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Oskarshamn site investigation

Boremap mapping of telescopic drilled borehole KLX15A

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Keywords: KLX15A, Geology, Drill core mapping, Boremap, Fractures, BIPS, Laxemar.

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

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Abstract

This report presents the Boremap mapping of KLX15A, which is a c. 1,000 m long telescopic core drilled borehole. The borehole was drilled with the orientation 199/–54°. The mapping was conducted between 2007-04-05 and 2007-05-10.

The documentation of geological structures and lithologies intersecting borehole KLX15A was made using the drill core and BIPS-images. Geological structures are correctly oriented in space along the borehole with the Boremap system.

The lithology in KLX15A (Table 5-1) is dominated by quartz monzodiorite (501036). Subordinate rock types comprise Ävrö granite (501044), fine-grained granite (511058), fine-grained diorite-gabbro (505102), pegmatite (501061) and granite (501058).

Twelve sections have been highlighted based on increased fracture frequencies, alterations and structural features. These sections cover the following intervals: 193.1–197.9 m, 250.5–254.6 m, 260.5–265.6 m, 379.3–385.5 m, 401.9–409.1 m, 502.5–505.6 m, 602.2–608.7 m, 629.4–634.9 m, 675.0–682.9 m, 711.4–744.1 m, 772.6–774.2 and 978.4–1,000.4 m.

Sammanfattning

Denna rapport presenterar boremapkarteringen av KLX15A som är ett ca 1 000 meter långt kärnborrhål. Borrhålet borrades med orienteringen 199/–54° och karterades mellan 2007-04-05 och 2007-05-10.

Dokumentationen av geologiska strukturer och litologi som genomskär borrhål KLX15A har utförts med borrkärna och BIPS-bilder. Geologiska strukturer har orienterats i rummet längs med borrhålet med Boremap systemet.

KLX15A domineras av kvartsmonzodiorit (501036). Underordnade bergarter utgörs av Ävrö granit (501044), finkornig granit (511058), finkornig diorit-gabbro (505102), pegmatit (501061) och granit (501058).

Tolv sektioner i KLX15A kan urskiljas baserat på förhöjd sprickfrekvens, bergets omvandlingar och geologiska strukturer. Dessa sektioner återfinns i följande intervall: 193,1–197,9 m, 250,5–254,6 m, 260,5–265,6 m, 379,3–385,5 m, 401,9–409,1 m, 502,5–505,6 m, 602,2–608,7 m, 629,4–634,9 m, 675,0–682,9 m, 711,4–744,1 m, 772,6–774,2 och 978,4–1 000,4 m.

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1 Introduction

This report gives a brief presentation of the data gained from the mapping of KLX15A in the Laxemar 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 400-07-046. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents. Rock type nomenclature that has been used is shown in Table 1-2.

SKB investigates two potential sites for a deep repository for 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 1,000 m at these sites, SKB has initiated a drilling program using core drilled boreholes. Every borehole usually starts with a percussion drilled part the first 100 m, where only drill cuttings are examined together with BIPS, followed by core drilling.

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

Activity plan	Number	Version
Boremapkartering av KLX15A	AP PS 400-07-046	1.0
Method descriptions	Number	Version
Nomenklatur vid Boremapkartering	SKB MD 143.008	1.0
Method Description for Boremap mapping	SKB MD 143.006	2.0
Mätsystembeskrivning för Boremap	SKB MD 146.005	1.0
Instruktion: Regler för bergarters benämningar vid platsundersökning I Oskarshamn	SKB MD 132.004	1.0
Instruktion för längdkalibrering vid undersökningar i kärnborrhål	SKB MD 620.010	2.0

Table 1-2. Rock type nomenclature for the site investigation at Oskarshamn.

Rock type	Rock code	Rock description
Dolerite	501027	Dolerite
Fine-grained Götemar granite	531058	Granite, fine- to medium-grained, ("Götemar granite")
Coarse-grained Götemar granite	521058	Granite, coarse-grained, ("Götemar granite")
Fine-grained granite	511058	Granite, fine- to medium-grained
Pegmatite	501061	Pegmatite
Granite	501058	Granite, medium- to coarse-grained
Ävrö granite	501044	Granite to quartz monzodiorite, generally porphyritic
Quartz monzodiorite	501036	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic
Diorite/gabbro	501033	Diorite to gabbro
Fine-grained dioritoid	501030	Intermediate magmatic rock
Fine-grained diorite-gabbro	505102	Mafic rock, fine-grained
Sulphide mineralization	509010	Sulphide mineralization
Sandstone	506007	Sandstone

Borehole KLX15A is situated within the Laxemar area (Figure 1-1). KLX15A is a c. 1,000 m long telescopic borehole with the orientation 199/–54°. Mapping of the borehole was performed between 2007-04-05 and 2007-05-10.

Detailed mapping of the drill cores is essential for a three dimensional modelling of the geology at depth. The mapping is based on the use of BIPS-image (Borehole Image Processing System) of the borehole wall and by the study of the drill core itself. The BIPS-image enables the study of orientations, since the Boremap software calculates strike and dip of planar features such as foliations, rock contacts and fractures.

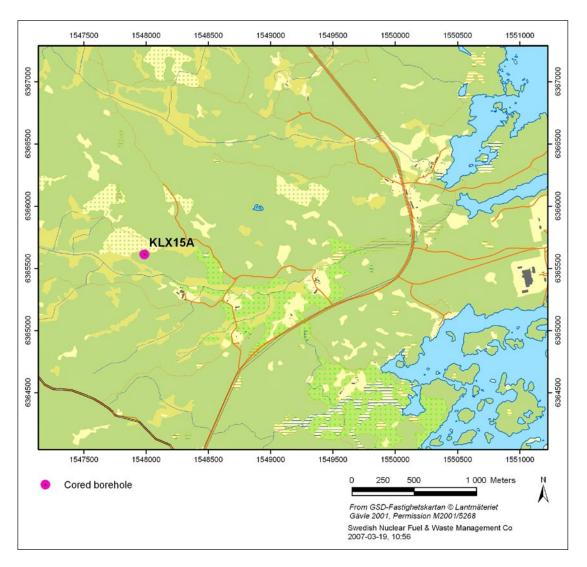


Figure 1-1. Location of the core drilled borehole KLX15A.

2 Objective and scope

The principal aim of the mapping activities presented in this report is to obtain a documentation of geological structures and lithologies intersecting borehole KLX15A. Geological structures will be correctly orientated in space along the borehole with the Boremap system. The result 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

Software used for the mapping of KLX15A was Boremap v. 3.9 with bedrock and mineral standards of SKB. The data presentation was made using WellCad v. 4, Microsoft Access and Microsoft Excel. Boremap is the software that unites orthodox core mapping with modern video mapping, where Boremap shows the 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 is used to facilitate the core mapping: folding rule, pen, diluted hydrochloric acid, knife, water-filled atomiser and hand lens.

3.3 BIPS-image video film sequences

The BIPS-image of KLX15A covers the interval 77.00 m-980.24 m.

3.4 BIPS-image video film quality

The visibility of thin fractures in BIPS depends on image resolution, image contrast and image quality.

3.4.1 BIPS-image resolution

Resolution of the BIPS-image is perhaps the principal reason why very thin fractures as well as very thin apertures are not visible in the BIPS-image and the resolution depends on the BIPS video camera pixel size and illumination angle.

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 contrast between the fracture and the wall rock. A bright fracture in a dark rock is clearly visible in the BIPS-image. But a bright coloured fracture in a light coloured 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 very rare cases 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.

3.4.3 BIPS-image quality

BIPS-image quality is sometimes limited due to:

- 1) blackish coatings probably related to the drilling equipment,
- 2) vertical bleached bands from the clayey mixture of drill cuttings and water,
- 3) light and dark bands at high 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.

Vertical bleached bands and blackish coatings are usually the main disturbances in the BIPS-image quality.

The image quality is classified into four levels; good, acceptable, bad and very bad. Good quality means a more or less clear image which is easy to interpret. If the quality is acceptable it means that the image is not good, but that the mapping can be performed without any problems. An image of bad quality is somewhat difficult to interpret while an image of very bad quality cannot be interpreted except from very obvious and outstanding features. When the BIPS-image quality is so bad that fractures and structures cannot be identified, they can still be oriented using the *guide-line method* (section 4.3.3). The BIPS-image quality for KLX15A is presented in Table 3-1.

Table 3-1. BIPS-image quality in KLX15A.

To (m)	Quality
91	Acceptable
648	Good
652	Bad
980	Acceptable
	91 648 652

4 Execution

4.1 General

Mapping of the drill core of the telescopic drilled borehole was performed and documented according to activity plan AP PS 400-07-046 (SKB, internal document) referring to the Method Description for Boremap mapping (SKB MD 143.006, v. 2.0), Nomenklatur vid Boremapkartering (SKB MD 143.008, v. 1.0), Instruktion: Regler för bergarters benämningar vid platsundersökningen i Oskarshamn (SKB MD 132.004, v. 1.0) and Instruktion för längdkalibrering vid undersökningar i kärnborrhål (SKB MD 620.010, v. 2.0), all of them SKB internal documents.

The drill core was displayed on inclined roller tables and mapped in its entire length with the Boremap software. The core mapping was carried out without any detailed geological knowledge of the area but with access to geophysical logs from the borehole and rock samples.

The term *oxidation* has been used as an alteration type until the mapping of KLX05. However, research has shown that the red colour of the bedrock is actually not only a result of oxidation. Since April 2005 the term *red staining* is used instead of the term *oxidation*.

The mapping was performed by Karl-Johan Mattsson and Peter Dahlin (Geosigma AB)

4.2 Preparations

Any depth registered in the BIPS-image deviates from the true depth in the borehole, a deviation which increases with depth, with approximately 0.4 m/100 m. This problem is eliminated by adjusting the depth of the BIPS-image to reference slots cut into the borehole walls every fiftieth meter (Appendix 7). The level for each slot is measured in the BIPS-images and then adjusted to the correct level using the correct depth value from the SICADA database.

Necessary in data for length adjustment and orientation in space are borehole diameter, reference marks, length and deviation; all data is collected from SICADA database (Appendices 6–8).

4.3 Execution of measurements

Concepts used during the core mapping, are defined in this chapter.

4.3.1 Fracture definitions

Definitions of different fracture types and aperture, crush zones and sealed fracture network are found in Nomenklatur vid Boremapkartering (SKB MD 143.008, v. 1.0), SKB internal document.

Two types of fractures are mapped in Boremap; broken and unbroken. Broken are fractures that split the core while unbroken fractures do not split the core. All fractures are described with their fracture minerals and other characteristics, e.g. width, aperture and roughness. Visible apertures are measured down to 1 mm in the BIPS-image. Smaller apertures, which are impossible to detect in the BIPS-image, are denoted a value of 0.5 mm. If the core pieces don't fit well, the aperture is considered "probable". If the core pieces do fit well, but the fracture surfaces are dull or altered, the aperture is considered "possible".

All fractures with apertures > 0 mm are treated as open in the SICADA database. Only few broken fractures are given the aperture = 0 mm. Unbroken fractures usually have apertures = 0 mm. Unbroken fractures that have apertures > 0 mm are interpreted as partly open and are included in the open-category. Open and sealed fractures are finally frequency calculated and shown in Appendix 1.

4.3.2 Fracture alteration and joint alteration number

Joint alteration number is principally related to the thickness of, and the clay content in a fracture. Thick fractures rich in clay minerals are given joint alteration numbers between 2 and 3. The majority of the broken fractures are very thin to extremely thin and seldom contain clay minerals. These fractures receive 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 as follows:

- a) fracture wall alterations,
- b) fracture mineral fillings assumed to have been deposited from circulating water-rich solutions,
- 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, e.g. oxidation or epidotization, and without mineral fillings is considered as fresh. The joint alteration number is thus set to 1.

Minerals such as calcite, quartz, fluorite, zeolites, laumontite and sulphides are regarded as deposited by circulating water-rich solutions and not as true fracture alteration minerals. The joint alteration number is thus set to 1.

Joint alteration number equal to 1.5: epidote, prehnite, hematite, chlorite and/or clay minerals are regarded as fracture minerals most likely resulting from altered wall rock. A weak alteration is thus assumed and the joint alteration number was set to 1.5. Extra considerations have been given to clay minerals since the occurrence of these minerals often resulted in a higher joint alteration number.

Joint alteration numbers higher than 1.5: When the mineral fillings is thick and contain a few mm of clay minerals, often together with epidote and chlorite, the joint alteration number is set to 2. In rare cases, when a fracture contains 5–10 mm thick clay, together with chlorite, the joint alteration number is set to 3 or higher.

When the alteration of a fracture is 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 is 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:

- Amplitude (measured along the drill core) which is the interval between fracture extremes along the drill core.
- The relation between the orientations of the fracture trace, measured on the drill core and a well defined structure visible in the BIPS-image.
- Absolute depth.

Orientation of fractures and other structures with the *guide-line method* is done in the following way: The first step is to calculate the amplitude of the fracture trace in the BIPS-image (with 76 mm diameter) from the measured fracture amplitude in the drill core (with 50 mm diameter). 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 trace is then put at the correct depth according to the depth measured on the drill core.

The *guide-line method* can be used to orientate any feature that is not 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 feature as the personnel delineating the trace in the BIPS-image, especially in intervals rich in fractures.

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. Accordingly, the *guide-line method* is so far considered better than mapping lots of non-oriented fractures. The fractures in question are mapped as "non-visible in BIPS" and can therefore be separated from fractures visible in BIPS which probably have a more accurate orientation.

4.3.4 Definition of veins and dikes

Rock occurrence is the way Boremap handles the occurrence of lithology up to 1 meter wide. Chiefly two different rock occurrences are mapped: veins and dikes. These two are separated by their respectively length in the drill core; veins are set to 0–20 cm and dikes are set to 20–100 cm. Rock occurrences that covers more than 100 cm of the drill core 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:

- X2 Barite.
- X5 Bleached fracture walls.
- X7 Fractures with a fresh appearance and no detectable mineral.
- X8 Fractures with epidotized / saussuritized walls.

