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SwedPower AB

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Svensk Kärnbränslehantering AB
Swedish Nuclear Fuel
and Waste Management Co
Box 5864
SE-102 40 Stockholm Sweden
Tel 08-459 84 00
+46 8 459 84 00
Fax 08-661 57 19
+46 8 661 57 19

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Abstract

This report presents the results from the Boremap mapping of telescopic drilled borehole KFM06A and core drilled borehole KFM06B. The boreholes are located north of the lake Bolundsfjärden, in the northeastern part of Forsmark candidate area, and plunges 60° and 85°, respectively, towards NW. The main purpose for the location of these boreholes was to investigate the existence of N–S and NE–SW trending, brittle deformation zones in the area. The full length of KFM06A is 1,000.64 metres, and the BIPS-images of the percussion- and core-drilled part cover the intervals 12.00–99.36 and 102.13–998.43 metres, respectively. KFM06B has a total length of 100.33 metres, and the BIPS-image covers an interval between 6.34 and 97.7 metres. All structures and lithologies intersected by the BIPS-logged interval have been documented in detail by integrating information from the drill core and the BIPS-image.

Lithologically, KFM06B and the upper 580 metres of KFM06A are dominated by a medium-grained metagranite with a tendency to be slightly granodioritic. The remaining part of KFM06A consists mainly of fine- to finely medium-grained metagranitoids of granitic to granodioritic compositions and a more or less continuous occurrence of fine-grained, whitish leucogranite that extends from 755 to 966 metres. This whitish rock is believed to be the result of intense albitization, and the inferred protolith comprises aplitic metagranite with subordinate amounts of the medium-grained metagranite. Other frequent rock units within the boreholes include various amphibolites and dykes or veins of pegmatite, aplitic granite and leucogranite. Virtually all rocks have undergone Svecofennian metamorphism under amphibolite facies conditions.

Structurally, KFM06A and KFM06B is characterised by composite L-S fabrics, with a general predominance of linear mineral fabrics. Totally 33 sections with more intense ductile and brittle-ductile deformation have been registered in the two boreholes, and a majority of these are concentrated to a rather short interval between 409 and 436 metres. The widths of individual zones are typically up to few decimetres. A faint to weak oxidation or red pigmentation of feldspars has affected most of KFM06B and the upper 360 metres of KFM06A. Also a few minor occurrences of vuggy and quartz-deficient granite have been noted in the most intensely oxidized intervals.

The total number of fractures registered in KFM06B and the cored part of KFM06A is 4,239. Most of these fractures are inferred to be sealed and the average frequency of open and partially open fractures is 1.1 fractures/meter. Three rather distinct fracture sets can be distinguished in the boreholes. The most obvious set consists of NE–SW striking, steeply dipping fractures, typically filled by a mineral assemblage of laumontite + calcite + chlorite + hematite stained adularia ± pyrite ± quartz. Most of them are inferred to be sealed. This is also the mineral assemblage of the second fracture set, which mainly occurs in the lowermost 300 metres of KFM06A, and consists of WSW striking fractures that dips steeply towards NNW. Tectonic breccias and the most frequently registered sealed networks belong to these two fracture groups. A third, well-defined fracture group, preferentially observed in KFM06B and the upper 360 metres of KFM06A, consists of sub-horizontal to gently dipping fractures. A majority of these fractures are inferred to be open, a few with apertures that exceed one centimetre. Eight minor crush zones belong to this group. Infillings of clay minerals and asphalt are broadly limited to this fracture set.

Sammanfattning

Föreliggande rapport redovisar resultaten från Boremap-karteringen av teleskopborrhål KFM06A och kärnborrhål KFM06B. Borrhålen är borrade strax norr om sjön Bolundsfjärden, i nordöstra delen av Forsmarksområdet, och stupar 60° respektive 85° mot nordväst i syfte att undersöka förekomsten av N–S och NO–SV orienterade, spröda deformastionszoner i området. Den totala längden av KFM06A är 1 000,64 meter och BIPS-bilden över de hammar- och kärnborrade delarna täcker längdintervallen 12,00–99,36 respektive 102,13–998,43 meter. KFM06B har en total längd på 100,33 meter och BIPS-bilden täcker ett intervall mellan 6,34 och 97,7 meter. Alla strukturer och litologier som förekommer i det BIPS-loggade intervallet har dokumenterats i detalj genom att integrera information från borrkärnan och BIPS-bilden.

Litologiskt domineras KFM06B och de övre 580 metrarna av KFM06A av en medelkornig metagranit som tenderar att vara något granodioritisk. Den resterande delen av KFM06A upptas huvudsakligen av fin- till fint medelkorniga metagranitoider av granitisk till granodioritisk sammansättning, samt en mer eller mindre kontinuerlig förekomst av finkornig, vitaktig leucogranit som sträcker sig från 755 till 966 meter. Denna vitaktiga bergart anses vara resultatet av intensiv albitisering och den förmodade protoliten utgörs av aplitisk metagranit, med inslag av medelkornig metagranit. Andra vanligt förekommande bergarter i borrhålen inkluderar olika amfiboliter och mindre gångar av pegmatit, aplitisk granit och fin- till fint medelkornig leucogranit. I det närmaste alla bergarter har genomgått Svekofennisk amfibolitfacies-metamorfos.

KFM06A och KFM06B karaktäriseras av en sammansatt L-S-struktur, med en förhärskande stänglighetskomponent. Totalt har 33 mindre zoner med plastisk och spröd-plastisk deformation registrerats i de två borrhålen. En majoritet av dessa är koncentrerade till ett relativt snävt intervall mellan 409 och 436 meter. Bredden på enskilda zoner är generellt upp till några decimeter. Svag till mycket svag oxidation eller rödfärgning av fältspater har påverkat större delen av KFM06B och de 360 översta metrarna av KFM06A. Även ett fåtal mindre förekomster av hålrumsförande och kvartsfattig granit har noterats i de kraftigast oxiderade intervallen.

Det totala antalet registrerade sprickor i KFM06B och den kärnborrade delen av KFM06A och är 4239. De flesta sprickor är läkta och antalet öppna och delvis öppna sprickor är endast 1,1 sprickor/meter. Tre relativt distinkta sprickgrupper kan urskiljas i borrhålen. Den mest tydliga gruppen består av NO–SV strykande sprickor med brant stupning, som ofta är fyllda av laumontit + kalcit + klorit + hematit impregnerad adularia ± pyrite ± quartz. De flesta av dessa sprickor är registrerade som läkta. Dessa mineral dominerar också i en annan väldefinierad sprickgrupp, som huvudsakligen uppträder i de understa 300 metrarna av KFM06A, och består av VSV strykande sprickor som stupar brant mot NNV. En tredje väldefinierad grupp, som huvudsakligen uppträder i KFM06B och de övre 360 metrarna av KFM06A, består av sub-horisontella till flackt stupande sprickor. Flertalet av dessa sprickor är registrerade som öppna, några med öppningar på över en centimeter. Tre mindre krosszoner ingår i denna grupp. Sprickfyllnader av lermineral och bergbeck är i stort sett begränsade till denna grupp.

Contents

1 Introduction

Since 2002, SKB investigates two potential sites at Forsmark and Oskarshamn, for a deep repository in the Swedish Precambrian basement. In order to characterise the bedrock down to a depth of about 1 km in the central part of the candidate area at Forsmark, three deep telescopic boreholes were drilled. Each borehole starts with 100 metres of percussion drilling, followed by core drilling down to about 1,000 metres depth. To obtain drill cores for the upper 100 metres, additional boreholes were drilled adjacent to telescopic boreholes at drilling site (DS) 1 and 3. After completion of these initial drillings, SKB launched a more extensive, complementary drilling programme, aiming to solve more specific geological issues. An important aspect when localizing one of these boreholes, KFM06A was to investigate the existence of N–S and NE–SW trending, brittle deformation zones in the north-eastern part of the candidate area (Figure 1-1), as suggested by topographic and magnetic data /cf SKB, 2002/. Consequently, the borehole was drilled close to the small lake Puttan, north of Bolundsfjärden with 60° inclination towards northwest. The borehole is a telescopic borehole (cf SKB MD 620.004), identical with the five previous deep boreholes in the area, with a total length of about 1,000 metres. An additional borehole, KFM06B, was drilled at DS6 to obtain a 100 metres long, complimentary drill core for the upper, percussion drilled part of KFM06A. The drilling activities in KFM06B and KFM06A were finished during June and September 2004, respectively. The geological logging of KFM06B started in August 2004. However, instabilities in the borehole wall lead to a seven month break, and the logging was not completed until reinforcement during March 2005. KFM06A was mapped during November and December 2004.

A detailed geological logging of the drill cores obtained through the drilling programs is essential for subsequent sampling and borehole investigations, and consequently, for the three-dimensional modelling of the site geology. For this purpose, the so-called Boremap system has been developed. The system integrates results from geological drill core logging, or alternatively, the drill cuttings when a core is not available, with information from BIPS-logging (Borehole Image Processing System) and calculates the absolute position and orientation of fractures and various planar lithological features (SKB MD 143.006 and 146.005).

This report presents the results from the geological logging of KFM06A and KFM06B. The work was carried out in accordance with activity plan AP PF 400-04-105. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are part of SKB's internal controlling documents.

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

Activity plan	Number	Version
Boremapkartering av teleskopborrhål KFM06A och kärnborrhål KFM06B	AP PF 400-04-105	1.0
Method documents	**Number**	**Version**
Metodbeskrivning för Boremap-kartering	SKB MD 143.006	1.0
Nomenklatur vid Boremap-kartering	SKB MD 143.008	1.0
Mätsystembeskrivning för Boremapkartering, Boremap v 3.0	SKB MD 146.005	1.0

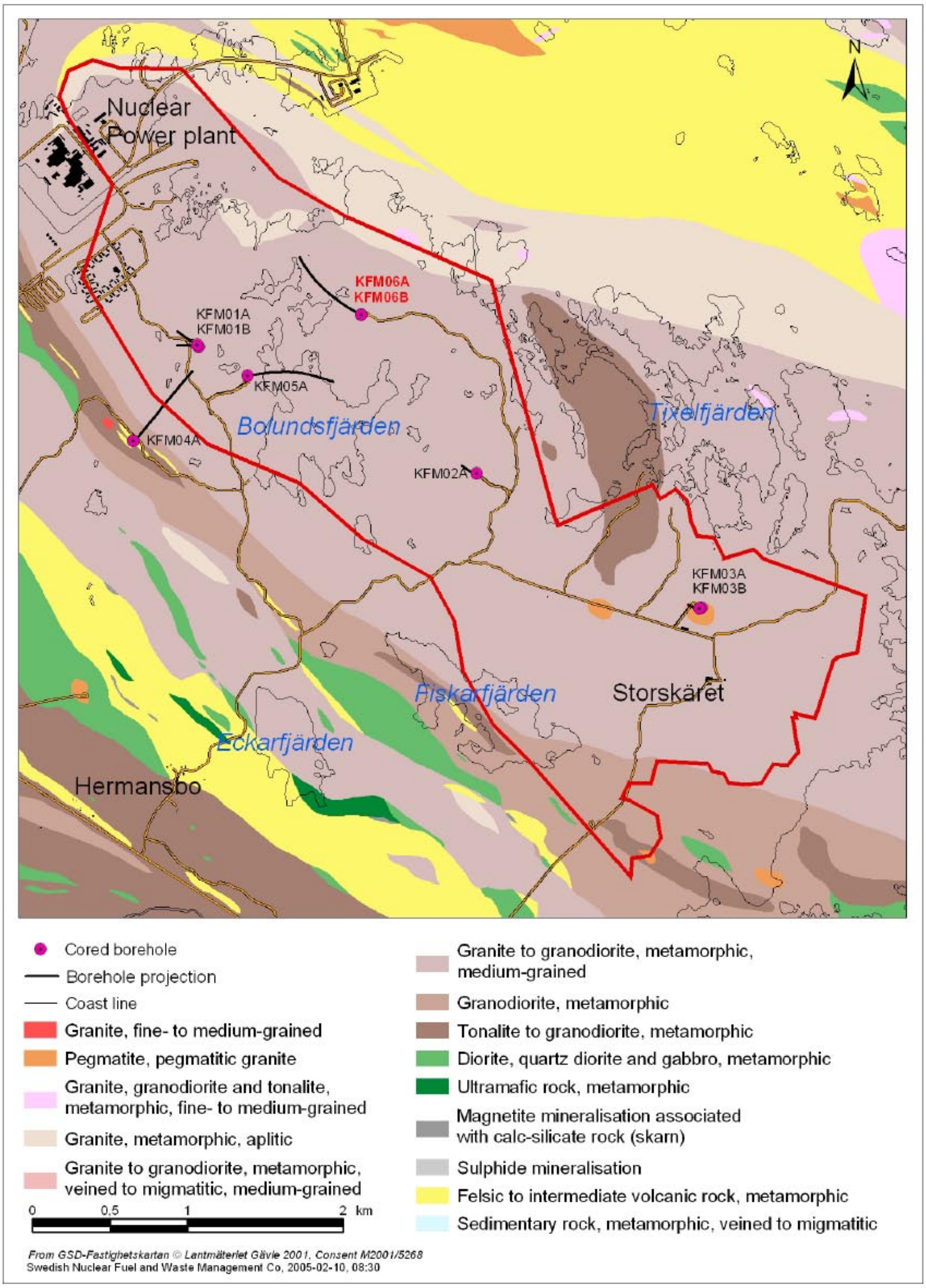

***Figure 1-1.** Generalized geological map showing Forsmark candidate area and the projections of cored boreholes KFM01A+B, KFM02A, KFM03A+B, KFM04A, KFM05A and KFM06A+B.*

2 Objective and scope

Borehole KFM06A starts with percussion drilling (Ø = 165 mm) to a length of 100.64 metres, followed by core drilling at Ø = 86 mm to a length of 102.01 metres, and at Ø = 77 mm down to full borehole length at 1,000.64 metres. The diameters of the two drill cores are 70 and 51 mm, respectively. The soil cover is about 1.8 metres and the BIPS-image from the upper, percussion drilled part of the borehole covers the length interval 12.00–99.36 metres. The interval usable for geological logging starts at 13.05 metres, although the resolution is poor down about 52 metres. Drill cuttings were collected at one-metre intervals between 3.0 and 100.0 metres. This material should only be used to support the BIPS-mapping and the engagement does, therefore, not include a detailed geological logging of the drill cuttings. The BIPS-image used for geological logging of KFM06A covers the length interval 102.13–998.43 metres, after length adjustment.

The core material from borehole KFM06B includes a stout (Ø = 70 mm) drill core from the length interval 5.70–6.34 metres, followed by drill core with a diameter of 51 mm down to full borehole length at 100.33 metres, though the BIPS-image ends at about 97.7 metres. The BIPS-logging of KFM06B was obstructed by an instable crush zone in the central part of the borehole. The first BIPS-logging of KFM06B yielded, therefore, only a usable image down to a borehole length of about 55.2 metres, before the log got stuck. The remaining part of the borehole was logged after reinforcement by perforated metal plates. These plates screen the borehole wall in the length interval 54.71–56.36 metres.

The aim of the geological logging is to obtain a detailed documentation of all structures and lithologies intersected by the BIPS-logged intervals of borehole KFM06A and KFM06B. These data will serve as a platform for forthcoming analyses of the drill cores, aimed at investigating geological, petrophysical and mechanical aspects of the rock volume, as well as site descriptive three-dimensional modelling.

3 Equipment

3.1 Description of equipment and interpretation tools

All BIPS-based mapping was performed in Boremap. This software contains the bedrock and mineral standard used by the Geological Survey of Sweden (SGU) for geological mapping of the surface at the Forsmark investigation site, to enable correlation with the surface geology. The Boremap versions used during mapping of KFM06A are v 3.4.4 down to a borehole length of about 680 metres, and below that, v 3.4.5. Borehole KFM06B, on the other hand, was mapped by using v 3.4.3 down to 55.2 metres, and v 3.6 in the remaining part, down to 97.7 metres. Additional software used during the course of the geological logging was BIPS Viewer v 1.10 and Microsoft Access. The final data presentation was made by Geoplot and WellCAD v 3.2.

The following equipment was used to facilitate the core logging: folding rule, concentrated hydrochloric acid diluted with three parts of water, unglazed porcelain plate, knife, hand lens, paintbrush and tap water.

4 Execution

4.1 General

During the core logging, the 1,000 metres drill core obtained from the interval 6.34–100.33 metres of KFM06B and 100.64–1,000.64 metres of KFM06A was available in its full length on roller tables in the core-mapping accommodation at Forsmark (the Llentab hall, near the SKB/SFR-office). The BIPS-based mapping of KFM06A was preceded by an overview mapping made by Kenneth Åkerström. No thin-sections were available from the drill cores, and all lithological descriptions are based on ocular inspection. Four geologists from SwedPower AB, Johan Berglund, Jesper Petersson, Göran Skogsmo and Anders Wängnerud, were involved in the BIPS-based mapping. Most of the mapping was done by two geologists at a time, forming a core logging team. However, to speed up the mapping at the prospect of a single-hole interpretation meeting in January 2005, two teams were working parallel part of the time.

The core logging of KFM06A and KFM06B was performed in Boremap v 3.4.2–3.4.5 and 3.6 according to activity plan AP PF 400-04-105 (SKB internal document) following the SKB method description/instruction for Boremap mapping, SKB MD 143.006 (v 1.0) and 143.008 (v 1.0). A WellCAD summary of the mapping is presented in Appendix 1.

4.2 Preparations

The length registered in the BIPS-image deviates from the true borehole length with increasing depth, and the difference at the bottom of the borehole is about 5 metres. It was therefore necessary to adjust the length with reference to groove millings cut into the borehole wall at every 50 metres, with the deepest slot at a length of 980 metres. The precise level of each reference mark can be found in SKB's database SICADA (Appendix 4). However, the adjusted length is still not completely identical with the one given in the drill core boxes, as the core recovery may yield erroneous lengths. The difference is typically a few centimetres, but may locally exceed 1 dm.

Data necessary for calculations of absolute orientation of structures in the borehole includes borehole diameter, azimuth and inclination, and these data were collected from SKB's database SICADA (Appendices 2 and 3). Corrections for the borehole deviation were done at every twelfth metre.

4.3 Data handling

To obtain the best possible data security, the mapping was performed on the SKB intranet, with regular back-ups on the local drive.

To avoid that some broken fractures become unregistered, the number of broken fractures in the drill core was regularly checked against the number of registered fractures. The quality routines include also daily controls of the mapping by detailed examination of Boremap generated variable/summary reports and WellCad log to match. The final quality check of the mapping was done by a routine in the Boremap software. The data were subsequently exported to the SKB database SICADA and stored under field note no Forsmark 255, 429, 456, and 461.

