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Jan Ehrenborg, Mirab

Peter Dahlin, Geosigma 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

Borehole KLX04 is a deep (1,000 m) cored borehole, drilled within the site investigation program in the Oskarshamn area. This telescopic borehole was drilled 2004. No B-hole was drilled why the drill core is missing for the interval 0–100 m. Only drill cuttings are available for this interval.

The principal aim of the mapping activities presented in this report was to obtain a detailed documentation in Boremap of geological structures and lithologies intersecting borehole KLX04. Geological structures were correctly orientated in space along the borehole. The results will serve as a platform for forthcoming investigations of the drill core, as well as various site descriptive modelling.

The drill core was displayed in its entire length on inclined roller tables and mapped with the Boremap system. Depth registered in the BIPS-image deviates from the true depth in the borehole. This problem was eliminated by adjusting the depth according to reference slots, visible in the BIPS-image, cut into the borehole wall every fiftieth meter (Appendix 8). The mapping was performed on-line on the SKB network, in order to obtain the best possible data security, and quality was checked by a standard routine in Boremap before it was exported to SICADA.

Geological parameters mapped in Boremap are presented in a Geological Summary table (Appendix 1). This is an easy to read overview of the geological parameters which facilitates comparison between Boremap information collected from different boreholes.

Drill core KLX04 was subdivided in four sections according to interpretation of the Geological Summary table. Section I (100–450 m) and section III (500–870 m) are dominated by Ävrö granite (501044) and quite similar geologically. They are separated by the section II (450–500 m) dominated by quartz monzodiorite (501036) and with extremely low frequencies of broken and unbroken fractures as well as a total lack of alteration, for example, oxidation. Section IV (870–993 m) is dominated by a medium to coarse grained granite (501058). It differs from sections I to III in the occurrence of strong frequency maxima of broken as well as unbroken fractures, high joint alteration numbers and of crush zones. This section is also more oxidized than in the interval 100–870 m. An unknown alteration type in the interval 942–948 m give the rock a weathered appearance and show dissolution of mineral grains. The rock is so rich in unbroken fractures in the interval 941–953 m that micro breccia might be an appropriate descriptive structural term.

Sammanfattning

Borrhål KLX04 är ett djupt (ca 1 000 m) kärnborrhål som borrats inom ramen för platsundersökningarna i Oskarshamnsområdet. Hålet borrades under 2004. Inget B-hål borrades varför borrkärna saknas för intervallet 0–100 m. Endast borrkax finns i detta intervall.

Huvudsyftet med de karteringsaktiviteter som presenteras i denna rapport var att erhålla en detaljerad dokumentation i Boremap av de geologiska strukturer och litologier som skär borrhål KLX04. Detta program möjliggör absolut orientering av geologiska strukturer utefter borrhålet. Karterade data kommer att ligga till grund för framtida tolkningar av bergets egenskaper i Oskarshamnsområdet ner till 1 000 m djup.

Borrkärnan lades upp på lutande rullbänkar och karterades med Boremapsystemet. Djup som registreras i BIPS-bilden avviker från det verkliga djupvärdet i borrhålet. Dessa djupproblem eliminerades genom justering av djupet i förhållande till referensmärken, synliga i BIPS-bilden, som slipats in i borrhålsväggen för var 50:e meter (Appendix 8). Karteringen utfördes on-line på SKB:s nätverk för att erhålla största möjliga datasäkerhet. Den karterade informationen kvalitetskontrollerades genom en standardrutin i Boremap innan den exporterades till SICADA.

Geologiska parametrar presenteras i en Geological Summary table (Appendix 1). Detta är en lättläst översikt över de Boremapkarterade geologiska parametrarna, vilken underlättar jämförelse av Boremapinformation från olika borrhål.

Borrkärna KLX04 har indelats i fyra sektioner beroende på tolkningen av Geological Summary table. Sektionerna I (100–450 m) och III (500–870 m) domineras av Ävrö granit (501044) och är geologiskt mycket likartade. De separeras av sektion II (450–500 m), vilken domineras av kvartsmonzodiorit (501036) som har extremt låga frekvenser av ”broken fractures” liksom av ”unbroken fractures”. Sektion II saknar oxidation. Sektion IV (870–993 m) domineras av en medel till grovkornig granit (501058). Den skiljer sig från sektionerna I till III i förekomsten av kraftiga frekvensmaxima för ”broken fractures”, liksom för ”unbroken fractures”. Höga ”joint alteration numbers” och krosszoner med höga frekvensmaxima. Sektion IV är också kraftigare oxiderat än intervallet 100–870 m. En ännu ej definierad omvandlingstyp förekommer i intervallet 942–948 m, inom vilket bergarten har ett vittrat utseende och uppvisar upplösning av mineralkorn. Bergarten är så rik på ”unbroken fractures” i intervallet 941–953 m, att termen mikrobreccia möjligen skulle vara lämplig för att beskriva bergartens struktur.

Contents

1 Introduction

This document reports the data gained by Boremap mapping of the borehole KLX04 within the Laxemar investigation area, which is one of the activities performed within the site investigation at Oskarshamn. The work was carried out in accordance with activity plan AP PS 400-04-070. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

Since 2002, SKB investigates two potential sites for a deep deposition of nuclear waste in the Swedish Precambrian basement at approximately 500 m depth. These places are Forsmark in northern Uppland and Oskarshamn in eastern Småland. In order to make a preliminary evaluation of the rock mass down to a depth of about 1 km at these sites, SKB has initiated a drilling program using core drilled boreholes.

The borehole KLX04 was drilled in 2004 and is situated within the Laxemar area (Figure 1-1). KLX04 is telescopic, which means that the uppermost 100 m were drilled by percussion drilling followed by core drilling (100–1,000 m). KLX04 includes two boreholes: KLX04 and KLX04B. Since drill core is missing for the uppermost 100 m, another core drilled borehole, KLX04B, was drilled adjacent to KLX04 to cover up the interval 0–100 m. In this report both boreholes are referred to as KLX04.

Detailed mapping of the drill cores is essential for a three dimensional understanding of the geology at depth. The Boremap mapping is based on the use of BIPS-images of the borehole wall and by the study of the drill core itself. The BIPS-images enable the study of orientations, since the Boremap software calculates strike and dip of planar structures such as foliations, rock contacts and fractures. Also the fracture apertures in the rock can be estimated. Important to keep in mind is that the mappings only represent the bedrock where it is intersected by the drill holes.

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

Activity plan	Number	Version
Boremapkartering av kärnborrhål KLX04	AP PS 400-04-070	1.0
Method descriptions	**Number**	**Version**
Nomenklatur vid Boremapkartering	PM internal document	2004-02-05
Method Description for Boremap mapping	SKB MD 143.006	1.0

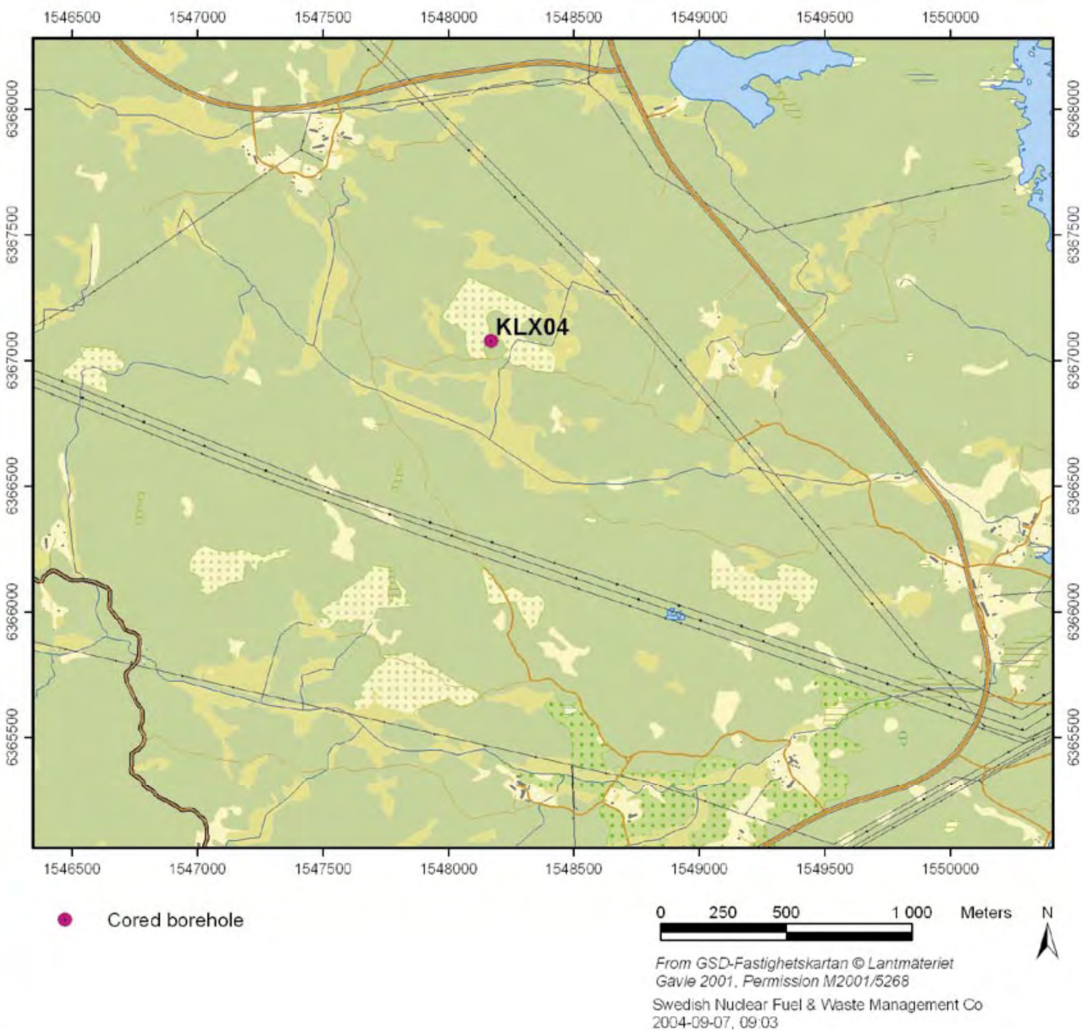


Figure 1-1. *Location of the core drilled borehole KLX04.*

2 Objective and scope

The principal aim of the mapping activities presented in this report is to obtain a detailed documentation of geological structures and lithologies intersecting borehole KLX04. Geological structures will be correctly orientated in space along the borehole. The results will serve as a platform for forthcoming investigations of the drill core, as well as various site descriptive modelling.

3 Equipment

3.1 Description of software

The mapping was performed in Boremap v. 3.4.3.1, loaded with the bedrock and mineral standards of SKB. The final data presentation was made using StereoNet, WellCad v. 3.2, and BIPS Image Print.

Boremap is a computerized system that unite orthodox core mapping with modern video mapping. Boremap is the central of the system and deals with the mapping as well as the internal communication between programs. Boremap shows the video image from BIPS (Borehole Image Processing System) and extracts the geometrical parameters: length, width, strike and dip from the image.

3.2 Other equipment

The following equipment was used to facilitate the core mapping: folding rule and pen, hydrochloric acid, knife, water-filled atomizer and hand lens.

3.3 BIPS-image video film sequences

The BIPS video film of KLX04 consists of four sequences. The first BIPS video sequence covers KLX04B which is the interval 11.53–99.33 m, while the others cover KLX04. The second sequence covers the interval 100.95–601.96 m, the third sequence covers the interval 600–808 m and the fourth sequence the interval 808–1,001.37 m. There are no BIPS-images neither where KLX04B and KLX04 meet, in the interval 99.33–100.95 m nor in the 8 cm long interval 601.96–602.04 m. Before mapping, the sequences 2, 3 and 4 were put together covering the interval 100.95–1,001.37 m.

3.4 BIPS-image video film quality

The main reasons why thinner fractures are visible or not in the BIPS-image are image resolution, image contrast and image quality.

3.4.1 BIPS-image resolution

The BIPS-image resolution is perhaps the principal reason why very thin fractures as well as very thin apertures are not visible in the BIPS-image. The theoretical resolution depends on the BIPS video camera pixel size and illumination angle. In this case one pixel represents 0.66 mm × 1 mm (width × length).

3.4.2 BIPS-image contrast

Thick fractures are always visible in both drill core and the BIPS-image. However, the visibility of thin fractures depends strongly on the colour contrast between the fracture and the wall rock.

A light fracture in a dark rock is clearly visible in the BIPS-image. A light fracture in a light rock might, however, be clearly visible in the drill core but not visible in the BIPS-image, especially if the fracture and wall rock have the same colour. The opposite is true for dark fractures.

In the rare case when the BIPS-image contrast between a very thin fracture and the wall rock is very strong the fracture might be visible in the BIPS-image even if it is not visible in the drill core. Such fractures were given the mineral code X9 in first mineral fill.

3.4.3 BIPS-image quality

The BIPS-image quality was sometimes limited by disturbances such as:

1) blackish coatings probably related to the drilling equipment,
2) vertical bleached bands from the clayey mixture of drill cuttings and water, which sometimes formed a spiral pattern,
3) light and dark bands at right angle to the drill hole related to the automatic aperture of the video camera,
4) vertical enlargements of pixels due to stick-slip movement of the camera probe.

Problems related to the video camera aperture and the enlargement of pixels are neglectable in KLX04.

The main disturbances for the BIPS-image quality in KLX04 are vertical bleached bands but also blackish coatings.

The image quality is classified into four classes; good, acceptable, bad and very bad. With good quality means a more or less clear, easy to interpret image. With acceptable quality means that the image is not really good, but that the mapping can be performed without problems. An image with bad quality is somewhat difficult to interpret and an image with very bad quality cannot be interpreted and only extremely thick and outstanding fractures can eventually be mapped. It should be remembered that even if only 10–20% of the image is visible this is often enough for an acceptable interpretation. When the BIPS-image quality is so bad that fractures and structures can not be identified in the BIPS-image these can still be oriented using the *guide-line method* (chapter 4.2.3)

Good to very good image quality is rare in KLX04 but 40% of the borehole length can be classified as good to acceptable. The BIPS-image quality in KLX04 is as follows; 11.5–25 m bad, 25–50 m acceptable to bad, 50–150 m good to acceptable, 150–263 m acceptable to bad, 263–290 m good, 290–353 m good to acceptable, 353–357 m very bad, 357–398 m bad, 398–403 m very bad, 403–429 m good to acceptable, 429–435 m good, 435–601.96 m good to acceptable, 601.96–602.04 m no image, 602.04–944 m acceptable to bad and 944–1,000 good to acceptable.

4 Execution

4.1 General

The Boremap-mapping of the telescopic drilled borehole KLX04 was performed and documented according to activity plan AP PS 400-04-070 (SKB, internal document) referring to the Method Description for Boremap mapping (SKB MD 143.006, v.1.0, SKB, internal controlling document).

Usually two cores represent a borehole over 1,000 m (100–1,000 m core borehole A and 0–100 m core borehole B. The first 100 m (0–100 m) of the borehole A is drilled by percussion drilling and no drill core can be received. A second core drilled borehole (B), is drilled adjacent to borehole A, in order to get a representative core for the uppermost section. In the current case there is only one core borehole (KLX04) that covers the interval 100.25–991 m.

The drill cores were displayed on inclined roller tables and mapped in their entire length with the Boremap system at Simpevarp. The core mapping was carried out without any detailed geological knowledge of the area but with access to geophysical logs and rock samples.

4.2 Preparations

Any depth registered in the BIPS-image deviates from the true depth in the borehole, a deviation which increases with depth. This problem was eliminated by adjusting the depth according to reference slots cut into the borehole every fiftieth meter (Appendix 8). The level for each slot was measured in the BIPS-images and then adjusted to the correct level using the correct depth value in SICADA.

The orientations of the observations were adjusted to true space. Data necessary for this adjustment were borehole diameter, length and deviation; both collected from SICADA (Appendices: 6 and 7).

4.3 Execution of measurements

Concepts used during the Boremap mapping are defined in this chapter.

4.3.1 Fracture definitions

Definition of different fracture types, also crush and sealed fracture network, are found in a PM “Nomenklatur vid Boremapkartering” (internal SKB document). Apertures for broken fractures have been mapped in accordance with the definitions in this PM.

In the mapping phase, fractures that have parted the core are mapped as “Broken” and fractures that have not parted the core, are mapped as “Unbroken”. All fractures are described with their fracture minerals and other characteristics, such as width and aperture.

Visible apertures are measured down to 1 mm in the BIPS-image. Smaller apertures, which are impossible to see in the BIPS-image, are denoted a value of 0.5 mm. Core pieces with bad fit were characterized as "probable aperture" and fractures with a dull or altered surface as "possible aperture".

All fractures in the SICADA database that possess apertures > 0 mm, are interpreted as "open". Only few "broken fractures" are given the aperture 0 mm. "Unbroken fractures" have apertures = 0 mm. If "unbroken" fractures possess apertures > 0 mm, they are interpreted as "partly open" and included in the "open"-category. "Open" and "sealed" fractures are finally frequency calculated and shown in the composite log (Appendices 1 and 5).

4.3.2 Fracture alteration and joint alteration number

The joint alteration number is principally related with the thickness of, and the clay content in, a fracture. Thicker fractures rich in clay minerals therefore get joint alteration numbers 2–3. The absolute majority of fractures in KLX04, however, are very thin to extremely thin and rarely contain clay minerals and therefore get joint alteration numbers between 1 and 2.

A subdivision of fractures with joint alteration numbers between 1 and 2 was introduced to facilitate both the evaluation process for fracture alterations and the possibility to compare the alterations between different fractures in the boreholes. The subdivision is based on fracture mineralogy and was as follows: a) fracture wall alterations, b) fracture mineral fillings assumed to have been deposited from circulating water rich solutions and c) fracture mineral fillings most likely resulting from altered wall rock material.

Joint alteration number equal to 1

Fractures with or without wall rock alteration, for example oxidation or epidotization, and without mineral fillings were considered as fresh. The joint alteration number was thus set to 1.

The minerals calcite, quartz, fluorite and zeolites like laumontite as well as sulphides were regarded as deposited by circulating water rich solutions in broken fractures and not as true fracture alteration minerals. The joint alteration number was thus set to 1 also for these minerals.

Joint alteration number equal to 1.5

Epidote, prehnite, hematite, chlorite and/or clay minerals were regarded as fracture minerals most likely resulting from altered wall rock material. A weak alteration was thus assumed and the joint alteration number was set to 1.5. Extra consideration was given to clay minerals since the occurrence of these often resulted in a higher joint alteration number.

Joint alteration numbers higher than 1.5

When the mineral fillings were thicker and contained a few mm thick bands of clay minerals, often together with minerals like epidote and chlorite, the joint alteration number was set to 2. In the extremely rare cases, when a fracture contains 5–10 mm thick clayey bands, together with epidote and chlorite, the joint alteration number is set to 3.

When the alteration of a fracture was too thick (and/or intense) to give the fracture the joint alteration number 1.5 and too thin and/or weak to give it a 2, 1.7 and 1.8 were used.

4.3.3 Mapping of fractures not visible in the BIPS-image

Not all fractures are visible in the BIPS-images, and these fractures are orientated by using the *guide-line method*, based on the following data:

- Absolute depth.
- Amplitude (measured along the drill core).The amplitude is the interval between fracture extremes along the drill core.
- Exact orientation of the fracture trace, measured on the drill core in relation to a close lying, well defined, geological structure visible in the BIPS-image.

The error of orientating fractures using the guide-line method is not known but experience and an estimation using stereographic plots indicated that the error is most likely insignificant. Anyhow, the guide-line method is so far considered much better than only marking fractures that are non-visible in the BIPS-images as planes perpendicular to the borehole. The fractures in question are mapped as "non-visible in BIPS" and can therefore be separated from fractures visible in BIPS which have a more accurate orientation.

When using the guide-line method the difference between the 50 mm drill core diameter and the 76 mm borehole diameter must be considered. This difference result in displacements of the structures seen in the drill core compared with the structures seen in the BIPS-image which represents the borehole walls. This displacement is zero for structures that cut the drill core at right angle and successively becomes larger as the orientation of the structure approximates the direction of the drill core axis. This displacement always has to be corrected for, since displacements of a few cm are common even if they seldom reach 10 cm.

Orientation of fractures and other structures with the guide-line method is done in the following way: The first step in the guide-line method is to correct the amplitude of the fracture trace in the BIPS-image to the higher amplitude value. The second step is the correction of strike and dip. This is done by rotating the fracture trace in the BIPS-image relative to a feature with known orientation. The fracture is then located at the correct depth according to the depth measured on the drill core.

The guide-line method can be used to orientate any fracture/structure that is not visible or visible in the BIPS-image. It is also a valuable tool to control that the personnel working with the drill core is observing the same fracture/structure as the personnel delineating the fracture trace in the BIPS-image, especially in intervals rich in fractures.

4.3.4 Definition of veins versus dikes

Veins and dykes were differentiated by the width. Veins were set to 0–20 cm wide and dykes 20–100 cm wide. Since the maximum width of *rock occurrences* is 100 cm wider dykes are mapped under the feature *rock type.*

4.3.5 Mineral codes

In the case where properties and/or minerals are not represented in the mineral list, following mineral codes have been used:

X5 whitish, bleached feldspar.

X6 the drill core is broken at right angle to the drill core and the broken surfaces have a polished appearance. This is believed to indicate that a sealed fracture broke up during drilling and where the two drill core parts have rotated against each other wearing away the mineral fill.

X7 broken fracture with a fresh appearance and no mineral fill.

X8 fractures with epidotized walls.

X9 sealed fractures visible in the BIPS-image but not in the drill core.

4.3.6 Data handling

The mapping was performed on-line on the SKB network, in order to obtain the best possible data security. Before every break (exceeding 15 minutes) a back-up was saved on the local disk.

The mapping was quality checked by a routine in Boremap before it was exported to and archived in SICADA. Personnel from SKB also performed spot test controls and regular quality revisions.

