

Forsmark site investigation

Supplementary drilling and soil sampling, and installation of groundwater monitoring wells, pumping wells and BAT filter tips

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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

Supplementary drilling, soil sampling, and installation of groundwater monitoring wells in Quaternary deposits, pumping wells in soil-rock and BAT filter tips in Quaternary deposits were performed in Bolundsfjärden, wetlands (two fens and one bog), in the vicinity of percussion boreholes (HFM03, HFM16 and HFM18) and close to a potential access tunnel to a deep repository in the Forsmark area during the period June 2005 to March 2006. In total, 13 groundwater monitoring wells, three pumping wells in soil-rock and 14 BAT filter tips were installed.

The objective of the investigations was to obtain supplementary information concerning soil depth, soil composition, groundwater levels and pore pressures in the area. Moreover, the groundwater monitoring wells, the pumping wells and the BAT filter tips are localized so that they can be used to perform slug tests, pumping tests and water sampling in assumed groundwater discharge areas and in locally elevated areas. In combination with measurements of groundwater levels and pore pressures, such tests may for instance be utilized as a basis for estimation of the hydraulic interaction between groundwater and surface water in assumed discharge areas.

The drilling on ground with good bearing capacity was performed by use of a track driven GeoMachine 100 GTT drilling rig. Soil sampling was performed during drilling by means of auger drilling and/or flushing. Compared to the activity plan, an important nonconformity was that due to weak ice and/or ground with low bearing capacity, installation of groundwater monitoring wells under open water in Bolundsfjärden and in the two fens was executed by use of a hand-held percussion drill. This implies that these boreholes are not drilled into rock as planned, and that soil sampling could not be performed during drilling of these wells. Further, it was planned to install one groundwater monitoring well (SFM0098) with its screen in a sand layer below the investigated bog. However, the sand layer was much thinner than expected, and this well was not installed.

A casing-driver system was used for installation of the groundwater monitoring wells and the pumping wells on land. The groundwater monitoring wells on land were installed inside the drill casing. HDPE screens and casings were used for these wells. Filter sand and bentonite clay were applied outside the well while the drill casing was pulled out. Cover pipes and caps of stainless steel were installed at the top to protect the HDPE casings. With one exception (SFM0087), steel pipes were used for the groundwater monitoring wells below Bolundsfjärden and in the two fens. These pipes are perforated at the bottom. The BAT filter tips were installed manually. Each adapter pipe (stainless steel for pore pressure measurements and HDPE for water sampling) was anchored with fittings to the nearby groundwater monitoring well.

The investigations showed that below Bolundsfjärden, the till is overlain by a layer of gyttja, with a thickness of less than 1 m. Below the fens, the till is overlain by layers of clay, sand, clayey gyttja and gyttja. However, the clay and sand layers are considerably thicker in one of the fens; 0.7 and 0.4 m compared to 0.05 and 0.1 m in the other one. At the bog, the gyttja is overlain by a peat layer with an approximate thickness of 1.5 m.

Sammanfattning

Kompletterande borring, jordprovtagning och installation av grundvattenobservationsrör i jord, pumpbrunnar i jord-berg samt filterspetsar av BAT-typ i jord utfördes i Bolundsfjärden, i våtmarker, i närheten av hammarborrhål (HFM03, HFM16 och HFM18) samt i anslutning till en möjlig tillfartstunnel till ett djupförvar i Forsmarksområdet under perioden juni 2005 till mars 2006. Totalt installerades 13 grundvattenrör, tre pumpbrunnar i jord-berg och 14 BAT-spetsar.

Målsättningen med undersökningarna var att erhålla kompletterande information rörande jorddjup, jordartssammansättning, grundvattennivåer och portryck i området. Grundvattenrören, pumpbrunnarna och BAT-spetsarna är lokaliserade så att de kan användas för slugtester, pumpförsök och vattenprovtagning i förmodade utströmningsområden för grundvatten och även i lokala höjdområden. Sådana tester kan, i kombination med mätningar av grundvattennivåer och portryck, bland annat nyttjas för att bedöma den hydrauliska kontakten mellan grundvatten och ytvatten i förmodade utströmningsområden.

Borringarna på fast mark utfördes med en borrhandsvagn av typ GeoMachine 100 GTT. Jordprovtagning utfördes i samband med borringarna genom skruvborring och/eller spolning. En viktig avvikelse jämfört med aktivitetsplanen var, att på grund av svag is och/eller dåliga markförhållanden, genomfördes installation av grundvattenrör under öppet vatten och i de två kärren med en handhållen hammarborr. Detta innebär att dessa borrhål inte borrats ned i berg som planerat, och att jordprovtagning inte kunde utföras i samband med installation av dessa rör. Det ingick även i planen att installera ett grundvattenrör (SFM0098) med intagsdelen i ett sandlager under den mosse som undersöktes. Detta sandlager var mycket tunnare än väntat, varför röret inte kunde installeras.

Grundvattenrören och pumpbrunnarna på fast mark installerades genom foderrörborring. Grundvattenrören installerades i borrhandsröret. HDPE-filer och -rör användes för dessa rör. Filtersand och bentonitlera fylldes utanför grundvattenöret medan borrhandsröret drogs upp. Skyddsror och huv av rostfritt stål installerades överst som skydd för HDPE-röret. Med ett undantag (SFM0087) användes stålrör för grundvattenrören under öppet vatten och i kärren. Dessa rör är perforerade i botten. BAT-spetsarna installerades manuellt. Varje adapterrör (rostfritt stål för porvattenmätningar och HDPE för vattenprovtagning) förankrades med beslag i närliggande grundvattenrör.

Undersökningarna visar att under Bolundsfjärden överlagras moränen av gyttja, med en mäktighet mindre än 1 m. Under de undersökta kärren överlagras moränen av lera, sand, lerig gyttja och gyttja. Mäktigheten av ler- och sandlagren är dock betydligt större i ett av kärren (0,7 and 0,4 m jämfört med 0,05 och 0,1 m). I mossen överlagras gyttjan av ett torvlager med en mäktighet av ca 1,5 m.

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1 Introduction

This report presents the methodology and results of drilling, soil sampling and installation of groundwater monitoring wells in Quaternary deposits, pumping wells in soil-rock and BAT filter tips in Quaternary deposits in the Forsmark area during the period June 2005 to March 2006. The work is part of the activities performed within the site investigations in Forsmark. Previous drilling, soil sampling, and installation of groundwater monitoring wells, pumping wells and BAT filter tips in the Forsmark area are reported in /1, 2, 3, 4/.

The present work has been performed in accordance with activity plan AP PF 400-05-134 for supplementary drilling, installations of groundwater monitoring wells, pumping wells in soil-rock and BAT filter tips, and soil sampling and analyses. The locations of the installed wells and BAT filter tips are shown in Figure 5-1 in Chapter 5. The methodology and results of the soil sampling, performed in connection to the drilling, are reported separately /5/.

Table 1-1 lists the controlling documents for performing the activity. Both the activity plan and the method descriptions are SKB's internal controlling documents.

Table 1-1. Controlling documents for performance of the activity.

Activity plan	Number	Version
Kompletterande borrhningar i jord, installationer av grundvattenrör, jord-bergbrunnar och BAT-spetsar samt provtagning och analyser.	AP PF 400-05-134	1.0
Method documents	Number	Version
Metodbeskrivning för jordborrning.	SKB MD 630.003	1.0
Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning.	SKB MD 600.004	1.0
Instruktion för användning av kemiska produkter och material vid borrning och undersökningar.	SKB MD 600.006	1.0
Instruktion för inmätning av objekt.	SKB MD 110.001	1.0

2 Objective and scope

The overall objectives of the hydrogeological investigations in the Forsmark area are described in /6/ and /7/. The specific objective of the present work is to obtain supplementary information on soil depth, soil composition, groundwater levels and pore pressures in (1) assumed groundwater discharge areas (lakes and wetlands), and (2) in locally elevated areas in the vicinity of percussion boreholes, and close to a potential access tunnel for a deep repository. In addition to enabling groundwater level and pore pressure measurements, the groundwater monitoring wells and the BAT filter tips shall also enable water sampling and characterisation of the hydraulic properties of the Quaternary deposits by slug tests (groundwater monitoring wells) and permeability tests (BAT filter tips). Further, the activity includes installation of pumping wells in soil-rock, in which pumping tests will be performed.

3 Description of equipment

Drilling and installation of groundwater monitoring wells and pumping wells on ground with good bearing capacity were performed using a track-driven drilling rig, GeoMachine GM 100 GTT, with an 8-bars Dynaset HKL 4100/8-113 air compressor (Figure 3-1). The groundwater monitoring wells in Quaternary deposits under open water in Bolundsfjärden and in the two fens were installed using a hand-held Berema Pionjär percussion drill (cf Section 4.5). Moreover, all the BAT filter tips were pushed down into pre-drilled boreholes.



Figure 3-1. Installation of groundwater monitoring well SFM0105. A GeoMachine GM 100 GTT drilling rig with an 8-bars Dynaset air compressor was used for installation of all groundwater monitoring wells and pumping wells on ground with good bearing capacity.

4 Execution

4.1 General

The work was performed according to the specifications given in SKB's method description for soil drilling, SKB MD 630.003, and the activity plan AP PF 400-05-134 (SKB's internal documents), cf Table 1-1. The work included the following: Preparation and mobilisation, drilling and soil sampling, installation of groundwater monitoring wells, pumping wells and BAT filter tips, finishing of work, surveying of boreholes, environmental control programme, and data handling.

4.2 Preparation and mobilisation

In the preparation stage, service and function control of all equipment were conducted. It was checked that the types of fuel, oil and grease were in accordance with SKB's instruction for chemical products used for drilling works, SKB MD 600.006 (SKB's internal controlling document). Finally, the equipment was cleaned according to SKB's instruction for cleaning of borehole equipment, level 1, SKB MD 600.004 (SKB's internal controlling document).

The steel pipes and the HDPE (High Density Poly Ethylene) screens and pipes (casings) were taken from SKB's storage in Forsmark or delivered directly from the manufacturer. In both cases, the material was stored in tight-fitting packages. For the soil-rock pumping wells (SFM0090, SFM0094, and SFM0103), custom-made drill casings were manufactured at SWECO's engineering workshop in Stockholm and transported in tight-fitting packages to Forsmark. In those wells, the drill casings were used as combined screens and stand pipes.

Mobilisation onto the site included transport, cleaning of all in-hole equipment, preparation of the first site, lining up the drilling machine and final control of function. It also included transport of pipes, sand, bentonite, and all other necessary equipment.

4.3 Execution of field work

4.3.1 Drilling and soil sampling

The boreholes on ground with good bearing capacity were drilled by air-rotary drilling technique using a casing driver system, Symmetrix N-85 (borehole diameter Ø: 122 mm). Drilling for installation of the pumping wells SFM0090, SFM0094, and SFM0103 was performed using the casing driver system Symmetrix STD-82 (Ø: 125 mm) and rock drilling (Ø: 57 mm).

In accordance with activity plan AP PF 400-05-134, soil sampling was performed by auger drilling (Ø: 122 mm) and/or flushing in most of the boreholes on land. Soil sampling (flushing using lake water) was performed in the borehole drilled below open water in Bolundsfjärden (SFM0081). The execution of the soil sampling is reported in detail in a separate report /5/.

4.3.2 Installation of groundwater monitoring wells

The groundwater monitoring wells on ground with good bearing capacity were installed inside the drill casing. HDPE screens (Ø: 63/50 mm, length: 1 m, slot width: 0.3 mm) and casings (Ø: 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. Cover pipes (Ø: 83/80 mm) and caps of stainless steel (SS2333) were installed at the top to protect the HDPE casings.



Figure 4-1. Soil sampling by auger drilling in borehole SFM0107.

For the groundwater monitoring wells below open water in Bolundsfjärden and in the two fens, steel pipes (SMS 327, Ø: 60.3/51.3 mm) were installed directly by a hand-held Berema Pionjär percussion drill. The steel pipes are perforated by 100 openings/m (Ø: 6 mm) at a length of 0.4 m at the bottom. The exception is SFM0087, where a HDPE screen and casing (see above) were installed.

Subsequent to installation, a function test was performed in each well using a submersible pump. No well development was found necessary according to the guidelines in activity plan AP PF 400-05-134.

4.3.3 Installation of pumping wells

To enable pumping tests in boreholes SFM0090, SFM0094, and SFM0103, custom-made steel drill casings (Ø: 114/101 mm) were installed and used as combined screens and casings. The screen in these wells is perforated by openings (c/c 30 mm, length 40 mm and width 3 mm) at a length of 2.5 m, of which 1–1.5 m is installed in rock below the soil-rock interface. The open borehole (Ø: 57 mm) continues between 3 and 5.5 m down into the bedrock.

After the installations, the pumping wells were cleaned using compressed air. Subsequently, short pumping tests were performed to estimate the capacity of the wells as a basis for planning of pumping tests.

4.3.4 Installation of BAT filter tips

The BAT filter tips were pushed down manually. Each adapter pipe (stainless steel, Ø: 33.7/25.6 mm for pore pressure measurements and HDPE, Ø: 63/50 mm for water sampling) was anchored with fittings to a nearby groundwater monitoring well (Figure 4-2).

4.3.5 Finishing of work

Subsequent to drillings and installations, the drilling rig and other used equipment were removed, the drilling sites were cleaned and an inspection was made by SKB and SWECO together. All drilling sites were documented by photos.

4.3.6 Suveying

After finishing the work, all the installed wells and BAT filter tips were surveyed by a precision GPS, thereby determining their X-, Y- and Z-coordinates. The results of the surveying are stored in SKB's SICADA database.

For the groundwater monitoring wells and the pumping wells, the surveyed point was the top of the HDPE or steel casing (the stand pipe). At the BAT filter tips, the top of the HDPE or steel adapter pipes (the stand pipe) was surveyed.

4.3.7 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.

4.4 Data handling/post processing

Minutes for the 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 filing in SKB's archive.



Figure 4-2. Groundwater monitoring well SFM0081 (middle), BAT filter tip SFM0082 for pore pressure measurements (left) and BAT filter tip SFM0083 for water sampling (right), installed below open water in Bolundsfjärden. The BAT casings are anchored with fittings to the groundwater monitoring well. After installation, the groundwater monitoring well was pumped until stable readings of the temperature and the electric conductivity were obtained.

4.5 Nonconformities

According to the activity plan AP PF 400-05-134, it was planned to install groundwater monitoring well SFM0098 with its screen in a sand layer. However, this well was not installed, as the sand layer was much thinner than expected.

Due to thin ice, the track-driven drilling rig could not be used to install the groundwater monitoring wells in soil below open water in Bolundsfjärden and in the two fens (SFM0081, 0084, 0087, and 0091). Instead, these wells were installed using a hand-held Berema Pionjär percussion drill. This implies that these boreholes were not drilled into rock as planned, and that soil sampling could not be performed during drilling of these wells. Soil sampling was neither performed during drilling of SFM0095, and borehole SFM0104 (groundwater monitoring well) was not drilled into bedrock as planned.

Due to poor ground bearing capacity at the planned location, there was some deviation between the planned and the actual location of the soil-rock pumping well SFM0090.

5 Results

The locations of all installed wells and BAT filter tips are shown in Figure 5-1. The coordinates of each borehole and its type are listed in Table 5-1.

The investigations showed that below Bolundsfjärden, the till is overlain by a layer of gyttja, with a thickness of less than 1 m. Below the fens, the till is overlain by layers of clay, sand, clayey gyttja and gyttja. However, the clay and sand layers are considerably thicker in one of the fens; 0.7 and 0.4 m compared to 0.05 and 0.1 m in the other one. At the bog, the gyttja is overlain by a peat layer with an approximate thickness of 1.5 m.