4.4 Analyses and interpretations

The Boremap system has obviously some limitations, since all geological features must be represented by intersecting planar surfaces. Non-planar structures, such as small scale folding, linear objects (e.g. mineral lineation) and curved fractures can, therefore, not be correctly documented. The major problem is curved structures (e.g. fractures), which run almost parallel with the borehole axis. During the mapping sessions of KFM06A and KFM06B such features were normally approximated by fitting the plane after one of their ends in the borehole. The fact that some of these structures do not actually intersect the borehole is only noted in the attached comments.

Another problem with the core logging system is related to geological features (mainly fractures) that can be observed only in the drill core. This problem usually arises from poor resolution in the BIPS-image, which in the present case often is caused by the occurrence of suspension from drilling and/or brownish black coating from the drilling rod on the borehole walls. However, even in the most perfect BIPS-image, it is sometimes difficult to distinguish a thin fracture, sealed by a low contrast mineral. All fractures observed in the drill core, but not recognised in the BIPS-image, have been registered as 'not visible in BIPS' in Boremap, to prevent them from being used in forthcoming fracture orientation analysis. Fractures supposed to be induced by the drilling activities fall within this category. Obviously drilling-induced fractures are not included in the mapping. Furthermore, it must be emphasized that none of the geological features registered in the reinforced interval of KFM06B (i.e. 54.71–56.36 metres) are oriented.

Even though reliable measurements of fracture widths/apertures less than 1 millimetre are possible to obtain in the drill core, it is often beyond the resolution of the BIPS-image. The minimum width/aperture given is therefore 0.5 mm. However, if the fracture width measured in the drill core is much less than 0.5 mm, it is normally noted in the attached comment.

The fracture mapping focuses on the division into broken and unbroken fractures, depending on whether they are parting the core or not. Broken fractures include both open fractures and originally sealed fractures, which were broken during the drilling. To decide if a fracture actually was open or sealed in the rock volume (i.e. in situ), SKB has developed a confidence classification expressed at three levels, 'possible', 'probable' and 'certain', which is based on the weathering of the fracture surface and fit of the fracture planes. The criteria for this classification are given in SKB method description for Boremap mapping, SKB MD 143.006 (v 2.0).

Up to four infilling minerals can be registered in the database for each fracture. As far as possible, they are given in order of decreasing abundance in the fracture. Additional minerals, which occur in a few fractures, are noted in the attached comment. However, it must be emphasized that this provides no information of the volumetric amount of individual minerals. In a fracture with two minerals, the mineral registered as 'second mineral' may range from sub-microscopic staining up to amounts equal to that of the mineral registered as 'first mineral'. Hematite, for example, which is found in more than 12% of the registered fractures in the cored interval of KFM06A, occur consistently as extremely thin coatings or impurities in other fracture minerals.

All fractures in the upper percussion drilled part of KFM06A were mapped as broken fractures with a possible aperture of at least 0.5 mm. Generally, it was not possible to distinguish individual minerals in the fractures, and the vast majority was mapped as 'unknown mineral'. However, in a few wide fractures it was actually possibly to distinguish calcite, oxidized walls and quartz in the BIPS-image.

4.5 Nonconformities

A large amount of the fractures intersected by KFM06A are sealed by laumontite (Ca-zeolite). These fractures occur as both broken and unbroken, but dehydration of laumontite tends produce volumetric changes, and the sealing will eventually crackle and break the drill core. Thus, all laumontite-bearing fractures suspected to have been sealed originally are registered as unbroken.

Some fracture filling minerals are more conspicuous than other. For example, the distinct red tinting shown by sub-microscopic hematite reveals extremely low concentrations of the mineral. Also the use of diluted hydrochloric acid for identification of calcite makes it possible to detect amounts that are macroscopically invisible. The amount of fractures filled with other less conspicuous minerals may, on the other hand, be underestimated.

As in previous cored boreholes, the mapping was locally hampered by suspended drill cuttings, brownish black coatings on the borehole walls as well as turning of the borehole walls. The moderate plunge of the last 200 metres of KFM06A (< 54°) in combination with the turning have locally led to mottling of the BIPS-image. Geological structures (e.g. fractures) depicted in these mottled intervals are typically highly distorted, and the registered orientations may, consequently, differ greatly from the actual orientations. However, the amount of dark coating is generally less than in the first four boreholes in the area. This coating phenomenon is obviously drill induced, and the explanation proposed by /Askling and Odén, 2004/ is that the coatings originate from metal fragments abraded from the drill rods.

The BIPS-image of the uppermost 52 metres of the percussion drilled part of KFM06A is generally hazy and of poor quality due to suspended drill cuttings. Thus, far from all fractures present in this interval is distinguishable. The most aggravating example is a major crush zone registered as a distinct caliper anomaly at about 50–51 metres. This zone is also found at approximately the same level in KFM06B. However, the BIPS-image reveals only a few vaguely defined fractures in this interval. It seems, therefore, that the registered fracture frequency in the percussion drilled part of KFM06A is more dependent on the quality of the BIPS-image than on the actual presence of fractures, especially in the uppermost 52 metres. Drill cuttings from the latter interval indicate also varying degrees of oxidation. However, the BIPS-image cannot be used to establish the exact extent of this oxidation.

Both during the mapping and the subsequent work with the mapping data, we noted a number of inexplicable errors in the database. These were all corrected, though there might still be unnoticed errors. We disclaim the responsibility for all such errors caused by the shortcomings in the software.

During the drilling of KFM06A a core sample of between 0.3 and 0.4 metres were immediately removed, approximately every 50 metres. The samples were sent to University of Bern, Switzerland, for analyses of pore water chemistry (AP PF 400-04-70). Two additional samples were removed before the geological logging from KFM06B (68.96–69.06 and 90.62–90.85 metres length) for fracture mineral analysis (AP PF 400-04-32). None of these intervals were possible to map in detail. Nevertheless, all geological features visible in the BIPS-image were registered, but with an attached comment, explaining that no drill core was available during the mapping.

5 Results

5.1 Core lithology

Down to a borehole length of about 580 metres, KFM06A is dominated by a medium-grained metagranite (rock code 101057) with a tendency to be slightly granodioritic. This is also the volumetrically most important rock type in KFM06B. The remaining part of KFM06A down to almost 1,000 meters consists mainly of fine- to finely medium-grained metagranitoids of granitic to granodioritic compositions (rock codes 101051, 101058 and 111058) and a more or less continuous occurrence of fine-grained, whitish leucogranite that extends from 755 to 966 metres. This whitish rock is assumed to be the result of intense albitization. However, it must be emphasized that this still is based on ocular observation and remains to be verified by microanalysis. Although the pervasive alteration has rendered the recognition of the protolith almost impossible, it is inferred that the affected interval comprises aplitic metagranite (rock code 101058) with subordinate amounts of the medium-grained metagranite (rock type 101057). Other frequent rock units within the borehole, none forming occurrences more than a few metres in length, include various amphibolites and dykes or veins of pegmatite, pegmatitic granite and leucogranite. Except for some late veins or dykes, all rocks have experienced Svecofennian metamorphism under amphibolite facies conditions.

The medium-grained metagranite(-granodiorite) (rock code 101057) is closely similar to the predominant variety of metagranite in the previously drilled deep boreholes located in the tectonic lens of the Forsmark area /i.e. rock domain RFM029; cf SKB, 2004/ /Petersson and Wängnerud, 2003; Petersson et al. 2003a,b, 2004a,b/. In KFM06A and KFM06B, it occupies about 50% and 86% of the logged drill core, respectively. Texturally, the rock is rather equigranular with elongated quartz domains, alternating with feldspar-dominated domains and thin streaks of biotite. The colour of the rock varieties ranges from greyish red to grey, though completely grey varieties, lacking the reddish tint, are sparse and typically associated with amphibolites. Minor sections variably speckled by fine-grained, whitish plagioclase occur sporadically throughout the borehole. Microscopic examination of similar rocks from KFM01A and KFM03A suggests that the feature is a result of retrograde sericitization /Petersson et al. 2004c/.

The whitish, fine-grained rock of inferred metasomatic origin is limited to the length interval between 755 to 966 metres of KFM06A. The interpretation that the rock has been subjected to intense albitization is based on the following facts: (1) Whitening of feldspars, as an effect of strong albitization, is a well-known phenomenon in granitic rocks /e.g. Kamineni and Dugal, 1982; Baker, 1985; Petersson and Eliasson, 1997/. (2) Similar whitened rocks from surface outcrops in the area are typically enriched in Si and Na at the expense of K and Ca (M. Stephens, unpubl data). However, defining the relative intensity of the albitization is more difficult. Thus, except for the uppermost 13 metres of the interval, where the intensity decreases towards the apparently unaltered medium-grained metagranite, all whitened rock has been mapped as 'strongly albitized'. The alteration appears to be pre- or syn-metamorphic with no apparent relationship to existing brittle structures. Original magmatic textures are mostly masked or have been obliterated by the alteration. Only the ferromagnesian phases (i.e. biotite and magnetite) give indications of the textural character of the rock (Figure 5-1a). Generally, they occur as disseminations, tiny spots (less than 1–2 mm in diameter) or define a vague banding.

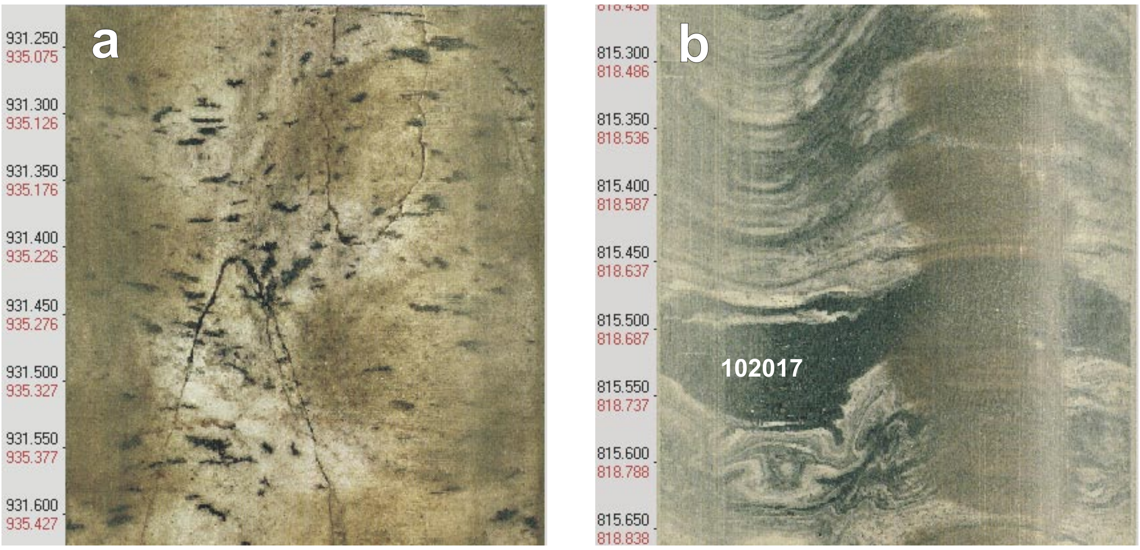

Figure 5-1. *BIPS-images showing two varieties of the whitish, fine-grained rock of inferred metasomatic origin in KFM06A. (a) Biotite spotted variety from length interval 935.04–935.45 metres. Note the fractures that run more or less parallel with borehole axis. (b) Banded and folded variety from length interval 818.43–818.85 m. Also a streak of amphibolite, marked 102017.*

Based on the distribution of the ferromagnesian minerals it was inferred that the rock is an alteration product of aplitic metagranite (rock code 101058) and medium-grained metagranite (rock code 101057). Some of the more distinctly banded interval is, however, reminiscent of a volcanic protolith (Figure 5-1b). However, it has not been practically possible to separate this rock from other fine-grained varieties, and all these varieties of the whitened rock are, therefore, recorded as aplitic metagranite. Some late veins or dykes of pegmatitic granite and fine- to finely medium-grained metagranitoids seem not to have been affected by the alteration. This conclusion is, however, based on the well-preserved igneous texture rather than the character of the feldspars.

A fine-grained, distinctly foliated metagranite, which might be a likely precursor to the fine-grained varieties of the whitened alteration rock described above, is mainly found in a rather continuous length interval at 635–698 metres in KFM06A. This rock has been mapped as 'aplitic metagranite' (rock code 101058), though it differs from the typical 'Klubbudden aplite' exposed north of the boreholes /cf Bergman et al. 2004/, by its higher content of biotite. Generally, the rock is equigranular and reddish grey in colour. A notable feature restricted to this rock is the presence of ptygmatically folded pegmatite veins (Figure 5-2).

Fine- to finely medium-grained, rather equigranular metagranitoids (rock code 101051) occupy 5.9% of the mapped drill cores. Most rocks in this group are of granodioritic composition and show sharp, intrusive contacts towards the wall rock. Although typically discordant, there are few contacts that differ from the general foliation pattern in orientation (Figure 5-3). There are, however, a few gradational contacts over some centimetres into the surrounding, medium-grained metagranite. The rock colour ranges from dark grey to red. Minor intrusives of this rock, all less than a few meters in width, are found throughout KFM06A. However, about half of the total volume of this rock material is concentrated into two major length intervals at 582–598 and 610–625 metres.

Figure 5-2. *BIPS-image from the length interval 638.13–638.84 metres of KFM06A, illustrating the ptygmatic pegmatite veins in the fine-grained, distinctly foliated metagranite.*

Dykes, veins and segregations of pegmatite, pegmatitic granite, aplite and leucogranitic material are frequent throughout the borehole, and the rock group occupy slightly more than 17% of the mapped drill cores. Most occurrences are some decimetre or less, but several pegmatites/pegmatitic granites reach up to a few metres in width. The pegmatitic granites are generally texturally heterogeneous, often with a highly variable grain-size, and some occurrences include intervals of finely medium-grained, equigranular granite. Rather coarse magnetite, and subordinately hematite, has been identified in some pegmatites. Despite the textural variability and temporal span within this unit, most of these rocks were grouped as 'pegmatite, pegmatitic granite' (rock code 101061). Considering the orientations of the pegmatites and pegmatitic granites, the vast majority are oriented parallel with the structures at the surface (cf Figure 5-11g in /Stephens et al. 2003/) and tends to fall along a π-circle, the pole to which plunges moderately towards SE (Figure 5-3). Rocks not included among the pegmatitic material are dyke-like occurrences of fine- to finely medium-grained, equigranular leucogranites (rock code 111058) and some minor aplites. Together, these rocks constitute about one sixth of the rock group. Some of the leucogranites are highly reminiscent of the more granitic varieties of the fine- to finely medium-grained metagranitoids discussed above. A distinctive criterion apart from their late-tectonic character is, however, their anomalously high natural gamma radiation /cf Mattsson and Keisu, 2005/. The most extensive interval of this rock is 11 metres wide and occurs in the bottom of KFM06A. The orientations of these granites are generally similar to those of the fine- to finely medium-grained metagranitoids (rock code 101051) described above.

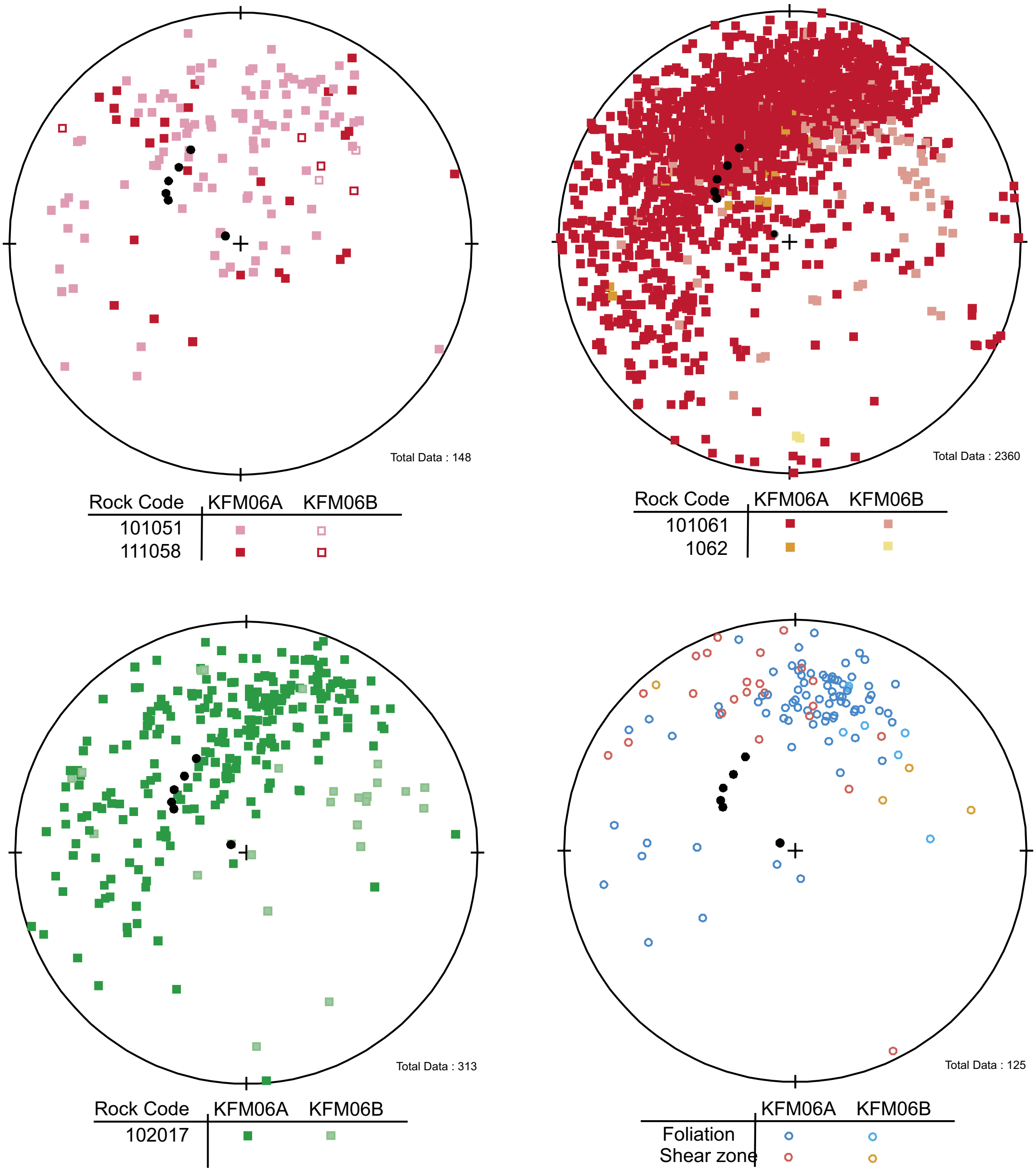

Figure 5-3. *a–c) Lower hemisphere, equal-area stereographic projection showing poles to upper and lower rock contacts for the following rock groups in KFM06A and KFM06B: pegmatitic granites (101061), aplite (1062), amphibolites (102017), fine- to medium-grained metagranitoids (101051) and granites (111058). d) Lower hemisphere, equal-area stereographic projection showing poles to ductile foliation planes as well as ductile and brittle-ductile shear zones mapped as "structural features" in KFM06A and KFM06B. Filled, black circles mark the orientation of the borehole axis of KFM06A at five different levels and KFM06B at the surface.*

The aplites, on the other hand, have been separated into two types on the basis of their tectonic character. Those that show a distinct foliation were mapped as "aplitic metagranite" (rock code 101058), whereas more massive occurrences were registered as "aplite" (rock code 1062). Quartz-dominated segregations or veins were coded as 8021. Some of them are sulphide bearing with scattered grains of pyrite, pyrrhotite and chalcopyrite.

