P-04-115

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Boremap mapping of telescopic drilled borehole KFM04A

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May 2004

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Keywords: KFM04A, Geology, Drill core mapping, BIPS, Boremap, Fractures, Forsmark, AP PF 400-03-100, Field note: Forsmark 313.

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 rock mass down to a depth of about 1 km in the central part of the test site area at Forsmark, three deep telescopic boreholes were drilled. Each borehole starts with 100 m of percussion drilling, followed by core drilling down to about 1000 m depth. To obtain drill cores for the upper 100 m, 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 program, aiming to solve more specific geological questions. An important aspect when localizing the first of these The borehole, KFM04A, aims to investigate the western boundary of the tectonic lens, which defines the test site area. The borehole is located just outside the northwestern part of the test site area and plunges 60° towards NE, beneath the area (Figure 1-1). The borehole is a telescopic borehole of the SKB chemical type (cf. SKB MD 620.004), identical with the three previous deep boreholes in the area, with a total length of about 1000 m. The drilling activities in KFM04A were

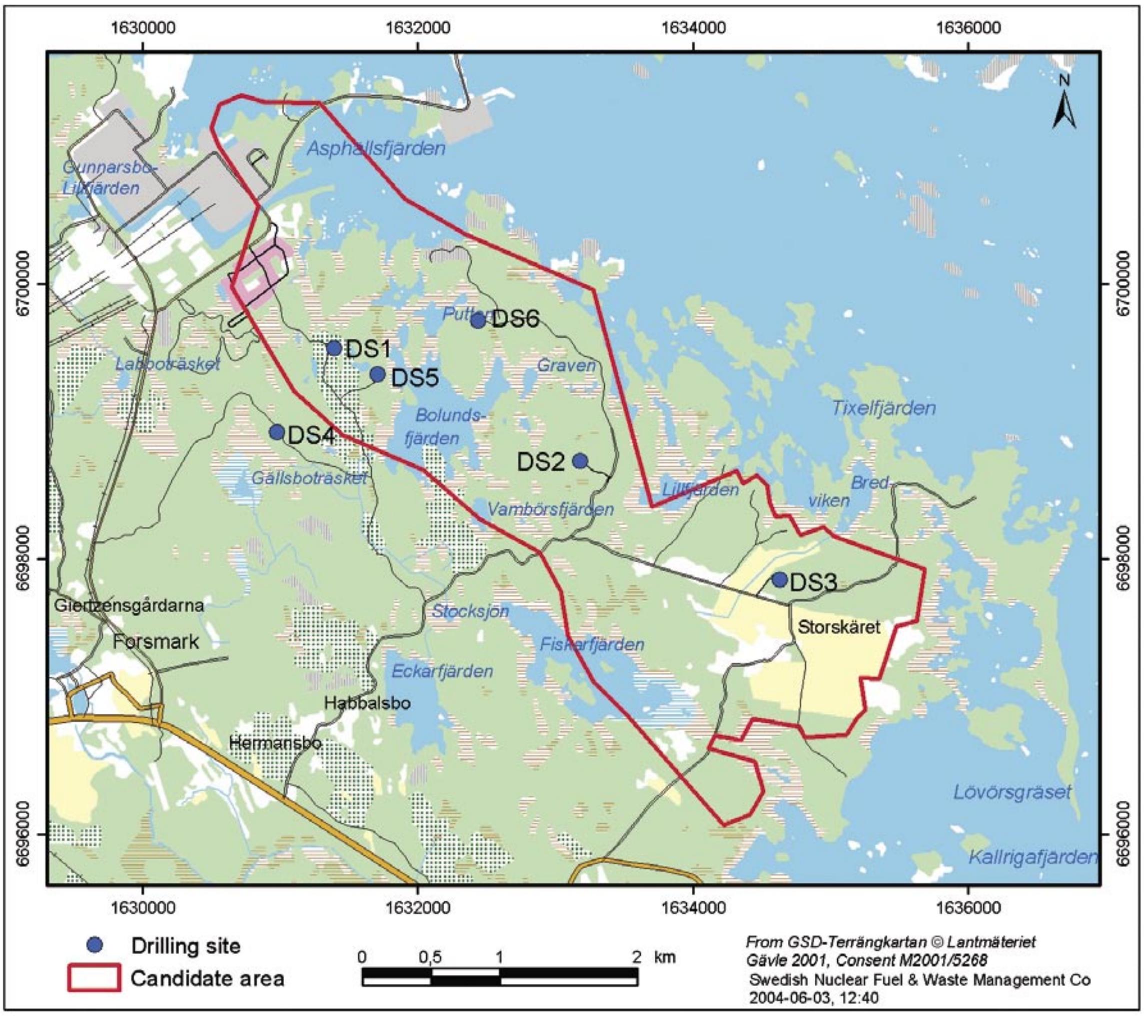


Figure 1-1. *Location of telescopic drilled boreholes KFM01A+B, KFM02A, KFM03A+B and KFM04A in the Forsmark test site area.*

finished in the turn of October-November 2003, after which the geological logging and sampling continued, with several breaks, to the middle of May 2004.

A detailed mapping of the material 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 information from drill core mapping, or alternatively, the drill cuttings when a core is not available, with results from BIPS-logging (Borehole Image Processing System) and calculates the absolute position and orientation of fractures and various lithological features /1/.

This report presents the results from the mapping of KFM04A by the Boremap system. It also gives a brief discussion of the results in a larger context, relative to the data from the four previous cored boreholes KFM01A, KFM02A and KFM03A+B, as well as the surface geology.

2 Objective and scope

Borehole KFM04A starts with 106.95 m of percussion drilling (ø = 165 mm), followed by core drilling at ø = 86 mm to a length of 108.69 m, and at ø = 77 mm down to full borehole length of 1001.42 m. The diameters of the two drill cores are 70 mm and 51 mm, respectively. The BIPS-image from the upper, percussion drilled part of KFM04A covers the length interval between 11.00 and 106.75 m, though the interval usable for mapping starts at c. 11.7 m /2/. Drill cuttings were collected at 1 m intervals between 2.0 and 107.4 m depth. The usable BIPS-image of the cored part of the borehole covers the interval between 108.75 and 985.68 m /2/. Thus, there are no BIPS-images available for the c. 1.7 m interval drilled by ø = 86 mm (i.e. from 106.95 to 108.69 m) and the last 15.5 m of the borehole, from 985.94 to 1001.42 m.

The aim of the mapping activities is to obtain a detailed documentation of all structures and lithologies intersected by the BIPS-logged intervals of borehole KFM04A. In addition, the engagement includes conventional mapping of all drill cuttings collected from the upper, percussion drilled 100 m and the drill core from the lowermost 15.5 m of the borehole. These data will serve as a platform for forthcoming analyses of the drill core, aimed at investigating geological, petrophysical and mechanical aspects of the rock volume, as well as site descriptive modelling.

3 Equipment

3.1 Description of equipment

All BIPS-based mapping was performed in Boremap v. 3.3.5 and 3.4.2.0. This software contains the bedrock and mineral standard used by the Geological Survey of Sweden (SGU) for surface mapping at the Forsmark investigation site to enable correlation with the surface geology. Additional software used during the course of the mapping 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 mapping: folding rule, hydrochloric acid, unglazed porcelain plate, knife, hand lens, paintbrush and tap water.

4 Execution

During the mapping, the c. 900 m drill core obtained from the interval 106.95–1001.45 m of KFM04A 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 was preceded by an overview mapping and initial separation of induced and natural fractures. No thin-sections were available from the drill cores, and all lithological descriptions are based on ocular inspection.

The mapping of KFM04A was performed according to activity plan AP PF 400-03-100 (SKB internal controlling document) following the SKB method description for Boremap mapping, SKB MD 143.006 (v. 2.0), with the exception that no geophysical logs were available for the percussion drilled upper part of the borehole.

4.1 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 m. It was, therefore, necessary to adjust the length with reference to groove millings cut into the borehole wall at every 50 m, with the deepest slot at a length of 950 m. The exact 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 at the drill core, as the core recovery may yield erroneous lengths. The difference above about 900 m is less than 2 dm. Below that level the difference may exceed 3 dm. No length adjustments was done in the BIPS-images for the percussion drilled 100 m of KFM04A, as the deviation from the true length is considered to be negligible (i.e. less than 0.5 m) at such shallow depths.

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.

Drill cuttings were collected each metre in the upper, percussion drilled 100 m. Each sample container hosts three such samples. Where lithological differences were distinguishable between the three samples a separation was made; otherwise the content was mixed to obtain a homogeneous 3 m interval sample. The data from the mapping of the drill cuttings are stored in SKB's database SICADA (Appendix 5).

4.2 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.

The mapping was quality checked by a routine in the Boremap software before it was archived. The data were subsequently exported to the SKB database SICADA and stored under Field note: Forsmark 313.

4.3 Analyses and interpretation

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 KFM04A such features were approximated by fitting the plane after one of their ends in the borehole. The fact that the structure did not actually intersect the borehole is only noted in the attached comments.

Another problem in the system is geological features (mainly fractures) that can be observed only in the drill core. This problem usually arises from poor resolution in the BIPS-image /9/, which in the present case often was caused by the presence of suspended drill cuttings and/or brownish black coating on the borehole walls. However, even in the most perfect BIPS-image, it is sometimes difficult to distinguish a thin fracture sealed by some low contrast mineral. All fractures and lithological contacts observed in the drill core, but not 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 suspected to be induced by the drilling activities fall within this category. Obviously drill induced fractures are not included mapped.

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

The fracture mapping centres on the division into broken and unbroken fractures, depending on whether they parting the core. Broken fractures include both open fractures and originally sealed fractures, which were broken during the drilling procedure. 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', based on the weathering 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).

All fractures in the percussion drilled upper part were mapped as broken fractures. Except for laumontite, it was not possible to distinguish individual infilling minerals in the BIPS-image for this interval, and the vast majority of the filling was mapped as 'unknown mineral'.

A large amount of the fractures intersected by KFM04A are sealed by laumontite (a Ca-zeolite). These fractures are both broken and unbroken, but laumontite tends to expand, and eventually crackle in the drill core. Thus, all laumontite-bearing fractures suspected to have been sealed originally are registered as unbroken.

As in pervious boreholes, the mapping was hampered by suspended drill cuttings and the occurrence of brownish black coatings on the borehole walls, as mentioned above. The coating occurs sporadically throughout the core-drilled interval of the borehole, and in the worst cases it obscures even the most contrasting rock occurrences completely. This phenomenon is obviously drill induced, although the mechanism behind it is not fully understood. One plausible explanation is that the coatings originate from metal fragments abraded from the drill pipes, and that the spiral pattern is a consequence of wobbling of the pipe string in the borehole. The last 100 m of the borehole is virtually free from coating, but the gentle plunge of the borehole (c. 45°) (Appendix 3) has locally led to a mottled BIPS-image and up to 1 m wide accumulations of drill cuttings.

The last 15.5 m of the drill core, for which no BIPS-image is available, was mapped conventionally. The results are reported in Appendix 6, and include rock types, alterations, occurrences wider than 4 cm, separation of sealed and open fractures and main fracture filling minerals.

5 Results

5.1 Ductile structures

Borehole KFM04A was located in the ductile, high-strain belt just outside the northwestern part of the test site area and plunges 60° towards NE, into the tectonic lens of less intense ductile strain, which defines the test site area. The boundary between the two structural domains is gradual at a borehole length of about 480–500 m (i.e. a true depth of c. 425 ± 9 m). The upper half of the borehole, within the high-strain belt, is characterised by strong penetrative foliation, generally striking SE and dipping steeply towards SW (Figure 5-1). Within the tectonic lens, the fabric becomes less intense and a linear mineral fabric becomes more obvious. This linear component is common in rocks that intruded after the formation of the foliation, but is normally less well defined in the predominant rock unit. There are, however, a few intervals of the latter in which the linear mineral fabric is more distinct than the foliation, i.e. at 640.5–648.1 m, 926.0–932.4 m and 970.4–975.4 m. The orientation of the foliation in this part is more variable, but generally parallel with that in the high-strain belt. Similar to the structures at the surface (cf. Figure 5-11g in /3/), the foliation tend to fall along a π-circle, the pole to which plunges moderately towards SE (Figure 5-1). None of the linear fabrics have been registered (cf. section 4.3), though the general impression is that they are gently to moderately dipping.

Several zones of more intense ductile deformation, typically 1–3 m wide, occur between 322 m and 440 m in the borehole. Two of them reach up to about 5 m in width. The lithology in these ductile, high-strain zones is often heterogeneous and seems to consist of highly deformed and grain-size reduced varieties of the rocks found adjacent to the zones. However, an almost complete muscovitization of some zones renders recognition of the original lithology impossible. Noteworthy, the metagranitoids (rock code 101051), which

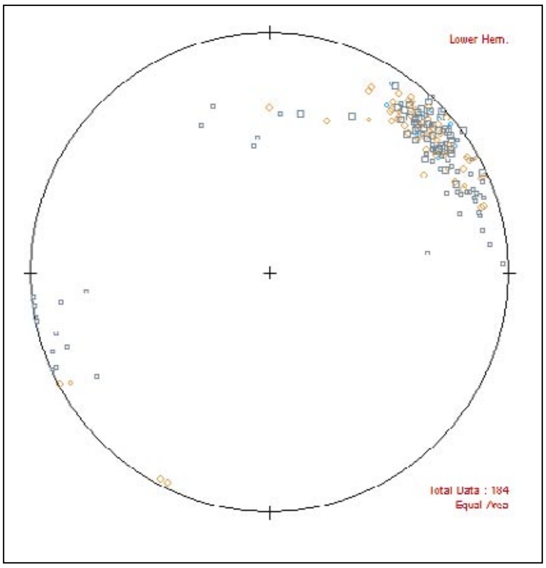


Figure 5-1. *Lower hemisphere equal-area stereographic projection showing poles to ductile foliation planes (blue squares) and ductile (red circles) and brittle-ductile (blue circles) shear zones (red squares) intersected by borehole KFM04A. Structures in the lower 500 m of the borehole (i.e. within the tectonic lens) are denoted by small symbols.*

typically show only linear mineral fabric, have intruded prior to the formation of the ductile high-strain zones. In addition, 15 brittle-ductile deformation zones are registered in the cored interval. Most of these are associated with fractures filled by epidote and chlorite. All planar structures within zones are more or less parallel with the tectonic foliation (Figure 5-1).

5.2 Core lithology

Similar to surface mapping of drilling site (DS) 4, the percussion drilled part of KFM04A is dominated by an intensely deformed sequence of fine- to medium-grained metagranodiorite (rock code 101056) and felsic to intermediate rocks of inferred volcanic origin (rock code 103076)/cf. 4/. The latter component decreases towards depth, and the uppermost part of the cored interval is dominated by the fine- to medium-grained metagranodiorite down to a borehole length of 176 m. Below that level, the main rock becomes more granitic, and the rock is inferred to be a more strongly deformed variety of the medium-grained metagranite-granodiorite (rock code 101057), which dominates the tectonic lens /cf. 5/. A third, volumetrically important, rock unit in KFM04A is a fine- to finely medium-grained metagranitoid (rock code 101051), which predominates the length interval from 342 to 442 m and 938 to 967 m. The upper of these two intervals has been variably affected by ductile deformation and contains virtually all major, ductile high-strain zones in the borehole; a fact that often renders recognition of individual rock units almost impossible. Another noteworthy component is a hornblende-rich rock of quartz dioritic composition, with sulphide disseminations and considerable amounts of garnet. During the mapping, the rock was registered as ‘amphibolite’ (rock code 102017). Major occurrences of the rock are found in three length intervals of the cored section: 444.6–448.0 m, 728.9–742.7 m and 989.7–999.0 m. Other rock units within the borehole, none exceeding a few metres in length, include amphibolites and minor dykes or veins of pegmatite, aplite and leucogranite. Except for some late veins or dykes, all rocks have experienced Svecofennian metamorphism under amphibolite facies conditions.