4.4 Data handling

Mapping of the drill core is performed on-line on the SKB network, in order to obtain the best possible data security. Before every break (> 15 minutes) a back-up is saved on the local disk. Regular quality controls are performed. Every working day a Summary report (from Boremap) and a WellCad plot are printed in order to find possible misprints. The mapping is also quality checked by a routine in Boremap before it is exported to and archived in SICADA database. Personnel from SKB also perform spot test controls and regular quality revisions. All primary data is stored in SKB's database SICADA and only these data are later used for interpretation and modelling.

4.5 Geological Summary table, general description

A Geological Summary table (Appendix 1) is an overview of the features mapped with the Boremap software. It also facilitates comparisons between Boremap information collected from different boreholes and is more objective than a pure descriptive borehole summary.

All information is taken directly from the Boremap database using simple and well defined search paths for each geological parameter (Appendix 2).

The Geological Summary table consists of 23 columns, each one representing a specific geological parameter, presented as either intervals or frequencies (see section 4.5.1 for column description). Intervals are calculated for parameters with a width ≥ 1 m and frequencies for parameters with a width < 1 m. Frequency information is treated as point observations. It should be noted that parameters with a thickness of only 1 mm get 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 red staining*.
- No *unbroken fractures* are mapped in intervals of *sealed fracture network*.
- No broken fractures are mapped in intervals with crush.
- Hybrid rock and composite dikes generally include a large amount of fine to medium grained granite veins. These veins are not mapped and the frequency presented for veins + dikes in column 6 (Appendix 1) are lower than the true frequency in composite dike intervals.

4.5.1 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 / Type*, interval column. No frequency column is presented for alteration/ type. The alteration/ type column are 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 + Dikes < 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.

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 / Foliated < 1 m wide* is a frequency column. Sections with foliation < 1 m wide are mapped as rock occurrence/structure in Boremap.
- **Column 13:** *Structure* / *Foliated* ≥ 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 as well as broken 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 and > 0.5, frequency column. This column includes fractures that certainly 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* / $Crush \ge 1$ m wide, interval column. This column includes longer sections with crush.

4.6 Nonconformities

The section at 77.00–980.24 m was mapped with drill core and BIPS and the section at 980.242–1,000.43 m only with core.

Core loss occurs at 216.541–216.591 m and at 996.075–996.545 m.

5 Results

5.1 General

Borehole KLX15A is oriented 199/–54°. The drill core covers the interval 77.00–1,000.43 m and the BIPS-image covers the interval 77.00–980.24 m.

All results from the mapping are principally found in the Appendices. Information from the SICADA database is shown in the Geological Summary table in Appendix 1 and a search path to Geological Summary table is presented in Appendix 2. The BIPS-image is presented in Appendix 3, the WellCad diagram in Appendix 4 and In-data, such as borehole length, reference marks, deviation data and diameter are presented in Appendices 6–8.

Original data from the reported activity are stored in the primary database SICADA. Data are traceable in SICADA by the Activity Plan number (AP PS 400-07-046). Only data in databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the databases may be revised, if needed. Such revisions will not necessarily result in a revision of the P-report, although the normal procedure is that major revisions entail a revision of the P-report. Minor revisions are normally presented as supplements, available at www.skb.se.

5.2 Lithology and structures

The lithology in KLX15A (Table 5-1) is dominated by quartz monzodiorite (501036). Subordinate rock types comprise Ävrö granite (501044), fine-grained granite (511058), fine-grained diorite-gabbro (505102), pegmatite (501061) and granite (501058).

Table 5-1. Lithology distribution in KLX15A.

Rock types	%
Quartz monzodiorite (501036)	95.4
Ävrö granite (501044)	2.1
Fine-grained granite (511058)	1.0
Fine-grained diorite-gabbro (505102)	0.9
Pegmatite (501061)	0.5
Granite (501058)	0.1

Twelve sections in KLX15A are recognized by increased fracture frequencies, alterations and structural features;

Section interval characteristics

- 1. 193.1–197.9 m. Increased frequency of sealed fractures and sealed fracture networks, slight increase of open fractures. The section is related to a deformed fine-grained diorite-gabbro (505102). Two crush zones occur within the section. The section is partly faint saussuritizated.
- 2. 250.5–254.6 m. Slight increased frequency of open fractures, sealed fractures and sealed fracture networks, ductile shear zones and one cataclasite.
- 3. 260.5–265.6 m. Increased frequency of open fractures and open fractures with aperture > 0.5 mm, sealed fractures and sealed fracture networks. Two crush zone occur in the section. The section is faint saussuritizated and faint to medium red stained.
- 4. 379.3–385.5 m. Increased frequency of sealed fractures, sealed fracture networks, brittle-ductile and ductile shear zones and cataclasites. The section is weak to medium red stained.
- 5. 401.9–409.1 m. Increased frequency of sealed fractures, sealed fracture networks, cataclasites and one brittle-ductile shear zone. The section is weak to medium red stained and partly weak saussuritizated.
- 6. 502.5–505.6 m. Slight increased frequency of sealed fractures, sealed fracture networks, cataclasites and brittle-ductile shear zones. The section is partly weak to medium red stained.
- 7. 602.2–608.7 m. Slight increased frequency of sealed fractures and sealed fracture networks. One cataclasite and one brittle-ductile shear zone. The section is partly weak to medium red stained.
- 8. 629.4–634.9 m. Increased frequency of open fractures and open fractures with aperture > 0.5 mm, sealed fractures and sealed fracture networks. Two crush zones occur in the section. The section is weak to medium red stained and partly weak epidotized and chloritized. The last 3 m of the section has a vuggy appearance.
- 9. 675.0–682.9 m. Increased frequency of sealed fractures, sealed fracture networks and cataclasites. One brittle-ductile shear zone and one breccia occur within the section. The section is faint to strong red stained and partly faint epidotized.
- 10. 711.4–744.1 m. Inhomogeneous section. Increased frequency of sealed fractures and sealed fracture networks. A slight increase of open fractures. Scattered cataclasites, brittle-ductile and ductile shear zones and breccias. The section is partly weak to medium red stained and partly medium epidotized.
- 11. 772.6–774.2 m. Increased frequency of open fractures, sealed fractures and sealed fracture networks. The section is related to a deformed fine-grained diorite-gabbro (505102). The section is partly faint saussuritizated.
- 12. 978.4–1,000.4 m. Increased frequency of sealed fractures and sealed fracture networks. Moderate increases of open fractures, brittle-ductile and ductile shear zones and cataclasite. One core loss occurs in the section. The section is faint to strong red stained and partly faint to weak saussuritizated.

5.3 Fracture mineralogy

Tables 5-3 and 5-4 show the frequency of minerals and rock wall alteration in sealed fractures and open fractures respectively. Minerals less than 0.1 % are not accounted for. For X-mineral classification, see section 4.3.5.

Calcite and chlorite are the most frequently occurring minerals in open fractures. Subordinate minerals are pyrite, clay minerals, epidote, oxidized walls and hematite. In sealed fractures the dominating minerals and rock wall alterations are calcite and oxidized walls. Subordinate minerals and rock wall alteration are chlorite, epidote, X8 (fractures with epidotized / saussuritized walls), quartz and prehnite.

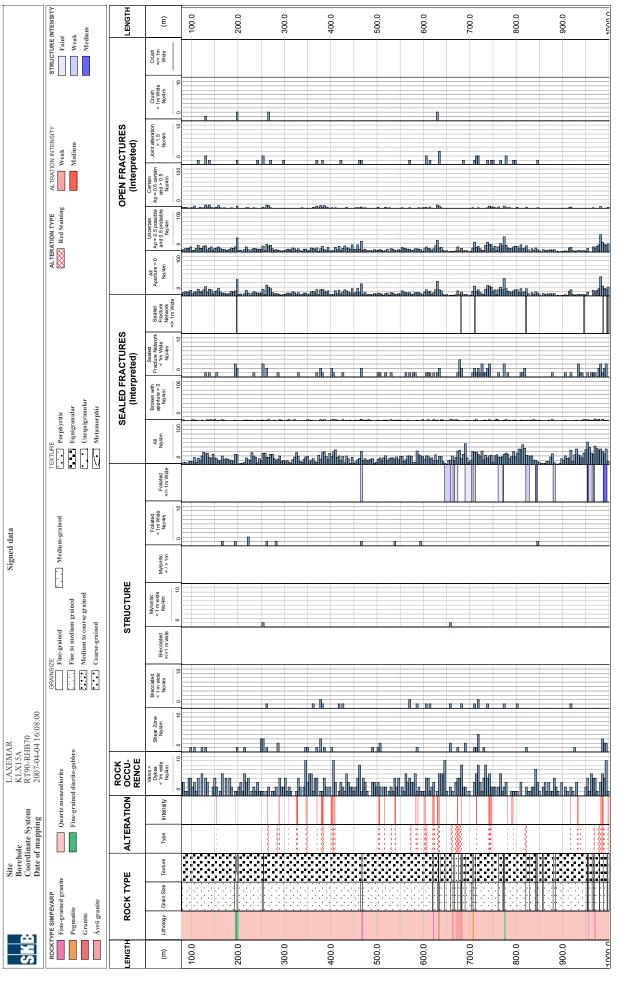
Table 5-3. Frequency of minerals and rock wall alteration in open fractures.

Mineral	%
Calcite	84.4
Chlorite	83.0
Pyrite	15.2
Clay Minerals	11.2
Epidote	8.3
Oxidized Walls	8.2
Hematite	3.6
X7	1.3
Quartz	1.2
Zeolite	8.0
Adularia	0.5
X5	0.5
X8	0.5
Prehnite	0.4
Unknown mineral	0.4
Laumontite	0.3
Sulphides	0.2
Iron Hydroxide	0.1
X2	0.1

Table 5-4. Frequency of minerals and rock wall alteration in sealed fractures.

Mineral	%
Calcite	47.9
Oxidized Walls	42.3
Chlorite	24.3
Epidote	23.9
X8	10.2
Quartz	9.0
Prehnite	6.9
X5	5.2
White Feldspar	4.8
Hematite	1.3
Adularia	1.2
Pyrite	1.0
Red Feldspar	0.3
X7	0.2
Laumontite	0.1

Geological Summary table for KLX15A



Appendix 2

Search paths for the Geological Summary table

TAB	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	9 gns g		Interval
Alteration	Туре	7	7 Sub 1 = 700		Interval
	Intensity	7	7 Sub 1 = 700	Sub 2	Interval
Rock occurrence	Vein + dyke	31	31 Sub 1 = 2 and 18		Frequence
Structure	Shear zone, < 1m wide	31	31 Sub 4 = 41 and 42		Frequence
	Brecciated, < 1m wide	31	Sub 4 = 7		Frequence
	Brecciated, >/= 1m wide	2	5 Sub 3 = 7	Sub 4; 101 and 102 = 102	Interval
		5	5 Sub 3 = 7	Sub 4; 103 and 104 = 104	
	Mylonite, < 1 m wide	31	31 Sub 4 = 34		Frequence
	Mylonite, >/= 1 m wide	2	Sub 3 = 34	Sub 4; 101 and 102 = 102	Interval
		5	Sub 3 = 34	Sub 4; 103 and 104 = 104	
	Foliated, < 1 m wide	31	31 Sub 4 = 81		Frequence
	Foliated, >/= 1 m wide	5	5 Sub 3 = 81	Sub 4; 101 and 102 = 102	Interval
		5	Sub 3 = 81	Sub 4; 103 and 104 = 104	
Sealed fracture	All unbroken fractures	3			Frequence
	and broken fractures	2	SNUM 11= 0		
	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	and 3 SNum 11>0		Frequence
	Uncertain, Aperture = 0.5 possible	2 and 3	and 3 SNum 11>0	3	Frequence
	and 0.5 probable	and 3	SNum 11>0	Sub 12 = 2	
	Certain, Aperture = 0.5 and >0.5	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

Appendix 3

BIPS-image for KLX15A

Borehole Name: KLX15A

Mapping Name: KLX15A_Geosigma_1

Mapping Range: 77.000 - 979.597 m

Diameter: 76.0 mm

Printed Range: 77.000 - 979.272

Pages: 47

Image File Information:

G:\skb\bips\oskarshamn\KLX15A\Used\KLX15A_77-979m.BIP 2007-03-28 12:39:00 77.000 m File: Date/Time:

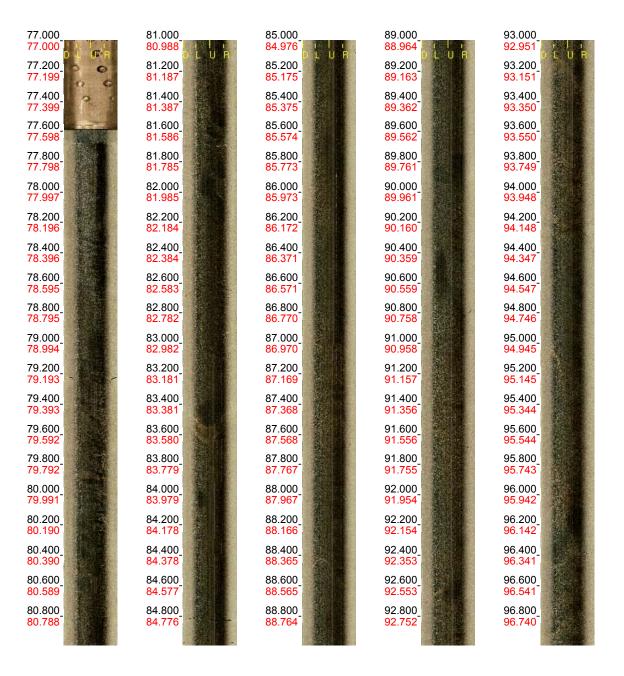
Start Depth: End Depth: 979.272 m

Resolution: 1.00 mm/pixel (depth)

