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Oskarshamn site investigation

Petrographic analysis of gravel and boulders in till from the Laxemar area

Torbjörn Bergman, Gustav Sohlenius
Geological Survey of Sweden

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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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Keywords: AP PS 400-06-024, Boulder, Glacial transport, Gravel, Petrographic analysis, Till.

Abstract

This report gives the results from a petrographic documentation of boulders along two north-south trending profiles and in three minor areas within the Laxemar subarea. In addition, results from petrographic analysis on the gravel fraction of 10 till samples are presented. This activity was conducted in order to verify if the lithological composition of the till is similar to the composition of the local bedrock and if it is possible to trace the provenance, and thus the direction and length of glacial transport of the till.

The results show that most of the boulders consist of bedrock types, which occur in the Laxemar subarea. Many of the boulders have been transported 100 metres or less. However, single boulders have been transported several kilometres.

The results from most of the gravel analysis show that the gravel fraction consists of material, which have been, transported a short distance. However, some of the gravel particles consist of bedrock types, which not occur in the Laxemar subarea. It has not been possible to determine the bedrock types in the gravel fraction with the same precision as in the boulder fraction.

The result of this investigation shows that the till has been transported from the north and most of the bedrock material is of local origin. However, it has not been possible to determine the direction of glacial transport in detail.

Sammanfattning

Denna rapport redovisar resultat från en petrografisk dokumentation av block, som utförts utmed två nord-sydliga profiler samt inom tre mindre områden inom delområde Laxemar. Dessutom redovisas resultaten från petrografiska analyser av grusfraktionen från 10 moränprover. Syftet med aktiviteten var att undersöka om moränens litologiska sammansättning liknar den lokala berggrundens och om det är möjligt att spåra ursprunget för moränblocken och på så sätt få en uppskattning om riktning och längd för den glaciala transporten.

Resultaten visar att merparten moränblocken består av bergarter som förekommer inom Laxemarområdet. I många fall har blocken transporterats 100 meter eller mindre. Enstaka block har dock transporterats flera kilometer.

Resultaten från merparten av grusanalyserna visar att denna fraktion består av bergarter som endast transporterats en kort sträcka. Vissa gruspartikal består dock av bergarter som inte är kända från Laxemarområdet. Det har inte varit möjligt att bestämma bergarterna i grusfraktionen lika detaljerat som i blockfraktionen.

Resultaten av studien visar att moränen domineras av lokalt bergartsmaterial som transporterats från norr. Det har dock inte varit möjligt att nyttja resultaten från denna undersökning för att få en detaljerad tolkning av riktningen på den glaciala transporten.

Contents

1 Introduction

This document reports the data gained within the activity "Mapping of rock types in boulders and gravel", 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 400-06-024. In Table 1-1 the controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

The glacial till consists of bedrock material, which has been eroded, transported and deposited by glacial ice. One aim of this study was to determine the transport length of the till in the Laxemar subarea. A second aim was to gain additional information regarding the direction of the glacial transport.

The composition and genesis of the till in the Laxemar area has been discussed in several reports /Bergman et al. 2005, Rudmark et al. 2005, Sohlenius et al. 2006/. The till in the area has probably been deposited during the latest glaciation /Rudmark et al. 2005/, but the occurrence of till from older glaciations can not be excluded /Lindborg 2006/. The direction of glacial striae on outcrops has been measured in order to determine the direction of glacial movement /e.g. Rudmark et al. 2005/. The glacial striae indicate a youngest ice movement from the north-west (310°–320°). At some localities, two distinct systems of striae with somewhat more northerly striae direction has been observed (325°–345°). These striae probably indicate somewhat older ice movements or alternatively local deviations caused by the bedrock morphology. Glacial striae indicating an ice movement from the north-east (45° and 15°) have been observed at two sites /Rudmark et al. 2005, Sohlenius et al. 2006/.

The chemical and mineralogical composition of the till in the Laxemar subarea reflects that of the local bedrock /Lindroos 2004, Sohlenius et al. 2006/. The transport length of the till has, however, not been studied before the present investigation.

The boulder mapping was performed in April 2006 and was carried out along two, approximately north south trending profiles. One, 1,200 m long, in the southern part of the Laxemar subarea, profile 1, and one, 600 m long, in the northern part, profile 2, see Figure 1-1. Both profiles are situated in till areas with relatively high frequency of superficial boulders /Rudmark et al. 2005/, see Figure 1-1.

In order to investigate the statistical variations of rock types in boulders, three different areas were also investigated with respect to boulder content (Figure 1-1). The boulder mapping were performed in small areas, approximately 20×20 m wide, and the rock type of 50 boulders were determined. The sites were selected to be at places where the till previously had been investigated with respect to stratigraphy and grain size distribution /Rudmark et al. 2005/.

