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MALMLETINGSRAPPORT HJERKINNFELTET - 1985

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Rapporten gjelder undersøkelser vedrørende Tverrfjell-malmens fortsettelse øst for storforkastningen.
(Sammendrag av resultater fra undersøkelser og konklusjoner). Rapporten har følgende inndeling:

- Sammendrag og konklusjoner
- Innledning og problemstilling
- Regional geologi
- Undersøkelser vedrørende "øst-malmen" av Tverrfjellforekomsten
- Resultater.

M A L M E L E T I N G S R A P P O R T

HJERKINNFELTET - 1985

Undersøkelser vedrørende Tverrfjell-malmens forsettelse øst for
storforkastningen.

(Sammendrag av resultater fra undersøkelser og konklusjoner).

Av: Dr. F.D. Priesemann
Mars 1986

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SAMMENDRAG OG KONKLUSJONER.

Rapporten presenterer de viktigste data fra de geologiske, mineralogiske og geokjemiske undersøkelser utført i Hjerkinnefeltet i tidsrommet vinteren 1983 til høsten 1985. Formålet med undersøkelsen var å påvise fortsettelsen av Tverrfjelllets kisse på øst siden av storforkastningen.

Områdets strukturelle karakteristiske trekk er en V - Ø orientert synform (synklinorium) som er delt i to gjennom storforkastningen. Forkastningens strøk er 15 grader til 20 grader NØ og den faller med 45 grader til 50 grader mot Ø. Det er den østlige bergmassen som tilsynelatende er skjøvet mere enn 1.300 meter ned og litt mot nord. Bergartene i området består av metavulkanitter og metamorfe epiklastiske sedimenter som representerer submarine bassenginnfyllinger. Tverrfjell-forekomsten er knyttet til en sekvens som domineres av meta-tuffer, metamorfe tuffitter og metapelitter, og er en følge av en eksplosjonsvulkanisme som ledsaget dannelse av malmen. Serien er blitt kalt "Tverrfjell-malmsekvens". Det er fremdeles uklart om malmarealene som utgjør malmsone I og V og malmen i malmsone IV, VI og VII er sammenhengende eller om de representerer to adskilte malmlinser. Det litostratigrafiske profil fra Tverrfjell-området viser en kvantitativ overvekt av basiske meta-vulkanitter, opprinnelig sedimentære bergarter er konsentrert nederst i lagfølgen. "Tverrfjell-malmsekvens" er omgitt av lagpakker som er preget av basaltiske lavastrømmer. De tilsvarende litologier er sammenfattet i "basaltsekvens i ligg" og "basaltsekvens i heng". En meget god overensstemmelse i både stratigrafi og bergartstyper eksisterer mellom Tverrfjellet og Grønnbakken - Gåvåliseter-området øst for storforkastningen. "Tverrfjell-malmsekvens" er her imidlertid ikke mineralisert med sulfider. Når det gjelder den sydlige flanke av synformen øst for storforkastningen, har BH 768 G og BH 769 G gjennomskåret en lagfølge tilsvarende den fra Tverrfjell-området. "Basaltsekvens i heng" viser en sterkt redusert maktighet og "Tverrfjell-malmsekvens" er anriket på metamorfe epiklastiske sedimenter. Serien₁ inneholder spredte lag av

sulfider. Lagpakken er på dagen sterkt forandret. Der mangler både "Tverrfjell-malmsekvens" og "basaltsekvens i heng". Isteden opptrer det kvartsitter og meta-pelitter. "Basaltsekvens i ligg" markerer seg gjennom en sterk geofysisk anomali som kan følges fra jernbaneinnskjersele til gruva i østlig retning til området ved Heimtjørnshøi.

Undersøkelsen har gitt svar på hvor Tverrfjellmalmen stratigrafisk sett skulle vært på østsiden av storforkastningen. Diamantboring kan gi svar på i hvilken dybde "øst-malmen" befinner seg. Etter de data som er tilgjengelig idag vil det reelle forkastningsasprang av storforkastningen være større enn 1300 m. "Øst-malmen" kommer dermed til å ligge i en dybde på mere enn 1.430 m fra dagen. Det er foreslått en plassering for diamantboring for å påvise "øst-malmen".

Resultatene fra undersøkelsen gir et solid grunnlag for videre malmleting i Hjerkinnefeltet. De geologiske forholdene er klarlagt og det er kjent at malmens opptreden er knyttet til en bestemt type vulkanisme. En favorabel sone for sulfid-malmer er selvsagt "Tverrfjell-malmsekvens" som må følges opp og bearbeides detaljert over hele dette område. I tillegg er det andre tuffrike formasjoner som bør undersøkes for muligheter av sulfidiske malmer. Hovedvekten i den videre malmleting vil ligge på geologisk kartlegging, men det er også mineralogiske studier og geokjemiske analyser som må gjennomføres. I denne sammenheng skal det nevnes spesielt hydrotermal omvandling og Cu - Zn fordelingen i sulfider som må kartlegges og oppfølges i tilfelle med diamantboring.

INNLEDNING OG PROBLEMSTILLING.

Malmen ved Tverrfjell-gruva er som kjent begrenset i øst ved en forkastning med en orientering 15 grader - 20 grader/45 grader - 50 grader øst. Denne forkastningen har skjøvet ned det østlige utgående av Tverrfjell-forekomsten, en kisse som etter opplysningene fra gruva må betraktes som en mindre malmressurs.

Letingen etter den avskårne malmen har tidligere vært utført ved hjelp av forskjellige geologiske og geofysiske metoder. Det er i tillegg drevet en undersøkelsesort fra nivå 7, 420 m mot øst gjennom storforkastningen. Atte undersøkelses-borhull ble plassert langs pilotorten. Boring foregikk både mot nord og syd, med hullene horisontal eller 60 grader på skrå. Ytterligere diamantborhull ble satt ut på dagen, mesteparten imidlertid for å undersøke geofysiske anomalier.

Letaksjonene ga en rekke viktige opplysninger om geologien av området, men den etter søkte Tverrfjell-kisen ble ikke påvist. Det var vanskelig å sammenknytte bergartene fra øst- og vestsiden av storforkastningen. De kompliserte forholdene skyldes at en litostratigrafi for det såkalte Hærkinn-feltet ikke var opprettet. Plasseringen av Tverrfjellets kisse eller dens tilsvarende distale bergarter i den østlige bergmassen var dermed umulig.

Et nytt undersøkelsesprogram med hovedmål å påvise Tverrfjell-sekvensen på østsiden av storforkastningen ble igangsatt sent i 1983. Som et resultat av de tidligere arbeider ble det bygget på detaljerte geologiske og mineralogiske studier og geokjemiske analyser for å løse korrelasjonsproblemene. Metodene som ble brukt, viste seg å være meget effektive og programmet kan sies å være avsluttet.

REGIONAL GEOLOGI.

Undersøkelsen er knyttet til bergarter fra Støren-gruppen, en tektonisk enhet av tremadoc-underordovicisk alder som tilhører Trondhjems-dekket. Serien består av lav - metamorfe (øvre grønnskifer til lavere amfibolitt facies) undervanns avsetninger. Det forekommer basaltiske grønnsteiner (pillow lavas), enkelte lag av kvarts-keratofyrer, horisonter med vulkano-kjemitter (vasskis, magnetitt-kvartsitter (cherts)) og pelitiske sedimenter samt turbiditter. Det kjemiske preg av grønnsteinene viser til et "ocean-floor" eller "back-arc basin" sedimentasjonsmiljø.

UNDERSØKELSER VEDRØRENDE "ØST-MALMEN" AV TVERRFJELLFOREKOMSTEN.

Prosjektet om "øst-malmen" av Tverrfjell-forekomsten startet vinteren 1983 med en gjennomgang av rapporter og publikasjoner vedrørende Hjerkin-feltet og en oppsummering av geologiske, mineralogiske, geokjemiske og geofysiske data fra tidligere leteprogram. Det ble også i stor grad benyttet data fra gruva. Grunnlaget for undersøkelsen var geologiske detaljstudier, mens mineralogiske og geokjemiske opplysninger hovedsakelig ble brukt som støtte i tolkningen av det geologiske materialet.

Detaljert geologisk kartlegging (målestokk 1 : 5000) foregikk mellom Grønnbakken og Gåvåliseter, ett område på ca. 8 km² på østsiden av storforkastningen, på Tverrfjellet og i Grisungdalen ca. 2 km nord for Tverrfjellet gruver (Fig. 1). Ytterligere kartlegging i en målestokk 1 : 50 ble utført på flere steder i gruva men hovedsakelig på nivå IV, hvor det var funnet gode undersøkelsesforhold gjennom flere tverrslag som krysser de mest viktige geologiske sekvenser vedrørende Tverrfjell-forekomsten.

Det ble utført en del rekognoserende undersøkelser av blotninger langs E-6 og langs den "Gamle Kongevei". Ved siden av en kort beskrivelse ble det målt strøk og fall på bergartene. Arbeidet skjedde med henblikk på en strukturell tolkning av Hjerkin-feltet.

En detaljert beskrivelse av bergartene ble gjennomført langs to omtrent N - S gående profiler i dagen øst for storforkastningen. "Railroad-profilen" ligger ca. 700 m nord for Hjerkinns stasjon hvor den følger jernbanen ialt 426,00 m. "Svani-profilen" ligger i nærheten av Grønbakken. Den strekker seg fra Jerosbekken bru på E-6 i syd, omtrent 784 m mot nord. Profilen gir et nøyaktig bilde av den litologiske oppbyggingen fra Grønbakken - Gåvåliseter området. En ytterligere detaljert litologisk profil går fra stollen ved loddsjakt mot syd på nivå IV.

Et tyvetalls diamantborhull, delvis fra gamle dager (1956/57), ble gjennomgått nøye. Fra vestsiden av storforkastningen ble borhull fra Tverrfjell-forekomsten, hull som er boret fra dagen og skjærer malmsone I og vestlige deler av malmsone IV benyttet. I tillegg ble BH 635 G beskrevet, dette gir opplysninger om bergartene i heng på nivå VII, og det ble sett gjennom arkiverte borkjerne-prøver fra BH 72 G fra nivå V (Y + 770, Y - 15) som undersøker geologien 300 m mot syd. Fra østsiden av storforkastningen ble BH 822 D, BH 767 G, BH 768 G, BH 769 G og BH 2000 D samt en del kortere hull boret fra dagen beskrevet.

Ved beskrivelsen av profiler og diamantborhull ble det lagt spesiell vekt på å kartlegge særskilte strukturer og teksturer i bergarter (leopard tekstur i amfibolitter, flekkemønstre i amfibolitter som skyldes spredte linser av feltspat, spesielle båndningstyper), det ble tatt hensyn til opptreden av viktige mineralfaser som f.eks. ilmenitt, magnetitt, granat og karbonat og det ble markert steder hvor hydrotermal- omvandlede bergarter opptrer. Når det gjelder sulfidsoner så ble det anslått både konsentrasjonen av sulfider og andel av svovelkis og magnetkis, samtidig ble de undersøkt på kobberkis og sinkblende. En stor del sulfidsoner ble prøvetatt for kjemisk analyse. Horisonter med hydrotermal-kvarts ble oppført nøye og kontrollert for innhold av magnetitt. Denne fremgangsmåte ved beskrivelsen sikret en mengde viktige data vedrørende geologien, stratigrafien og forekomsten av malmen og skaffet dermed et gunstig grunnlag for de senere interpretasjoner.

De mineralogiske undersøkelser var begrenset til mikroskopiske studier av tynn- og poler-slip. Et antall på ca. 250 slip ble behandlet under prosjektet. Formålet med undersøkelsen var å hjelpe med klassifiseringen av de enkelte litologier og beskrive deres komponenter. En stor del arbeid ble brukt til å studere omvandlings-fenomener, strengt talt deres utseende og opptreden i de forskjellige bergarter. Slike fenomener er et viktig tema i forbindelse med problemstillingen, de har stor betydning når man driver med leting etter sulfidiske malmer. Omvandlinger i bergarter oppstår under dannelsen av massive sulfid-forekomster, hvor også Tverrfjell-malmen hører til, der varme metallførende løsninger (hydrotermer) gjennomstrømmer tidligere avlagrede bergarter (liggbergartene) og forandrer deres opprinnelige sammensetning. Det er kjent at også bergarter i heng blir påvirket av "hydrotermale faser" men vanligvis i en adskillig mindre grad enn de liggende formasjoner. Omvandlinger er dermed karakteristiske for kisseforekomster. De bygger en omvandlingssone (halo) av vekslende karakter med lett synlige omvandlingsfenomener der påvirkningen av løsninger har vært størst og et område med lavere omvandlingsgrad som kan bestemmes ved hjelp av mikroskopi og geokjemi. Omvandlingssonen er vanligvis betydelig større enn den innesluttete malmen, og dette er grunnen til at omvandlingsfenomener kan betraktes som et viktig hjelpemiddel ved både problemstillingen og videre malmleting.

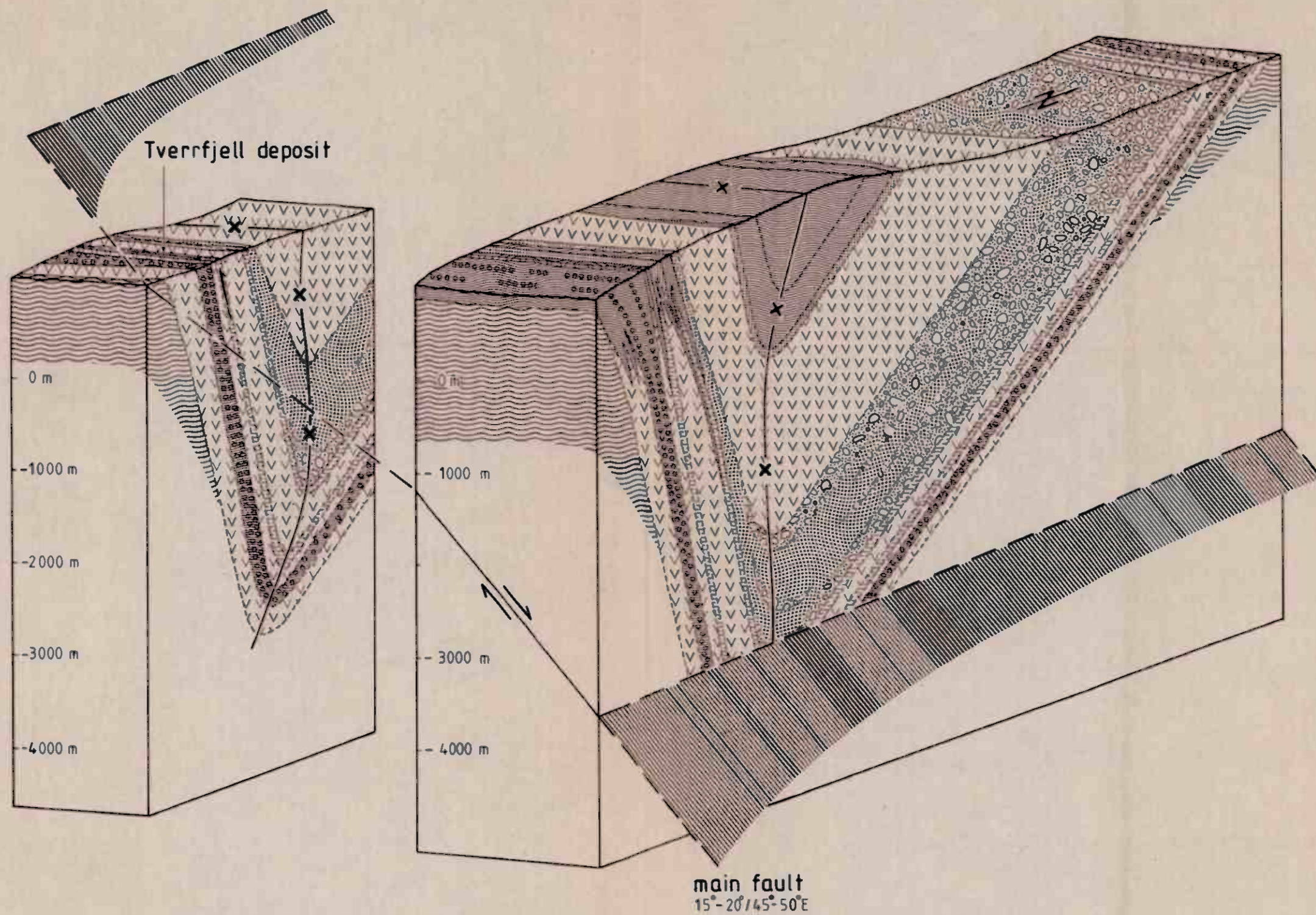
Når det gjelder geokjemien, er det kjent hoved- og sporelementer på tilsammen 46 prøver fra bergarter som er av vesentlig betydning for Tverrfjell-forekomsten. Fra kisser foreligger det Cu - Zn fordelinger.

Analyser ble kjørt for å utforske de muligheter geokjemien gir angående problemstillingen. Resultatene var oppmuntrende i den forstand, at bergartsgeokjemien bekreftet de geologiske interpretasjoner. Metoden ser dermed ut til å være nyttig i den videre malmleting. Vedrørende Cu - Zn fordelingen, har den vært til mindre nytte under korrelasjonsarbeidene, men grunnen til det kan være mangel på data, d.v.s. at flere analyser må til for å skaffe en solid tolkningsbasis.

RESULTATER.

Hjerkinnfeltets strukturelle særpreg er en assymetrisk synform. Det viser en ca. V - Ø orientert foldeakse som tilsynelatende stuper moderat mot øst (15 - 20 grader). Akseplanet av strukturen kan tolkes å være steilstående. Den sydlige flanke av synformen er karakterisert av bergarter som stuper mot nord og i enkelte tilfeller også mot syd mens fallet varierer mellom 75 og 90 grader. De formasjoner som danner den nordlige flanke faller mot syd med 30 til 45 grader. Hovedstrukturen er gjennomskåret av en rekke forkastninger, hvorav storforkastningen er den som har forårsaket de største forskyvninger, og har størst betydning for området. Forkastningen går nesten på tvers av synformen og hovedstrøkretningen av bergarter. Den er konstant i strøk (15 til 20 grader) over hele området. I gruva (nivå VII og VIII) er den markert ved en flere meter mektig breksjesone (rivningsbreksje) som stedvis inneholder tektonisk leire (forkastningsmel = fault-gouge). Det er fastlagt at bergmassen øst for storforkastningen er blitt beveget ned og samtidig mot nord i forhold til de bergarter som utgjør blokken i vest (Fig. 2). Forskyvningsmønsteret fremgår av harniske striper og kratere, foliasjons- og slepemønster i bergarter, kvarts-fyllte sigmoidale fjærsprekker og parallellspende småforkastninger (konjugerte shear planer) som er orientert og beveget parallelt med hovedforkastningen. Mye tyder på at netto forkastningsprang er større enn 1.300 m. Et tilsvarende tall har tidligere blitt nevnt av M. Motys.