The preliminary estimated capacities of the pumping wells are 50 L/minute for SFM0090, and 60 L/minute for SFM0094 and SFM0103.

All results have been delivered to the Activity Leader also in digital form for quality control and storage in SKB's SICADA database. In SICADA, the results of the investigation are traceable by the activity plan number AP PF 400-05-134.

Drawings of all boreholes are presented in Appendix 1, and photos are shown in Appendix 2.

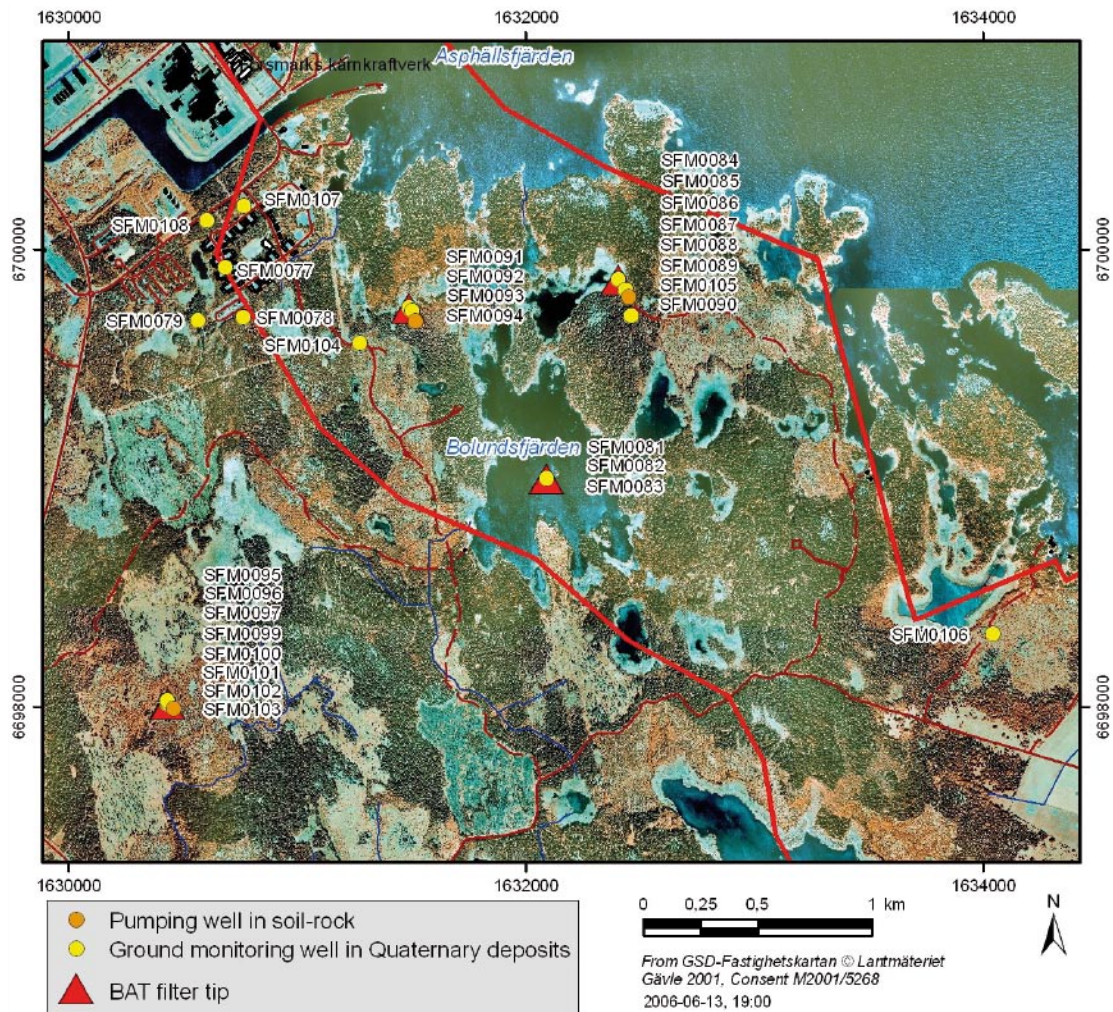


Figure 5-1. Locations of all groundwater monitoring wells, pumping wells and BAT filter tips of the present report.

Table 5-1. Coordinates (coordinate system RT 90 2.5 gon W 0: –15 for X and Y, and RHB70 for Z) and type for all boreholes.

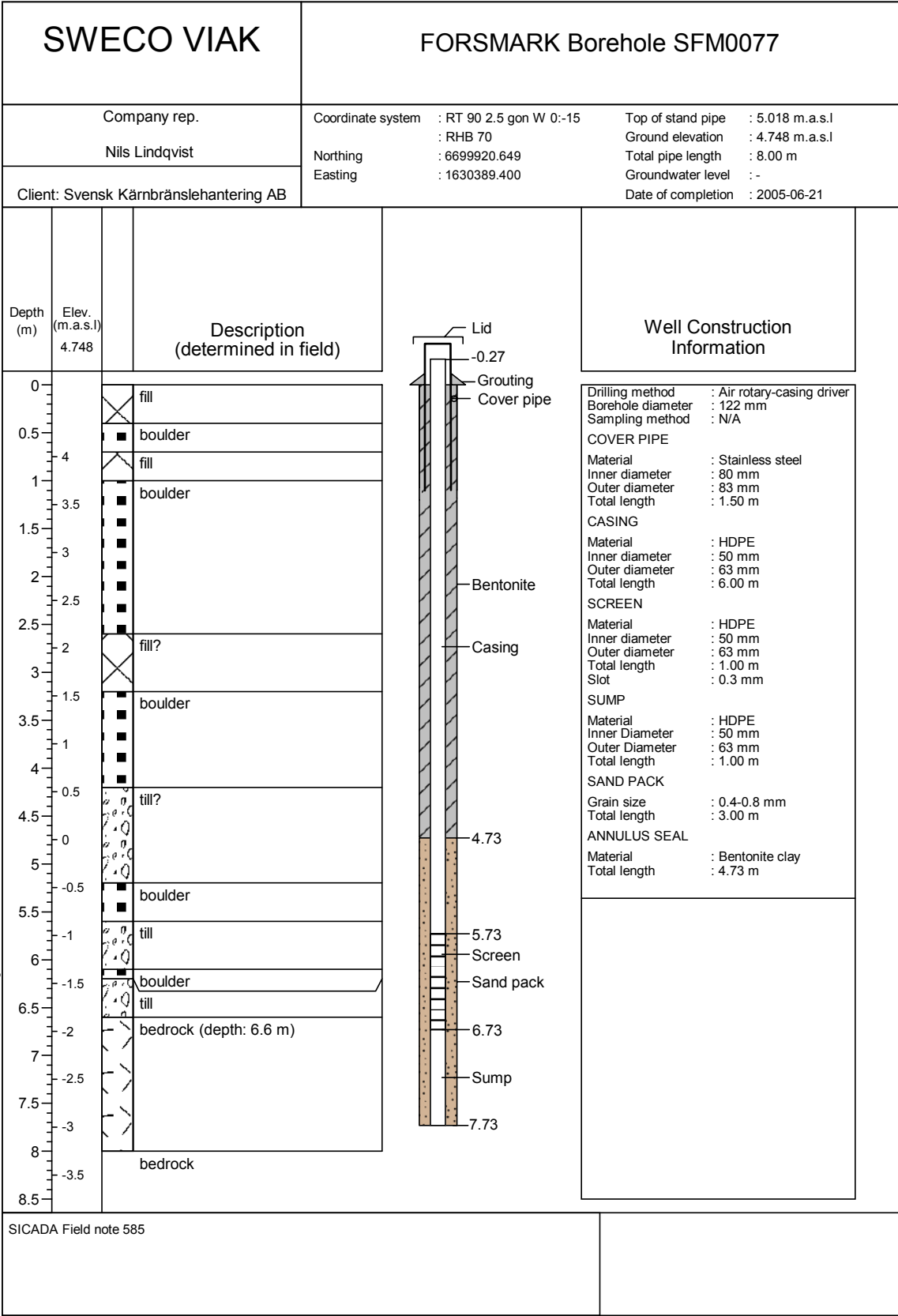
Borehole ID	X	Y	Z ¹	Type
SFM0077	6699920.649	1630389.400	5.018	Groundwater monitoring well (HDPE), in till.
SFM0078	6699703.697	1630764.943	5.239	Groundwater monitoring well (HDPE), in till.
SFM0079	6699690.551	1630567.896	4.198	Groundwater monitoring well (HDPE), in till.
SFM0081	6698999.907	1632093.487	1.308	Groundwater monitoring well (steel pipe), in till below open water (Bolundsfjärden).
SFM0082	6699000.136	1632093.965	1.387	BAT filter tip for pore pressure measurements, in gyttja below open water (Bolundsfjärden).
SFM0083	6698999.782	1632093.045	1.359	BAT filter tip for water sampling, in gyttja below open water (Bolundsfjärden).
SFM0084	6699868.483	1632405.985	1.230	Groundwater monitoring well (steel pipe), in till below fen.
SFM0085	6699868.905	1632405.793	1.674	BAT filter tip for pore pressure measurements, in clay below fen.
SFM0086	6699868.764	1632406.398	1.691	BAT filter tip for water sampling, in clay below fen.
SFM0087	6699868.143	1632406.371	1.309	Groundwater monitoring well (HDPE), in sand below fen.
SFM0088	6699868.154	1632405.592	1.096	BAT filter tip for pore pressure measurements, in clayey gyttja below fen.
SFM0089	6699867.969	1632406.093	1.065	BAT filter tip for water sampling, in clayey gyttja below fen.
SFM0090	6699824.641	1632437.560	1.638	Till-rock pumping well, close to fen.
SFM0091	6699745.569	1631490.633	1.414	Groundwater monitoring well (steel pipe), in till below fen.
SFM0092	6699746.063	1631490.713	1.414	BAT filter tip for pore pressure measurements, in peat below fen.
SFM0093	6699745.066	1631490.526	1.314	BAT filter tip for water sampling, in peat/gyttja below fen.
SFM0094	6699731.624	1631506.647	1.365	Till-rock pumping well, close to fen.
SFM0095	6698017.752	1630437.616	12.099	Groundwater monitoring well (HDPE), in till below bog.
SFM0096	6698014.587	1630436.941	11.637	BAT filter tip for pore pressure measurements, in clay below bog.
SFM0097	6698015.187	1630438.140	11.488	BAT filter tip for water sampling, in clay below bog.
SFM0099	6698014.138	1630437.490	11.559	BAT filter tip for pore pressure measurements, in gyttja below bog.
SFM0100	6698015.303	1630437.106	11.479	BAT filter tip for water sampling, in gyttja below bog.
SFM0101	6698014.510	1630437.853	12.040	BAT filter tip for pore pressure measurements, in peat below bog.
SFM0102	6698015.469	1630437.551	12.034	BAT filter tip for water sampling, in peat below bog.
SFM0103	6698029.589	1630435.231	11.797	Till-rock pumping well, below bog.
SFM0104	6699591.792	1631275.359	3.545	Groundwater monitoring well (HDPE), in till.
SFM0105	6699710.161	1632464.596	3.618	Groundwater monitoring well (HDPE), in till.
SFM0106	6698321.312	1634043.400	4.693	Groundwater monitoring well (HDPE), in till.
SFM0107	6700187.423	1630769.188	3.148	Groundwater monitoring well (HDPE), in till.
SFM0108	6700126.451	1630609.465	4.213	Groundwater monitoring well (HDPE), in till.

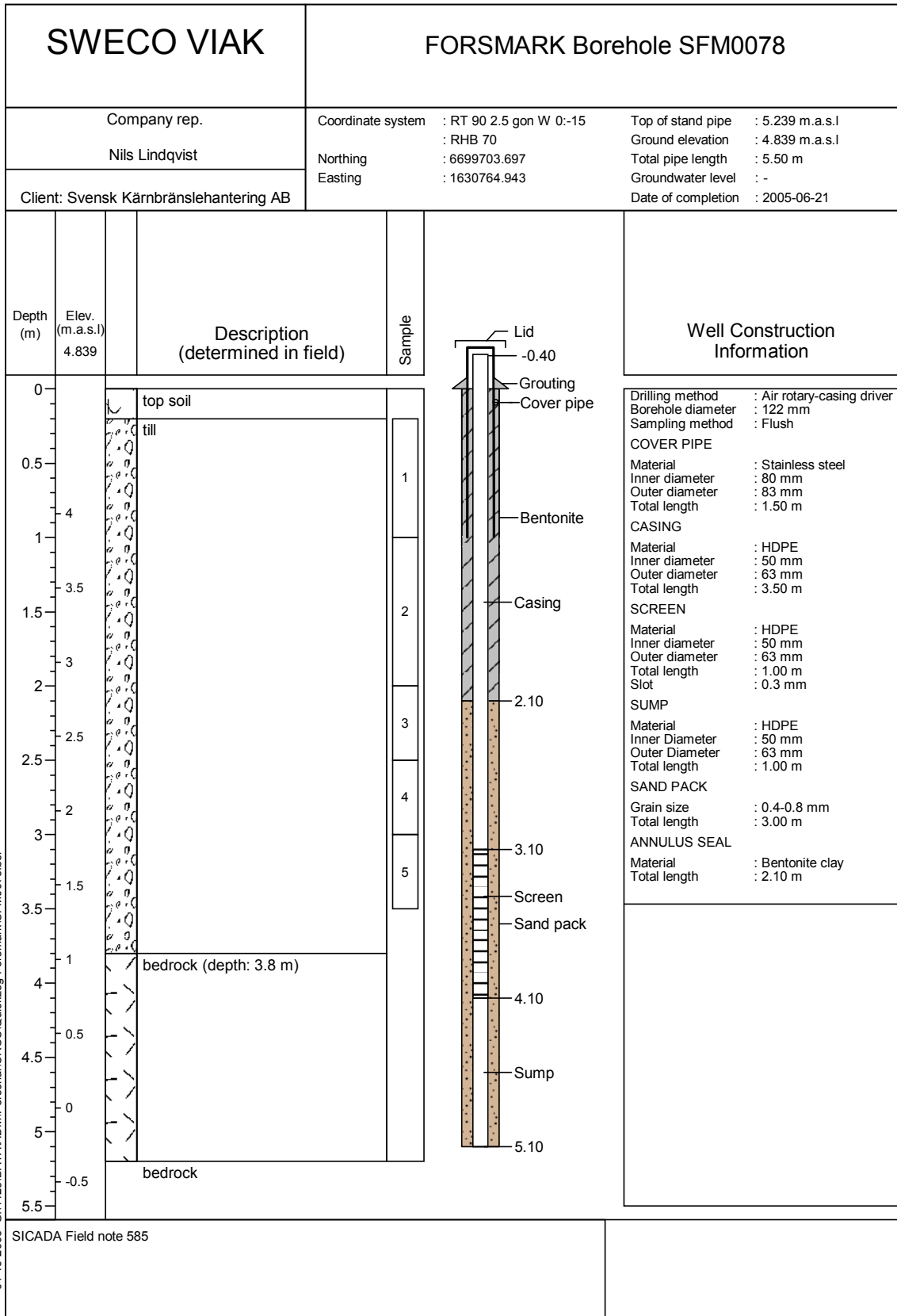
¹Top of the stand pipe (m.a.s.l.).