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

Activity plan	**Number**	**Version**
Kartering av bergartsinnehåll i block och grus vid platsundersökningen i Oskarshamn	AP PS 400-06-024	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för jordartskartering	SKB MD 131.001	1.0
Metodbeskrivning för berggrundskartering	SKB MD 132.001	1.0

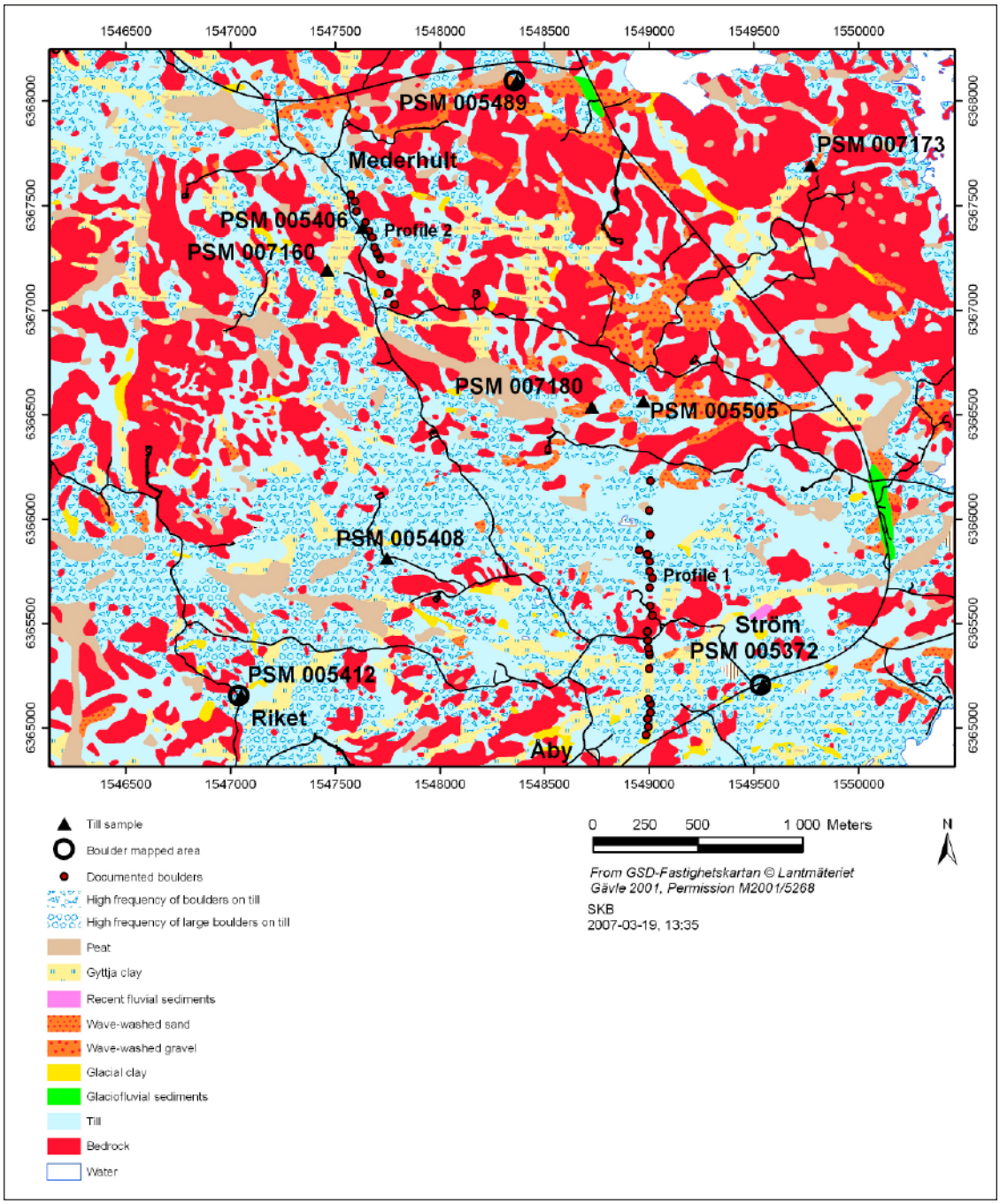

Figure 1-1. *Quaternary deposits and location of documented boulders and till-samples in the Laxemar area.*

This present study includes also a petrographic analysis of the gravel fraction from 10 till samples from the Laxemar area. The samples have previously been collected for grain size distribution analyses. /Rudmark et al. 2005, Sohlenius et al. 2006/. Three of the selected samples are from the local areas where also the boulder mapping were performed in the present study. The petrographic analyses of gravel comprised, determination of rock types and roundness of rock fragments. The sample sites are showed in Figure 1-1.

2 Objective and scope

Based on the detailed knowledge of the bedrock in the Laxemar area, the present study was carried out in order to investigate if the rock types found boulders and the gravel fraction of the till represents the local bedrock or not. Additionally, the present study tested if it was possible to trace the provenance, directions and length of the glacial transport of boulders and till in the Laxemar area.

3 Equipment

The mapping of the boulders was carried out in accordance to the method description for bedrock mapping (SKB MD 132.00, SKB internal document) and the methodology of /Lundqvist 1952/.

The following equipment was used during the boulder mapping:

- Garmin GPS 12 for positioning of boulders.
- Silva compass in order to keep bearing of profile.
- Instrument to measure magnetic susceptibility (Geoinstruments, Finland; GF Instruments, Czech Republic).
- A digital camera for taking photos of each boulder.
- Field notebook with standard observation protocol.

The petrographic analyses of washed gravel samples were carried out in the laboratory using a stereo microscope, Figure 3-1.