Orientation: Gravmetric 902272 pixels 360 pixels BIP-III Image height: Image width: BIP Version: Locality: LAXEMAR Borehole: KLX15A Scan Direction: Down Color adjust: 0 0 0 (RGB)

Printed: 2007-05-10 16:03:58 Scale: 1:20 Aspect: 150 % 1 (47) Borehole: KLX15A Depth range: 77.000 - 97.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.9 Inclination: -50.8



Borehole: KLX15A Depth range: 97.000 - 117.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.9 Inclination: -50.9



Borehole: KLX15A Depth range: 117.000 - 137.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 197.0 Inclination: -50.8



Borehole: KLX15A Depth range: 137.000 - 157.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.8 Inclination: -50.7

137.000	141.000	145.000	149.000	153.000
137.031	141.042	145.053	149.064	153.077
137.200	141.200	145.200	149.200	153.200
137.232	141.243	145.254	149.265	153.278
137.400 ₁	141.400 ₋	145.400_ 145.455	149.400 149.466	153.400 153.478
137.600 ₁	141.600_	145.600	149.600	153.600
	141.644	145.655	149.666	153.679
137.800 ₁	141.800 __	145.800 ₋	149.800	153.800
137.834	141.845	145.856	149.867	153.880
138.000	142.000	146.000	150.000	154.000
138.034	142.045	146.056	150.067	154.080
138.200	142.200	146.200	150.200	154.200
138.235	142.246	146.257	150.268	154.281
138.400	142.400 ₁	146.400	150.400	154.400
138.435		146.457	150.469	154.482
138.600 ₁	142.600 ₋	146.600 146.658	150.600 150.669	154.600 154.682
138.800	142.800	146.800	150.800	154.800
138.836	142.847	146.858	150.870	154.883
139.000	143.000	147.000	151.000	155.000
139.037	143.048	147.059	151.071	155.084
139.200 ₁	143.200 ₁	147.200	151.200	155.200
139.238		147.259	151.271	155.284
139.400 _{139.438}	143.400_	147.400	151.400	155.400
	143.449	147.460	151.472	155.485
139.600	143.600	147.600	151.600	155.600
139.639	143.650	147.661	151.673	155.686
139.800	143.800	147.800	151.800	155.800
139.839	143.850	147.861	151.873	155.886
140.000	144.000	148.000	152.000	156.000
140.040	144.051	148.062	152.074	156.087
140.200	144.200	148.200	152.200	156.200
140.240	144.251	148.262	152.275	156.288
140.400	144.400	148.400	152.400	156.400
140.441	144.452	148.463	152.475	156.488
140.600	144.600	148.600	152.600	156.600
140.641	144.652	148.663	152.676	156.689
140.800 _{140.842}	144.800 ₁	148.800 148.864	152.800 152.876	156.800 156.890
北西鄉				

Borehole: KLX15A Depth range: 157.000 - 177.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.5 Inclination: -50.5



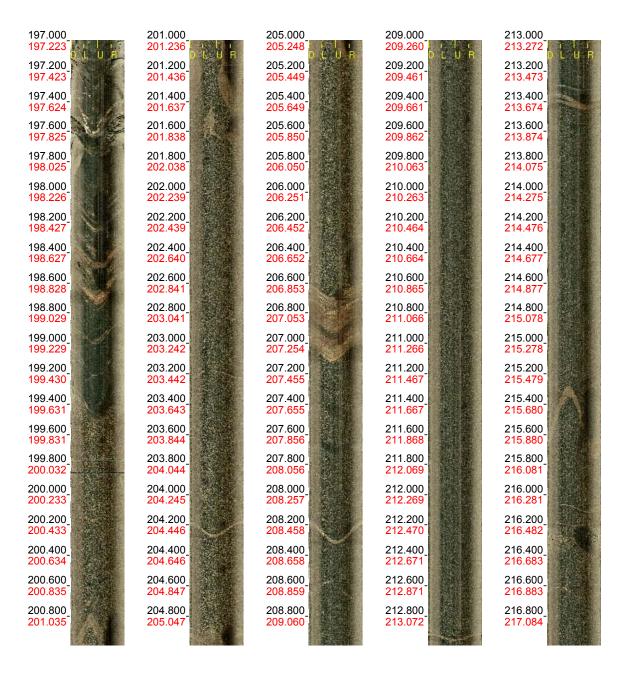
Borehole: KLX15A Depth range: 177.000 - 197.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.3 Inclination: -50.5



Borehole: KLX15A Depth range: 197.000 - 217.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.6 Inclination: -50.5



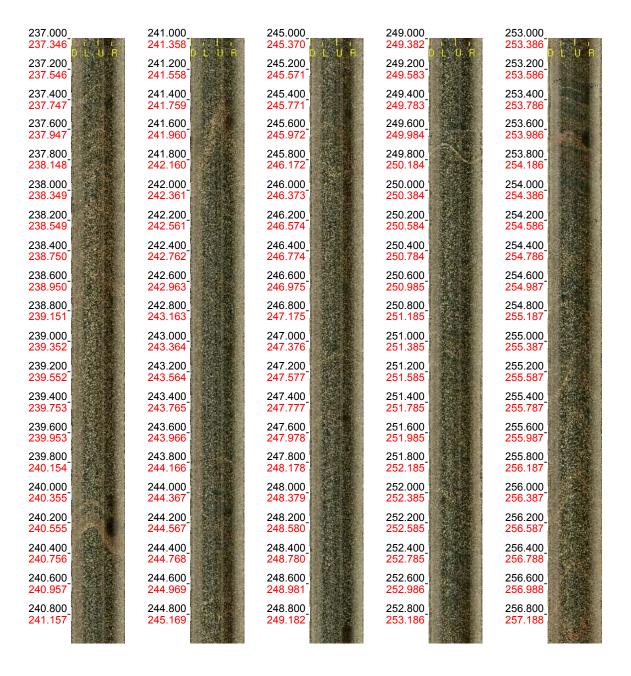
Borehole: KLX15A Depth range: 217.000 - 237.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 196.0 Inclination: -50.3

217.000	221.000	225.000	229.000	233.000
217.285	221.297	225.309	229.321	233.333
217.200	221.200	225.200	229.200	233.200
217.485	221.497	225.510	229.522	233.534
217.400	221.400_	225.400	229.400_	233.400
217.686	221.698	225.710	229.722	233.735
217.600	221.600	225.600 _{225.911}	229.600	233.600
217.886	221.899		229.923	233.935
217.800	221.800	225.800	229.800	233.800
218.087	222.099	226.111	230.124	234.136
218.000	222.000	226.000	230.000	234.000
218.288	222.300	226.312		234.336
218.200 218.488	222.200 _{222.500}	226.200 _{226.513}	230.200 230.525	234.200 234.537
218.400	222.400_	226.400	230.400	234.400
218.689	222.701	226.713	230.725	234.738
218.600	222.600	226.600	230.600	234.600
218.889	222.902	226.914	230.926	234.938
218.800	222.800 ₂	226.800 _{227.114}	230.800	234.800 ₂
219.090	223.102		231.127	235.139
219.000	223.000 ₂	227.000 _{227.315}	231.000 ₂	235.000 ₂
219.291	223.303		231.327	235.339
219.200	223.200	227.200	231.200	235.200
219.491	223.503	227.516	231.528	235.540
219.400	223.400	227.400	231.400	235.400
219.692	223.704	227.716	231.728	235.741
219.600	223.600	227.600	231.600	235.600
219.892	223.905	227.917	231.929	235.941
219.800	223.800_	227.800	231.800	235.800
220.093	224.105	228.117	232.130	236.142
220.000	224.000	228.000	232.000	236.000
220.294	224.306	228.318	232.330	236.342
220.200	224.200	228.200	232.200	236.200
220.494	224.507	228.519	232.531	236.543
220.400	224.400_	228.400_	232.400	236.400 ₂
220.695	224.707	228.719	232.731	236.744
220.600	224.600 ₂	228.600	232.600	236.600
220.896	224.908	228.920	232.932	236.944
220.800	224.800	228.800	232.800 233.133	236.800
221.096	225.108	229.121		237.145

Borehole: KLX15A Depth range: 237.000 - 257.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.6 Inclination: -50.2



Borehole: KLX15A Depth range: 257.000 - 277.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.5 Inclination: -50.0



Borehole: KLX15A Depth range: 277.000 - 297.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.3 Inclination: -49.9



Borehole: KLX15A Depth range: 297.000 - 317.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.4 Inclination: -49.8

297.000 297.409	301.000 ₃	305.000 ₃	309.000 309.424	313.000 313.430
297.200	301.200	305.200	309.200	313.200
297.609	301.612	305.619	309.625	313.631
297.400 297.809	301.400 ₃	305.400 ₃	309.400 309.825	313.400 313.831
297.600	301.600	305.600	309.600	313.600
298.009	302.013	306.019	310.025	314.031
297.800	301.800	305.800	309.800	313.800
298.209	302.213	306.219	310.226	314.232
298.000	302.000	306.000	310.000	314.000
298.409	302.414	306.420	310.426	314.432
298.200	302.200	306.200 _{306.620}	310.200	314.200
298.609	302.614		310.626	314.632
298.400 298.809	302.400 _{302.814}	306.400 ₃	310.400 310.826	314.400 314.833
298.600 299.009	302.600 ₃	306.600 _{307.021}	310.600 311.027	314.600 315.033
298.800	302.800	306.800	310.800	314.800
299.210	303.215	307.221	311.227	315.233
299.000 299.410	303.000 _{303.415}	307.000 ₃	311.000 311.427	315.000 315.433
299.200	303.200	307.200	311.200	315.200
299.610	303.616	307.622	311.628	315.634
299.400	303.400	307.400	311.400	315.400
299.810	303.816	307.822	311.828	315.834
299.600	303.600	307.600	311.600	315.600
300.010	304.016	308.022	312.028	316.034
299.800	303.800 _{304.216}	307.800	311.800	315.800
300.210		308.222	312.229	316.235
300.000	304.000	308.000	312.000	316.000
300.411	304.417	308.423	312.429	316.435
300.200	304.200	308.200	312.200	316.200
300.611	304.617	308.623	312.629	316.635
300.400	304.400	308.400 _{308.823}	312.400	316.400
300.811	304.817		312.829	316.836
300.600	304.600 _{305.018}	308.600	312.600	316.600
301.012		309.024	313.030	317.036
300.800	304.800	308.800	312.800 _{313.230}	316.800
301.212	305.218	309.224		317.236

Borehole: KLX15A Depth range: 317.000 - 337.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.3 Inclination: -49.8



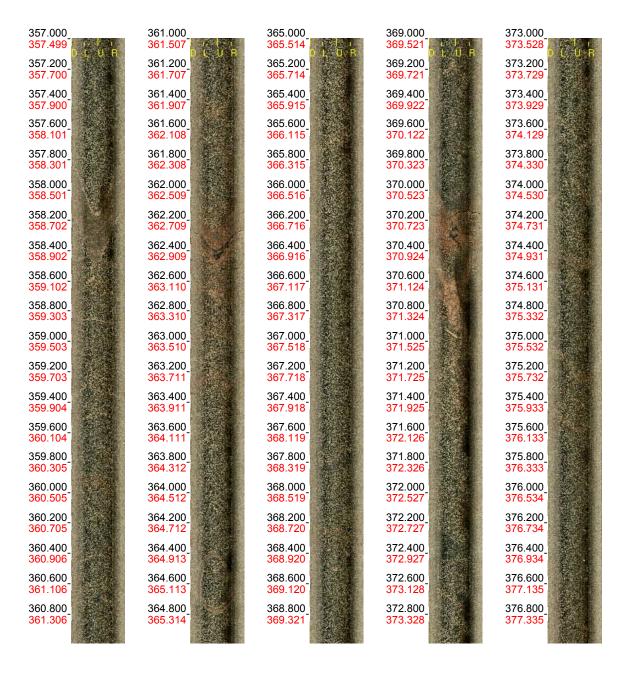
Borehole: KLX15A Depth range: 337.000 - 357.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.1 Inclination: -49.8

337.000	341.000	345.000	349.000	353.000
337.467	341.473	345.479	349.485	353.492
337.200	341.200	345.200	349.200	353.200
337.667	341.673	345.679	349.686	353.693
337.400	341.400_	345.400 ₃	349.400	353.400
337.868	341.874		349.886	353.893
337.600	341.600_	345.600 ₃	349.600	353.600
338.068	342.074		350.086	354.093
337.800 338.268	341.800 __ 342.274	345.800 ₃	349.800 350.286	353.800 _{354.294}
338.000 338.468	342.000_ 342.475	346.000 ₃	350.000 350.487	354.000 _{354.494}
338.200	342.200	346.200 ₃	350.200	354.200
338.669	342.675		350.687	354.694
338.400	342.400_	346.400 ₃	350.400 __	354.400 ₋
338.869	342.875		350.888	354.895
338.600	342.600	346.600 _{347.082}	350.600	354.600
339.069	343.075		351.088	355.095
338.800	342.800	346.800	350.800	354.800
339.270	343.276	347.282	351.288	355.296
339.000	343.000 __	347.000 ₃	351.000	355.000_
339.470	343.476		351.489	355.496
339.200	343.200	347.200	351.200	355.200
339.670	343.676	347.682	351.689	355.696
339.400	343.400_	347.400	351.400	355.400
339.871	343.877	347.883	351.889	355.897
339.600	343.600	347.600	351.600	355.600
340.071	344.077	348.083	352.090	356.097
339.800	343.800	347.800	351.800	355.800
340.271	344.277	348.283	352.290	356.297
340.000	344.000	348.000	352.000	356.000
340.471	344.478	348.484	352.490	356.498
340.200	344.200	348.200	352.200	356.200
340.672	344.678	348.684	352.691	356.698
340.400	344.400	348.400	352.400	356.400
340.872	344.878	348.884	352.891	356.898
340.600	344.600	348.600	352.600	356.600
341.072	345.079	349.085	353.092	357.099
340.800	344.800	348.800	352.800	356.800
341.273	345.279	349.285	353.292	357.299
		A COL		

