NGU Rapport 93.136

Report on the data and literature available on the Korgen Waterworks area, Lillehammer

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RAPPORT

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Report on the data and literature available on the Korgen Waterworks area, Lillehammer

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Sammendrag:

Denne rapporten er blitt til som en del av NGUs bidrag til Berdal Strømmes prosjekt "Korgen vannverk"; en del av ENSIS -94 prosjektet i forbindelse med de Olympiske Vinterleker 1994 på Lillehammer. Rapporten lister opp all litteraturen og datamaterialet som NGU har på Korgen-området og det nærliggende Hovemoen-området. Et sammendrag av inholdet i hver rapport er også gitt, samt en beskrivelse av geologien og hydrogeologien i området.

This report has been prepared as part of NGUs contribution to the "Korgen vannverk" project being carried out by Berdal Strømme a/s as part of the ENSIS '94 project connected with the 1994 Winter Olympic Games in Lillehammer. The report lists all the literature and data held by NGU on the Korgen area and the adjacent Hovemoen area. A summary of the contents of each report is given. A description of the geology and hydrogeology of the areas is also given.

Emneord: Hydrogeologi	Grunnvannsmagasin	Breelvavsetning
Løsmasse	Grunnvannsbrønn	Borestedsundersøkelse
Grunnvannsstrømning	Vannverk stort	Bibliografi

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REPORT ON THE DATA AND LITERATURE AVAILABLE ON THE KORGEN WATERWORKS AREA, LILLEHAMMER KOMMUNE

PART I: INTRODUCTION

This report forms part of NGU's contribution to the "Korgen referansevannverk" project being undertaken by Berdal Strømme a/s for Lillehammer kommune. This project is being carried out as part of the establishment of ENSIS VANN in connection with the 1994 Winter Olympic Games.

Location

The Korgen Waterworks are situated approximately 2km northwest of Lillehammer on the eastern shore of the Mjøsa. The waterworks have been constructed on the fan of the River Bæla which is an area of low lying ground approximately 300m square. Immediately to the northwest of the waterworks is the Hovemoen area, which has an area of approximately 2km^2 and reaches a height of 170m a.s.l.. Korgen is bordered in the east and northeast by higher ground rising to an elevation of approximately 600-700m a.s.l..

Previous work

The Korgen and Hovemoen areas have been the subject of a number of detailed geological and hydrogeological investigations. The most important are described briefly below.

Hillestad (1971) carried out 12 seismic profiles across Hovemoen and Korgen. Dahl (1972) carried out tracer tests on the aquifer at Korgen with a view to assessing the groundwater abstraction potential in the area. A total of 16 investigation boreholes have been drilled by NGU in the Hovemoen and Korgen areas (Gaut and Klemetsrud, 1983). Borehole logs were drawn up for each borehole and groundwater sampling and test pumping undertaken. In connection with the planning of a new route for the E6 road, geophysical investigations were carried out by NGU and Oppland Vegvesen on the eastern side of Hovemoen (Hughdahl, 1981). Soldal (1988) carried out a detailed geological and hydrogeological investigation of both the Hovemoen and Korgen areas involving Vertical Electrical Sounding (VES), investigatory drilling with core sampling and test pumping.

The structure of this report

Part II of this report gives a brief introduction to the geology and hydrogeology of the Korgen area and the adjacent Hovemoen area. The latter is included because of its importance to the hydrogeology of Korgen. Part III of the report then gives an inventory of the literature published on the investigations carried out on the two areas, including a brief overview of the contents of each publication.

PART II: A SUMMARY OF THE QUATERNARY GEOLOGY AND HYDROGEOLOGY OF THE KORGEN AND HOVEMOEN AREAS

GEOLOGY

The Hovemoen area

A total thickness of up to 130m of Quaternary sediments are present in the Hovemoen area.

The lowermost Quaternary sediments in the Hovemoen area consist of fine-grained deposits of silt and clay. These deposits lie directly on the basement rock and were probably formed during an interstadial period (Soldal, 1988). Overlying these sediments are fine-grained sediments probably of glacio-lacustrine origin. These deposits were probably formed during a period of deglaciation at a time when the ice front was at Jørstadmoen. These fine-grained sediments have a total thickness of approximately 100m.