Figure 3-1. *Laboratory set-up for petrographic analysis of washed gravel samples.*

4 Execution

4.1 General

The boulder mapping was performed along two, approximately north-south trending profiles, 1,200 m and 600 m respectively, see Figure 1-1. Boulders were documented at approximately every 50 metres. A total of 37 boulders were documented, see Appendix 1.

The boulders along the profiles were documented with respect to rock type, colour, structural characteristics, magnetic susceptibility and roundness. A digital photo was taken of each boulder and the assumed provenance area was also noted.

The boulders in the local investigated areas were only classified with respect to rock type. The number of boulders in each group was counted and the proportional distribution of each rock type is presented in Appendix 2.

Petrographic analyses of washed gravel-fraction (grains 2–20 mm) were performed on 10 samples from different parts of the Laxemar subarea (Table 4-1). The gravel grains were separated into groups based on rock type and colour. The number of grains in each group was counted, and the proportional distribution of the different rock types was calculated. The roundness of the boulders and gravel grains was estimated on a scale 1–5, where 1 is rough and 5 is well rounded, see Appendix 1 and 3.

4.2 Data handling/post processing

The result of the boulder mapping was transferred into an Access database by using the database application BGDATA, version 1.7.5. The Access database and a selection of data from the Access database are stored in the SKB primary database (SICADA). The data are traceable by the activity plan number. The result of the petrographic analyses of the gravel-fraction (grain size 2–20 mm) is stored in the file archive of the SICADA database.

4.3 Nonconformities

The work has been carried out in accordance with the activity plan without any nonconformities.

Table 4-1. Results from grain size analyses of the 10 till samples used for petrographic analyses of the gravel fraction /from Rudmark et al. 2005, Sohlenius et al. 2006/.

Id code	Sampling depth (m)	Quaternary deposit	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
PSM 005372	2.0	Gravelly till	58.8	33.3	6.1	1.7
PSM 005406	1.0	Sandy till	33.4	51.7	10.6	4.3
PSM 005408	1.2	Gravelly till	45.1	43.9	8.8	2.2
PSM 005412	3.0	Sandy till	37.7	44.0	16.3	2.0
PSM 005489	1.0	Sandy till	25.3	47.2	24.5	3.1
PSM 005505	1.5	Gravelly till	46.1	39.3	12.4	2.2
PSM 005507	1.0	Gravelly till	41.6	48.7	6.7	3.0
PSM 007160	2.2	Gravelly till	75.2	18.6	4.4	1.8
PSM 007173	1.5	Gravelly till	34.2	60.2	2.9	2.7
PSM 007180	2.5	Gravelly till	35.0	58.2	4.0	2.7

5 Results and discussion

5.1 Boulder mapping along profiles

5.1.1 Profile 1, south- to central Laxemar

Profile 1 is north south trending, approximately 1,200 m long and goes from a point between Åby and Ström, close to the main road in the southern part of the Laxemar subarea, to a point in the central part of the Laxemar subarea, se Figure 5-1. The profile crosses several bedrock contacts. Totally 23 boulders were mapped along the profile and the main part of the boulders consist of the local rock types, i.e quartz monzodiorite, Ävrö granite and fine-grained dioritoid, Figure 5-1 /Wahlgren et al. 2006/. The coordinates, rock type and roundness of the documented boulders are listed in Appendix 1.

Boulders of quartzite, strongly foliated metagranodiorite, sandstone and coarse-grained Götemar granite were also found along the profile. These rock types are not known from outcrops in the area. The nearest known quartzite occurrence is found about 10 km north-north east of the Laxemar area. The foliated metagranodiorite boulder has most probably been transported even further. Sandstone is not known in larger areas north of Oskarshamn, only minor fracture fillings has been noted in drill cores and outcrops. The well rounded Götemar granite boulder, Figure 5-2, has been transported at least 4.5 km from the Götemar intrusion north of the Laxemar area.

Three of the six southernmost boulders along the profile consist of quartz monzodiorite, i.e the local bedrock. Which imply a glacial transport for these boulders of less than 350 metres, if assuming a direction of the glacial transport from the north or north-west /Rudmark et al. 2005/.

The most indicative rock type along the profile, is the fine-grained dioritoid, which occur in a 50–100 m wide east-west trending belt. Two boulders of fine-grained dioritoid were found along the profile, one 40 m south of the southern rock contact and one in the central part of the rock unit. The southernmost boulder has at a maximum been transported 140 m assuming a north-south direction of the glacial transport.

The bedrock along the profile farther to the north comprises two varieties of Ävrö granite. These varieties of Ävrö granite are judged to have a granodioritic and quartz monzodioritic composition (cf. Figure 5-1). This compositional variation is also reflected in the composition of boulders along the profile. The first boulder of Ävrö granite, judged to have a granodioritic composition, is found approximately 300 m south of the contact between the Ävrö granite and the Ävrö quartz monzodiorite (cf. Figure 5-1).

5.1.2 Profile 2, northern Laxemar

Profile 2 is north-north-west trending, approximately 600 m long and extends from the central part of Laxemar subarea to about 300 m south of Mederhult (see Figure 5-1). Totally 16 boulders were documented along the profile, see Appendix 1. The major part of the boulders consists of Ävrö granite. Two varieties of the Ävrö granite are observed, one with an inferred granodioritic composition which dominates in the southern part, and one with a quartz monzodioritic composition which dominates in the northern part. Subordinately diorite/gabbro, granite and coarse-grained Götemar granite also occur along the profile. The boulders are relatively well rounded, in particular the long transported boulders, see Appendix 1.