Borehole: KLX15A Depth range: 357.000 - 377.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.1 Inclination: -49.7



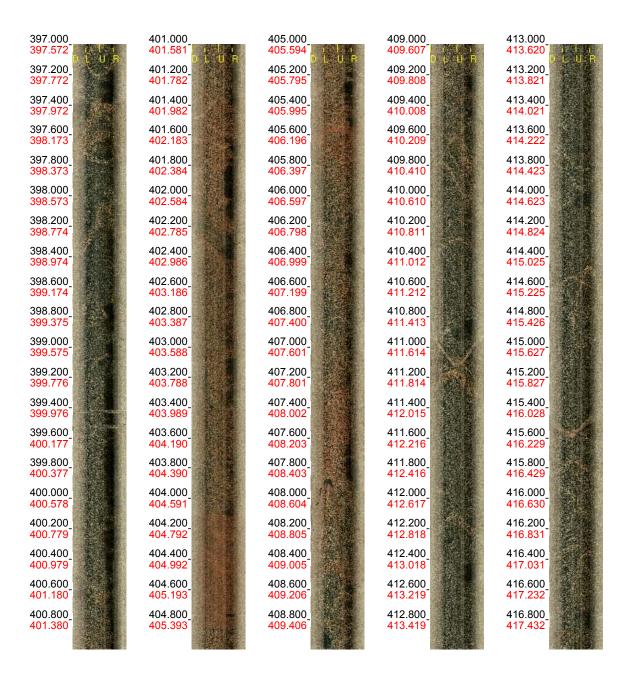
Borehole: KLX15A Depth range: 377.000 - 397.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 195.0 Inclination: -49.6

377.000	381.000	385.000	389.000	393.000
377.536	381.543	385.550	389.557	393.564
377.200	381.200	385.200	389.200	393.200
377.736	381.743	385.750	389.758	393.765
377.400	381.400	385.400	389.400	393.400
377.936	381.943	385.951	389.958	393.965
377.600 _{378.137}	381.600 382.144	385.600 _{386.151}	389.600 390.158	393.600 394.165
377.800	381.800	385.800	389.800	393.800
378.337	382.344	386.351	390.359	394.366
378.000	382.000	386.000	390.000	394.000
378.537	382.545	386.552	390.559	394.566
378.200	382.200	386.200	390.200	394.200
378.738	382.745	386.752	390.759	394.767
378.400	382.400	386.400	390.400	394.400
378.938	382.945	386.952	390.960	394.967
378.600	382.600	386.600	390.600	394.600
379.138	383.146	387.153	391.160	395.167
378.800	382.800	386.800 ₂	390.800 _{391.360}	394.800
379.339	383.346	387.353		395.368
379.000	383.000	387.000	391.000 ₃	395.000
379.539	383.546	387.554		395.568
379.200	383.200	387.200	391.200_	395.200
379.740	383.747	387.754	391.761	395.768
379.400	383.400	387.400	391.400_	395.400
379.940	383.947	387.954	391.962	395.969
379.600	383.600	387.600	391.600 _{392.162}	395.600
380.140	384.147	388.155		396.169
379.800 _{380.341}	383.800	387.800	391.800	395.800
	384.348	388.355	392.362	396.369
380.000	384.000	388.000	392.000	396.000
380.541	384.548	388.555	392.563	396.570
380.200	384.200	388.200	392.200 _{392.763}	396.200
380.741	384.749	388.756		396.770
380.400 _{380.942}	384.400 384.949	388.400 388.956	392.400 _{392.963}	396.400 396.971
380.600	384.600	388.600	392.600 _{393.164}	396.600
381.142	385.149	389.156		397.171
380.800	384.800	388.800	392.800	396.800
381.342	385.350	389.357	393.364	397.371

Borehole: KLX15A Depth range: 397.000 - 417.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.6 Inclination: -49.5



Borehole: KLX15A Depth range: 417.000 - 437.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.4 Inclination: -49.4

417.000	421.000	425.000	429.000	433.000
417.633	421.646	425.659	429.672	433.685
417.200	421.200	425.200	429.200	433.200
417.834	421.847	425.860	429.873	433.886
417.400 _{418.034}	421.400_	425.400	429.400_	433.400
	422.047	426.060	430.073	434.086
417.600 418.235	421.600_ 422.248	425.600 _{426.261}	429.600 430.274	433.600 _{434.287}
417.800 _{418.436}	421.800_ 422.449	425.800 426.462	429.800 _{430.475}	433.800 _{434.488}
418.000	422.000	426.000	430.000	434.000
418.636	422.649	426.662	430.675	434.688
418.200	422.200	426.200	430.200	434.200
418.837	422.850	426.863	430.876	434.889
418.400	422.400	426.400	430.400	434.400
419.038	423.051	427.064	431.077	435.090
418.600	422.600	426.600	430.600	434.600
419.238	423.251	427.264	431.277	435.290
418.800	422.800	426.800	430.800	434.800
419.439	423.452	427.465	431.478	435.491
419.000	423.000	427.000	431.000	435.000
419.640	423.653	427.666	431.679	435.692
419.200	423.200	427.200	431.200	435.200
419.840	423.853	427.866	431.879	435.892
419.400	423.400	427.400	431.400	435.400
420.041	424.054	428.067	432.080	436.093
419.600	423.600	427.600	431.600	435.600
420.242	424.255	428.268	432.281	436.294
419.800	423.800	427.800	431.800	435.800
420.442	424.455	428.468	432.481	436.494
420.000	424.000	428.000	432.000	436.000
420.643	424.656	428.669	432.682	436.695
420.200	424.200	428.200	432.200	436.200
420.844	424.857	428.870	432.883	436.896
420.400	424.400	428.400	432.400	436.400
421.044	425.057	429.070	433.083	437.096
420.600	424.600	428.600	432.600	436.600
421.245	425.258	429.271	433.284	437.297
420.800	424.800	428.800	432.800	436.800
421.445	425.458	429.471	433.484	437.497

Borehole: KLX15A Depth range: 437.000 - 457.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.5 Inclination: -49.3

437.000 437.698	441.000 441.711	445.000 _{445.724}	449.000 _{449.737}	453.000 453.736
437.200	441.200	445.200	449.200	453.200
437.899	441.912	445.925	449.938	453.936
437.400	441.400	445.400	449.400	453.400
438.099	442.112	446.125	450.138	454.136
437.600 438.300	441.600 442.313	445.600 _{446.326}	449.600 _{450.338}	453.600 454.336
437.800	441.800 _{442.514}	445.800	449.800	453.800
438.501		446.527	450.538	454.536
438.000	442.000	446.000	450.000	454.000
438.701	442.714	446.727	450.738	454.736
438.200	442.200	446.200	450.200	454.200
438.902	442.915	446.928	450.938	454.936
438.400	442.400_	446.400	450.400	454.400
439.103	443.116	447.129	451.137	455.135
438.600	442.600	446.600	450.600	454.600
439.303	443.316	447.329	451.337	455.335
438.800 439.504	442.800 443.517	446.800 _{447.530}	450.800 _{451.537}	454.800 455.535
439.000 439.705	443.000_ 443.718	447.000 _{447.731}	451.000 _{451.737}	455.000 455.735
439.200	443.200	447.200	451.200	455.200
439.905	443.918	447.931	451.937	455.935
439.400	443.400	447.400	451.400 _{452.137}	455.400
440.106	444.119	448.132		456.135
439.600	443.600	447.600	451.600	455.600
440.307	444.320	448.333	452.337	456.335
439.800 440.507	443.800 444.520	447.800 _{448.533}	451.800 _{452.537}	455.800 456.535
440.000	444.000	448.000	452.000 _{452.737}	456.000
440.708	444.721	448.734		456.735
440.200	444.200	448.200	452.200	456.200
440.909	444.922	448.935	452.937	456.935
440.400	444.400_	448.400	452.400	456.400
441.109	445.122	449.135	453.136	457.134
440.600	444.600_	448.600_	452.600 _{453.336}	456.600
441.310	445.323	449.336		457.334
440.800 441.510	444.800 445.523	448.800 _{449.536}	452.800 _{453.536}	456.800 457.534
			4	

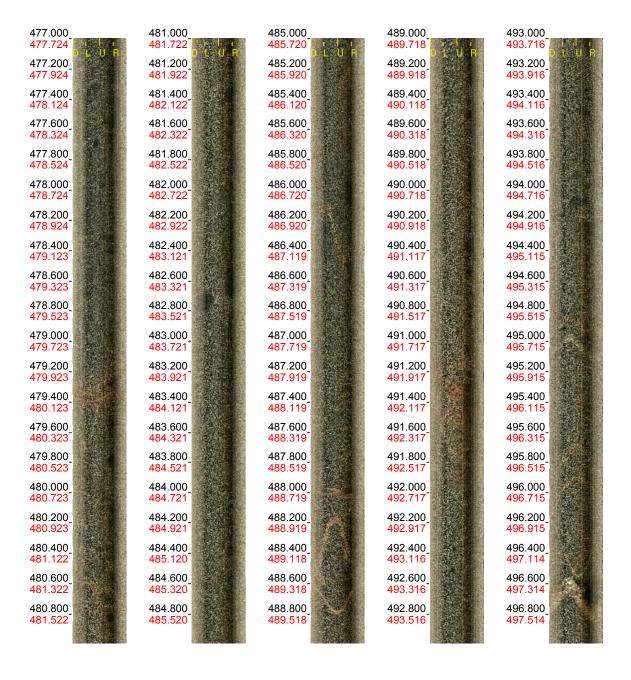
Borehole: KLX15A Depth range: 457.000 - 477.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.0 Inclination: -49.2

457.000 _{457.734}	461.000 _{461.732}	465.000 465.730	469.000 469.728	473.000 473.726
457.200	461.200	465.200	469.200	473.200
457.934	461.932	465.930	469.928	473.926
457.400 _{458.134}	461.400 ₄	465.400 466.130	469.400 470.128	473.400 474.126
457.600	461.600	465.600	469.600	473.600
458.334	462.332	466.330	470.328	474.326
457.800	461.800	465.800	469.800	473.800
458.534	462.532	466.530	470.528	474.526
458.000	462.000	466.000	470.000	474.000
458.734	462.732	466.730	470.728	474.726
458.200	462.200	466.200	470.200 _{470.928}	474.200
458.934	462.932	466.930		474.926
458.400 _{459.133}	462.400_ 463.131	466.400 467.129	470.400 471.127	474.400 _{475.125}
458.600 _{459.333}	462.600 _{463.331}	466.600 467.329	470.600 471.327	474.600 475.325
458.800	462.800_	466.800	470.800	474.800
459.533	463.531	467.529	471.527	475.525
459.000	463.000 _{463.731}	467.000	471.000	475.000
459.733		467.729	471.727	475.725
459.200	463.200	467.200	471.200	475.200
459.933	463.931	467.929	471.927	475.925
459.400	463.400 _{464.131}	467.400	471.400	475.400
460.133		468.129	472.127	476.125
459.600	463.600	467.600	471.600	475.600
460.333	464.331	468.329	472.327	476.325
459.800	463.800	467.800	471.800	475.800
460.533	464.531	468.529	472.527	476.525
460.000	464.000	468.000	472.000	476.000
460.733	464.731	468.729	472.727	476.725
460.200	464.200	468.200	472.200	476.200
460.933	464.931	468.929	472.927	476.925
460.400	464.400	468.400_	472.400	476.400
461.132	465.130	469.128	473.126	477.124
460.600	464.600	468.600_	472.600	476.600
461.332	465.330	469.328	473.326	477.324
460.800	464.800	468.800	472.800	476.800
461.532	465.530	469.528	473.526	477.524

Borehole: KLX15A Depth range: 477.000 - 497.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.0 Inclination: -49.0



Borehole: KLX15A Depth range: 497.000 - 517.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 194.0 Inclination: -48.9



Borehole: KLX15A Depth range: 517.000 - 537.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.8 Inclination: -48.8



Borehole: KLX15A Depth range: 537.000 - 557.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.4 Inclination: -48.7

537.000	541.000	545.000	549.000	553.000
537.716	541.716	545.717	549.717	553.723
537.200	541.200	545.200	549.200	553.200
537.916	541.916	545.917	549.917	553.923
537.400 _{538.116}	541.400_ 542.116	545.400 546.117	549.400 550.117	553.400 _{554.124}
537.600	541.600	545.600	549.600	553.600
538.316	542.316	546.317	550.317	554.324
537.800	541.800	545.800	549.800	553.800 ₋
538.516	542.516	546.517	550.518	
538.000	542.000	546.000	550.000	554.000
538.716	542.716	546.717	550.718	554.724
538.200 538.916	542.200 __ 542.916	546.200 ₋ 546.917	550.200 _{550.918}	554.200_ 554.925
538.400 _{539.116}	542.400_ 543.116	546.400 ₋	550.400 ₅	554.400_ 555.125
538.600	542.600	546.600	550.600	554.600 _{555.325}
539.316	543.316	547.317	551.319	
538.800 _{539.516}	542.800 ₅	546.800 ₋ 547.517	550.800 _{551.519}	554.800 _{555.526}
539.000 _{539.716}	543.000 ₋	547.000 ₋	551.000 _{551.720}	555.000 ₋ 555.726
539.200	543.200	547.200	551.200	555.200_
539.916	543.917	547.917	551.920	555.926
539.400	543.400_	547.400	551.400	555.400
540.116	544.117	548.117	552.120	556.127
539.600	543.600	547.600	551.600	555.600
540.316	544.317	548.317	552.321	556.327
539.800 _{540.516}	543.800_ 544.517	547.800 _{548.517}	551.800 _{552.521}	555.800 556.527
540.000	544.000	548.000 _{548.717}	552.000	556.000
540.716	544.717		552.721	556.728
540.200 _{540.916}	544.200_	548.200_	552.200	556.200
	544.917	548.917	552.922	556.928
540.400	544.400_	548.400 ₋	552.400	556.400_
541.116	545.117	549.117	553.122	557.128
540.600	544.600 ₅	548.600	552.600	556.600
541.316		549.317	553.322	557.329
540.800	544.800	548.800	552.800	556.800
541.516	545.517	549.517	553.523	557.529