Amphibolites (rock code 102017) and related rocks occupy 3.0% of the total cored interval of KFM06A and KFM06B. All extensions and contacts are more or less parallel with the tectonic foliation (Figure 5-3). Generally, the amphibolites are fine-grained, equigranular with a large proportion of biotite. Disseminations of pyrite and/or pyrrhotite are macroscopically visible in some of the occurrences. None of the amphibolites form occurrences that exceed a few metres in core-length, and some are surrounded by up to 1 dm wide rims of whitish, leucogranitic material, similar to the whitened, 'albite rock' described above.

Some minor occurrences of skarn-like material (rock code 108019) occur in the lower part of KFM06A. They are all vaguely defined and distinguished by their visible content of epidote and/or prehnite. A heterogeneous, rather mafic occurrence with subordinate amounts of skarn-like material at 889.6–890.1 metres was coded as 'intermediate metavolcanic rock' (rock code 103076). None of the occurrences exceed six decimetres in core-length, though the majority are less than two decimetres. In addition, there are a few minor occurrences of quartz diorite and tonalite in the length interval 520–574 metres and one at 942.6–942.9 metres. None of them appears to fit into the bedrock nomenclature defined by SKB ('Regler för bergarters benämningar vid platsundersökningarna i Simpevarp och Forsmark', v 1.0). Instead they were coded as 1038 (unspecified quartz diorite) and 1053 (unspecified tonalite).

5.2 Ductile structures

The rocks in KFM06A and KFM06B is characterised by composite L-S fabrics, with a general predominance of linear mineral fabrics. However, the relative intensity of the two components is locally highly variable, and the planar fabric is typically more prevalent in the fine-grained metagranite and whitish alteration rock in the lower part of KFM06A. The intensity of the deformational fabric is mostly weak to faint, and more rarely medium. It must, however, be emphasized that it often is difficult to distinguish tectonic fabric visually in the pegmatites and some of the fine-grained mafic rocks, but the fact that these appear massive does not necessarily mean that they actually are post-kinematic. Similar to the structures at the surface in this area /cf Bergman et al. 2004/, the foliation in KFM06A tends to strike towards E–W or ESE and dip moderately towards south (Figure 5-3). There are, however, a distinct group of nine registered foliations that strikes N–S and dips variably towards east. The foliation in KFM06B, on the other hand, has generally a more NO trending strike. None of the linear fabrics have been possible to register, though the general impression is that they are gently to moderately dipping.

Totally 33 narrow zones of more intense ductile and brittle-ductile deformation have been registered in KFM06A and KFM06B. A majority of these are concentrated to a rather short interval between 409 and 436 metres. The widths of individual zones in this interval range up to 1.9 metres. However, the typical width is less than a few decimetres. The formation of at least some of these zones precedes evidently the intrusion of the fine- to finely medium-grained metagranitoids (101051). The protolith in the zones seems mainly to consist of a highly deformed and grain-size reduced variety of the metagranite (101057). Some of the zones are intimately associated with occurrences of amphibolite. Except for one zone, located between 356.5–357.3 metres, all ductile and brittle-ductile shear zones in the boreholes are more or less parallel with the local tectonic foliation (Figure 5-3). Interestingly, there seems to be a slight rotation of the general structural trend associated with the intensely deformed interval just below 400 metres.

5.3 Alteration

Besides the metasomatic whitening as discussed in section 5.1, the most common alteration encountered in KFM06A and KFM06B is varying degrees of oxidation or red pigmentation of feldspars by sub-microscopic hematite. It is almost always associated with more intensely fractured intervals. About 77% of the 100 metres deep KFM06B has been affected by oxidation. In KFM06A oxidation is mainly limited to the upper 360 metres of the borehole. Less than 25% of the cored interval has been affected. The majority of this oxidation is faint to weak, and more rarely medium to strong, in intensity. The most intense oxidation is generally associated with minor occurrences of vuggy, syenitic rock, similar to that found in borehole KFM02A /Möller et al. 2003; Petersson et al. 2003a/. According to the IUGS recommendations /Le Maitre, 2002/ this rock should be denoted 'episyenite' as it apparently was formed by hydrothermal processes involving the selective removal of quartz. It is, therefore, mapped as 'quartz dissolution' or 'oxidation' with an attached comment. This alteration type is registered at the following intervals: 66.56–66.91 and 68.66–70.17 metres in KFM06B and 330.96–337.00, 610.64–611.09 and 770.84–770.88 metres in KFM06A. The alteration has mainly affected the medium-grained metagranite-granodiorite (101057), but is clearly not bound to any specific lithology or ductile structure. Most of the vugs have been infilled by the following minerals: finely crystalline calcite, chlorite, quartz and possible epidote. Some of the occurrences in KFM06B also contain asphalt.

Other types of alterations within KFM06A and KFM06B include chloritization, sassuritization, probable prehnitization, sericitization, argillization and impregnation of laumontite. Some of these alterations, such as the probable prehnitization and the impregnation of laumontite, occur in intervals also affected by oxidation. Individual occurrences are typically less than a few decimetres in width, though the intervals affected by sassuritization is only a few centimetres wide. The probable prehnitization and the laumontite impregnation are limited to several minor occurrences in the interval 950.50–954.74 and 926.82–951.59 metres, respectively, in KFM06A. Also the argillization and sericitization were encountered in the lowermost part of KFM06A, at 861.21–861.22 and 893.85–894.47 metres, respectively.

5.4 Fractures

5.4.1 Fracture frequencies and orientations

Excluding crush zones and sealed networks, the total number of open (broken fractures with aperture > 0), partly open (unbroken fractures with aperture > 0) and sealed fractures (broken and unbroken fractures with aperture = 0) registered within the cored intervals of KFM06A and KFM06B amounts to 4,239, i.e. about 4.3 fractures/m. Of these are 970 open, 136 partly open and 3,133 sealed. It must, however, be emphasized that there is a certain degree of uncertainty in whether a fracture actually is open or sealed. Throughout the borehole, the frequency of open and sealed fractures varies rather coherently, with an increased number of open fractures in intervals with concentrations of sealed fractures (Appendix 1). However, the proportion of open fractures tends to increase towards the surface, and the number of open (incl partly open) fractures in KFM06B is even slightly greater than the amount of sealed fractures (290 vs 273). Two major intervals with anomalously high fracture frequencies can be clearly distinguished; the upper interval includes entire KFM08B and the upper 360 metres of KFM06A, whereas the lower are, more or less restricted to the whitish, fine-grained rock of inferred metasomatic origin in the lowermost part of KFM06A (Appendix 1). Although the frequency of both open and sealed fractures is anomalously high in these intervals, the relative increase of open fractures is higher in the upper interval, and the relative increase of sealed is higher in the lower interval.

The fracture orientations vary considerably throughout KFM06A and KFM06B, though the stereographic projections in Figure 5-4 reveal at least three, possibly four distinct fracture sets. All these sets include both open and sealed fractures, though the proportions differs largely. The first fracture set, which is most conspicuous and also found in the other five deep boreholes in the area /cf Petersson and Wängnerud, 2003; Petersson et al. 2003a,b, 2004a,b/, consists of vertical to sub-vertical fractures with NE–SW strike. Fractures of this set are found throughout both KFM06A and KFM06B (Figure 5-4). Most of these fractures are inferred to be sealed, and a considerable proportion of the fracture orientations registered in the sealed networks fall in this group. The second fracture set, also well-defined and mainly restricted to KFM06B and the upper 360 metres of KFM06A, consists of near horizontal to gently dipping fractures (Figure 5-4). A majority of these fractures are mapped as open and several have apertures that are clearly visible in the BIPS-image (i.e. > 1 mm). A few apertures reach up to 5–7 mm. A third fracture set, mainly restricted to the lowermost 300 metres of KFM06A, consist of WSW striking fractures that dip steeply towards NNW. Fractures in this set are inferred to be both sealed and open. In addition to these three sets there are a number of fractures with highly variable dips that strikes roughly NW–SE. These fractures are found throughout KFM06A (Figure 5-4).

It is reasonable to expect that mechanical discontinuities, such as lithological contacts, should be the locus of fracture formation. For this reason we have noted the proportion of fractured amphibolite contacts. About 22% of the contacts in the mapped interval of KFM06A and KFM06B are fractured. This can be compared with KFM02A, KFM03A, KFM04A and KFM05A, in which 25–35% of the contacts are fractured /Petersson et al. 2003a,b, 2004a,b/.

Totally nine crush zones have been observed, five in KFM06B and four in the cored interval of KFM06A. All zones in KFM06B and three of the four crush zones found in the cored interval of KFM06A are near horizontal to gently dipping. The latter three zones are limited to the upper 270 metres of the borehole. The forth crush zone, on the other hand, occurs at the borehole length 770.24–770.80 metres, and comprises steeply dipping fractures with NE–SW strike (see Figure 5-4).

Totally three breccia zones and 114 sealed network have been registered in KFM06A and KFM06B. However, the distinction between breccia and sealed network is not straight forward, but normally zones with none or minor rotation of individual rock fragments has been mapped as sealed network. Most breccias and sealed networks belong to the NE–SW striking fracture group (Figure 5-4). A conspicuous concentration of sealed networks occurs in the whitish, fine-grained rock of inferred metasomatic origin between in the lower part of KFM06A. Except for the observed breccia zones at 66.70–66.71, 323.02–323.03 and 348.06–348.12 metres, fractures with measurable reverse displacements, indicating that they have been initiated or reactivated as shear fractures, are only found in three places in KFM06A: 664.51, c 801.6 and 823.12 metres.

Inferred core discing occurs sporadically in five intervals down to 360 metres in drill core KFM06A (135.59–135.91, 198.39, 271.13–271.19, 286.81–287.04 and 359.53–359.55 metres). Some intervals include also what appears to be initial core discing that not actually breaks the core. An alternative interpretation proposed by A. Simeonov, amongst other, is that these features are incipient natural fractures. None of the intervals exceed 3 dm in width, and the typical dimension of individual discs range between 1 and 3 cm. The fractures are all planar to slightly saddle-shaped.

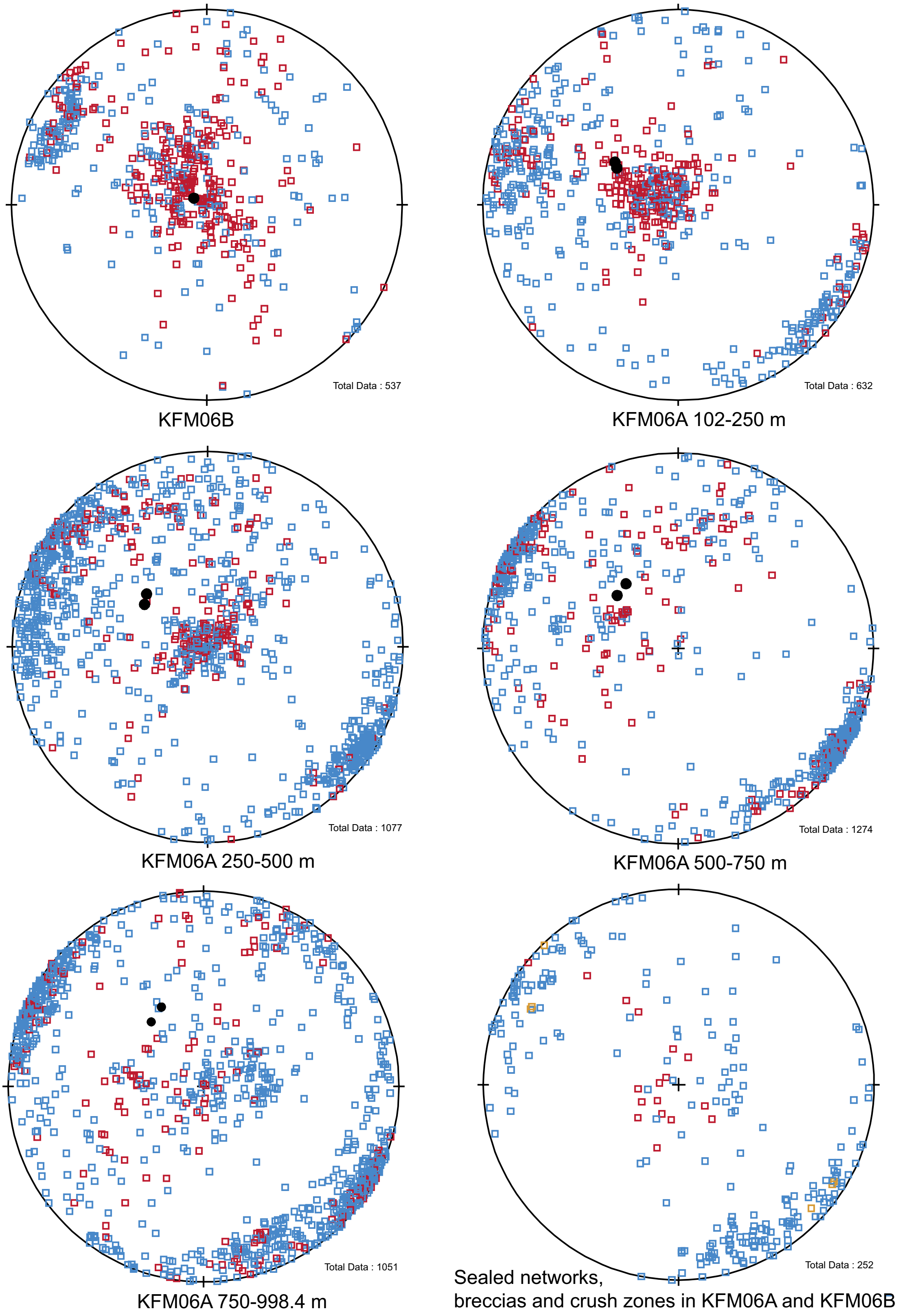

Figure 5-4. *Lower hemisphere, equal-area stereographic projections showing the poles to all sealed (blue squares) and open (red squares) fractures, as well as the orientation of breccias (orange squares) and prevailing fracture orientations in sealed networks (blue squares) and crush zones (red squares) in borehole KFM06A and KFM06B. The fracture data for KFM06A have been divided into four length intervals (102–250, 250–500, 500–750 and 950–998.4 metres). Filled, black circles mark the orientation of the borehole axes.*

5.4.2 Fracture mineralogy

Chlorite and/or calcite are found in three fourth of the total number of the registered fractures in KFM06A and KFM06B. These minerals are found in all abovementioned fracture sets (Figure 5-5). Other infilling minerals, in order of decreasing abundance, include hematite, quartz, adularia, undifferentiated clay minerals, laumontite, pyrite, asphalt, prehnite, epidote, galena, Fe-hydroxide, zeolites, biotite, fluorite, sericite, magnetite, hornblende, chalcopyrite and pyrrhotite. In addition, there are a number of fractures with unknown mineral filling. XRD analyses of similar material from the previously mapped cored boreholes in the area have revealed that most such filling are mineral mixtures, or in some cases, feldspars, apophyllite or analcime /Sandström et al. 2004/. Totally in KFM06A and KFM06B, there are also 289 fractures that are virtually free from visible mineral coatings. These are mostly open, and the majority belong to the sub-horizontal set (Figure 5-5), or sealed fractures with highly variable dips that strikes roughly WNW–ESE.

The various clay minerals are found in open fractures throughout the borehole, though the majority occurs in fractures at shallow depth (< 150 metres) that belong to the flat lying set. Clay minerals registered in fractures at greater depths are typically corrensite, often intimately associated with chlorite. Also asphalt are mostly restricted to this flay lying set, and the deepest finding was registered at a borehole length of 142.95 metres (Figure 5-5).

Other minerals that frequently occur in open fractures are hematite, pyrite and Fe-hydroxide (Figure 5-5). Hematite occurs in two main varieties: (1) thin, reddish coatings, preferentially found in the flat lying fractures, and (2) staining of various silicates, such as adularia and laumontite, which are more or less restricted to the NE–SW set. Pyrite, on the other hand, are often associated with calcite, and can also be found in sealed fractures. However, the fact that pyrite typically forms up to millimetre-sized, euhedral and isolated crystals, suggests that it locally might be underrepresented in the unbroken fractures.

The distribution of fractures coated with Fe-hydroxide (rust) and pyrite may give an indication of the redox potential in the rock volume, and hence, the circulation of surface water. Except for a single fracture found at 503.45 metres length in KFM06A, all Fe-hydroxide coated fractures are restricted to the upper part of KFM06B, with a concentration around the crush zones at 55.3–56.2 metres. An illustration of the frequency of Fe-hydroxide and pyrite bearing fractures in KFM06B shows that this length roughly coincides with an increasing amount of pyrite towards depth (Figure 5-6). A considerable part of the pyrite bearing fractures are, however, inferred to be sealed, and the increased frequency might just reflect a general increase in the fracture frequency below a certain depth. A similar pattern as shown by pyrite, would also be expected for calcite and to some extent hematite, if surface water with low Ph and high O_2-content circulated in the bedrock /cf Tullborg, 1989/. However, none of these minerals give any obvious support for the incursion of surface water dissolution.

All other minerals, as well as the presence of oxidized walls, are preferentially associated with sealed fractures (Figure 5-5). A typical mineral assemblage is laumontite + calcite + chlorite + hematite stained adularia ± pyrite. Also quartz may occur in association with this assemblage. However, the exact assemblage varies locally, and individual fractures seldom contain the full range of minerals. Laumontite, for example, is mainly restricted to the lowermost 250 metres of the borehole.