The metagranite-granodiorite (rock code 101057) in the lower half of KFM04A is more or less identical to the variety found in the three previous deep boreholes (KFM01A, KFM02A and KFM03A) in the area /6–8/. In the upper, high-strain domain of the borehole, the rock becomes more strongly foliated with a fine- to medium-grained, equigranular texture. Together, the two varieties comprise more than 65 % of the cored interval. The colour of the rock ranges from greyish red to grey. However, completely grey varieties, lacking the reddish tint, are sparse and typically restricted to contact zones with amphibolites. A few, metre-wide intervals in the lower part of KFM04A, are variably speckled by fine-grained, whitish plagioclase. Microscopic examination of similar rocks from KFM01A and KFM03A suggests that the feature is a result of retrograde sericitisation /9/.

The occurrence of fine- to medium-grained metagranodiorite (rock code 101056) is limited to the upper 176 m of the borehole and comprises about 6 % of the cored interval. It is equigranular and grey to dark reddish grey in colour. The metagranodiorite is difficult to distinguish from the strongly foliated variety of the metagranite-granodiorite, and the macroscopic separation is based on the rock colour and content of ferromagnesian phases.

Another rock mainly found in the upper parts of the borehole is the fine-grained, felsic to intermediate rock of inferred volcanic origin (rock code 103076). Except for a single occurrence at 804.7–806.4 m length, it is limited to the upper 450 m of the borehole. In the cored interval, it comprises about 2 % of the total length and none of the occurrences exceed a few metres in width. The rock is equigranular, dark grey in colour and all contacts are parallel with the tectonic foliation. Apart from the grain-size, there are no textural or structural macroscopic features that unambiguously point towards a volcanic origin of the rock.

Fine- to finely medium-grained, equigranular granitoids (rock code 101051) occupy approximately 11 % of the cored interval. Most rocks in this group are of granodioritic to granitic composition. As mentioned above, these rocks are concentrated in two length intervals (342–442 m and 938–967 m). Occurrences outside the intervals are scarce and typically less than 1 m wide. Obviously, the metagranitoids in the length interval have intruded prior to the formation of the ductile high-strain zones in the length interval 342–442 m. Elsewhere, however, the mineral fabric is commonly of linear character, and external contacts are locally clearly discordant to the tectonic foliation in the wall rock (i.e. at 463.10 m).

Dykes, veins and segregations of pegmatite, pegmatitic granite, aplite and leucogranitic material are frequent throughout the boreholes, and the rock group about 13 % of the total drill core length. A majority of the rocks in this group exhibit a weak to faint tectonic fabric, often of linear character, although there are several examples of discordant and, what seems to be, massive pegmatites. However, it must be emphasized that it often was difficult to distinguish tectonic fabric visually in the pegmatitic rocks, but the fact that they appear massive does not necessarily mean that they actually are post-kinematic. Most occurrences are some decimetre or less, but several pegmatites/pegmatitic granites reach up to a few metres in length. The pegmatitic granites are generally texturally heterogeneous, often with a highly variable grain-size, and some occurrences include intervals of medium-grained, equigranular granite. Minor occurrences of leucogranite and pegmatitic granite are typically irregular with blurred or indistinct contacts toward the surrounding metagranite-granodiorite. Rather coarse magnetite and hematite have been identified in several pegmatites. Despite the textural variability and temporal span within this unit, most of these rocks were grouped as “pegmatite, pegmatitic granite” (rock code 101061), “aplitic metagranite” (rock code 101058) or “fine- to medium-grained granite” (rock code 111058), if a late-tectonic formation is inferred. Quartz-dominated segregations or veins were coded as 8021.

Amphibolites (rock code 102017) and related rocks occupy about 5 % of the cored interval in KFM04A. All extensions and contacts are more or less parallel with the tectonic foliation. Included in this group is a hornblende-rich rock of quartz dioritic composition, with sulphide disseminations and considerable amounts of garnet. As mentioned above, this rock is restricted to three major occurrences, which volumetrically constitute half of the amphibolites. The occurrence at the length interval 444.6–448.0 m is locally coarse-grained and tremolite-bearing, whereas the other two are fine- to finely medium-grained and the only distinguishable amphibole is hornblende. The more typical amphibolites are fine grained, equigranular with a large proportion of biotite. None of these occurrences exceed a few metres in length and some are surrounded by up to 1 dm wide rims of leucogranitic material. In addition, there is a fine- to finely medium-grained, hornblende-bearing rock of inferred quartz dioritic composition, which was coded as “quartz diorite” (1038). This is only found in the length interval 392.7–393.4 m.

Minor occurrences of fine-grained, skarn-like material, coded as “calc-silicate rock” (108019), have been found at four locations in the cored interval.

5.3 Alteration

The most common alteration encountered in KFM04A is varying degrees of oxidation or red discolouration of feldspars, which has affected about 12 % of the cored interval. It is almost always associated with more intensely fractured intervals, with a marked concentration in the upper 450 m of the borehole. A more or less continuous, but variably affected, interval occurs between 200 and 250 m. Elsewhere, individual occurrences are typically less than a few metres in width.

Other types of alterations within KFM04A include muscovitization, chloritization, epidotization, prehnitization and two short intervals affected by clay (illite?) formation at 359.5–359.9 m and 414.4–415.7 m. The muscovitization, which has been registered as "sericitization" (code 714) in Boremap, is restricted to two rather wide intervals at 394.5–401.4 m and 426.2–430.6 m length. The affected intervals correspond largely with some of the major ductile high-strain zones in the borehole. The rare, but unmistakable, chloritization is mainly restricted to amphibolite occurrences. Also epidotization and prehnitization occur sparsely, and only four to five minor intervals of each type were found. Prehnitization is not available among the alterations listed in Boremap. Thus, prehnitization has been registered as other types of alterations, mainly epidotization, with a declaration in the attached comments. Following intervals have been subjected to a faint to weak prenitization: 197.7–198.2 m, 205.6–205.7 m, 423.6–425.1 m and 436.8–436.9 m.

5.4 Fractures

5.4.1 Fracture frequencies and orientation

Excluding crush zones and sealed networks, the total number of broken (parting the core) and unbroken (not parting the core) fractures registered within the cored part of borehole KFM04A amounts to 4324. However, the difference in fracture frequency between the ductile high-strain domain in the upper 480–500 m of the borehole and the lower part, within the tectonic lens is striking, with 7.7 and 2.7 fractures/m, respectively (cf. Appendix 1). The value for the lower half is comparable with the fracture frequencies yielded by the other three deep cored boreholes within the tectonic lens, which range between 1.7 and 2.4 fractures/m /6–8/. Almost 70 % of all fractures intersected by KFM04A are inferred to be sealed (fracture aperture = 0). However, also this number differs markedly between the high-strain domain and the lens, by being 63 % in the upper 500 m and 82 % in the lower half of the borehole. Generally, the frequency of open and sealed fractures varies rather coherently throughout the borehole, with an increased number of open fractures in intervals with concentrations of sealed fractures (cf. Appendix 1).

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 31 % of the contacts in the cored interval of KFM04A is fractured. About 10 % of these fractures are sealed. This can be compared with the corresponding fracture frequencies in KFM02A and KFM03A, which is around 35 % and 30 %, respectively /7, 8/.

The fracture orientations vary considerably throughout KFM04A, though the stereographic projections in Figure 5-2 reveal at least four distinct fracture sets. The most distinct set, which prevails in the upper half of the borehole, is parallel with the orientation of the tectonic foliation in the high-strain domain, striking SE and dipping steeply towards SW. This set includes fractures inferred to be both sealed and open. Another well-defined group, most conspicuous in the upper 300 m of the borehole, consists of near horizontal to gently dipping fractures. A majority of these fractures are inferred to be open and a few have apertures that exceed 1 cm in width. The two, 15 cm wide, crush zones found at 232.58–232.73 m and 359.70–359.85 m in the borehole belong to this group. A third set, also found in the other three deep cored boreholes in the area /cf. 6–8/, consists of steep to sub-vertical fractures

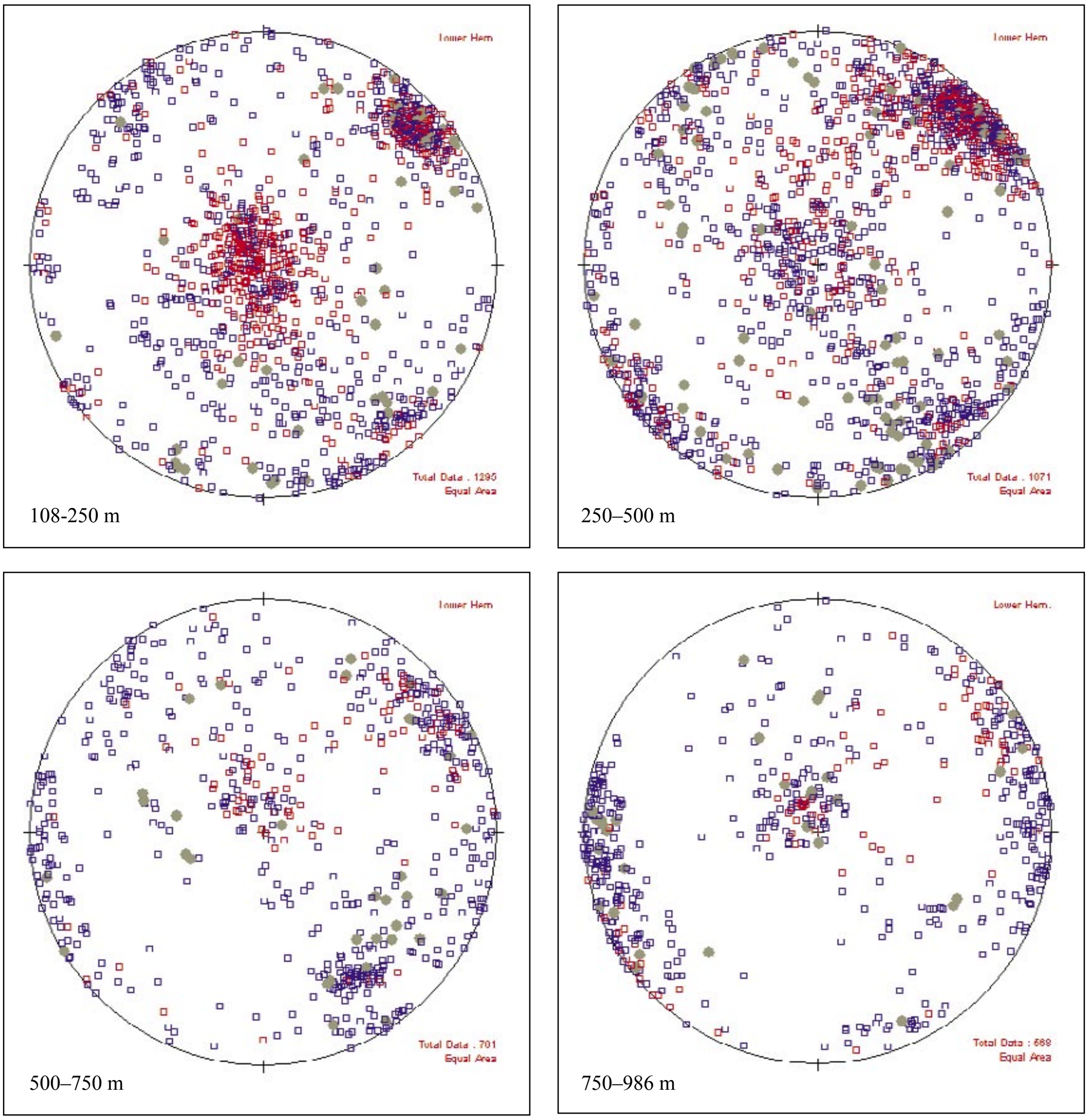


Figure 5-2. *Lower hemisphere equal-area stereographic projections showing the poles to sealed (blue squares) and open (red squares) fractures in four length intervals of borehole KFM04A: 108–250 m, 250–500 m, 500–750 m and 750–986 m. Prevailing fracture orientations in sealed networks are marked by grey dots.*

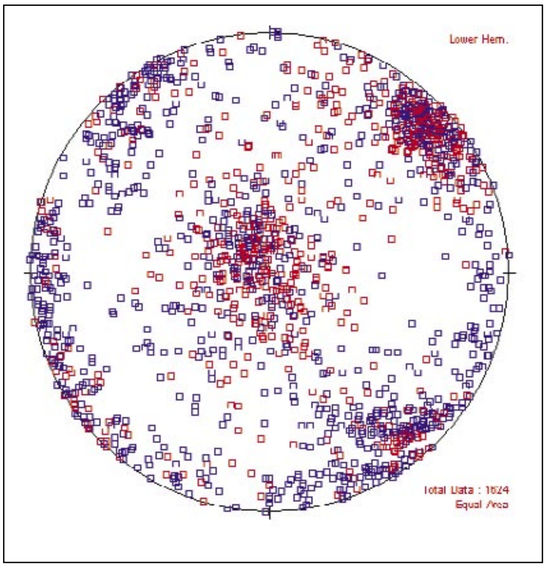
with SW strike. The fractures in this set are mostly sealed, and a considerable proportion of the fracture orientations registered in the sealed networks fall in this group. A forth set of sub-vertical, mainly sealed fractures strikes N–S to NNW. This set is more or less limited to the lower part of the borehole, within the tectonic lens.

Seventeen breccia zones have been registered in KFM04A. However, the distinction between breccia and sealed network is not obvious, and zones with minor rotation of individual rock fragments are often mapped as sealed network. Breccias dominated by matrix have been mapped as "breccia" (rock code 6005), whereas the coding of fragment-dominated zones is defined by the fragment lithology. In the latter case, brecciation is only indicated by the rock structure. Most breccias belong to the SW striking fracture group, and about half of them occur in a rather short length interval between 211 and 248 m. Except for the breccia zones, fractures with measurable displacements, indicating that they have been initiated or reactivated as shear fractures, are few. The offset is typically up to 5 cm, though the displacement direction has not been registered. Similar to the breccias most are steeply dipping and belong to the SW striking fracture group.

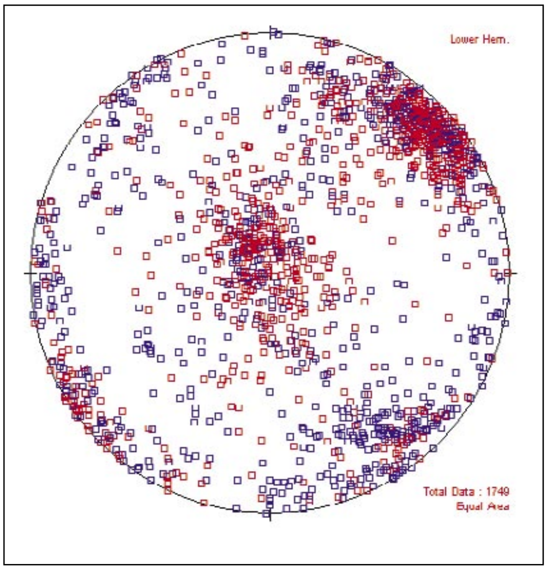
Inferred core discing occurs sporadically in the length interval 120–505 m of the drill core. The typical distance between the discs is 1-3 cm, and the fractures are all planar to slightly saddle shaped.

