

## **Oskarshamn site investigation**

### **Drilling and sampling in soil**

### **Installation of groundwater monitoring wells**

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June 2004

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June 2004

*Keywords:* Simpevarp, Ävrö, Soil, Quaternary deposits, Geological characterization, Geotechnical characterization, Soil tubes.

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.

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# Abstract

Drilling and sampling of soil, and installation of groundwater monitoring wells were performed in the Simpevarp area December 2003 – January 2004. At 19 locations weight sounding were performed, at 17 locations soil/rock drilling were performed and at 14 location soil sampling were performed. Totally, 13 groundwater monitoring wells were installed.

The objective of the investigation was to obtain information on soil depth, soil composition and groundwater levels from boreholes distributed within the investigation area. The groundwater monitoring wells shall, beside to enable groundwater level measurements, also give possibilities for characterization of hydraulic properties of the soil layer by slug tests.

The drilling were performed by two track driven drilling rigs, Geotech 604D and Geomachine 25GT. The weight sounding were performed by Geomachine 25GT and the soil/rock drilling were performed by Geotech 604D.

The soil samplings were performed by auger drilling ( $\varnothing$  90 mm). Air-rotary drilling with a casing driver system (NOEK), were used for check of soil depth and for installation of groundwater monitoring wells. To assure that the bedrock was reached, the drilling continued approximately 1–3 meters into the bedrock.

The groundwater monitoring wells were installed inside the drill casing. PEH screens (outer  $\varnothing$ : 63 mm, inner  $\varnothing$ : 50 mm; length: 1–2 m; slot: 0.3 mm) and casings (outer  $\varnothing$ : 63 mm, inner  $\varnothing$ : 50 mm) were used. Filter sand (0.4–0.8 mm) and bentonite clay (Volclay SG40) were filled outside the well while the drill casing was pulled out.

The soil depth at the boreholes varied between 0.8 and 8.6 m. The composition of the soil at most locations are a thin layer of topsoil underlain by sand, clay and till.

# Sammanfattning

Jordborring, jordprovtagning samt installation av grundvattenrör i Simpevarpområdet utfördes under december 2003 – januari 2004. I 19 punkter utfördes viktsondering, i 17 punkter utfördes jord-bergsondering och i 14 punkter utfördes jordprovtagning. Totalt installerades 13 grundvattenrör.

Målet med undersökningen var att erhålla information om jorddjup, jordartssammansättning samt grundvattennivåer inom området. Grundvattenrören ska förutom för mätning av grundvattennivå användas för bestämning av jordlagrens hydrauliska egenskaper genom slugtester.

Borringarna utfördes med två borrhandsvagnar, Geotech 604D och Geomachine 25GT. Viktsonderingen utfördes med Geomachine 25GT och jord-bergsonderingen utfördes med Geotech 604D.

Jordprovtagningen utfördes med skruvprovtagare (Ø: 90 mm). Foderrörborring (NOEK) användes vid jorddjupsbestämning och vid installation av grundvattenrör. För att säkerställa att bergytan var nådd, borrades det ca 1–3 meter ner i berget.

Grundvattenrören installerades i borrhandsröret. PEH-filter (yttre Ø: 63 mm, inre Ø: 50 mm; längd: 1–2 m; slitsvidd: 0,3 mm) och PEH-rör (yttre Ø: 63 mm, inre Ø: 50 mm) användes som grundvattenrör. Filtersand (0,4–0,8 mm) och bentonit (Volclay SG40) fylldes runt grundvattenröret medans borrhandsröret drogs upp.

Jorddjupen i borrhålen varierade mellan 0,8 och 8,6 m. Jordens sammansättning var i de flesta punkter ett tunt mulljordslager på sand, lera och morän.

# Contents

<b>1</b>	<b>Introduction</b>	7
<b>2</b>	<b>Objectives</b>	11
<b>3</b>	<b>Equipment</b>	13
<b>4</b>	<b>Execution</b>	15
4.1	Mobilisation and preparation	15
4.2	Drilling and sampling in soil	15
4.3	Installation of groundwater monitoring wells	16
4.4	Finishing of works	16
4.5	Surveying	16
4.6	Environmental programme	16
4.7	Data handling	16
<b>5</b>	<b>Results</b>	17
<b>6</b>	<b>References</b>	19
	<b>Appendix 1</b> Borehole profiles	21
	<b>Appendix 2</b> Photos of the borehole sites after completion of work	57

# 1 Introduction

A general program for site investigations presenting survey methods has been prepared /SKB, 2001a/, as well as a site-specific program for the investigations in the Simpevarp area /SKB, 2001b/. The geotechnical characterization of the Quaternary deposits and installation of soil tubes form part of the site characterization program under item 1.1.8.1 in the work breakdown structure of the execution programme, /SKB, 2002/.