Litologien i området viser som følge av foldning en markert V - Ø strøk. Det opptrer en uregelmessig vekslning av opprinnelig vulkanogene og epiklastiske sedimentære bergartstyper, horisonter eller sekvenser opp til flere ti-meter mektig. Det er graderinger i sedimenter, kontakter mellom vulkanitter og sedimenter og omvandlingsfenomener i bergarter omkring Tverrfjellforekomsten som viser at avleiringen blir yngre mot nord i de sydlige flanker av den delte synformen, mens utviklingen gikk i motsatt retning



- | | | | | | | | |
|--|----------------------------------|--|---|--|-------------------------------|--|-------------|
| | meta basalt flow | | tuffaceous series | | quartzite (turbidite related) | | meta pelite |
| | meta konglomeratic tilloide | | meta debris flow deposit (lahar) (proximal a distal facies) | | | | |
| | meta sandy pelite (Gula group ?) | | | | | | |

nord for foldeaksen. Fra diamantboringen ser man at den epiklastisk sedimentære andel i lagpakken minker i nordlig retning ved å følge synformen.

De bergarter som utgjør området inndeles i basiske og sure vulkanitter, metamorfe vulkano-kjemitter, metamorfe hemipelagiske pelitter og turbiditter samt debris-flows (lahars), og metamorfe tuffitter og urene epiklastiske sedimenter. De vulkanske bergarter domineres av basaltiske lavastrømmer (homogene amfibolitter/grønnsteiner og - skifer sjelden med leopard tekstur (Fig. 3) som stedvis er variolittiske (amfibolitter/ grønnsteiner og - skifer med spredte linser av feldspat (Fig. 4)). Disse fører enkelte steder spredte bittesmå korn av ilmenitt, sjelden magnetitt. I nærheten av malmen er karbonat en vanlig komponent. Den neste vanlige bergart er båndede amfibolitter. De representerer tilsynelatende metamorfe basiske vulkanske askeavsetninger (tuffer) med nokså høy tilblanding av sure vulkanske og vulkanogene exhalative materialer. Bergarten viser en mer eller mindre utpreget rytmisk vekslning av sure og basiske bånd. Typisk er tilstedeværelsen av uorienterte, idiomorfe porfyroblaster av amfibol som av og til former sfærolitter og hypidio - til idiomorfe krystaller av karbonat. Bergarten inneholder alltid en viss mengde svovelkis, enten som spredte krystaller eller i form av anrikninger i smale bånd. Mer underordnet i mengdeforholdet rangerer heterogene amfibolitter. De er utbredt bare innenfor visse deler av området. Dette er en bergartstype som består av tettpakkede amfibolfragmenter av varierende størrelse. Ved metamorfe basiske agglomerater ligger de i en fattig matriks av plagioklas - amfibol og kvarts, og ved metamorfe basiske hyaloklastitter er de omlagret av epidot - biotitt - kloritt og karbonat, mineraler som er oppstått ved metamorf omvandling av nontronitt og saponitt. Meta - kvartskeratofyrer/meta-ryoliter (kvartso - feltspatiske gneiser med aksessorisk amfibol, serisitt og biotitt) opptrer i meget små mengder. De er tilsluttet pyroklastiske serier (tuff serier). Bergartene er nokså båndet iblandt og de viser ofte en tydelig porfyroblastisk tekstur som er forårsaket av store, uorienterte nåler av amfibol. Horisontene er tolket til å representere tuff-avsetninger. Når det gjelder metamorfe vulkano-kjemitter (BIF) så finnes typiske meta-cherts

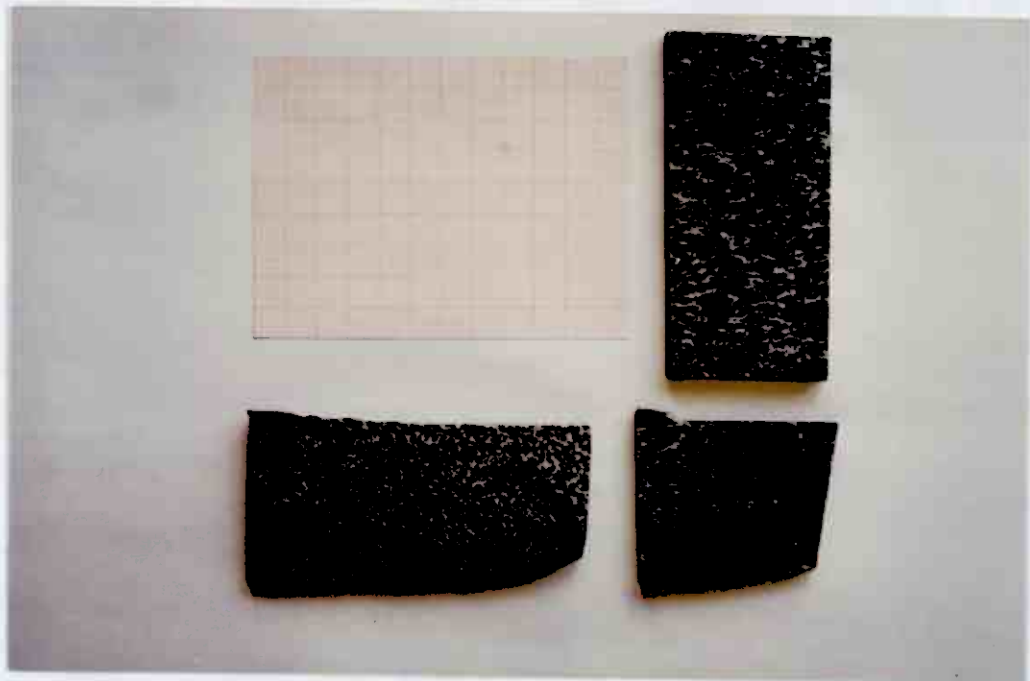


Fig. 3: Leopard tekstur i amfibolitt. Deres utseende med fall (venstre ned) og strøk (høyre ned) av bergartene og vinkelrett på skifrihetens overflater. (øverst til høyre).



Fig. 4: Metamorf variolittisk basaltisk lavastrom. Sett med fall (venstre) og strøk (høyre) av bergarten. Legg merke til at feldspatlinser danner en utpreget lineasjon.

(kvartsitter, magnetitt-kvartsitter) bergarter som består av tett, finkornet kvarts og stedvis finfordelt magnetitt, eller yasskis-horisonter (sulfidfacies BIF), med svovelkis/magnetkis anrikninger som alltid inneholder store mengder kvarts. Sjelden er silikat-facies BIF, en bergartstype som er karakterisert gjennom et cm - til dm - bånding dannet av en rytmisk vekslning av kvarts og fyllosilikater (for det meste biotitt). De vanligste bergartstypene innen de metamorfe epiklastiske sedimenter er biotitt - serisitt-skifer eller granet - biotitt - serisitt-skifer. Det er fastslått at de representerer metamorfe hemipelagiske pelitter. En del av dem sannsynligvis av turbidittisk opprinnelse. Bergartene er mere eller mindre homogene men kan også være tydelig laminert, biotitt lager typiske porfyroblastisk teksturer. I enkelte tilfeller er det amfibol som former porfyroblaster (Gärbenskiifer). En del glimmerskifer inneholder betydelige mengder av karbonat mens en grafittinnblanding er nokså sjelden. De forskjellige turbiditter og debris-flow avsetninger deles i kvartsitter og metamorfe konglomeratiske slamsteiner (konglomeratiske tilloider) (Fig. 5 og 6) samt metagråvakk. Bergartsgruppen er ganske lite utbredt, men den er viktig for sine enestående litologier. Kvartsitter er ofte preget av en overmåte fin bånding, med rytmiske cm-tykke lag av ren kvarts og mm-tynne striper eller linser av fyllosilikater (serisitt). Båndningen er enkelte steder sterkt deformert og den kan være helt ødelagt. De konglomeratiske slamsteiner kan beskrives som dårlig sorterte, polimikte konglomerater med en matriksandel på mere enn 50 %. Fragmentene er sterkt deformert fra deres opprinnelige form som var mellom noe rundet og godt rundet. Størrelsen av debrisen varierer mellom grus og sand. Metagråvakkene ligner i struktur og tekstur på de konglomeratiske slamsteiner, der er bare kornstørrelsen av fragmenter som gjør dem til en egen bergart. Når det gjelder metamorfe tuffitter og urene sedimenter så utgjør gruppen et utall bergarter av sterk varierende sammensetning og teksturelt preg. De fleste kan klassifiseres som glimmerskifer som hyppig domineres av kloritt mens resten beskrives best som fyllosilikatrike kvarts-feltspat bergarter.



Fig. 5: Metamorf konglomeratisk slamstein. Prøver er fra "konglomerat"-horisont ved RV 27, Eysteinkyrkja.



Fig. 6: Metamorf konglomeratisk slamstein. Deres utseende med strøk (venstre) og fall (høyre). Prøver stammer fra en bløtning langs E-6, ca. 1 km nordøst for Grønbakken.

Fra de enkelte litologier nevnt ovenfor er det homogene amfibolitter, biotitt - serisitt skifer og metamorfe konglomeratiske slamsteiner som er utholdende i strøkretningen. De er med visse unntak ganske konstante over hele området. Turbiditt-dannede kvartsitter viser en mindre utstrekning, bergarten danner flate linser som kan komme opp på flere km² størrelse. De kiler ut eller går gradvis over i granat-biotitt-serisitt skifer. Alle andre bergartstyper er lite horisontbestandig, ialle fall når man betrakter de hver for seg. Dette bildet blir imidlertid forandret når det opprettes geologiske enheter som f.eks.: serier med tuffogene bergarter eller formasjoner med en større mengde av metamorfe vulkano-kjemitter. Slike sekvenser kan følges over store avstander, mens den interne litologiske oppbyggingen og mektigheten kan variere en del.

Tverrfjellmalmen har vært dannet under relativt rolige sedimentasjonsforhold. Det er en periode med basisk og sur eksplosjonsvulkanisme som følger med avsetningen av malmen. Sonen som inneholder forekomsten er blitt kalt "Tverrfjell-malmsekvens". Det er en 30 m til 50 m mektig formasjon som består av en flere talls bergarter: metamorfe basaltiske lavastrømmer, metamorfe vulkano-kjemitter, basiske og sure meta-tuffer (båndete amfibolitter, meta-kvartskeratofyrer), metamorfe tuffitter og urene meta-sedimenter og meta-pelitter (biotitt - serisitt skifer). Bergartstypene forekommer i tynne lag (maks. 5 m) og de viser en klar tendens til å variere i sammensetning fra sted til sted eller å kile ut etter korte distanser. Dette til tross er det mulig å påvise en regel i lagserien (internstratigrafi). Dette fremgår av det geologiske kart fra nivå IV (vedlegg), der det alltid er bestemte nivåer hvor basaltiske lavastrømmer, meta-kvartskeratofyrer eller meta-pelitter opptrer. Plasseringen av malmen i sekvensen er med henblikk på malmsone IV, VI og VII toppen av enheten, mens en basis-avsetning er tilsynelatende for malmsone I og V ifølge borhullsundersøkelser (profilkart malmsone I, vedlegg). Forholdene mellom de to malmarealer er blitt undersøkt på nivå IV. Til tross for en detaljert geologisk behandling er dette problemet fremdeles uløst. Det hersker en alt for

kaotisk geologi i området hvor de to malmarealer møtes.

En stratigrafisk profil av Tverrfjell-området ble opprettet i forbindelse med korrelasjonsarbeidene. Profilen kan studeres på korrelasjonskartet (vedlegg). "Tverrfjell-malmsekvensen" er omgitt av lagpakker som domineres av metamorfe basaltiske lavastrømmer (amfibolitter). "Basalt-sekvens i heng" er nokså ensformig. Den måler 240 m til 290 m med homogene amfibolitter som bare på enkelte steder viser tynne mellomag av meta-tuffer og metamorfe tuffitter. Sekvensen inneholder i sin øvre del metamorfe variolitiske basalter, en bergart som markeres gjennom en fremtredende tekstur (Fig. 4). En rekke tynne striper med magnetitt-chert avslutter serien mot en heterogen enhet som følger i heng. Den overliggende formasjon er oppbygd av meta-tuffer, metamorfe tuffitter, urene meta-sedimenter, basaltiske lavastrømmer, meta-pelitter og kvartsitter. En magnetitt-rik meta-tuff som tilhører sekvensen er brukt som "marker"-horisont, selv om horisonten i dette tilfelle bare er 0,40 cm tykk. "Basaltsekvens i ligg" varierer mellom 5 m og 80 m. Formasjonen viser en del variasjon i sin interne oppbygging med strøk og fall. Amfibolitter som tilhører sekvensen er stedvis karakterisert ved en leopard-tekstur (Fig. 3), mens andre er typiske grønnsteiner eller grønnskifer. Det finnes også meta-leuco-basalter, en plagioklasrik amfibolitt som ofte er tydelig båndet. Sjelden opptrer det en kvartskeratofyr-lignende bergart som kan være ganske rik på epidot. Sulfid-striper (svovelkis) og bånd av magnetitt-chert forekommer på enkelte steder, men de virker veldig ustabile med henblikk på en lateral utbredelse. "Basalt-sekvensen i ligg" går gradvis over i det stratigrafisk lavere granat-biotitt-serisitt skifer, en nokså homogen formasjon av maks. 250 m mektighet, som inneholder to lag av metamorfe konglomeratiske slamsteiner (konglomeratiske tilloider) (Fig. 5). Disse bollehorisontene er av og til ledsaget av meta-gråvakker. Magnetkismineraliseringer kan finnes i et bestemt nivå høyt oppe i sekvensen. Granat-glimmerskifer-serien overleirer en opp til 300 m mektig lagpakke bestående av skifrige og massive grønnsteiner og amfibolitter igjen med leopard-tekstur (Fig. 3). Båndete amfibolitter finnes enkeltvis og det opptrer sporadisk bånd med biotittskifer. Sekvensen grenser i ligg til kvartsfyllitt, en bergartstype som ut fra tidligere tolkninger tilhører

Gula-gruppen.

På østsiden av storforkastningen er det blitt påvist sammenlignbare bergarter og en tilsvarende stratigrafi fra Grønbakken - Gåvaliseter området (korrelasjonskart). "Tverrfjell-malmsekvens" har her en mektighet på mellom 60 m og 80 m. Med "Svåni-profilen" er det beskrevet en lagfølge som stemmer godt overens med det som f.eks. finnes ved nivå IV. I BH 2000 D, imidlertid, er serien fattig på meta-vulkanitter (tuffer, tuffitter) og det forekommer en del grafitt. Sulfidanrikninger mangler totalt hvis man ser bort fra en veldig fattig svovelkisdisseminasjon i en felsisk tuff som har vært funnet i en blotning langs E-6. "Basalt-sekvens i heng" er 130 m til 300 m mektig. Den er i motsetning til Tverrfjellet meget vekslende og det skyldes et antall horisonter av meta-hyaloklastitter som veksler uregelmessig med homogene amfibolitter. Det er verdt å nevne at formasjonen inneholder lag av samme type variolitisk basalt (Fig. 4) som er beskrevet ved Tverrfjellet. Bergarten kan følges over hele dette område og den finnes også i BH 2000 D. Basaltsekvensen ligger stratigrafisk sett under en mektig tuff-serie som til tross for en mangel på meta-pelitter og kvartsitter ligner de øverste lagpakker i Tverrfjell-profilen. I BH 2000 D er også en magnetitt-rik meta-tuff påtruffet. Når det gjelder "basaltsekvens i ligg" er serien gjennomsnittlig 130 m mektig og den fører en god del amfibolitter med leopard-tekstur. Videre er det blitt påvist, fra blotning og i BH 2000 D, båndete meta-leukobasalter som også forekommer ved Tverrfjellet. Formasjonen er rik på magnetitt-cherts og det ble funnet vasskis-horisonter med opp til 10 cm tykkelse (Fig. 7). Granat-glimmerskifer med to distinkte metamorfe konglomeratiske slamsteiner (konglomeratiske tilloider) (Fig. 6) former underlaget for basalten. Disse bollehorisontene avviker ikke vesentlig i sammensetningen og strukturen fra de konglomeratiske lagene som opptrer på det samme stratigrafiske nivå i Tverrfjell-profilen. Det er kun matriksen som virker anriket på karbonat og kloritt. Meta-pelitt-sekvensen følges av en 110 m mektig serie av amfibolitter som på enkelte steder kan utvikle en tydelig leopard tekstur (Fig. 3). Sjelden forekommer det agglomeratiske basalter. Lagpakken grenser i nord mot en kvartsfyllitt av samme karakter som ved Tverrfjellet.