All primary data are stored in the SKB SICADA database. Only these data are to be used for further interpretation and modelling.

4.4 Geological Summary table, general description

The Geological Summary table (Appendix 1) is an easy to read overview of the geological parameters mapped with the Boremap system. It also facilitates comparisons between Boremap information collected from different boreholes and is more objective than a pure descriptive summary of a borehole.

This Geological Summary table is the result of cooperation between Jan Ehrenborg from the mapping personnel at Simpevarp and Pär Kinnbom from PO (site investigation, Simpevarp). The aim was to make a standard form in handy A4-size, where all information is taken directly from the SICADA database by using simple and well defined search paths for each geological parameter (Appendix 2).

The search paths cannot, however, yet be used in an automatic way and therefore the geological information has first been extracted from the SICADA database, then reworked on separate Excel-files and last presented in the Geological Summary table. At the moment it is only possible to extract the Rock Type and Alteration parameters directly from the SICADA database.

The main reason why the information in the SICADA database cannot be extracted automatically is the lack of a mathematical formula to calculate frequencies for different parameters. Such a formula will be added.

The need to rework the SICADA information on separate Excel-files exists because some information is written in the *Comment* field for individual observations in Boremap, and therefore has to be extracted manually. This problem is also being dealt with.

The Geological Summary table is made up of 23 columns, each one representing a specific geological parameter. The geological parameters are presented as either intervals or frequencies. Intervals are calculated for parameters with a width ≥ 1 m and frequencies for parameters with a width < 1 m. Frequency information is treated as if it does not have any extension along the borehole axis. They are treated as point observations. It should be noted that parameters with a thickness of only 1 mm therefore has the same "value" as a similar parameter with a thickness of 999 mm since both are treated as point observations and used for frequency calculations.

Parameters are sometimes related in such a way that the mapping of one parameter cause a decrease in the frequency of another parameter. This type of intimate relationship between parameters has been noted for the following cases;

- There is a decrease in the frequency of *unbroken fractures* with oxidized walls and without mineral fillings in intervals mapped with *Alteration-oxidation*.
- No *unbroken fractures* are mapped in intervals mapped as *sealed fracture network*.
- No *broken fractures* are mapped in intervals with *crush*.
- Composite dykes generally include a very large amount of fine- to medium-grained granite (511058) veins. Usually all of these veins are not mapped and the frequency presented for veins + dykes in column 6 (Appendix 1) is lower than the true frequency in composite dyke intervals.

4.4.1 Columns in the Geological Summary table

The Geological Summary table includes the following 23 columns:

Column 1: *Rock Type / Lithology*, interval column. Only lithologies longer than 1 m are presented here. Shorter lithologies are presented in column 6. This column is identical with the ordinary WellCad presentation.

Column 2: *Rock Type / Grain size*, interval column. Interval limits follows column 1. This column is identical with the ordinary WellCad presentation.

Column 3: *Rock Type / Texture*, interval column. Interval limits follows column 1. This column is identical with the ordinary WellCad presentation.

Column 4: *Alteration / Oxidation*, interval column. No frequency column is presented for alteration/oxidation. The alteration/oxidation column is identical with the ordinary WellCad presentation.

Column 5: *Alteration / Intensity*, interval column. This column is identical with the ordinary WellCad presentation.

Column 6: *Rock Occurrence / Veins + Dykes < 1 m wide*, frequency column. This rock type column can be seen as the frequency complement to the rock type/lithology interval column. Only rock type sections that are thinner than 1 m can be described as rock occurrences in Boremap. Thicker rock type sections are mapped as rock type.

Column 7: *Structure / Shear Zone < 1 m wide*, frequency column. This column includes ductile shear structures as well as brittle-ductile shear structures and these are mapped as rock occurrences in Boremap. Ductile sections in mm-cm scale are mapped as shear structures and in dm–m scale as sections with foliation.

Column 8: *Structure / Brecciated < 1 m wide*, frequency column. Breccias < 1 m wide are mapped as rock occurrence in Boremap. Very thin micro breccias along sealed/natural fracture planes are generally not considered.

Column 9: *Structure / Brecciated ≥ 1 m wide*, interval column. Breccias > 1 m wide are mapped as rock type/structure in Boremap.

Column 10: *Structure / Mylonite < 1 m wide*, frequency column. Mylonites < 1 m wide are mapped as rock occurrence/structure in Boremap.

Column 11: *Structure / Mylonite ≥ 1 m wide* is an interval column. Mylonites > 1 m wide are mapped as rock type/structure in Boremap.

Column 12: *Structure / Foliation < 1 m wide* is a frequency column. Sections with foliation < 1 m wide are mapped as rock occurrence/structure in Boremap. Very thin sections with foliation are called ductile shear structures and presented in column 7.

Column 13: *Structure / Foliation ≥ 1 m wide* is an interval column. Sections with foliation > 1 m wide are mapped as rock type/structure in Boremap.

Column 14: *Sealed fractures / All*, frequency column. This column includes all fractures mapped as unbroken in the Boremap system and this includes unbroken fractures where the drill core is not broken as well as unbroken fractures interpreted to have broken up artificially during/after drilling.

Column 15: *Sealed fractures / Broken fractures with aperture = 0*, frequency column. This column includes unbroken fractures interpreted to have broken up artificially during/after drilling.

Column 16: *Sealed fractures / Sealed Fracture Network < 1 m wide,* frequency column. The sealed fracture network parameter is the only parameter that is generally evaluated directly from observations of the drill core. These types of sealed fractures can only in rare cases be observed in the BIPS-image.

Column 17: *Sealed fractures / Sealed Fracture Network ≥ 1 m wide*, interval column.

Column 18: *Open fractures / All Apertures > 0*, frequency column. This column includes all broken fractures, both fractures that with certainty were open before drilling and fractures that probably or possibly were open before drilling.

Column 19: *Open fractures / Uncertain, Aperture = 0.5 probable + 0.5 possible*, frequency column. This column includes fractures that probably or possibly open before drilling.

Column 20: Open fractures / Certain Aperture = 0.5 certain and > 0.5, frequency column. This column includes fractures that with certainty were open before drilling.

Column 21: *Open fractures / Joint alteration > 1.5*, frequency column. This column show fractures with stronger joint alteration than normal. This parameter is generally correlated with the location of lithologies with a more weathered appearance.

Column 22: *Open fractures / Crush < 1 m wide*, frequency column. This column includes shorter sections with crush.

Column 23: *Open fractures / Crush ≥ 1 m wide*, interval column. This column includes longer sections with crush.

5 Results

The results of the Boremap mapping of KLX04 are principally found in the appendices. The information in SICADA has been compressed to the size of an A4-sheet in the Geological Summary table, Appendix 1. The search paths for this table are presented in Appendix 2. Stereographic diagrams of the orientation of open fractures are presented in Appendix 3. The BIPS-images of KLX04 are shown in Appendix 4 and the corresponding WellCad diagrams in Appendix 5. In data, like borehole length, diameter, borehole orientation and length calibration marks, are presented in Appendices 6, 7 and 8.

5.1 Geological Summary table, KLX04

All length information in this chapter is taken from the Geological Summary table and therefore includes an error of 5–10 m.

The Geological Summary table for KLX04 is presented in Appendix 1.

KLX04 is dominated, about 2/3, by Ävrö granite. Quartz monzodiorite to monzodiorite (from here called monzodiorite) and granite, fine- to medium grained, covers about ten per cent each. More mafic varieties, including diorite/dioritoid to gabbro makes up about five per cent of the core.

From the occurrence of different rock types and alteration intensity the core have been divided into four sections. Section I between 100–440 m, section II between 440–495 m, section III between 495–875 m and section IV between 875–991 m.

In section I Ävrö granite is the dominating rock type and the oxidation intensity is mostly faint and weak. Dioritoid is present in a section between 250–275 m and in the lower part of the section. The monzodiorite begin to occur in the lower part of section I and can be seen more or less down to 750 m depth in section IV, with a break between 550–670 m. Vein frequency varies between 1 and 4 per four metres, and with a peak of 9 veins per four metre, around the fine grained dioritoid on 275 m. A sealed network coincides with this rock type and enhanced frequency of veins.

Section II has almost no open fractures and a low frequency of unbroken fractures. This section is characterized by lots of veins in the monzodiorite and Ävrö granite. The oxidation is absent and small portions have visible foliation and even thin mylonites can be seen.

Section III has generally a low intensity of oxidation. Characteristically for this section is the high frequency of veins, especially between 520–550 m and 645–725 m. Also in this section it seems to be a relation between presence of mafic rocks and enhanced frequency of veins. Section III begins with a high frequency of veins that already starts in section II. Vein frequency is very high in the section 520–560 m and 650–735 m, with short portions with lower frequency in the later section, but with shear zones and sealed network instead.

Section IV is dominated by fine to medium grained granite and to a smaller part by Ävrö granite. This section is characterised by a much altered core, where it looks like the core were weathered, and with a lot of open fractures. The whole section is oxidised, except small a portion around 900 m depth. The fracture frequency is very high, up to 55 fractures per four metres and sealed network is stretching over a range of 50 m on 925–975 m depth.

The sealed network coincides with an increased frequency of open fractures. A section of five metres is micro-brecciated around 935 m depth. On depths of 942–948 m the core has got a strange appearance, and the term we have use is "Quartz dissolution" with the comment "This is not really quartz dissolution. The rock is saussuritized, looks weathered and with dissolution of particular minerals. The rock often looks brecciated and sheared." 15 thin (< 1 m wide) crush zones have been mapped in this section down to 970 m depth.

There is a strong uncertainty whether broken fractures were open before or during/after drilling. This is shown by columns 19 (Open fractures interpreted, uncertain) and 20 (Open fractures interpreted, certain) in the Geological Summary table for KLX04 (Appendix 1). The reason for this is that the core has a tendency to break up along existing sealed fractures. It is probable that this problem is related to the geology in the Simpevarp peninsula and not a general problem for the Boremap mapping system.

5.2 Orientation of broken fractures

Broken fractures are presented in stereograms for each 100 m interval in KLX04 (see Appendix 3). The stereographic information is from plane to pole plot data. Fracture orientation values are strike/dip values using the right hand rule.

The orientation for borehole KLX04 at ground level is 002/-85.

Broken fractures not visible in the BIPS-image were oriented according to the *guide-line method* (see chapter 4.3.3), thus not drawn as lines at right angle to the drill core in BIPS.

There is a general strong overrepresentation of broken fractures cutting the borehole at high angles compared to fractures cutting the borehole at low angles. This results in artificially high anomaly values for fractures cutting the borehole at high angles and in semi circular distortion of anomaly shapes in the stereographic plots. These effects are stronger the longer the plotted depth interval. It is therefore not recommended to plot intervals longer than 100 m in the same stereogram.

The dominating fracture set in KLX04 is sub horizontal fractures (05–20° dip) dominantly with WNW orientations in the interval 100–300 m, ESE orientations in the interval 200–800 m and SE orientations in the interval 800–1,000 m.

Other fracture sets only show minor maxima in the stereonet plots. One such fracture set is NW fractures (60° dip) that occur in the intervals 100–200 m and 300–700 m.

A third fracture set show ENE orientations (70–85° dip) in the intervals 200–300 m, 500–600 m and 700–900 m.

Other minor stereonet plot maxima are;

- SW-WSW oriented fractures (30–45° dip) in the interval 100–500 m.
- ESE oriented fractures (45° dip) in the interval 400–600 m and 700–800 m.
- NW oriented fractures (20–30° dip) in the interval 500–700 m.
- WNW oriented fractures (75–80° dip) in the interval 500–600 m and 700–800 m.
- SE oriented fractures (85° dip) in the interval 500–700 m.

6 Discussion

The information presented in the Geological Summary table has so far been extracted directly from SICADA and from Excel files of Mapping Data and Comment. No information presented in the Geological Summary table for KLX04 is now taken from other Comment Excel files.

The structural term *veined* is in KLX04 used for rocks interpreted as hybrids between two different magma types. The rock type gets its name from the principal magma type.

The concept *sealed network* has been extended to include also all unbroken fractures that are extremely thin no matter whether they can be seen only in the drill core, the BIPS-image or both. Richly occurring extremely thin unbroken fractures with oxidized walls is a good example of this. These fractures can almost always be identified both in the drill core and the BIPS-image but this can be a very time consuming task if such fractures are plentiful.

Breaks might be interpreted as broken fractures when the drill core is broken at approximately right angle to the drill core. This might result in an artificial maximum of broken fractures at approximately right angle to the borehole, in the stereogram.

Broken fractures crush zones, high joint alteration numbers and unbroken fractures show strong frequency maxima in the interval 870–993 m. The interval 942–948 m shows an unknown alteration type which gives the rock a weathered appearance and show dissolution of mineral grains. The interval 941–953 m is so rich in unbroken fractures that micro breccia might be an appropriate descriptive term.

Appendix 1

Geological Summary table, KLX04

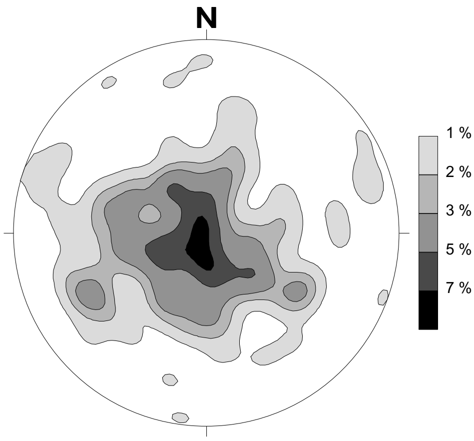
Appendix 2

Search paths for the Geological Summary table

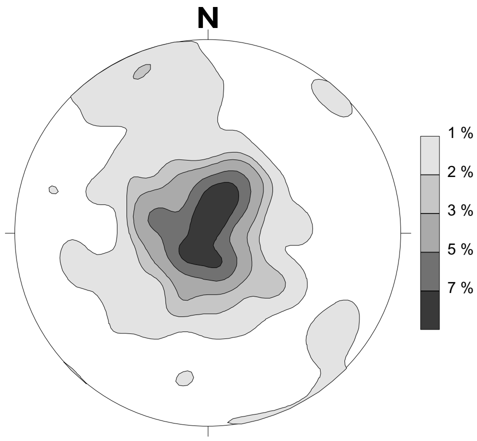
TABLE HEAD LINES		INFORMATION SOURCE			PRESENTATION
Head lines	Sub head lines	Varcode	First suborder	Second suborder	Interval / frequence
Rock type	Lithology	5	Sub 1		Interval
	Grain size	5	Sub 5		Interval
	Texture	5	Sub 6		Interval
Alteration	Oxidation	7	Sub 1 = 700		Interval
	Oxidation intensity	7	Sub 1 = 700	Sub 2	Interval
Rock occurrence	Vein + dyke	31	Sub 1 = 2 or 18		Frequence
Structure	Shear zone	31	Sub 4 = 41 or 42		Frequence
	Brecciated, < 1m wide	31	Sub 4 = 7		Frequence
	Brecciated, >/= 1m wide	5 5	Sub 3 = 7 Sub 3 = 7	Sub 4; 101 or 102 = 102 Sub 4; 103 or 104 = 104	Interval
	Mylonite, < 1 m wide	31	Sub 4 = 34		Frequence
	Mylonite, >/= 1 m wide	5 5	Sub 3 = 34 Sub 3 = 34	Sub 4; 101 or 102 = 102 Sub 4; 103 or 104 = 104	Interval
	Foliation zone, < 1 m wide	31	Sub 4 = 81		Frequence
	Foliation zone, >/= 1 m wide	5 5	Sub 3 = 81 Sub 3 = 81	Sub 4; 101 or 102 = 102 Sub 4; 103 or 104 = 104	Interval
Sealed fracture	All unbroken fractures and broken fractures	3 2	 SNUM 11= 0		Frequence
	Broken fractures, Aperture = 0	2	SNum 11 = 0		Frequence
	Sealed fracture network < 1 m wide	32			Frequence
	Sealed fracture network>/= 1 m wide	32			Interval
Open fractures	All, Aperture > 0	2 and 3	SNum 11>0		Frequence
	Uncertain, Aperture = 0.5 possible and 0.5 probable	2 and 3 2 and 3	SNum 11>0 SNum 11>0	Sub 12 = 3 Sub 12 = 2	Frequence
	Certain, Aperture = 0.5 certain	2 and 3	SNum 11>0	Sub 12 = 1	Frequence
	Joint alteration > 1.5	2	SNum16 > 1.5		Frequence
	Crush < 1 m wide	4			Frequence
	Crush >/= 1 m wide	4			Interval

Stereographic projections of open fractures, KLX04

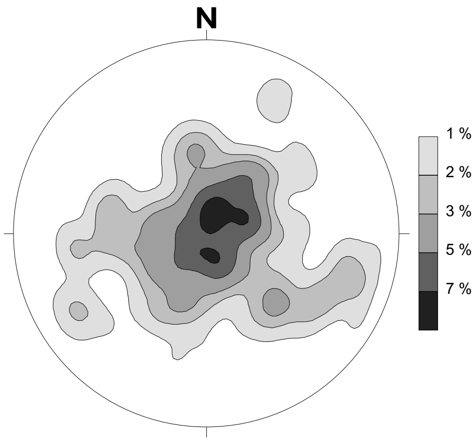
Stereonet plots showing contoured poles to plane of broken fractures with aperture in borehole KLX04, Schmidt's Net, lower hemisphere.



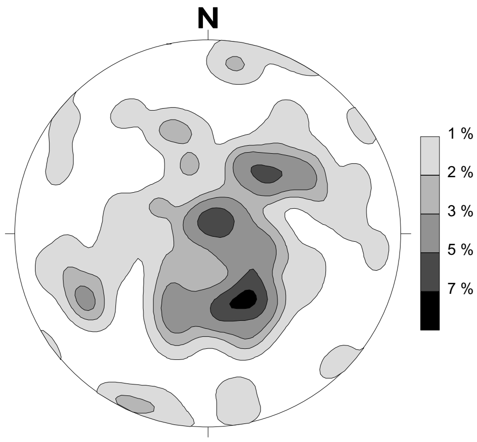
100-200 m (172 fractures)



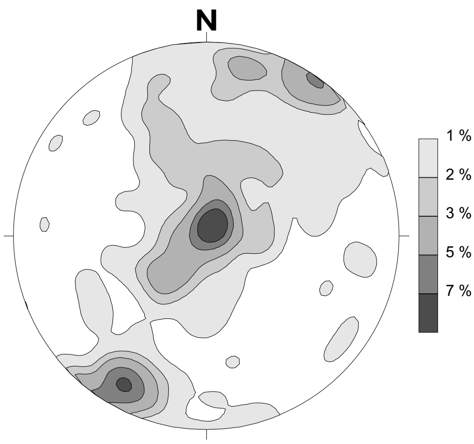
200-300 m (260 fractures)



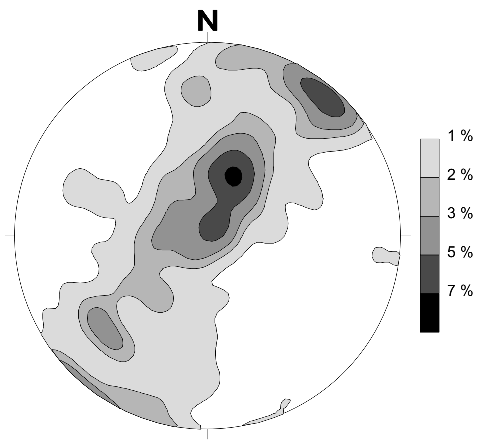
300-400 m (209 fractures)



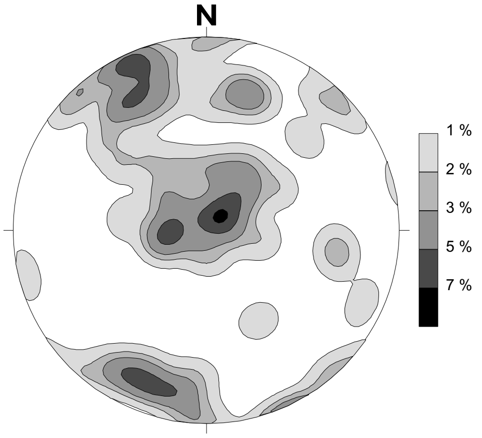
400-500 m (107 fractures)



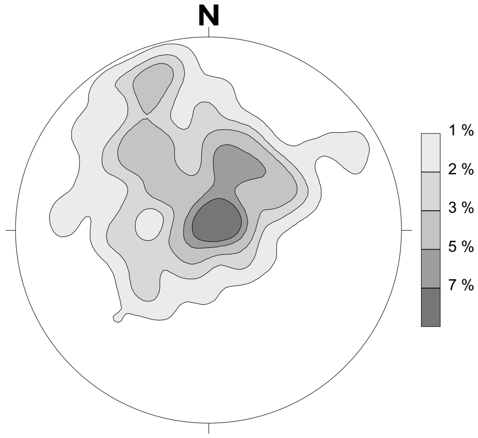
500-600 m (174 fractures)



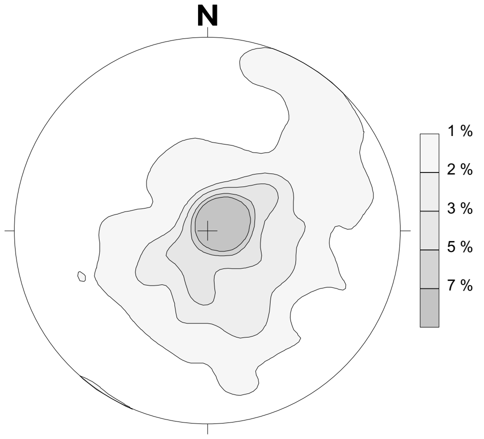
600-700 m (201 fractures)



700-800 m (76 fractures)



800-900 m (192 fractures)



900-1000 m (617 fractures)