Most of the boulders along the profile consist of the local bedrock and the profile does not cross any known bedrock contacts. An assessment of glacial transport distance and directions for the boulders is therefor difficult to make. However, most of the boulders appear to have a relatively local provenance, except for the Götemar granite boulder that most likely is transported at least 2.5 km.

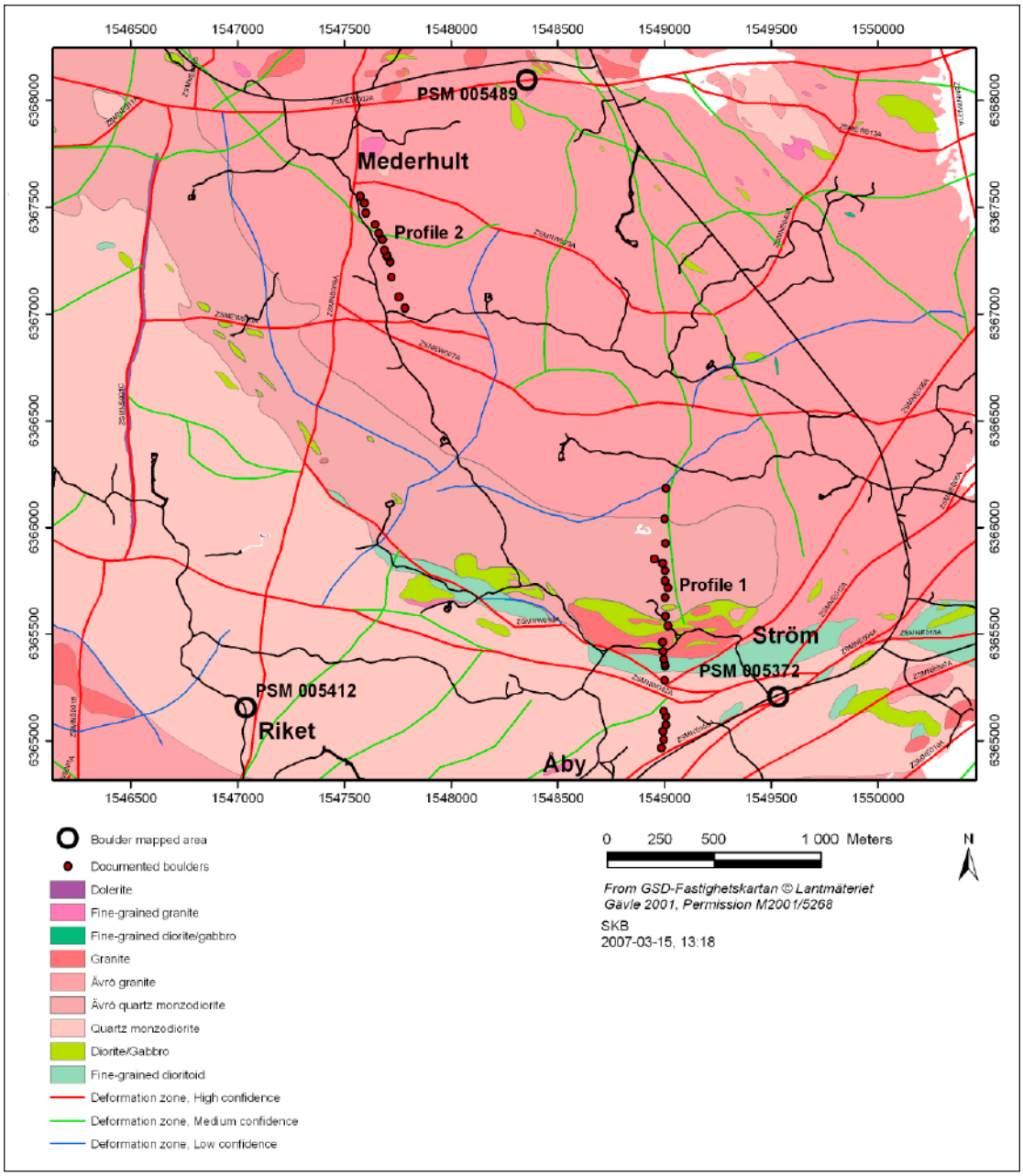

Figure 5-1. *Bedrock map of the Laxemar sub area /Wahlgren et al. 2006/ with location of documented boulders along Profile 1 and 2 and boulder mapped areas.*

Figure 5-2. *Boulder of Götemar granite, relatively well rounded.*

5.2 Boulder mapping at three minor areas

5.2.1 The “Mederhult lineament”, sample site PSM005489

Boulder mapping was performed on a small till covered hill south of the road to Misterhult in the northern part of the Laxemar subarea (Figure 5-1). Totally 44 of the 50 boulders consist of granite, generally medium- to coarse-grained. This granite type is found in outcrops approximately 80 m to the north and in several minor areas towards north-west, in a distance of 200–400 m. Boulders of Ävrö granite, fine-grained granite and diorite/gabbro occur subordinately. These rock types are also found in outcrops in the vicinity to the north. The conclusion is that most of the boulders are relatively short-transported or locally derived. The proportional distribution of the different rock types is presented in Appendix 2.