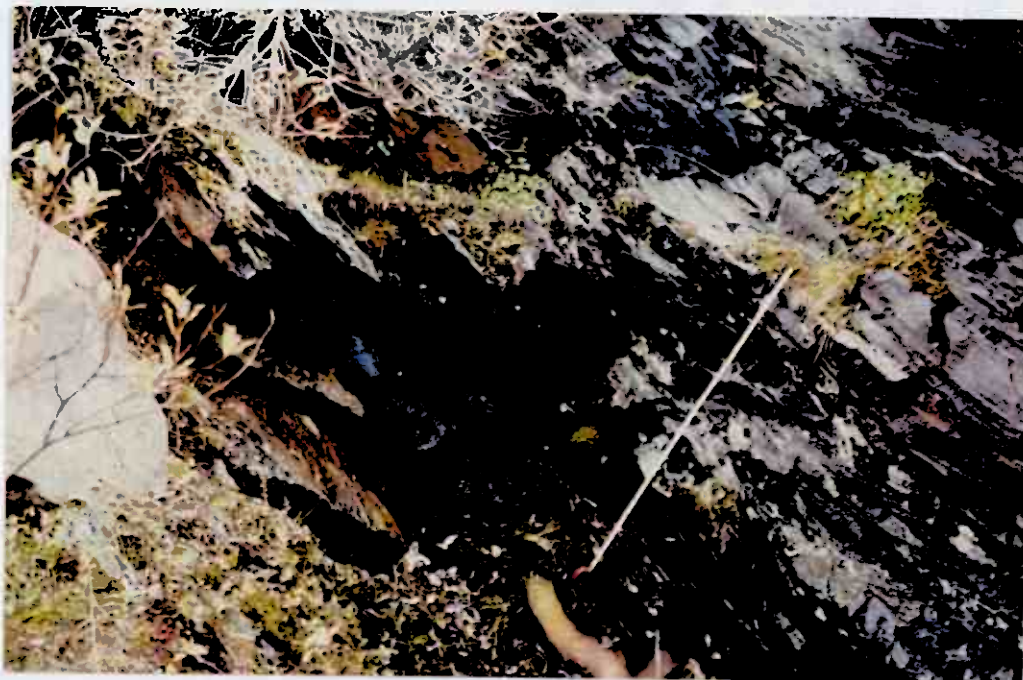


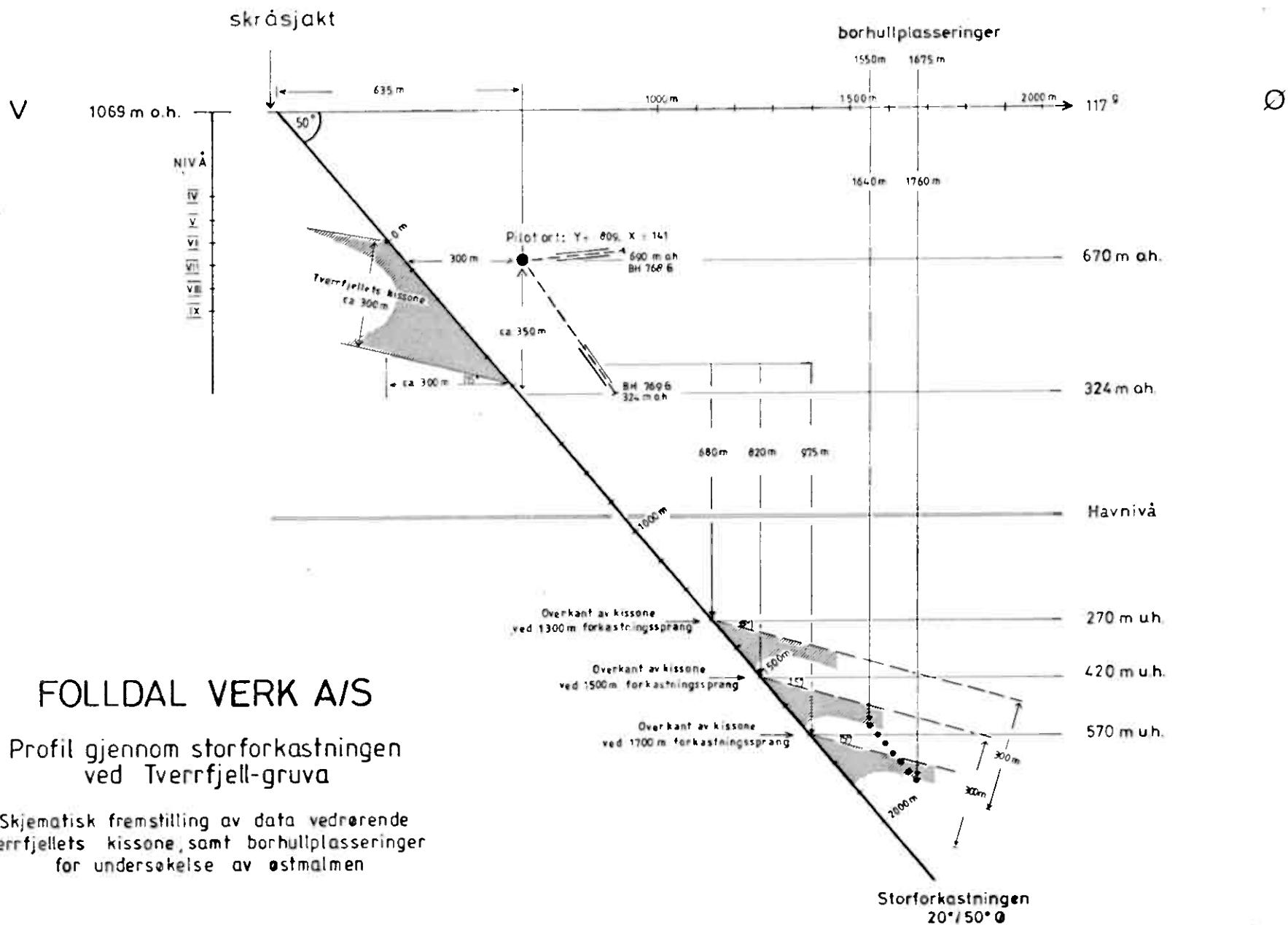
Fig. 7: Skjerp ved E-6 nordøst fra Grønbakken. Bånd vasskis (brune bergarter til venstre) (prøver: SNØ-02. Cu 70 ppm, Zn 56 ppm, 32,2 % S) underligger en 2,40 m mektig lagpakke av magnetitt-chert. Målestokk: 1 m.

Når det gjelder den sydlige flanke av synformen på østsiden av storforkastningen, er "Tverrfjell-malm-sekvens" gjennomboet med BH 768 G og BH 769 G (Korrelasjonskart, vedlegg). Disse borrhullene er boret mot syd fra pilotorten. Sekvensen er her anrikt på metamorfe epiklastiske sedimenter men den inneholder fremdeles en god del opprinnelig tuffogene bergarter. Mange lag av meta-chert (med og uten magnetitt) er knyttet til formasjonen, horisonter som er kjent i serien fra kartlegging i gruva (kart nivå IV). Anrikninger på sulfid finnes flere steder, de opptrer i

disseminasjoner men stedvis også som tynne massive lag. "Basalt-sekvens i heng" er blitt funnet i begge borhull med en sterkt redusert mektighet (BH 768 G: 22 m, BH 769 G: 45 m). Sonen viser ingen variolitisk basalt. Den stratigrafisk høyereliggende tuffserie fører igjen magnetitt-rik meta-tuff. "Basalt-sekvens i ligg" har det samme karakteristiske trekk som formasjonen fra Grønbakken - Gåvåliseter-området. Flere lag av magnetitt-chert og vasskis veksler med benker av amfibolitt, noen ganger med leopard-tekstur. Den underliggende granat-biotitt-serisitt-skifer er i nærheten av kontakten til "basaltsekvens i ligg" mineralisert med magnetkis. Det er gjennomboret bare en horisont med meta-konglomeratisk slamstein og metagråvakter.

"Tverrfjell-malmsekvens" og "basalt-sekvens i ligg" kiler ut mot dagen. Det virker som om "Tverrfjell-malmsekvens" går gradvis ut i kvartsitter. Fra de vulkanitter, som ledsager Tverrfjellforekomsten i dagen er det dermed bare igjen "basalt-sekvens i ligg" (korrelasjonskart, vedlegg). Formasjonen har den samme karakter som i borhullene. Det er utviklet amfibolitter med leopard tekstur og magnetitt-cherts og vasskis-horisonter. Serien former et geofysisk fremtredende drag som kan følges fra jernbaneinnkjørselen til gruva i østlig retning forbi Hjerkin Fjellstue til området ved Heimtjørnshøi.

Disse undersøkelser har avklart spørsmålet om hvor Tverrfjellmalmen befinner seg stratigrafisk sett. Når det gjelder dybde på "øst-malmen" så er den ukjent og kan bare fastslås gjennom diamantboring. På grunnlag av alle data vedrørende storforkastningen og opplysninger fra geologien er det imidlertid å anta et forkastningssprang på mere enn 1.300 m, d.v.s. at "øst-malmen" vil ligge dypere enn 270 m under havnivå. Skjematisk kart over storforkastningen forklarer forholdene og den viser "øst-malmens" beliggenhet ved tre antatte forkastningssprang. Det synes å være mest gunstig å bore fra en plassering 1.550 m til 1.675 m øst for skråsjakt for å påvise "øst-malmen". Avstanden fra overflate til malmen ville da være på 1.640 m til 1.760 m og det vil kreve et borhull på mere enn 2.000 m lengde.



FOLLDAL VERK A/S

Profil gjennom storforkastningen
ved Tverrfjell-gruva

Skjematisk fremstilling av data vedrørende
Tverrfjellets kissone, samt borhullplasseringer
for undersøkelse av østmalmen

DIAMOND DRILL HOLE 4

Tverrfjellet mine, Follidal Verk A/S, Exploration hole from 1957.

Location: 2600 W - 1275 N.

Inclination : 55°N, no deviation measured.

Total length : 113.20 m (2.60 m overburden).

Description :

0.00 - 27.85 : Slightly calcareous garnet bear. biotite - sericite schist

(meta - pelite)

lightgn., layered with wavy lenticular texture, alternation of qtz with phyllosilicate, qtz - poor layers or stringers, poikiloblasts of biotite randomly oriented (cross-mica)

5.33 - 5.53 : sericite bear. quartzite (sed.)

bluishgr, fine grained, massive, some irregular spots and traces of granules of carbonate.

25.20 - 25.40 : slightly calcareous garnet - chlorite bear. biotite - sericite schist (garben-schist).

A

(Meta - pelite)

see above, poikiloblasts of chlorite max. 1.5 cm size randomly oriented, pseudomorphs after amphibole.

27.85 - 31.90 : Slightly calcareous biotite - sericite schist

(meta - pelite or tuffaceous meta - pelite)

gr to brownishgr, layered with in places wavy - lenticular bedding, biotite often aligned with foliation in places forming discrete lamina, sporadically porphyroblasts of amphibole which in places are altered to chlorite (chlorite - pseudo - morphs), locally medium to even high-grade dissemination of py always connected to highly altered dacitic layers (high carbonaceous biotite - chlorite - qtz - plagioclase schist) : 30.40 m, 32.20 - 32.25 m. gradual hanging wall.

AA/C

DDH 4

- 31.90 - 34.00 : High calcareous chlorite - epidote - amphibole -
qtz - fspar rock
(meta - mafic tuff or tuffite) (banded amphibolite)
gngr, medium - grained, crude development of com -
positional banding, chlorite - amphibole - rich layers
gradually change into qtz - plagioclase dominated
bands, amphibole prisms max. 0.1 cm long and randomly
oriented (porphyroblasts), porphyric, hypidio -
morphic crystals of carbonate (spotted carbonate)
33.17 - 33.20 : several mm - bands of nearly massive
po and py in alternation with qtz and amphibole
layers.
- C
- 34.00 - 35.90 : Calcareous chlorite bear. epidote - qtz - plag.-
amphibole schist
(meta - basalt, flow)
grgn, fine-to medium-grained, fibrous amphibole mainly
parallel schistosity, disseminated huge spots of
carbonate, mainly as hypidiomorphic poikiloblasts
which in places form traces of granules being dis -
cordant schistosity.
sharp hanging wall
45°.
- 35.90 - 39.85 : High calcareous chlorite - epidote - amphibole -
qtz - fspar rock
(meta - mafic tuff or tuffite) (banded amphibolite)
same as: 31.90 - 34.00 m
several interlayers of qtz - fspar rock (qtz - kera -
tophyr) with high - grade dissemination of py :
36.20 - 36.22 m, 36.25 - 36.28 m, 36.35 - 36.37 m,
36.85 - 36.90 m mainly basaltic , 20 Vol.-%, 39.80 -
39.85 m.
45°
sharp hanging wall.
- 39.85 - 40.75 : Amphibole schist
(meta - basalt, flow)
gn, fine - grained, fibrous amphibole, in - places
biotite bearing, closely interfingered by tiny

DDH 4

veins of qtz often laying conformable with schistosity, rare spots of py.
gradual hanging wall

40.75 - 42.80 : Epidote - plag.- qtz bear. amphibolite
(meta - basalt, flow)
gn, medium - grained, crudely schistose, ellipsoi -
dal multi - crystal amphibole surrounded by a xeno -
blastic plag. - qtz mosaic, low - grade dissemination
of opaques which sporadically are decomposed to
titanite, qtz - plagioclase rock (qtz - keratophyr)
with medium - grade dissemination of py :
42.75 - 42.80 m.
sharp hanging wall.

42.80 - 44.55 : Amphibole schist
(meta - basalt, flow)
same as: 39.85 - 40.75 m
sometimes cluts of qtz with sutured boundaries
43.39 - 44.09: qtz - fspar rock (qtz - keratophyr)
with high - grade py, cut by small fault.
gradual hanging wall.

44.55 - 45.40 : Calcareous to high calcareous
amphibole - biotite - sericite bear. chlorite -
plagioclase - qtz rock
(meta - dacite, tuff to tuffite) see too 53.80-54.80m
A/C greenishgr, fine - grained, nebulous texture due to
alteration, crudely developed wavy - lenticular texture
remainding to lapilli tuff, qtz - nodules of max.
0.5 cm size equally distributed and always parallel
to a slight foliation, carbonate as minor spots but
sometimes as bigger lumps.
sharp hanging wall.

45.40 - 46.65 : Calcareous - plagioclase - chlorite - amphibole
schist
(meta - basalt, flow)
gn. to grgn, fine - grained, sometimes cm-layered,
here alternation of qtz - with amphibole bands,
irregular qtz - veining throughout.
gradual hanging wall.

DDH 4

46.65 - 52.00 : Calcareous to high calcareous chlorite - epidote - bear. amphibole - fspar rock
 (meta - mafic, tuff or tuffite)
 slightlygr, banded, due to amphibole forming sporadically always monomineralic layers or traces of granules, texture very close to banded amphibolite, amphibole with prismatic outlines, poikiloblasts max. 0.5 cm long randomly oriented but slightly aligned with layering within more monomineralic amphibole layers, granoblastic qtz - fspar. mosaic, hypidio - morphic porphyroblasts of carbonate equally distributed, opaques (Fe - Tioxides) often decomposed to titanite, some rare spots of tiny py, sometimes inter - layers of qtz - fspar rock (qtz - keratophyr) with low - grade py : 48.00 m, 47.65 m, 50.70 - 50.82 m. gradual hanging wall.
 60°.

C

52.00 - 53.80 : High calcareous biotite bear. amphibole - chlorite - qtz - plagioclase rock
 (meta - mafic tuff)
 blueishgreenishgr, fine - grained, often nebulous - texture prisms of amphibole being conformable and randomly oriented, porphyroblasts mainly 0.1 cm long, sometimes nodules or bands of qtz, spotted carbonate. gradual hanging wall.

A/C

53.80 - 54.80 : High calcareous biotite - sericite bear. chlorite - plagioclase - qtz rock
 (meta - dacite, crystal tuff)
 lightblueishgr, fine - grained, crudely schistose, nebulous - texture supposedly due to high carbonate content and alteration, phyllosilicates strongly parallel, sometimes cross - biotite, spotted carbonate mainly as xenomorphic crystals, finely - dispersed titanite sometimes forming discontinuous traces of granules.
 gradual hanging wall.

A/C

DDH 4

54.80 - 59.70 : High calcareous amphibole bear. biotite - chlorite - qtz - plagioclase rock / schist

(meta - mafic, flow or tuff)

see too: 66.30 - 77.30 m, AA/C - sections

AA/C

slightly greengr, mostly massive but sporadically well bedded, fine - grained with poikiloblasts of biotite being aligned with layering or randomly oriented, in places highly enriched in biotite, sometimes cm - interlayers of qtz - fspar rock (qtz - keratophyr) always carrying some py : 55.70 - 55.80m, 58.73 - 58.75m, 59.15 - 59.25m. Sharp hanging wall.

59.70 - 66.30 : Slightly calcareous qtz - plagioclase - epidote - bear. amphibole schist

(meta - basalt, flow)

gn, fine - grained, fibrous amphibole always parallel schistosity, irregular qtz and carbonate veining, sometimes only stringers, opaques decomposed to titanite, interlayer of qtz - fspar rock (qtz - keratophyr) with rare spots of py: 60.96 - 61.00m. Sharp hanging wall.

66.30 - 77.30 : High calcareous epidote - biotite - chlorite bear. qtz - amphibole-plagioclase rock

(meta - mafic tuff) (banded amphibolite)

C

greenishgr, fine - grained, porphyroblasts of amphibole randomly oriented, prisms max. 0.4 cm long, spotted carbonate as hydriomorphic and idiomorphic porphyro - blasts randomly larger 0.1 cm, often crystal aggregates of carbonate, slightly mineralized by py, some sections highly altered to high calcareous : epidote bear. biotite amphibole - chlorite - qtz - plagioclase rock or high

AA/C

calcareous chlorite - qtz - biotite - plagioclase rock greenishgr, fine - grained with poikiloblasts of biotite equally distributed and randomly oriented, nebulous texture due to extensive alteration, spotted carbonate often as irregularly-shaped grain aggregates, slightly mineralized by py : 66.00 - 67.00m, 67.90 - 69.00m, 72.00 - 77.30m. Gradual hanging wall.

DDH 4

77.30 - 93.60 : Calcareous plag.-biotite - qtz - chlorite schist
(meta - basalt, flow and tuff)

AA/C

gn, fine - fibrous chlorite with occasional huge poikiloblasts of biotite randomly aligned with schistosity, crude development of wavy-lenticular texture, in places crudely cm-banded with alternate chlorite - dominated layers and qtz - and/or plagioclase - rich bands, banding when present only partly due to metamorphic differentiation, chlorite always with distinct crenulation cleavage, finest spots of carbonate often accreted to bigger (giant) spots which normally are lense - shaped and equally distributed (multi-crystal carbonate), random cross-cutting veinlets of carbonate, slightly mineralized by py, irregular qtz - veining throughout, sometimes mineralized by py and/or po.
Gradual hanging wall.

45°, 75.20m Φ , 80.70m 65°, 84.80m 60°, 85.30m Φ ,
89.85m Φ , 90.85m 45°, 93.05m 40°

93.60 - 94.55 : Calcareous biotite - qtz - chlorite schist
(meta - basalt, flow, feeder)

AA/giant C
feeder

gn, fine - fibrous chlorite, crudely development of wavy-lenticular bedding, irregular veins, veinlets, nodules, stringers of qtz randomly accompanied by carbonate but sometimes carrying cp and po or py as irregular stringers or spots, carbonate as giant spots of ellipsoidal shape (multi-crystal aggregate), mt as huge irregular shaped spots equally distributed, at hanging wall some interlayers of pure biotite - schist.
sharp hanging wall.