Appendix 4

BIPS-images of KLX04

Borehole Image Report

Borehole Name:	KLX04
Mapping Name:	KLX04_041208
Mapping Range:	100.000 - 986.016 m
Diameter:	76.0 mm
Printed Range:	100.000 - 986.016
Pages:	37

Image File Information:

File:	C:\PROGRAM\Boremap\KLX04\klx04a 100_986.bip
Date/Time:	2004-07-12 16:53:00
Start Depth:	100.000 m
End Depth:	986.016 m
Resolution:	1.00 mm/pixel (depth)
Orientation:	Gravmetric
Image height:	886016 pixels
Image width:	360 pixels
BIP Version:	BIP-III
Locality:	LAXEMAR
Borehole:	KLX04A
Scan Direction:	Down
Color adjust:	0 0 0 (RGB)

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 1 (37)

Borehole: KLX04
Mapping: KLX04_041208

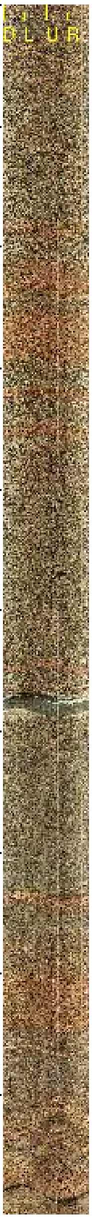
Depth range: 100.000 - 125.000 m
Azimuth: 5.5
Inclination: -84.0

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 2 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 125.000 - 150.000 m
Azimuth: 5.5
Inclination: -84.1

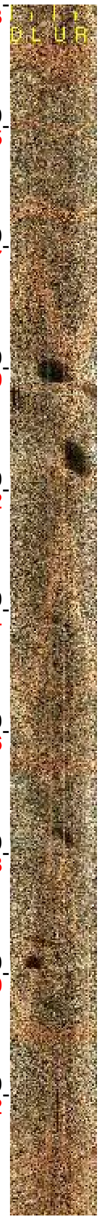
125.000
126.279
125.500
126.781
126.000
127.283
126.500
127.786
127.000
128.288
127.500
128.790
128.000
129.292
128.500
129.794
129.000
130.296
129.500
130.798



130.000
131.301
130.500
131.803
131.000
132.305
131.500
132.807
132.000
133.309
132.500
133.811
133.000
134.313
133.500
134.815
134.000
135.318
134.500
135.820

135.000
136.322
135.500
136.824
136.000
137.326
136.500
137.828
137.000
138.330
137.500
138.833
138.000
139.335
138.500
139.837
139.000
140.339
139.500
140.841

140.000
141.343
140.500
141.845
141.000
142.347
141.500
142.850
142.000
143.352
142.500
143.854
143.000
144.356
143.500
144.858
144.000
145.360
144.500
145.862



145.000
146.365
145.500
146.867
146.000
147.369
146.500
147.871
147.000
148.373
147.500
148.875
148.000
149.377
148.500
149.879
149.000
150.382
149.500
150.884

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 3 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 150.000 - 175.000 m
Azimuth: 7.4
Inclination: -84.0

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 4 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 175.000 - 200.000 m
Azimuth: 5.5
Inclination: -84.0

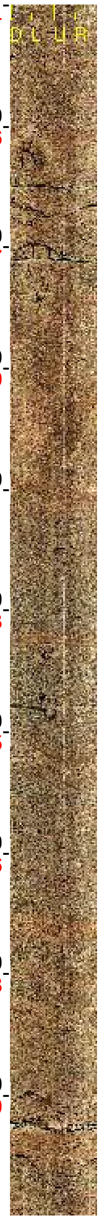
Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 5 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 200.000 - 225.000 m
Azimuth: 9.5
Inclination: -84.2

200.000 / 201.606
200.500 / 202.108
201.000 / 202.609
201.500 / 203.111
202.000 / 203.613
202.500 / 204.115
203.000 / 204.617
203.500 / 205.118
204.000 / 205.620
204.500 / 206.122

205.000 / 206.624
205.500 / 207.126
206.000 / 207.627
206.500 / 208.129
207.000 / 208.631
207.500 / 209.133
208.000 / 209.635
208.500 / 210.136
209.000 / 210.638
209.500 / 211.140



210.000 / 211.642
210.500 / 212.144
211.000 / 212.646
211.500 / 213.147
212.000 / 213.649
212.500 / 214.151
213.000 / 214.653
213.500 / 215.155
214.000 / 215.656
214.500 / 216.158

215.000 / 216.660
215.500 / 217.162
216.000 / 217.664
216.500 / 218.165
217.000 / 218.667
217.500 / 219.169
218.000 / 219.671
218.500 / 220.173
219.000 / 220.674
219.500 / 221.176

220.000 / 221.678
220.500 / 222.180
221.000 / 222.682
221.500 / 223.183
222.000 / 223.685
222.500 / 224.187
223.000 / 224.689
223.500 / 225.191
224.000 / 225.692
224.500 / 226.194

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 6 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 225.000 - 250.000 m
Azimuth: 9.5
Inclination: -84.2

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 7 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 250.000 - 275.000 m
Azimuth: 11.7
Inclination: -84.3

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 8 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 275.000 - 300.000 m
Azimuth: 15.4
Inclination: -84.3

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 9 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 300.000 - 325.000 m
Azimuth: 16.5
Inclination: -84.6

300.000
301.949
300.500
302.451
301.000
302.953
301.500
303.456
302.000
303.958
302.500
304.460
303.000
304.962
303.500
305.465
304.000
305.967
304.500
306.469

305.000
306.971
305.500
307.474
306.000
307.976
306.500
308.478
307.000
308.980
307.500
309.483
308.000
309.985
308.500
310.487
309.000
310.989
309.500
311.492

310.000
311.994
310.500
312.496
311.000
312.998
311.500
313.501
312.000
314.003
312.500
314.505
313.000
315.007
313.500
315.510
314.000
316.012
314.500
316.514

315.000
317.016
315.500
317.519
316.000
318.021
316.500
318.523
317.000
319.025
317.500
319.528
318.000
320.030
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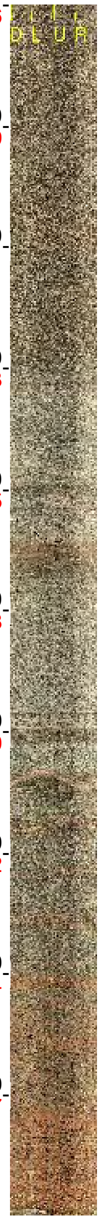
320.532
319.000
321.034
319.500
321.537



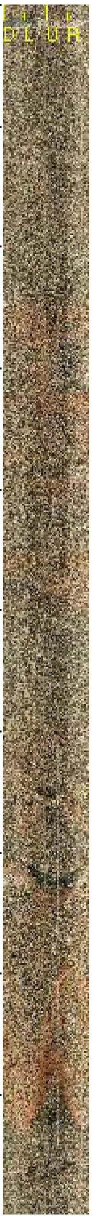
320.000
322.039
320.500
322.541
321.000
323.043
321.500
323.546
322.000
324.048
322.500
324.550
323.000
325.052
323.500
325.555
324.000
326.057
324.500
326.559

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 10 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 325.000 - 350.000 m
Azimuth: 16.5
Inclination: -84.6

325.000
327.061
325.500
327.564
326.000
328.066
326.500
328.568
327.000
329.071
327.500
329.573
328.000
330.075
328.500
330.577
329.000
331.080
329.500
331.582

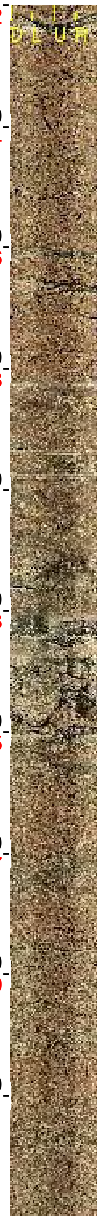


330.000
332.084
330.500
332.586
331.000
333.089
331.500
333.591
332.000
334.093
332.500
334.595
333.000
335.098
333.500
335.600
334.000
336.102
334.500
336.604

335.000
337.107
335.500
337.609
336.000
338.111
336.500
338.613
337.000
339.116
337.500
339.618
338.000
340.120
338.500
340.622
339.000
341.125
339.500
341.627

340.000
342.129
340.500
342.631
341.000
343.134
341.500
343.636
342.000
344.138
342.500
344.640
343.000
345.143
343.500
345.645
344.000
346.147
344.500
346.649

345.000
347.152
345.500
347.654
346.000
348.156
346.500
348.658
347.000
349.161
347.500
349.663
348.000
350.165
348.500
350.667
349.000
351.169
349.500
351.671



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 11 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 350.000 - 375.000 m
Azimuth: 18.4
Inclination: -84.5

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 12 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 375.000 - 400.000 m
Azimuth: 22.9
Inclination: -84.6

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 13 (37)

Borehole: KLX04
Mapping: KLX04_041208

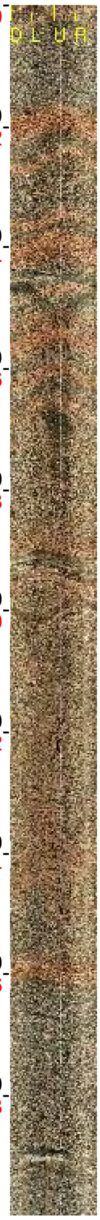
Depth range: 400.000 - 425.000 m
Azimuth: 25.6
Inclination: -84.7

400.000
402.380
400.500
402.882
401.000
403.384
401.500
403.886
402.000
404.388
402.500
404.890
403.000
405.392
403.500
405.894
404.000
406.396
404.500
406.898

405.000
407.400
405.500
407.902
406.000
408.404
406.500
408.906
407.000
409.408
407.500
409.910
408.000
410.412
408.500
410.914
409.000
411.416
409.500
411.918

410.000
412.420
410.500
412.922
411.000
413.424
411.500
413.926
412.000
414.428
412.500
414.930
413.000
415.432
413.500
415.934
414.000
416.436
414.500
416.938

415.000
417.440
415.500
417.942
416.000
418.444
416.500
418.946
417.000
419.448
417.500
419.950
418.000
420.452
418.500
420.954
419.000
421.456
419.500
421.958



420.000
422.460
420.500
422.962
421.000
423.464
421.500
423.966
422.000
424.468
422.500
424.970
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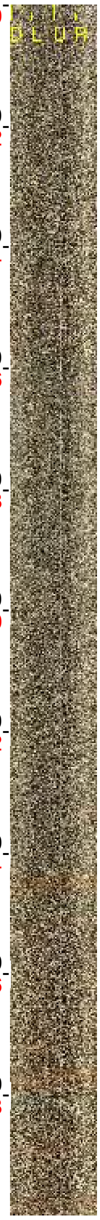
425.472
423.500
425.974
424.000
426.476
424.500
426.978



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 14 (37)

Borehole: KLX04

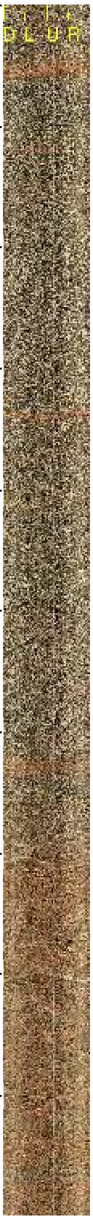
Mapping: KLX04_041208

Depth range: 425.000 - 450.000 m

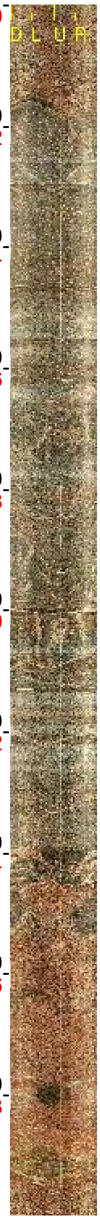
Azimuth: 25.6

Inclination: -84.7

425.000	427.480
425.500	427.982
426.000	428.484
426.500	428.986
427.000	429.488
427.500	429.990
428.000	430.492
428.500	430.994
429.000	431.496
429.500	431.998

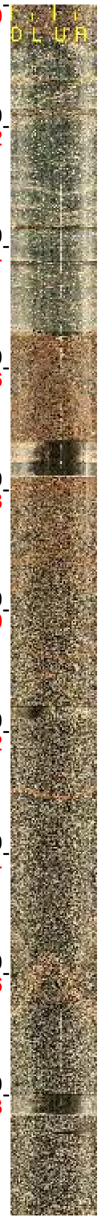


430.000	432.500
430.500	433.002
431.000	433.504
431.500	434.006
432.000	434.508
432.500	435.010
433.000	435.512
433.500	436.014
434.000	436.516
434.500	437.018

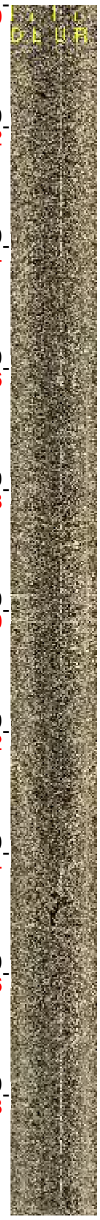


435.000	437.520
435.500	438.022
436.000	438.524
436.500	439.026
437.000	439.528
437.500	440.030
438.000	440.532
438.500	441.034
439.000	441.536
439.500	442.038

440.000	442.540
440.500	443.042
441.000	443.544
441.500	444.046
442.000	444.548
442.500	445.050
443.000	445.552
443.500	446.054
444.000	446.556
444.500	447.058



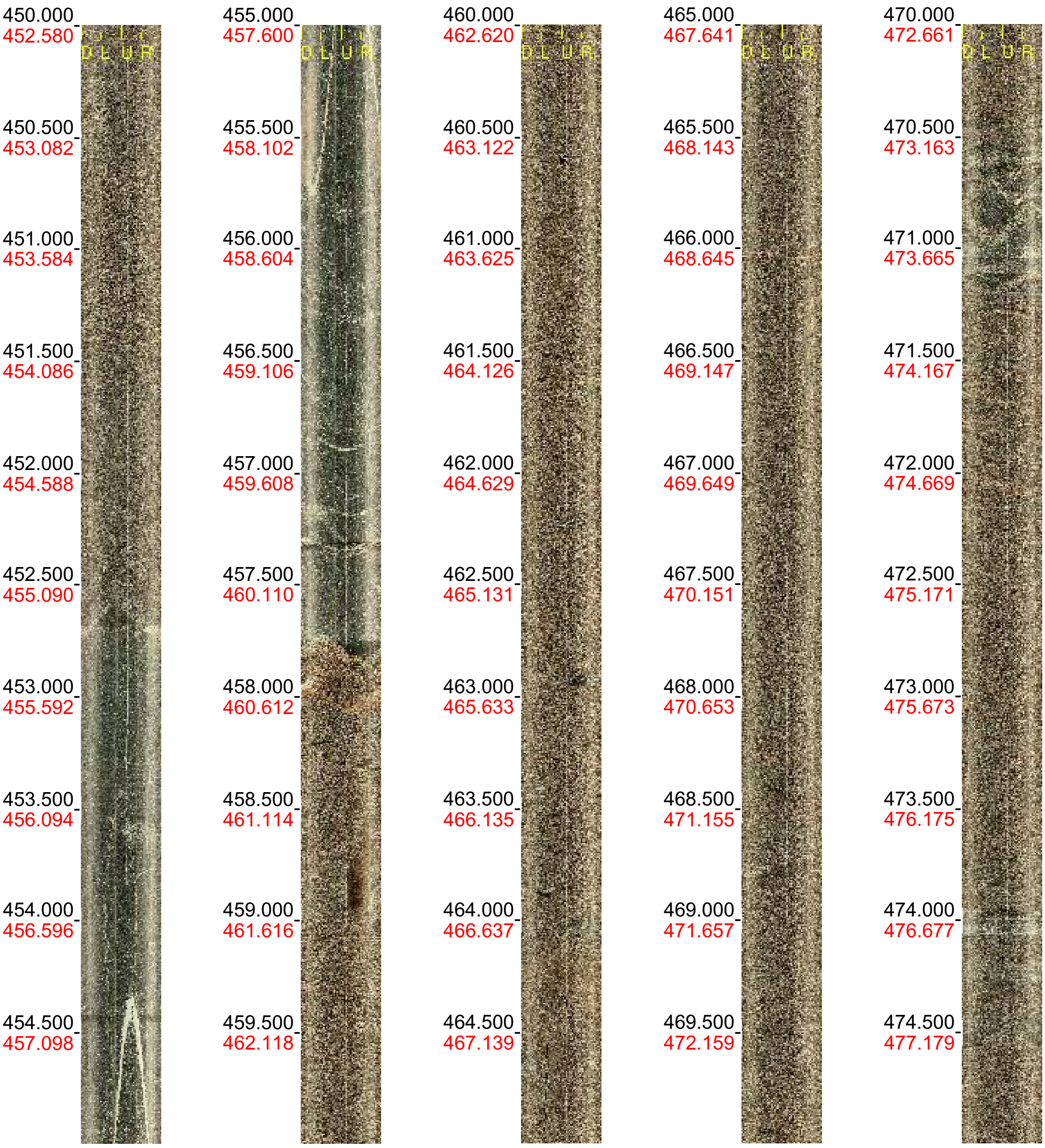
445.000	447.560
445.500	448.062
446.000	448.564
446.500	449.066
447.000	449.568
447.500	450.070
448.000	450.572
448.500	451.074
449.000	451.576
449.500	452.078



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 15 (37)

Borehole: KLX04
Mapping: KLX04_041208

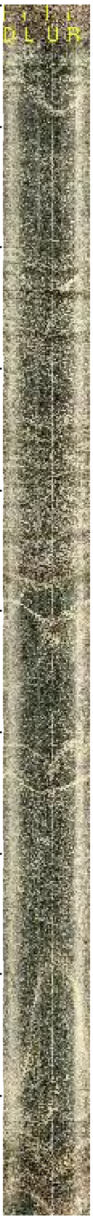
Depth range: 450.000 - 475.000 m
Azimuth: 28.4
Inclination: -84.8



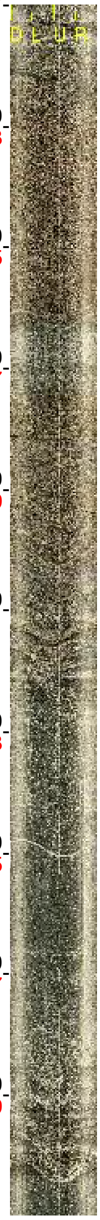
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 475.000 - 500.000 m
Azimuth: 29.2
Inclination: -84.5

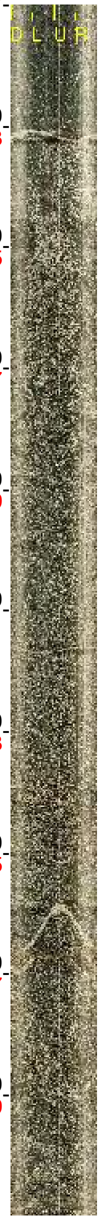
475.000 / 477.681
475.500 / 478.183
476.000 / 478.685
476.500 / 479.187
477.000 / 479.689
477.500 / 480.191
478.000 / 480.693
478.500 / 481.195
479.000 / 481.697
479.500 / 482.199



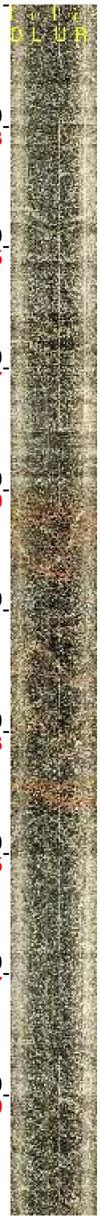
480.000 / 482.701
480.500 / 483.203
481.000 / 483.705
481.500 / 484.207
482.000 / 484.709
482.500 / 485.211
483.000 / 485.713
483.500 / 486.215
484.000 / 486.717
484.500 / 487.219



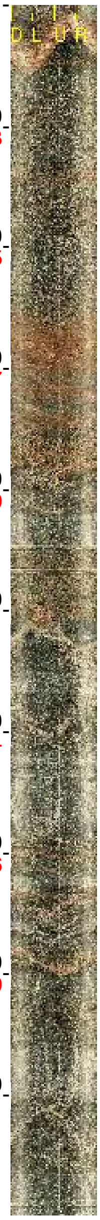
485.000 / 487.721
485.500 / 488.223
486.000 / 488.725
486.500 / 489.227
487.000 / 489.729
487.500 / 490.231
488.000 / 490.733
488.500 / 491.235
489.000 / 491.737
489.500 / 492.239



490.000 / 492.741
490.500 / 493.243
491.000 / 493.745
491.500 / 494.247
492.000 / 494.749
492.500 / 495.251
493.000 / 495.753
493.500 / 496.255
494.000 / 496.757
494.500 / 497.259



495.000 / 497.761
495.500 / 498.263
496.000 / 498.765
496.500 / 499.267
497.000 / 499.769
497.500 / 500.271
498.000 / 500.774
498.500 / 501.276
499.000 / 501.779
499.500 / 502.281



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 17 (37)

Borehole: KLX04
Mapping: KLX04_041208

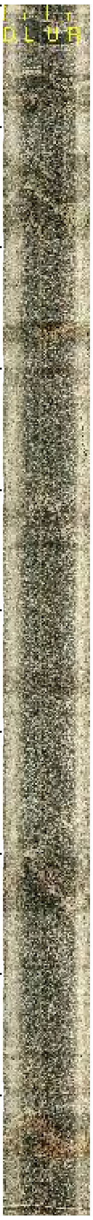
Depth range: 500.000 - 525.000 m
Azimuth: 32.0
Inclination: -84.6

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 18 (37)

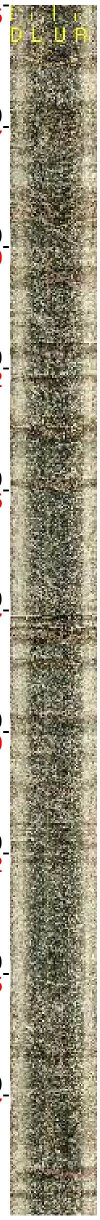
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 525.000 - 550.000 m
Azimuth: 34.8
Inclination: -84.6