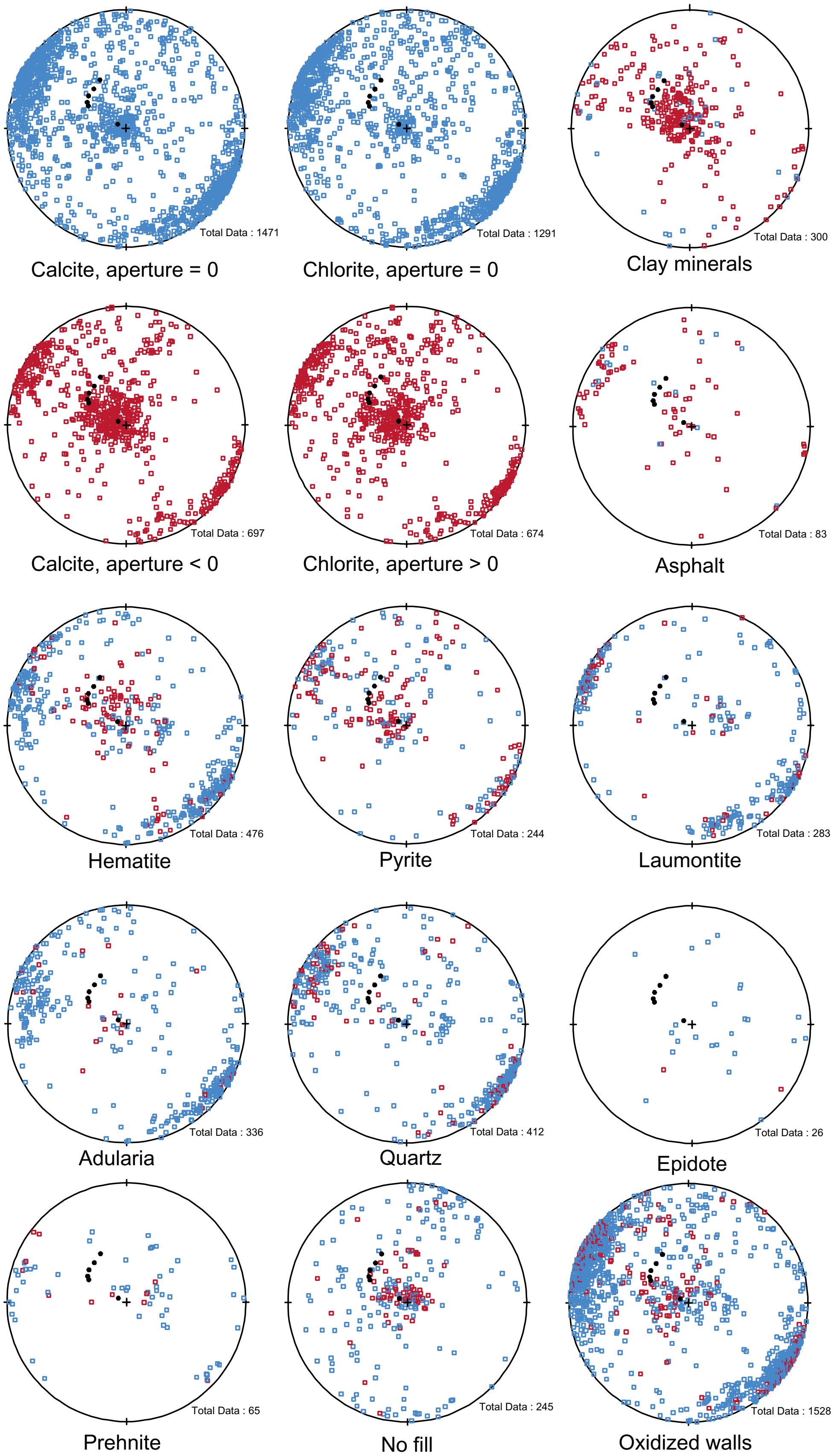

Figure 5-5. *Lower hemisphere, equal-area stereographic projections showing the poles to sealed (blue squares) and open (red squares) fractures filled with: calcite, chlorite, clay minerals, asphalt, hematite, pyrite, laumontite, adularia, quartz, epidote and prehnite. Also shown are those that are free from visible filling and those surrounded by oxidized walls. Filled, black circles mark the orientation of the borehole axes.*

A noteworthy property of laumontite, is it tendency to contract, and eventually crackles in the drill core. Thus, some laumontite-bearing fractures that are broken in the drill core may in fact represent originally unbroken fractures. As in the other deep, cored boreholes in the area, the laumontite-dominated assemblage is mainly found in sealed fractures of the NE–SW and the WSW–ENE trending sets. This is also the assemblage most commonly found in the breccias and sealed networks. Another mineral found to occur in the NE–SW trending fractures is galena. It is generally scarce, and has been registered in totally 16 fractures from two intervals (106.7–111.5 and 140.6–144.4 metres) plus a single fracture at 568.46 metres in KFM06A.

The orientation of fractures filled by prehnite and epidote are more variable (Figure 5-5). As pointed out previously, some of the light greenish mineral mapped as prehnite is likely to be adularia.

Fractures sealed by the laumontite–adularia-bearing assemblage, hematite, prehnite and epidote typically exhibit oxidized walls. A number of very thin (<< 1 mm), sealed fractures are typically revealed only by their oxidized walls. Several of these thin fractures have been sealed by a mineral inferred to be hematite, but it might well be hematite-stained laumontite or adularia.

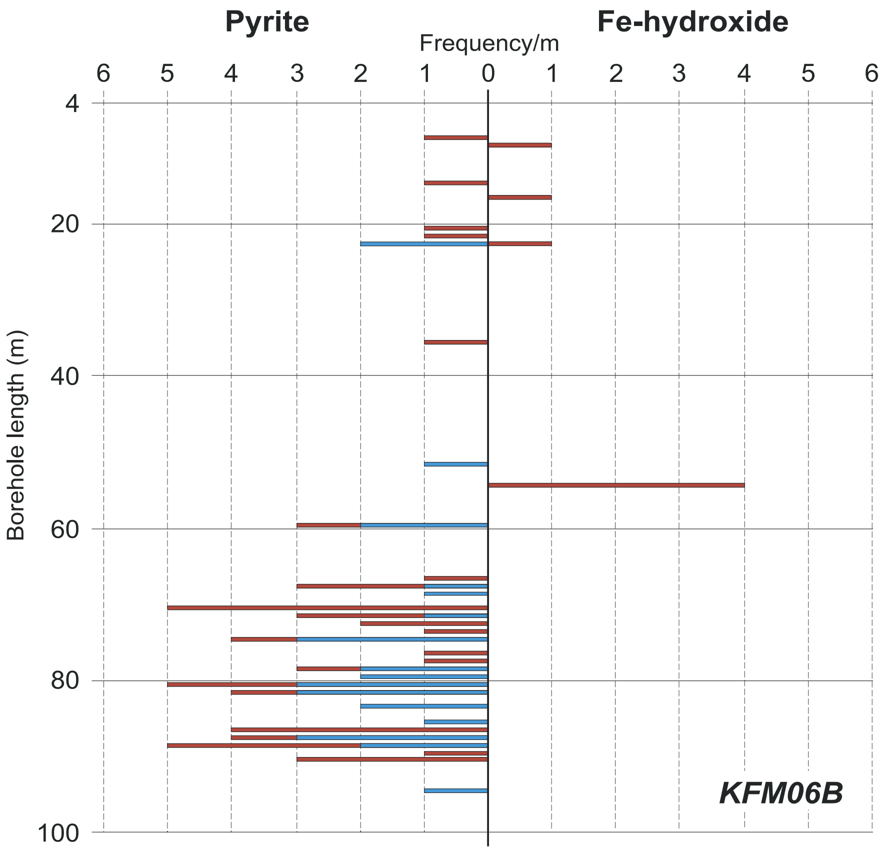

Figure 5-6. *Diagram showing the frequency of pyrite and Fe-hydroxide bearing sealed (blue) and open (red) fractures vs borehole length in KFM06B. Sealed fractures (aperture = 0) are blue and open fractures (aperture > 0) are red.*

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Appendix 1

WellCAD images

Title LEGEND FOR FORSMARK KFM06A and KFM06B

Site	FORSMARK
Borehole	KFM06A
Plot Date	2005-05-11 23:12:19

ROCKTYPE FORSMARK

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granitoid, metamorphic
- Granite, granodiorite and tonalite, metamorphic, fine- to medium-grained
- Granite, metamorphic, aplitic
- Granite to granodiorite, metamorphic, medium-grained
- Granodiorite, metamorphic
- Tonalite to granodiorite, metamorphic
- Diorite, quarts diorite and gabbro, metamorphic
- Ultramafic rock, metamorphic
- Amphibolite
- Calc-silicate rock (skarn)
- Magnetite mineralization associated with calc-silicate rock (skarn)
- Sulphide mineralization
- Felsic to intermediate volcanic rock, metamorphic
- Mafic volcanic rock, metamorphic
- Sedimentary rock, metamorphic

ROCK ALTERATION

- Oxidized
- Chloritisized
- Epidotisized
- Weathered
- Tectonized
- Sericitisized
- Quartz dissolution
- Silicification
- Argillization
- Albitization
- Carbonatization
- Saussuritization
- Steatitization
- Uralitization
- Laumontitization
- Fract zone alteration

MINERAL

- Epidote
- Hematite
- Calcite
- Chlorite
- Quartz
- Unknown
- Pyrite
- Clay Minerals
- Laumontite
- Prehnite
- Asphalt
- Oxidized Walls

STRUCTURE

- Cataclastic
- Schistose
- Gneissic
- Mylonitic
- Ductile Shear Zone
- Brittle-Ductile Zone
- Veined
- Banded
- Massive
- Foliated
- Brecciated
- Lineated

TEXTURE

- Hornfelsed
- Porphyritic
- Ophitic
- Equigranular
- Augen-Bearing
- Unequigranular
- Metamorphic

GRAINSIZE

- Aphanitic
- Fine-grained
- Fine to medium grained
- Medium to coarse grained
- Coarse-grained
- Medium-grained

STRUCTURE ORIENTATION

- Cataclastic
- Bedded
- Gneissic
- Schistose
- Brittle-Ductile Shear Zone
- Ductile Shear Zone
- Lineated
- Banded
- Veined
- Brecciated
- Foliated
- Mylonitic

ROCK ALTERATION INTENSITY

- No intensity
- Faint
- Weak
- Medium
- Strong

ROUGHNESS

- Planar
- Undulating
- Stepped
- Irregular

SURFACE

- Rough
- Smooth
- Slickensided

CRUSH ALTERATION

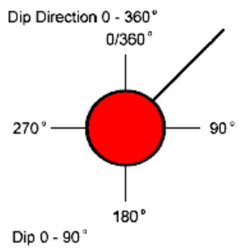
- Slightly Altered
- Moderately Altered
- Highly Altered
- Completley Altered
- Gouge
- Fresh

FRACTURE ALTERATION

- Fresh
- Gouge
- Completely Altered
- Highly Altered
- Moderately Altered
- Slightly Altered

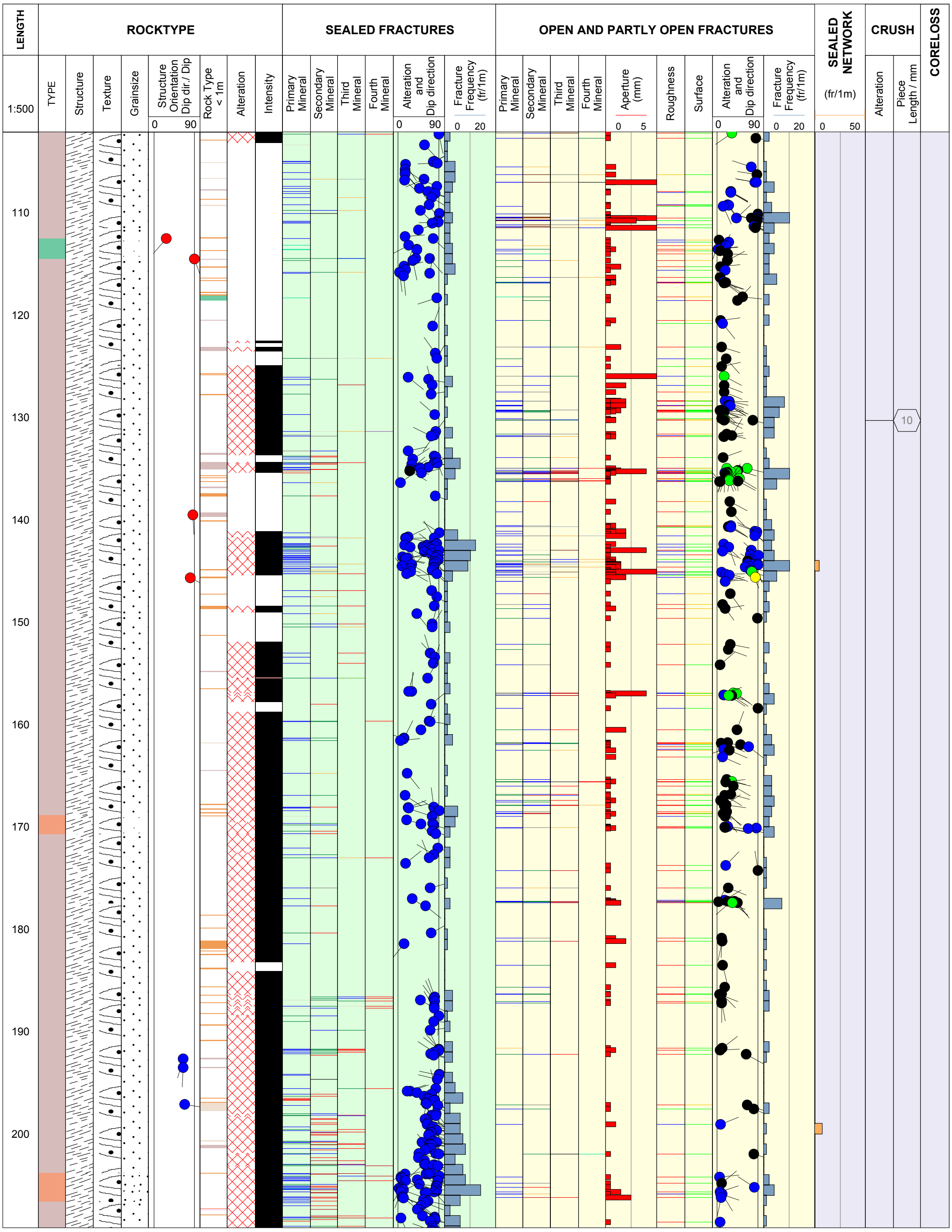
FRACTURE DIRECTION

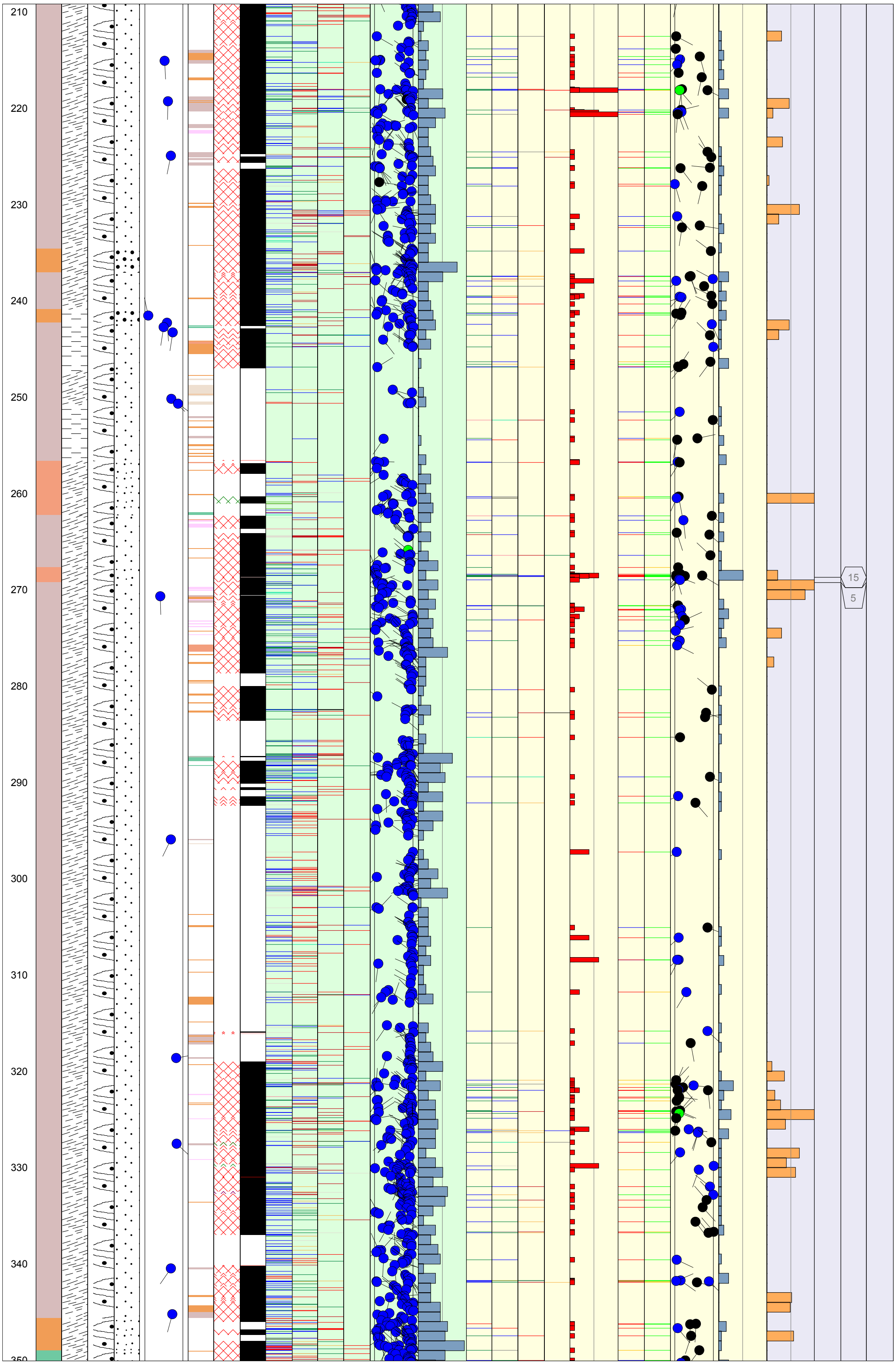
STRUKTURE ORIENTATION



Title **GEOLOGY IN KFM06A** **Appendix:**

Site	FORSMARK	**Coordinate System**	RT90-RHB70
Borehole	KFM06A	**Northing [m]**	6699732.88
Diameter [mm]	77	**Easting [m]**	1632442.51
Length [m]	1000.640	**Elevation [m.a.s.l.]**	4.10
Bearing [°]	300.92	**Drilling Start Date**	2003-11-11 16:25:00
Inclination [°]	-60.24	**Drilling Stop Date**	2004-09-21 03:37:00
Date of coremapping	2004-11-02 10:55:00	**Plot Date**	2005-05-11 23:12:19
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core