5.4.2 Fracture mineralogy

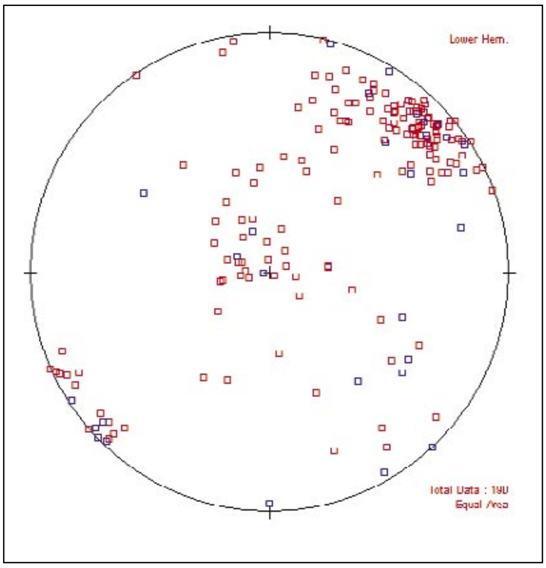
More than half of the total number of fractures in the cored interval of KFM04A is filled by chlorite and/or calcite. These minerals are found in all abovementioned fracture groups, but are highly overrepresented within the steeply dipping fractures with SE strike and the near horizontal fractures (Figure 5-3). In this context, it is worth to mention a 5–6 cm wide calcite + chlorite vein, recorded as a "carbonate-dominated hydrothermal vein" (rock code 8022), which occurs at a borehole length of 900.94–900.99 m. Other infilling minerals, in order of decreasing abundance, include laumontite, hematite, prehnite, pyrite, quartz, undifferentiated clay minerals, feldspars, zeolites, sulphides, Fe-hydroxide and sericite. In addition, there are a number of fractures with unknown mineral filling. XRD analyses of similar material from the other three deep cored boreholes in the area have revealed that most such filling are mineral mixtures, and in some cases zeolites /9/. One fracture at 427.70 m was found to contain fluorite. There are also several fractures that are virtually free from visible mineral coatings. These fractures are mostly open, and similar to the calcite and chlorite filled fractures, the majority belong to the SE trending and flat lying sets. Also the finely crystalline coating inferred to be clay minerals are more or less restricted to open fractures of the SE trending and flat lying sets, often in close association with chlorite and/or calcite. All other minerals, as well as the presence of oxidized walls, are preferentially associated with sealed fractures (Figure 5-3). A typical mineral assemblage is laumontite + calcite ± chlorite ± hematite ± pyrite. Laumontite tends to contract, and eventually crackle 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 three previous deep cored boreholes in the area, the laumontite-dominated assemblage is mainly found in sealed fractures of the SW and N–S trending sets. This is also the assemblage most commonly found in the breccias and sealed networks. Prehnite, epidote, and to some extent quartz, occur preferentially in the steeply dipping SE trending fractures. There is also a considerable amount of epidote and prehnite sealed fractures, which strike SW and dip moderately towards NW (Figure 5-3). Fractures sealed by the laumontite-dominated assemblage, hematite, prehnite and epidote exhibit typically oxidized walls. A number of very thin (<<1 mm), sealed fractures with en echelon character are often revealed by their oxidized walls. Several of these thin fractures have sealings inferred to be hematite, but it might well be hematite-stained laumontite instead.



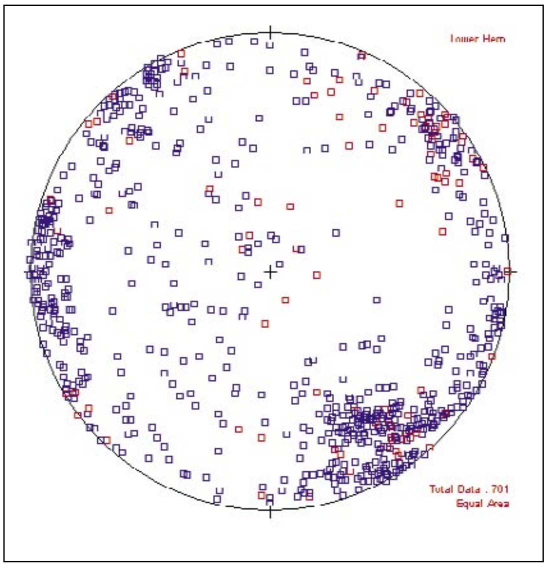
Calcite



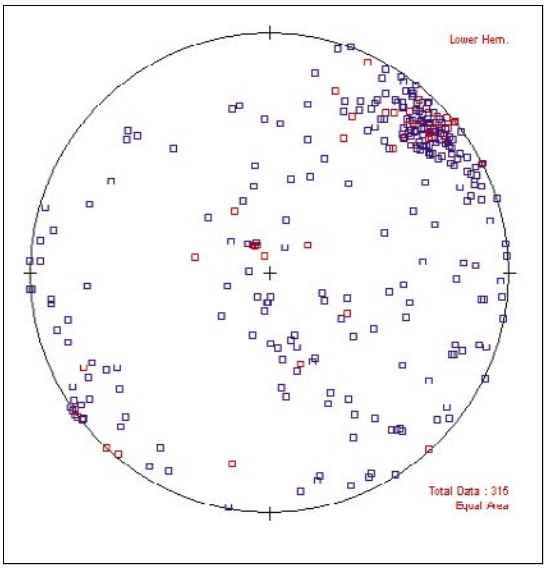
Chlorite



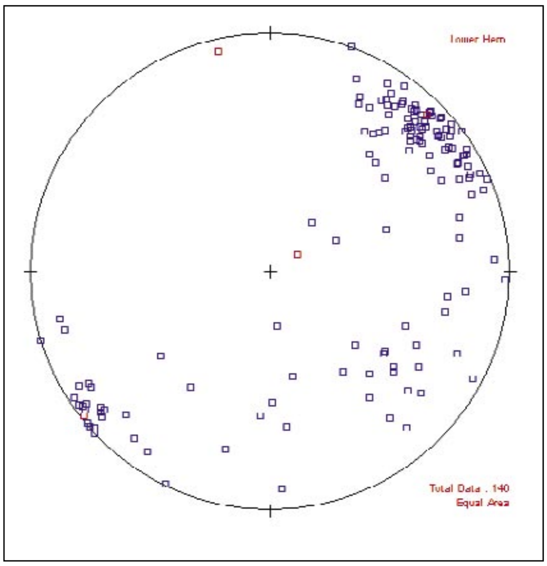
Clay Minerals



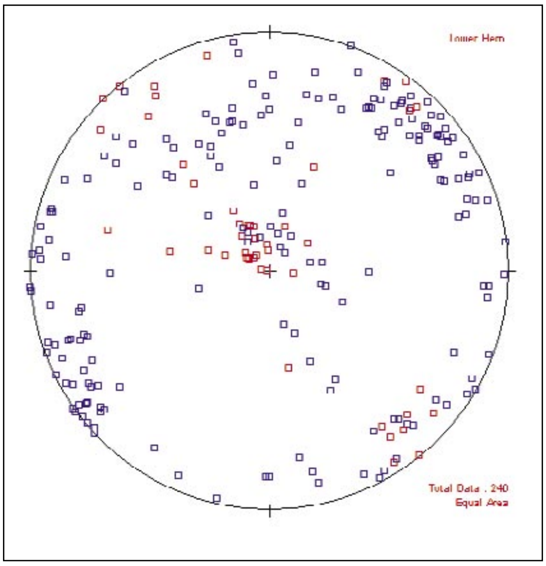
Laumontite



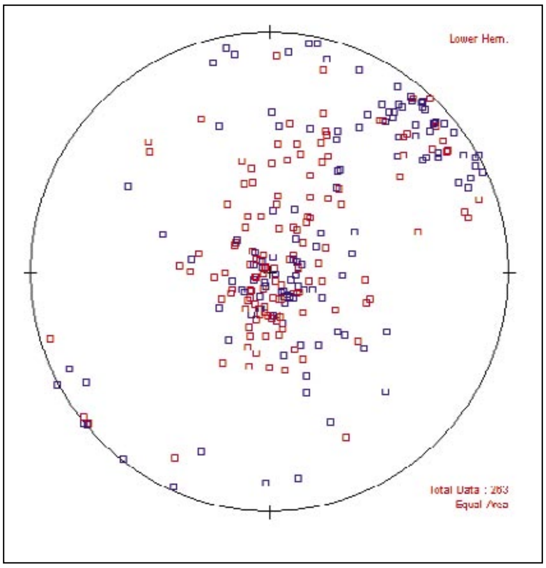
Prehnite



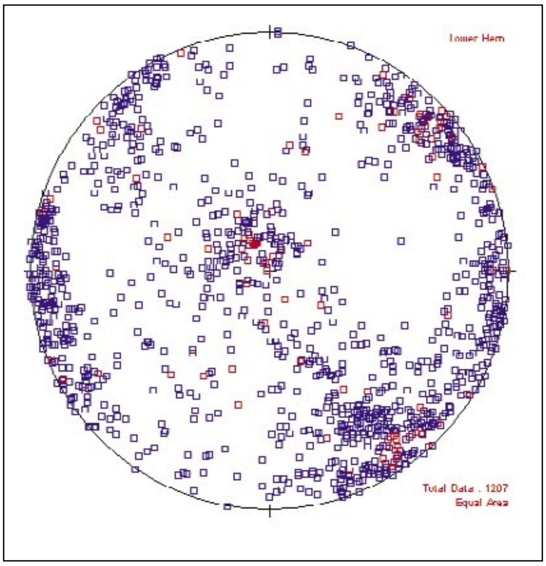
Epidote



Quartz



No filling



Oxidized walls

Figure 5-3. *Lower hemisphere equal-area stereographic projections showing the poles to sealed (blue squares) and open (red squares) fractures filled with: a) calcite, b) chlorite, c) clay minerals, d)laumontite, e) prehnite, f) epidote and g) quartz. Also shown are: h) those that are free from visible filling and i) those surrounded by oxidized walls.*

5.5 Discussion

The lithology of KFM04A corresponds generally well with what might be expected from both the detailed mapping of DS4 by Persson Nilsson /4/ and the surface geology in the area /5/. Also the ductile features, with an intense SE trending tectonic foliation dipping steeply towards SW, are in close agreement with the surface structural trend in the area /3/. Most importantly, KFM04A verifies both that the high-strain belt, which extends along the south-western margin of the tectonic lens dips steeply towards SW, and that the transition between the two structural domains is rather abrupt over a length interval of about 20 m.

A noteworthy feature in KFM04A is the occurrences of hornblende-rich rocks of quartz dioritic compositions. Typically, these rocks are rich in sulphides, which occur as disseminated grains less than 1 mm in size. The predominant sulphide is pyrite, but also pyrrhotite and chalcopyrite have been identified. It is, therefore, suggested that trace element analyses of these rocks are included in future investigations.

Laumontite sealed fractures occurs throughout the cored interval of KFM04A, and especially in the length interval between 412 and 462 m, which also includes some of the major breccia zones. In the upper 750 m of the borehole, most of the laumontite-bearing fractures strike SW and dip sub-vertically to steeply towards NW. This means that the fractures run more or less parallel with the borehole. The possible fracture zone between 412 m and 462 m is, therefore, not necessarily wide. A fault zone of similar orientation, sealed by laumontite and calcite, runs across DS4. Laumontite filled fractures, striking NE–SW and dipping steeply to vertically, are also encountered in the other three deep cored boreholes, especially in KFM01A where they form an intensely fractured zone at 656–674 m depth /6/. Thus, the laumontite-bearing fracture set seems to be widespread in the area, and locally it forms intensely fractured zones characterised by faulting and brecciation.

6 References

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/7/ Petersson J, Wängnerud A, Stråhle A, 2003. Boremap mapping of telescopic drilled borehole KFM02A. SKB P-03-98, Svensk Kärnbränslehantering AB, 111 pp.

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/9/ Petersson J, Tullborg E-L, Mattsson H, Thunehed H, Isaksson H, Berglund J, Lindroos H, Danielsson P,Wängnerud W, 2004. Petrography, geochemistry, petrophysics and fracture mineralogy of boreholes KFM01A, KFM02A and KFM03A+B. SKB P-04-103, Svensk Kärnbränslehantering AB.

Appendix 1

WellCAD images

Title	Geological legend for the core drilled borehole KFM04A at Forsmark
Site	FORSMARK
Borehole	KFM04A
Plot Date	2004-06-20 21:01:56

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

MINERAL
- Epidote
- Hematite
- Calcite
- Potash Feldspar
- Chlorite
- Quartz
- Muscovite
- Unknown
- Pyrite
- Clay Minerals
- Laumontite
- Zeolite
- Prehnite
- Iron Hydroxide

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

TEXTURE
- Hornfelsed
- Porphyritic
- Ophitic
- Equigranular
- Augen-Bearing
- Non_equigranular
- Metamorphic

GRAINSIZE
- Aphanitic
- Fine grained
- Fine to Medium Grained
- Medium coarse
- Coarse grained
- Medium grained

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

INTENSITY
- No intensity
- Faint
- Weak
- Medium
- Strong

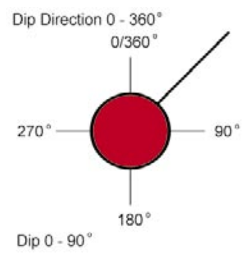
ROUGHNESS
- Planar
- Undulating
- Stepped
- Irregular

SURFACE
- Rough
- Smooth
- Slickensided

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

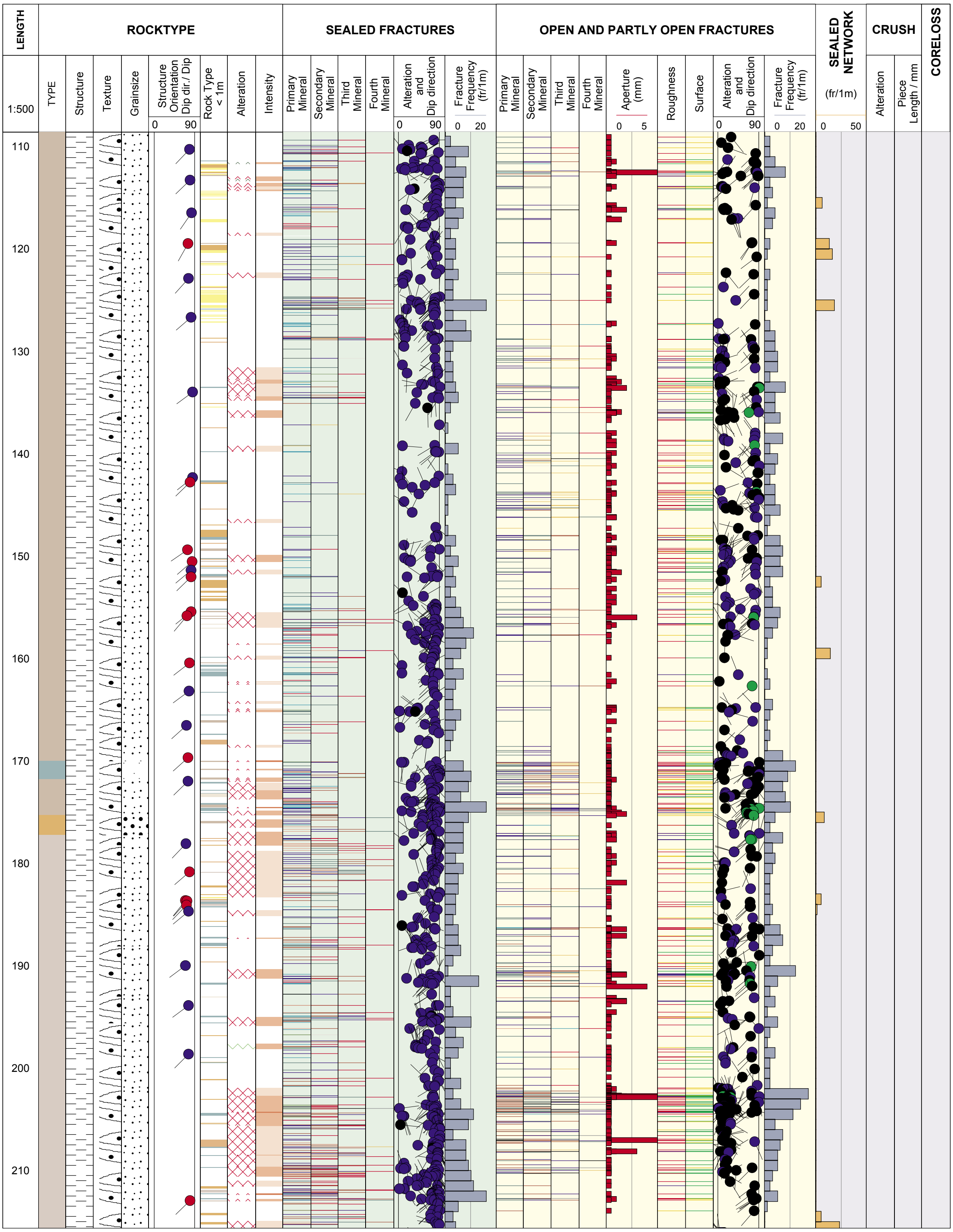
FRACTURE ALTERATION
- Slightly Altered
- Moderately Altered
- Highly Altered
- Completely Altered
- Gouge
- Fresh