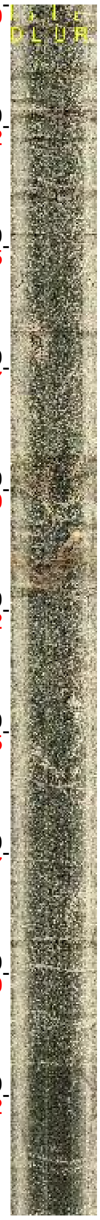
525.000 527.910
525.500 528.412
526.000 528.915
526.500 529.417
527.000 529.920
527.500 530.422
528.000 530.925
528.500 531.427
529.000 531.930
529.500 532.432



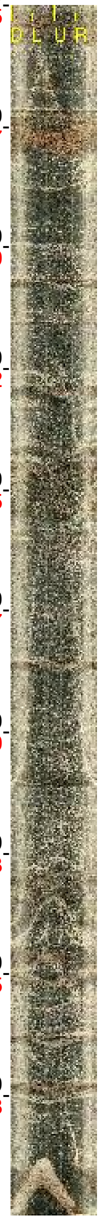
530.000 532.935
530.500 533.437
531.000 533.940
531.500 534.442
532.000 534.945
532.500 535.447
533.000 535.950
533.500 536.452
534.000 536.955
534.500 537.457



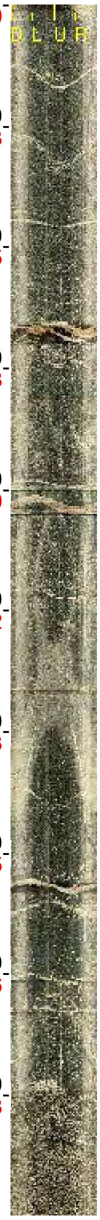
535.000 537.960
535.500 538.462
536.000 538.965
536.500 539.467
537.000 539.970
537.500 540.472
538.000 540.975
538.500 541.477
539.000 541.980
539.500 542.482



540.000 542.985
540.500 543.487
541.000 543.990
541.500 544.492
542.000 544.995
542.500 545.497
543.000 546.000
543.500 546.503
544.000 547.005
544.500 547.508



545.000 548.010
545.500 548.513
546.000 549.015
546.500 549.518
547.000 550.020
547.500 550.522
548.000 551.023
548.500 551.525
549.000 552.026
549.500 552.528

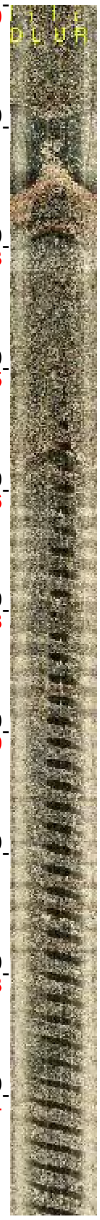


Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 19 (37)

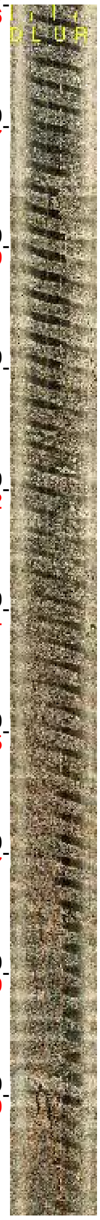
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 550.000 - 575.000 m
Azimuth: 34.8
Inclination: -84.6

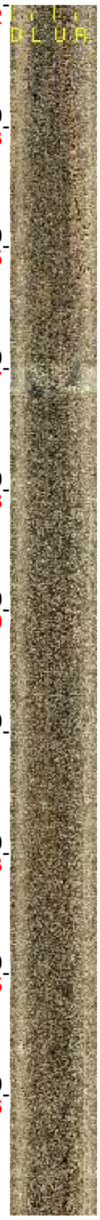
550.000
553.030
550.500
553.531
551.000
554.033
551.500
554.535
552.000
555.036
552.500
555.538
553.000
556.039
553.500
556.541
554.000
557.043
554.500
557.544



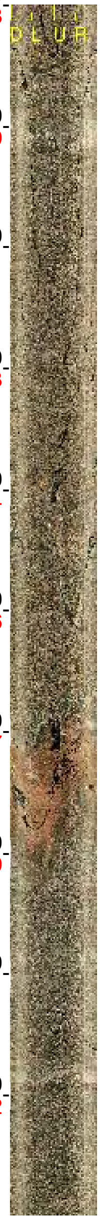
555.000
558.046
555.500
558.547
556.000
559.049
556.500
559.551
557.000
560.052
557.500
560.554
558.000
561.055
558.500
561.557
559.000
562.059
559.500
562.560



560.000
563.062
560.500
563.563
561.000
564.065
561.500
564.567
562.000
565.068
562.500
565.570
563.000
566.071
563.500
566.573
564.000
567.075
564.500
567.576



565.000
568.078
565.500
568.579
566.000
569.081
566.500
569.583
567.000
570.084
567.500
570.586
568.000
571.087
568.500
571.589
569.000
572.091
569.500
572.592



570.000
573.094
570.500
573.596
571.000
574.097
571.500
574.599
572.000
575.100
572.500
575.602
573.000
576.104
573.500
576.605
574.000
577.107
574.500
577.608

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 20 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 575.000 - 600.000 m
Azimuth: 37.7
Inclination: -84.7

575.000	578.110
575.500	578.612
576.000	579.113
576.500	579.615
577.000	580.116
577.500	580.618
578.000	581.120
578.500	581.621
579.000	582.123
579.500	582.624

580.000	583.126
580.500	583.628
581.000	584.129
581.500	584.631
582.000	585.132
582.500	585.634
583.000	586.136
583.500	586.637
584.000	587.139
584.500	587.640

585.000	588.142
585.500	588.644
586.000	589.145
586.500	589.647
587.000	590.148
587.500	590.650
588.000	591.152
588.500	591.653
589.000	592.155
589.500	592.656

590.000	593.158
590.500	593.660
591.000	594.161
591.500	594.663
592.000	595.165
592.500	595.666
593.000	596.168
593.500	596.669
594.000	597.171
594.500	597.673

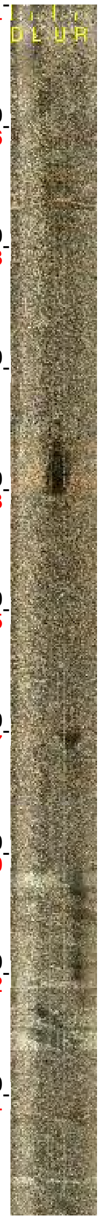
595.000	598.174
595.500	598.676
596.000	599.177
596.500	599.679
597.000	600.181
597.500	600.683
598.000	601.185
598.500	601.687
599.000	602.190
599.500	602.692

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 21 (37)

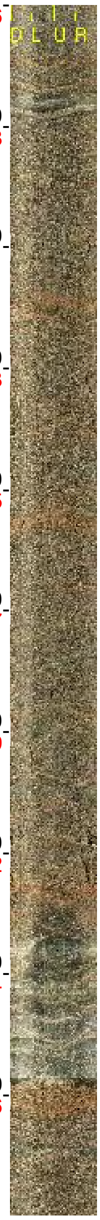
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 600.000 - 625.000 m
Azimuth: 37.7
Inclination: -84.7

600.000 / 603.194
600.500 / 603.696
601.000 / 604.198
601.500 / 604.701
602.000 / 605.203
602.500 / 605.705
603.000 / 606.207
603.500 / 606.710
604.000 / 607.212
604.500 / 607.714

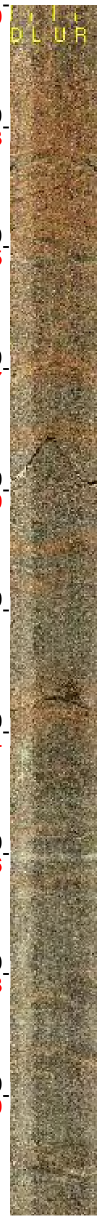


605.000 / 608.216
605.500 / 608.718
606.000 / 609.221
606.500 / 609.723
607.000 / 610.225
607.500 / 610.727
608.000 / 611.229
608.500 / 611.732
609.000 / 612.234
609.500 / 612.736

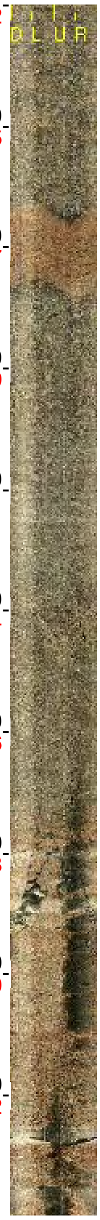


610.000 / 613.238
610.500 / 613.740
611.000 / 614.243
611.500 / 614.745
612.000 / 615.247
612.500 / 615.749
613.000 / 616.252
613.500 / 616.754
614.000 / 617.256
614.500 / 617.758

615.000 / 618.260
615.500 / 618.763
616.000 / 619.265
616.500 / 619.767
617.000 / 620.269
617.500 / 620.771
618.000 / 621.274
618.500 / 621.776
619.000 / 622.278
619.500 / 622.780



620.000 / 623.282
620.500 / 623.785
621.000 / 624.287
621.500 / 624.789
622.000 / 625.291
622.500 / 625.794
623.000 / 626.296
623.500 / 626.798
624.000 / 627.300
624.500 / 627.802

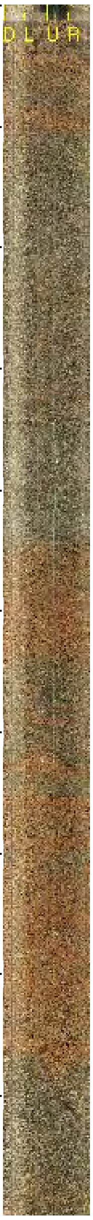


Printed: 2005-03-07 14:23:35   Scale: 1 : 25   Aspect: 150 %   22 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 625.000 - 650.000 m
Azimuth: 36.9
Inclination: -84.3

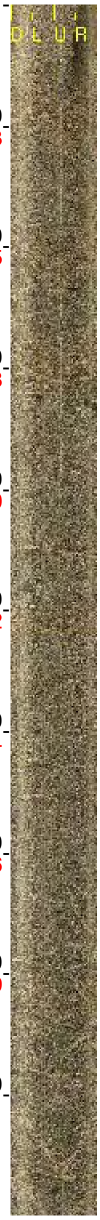
625.000
628.305
625.500
628.807
626.000
629.309
626.500
629.811
627.000
630.313
627.500
630.816
628.000
631.318
628.500
631.820
629.000
632.322
629.500
632.824



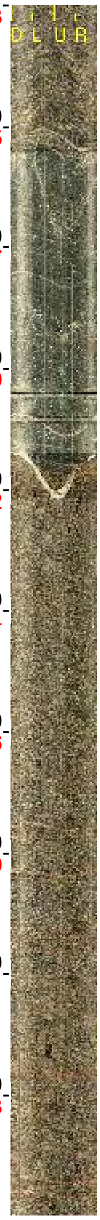
630.000
633.327
630.500
633.829
631.000
634.331
631.500
634.833
632.000
635.336
632.500
635.838
633.000
636.340
633.500
636.842
634.000
637.344
634.500
637.847

635.000
638.349
635.500
638.851
636.000
639.353
636.500
639.855
637.000
640.358
637.500
640.860
638.000
641.362
638.500
641.864
639.000
642.366
639.500
642.869

640.000
643.371
640.500
643.873
641.000
644.375
641.500
644.878
642.000
645.380
642.500
645.882
643.000
646.384
643.500
646.886
644.000
647.389
644.500
647.891



645.000
648.393
645.500
648.895
646.000
649.397
646.500
649.900
647.000
650.402
647.500
650.904
648.000
651.406
648.500
651.909
649.000
652.411
649.500
652.913

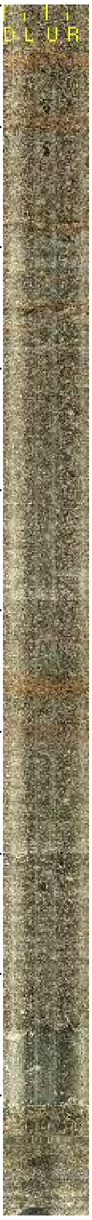


Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 23 (37)

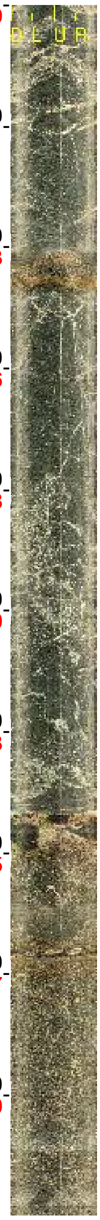
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 650.000 - 675.000 m
Azimuth: 39.6
Inclination: -84.3

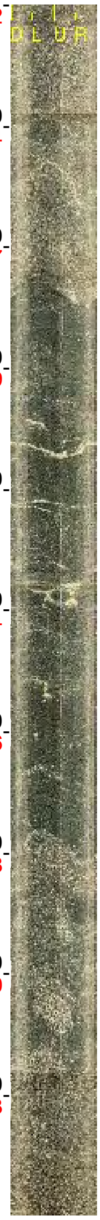
650.000
653.416
650.500
653.918
651.000
654.420
651.500
654.923
652.000
655.425
652.500
655.927
653.000
656.430
653.500
656.932
654.000
657.434
654.500
657.937



655.000
658.439
655.500
658.941
656.000
659.443
656.500
659.946
657.000
660.448
657.500
660.950
658.000
661.453
658.500
661.955
659.000
662.457
659.500
662.960

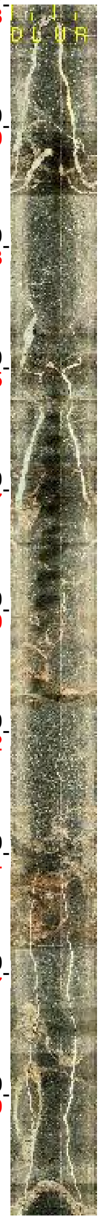


660.000
663.462
660.500
663.964
661.000
664.467
661.500
664.969
662.000
665.471
662.500
665.974
663.000
666.476
663.500
666.978
664.000
667.480
664.500
667.983



665.000
668.485
665.500
668.987
666.000
669.490
666.500
669.992
667.000
670.494
667.500
670.997
668.000
671.499
668.500
672.001
669.000
672.504
669.500
673.006

670.000
673.508
670.500
674.010
671.000
674.513
671.500
675.015
672.000
675.517
672.500
676.020
673.000
676.522
673.500
677.024
674.000
677.527
674.500
678.029



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 24 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 675.000 - 700.000 m
Azimuth: 41.0
Inclination: -84.2

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 25 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 700.000 - 725.000 m
Azimuth: 42.5
Inclination: -83.8

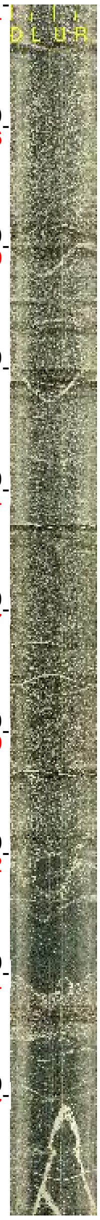
700.000	703.649
700.500	704.152
701.000	704.654
701.500	705.157
702.000	705.659
702.500	706.162
703.000	706.665
703.500	707.167
704.000	707.670
704.500	708.172

705.000	708.675
705.500	709.178
706.000	709.680
706.500	710.183
707.000	710.686
707.500	711.188
708.000	711.691
708.500	712.193
709.000	712.696
709.500	713.199

710.000	713.701
710.500	714.204
711.000	714.706
711.500	715.209
712.000	715.712
712.500	716.214
713.000	716.717
713.500	717.220
714.000	717.722
714.500	718.225

715.000	718.727
715.500	719.230
716.000	719.733
716.500	720.235
717.000	720.738
717.500	721.240
718.000	721.743
718.500	722.246
719.000	722.748
719.500	723.251

720.000	723.754
720.500	724.256
721.000	724.759
721.500	725.261
722.000	725.764
722.500	726.267
723.000	726.769
723.500	727.272
724.000	727.774
724.500	728.277



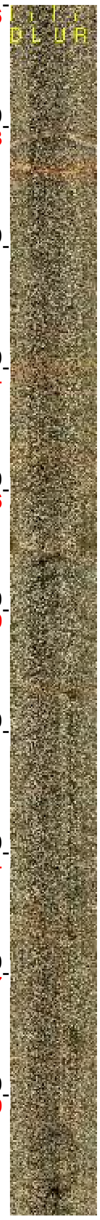
Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 26 (37)

Borehole: KLX04
Mapping: KLX04_041208

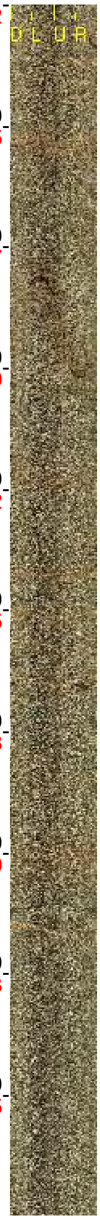
Depth range: 725.000 - 750.000 m
Azimuth: 46.2
Inclination: -83.6

725.000	728.780
725.500	729.282
726.000	729.785
726.500	730.287
727.000	730.790
727.500	731.293
728.000	731.795
728.500	732.298
729.000	732.801
729.500	733.303

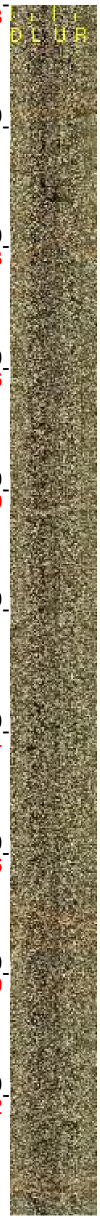
730.000	733.806
730.500	734.308
731.000	734.811
731.500	735.314
732.000	735.816
732.500	736.319
733.000	736.821
733.500	737.324
734.000	737.827
734.500	738.329



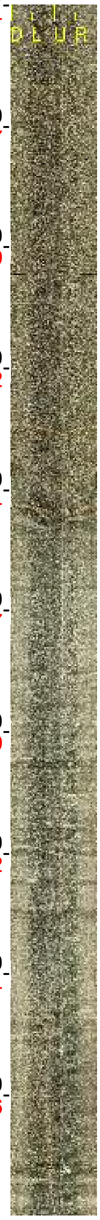
735.000	738.832
735.500	739.335
736.000	739.837
736.500	740.340
737.000	740.842
737.500	741.345
738.000	741.848
738.500	742.350
739.000	742.853
739.500	743.355



740.000	743.858
740.500	744.361
741.000	744.863
741.500	745.366
742.000	745.869
742.500	746.371
743.000	746.874
743.500	747.376
744.000	747.879
744.500	748.382



745.000	748.884
745.500	749.387
746.000	749.889
746.500	750.392
747.000	750.894
747.500	751.397
748.000	751.899
748.500	752.402
749.000	752.904
749.500	753.406

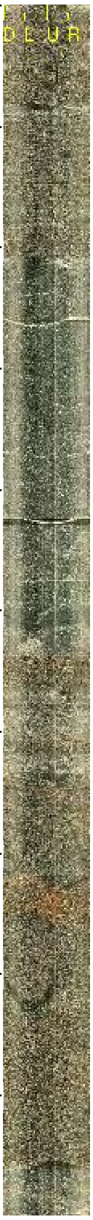


Printed: 2005-03-07 14:23:35　Scale: 1 : 25　Aspect: 150 %　27 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 750.000 - 775.000 m
Azimuth: 47.4
Inclination: -83.5

750.000
753.909



750.500
754.411
751.000
754.914
751.500
755.416
752.000
755.918
752.500
756.421
753.000
756.923
753.500
757.426
754.000
757.928
754.500
758.430

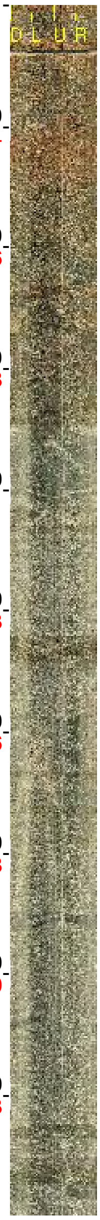
755.000
758.933

755.500
759.435
756.000
759.938
756.500
760.440
757.000
760.943
757.500
761.445
758.000
761.947
758.500
762.450
759.000
762.952
759.500
763.455

760.000
763.957

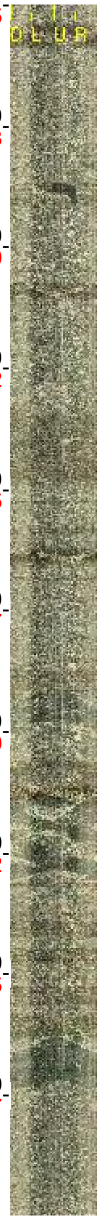
760.500
764.459
761.000
764.962
761.500
765.464
762.000
765.967
762.500
766.469
763.000
766.971
763.500
767.474
764.000
767.976
764.500
768.479

765.000
768.981



765.500
769.484
766.000
769.986
766.500
770.488
767.000
770.991
767.500
771.493
768.000
771.996
768.500
772.498
769.000
773.000
769.500
773.503

770.000
774.005



770.500
774.508
771.000
775.010
771.500
775.512
772.000
776.015
772.500
776.517
773.000
777.020
773.500
777.522
774.000
778.025
774.500
778.527

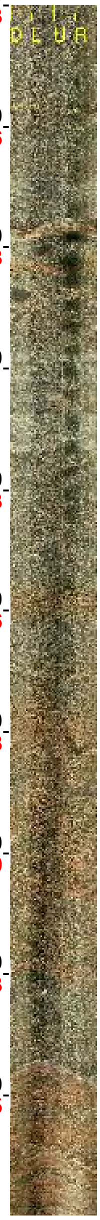
Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 28 (37)