94.55 - 95.10 : Calcareous biotite - chlorite - pyrite - plagioclase rock

AA/C
disseminated
ore

(meta - felsic volcanic supp. dacitic composition)
grgn, medium-grained, crudely layered, mm- to cm-alternation of biotite - chlorite layers with pyrite - plagioclase bands, mostly gradual borders plagioclase as idiomorphic crystals (shortprismatic) max. 0.1 cm size (spotted plag.), carbonate as minute spots and sometimes as bigger crystal - aggregates equally distri-

tributed, average low - dissemination of py.
sharp hanging wall.

95.10 - 95.25 : Quartzite

(chert or qtz - keratophyr)

gr, fine - grained, massive, some tiny stringers or
lamina of py and po.

sharp hanging wall.

95.25 - 95.70 : Calcareous pyrite - sericite bear. biotite -
chlorite - qtz schist

(meta - basalt, feeder)

AA/C
feeder

browngr, coarse - grained, chaotically folded, nodules,
stringers, bands of qtz rich in idiomorphic py of max.
0.2 cm size within a biotite - chlorite matrix with
abundant carbonate, phyllosilicate matrix contains
low-grade dissemination of iron-titanium oxides.
sharp hanging wall.

95.70 - 96.25 : Slightly calcareous biotite bear. pyrite - qtz -
sericite schist

(meta - pelite)

low-grade
dissemination
of py

gr, crudely layered but mostly wavy - lenticular texture
lenses and discontinuous bands of qtz rich in disse -
minated py, poikiloblasts of biotite equally distri -
buted (cross - mica), low - grade dissemination of
pyrite throughout, often idiomorphic crystal faces.
sharp hanging wall.

40° - 35°

96.25 - 96.50 : Calcareous pyrite - sericite bear. biotite - chlorite -
qtz schist

(meta - basalt, feeder)

AA/C
feeder

same as: 95.25 - 95.70m
sharp hanging wall.

96.50 - 110.60 : Py - ore

(massive sulphide layer)

medium-grade, massive, intercalation of chert with irre -
gular sulphides : 98.25 - 98.60 and altered basalt :
106.43 - 106.93m, 108.60 - 109.10m.

110.60m end of DDH.

FOLLDAL VERK ½

avd. Tverrfjellet

- 8 -

DDH 4

Chemical composition of ore:

96.50 - 99.30m = 2.80m = 0.40% Cu, 1.70% Zn, 36.75% S
99.30 - 102.91m = 3.61m = 1.60% Cu, 1.00% Zn, 41.10% S
102.91 - 106.43m = 3.52m = 1.26% Cu, 1.15% Zn, 27.15% S
106.43 - 110.60m = 4.17m = 0.80% Cu, 1.50% Zn, 36.00% S

Thinnsection:

4/1	33.60 m
4/2	34.70 m
4/3	41.80 m
4/4	49.40 m
4/5	54.50 m
4/6	60.55 m
4/7	69.60 m
4/8	73.75 m
4/9	75.90 m
4/10	77.60 m
4/11	83.60 m
4/12	92.40 m
4/13	94.20 m
4/14	94.80 m
4/15	95.85 m
4/16	96.40 m

DIAMOND DRILL HOLE 13

Tverrfjellet mine, Folldal Verk A/S.

Exploration hole from 1957.

Location : 1280 N - 2700 W.

Inclination : 55°, 75 m 44°, 140 m 37°.

Total length : 196.86 m (4.5 m overburden).

Description :

0.00 - 13.10 : Slightly calcareous garnet bear. biotite - sericite schist

(meta - pelite)

greenishgr, fine - grained, wavy - lenticular structure to flaser-structure porphyric biotite as cross - mica, occurs in varying degrees, some sections even biotite - poor, biotite cause spotted appearance of the rock, garnet often idiomorphic and max. 0.5 cm in size, not equally distributed, rare spots of carbonate, occasionally chlorite - pseudomorphs after amphibole - porphyroblasts. Gradual hanging wall. 30°.

13.10 - 14.70 : Calcareous biotite bear. qtz - sericite schist

(meta - pelite)

C

bluegngr, fine-grained, flaser - structure, spotted carbonate sometimes forming traces of granules, rare stringers of po throughout always conformable with schistosity, band of stringery or web - like low - grade po - mineralization: 14.10 - 14.11 m. Gradual hanging wall. 45°.

14.70 - 16.95 : Slightly calcareous garnet - biotite bear. amphibole sericite schist (garbenschist)

(tuffaceous meta - pelite)

lightgreenishgr, with gn garben, fine - grained biotite - sericite matrix, porphyroblasts of amphibole as ellipsoidal crystals often forming spheroids, randomly oriented, mainly very coarse with 2.0 cm length and 0.3 cm width, in

BH 13

14.70 - 16.95 : general equally distributed, idiomorphic garnets as max. 0.5 cm large crystals.
Gradual hanging wall.

16.95 - 18.28 : Calcareous biotite - chlorite bear. qtz - sericite schist

C

(tuffaceous meta - pelite)

bluegngr, fine - grained, flaser-structure gradually changing into **distinctly** laminated rock and vice versa, biotite mostly fine - grained, within layered sections increased in grain - size and randomly oriented, always together with chlorite, rare cm - interlayers of qtz - amphibolite, coarse grained with gradual contacts.

Sharp hanging wall.

50°.

18.28 - 18.38 : Quartzite

(meta - chert)

white, fine - grained, flasers of po conformable with schistosity of neighbouring schist.

Sharp hanging wall.

50°.

18.38 - 18.66 : Biotite - amphibole bear. qtz - sericite schist

(garbenschist)

(tuffaceous meta - pelite)

same as : 14.70 - 16.95 m.

Gradual hanging wall.

18.66 - 19.50 : Slightly calcareous qtz - biotite - sericite schist

(meta - pelite)

gr, fine - grained, flaser -structure porphyric biotite randomly oriented (cross - mica), biotite cause spotted appearance of the rock, increasing qtz - content upsection, web - like po - mineralization : 19.38 - 19.46 m.

Gradual hanging wall.

50°.

BH 13

- 19.50 - 19.60 : Biotite - qtz - fspar gneiss
 (meta - qtz - keratophyr)
 whitegr, fine - grained, laminated, biotite - cluts
 (multi - crystals) strongly aligned with foliation,
 distinct light - dark banding.
 Gradual hanging wall.
- 19.60 - 20.35 : Quartzite
 (meta - chert)
 white sometimes transparent, sporadic mm - interlayers
 of chlorite - schist with rare spots of py, footwall
 slightly mineralized by po.
 Sharp hanging wall.
- 20.35 - 20.79 : Biotite - amphibole bear. qtz - fspar gneiss
 (meta - qtz - keratophyr)
 same as: 19.50 - 19.60 m, rare porphyroblasts of am-
 phibole randomly oriented, web - like po - mineraliza-
 tion: 20.44 - 20.45 m, 20.48 - 20.51 m high - grade po
 stratigraphically followed by a cm - band of altered
 basic - volcanic.
 Sharp hanging wall.
 45°.
- 20.79 - 21.47 : Calcareous qtz - biotite - sericite schist
 C
 (meta - pelite)
 same as: 18.66 - 19.50 m, footwall tuffaceous and highly
 altered (biotite - sericite schist).
 Gradual hanging wall.
 45°.
- 21.47 - 24.20 : Garnet - biotite bear. amphibole - sericite schist
 (garbenschist)
 (tuffaceous meta - pelite)
 same as: 14.70 - 16.95 m, biotite more coarser grained
 and randomly oriented (cross - mica), irregularly
 distributed.
 Sharp hanging wall.

AA/C

BH 13

- 24.20 - 74.00 : Slightly calcareous garnet bear. biotite - sericite schist
 (meta - pelite)
 same as: 0.00 - 13.10 m, interlayer of low - grade dissemination of py: 31.81 - 31.82 m.
 Sharp hanging wall.
 78°, 48.67 m fault.
- 74.00 - 75.96 : High calcareous chlorite - sericite bear. garnet - pyrrhotite - qtz - rock
 (meta - felsic - tuff with high - grade po)
 C
 brown, medium - grained with fine - grained pyrrhotite, web - like po - mineralization sometimes flasers sometimes massive bands, hypidiomorphic plagioclase with varying amounts, spotted carbonate, in places slightly distorted.
 po-mineralization
 Gradual hanging wall.
- 75.90 - 76.76 : High calcareous biotite bearing pyrrhotite - sericite qtz schist
 (meta - tuffite, highly altered)
 greenishgr, medium - grained, mm - and cm - layered, alternate biotite - chlorite bands and qtz - carbonate rich layers, often disharmonic folded, low - grade po - mineralization as stringers and web - like features mainly within felsic bands.
 AA/C
 po-mineralization
 85°.
- 76.76 - 77.41 : Garnet - epidote rock
 (fault - mylonite)
- 77.41 - 85.50 : High calcareous biotite - sericite bear. garnet - chlorite - fspar - qtz rock/schist
 (meta - tuffite, meta - pelite with volcanic impurity)
 greenishbrownishgr, medium - grained crudely layered and schistose, nebulous texture due to alteration, fine - fibrous chlorite, often porphyric biotite as cross - mica, varying amount of idiomorphic garnets max. 0.2 cm large, spotted also flasers carbonate, rare spots of

BH 13

idiomorphic mt, very rare spots of py.

Sharp hanging wall.

75°.

85.50 - 88.20 : Slightly calcareous biotite - epidote bear. garnet - chlorite - amphibole - qtz - fspar rock

(meta - tuff to tuffite, flow or tuff)

gngr, medium to coarse grained, crudely layered by variation in the mode by amphibole, amphibole as porphyroblasts randomly oriented, elliptical crystals of 0,7 cm length and 0,2 cm width not crossing or touching, idiomorphic garnets of max. 0,3 cm size nearly equally distributed, but some modal variation possible, rare flasers of biotite and chlorite, rare spots of py. Sharp hanging wall.

88.20 - 88.75 : Calcareous biotite - chlorite - fspar - qtz rock

A/C

(meta - mafic tuff or tuffite, altered)

gr, mainly fine-grained, flaser-texture often nebulous due to alteration, fine-fibrous chlorite always accompanied by slightly coarser biotite which mainly is parallel foliation, carbonate as irregular aggregates or flasers equally distributed, web-like py-mineralization of low-grade: 88.25 - 88.26m.

Gradual hanging wall.

90°.

88.75 - 89.90 : Slightly calcareous chlorite bear. amphibole - qtz - plagioclase rock

(meta - mafic volcanic compare with DDH-18 77.00 - 82.50m)

greenishgr, medium-grained, prisms of amphibole max. 0.3 cm long and randomly oriented, fine-fibrous chlorite rare spots of carbonate mostly hypidiomorphic, very rare spots of py.

Sharp hanging wall.

89.90 - 93.00 : Slightly calcareous plag. amphibolite

(meta - basalt, flow)

grgn, medium to coarse grained, amphibole accreted to

BH 13

multi-crystal porphyroblasts of elliptical shape, plag. and qtz fill interstices of the amphibole crystals, spots and minute veins of carbonate.
Gradual hanging wall.

93.00 - 93.67 : Calcareous chlorite bear. amphibole - plagioclase - qtz rock

(meta - mafic volcanic)

same as: 88.75 - 89.90 m.

Gradual hanging wall.

93.67 - 96.40 : Calcareous biotite - amphibole bear. sericite - chlorite - fspar - qtz rock

(meta - dacite, tuff or tuffite, correlation with:
DDH 4 53.80 - 54.80 m)

A/C

greenishgr, fine-grained, crudely schistose, nebulous texture, flasers of fine-fibrous chlorite equally distributed, biotite often as cluts crosscutting but to conformable schistosity, random prisms of amphibole max. 0,2 cm long mostly not oriented, mode of biotite and amphibole changes with the degree of alteration, irregular shaped carbonate mostly equally distributed.

Gradual hanging wall.

90°.

96.40 - 107.81 : Calcareous to high calcareous sericite - garnet-bear. biotite - chlorite - fspar - qtz rock

(meta -tuff to tuffite highly altered, see: DDH 4
72.00 - 77.30 m)

AA/C

lightgreen, fine-and medium-grained, often nebulous texture due to intense alteration, compositional changes mainly caused by varying degrees of alteration, fine-fibrous chlorite, biotite often as porphyroblasts randomly oriented but sometimes parallel a slight lineation, footwall even basaltic with prisms of amphibole (porphyroblasts) randomly oriented, crystals mainly elliptical in outline with max. 0.7 cm length, strongly varying garnet content, mainly idiomorphic crystals with max. 0.3 cm in crossection, rare spots of mt throughout, crystals or crystal aggregates mainly xenomorphic, some with

BH 13

idiomorphic outlines, dusty carbonate often accreted to discrete stringers and/or lamina, interlayers of quartzite rich in py and po, mainly low-grade laminated ore: 96.85 - 96.95 m, 97.15 - 97.20 m, 98.40 - 98.55 m high-grade exhalative mt as laminated ore making up upper half part of the mineralization, rare interlayers of quartzite (chert): 105.04 - 105.06 m, 106.07 - 106.09 m.

Gradual hanging wall.

107.81 - 109.48 : High calcareous biotite bear. sericite - chlorite - fspar - qtz rock/schist

(meta - dacite, tuff, highly altered)

AA/C

greenishgr, fine-grained, flaser-structure due to accretion of fine-fibrous chlorite to semiconformable flasers and lenses which are surrounded by felsic compounds highly enriched in dusty carbonate, biotite as finest flakes always conformable a slight lineation of the rock, sericite seems to be equally distributed.

Gradual hanging wall.

70°.

109.48 - 123.65 : High calcareous biotite - amphibole bear. fspar - qtz - chlorite schist/rock

(meta - basalt, tuff or flow, highly altered)

bluishgn, flaser-structure in places disharmonic folded, fine-fibrous chlorite interlayered by lenses, stringers and laminae of qtz or qtz with carbonate, amphibole as tiny prisms possibly conformable with foliation, giant spots of mt (multi-crystal spots): 109.60 - 110.60 m, 114.00 - 114.61 m, 117.25 - 122.90 m, rare spots of py throughout; interlayers of quartzite rich in carbonate and always laminated by chlorite: 109.54 - 109.59 m laminae rich in dusty mt, 109.85- 110.16 m rare bands of nearly massive py, several flasers and laminal of dusty mt, 110.15 - 110.16 m some rare flasers of mt, 110.36 - 110.37m laminae of py, 112.60 - 112.75 m low-grade web-like py-,po-mineralization, 115.50 - 115.60 m some spots of py and po, rare flasers of mt; interlayers of quartzite (chert) with rare spots of po or py: 113.59 - 113.62 m, 114.61 - 114.80 m, 116.30 - 116.45 m,

BH 13

116.75 - 116.85 m, 118.80 - 119.30 m, 119.50 - 119.65 m, repeated by folding, 120.00 - 120.56 m partly isoclinal folded, 121.60 - 121.66 m, 121.79 - 121.81 m, 123.25 - 123.26 m, 123.52 - 123.65 m.

Sharp hanging wall.

90°, abundant isoclinal folding: 119.57 m ϕ , 120.00 - 120.30 m ϕ , chert supposedly be repeated several times.

123.65 - 124.75 : Calcareous biotite - chlorite - fspar - qtz gneiss
(meta - tuff, highly altered, correlation with
DDH 20 70.10 - 73.85 m)

lightgn, mm-and cm-layered, alternate mm-thick qtz-layers with cm-thick bands of carbonate biotite - chlorite schist, clots of biotite randomly oriented and surrounded by fine-fibrous chlorite, spots and flasers of carbonate, slowly increasing py-content towards hanging portion, from 124.25 m upsection alternation of cm-thick carbonate biotite - chlorite schist with cm-to dm-thick layers of medium-grade py-ore (qtz-pyrite rock) which contains abundant cp. Bedding fault line at hanging contact.
50°.

ore zone

124.75 - 126.50 : Calcareous to high calcareous biotite - chlorite - fspar - qtz gneiss/schist

(meta - dacite tuff or tuffite, highly altered)
slightly brownishgr, mainly fine-grained, laminated with sections being more massive and nearly coarse-grained, laminae of phyllosilicates alternate with slightly thicker bands rich in carbonate, coarse-grained more massive looking sections rich in biotite and chlorite (carbonaceous qtz biotite - chlorite schist) sporadically embedded which carry a low-grade dissemination of py and some spots of cp, several interlayers of medium-grade py-ore between: 125.92 - 126.05 m.

AA/C

Sharp hanging wall.

85°.

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BH 13

126.50 - 129.60 : Calcareous to high calcareous biotite - chlorite-fspar - qtz schist/gneiss

(meta - tuff or tuffite highly altered)

AA/C

gngr, mainly fine-grained, laminated to crudely banded, alternate felsic bands or flasers and phyllosilicate layers, porphyric biotite forming randomly oriented cluts or conformable sheets or lenses, lower portion with subordinate amount of amphibole, slightly altered porphyroblasts max. 0.7 cm long and elliptical in shape, always randomly oriented, carbonate sometimes of spotted appearance but mostly as finest dissemination within qtz, rare spots of py, xenomorphic spots of mt throughout.

Sharp hanging wall.

50°, partly isoclinal folded: 128.00 m \mathcal{D} , 128.30 m \mathcal{C} ,
128.54 - 129.00 m \mathcal{S} .

129.60 - 131.00 : High calcareous biotite - amphibole bear. fspar - qtz - chlorite schist

AA/C

(meta - basalt tuff, highly altered)

same as: 109.45 - 123.65 m, spots of mt to about 130.60m.

Gradual hanging wall.

75°.

131.00 - 134.45 : High calcareous biotite bearing chlorite - fspar - qtz schist

(meta - tuff or tuffite, highly altered)

gn, laminated with often flaser-or wavy - lenticular structure, some sections even cm-banded, here alternate quartzite or calcareous quartzite with dusty mt and highly altered intermediate to even basic volcanics in places carrying mm-layers of pyrite; fine-fibrous chlorite, porphyric biotite mainly as cross-mica, some sections with poikiloblasts of amphibole max. 1.7 cm long randomly oriented, carbonate as lenses, flasers or lamina, only sporadically of spotted occurrence, abundant pyrite mainly as scattered idiomorphic crystals but sometimes as mm-interlayers, spots of mt mainly with xenomorphic outlines, interlayers of quartzite (chert) often with flasers or more rarely

BH 13

interlayers of high calcareous biotite - chlorite schist and sometimes with dusty mt: 131.95 - 132.10m areas with dusty mt, 132.20 - 132.35m layers enriched by dusty mt, 133.56 - 133.84m, 133.96 - 134.00m. Sharp hanging wall.