The field campaign was carried out during December 2003 to January 2004 following the methodologies described in SKB MD 630.003, SKB MD 600.006, SKB MD 600.004, and in the activity plan AP PS 400-03-061 (SKB internal controlling documents). Data and results were delivered to the SKB site characterization database SICADA with field note number: Simpevarp 192, 199, 209, 210, 213, 214, 219, 224, 227, 244, 248, 249.

The geotechnical drilling campaign has the aim to characterise the Quaternary deposits with respect to stratigraphy and composition. In addition, installation of soil tubes for groundwater sampling and monitoring was a key issue. This report describes the results and primary data evaluation of the characterization. The data is subsequently delivered for the site descriptive modelling. The commission was conducted by WSP Group.

The focus for the campaign was the Simpevarp sub-area, including the Simpevarp peninsula and the islands Hålö and Ävrö. Included in the campaign was also installation of two soil tubes in the Laxemar area adjacent to the drill site for KLX04. At 19 locations weight sounding were performed, at 17 locations soil/rock drilling were performed and at 14 locations soil sampling were performed. Totally, 13 groundwater monitoring wells were installed. The locations of the installed soil tubes are given in Figure 1-1.

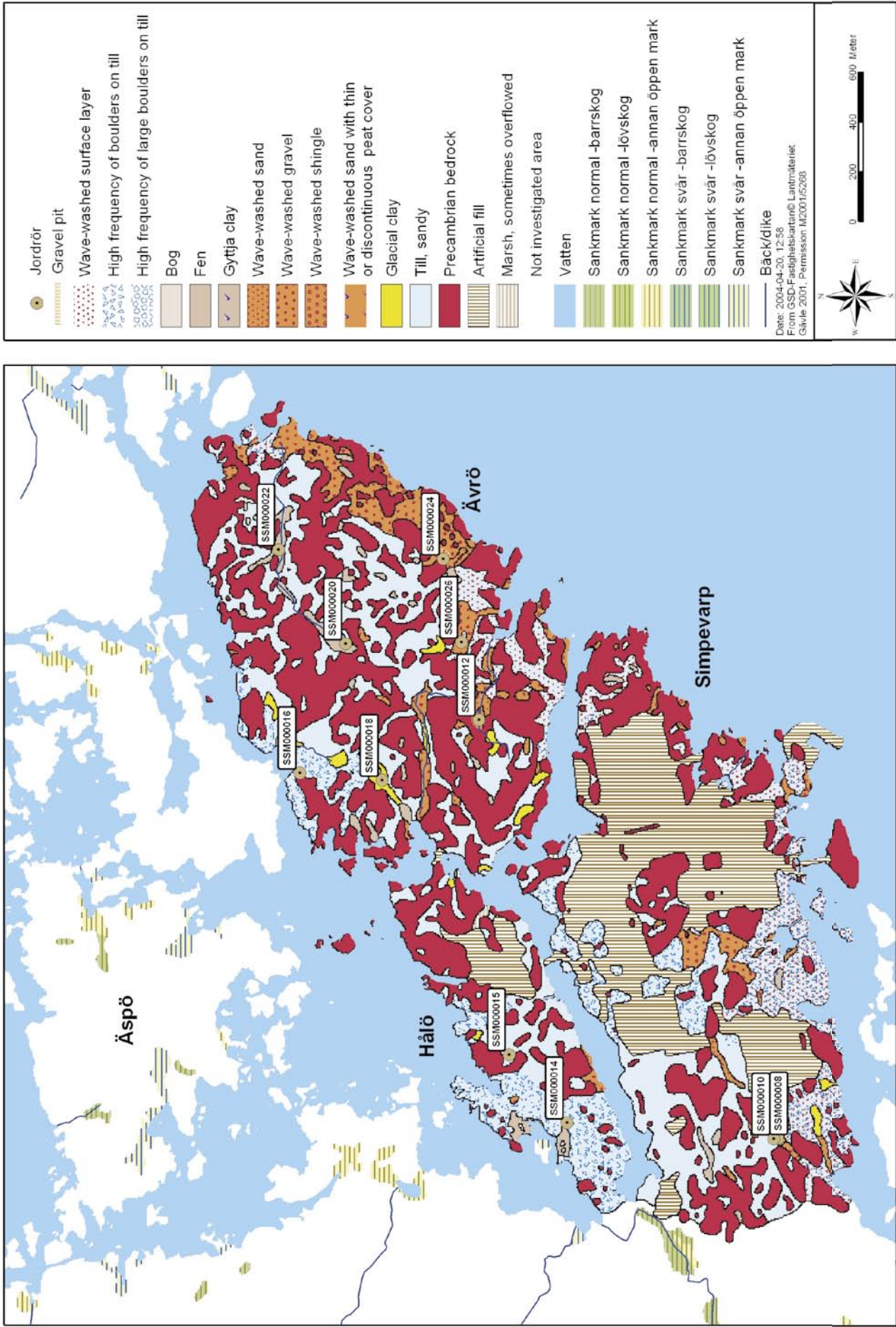
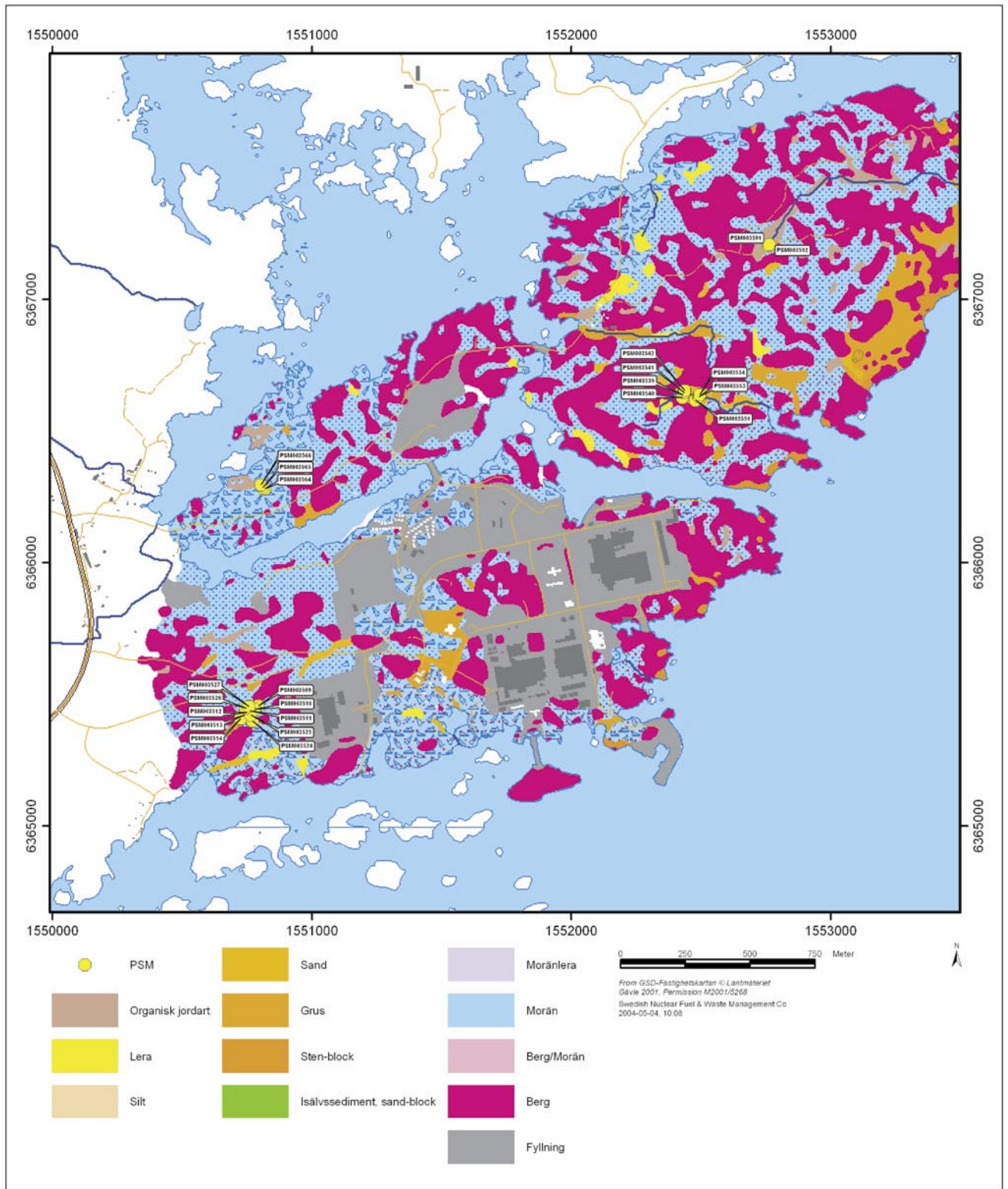