These sediments are, in turn, overlain by coarse fluvio-glacial sediments that are interpreted to be esker sediments deposited during an ice-advance. These sediments are approximately 30m thick. The sedimentary structure and the petrographic texture of the sediments suggest that the ice-movement was from the direction of Gudbrandsdalen. Correlation with other work suggests that the esker was formed prior to 9000 years B.P..

In the southern part of Hovemoen the esker sediment is absent. In this area, however, reworked coarse-grained sands and gravels are present. These sediments are interpreted by Soldal (1988) as being derived from the esker sediments further north. The processes involved in the reworking of these sediments are not clearly understood although fluvial erosion and deposition or marine reworking (at a time when the sea level was significantly higher than now) are two possibilities.

The Korgen area

The fine-grained interstadial sediments described above are also present in the Korgen area. As in the Hovemoen area, these sediments directly overlie the basement rock. The fine-grained glacio-lacustrine sediments, the coarse-grained esker sediments and the reworked esker sediments present at Hovemoen are, however, absent from the Korgen area.

Overlying the interstadial sediments at Korgen is the alluvial fan of the River Bæla. This fan is post-glacial in origin and is typically 20m thick. It consists of moderately to poorly sorted sands and gravels.

Within the fan deposits across the southern part of Korgen is a fine-grained bimodal deposit consisting of cobble and boulder grade clasts in a matrix of clays and silts. According to Soldal (1988), this deposit is wedge-shaped, being thickest in the southern part of Korgen (where it is at least 15m thick) and lenses out towards the central part of the area. Across the south-central part of Korgen it is typically 5m thick. This deposit was interpreted by Soldal (1988) as being predominantly the result of a landslide formed of material derived from the southern slopes of

Hovemoen. Soldal (1988) suggests that the landslide may have been the result of the River Bæla cutting into the fine-grained sediments in the south of Hovemoen. However, Soldal suggests that the origin of some of the material may be due to other processes such as fluvial deposition. The precise lateral extent of this deposit is not known.

HYDROGEOLOGY

The Hovemoen area

With the exception of the Kobberslagergrøpene in the central area of Hovemoen, the groundwater level in the Hovemoen area is approximately coincident with the interface between the fine-grained glacio-lacustrine sediments and the overlying coarse-grained esker sediments. This means that the saturated part of the aquifer in Hovemoen is of relatively low permeability. Consequently, there is relatively little potential for water abstraction in this area.

The coarse-grained resedimented esker deposits in the south of Hovemoen are, however, saturated and form an unconfined aquifer. This aquifer is in hydraulic connection with the Mjøsa when the water level in the Mjøsa rises above 121m a.s.l.. A direct correlation is apparent between the water level in the Mjøsa and the groundwater level when the water level in the Mjøsa rises above this elevation. This implies that there are low permeability sediments on the floor of the Mjøsa below this level. A hydraulic connection also probably exists to the River Bæla fan described below.

The Korgen area

The principal aquifer in the Korgen area is the fan of the River Bæla described above. This aquifer is approximately 20m thick and is formed by moderately to poorly sorted sands and gravels. In the southern part of Korgen, this fan is divided by the fine-grained landslide deposit which forms an aquitard. This deposit wedges out in the northern part of the Korgen fan and there is likely to be a good hydraulic connection between the upper and lower parts of the aquifer in this area. The base of the aquifer is formed by the underlying fine-grained glacio-lacustrine silts and clays.

This aquifer thins towards the higher ground north and northeast of Korgen to a thickness of less than 2m. Tracer tests on the aquifer undertaken by Dahl (1972) showed that little groundwater flow comes from this direction. Towards the northwest, the aquifer is in hydraulic connection with the resedimented esker deposits in the southern part of Hovemoen. The fan at Korgen is believed to have been deposited after the resedimented esker deposits and consequently it is thought that it overlies the resedimented deposits where they are in contact. Soldal (1988) suggests that most of the water entering the aquifer at Korgen comes from the Mjøsa through the coarse-grained resedimented esker deposits on the southern slopes of Hovemoen. Further northwest in the Hovemoen area, the saturated aquifer is believed to be of relatively low permeability and little groundwater flow occurs from this direction.