60° 131.50m, 35° 132.00m, 80° 132.80m, 60° 133.90m, 45° 134.00m.

134.45 - 136.20 : Slightly calcareous quartzite

(meta - chert with interlayers of mafic volcanics) white, extremely fine-grained, in places chaotically folded, web-like carbonate, scattered mt, always xenomorphic crystals of mm-size, cm- and dm-interlayers of pyrite bearing carbonate - quartzite and biotite bearing qtz - chlorite - amphibole schist

(meta - basalt - tuff, weakly altered), coarse grained, amphibole - porphyroblasts of average 1.7 cm length, abundant py as trains of granules or dissemination, interlayer of pyrite-rich quartzite: 134.57 - 134.63 m. Sharp hanging wall.

45°.

136.20 - 138.28 : High calcareous biotite - fspar - qtz - chlorite schist

AA/C

(meta - basalt, flow or tuff, highly altered) gn, fine-grained, laminated with tendency to lenticular structure some sections with nodular structure supposedly due to folding, fine - fibrous chlorite, biotite slightly coarser grained and strictly aligned with foliation, sometimes as porphyroblasts randomly oriented, lenses and flasers of carbonate, qtz forming nodules of irregular shape as well as mm - layers or flasers giant spots of mt with sutured boundaries: 136.20 - 137.30m; rare spots and sometimes discontinuous laminae of py; interbeds of quartzite with abundant pyrite and/or mt: 137.18 - 137.20 m high-grade dusty mt, 137.43 - 137.55 m cm - layers of high-grade dusty mt and cm - band of medium-grade py - ore.

Sharp hanging wall.

65°, sometimes distorted.

BH 13

138.28 - 139.80 : High calcareous biotite - chlorite - fspar - qtz schist

(meta - tuffite) (highly altered)

AA/C

gn, fine-grained, laminated sometimes with tendency to lenticular-structure decrease in alteration towards hanging portion, fine-prismatic amphibole from 138.95 upsection, here minor biotite and chlorite, spots of mt throughout, mainly of irregular shape and with sutured grain boundaries, carbonate forms flasers and lenses, rare spots of pyrite which in places constitute trains of granules.

A/C

Sharp hanging wall.

45°.

139.80 - 142.00 : Calcareous biotite - chlorite - qtz schist

(meta - dacite, tuffite, altered)

A/C

greenishgr, fine-grained, crudely laminated with tendency to nodular - texture, biotite and chlorite strongly aligned with foliation, flasers, lenses, nodules and layers of qtz alternate with stringers or laminae of phyllosilicates, rare spots of mt sometimes forming giant spots which sporadically occur with idiomorphic outlines, carbonate mainly forms flasers or mm-layers or web-like features.

140.00 - 140.40: High calcareous biotite - chlorite schist in close alternation with mt-rich quartzite

AA/C

(tuffaceous sequence, alternate cherts and basic tuffs, highly altered)

low-grade pyrite mineralization occurring as dissemination within biotite - chlorite schist, high - grade dusty mt restricted to cherty layers.

45°.

142.00 - 155.63 : Calcareous biotite - amphibole bearing fspar - chlorite - qtz schist

(meta - tuffite or tuff, altered)

A/C

gn, fine-grained, crudely laminated with tendency to flaser-structure some sections well layered and highly enriched in carbonate and intensively altered:

AA/C

143.00 - 143.15 m, 144.20 - 144.80 m; fine-fibrous

BH 13

chlorite, biotite slightly coarser grained and always conformable with schistosity, amphibole as minute prisms (max. 0.15 cm lengths) strongly aligned foliation, qtz forming nodules and flasers or web-like features, spotted carbonate, giant spots of mt throughout, interlayers of quartzite with subordinate mt occurring mainly as stringers: 145.00 - 145.12 m, 147.09 - 147.26 m, 149.00 - 149.10 m, 149.45 - 149.60 m 149.67 - 149.87 m, 151.25 - 151.32 m, 152.73 - 153.02 m with flasers and mm-interlayers or web-like features of py and po, 153.50 - 153.82 m, 154.97 - 155.17 m hanging wall with interlayers of py, 155.40 - 155.50 m.

155.63 - 163.10 : Slightly calcareous biotite bearing chlorite - amphibole - fspar - qtz gneiss/schist

(meta - basalt, tuff, weakly altered)

A

gn to grgn, medium-grained, mm-and cm-layered sections alternate with more massive parts, several interlayers of quartzite (chert), in places distorted, prisms of amphibole max. 0.4 cm long and often not oriented, chlorite forming fine-fibrous aggregates, biotite - cluts mainly conformable foliation or layering, gradual compositional changes due to variation in the degree of alteration, highly altered section (garnet biotite-chlorite schist): 158.20 - 158.32 m, 158.54 - 158.70m, 159.90 - 159.92 m, 162.36 - 162.56 m, several interlayers of quartzite (chert) often slightly mineralized by mt: 156.40 - 156.65 m, 156.99 - 157.50 m, 157.65 - 158.20 m partly with high-grade dusty mt and mm-layers of massive py, 158.32 - 158.54 m laminated by AA/C - basalt, high-grade dusty mt, some rare spots of py, 158.70 - 159.30 m, 159.80 - 159.90 m several layers of dusty mt, 161.00 - 161.15 m, 161.55 - 161.72 m, 162.22 - 162.42 m several cm-thick interlayers of chlorite bearing amphibole schist; rare stripes or discontinuous layers of py: 155.73 - 155.83 m within qtz - fspar amphibolite, 160.34 - 160.44 m within qtz amphibolite; interlayer of amphibole - fspar - qtz rock

AA

BH 13

(qtz - keratophyr): 160.54 - 160.90 m.

Gradual hanging wall.

65 to 70°, often strongly distorted.

163.10 - 169.36 : Slightly calcareous biotite bearing chlorite - amphibole schist

(meta - basalt, flow, weakly altered)

A

gn, fine - to medium grained, crudely laminated or layered, decrease in the degree of alteration towards upsection, lower part rich in biotite -always as multi-crystal porphyroblasts mainly conformable foliation- and chlorite (fine-fibrous appearance), amphibole as minute prisms strictly aligned schistosity, rare spots of py throughout, hanging portion with little biotite and too subordinate chlorite, here mainly amphibole schist.

Sharp hanging wall.

75 to 85°, partly distorted.

169.36 - 170.58 : High calcareous biotite - chlorite - plagioclase - amphibole - qtz gneiss

(meta - mafic tuff with tuffaceous sediment interlayers)

C

grgn, medium-grained, crudely cm-banded, mainly gradual compositional changes, bands of calcareous biotite - chlorite schist, chlorite - amphibole schist and calcareous to high calcareous chlorite - amphibole bear. qtz - fspar rock, amphibole as max. 0.3 cm long prisms randomly oriented, fine-fibrous chlorite, biotite slightly coarser than chlorite forming cluts mainly being conformable with compositional layering, spotted carbonate often forming discrete layers, some rare spots of py; medium-grade dissemination of py:

169.61 - 169.63 m.

Sharp hanging wall.

60°.

170.58 - 171.07 : High calcareous chlorite bearing biotite - sericite - qtz - fspar rock/schist

(meta - tuffite, dacitic composition)

BH 13

gr, medium-grained, flaser-texture, large idiomorphic crystals of carbonate equally distributed.
Gradual hanging wall.

171.07 - 173.87 : High calcareous chlorite - sericite bearing amphibole - fspar - qtz rock/gneiss
(meta - dacite/-keratophyr, tuff)
gr, medium-grained, crudely layered, alternate amphibole-rich and -poor layers, amphibole forming porphyroblasts of max. 0.7 cm length, prisms randomly oriented, carbonate mainly forming traces of granules but sometimes large aggregates; interlayer of low-grade pyrite - mineralization: 171.47 - 171.50 m; band of slightly mt bearing quartzite (chert): 171.52 - 171.62 m.
Sharp hanging wall, sheared.
Strongly folded.

C

173.87 - 174.69 : High calcareous biotite - chlorite - fspar - qtz schist
(meta - keratophyr)
white with brown stripes, mm-bands or flasers of biotite - chlorite alternate with high carb. fspar - qtz layers.
Gradual hanging wall.
Strongly folded, \$.

AA/C

174.69 - 176.65 : High calcareous fspar - biotite - chlorite - qtz schist
(meta - tuff, highly altered)
grgn, medium-to coarse - crystalline biotite surrounded by fine-fibrous chlorite, flaser- and lenticular structure partly due to strong small - scale folding, carbonate tends to accompany qtz and- fspar which form irregular shaped aggregates, some dusty carbonate within flasers and lenses made by phyllosilicates, slow income of amphibole which forms 0.4 cm long prisms being randomly oriented, towards hanging portion band of py within 175.39 m.
Gradual hanging wall.
Strongly foleded, \$.

AA/C

BH 13

176.65 - 179.17 : Carbonate - biotite bearing chlorite - plagioclase - amphibole - gtz gneiss/rock

(meta - basalt, tuff)

grgn, medium-grained, crudely layered, gradual compositional changes, porphyric amphibole, prisms average 0.4 cm long and always not oriented, fine-fibrous chlorite, sporadic clots of biotite being conformable with compositional layering, idiomorphic crystals of py sometimes forming trains of granules or cm - interlayers of low-grade dissemination, some lenses and flasers of po.

Sharp hanging wall.

90°.

179.17 - 179.42 : Mt - bearing quartzite

(meta-chert)

whitegr, fine-grained, dense, some rare tiny flasers of mt.

Sharp hanging wall.

179.42 - 182.25 : Biotite - chlorite bearing gtz - plagioclase - amphibole gneiss

(meta - basalt, tuff)

gn to grgn, coarse - grained, crudely cm-layered, amphibole as ellipsoidal shaped porphyroblasts of 1.0 cm length and 0.2 cm width not oriented, sometimes altered sections of biotite - chlorite - amphibolite; cm - to dm - thick interlayers of chert (alternation chert - basaltic volcanic) within 180.17 - 180.54 m.

45°.

182.25 - 183.80 : Stressed amphibolite

fault - zone.

183.25 - 185.71 : Chlorite bearing biotite - sericite schist

(meta - pelite)

gr, fine-grained, laminated to wavy-lenticular structure porphyroblasts of biotite always crosscutting foliation cause spotted appearance of the rock,
Small-scale folding.

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BH 13

185.71 - 188.53 : Qtz - fspar amphibolite

(meta - basalt, tuff)

same as: 179.42 - 182.25 m, no altered sections, foot-wall and hanging wall rich in fspar and qtz; low-grade dissemination of pyrite: 185.71 - 185.72 m; mm-to cm-bands of nearly massive py: 188.30 - 188.53 m.
Gradual hanging wall.

188.53 - 188.60 : Qtz - rich pyrite rock

(sulphide layer, high-grade pyrite ore)

pyrite ore

medium-grained.

Gradual hanging wall.

188.60 - 192.36 : Carbonate bearing amphibole schist

(meta - basalt, flow)

gn, fine-grained with tendency to extremely fine-grained, spots of idiomorphic carbonate sometimes forming traces of granules which often are conformable with schistosity, interlayers of chert at several locations: 190.30 - 190.35 m, 190.45 - 190.47 m; pyrite - mineralizations at: 189.00 - 189.02 m, 190.20 - 190.26 m.

192.36 m end of DDH.

Composition of ore:

74.00 - 75.00 m = 1.0 m = 0.02 % Cu, 0.015 % Zn,
75.00 - 76.00 m = 1.0 m = 0.024 % Cu, 0.023 % Zn,
76.00 - 76.80 m = 0.8 m = 0.015 % Cu, 0.041 % Zn,
124.25 - 124.66 m = 0.41 m = 0.632 % Cu, 0.809 % Zn,
124.66 - 125.15 m = 0.49 m = 0.466 % Cu, 0.114 % Zn,
188.23 - 188.69 m = 0.46 m = 0.063 % Cu, 0.025 % Zn.

Thinsection

13/2 22.50 m
13/9 74.30 m
13/8 76.70 m
13/11 79.30 m
13/25 86.30 m

DIAMOND DRILL HOLE 14

Tverrfjellet mine, Folldal Verk A/S.

Exploration hole from 1957.

Location: 2350 V - 1225 N.

Inclination: 55° N, 80 m 30°, 115 m 25°.

Total length: 120.00 m. (3.50 m overburden).

Description:

0.00 - 18.10 : Garnet bearing biotite - sericite schist

(meta - pelite)

gr, fine - grained, in places wavy - lenticular - structure nodules of qtz surrounded by phyllosilicates, sometimes cm - banding of alternate qtz - rich layers with sericite bands, porphyric biotite always as cross - mica, responsible for spotted appearance of the rock, garnets max. 0.4 cm in size and mainly equally distributed, seem to occur more often within parts wavy - lenticular texture, rare spots of carbonate.

Gradual hanging wall.

45° 10.00 m, 45° 15.00 m.

18.10 - 19.25 : Fragment horizon

slightly calcareous biotite - sericite quartzite

(meta - paraconglomerate supp. meta - tilloide)

gr, wavy - lenticular structure sometimes banded, rounded fragments of qtz surrounded by fine - grained sericite with minor chlorite and porphyric biotite often crossing foliation, qtz - clasts mainly of 0.3 cm width and 1.0 cm length being flattened or squeezed, cm - banding at 18.85 - 19.25 m supposedly is due to sedimentation and flattening of larger qtz - clasts, matrix is here rich in silica.

Sharp hanging wall.

45°.

19.25 - 20.10 : Garnet bearing biotite - sericite schist

(meta - pelite)

same as: 0.00 - 18.10 m, at hanging wall distinctly enriched in chlorite.

Sharp hanging wall. 50°.

BH 14

Fragment horizon.

20.10 - 23.95 :

Garnet bearing biotite - sericite - quartzite

(meta - paraconglomerate supp. meta - tilloide)

same as: 18.85 - 19.25 m, sometimes cm-thick inter-layers of garnet bear. biotite - sericite schist, porphyroblasts of amphibole within matrix between flattened and stretched qtz- and qtz - keratophyr clasts (22.00 - 22.45 m, 23.38 - 23.58 m) prisms max. 0.5 cm long and often not oriented.

Sharp hanging wall.

45°, 15°, 23.70 m.

23.95 - 26.40 :

Carbonate bearing biotite - amphibole - fspar - qtz gneiss

(meta - qtz - keratophyr, tuff)

gr, fine - grained with porphyroblasts of amphibole mainly of lenticular shape randomly oriented but sometimes aligned with foliation, crystals max. 1.2 cm long, mainly mm - banded (due to extreme foliation) sometimes sections cm - layered with alternate qtz - fspar bands and traces of granules of amphibole, biotite only within foliated sections, resulting from decomposition of amphibole, always paralling schistosity. Gradual hanging wall.

15°, foliated sections 45°.

26.40 - 37.60 :

Slightly calcareous garnet - chlorite bear. biotite - sericite schist

(meta - pelite, slightly tuffaceous)

gngr, fine - grained, crude development of wavy - lenticular structure, in places laminated, alternate qtz - bands and phyllosilicate - layers, porphyric biotite as cross-mica, qtz mainly as lenticular - shaped nodules (accretion due to folding and metamorphysm.), 36.48 - 36.52: calcareous quartzo - feldspatic gneiss

(meta - qtz - keratophyr - tuff) laminated, alternation of qtz and fspar - qtz and carbonate laminae with bands and stringers of py, (average 5 Vol. - %).

Gradual hanging wall.

45°.

BH 14

37.60 - 38.33 : Carbonate - rich biotite - sericite - quartzite

(tuffaceous meta - pelite)

gr, wavy-lenticular structure with transition into distinctly laminated rock, porphyritic biotite as cross-mica, within laminated sections always parallel layering / foliation, sporadically some porphyroblasts of amphibole mainly restricted to even basic looking interbeds, cm - interlayers of qtz with dissemination of py (meta - chemical sediment) : 36.85 m, 36.95 - 36.98 m, 37.40 m.

Sharp hanging wall.

45°.

38.33 - 39.33 : Carbonate - rich sericite - chlorite bear. amphibole - fspar - qtz gneiss

(meta - tuffite)

grgn, medium - grained, cm - sometimes mm - banded, alternate qtz - or fspar - qtz bands and amphibole layers rich in qtz and fspar, inplaces layers of chlorite - sericite schist, prisms of amphibole max. 0.3 cm long and randomly oriented, rare spots of py throughout, medium - grade py mineralization within qtz - layer : 38.35 - 38.39 m.

Sharp hanging wall.

45°.

39.33 - 41.88 : Carbonate - rich qtz - fspar - amphibole schist

(meta - basalt, flow)

gn, fine - grained, crude development of layering, sometimes cm interlayers of medium - grained chlorite bear. amphibolite, prisms randomly oriented, spotted carbonate, also often traces of granules, always idiomorphic crystals. Sharp hanging wall.

45°.

41.88 - 42.30 : Qtz - fspar amphibolite

(meta - basalt, flow),

grgn, medium - grained, randomly oriented amphibole - prisms max. 0.3 cm size.

Sharp hanging wall.

BH 14

42.30 - 61.22 : Carbonate bear. amphibole schist

(meta - basalt, flow)

gn, fine - grained, in places laminated, alternation of qtz and amphibole beds, spots of idiomorphic carbonate sometimes forming traces of granules, in places lamina or stringers of biotite getting more abundant stratigraphically upwards, interlayers of quartzite (chert): 47.52 - 47.60 m, 48.49 - 48.55 m, in general low - grade dissemination of py often forming traces of granules, always sharp borders to amphibole schist.

Sharp hanging wall.

45°.

61.22 - 62.40 : Calcareous amphibole - qtz - plagioclase gneiss

(meta - basalt, tuff supp. with hydrothermal silica)

grgn, medium - grained, cm - layering mostly crudely developed, prisms of amphibole max. 0.3 cm long and always randomly oriented, spotted carbonate, hypidiorhombic crystals sometimes form traces of granules, fine spots of py throughout.