Figure 1-1. Soil tubes in the Simpevarp area.



**Figur 1-2.** Soil sounding in the Simpevarp area.



## **2 Objectives**

The objective of this study is to obtain general information on soil depth, soil stratum, soil composition and groundwater levels from the boreholes distributed within the site investigation area.

The groundwater monitoring wells shall, beside to enable groundwater sampling and monitoring, also give possibilities for characterisation of the hydraulic properties of the soil deposits by slug tests.

### **3 Equipment**

The drillings and samplings of soil were performed with track driven drilling rigs, Geotech 604 D and Geomachine 25 GT. The weight sounding were performed by Geomachine 25 GT and the soil/rock drilling were performed by Geotech 604D.

The soil sampling was performed by auger drilling ( $\varnothing = 90$  mm) and the soil/rock drilling was performed with air-rotary drilling with a casing driver system (NOEK).

## 4 Execution

The work was performed according to SKB's method description for soil drilling, soil mapping and according to Activity Plan AP PS 400-03-061 (SKB internal controlling document) and included the following: preparation and mobilisation, drilling and sampling soil, installation of groundwater monitoring wells, finishing of work, surveying of boreholes, environmental control programme and data handling.

### 4.1 Mobilisation and preparation

Before drilling commences, service and function control of all equipment were conducted. It was checked that type of fuel, oil and grease was in accordance with SKB's instruction for chemical products used for drill works, SKB MD 600.006 (SKB internal controlling document). Finally, the equipment was cleaned according to SKB's instruction, SKB MD 600.004.

Mobilisation onto the site included transport, cleaning of all in-hole equipment, preparation of the site, lining up the machine and final control of function. It also included transport of pipes, sand, bentonite, sampling pots for soil as well as all other necessary equipment.

### 4.2 Drilling and sampling in soil

The soil sampling was performed by auger drilling ( $\varnothing = 90$  mm).

When the soil sampling was finished, air-rotary drilling with a casing driver system (NOEK) was performed in the same borehole. To assure that the bedrock was reached, the drilling continued approximately one meter into the bedrock. The soil sampling was performed within the activity according to AP PF 400-03-061 and the results are presented separately. The client obtained the soil samplings.

The soil samplings are marked with borehole ID (e.g. SSM000012:1) and the soil samplings for environmental studies are marked as above but with the additional "M" (e.g. SSM000012:1M).

The characterisation of the soil is made in field.

### **4.3 Installation of groundwater monitoring wells**

Groundwater monitoring wells were installed inside the drill casing. PEH screens ( $\varnothing$ : 63/50 mm, length: 1–2 m, slot: 0.3 mm) and PEH casings ( $\varnothing$ : 63/50 mm) were used for these wells. Filter sand (0.4–0.8 mm) and bentonite clay (Volclay SG40) were filled outside the well while the drill casing was pulled out. PEH cap were installed at the top to prevent trash entering the casing.

After installation, function tests were performed. Water was either pumped out or blown out by air.

### **4.4 Finishing of works**

The rig was removed and the site was cleaned.

### **4.5 Surveying**

After finishing the work, all investigation points were temporarily surveyed by precision GPS, x-, and y-coordinates. The accuracy of the coordinates is  $\pm 10$  meters. After completion SKB executed a precision survey and the actual coordinates were documented in Sicada database.

### **4.6 Environmental programme**

Checklists due to SKB's routine for the environmental programme were signed by the Activity Leader and are filed in SKB's archive.

### **4.7 Data handling**

Minutes for the following items: Activities, cleaning of equipment, installation of groundwater monitoring wells and pore pressure devices, and discrepancy reports have been collected by the Activity Leader for quality control and storage.

## **5 Results**

The location of all boreholes is shown in Figure 1-1 and coordinates and borehole types are listed in Table 5-1.

The soil depth at the boreholes varied between 0.8 and 8.6 m. The composition of the soil at most locations are a thin layer of topsoil underlain by sand, clay and till. The composition of the till varies from gravely sandy till to clayey till.

Drawings of all boreholes are presented in Appendix 1 and photos of the sites after completion of work in Appendix 2.

**Table 5-1. Coordinates and type for all boreholes.**

<b>Borehole</b>	<b>Northing</b>	<b>Easting</b>	<b>Type</b>
SSM000008	6365431.362	1550750.562	Soil/rock drilling, groundwater monitoring well
SSM000009	6367044.367	1548244.188	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000010	6365447.166	1550747.936	Soil/rock drilling, groundwater monitoring well
SSM000011	6367013.025	1548132.649	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000012	6366645.034	1552435.049	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000014	6366286.479	1550812.794	Soil/rock drilling, groundwater monitoring well
SSM000015	6366521.840	1551087.228	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000016	6367371.552	1552221.702	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000018	6367037.707	1552191.891	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000020	6367186.437	1552742.231	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000022	6367457.660	1553120.333	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000024	6366789.757	1553083.487	Soil/rock drilling, groundwater monitoring well, soil sampling
SSM000026	6366714.805	1552748.547	Soil/rock drilling, groundwater monitoring well, soil sampling
PSM003509	6365457.019	1550794.654	Weight sounding
PSM003510	6365445.912	1550781.885	Weight sounding, soil sampling
PSM003511	6365438.422	1550762.747	Soil/rock drilling
PSM003512	6365432.385	1550752.090	Weight sounding, soil sampling
PSM003513	6365422.012	1550740.148	Soil/rock drilling
PSM003514	6365409.743	1550726.276	Weight sounding
PSM003524	6365400.247	1550772.999	Weight sounding, soil sampling
PSM003525	6365422.432	1550766.940	Weight sounding
PSM003526	6365448.160	1550747.734	Weight sounding
PSM003527	6365454.518	1550758.515	Weight sounding
PSM003539	6366636.610	1552432.084	Weight sounding
PSM003540	6366627.804	1552429.641	Weight sounding
PSM003541	6366645.145	1552435.026	Weight sounding
PSM003542	6366653.246	1552438.079	Weight sounding
PSM003551	6366617.035	1552479.444	Weight sounding
PSM003552	6366630.461	1552493.195	Weight sounding
PSM003553	6366638.679	1552497.666	Weight sounding
PSM003554	6366651.860	1552491.485	Weight sounding
PSM003564	6366281.933	1550819.413	Weight sounding
PSM003565	6366285.915	1550812.425	Weight sounding, soil sampling
PSM003566	6366295.988	1550804.765	Weight sounding
PSM003591	6367201.196	1552761.438	Soil/rock drilling
PSM003592	6367206.422	1552764.761	Soil/rock drilling