The continuation of the aquifer towards the southwest is uncertain. Soldal (1988) states that there is a transition in a southerly direction towards finer grained sediments and suggests in a schematic diagram that the aquifer may wedge out in this direction. Pumping tests and tracer tests undertaken in this part of the aquifer have indicated that very little groundwater is derived from this area. The hydrogeological map produced by Gaut and Klemetsrud (1983) suggests that the aquifer continues in a southeasterly direction for approximately 1.5km. The superficial sediments in this direction consist of fluvial sediments, typically sands and gravels. The thickness of these sediments varies considerably, however, and it is uncertain as to how far the aquifer extends in a southeasterly direction. It is likely that these sediments form a number of small isolated aquifers.

The general direction of groundwater flow under non-pumping conditions in the Korgen area is towards the southwest, although this pattern is altered to some extent by the presence of the Bæla stream. North of the Korgen area this stream probably receives groundwater. Soldal (1988) presents evidence to suggest that the Bæla produces a groundwater ridge across the fan but suggests that because the river runs across a fine-grained part of the aquifer little infiltration occurs into the aquifer.

Under pumping conditions, the groundwater flow pattern in the Korgen area is complicated by the presence of the low permeability dividing layer formed by the landslide. At Korgen, the intake level of the borehole used for the pumping tests is below this low permeability layer. Whilst the groundwater flow direction at the level of the borehole intake is generally towards the borehole. In the tracer tests carried out by Dahl (1972), however, groundwater flow was found to occur away from the borehole above this layer.

With the borehole intake being placed below the dividing layer, the onset of pumping creates significant downward head gradients between the upper and lower parts of the aquifer. However, because of the low permeability of the dividing layer, significant vertical flow can only occur through the windows in this layer. Thus, in the aquifer layers above the dividing layer horizontal flow occurs towards the windows. Given that the major window in the dividing layer lies to the north of the pumping borehole, the majority of this horizontal flow will be away from the borehole. Downward vertical flow then occurs through the windows into the lower aquifer level followed by horizontal flow towards the borehole intake. The dominant source of groundwater in the Korgen area under pumping conditions is from the Mjøsa via the reworked esker sediments to the northwest of Korgen. The magnitude of this groundwater source is dependent on the water level in the Mjøsa, being greatest in late Winter when the level in the Mjøsa is at it's highest.

Using the tracer tests carried out on the aquifer at Korgen by Dahl (1972), Soldal (1988) obtained estimates for the porosity of the aquifer (n=0.13) and the permeability of each layer with a high flow velocity ($k=3.6 \times 10^{-2}$m/s).In addition the tracer test results were used in conjunction with the pumping test to determine an estimate of the anisotropy of the aquifer in a horizontal plane. Soldal (1988) gives estimates of 6.7×10^{-3}m/s and 1.6×10^{-2}m/s for two mutually perpendicular horizontal directions within the aquifer.

PART III: A REVIEW OF AVAILABLE LITERATURE RELATING TO INVESTIGATIONS UNDERTAKEN ON THE KORGEN AREA

TITLE: KVARTÆRGEOLOGI OG HYDROGEOLOGI PÅ HOVEMOEN VED LILLEHAMMER (GEOLOGY AND HYDROGEOLOGY OF THE HOVEMOEN AREA, LILLEHAMMER)
AUTHOR(S): O.SOLDAL
REF: M.Sc. THESIS, UNIVERSITY OF BERGEN
DATE: 1988

SUMMARY OF CONTENTS:

This thesis presents the results of a detailed investigation of the geology and hydrogeology of the Quaternary sediments in the Hovemoen-Korgen area. This investigation involved the use of Vertical Electrical Soundings (VES), the drilling of investigation boreholes, core sampling and pumping tests. The study also used data obtained from previous fieldwork including seismic investigations, drilling, core sampling, test pumping and tracer tests. Aquifer porosity and permeability estimates were obtained from the pumping tests and tracer tests.

The thesis gives a detailed description and interpretation of the investigations carried out.

TITLE: LARS OLSEN: LILLEHAMMER BESKRIVELSE TIL KVARTÆRGEOLOGISK KART 1817 - M 1:50 000 (LILLEHAMMER: DESCRIPTION OF THE QUATERNARY GEOLOGICAL MAP 1817 II - 1:50 000)
AUTHOR: L.OLSEN
REF: N.G.U SKRIFTER SERIES NO.60
DATE: 1985

SUMMARY OF CONTENTS:

This report presents a description and interpretation of the Quaternary geological map no.1817 III covering the Lillehammer area. The Hovemoen and Korgen areas form a very small part of this map and so do not receive extensive coverage. In addition to brief descriptions of the Quaternary geology of these areas, a short summary of the sand and gravel resources and hydrogeology is given.