Borehole: KLX04
Mapping: KLX04_041208

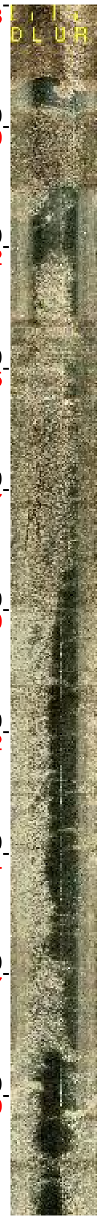
Depth range: 775.000 - 800.000 m
Azimuth: 49.8
Inclination: -83.5

775.000 779.029
775.500 779.532
776.000 780.034
776.500 780.537
777.000 781.039
777.500 781.541
778.000 782.044
778.500 782.546
779.000 783.049
779.500 783.551

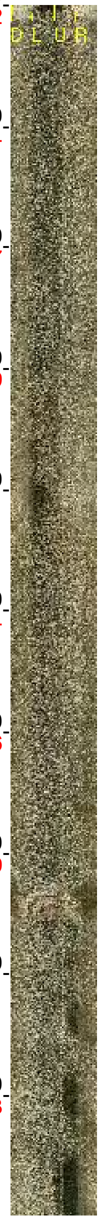
780.000 784.053
780.500 784.556
781.000 785.058
781.500 785.561
782.000 786.063
782.500 786.566
783.000 787.068
783.500 787.570
784.000 788.073
784.500 788.575



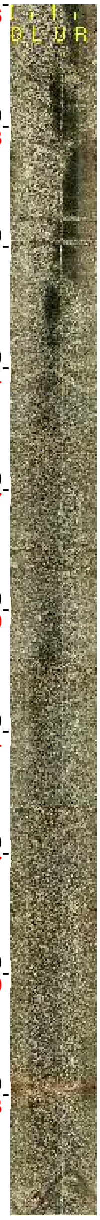
785.000 789.078
785.500 789.580
786.000 790.082
786.500 790.585
787.000 791.087
787.500 791.590
788.000 792.092
788.500 792.594
789.000 793.097
789.500 793.599



790.000 794.102
790.500 794.604
791.000 795.107
791.500 795.609
792.000 796.111
792.500 796.614
793.000 797.116
793.500 797.619
794.000 798.121
794.500 798.623



795.000 799.126
795.500 799.628
796.000 800.131
796.500 800.634
797.000 801.137
797.500 801.640
798.000 802.144
798.500 802.647
799.000 803.150
799.500 803.653

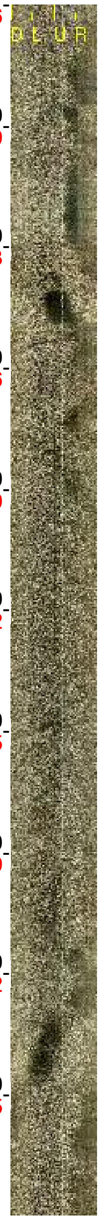


Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 29 (37)

Borehole: KLX04
Mapping: KLX04_041208

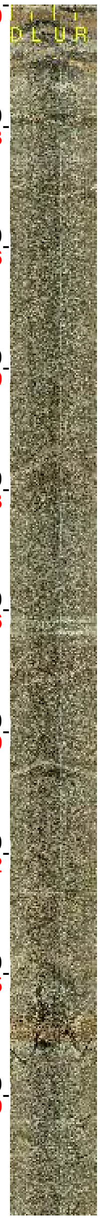
Depth range: 800.000 - 825.000 m
Azimuth: 52.1
Inclination: -83.5

800.000
804.156
800.500
804.659
801.000
805.163
801.500
805.666
802.000
806.169
802.500
806.672
803.000
807.175
803.500
807.679
804.000
808.182
804.500
808.685

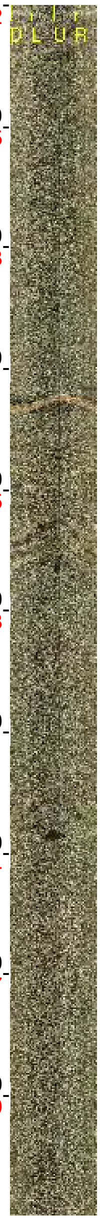


805.000
809.188
805.500
809.691
806.000
810.195
806.500
810.698
807.000
811.201
807.500
811.704
808.000
812.207
808.500
812.710
809.000
813.214
809.500
813.717

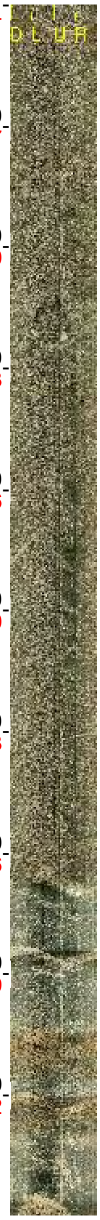
810.000
814.220
810.500
814.723
811.000
815.226
811.500
815.729
812.000
816.233
812.500
816.736
813.000
817.239
813.500
817.742
814.000
818.245
814.500
818.749



815.000
819.252
815.500
819.755
816.000
820.258
816.500
820.761
817.000
821.265
817.500
821.768
818.000
822.271
818.500
822.774
819.000
823.277
819.500
823.780



820.000
824.284
820.500
824.787
821.000
825.290
821.500
825.793
822.000
826.296
822.500
826.800
823.000
827.303
823.500
827.806
824.000
828.309
824.500
828.812

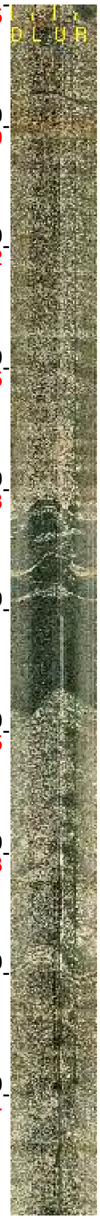


Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 30 (37)

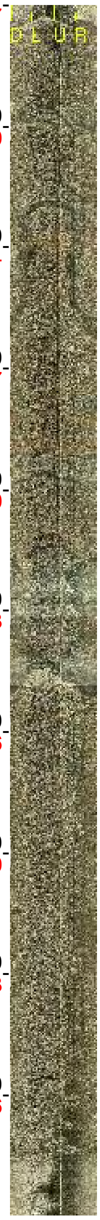
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 825.000 - 850.000 m
Azimuth: 53.1
Inclination: -83.3

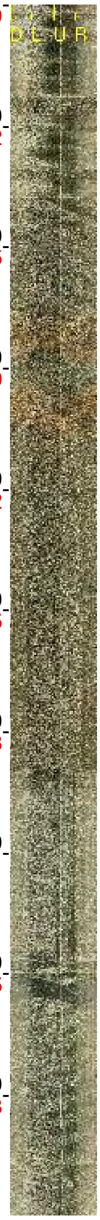
825.000
829.315
825.500
829.819
826.000
830.322
826.500
830.825
827.000
831.328
827.500
831.831
828.000
832.335
828.500
832.838
829.000
833.341
829.500
833.844



830.000
834.347
830.500
834.850
831.000
835.354
831.500
835.857
832.000
836.360
832.500
836.863
833.000
837.366
833.500
837.870
834.000
838.373
834.500
838.876

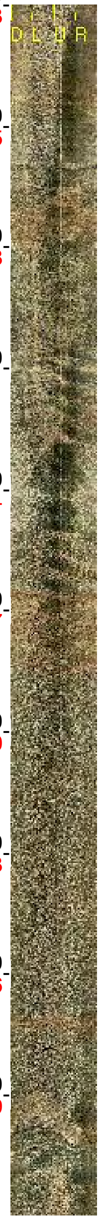


835.000
839.379
835.500
839.882
836.000
840.385
836.500
840.889
837.000
841.392
837.500
841.895
838.000
842.398
838.500
842.901
839.000
843.405
839.500
843.908



840.000
844.411
840.500
844.914
841.000
845.417
841.500
845.921
842.000
846.424
842.500
846.927
843.000
847.430
843.500
847.933
844.000
848.436
844.500
848.940

845.000
849.443
845.500
849.945
846.000
850.448
846.500
850.951
847.000
851.454
847.500
851.957
848.000
852.460
848.500
852.963
849.000
853.466
849.500
853.969



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 31 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 850.000 - 875.000 m
Azimuth: 56.8
Inclination: -83.4

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 32 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 875.000 - 900.000 m
Azimuth: 57.2
Inclination: -82.9

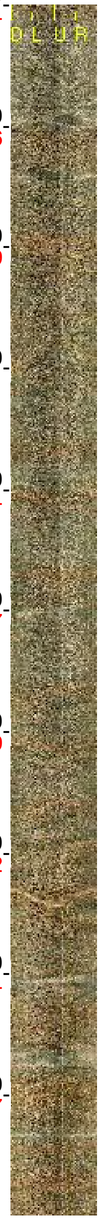
875.000
879.618
875.500
880.120
876.000
880.623
876.500
881.126
877.000
881.629
877.500
882.132
878.000
882.635
878.500
883.138
879.000
883.641
879.500
884.144

880.000
884.647
880.500
885.150
881.000
885.653
881.500
886.156
882.000
886.658
882.500
887.161
883.000
887.664
883.500
888.167
884.000
888.670
884.500
889.173

885.000
889.676
885.500
890.179
886.000
890.682
886.500
891.185
887.000
891.688
887.500
892.190
888.000
892.693
888.500
893.196
889.000
893.699
889.500
894.202

890.000
894.705
890.500
895.208
891.000
895.711
891.500
896.214
892.000
896.717
892.500
897.220
893.000
897.723
893.500
898.225
894.000
898.728
894.500
899.231

895.000
899.734
895.500
900.236
896.000
900.739
896.500
901.241
897.000
901.744
897.500
902.247
898.000
902.749
898.500
903.252
899.000
903.754
899.500
904.257



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 33 (37)

Borehole: KLX04
Mapping: KLX04_041208

Depth range: 900.000 - 925.000 m
Azimuth: 58.5
Inclination: -83.0

900.000 / 904.759
900.500 / 905.262
901.000 / 905.764
901.500 / 906.267
902.000 / 906.770
902.500 / 907.272
903.000 / 907.775
903.500 / 908.277
904.000 / 908.780
904.500 / 909.282

905.000 / 909.785
905.500 / 910.288
906.000 / 910.790
906.500 / 911.293
907.000 / 911.795
907.500 / 912.298
908.000 / 912.800
908.500 / 913.303
909.000 / 913.805
909.500 / 914.308

910.000 / 914.811
910.500 / 915.313
911.000 / 915.816
911.500 / 916.318
912.000 / 916.821
912.500 / 917.323
913.000 / 917.826
913.500 / 918.329
914.000 / 918.831
914.500 / 919.334

915.000 / 919.836
915.500 / 920.339
916.000 / 920.841
916.500 / 921.344
917.000 / 921.846
917.500 / 922.349
918.000 / 922.852
918.500 / 923.354
919.000 / 923.857
919.500 / 924.359

920.000 / 924.862
920.500 / 925.364
921.000 / 925.867
921.500 / 926.370
922.000 / 926.872
922.500 / 927.375
923.000 / 927.877
923.500 / 928.380
924.000 / 928.882
924.500 / 929.385

Printed: 2005-03-07 14:23:35   Scale: 1 : 25   Aspect: 150 %   34 (37)

Borehole: KLX04
Mapping: KLX04_041208

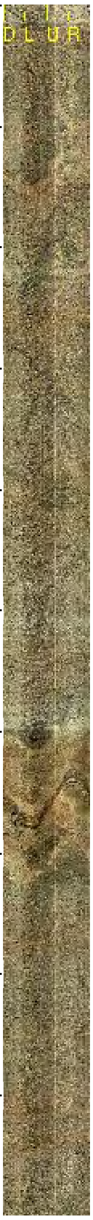
Depth range: 925.000 - 950.000 m
Azimuth: 60.6
Inclination: -83.0

Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 35 (37)

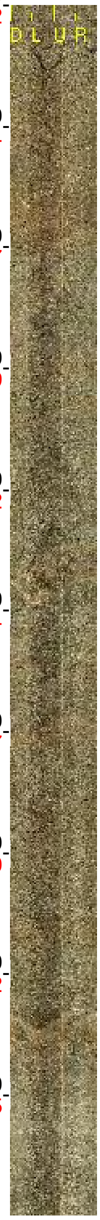
Borehole: KLX04
Mapping: KLX04_041208

Depth range: 950.000 - 975.000 m
Azimuth: 61.4
Inclination: -82.8

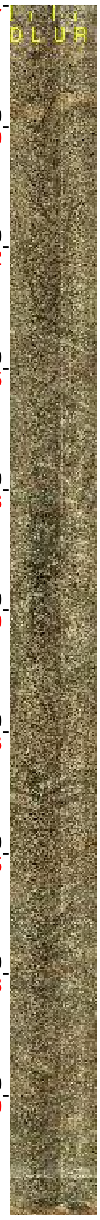
950.000
955.016
950.500
955.518
951.000
956.021
951.500
956.523
952.000
957.026
952.500
957.529
953.000
958.031
953.500
958.534
954.000
959.036
954.500
959.539



955.000
960.042
955.500
960.544
956.000
961.047
956.500
961.549
957.000
962.052
957.500
962.554
958.000
963.057
958.500
963.560
959.000
964.062
959.500
964.565



960.000
965.067
960.500
965.570
961.000
966.072
961.500
966.575
962.000
967.078
962.500
967.580
963.000
968.083
963.500
968.585
964.000
969.088
964.500
969.590



965.000
970.093
965.500
970.596
966.000
971.098
966.500
971.601
967.000
972.103
967.500
972.606
968.000
973.109
968.500
973.611
969.000
974.114
969.500
974.616

970.000
975.119
970.500
975.621
971.000
976.124
971.500
976.627
972.000
977.129
972.500
977.632
973.000
978.134
973.500
978.637
974.000
979.139
974.500
979.642

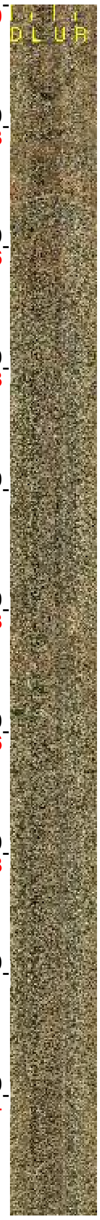
Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 36 (37)

Borehole: KLX04
Mapping: KLX04_041208

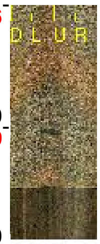
Depth range: 975.000 - 986.016 m
Azimuth: 62.7
Inclination: -82.9

975.000
980.145
975.500
980.647
976.000
981.150
976.500
981.652
977.000
982.155
977.500
982.657
978.000
983.160
978.500
983.663
979.000
984.165
979.500
984.668

980.000
985.170
980.500
985.673
981.000
986.176
981.500
986.678
982.000
987.181
982.500
987.683
983.000
988.186
983.500
988.688
984.000
989.191
984.500
989.694



985.000
990.196
985.500
990.699
986.000
991.201
986.500
987.000
987.500
988.000
988.500
989.000
989.500



Printed: 2005-03-07 14:23:35 Scale: 1 : 25 Aspect: 150 % 37 (37)

Appendix 5

WellCad diagram of KLX04

Title	LEGEND FOR LAXEMAR	KLX04

Site	LAXEMAR
Borehole	KLX04
Plot Date	2005-02-09 22:06:44

ROCKTYPE LAXEMAR

- **Dolerite / Diabas**
- **Fine-grained Götemargranite**
- **Coarse-grained Götemargranite**
- **Fine-grained granite**
- **Pegmatite**
- **Granite**
- **Ävrö granite**
- **Quartz monzodiorite**
- **Diorite / Gabbro**
- **Fine-grained dioritoid**
- **Fine-grained diorite-gabbro**
- **Sulphide mineralization**
- **Sandstone**
- **Soil**

ROCK ALTERATION

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

MINERAL

- **Epidote**
- **Flourite**
- **Hematite**
- **Calcite**
- **Chlorite**
- **Quartz**
- **Red Feldspar**
- **Muscovite**
- **Unknown**
- **Pyrite**
- **Corundum**
- **Caolinite**
- **Clay Minerals**
- **Laumontite**
- **Prehnite**
- **Iron Hydroxide**
- **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

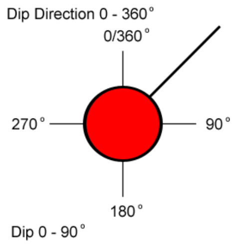
- **Slightly Altered**
- **Moderately Altered**
- **Highly Altered**
- **Completley Altered**
- **Gouge**
- **Fresh**

FRACTURE ALTERATION

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

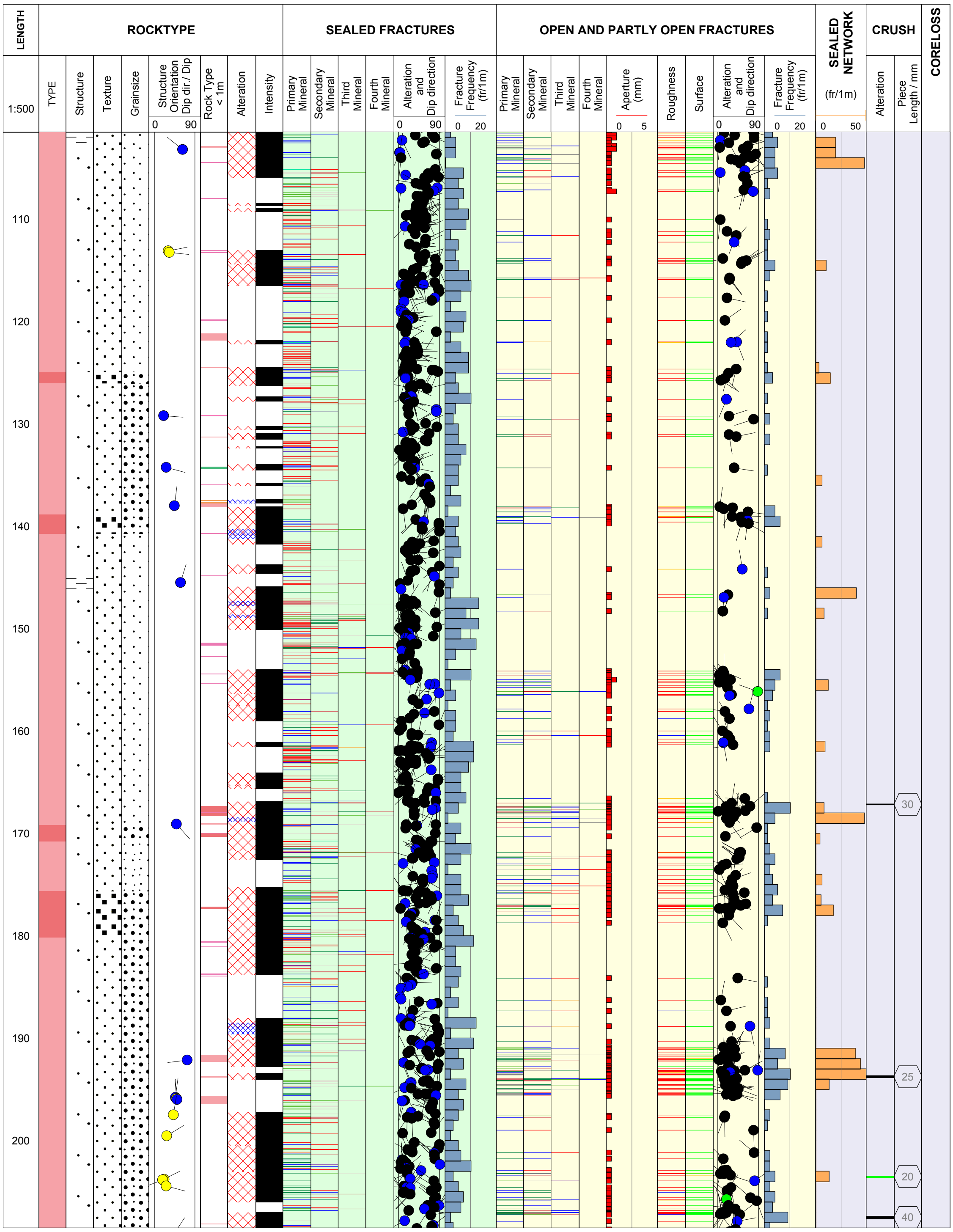
FRACTURE DIRECTION

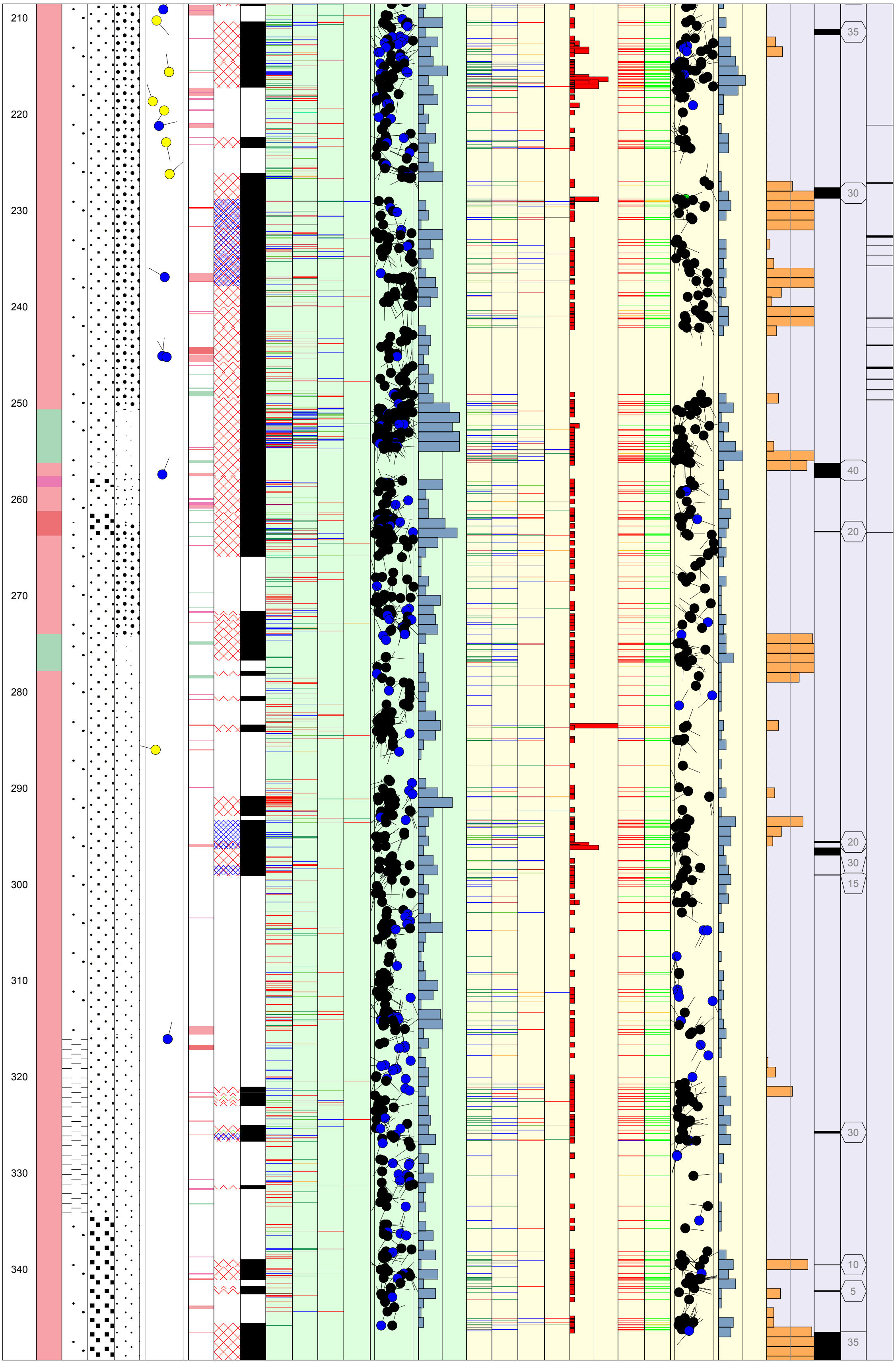
STRUKTURE ORIENTATION



Title **GEOLOGY IN KLX04** **Appendix: 5**

Site	LAXEMAR	**Coordinate System**	RT90-RHB70
Borehole	KLX04	**Northing [m]**	6367077.19
Diameter [mm]	76	**Easting [m]**	1548171.94
Length [m]	993.490	**Elevation [m.a.s.l.]**	24.09
Bearing [°]	0.11	**Drilling Start Date**	2004-02-11 11:30:00
Inclination [°]	-84.67	**Drilling Stop Date**	2004-06-28 10:12:00
Date of mapping	2004-07-22 10:00:00	**Plot Date**	2005-02-08 22:10:04
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core