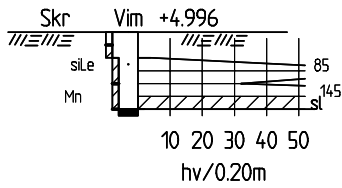
## 6 References

**SKB, 2001a.** Site investigations: Investigation methods and general execution programme. SKB TR-01-29, Svensk Kärnbränslehantering AB.

**SKB, 2001b.** Geovetenskapligt program för platsundersökning vid Simpevarp. SKB R-01-44, Svensk Kärnbränslehantering AB.

**SKB, 2002.** Execution programme for the initial site investigations at Simpevarp. SKB P-02-06, Svensk Kärnbränslehantering AB.

Borehole profiles

		SIMPEVARP BOREHOLE PSM003509	
Company rep. Lennart Adestam and Torbjörn Johansson		Northing :6365457.019 Easting :1550794.654	Date of completion:2003-12-03
Client: Svensk Kärnbränslehantering AB		Coordinate system : RT90-RHB70	
Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	 <p style="text-align: center;">10 20 30 40 50 hv/0.20m</p>		GEOLOGICAL LOG  0-0,2m Top soil 0,2-0,8m silty clay 0,8-1,2m till





# SIMPEVARP BOREHOLE PSM003510

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365445.912  
Easting :1550781885

Date of completion:2003-12-05

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples							
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>             Skr Vim +4.171              0.75              0.50              70/5              sl              53              sl              70/5              10 20 30 40 50              hv/0.20m           </p>	<div style="border: 1px solid black; padding: 2px; width: fit-content;">             1M              2M           </div>	<p style="text-align: center;">GEOLOGICAL LOG</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">0-0,3m</td> <td style="width: 50%;">Top soil</td> </tr> <tr> <td>0,3-2,2m</td> <td>clay</td> </tr> <tr> <td>2,2-3,0m</td> <td>till</td> </tr> </table>	0-0,3m	Top soil	0,3-2,2m	clay	2,2-3,0m	till
0-0,3m	Top soil								
0,3-2,2m	clay								
2,2-3,0m	till								



# SIMPEVARP BOREHOLE PSM003511

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365438.422  
Easting :1550762.747

Date of completion: 2003-12-05

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>The diagram shows a borehole log with depth in meters on the y-axis (0 to 12). Key features include:            - Surface level: +4.162 m            - Soil layers: Le (0-0.3m), Mn (0.3-1.4m)            - Till layer: 1.4-2.8m            - Rock surface: 3.6m            - A scale bar at the bottom indicates 50 and 100 units, with the unit being s/0.20m.</p>		<p><b>GEOLOGICAL LOG</b></p> <ul style="list-style-type: none"> <li>0-0,3m Top soil</li> <li>0,3-1,4m clay</li> <li>1,4-2,8m till</li> <li>3,6m rock surface</li> </ul>



# SIMPEVARP BOREHOLE PSM003512

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365432.385  
Easting :1550752.090

Date of completion:2003-12-03

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>Vim +4.179</p> <p>0.50</p> <p>70 70/10</p> <p>st</p> <p>10 20 30 40 50 hv/0.20m</p>	1 2 3	<p>GEOLOGICAL LOG</p> <p>0-0,3m Top soil            0,3-0,5m sandy clay            0,5-1,6m clay            1,6-1,8m clayey gravelly sand</p>



# SIMPEVARP BOREHOLE PSM003513

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365422.012  
Easting :1550740.148

Date of completion: 2003-12-05

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p style="text-align: center;">Skr Jb +4.285</p> <p style="text-align: center;">Le</p> <p style="text-align: center;">Mn</p> <p style="text-align: center;">50 100 s/0.20m</p>		<p style="text-align: center;">GEOLOGICAL LOG</p> <p>0-0,3m Top soil 0,3-1,8m clay 1,8-2,4m till 3,8m rock surface</p>



# SIMPEVARP BOREHOLE PSM003514

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365409.743  
Easting :1550726.276

Date of completion:2003-12-03

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p>GEOLOGICAL LOG</p> <p>0-0,3m Top soil            0,3-2,0m silty clay            2,0-2,4m till</p>



# SIMPEVARP BOREHOLE PSM003524

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365400.247  
Easting :1550772.999

Date of completion:2003-12-04

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p><b>GEOLOGICAL LOG</b></p> <ul style="list-style-type: none"> <li>0-0,4m Top soil</li> <li>0,4-0,6m silty clay</li> <li>0,6-0,8m clay</li> <li>0,8-0,9m clayey gravelly sand</li> </ul>