Gradual hanging wall.

45°.

62.40 - 66.10 : Amphibole schist

(meta - basalt, flow)

gn, fine - grained, slightly varying qtz - plagioclase content, some irregular qtz - veining, sporadically some clots of biotite strongly aligned with schistosity, interlayers of quartzite (chert): 67.10 - 67.11 m, 67.15 - 67.17 m.

Sharp hanging wall.

60°.

66.10 - 72.00 : Calcareous qtz - plagioclase - chlorite - amphibole gneiss

(meta - basalt, tuff, weakly altered)

gn, to grgn, medium - grained, cm-banding with gradual contacts, alternation of amphibole or amphibole - chlorite layers with qtz - plagioclase dominated bands, prisms of amphibole max. 0.4 cm long and randomly oriented, fine -

A/C

BH 14

fibrous chlorite, mainly spotted carbonate sometimes as stringers, towards hanging wall some biotite, rare spots of py, giant spots of mt : 69.45 - 70.45 m.
Gradual hanging wall.
45°.

72.00 - 74.33 : Calcareous amphibole / biotite bear. chlorite schist
AA/C
(meta - basalt, highly altered)
gn, fine - grained, fine - fibrous chlorite together with giant clots of biotite (multi - crystals porphyroblasts), in places prisms of amphibole max. 0.3 cm long and randomly oriented, here no biotite, irregularly shaped carbonate not equally distributed, rare spots of py.
Sharp hanging wall.
80°.

74.33 - 74.85 : Qtz - rich pyrite rock
ore zone
(massive sulphide layer)
medium - grained.
Sharp hanging wall.

74.85 - 75.00 : Carbonate bear. amphibole - fspar - qtz gneiss
(meta - mafic tuff)
greenishgr, cm - banding, alternate amphibole - rich layers with qtz - fspar bands poor in amphibole, prisms of amphibole max. 0.3 cm long and randomly oriented, rare spots of carbonate, rare spots of py.
Sharp hanging wall.
75°.

75.00 - 76.00 : Calcareous qtz - amphibole - chlorite schist
AA/C
(meta - basalt, flow, highly altered)
same as: 72.00 - 74.33 m, high - grade dissemination of pyrite with qtz: 75.85 - 75.86 m.
Sharp hanging wall,

76.00 - 76.60 : Amphibole schist
(meta - basalt, flow)
gn, fine - grained, some irregular qtz - veining.
Sharp hanging wall.

BH 14

76.60 - 77.45 : Sericite - amphibole - fspar - qtz rock

(meta - mafic tuff)

greenishgr, crudely laminated, prisms of amphibole max. 0.3 cm long and randomly oriented, sometimes compositional changes towards amphibole schist.

Sharp hanging wall.

80°.

77.45 - 77.70 : Calcareous amphibole - chlorite schist

(meta - basalt, flow or tuff, altered)

A/C

gn, fine - fibrous chlorite surrounding porphyroblasts of amphibole of max. 1.0 cm length and 0.3 cm width, lense - shaped crystals randomly oriented, carbonate mainly fills interstices between amphibole porphyroblasts.

Sharp hanging wall.

77.70 - 79.60 : Qtz - bear. /- rich pyrite rock

(massive sulphide layer)

ore zone

medium - grained, modal changes from medium - to high - grade ore.

Sharp hanging wall.

79.60 - 81.90 : Calcareous sericite bear. biotite - chlorite - qtz - plagioclase rock / schist

A/C

(meta - tuff, altered)

greenishgr, fine - grained, porphyric biotite mainly aligned with schistosity, sometimes crosscutting traces of granules, lense-shaped carbonate paralleling biotite, rare stringers and laminae of qtz only sporadically crosscutting schistosity.

Gradual hanging wall.

85°.

81.90 - 85.19 : Biotite bear. qtz - plagioclase - amphibole schist

(meta - basalt, flow)

gn, fine - grained, some irregular qtz and carbonate, biotite as multi - crystal porphyroblasts sporadically embedded, some banded sections rich in qtz and plagioclase, interlayers of quartzite (chert) with rare spots

BH 14

of py: 84.15 - 84.25 m, 84.35 - 84.42 m, 84.92 - 85.19 m.
Sharp hanging wall.

85.19 - 96.90 : Calcareous amphibole bear. qtz - biotite - chlorite schist

(meta - basalt, flow, highly altered)
gn, fine - grained, only in places slightly banded, gradual changes in modal composition towards altered andesite, always fine - fibrous chlorite, giant cluts of biotite (multi - crystal) in places pseudomorph amphibole, biotite decreases when amphibole occurs, amphibole mainly as tiny prisms randomly oriented but sometimes as porphyroblasts of sporadically 1.0 cm size always randomly oriented, carbonate as stringers or irregular formed crystal aggregates, sometimes of spotted type, interlayer of quartzite with amphibole lamination and some spots of py: 88.10 - 88.35 m ; medium-grade pyrite mineralization: 90.76 - 90.81 m. Sharp hanging wall.

96.90 - 97.75 : Qtz - rich pyrite rock

(massive sulphide layer)

medium - grained, varying qtz - amount,

97.05 - 97.15 m: calcareous chlorite bear. quartzite

(meta - felsic - tuff)

gr, fine - grained, laminated, alternate chlorite - and qtz - layers and stringers of carbonate, spots of py and mt.

Sharp foot - and hanging wall.

85°.

ore zone

97.75 - 100.50 : Biotite - chlorite bear. quartzo - feldspatic gneiss

(meta - qtz - keratophyr with transition to tuffaceous meta - quartzite, strongly folded and tectonized)

gr, sometimes white, chaotically folded in places strongly foliated, laminated sections with

wavy -lenticular and flaser-structure phyllosilicates in places coarse - grained with biotite often forming randomly oriented cluts, sometimes phyllosilicates.

BH 14

strongly squeezed and aligned with foliation, varying fspar content, highest concentration at : 97.75 - 97.95 m, 99.40 - 100.15 m, (strongly foliated qtz - keratophyrs), in places some spots of carbonate. Sharp hanging wall.

- 100.50 - 101.10 : High calcareous biotite - chlorite bear. sericite - qtz - fspar rock
 C (meta - dacite, tuff)
 gr, fine - grained, some flasers of biotite and chlorite irregularly distributed, sometimes forming ghost-like layers.
- 101.10 - 102.00 : Biotite - chlorite bear. sericite - quartzite
 (meta - pelite, slightly tuffaceous)
 gr, wavy-lenticular structure porphyric biotite often as cross - mica sometimes forming flasers together with chlorite.
 Sharp hanging wall.
- 102.00 - 103.90 : High calcareous biotite - sericite bear. chlorite qtz - fspar rock / schist
 A/C (meta - dacite, crystal - tuff (?), altered)
 lightgrgn, mainly fine - grained, crudely laminated in places, nebulous texture, fine - fibrous chlorite, sometimes some cluts of biotite randomly oriented, spotted carbonate mainly as xenomorphic crystals, interlayers of low - to medium grade py - ore: 102.00 - 102.03 m, 102.35 - 102.36 m.
 Sharp hanging wall.
- 103.90 - 107.70 : Calcareous biotite - qtz - chlorite schist
 (meta - mafic tuffite)
 gn to grgn, cm - layered sometimes wavy - lenticular structure, compositional changes from basaltic to intermediate or even felsic (sed.), fine-fibrous chlorite, cluts of biotite mainly parallel layering, carbonate as xenomorphic aggregates irregularly distributed, rare spots of py, intersections of low-to medium - grade

BH 14

103.90 - 107.70 : py - mineralization within qtz - fspar rock (meta - felsic - tuff) : 104.15 - 104.25 m, 104.35 - 104.42 m, 105.06 - 105.54 m; quartzite - layer (chert) : 106.80 - 106.86 m.

Gradual hanging wall.

85°.

107.70 - 108.50 : Carbonate bear. biotite - qtz - chlorite - sericite schist

(tuffaceous meta - pelite)

slight gnr, wavy-lenticular structure due to accretion of qtz and phyllosilicates, porphyric biotite as cross - mica but sometimes parallel foliation / schistosity.

Gradual hanging wall.

70°.

108.50 - 116.50 : Carbonate bear. amphibole - qtz - fspar - chlorite gneiss / rock

(meta - mafic tuff or tuffite)

gn, cm - banding sometimes passing into nearly massive rock, alternate amphibole - chlorite layers and qtz - fspar bands poor in Fe - Mg silicates, more massive sections bear. a crude banding due to traces of granules of amphibole within fine - fibrous qtz - chlorite rock, porphyroblasts of amphibole often are ellipsoidal in shape (max. 1.4 cm long a. 0.3 cm thick) and always are randomly oriented, irregular changes in the mode, sometimes very felsic.

116.50 end of DDH.

Composition of ore :

72.62 - 74.85 m = 2.23 m = 0.55% Cu, 2.60% Zn, 32.00% S

77.70 - 79.60 m = 1.90 m = 0.63% Cu, 1.10% Zn, 38.20% S

96.60 - 97.75 m = 1.15 m = 0.39% Cu, 1.10% Zn, 32.50% S

DIAMOND DRILL HOLE 18

Tverrfjellet mine, Folldal Verk A/S.

Exploration hole from 1958.

Location: 2650 W - 1290 N.

Inclination: 56° N, at 60 m 33°.

Total length: 144.50 m (4.50 m overburden).

Description:

- 0.00 - 27.85 : Slightly calcareous biotite - sericite schist
(meta - pelite)
lightgn, wavy lenticular texture, slightly layered, mainly alternation of qtz - rich bands and phyllosilicate qtz - poor layers, banding supposedly due to metamorphic differentiation, porphyroblasts of biotite mainly cutting the older foliation (cross - mica)
Gradual hanging wall.
- 27.85 - 28.30 : Garnenschist, calcareous to high calcareous biotite bearing amphibole - chlorite - fspar - qtz schist
(meta - volcanic shale / siltstone) grgn, laminated to cm layered, close alternation of chlorite - rich, carbonate - rich and qtz - rich layers, in places wavy lenticular texture, porphyroblasts of amphibole randomly oriented, prisms of 0.2 to 1.2 cm size and often ellipsoidal formed, interlayers of qtz - fspar rock, (supp. meta - qtz - keratophyr) with some spots of py.
Sharp contact at hanging wall.
- 28.30 - 28.70 : Calcareous garnet - chlorite - plag. - amphibole schist
(meta - basalt - flow, weakly altered), gn,
A medium grained, crudely layered, varying amount in chlorite, amphibole as poikiloblasts mainly parallel foliation, prisms max. 0.3 cm long, garnets slightly corroded and less 0.3 cm large, invariably

BH 18

distributed, irregular enrichments of qtz - fspar rock (meta - qtz - keratophyr) at :
 28.40 m, 28.55 m and 28.60 m, always with low-grade or even mediumgrade dissemination of po, max. 10 Vol.-%.
 Gradually passing into hanging amphibole schist.

28.70 - 30.00 : Garnet bear. plag. - amphibole schist, (meta - basalt - flow) gn. fine grained, irregular stringers of qtz sometimes conformable with foliation, garnets variably distributed.
 Sharp contact at hanging wall.

30.00 - 36.70 : High calcareous chlorite - sericite - qtz - fspar rock
 (Meta - dacite, crystal tuff or tuffite)
 Lightgreenishgr, extremely fine grained, footwal slightly coarser grained, spotted carbonate mainly with dusty boundaries, sometimes cluts of biotite.
 35°

36.70 - 41.60 : High calcareous biotite - chlorite bear., amphibole - qtz - fspar rock.
 (Meta - mafic tuff)
 Greenishgr, slightly schistose and crudely laminated, porphyric texture, prisms of amphibole randomly oriented, needles mainly 0.2 cm long, some rare spots of py.

41.60 - 45.60 : High calcareous sericite bear. chlorite - qtz - fspar rock
 (Meta - dacite, tuff or tuffite)
 Grgn., fine grained slightly coarser grained towards hanging wall, crudely schistose, in places slightly porphyric crystals of biotite, minute bands and stringers of qtz always irregular, sporadically enriched in mesh - like po often accompanied by qtz - fspar rock (supp. qtz - keratophyr) :
 41.70 - 41.75 (40 Vol.- % po), 41.75 - 41.96 (low - grade), 42.20 - 42.32 (60 Vol. - % po).

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45.60 - 51.93 : High calcareous chlorite - amphibole - qtz - fspar rock

(Meta - mafic tuff)

C

Greenishgr, medium grained, slight foliation present by subparallel alignment of prisms of amphibole, amphibole needles max 0.2 cm long, spotted carbonate more distinct within the hanging porportion, irregular bands of qtz with carbonate, borders often nebulous.

51.93 - 53.80 : Calcareous chlorite - amphibole schist

(Meta - basalt - flow)

Gn., fine grained, spotted carbonate often mesh - like arranged.

53.80 - 57.00 : High calcareous chlorite - amphibole - qtz - fspar rock

C

(Meta - mafic tuff)

Same as : 45.60 - 51.93, sometimes minor of py.

57.00 - 62.75 : High calcareous epidote - sericite bear. qtz - fspar - chlorite schist

(Meta - mafic tuff or tuffite)

A / C

Greenishgr, fine grained, crudely laminated, nebulous texture supp. due to alteration, sporadically minute prisms of amphibole always not oriented, irregular accretion of qtz always accompanied by carbonate, rare spots of py.

Qtz - fspar rock (supp. meta - chert)

with low - grade py mineralization as spots and stringers : 57.30 - 57.50 m.

Gradual hanging wall.

62.75 - 66.30 : High calcareous epidote - chlorite - fspar - qtz - amphibole rock

(Meta - basalt , supp. tuff)

A / C

Lightgreen, slightly schistose, crudely laminated, randomly oriented porphyric prisms of amphibole mainly 0.1 cm, qtz and carbonate often irregularly

BH 18

accreted, minute qtz - veining, fuzzy and spotted carbonate.

Gradual hanging wall.

45°

66.30 - 70.00 : Calcareous sericite- biotite - chlorite - schist
(Meta - mafic tuff)

Lightgn, fine grained with slightly porphyric amphi -
bole of 0.1 to 0.3 cm crystal length, randomly
oriented, nebulous texture only slightly schistose,
carbonate as fuzzy aggregates and sometimes
minute spots.

Gradual hanging wall.

80°

Qtz - fspar rock, (supp. meta chert)

with low - grade py mineralization : 58.80 - 68.85 m.

70.00 - 71.00 : High calcareous epidote bear. chlorite - qtz -
fspar - amphibolite

(Meta - basalt, crystal tuff or amygdaloid basalt)

Grgn., medium grained due to multi - crystal
ellipsoidal chlorite-amphibole, qtz - plagioclase or
carbonate lenses or spots of max. 0.5 cm size dis -
continuously surrounded by amphibole and chlorite,
also spotted carbonate.

C

71.00 - 71.61 : Mylonite within amphibolite

71.61 - 72.70 : High calcareous epidote - plagioclase - qtz -
amphibole - chlorite gneiss

(Banded amphibolite, meta - basic tuff)

Grgn. to blueishgn., medium grained, slight light -
dark banding mainly in a cm - scale due to alternation
of amphibole - chlorite layers with plagioclase -
qtz bands, contacts between distinct layers often
gradual, amphibole prisms max 0.5 cm in size and
randomly oriented, spotted carbonate mainly with
idiomorphic outlines, spots of py throughout often
concentrated within mafic layers.

A / C

Gradual hanging wall.

BH 18

72.70 - 75.10 : High calcareous epidote - biotite bear. qtz - plagioclase - rich chlorite schist

(Meta - basalt - flow, altered)

A / C

Gn. fine grained with porphyric biotite, max. 0.2 cm large flakes randomly oriented, sometimes somewhat larger clots (crystal aggregates), nebular texture due to mineral alteration, spotted carbonate showing tendency to form trains of granules, qtz - carbonate accompanied by sericite as crosscutting minute veins.

75.10 - 77.00 : Biotite - chlorite bear. amphibolite

(Meta - basalt - flow, weakly altered)

A

Gn. fine grained with porphyric amphibole, prisms randomly oriented.

Gradual hanging wall.

77.00 - 82.50 : Calcareous epidote - chlorite - amphibole - plagioclase - qtz rock

(Meta - mafic volcanic, banded amphibolite)

Grgn. fine grained with porphyric amphibole, prisms max. 0.3 cm long and randomly oriented, crudely laminated, indistinct alternation of mm - thick felsic layers with cm - sections richer in chlorite and amphibole, carbonate as tears or stringers mainly conformable with lamination, finely - dispersed sulphide, mainly py.

Gradual hanging wall.

82.50 - 87.95 : Calcareous to high calcareous chlorite schist

(Meta - basalt - flow, highly altered)

high A/ giant C

Gn. fine grained fibrous chlorite, in places porphyric biotite possibly parallel with foliation, carbonate as minute spots, sometimes giant spots

(max. 0.7 cm in diameter) of carbonate which are often accompanied by qtz and plagioclase, rare crosscutting veinlets of qtz often together with carbonate, interlayers of qtz - fspar rock, (meta - qtzkeratophyr) : 84.20 - 84.30 , 84.60 - 84.62 , 85.55 - 85.95 with low - grade po dissemination, minute beds of biotite - chlorite schist.

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87.69 - 87.75 : Calcareous qtz - chlorite - plagioclase schist

A

(Meta - mafic tuff / tuffite)

Grgn. fine grained, crudely bedded, conformable lenses of qtz - carbonate and granulated fspar of max. 0.3 cm size, stringery chlorite, rare spots of po and cp .

87.85 - 87.95 : translucent qtz, (meta - chert).

Gradual hanging wall.

Schistosity a. layering 50° to 60°.

87.95 - 89.83 : High calcareous chlorite - biotite - sericite - schist

(Meta - tuff or tuffite)

AA/C

Lightbluishgn., medium grained, cross - biotite as porphyroblasts, spotted carbonate, in places crudely laminated, alternation of felsic (plagioclase), and biotite - chlorite layers, trains of granules of py within layered sections. Interbeds of qtz - fspar rock (qtz - keratophyr): 88.10 - 88.25 , 89.00 - 89.30.

Gradual hanging wall.

Schistosity a. layering : 45° , 88.30 m §

89.83 - 95.65 : Calcareous to high calcareous biotite bear. chlorite schist

high A/giant C
feeder

(Meta - basalt - flow, highly altered) same as 82.50 - 87.95 m.