TITLE: **BESKRIVELSE TIL VANNRESSURSKART "GRUNNVANN I LØSAVSETNINGER" LILLEHAMMER - M 1:50 000 (DESCRIPTION OF THE WATER RESOURCES MAP - "GROUNDWATER IN UNUNNVANN I LØSAVSETNINGER" LILLEHAMMER M 1:50 000)**
AUTHOR(S): A. GAUT AND T. KLEMETSRUD
REF: **NGU SPECIAL REPORT NO. 33**
DATE: **MARCH 1983**

SUMMMARY OF CONTENTS:

This report is basically a description of the 1:50 000 water resources map based on the Statens Kartverk sheet No. 1817 II which covers the Lillehammer area, including Korgen waterworks.

The report gives:

a) a brief introduction to the topography, hydrology and landuse of the area
b) a description of the solid and drift geology
c) an overview of geological investigations carried out in the area up to 1983
d) a brief hydrogeological assessment of the bedrock within the area based on pumping tests carried out in bedrock boreholes
e) the location of possible groundwater resources within the area
f) a brief summary of groundwater quality within the area
g) the results of geological and hydrogeological investigations carried out in the map area, including:

(i) borehole locations and logs
(ii) location of seismic profiles carried out
(iii) grain-size analyses
(iv) chemical analyses
(v) bacteriological analyses

TITLE: **SAND- OG GRUSUNDERSØKELSER I SANNHEIM-BÆLAOMRÅDET PÅ LILLEHAMMER KOMMUNE (SAND AND GRAVEL INVESTIGATIONS IN THE SANNHEIM-BÆLA AREA AT HOVEMOEN)**
AUTHOR(S): P.R.NEEB
REF: **NGU REPORT NO.1807/2**
DATE: **NOVEMBER 1981**

SUMMARY OF CONTENTS:

This report details the investigations carried out on the sand and gravel deposits in the Sannheim-Bæla area. This work was undertaken by NGU on the request of Lillehammer kommune. The principal objective of this work was to determine the volume and quality of the sand and gravel deposits and to assess its suitability for use as construction aggregate. The report includes volume calculations and grain-size distributions for the sediments.

The report contains the following enclosures:

- location map
- map showing the (then) current owners of the land in the area
- summary map of ground investigations carried out to date
- structure contour maps for the interface between the coarse-grained sediments (sands and gravels) and the underlying silts and clays
- isopachyte map of the sands and gravels

TITLE: **LETTSEISMISKE- OG ELEKTRISKE SONDERINGER PÅ HOVEMOEN, LILLEHAMMER (SEISMIC AND ELECTRICAL INVESTIGATIONS AT HOVEMOEN, LILLEHAMMER)**
AUTHOR(S): **H.HUGDAHL**
REF: **NGU REPORT NO. 1806/11**
DATE: **NOVEMBER 1981**

SUMMARY OF CONTENTS:

This report presents the results of seismic and electrical investigations undertaken at Hovemoen in September 1981 along the line of the (then) proposed E6 road (i.e. north of Korgen). The investigations were carried out in connection with the appraisal of sand and gravel deposits in the area. Much of the investigation centered on determining the depth to the finer-grained underlying sediments. Soundings were carried out in a total of eight locations.

TITLE: **VANNVERK I KORGEN (KORGEN WATERWORKS)**
AUTHOR(S): **ELLIOT STRØMME**
REF: **TENDER FOR THE CONSTRUCTION OF KORGEN WATERWORKS**
DATE: **JANUARY 1980**

SUMMARY OF CONTENTS:

This tender document contains the diagrams relating to the tender for the construction of Korgen waterworks.