# SIMPEVARP BOREHOLE PSM003525

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365422.432  
Easting :1550766.940

Date of completion:2003-12-03

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples									
0 1 2 3 4 5 6 7 8 9 10 11 12			<p style="text-align: center;">GEOLOGICAL LOG</p> <table border="0"> <tr> <td>0-0,3m</td> <td>Top soil</td> </tr> <tr> <td>0,3-1,6m</td> <td>clay</td> </tr> <tr> <td>1,6-2,4m</td> <td>silty clay</td> </tr> <tr> <td>2,4-2,6m</td> <td>till</td> </tr> </table>	0-0,3m	Top soil	0,3-1,6m	clay	1,6-2,4m	silty clay	2,4-2,6m	till
0-0,3m	Top soil										
0,3-1,6m	clay										
1,6-2,4m	silty clay										
2,4-2,6m	till										



# SIMPEVARP BOREHOLE PSM003526

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365448.160  
Easting :1550747.734

Date of completion:2003-12-03

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p>GEOLOGICAL LOG</p> <ul style="list-style-type: none"> <li>0-0,3m Top soil</li> <li>0,3-0,8m silty clay</li> <li>0,8-1,0m clay</li> <li>1,0-1,4m clayey gravelly sand</li> </ul>





# SIMPEVARP BOREHOLE PSM003527

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365454.518  
Easting :1550758.515  
Coordinate system : RT90-RHB70

Date of completion:2003-12-03

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p style="text-align: center;">Vim +4.338</p> <p style="text-align: center;">10 20 30 40 50 hv/0.20m</p>		<p style="text-align: center;">GEOLOGICAL LOG</p> <p>0-0,2m Top soil 0,2-0,8m fill</p>



# SIMPEVARP BOREHOLE PSM003539

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366636.610  
Easting :1552432.084

Date of completion: 2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			



# SIMPEVARP BOREHOLE PSM003540

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366627.804  
Easting :1552429.641

Date of completion:2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			



# SIMPEVARP BOREHOLE PSM003541

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366645.145  
Easting :1552435.026

Date of completion: 2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			



# SIMPEVARP BOREHOLE PSM003542

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366653.246  
Easting :1552438.079

Date of completion:2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>Vim +1.431</p> <p>sl</p> <p>84</p> <p>70/15</p> <p>10 20 30 40 50 hv/0.20m</p>		



# SIMPEVARP BOREHOLE PSM003551

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366617.035  
Easting :1552479.444

Date of completion: 2004-01-13

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>Vim +1.470</p> <p>70/10 st</p> <p>10 20 30 40 50 hv/0.20m</p>		



# SIMPEVARP BOREHOLE PSM003552

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366630,461  
Easting :1552493,195

Date of completion:2004-01-13

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			GEOLOGICAL LOG



# SIMPEVARP BOREHOLE PSM003553

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366638,679  
Easting :1552497,666

Date of completion: 2004-01-13

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p style="text-align: center;">GEOLOGICAL LOG</p>





# SIMPEVARP BOREHOLE PSM003554

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366651,860  
Easting :1552491,485

Date of completion:2004-01-13

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p style="text-align: center;">GEOLOGICAL LOG</p>



# SIMPEVARP BOREHOLE PSM003564

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366281933  
Easting :1550819413

Date of completion: 2003-12-09

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p>GEOLOGICAL LOG</p> <p>0-0,2m Top soil            0,2-0,6m gravelly sand            0,6-0,9m fill</p>



# SIMPEVARP BOREHOLE PSM003565

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366285.915  
Easting :1550812.425

Date of completion:2003-12-04

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12	<p>Skr Vim +0.817</p> <p>grSa Le legrSa sagrMn</p> <p>78 70/15 st 70/10 st</p> <p>10 20 30 40 50 hv/0.20m</p>	1M 2M 1 2 3	<p>GEOLOGICAL LOG</p> <p>0-0,2m Top soil 0,2-0,9m gravelly sand 0,9-1,0m clay 1,0-1,2m clayey gravelly sand 1,2-2,4m sandy gravelly till</p>



# SIMPEVARP BOREHOLE PSM003566

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366295.988  
Easting :1550804.765

Date of completion:2003-12-09

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			



# SIMPEVARP BOREHOLE PSM003591

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367201.196  
Easting :15527614.38

Date of completion:2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			<p><b>GEOLOGICAL LOG</b></p> <ul style="list-style-type: none"> <li>0-0,3m Top soil</li> <li>0,3-0,8m clay</li> <li>0,8-1,8m silty sandy till</li> <li>2,4m rock surface</li> </ul>



# SIMPEVARP BOREHOLE PSM003592

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367206.422  
Easting :1552764.761

Date of completion: 2004-01-14

Coordinate system : RT90-RHB70

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	
0 1 2 3 4 5 6 7 8 9 10 11 12			



# SIMPEVARP BOREHOLE SSM000008

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365431.362  
Easting :1550750.562  
Coordinate system : RT90-RHB70