Borehole: KLX15A Depth range: 557.000 - 577.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.0 Inclination: -48.6



Borehole: KLX15A Depth range: 577.000 - 597.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.2 Inclination: -48.5

577.000	581.000	585.000	589.000	593.000
577.761	581.767	585.774	589.780	593.786
577.200	581.200	585.200	589.200	593.200
577.961	581.968	585.974	589.980	593.987
577.400 _{578.161}	581.400 _{582.168}	585.400 586.174	589.400_ 590.181	593.400 594.187
577.600 _{578.362}	581.600 _{582.368}	585.600 586.374	589.600 590.381	593.600 594.387
577.800 _{578.562}	581.800 _{582.568}	585.800 586.575	589.800_ 590.581	593.800 594.587
578.000 _{578.762}	582.000	586.000	590.000	594.000
	582.769	586.775	590.781	594.788
578.200	582.200	586.200	590.200	594.200
578.963	582.969	586.975	590.982	594.988
578.400	582.400	586.400	590.400	594.400
579.163	583.169	587.176	591.182	595.188
578.600 _{579.363}	582.600	586.600	590.600	594.600
	583.370	587.376	591.382	595.389
578.800	582.800	586.800	590.800	594.800
579.564	583.570	587.576	591.583	595.589
579.000	583.000	587.000	591.000	595.000
579.764	583.770	587.777	591.783	595.789
579.200 _{579.964}	583.200 _{583.971}	587.200 587.977	591.200 591.983	595.200 595.990
579.400 _{580.165}	583.400 _{584.171}	587.400 588.177	591.400 592.184	595.400 596.190
579.600	583.600	587.600	591.600	595.600
580.365	584.371	588.378	592.384	596.390
579.800 _{580.565}	583.800 _{584.572}	587.800 588.578	591.800 592.584	595.800 596.591
580.000	584.000	588.000	592.000	596.000
580.766	584.772	588.778	592.785	596.791
580.200	584.200	588.200	592.200	596.200
580.966	584.972	588.979	592.985	596.991
580.400	584.400	588.400	592.400	596.400
581.166	585.173	589.179	593.185	597.192
580.600	584.600	588.600	592.600	596.600
581.367	585.373	589.379	593.386	597.392
580.800	584.800	588.800 ₋	592.800 ₋	596.800
581.567	585.573	589.580	593.586	597.592

Borehole: KLX15A Depth range: 597.000 - 617.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.0 Inclination: -48.3



Borehole: KLX15A Depth range: 617.000 - 637.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.1 Inclination: -48.3



Borehole: KLX15A Depth range: 637.000 - 657.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.3 Inclination: -48.2



Borehole: KLX15A Depth range: 657.000 - 677.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.9 Inclination: -48.1

657.000	661.000	665.804	669.000	673.000
657.802	661.803	665.804	669.805	673.806
657.200	661.200	665.200	669.200	673.200
658.002	662.003	666.004	670.005	674.006
657.400	661.400	665.400	669.400	673.400 _{674.206}
658.202	662.203	666.204	670.205	
657.600	661.600	665.600	669.600	673.600
658.402	662.403	666.404	670.405	674.406
657.800	661.800	665.800	669.800	673.800
658.602	662.603	666.604	670.605	674.606
658.000 658.802	662.803	666.804	670.000 670.805	674.000 674.806
658.200	662.200	666.200	670.200	674.200
659.002	663.003	667.004	671.005	675.007
658.400	662.400	666.400	670.400	674.400
659.202	663.203	667.204	671.206	675.207
658.600	662.600	666.600	670.600	674.600
659.402	663.403	667.404	671.406	675.407
658.800	662.800	666.800	670.800	674.800
659.602	663.604	667.605	671.606	675.607
659.000 659.803	663.804	667.805	671.000 671.806	675.000 675.807
659.200	663.200	667.200	671.200	675.200
660.003	664.004	668.005	672.006	676.007
659.400	663.400	667.400	671.400	675.400
660.203	664.204	668.205	672.206	676.207
659.600	663.600	667.600	671.600	675.600
660.403	664.404	668.405	672.406	676.407
659.800	663.800	667.800	671.800	675.800
660.603	664.604	668.605	672.606	676.607
660.000	664.000	668.805	672.000	676.000
660.803	664.804		672.806	676.807
660.200	664.200	668.200	672.200	676.200
661.003	665.004	669.005	673.006	677.007
660.400	664.400	668.400	672.400	676.400
661.203	665.204	669.205	673.206	677.207
660.600	664.600 _{665.404}	668.600	672.600	676.600
661.403		669.405	673.406	677.407
660.800	664.800	668.800	672.800	676.800
661.603	665.604	669.605	673.606	677.607

Borehole: KLX15A Depth range: 677.000 - 697.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.2 Inclination: -48.1



Borehole: KLX15A Depth range: 697.000 - 717.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.2 Inclination: -47.9

697.000	701.000_	705.000	709.000	713.000
697.812	701.814	705.816	709.819	713.821
697.200	701.200_	705.200	709.200	713.200
698.013	702.014	706.017	710.019	714.021
697.400	701.400_	705.400	709.400	713.400
698.213	702.214	706.217	710.219	714.222
697.600	701.600_	705.600	709.600	713.600
698.413	702.414	706.417	710.419	714.422
697.800	701.800 ₋	705.800	709.800 _{710.619}	713.800
698.613	702.615	706.617		714.622
698.000	702.000 ₋	706.000	710.000	714.000
698.813	702.815	706.817	710.819	714.822
698.200 _{699.013}	702.200_	706.200	710.200_	714.200
	703.015	707.017	711.020	715.022
698.400 _{699.213}	702.400_	706.400	710.400	714.400
	703.215	707.217	711.220	715.222
698.600	702.600 __	706.600	710.600 _{711.420}	714.600
699.413	703.415	707.417		715.422
698.800 _{699.613}	702.800 _{703.615}	706.800 707.618	710.800 711.620	714.800 715.622
699.000 _{699.813}	703.000 ₇	707.000 707.818	711.000 711.820	715.000 715.823
699.200	703.200	707.200	711.200	715.200
700.013	704.015	708.018	712.020	716.023
699.400	703.400	707.400	711.400	715.400
700.213	704.216	708.218	712.220	716.223
699.600	703.600	707.600	711.600	715.600
700.413	704.416	708.418	712.420	716.423
699.800	703.800	707.800	711.800	715.800
700.613	704.616	708.618	712.621	716.623
700.000	704.000	708.000	712.000	716.000
700.813	704.816	708.818	712.821	716.823
700.200	704.200 _{705.016}	708.200	712.200	716.200
701.014		709.018	713.021	717.023
700.400	704.400 _{705.216}	708.400	712.400	716.400
701.214		709.219	713.221	717.223
700.600	704.600	708.600	712.600	716.600
701.414	705.416	709.419	713.421	717.423
700.800	704.800_	708.800	712.800	716.800
701.614	705.616	709.619	713.621	717.624

Borehole: KLX15A Depth range: 717.000 - 737.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.4 Inclination: -47.7



Borehole: KLX15A Depth range: 737.000 - 757.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 193.1 Inclination: -47.6

737.000	741.000	745.000	749.000	753.000
737.836	741.838	745.841	749.843	753.846
737.200	741.200	745.200	749.200	753.200
738.036	742.038	746.041	750.043	754.046
737.400 _{738.236}	741.400	745.400 ₋	749.400_	753.400 ₋
	742.238	746.241	750.243	754.246
737.600	741.600	745.600	749.600 _{750.443}	753.600
738.436	742.438	746.441		754.446
737.800	741.800	745.800	749.800	753.800
738.636	742.639	746.641	750.643	754.647
738.000	742.000	746.000	750.000	754.000
738.836	742.839	746.841	750.844	754.847
738.200	742.200	746.200	750.200	754.200
739.036	743.039	747.041	751.044	755.047
738.400	742.400	746.400	750.400	754.400
739.237	743.239	747.241	751.244	755.247
738.600	742.600	746.600	750.600	754.600
739.437	743.439	747.441	751.444	755.447
738.800	742.800	746.800	750.800	754.800
739.637	743.639	747.642	751.644	755.647
739.000	743.000	747.000	751.000	755.000
739.837	743.839	747.842	751.844	755.848
739.200	743.200	747.200	751.200	755.200
740.037	744.039	748.042	752.045	756.048
739.400	743.400	747.400	751.400	755.400
740.237	744.240	748.242	752.245	756.248
739.600	743.600	747.600	751.600	755.600
740.437	744.440	748.442	752.445	756.448
739.800 _{740.637}	743.800 _{744.640}	747.800 748.642	751.800 752.645	755.800 756.648
740.000	744.000	748.000	752.000	756.000
740.838	744.840	748.842	752.845	756.848
740.200	744.200	748.200	752.200	756.200
741.038	745.040	749.042	753.045	757.049
740.400	744.400	748.400	752.400	756.400
741.238	745.240	749.243	753.246	757.249
740.600	744.600	748.600	752.600	756.600
741.438	745.440	749.443	753.446	757.449
740.800 _{741.638}	744.800 ₋ 745.640	748.800 749.643	752.800 753.646	756.800 _{757.649}

Borehole: KLX15A Depth range: 757.000 - 777.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.7 Inclination: -47.4

757.000	761.000	765.000	769.000	773.000
757.849	761.852	765.855	769.859	773.862
757.200	761.200	765.200	769.200	773.200
758.049	762.052	766.056	770.059	774.062
757.400	761.400	765.400	769.400	773.400
758.249	762.253	766.256	770.259	774.262
757.600	761.600	765.600	769.600	773.600
758.450	762.453	766.456	770.459	774.462
757.800	761.800	765.800	769.800	773.800
758.650	762.653	766.656	770.659	774.662
758.000	762.000	766.000	770.000	774.000
758.850	762.853	766.856	770.859	774.862
758.200	762.200	766.200	770.200	774.200
759.050	763.053	767.056	771.059	775.063
758.400	762.400	766.400	770.400	774.400
759.250	763.253	767.257	771.260	775.263
758.600	762.600	766.600	770.600	774.600
759.450	763.453	767.457	771.460	775.463
758.800 _{759.651}	762.800	766.800	770.800	774.800
	763.654	767.657	771.660	775.663
759.000	763.000	767.000	771.000	775.000
759.851	763.854	767.857	771.860	775.863
759.200	763.200	767.200	771.200	775.200
760.051	764.054	768.057	772.060	776.063
759.400	763.400	767.400	771.400	775.400
760.251	764.254	768.257	772.260	776.264
759.600	763.600	767.600	771.600	775.600
760.451	764.454	768.457	772.461	776.464
759.800	763.800	767.800	771.800 ₋	775.800
760.651	764.654	768.658	772.661	776.664
760.000	764.000	768.000	772.000	776.000
760.852	764.855	768.858	772.861	776.864
760.200 ₂	764.200 765.055	768.200_ 769.058	772.200 ₋	776.200 777.064
760.400 _{761.252}	764.400_ 765.255	768.400 _{769.258}	772.400 ₋ 773.261	776.400 777.264
760.600	764.600	768.600	772.600	776.600
761.452	765.455	769.458	773.461	777.464
760.800	764.800	768.800	772.800	776.800
761.652	765.655	769.658	773.661	777.665

Borehole: KLX15A Depth range: 777.000 - 797.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.9 Inclination: -47.3

777.000	781.000	785.000	789.000	793.000
777.865	781.868	785.871	789.874	793.877
777.200	781.200_	785.200	789.200	793.200
778.065	782.068	786.071	790.074	794.077
777.400	781.400_	785.400	789.400	793.400
778.265	782.268	786.271	790.274	794.278
777.600	781.600_	785.600	789.600	793.600
778.465	782.468	786.471	790.475	794.478
777.800	781.800	785.800	789.800	793.800
778.665	782.669	786.672	790.675	794.678
778.000	782.000	786.000	790.000	794.000
778.866	782.869	786.872	790.875	794.878
778.200	782.200_	786.200	790.200	794.200
779.066	783.069	787.072	791.075	795.078
778.400	782.400	786.400	790.400	794.400
779.266	783.269	787.272	791.275	795.278
778.600	782.600_	786.600	790.600	794.600
779.466	783.469	787.472	791.475	795.478
778.800	782.800	786.800	790.800	794.800
779.666	783.669	787.672	791.676	795.679
779.000	783.000	787.000	791.000	795.000
779.866	783.869	787.873	791.876	795.879
779.200	783.200	787.200	791.200	795.200
780.066	784.070	788.073	792.076	796.079
779.400	783.400	787.400	791.400	795.400
780.267	784.270	788.273	792.276	796.279
779.600	783.600	787.600	791.600	795.600
780.467	784.470	788.473	792.476	796.479
779.800	783.800	787.800	791.800	795.800
780.667	784.670	788.673	792.676	796.679
780.000	784.000	788.000	792.000	796.000
780.867	784.870	788.873	792.876	796.880
780.200	784.200	788.200	792.200	796.200
781.067	785.070	789.073	793.077	797.080
780.400	784.400	788.400_	792.400	796.400
781.267	785.271	789.274	793.277	797.280
780.600	784.600	788.600	792.600	796.600
781.468	785.471	789.474	793.477	797.480
780.800	784.800	788.800	792.800	796.800
781.668	785.671	789.674	793.677	797.680