Some spots of mt, crosscutting features of qtz with stringery po and cp, feeder material :

89.83 - 92.65 high- grade feeder ore, 92.65 -

93.65 low- grade feeder ore, 93.65 - 95.02 high - grade feeder ore.

95.65 - 120.25 : Massive pyrite ore

(Massive sulphide layer)

120.25- 124.95 : High calcareous sericite bear. qtz - plagioclase - chlorite schist.

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high A/giant C

(Meta - basalt - flow , highly altered).

Gn, crudely laminated, suggestion of flaser texture, mainly coarse chlorite, sporadically disharmonic small - scale folding, irregularly distributed carbonate as minute crystals of mainly anhedral shape, often giant, lense - like spots of carbonate accompanied by qtz, stringery mineralization and sometimes spots of po, py and cp, interlayers of qtz - fspar rock, (qtz - kera - tophyr) at : 123.13 - 123.23 with high - grade py mineralization, 124.00 - 124.95 high - grade py mineralization.

Gradual hanging wall.

Foliation at 30°

124.95 - 129.30 : Calcareous biotite bear. qtz - amphibole - chlorite schist , (Garbenschist)

(Meta - basalt - tuff, weakly altered)

A

Gn to grgn, crudely layered sometimes well banded, banded sections composed of alternate granoblastic (qtz - fspar) and schistose layers, porphyroblasts of amphibole - mainly elliptical crystals from 126.54 m randomly oriented prisms of up to 2.0 cm in size, spotted carbonate irregularly distributed mainly as minute spots, some smaller crystals of py, mt as 0.1 to 0.2 cm spots : 126.54 - 127.00 , 127.20 - 127.40 , 127.75 - 127.85 , 128.20 - 128.75 , 128.77 - 129.30. Interlayers of qtz - fspar rock (meta - qtz - keratophyr, tuff), : 127.00 - 127.20 slightly mineralized by dusty mt, some spots of py, 127.85 - 128.20 stringery mt and stringery po, some rare spots of py, 128.75 - 128.77 rare spots of py.

Sharp hanging contact.

Layering 30°, 129.40 †

129.30 - 130.10 : Slightly calcareous amphibole bear. qtz - fspar rock

(Meta - mafic tuff or tuffite)

BH 18

Gr, crudely layered by trains of granules of amphibole, amphibole as porphyroblasts often with elliptical crystal face and max. 1.0 cm long randomly oriented, amphibole layers sometimes accompanied by fibrous chlorite, varying carb. content, in places lamina of carbonate, here some finest spots of mt and some biotite besides chlorite (alteration).

Gradual hanging wall.

130.10 - 130.90 : High calcareous amphibole bear. chlorite - biotite - qtz - fspar schist

(Meta - tuff)

high A / C

Gr to grgn, laminated, alternation of carbonate layers with chlorite - biotite bands and sections of granoblastic qtz - fspar rock in places carrying prisms (max. 0.2 cm size, elliptical) of amphibole, sometimes cm - thick interlayers of qtz - fspar rock, finely bedded with low - grade dissemination of py, spots of py throughout, sometimes forming trains of granules.

130.80 - 130.83 : qtz - fspar rock, (meta - qtz - keratophyr) laminated by ex mt and carbonate, some bigger spots of mt.

C

Sharp hanging wall.

130.90 - 133.90 : Calcareous qtz - fspar - amphibole - chlorite schist

(Meta - basalt, altered tuff)

A / C

Gn, crudely layered, wavy lenticular texture, porphyroblasts of amphibole mainly elliptical in shape and max. 1.5 cm long randomly oriented, in places slightly parallel align with foliation / schistosity, qtz - carbonate as flasers and irregular layers throughout.

Sharp hanging wall.

133.70 - 133.75 : Qtz - fspar rock

(Meta - qtzkeratophyr)

BH 18

133.75 - 134.10 : Calcareous chlorite bear. amphibole - qtz - fspar rock

(Meta - dacite, supp. tuff)

Gr, to greenishgr, crudely layered, porphyric amphibole as max. 1 cm large crystals mainly elliptical, randomly oriented, spotted carbonate. Sharp hanging wall.

134.10 - 136.10 : Plagioclase amphibole schist

Gn, medium grained, crudely laminated, conformable bands of carbonate, fine spots of mt throughout, stripes of massive py : 134.75 - 134.76 ,

135.50 - 135.80 , 134.76 - 134.96 : High calcareous chlorite - qtz - fspar rock

(Meta - dacite , tuff)

Low - grade dissemination of py , finest spots of mt.

136.10 m end of DDH.

Thinnsections :	18/1	28.00 m
	18/2	28.40 m
	18/3	29.75 m
	18/4	32.85 m
	18/5	36.80 m
	18/6	43.95 m
	18/7	48.40 m
	18/8	58.60 m
	18/9	64.40 m
	18/10	70.30 m
	18/11	72.35 m
	18/12	74.80 m
	18/13	78.70 m
	18/14	85.40 m
	18/15	86.80 m
	18/16	87.70 m
	18/17	89.70 m
	18/18	125.30 m
	18/19	131.60 m

BH 18

Composition of ore :

95.65 -120.00 = 24.35 m = 1.20% Cu, 0.90% Zn, 40.0% S

89.83 -125.00 = 45.17 m = 1.00% Cu, 0.80% Zn, 34.30% S

DIAMOND DRILL HOLE 20

Tverrfjellet mine, Folldal Verk A/S.

Exploration hole from 1958.

Location : 1240 N - 2450 V.

Inclination : 56° N, 35 m 50°, 75 m 42°, 115 m 37°.

Total length : 118.97 m (3 m overburden).

0.00 - 9.10 : Garnet bear. biotite - sericite schist

(meta - pelite)

darkgr, fine - grained, lenticular - texture often grading towards wavy - lenticular texture, porphyro - blasts of biotite as cross - mica, in places cluts (multi - crystal) randomly oriented, biotite causing spotted appearance of the rock, equally distributed garnets of max. 0.4 cm size, often idiomorphic, rare spots of xenomorphic carbonate.

Gradual hanging wall.

60°, from 5m 45°.

9.10 - 13.34 : Calcareous sericite bear. biotite - qtz - fspar gneiss

(meta - qtz - keratophyr)

gr, to browngr, laminated with in places flaser - texture, strongly folded, mm - layers of biotite alternate with slightly thicker bands of qtz accom - panied by carbonate, in places traces of granules of porphyroblasts of amphibole strongly aligned with foliation, very rare spots of mostly idiomorphic py.

Gradual hanging wall.

45°, strongly disharmonic folded, squeezed.

13.34 - 18.80 : Slightly calcareous garnet - biotite - sericite rich quartzite

(meta - arenite)

greenishgr, flaser - texture, close alternation of qtz with phyllosilicates, cross - biotite.

Sharp hanging wall.

50°.

DDH 20

18.80 - 28.25 : Slightly calcareous garnet - chlorite - biotite
bear. sericite schist

(meta - pelite)

dark greenishgr, fine - grained, some flasers or
lenses of qtz, porphyric biotite often as cross -
mica but sometimes flattened and aligned with
schistosity, biotite cause spotty appearance of the
rock, strongly idiomorphic garnets of max. 1.0 cm size.
Gradual hanging wall.

Mainly 60°.

28.25 - 31.35 : Calcareous chlorite - biotite - qtz - sericite
schist

C

(tuffaceous meta - pelite)

gngr, fine - grained, laminated, alternate carbonate -
qtz layers and phyllosilicatebands, porphyric biotite
often as cross - mica but sometimes streched and
aligned with schistosity, sporadically mm - layers
of chlorite - biotite with coarse multi crystal
biotite randomly oriented, distinct increase in biotite
and chlorite and decrease in sericite within hanging
portion, interlayers of medium - grade py within
qtz - rock : 30.14 - 30.15 m; low - grade dissemin -
ation of py : 30.90 - 31.35 m.

Gradual hanging wall, conformable.

60° changing towards 45°.

31.35 - 35.87 : Calcareous chlorite - amphibole - qtz - plagioclase
gneiss (banded amphibolite)

(meta - mafic tuff or tuffite)

C

grgn, medium - grained, crudely cm - layered mainly
due to variation of chlorite (fine - fibrous) and
amphibole, latter forming prisms of max. 0.7 cm size
being randomly oriented, spotted carbonate, in places
flaser or lenses conformable with indistinct banding,
rare spots of idiomorphic py.

Gradual hanging wall.

45°.

DDH 20

35.87 - 68.87 : Slightly calcareous amphibole schist

(meta - basalt, flow)

gn, fine to medium grained, in places laminated or crudely banded due to mm - or cm - interlayers of quartz, clots of biotite often as cross - mica and sometimes forming traces of granules (layers) :

A

57.20 - 58.90 m and again at 59.66 - 68.87 m,

latter section often enriched in chlorite and more laminated (weak alteration), carbonate as rare spots of mostly lense - like shape; sporadically spotted carbonate mainly idiomorphic crystals :

C

38.00 - 39.40 m, 41.30 - 42.95 m; interlayers of quartzite (chert) with subordinate amounts of mt and py : 37.20 - 37.35 m, 57.35 - 57.37 m, 57.60 - 57.65 m (exmt), 59.41 - 59.66 m, 60.10 - 60.22 m, 66.12 - 66.19 m; occasional interbeds rich in py, pyrite mineralization often accompanied by quartz sometimes embedded in amphibolite : 37.60 - 37.70 m 10 Vol.-% py, 40.82 - 40.93 m 60 Vol.-% py, 43.80 - 43.81 m 80 Vol.-% py, 45.75 - 45.76 m rare spots of py, 46.75 - 46.76 m 60 Vol.-% py, 50.12 - 50.57 m low - grade dissemination or web - like py, (tuff sequence), 52.95 - 52.96 m 60 Vol.-% py, 53.61 - 53.86 m 90 Vol.-% py.

Sharp hanging wall.

68.87 - 69.10 : Qtz - pyrite rock

(disseminated pyrite layer)

medium - grained, medium - grade pyrite - ore, disseminated pyrite sometimes forming traces of granules.

Sharp hanging wall.

69.10 - 69.50 : Quartzite(meta - chert)

white, extremely fine - grained, subordinate pyrite as minute spots and mm-layers.

Sharp hanging wall.

DDH 20

- 69.50 - 69.95 : Qtz - rich pyrite rock
 (massive sulphide layer)
 medium - grained.
 Sharp hanging wall (bedding fault line)
- 69.95 - 70.10 : Calcareous sericite - amphibole - chlorite - qtz - fspar rock / gneiss
 (meta - tuff, weakly altered)
 grn, to lightgn, medium - grained, crude development of cm - layering, fine - fibrous sericite and chlorite, porphyric amphibole max. 0.3 cm long and randomly oriented, sometimes elliptical in shape, minute spots of carbonate equally distributed.
 Gradual hanging wall.
- 70.10 - 78.36 : Chlorite bear. sericite - amphibole - qtz - fspar rock
 (meta - mafic, flow or tuff)
 grgn, medium - grained, prisms of amphibole max. 0.2 cm long always randomly oriented, rare spots of idiomorphic py, band of massive pyrite : 72.31 - 72.33 m.
 Gradual hanging wall.
- 72.36 - 73.85 : Calcareous biotite - qtz - chlorite - amphibole schist / gneiss
 (meta - basalt, tuff, weakly altered)
 grgn, fine - grained with footwall more medium - grained, here more intensively altered and distinctly banded, amphibole prisms average 0.2 cm long and often parallel layering, giant spots of mt : 73.00 - 73.75 m, minute spots and stringers of carbonate throughout.
 Sharp hanging wall.
- 73.85 - 84.50 : Qtz - bear. pyrite rock
 (massive sulphide layer)
 medium - grained, gradual changes in qtz- content, cherty pyrite - ore of low - grade : 80.25 - 80.70 m
 ore zone slightly mt bearing; close alternation of highly

A/C

DDH 20

altered andesitic tuff with high - grade pyrite :
84.38 - 84.50 m.
Sharp hanging wall.

84.50 - 87.90 : Calcareous amphibole - biotite bear. chlorite -
fspar - qtz schist
(meta - mafic tuff, highly altered)
AA/C lightgn, fine - grained, laminated with in places
wavy - lenticular texture, sometimes chaotical,
spotted appearance due to scattered minute flakes
of biotite, fine - fibrous chlorite, carbonate often
associated with qtz forming irregular aggregates
and stringers or even bands, rare spots and stringers
of py, interlayers of quartzite (chert) with py
mineralization : 85.36 - 85.70 m, footwall and
hanging wall marked by cm - layers of massvie py,
85.92 - 85.95 m subordinate py, 86.13 - 86.18 m
traces of granules of py, low - grade mineralisation.
Gradual hanging wall.
85°.

87.90 - 90.88 : High calcareous chlorite - biotite bear. sericite -
qtz - fspar rock
(meta - qtz - keratophyr, tuff)
C grwhite, fine - grained, biotite mainly as porpyro -
blasts randomly oriented (cross - biotite) not
equally distributed, carbonate as minute spots often
accreted within layers or nodules, carbonate in places
major compound, intersections of garbenschist
(calcareous amphibole - sericite - qtz - fspar rock) :
88.57 - 88.77 m, 89.13 - 89.40 m, 90.00 - 90.88 m,
porphyroblasts of amphibole (extremely coarse sometimes
as spherolites) randomly oriented; interlayers of
quartzite with mt and py : 88.10 - 88.18 m low - grade
py, 88.77 - 89.13 m rare spots of py, dissemination
of mt, 89.40 - 89.46 m rare spots of mt.
Sharp hanging wall.

DDH 20

90.88 - 91.16 : Quartzite

(meta - chert)

withegr, extremely fine-grained, increasing py-content towards hanging portion, py- barren footwall. Gradual hanging wall.

91.16 - 92.25 : Qtz - pyrite rock

(massive sulphide layer)

ore zone

medium-grained, sporadically transparent qtz. Sharp hanging wall.

92.25 - 96.19 : High calcareous sericite bear. biotite - chlorite - qtz - plagioclase schist

AA/C

(meta - mafic tuff, very similar 66.30 - 77.30 m DDH 4) (banded amphibolite)

lightgn, fine-fibrous chlorite, porphyroblasts of biotite forming traces of granules conformable with schistosity, sometimes isolated clots of biotite as cross - mica, carbonate as minute spots often scattered but sometimes as traces of granules, footwall contains porphyroblasts of amphibole randomly oriented, prisms decrease in size upsection (max. 1.0 cm long).

Sharp hanging wall, bedding fault line.

45°, strongly folded §

96.19 - 105.40 : High calcareous qtz - biotite - chlorite schist

(meta - mafic tuff or tuffite, highly altered)

AA/C

gn, to lightgn, mainly coarse - grained, chaotically folded only sometimes harmonic with crude development of banding, huge multi - crystals of biotite surrounded by medium - grained chlorite, dissemination of pyrite, occasional some prisms of amphibole, infolded high - grade py-ore : 96.14 - 96.30 m, 96.35 - 97.20 m, 98.10 - 98.30 m, 98.70 - 98.85 m, 99.65 - 99.80 m, 102.00 - 102.15 m low-grade py, 103.32 - 103.60 m medium-grade py.

Gradual hanging wall.

Strongly folded, §

avd. Tverrfjellet

DDH 20

105.40 - 108.90 : Calcareous chlorite bear. amphibole - plagioclase -
qtz rock (banded amphibolite)

C

(meta - andesite/-basalt, tuff)

grgn, medium - grained, crude development of banding,
porphyroblasts of amphibole max. 0.4 cm long randomly
oriented, idiomorphic carbonate equally distributed,
very sporadically forming traces of granules, rare
spots of py.

107.30 - 108.90 m : high calcareous amphibole bear.
qtz - chlorite schist

AA/C

(meta - mafic tuff, or tuffite)

lightgn, fine - fibrous chlorite, rare prisms of
amphibole (0.4 cm long) randomly oriented, coarse
idiomorphic carbonate equally distributed, in places
forming irregular aggregates, hanging portion with
low - grade dissemination of py.

Sharp hanging wall.

45°.

108.90 - 109.00 : Quartzite

(meta - chert)

white, extremely fine - grained, interlayers of
massive py.

Sharp hanging wall.

109.00 - 109.40 : Qtz - rich pyrite rock

(massive sulphide layer, repeated by folding)

medium - grained.

Sharp discordant hanging wall.

109.40 - 109.60 : High - calcareous amphibole bear. qtz - chlorite
schist

AA/C

(meta - mafic tuff or tuffite)

same as : 107.30 - 108.90m.

DDH 20

109.60 - 115.97 : Calcareous to high calcareous chlorite - bear.
amphibole - plagioclase - qtz rock / gneiss
(banded amphibolite)

C

(meta - basalt, tuff)

same as : 105.40 - 107.30 m, some interlayers of
low - grade py within quartzite : 110.45 - 110.70 m,
111.59 - 111.72 m Φ , 115.80 - 115.97 m.

115.97 m end of DDH.

Chemical composition of ore :

73.85 - 84.50 m = 10.75m = 0.63% Cu, 1.50% Zn, 42.75% S
90.88 - 92.25 m = 1.37m = 0.45% Cu, 1.40% Zn, 27.50% S
96.14 - 103.62 m = 7.48m =

DIAMOND DRILL HOLE 2000 D

Location: Gåvåliseter, 532840 6904890 UTM grid, zone 32,

Top. map 1519 IV Snøhetta.

Azimuth: 394.5^g.

Inclination: - 70^o, measured deviation until 630 m.

Total length: 701.60 m.

Started: 16 sep. 1985.

Finnished: 07.nov. 1985.

DESCRIPTION:

0.00 - 5.25 : Overburden.

5.25 - 8.30 : Slightly calcareous amphibole bear. biotite - chlorite schist

(meta - mafic volcanic sediment with coarse mafic and felsic fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible slightly distal facies or middle succession of subaqueous debris flow/lahar)
grgn with abundant gn clusters, distinct fragmental structure, often chaotic, coarse rounded to subrounded stretched fragments of predominately basaltic composition (biotite bear. amphibolite) and sparce felsic clasts (amphibole - qtz - fspar rock) embedded in a schistose matrix with often distinct flaser texture composed of chlorite, biotite and qtz and subordinate carbonate, interlocked qtz and carbonate crystals as lenses and layers alternate with schlieren and laminae composed of fine - fibrous chlorite and containing fascicular bundles or trains of flakes of biotite, occasionally the phyllosilicates are accompanied by tiny prisms of amphibole. Gradual footwall.