Top of stand pipe :0.4 m.a.g.l.  
Total pipe length :5,10 m  
Groundwater level :0.2 m.b.g.l.  
Date of completion :2003-12-08

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12				<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 3,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,60 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 3,30 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,3m Top soil 0,3-0,5m sandy clay 0,5-1,6m clay 1,6-1,8m clayey gravelly sand 2,6m boulders 3,2m boulders 4,6m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000009

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367044.367  
Easting :1548244.188  
Coordinate system : RT90-RHB70

Top of stand pipe :0,4 m.a.g.l.  
Total pipe length :4,10 m  
Groundwater level :1,3 m.b.g.l.  
Date of completion :2004-01-29

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		1M 2M 3M 4M 5M 6M		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p><b>CASING</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 3,00 m</p> <p><b>SCREEN</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p><b>ANNULUS SEAL</b> Material : Bentonite clay Total length : 0,40 m</p> <p><b>SAND PACK</b> Grain size : 0,4-0,8 mm Total length : 3,50 m</p> <p><b>DRILLING EQUIPMENT</b> Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p><b>GEOLOGICAL LOG</b> 0-0,4m Top soil 0,4-1,0m gravelly sand 1,0-1,4m clayey silty sand 1,4-1,5m clay 1,5-2,0m silt 2,0-3,0m silty sandy till 3,0m boulders 4,2m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	





# SIMPEVARP BOREHOLE SSM000010

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6365447.166  
Easting :1550747.936  
Coordinate system : RT90-RHB70

Top of stand pipe :0.6 m.a.g.l.  
Total pipe length :3.10 m  
Groundwater level :0.3 m.b.g.l.  
Date of completion :2003-12-05

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12				<p>Drilling method : NDEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2.00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1.00 m Slot : 0.3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0.50 m</p> <p>SAND PACK Grain size : 0.4-0.8 mm Total length : 1.80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0.3m Top soil 0.3-0.8m silty clay 0.8-1.0m clay 1.0-1.4m clayey gravelly sand 1.4m boulders 2.0m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000011

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367013025  
Easting :1548132649  
Coordinate system : RT90-RHB70

Top of stand pipe :0,2 m.a.g.l.  
Total pipe length :3,10 m  
Groundwater level :1,15 m.b.g.l.  
Date of completion :2004-01-29

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		1M 2M 3M 4M 5M 6M		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,50 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 2,60 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,3m Top soil 0,3-2,0m boulder-bearing gravelly sand 2,0-2,8m silty sandy fill 2,8m rock surface</p>
<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>				



# SIMPEVARP BOREHOLE SSM000012

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366645.034  
Easting :1552435.049  
Coordinate system : RT90-RHB70

Top of stand pipe :0.3 m.g.l.  
Total pipe length :6,10 m  
Groundwater level :0,6 m.b.g.l.  
Date of completion :2004-01-22

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		1M 2M 1		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 5,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,90 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 3,30 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,4m Top soil 0,4-0,6m sand 0,6-2,6m clay 2,6-3,0m cobble-bearing silty clay 3,0-5,7m silty sandy till 5,7m boulders 6,1m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000014

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366286.479  
Easting :1550812.794  
Coordinate system : RT90-RHB70

Top of stand pipe : 0,8 m.a.g.l.  
Total pipe length : 3,10 m  
Groundwater level : 0,6 m.b.g.l.  
Date of completion : 2003-12-09

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12				<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p><b>CASING</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m</p> <p><b>SCREEN</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p><b>ANNULUS SEAL</b> Material : Bentonite clay Total length : 0,80 m</p> <p><b>SAND PACK</b> Grain size : 0,4-0,8 mm Total length : 1,50 m</p> <p><b>DRILLING EQUIPMENT</b> Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p><b>GEOLOGICAL LOG</b> 0-0,2m Top soil 0,2-0,9m gravelly sand 0,9-1,0m clay 1,0-1,2m clayey gravelly sand 1,2-2,4m sandy gravelly till 2,4m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000015

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366521840  
Easting :1551087228  
Coordinate system : RT90-RHB70

Top of stand pipe :0.2 m.a.g.l.  
Total pipe length :5,10 m  
Groundwater level :1,8 m.b.g.l.  
Date of completion :2004-01-28

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12				<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 4,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 2,30 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 2,80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,1m Top soil 0,1-0,3m gravelly sand 0,3-0,5m silty clay 0,5-0,8m boulder-bearing clayey till 0,8-1,3m boulders 1,3-1,8m sandy till 1,8m boulders 3,4m boulders 4,8m rock surface</p>
<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>				



# SIMPEVARP BOREHOLE SSM000016

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367371552  
Easting :1552221702  
Coordinate system : RT90-RHB70

Top of stand pipe :0,5 m.a.g.l.  
Total pipe length :3,10 m  
Groundwater level :1,3 m.b.g.l.  
Date of completion :2003-12-12