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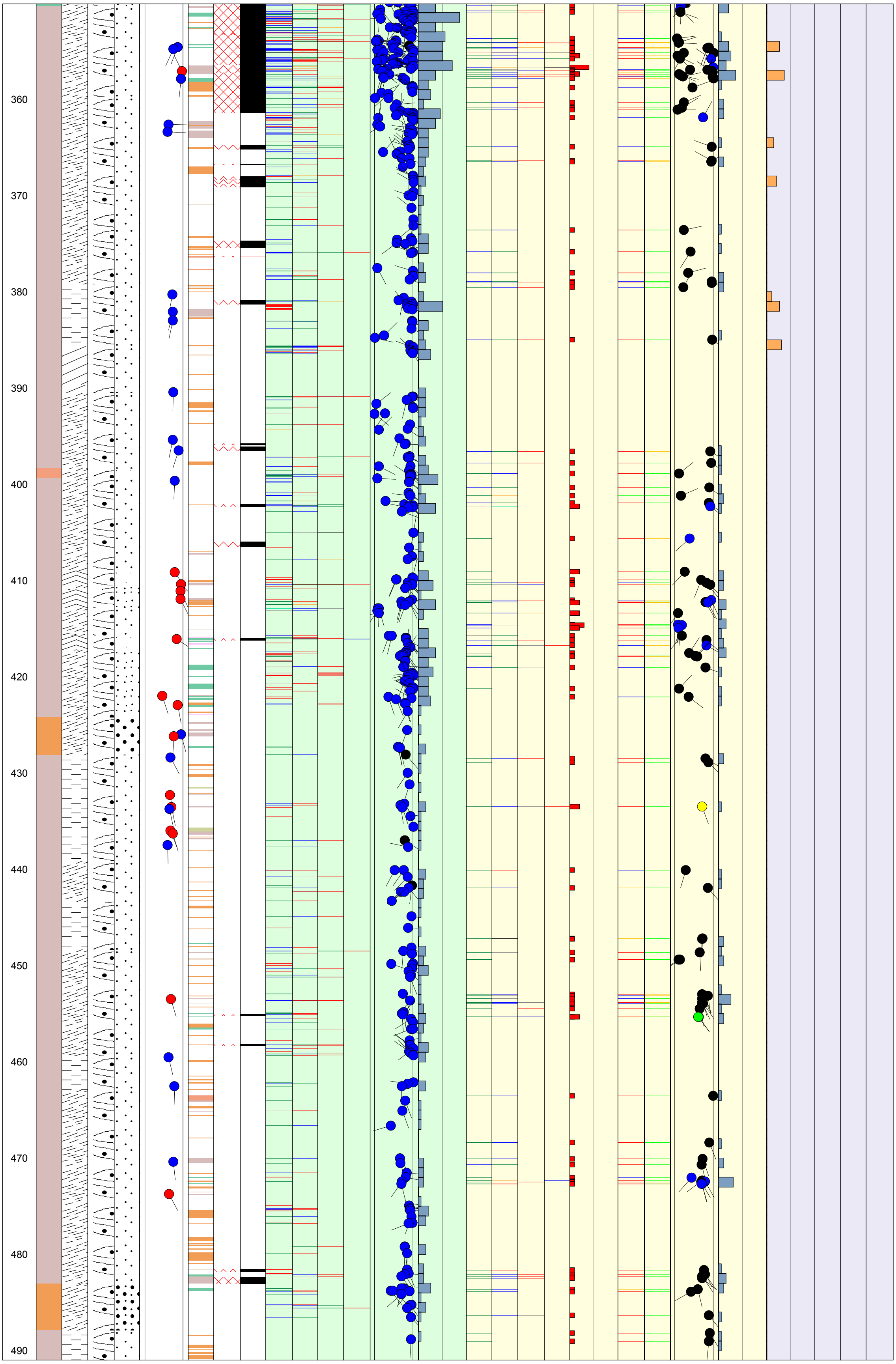
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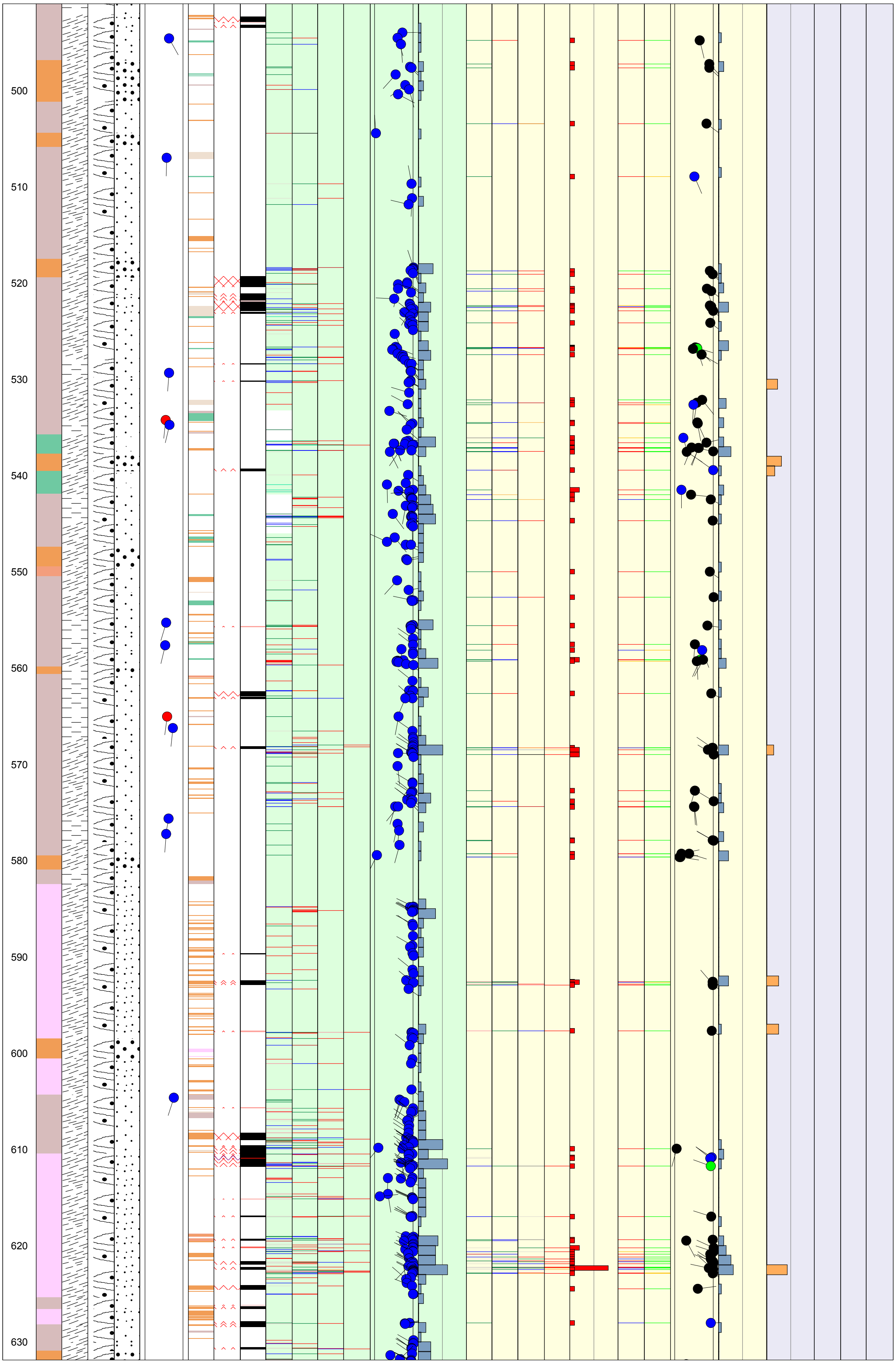
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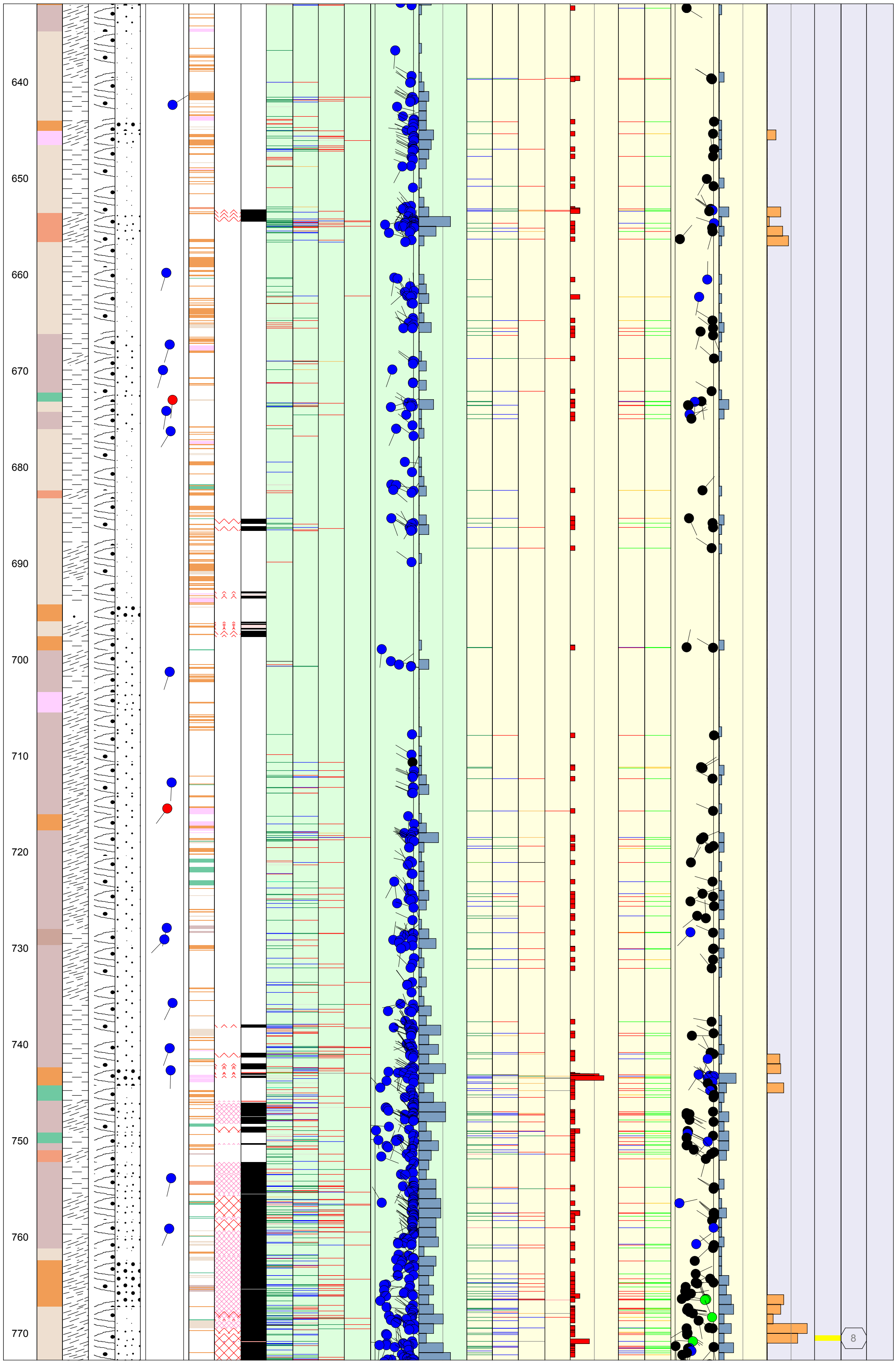
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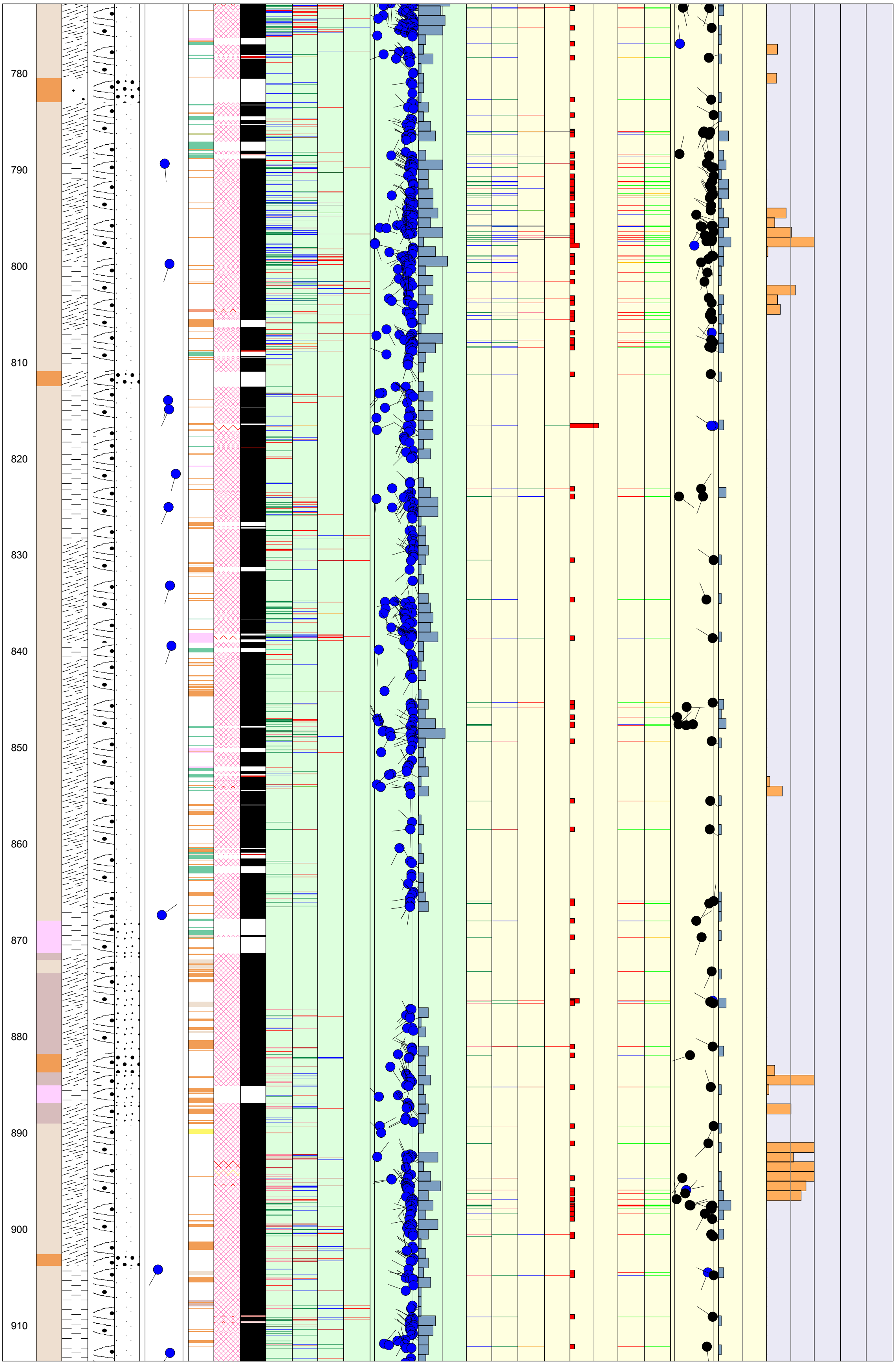
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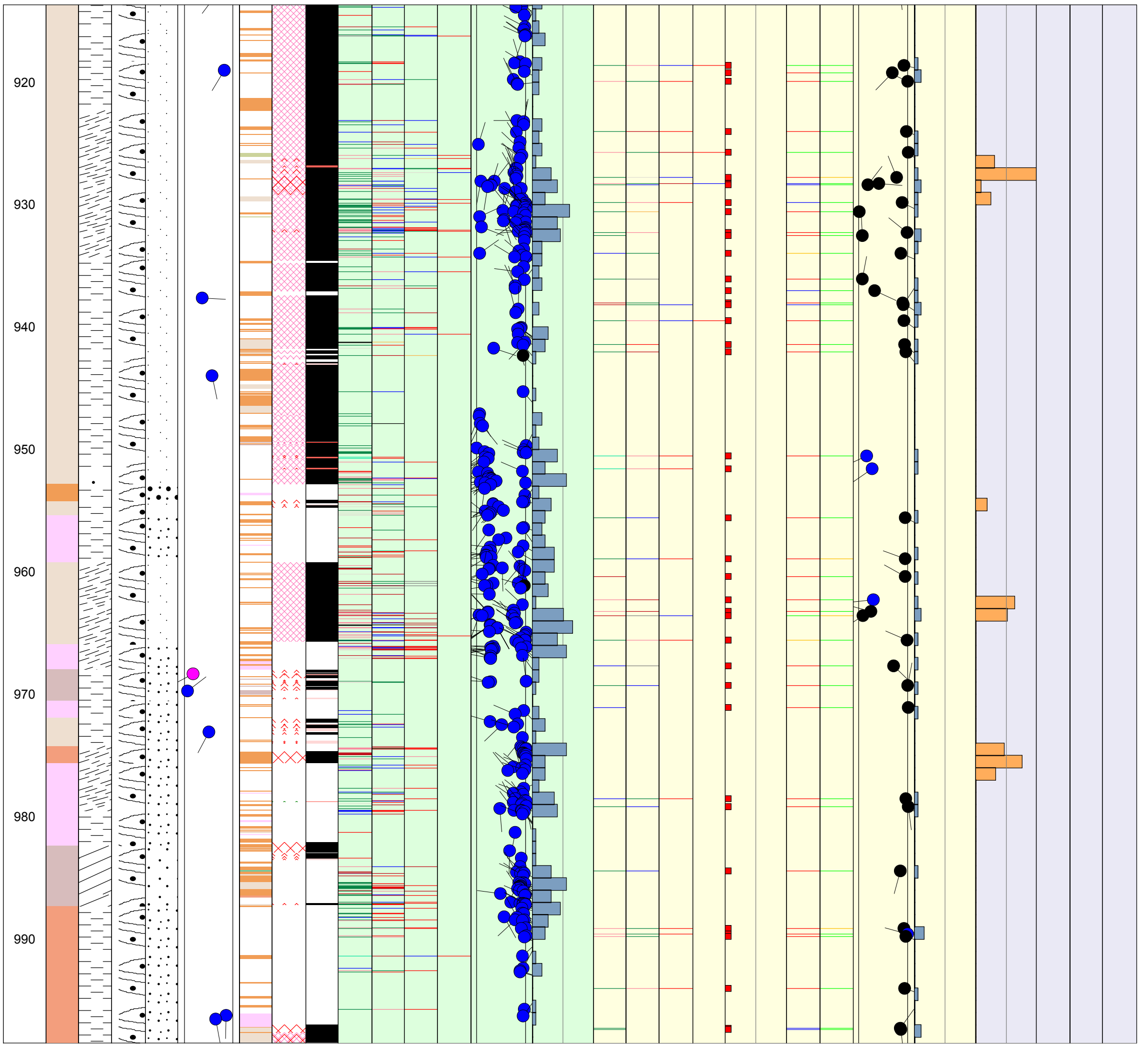
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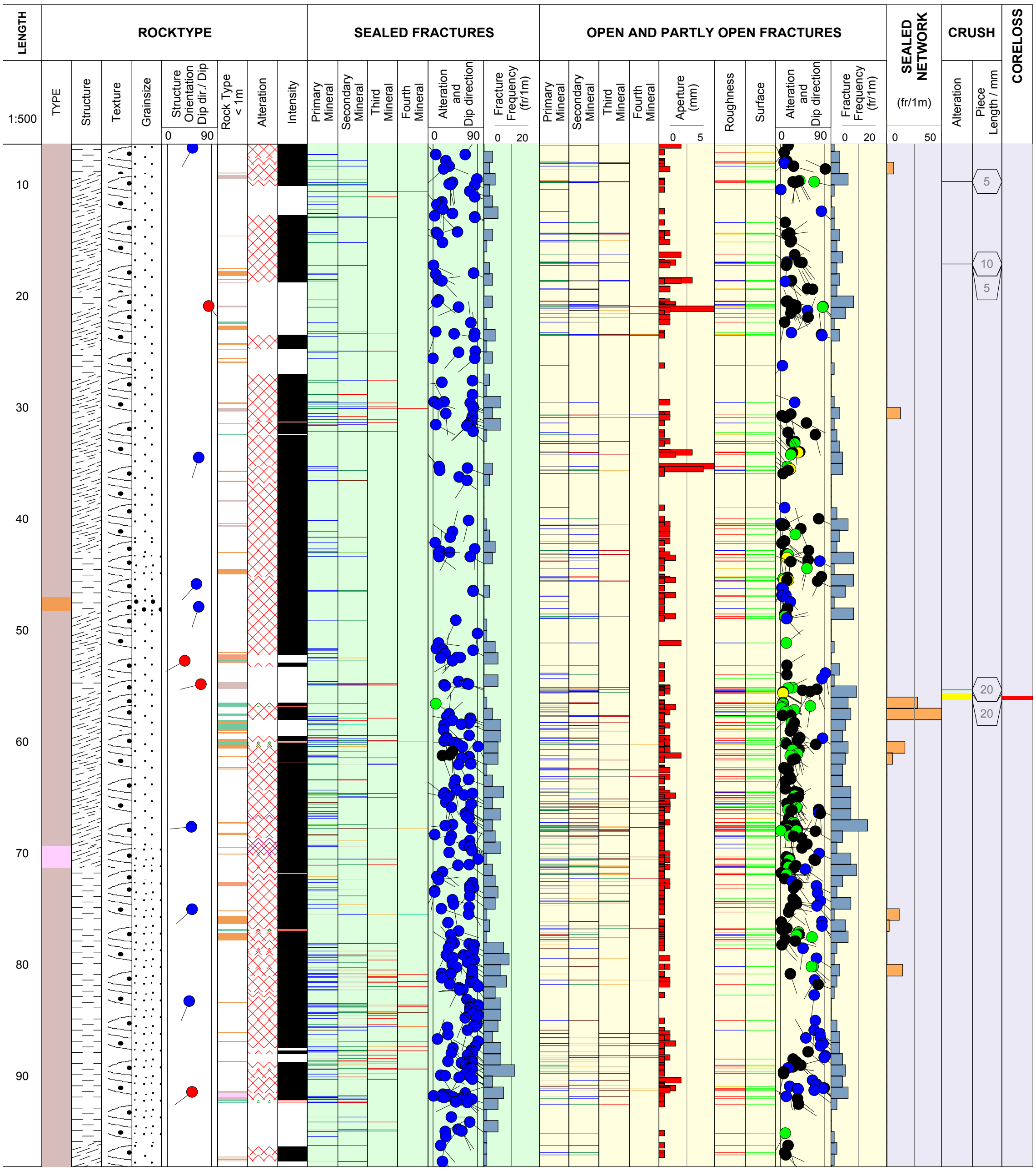
Title GEOLOGY IN KFM06B **Appendix:**