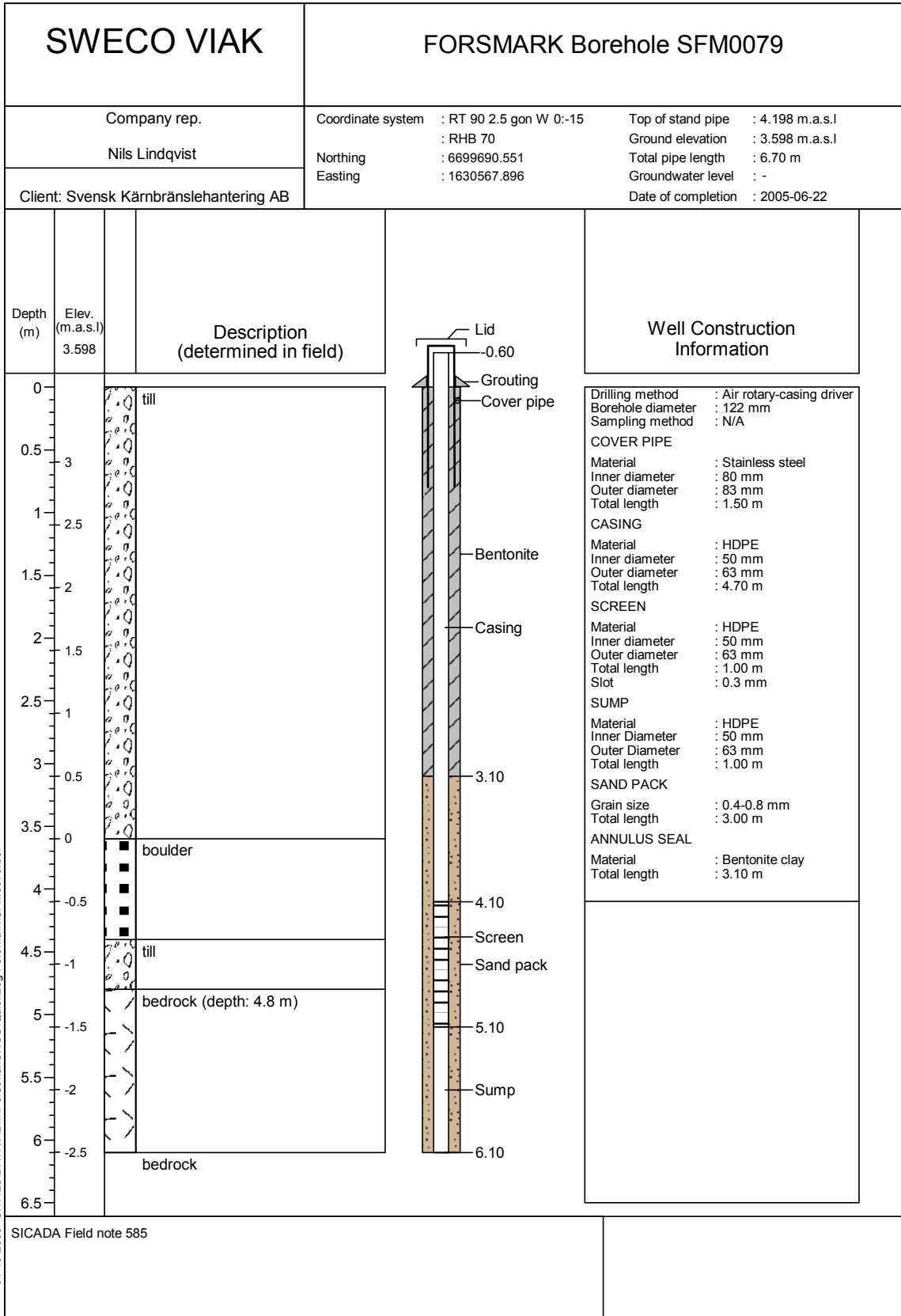
6 References

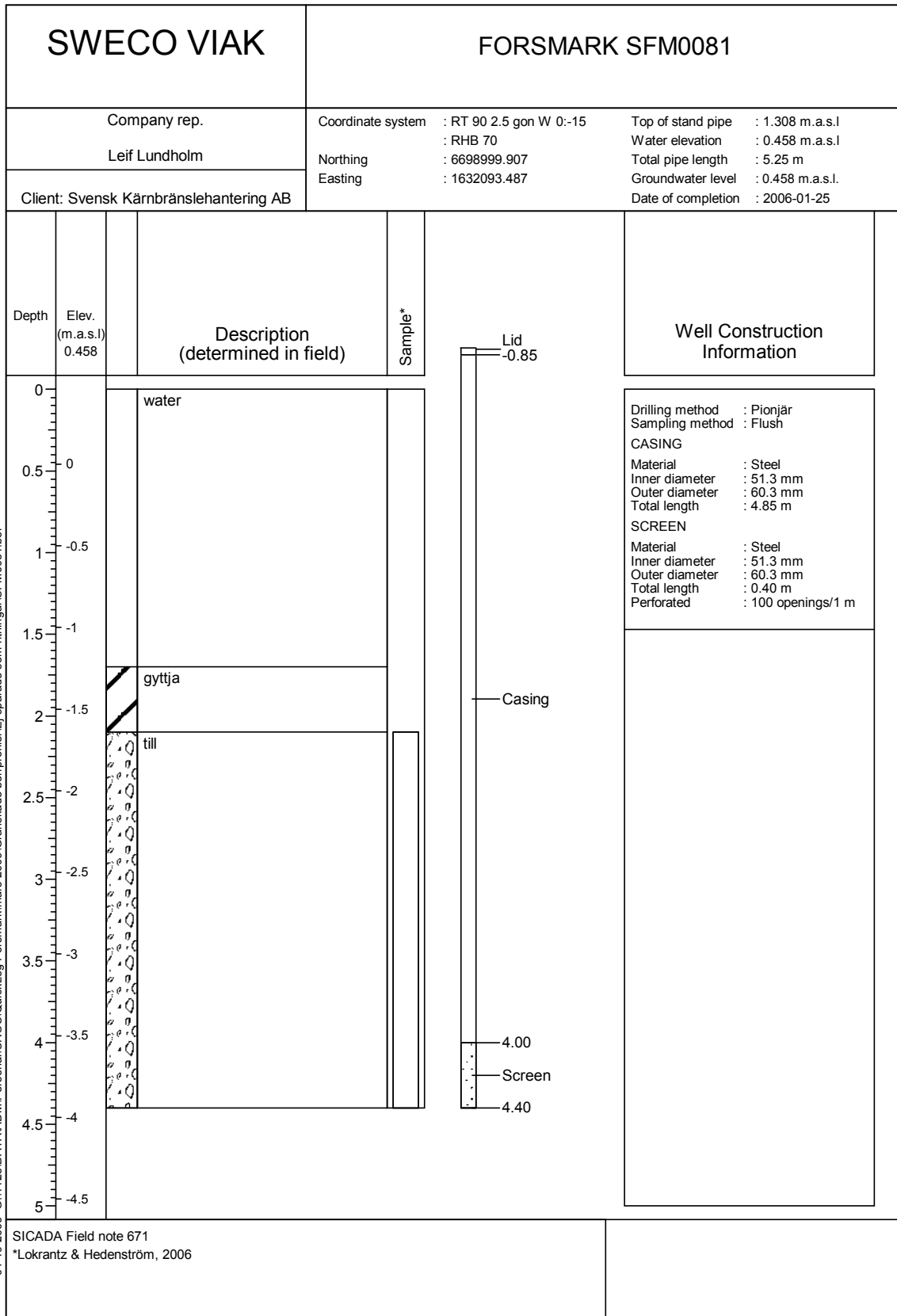
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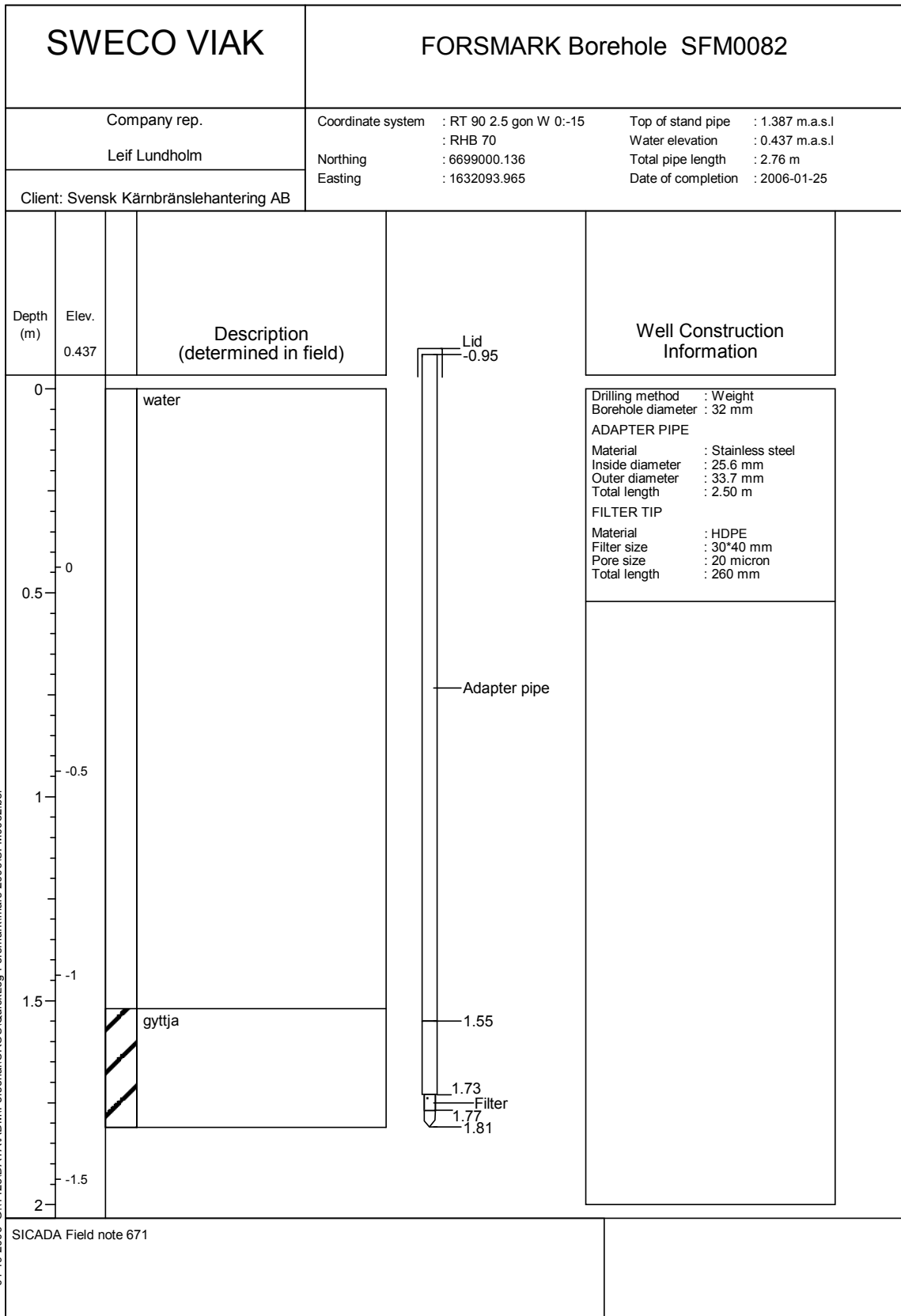
Borehole profiles