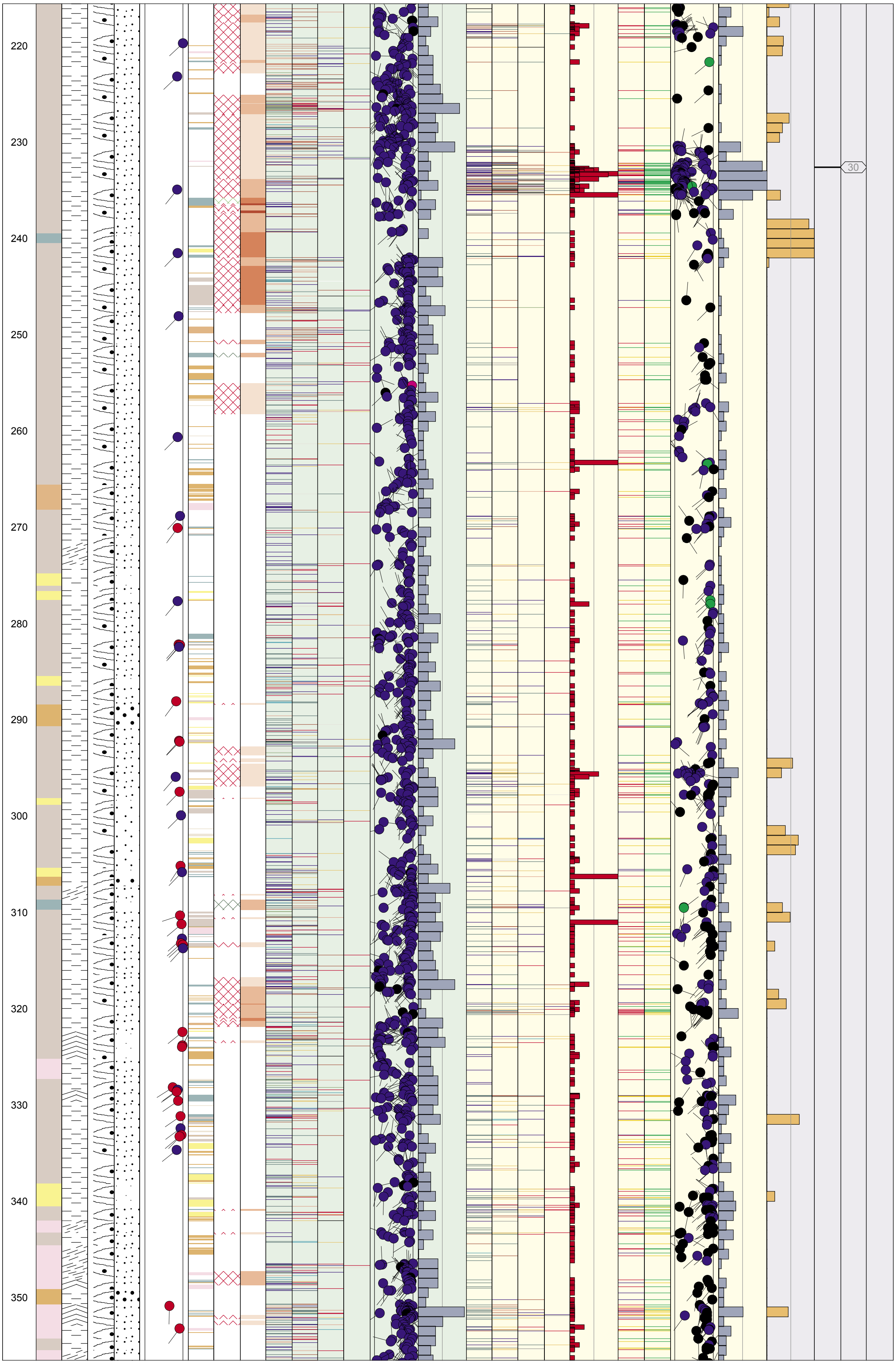
FRACTURE DIRECTION
STRUKTURE ORIENTATION



Title Geological mapping of the core drilled borehole KFM04A at Forsmark

Site	FORSMARK	**Coordinate System**	RT90-RHB70
Borehole	KFM04A	**Northing [m]**	6698921.74
Diameter [mm]	77	**Easting [m]**	1630978.96
Length [m]	1001.420	**Elevation [m.a.s.l.]**	8.77
Bearing [°]	45.24	**Drilling Start Date**	2003-05-20 07:00:00
Inclination [°]	-60.07	**Drilling Stop Date**	2003-11-19 15:15:00
Date of mapping	2004-05-24 17:00:00	**Plot Date**	2004-06-20 21:01:56
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core

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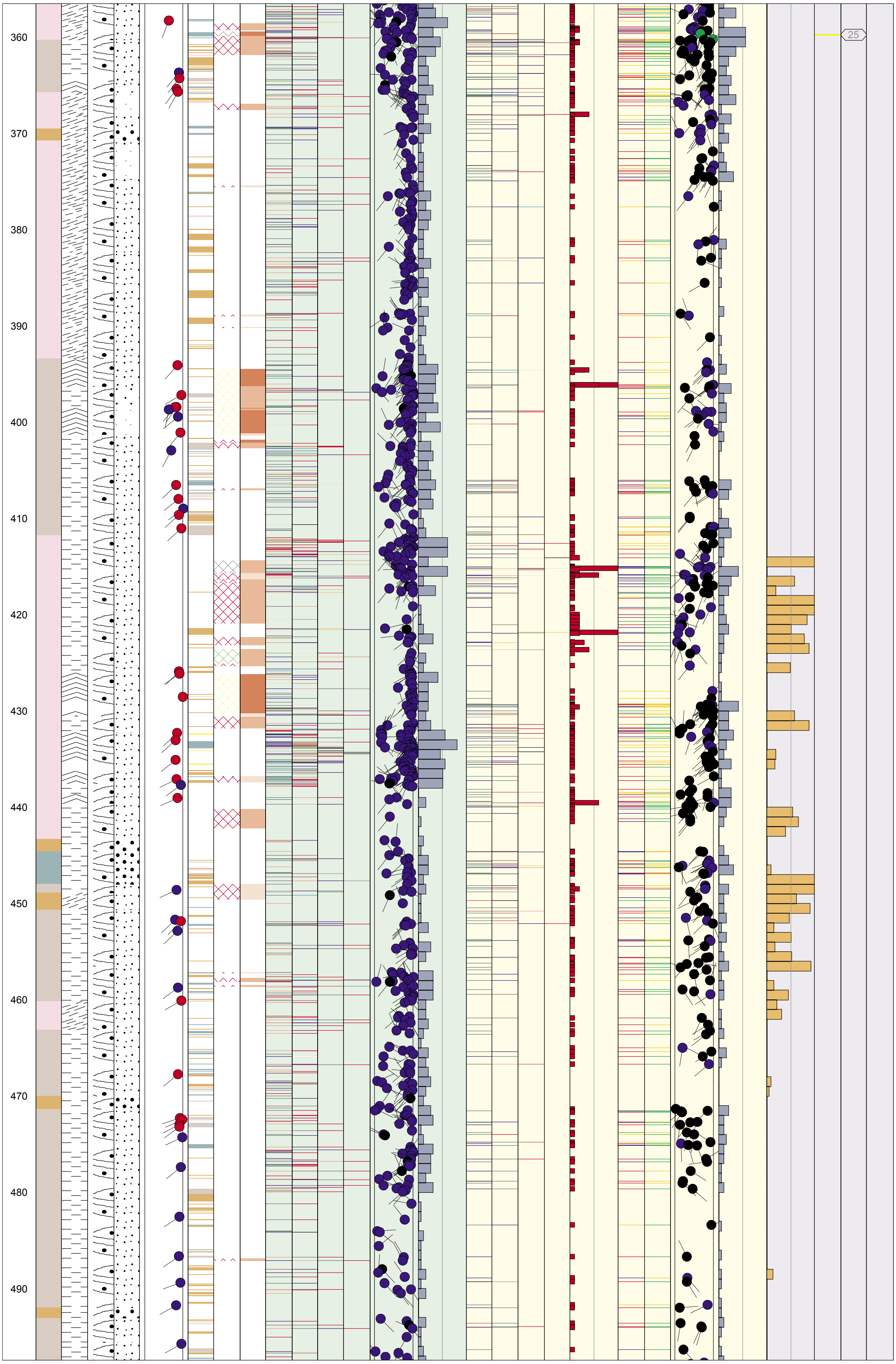
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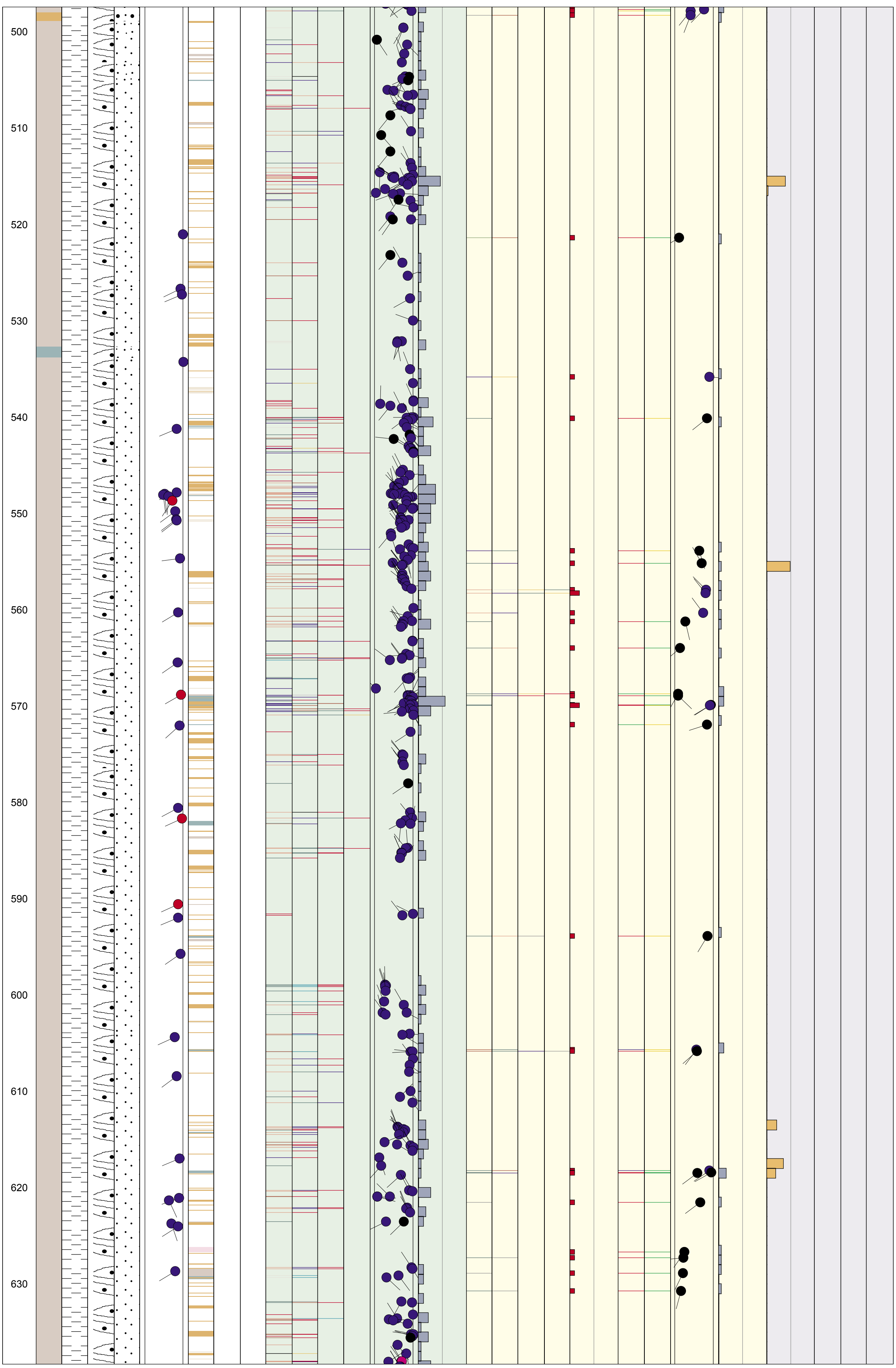
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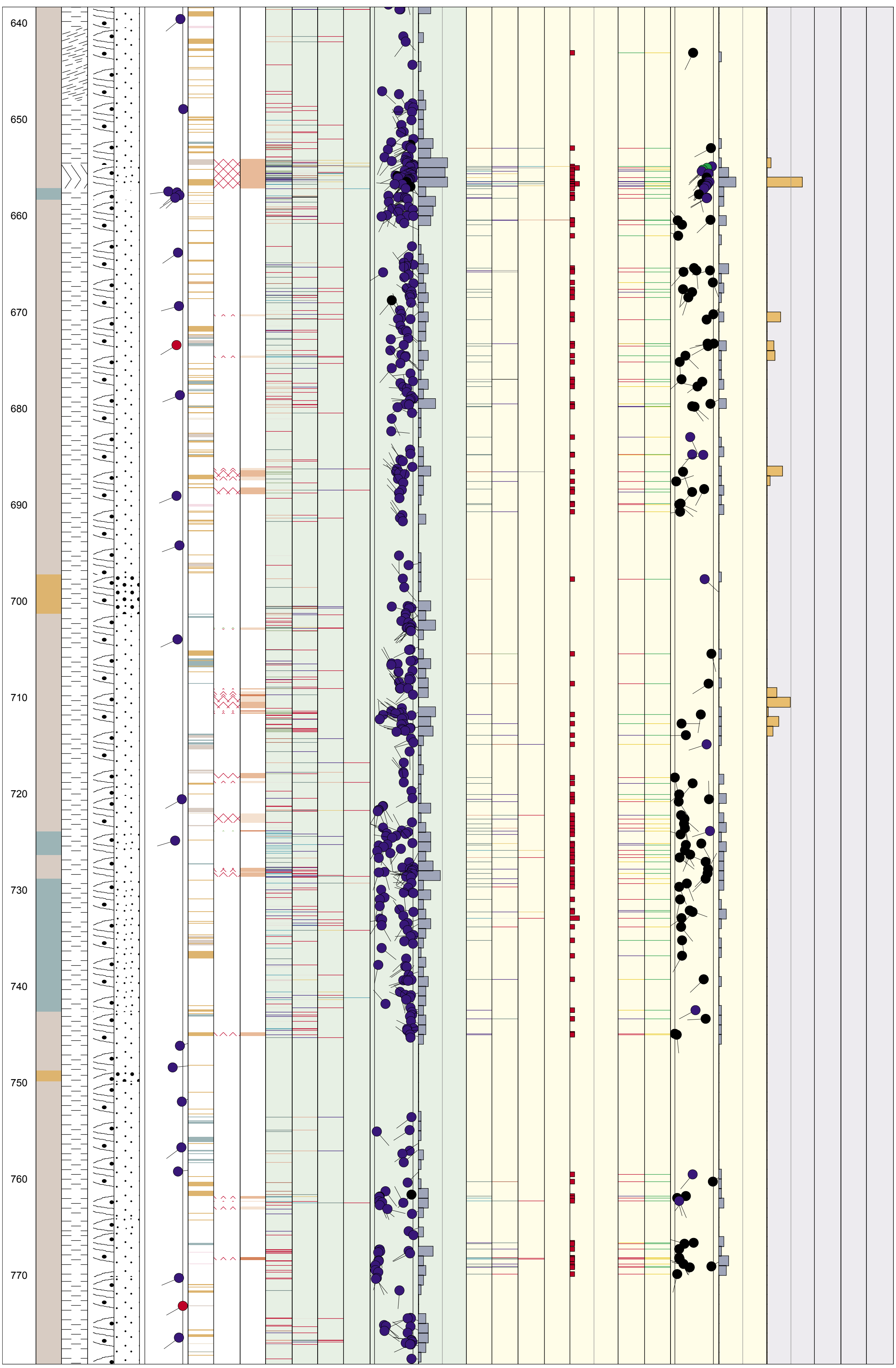
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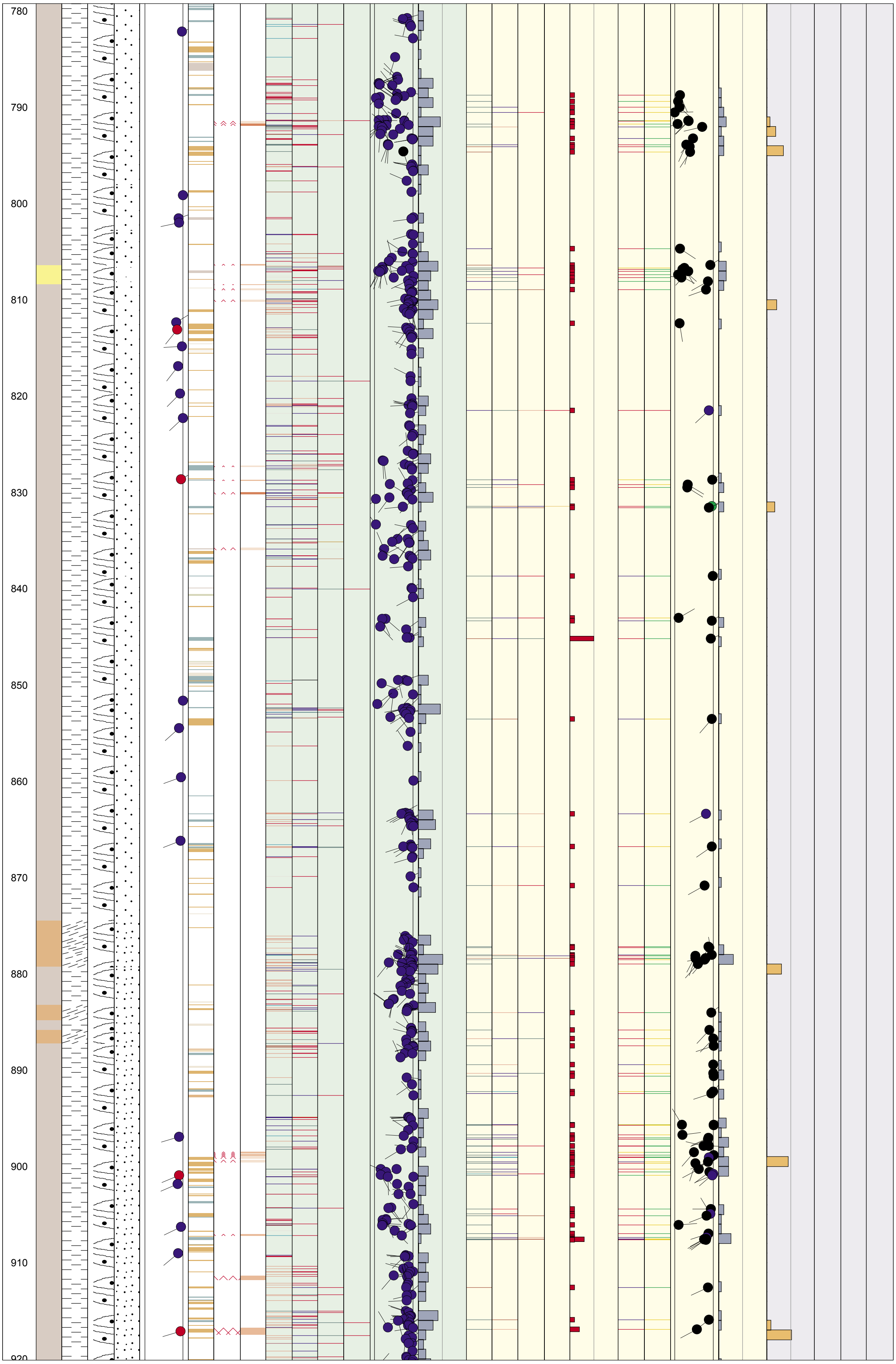
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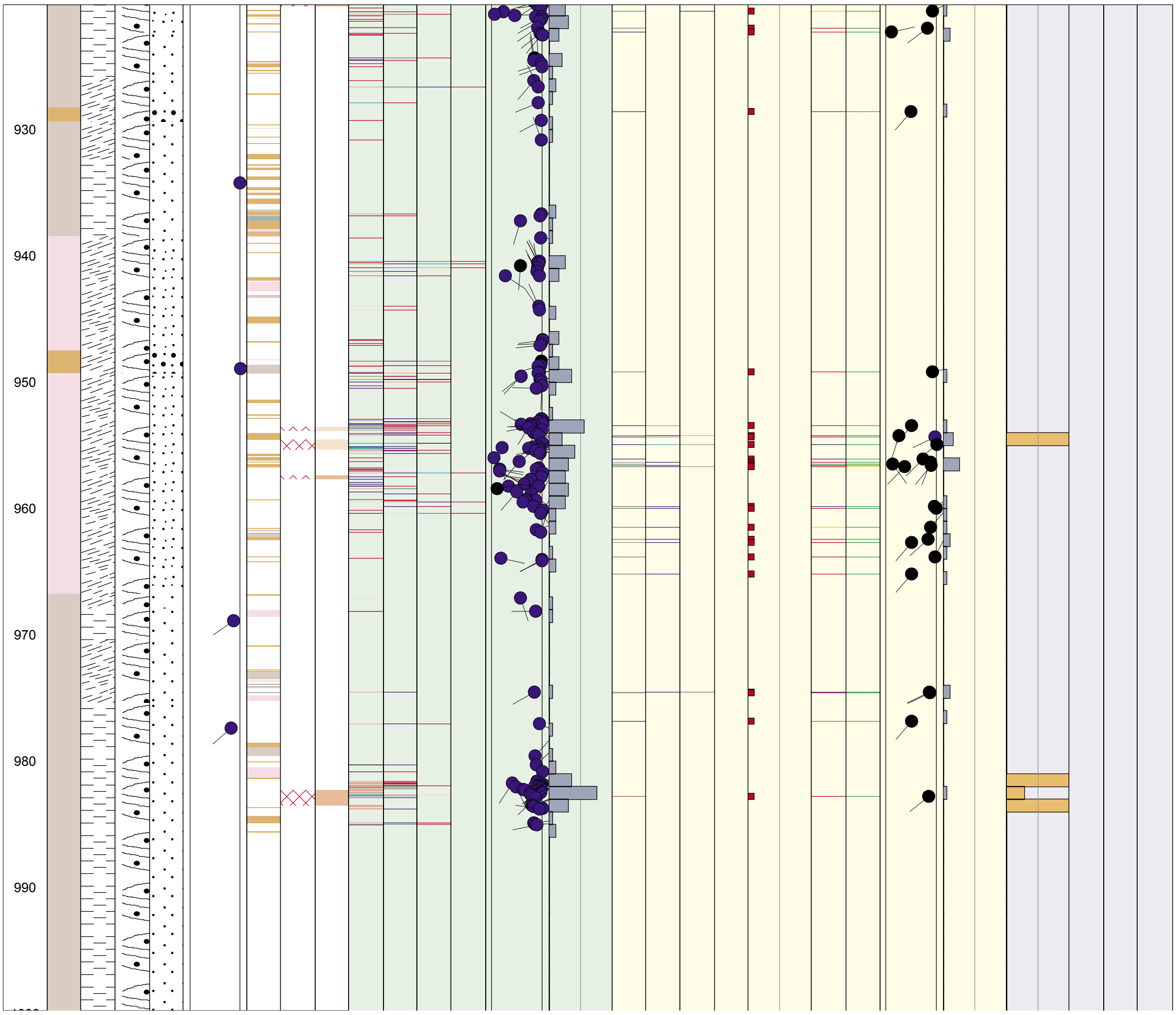
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950
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990