Borehole: KLX15A Depth range: 797.000 - 817.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.7 Inclination: -47.2

797.000 797.880		801.000 801.881		805.000 805.878		809.000 809.875		813.000 813.873	No.
797.200 _{798.081}	D L U A	801.200_ 802.081	L U =	805.200 806.078	CAUNF SAME	809.200_ 810.075	C USE	813.200 814.072	E-USF
797.400 _{798.281}		801.400 _{802.281}		805.400 _{806.278}		809.400_ 810.275		813.400 814.272	
797.600 ₂		801.600 _{802.480}		805.600 806.478		809.600 _{810.475}		813.600 814.472	
797.800 _{798.681}		801.800 _{802.680}		805.800 806.677		809.800 810.675		813.800 814.672	
798.000 798.881		802.000 802.880		806.000 806.877		810.000 810.875		814.000 814.872	
798.200 799.081		802.200 803.080		806.200 807.077		810.200 811.075		814.200 815.072	
798.400 799.281		802.400 803.280		806.400 807.277		810.400 811.274		814.400 815.272	
798.600 ₂ 799.482		802.600 _{803.480}		806.600 807.477		810.600 _{811.474}		814.600 815.471	
798.800 799.682		802.800 803.680		806.800 807.677		810.800 811.674		814.800 815.671	No.
799.000 799.882		803.000 803.879		807.000 807.877		811.000 811.874		815.000 815.871	
799.200 _{800.082}	200	803.200 _{804.079}		807.200 808.077		811.200 812.074		815.200 816.071	
799.400 _{800.282}		803.400 _{804.279}		807.400 808.276		811.400 812.274	200	815.400 816.271	
799.600 _{800.482}		803.600 _{804.479}		807.600 808.476		811.600 812.474		815.600 816.471	
799.800 _{800.682}		803.800 _{804.679}		807.800 808.676		811.800 812.673		815.800 816.671	
800.000 800.881		804.000 804.879		808.000 808.876		812.000 812.873		816.000 816.871	
800.200 ₈		804.200 805.079		808.200 809.076		812.200 813.073		816.200 817.070	a d
800.400 _{801.281}	U de la	804.400 _{805.278}		808.400 809.276		812.400 813.273		816.400 817.270	
800.600 801.481		804.600 805.478		808.600 809.476		812.600 813.473		816.600 817.470	
800.800 801.681		804.800 _{805.678}		808.800 809.675		812.800 813.673		816.800 817.670	

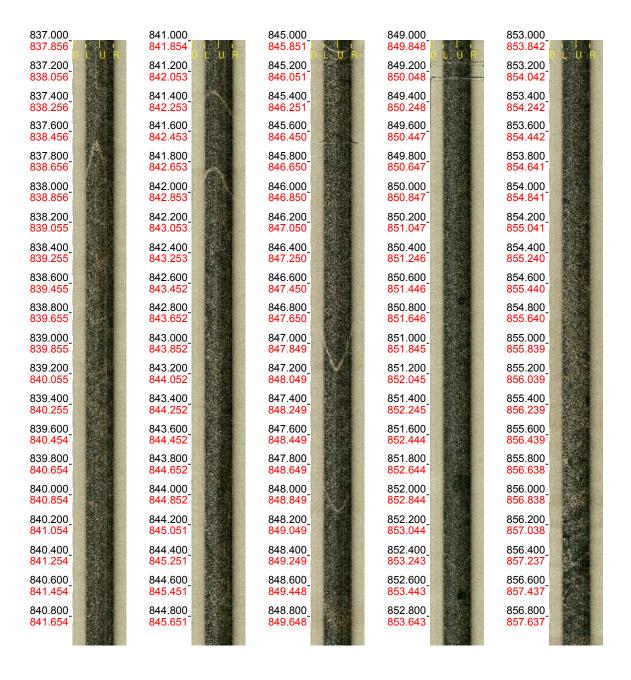
Borehole: KLX15A Depth range: 817.000 - 837.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.5 Inclination: -47.0

817.000 817.870	821.000 821.867	超過	825.000 825.864	829.000 829.862		833.000 833.859	
817.200 818.070	821.200 822.067		825.200 826.064	829.200 830.062		833.200 834.059	
817.400 818.270	821.400 822.267		825.400 826.264	829.400 830.261		833.400 834.259	
817.600 ₈ 18.469	821.600_ 822.467		825.600 _{826.464}	829.600_ 830.461		833.600 _{834.459}	
817.800 _{818.669}	821.800 _{822.667}		825.800_ 826.664	829.800_ 830.661		833.800 _{834.658}	
818.000 _{818.869}	822.000 822.866		826.000 826.864	830.000 830.861		834.000 834.858	
818.200 819.069	822.200 823.066		826.200 827.064	830.200 831.061		834.200 835.058	
818.400 819.269	822.400 823.266		826.400 827.263	830.400 831.261		834.400 835.258	
818.600 819.469	822.600 823.466		826.600 827.463	830.600 831.461		834.600 835.458	
818.800 819.669	822.800 823.666		826.800 827.663	830.800 831.660		834.800 835.658	
819.000 819.869	823.000 823.866		827.000 827.863	831.000 831.860		835.000 835.858	A.N
819.200 820.068	823.200 _{824.066}		827.200 828.063	831.200 832.060	图图	835.200 836.057	
819.400 _{820.268}	823.400 824.266		827.400 828.263	831.400 832.260		835.400 836.257	
819.600 820.468	823.600 _{824.465}		827.600 828.463	831.600 832.460		835.600 836.457	
819.800 _{820.668}	823.800 824.665		827.800 828.663	831.800 832.660		835.800 836.657	
820.000 820.868	824.000 824.865		828.000 828.862	832.000 832.860		836.000 836.857	
820.200 821.068	824.200 825.065		828.200 829.062	832.200 833.060		836.200 837.057	
820.400 821.268	824.400 825.265		828.400 829.262	832.400 833.259		836.400 837.257	
820.600 821.467	824.600 825.465		828.600 829.462	832.600 833.459		836.600 837.457	
820.800 821.667	824.800_ 825.665		828.800 829.662	832.800 833.659		836.800 837.656	

Borehole: KLX15A Depth range: 837.000 - 857.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.4 Inclination: -46.8



Borehole: KLX15A Depth range: 857.000 - 877.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 192.0 Inclination: -46.8

857.000	861.000	865.000	869.000	873.000
857.837	861.831	865.825	869.819	873.813
857.200	861.200	865.200	869.200	873.200_
858.036	862.030	866.025	870.019	874.013
857.400	861.400	865.400	869.400_	873.400
858.236	862.230	866.224	870.219	874.213
857.600	861.600_	865.600	869.600	873.600
858.436	862.430	866.424	870.418	874.412
857.800	861.800_	865.800	869.800	873.800
858.635	862.630	866.624	870.618	874.612
858.000	862.000	866.000	870.000	874.000
858.835	862.829	866.823	870.818	874.812
858.200	862.200	866.200	870.200	874.200
859.035	863.029	867.023	871.017	875.012
858.400	862.400	866.400	870.400	874.400
859.235	863.229	867.223	871.217	875.211
858.600	862.600	866.600_	870.600	874.600
859.434	863.428	867.423	871.417	875.411
858.800	862.800	866.800	870.800	874.800
859.634	863.628	867.622	871.616	<mark>875.611</mark>
859.000	863.000	867.000	871.000	875.000
859.834	863.828	867.822	871.816	875.810
859.200	863.200	867.200	871.200	875.200
860.033	864.028	868.022	872.016	<mark>876.010</mark>
859.400	863.400	867.400_	871.400	875.400
860.233	864.227	868.221	872.216	876.210
859.600	863.600	867.600	871.600	875.600
860.433	864.427	868.421	872.415	876.409
859.800	863.800	867.800	871.800	875.800
860.633	864.627	868.621	872.615	<mark>876.609</mark>
860.000	864.000	868.000	872.000	876.000
860.832	864.826	868.821	872.815	876.809
860.200	864.200	868.200	872.200	876.200
861.032	865.026	869.020	873.014	877.009
860.400	864.400	868.400	872.400	876.400
861.232	865.226	869.220	873.214	877.208
860.600	864.600	868.600	872.600	876.600
861.431	865.425	869.420	873.414	877.408
860.800	864.800_	868.800	872.800_	876.800
861.631	865.625	869.619	873.614	877.608

Borehole: KLX15A Depth range: 877.000 - 897.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 191.7 Inclination: -46.7



Borehole: KLX15A Depth range: 897.000 - 917.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 191.4 Inclination: -46.7

897.000	901.000	905.000	909.000	913.000
897.778	901.772	905.766	909.759	913.753
897.200	901.200	905.200	909.200	913.200
897.978	901.972	905.965	909.959	913.952
897.400 _{898.178}	901.400 902.172	905.400 _{906.165}	909.400 910.159	913.400 914.152
897.600	901.600	905.600 _{906.365}	909.600	913.600
898.377	902.371		910.358	914.352
897.800	901.800	905.800 _{906.564}	909.800	913.800_
898.577	902.571		910.558	914.551
898.000	902.000	906.000	910.000	914.000
898.777	902.771	906.764	910.758	914.751
898.200	902.200	906.200	910.200	914.200
898.977	902.970	906.964	910.957	914.951
898.400	902.400	906.400	910.400	914.400
899.176	903.170	907.163	911.157	915.151
898.600	902.600	906.600	910.600	914.600
899.376	903.370	907.363	911.357	915.350
898.800	902.800	906.800	910.800	914.800
899.576	903.569	907.563	911.556	915.550
899.000	903.000	907.000	911.000	915.000
899.775	903.769	907.762	911.756	915.750
899.200	903.200	907.200	911.200	915.200
899.975	903.969	907.962	911.956	<mark>915.949</mark>
899.400	903.400	907.400	911.400	915.400
900.175	904.168	908.162	912.155	<mark>916.149</mark>
899.600	903.600	907.600 _{908.361}	911.600	915.600
900.374	904.368		912.355	916.349
899.800	903.800	907.800	911.800	915.800
900.574	904.568	908.561	912.555	<mark>916.548</mark>
900.000	904.000	908.000	912.000	916.000
900.774	904.767	908.761	912.754	916.748
900.200	904.200	908.200	912.200	916.200
900.973	904.967	908.961	912.954	916.948
900.400	904.400	908.400	912.400	916.400
901.173	905.167	909.160	913.154	917.147
900.600	904.600	908.600	912.600	916.600
901.373	905.366	909.360	913.353	917.347
900.800	904.800	908.800	912.800	916.800 _{917.547}
901.572	905.566	909.560	913.553	

Borehole: KLX15A Depth range: 917.000 - 937.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 191.4 Inclination: -46.8

917.000	921.000	925.000	929.000	933.000
917.746	921.740	925.733	929.727	933.720
917.200	921.200	925.200	929.200	933.200
917.946	921.939	925.933	929.927	933.920
917.400_ 918.146	921.400 _{922.139}	925.400 _{926.133}	929.400 _{930.126}	933.400 _{934.120}
917.600	921.600	925.600	929.600	933.600 _{934.319}
918.345	922.339	926.332	930.326	
917.800	921.800	925.800	929.800	933.800
918.545	922.538	926.532	930.526	934.519
918.000	922.000	926.000	930.000	934.000
918.745	922.738	926.732	930.725	934.719
918.200	922.200	926.200	930.200	934.200
918.944	922.938	926.931	930.925	934.918
918.400	922.400	926.400	930.400	934.400
919.144	923.138	927.131	931.125	935.118
918.600	922.600	926.600	930.600	934.600
919.344	923.337	927.331	931.324	935.318
918.800	922.800	926.800	930.800	934.800
919.543	923.537	927.530	931.524	935.517
919.000	923.000	927.000	931.000	935.000
919.743	923.737	927.730	931.724	935.717
919.200	923.200	927.200	931.200	935.200
919.943	923.936	927.930	931.923	935.917
919.400	923.400 _{924.136}	927.400	931.400	935.400
920.142		928.129	932.123	936.117
919.600	923.600	927.600	931.600	935.600
920.342	924.336	928.329	932.323	936.316
919.800 920.542	923.800 _{924.535}	927.800 928.529	931.800 932.522	935.800 _{936.516}
920.000	924.000 _{924.735}	928.000	932.000	936.000
920.741		928.728	932.722	936.716
920.200	924.200	928.200	932.200	936.200
920.941	924.935	928.928	932.922	936.915
920.400	924.400	928.400	932.400	936.400
921.141	925.134	929.128	933.121	937.115
920.600	924.600	928.600	932.600	936.600
921.340	925.334	929.327	933.321	937.315
920.800	924.800	928.800_	932.800	936.800 _{937.514}
921.540	925.534	929.527	933.521	

Borehole: KLX15A Depth range: 937.000 - 957.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 190.8 Inclination: -46.7



Borehole: KLX15A Depth range: 957.000 - 977.000 m

Mapping: KLX15A_Geosigma_1 Azimuth: 191.0 Inclination: -46.6



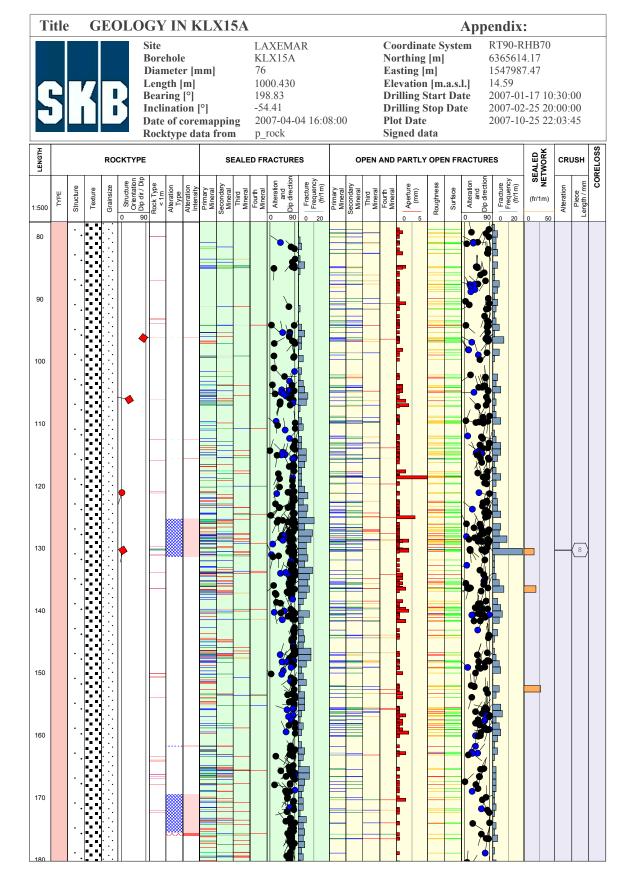
Borehole: KLX15A Depth range: 977.000 - 979.272 m