Site	FORSMARK	**Coordinate System**	RT90-RHB70
Borehole	KFM06B	**Northing [m]**	6699732.24
Diameter [mm]	77	**Easting [m]**	1632446.41
Length [m]	100.330	**Elevation [m.a.s.l.]**	4.13
Bearing [°]	296.96	**Drilling Start Date**	2004-05-26 07:00:00
Inclination [°]	-83.51	**Drilling Stop Date**	2004-06-08 12:16:00
Date of coremapping	2004-08-17 15:23:00	**Plot Date**	2005-03-16 22:18:42
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core



Appendix 2

Borehole diameter

KFM06A, 2004-06-14 14:00:00 - 2004-09-21 03:37:00 (100.640 - 1000.640 m).

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment (m)
0.000	2.120	0.415	
2.120	12.300	0.333	
12.300	100.590	0.243	
100.590	100.640	0.164	
100.640	102.190	0.086	Kärnborrning (stubbe kvar 0,09 m)
102.190	1,000.640	0.077	Kärnborrning

Printout from SICADA 2005-05-11 17:35:27.

KFM06B, 2005-02-03 11:00:00 - 2005-02-08 14:00:00 (54.650 - 56.400 m).

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment (m)
0.000	3.880	0.116	
3.880	4.610	0.101	
4.610	6.330	0.086	
6.330	54.650	0.077	
54.650	56.400	0.084	”PLEX ” monterad 2005-02-03 11:00
56.400	100.330	0.077	

Printout from SICADA 2005-05-11 17:16:24.

Appendix 3

Downhole deviation measurements

Maxibor T - Borehole deviation: Maxibor

KFM06A, 2004-08-23 00:00:00 (0.000–990.000 m).

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
0.00	6699732.88	1632442.51	-4.10	RT90-RHB70	-60.25	300.92	0.0000	0.0000	0.0000	
3.00	6699733.64	1632441.23	-1.50	RT90-RHB70	-60.35	300.74	1.4900	0.0000	0.0000	
6.00	6699734.40	1632439.96	1.11	RT90-RHB70	-60.33	300.64	2.9700	0.0000	-0.0100	
9.00	6699735.16	1632438.68	3.72	RT90-RHB70	-60.22	300.52	4.4600	-0.0100	-0.0100	
12.00	6699735.92	1632437.40	6.32	RT90-RHB70	-60.10	300.50	5.9500	-0.0200	-0.0100	
15.00	6699736.68	1632436.11	8.92	RT90-RHB70	-59.96	300.53	7.4400	-0.0300	0.0000	
18.00	6699737.44	1632434.81	11.52	RT90-RHB70	-59.87	300.49	8.9400	-0.0400	0.0200	
21.00	6699738.20	1632433.52	14.11	RT90-RHB70	-59.84	300.41	10.4500	-0.0600	0.0300	
24.00	6699738.97	1632432.22	16.71	RT90-RHB70	-59.92	300.30	11.9600	-0.0700	0.0600	
27.00	6699739.72	1632430.92	19.30	RT90-RHB70	-60.02	300.27	13.4600	-0.0800	0.0700	
30.00	6699740.48	1632429.62	21.90	RT90-RHB70	-60.10	300.29	14.9600	-0.1000	0.0900	
33.00	6699741.23	1632428.33	24.50	RT90-RHB70	-60.11	300.21	16.4600	-0.1200	0.0900	
36.00	6699741.99	1632427.04	27.10	RT90-RHB70	-60.09	300.06	17.9500	-0.1400	0.1000	
39.00	6699742.74	1632425.75	29.71	RT90-RHB70	-60.08	299.98	19.4500	-0.1600	0.1100	
42.00	6699743.48	1632424.45	32.31	RT90-RHB70	-60.08	299.77	20.9400	-0.1800	0.1200	
45.00	6699744.23	1632423.15	34.91	RT90-RHB70	-60.11	299.60	22.4400	-0.2100	0.1300	
48.00	6699744.97	1632421.85	37.51	RT90-RHB70	-60.20	299.55	23.9300	-0.2500	0.1300	
51.00	6699745.70	1632420.55	40.11	RT90-RHB70	-60.21	299.51	25.4200	-0.2800	0.1400	
54.00	6699746.43	1632419.26	42.71	RT90-RHB70	-60.22	299.44	26.9100	-0.3200	0.1400	
57.00	6699747.17	1632417.96	45.32	RT90-RHB70	-60.17	299.38	28.4000	-0.3600	0.1400	
60.00	6699747.90	1632416.66	47.92	RT90-RHB70	-60.12	299.33	29.8900	-0.4000	0.1400	
63.00	6699748.63	1632415.36	50.52	RT90-RHB70	-60.10	299.27	31.3900	-0.4400	0.1500	
66.00	6699749.36	1632414.05	53.12	RT90-RHB70	-60.15	299.09	32.8800	-0.4800	0.1600	
69.00	6699750.09	1632412.75	55.72	RT90-RHB70	-60.23	298.89	34.3800	-0.5300	0.1600	
72.00	6699750.81	1632411.44	58.33	RT90-RHB70	-60.21	298.79	35.8700	-0.5800	0.1600	
75.00	6699751.53	1632410.14	60.93	RT90-RHB70	-60.15	298.80	37.3500	-0.6400	0.1600	
78.00	6699752.25	1632408.83	63.53	RT90-RHB70	-60.02	298.77	38.8500	-0.6900	0.1700	
81.00	6699752.97	1632407.51	66.13	RT90-RHB70	-59.87	298.73	40.3400	-0.7500	0.1800	
84.00	6699753.69	1632406.19	68.73	RT90-RHB70	-59.79	298.73	41.8500	-0.8100	0.2000	
87.00	6699754.42	1632404.87	71.32	RT90-RHB70	-59.76	298.83	43.3600	-0.8700	0.2200	
90.00	6699755.14	1632403.55	73.91	RT90-RHB70	-59.74	298.88	44.8700	-0.9200	0.2400	
93.00	6699755.87	1632402.22	76.50	RT90-RHB70	-59.71	298.97	46.3800	-0.9800	0.2700	
96.00	6699756.61	1632400.90	79.09	RT90-RHB70	-59.70	299.09	47.8900	-1.0300	0.3000	
99.00	6699757.34	1632399.58	81.68	RT90-RHB70	-59.72	299.16	49.4000	-1.0700	0.3300	
102.00	6699758.08	1632398.25	84.27	RT90-RHB70	-59.70	299.32	50.9200	-1.1200	0.3500	
105.00	6699758.82	1632396.93	86.86	RT90-RHB70	-59.70	299.39	52.4300	-1.1600	0.3800	
108.00	6699759.56	1632395.62	89.45	RT90-RHB70	-59.67	299.50	53.9400	-1.2000	0.4100	

Length (m)	Northing (m)	Easting (m)	Elevation (m)	Coord System	Inclination (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
111.00	6699760.31	1632394.30	92.04	RT90-RHB70	-59.65	299.63	55.4600	-1.2400	0.4400	
114.00	6699761.06	1632392.98	94.63	RT90-RHB70	-59.65	299.74	56.9700	-1.2800	0.4700	
117.00	6699761.81	1632391.66	97.22	RT90-RHB70	-59.64	299.85	58.4900	-1.3100	0.5000	
120.00	6699762.57	1632390.35	99.81	RT90-RHB70	-59.62	300.03	60.0000	-1.3400	0.5300	
123.00	6699763.33	1632389.03	102.40	RT90-RHB70	-59.61	300.15	61.5200	-1.3600	0.5700	
126.00	6699764.09	1632387.72	104.99	RT90-RHB70	-59.59	300.29	63.0400	-1.3800	0.6000	
129.00	6699764.85	1632386.41	107.57	RT90-RHB70	-59.57	300.44	64.5600	-1.4000	0.6300	
132.00	6699765.62	1632385.10	110.16	RT90-RHB70	-59.56	300.56	66.0800	-1.4100	0.6700	
135.00	6699766.40	1632383.79	112.75	RT90-RHB70	-59.54	300.69	67.6000	-1.4200	0.7100	
138.00	6699767.17	1632382.48	115.33	RT90-RHB70	-59.51	300.81	69.1200	-1.4200	0.7400	
141.00	6699767.95	1632381.18	117.92	RT90-RHB70	-59.50	300.90	70.6400	-1.4300	0.7800	
144.00	6699768.73	1632379.87	120.50	RT90-RHB70	-59.48	301.01	72.1600	-1.4300	0.8200	
147.00	6699769.52	1632378.56	123.09	RT90-RHB70	-59.48	301.11	73.6800	-1.4300	0.8600	
150.00	6699770.31	1632377.26	125.67	RT90-RHB70	-59.46	301.24	75.2100	-1.4200	0.9000	
153.00	6699771.10	1632375.96	128.25	RT90-RHB70	-59.45	301.35	76.7300	-1.4100	0.9400	
156.00	6699771.89	1632374.65	130.84	RT90-RHB70	-59.38	301.46	78.2600	-1.4000	0.9800	
159.00	6699772.69	1632373.35	133.42	RT90-RHB70	-59.31	301.59	79.7900	-1.3900	1.0300	
162.00	6699773.49	1632372.05	136.00	RT90-RHB70	-59.26	301.70	81.3200	-1.3700	1.0800	
165.00	6699774.30	1632370.74	138.58	RT90-RHB70	-59.22	301.83	82.8500	-1.3500	1.1300	
168.00	6699775.11	1632369.44	141.16	RT90-RHB70	-59.20	301.97	84.3800	-1.3200	1.1800	
171.00	6699775.92	1632368.14	143.73	RT90-RHB70	-59.18	302.10	85.9200	-1.2900	1.2400	
174.00	6699776.74	1632366.83	146.31	RT90-RHB70	-59.15	302.21	87.4600	-1.2600	1.2900	
177.00	6699777.56	1632365.53	148.88	RT90-RHB70	-59.11	302.26	89.0000	-1.2300	1.3500	
180.00	6699778.38	1632364.23	151.46	RT90-RHB70	-59.08	302.35	90.5300	-1.1900	1.4100	
183.00	6699779.20	1632362.93	154.03	RT90-RHB70	-59.04	302.45	92.0800	-1.1500	1.4700	
186.00	6699780.03	1632361.62	156.60	RT90-RHB70	-58.97	302.53	93.6200	-1.1100	1.5400	
189.00	6699780.86	1632360.32	159.18	RT90-RHB70	-58.93	302.62	95.1600	-1.0700	1.6000	
192.00	6699781.70	1632359.02	161.75	RT90-RHB70	-58.89	302.69	96.7100	-1.0200	1.6700	
195.00	6699782.53	1632357.71	164.31	RT90-RHB70	-58.84	302.76	98.2600	-0.9800	1.7400	
198.00	6699783.37	1632356.41	166.88	RT90-RHB70	-58.81	302.86	99.8100	-0.9300	1.8100	
201.00	6699784.22	1632355.10	169.45	RT90-RHB70	-58.77	302.91	101.3700	-0.8700	1.8900	
204.00	6699785.06	1632353.80	172.01	RT90-RHB70	-58.72	303.00	102.9200	-0.8200	1.9700	
207.00	6699785.91	1632352.49	174.58	RT90-RHB70	-58.68	303.04	104.4800	-0.7600	2.0400	
210.00	6699786.76	1632351.18	177.14	RT90-RHB70	-58.63	303.12	106.0300	-0.7000	2.1300	
213.00	6699787.61	1632349.87	179.70	RT90-RHB70	-58.61	303.22	107.6000	-0.6400	2.2100	
216.00	6699788.47	1632348.57	182.26	RT90-RHB70	-58.59	303.25	109.1600	-0.5800	2.2900	
219.00	6699789.33	1632347.26	184.82	RT90-RHB70	-58.57	303.34	110.7200	-0.5200	2.3800	
222.00	6699790.19	1632345.95	187.38	RT90-RHB70	-58.57	303.40	112.2800	-0.4500	2.4700	
225.00	6699791.05	1632344.65	189.94	RT90-RHB70	-58.56	303.50	113.8400	-0.3800	2.5500	
228.00	6699791.91	1632343.34	192.50	RT90-RHB70	-58.52	303.56	115.4100	-0.3100	2.6400	
231.00	6699792.78	1632342.04	195.06	RT90-RHB70	-58.50	303.68	116.9700	-0.2400	2.7300	
234.00	6699793.65	1632340.73	197.62	RT90-RHB70	-58.49	303.74	118.5400	-0.1700	2.8200	
237.00	6699794.52	1632339.43	200.18	RT90-RHB70	-58.46	303.82	120.1100	-0.0900	2.9100	
240.00	6699795.39	1632338.12	202.73	RT90-RHB70	-58.42	303.88	121.6700	-0.0100	3.0000	
243.00	6699796.27	1632336.82	205.29	RT90-RHB70	-58.39	303.97	123.2400	0.0700	3.1000	

