
KFR68	DS8	In Sicada	Y				Malâ
KFR69	DS9	In Sicada	Y, diagram	Y, diagram			Malâ
KFR70	DS10	In Sicada	Y, diagram	Y, diagram			Malâ
KFR71	DS101	In Sicada					Malâ
KFR72	DS102						Malâ
KFR7A	HK7A	In Sicada	Y				Malâ
KFR7B	HK7B	In Sicada	Y				Malâ
KFR7C	HK7C	In Sicada	Y				Malâ
KFR80	INJ	In Sicada					
KFR83	SH3	In Sicada					
KFK84	BT 5/241	In Sicada					
KFK85	BT 5/247 1	In Sicada					
KFK86	BT 5/247 2	In Sicada					
KFK87	NBT 1	In Sicada					
KFK88	NBT 2	In Sicada					