Appendix 2

Borehole length and diameter

Hole Diam T - Drilling: Borehole diameter

KFM04A, 2003-05-20 10:00:00 - 2003-11-19 15:15:00 (107.420 - 1001.420 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
107.420	108.690	0.086	
108.690	1001.420	0.077	

Printout from SICADA 2004-03-25 10:23:24

Appendix 3

Down hole deviation measurements

Maxibor T - Borehole deviation: Maxibor

KFM04A, 2003-11-11 09:00:00 - 2003-11-11 15:00:00 (0.000 - 990.000 m)

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
0.00	6698921.744	1630978.964	-8.771	RT90-RHB70	-60.0800	45.2400	0.0000	0.0000	0.0000	
3.00	6698922.798	1630980.027	-6.171	RT90-RHB70	-60.0700	45.3000	1.4960	0.0000	0.0000	
6.00	6698923.850	1630981.091	-3.571	RT90-RHB70	-60.0700	45.2400	2.9930	0.0010	0.0010	
9.00	6698924.905	1630982.153	-0.971	RT90-RHB70	-60.1200	45.1800	4.4900	0.0010	0.0010	
12.00	6698925.958	1630983.214	1.630	RT90-RHB70	-60.1200	45.1200	5.9850	0.0000	0.0000	
15.00	6698927.013	1630984.273	4.231	RT90-RHB70	-60.2000	45.0600	7.4790	-0.0040	-0.0030	
18.00	6698928.066	1630985.328	6.835	RT90-RHB70	-60.3200	45.0500	8.9700	-0.0080	-0.0090	
21.00	6698929.115	1630986.379	9.441	RT90-RHB70	-60.5200	45.0700	10.4560	-0.0140	-0.0220	
24.00	6698930.158	1630987.424	12.053	RT90-RHB70	-60.7100	45.0800	11.9320	-0.0180	-0.0450	
27.00	6698931.195	1630988.464	14.669	RT90-RHB70	-60.9500	45.0600	13.4000	-0.0220	-0.0770	
30.00	6698932.224	1630989.495	17.292	RT90-RHB70	-61.1400	45.0700	14.8570	-0.0270	-0.1230	
33.00	6698933.246	1630990.520	19.919	RT90-RHB70	-61.3000	45.0500	16.3050	-0.0310	-0.1780	
36.00	6698934.264	1630991.540	22.550	RT90-RHB70	-61.3600	45.1000	17.7450	-0.0360	-0.2420	
39.00	6698935.279	1630992.558	25.183	RT90-RHB70	-61.4800	44.9900	19.1830	-0.0400	-0.3090	
42.00	6698936.292	1630993.571	27.819	RT90-RHB70	-61.5700	44.7000	20.6160	-0.0460	-0.3820	
45.00	6698937.307	1630994.575	30.458	RT90-RHB70	-61.6800	44.4400	22.0440	-0.0600	-0.4610	
48.00	6698938.323	1630995.572	33.098	RT90-RHB70	-61.7900	44.3100	23.4670	-0.0800	-0.5440	
51.00	6698939.338	1630996.562	35.742	RT90-RHB70	-61.9100	44.1800	24.8850	-0.1030	-0.6340	
54.00	6698940.351	1630997.547	38.389	RT90-RHB70	-62.0600	44.0500	26.2970	-0.1290	-0.7300	
57.00	6698941.361	1630998.524	41.039	RT90-RHB70	-62.2600	44.0100	27.7020	-0.1580	-0.8340	
60.00	6698942.366	1630999.494	43.694	RT90-RHB70	-62.5000	43.9000	29.0980	-0.1880	-0.9480	
63.00	6698943.364	1631000.455	46.355	RT90-RHB70	-62.5400	43.7600	30.4830	-0.2210	-1.0750	

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
66.00	6698944.363	1631001.412	49.017	RT90-RHB70	-62.4300	43.5500	31.8660	-0.2570	-1.2040	
69.00	6698945.369	1631002.368	51.677	RT90-RHB70	-62.3700	43.3600	33.2540	-0.2980	-1.3280	
72.00	6698946.381	1631003.324	54.334	RT90-RHB70	-62.4500	43.1100	34.6450	-0.3430	-1.4480	
75.00	6698947.394	1631004.272	56.994	RT90-RHB70	-62.6300	42.8200	36.0310	-0.3950	-1.5730	
78.00	6698948.405	1631005.209	59.659	RT90-RHB70	-62.7800	42.6200	37.4090	-0.4530	-1.7080	
81.00	6698949.415	1631006.139	62.326	RT90-RHB70	-62.9800	42.4800	38.7800	-0.5160	-1.8500	
84.00	6698950.421	1631007.059	64.999	RT90-RHB70	-63.0600	42.2700	40.1420	-0.5820	-2.0030	
87.00	6698951.426	1631007.974	67.673	RT90-RHB70	-63.0200	42.0400	41.4990	-0.6520	-2.1600	
90.00	6698952.437	1631008.885	70.347	RT90-RHB70	-62.9300	41.7300	42.8580	-0.7280	-2.3160	
93.00	6698953.456	1631009.794	73.018	RT90-RHB70	-62.9100	41.5000	44.2210	-0.8120	-2.4680	
96.00	6698954.479	1631010.699	75.689	RT90-RHB70	-62.9300	41.2700	45.5840	-0.9010	-2.6180	
99.00	6698955.505	1631011.600	78.360	RT90-RHB70	-62.9800	41.1200	46.9460	-0.9960	-2.7700	
102.00	6698956.532	1631012.496	81.033	RT90-RHB70	-63.1200	40.9000	48.3050	-1.0940	-2.9250	
105.00	6698957.558	1631013.384	83.708	RT90-RHB70	-63.2500	40.8100	49.6580	-1.1970	-3.0870	
108.00	6698958.580	1631014.267	86.387	RT90-RHB70	-63.1900	40.6300	51.0040	-1.3010	-3.2560	
111.00	6698959.607	1631015.148	89.065	RT90-RHB70	-63.0000	40.3900	52.3530	-1.4100	-3.4230	
114.00	6698960.644	1631016.030	91.738	RT90-RHB70	-62.8200	40.2000	53.7100	-1.5250	-3.5800	
117.00	6698961.691	1631016.915	94.406	RT90-RHB70	-62.6700	40.0600	55.0750	-1.6460	-3.7280	
120.00	6698962.745	1631017.801	97.072	RT90-RHB70	-62.5200	40.0500	56.4470	-1.7700	-3.8680	
123.00	6698963.805	1631018.692	99.733	RT90-RHB70	-62.4000	39.9900	57.8260	-1.8950	-4.0010	
126.00	6698964.869	1631019.585	102.392	RT90-RHB70	-62.2900	39.9900	59.2100	-2.0220	-4.1270	
129.00	6698965.938	1631020.482	105.048	RT90-RHB70	-62.1600	39.9700	60.5990	-2.1500	-4.2480	
132.00	6698967.012	1631021.382	107.700	RT90-RHB70	-62.0400	40.0000	61.9940	-2.2790	-4.3610	
135.00	6698968.090	1631022.286	110.350	RT90-RHB70	-61.9300	39.9200	63.3950	-2.4080	-4.4690	
138.00	6698969.172	1631023.192	112.997	RT90-RHB70	-61.8000	39.9400	64.8000	-2.5390	-4.5710	
141.00	6698970.259	1631024.102	115.641	RT90-RHB70	-61.7600	39.9700	66.2120	-2.6700	-4.6670	
144.00	6698971.347	1631025.014	118.284	RT90-RHB70	-61.6800	39.9600	67.6250	-2.8000	-4.7600	
147.00	6698972.438	1631025.928	120.925	RT90-RHB70	-61.6300	39.9200	69.0420	-2.9310	-4.8490	
150.00	6698973.531	1631026.842	123.565	RT90-RHB70	-61.5700	39.9200	70.4610	-3.0630	-4.9360	
153.00	6698974.626	1631027.759	126.203	RT90-RHB70	-61.5300	39.9000	71.8840	-3.1960	-5.0190	