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
246.00	6699797.15	1632335.52	207.84	RT90-RHB70	-58.37	304.01	124.8100	0.1500	3.1900	
249.00	6699798.03	1632334.21	210.40	RT90-RHB70	-58.35	304.08	126.3800	0.2400	3.2900	
252.00	6699798.91	1632332.91	212.95	RT90-RHB70	-58.33	304.15	127.9500	0.3300	3.3900	
255.00	6699799.79	1632331.60	215.50	RT90-RHB70	-58.31	304.21	129.5300	0.4100	3.4800	
258.00	6699800.68	1632330.30	218.06	RT90-RHB70	-58.28	304.29	131.1000	0.5100	3.5800	
261.00	6699801.57	1632329.00	220.61	RT90-RHB70	-58.27	304.35	132.6700	0.6000	3.6800	
264.00	6699802.46	1632327.69	223.16	RT90-RHB70	-58.25	304.41	134.2500	0.6900	3.7900	
267.00	6699803.35	1632326.39	225.71	RT90-RHB70	-58.25	304.50	135.8300	0.7900	3.8900	
270.00	6699804.24	1632325.09	228.26	RT90-RHB70	-58.25	304.61	137.4000	0.8900	3.9900	
273.00	6699805.14	1632323.79	230.81	RT90-RHB70	-58.24	304.67	138.9800	0.9900	4.0900	
276.00	6699806.04	1632322.49	233.36	RT90-RHB70	-58.19	304.70	140.5500	1.0900	4.1900	
279.00	6699806.94	1632321.19	235.91	RT90-RHB70	-58.16	304.73	142.1300	1.2000	4.3000	
282.00	6699807.84	1632319.89	238.46	RT90-RHB70	-58.13	304.79	143.7100	1.3000	4.4000	
285.00	6699808.74	1632318.59	241.01	RT90-RHB70	-58.11	304.84	145.2900	1.4100	4.5100	
288.00	6699809.65	1632317.29	243.56	RT90-RHB70	-58.08	304.91	146.8700	1.5200	4.6200	
291.00	6699810.56	1632315.99	246.10	RT90-RHB70	-58.06	305.01	148.4500	1.6300	4.7300	
294.00	6699811.47	1632314.69	248.65	RT90-RHB70	-58.03	305.05	150.0400	1.7400	4.8400	
297.00	6699812.38	1632313.39	251.19	RT90-RHB70	-58.01	305.07	151.6200	1.8500	4.9600	
300.00	6699813.29	1632312.09	253.74	RT90-RHB70	-57.97	305.10	153.2100	1.9700	5.0700	
303.00	6699814.21	1632310.79	256.28	RT90-RHB70	-57.92	305.09	154.7900	2.0900	5.1800	
306.00	6699815.12	1632309.48	258.82	RT90-RHB70	-57.89	305.07	156.3800	2.2000	5.3000	
309.00	6699816.04	1632308.18	261.37	RT90-RHB70	-57.88	305.12	157.9700	2.3200	5.4200	
312.00	6699816.96	1632306.87	263.91	RT90-RHB70	-57.86	305.15	159.5600	2.4300	5.5400	
315.00	6699817.88	1632305.57	266.45	RT90-RHB70	-57.85	305.19	161.1500	2.5500	5.6600	
318.00	6699818.80	1632304.26	268.99	RT90-RHB70	-57.84	305.24	162.7500	2.6700	5.7900	
321.00	6699819.72	1632302.96	271.53	RT90-RHB70	-57.81	305.31	164.3400	2.7900	5.9100	
324.00	6699820.64	1632301.66	274.06	RT90-RHB70	-57.78	305.41	165.9300	2.9100	6.0300	
327.00	6699821.57	1632300.35	276.60	RT90-RHB70	-57.74	305.51	167.5300	3.0400	6.1600	
330.00	6699822.50	1632299.05	279.14	RT90-RHB70	-57.73	305.60	169.1200	3.1700	6.2800	
333.00	6699823.43	1632297.75	281.68	RT90-RHB70	-57.71	305.68	170.7200	3.3000	6.4100	
336.00	6699824.37	1632296.44	284.21	RT90-RHB70	-57.68	305.75	172.3200	3.4300	6.5400	
339.00	6699825.30	1632295.14	286.75	RT90-RHB70	-57.64	305.84	173.9100	3.5600	6.6700	
342.00	6699826.24	1632293.84	289.28	RT90-RHB70	-57.62	305.90	175.5100	3.7000	6.8000	
345.00	6699827.19	1632292.54	291.82	RT90-RHB70	-57.59	305.98	177.1200	3.8400	6.9300	
348.00	6699828.13	1632291.24	294.35	RT90-RHB70	-57.56	306.00	178.7200	3.9800	7.0700	
351.00	6699829.08	1632289.94	296.88	RT90-RHB70	-57.52	306.03	180.3200	4.1300	7.2000	
354.00	6699830.02	1632288.63	299.41	RT90-RHB70	-57.47	306.05	181.9200	4.2700	7.3400	
357.00	6699830.97	1632287.33	301.94	RT90-RHB70	-57.42	306.15	183.5300	4.4100	7.4800	
360.00	6699831.93	1632286.03	304.47	RT90-RHB70	-57.39	306.26	185.1400	4.5600	7.6200	
363.00	6699832.88	1632284.72	306.99	RT90-RHB70	-57.34	306.38	186.7500	4.7100	7.7700	
366.00	6699833.84	1632283.42	309.52	RT90-RHB70	-57.31	306.50	188.3600	4.8700	7.9100	
369.00	6699834.81	1632282.12	312.04	RT90-RHB70	-57.27	306.63	189.9700	5.0200	8.0600	
372.00	6699835.77	1632280.81	314.57	RT90-RHB70	-57.23	306.74	191.5900	5.1800	8.2100	
375.00	6699836.75	1632279.51	317.09	RT90-RHB70	-57.18	306.83	193.2000	5.3500	8.3600	
378.00	6699837.72	1632278.21	319.61	RT90-RHB70	-57.15	306.94	194.8200	5.5200	8.5100	

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
381.00	6699838.70	1632276.91	322.13	RT90-RHB70	-57.10	307.04	196.4400	5.6900	8.6700	
384.00	6699839.68	1632275.61	324.65	RT90-RHB70	-57.06	307.15	198.0600	5.8600	8.8200	
387.00	6699840.66	1632274.31	327.17	RT90-RHB70	-57.00	307.25	199.6800	6.0400	8.9800	
390.00	6699841.65	1632273.01	329.69	RT90-RHB70	-56.96	307.34	201.3100	6.2200	9.1400	
393.00	6699842.65	1632271.71	332.20	RT90-RHB70	-56.92	307.42	202.9300	6.4000	9.3100	
396.00	6699843.64	1632270.41	334.71	RT90-RHB70	-56.90	307.53	204.5600	6.5900	9.4700	
399.00	6699844.64	1632269.11	337.23	RT90-RHB70	-56.87	307.63	206.1900	6.7800	9.6400	
402.00	6699845.64	1632267.81	339.74	RT90-RHB70	-56.85	307.73	207.8100	6.9700	9.8100	
405.00	6699846.64	1632266.51	342.25	RT90-RHB70	-56.82	307.84	209.4400	7.1600	9.9700	
408.00	6699847.65	1632265.22	344.76	RT90-RHB70	-56.80	307.93	211.0700	7.3600	10.1400	
411.00	6699848.66	1632263.92	347.27	RT90-RHB70	-56.78	308.04	212.7000	7.5600	10.3100	
414.00	6699849.67	1632262.63	349.78	RT90-RHB70	-56.74	308.13	214.3300	7.7600	10.4800	
417.00	6699850.69	1632261.33	352.29	RT90-RHB70	-56.70	308.22	215.9700	7.9700	10.6500	
420.00	6699851.71	1632260.04	354.80	RT90-RHB70	-56.67	308.32	217.6000	8.1800	10.8300	
423.00	6699852.73	1632258.74	357.30	RT90-RHB70	-56.65	308.37	219.2300	8.3900	11.0000	
426.00	6699853.75	1632257.45	359.81	RT90-RHB70	-56.62	308.42	220.8700	8.6100	11.1800	
429.00	6699854.78	1632256.16	362.32	RT90-RHB70	-56.60	308.54	222.5100	8.8200	11.3600	
432.00	6699855.81	1632254.87	364.82	RT90-RHB70	-56.59	308.61	224.1400	9.0400	11.5400	
435.00	6699856.84	1632253.58	367.32	RT90-RHB70	-56.60	308.71	225.7800	9.2600	11.7100	
438.00	6699857.87	1632252.29	369.83	RT90-RHB70	-56.62	308.84	227.4200	9.4800	11.8900	
441.00	6699858.91	1632251.00	372.33	RT90-RHB70	-56.63	308.90	229.0500	9.7100	12.0700	
444.00	6699859.94	1632249.72	374.84	RT90-RHB70	-56.64	308.95	230.6800	9.9400	12.2400	
447.00	6699860.98	1632248.43	377.35	RT90-RHB70	-56.62	309.05	232.3200	10.1700	12.4200	
450.00	6699862.02	1632247.15	379.85	RT90-RHB70	-56.60	309.14	233.9500	10.4100	12.5900	
453.00	6699863.06	1632245.87	382.35	RT90-RHB70	-56.56	309.21	235.5900	10.6400	12.7700	
456.00	6699864.11	1632244.59	384.86	RT90-RHB70	-56.52	309.28	237.2200	10.8800	12.9500	
459.00	6699865.16	1632243.31	387.36	RT90-RHB70	-56.51	309.33	238.8600	11.1200	13.1300	
462.00	6699866.20	1632242.03	389.86	RT90-RHB70	-56.45	309.42	240.5000	11.3600	13.3100	
465.00	6699867.26	1632240.75	392.36	RT90-RHB70	-56.45	309.54	242.1400	11.6100	13.4900	
468.00	6699868.31	1632239.47	394.86	RT90-RHB70	-56.47	309.69	243.7800	11.8600	13.6700	
471.00	6699869.37	1632238.19	397.36	RT90-RHB70	-56.45	309.85	245.4100	12.1100	13.8600	
474.00	6699870.43	1632236.92	399.86	RT90-RHB70	-56.48	309.99	247.0500	12.3700	14.0400	
477.00	6699871.50	1632235.65	402.36	RT90-RHB70	-56.47	310.12	248.6900	12.6300	14.2200	
480.00	6699872.57	1632234.39	404.87	RT90-RHB70	-56.46	310.20	250.3200	12.8900	14.4000	
483.00	6699873.64	1632233.12	407.37	RT90-RHB70	-56.43	310.30	251.9600	13.1600	14.5700	
486.00	6699874.71	1632231.85	409.87	RT90-RHB70	-56.41	310.44	253.6000	13.4300	14.7600	
489.00	6699875.79	1632230.59	412.36	RT90-RHB70	-56.40	310.58	255.2300	13.7000	14.9400	
492.00	6699876.87	1632229.33	414.86	RT90-RHB70	-56.37	310.71	256.8700	13.9800	15.1200	
495.00	6699877.95	1632228.07	417.36	RT90-RHB70	-56.35	310.83	258.5100	14.2700	15.3000	
498.00	6699879.04	1632226.81	419.86	RT90-RHB70	-56.28	310.92	260.1500	14.5500	15.4800	
501.00	6699880.13	1632225.55	422.35	RT90-RHB70	-56.23	310.98	261.7900	14.8400	15.6700	
504.00	6699881.22	1632224.29	424.85	RT90-RHB70	-56.21	311.04	263.4300	15.1300	15.8600	
507.00	6699882.32	1632223.04	427.34	RT90-RHB70	-56.19	311.21	265.0700	15.4200	16.0500	
510.00	6699883.42	1632221.78	429.83	RT90-RHB70	-56.19	311.29	266.7100	15.7200	16.2400	
513.00	6699884.52	1632220.53	432.33	RT90-RHB70	-56.17	311.39	268.3600	16.0200	16.4200	

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
516.00	6699885.62	1632219.27	434.82	RT90-RHB70	-56.15	311.48	270.0000	16.3300	16.6100	
519.00	6699886.73	1632218.02	437.31	RT90-RHB70	-56.12	311.58	271.6400	16.6300	16.8000	
522.00	6699887.84	1632216.77	439.80	RT90-RHB70	-56.13	311.71	273.2800	16.9400	16.9900	
525.00	6699888.95	1632215.52	442.29	RT90-RHB70	-56.09	311.86	274.9300	17.2600	17.1800	
528.00	6699890.07	1632214.27	444.78	RT90-RHB70	-56.09	311.98	276.5700	17.5700	17.3800	
531.00	6699891.19	1632213.03	447.27	RT90-RHB70	-56.07	312.09	278.2100	17.8900	17.5700	
534.00	6699892.31	1632211.79	449.76	RT90-RHB70	-56.07	312.18	279.8600	18.2200	17.7600	
537.00	6699893.44	1632210.55	452.25	RT90-RHB70	-56.05	312.29	281.5000	18.5500	17.9500	
540.00	6699894.56	1632209.31	454.74	RT90-RHB70	-56.01	312.37	283.1400	18.8800	18.1400	
543.00	6699895.69	1632208.07	457.22	RT90-RHB70	-55.99	312.49	284.7800	19.2100	18.3300	
546.00	6699896.83	1632206.83	459.71	RT90-RHB70	-56.02	312.65	286.4300	19.5500	18.5300	
549.00	6699897.96	1632205.60	462.20	RT90-RHB70	-56.07	312.77	288.0700	19.8900	18.7200	
552.00	6699899.10	1632204.37	464.69	RT90-RHB70	-56.09	312.90	289.7100	20.2300	18.9000	
555.00	6699900.24	1632203.14	467.18	RT90-RHB70	-56.07	312.97	291.3500	20.5800	19.0900	
558.00	6699901.38	1632201.92	469.67	RT90-RHB70	-56.07	313.07	292.9800	20.9300	19.2800	
561.00	6699902.52	1632200.69	472.16	RT90-RHB70	-56.07	313.15	294.6200	21.2800	19.4600	
564.00	6699903.67	1632199.47	474.65	RT90-RHB70	-56.05	313.26	296.2600	21.6300	19.6500	
567.00	6699904.82	1632198.25	477.13	RT90-RHB70	-56.03	313.35	297.8900	21.9900	19.8300	
570.00	6699905.97	1632197.03	479.62	RT90-RHB70	-56.02	313.49	299.5300	22.3500	20.0200	
573.00	6699907.12	1632195.82	482.11	RT90-RHB70	-56.00	313.56	301.1700	22.7200	20.2100	
576.00	6699908.28	1632194.60	484.60	RT90-RHB70	-56.00	313.71	302.8000	23.0900	20.3900	
579.00	6699909.44	1632193.39	487.08	RT90-RHB70	-56.02	313.76	304.4400	23.4600	20.5800	
582.00	6699910.60	1632192.18	489.57	RT90-RHB70	-56.01	313.90	306.0700	23.8300	20.7700	
585.00	6699911.76	1632190.97	492.06	RT90-RHB70	-56.01	314.01	307.7100	24.2100	20.9500	
588.00	6699912.92	1632189.76	494.55	RT90-RHB70	-56.01	314.09	309.3400	24.5900	21.1300	
591.00	6699914.09	1632188.56	497.03	RT90-RHB70	-55.99	314.16	310.9800	24.9700	21.3200	
594.00	6699915.26	1632187.35	499.52	RT90-RHB70	-55.96	314.23	312.6100	25.3500	21.5000	
597.00	6699916.43	1632186.15	502.01	RT90-RHB70	-55.92	314.27	314.2400	25.7400	21.6900	
600.00	6699917.61	1632184.95	504.49	RT90-RHB70	-55.87	314.37	315.8800	26.1300	21.8700	
603.00	6699918.78	1632183.74	506.97	RT90-RHB70	-55.84	314.47	317.5200	26.5200	22.0600	
606.00	6699919.96	1632182.54	509.46	RT90-RHB70	-55.83	314.52	319.1500	26.9100	22.2500	
609.00	6699921.14	1632181.34	511.94	RT90-RHB70	-55.82	314.59	320.7900	27.3100	22.4400	
612.00	6699922.33	1632180.14	514.42	RT90-RHB70	-55.82	314.71	322.4300	27.7100	22.6300	
615.00	6699923.51	1632178.94	516.90	RT90-RHB70	-55.81	314.79	324.0700	28.1100	22.8200	
618.00	6699924.70	1632177.75	519.38	RT90-RHB70	-55.80	314.85	325.7000	28.5100	23.0100	
621.00	6699925.89	1632176.55	521.87	RT90-RHB70	-55.75	314.92	327.3400	28.9200	23.2000	
624.00	6699927.08	1632175.36	524.35	RT90-RHB70	-55.69	315.03	328.9800	29.3300	23.3900	
627.00	6699928.28	1632174.16	526.82	RT90-RHB70	-55.65	315.13	330.6200	29.7400	23.5900	
630.00	6699929.48	1632172.97	529.30	RT90-RHB70	-55.62	315.27	332.2600	30.1600	23.7800	
633.00	6699930.68	1632171.77	531.78	RT90-RHB70	-55.58	315.34	333.9000	30.5800	23.9800	
636.00	6699931.89	1632170.58	534.25	RT90-RHB70	-55.55	315.47	335.5400	31.0000	24.1800	
639.00	6699933.10	1632169.39	536.73	RT90-RHB70	-55.54	315.61	337.1800	31.4200	24.3800	
642.00	6699934.31	1632168.21	539.20	RT90-RHB70	-55.52	315.78	338.8200	31.8500	24.5700	
645.00	6699935.53	1632167.02	541.67	RT90-RHB70	-55.48	315.96	340.4700	32.2900	24.7700	
648.00	6699936.75	1632165.84	544.14	RT90-RHB70	-55.45	316.11	342.1100	32.7300	24.9700	