The following diagrams are enclosed:

- abstraction borehole locations
- borehole construction details
- control system diagrams
- flow diagrams for the waterworks
- building plans
- site plans

TITLE: VEDRØRENDE PLASSERING AV NYE BOREBRØNNER I KORGEN, LILLEHAMMER KOMMUNE (PLACEMENT OF NEW BOREHOLES AT KORGEN, LILLEHAMMER KOMMUNE)
AUTHOR(S): T.KLEMETSRUD
REF: NGU REPORT/LETTER NO. 0-78 033 TK/EM
DATE: JUNE 1979

SUMMARY OF CONTENTS:

This report details investigations carried out in 1979 into the ground conditions in the Korgen area, where the proposed abstraction boreholes were originally to be placed. The report concludes that this area was not suitable but that an area further west showed good potential for water supply. A decision was made shortly after to locate the abstraction boreholes in this area and NGU were commissioned to carry out a furthermore detailed investigation. This investigation, carried out in March 1979, involved the drilling of investigation boreholes and the collection of sand and groundwater samples. Pumping tests were also carried out in the newly constructed boreholes.

The report includes the following enclosures:

- site plan
- borehole logs
- water analyses
- grain-size analyses

TITLE: VEDRØRENDE VANNFORSYNING TIL KORGEN VANNVERK (WATER SUPPLY TO KORGEN WATERWORKS)
AUTHOR(S): T.KLEMETSRUD
REF: NGU REPORT/LETTER NO. 0-78 033 TK/BR
DATE: DECEMBER 1978

SUMMARY OF CONTENTS:

This report details the investigations carried out by NGU into the optimum location for the Korgen waterworks abstraction boreholes. As part of this study, four investigation boreholes were drilled in August 1978. The report describes the investigations carried out and presents the data obtained. A brief discussion of the results is also given.

The report includes the following enclosures:

- borehole location map
- borehole logs
- grain size analyses
- chemical analyses from pumping tests

TITLE: **GEOLOGISKE OG HYDROGEOLOGISKE UNDERSØKELSER I KORGEN-HOVEMOEN OMRÅDET. FORSLAG TIL KLAUSULOMRÅDER FOR LILLEHAMMER VANNVERK. (GEOLOGICAL AND HYDROGEOLOGICAL INVESTIGATIONS AT KORGEN-HOVEMOEN. SUGGESTION FOR RESTRICTED AREAS AROUND LILLEHAMMER WATER SUPPLY WORKS)**

AUTHOR(S): **L.A.KIRKHUSMO et al.**

REF: **Reprint from Nordic Hydrological Conference, 1972. Volume 1, 49-65**

DATE: **6-8 September 1972**

SUMMARY OF CONTENTS:

This paper contains a summary of a study undertaken by NGU and the Institute for Atomic Energy (IFA) to determine the hydrogeology of the Korgen area in connection with the construction of the Lillehammer (Korgen) waterworks. This paper includes a geological and hydrogeological description of the Korgen-Hovemoen area, and forms an introduction to the paper by J.Dahl on the determination of hydrogeological parameters using isotopic techniques.

TITLE: **MÅLING AV GRUNNVANNSPARAMETERE VED KORGEN VANNVERK, LILLEHAMMER, VED HJELP AV ISOTOPTEKNIKK (MEASUREMENT OF GROUNDWATER PARAMETERS OF KORGEN WATER SUPPLY WORKS, LILLEHAMMER, BY MEANS OF ISOTOPIC TECHNIQUES.**

AUTHOR(S): **J.R.DAHL et al.**

REF: **Reprint from Nordic Hydrological Conference, 1972. Volume 1, 67-107**

DATE: **6-8 September 1972**

SUMMARY OF CONTENTS:

This paper describes a project carried out by the IFA and NGU to determine the hydrogeological parameters in the area of Korgen Waterworks, Lillehammer. Radioactive tracers combined with isotope-determination techniques were used to determine the groundwater flow velocity and direction at different depths. Stable tracers and "active analysis" were used to determine possible pollution paths within the aquifer.

TITLE: **LILLEHAMMER VANNVERK: RAPPORT VEDRØRENDE GEOLOGISKE OG HYDROGELOGISKE FORHOLD I KORGEN-HOVEMOEN OMRÅDET, HERUNDER FORSLAG TIL KLAUSULERINSOMRÅDET OG NEDSETTELSE AV NYE GRUNNVANNSBRØNNER (LILLEHAMMER WATERWORKS: GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS IN THE KORGEN-HOVEMOEN AREA, A PROPOSAL FOR RESTRICTIONS IN THE AREA AND THE DRILLING OF NEW BOREHOLES)**

AUTHOR(S): **S.ØSTMO, L.KIRKHUSMO AND T.KLEMETSRUD**

REF: **NGU (Hydrogeology Section) Report**

DATE: **2 March 1972**

SUMMARY OF CONTENTS:

This report covers the work undertaken as a result of a collaboration between NGU and E.Strømme involving the mapping of groundwater conditions in the Korgen area, Lillehammer. The report includes a description of the local bedrock surface, the distribution and stratigraphy of the unconsolidated deposits, and the form of the Hovemoen and Korgen delta.