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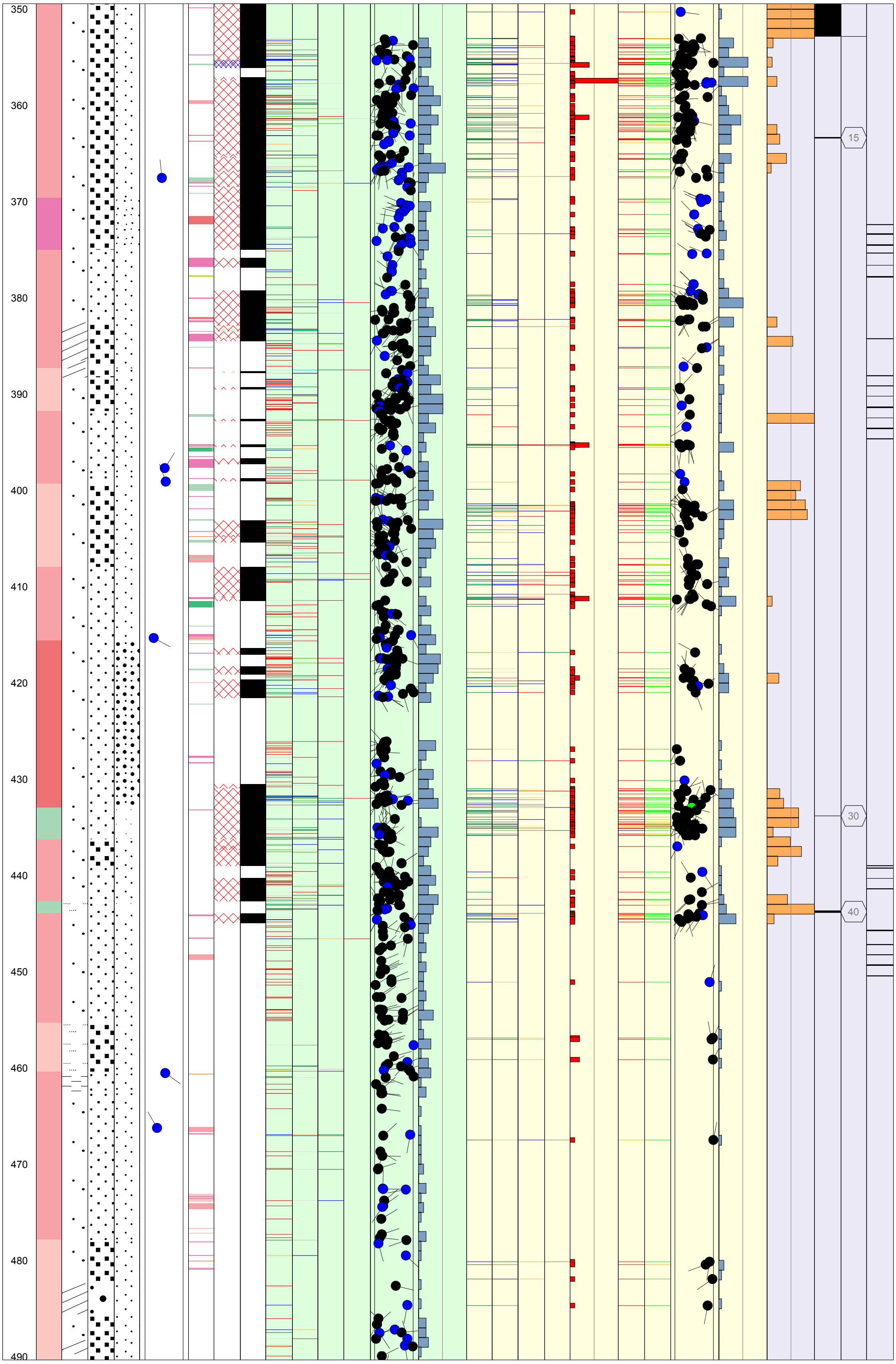
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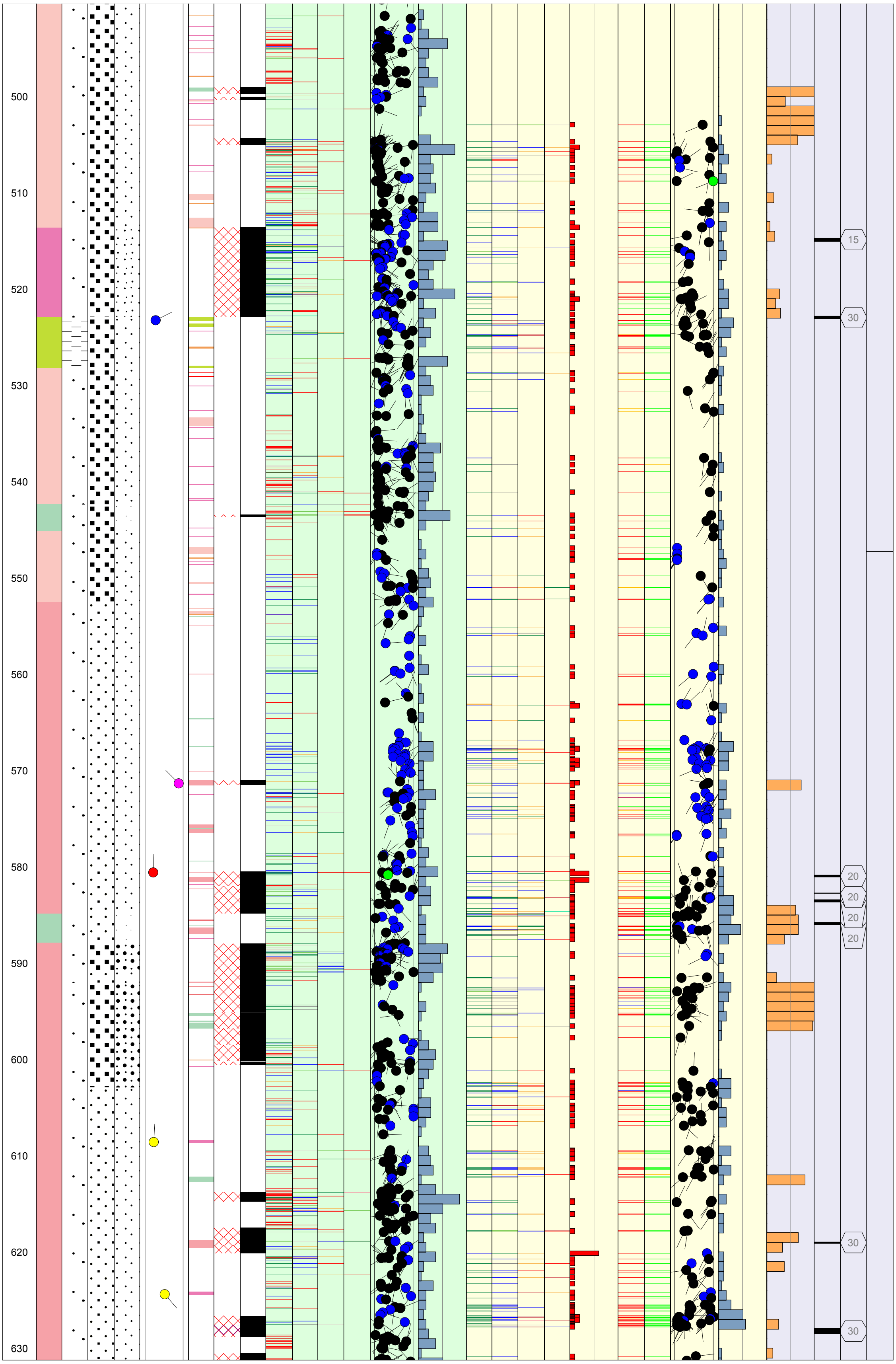
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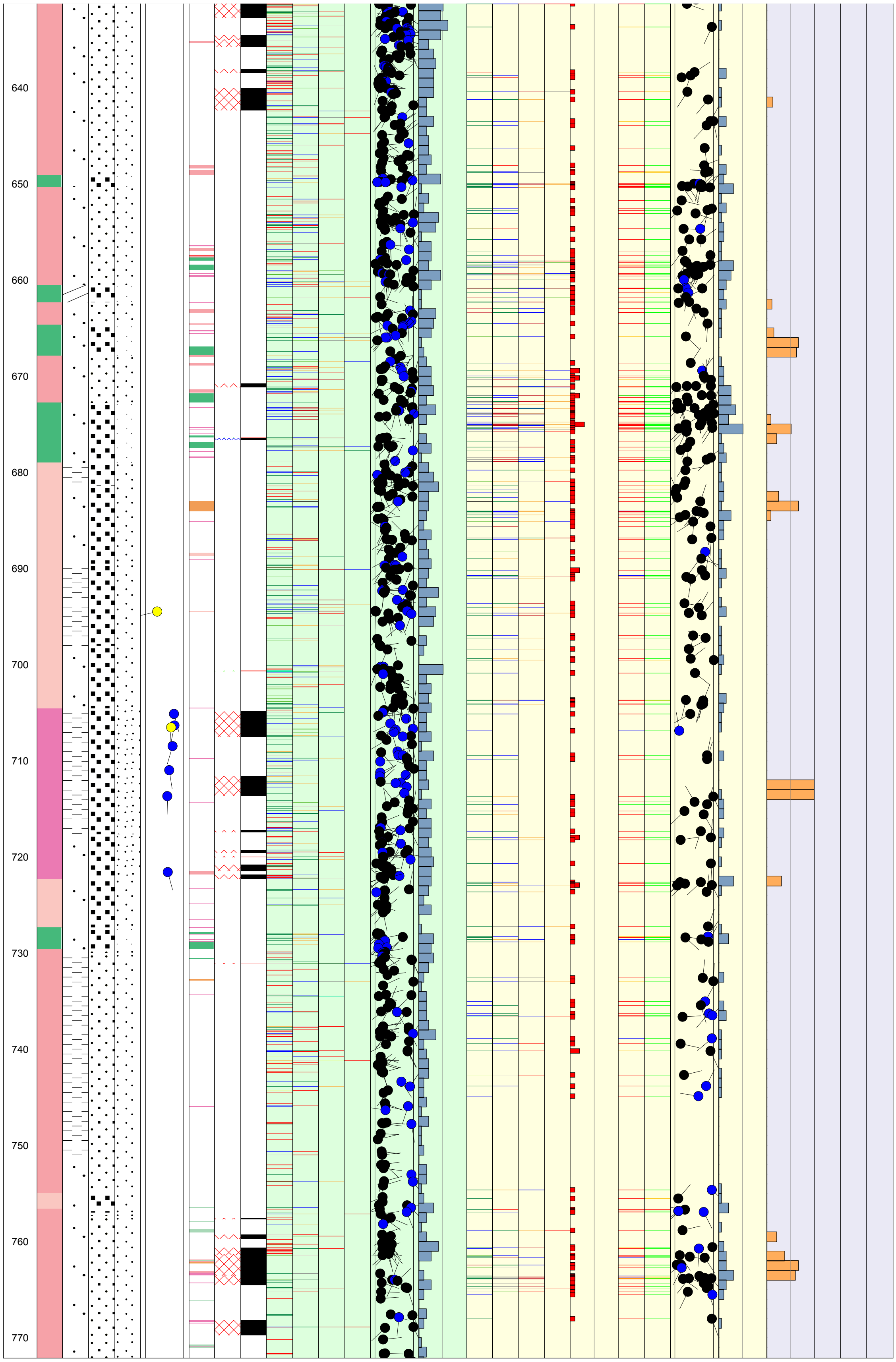
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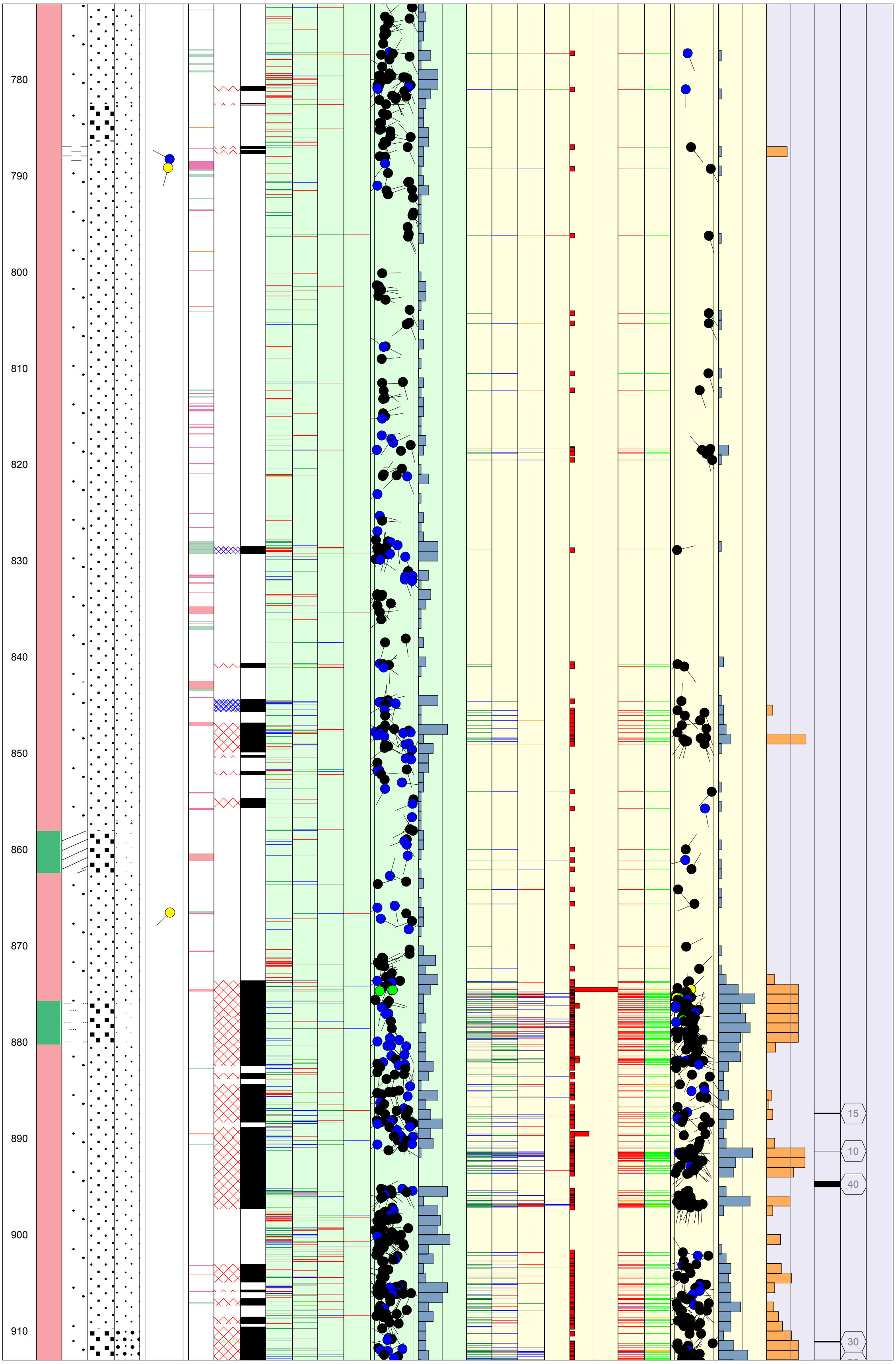
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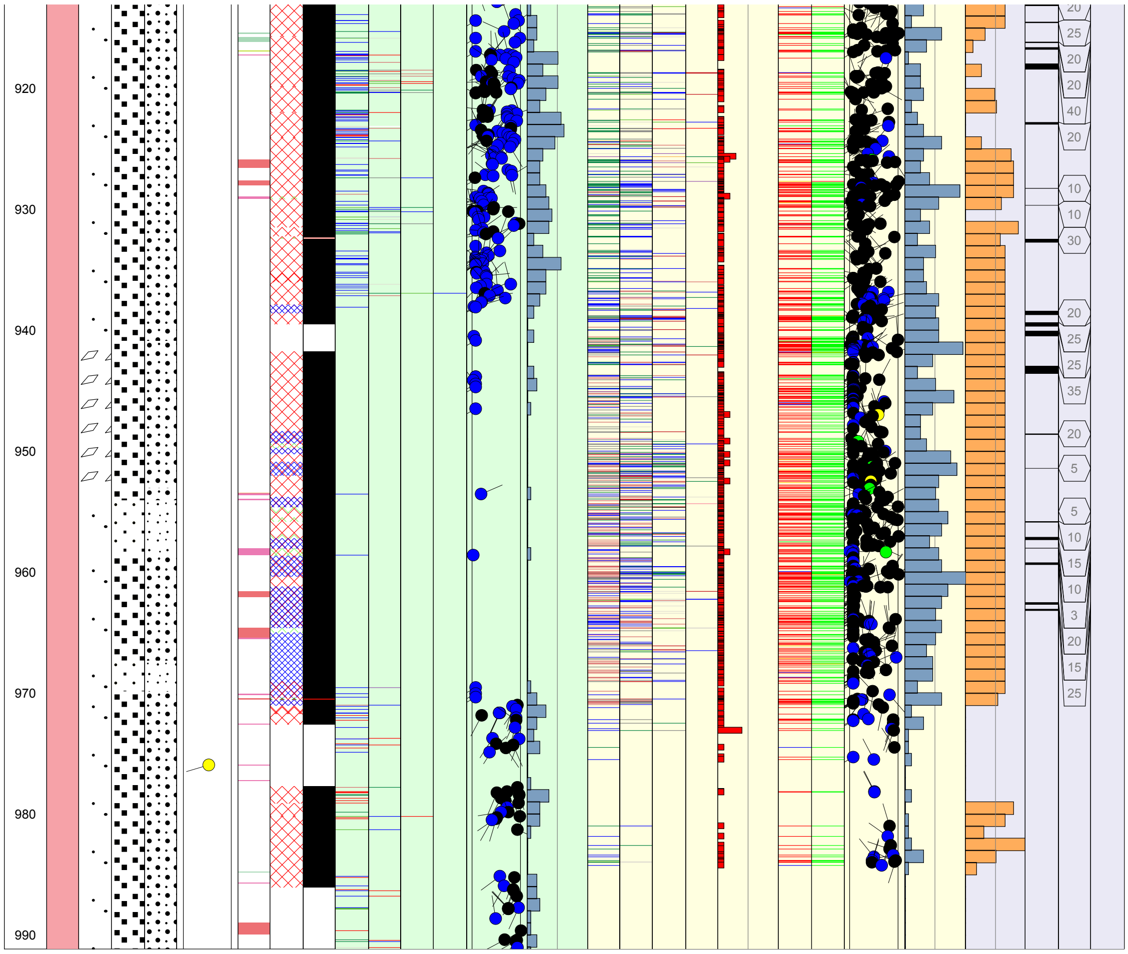

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Appendix 6

In data: Borehole length and diameter for KLX04

Hole Diam T - Drilling: Borehole diameter

KLX04, 2004-03-13 11:00:00 - 2004-06-28 10:12:00 (0.000 - 993.490 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
100.350	101.470	0.086	Borrning för stödcasing
101.470	993.490	0.076	

Printout from SICADA 2005-02-01 17:08:30.