5.2.2 Ström, sample site PSM005372

More than 80% of the boulders consist of the local bedrock, i.e quartz monzodiorite which is medium-grained and grey. A few boulders of fine-grained diorite/gabbro and Ävrö granite were also found. The proportional distribution of the different rock types is presented in Appendix 2. The site is situated about 100 m south of the bedrock contact between fine-grained dioritoid and quartz monzodiorite. This concludes that the quartz monzodiorite boulders are glacially transported less than 100 metres. The Ävrö granite and diorite/gabbro boulders indicate a transport distance of at least 300 m, see Figure 5-1.

Figure 5-3. *Short transported granite boulders on a till covered hill in the eastern part of the Mederhult lineament.*

5.2.3 The Basthult road close to Riket, sample site PSM005412

More than 90% of the boulders consist of the local bedrock, i.e quartz monzodiorite which is medium-grained and grey. Separate boulders of fine-grained granite, granite and fine-grained diorite/gabbro were also found. The proportional distribution of the different rock types is presented in Appendix 2.

5.3 Petrographic analysis of gravel from till samples

The petrographic analysis of gravel was performed on 10 till samples from the Laxemar sub area, see Figure 1-1. The results are presented in Appendix 3. Nine of the samples are from the area covered by detailed bedrock geological information.

Most of the rock types noted in the gravel samples are also found in the Laxemar subarea and a correlation between the local bedrock and the gravel fragments is generally seen.

Ävrö granite and reddish, fine-grained granite are found in most of the samples. The Ävrö granite is generally dominating and the proportion of Ävrö granite varies between 44–98%. The Ävrö granite fragments are generally easily distinguished from the other rock fragments. However, some of the samples are strongly altered and the distinction between reddish granite and altered/red stained Ävrö granite is sometimes difficult to make.

The reddish fine to medium grained granite is the second largest group in several samples. In sample PSM005489, 64% of the gravel fragments consists of reddish granite. Boulder mapping from the same area shows a similar result, see section 5.2.1.

The strong alteration, found in some of the samples, is generally associated to samples taken close to interpreted deformation zones. These samples also tend to hold a great part of grains that are difficult to classify. These fragments are counted under the label “unspecified” and comprise generally fragments of breccia material, fracture fillings and other strongly altered bedrock types. Up to 29% of the gravel fraction consists occasionally of unspecified rock fragments, e.g. sample (PSM005406) south of Mederhult, see Figure 5-1. That sample contains also several subordinate and exotic rock fragments, such as quartzite, felsic volcanic rock and sandstone. Quartzite and felsic volcanic rock is not known from the area and is most certainly relatively far transported. Sandstone is only known, from outcrops and drillings in the area, as minor fracture fillings. In addition, several grains (8%) of highly consolidated till is also found in this sample.

In two samples fine-grained dioritoid are present in large amounts. These two gravel samples (PSM005408 and PSM005372) are from excavations, at or just south of the east-west trending dioritoid rock unit, see Figure 5-1. Sample PSM005372, approximately 100 m south of the fine-grained dioritoid, consists to 49% of fine-grained dioritoid fragments. The boulders from the same site were to 82% dominated by quartz monzodiorite. The gravel sample from the same place is lacking quartz monzodiorite fragments, which indicate a glacial transport distance of at least 100 m for the gravel fraction and less than 100 m for most of the boulders.

Mono-mineral fragments of quartz and feldspar are found in almost all samples. This group constitutes generally 1–5% of the gravel grains.

Generally 1–5% of the gravel fragments consist of diorite/gabbro, with the exception for sample PSM007173 in which 17% of the grains consist of diorite/gabbro. This sample originates from the area south-east of Lake Frisksjön and 100 metres south of a minor diorite/gabbro body, see Figure 5-1. The correlation between the diorite/gabbro body and the relatively high content of diorite/gabbro fragments is interpreted as an indication of a transport distance of less than 100 metres. In addition, the same sample contains a relatively high content of reddish fine-grained granite (36%), which also occur in the bedrock 100–150 metres north-west of the sample site.

As can be concluded from the results presented above most of the gravel has been transported a short distance and reflects the local bedrock or the bedrock occurring 100–200 metres north of the sampled site. However, a deviating result from this statement is found in sample PSM005412, from the south-western part of the Laxemar area, see Figure 5-1. This gravel sample does not contain any fragments of the local quartz monzodioritic bedrock and is surprisingly dominated to 85% of Ävrö granite. The nearest Ävrö granite found in outcrops is approximately 1,300 metres to the north. The boulder mapping from the same site is to 91% dominated by the local bedrock, see section 5.2.3.

The studied till samples have a generally high content of gravel (Table 4-1), which imply a short transport length. One sample (PSM007160) has an extremely high content of gravel and is completely dominated by one bedrock type (Appendix 3). The dominance of one or few bedrock types also indicates short transport length.

Grains with a low roundness have probably been transported for a shorter distance than grains with a high roundness. The gravel grains studied here are generally not so well rounded. Roundness between 2–3 is dominating. That implies a relatively short glacial transportation for the gravel fragments. Gravel grains from samples with one dominating bedrock type is generally less rounded than grains from samples with several bedrock types (Appendix 3). That is logical, since the samples with several bedrock types probably contain a higher degree of more long transported material.