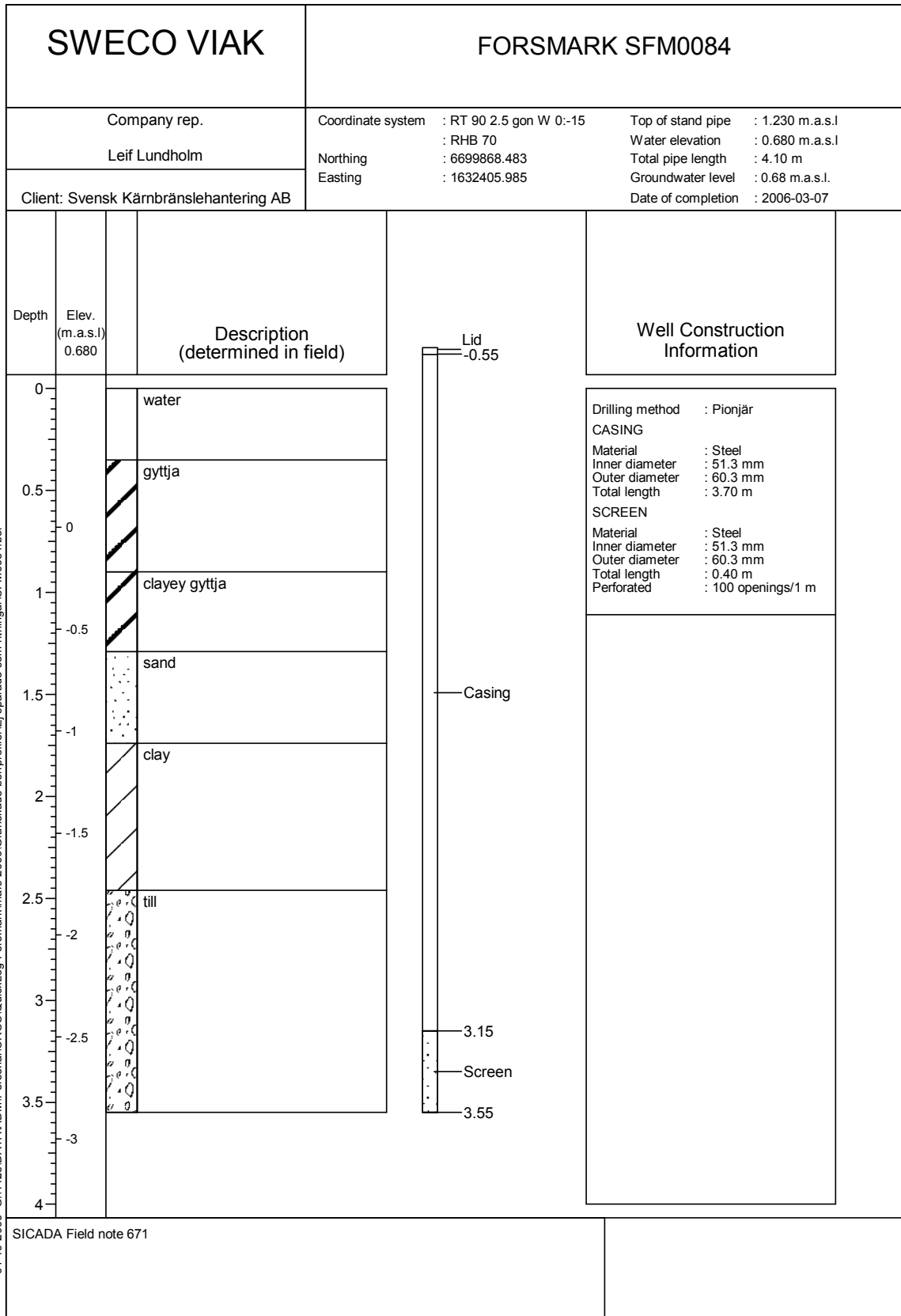


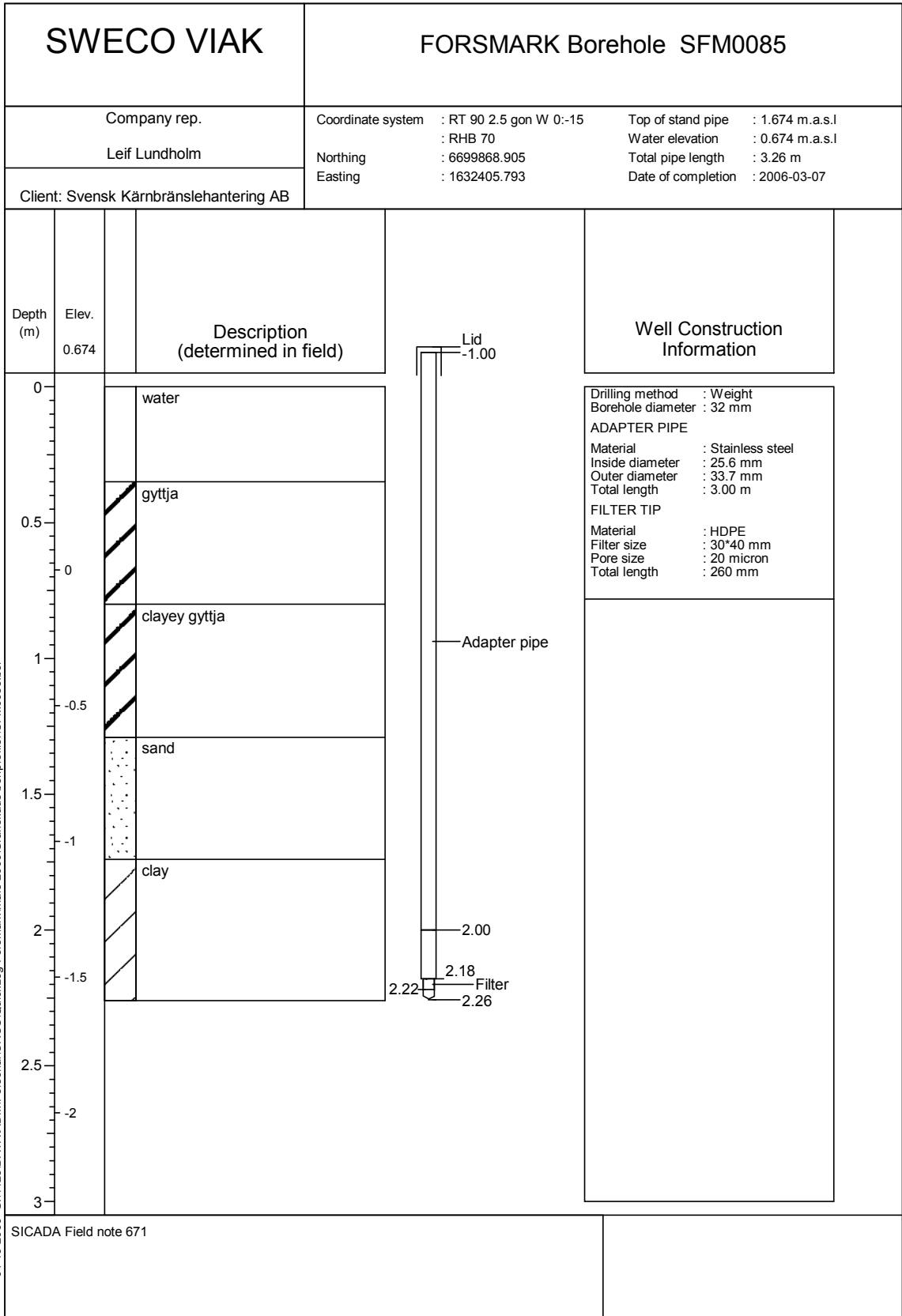


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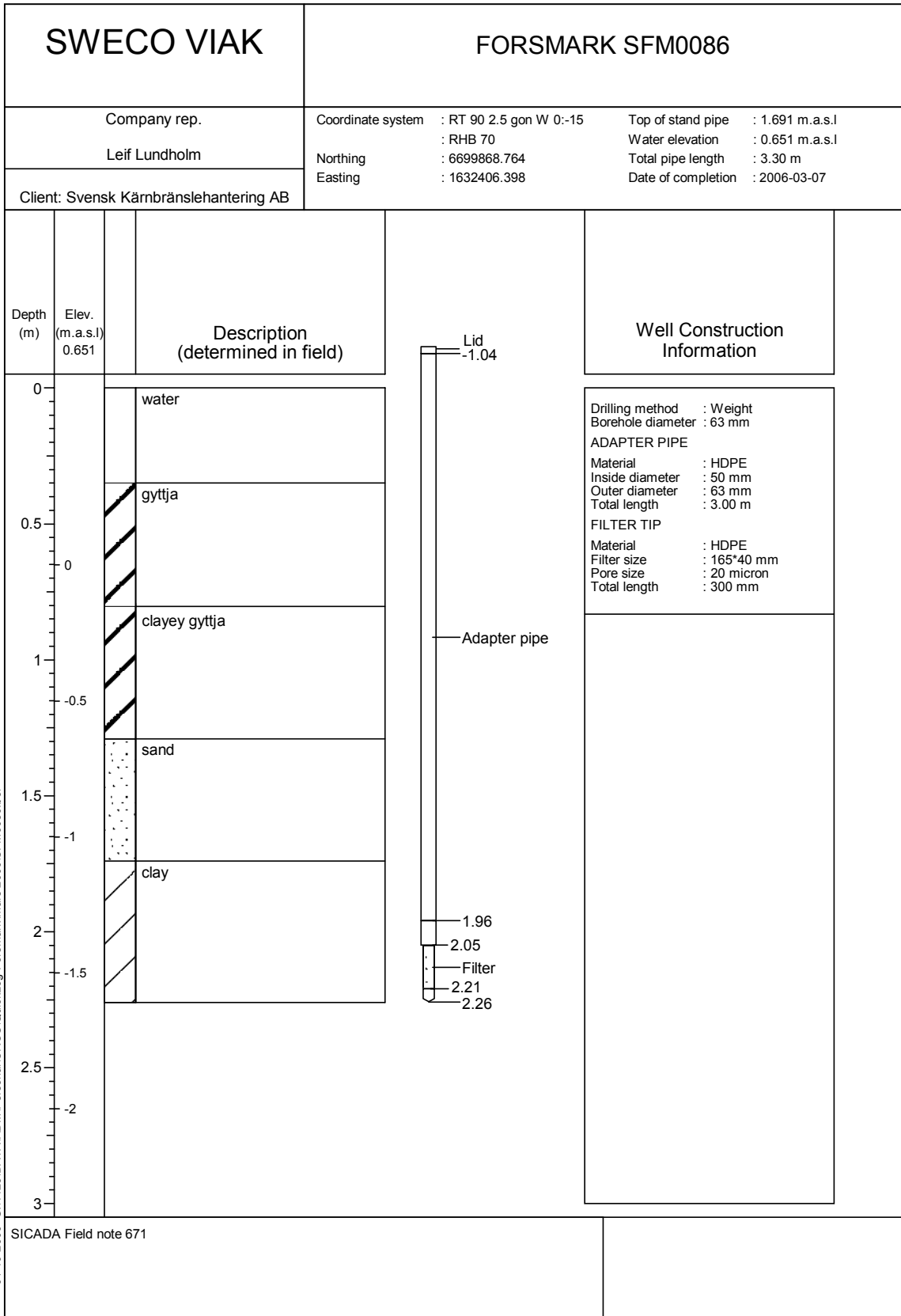
SWECO VIAK		FORSMARK SFM0083	
Company rep. Leif Lundholm		Coordinate system : RT 90 2.5 gon W 0:-15 : RHB 70 Northing : 6698999.782 Easting : 1632093.045	Top of stand pipe : 1.359 m.a.s.l Water elevation : 0.409 m.a.s.l Total pipe length : 2.75 m Date of completion : 2006-01-25
Client: Svensk Kärnbränslehantering AB			
Depth (m)	Elev. (m.a.s.l) 0.409	Description (determined in field)	Well Construction Information
0		water	Drilling method : Weight Borehole diameter : 63 mm ADAPTER PIPE Material : HDPE Inside diameter : 50 mm Outer diameter : 63 mm Total length : 2.45 m FILTER TIP Material : HDPE Filter size : 165*40 mm Pore size : 20 micron Total length : 300 mm
0.5			
1			
1.5			
1.59			
1.75		gyttja	
1.80			
2			
SICADA Field note 671			

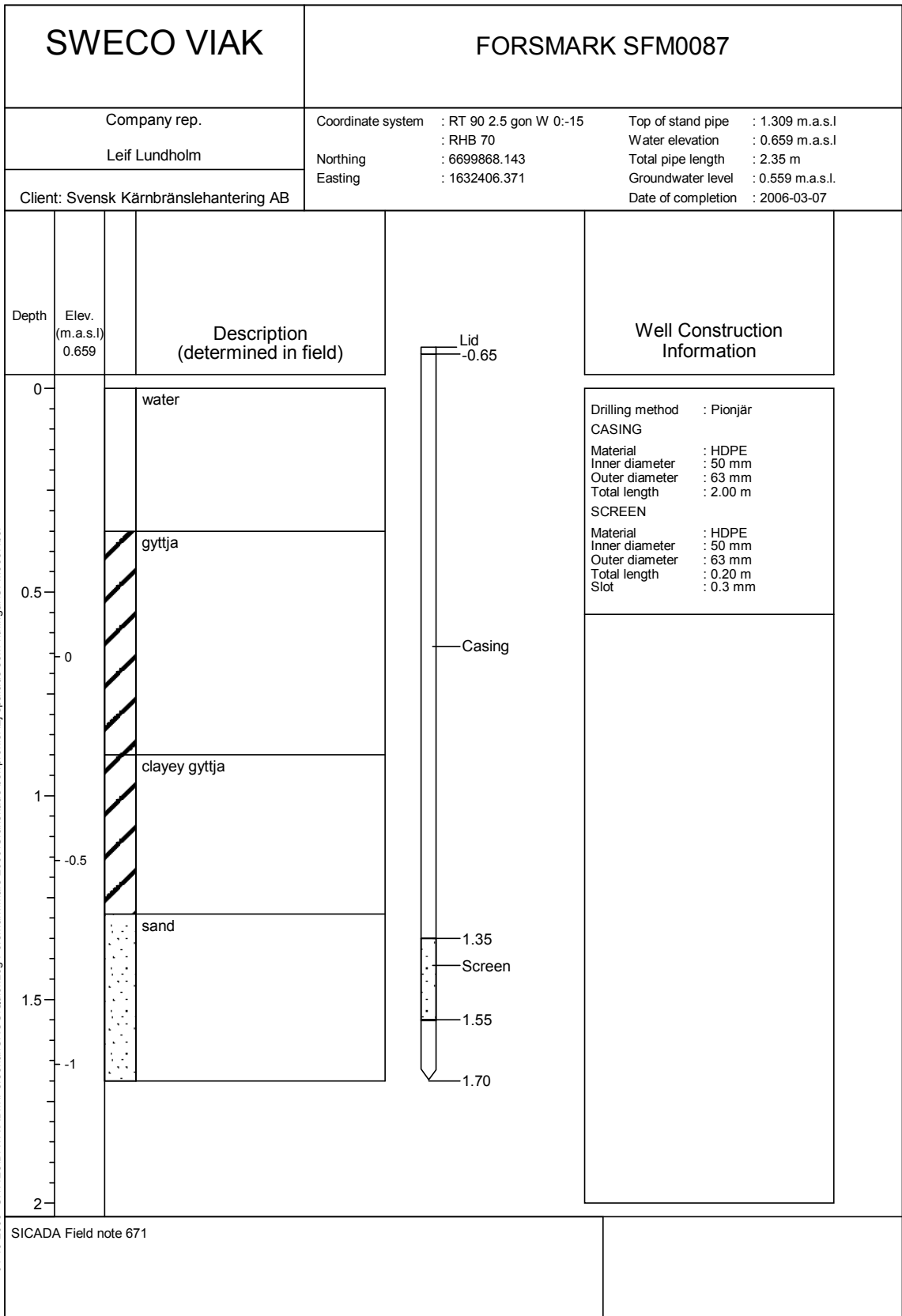
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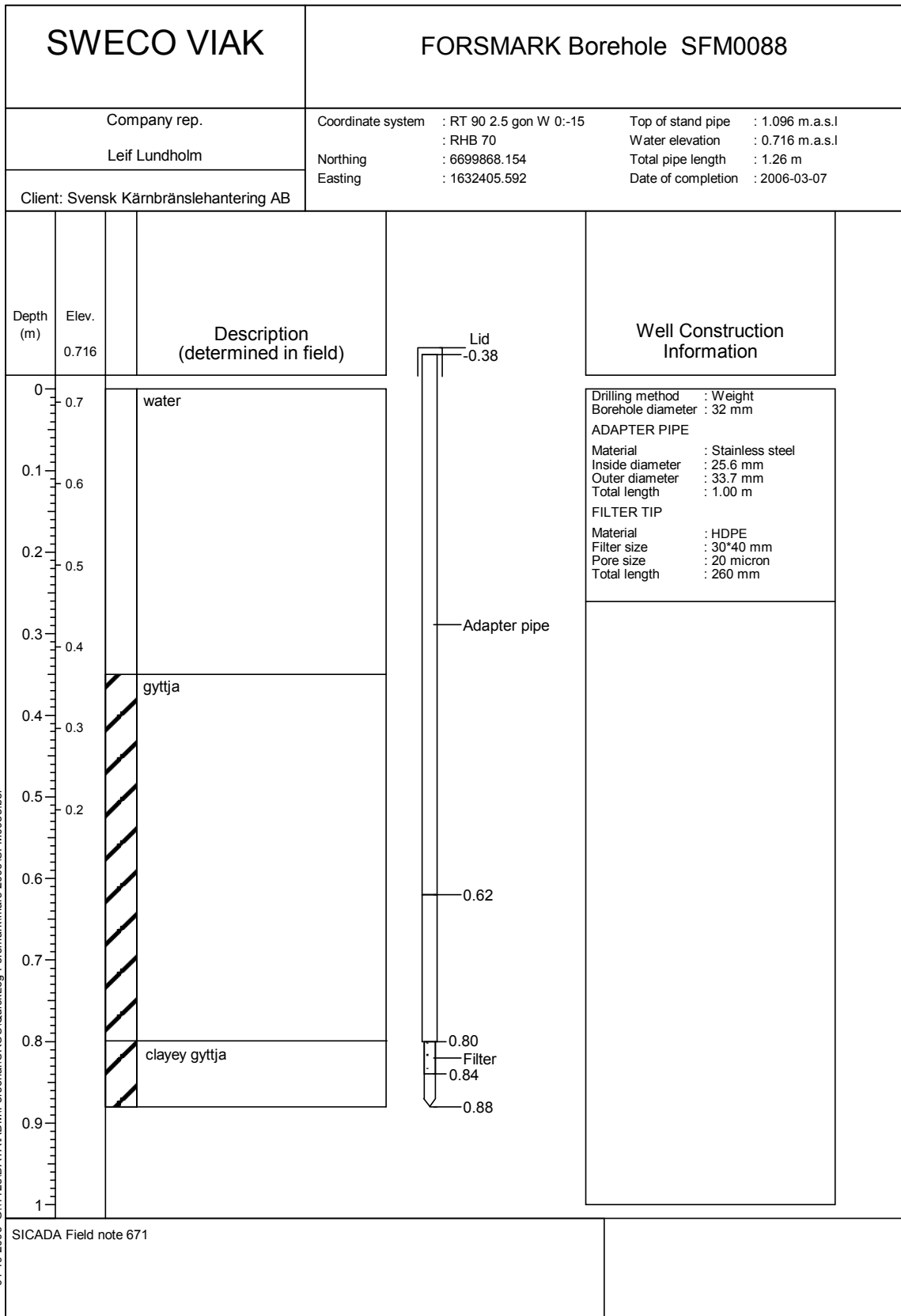