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
156.00	6698975.723	1631028.676	128.840	RT90-RHB70	-61.5000	39.8600	73.3070	-3.3290	-5.1000	
159.00	6698976.822	1631029.593	131.477	RT90-RHB70	-61.4600	39.8400	74.7320	-3.4630	-5.1800	
162.00	6698977.923	1631030.512	134.112	RT90-RHB70	-61.4100	39.8600	76.1590	-3.5980	-5.2580	
165.00	6698979.024	1631031.432	136.747	RT90-RHB70	-61.3500	39.8100	77.5890	-3.7330	-5.3330	
168.00	6698980.129	1631032.353	139.379	RT90-RHB70	-61.3100	39.7900	79.0200	-3.8690	-5.4060	
171.00	6698981.236	1631033.274	142.011	RT90-RHB70	-61.2600	39.7800	80.4540	-4.0060	-5.4760	
174.00	6698982.344	1631034.197	144.642	RT90-RHB70	-61.2300	39.7500	81.8900	-4.1430	-5.5430	
177.00	6698983.454	1631035.120	147.271	RT90-RHB70	-61.1700	39.7100	83.3270	-4.2820	-5.6090	
180.00	6698984.567	1631036.045	149.900	RT90-RHB70	-61.1500	39.6900	84.7670	-4.4210	-5.6720	
183.00	6698985.681	1631036.969	152.527	RT90-RHB70	-61.1300	39.6200	86.2070	-4.5610	-5.7340	
186.00	6698986.797	1631037.892	155.154	RT90-RHB70	-61.0700	39.5900	87.6490	-4.7030	-5.7950	
189.00	6698987.916	1631038.817	157.780	RT90-RHB70	-61.0200	39.5800	89.0930	-4.8460	-5.8530	
192.00	6698989.036	1631039.744	160.404	RT90-RHB70	-60.9700	39.5100	90.5400	-4.9900	-5.9080	
195.00	6698990.159	1631040.670	163.027	RT90-RHB70	-60.9000	39.5200	91.9880	-5.1350	-5.9610	
198.00	6698991.285	1631041.598	165.649	RT90-RHB70	-60.8400	39.6200	93.4400	-5.2810	-6.0100	
201.00	6698992.411	1631042.530	168.268	RT90-RHB70	-60.7200	39.6100	94.8950	-5.4240	-6.0560	
204.00	6698993.541	1631043.466	170.885	RT90-RHB70	-60.6300	39.6600	96.3550	-5.5680	-6.0960	
207.00	6698994.674	1631044.405	173.499	RT90-RHB70	-60.4800	39.7100	97.8190	-5.7110	-6.1300	
210.00	6698995.811	1631045.349	176.110	RT90-RHB70	-60.4100	39.6800	99.2910	-5.8540	-6.1570	
213.00	6698996.951	1631046.295	178.719	RT90-RHB70	-60.3800	39.6500	100.7650	-5.9980	-6.1800	
216.00	6698998.093	1631047.241	181.327	RT90-RHB70	-60.3200	39.6900	102.2410	-6.1420	-6.2020	
219.00	6698999.236	1631048.190	183.933	RT90-RHB70	-60.2500	39.6200	103.7190	-6.2860	-6.2210	
222.00	6699000.383	1631049.139	186.538	RT90-RHB70	-60.1700	39.6400	105.2010	-6.4320	-6.2360	
225.00	6699001.532	1631050.091	189.140	RT90-RHB70	-60.1200	39.6500	106.6860	-6.5780	-6.2470	
228.00	6699002.682	1631051.045	191.741	RT90-RHB70	-60.0500	39.6100	108.1730	-6.7230	-6.2550	
231.00	6699003.836	1631052.000	194.341	RT90-RHB70	-60.0000	39.7100	109.6640	-6.8700	-6.2600	
234.00	6699004.990	1631052.958	196.939	RT90-RHB70	-59.9500	39.6700	111.1570	-7.0150	-6.2610	
237.00	6699006.147	1631053.917	199.536	RT90-RHB70	-59.8800	39.6400	112.6520	-7.1610	-6.2600	
240.00	6699007.306	1631054.878	202.131	RT90-RHB70	-59.8000	39.6600	114.1500	-7.3080	-6.2560	
243.00	6699008.468	1631055.841	204.723	RT90-RHB70	-59.7700	39.6800	115.6520	-7.4550	-6.2480	

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
246.00	6699009.630	1631056.805	207.315	RT90-RHB70	-59.7300	39.6200	117.1560	-7.6010	-6.2380	
249.00	6699010.795	1631057.770	209.906	RT90-RHB70	-59.6600	39.6400	118.6610	-7.7490	-6.2260	
252.00	6699011.962	1631058.736	212.495	RT90-RHB70	-59.5900	39.6600	120.1690	-7.8970	-6.2100	
255.00	6699013.131	1631059.706	215.083	RT90-RHB70	-59.5500	39.6500	121.6800	-8.0450	-6.1900	
258.00	6699014.302	1631060.676	217.669	RT90-RHB70	-59.4800	39.5900	123.1930	-8.1930	-6.1690	
261.00	6699015.476	1631061.647	220.253	RT90-RHB70	-59.4100	39.6200	124.7090	-8.3430	-6.1440	
264.00	6699016.652	1631062.620	222.836	RT90-RHB70	-59.3700	39.5500	126.2290	-8.4930	-6.1150	
267.00	6699017.830	1631063.594	225.417	RT90-RHB70	-59.3300	39.5300	127.7500	-8.6440	-6.0840	
270.00	6699019.011	1631064.568	227.997	RT90-RHB70	-59.3100	39.4900	129.2730	-8.7970	-6.0510	
273.00	6699020.192	1631065.541	230.577	RT90-RHB70	-59.2000	39.4500	130.7960	-8.9500	-6.0180	
276.00	6699021.378	1631066.517	233.154	RT90-RHB70	-59.1300	39.4900	132.3240	-9.1050	-5.9790	
279.00	6699022.566	1631067.496	235.729	RT90-RHB70	-59.0600	39.4500	133.8550	-9.2590	-5.9360	
282.00	6699023.757	1631068.476	238.303	RT90-RHB70	-59.0200	39.4700	135.3900	-9.4150	-5.8890	
285.00	6699024.949	1631069.458	240.874	RT90-RHB70	-58.9900	39.4200	136.9270	-9.5700	-5.8400	
288.00	6699026.143	1631070.439	243.446	RT90-RHB70	-58.9600	39.3700	138.4640	-9.7270	-5.7900	
291.00	6699027.339	1631071.421	246.016	RT90-RHB70	-58.9000	39.3800	140.0030	-9.8850	-5.7390	
294.00	6699028.537	1631072.404	248.585	RT90-RHB70	-58.8300	39.3200	141.5440	-10.0440	-5.6840	
297.00	6699029.738	1631073.388	251.152	RT90-RHB70	-58.8000	39.3400	143.0890	-10.2040	-5.6260	
300.00	6699030.940	1631074.373	253.718	RT90-RHB70	-58.7300	39.3100	144.6350	-10.3640	-5.5660	
303.00	6699032.145	1631075.359	256.282	RT90-RHB70	-58.6800	39.3000	146.1840	-10.5250	-5.5020	
306.00	6699033.352	1631076.347	258.845	RT90-RHB70	-58.6200	39.2900	147.7350	-10.6870	-5.4360	
309.00	6699034.561	1631077.337	261.406	RT90-RHB70	-58.5700	39.3200	149.2890	-10.8480	-5.3670	
312.00	6699035.771	1631078.328	263.966	RT90-RHB70	-58.5200	39.3200	150.8450	-11.0100	-5.2950	
315.00	6699036.983	1631079.320	266.524	RT90-RHB70	-58.4700	39.3200	152.4030	-11.1710	-5.2210	
318.00	6699038.196	1631080.314	269.082	RT90-RHB70	-58.3900	39.2800	153.9630	-11.3330	-5.1440	
321.00	6699039.413	1631081.310	271.636	RT90-RHB70	-58.3200	39.3500	155.5270	-11.4970	-5.0620	
324.00	6699040.632	1631082.309	274.189	RT90-RHB70	-58.2600	39.2400	157.0940	-11.6590	-4.9770	
327.00	6699041.854	1631083.307	276.741	RT90-RHB70	-58.2100	39.2100	158.6640	-11.8240	-4.8890	
330.00	6699043.079	1631084.307	279.291	RT90-RHB70	-58.1900	39.1300	160.2360	-11.9900	-4.7990	
333.00	6699044.306	1631085.305	281.840	RT90-RHB70	-58.1700	39.1300	161.8080	-12.1580	-4.7080	

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
336.00	6699045.533	1631086.303	284.389	RT90-RHB70	-58.1100	39.0400	163.3810	-12.3270	-4.6160	
339.00	6699046.764	1631087.301	286.936	RT90-RHB70	-58.0600	38.9700	164.9570	-12.4980	-4.5210	
342.00	6699047.998	1631088.299	289.482	RT90-RHB70	-57.9600	38.8700	166.5340	-12.6710	-4.4230	
345.00	6699049.237	1631089.298	292.025	RT90-RHB70	-57.9000	38.8300	168.1160	-12.8480	-4.3210	
348.00	6699050.478	1631090.298	294.566	RT90-RHB70	-57.8300	38.7700	169.7000	-13.0260	-4.2150	
351.00	6699051.724	1631091.298	297.106	RT90-RHB70	-57.7300	38.6900	171.2870	-13.2060	-4.1060	
354.00	6699052.974	1631092.299	299.642	RT90-RHB70	-57.6800	38.7100	172.8780	-13.3890	-3.9920	
357.00	6699054.226	1631093.302	302.178	RT90-RHB70	-57.6100	38.7100	174.4720	-13.5710	-3.8760	
360.00	6699055.480	1631094.307	304.711	RT90-RHB70	-57.5500	38.7000	176.0680	-13.7540	-3.7550	
363.00	6699056.736	1631095.314	307.243	RT90-RHB70	-57.4100	38.7500	177.6680	-13.9370	-3.6320	
366.00	6699057.996	1631096.325	309.770	RT90-RHB70	-57.2400	38.6700	179.2730	-14.1200	-3.5020	
369.00	6699059.263	1631097.339	312.293	RT90-RHB70	-57.1000	38.6400	180.8860	-14.3060	-3.3620	
372.00	6699060.536	1631098.357	314.812	RT90-RHB70	-57.0100	38.6200	182.5040	-14.4930	-3.2160	
375.00	6699061.813	1631099.376	317.328	RT90-RHB70	-56.9000	38.6100	184.1270	-14.6820	-3.0640	
378.00	6699063.093	1631100.399	319.841	RT90-RHB70	-56.8400	38.6600	185.7540	-14.8710	-2.9070	
381.00	6699064.374	1631101.424	322.353	RT90-RHB70	-56.7700	38.7500	187.3840	-15.0590	-2.7470	
384.00	6699065.656	1631102.453	324.862	RT90-RHB70	-56.6700	38.6900	189.0180	-15.2450	-2.5830	
387.00	6699066.942	1631103.483	327.369	RT90-RHB70	-56.6000	38.6200	190.6550	-15.4330	-2.4140	
390.00	6699068.233	1631104.514	329.874	RT90-RHB70	-56.4900	38.6000	192.2960	-15.6240	-2.2420	
393.00	6699069.527	1631105.547	332.375	RT90-RHB70	-56.3100	38.5200	193.9410	-15.8150	-2.0640	
396.00	6699070.829	1631106.583	334.871	RT90-RHB70	-56.1200	38.5000	195.5930	-16.0100	-1.8760	
399.00	6699072.137	1631107.624	337.362	RT90-RHB70	-55.9700	38.4900	197.2540	-16.2060	-1.6790	
402.00	6699073.452	1631108.163	339.848	RT90-RHB70	-55.8100	38.3700	198.9210	-16.4040	-1.4740	
405.00	6699074.773	1631109.716	342.330	RT90-RHB70	-55.6600	38.3200	200.5950	-16.6060	-1.2620	
408.00	6699076.101	1631110.765	344.807	RT90-RHB70	-55.5100	38.2900	202.2750	-16.8100	-1.0410	
411.00	6699077.435	1631111.818	347.280	RT90-RHB70	-55.4000	38.2900	203.9610	-17.0160	-0.8130	
414.00	6699078.772	1631112.873	349.749	RT90-RHB70	-55.3300	38.2900	205.6520	-17.2220	-0.5790	
417.00	6699080.111	1631113.931	352.216	RT90-RHB70	-55.2900	38.3100	207.3460	-17.4280	-0.3410	
420.00	6699081.451	1631114.990	354.682	RT90-RHB70	-55.2700	38.3200	209.0420	-17.6340	-0.1010	
423.00	6699082.792	1631116.050	357.148	RT90-RHB70	-55.2200	38.3500	210.7390	-17.8400	0.1400	

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426.00	6699084.135	1631117.111	359.612	RT90-RHB70	-55.1200	38.3300	212.4380	-18.0460	0.3830	
429.00	6699085.480	1631118.175	362.073	RT90-RHB70	-55.0400	38.3300	214.1410	-18.2520	0.6320	
432.00	6699086.829	1631119.241	364.532	RT90-RHB70	-54.9600	38.3700	215.8470	-18.4590	0.8840	
435.00	6699088.179	1631120.310	366.988	RT90-RHB70	-54.9000	38.4100	217.5570	-18.6660	1.1410	
438.00	6699089.531	1631121.382	369.442	RT90-RHB70	-54.8000	38.4400	219.2700	-18.8710	1.4020	
441.00	6699090.885	1631122.457	371.894	RT90-RHB70	-54.7400	38.5000	220.9870	-19.0760	1.6670	
444.00	6699092.241	1631123.535	374.343	RT90-RHB70	-54.6900	38.5300	222.7070	-19.2790	1.9360	
447.00	6699093.597	1631124.616	376.792	RT90-RHB70	-54.5900	38.5600	224.4290	-19.4820	2.2070	
450.00	6699094.956	1631125.699	379.237	RT90-RHB70	-54.4600	38.6100	226.1550	-19.6840	2.4840	
453.00	6699096.319	1631126.787	381.678	RT90-RHB70	-54.3600	38.6000	227.8870	-19.8850	2.7680	
456.00	6699097.685	1631127.877	384.116	RT90-RHB70	-54.2700	38.5400	229.6230	-20.0880	3.0560	
459.00	6699099.055	1631128.969	386.552	RT90-RHB70	-54.2100	38.4700	231.3630	-20.2920	3.3500	
462.00	6699100.429	1631130.061	388.985	RT90-RHB70	-54.1400	38.4400	233.1060	-20.4990	3.6460	
465.00	6699101.806	1631131.153	391.416	RT90-RHB70	-54.0500	38.4400	234.8510	-20.7070	3.9460	
468.00	6699103.185	1631132.248	393.845	RT90-RHB70	-53.9700	38.4700	236.6000	-20.9160	4.2500	
471.00	6699104.567	1631133.346	396.271	RT90-RHB70	-53.9000	38.4600	238.3520	-21.1240	4.5590	
474.00	6699105.951	1631134.445	398.695	RT90-RHB70	-53.8200	38.4600	240.1070	-21.3330	4.8710	
477.00	6699107.338	1631135.547	401.116	RT90-RHB70	-53.7300	38.4300	241.8660	-21.5420	5.1880	
480.00	6699108.728	1631136.650	403.535	RT90-RHB70	-53.6700	38.4300	243.6280	-21.7530	5.5090	
483.00	6699110.120	1631137.755	405.952	RT90-RHB70	-53.5900	38.4700	245.3930	-21.9640	5.8330	
486.00	6699111.514	1631138.862	408.366	RT90-RHB70	-53.5300	38.5000	247.1610	-22.1740	6.1610	
489.00	6699112.910	1631139.973	410.779	RT90-RHB70	-53.4800	38.5000	248.9320	-22.3830	6.4930	
492.00	6699114.307	1631141.084	413.190	RT90-RHB70	-53.4200	38.5600	250.7050	-22.5930	6.8270	
495.00	6699115.705	1631142.198	415.599	RT90-RHB70	-53.3700	38.5700	252.4810	-22.8010	7.1640	
498.00	6699117.105	1631143.314	418.006	RT90-RHB70	-53.3200	38.5900	254.2580	-23.0090	7.5040	
501.00	6699118.505	1631144.432	420.412	RT90-RHB70	-53.2500	38.6200	256.0380	-23.2170	7.8470	
504.00	6699119.908	1631145.552	422.816	RT90-RHB70	-53.1900	38.6400	257.8210	-23.4240	8.1930	
507.00	6699121.311	1631146.674	425.218	RT90-RHB70	-53.1400	38.6100	259.6070	-23.6300	8.5430	
510.00	6699122.717	1631147.797	427.619	RT90-RHB70	-53.0900	38.6300	261.3940	-23.8380	8.8940	
513.00	6699124.125	1631148.922	430.017	RT90-RHB70	-53.0300	38.6500	263.1840	-24.0460	9.2490	