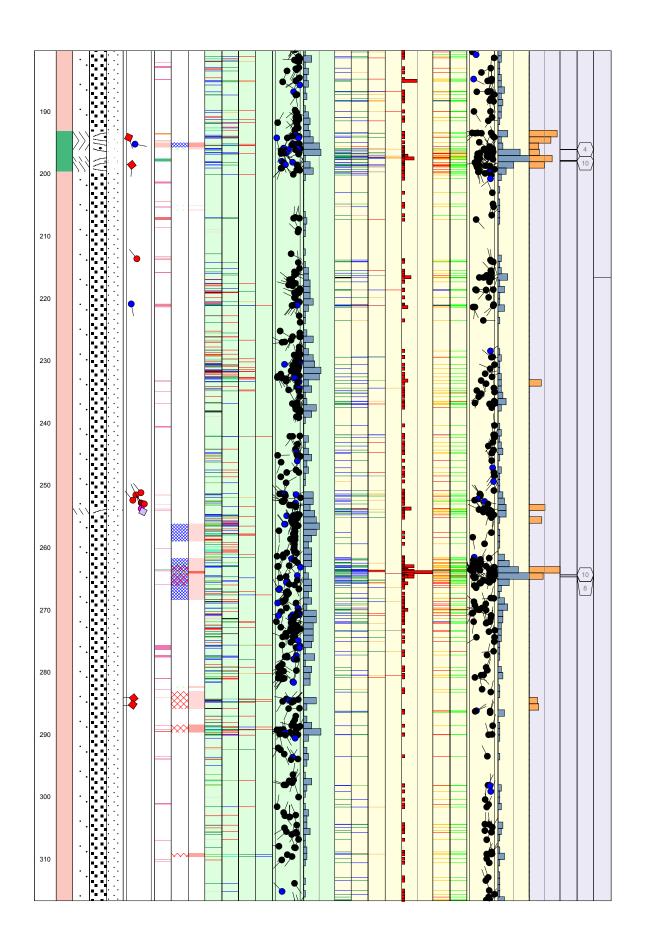
Mapping: KLX15A_Geosigma_1 Azimuth: 190.6 Inclination: -46.7

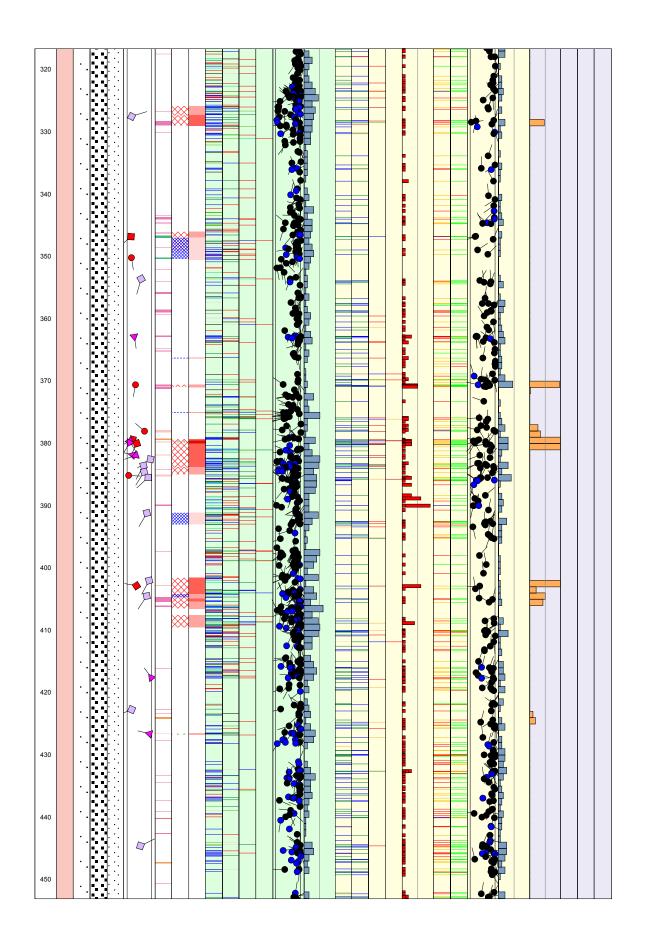


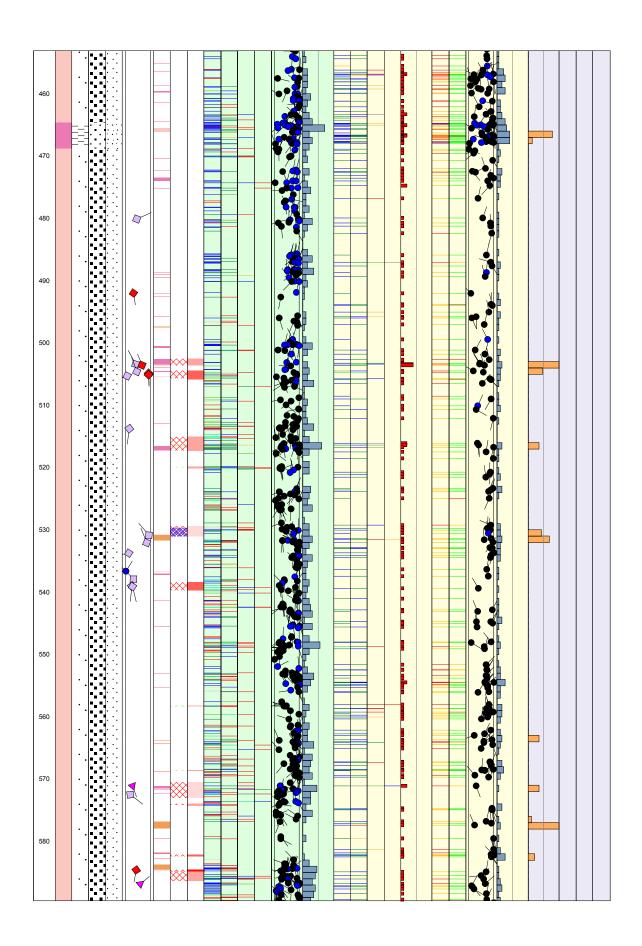
Appendix 4

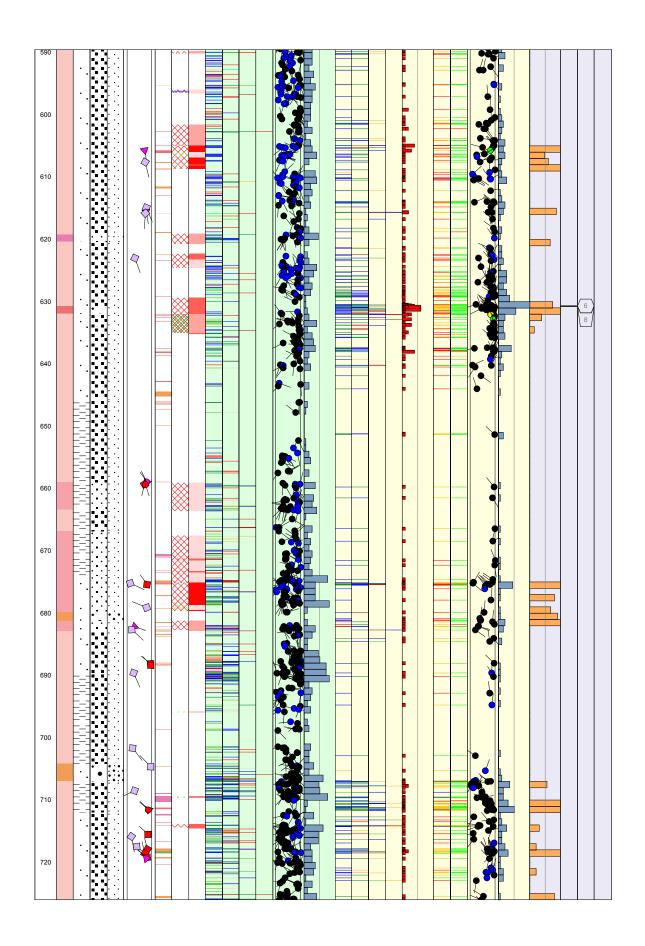
WellCad diagram for KLX15A

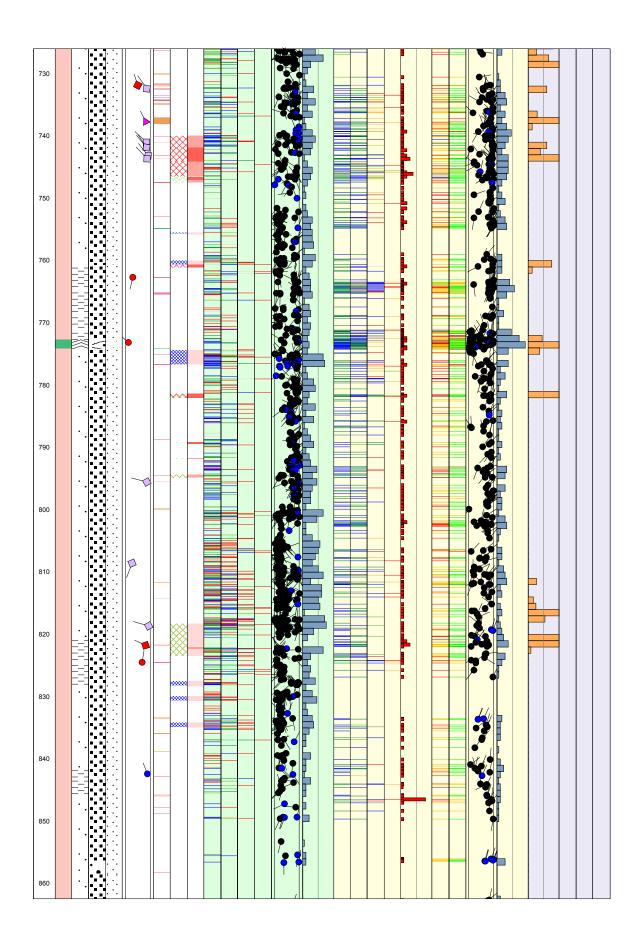


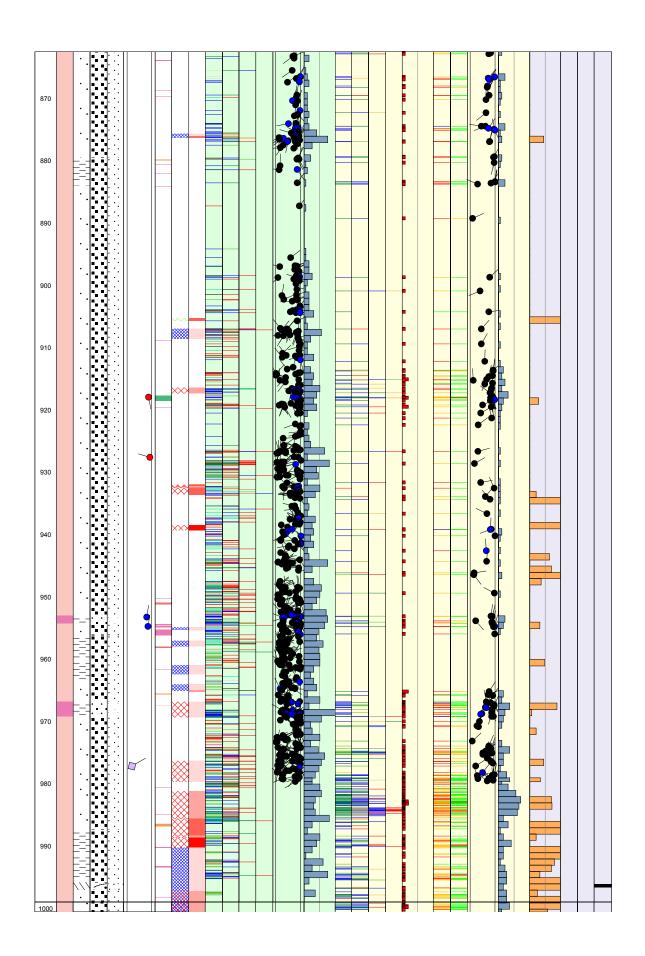






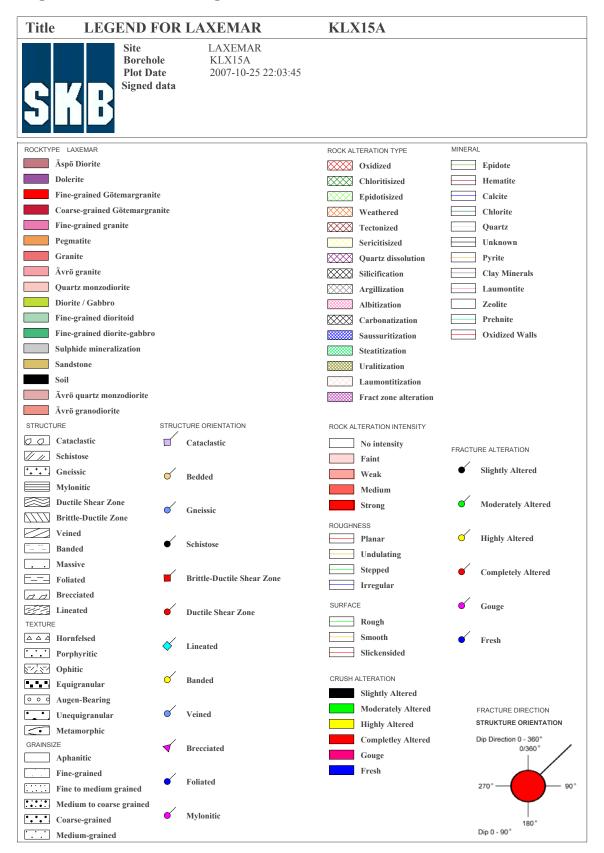






Appendix 5

Legend to WellCad diagram for KLX15A



Appendix 6

In-data: Borehole length and diameter for KLX15A

Hole Diam T - Drilling: Borehole diameter

KLX15A, 2007-01-17 10:30:00 - 2007-02-25 20:00:00 (76.130 - 1000.430 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
76.130	76.710	0.0862	T-86
76.710	77.580	0.0862	T-86 (Rymning)
77.580	1000.430	0.0758	Corac N/3

Printout from SICADA 2007-05-10 16:20:05.