6 Summary and conclusions

This activity was conducted to test if the petrographic composition of the till is similar to the composition of the local bedrock. Additionally, the activity tested if it was possible to trace the provenance, and thus the direction of glacial transport of the till. Even though the activity only comprised two days of geological mapping of boulders in the Laxemar subarea and less than one week of petrographic analyses in the laboratory, the study resulted in some clear and interesting results.

Most of the boulders are local and have been glacial transported 100 metres or less. However, some individual boulders of Götemar granite and quartzite indicate that at least some boulders are glacial transported 4.5 km or more.

A similar conclusion can be drawn from studies of the gravel fraction. Indicative rock types, such as fine-grained dioritoid or diorite/gabbro, indicate a glacial transport length of at least 100 metres for the gravel fraction. Furthermore, several rock types not found in the Laxemar area were also identified in the gravel fraction.

The result shows that the till has been transported from the north, however, it has not been possible to determine the direction of glacial transport in detail.

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Appendix 1

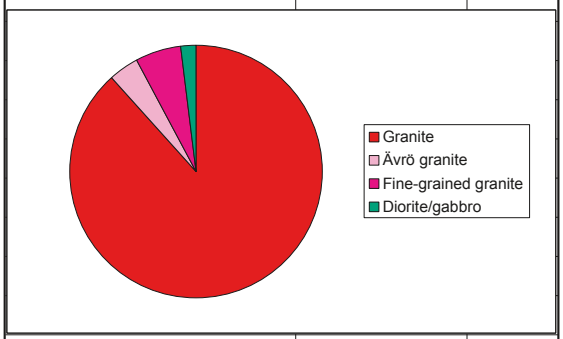
Location of boulder observations

Boulder id	Round-ness	Rock type	Rock code	Easting	Northing	Profile
PSM007776	3	Quartz monzodiorite	501036	1548985	6364966	1
PSM007777	3	Quartz monzodiorite	501036	1548999	6365003	1
PSM007778	4	Coarse-grained Götemar granite	521058	1548995	6365045	1
PSM007779	3	Quartz monzodiorite	501036	1549009	6365074	1
PSM007780	3	Pegmatite	501061	1549008	6365116	1
PSM007781	4	Quartzite	7012	1548998	6365137	1
PSM007782	3	Fine-grained dioritoid	501030	1549002	6365284	1
PSM007783	4	Granodiorite (foliated)	1056	1549005	6365348	1
PSM007784	3	Ävrö granite (quartz monzodioritic*)	501044	1549002	6365360	1
PSM007785	2	Fine-grained dioritoid	501030	1548999	6365380	1
PSM007786	3	Diorite/gabbro	501033	1548995	6365418	1
PSM007787	4	Quartz monzodiorite (granodioritic*)	501036	1548992	6365461	1
PSM007788	4	Coarse-grained Götemar granite	521058	1549016	6365538	1
PSM007789	3	Fine-grained granite	511058	1549007	6365584	1
PSM007790	2	Ävrö granite (quartz monzodioritic*)	501044	1549004	6365670	1
PSM007791	3	Ävrö granite (quartz monzodioritic*)	501044	1549017	6365716	1
PSM007792	3	Ävrö granite (granodioritic*)	501044	1549005	6365749	1
PSM007793	3	Granite	501058	1549004	6365796	1
PSM007794	3	Diorite/gabbro	501030	1548992	6365830	1
PSM007795	3	Sandstone	506007	1548954	6365850	1
PSM007796	3	Ävrö granite (granodioritic*)	501044	1549006	6365925	1
PSM007797	3	Ävrö granite (quartz monzodioritic*)	501044	1549002	6366039	1
PSM007798	3	Ävrö granite (granodioritic*)	501044	1549008	6366184	1
PSM007799	3	Ävrö granite (granodioritic*)	501044	1547784	6367028	2
PSM007800	3	Ävrö granite (granodioritic*)	501044	1547757	6367081	2
PSM007801	3	Ävrö granite (granodioritic*)	501044	1547722	6367171	2
PSM007802	4	Ävrö granite (quartz monzodioritic*)	501044	1547716	6367244	2
PSM007803	3	Ävrö granite (granodioritic*)	501044	1547703	6367267	2
PSM007804	4	Diorite/gabbro (foliated)	501033	1547699	6367275	2
PSM007805	3	Ävrö granite (quartz monzodioritic*)	501044	1547689	6367300	2
PSM007806	3	Ävrö granite (granodioritic*)	501044	1547674	6367351	2
PSM007807	4	Quartz monzodiorite (granodioritic*)	501036	1547679	6367348	2
PSM007808	4	Granite	501058	1547662	6367378	2
PSM007809	3	Ävrö granite (quartz monzodioritic*)	501044	1547645	6367418	2
PSM007810	3	Ävrö granite (quartz monzodioritic*)	501044	1547601	6367474	2
PSM007811	4	Ävrö granite (quartz monzodioritic*)	501044	1547594	6367520	2
PSM007812	4	Coarse-grained Götemar granite	521058	1547576	6367552	2

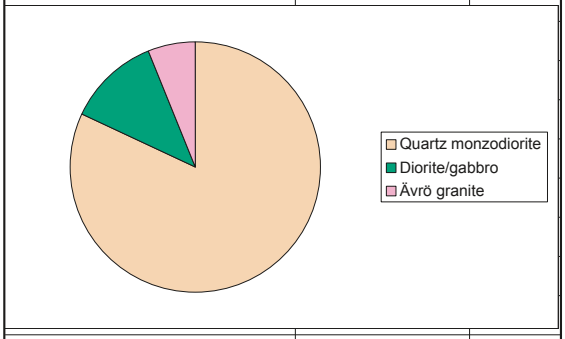
* Field classification, not analysed.