Map enclosures include:

- bedrock topography
- elevation map of the seismic discontinuity interpreted as being due to the water table
- proposed zones of protection for the waterworks
- proposed area for the 'new' boreholes
- draft limit of the area required for the works

TITLE: **SEISMISKE UNDERSØKELSER: HOVEMOEN OG KORGEN, LILLEHAMMER (SEISMIC INVESTIGATIONS IN THE HOVEMOEN-KORGEN AREA, LILLEHAMMER)**

AUTHOR(S): **G.HILLESTAD**

REF: **NGU REPORT NO.1045**

DATE: **FEBRUARY 1972**

SUMMARY OF CONTENTS:

This report gives a description of the methodology and results of a seismic investigation carried out in the Hovemoen-Korgen area. A total of 12 soundings were undertaken in the area. However, only three of these were in the Korgen area. The seismic sections presented show the interpreted geology, including the depth to bedrock, an indication of the grain-size of the sediments and the approximate groundwater level along each of the soundings.

TITLE: VEDRØRENDE DE KVARTÆRGEOLOGISKE OG HYDROGEOLOGISKE FORHOLDENE PÅ HOVEMOEN, LILLEHAMMER KOMMUNE (REPORT ON THE QUATERNARY GEOLOGY AND HYDROGEOLOGICAL CONDITIONS AT HOVEMOEN, LILLEHAMMER KOMMUNE)
AUTHOR(S): S.R.ØSTMO
REF: NGU REPORT, OSLO OFFICE.
DATE: JANUARY 1972

SUMMARY OF CONTENTS

This report details the results of investigations carried out on the Quaternary geology and hydrogeology of the Hovemoen area including the Korgen area to the south. The report describes the results of 12 seismic profiles and the construction of three boreholes in the area. The report also describes the results of investigation boreholes drilled between Bæla and the railway line in connection with the construction of the new E6.

The report describes the interpreted stratigraphy of the Hovemoen area and the topography of the bedrock surface as determined from the seismic investigations. The report also details the form of the water table in the area.

The report includes:

- borehole logs from the 3 boreholes
- topographic map of the bedrock surface
- topographic map of the seismic discontinuity surface present in the area

TITLE: MÅLING AV GRUNNVANNSPARAMETRE I KORGEN VANNVERK, LILLEHAMMER VED HJELP AV ISOTOPTEKNIKK (MEASUREMENT OF GROUNDWATER PARAMETERS AT KORGEN WATERWORKS, LILLEHAMMER USING ISOTOPIC TECHNIQUES)
AUTHOR(S): J.B.DAHL, U.HAAGENSEN AND O.TOLLAN (INSTITUTT FOR ATOMENERGI)
REF: OPPDRAGSNR.:E-257/71
DATE: DECEMBER 1971

SUMMARY OF CONTENTS

This report describes a hydrogeological investigation carried out on the aquifer in the vicinity of Korgen waterworks. The investigation was intended to measure:

- groundwater flow rates and directions in the aquifer with and without abstraction from the main pumping boreholes
- tracer transport towards the boreholes under pumping conditions
- pollutant transport towards the borteholes from a remote site under pumping conditions

The report details the methods used and the results obtained from this study.

TITLE: **RØRBRØNNER (BOREHOLES IN UNCONSOLIDATED SEDIMENTS)**
AUTHOR(S): **S.SKJESETH AND T.KLEMETSRUD**
REF: **NGU REPRINT NO. 215, 87-100**
DATE: **UNKNOWN**

SUMMARY OF CONTENTS:

This reprint is actually a general information pamphlet on boreholes in unconsolidated sediments but it includes an example of a well in the esker at Hovemoen. It gives a brief description of the geology and hydrogeology of the site. It concludes that there is good potential for groundwater abstraction in the area due to the high permeability of the sediments.

A schematic cross-section of the area is shown.