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		<div style="border: 1px solid black; width: 30px; height: 30px; display: inline-block; margin: 0 auto;">1</div>		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p><b>CASING</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m</p> <p><b>SCREEN</b> Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p><b>ANNULUS SEAL</b> Material : Bentonite clay Total length : 0,60 m</p> <p><b>SAND PACK</b> Grain size : 0,4-0,8 mm Total length : 1,80 m</p> <p><b>DRILLING EQUIPMENT</b> Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p><b>GEOLOGICAL LOG</b> 0-0,25m Top soil 0,25-1,8m cobble-bearing gravelly sand 1,8m boulders 2,6m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000018

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367037.707  
Easting :1552191.891  
Coordinate system : RT90-RHB70

Top of stand pipe :0.2 m.a.g.l.  
Total pipe length :3.10 m  
Groundwater level :0.25 m.b.g.l.  
Date of completion :2003-12-11

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		1M 1, 2M 2		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2.00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1.00 m Slot : 0.3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0.60 m</p> <p>SAND PACK Grain size : 0.4-0.8 mm Total length : 1.80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0.4m clayey top soil 0.4-1.8m clay 1.8-3.0m clayey till 3.2m rock surface</p>
<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>				



# SIMPEVARP BOREHOLE SSM000020

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367186.437  
Easting :1552742.231  
Coordinate system : RT90-RHB70

Top of stand pipe : 0.5 m.a.g.l.  
Total pipe length : 3.10 m  
Groundwater level : 0.4 m.b.g.l.  
Date of completion : 2004-01-20

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12				<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,50 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 1,80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång <math>\phi</math>44 Drill bit : Stiff <math>\phi</math>54</p> <p>GEOLOGICAL LOG 0-0,3m Top soil, peat 0,3-0,6m gravelly sand 0,6-2,0m clay 2,0-2,3m gravelly sandy till 2,4m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	





# SIMPEVARP BOREHOLE SSM000022

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6367457.660  
Easting :1553120.333  
Coordinate system : RT90-RHB70

Top of stand pipe :0.4 m.a.g.l.  
Total pipe length :7,10 m  
Groundwater level :0.23 m.b.g.l.  
Date of completion :2004-01-13

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
		<p>1</p> <p>2</p>		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 5,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,50 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 2,80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-1,5m Peat 1,5-1,6m gravelly sand 1,6-4,6m clay 4,6-4,8m silty clay 4,8-5,4m silty sandy till 5,4m boulders 8,6m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000024

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366789.757  
Easting :1553083.487  
Coordinate system : RT90-RHB70

Top of stand pipe : 0,55 m.a.g.l.  
Total pipe length : 3,90 m  
Groundwater level : 0,7 m.b.g.l.  
Date of completion : 2003-12-16

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
				<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,80 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 1,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,45 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 2,50 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,2m Top soil 0,2-1,0m boulder and cobble-bearing gravelly sand 1,0-1,6m clayey gravelly sand 1,6-4,2m sandy till 4,2m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	



# SIMPEVARP BOREHOLE SSM000026

Company rep.  
Lennart Adestam and Torbjörn Johansson

Northing :6366714.805  
Easting :1552748.547  
Coordinate system : RT90-RHB70

Top of stand pipe :0.2 m.a.g.l.  
Total pipe length :4,10 m  
Groundwater level :0.2 m.b.g.l.  
Date of completion :2003-12-17

Client: Svensk Kärnbränslehantering AB

Depth (m)	Description	Samples	Groundwater monitoring well description	Borehole Construction Information
0 1 2 3 4 5 6 7 8 9 10 11 12		1 2 3 4		<p>Drilling method : NOEK Borehole diameter : 120 mm sampling method : Auger</p> <p>CASING Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m</p> <p>SCREEN Material : PEH Outer diameter : 63 mm Inner diameter : 50 mm Total length : 2,00 m Slot : 0,3 mm</p> <p>ANNULUS SEAL Material : Bentonite clay Total length : 0,50 m</p> <p>SAND PACK Grain size : 0,4-0,8 mm Total length : 2,80 m</p> <p>DRILLING EQUIPMENT Drilling rig : Geotech 604 Drill hammer : Furukawa HB2G Drill rod : Geostång Ø44 Drill bit : Stiff Ø54</p> <p>GEOLOGICAL LOG 0-0,2m Top soil 0,2-0,8m gravelly sand 0,8-1,7m clay 1,7-4,0m sandy fill 4,2m rock surface</p>
			<p>ToSP : Top of Stand Pipe m.a.g.l. : meters above ground level m.b.g.l. : meters below ground level</p>	

**Photos of the borehole sites after completion of work**

**Borehole SSM000008**



**Borehole SSM000009**



**Borehole SSM000010**



**Borehole SSM000011**



**Borehole SSM000012**





Borehole SSM000014



**Borehole SSM000015**



**Borehole SSM000016**



**Borehole SSM000018**



**Borehole SSM000020**



**Borehole SSM000022**



**Borehole SSM000024**



**Borehole SSM000026**