In-data: Reference marks for length adjustments for KLX15A

Reference Mark T - Reference mark in drillhole

KLX15A, 2007-03-01 08:00:00 - 2007-03-02 09:30:00 (100.000 - 980.000 m)

er Comment																			
Cutter Diameter (mm)	•																		
Trace Detectable	JA	PΛ	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	٩٢	PΛ	٩٢	PΛ	٩٢	٩٢
Cutter Time (s)	. 28	09	29	29	28	54	55	63	09	99	27	29	62	99	20	63	61	64	65
Stop Pressure (bar)	30.0	30.0	30.0	32.0	32.0	32.0	32.0	32.0	32.0	34.0	34.0	34.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0
Stop Flow (I/h)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Start Flow (I/h)	350	250	300	300	300	300	300	300	300	300	350	350	350	350	350	350	400	400	400
Bhlen Rotation Speed (m) (rpm)	100.00 400.00																		

Printout from SICADA 2007-05-21 09:26:01.

In-data: Borehole deviation data for KLX15A

SICADA - object_location

Indat		2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18	2007-04-18 09:18		007-04-18 09:18	07.00 07.70
Origin)	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	Measured 20	
Bearing Uncert Radius Uncert	Œ	0.00	0.02	0.04	0.05	0.07	60.0	0.11	0.13	0.15	0.16	0.18	0.20	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.39	0.41	0.43	0.45	0.47	0.48	0.50	0.52	0.54	0.56	0.58	09.0	0.62	
	(degrees)	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	
Inclination Uncert	(degrees)	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	
Bearing	(degrees)	198.83	198.83	198.79	198.76	198.72	198.69	198.65	198.62	198.57	198.57	198.43	198.30	198.07	197.96	197.83	197.79	197.75	197.68	197.56	197.39	197.03	196.94	196.87	196.85	196.86	196.86	196.89	196.82	196.81	196.80	196.83	196.89	196.92	196.94	
h Inclination	(degrees)	-54.42	-54.35	-54.26	-54.23	-54.22	-54.16	-54.03	-53.97	-53.88	-53.73	-53.59	-53.43	-53.28	-53.16	-53.00	-52.77	-52.64	-52.54	-52.38	-52.20	-52.08	-51.96	-51.79	-51.56	-51.11	-50.83	-50.83	-50.84	-50.87	-50.91	-50.93	-50.93	-50.93	-50.92	
Vertical Depth	Œ	0.00	2.44	4.88	7.31	9.74	12.18	14.61	17.03	19.46	21.88	24.30	26.71	29.11	31.52	33.92	36.31	38.69	41.08	43.46	45.83	48.20	50.56	52.92	55.28	57.62	59.95	62.28	64.60	66.93	69.26	71.58	73.91	76.24	78.57	
Length	Έ	0.00	3.00	00.9	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00	33.00	36.00	39.00	42.00	45.00	48.00	51.00	54.00	57.00	00.09	63.00	00.99	69.00	72.00	75.00	78.00	81.00	84.00	87.00	90.00	93.00	96.00	99.00	
Elevation Length	(m.a.s.l.)	14.59	12.15	9.71	7.28	4.85	2.41	-0.02	-2.44	-4.87	-7.29	-9.71	-12.12	-14.52	-16.93	-19.33	-21.72	-24.10	-26.49	-28.87	-31.24	-33.61	-35.97	-38.33	-40.69	-43.03	-45.36	-47.69	-50.01	-52.34	-54.67	-56.99	-59.32	-61.65	-63.98	
Easting	Œ)	6365614.17 1547987.47	6365612.51 1547986.90	6365610.86 1547986.34	6365609.20 1547985.77			6365604.21 1547984.08	6365602.54 1547983.52	6365600.86 1547982.96					6365592.39 1547980.15	6365590.68 1547979.60	6365588.96 1547979.05		6365585.49 1547977.94	6365583.75 1547977.38	6365582.00 1547976.83	6365580.24 1547976.29	6365578.47 1547975.75	6365576.70 1547975.21	6365574.92 1547974.67	6365573.13 1547974.13	6365571.32 1547973.58	6365569.50 1547973.03	6365567.69 1547972.48	6365565.88 1547971.93	6365564.07 1547971.38	6365562.26 1547970.84	6365560.45 1547970.29	6365558.64 1547969.74	6365556.83 1547969.19	
Northing	Έ	6365614.1	6365612.5	6365610.8	6365609.2	6365607.5	6365605.8	6365604.2	6365602.5	6365600.8	6365599.1	6365597.5	6365595.8	6365594.1	6365592.3	6365590.6	6365588.9	6365587.2	6365585.4	6365583.7	6365582.0	6365580.2	6365578.4	6365576.7	6365574.9	6365573.1	6365571.3	6365569.5	6365567.6	6365565.8	6365564.0	6365562.2	6365560.4	6365558.6	6365556.8	
Coord System Northing	.	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70				RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70	RT90-RHB70		RT90-RHB70	
Idcode (KLX15A F	KLX15A F	KLX15A F	KLX15A F		KLX15A F			KLX15A F																			_	_	KLX15A F	KLX15A F	KLX15A F	_	KLX15A F	

Measured 2007-04-18 09:18	2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18 2007-04-18
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6365553.21 1547968.09 6365551.40 1547967.50 6365554.78 1547966.43 6365547.78 1547966.43 6365545.97 1547965.87 6365542.34 1547964.77 6365540.53 1547964.77 6365538.89 1547964.70 6365538.89 1547969.10 6365539.61 1547960.31 6365529.61 1547960.31 6365529.41 3 1547969.81 6365529.47 1547959.81 6365529.47 1547959.81 6365529.81 1547959.81 6365529.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81 6365518.81 1547959.81	6365505.82 1547953.85 6365502.05 1547955.31 6365500.32 1547952.78 6365498.49 1547951.70 6365494.81 1547951.10 6365494.83 1547950.03 6365492.99 1547950.03 6365492.99 1547949.04 6365489.32 1547949.04 6365489.32 1547948.04 6365488.79 1547947.45 6365488.79 1547947.45 6365488.79 1547947.45 6365488.79 1547947.45 6365488.70 1547947.45
RT90-RHB70 RT90-RHB70	RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70 RT90-RHB70
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1.51 1.53	1.55	1.57	1.59	1.61	1.63	1.65	1.67	1.69	1.71	1.73	1.75	1.77	1.79	1.81	1.82	1.84	1.86	1.88	1.90	1.92	1.94	1.96	1.98	2.00	2.02	2.04	2.06	2.08	2.10	2.12	2.14	2.16	2.18	2.20	2.22	2.24	2.26	2.28	2.30	2.32	2.34
	0.591		0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591		0.591			0.591
0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160
195.67 195.63	5	195.53	195.41	195.40	195.49	195.51	195.56	195.56	195.42	195.33	195.29	195.32	195.33	195.34	195.21	195.16	195.16	195.18	195.35	195.37	195.38	195.35	195.34	195.32	195.28	195.29	195.27	195.28	195.26	195.26	195.18	195.10	195.10	195.15	195.20	195.37	195.16	195.13	195.13	195.13	195.12
-50.17	-50.11	-50.09	-50.07	-50.05	-50.03	-50.02	-50.00	-49.98	-49.96	-49.94	-49.92	-49.92	-49.92	-49.90	-49.89	-49.89	-49.86	-49.85	-49.84	-49.82	-49.81	-49.81	-49.81	-49.81	-49.83	-49.83	-49.83	-49.81	-49.80	-49.80	-49.80	-49.80	-49.77	-49.77	-49.75	-49.75	-49.74	-49.74	-49.73	-49.72	-49.69
182. 185.		189		194	196	00 198.91	00 201.20				.00 210.39						.00 224.16				233		237	240	.00 242.50		247	246	251	253	256	.00 258.54	260	00 263.12	.00 265.41	00 267.70	00 269.99	272	274		279.
234	240.	243	246	249.00	252.	255.	258.	261	264		270	273.	276	279		285	288	291.00		297			306	309	312	315.00	318	321	324	327.	330	333	00.988 1	339.	342	345.	348.	351.00	354	357.	360.
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	1547943	_	_	6365465.29 1547942.27	$\overline{}$	_	6365459.72 1547940.73	$\overline{}$	$\overline{}$	6365454.141547939.18	$\overline{}$	$\overline{}$		$\overline{}$		6365442.96 1547936.13	6365441.09 1547935.62	6365439.22 1547935.11	6365437.36 1547934.61	$\overline{}$			$\overline{}$		6365426.161547931.53	6365424.29 1547931.02					$\overline{}$		6365411.21 1547927.46		6365407.47 1547926.45	6365405.60 1547925.94	6365403.73 1547925.43	6365401.86 1547924.92		6365398.12 1547923.91	6365396.24 1547923.41
RT90-	5A RT90-	RT90-	5A RT90-	5A RT90-	KLX15A RT90-RHB70	KLX15A RT90-RHB70	KLX15A RT90-RHB70	RT90-	5A RT90-	KLX15A RT90-RHB70	RT90-	RT90-	RT90-	Ξ.	RT90		KLX15A RT90-RHB70	KLX15A RT90-RHB70	KLX15A RT90-RHB70	KLX15A RT90-RHB70	RT90-		RT90-	RT90-	KLX15A RT90-RHB70	RT90-	RT90-		RT90-	. RT90-	RT90-	RT90-	KLX15A RT90-RHB70	RT90-	KLX15A RT90-RHB70	RT90-					

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-49.67 -49.66 -49.65	49.63 49.59 49.58	-49.55 -49.53 -49.51 -49.48	49.48 49.48 49.447 49.446 455 446	49.44 49.44 49.42 49.39 49.37	49.34 49.32 49.30 49.27 49.25 49.22	4 4 9 9 1 6 4 4 9 9 1 6 4 4 9 9 1 6 4 4 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1547922.90 -266.84 1547922.39 -269.13 1547921.89 -271.42 1547921.38 -273.70	1547920.88 -275.99 1547920.38 -278.27 1547919.88 -280.56 1547919.38 -282.84	1547918.88 -285.13 1547918.38 -287.41 1547917.89 -289.69 1547917.39 -291.97 1547916.90 -294.25		1547913.97 -307.39 1547913.49 -310.21 1547912.53 -314.77 1547912.64 -317.05 1547911.56 -319.33	547911.07 -321.60 547910.58 -323.88 547910.10 -326.15 547909.61 -328.43 547909.13 -330.70 547908.65 -332.97 547908.18 -335.24	6365335.85 1547907.70 -337.51 456. 6365333.95 1547907.23 -339.78 459. 6365323.05 1547906.75 -342.05 462. 6365328.04 1547905.79 -346.59 468. 6365326.33 1547905.30 -348.85 468. 6365322.52 1547904.35 -353.39 477. 6365320.61 1547903.88 -355.65 480. 6365318.70 1547903.40 -357.92 483. 6365316.79 1547902.93 -360.18 486.
5A RT90- 5A RT90- 5A RT90- 5A RT90-	RT90- RT90- RT90-	RT90- RT90- RT90- RT90-	KLX15A RT90-RHB70 KLX15A RT90-RHB70 KLX15A RT90-RHB70 KLX15A RT90-RHB70 KLX15A RT90-RHB70 KLX15A RT90-RHB70		RT90- RT90- RT90- RT90- RT90- RT90- RT90-	KLX15A RT90-RHB70

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492.00 379.30 495.00 381.56 498.00 383.82 501.00 386.08 504.00 388.34 507.00 390.59	0.00	615.00 469.31 615.00 471.55 618.00 473.79
6365312.97 1547901.98 -364.71 492. 6365311.05 1547901.51 -366.97 495. 6365309.14 1547901.03 -369.23 498. 6365307.22 1547900.56 -371.49 501. 6365305.30 1547890.10 -373.75 504. 6365303.39 1547899.63 -376.00 507. 6365301.47 1547899.16 -378.26 510.	1547898.21 -382.78 1547897.74 -385.03 1547897.28 -385.03 1547896.36 -391.80 1547896.36 -391.80 1547894.98 -398.56 1547894.98 -398.56 1547894.96 -400.82 1547894.06 -403.07 1547893.16 -407.58 1547893.16 -407.58 1547890.33 -418.83 1547890.33 -418.83 1547890.33 -418.83 1547890.33 -418.83 1547890.33 -425.57 1547880.33 -418.83 1547889.13 -427.82 1547889.13 -427.82 1547888.67 -430.07 1547886.42 -441.28 1547886.42 -441.28 1547886.42 -441.28 1547886.42 -441.28 1547886.42 -441.28	-456.96 -459.20
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