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516.00	6699125.534	1631150.049	432.414	RT90-RHB70	-52.9600	38.6700	264.9760	-24.2530	9.6070	
519.00	6699126.945	1631151.178	434.809	RT90-RHB70	-52.9200	38.6700	266.7710	-24.4600	9.9690	
522.00	6699128.357	1631152.308	437.202	RT90-RHB70	-52.8800	38.7300	268.5680	-24.6670	10.3330	
525.00	6699129.770	1631153.441	439.594	RT90-RHB70	-52.8100	38.7500	270.3670	-24.8720	10.6990	
528.00	6699131.184	1631154.576	441.984	RT90-RHB70	-52.7700	38.8000	272.1690	-25.0770	11.0680	
531.00	6699132.598	1631155.714	444.373	RT90-RHB70	-52.7200	38.8400	273.9720	-25.2810	11.4400	
534.00	6699134.014	1631156.853	446.760	RT90-RHB70	-52.6600	38.8500	275.7780	-25.4840	11.8150	
537.00	6699135.431	1631157.995	449.145	RT90-RHB70	-52.6300	38.8400	277.5860	-25.6860	12.1920	
540.00	6699136.849	1631159.136	451.529	RT90-RHB70	-52.5800	38.8400	279.3960	-25.8890	12.5710	
543.00	6699138.269	1631160.280	453.912	RT90-RHB70	-52.5500	38.8300	281.2080	-26.0930	12.9530	
546.00	6699139.690	1631161.423	456.293	RT90-RHB70	-52.5000	38.8600	283.0200	-26.2970	13.3360	
549.00	6699141.113	1631162.569	458.673	RT90-RHB70	-52.4700	38.8900	284.8350	-26.5000	13.7220	
552.00	6699142.535	1631163.717	461.052	RT90-RHB70	-52.4300	38.9500	286.6520	-26.7020	14.1100	
555.00	6699143.958	1631164.867	463.430	RT90-RHB70	-52.3900	38.9900	288.4700	-26.9020	14.5000	
558.00	6699145.381	1631166.019	465.807	RT90-RHB70	-52.3500	39.0400	290.2900	-27.1020	14.8920	
561.00	6699146.804	1631167.173	468.182	RT90-RHB70	-52.3100	39.1200	292.1120	-27.3000	15.2860	
564.00	6699148.227	1631168.330	470.556	RT90-RHB70	-52.2400	39.1400	293.9360	-27.4960	15.6830	
567.00	6699149.652	1631169.490	472.927	RT90-RHB70	-52.1800	39.1200	295.7620	-27.6910	16.0830	
570.00	6699151.079	1631170.651	475.297	RT90-RHB70	-52.1200	39.1000	297.5920	-27.8870	16.4870	
573.00	6699152.509	1631171.812	477.665	RT90-RHB70	-52.1000	39.0800	299.4230	-28.0840	16.8930	
576.00	6699153.939	1631172.974	480.032	RT90-RHB70	-52.0600	39.0800	301.2550	-28.2820	17.3000	
579.00	6699155.371	1631174.137	482.398	RT90-RHB70	-51.9800	39.0500	303.0890	-28.4800	17.7100	
582.00	6699156.806	1631175.301	484.762	RT90-RHB70	-51.9100	39.0500	304.9260	-28.6800	18.1230	
585.00	6699158.244	1631176.467	487.123	RT90-RHB70	-51.8400	39.0500	306.7660	-28.8790	18.5400	
588.00	6699159.683	1631177.635	489.482	RT90-RHB70	-51.7600	39.0700	308.6090	-29.0790	18.9610	
591.00	6699161.125	1631178.805	491.838	RT90-RHB70	-51.6800	39.0700	310.4550	-29.2790	19.3860	
594.00	6699162.569	1631179.977	494.191	RT90-RHB70	-51.5900	39.1200	312.3040	-29.4790	19.8150	
597.00	6699164.015	1631181.153	496.542	RT90-RHB70	-51.5100	39.1300	314.1580	-29.6780	20.2480	
600.00	6699165.464	1631182.331	498.891	RT90-RHB70	-51.4500	39.1500	316.0140	-29.8770	20.6860	
603.00	6699166.914	1631183.511	501.237	RT90-RHB70	-51.3800	39.2000	317.8730	-30.0760	21.1270	

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
606.00	6699168.365	1631184.695	503.581	RT90-RHB70	-51.3100	39.2500	319.7350	-30.2730	21.5720	
609.00	6699169.817	1631185.881	505.922	RT90-RHB70	-51.2400	39.2800	321.6000	-30.4690	22.0200	
612.00	6699171.271	1631187.070	508.262	RT90-RHB70	-51.1900	39.3300	323.4680	-30.6640	22.4720	
615.00	6699172.725	1631188.262	510.599	RT90-RHB70	-51.1400	39.3400	325.3380	-30.8580	22.9270	
618.00	6699174.181	1631189.455	512.936	RT90-RHB70	-51.0800	39.3600	327.2100	-31.0520	23.3850	
621.00	6699175.638	1631190.650	515.269	RT90-RHB70	-51.0100	39.3900	329.0850	-31.2450	23.8460	
624.00	6699177.097	1631191.848	517.601	RT90-RHB70	-50.9500	39.3600	330.9630	-31.4380	24.3100	
627.00	6699178.558	1631193.047	519.931	RT90-RHB70	-50.8800	39.3700	332.8430	-31.6310	24.7780	
630.00	6699180.022	1631194.247	522.259	RT90-RHB70	-50.8100	39.3800	334.7260	-31.8250	25.2490	
633.00	6699181.487	1631195.450	524.584	RT90-RHB70	-50.7400	39.3500	336.6120	-32.0190	25.7230	
636.00	6699182.955	1631196.654	526.907	RT90-RHB70	-50.6800	39.3100	338.5000	-32.2140	26.2010	
639.00	6699184.426	1631197.858	529.228	RT90-RHB70	-50.6300	39.3100	340.3910	-32.4100	26.6820	
642.00	6699185.898	1631199.063	531.547	RT90-RHB70	-50.5700	39.3200	342.2830	-32.6070	27.1660	
645.00	6699187.372	1631200.271	533.864	RT90-RHB70	-50.5200	39.3400	344.1790	-32.8030	27.6530	
648.00	6699188.847	1631201.480	536.180	RT90-RHB70	-50.4800	39.3600	346.0760	-32.9990	28.1420	
651.00	6699190.323	1631202.691	538.494	RT90-RHB70	-50.4200	39.3900	347.9750	-33.1950	28.6340	
654.00	6699191.800	1631203.904	540.806	RT90-RHB70	-50.3700	39.4200	349.8760	-33.3900	29.1290	
657.00	6699193.278	1631205.119	543.117	RT90-RHB70	-50.3200	39.4000	351.7800	-33.5840	29.6260	
660.00	6699194.758	1631206.335	545.426	RT90-RHB70	-50.2600	39.3800	353.6850	-33.7790	30.1260	
663.00	6699196.241	1631207.551	547.733	RT90-RHB70	-50.2100	39.3600	355.5930	-33.9750	30.6290	
666.00	6699197.725	1631208.769	550.038	RT90-RHB70	-50.1600	39.3400	357.5030	-34.1720	31.1340	
669.00	6699199.211	1631209.987	552.342	RT90-RHB70	-50.1000	39.3500	359.4140	-34.3700	31.6420	
672.00	6699200.699	1631211.207	554.643	RT90-RHB70	-50.0200	39.3600	361.3280	-34.5670	32.1530	
675.00	6699202.190	1631212.430	556.942	RT90-RHB70	-49.9600	39.3300	363.2460	-34.7640	32.6680	
678.00	6699203.683	1631213.653	559.239	RT90-RHB70	-49.8500	39.3000	365.1660	-34.9630	33.1870	
681.00	6699205.179	1631214.878	561.532	RT90-RHB70	-49.7300	39.3000	367.0900	-35.1630	33.7110	
684.00	6699206.680	1631216.107	563.821	RT90-RHB70	-49.6500	39.3400	369.0180	-35.3640	34.2400	
687.00	6699208.182	1631217.338	566.107	RT90-RHB70	-49.6100	39.3600	370.9500	-35.5640	34.7750	
690.00	6699209.685	1631218.571	568.392	RT90-RHB70	-49.5600	39.3900	372.8840	-35.7630	35.3110	
693.00	6699211.189	1631219.806	570.675	RT90-RHB70	-49.5000	39.4300	374.8200	-35.9620	35.8500	

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
696.00	6699212.694	1631221.044	572.956	RT90-RHB70	-49.4500	39.4700	376.7590	-36.1590	36.3930	
699.00	6699214.200	1631222.284	575.235	RT90-RHB70	-49.3900	39.4700	378.6990	-36.3550	36.9380	
702.00	6699215.707	1631223.525	577.513	RT90-RHB70	-49.3200	39.4700	380.6420	-36.5510	37.4860	
705.00	6699217.217	1631224.768	579.788	RT90-RHB70	-49.2400	39.5000	382.5880	-36.7480	38.0380	
708.00	6699218.728	1631226.014	582.060	RT90-RHB70	-49.1600	39.4900	384.5370	-36.9440	38.5930	
711.00	6699220.242	1631227.262	584.330	RT90-RHB70	-49.0400	39.4500	386.4890	-37.1410	39.1530	
714.00	6699221.761	1631228.512	586.595	RT90-RHB70	-48.9500	39.4600	388.4460	-37.3390	39.7190	
717.00	6699223.282	1631229.764	588.857	RT90-RHB70	-48.8600	39.4900	390.4060	-37.5380	40.2900	
720.00	6699224.805	1631231.019	591.117	RT90-RHB70	-48.8100	39.5300	392.3690	-37.7360	40.8650	
723.00	6699226.329	1631232.276	593.375	RT90-RHB70	-48.7500	39.5700	394.3350	-37.9320	41.4420	
726.00	6699227.854	1631233.536	595.630	RT90-RHB70	-48.6500	39.6200	396.3040	-38.1280	42.0230	
729.00	6699229.381	1631234.800	597.882	RT90-RHB70	-48.5600	39.6900	398.2760	-38.3220	42.6100	
732.00	6699230.908	1631236.068	600.131	RT90-RHB70	-48.5200	39.7500	400.2520	-38.5140	43.2010	
735.00	6699232.436	1631237.339	602.379	RT90-RHB70	-48.4700	39.8300	402.2300	-38.7040	43.7940	
738.00	6699233.964	1631238.613	604.624	RT90-RHB70	-48.4100	39.8700	404.2100	-38.8920	44.3900	
741.00	6699235.492	1631239.889	606.868	RT90-RHB70	-48.3500	39.9100	406.1930	-39.0780	44.9890	
744.00	6699237.021	1631241.168	609.110	RT90-RHB70	-48.3000	39.9000	408.1780	-39.2640	45.5920	
747.00	6699238.552	1631242.449	611.350	RT90-RHB70	-48.2400	39.8800	410.1650	-39.4500	46.1970	
750.00	6699240.086	1631243.730	613.587	RT90-RHB70	-48.1600	39.8500	412.1550	-39.6360	46.8050	
753.00	6699241.622	1631245.012	615.822	RT90-RHB70	-48.0900	39.7800	414.1470	-39.8250	47.4170	
756.00	6699243.162	1631246.294	618.055	RT90-RHB70	-48.0400	39.7300	416.1420	-40.0150	48.0330	
759.00	6699244.705	1631247.577	620.286	RT90-RHB70	-48.0000	39.6700	418.1380	-40.2080	48.6500	
762.00	6699246.250	1631248.858	622.515	RT90-RHB70	-47.9500	39.6400	420.1360	-40.4030	49.2700	
765.00	6699247.797	1631250.140	624.743	RT90-RHB70	-47.9100	39.6300	422.1360	-40.5990	49.8920	
768.00	6699249.346	1631251.423	626.969	RT90-RHB70	-47.8700	39.5800	424.1370	-40.7960	50.5160	
771.00	6699250.897	1631252.705	629.194	RT90-RHB70	-47.7800	39.5600	426.1400	-40.9940	51.1430	
774.00	6699252.451	1631253.989	631.415	RT90-RHB70	-47.7200	39.4800	428.1460	-41.1940	51.7730	
777.00	6699254.009	1631255.272	633.635	RT90-RHB70	-47.6300	39.4300	430.1540	-41.3970	52.4060	
780.00	6699255.570	1631256.556	635.852	RT90-RHB70	-47.5900	39.3800	432.1650	-41.6010	53.0440	
783.00	6699257.134	1631257.840	638.067	RT90-RHB70	-47.5600	39.3600	434.1780	-41.8080	53.6830	

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
786.00	6699258.700	1631259.123	640.281	RT90-RHB70	-47.5200	39.3600	436.1920	-42.0160	54.3250	
789.00	6699260.266	1631260.408	642.493	RT90-RHB70	-47.4700	39.3800	438.2070	-42.2240	54.9680	
792.00	6699261.834	1631261.695	644.704	RT90-RHB70	-47.4200	39.4200	440.2240	-42.4310	55.6140	
795.00	6699263.402	1631262.984	646.913	RT90-RHB70	-47.3900	39.4700	442.2440	-42.6370	56.2620	
798.00	6699264.969	1631264.275	649.121	RT90-RHB70	-47.3600	39.5300	444.2640	-42.8410	56.9120	
801.00	6699266.537	1631265.568	651.328	RT90-RHB70	-47.3300	39.6000	446.2860	-43.0440	57.5640	
804.00	6699268.104	1631266.864	653.534	RT90-RHB70	-47.2800	39.6800	448.3100	-43.2430	58.2170	
807.00	6699269.670	1631268.164	655.738	RT90-RHB70	-47.2200	39.7400	450.3350	-43.4410	58.8740	
810.00	6699271.237	1631269.466	657.940	RT90-RHB70	-47.1600	39.7700	452.3640	-43.6360	59.5330	
813.00	6699272.805	1631270.771	660.139	RT90-RHB70	-47.1000	39.8400	454.3940	-43.8310	60.1960	
816.00	6699274.373	1631272.080	662.337	RT90-RHB70	-47.0500	39.8800	456.4270	-44.0230	60.8620	
819.00	6699275.941	1631273.390	664.533	RT90-RHB70	-46.9800	39.9100	458.4620	-44.2140	61.5310	
822.00	6699277.511	1631274.704	666.726	RT90-RHB70	-46.9200	39.9600	460.5000	-44.4040	62.2030	
825.00	6699279.082	1631276.019	668.918	RT90-RHB70	-46.8700	40.0000	462.5400	-44.5930	62.8780	
828.00	6699280.653	1631277.338	671.107	RT90-RHB70	-46.8100	40.0300	464.5830	-44.7800	63.5560	
831.00	6699282.225	1631278.658	673.294	RT90-RHB70	-46.7500	40.0700	466.6280	-44.9670	64.2380	
834.00	6699283.798	1631279.982	675.479	RT90-RHB70	-46.6900	40.1100	468.6750	-45.1520	64.9220	
837.00	6699285.372	1631281.307	677.662	RT90-RHB70	-46.6200	40.1400	470.7240	-45.3370	65.6100	
840.00	6699286.947	1631282.636	679.843	RT90-RHB70	-46.5400	40.1800	472.7770	-45.5200	66.3010	
843.00	6699288.524	1631283.967	682.020	RT90-RHB70	-46.4500	40.1900	474.8330	-45.7020	66.9970	
846.00	6699290.103	1631285.301	684.195	RT90-RHB70	-46.3800	40.2300	476.8910	-45.8840	67.6970	
849.00	6699291.683	1631286.638	686.366	RT90-RHB70	-46.3300	40.3100	478.9530	-46.0650	68.4000	
852.00	6699293.263	1631287.978	688.536	RT90-RHB70	-46.2800	40.3500	481.0170	-46.2430	69.1070	
855.00	6699294.843	1631289.320	690.704	RT90-RHB70	-46.2300	40.3900	483.0830	-46.4200	69.8160	
858.00	6699296.424	1631290.665	692.871	RT90-RHB70	-46.2000	40.4200	485.1510	-46.5960	70.5280	
861.00	6699298.005	1631292.012	695.036	RT90-RHB70	-46.1600	40.4800	487.2200	-46.7700	71.2420	
864.00	6699299.585	1631293.361	697.199	RT90-RHB70	-46.1300	40.5100	489.2910	-46.9430	71.9570	
867.00	6699301.166	1631294.711	699.362	RT90-RHB70	-46.0800	40.5800	491.3630	-47.1140	72.6750	
870.00	6699302.747	1631296.065	701.523	RT90-RHB70	-46.0300	40.5900	493.4370	-47.2840	73.3950	
873.00	6699304.328	1631297.420	703.682	RT90-RHB70	-45.9700	40.6200	495.5130	-47.4520	74.1170	