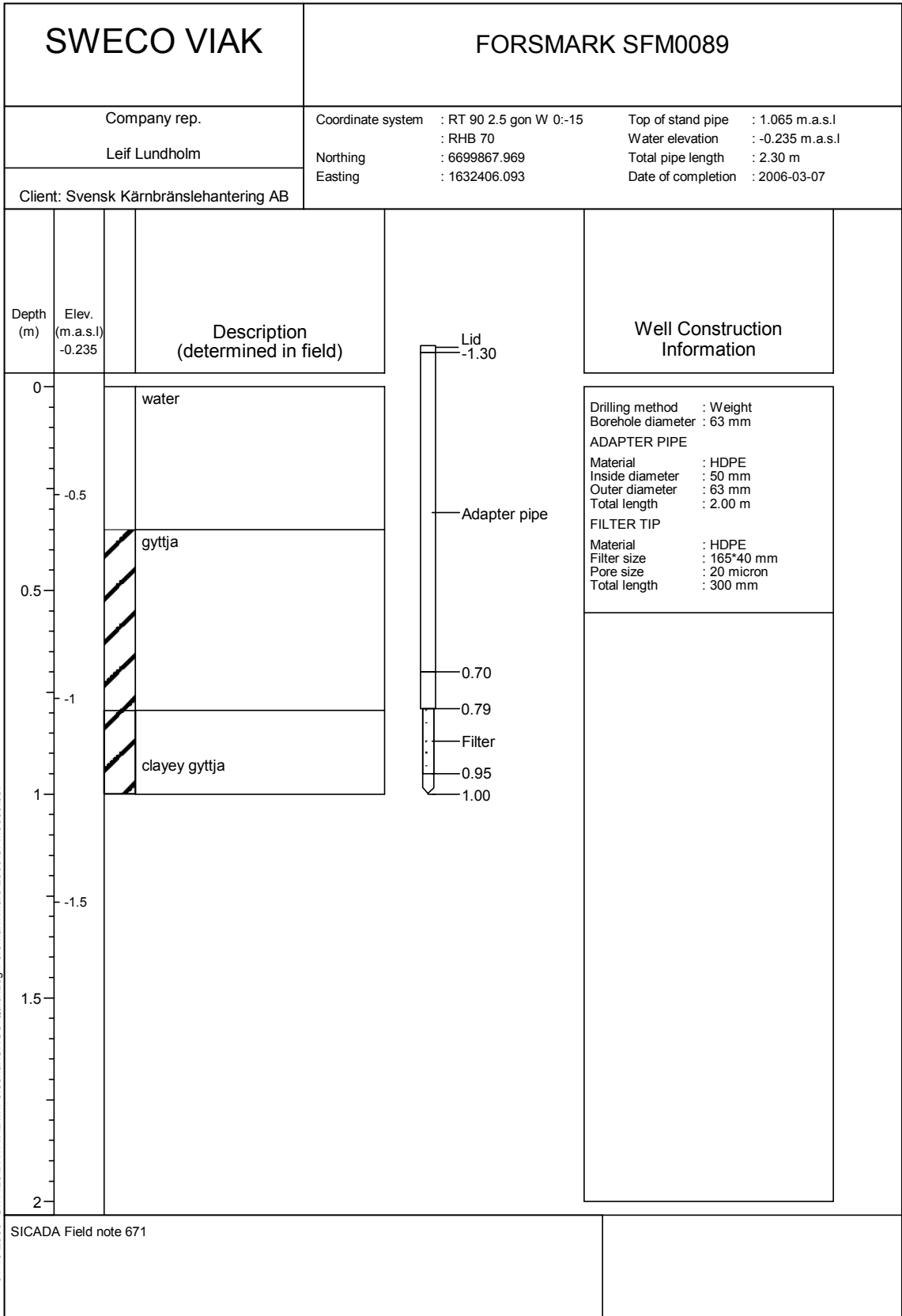
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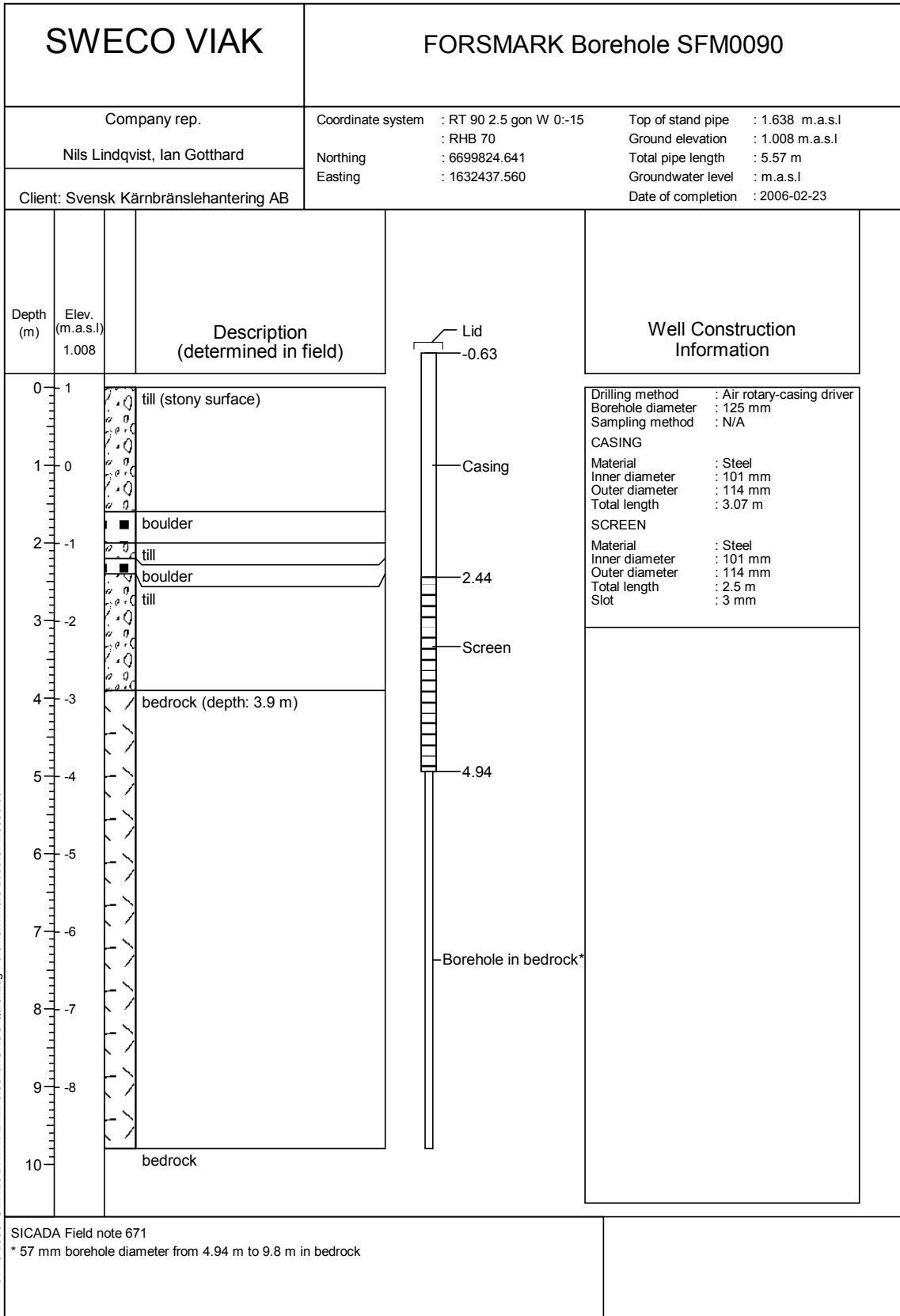




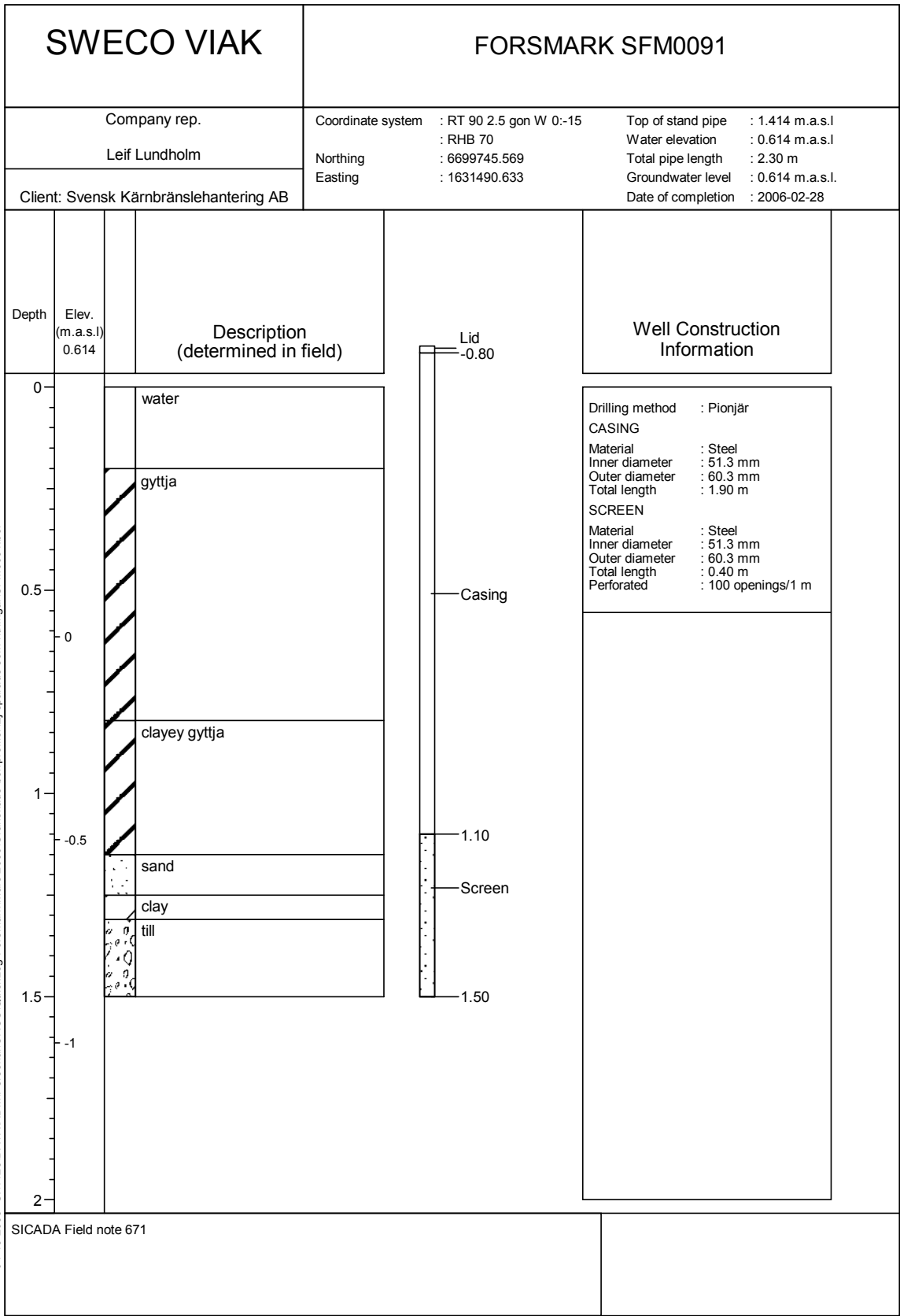
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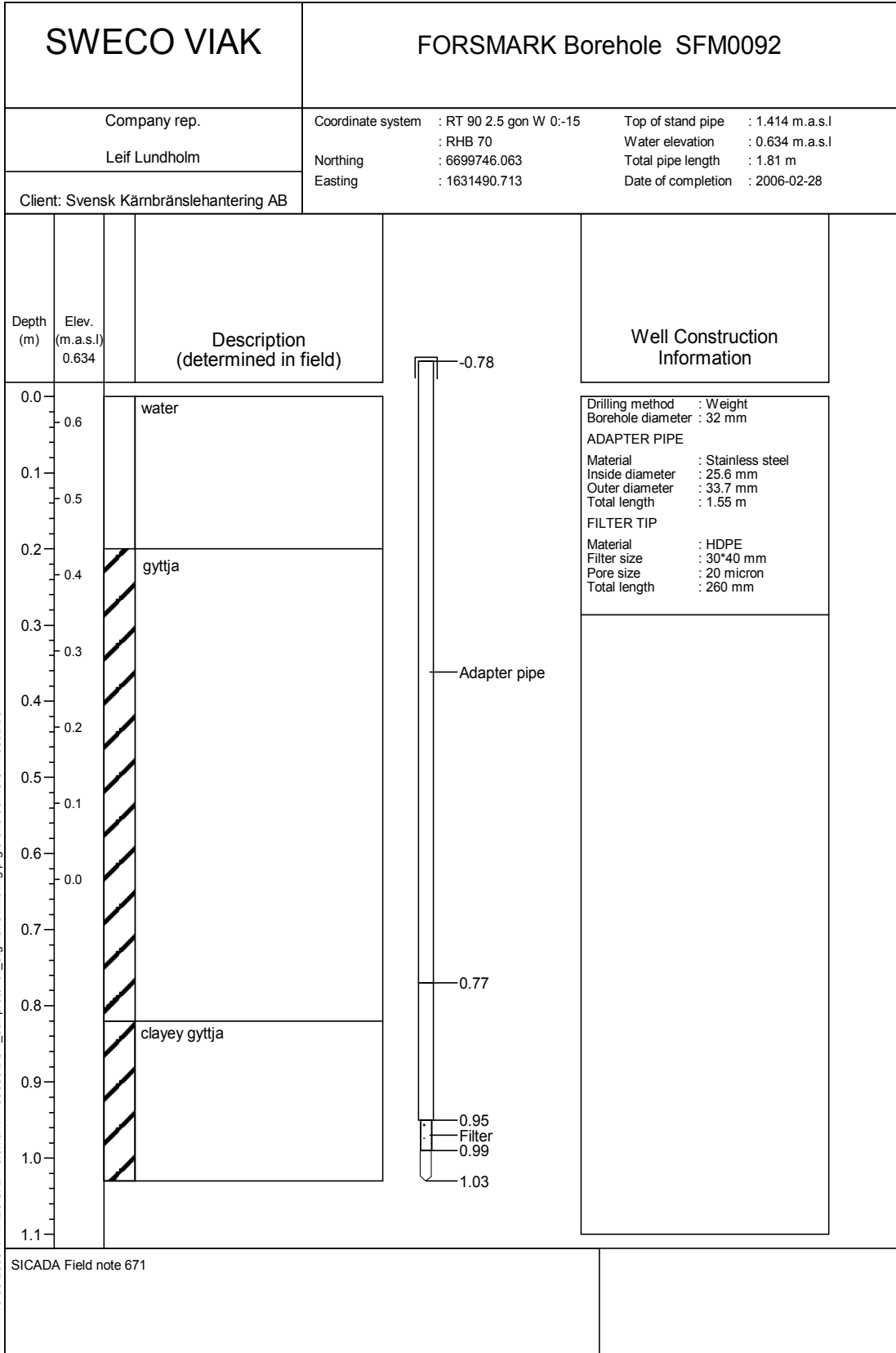