Appendix 7

In data: Borehole orientation data for KLX04

Maxibor T - Borehole deviation: Maxibor

KLX04, 2004-06-28 00:00:00 (0.000 - 987.000 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	6367077.19	1548171.94	-24.09	RT90-RHB70	-84.72	1.62	0.0000	0.0000	0.0000	
3.00	6367077.47	1548171.95	-21.10	RT90-RHB70	-84.83	1.75	0.2800	0.0000	0.0000	
6.00	6367077.74	1548171.96	-18.11	RT90-RHB70	-84.74	1.84	0.5500	0.0000	-0.0100	
9.00	6367078.01	1548171.96	-15.13	RT90-RHB70	-84.70	1.94	0.8200	0.0000	-0.0100	
12.00	6367078.29	1548171.97	-12.14	RT90-RHB70	-84.69	1.62	1.1000	0.0000	-0.0100	
15.00	6367078.57	1548171.98	-9.15	RT90-RHB70	-84.65	1.74	1.3800	0.0000	0.0000	
18.00	6367078.85	1548171.99	-6.17	RT90-RHB70	-84.65	2.31	1.6600	0.0000	0.0000	
21.00	6367079.12	1548172.00	-3.18	RT90-RHB70	-84.64	2.48	1.9400	0.0100	0.0000	
24.00	6367079.40	1548172.01	-0.19	RT90-RHB70	-84.59	2.77	2.2200	0.0100	0.0100	
27.00	6367079.69	1548172.03	2.79	RT90-RHB70	-84.60	3.30	2.5000	0.0200	0.0100	
30.00	6367079.97	1548172.04	5.78	RT90-RHB70	-84.61	3.19	2.7800	0.0300	0.0200	
33.00	6367080.25	1548172.06	8.77	RT90-RHB70	-84.55	3.59	3.0600	0.0300	0.0300	
36.00	6367080.53	1548172.08	11.75	RT90-RHB70	-84.57	3.81	3.3500	0.0400	0.0300	
39.00	6367080.82	1548172.10	14.74	RT90-RHB70	-84.52	3.29	3.6300	0.0500	0.0400	
42.00	6367081.10	1548172.11	17.73	RT90-RHB70	-84.47	3.58	3.9200	0.0600	0.0500	
45.00	6367081.39	1548172.13	20.71	RT90-RHB70	-84.53	3.51	4.2100	0.0700	0.0700	
48.00	6367081.68	1548172.15	23.70	RT90-RHB70	-84.49	3.17	4.4900	0.0800	0.0700	
51.00	6367081.97	1548172.16	26.69	RT90-RHB70	-84.46	3.71	4.7800	0.0900	0.0900	
54.00	6367082.25	1548172.18	29.67	RT90-RHB70	-84.48	3.56	5.0700	0.1000	0.1000	
57.00	6367082.54	1548172.20	32.66	RT90-RHB70	-84.41	3.52	5.3600	0.1100	0.1100	
60.00	6367082.83	1548172.22	35.64	RT90-RHB70	-84.40	4.05	5.6500	0.1200	0.1300	
63.00	6367083.13	1548172.24	38.63	RT90-RHB70	-84.38	3.59	5.9400	0.1300	0.1500	
66.00	6367083.42	1548172.26	41.61	RT90-RHB70	-84.33	4.13	6.2400	0.1400	0.1600	
69.00	6367083.72	1548172.28	44.60	RT90-RHB70	-84.36	4.36	6.5300	0.1500	0.1800	
72.00	6367084.01	1548172.30	47.59	RT90-RHB70	-84.29	4.10	6.8300	0.1700	0.2000	
75.00	6367084.31	1548172.32	50.57	RT90-RHB70	-84.27	4.40	7.1200	0.1800	0.2200	
78.00	6367084.61	1548172.35	53.56	RT90-RHB70	-84.27	4.13	7.4200	0.2000	0.2500	
81.00	6367084.90	1548172.37	56.54	RT90-RHB70	-84.21	4.19	7.7200	0.2100	0.2700	
84.00	6367085.21	1548172.39	59.53	RT90-RHB70	-84.18	4.87	8.0200	0.2200	0.3000	
87.00	6367085.51	1548172.42	62.51	RT90-RHB70	-84.10	5.02	8.3300	0.2400	0.3200	
90.00	6367085.82	1548172.44	65.49	RT90-RHB70	-84.00	5.14	8.6400	0.2600	0.3600	
93.00	6367086.13	1548172.47	68.48	RT90-RHB70	-83.99	5.31	8.9500	0.2800	0.3900	
96.00	6367086.44	1548172.50	71.46	RT90-RHB70	-83.97	5.28	9.2600	0.3000	0.4300	
99.00	6367086.76	1548172.53	74.44	RT90-RHB70	-83.94	5.71	9.5800	0.3200	0.4700	
102.00	6367087.07	1548172.56	77.43	RT90-RHB70	-84.01	6.11	9.8900	0.3400	0.5100	
105.00	6367087.38	1548172.59	80.41	RT90-RHB70	-83.98	6.03	10.2100	0.3700	0.5500	

108.00	6367087.69	1548172.63	83.39	RT90-RHB70	-83.97	6.29	10.5200	0.3900	0.5800
111.00	6367088.01	1548172.66	86.38	RT90-RHB70	-84.01	6.13	10.8300	0.4200	0.6200
114.00	6367088.32	1548172.69	89.36	RT90-RHB70	-83.99	6.27	11.1500	0.4400	0.6600
117.00	6367088.63	1548172.73	92.35	RT90-RHB70	-84.03	6.41	11.4600	0.4700	0.7000
120.00	6367088.94	1548172.76	95.33	RT90-RHB70	-84.00	6.23	11.7700	0.4900	0.7300
123.00	6367089.25	1548172.80	98.31	RT90-RHB70	-84.00	6.69	12.0800	0.5200	0.7700
126.00	6367089.56	1548172.83	101.30	RT90-RHB70	-84.03	6.20	12.3900	0.5400	0.8000
129.00	6367089.87	1548172.87	104.28	RT90-RHB70	-84.04	6.71	12.7100	0.5700	0.8400
132.00	6367090.18	1548172.90	107.26	RT90-RHB70	-84.04	6.99	13.0200	0.6000	0.8700
135.00	6367090.49	1548172.94	110.25	RT90-RHB70	-84.02	6.76	13.3300	0.6300	0.9100
138.00	6367090.80	1548172.98	113.23	RT90-RHB70	-84.01	6.94	13.6400	0.6500	0.9400
141.00	6367091.11	1548173.02	116.21	RT90-RHB70	-84.01	7.02	13.9500	0.6800	0.9800
144.00	6367091.42	1548173.06	119.20	RT90-RHB70	-83.99	7.14	14.2600	0.7100	1.0100
147.00	6367091.74	1548173.09	122.18	RT90-RHB70	-84.02	7.00	14.5700	0.7400	1.0500
150.00	6367092.05	1548173.13	125.17	RT90-RHB70	-84.03	6.50	14.8800	0.7700	1.0900
153.00	6367092.36	1548173.17	128.15	RT90-RHB70	-84.03	6.71	15.1900	0.8000	1.1200
156.00	6367092.67	1548173.20	131.13	RT90-RHB70	-84.05	6.55	15.5100	0.8300	1.1600
159.00	6367092.98	1548173.24	134.12	RT90-RHB70	-84.00	6.67	15.8200	0.8500	1.1900
162.00	6367093.29	1548173.28	137.10	RT90-RHB70	-84.03	7.05	16.1300	0.8800	1.2300
165.00	6367093.60	1548173.31	140.08	RT90-RHB70	-84.02	6.76	16.4400	0.9100	1.2600
168.00	6367093.91	1548173.35	143.07	RT90-RHB70	-84.02	7.03	16.7500	0.9400	1.3000
171.00	6367094.22	1548173.39	146.05	RT90-RHB70	-84.07	7.01	17.0600	0.9700	1.3300
174.00	6367094.52	1548173.43	149.04	RT90-RHB70	-84.05	6.95	17.3700	1.0000	1.3600
177.00	6367094.83	1548173.46	152.02	RT90-RHB70	-84.08	7.38	17.6800	1.0300	1.4000
180.00	6367095.14	1548173.50	155.00	RT90-RHB70	-84.09	7.47	17.9900	1.0600	1.4300
183.00	6367095.45	1548173.54	157.99	RT90-RHB70	-84.09	7.68	18.2900	1.0900	1.4600
186.00	6367095.75	1548173.59	160.97	RT90-RHB70	-84.14	7.81	18.6000	1.1200	1.4900
189.00	6367096.06	1548173.63	163.96	RT90-RHB70	-84.10	8.15	18.9100	1.1500	1.5200
192.00	6367096.36	1548173.67	166.94	RT90-RHB70	-84.14	8.59	19.2100	1.1900	1.5500
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198.00	6367096.97	1548173.76	172.91	RT90-RHB70	-84.13	8.79	19.8200	1.2600	1.6100
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207.00	6367097.88	1548173.90	181.86	RT90-RHB70	-84.10	8.88	20.7400	1.3700	1.7000
210.00	6367098.18	1548173.95	184.84	RT90-RHB70	-84.08	8.79	21.0400	1.4100	1.7300
213.00	6367098.49	1548173.99	187.83	RT90-RHB70	-84.09	8.87	21.3500	1.4500	1.7600
216.00	6367098.80	1548174.04	190.81	RT90-RHB70	-84.11	8.79	21.6600	1.4900	1.7900
219.00	6367099.10	1548174.09	193.80	RT90-RHB70	-84.10	9.26	21.9600	1.5300	1.8200
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225.00	6367099.71	1548174.19	199.77	RT90-RHB70	-84.13	9.36	22.5700	1.6100	1.8700
228.00	6367100.01	1548174.24	202.75	RT90-RHB70	-84.12	9.69	22.8700	1.6500	1.9000
231.00	6367100.31	1548174.29	205.73	RT90-RHB70	-84.14	10.14	23.1800	1.7000	1.9300
234.00	6367100.61	1548174.34	208.72	RT90-RHB70	-84.20	10.17	23.4800	1.7400	1.9600

237.00	6367100.91	1548174.40	211.70	RT90-RHB70	-84.20	10.62	23.7800	1.7900	1.9800
240.00	6367101.21	1548174.45	214.69	RT90-RHB70	-84.20	10.99	24.0800	1.8300	2.0100
243.00	6367101.51	1548174.51	217.67	RT90-RHB70	-84.22	11.17	24.3800	1.8800	2.0300
246.00	6367101.80	1548174.57	220.66	RT90-RHB70	-84.23	11.51	24.6800	1.9300	2.0500
249.00	6367102.10	1548174.63	223.64	RT90-RHB70	-84.25	11.66	24.9700	1.9800	2.0700
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255.00	6367102.69	1548174.75	229.61	RT90-RHB70	-84.27	12.55	25.5700	2.0900	2.1100
258.00	6367102.98	1548174.82	232.60	RT90-RHB70	-84.25	12.98	25.8600	2.1500	2.1300
261.00	6367103.27	1548174.89	235.58	RT90-RHB70	-84.26	13.29	26.1600	2.2100	2.1500
264.00	6367103.56	1548174.96	238.57	RT90-RHB70	-84.25	13.72	26.4500	2.2700	2.1700
267.00	6367103.86	1548175.03	241.55	RT90-RHB70	-84.28	13.87	26.7400	2.3300	2.1800
270.00	6367104.15	1548175.10	244.54	RT90-RHB70	-84.26	14.15	27.0400	2.4000	2.2000
273.00	6367104.44	1548175.17	247.52	RT90-RHB70	-84.31	14.21	27.3300	2.4600	2.2200
276.00	6367104.73	1548175.25	250.51	RT90-RHB70	-84.32	14.60	27.6200	2.5300	2.2300
279.00	6367105.01	1548175.32	253.49	RT90-RHB70	-84.36	14.54	27.9100	2.5900	2.2400
282.00	6367105.30	1548175.39	256.48	RT90-RHB70	-84.40	14.36	28.1900	2.6600	2.2600
285.00	6367105.58	1548175.47	259.46	RT90-RHB70	-84.43	14.58	28.4800	2.7200	2.2700
288.00	6367105.86	1548175.54	262.45	RT90-RHB70	-84.47	14.77	28.7600	2.7900	2.2700
291.00	6367106.14	1548175.61	265.43	RT90-RHB70	-84.52	15.36	29.0500	2.8500	2.2800
294.00	6367106.42	1548175.69	268.42	RT90-RHB70	-84.55	15.62	29.3200	2.9200	2.2800
297.00	6367106.69	1548175.77	271.41	RT90-RHB70	-84.60	15.85	29.6000	2.9900	2.2800
300.00	6367106.97	1548175.84	274.39	RT90-RHB70	-84.63	16.12	29.8700	3.0600	2.2800
303.00	6367107.24	1548175.92	277.38	RT90-RHB70	-84.65	16.40	30.1500	3.1300	2.2800
306.00	6367107.50	1548176.00	280.37	RT90-RHB70	-84.65	16.64	30.4200	3.2000	2.2700
309.00	6367107.77	1548176.08	283.36	RT90-RHB70	-84.65	16.90	30.6900	3.2800	2.2600
312.00	6367108.04	1548176.16	286.34	RT90-RHB70	-84.68	17.48	30.9600	3.3500	2.2600
315.00	6367108.31	1548176.25	289.33	RT90-RHB70	-84.65	17.30	31.2200	3.4200	2.2500
318.00	6367108.57	1548176.33	292.32	RT90-RHB70	-84.66	17.15	31.4900	3.5000	2.2400
321.00	6367108.84	1548176.41	295.30	RT90-RHB70	-84.66	17.52	31.7600	3.5700	2.2400
324.00	6367109.10	1548176.50	298.29	RT90-RHB70	-84.65	17.69	32.0300	3.6500	2.2300
327.00	6367109.37	1548176.58	301.28	RT90-RHB70	-84.66	17.98	32.3000	3.7300	2.2200
330.00	6367109.64	1548176.67	304.26	RT90-RHB70	-84.66	17.70	32.5700	3.8100	2.2100
333.00	6367109.90	1548176.75	307.25	RT90-RHB70	-84.63	17.68	32.8400	3.8800	2.2100
336.00	6367110.17	1548176.84	310.24	RT90-RHB70	-84.62	18.10	33.1100	3.9600	2.2000
339.00	6367110.44	1548176.92	313.22	RT90-RHB70	-84.63	18.10	33.3800	4.0400	2.1900
342.00	6367110.70	1548177.01	316.21	RT90-RHB70	-84.63	18.56	33.6400	4.1200	2.1900
345.00	6367110.97	1548177.10	319.20	RT90-RHB70	-84.66	18.76	33.9100	4.2000	2.1800
348.00	6367111.23	1548177.19	322.19	RT90-RHB70	-84.66	19.24	34.1800	4.2900	2.1700
351.00	6367111.50	1548177.28	325.17	RT90-RHB70	-84.66	19.80	34.4500	4.3700	2.1600
354.00	6367111.76	1548177.38	328.16	RT90-RHB70	-84.64	20.19	34.7100	4.4600	2.1500
357.00	6367112.02	1548177.47	331.15	RT90-RHB70	-84.63	20.69	34.9800	4.5500	2.1400
360.00	6367112.29	1548177.57	334.13	RT90-RHB70	-84.65	21.38	35.2400	4.6400	2.1300
363.00	6367112.55	1548177.67	337.12	RT90-RHB70	-84.64	21.85	35.5000	4.7300	2.1100

366.00	6367112.81	1548177.78	340.11	RT90-RHB70	-84.61	22.33	35.7700	4.8300	2.1000
369.00	6367113.07	1548177.89	343.09	RT90-RHB70	-84.61	22.56	36.0300	4.9300	2.0900
372.00	6367113.33	1548177.99	346.08	RT90-RHB70	-84.57	23.06	36.2900	5.0300	2.0800
375.00	6367113.59	1548178.11	349.07	RT90-RHB70	-84.53	23.21	36.5600	5.1300	2.0600
378.00	6367113.85	1548178.22	352.05	RT90-RHB70	-84.51	23.34	36.8200	5.2400	2.0500
381.00	6367114.12	1548178.33	355.04	RT90-RHB70	-84.51	23.81	37.0900	5.3500	2.0500
384.00	6367114.38	1548178.45	358.03	RT90-RHB70	-84.57	23.77	37.3600	5.4500	2.0300
387.00	6367114.64	1548178.56	361.01	RT90-RHB70	-84.57	24.25	37.6200	5.5600	2.0200
390.00	6367114.90	1548178.68	364.00	RT90-RHB70	-84.58	24.75	37.8800	5.6700	2.0100
393.00	6367115.15	1548178.80	366.99	RT90-RHB70	-84.58	24.85	38.1400	5.7800	1.9900
396.00	6367115.41	1548178.92	369.97	RT90-RHB70	-84.61	25.43	38.4000	5.8900	1.9800
399.00	6367115.67	1548179.04	372.96	RT90-RHB70	-84.65	25.56	38.6600	6.0100	1.9600
402.00	6367115.92	1548179.16	375.95	RT90-RHB70	-84.68	26.06	38.9200	6.1200	1.9400
405.00	6367116.17	1548179.28	378.93	RT90-RHB70	-84.68	26.57	39.1700	6.2400	1.9200
408.00	6367116.42	1548179.40	381.92	RT90-RHB70	-84.74	26.70	39.4200	6.3500	1.8900
411.00	6367116.66	1548179.53	384.91	RT90-RHB70	-84.75	26.69	39.6700	6.4700	1.8700
414.00	6367116.91	1548179.65	387.89	RT90-RHB70	-84.78	27.22	39.9200	6.5900	1.8400
417.00	6367117.15	1548179.78	390.88	RT90-RHB70	-84.79	27.45	40.1700	6.7000	1.8100
420.00	6367117.39	1548179.90	393.87	RT90-RHB70	-84.80	27.24	40.4100	6.8200	1.7800
423.00	6367117.63	1548180.03	396.86	RT90-RHB70	-84.78	27.16	40.6600	6.9400	1.7500
426.00	6367117.88	1548180.15	399.84	RT90-RHB70	-84.75	27.36	40.9000	7.0600	1.7200
429.00	6367118.12	1548180.28	402.83	RT90-RHB70	-84.76	27.53	41.1500	7.1800	1.6900
432.00	6367118.36	1548180.40	405.82	RT90-RHB70	-84.75	27.75	41.4000	7.3000	1.6600
435.00	6367118.61	1548180.53	408.81	RT90-RHB70	-84.71	27.97	41.6400	7.4200	1.6300
438.00	6367118.85	1548180.66	411.79	RT90-RHB70	-84.71	27.96	41.8900	7.5400	1.6000
441.00	6367119.09	1548180.79	414.78	RT90-RHB70	-84.73	28.00	42.1400	7.6600	1.5700
444.00	6367119.34	1548180.92	417.77	RT90-RHB70	-84.71	28.19	42.3900	7.7900	1.5400
447.00	6367119.58	1548181.05	420.76	RT90-RHB70	-84.71	28.34	42.6300	7.9100	1.5200
450.00	6367119.83	1548181.18	423.74	RT90-RHB70	-84.72	28.63	42.8800	8.0300	1.4900
453.00	6367120.07	1548181.31	426.73	RT90-RHB70	-84.70	28.81	43.1300	8.1600	1.4600
456.00	6367120.31	1548181.45	429.72	RT90-RHB70	-84.66	28.82	43.3700	8.2900	1.4300
459.00	6367120.56	1548181.58	432.70	RT90-RHB70	-84.61	28.80	43.6200	8.4100	1.4000
462.00	6367120.80	1548181.72	435.69	RT90-RHB70	-84.56	28.71	43.8700	8.5400	1.3700
465.00	6367121.05	1548181.86	438.68	RT90-RHB70	-84.52	28.93	44.1200	8.6700	1.3500
468.00	6367121.30	1548181.99	441.66	RT90-RHB70	-84.47	29.04	44.3800	8.8000	1.3300
471.00	6367121.56	1548182.13	444.65	RT90-RHB70	-84.45	29.08	44.6400	8.9400	1.3100
474.00	6367121.81	1548182.28	447.64	RT90-RHB70	-84.46	29.40	44.8900	9.0700	1.2900
477.00	6367122.06	1548182.42	450.62	RT90-RHB70	-84.45	29.57	45.1500	9.2000	1.2700
480.00	6367122.31	1548182.56	453.61	RT90-RHB70	-84.44	30.27	45.4100	9.3400	1.2500
483.00	6367122.56	1548182.71	456.59	RT90-RHB70	-84.47	30.09	45.6600	9.4800	1.2300
486.00	6367122.81	1548182.85	459.58	RT90-RHB70	-84.51	30.08	45.9100	9.6200	1.2100
489.00	6367123.06	1548183.00	462.57	RT90-RHB70	-84.51	30.21	46.1700	9.7500	1.1900
492.00	6367123.31	1548183.14	465.55	RT90-RHB70	-84.56	30.60	46.4200	9.8900	1.1600