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
651.00	6699937.98	1632164.66	546.61	RT90-RHB70	-55.41	316.24	343.7500	33.1800	25.1700	
654.00	6699939.21	1632163.48	549.08	RT90-RHB70	-55.39	316.43	345.3900	33.6300	25.3700	
657.00	6699940.44	1632162.31	551.55	RT90-RHB70	-55.33	316.64	347.0400	34.0800	25.5700	
660.00	6699941.68	1632161.14	554.02	RT90-RHB70	-55.28	316.86	348.6800	34.5500	25.7700	
663.00	6699942.93	1632159.97	556.49	RT90-RHB70	-55.25	317.07	350.3200	35.0100	25.9800	
666.00	6699944.18	1632158.80	558.95	RT90-RHB70	-55.23	317.24	351.9600	35.4900	26.1800	
669.00	6699945.44	1632157.64	561.42	RT90-RHB70	-55.21	317.42	353.6100	35.9700	26.3800	
672.00	6699946.70	1632156.48	563.88	RT90-RHB70	-55.19	317.61	355.2500	36.4600	26.5800	
675.00	6699947.96	1632155.33	566.34	RT90-RHB70	-55.18	317.77	356.8900	36.9500	26.7900	
678.00	6699949.23	1632154.18	568.81	RT90-RHB70	-55.16	317.94	358.5300	37.4500	26.9900	
681.00	6699950.50	1632153.03	571.27	RT90-RHB70	-55.13	318.13	360.1700	37.9500	27.1900	
684.00	6699951.78	1632151.88	573.73	RT90-RHB70	-55.11	318.27	361.8000	38.4500	27.3900	
687.00	6699953.06	1632150.74	576.19	RT90-RHB70	-55.11	318.38	363.4400	38.9700	27.5900	
690.00	6699954.34	1632149.60	578.65	RT90-RHB70	-55.11	318.52	365.0800	39.4800	27.7900	
693.00	6699955.63	1632148.47	581.11	RT90-RHB70	-55.12	318.65	366.7100	40.0000	27.9900	
696.00	6699956.92	1632147.33	583.57	RT90-RHB70	-55.08	318.79	368.3500	40.5200	28.1900	
699.00	6699958.21	1632146.20	586.03	RT90-RHB70	-55.03	318.91	369.9800	41.0500	28.3800	
702.00	6699959.50	1632145.07	588.49	RT90-RHB70	-54.98	319.05	371.6200	41.5800	28.5800	
705.00	6699960.80	1632143.94	590.95	RT90-RHB70	-54.92	319.14	373.2500	42.1200	28.7900	
708.00	6699962.11	1632142.81	593.40	RT90-RHB70	-54.85	319.26	374.8900	42.6500	28.9900	
711.00	6699963.42	1632141.69	595.86	RT90-RHB70	-54.87	319.39	376.5300	43.2000	29.2000	
714.00	6699964.73	1632140.56	598.31	RT90-RHB70	-54.87	319.47	378.1700	43.7500	29.4000	
717.00	6699966.04	1632139.44	600.76	RT90-RHB70	-54.90	319.53	379.8100	44.2900	29.6000	
720.00	6699967.35	1632138.32	603.22	RT90-RHB70	-54.91	319.64	381.4400	44.8500	29.8100	
723.00	6699968.67	1632137.20	605.67	RT90-RHB70	-54.91	319.74	383.0700	45.4000	30.0100	
726.00	6699969.98	1632136.09	608.13	RT90-RHB70	-54.90	319.88	384.7100	45.9500	30.2000	
729.00	6699971.30	1632134.98	610.58	RT90-RHB70	-54.89	319.96	386.3400	46.5200	30.4000	
732.00	6699972.62	1632133.87	613.04	RT90-RHB70	-54.89	320.14	387.9700	47.0800	30.6000	
735.00	6699973.95	1632132.76	615.49	RT90-RHB70	-54.89	320.29	389.6000	47.6500	30.8000	
738.00	6699975.27	1632131.66	617.94	RT90-RHB70	-54.90	320.45	391.2300	48.2200	30.9900	
741.00	6699976.60	1632130.56	620.40	RT90-RHB70	-54.90	320.62	392.8500	48.8000	31.1900	
744.00	6699977.94	1632129.47	622.85	RT90-RHB70	-54.90	320.79	394.4700	49.3800	31.3800	
747.00	6699979.27	1632128.38	625.31	RT90-RHB70	-54.86	320.96	396.1000	49.9600	31.5700	
750.00	6699980.61	1632127.29	627.76	RT90-RHB70	-54.78	321.12	397.7200	50.5500	31.7600	
753.00	6699981.96	1632126.20	630.21	RT90-RHB70	-54.70	321.25	399.3400	51.1500	31.9500	
756.00	6699983.31	1632125.12	632.66	RT90-RHB70	-54.64	321.39	400.9700	51.7500	32.1500	
759.00	6699984.67	1632124.03	635.11	RT90-RHB70	-54.56	321.50	402.6000	52.3600	32.3500	
762.00	6699986.03	1632122.95	637.55	RT90-RHB70	-54.54	321.61	404.2200	52.9700	32.5500	
765.00	6699987.40	1632121.87	639.99	RT90-RHB70	-54.52	321.75	405.8500	53.5900	32.7500	
768.00	6699988.76	1632120.79	642.44	RT90-RHB70	-54.49	321.87	407.4800	54.2100	32.9500	
771.00	6699990.13	1632119.72	644.88	RT90-RHB70	-54.45	321.99	409.1100	54.8300	33.1500	
774.00	6699991.51	1632118.64	647.32	RT90-RHB70	-54.43	322.08	410.7300	55.4600	33.3500	
777.00	6699992.88	1632117.57	649.76	RT90-RHB70	-54.41	322.21	412.3600	56.0900	33.5600	
780.00	6699994.26	1632116.50	652.20	RT90-RHB70	-54.36	322.31	413.9900	56.7200	33.7600	
783.00	6699995.65	1632115.43	654.64	RT90-RHB70	-54.28	322.45	415.6200	57.3600	33.9600	

Length (m)	Northing (m)	Easting (m)	Eleva- tion (m)	Coord System	Inclina- tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
786.00	6699997.04	1632114.36	657.07	RT90-RHB70	-54.19	322.53	417.2500	58.0000	34.1700	
789.00	6699998.43	1632113.30	659.51	RT90-RHB70	-54.14	322.63	418.8800	58.6500	34.3800	
792.00	6699999.83	1632112.23	661.94	RT90-RHB70	-54.10	322.80	420.5100	59.3000	34.5900	
795.00	6700001.23	1632111.17	664.37	RT90-RHB70	-54.07	323.00	422.1400	59.9500	34.8000	
798.00	6700002.63	1632110.11	666.80	RT90-RHB70	-54.04	323.12	423.7700	60.6200	35.0100	
801.00	6700004.04	1632109.05	669.22	RT90-RHB70	-53.99	323.27	425.4100	61.2800	35.2200	
804.00	6700005.46	1632108.00	671.65	RT90-RHB70	-53.92	323.44	427.0400	61.9500	35.4300	
807.00	6700006.88	1632106.94	674.08	RT90-RHB70	-53.87	323.61	428.6700	62.6300	35.6500	
810.00	6700008.30	1632105.89	676.50	RT90-RHB70	-53.79	323.76	430.3000	63.3100	35.8600	
813.00	6700009.73	1632104.85	678.92	RT90-RHB70	-53.77	323.94	431.9300	64.0000	36.0800	
816.00	6700011.16	1632103.80	681.34	RT90-RHB70	-53.77	324.11	433.5700	64.6900	36.2900	
819.00	6700012.60	1632102.76	683.76	RT90-RHB70	-53.74	324.31	435.2000	65.3900	36.5100	
822.00	6700014.04	1632101.73	686.18	RT90-RHB70	-53.70	324.47	436.8200	66.0900	36.7200	
825.00	6700015.49	1632100.70	688.60	RT90-RHB70	-53.67	324.66	438.4500	66.8000	36.9400	
828.00	6700016.93	1632099.67	691.01	RT90-RHB70	-53.64	324.79	440.0800	67.5200	37.1500	
831.00	6700018.39	1632098.64	693.43	RT90-RHB70	-53.60	324.93	441.7100	68.2400	37.3600	
834.00	6700019.85	1632097.62	695.84	RT90-RHB70	-53.58	325.09	443.3300	68.9600	37.5800	
837.00	6700021.31	1632096.60	698.26	RT90-RHB70	-53.58	325.25	444.9600	69.6900	37.7900	
840.00	6700022.77	1632095.58	700.67	RT90-RHB70	-53.58	325.42	446.5800	70.4300	38.0000	
843.00	6700024.24	1632094.57	703.09	RT90-RHB70	-53.58	325.55	448.2000	71.1700	38.2100	
846.00	6700025.70	1632093.57	705.50	RT90-RHB70	-53.55	325.69	449.8200	71.9100	38.4200	
849.00	6700027.18	1632092.56	707.91	RT90-RHB70	-53.52	325.84	451.4400	72.6500	38.6200	
852.00	6700028.65	1632091.56	710.33	RT90-RHB70	-53.48	326.02	453.0600	73.4100	38.8300	
855.00	6700030.13	1632090.56	712.74	RT90-RHB70	-53.45	326.19	454.6700	74.1600	39.0400	
858.00	6700031.62	1632089.57	715.15	RT90-RHB70	-53.43	326.29	456.2900	74.9300	39.2500	
861.00	6700033.10	1632088.58	717.56	RT90-RHB70	-53.45	326.40	457.9000	75.6900	39.4500	
864.00	6700034.59	1632087.59	719.97	RT90-RHB70	-53.44	326.51	459.5200	76.4600	39.6600	
867.00	6700036.08	1632086.60	722.38	RT90-RHB70	-53.42	326.65	461.1300	77.2300	39.8600	
870.00	6700037.58	1632085.62	724.78	RT90-RHB70	-53.39	326.81	462.7400	78.0100	40.0600	
873.00	6700039.07	1632084.64	727.19	RT90-RHB70	-53.39	326.95	464.3500	78.7900	40.2700	
876.00	6700040.57	1632083.66	729.60	RT90-RHB70	-53.43	327.03	465.9500	79.5800	40.4700	
879.00	6700042.07	1632082.69	732.01	RT90-RHB70	-53.40	327.12	467.5600	80.3600	40.6600	
882.00	6700043.57	1632081.72	734.42	RT90-RHB70	-53.35	327.23	469.1600	81.1500	40.8600	
885.00	6700045.08	1632080.75	736.83	RT90-RHB70	-53.30	327.35	470.7700	81.9500	41.0600	
888.00	6700046.59	1632079.78	739.23	RT90-RHB70	-53.23	327.44	472.3800	82.7400	41.2600	
891.00	6700048.10	1632078.82	741.63	RT90-RHB70	-53.20	327.54	473.9800	83.5500	41.4700	
894.00	6700049.62	1632077.85	744.04	RT90-RHB70	-53.20	327.67	475.5900	84.3500	41.6700	
897.00	6700051.14	1632076.89	746.44	RT90-RHB70	-53.18	327.82	477.1900	85.1600	41.8700	
900.00	6700052.66	1632075.93	748.84	RT90-RHB70	-53.14	327.91	478.8000	85.9700	42.0700	
903.00	6700054.18	1632074.98	751.24	RT90-RHB70	-53.10	328.04	480.4000	86.7900	42.2700	
906.00	6700055.71	1632074.02	753.64	RT90-RHB70	-53.04	328.12	482.0000	87.6100	42.4700	
909.00	6700057.24	1632073.07	756.04	RT90-RHB70	-52.94	328.24	483.6100	88.4300	42.6800	
912.00	6700058.78	1632072.12	758.43	RT90-RHB70	-52.88	328.32	485.2100	89.2600	42.8800	
915.00	6700060.32	1632071.17	760.82	RT90-RHB70	-52.82	328.40	486.8200	90.1000	43.0900	
918.00	6700061.87	1632070.22	763.21	RT90-RHB70	-52.74	328.48	488.4300	90.9300	43.3000	

Length (m)	Northing (m)	Easting (m)	Eleva-tion (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
921.00	6700063.41	1632069.27	765.60	RT90-RHB70	-52.64	328.54	490.0400	91.7700	43.5100	
924.00	6700064.97	1632068.32	767.99	RT90-RHB70	-52.58	328.67	491.6500	92.6200	43.7300	
927.00	6700066.52	1632067.37	770.37	RT90-RHB70	-52.48	328.82	493.2700	93.4700	43.9500	
930.00	6700068.09	1632066.43	772.75	RT90-RHB70	-52.43	328.98	494.8800	94.3200	44.1700	
933.00	6700069.65	1632065.48	775.13	RT90-RHB70	-52.42	329.12	496.5000	95.1800	44.3900	
936.00	6700071.23	1632064.54	777.50	RT90-RHB70	-52.42	329.23	498.1100	96.0500	44.6100	
939.00	6700072.80	1632063.61	779.88	RT90-RHB70	-52.41	329.35	499.7200	96.9100	44.8300	
942.00	6700074.37	1632062.67	782.26	RT90-RHB70	-52.39	329.49	501.3300	97.7900	45.0500	
945.00	6700075.95	1632061.74	784.63	RT90-RHB70	-52.34	329.60	502.9400	98.6600	45.2700	
948.00	6700077.53	1632060.82	787.01	RT90-RHB70	-52.32	329.72	504.5400	99.5400	45.4800	
951.00	6700079.11	1632059.89	789.38	RT90-RHB70	-52.31	329.87	506.1500	100.4200	45.7000	
954.00	6700080.70	1632058.97	791.76	RT90-RHB70	-52.28	329.99	507.7600	101.3100	45.9200	
957.00	6700082.29	1632058.05	794.13	RT90-RHB70	-52.24	330.14	509.3600	102.2000	46.1300	
960.00	6700083.88	1632057.14	796.50	RT90-RHB70	-52.20	330.26	510.9600	103.1000	46.3500	
963.00	6700085.48	1632056.23	798.87	RT90-RHB70	-52.15	330.42	512.5700	104.0000	46.5600	
966.00	6700087.08	1632055.32	801.24	RT90-RHB70	-52.15	330.60	514.1700	104.9100	46.7800	
969.00	6700088.68	1632054.42	803.61	RT90-RHB70	-52.13	330.76	515.7700	105.8200	46.9900	
972.00	6700090.29	1632053.52	805.98	RT90-RHB70	-52.09	330.90	517.3600	106.7400	47.2000	
975.00	6700091.90	1632052.62	808.35	RT90-RHB70	-52.09	331.03	518.9600	107.6600	47.4100	
978.00	6700093.51	1632051.73	810.71	RT90-RHB70	-52.07	331.18	520.5600	108.5800	47.6200	
981.00	6700095.13	1632050.84	813.08	RT90-RHB70	-52.02	331.32	522.1500	109.5100	47.8300	
984.00	6700096.75	1632049.95	815.44	RT90-RHB70	-51.95	331.42	523.7400	110.4500	48.0400	
990.00	6700100.01	1632048.18	820.16	RT90-RHB70	-51.82	331.54	526.9300	112.3300	48.4700	

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KFM06B, 2004-06-08 00:00:00 (0.000–96.000 m).

Length (m)	Northing (m)	Easting (m)	Elevation (m)	Coord System	Inclina-tion (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag (m)
0.00	6699732.24	1632446.41	-4.13	RT90-RHB70	-83.52	296.96	0.0000	0.0000	0.0000	
3.00	6699732.39	1632446.11	-1.15	RT90-RHB70	-83.59	296.73	0.3400	0.0000	0.0000	
6.00	6699732.54	1632445.81	1.83	RT90-RHB70	-83.70	296.79	0.6700	0.0000	0.0000	
9.00	6699732.69	1632445.52	4.81	RT90-RHB70	-83.68	296.92	1.0000	0.0000	-0.0100	
12.00	6699732.84	1632445.22	7.80	RT90-RHB70	-83.65	296.49	1.3300	0.0000	-0.0200	
15.00	6699732.99	1632444.92	10.78	RT90-RHB70	-83.60	296.70	1.6600	-0.0100	-0.0300	
18.00	6699733.14	1632444.63	13.76	RT90-RHB70	-83.57	296.85	2.0000	-0.0100	-0.0300	
21.00	6699733.29	1632444.33	16.74	RT90-RHB70	-83.55	297.01	2.3300	-0.0100	-0.0400	
24.00	6699733.45	1632444.03	19.72	RT90-RHB70	-83.52	297.14	2.6700	-0.0100	-0.0400	
27.00	6699733.60	1632443.72	22.70	RT90-RHB70	-83.50	297.46	3.0100	-0.0100	-0.0400	
30.00	6699733.76	1632443.42	25.68	RT90-RHB70	-83.52	297.50	3.3500	0.0000	-0.0400	
33.00	6699733.91	1632443.12	28.66	RT90-RHB70	-83.48	298.00	3.6900	0.0000	-0.0400	
36.00	6699734.07	1632442.82	31.64	RT90-RHB70	-83.46	298.31	4.0300	0.0100	-0.0300	
39.00	6699734.23	1632442.52	34.62	RT90-RHB70	-83.50	298.35	4.3700	0.0100	-0.0300	
42.00	6699734.40	1632442.22	37.60	RT90-RHB70	-83.47	298.13	4.7100	0.0200	-0.0300	
45.00	6699734.56	1632441.92	40.59	RT90-RHB70	-83.44	298.84	5.0500	0.0300	-0.0300	
48.00	6699734.72	1632441.62	43.57	RT90-RHB70	-83.47	298.91	5.3900	0.0400	-0.0200	
51.00	6699734.89	1632441.32	46.55	RT90-RHB70	-83.47	298.94	5.7400	0.0500	-0.0200	
54.00	6699735.05	1632441.02	49.53	RT90-RHB70	-83.46	299.25	6.0800	0.0600	-0.0200	
57.00	6699735.22	1632440.73	52.51	RT90-RHB70	-83.44	299.37	6.4200	0.0800	-0.0200	
60.00	6699735.39	1632440.43	55.49	RT90-RHB70	-83.42	299.02	6.7600	0.0900	-0.0100	
63.00	6699735.55	1632440.13	58.47	RT90-RHB70	-83.41	298.79	7.1000	0.1000	-0.0100	
66.00	6699735.72	1632439.82	61.45	RT90-RHB70	-83.41	298.69	7.4500	0.1200	0.0000	
69.00	6699735.88	1632439.52	64.43	RT90-RHB70	-83.40	298.43	7.7900	0.1300	0.0000	
72.00	6699736.05	1632439.22	67.41	RT90-RHB70	-83.42	298.27	8.1400	0.1300	0.0100	
75.00	6699736.21	1632438.92	70.39	RT90-RHB70	-83.43	298.21	8.4800	0.1400	0.0200	
78.00	6699736.37	1632438.61	73.37	RT90-RHB70	-83.44	298.04	8.8200	0.1500	0.0200	
81.00	6699736.53	1632438.31	76.35	RT90-RHB70	-83.47	297.80	9.1700	0.1600	0.0200	
84.00	6699736.69	1632438.01	79.33	RT90-RHB70	-83.51	297.75	9.5100	0.1600	0.0300	
87.00	6699736.85	1632437.71	82.31	RT90-RHB70	-83.55	297.70	9.8500	0.1700	0.0300	
90.00	6699737.01	1632437.41	85.29	RT90-RHB70	-83.59	297.67	10.1800	0.1700	0.0300	
96.00	6699737.32	1632436.82	91.25	RT90-RHB70	-83.60	298.44	10.8500	0.1800	0.0200	

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Appendix 4

Length reference marks

Reference Mark T - Reference mark in drillhole

KFM06A, 2004-09-22 00:00:00 (152.000–980.000 m).

Bhlen (m)	Rotation Speed (rpm)	Start Flow (l/min)	Stop Flow (l/min)	Stop Pressure (bar)	Cutter Time (s)	Trace Detectable	Cutter Diameter (mm)	Comment
152.00	400.00	400	600	40.0	60	Ja		Signal Ja
200.00	400.00	400	600	44.0	120	Ja		Signal Ja
250.00	400.00	300	600	45.0	240	Ja		Signal Ja
301.00	400.00	500	600	50.0	300	Ja		Signal Ja
350.00	400.00	300	600	35.0	180	Ja		Signal Ja
400.00	400.00	500	700	50.0	360	Ja		Signal Nej
450.00	400.00	300	600	50.0	300	Ja		Signal Nej
500.00	400.00	300	600	50.0	360	Ja		Signal Nej
550.00	400.00	700	800	50.0	300	Ja		Signal Nej
600.00	400.00	300	800	50.0	300	Ja		Signal Nej
650.00	400.00	400	900	50.0	420	Nej		Signal Nej
700.00	400.00	450	1,000	50.0	420	Nej		Signal Nej
750.00	400.00	600	1,000	50.0	420	Ja		Signal Nej
800.00	400.00	800	1,000	50.0	420	Nej		Signal Nej
850.00	300.00		1,000	50.0	480	Nej		Signal Nej
900.00	400.00		1,000	44.0	600	Nej		Signal Nej
950.00	400.00		1,000	50.0	600	Nej		Signal Nej
980.00	400.00		1,000	50.0	600	Nej		Signal Nej

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