Petrographic analyses of boulders

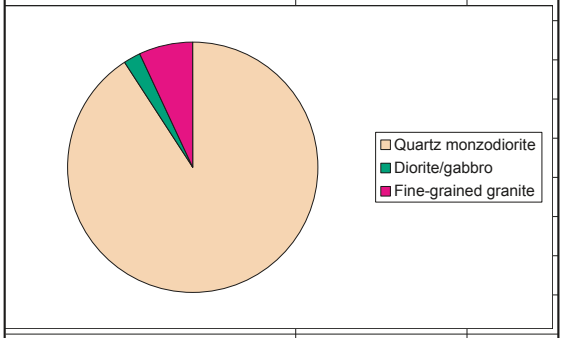
Petrographic analysis: boulders,Laxemar		
SKB id: PSM005489		
Rocktype	Number of boulders	%
Granite	45	88,2
Ävrö granite	2	3,9
Fine-grained granite	3	5,9
Diorite/gabbro	1	2,0
Sum	51	100,0



Petrographic analysis: boulders,Laxemar		
SKB id: PSM005372		
Rocktype	Number of boulders	%
Quartz monzodiorite	41	82,0
Diorite/gabbro	6	12,0
Ävrö granite	3	6,0
Sum	50	100,0



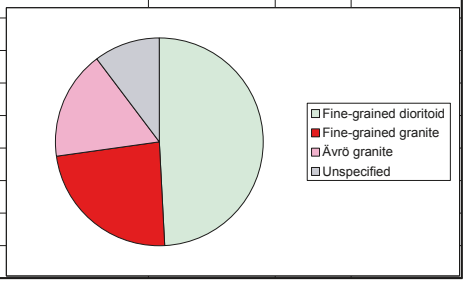
Petrographic analysis: boulders,Laxemar		
SKB id: PSM005412		
Rocktype	Number of boulders	%
Quartz monzodiorite	40	90,9
Diorite/gabbro	1	2,3
Fine-grained granite	3	6,8
Sum	44	100,0



Petrographic analyses of gravel from till samples

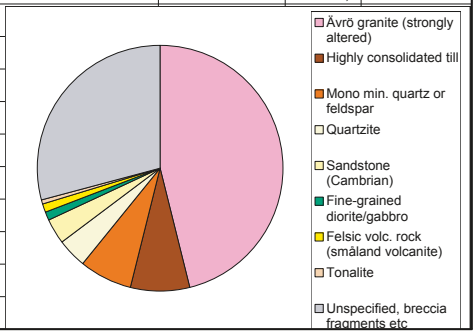
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28103	SKB id: PSM005372		Depth: 2.0 m
Rocktype	Number of grains	%	Roundness
Fine-grained dioritoid	104	49,1	2
Fine-grained granite	50	23,6	2
Ävrö granite	36	17,0	3
Unspecified	22	10,4	2
Sum	212	100,0	



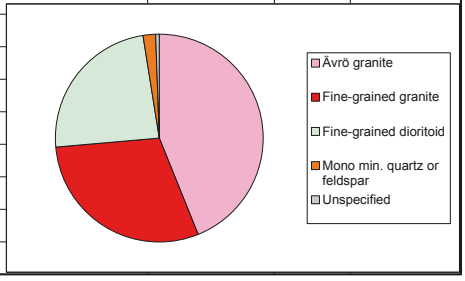
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28109	SKB id: PSM005406		Depth:1 m
Rocktype	Number of grains	%	Roundness
Ävrö granite (strongly altered)	203	46,1	3
Highly consolidated till	34	7,7	3
Mono min. quartz or feldspar	31	7,0	2
Quartzite	17	3,9	3
Sandstone (Cambrian)	14	3,2	3
Fine-grained diorite/gabbro	5	1,1	2
Felsic volc. rock (småland volcanite)	5	1,1	4
Tonalite	3	0,7	4
Unspecified, breccia fragments etc	128	29,1	3
Sum	440	100,0	



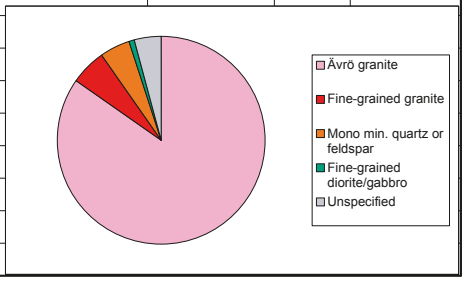
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28110	SKB id: PSM005408		Depth:1,2 m
Rocktype	Number of grains	%	Roundness
Ävrö granite	341	44,2	2
Fine-grained granite	232	30,1	2
Fine-grained dioritoid	185	24,0	2
Mono min. quartz or feldspar	14	1,8	3
Unspecified	5	0,6	3
Sum	772	100,0	