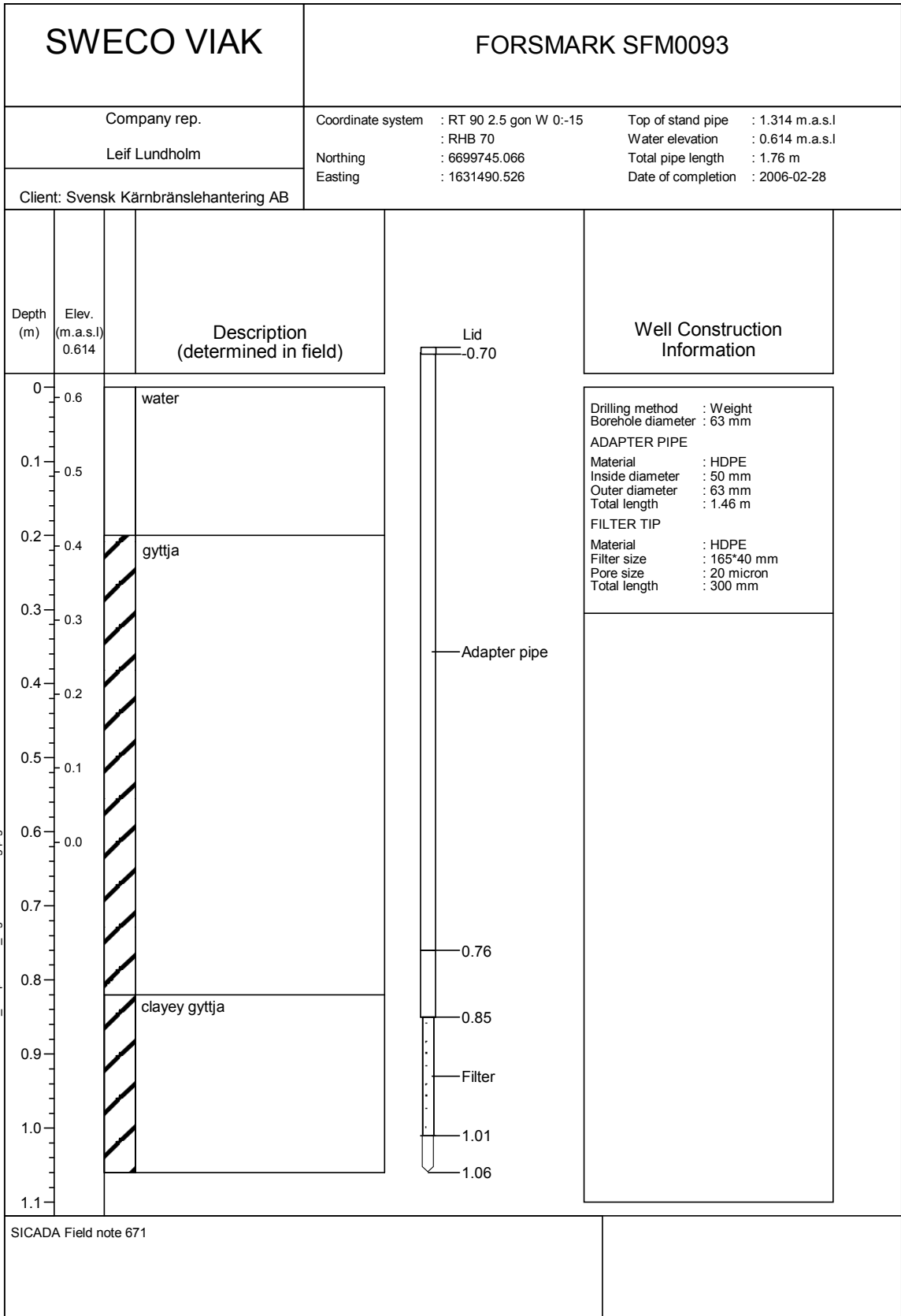




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SWECO VIAK		FORSMARK Borehole SFM0094	
Company rep. Nils Lindqvist, Ian Gotthard		Coordinate system : RT 90 2.5 gon W 0:-15 : RHB 70	Top of stand pipe : 1.365 m.a.s.l Ground elevation : 0.565 m.a.s.l
Client: Svensk Kärnbränslehantering AB		Northing : 6699731.624 Easting : 1631506.647	Total pipe length : 4.74 m Groundwater level : 0.815 m.a.s.l Date of completion : 2006-02-14
Depth (m)	Elev. (m.a.s.l)	Description (determined in field)	Sample**
0	0.565		
0		till	
1			1
2			2
3		bedrock (depth: 2.7 m)	3
4			
5			
6			
7			
8			
9			
10		bedrock	

Lid
-0.80
Casing
1.44
Screen
3.94
Borehole in bedrock*

Well Construction Information

Drilling method : Air rotary-casing driver
Borehole diameter : 125 mm
Sampling method : Auger

CASING

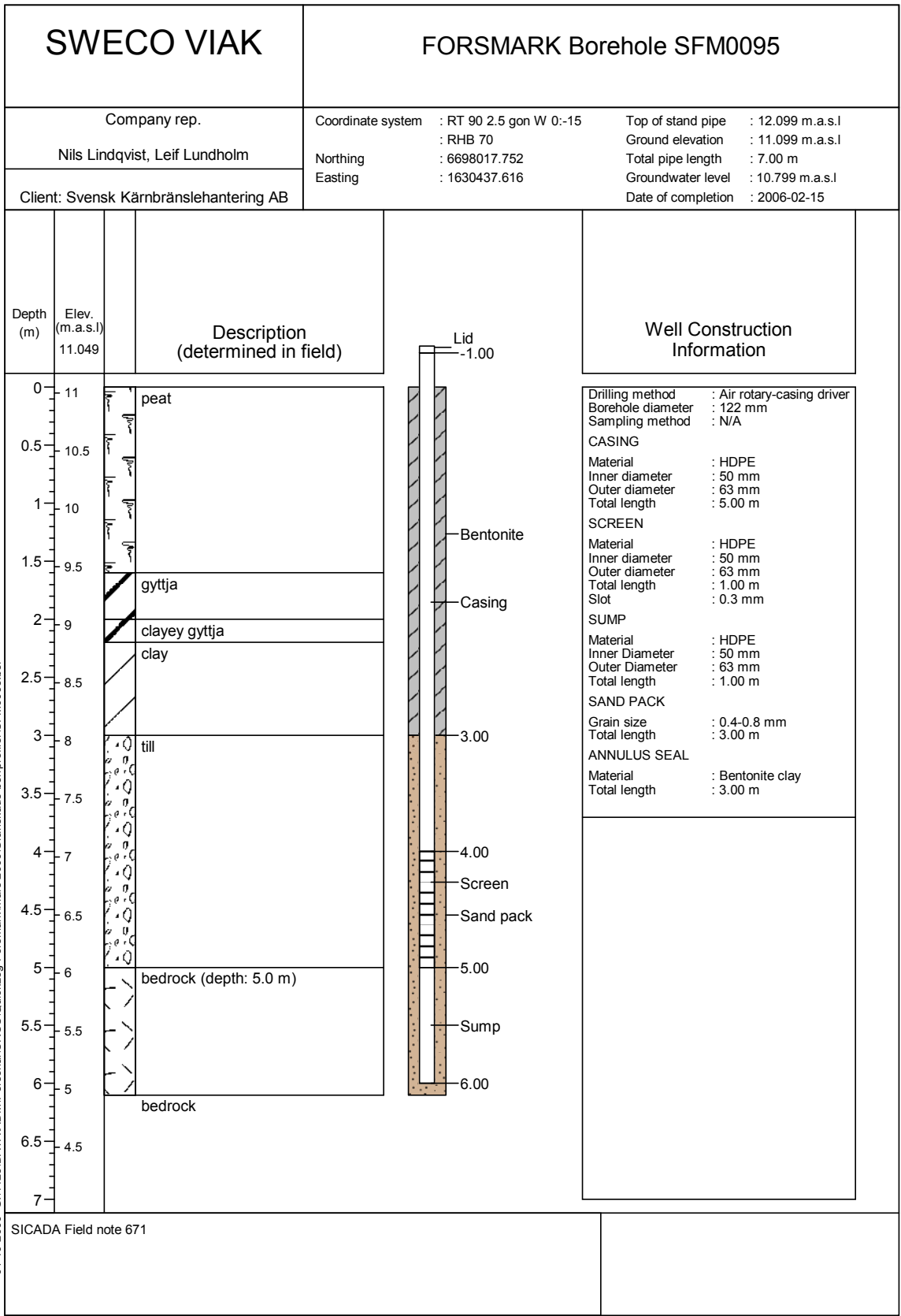
Material : Steel
Inner diameter : 101 mm
Outer diameter : 114 mm
Total length : 2.24 m

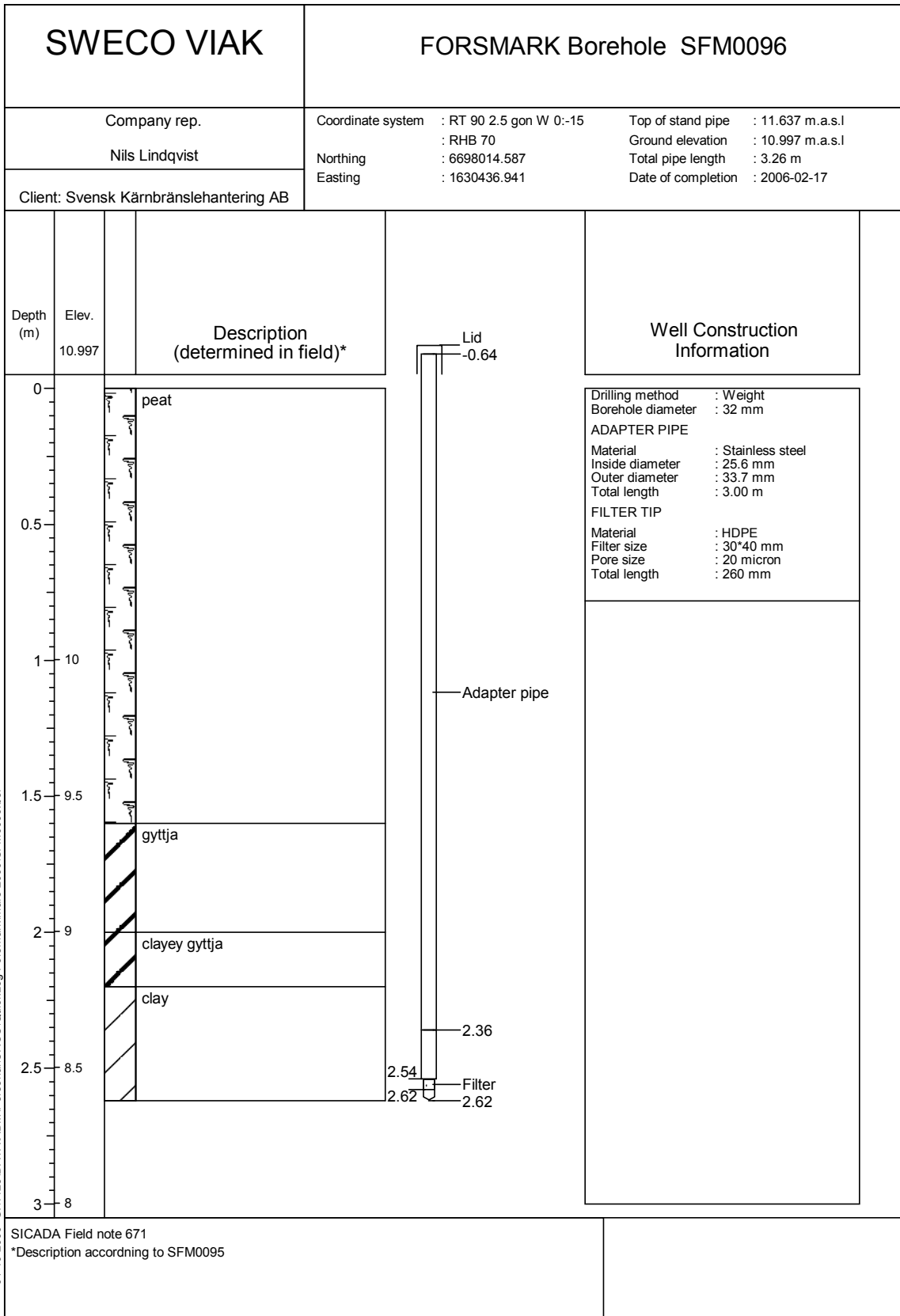
SCREEN

Material : Steel
Inner diameter : 101 mm
Outer diameter : 114 mm
Total length : 2.5 m
Slot : 3 mm

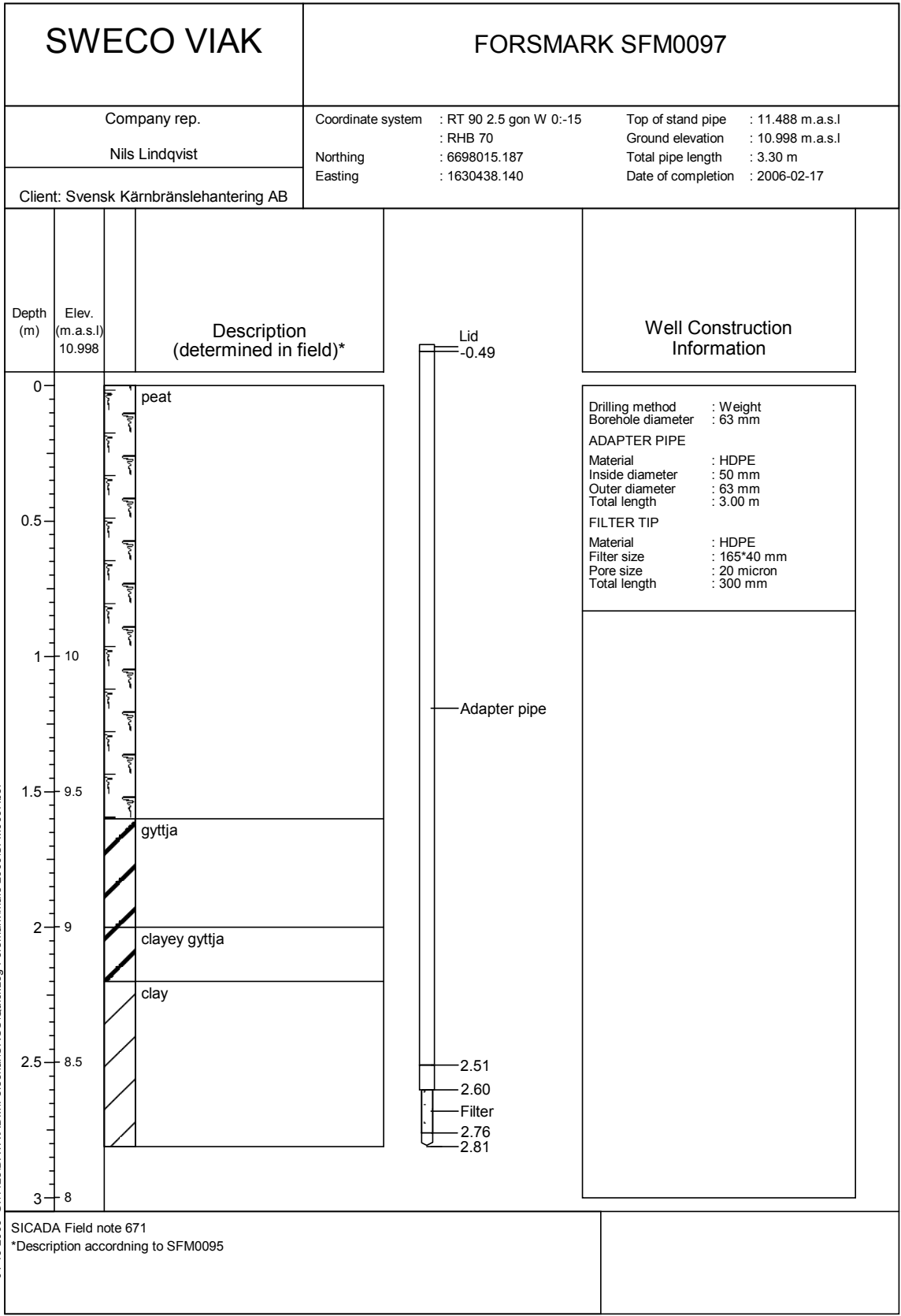
SICADA Field note 671
* 57 mm borehole diameter from 3.94 m to 9.5 m in bedrock
** Lokrantz & Hedenström, 2006