495.00	6367123.56	1548183.29	468.54	RT90-RHB70	-84.60	30.92	46.6700	10.0300	1.1400
498.00	6367123.80	1548183.43	471.53	RT90-RHB70	-84.64	31.17	46.9100	10.1700	1.1100
501.00	6367124.04	1548183.58	474.51	RT90-RHB70	-84.67	31.75	47.1600	10.3100	1.0800
504.00	6367124.28	1548183.72	477.50	RT90-RHB70	-84.64	31.94	47.4000	10.4500	1.0400
507.00	6367124.51	1548183.87	480.49	RT90-RHB70	-84.62	32.30	47.6400	10.5900	1.0100
510.00	6367124.75	1548184.02	483.47	RT90-RHB70	-84.63	32.60	47.8800	10.7300	0.9700
513.00	6367124.99	1548184.17	486.46	RT90-RHB70	-84.64	33.04	48.1200	10.8800	0.9400
516.00	6367125.22	1548184.32	489.45	RT90-RHB70	-84.60	33.32	48.3600	11.0200	0.9000
519.00	6367125.46	1548184.48	492.43	RT90-RHB70	-84.60	34.32	48.6000	11.1700	0.8600
522.00	6367125.69	1548184.64	495.42	RT90-RHB70	-84.62	34.53	48.8400	11.3200	0.8300
525.00	6367125.92	1548184.80	498.41	RT90-RHB70	-84.65	34.49	49.0800	11.4800	0.7900
528.00	6367126.15	1548184.96	501.39	RT90-RHB70	-84.65	34.66	49.3100	11.6300	0.7500
531.00	6367126.38	1548185.12	504.38	RT90-RHB70	-84.66	34.86	49.5500	11.7800	0.7000
534.00	6367126.61	1548185.28	507.37	RT90-RHB70	-84.66	34.88	49.7800	11.9300	0.6600
537.00	6367126.84	1548185.44	510.35	RT90-RHB70	-84.67	34.82	50.0100	12.0900	0.6200
540.00	6367127.07	1548185.59	513.34	RT90-RHB70	-84.66	35.15	50.2500	12.2400	0.5800
543.00	6367127.30	1548185.76	516.33	RT90-RHB70	-84.65	35.21	50.4800	12.3900	0.5300
546.00	6367127.53	1548185.92	519.32	RT90-RHB70	-84.63	35.21	50.7100	12.5500	0.4900
549.00	6367127.76	1548186.08	522.30	RT90-RHB70	-84.65	35.26	50.9500	12.7000	0.4500
552.00	6367127.99	1548186.24	525.29	RT90-RHB70	-84.67	35.22	51.1800	12.8600	0.4100
555.00	6367128.21	1548186.40	528.28	RT90-RHB70	-84.67	35.37	51.4100	13.0100	0.3600
558.00	6367128.44	1548186.56	531.26	RT90-RHB70	-84.66	35.76	51.6400	13.1700	0.3200
561.00	6367128.67	1548186.73	534.25	RT90-RHB70	-84.65	35.87	51.8700	13.3200	0.2700
564.00	6367128.89	1548186.89	537.24	RT90-RHB70	-84.65	35.86	52.1100	13.4800	0.2300
567.00	6367129.12	1548187.05	540.22	RT90-RHB70	-84.66	36.25	52.3400	13.6400	0.1800
570.00	6367129.35	1548187.22	543.21	RT90-RHB70	-84.67	36.26	52.5700	13.8000	0.1400
573.00	6367129.57	1548187.38	546.20	RT90-RHB70	-84.67	36.54	52.8000	13.9600	0.0900
576.00	6367129.79	1548187.55	549.19	RT90-RHB70	-84.69	36.91	53.0200	14.1200	0.0400
579.00	6367130.02	1548187.72	552.17	RT90-RHB70	-84.65	37.08	53.2500	14.2800	0.0000
582.00	6367130.24	1548187.88	555.16	RT90-RHB70	-84.60	37.36	53.4800	14.4400	-0.0500
585.00	6367130.46	1548188.06	558.15	RT90-RHB70	-84.55	37.58	53.7100	14.6000	-0.1000
588.00	6367130.69	1548188.23	561.13	RT90-RHB70	-84.53	37.81	53.9400	14.7700	-0.1400
591.00	6367130.92	1548188.40	564.12	RT90-RHB70	-84.51	37.82	54.1700	14.9400	-0.1900
594.00	6367131.14	1548188.58	567.11	RT90-RHB70	-84.49	38.03	54.4000	15.1100	-0.2300
597.00	6367131.37	1548188.76	570.09	RT90-RHB70	-84.49	38.25	54.6300	15.2800	-0.2800
600.00	6367131.60	1548188.94	573.08	RT90-RHB70	-84.47	38.17	54.8600	15.4500	-0.3200
603.00	6367131.82	1548189.11	576.06	RT90-RHB70	-84.43	38.12	55.1000	15.6200	-0.3700
606.00	6367132.05	1548189.29	579.05	RT90-RHB70	-84.37	38.05	55.3300	15.8000	-0.4100
609.00	6367132.28	1548189.48	582.03	RT90-RHB70	-84.31	37.97	55.5700	15.9700	-0.4500
612.00	6367132.52	1548189.66	585.02	RT90-RHB70	-84.28	37.97	55.8100	16.1500	-0.4800
615.00	6367132.75	1548189.84	588.01	RT90-RHB70	-84.29	38.20	56.0500	16.3200	-0.5200
618.00	6367132.99	1548190.03	590.99	RT90-RHB70	-84.32	38.33	56.2900	16.5000	-0.5500
621.00	6367133.22	1548190.21	593.98	RT90-RHB70	-84.31	38.37	56.5200	16.6800	-0.5900

624.00	6367133.45	1548190.40	596.96	RT90-RHB70	-84.29	38.55	56.7600	16.8600	-0.6300
627.00	6367133.69	1548190.58	599.95	RT90-RHB70	-84.28	38.55	57.0000	17.0400	-0.6700
630.00	6367133.92	1548190.77	602.93	RT90-RHB70	-84.27	38.39	57.2400	17.2200	-0.7000
633.00	6367134.16	1548190.95	605.92	RT90-RHB70	-84.26	38.36	57.4800	17.4000	-0.7400
636.00	6367134.39	1548191.14	608.90	RT90-RHB70	-84.25	38.68	57.7200	17.5800	-0.7700
639.00	6367134.63	1548191.33	611.89	RT90-RHB70	-84.24	38.71	57.9600	17.7600	-0.8100
642.00	6367134.86	1548191.52	614.87	RT90-RHB70	-84.26	38.70	58.2000	17.9400	-0.8500
645.00	6367135.09	1548191.70	617.86	RT90-RHB70	-84.26	38.99	58.4400	18.1200	-0.8800
648.00	6367135.33	1548191.89	620.84	RT90-RHB70	-84.26	39.00	58.6800	18.3000	-0.9200
651.00	6367135.56	1548192.08	623.83	RT90-RHB70	-84.24	38.81	58.9200	18.4800	-0.9600
654.00	6367135.80	1548192.27	626.81	RT90-RHB70	-84.22	39.05	59.1600	18.6700	-0.9900
657.00	6367136.03	1548192.46	629.80	RT90-RHB70	-84.20	39.48	59.4000	18.8500	-1.0300
660.00	6367136.26	1548192.65	632.78	RT90-RHB70	-84.19	39.74	59.6400	19.0400	-1.0600
663.00	6367136.50	1548192.85	635.76	RT90-RHB70	-84.18	39.98	59.8800	19.2200	-1.1000
666.00	6367136.73	1548193.04	638.75	RT90-RHB70	-84.16	40.14	60.1100	19.4100	-1.1400
669.00	6367136.96	1548193.24	641.73	RT90-RHB70	-84.13	40.29	60.3500	19.6000	-1.1700
672.00	6367137.20	1548193.44	644.72	RT90-RHB70	-84.11	40.88	60.5900	19.7900	-1.2100
675.00	6367137.43	1548193.64	647.70	RT90-RHB70	-84.11	41.26	60.8300	19.9900	-1.2500
678.00	6367137.66	1548193.84	650.69	RT90-RHB70	-84.10	41.41	61.0700	20.1800	-1.2900
681.00	6367137.89	1548194.05	653.67	RT90-RHB70	-84.08	41.83	61.3000	20.3800	-1.3200
684.00	6367138.12	1548194.25	656.65	RT90-RHB70	-84.05	42.31	61.5400	20.5800	-1.3600
687.00	6367138.35	1548194.46	659.64	RT90-RHB70	-84.00	42.64	61.7800	20.7800	-1.4000
690.00	6367138.59	1548194.68	662.62	RT90-RHB70	-83.99	42.90	62.0100	20.9900	-1.4400
693.00	6367138.82	1548194.89	665.61	RT90-RHB70	-83.97	43.26	62.2500	21.2000	-1.4800
696.00	6367139.04	1548195.11	668.59	RT90-RHB70	-83.95	43.45	62.4900	21.4100	-1.5200
699.00	6367139.27	1548195.32	671.57	RT90-RHB70	-83.91	43.50	62.7200	21.6200	-1.5600
702.00	6367139.51	1548195.54	674.55	RT90-RHB70	-83.88	43.79	62.9600	21.8300	-1.6000
705.00	6367139.74	1548195.76	677.54	RT90-RHB70	-83.84	44.19	63.1900	22.0500	-1.6400
708.00	6367139.97	1548195.99	680.52	RT90-RHB70	-83.81	44.30	63.4300	22.2600	-1.6800
711.00	6367140.20	1548196.21	683.50	RT90-RHB70	-83.79	44.33	63.6700	22.4800	-1.7200
714.00	6367140.43	1548196.44	686.49	RT90-RHB70	-83.76	44.74	63.9100	22.7000	-1.7500
717.00	6367140.66	1548196.67	689.47	RT90-RHB70	-83.76	45.25	64.1500	22.9200	-1.7900
720.00	6367140.89	1548196.90	692.45	RT90-RHB70	-83.73	45.15	64.3800	23.1500	-1.8300
723.00	6367141.12	1548197.13	695.43	RT90-RHB70	-83.72	45.47	64.6200	23.3800	-1.8700
726.00	6367141.35	1548197.37	698.41	RT90-RHB70	-83.68	45.83	64.8600	23.6000	-1.9100
729.00	6367141.58	1548197.60	701.40	RT90-RHB70	-83.68	45.93	65.0900	23.8300	-1.9400
732.00	6367141.81	1548197.84	704.38	RT90-RHB70	-83.64	46.18	65.3300	24.0600	-1.9800
735.00	6367142.04	1548198.08	707.36	RT90-RHB70	-83.64	46.41	65.5700	24.3000	-2.0200
738.00	6367142.27	1548198.32	710.34	RT90-RHB70	-83.64	46.70	65.8000	24.5300	-2.0600
741.00	6367142.50	1548198.56	713.32	RT90-RHB70	-83.60	47.05	66.0400	24.7700	-2.1000
744.00	6367142.73	1548198.81	716.30	RT90-RHB70	-83.56	47.45	66.2700	25.0000	-2.1400
747.00	6367142.96	1548199.06	719.28	RT90-RHB70	-83.55	47.52	66.5100	25.2500	-2.1800
750.00	6367143.18	1548199.30	722.27	RT90-RHB70	-83.53	47.77	66.7400	25.4900	-2.2300

753.00	6367143.41	1548199.55	725.25	RT90-RHB70	-83.47	48.13	66.9700	25.7300	-2.2700
756.00	6367143.64	1548199.81	728.23	RT90-RHB70	-83.45	48.58	67.2100	25.9800	-2.3100
759.00	6367143.86	1548200.07	731.21	RT90-RHB70	-83.50	49.07	67.4400	26.2300	-2.3500
762.00	6367144.09	1548200.32	734.19	RT90-RHB70	-83.48	49.16	67.6700	26.4800	-2.3900
765.00	6367144.31	1548200.58	737.17	RT90-RHB70	-83.48	49.34	67.9000	26.7300	-2.4400
768.00	6367144.53	1548200.84	740.15	RT90-RHB70	-83.47	49.67	68.1300	26.9800	-2.4900
771.00	6367144.75	1548201.10	743.13	RT90-RHB70	-83.46	49.94	68.3600	27.2400	-2.5300
774.00	6367144.97	1548201.36	746.11	RT90-RHB70	-83.44	50.11	68.5900	27.4900	-2.5800
777.00	6367145.19	1548201.62	749.09	RT90-RHB70	-83.44	50.40	68.8100	27.7500	-2.6300
780.00	6367145.41	1548201.89	752.07	RT90-RHB70	-83.43	50.60	69.0400	28.0100	-2.6800
783.00	6367145.63	1548202.15	755.05	RT90-RHB70	-83.42	50.84	69.2700	28.2700	-2.7300
786.00	6367145.85	1548202.42	758.03	RT90-RHB70	-83.43	50.98	69.4900	28.5300	-2.7800
789.00	6367146.06	1548202.69	761.01	RT90-RHB70	-83.44	50.78	69.7100	28.7900	-2.8300
792.00	6367146.28	1548202.95	763.99	RT90-RHB70	-83.45	50.96	69.9400	29.0500	-2.8800
795.00	6367146.49	1548203.22	766.97	RT90-RHB70	-83.46	51.24	70.1600	29.3100	-2.9300
798.00	6367146.71	1548203.48	769.95	RT90-RHB70	-83.46	51.37	70.3800	29.5700	-2.9900
801.00	6367146.92	1548203.75	772.93	RT90-RHB70	-83.45	51.49	70.6000	29.8300	-3.0400
804.00	6367147.13	1548204.02	775.91	RT90-RHB70	-83.45	51.83	70.8200	30.0900	-3.1000
807.00	6367147.35	1548204.29	778.89	RT90-RHB70	-83.44	52.02	71.0400	30.3500	-3.1500
810.00	6367147.56	1548204.56	781.87	RT90-RHB70	-83.43	52.35	71.2600	30.6200	-3.2100
813.00	6367147.77	1548204.83	784.85	RT90-RHB70	-83.43	52.59	71.4800	30.8800	-3.2700
816.00	6367147.97	1548205.10	787.84	RT90-RHB70	-83.42	52.83	71.6900	31.1500	-3.3300
819.00	6367148.18	1548205.38	790.82	RT90-RHB70	-83.41	53.15	71.9100	31.4200	-3.3900
822.00	6367148.39	1548205.65	793.80	RT90-RHB70	-83.39	53.45	72.1200	31.6800	-3.4500
825.00	6367148.59	1548205.93	796.78	RT90-RHB70	-83.37	53.69	72.3400	31.9600	-3.5100
828.00	6367148.80	1548206.21	799.76	RT90-RHB70	-83.34	53.93	72.5500	32.2300	-3.5700
831.00	6367149.00	1548206.49	802.74	RT90-RHB70	-83.32	54.37	72.7600	32.5100	-3.6300
834.00	6367149.21	1548206.77	805.71	RT90-RHB70	-83.30	54.72	72.9700	32.7800	-3.7000
837.00	6367149.41	1548207.06	808.69	RT90-RHB70	-83.28	54.85	73.1800	33.0600	-3.7600
840.00	6367149.61	1548207.35	811.67	RT90-RHB70	-83.26	54.99	73.3900	33.3400	-3.8300
843.00	6367149.81	1548207.63	814.65	RT90-RHB70	-83.24	55.25	73.6000	33.6300	-3.8900
846.00	6367150.02	1548207.92	817.63	RT90-RHB70	-83.22	55.56	73.8100	33.9100	-3.9600
849.00	6367150.22	1548208.22	820.61	RT90-RHB70	-83.20	55.88	74.0200	34.2000	-4.0200
852.00	6367150.41	1548208.51	823.59	RT90-RHB70	-83.17	56.12	74.2300	34.4900	-4.0900
855.00	6367150.61	1548208.81	826.57	RT90-RHB70	-83.18	56.12	74.4400	34.7800	-4.1600
858.00	6367150.81	1548209.10	829.55	RT90-RHB70	-83.17	56.13	74.6400	35.0700	-4.2300
861.00	6367151.01	1548209.40	832.53	RT90-RHB70	-83.15	56.32	74.8500	35.3600	-4.3000
864.00	6367151.21	1548209.70	835.50	RT90-RHB70	-83.14	56.48	75.0600	35.6500	-4.3600
867.00	6367151.41	1548209.99	838.48	RT90-RHB70	-83.13	56.48	75.2600	35.9400	-4.4300
870.00	6367151.61	1548210.29	841.46	RT90-RHB70	-83.12	56.58	75.4700	36.2300	-4.5000
873.00	6367151.80	1548210.59	844.44	RT90-RHB70	-83.10	56.76	75.6800	36.5300	-4.5700
876.00	6367152.00	1548210.90	847.42	RT90-RHB70	-83.07	56.80	75.8800	36.8200	-4.6400
879.00	6367152.20	1548211.20	850.40	RT90-RHB70	-83.05	56.93	76.0900	37.1200	-4.7100

882.00	6367152.40	1548211.50	853.37	RT90-RHB70	-83.03	57.32	76.3000	37.4200	-4.7800
885.00	6367152.59	1548211.81	856.35	RT90-RHB70	-83.02	57.47	76.5000	37.7200	-4.8400
888.00	6367152.79	1548212.12	859.33	RT90-RHB70	-83.01	57.44	76.7100	38.0200	-4.9200
891.00	6367152.99	1548212.42	862.31	RT90-RHB70	-82.99	57.63	76.9100	38.3200	-4.9800
894.00	6367153.18	1548212.73	865.29	RT90-RHB70	-82.98	58.03	77.1200	38.6300	-5.0600
897.00	6367153.38	1548213.04	868.26	RT90-RHB70	-82.97	58.27	77.3200	38.9300	-5.1300
900.00	6367153.57	1548213.36	871.24	RT90-RHB70	-82.98	58.43	77.5200	39.2400	-5.2000
903.00	6367153.76	1548213.67	874.22	RT90-RHB70	-82.98	58.58	77.7200	39.5500	-5.2700
906.00	6367153.95	1548213.98	877.20	RT90-RHB70	-82.97	58.62	77.9200	39.8500	-5.3500
909.00	6367154.14	1548214.30	880.17	RT90-RHB70	-82.95	58.80	78.1200	40.1600	-5.4200
912.00	6367154.33	1548214.61	883.15	RT90-RHB70	-82.94	59.17	78.3200	40.4700	-5.5000
915.00	6367154.52	1548214.93	886.13	RT90-RHB70	-82.95	59.37	78.5200	40.7800	-5.5800
918.00	6367154.71	1548215.24	889.10	RT90-RHB70	-82.94	59.63	78.7100	41.0900	-5.6500
921.00	6367154.90	1548215.56	892.08	RT90-RHB70	-82.95	60.00	78.9100	41.4100	-5.7300
924.00	6367155.08	1548215.88	895.06	RT90-RHB70	-82.94	60.24	79.1000	41.7200	-5.8200
927.00	6367155.26	1548216.20	898.04	RT90-RHB70	-82.94	60.27	79.2900	42.0400	-5.9000
930.00	6367155.45	1548216.52	901.01	RT90-RHB70	-82.94	60.29	79.4900	42.3500	-5.9800
933.00	6367155.63	1548216.84	903.99	RT90-RHB70	-82.94	60.61	79.6800	42.6700	-6.0700
936.00	6367155.81	1548217.16	906.97	RT90-RHB70	-82.94	60.87	79.8700	42.9800	-6.1500
939.00	6367155.99	1548217.48	909.95	RT90-RHB70	-82.94	60.84	80.0600	43.3000	-6.2400
942.00	6367156.17	1548217.81	912.92	RT90-RHB70	-82.93	61.02	80.2500	43.6100	-6.3200
945.00	6367156.35	1548218.13	915.90	RT90-RHB70	-82.91	61.18	80.4300	43.9300	-6.4100
948.00	6367156.53	1548218.45	918.88	RT90-RHB70	-82.92	61.29	80.6200	44.2500	-6.5000
951.00	6367156.71	1548218.78	921.85	RT90-RHB70	-82.91	61.50	80.8100	44.5700	-6.5800
954.00	6367156.88	1548219.10	924.83	RT90-RHB70	-82.90	61.62	80.9900	44.8900	-6.6700
957.00	6367157.06	1548219.43	927.81	RT90-RHB70	-82.90	61.61	81.1800	45.2100	-6.7600
960.00	6367157.23	1548219.76	930.79	RT90-RHB70	-82.87	61.42	81.3600	45.5300	-6.8500
963.00	6367157.41	1548220.08	933.76	RT90-RHB70	-82.83	61.36	81.5500	45.8600	-6.9400
966.00	6367157.59	1548220.41	936.74	RT90-RHB70	-82.83	61.28	81.7400	46.1800	-7.0200
969.00	6367157.77	1548220.74	939.72	RT90-RHB70	-82.85	61.45	81.9300	46.5000	-7.1100
972.00	6367157.95	1548221.07	942.69	RT90-RHB70	-82.85	61.69	82.1200	46.8200	-7.2000
975.00	6367158.13	1548221.40	945.67	RT90-RHB70	-82.84	62.07	82.3000	47.1500	-7.2900
978.00	6367158.30	1548221.73	948.65	RT90-RHB70	-82.77	62.47	82.4900	47.4700	-7.3800
981.00	6367158.48	1548222.06	951.62	RT90-RHB70	-82.69	62.70	82.6700	47.8000	-7.4700
987.00	6367158.83	1548222.75	957.57	RT90-RHB70	-82.60	63.33	83.0400	48.4800	-7.6500

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Appendix 8

In data: Reference marks for length adjustments for KLX04

Reference Mark T - Reference mark in drillhole

KLX04, 2004-07-04 11:00:00 (110.000 - 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
110.00	400.00	340	1000	36.0	135	Yes		
150.00	400.00	260	1000	38.0	72	Yes		
200.00	400.00	250	1000	44.0	66	Yes		
250.00	400.00	250	1000	42.0	71	Yes		
300.00	400.00	260	1000	42.0	75	Yes		
349.00	400.00	250	1000	43.0	66	Yes		
400.00	400.00	260	1000	43.0	76	Yes		
450.00	400.00	260	1000	49.0	127	Yes		
500.00	400.00	260	1000	48.0	91	Yes		
550.00	400.00	260	1000	42.0	86	Yes		
600.00	400.00	260	1000			Yes		Inget tryckfall
650.00	400.00	280	1000	43.0	68	Yes		
700.00	400.00	280	1000	46.0	89	Yes		
750.00	400.00	280	1000			Yes		Inget tryckfall
800.00	400.00	280	1000		121	Yes		Inget tryckfall
849.00	400.00	500	1000		253	Yes		Inget tryckfall
899.00	400.00	500	1000		202	Yes		Inget tryckfall
950.00	400.00	380	1000	43.0	137	Yes		Inget tryckfall

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