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
876.00	6699305.911	1631298.778	705.839	RT90-RHB70	-45.9200	40.6300	497.5920	-47.6200	74.8420	
879.00	6699307.495	1631300.137	707.994	RT90-RHB70	-45.8600	40.6200	499.6720	-47.7880	75.5700	
882.00	6699309.081	1631301.497	710.147	RT90-RHB70	-45.7900	40.6700	501.7540	-47.9570	76.3020	
885.00	6699310.667	1631302.860	712.297	RT90-RHB70	-45.7100	40.6700	503.8400	-48.1240	77.0370	
888.00	6699312.256	1631304.225	714.445	RT90-RHB70	-45.6400	40.6800	505.9280	-48.2910	77.7750	
891.00	6699313.847	1631305.593	716.589	RT90-RHB70	-45.5600	40.7100	508.0190	-48.4580	78.5180	
894.00	6699315.439	1631306.963	718.731	RT90-RHB70	-45.5000	40.7400	510.1120	-48.6240	79.2640	
897.00	6699317.032	1631308.335	720.871	RT90-RHB70	-45.4400	40.7900	512.2090	-48.7880	80.0140	
900.00	6699318.626	1631309.710	723.009	RT90-RHB70	-45.3600	40.8400	514.3070	-48.9520	80.7660	
903.00	6699320.220	1631311.089	725.144	RT90-RHB70	-45.2700	40.8600	516.4090	-49.1140	81.5230	
906.00	6699321.817	1631312.470	727.275	RT90-RHB70	-45.2200	40.8700	518.5140	-49.2750	82.2850	
909.00	6699323.415	1631313.853	729.404	RT90-RHB70	-45.2000	40.8800	520.6210	-49.4360	83.0490	
912.00	6699325.014	1631315.236	731.533	RT90-RHB70	-45.1900	40.8600	522.7290	-49.5970	83.8140	
915.00	6699326.613	1631316.619	733.661	RT90-RHB70	-45.1900	40.8600	524.8370	-49.7590	84.5800	
918.00	6699328.212	1631318.003	735.789	RT90-RHB70	-45.1800	40.8400	526.9450	-49.9200	85.3450	
921.00	6699329.812	1631319.386	737.917	RT90-RHB70	-45.1500	40.8100	529.0540	-50.0830	86.1120	
924.00	6699331.413	1631320.769	740.044	RT90-RHB70	-45.1200	40.7800	531.1630	-50.2460	86.8790	
927.00	6699333.016	1631322.151	742.170	RT90-RHB70	-45.0900	40.7400	533.2740	-50.4110	87.6480	
930.00	6699334.621	1631323.533	744.294	RT90-RHB70	-45.0600	40.7400	535.3850	-50.5770	88.4180	
933.00	6699336.226	1631324.917	746.418	RT90-RHB70	-45.0200	40.7400	537.4980	-50.7440	89.1900	
936.00	6699337.833	1631326.300	748.540	RT90-RHB70	-44.9800	40.7300	539.6120	-50.9100	89.9640	
939.00	6699339.441	1631327.685	750.660	RT90-RHB70	-44.9300	40.7000	541.7280	-51.0770	90.7400	
942.00	6699341.052	1631329.070	752.779	RT90-RHB70	-44.8700	40.6800	543.8450	-51.2450	91.5180	
945.00	6699342.664	1631330.456	754.896	RT90-RHB70	-44.8100	40.6900	545.9640	-51.4150	92.3000	
948.00	6699344.278	1631331.844	757.010	RT90-RHB70	-44.7200	40.7400	548.0860	-51.5840	93.0840	
951.00	6699345.893	1631333.235	759.121	RT90-RHB70	-44.6100	40.7600	550.2110	-51.7510	93.8730	
954.00	6699347.511	1631334.629	761.228	RT90-RHB70	-44.5000	40.7600	552.3400	-51.9180	94.6680	
957.00	6699349.132	1631336.026	763.330	RT90-RHB70	-44.4100	40.7600	554.4730	-52.0850	95.4680	
960.00	6699350.755	1631337.425	765.430	RT90-RHB70	-44.3400	40.7600	556.6100	-52.2530	96.2720	
963.00	6699352.380	1631338.826	767.526	RT90-RHB70	-44.2800	40.8200	558.7490	-52.4210	97.0810	

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
966.00	6699354.005	1631340.230	769.621	RT90-RHB70	-44.2500	40.8900	560.8900	-52.5860	97.8920	
969.00	6699355.630	1631341.637	771.714	RT90-RHB70	-44.2100	40.9600	563.0330	-52.7490	98.7050	
972.00	6699357.254	1631343.046	773.806	RT90-RHB70	-44.1600	41.0300	565.1770	-52.9100	99.5200	
975.00	6699358.877	1631344.459	775.896	RT90-RHB70	-44.1100	41.1200	567.3230	-53.0690	100.3380	
978.00	6699360.500	1631345.875	777.985	RT90-RHB70	-44.0800	41.2000	569.4720	-53.2230	101.1580	
981.00	6699362.121	1631347.295	780.072	RT90-RHB70	-44.0300	41.3000	571.6210	-53.3750	101.9800	
984.00	6699363.742	1631348.718	782.157	RT90-RHB70	-43.9900	41.3800	573.7730	-53.5240	102.8050	
990.00	6699366.979	1631351.580	786.320	RT90-RHB70	-43.9200	41.5300	578.0840	-53.8070	104.4650	

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Appendix 4

Length reference marks

Reference Mark T - Reference mark in drillhole

KFM04A, 2003-11-04 10:00:00 - 2003-11-04 17:00:00 (119.000 - 950.000 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
119.00	400.00	320	600	38.0	92			OK Klar signal NK
150.00	400.00	360	620	39.0	70			OK Klar signal NK
200.00	400.00	300	560	39.0	60			OK Klar signal NK
250.00	400.00	410	710	40.0	90			OK Klar signal NK
300.00	400.00	500	760	40.0	65			OK Klar signal NK
350.00	400.00	360	600	39.0	70			OK Klar signal NK
400.00	400.00	520	800	39.0	65			OK Klar signal NK
450.00	400.00	500	950	45.0	130			OK Klar signal NK
500.00	400.00	300	600	45.0	135			OK Klar signal NK
550.00	400.00	400	600	46.0	135			OK Klar signal NK
600.00	400.00	280	620	47.0	150			OK Klar signal NK
650.00	400.00	180	670	48.0	190			OK Klar signal NK
700.00	400.00	350	800	50.0	255			OK Klar signal NK
750.00	400.00	250	750	50.0	225			OK Klar signal NK
800.00	400.00	280	800	49.0	195			OK Klar signal NK
850.00	400.00	180	550	50.0	265			OK Klar signal NK
900.00	400.00	180	450	52.0	315			OK Klar signal NK
950.00	400.00	180	450	52.0	225			OK Klar signal NK

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Appendix 5

Mapping of drill cuttings

Drill cuttings			Date: 2004-03-06 Sign.: Jesper Petersson																
			Untreated drill cuttings sample				Washed and sieved drill cuttings sample												
Hole	From	To	Lightn.	Chrom.	Hue	Grainsize	Lightn.	Chrom.	Hue	Grainsize	Rock type A	Rock type B	Min-1	Min-2	Min-3	Min-4	Min-5	Distr.	Kommentar
KFM04A	2	3		20; Reddish	8; Grey	6; Fine-to medium grained	200; Dark	10; Pinkish	8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101061; Pegmatite, pegmatitic granite	49; Plagioclase	10; Biotite	36; Quartz	32; Potash Feldspar	28; Hornblende	90; 90/10	Partially oxidized.
KFM04A	3	4	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic		49; Plagioclase	10; Biotite	36; Quartz	32; Potash Feldspar	28; Hornblende		Partially oxidized.
KFM04A	4	7	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	80; 80/20	<5% pegmatitic granite (101061).
KFM04A	7	10	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	80; 80/20	
KFM04A	10	11			8; Grey	6; Fine-to medium grained			8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	70; 70/30	Ca. 5% coarse-grained quartz. Also a few grains of a green fine-grained rock.
KFM04A	11	12			8; Grey	6; Fine-to medium grained	200; Dark		8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	90; 90/10	<5% coarse-grained quartz. Also a few grains of a green fine-grained rock.
KFM04A	12	13	200; Dark		8; Grey	6; Fine-to medium grained	200; Dark		8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	60; 60/40	
KFM04A	13	15	200; Dark		8; Grey	6; Fine-to medium grained			8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	90; 90/10	<5 vol% greenish, fine-grained rock; possibly pure epidote.
KFM04A	15	17	100; Light		8; Grey	2; Fine-grained (<1 mm)		10; Pinkish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	60; 60/40	Ca. 5% pegmatitic granite (101061).
KFM04A	17	18	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	80; 80/20	
KFM04A	18	21	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	50; 50/50	
KFM04A	21	24	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	60; 60/40	<5 vol% red, fine-grained granite (111058?).
KFM04A	24	27		50; Greenish	8; Grey	6; Fine-to medium grained	100; Light	20; Reddish	8; Grey	6; Fine-to medium grained	111058; Granite, fine to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	36; Quartz	32; Potash Feldspar	49; Plagioclase	10; Biotite	28; Hornblende	80; 80/20	Ca. 5 vol% coarse-grained quartz. Ca. 10% green, fine-grained, epidote and a more dark green mineral.

Drill cuttings

Date: 2004-03-06 Sign.: Jesper Petersson

Hole	From	To	Untreated drill cuttings sample Lightn.	Chrom.	Hue	Grainsize	Washed and sieved drill cuttings sample Lightn.	Chrom.	Hue	Grainsize	Rock type A	Rock type B	Min-1	Min-2	Min-3	Min-4	Min-5	Distr.	Kommentar
KFM04A	27	30	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	90; 90/10	
KFM04A	30	33	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	80; 80/20	101056 is dark-greenish grey.
KFM04A	33	34	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	111058; Granite, fine to medium grained	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	80; 80/20	111058 is oxidized. Ca 5% 101056.
KFM04A	34	35	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	80; 80/20	Ca 5% 111058 (oxidized).
KFM04A	35	36	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	50; 50/50	A few grains of 111058.
KFM04A	36	38	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	70; 70/30	Several grains are dark greenish grey.
KFM04A	38	39	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	80; 80/20	A few grains with epidote.
KFM04A	39	42		80; Greyish	5; Green	2; Fine-grained (<1 mm)		50; Greenish	8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	16; Epidote	10; Biotite	32; Potash Feldspar	60; 60/40	Most of the material seems to be epidotized.
KFM04A	42	45	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic		49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	100; 100 %	Ca 5 % 101056.
KFM04A	45	47	200; Dark		8; Grey	6; Fine-to medium grained	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	80; 80/20	
KFM04A	47	48		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	2; Fine-grained (<1 mm)	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	60; 60/40	
KFM04A	48	49			8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	50; 50/50	Also some epidote fracture sealing and a few grains of quartz.
KFM04A	49	51			8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	60; 60/40	Also a few grains of quartz.
KFM04A	51	54	200; Dark		8; Grey	2; Fine-grained (<1 mm)	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic		49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	100; 100 %	Ca 5 % pegmatitic granite.
KFM04A	54	57		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained		32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		100; 100 %	
KFM04A	57	60		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained		32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		100; 100 %	
KFM04A	60	63		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite		100; 100 %	One grain epidote sealing.

Drill cuttings

Date: 2004-03-06 Sign.: Jesper Petersson

Hole	From	To	Untreated drill cuttings sample: Lightn.	Untreated: Chrom.	Untreated: Hue	Untreated: Grainsize	Washed and sieved drill cuttings sample: Lightn.	Washed: Chrom.	Washed: Hue	Washed: Grainsize	Rock type A	Rock type B	Min-1	Min-2	Min-3	Min-4	Min-5	Distr.	Kommentar
KFM04A	63	66		20; Reddish	8; Grey	2; Fine-grained (<1 mm)		80; Greyish	2; Red	6; Fine-to medium grained	101056; Granodiorite, metamorphic		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite		100; 100 %	
KFM04A	66	68		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained		32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		100; 100 %	
KFM04A	68	69	200; Dark		8; Grey	2; Fine-grained (<1 mm)		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite		90; 90/10	One grain with calcite fracture sealing.
KFM04A	69	70	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	200; Dark	10; Pinkish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	101061; Pegmatite, pegmatitic granite	49; Plagioclase	10; Biotite	36; Quartz	32; Potash Feldspar		60; 60/40	Biotite-rich granodiorite material.
KFM04A	70	71	200; Dark		8; Grey	6; Fine-to medium grained		10; Pinkish	8; Grey	8; Medium to coarse grained	101061; Pegmatite, pegmatitic granite	101056; Granodiorite, metamorphic	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		80; 80/20	
KFM04A	71	72	200; Dark	10; Pinkish	8; Grey	6; Fine-to medium grained	100; Light		1; Pink	8; Medium to coarse grained	101061; Pegmatite, pegmatitic granite		32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		100; 100 %	Ca 5 % biotite-rich, fine-grained material
KFM04A	72	75	100; Light	80; Greyish	1; Pink	8; Medium to coarse grained	200; Dark		8; Grey	2; Fine-grained (<1 mm)	103076; Felsic to intermediate volcanic rock, metamorphic	101056; Granodiorite, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	90; 90/10	
KFM04A	75	76	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained	103076; Felsic to intermediate volcanic rock, metamorphic	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite	28; Hornblende	90; 90/10	
KFM04A	76	78	200; Dark		8; Grey	6; Fine-to medium grained	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	100; 100 %	Biotite-rich 101056.
KFM04A	78	81		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained	101056; Granodiorite, metamorphic	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		90; 90/10	Biotite-rich 101056.
KFM04A	81	83		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained		32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		100; 100 %	
KFM04A	83	84		20; Reddish	8; Grey	2; Fine-grained (<1 mm)		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	101057; Granite to granodiorite, metamorphic, medium grained, medium grained	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite		90; 90/10	
KFM04A	84	85		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained	101056; Granodiorite, metamorphic	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		90; 90/10	A grain with calcite fracture sealing.
KFM04A	85	86		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101057; Granite to granodiorite, metamorphic, medium grained, medium grained	101056; Granodiorite, metamorphic	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		90; 90/10	<5% pegmatitic granite (101061).
KFM04A	86	87		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	90; 90/10	

Drill cuttings Date: 2004-03-06 Sign.: Jesper Petersson

			Untreated drill cuttings sample				Washed and sieved drill cuttings sample												
Hole	From	To	Lightn.	Chrom.	Hue	Grainsize	Lightn.	Chrom.	Hue	Grainsize	Rock type A	Rock type B	Min-1	Min-2	Min-3	Min-4	Min-5	Distr.	Kommentar
KFM04A	87	88	100; Light	10; Pinkish	8; Grey	6; Fine-to medium grained	100; Light	20; Reddish	8; Grey	8; Medium to coarse grained	101061; Pegmatite, pegmatitic granite	102017; Amphibolite	36; Quartz	32; Potash Feldspar	49; Plagioclase	10; Biotite		80; 80/20	
KFM04A	88	90		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	70; 70/30	
KFM04A	90	93		80; Greyish	2; Red	6; Fine-to medium grained		80; Greyish	2; Red	6; Fine-to medium grained	101056; Granodiorite, metamorphic	111058; Granite, fine to medium grained	32; Potash Feldspar	36; Quartz	49; Plagioclase	10; Biotite		50; 50/50	Ca 5% 101061.
KFM04A	93	96		20; Reddish	8; Grey	6; Fine-to medium grained	200; Dark	20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	103076; Felsic to intermediate volcanic rock, metamorphic	49; Plagioclase	36; Quartz	10; Biotite	32; Potash Feldspar	28; Hornblende	60; 60/40	<<5% 101061.
KFM04A	96	99		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	100; 100 %	
KFM04A	99	102		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	100; 100 %	
KFM04A	102	105		20; Reddish	8; Grey	6; Fine-to medium grained		20; Reddish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic		49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	100; 100 %	
KFM04A	105	108		20; Reddish	8; Grey	6; Fine-to medium grained		10; Pinkish	8; Grey	6; Fine-to medium grained	101056; Granodiorite, metamorphic	101061; Pegmatite, pegmatitic granite	49; Plagioclase	36; Quartz	32; Potash Feldspar	10; Biotite	28; Hornblende	90; 90/10	

Appendix 6

Detailed overview mapping of drill core 985.95–1000.89 m