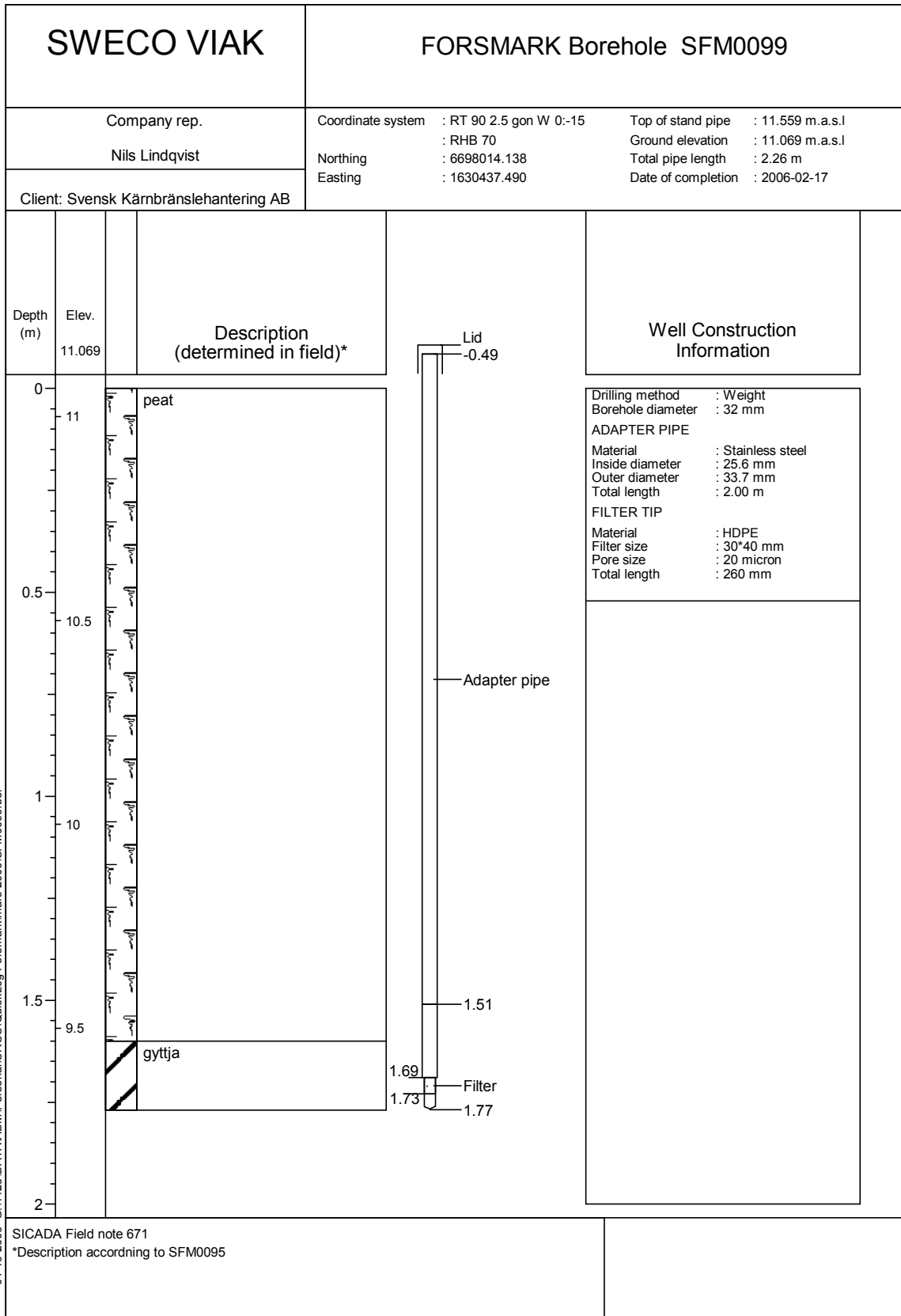
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SWECO VIAK		FORSMARK SFM0100	
Company rep. Nils Lindqvist		Coordinate system : RT 90 2.5 gon W 0:-15 : RHB 70 Northing : 6698015.303 Easting : 1630437.106	Top of stand pipe : 11.479 m.a.s.l Ground elevation : 11.039 m.a.s.l Total pipe length : 2.30 m Date of completion : 2006-02-17
Client: Svensk Kärnbränslehantering AB			
Depth (m)	Elev. (m.a.s.l) 11.039	Description (determined in field)*	Well Construction Information
0	11	peat	Drilling method : Weight Borehole diameter : 63 mm ADAPTER PIPE Material : HDPE Inside diameter : 50 mm Outer diameter : 63 mm Total length : 2.00 m FILTER TIP Material : HDPE Filter size : 165*40 mm Pore size : 20 micron Total length : 300 mm
0.5	10.5		
1	10		
1.5	9.5	gyttja	
2			
SICADA Field note 671 *Description according to SFM0095			

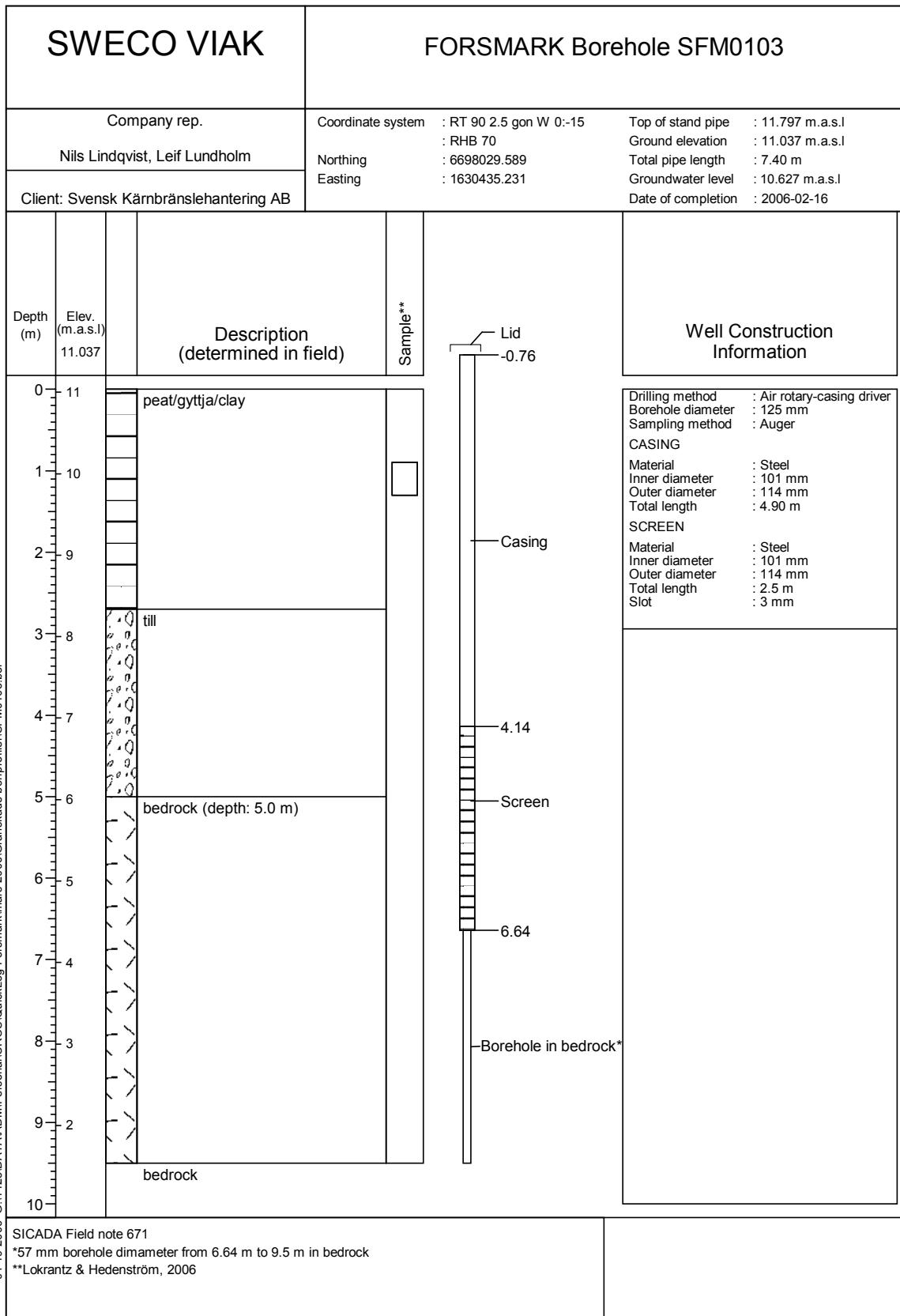
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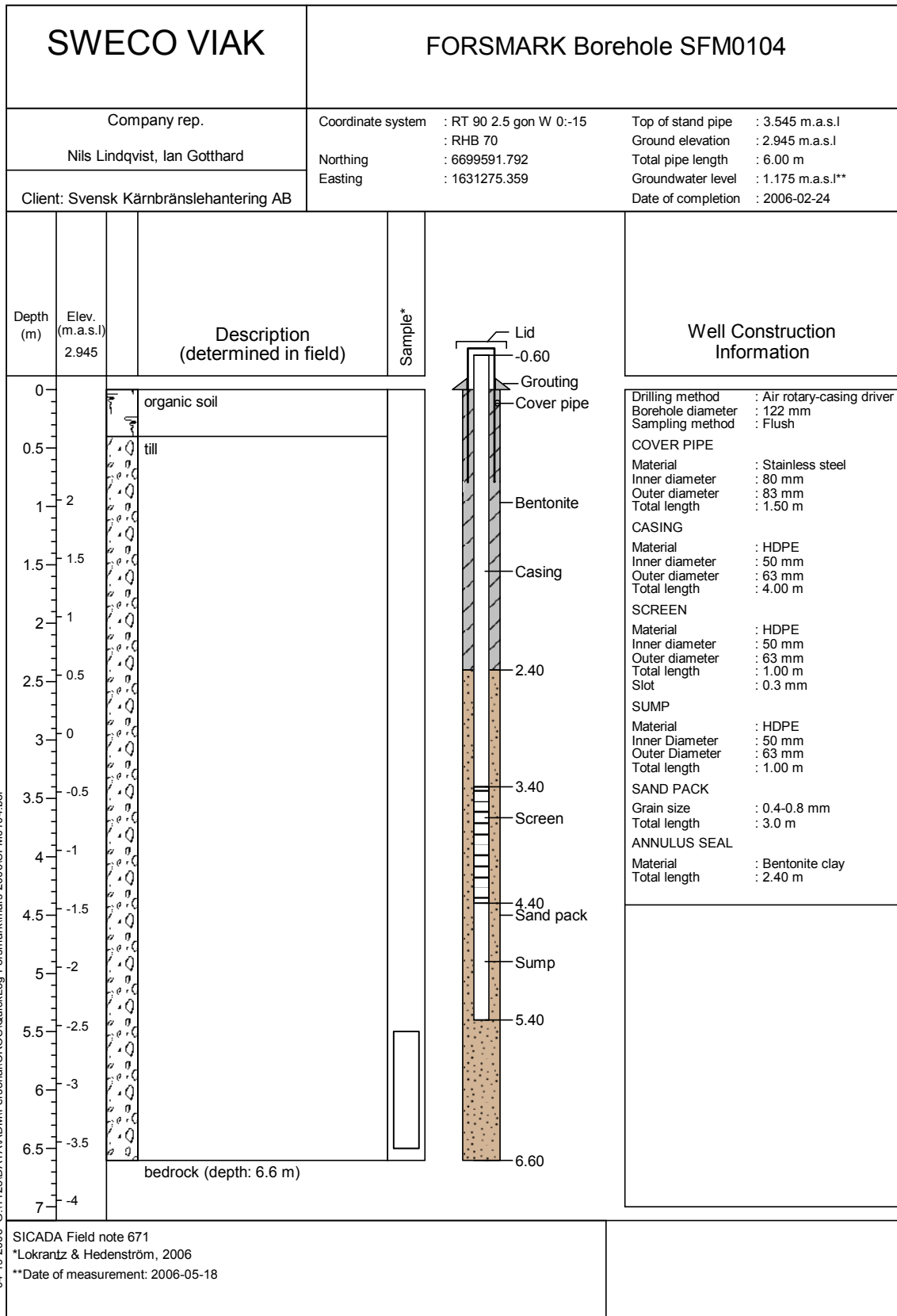
SWECO VIAK		FORSMARK Borehole SFM0101	
Company rep. Nils Lindqvist		Coordinate system : RT 90 2.5 gon W 0:-15 : RHB 70	Top of stand pipe : 12.040 m.a.s.l Ground elevation : 11.010 m.a.s.l
Client: Svensk Kärnbränslehantering AB		Northing : 6698014.510 Easting : 1630437.853	Total pipe length : 2.26 m Date of completion : 2006-02-17
Depth (m)	Elev.	Description (determined in field)*	Well Construction Information
0	11.010	peat	
0.5	1.5		
1	10		Drilling method : Weight Borehole diameter : 32 mm ADAPTER PIPE Material : Stainless steel Inside diameter : 25.6 mm Outer diameter : 33.7 mm Total length : 2.00 m FILTER TIP Material : HDPE Filter size : 30*40 mm Pore size : 20 micron Total length : 260 mm
1.5	9.5		
2			
SICADA Field note 671 *Description according to SFM0095			

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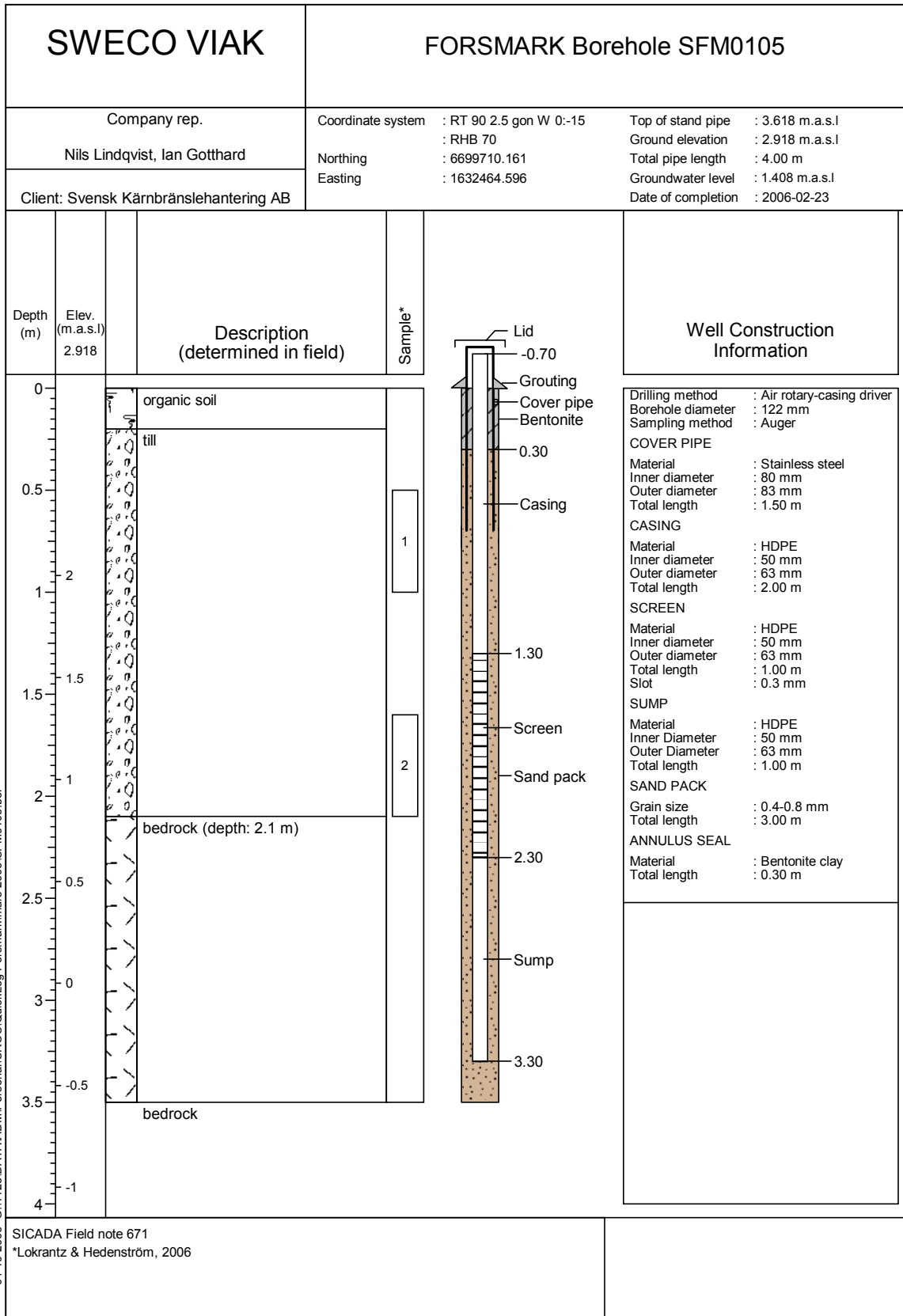
SWECO VIAK		FORSMARK SFM0102	
Company rep. Nils Lindqvist		Coordinate system : RT 90 2.5 gon W 0:-15 : RHB 70 Northing : 6698015.496 Easting : 1630437.551	Top of stand pipe : 12.034 m.a.s.l Ground elevation : 11.044 m.a.s.l Total pipe length : 2.30 m Date of completion : 2006-02-17
Client: Svensk Kärnbränslehantering AB			
Depth	Elev. (m.a.s.l) 11.044	Description (determined in field)*	Well Construction Information
0	11	peat	
0.5	10.5		
1	10		
1.5	9.5		
2			
SICADA Field note 671 *Description according to SFM0095			