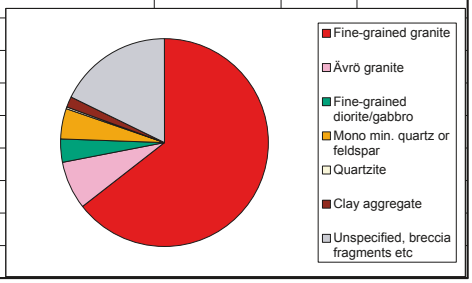
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28112	SKB id: PSM005412		Depth: 3.0 m
Rocktype	Number of grains	%	Roundness
Ävrö granite	439	84,6	3
Fine-grained granite	29	5,6	2
Mono min. quartz or feldspar	25	4,8	3
Fine-grained diorite/gabbro	4	0,8	4
Unspecified	22	4,2	3
Sum	519	100,0	



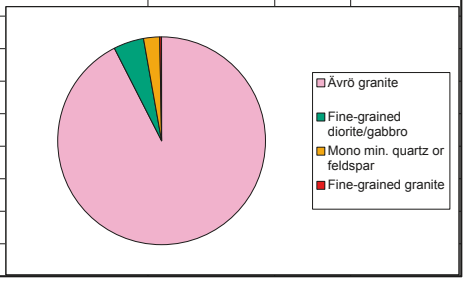
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28095	SKB id: PSM005489		Depth:1 m
Rocktype	Number of grains	%	Roundness
Fine-grained granite	387	64,5	2
Ävrö granite	44	7,3	3
Fine-grained diorite/gabbro	22	3,7	2
Mono min. quartz or feldspar	29	4,8	3
Quartzite	1	0,2	3
Clay aggregate	11	1,8	4
Unspecified, breccia fragments etc	106	17,7	2
Sum	600	100,0	



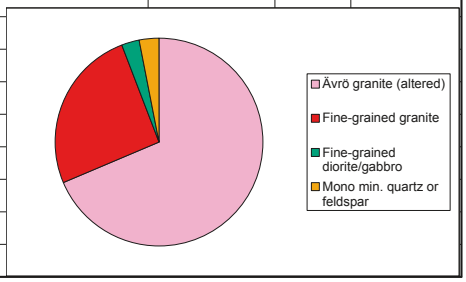
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28097	SKB id: PSM005505		Depth:1,5 m
Rocktype	Number of grains	%	Roundness
Ävrö granite	445	92,5	3
Fine-grained diorite/gabbro	22	4,6	3
Mono min. quartz or feldspar	12	2,5	2
Fine-grained granite	2	0,4	3
Sum	481	100,0	



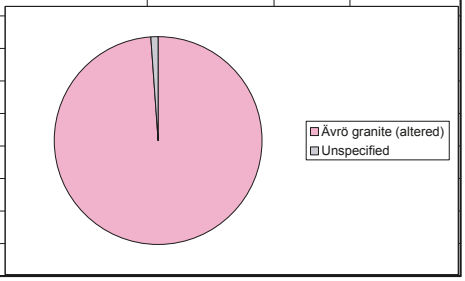
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28098	SKB id: PSM005507		Depth:1,5 m
Rocktype	Number of grains	%	Roundness
Ävrö granite (altered)	463	68,7	2
Fine-grained granite	171	25,4	2
Fine-grained diorite/gabbro	20	3,0	3
Mono min. quartz or feldspar	20	3,0	2
Sum	674	100,0	



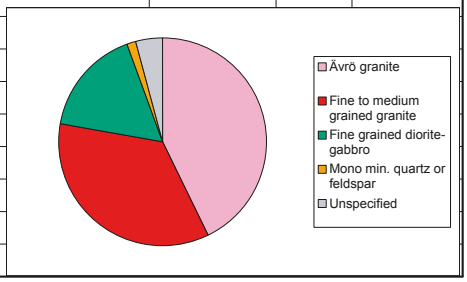
Petrographic analysis: gravel fraction, Laxemar

Lab id: 28203	SKB id: PSM007160-4		Depth:2,2 m
Rocktype	Number of grains	%	Roundness
Ävrö granite (altered)	251	98,8	2
Unspecified	3	1,2	2
Sum	254	100,0	



Petrographic analysis: gravel fraction, Laxemar

Lab id: 28212	SKB id: PSM007173		Depth:1,5 m
Rocktype	Number of grains	%	Roundness
Ävrö granite	172	44,8	3
Fine to medium grained granite	140	36,5	3
Fine grained diorite-gabbro	67	17,4	3
Mono min. quartz or feldspar	5	1,3	4
Unspecified	17	4,4	3
Sum	384	100,0	



Petrographic analysis: gravel fraction, Laxemar

Lab id: 28216	SKB id: PSM007180		Depth:2,5 m
Rocktype	Number of grains	%	Roundness
Ävrö granite (altered)	652	88,1	3
Fine-grained diorite/gabbro	21	2,8	3
Mono min. quartz or feldspar	32	4,3	3
Unspecified	35	4,7	3
Sum	740	100,0