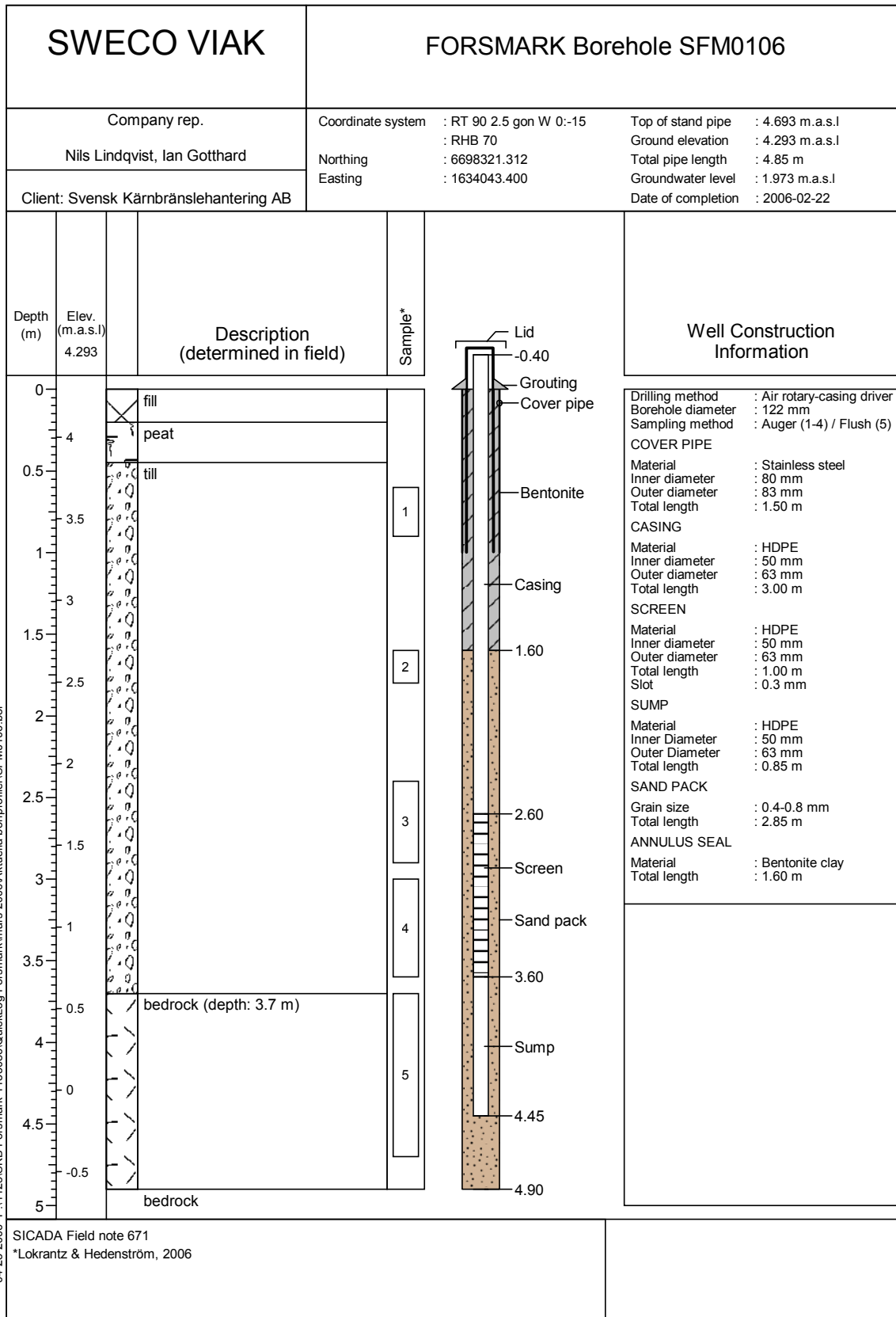
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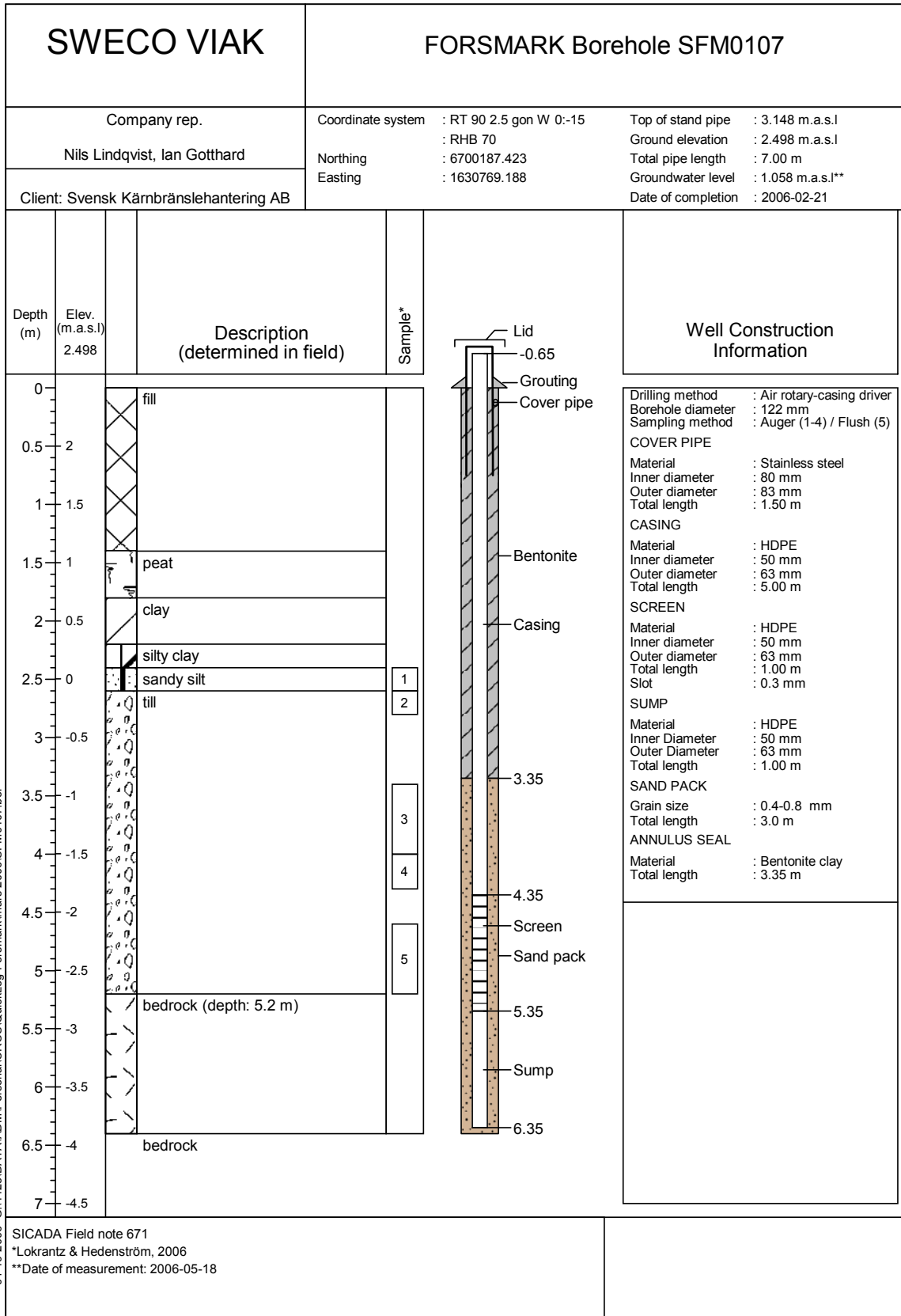


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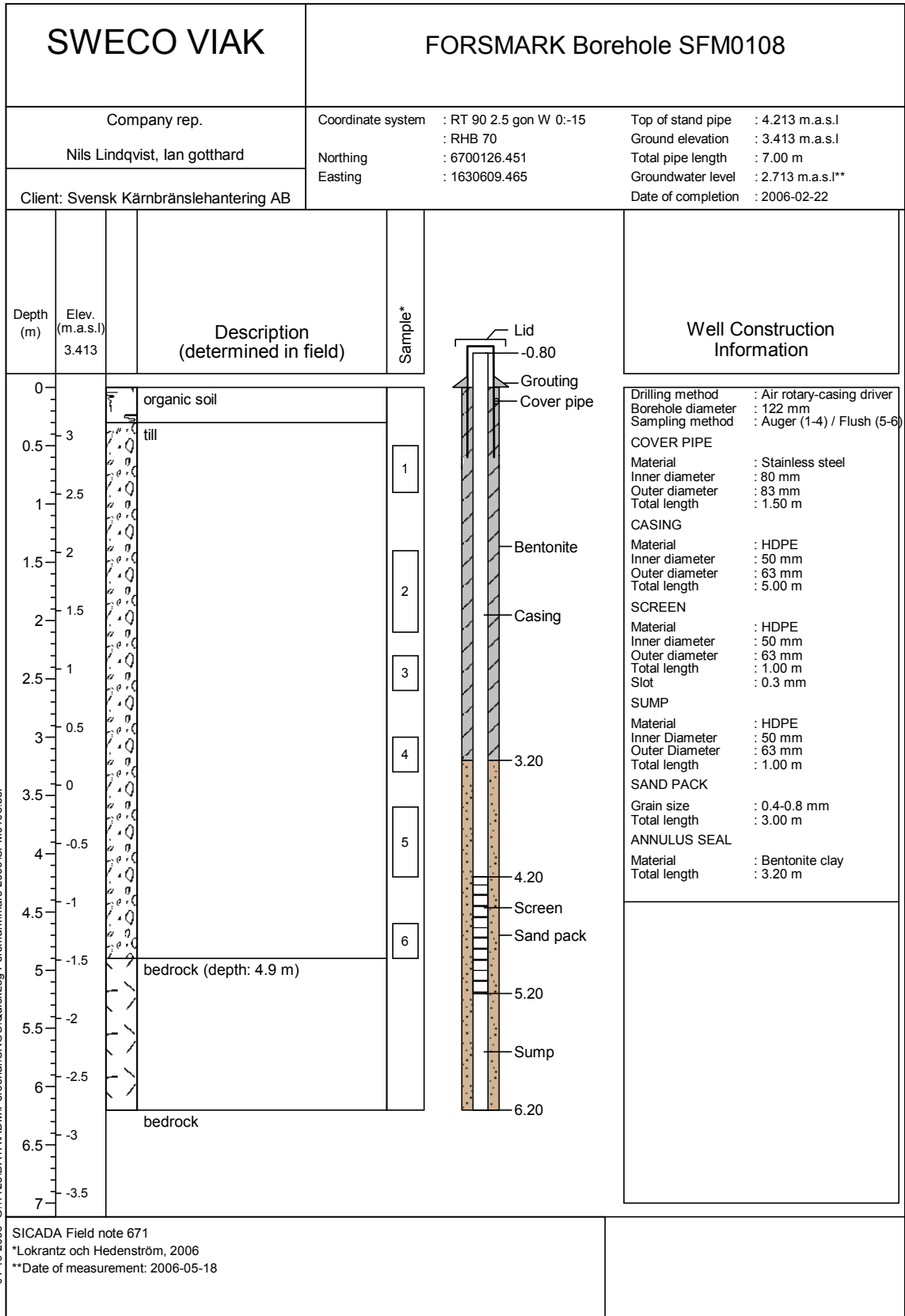




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Photographs of all boreholes

Borehole SFM0077

After



Borehole SFM0078

After



Borehole SFM0079

After



Boreholes SFM0081–0083

Before



After

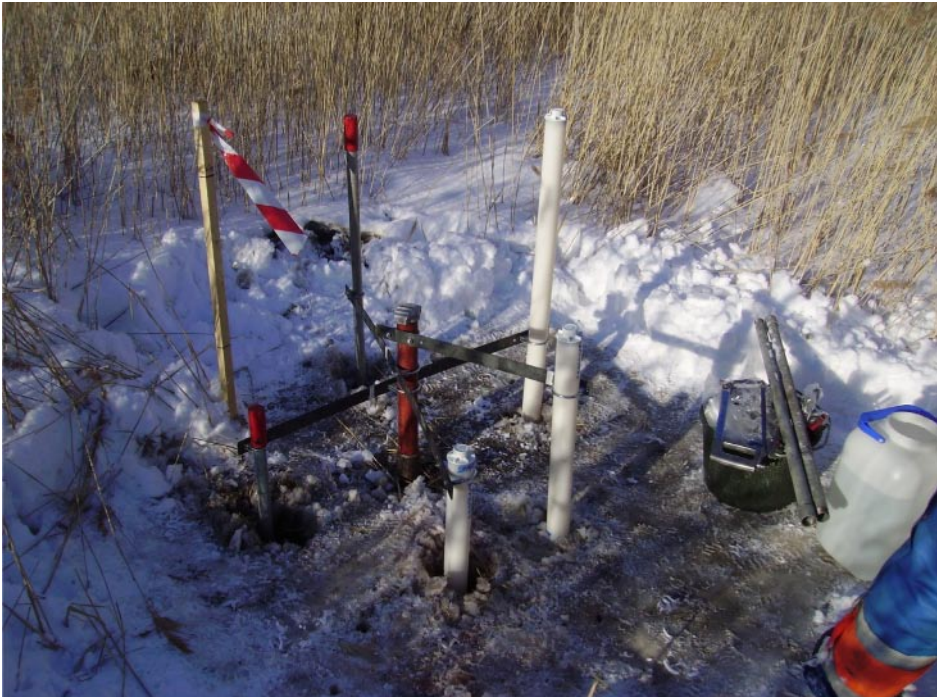


Boreholes SFM0084–0089

Before



After



Borehole SFM0090

Before



After



Boreholes SFM0091-0093

Before



After



Borehole SFM0094

Before



After



Boreholes SFM0095–0097, SFM0099–0102

Before



After



Borehole SFM0103

Before



After



Borehole SFM0105

Before



After



Borehole SFM0106

Before



After



Borehole SFM0108

Before



After