8.30 - 13.60 : Calcareous sericite bear. qtz - chlorite schist

(meta - mafic volcanic sediment with epiclastic sedimentary impurity)
greenishgr with abundant brown schlieren and laminae.

distinct flaser and lenticular structure, in places web - like facility, interlocking qtz and qtz and carbonate crystals as lenses and flasers alternate with schieren and laminae composed of fine - fibrous chlorite, fine crystalline sericite and biotite which tends to form scattered fascicular bundles but sometimes displays trains of flakes (laminae), carbonate locally occurs as idiomorphs max. 0.3 cm in diameter.

Schistosity: 45°.

Gradual contact.

13.60 - 16.90 : Slightly calcareous plagioclase - amphibole rock
(meta - mafic crystal tuff)

Sample 2000D/1
15.05 m
Thinsection

lightgn, blastoporphyritic texture, spotted appearance, nearly equal distribution of slightly elongate augen of plagioclase (blasts) max. 0.4 cm across which locally are carbonatized and average 0.15 cm large spots of amphibole within a fine-crystalline and homogeneous matrix composed in decreasing order of plagioclase, amphibole, epidote and carbonate, there exists only a slight distinction between amphibole spots and matrix.

Gradual contact.

16.90 - 19.00 : Slightly calcareous sericite - amphibole bear.
biotite - chlorite schist

Sample 2000D/2
from 17.70 m
Thinsection

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)

lightgn with abundant brown schlieren, flaser and lenticular structure, interlocking qtz, fspar and carbonate crystals forming a fine - grained mosaic as schlieren and lenses and sometimes cm - thick layers in alternation with layers and schlieren composed of fine - fibrous chlorite which is accompanied by scattered bundles of biotite max. 1.0 cm in long dimension which are oriented parallel to the major plane of foliation but may sometimes be

oriented at random, amphibole occurs as scarce tiny needles and tends to join chlorite.

Schistosity: 70 - 75°, flattens to 65° within lower most part.

Gradual contact.

19.00 - 23.40 : Calcareous chlorite bear. qtz - fspar amphibole rock

(meta - mafic volcanic sediment with fine to medium size mafic fragments, matrix support sediment; possible distal facies or upper succession of sub-aqueous debris flow / laher, or ash fall tuff), grgn, well developed fragmental structure within the upper part of the layer, elsewhere the distinction between fragments and matrix is less conspicuous and sometimes even is lost, matrix support sediment, stretched and flattened mostly subrounded elongate fine and medium sized fragments of fine - crystalline schistose amphibolite which often is vesicular thus carrying abundant elongate plagioclase augen of max. 0.3 cm long dimension (scoria) are embedded in a sparse matrix which in the lowermost part is predominated by amphibole and chlorite and otherwise is composed of carbonate, qtz and fspar and subordinate chlorite and amphibole, the latter forms fascicular bundles max. 0.3 cm large which always are aligned along the foliation of the rock.

Schistosity: 70°, within lower most part 80 - 85°. Gradual footwall.

23.40 - 31.80 : High calcareous biotite - chlorite schist

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity)
deepgn with abundant brown schlieren and white spots, spotted appearance, flaser and lenticular structure with transition into laminated rock, interlocking qtz and qtz and carbonate crystals as tiny lenses and laminae in alternation with thick layers composed of fine - fibrous chlorite which is accom-

DDH 2000 D

panied by fascicular bundles and rare imperfect spherulites max. 0.3 cm large of biotite, biotite further forms laminae or schlieren which are conformable with the foliation of the rock, carbonate displays scattered idiomorphs max. 0.3 cm across. slightly calcareous biotite - chlorite schist similar 16.90 - 19.00 m occurs as dm-thick infolded sections.

Schistosity: 24.50 m 70°, from 25.00 to 31.80 m strongly folded rock, occurrence of foldhinges. Gradual contact.

31.80 - 33.40 : Slightly calcareous biotite bear. qtz - chlorite - amphibole gneiss/schist

(meta - mafic volcanic sediment with fine to medium size mafic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar, or ash fall tuff)

Similar: 19.00 - 23.40 m, but with strain induced gneissic texture, folded.

Gradual contact.

33.40 - 35.50 : Calcareous biotite - chlorite schist

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity, possible distal facies or upper succession of subaqueous debris flow / lahar) similar: 16.90 - 19.00 m, but strongly folded, occurrence of foldhinges.

Gradual contact.

35.50 - 39.90 : Calcareous qtz - fspar - amphibole schist

(meta - mafic volcanic sediment with fine to medium size mafic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar, or ash fall tuff)

similar: 31.80 - 33.40 m, clusters of milky qtz at: 37.70 - 38.20 m and 39.20 - 39.50 m. Interlayers of slightly calcareous biotite - chlorite schist at: 37.20 - 37.70 m.

Gradual contact.

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39.90 - 47.20 : Slightly calcareous biotite - chlorite schist
(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession subaqueous debris flow/lahar),
similar: 16.90 - 19.00 m, but strongly folded and with occurrence of foldhinges, clusters of milky qtz at: 44.00 - 44.60 m, 44.90 - 45.00 m, 45.40 - 46.00 m, 47.50 - 48.00 m.
Sharp contact.

47.20 - 49.70 : Calcareous to high calcareous biotite - amphibole - chlorite schist
(meta - mafic volcanic sediment)
brownishgr, within lower section grgn, coarse - crystalline, strong compositional changes upsection, lower part with high chlorite and amphibole content and with rare round slightly elongated fine - grained fragments of amphibolite, the fragments are still distinctionable from matrix but tend to blend together to give a homogeneous amphibolite, matrix amphibole forms fascicular bundles or imperfect spherulites max. 0.5 cm large which poorly are directed, they originate a slight leopard texture, chlorite is fine-fibrous and joins the felsic compounds as being qtz, fspar and carbonate; the upper part contains abundant carbonate and biotite but strongly is decreased in chlorite and amphibole, the rock is homogeneous and shows a distinct porphyroblastic texture, biotite forms multi crystal pseudomorphs after amphibole as well as fascicular bundles and imperfect spherulites all being not oriented, biotite together with bundles of amphibole constitute an open framework the interstices of which being filled by interlocking carbonate crystals as elongate spots of average 0.2 cm size and accompanied by qtz and fspar.
Gradual footwall.

49.70 - 54.80 : Slightly calcareous biotite bear. chlorite - amphibole rock/schist

avd. Tverrfjellet

DDH 2000 D

Sample 2000D/3
54.50 m
thinsection

(meta - mafic volcanic sediment with medium size mafic fragments, matrix support sediment; possible slightly distal or upper succession of subaqueous debris flow / lahar),
gn to grgn with brown schlieren, well developed fragmental structure, stretched and flattened elongate clasts of basaltic composition reaching 50% of the total are surrounded by a schistose matrix with often distinct flaser and lenticular structure composed in decreasing order of chlorite, biotite , amphibole, qtz, fspar and carbonate, it is obvious that coarse and fine grained clasts are sedimentated simultaneously, slight grading characteristics may be present locally, the fragments are composed of fine crystalline amphibole which is poorly directed but displays a distinct nematoblastic texture within the edges of the clasts and rarely contain chlorite and/or carbonate, they often are vesiculated the ellipsoidal - stretched and flattened - augen max. 0.3 cm in long dimension being composed of plagioclase often with mortartexture, a fine grained mosaic of carbonate, qtz and fspar or a crystal aggregate of carbonate.
Gradual footwall.

54.80 - 65.90 : Slightly calcareous amphibole - biotite - chlorite schist

(meta - mafic volcanic sediment with fine and coarse mafic clasts and supp. with epiclastic sedimentary impurity ; matrix support sediment, possible distal facies or upper succession of subaqueous debris flow / lahar)
gn with abundant giant brown rods and cluts, poorly developed fragmental structure, porphyroblastic texture, fine to coarse elongate fragments of fine - crystalline schistose amphibolite which often are vesiculated carrying max. 0.1 cm large augen of plagioclase are embedded in a phyllosilicate matrix composed of fine - fibrous chlorite which contains

abundant rods, fascicular bundles and nearly perfect spherulites of biotite, the crystal aggregates reach sizes between 0.15 and 1.0 cm, carbonate forms minute spots and joins qtz and fspar in tiny schlieren and lenses, the matrix in places is enriched in qtz and fspar thus similar 49.70 - 54.80 m; clusters of milky qtz sometimes accompanied by cm - thick interlayers of pure biotite occur between 56.90 - 58.30 m; sparse spots of cp within qtz - carbonate are present at 59.80 - 60.10 m. Schistosity: 56.30 m 65° , 56.90 - 58.70 m disharmonic folded chaotic, 59.00 m 70° , 59.60 - 61.00 m disharmonic small scale folding, 61.30 m 30° , 62.00 m 35° , 63.80 m 60° , 64.60 m 45° , 64.70 - 65.35 m small scale isoclinal folding ϕ , 65.50 m 90° , 65.70 m 20° .
Gradual contact.

65.90 - 68.10 : Slightly calcareous biotite bear. chlorite - amphibole rock / schist

(meta - mafic volcanic sediment with medium size mafic fragments, matrix support sediment; possible slightly distal facies or upper to middle succession of subaqueous debris flow / lahar)
similar: 49.70 - 54.80 m, but strongly schistose, squeezing and stretching of fragments result in a distinct gneissic texture, locally small scale isoclinal folding,
schistosity: 66.70 m 50° , 67.70 m 60° , 68.00 m 45° .
Gradual contact.

68.10 - 75.35 : Slightly calcareous biotite - chlorite schist

Sample: 2000D/4
73.45 m
thinsection

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)
similar: 16.90 - 19.00 m, but with much clearer separation of phyllosilicates and felsic compounds, more distinct flaser and lenticular structure, biotite in general coarser crystalline and more often

cross the major foliation, from 74.40 m downsection occurrence of small fragments of amphibolite and sparse medium sized ellipsoidal fragments of felsic volcanic composed of qtz, fspar and little amphibole.

Schistosity: 68.70 m 50° , 69.70 m 70° , 70.70 m 85° , 70.80 - 71.10 m ϕ , 71.20m, 90° , 71.55 - 71.80 m ϕ , 72.00 m 45° , 72.60 m ϕ , 72.70m 45° , 74.70m 65° .
Gradual contact.

75.35 - 79.20 : Slightly calcareous biotite - chlorite - amphibole schist / rock

(meta - mafic volcanic sediment with coarse mafic fragments, matrix support sediment, possible slightly distal or lower to middel succession of subaqueous debris flow / lahar)
gn with abundant brown schlieren, poorly developed fragmental structure which results from little differences in colour of matrix and fragments, the rock has a sparse matrix - approx. 30% of the total - which is extremely poor in felsic compounds, it is characterized by a lamination composed of alternate layers of chlorite and schlieren or discontinuous layers of biotite, the fragments are large and cover maximum 5 cm of core, they are composed of fine - crystalline amphibole and nearly always carry elongate vesicles of plagioclase or epidote and plagioclase which may reach 0.3 cm in long dimension; clusters of milky qtz exist between 75.90 - 76.10 m.
Schistosity: 76.50 m 55° , 77.75 m 45° .
Gradual contact.

79.20 - 81.20 : Slightly calcareous amphibole - biotite - chlorite schist

(meta - mafic volcanic sediment with fine and medium size, mafic fragments, matrix support sediment; possible slightly distal facies or upper succession of subaqueous debris flow / lahar)
similar: 75.35 - 79.20 m, but with smaller fragments approx. 10% of the total.

DDH 2000 D

Schistosity : 80.40 m 60°.

Sharp contact.

81.20 - 84.20 : Epidote bear. qtz - fspar amphibolite

Sample: 2000D/21 (meta - mafic volcanic sediment with fine frag-
82.50 m ments of amphibolite)
thinsection

grgn, massive, homogeneous, less distinct frag-
mental structure due to compositional similari-
ties of matrix and fragments, medium - crystal-
line, **subangular** to subrounded fragments of cm -
size composed of amphibole are widely scattered
in a matrix composed of in decreasing order am-
phibole, qtz, fspar and epidote, amphibole forms
needles, fascicular bundles or imperfect radia-
ting aggregates of max. 0.2 cm size which homogen-
eously are distributed forming an open framework
the interstices of which being filled by fine -
grained granoblastic qtz and fspar and epidote.
Sharp contact.

84.20 - 88.20 : Slightly calcareous amphibole - biotite - chlor-
ite schist

(meta - mafic volcanic sediment with fine and
medium size mafic fragments, matrix support sed-
iment; possible slightly distal facies or upper
succession of subaqueous debris flow / lahar)
similar: 79.20 - 81.30 m, but with 30% fragments
of the total.

Schistosity: 86.20 m, 85°, 87.20 m, 85°.

Sharp contact, 85°.

88.20 - 90.45 : Slightly calcareous amphibole bear. biotite -
chlorite schist

(meta - mafic volcanic sediment with sparse medi-
um size fragments and supp. with epiclastic sedi-
mentary impurity; possible distal facies or upper
succession of subaqueous debris flow / lahar)
similar: 16.90 - 19.00 m, but enriched in phyllosi-
licates, straininduced lamination instead of flaser
and lenticular texture, sparse fragments - 5% of

the total - composed of fine - fibrous amphibole which extremely are stretched; at lower - most section similar : 54.70 - 65.90 m.

Minor faults at : 90.40 - 90.45 m.

Schistosity: 88.20 m 85°, 89.20 m 75°, 90.20 m 85°.

Sharp contact, bedding fault line.

90.45 - 90.70 : Epidote - biotite - amphibole - chlorite schist
(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal or upper succession of subaqueous debris flow / lahar)
similar: 16.90 - 19.00 m, but disturbed with small scale folding and several foldinduced minor faults.
Sharp footwall.

90.70 - 91.18 : Chlorite - epidote - amphibole - plagioclase rock
(meta - mafic crystal tuff)
Sample: 2000D/5
91.00 m
thinsection
gr with faint yellowish tint and tiny blackish spots, fine - crystalline, poorly developed porphyritic texture, equal distribution of tiny needles of amphibole which are poorly directed within a matrix composed of plagioclase, epidote and fine - fibrous chlorite, a sparse occurrence are fascicular bundles of biotite max. 0.15 cm large which slightly are oriented, medium - grade dissemination of ilmenite the crystals being lesser 0.1 cm large and mostly show sutured boundaries.
Sharp contact.

91.18 - 91.25: Slightly calcareous amphibole bear. biotite - chlorite schist
(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow/lahar)
grgn, laminated upper section, alternation of carbonate bear. qtz - fspar layers with bands and schlieren of chlorite which near the footwall contain tiny needles of amphibole being oriented at random, biotite is always conformable the compositional layering and forms schlieren which escort the chlorite

layers, the lower part displays a homogeneous chlorite schist with sparse occurrence of tiny flakes and bundles or imperfect spherulites of biotite, milky qtz is present locally as tiny veins and small clusters.

Schistosity: 50°.

Sharp contact.

91.25 - 91.45 : Magnetite amphibolite

(meta - ironrich mafic volcanic)

chemical
analysis
91.18-91.45m

bluishblack, medium crystalline, crude development of lamination, indistinct alternation of cm - thick layers composed of amphibole and subordinate mt with mm - thick qtz - magnetite bands (chert), amphibole forms 0.4 cm long needles strongly being parallel and forming the foliation, pyrite occurs as spots, stringers and net -work features its amount being lesser 1 Vol.-%.

Layering: 55°.

Gradual contact.

91.45 - 92.50 : Slightly calcareous epidote bear. biotite - chlorite schist

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)

similar: 16.90 - 19.00 m, but with epidote joining the mosaic of qtz, fspar and carbonate.

Minor faults: 91.75 - 91.78 m, strong deformation and with milky qtz clusters between: 92.40-92.50m.

Schistosity: 45°.

Sharp disharmonic footwall.

92.50 - 94.62 : Amphibole - biotite - qtz - epidote - plagioclase rock

(meta - leucobasalt, spilite)

Sample:2000D/6
93.96m
thinsection

gr with faint yellowish tint, abundant gn needles and brown rods and veins, heterogeneous in structure and composition, often chaotic within the

upper part crude development of layering as a result of rhythmic changes in the mode of qtz and amphibole, predominately with porphyritic texture, scattered amphibole needles max. 0.3 cm long and randomly oriented within a matrix composed of interlocking plagioclase and epidote, biotite forms fascicular bundles, bow - tie aggregates and cluters of mm and sometimes cm - size which variably are distributed, frequent occurrence of discontinuous laminae of biotite which seem to follow no regulation, garnet sporadically is present forming tiny idiomblasts, spots of pyrite are a local exception. Layering: 92.90 m 45°, 93.00 - 93.50 m *///*. Sharp footwall.

94.62 - 94.75 : Qtz - biotite - chlorite - amphibole schist
 (meta - mafic volcanic sediment with fine to medium size mafic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar)
 similar: 19.00 - 23.40 m.
 Schisosity: 45°.

94.75 - 94.91 : Biotite bear. qtz - fspar - amphibole - epidote rock
 (meta - mafic volcanic tuff)
 chemical analysis
 94.75-94.91m
 gr with distinct yellowish tint, heterogeneous in composition and texture, mainly fine grained granoblastic qtz - fspar - epidote rock which contains schlieren or fascicular bundles of biotite forming the foliation and sparse amphibole needles max. 1.0 cm long which tend to be oriented, near the footwall 2 cm thick interlayer composed of coarse ellipsoidal amphibole and fibrous chlorite which contains 10% of pyrite filling the interstices of amphibole crystals.
 Layering : 45°.
 Sharp contact.

94.91 - 95.92 : Pyrite - epidote - amphibole - biotite - magnetite - qtz gneiss

DDH 2000 D

chemical
analysis

94.91-95.98m

(oxide - facies banded iron formation)
 darkgr to bluishblack, extremely fine grained,
 granoblastic but often with porphyroblastic texture,
 laminated, close alternation of mm - thick layers
 composed of qtz, qtz - magnetite, epidote - amphibole -
 magnetite, qtz - magnetite - amphibole and magnetite -
 biotite - qtz, sparse cm - thick interlayers rich in
 pyrite which tends to forms trains of granules up to
 0.5 cm thick within a qtz matrix, amphibole displays
 porphyroblasts max. 0.7 cm in long dimension, the
 needles being oriented at random and often prolongate in
 adjoining layers, it supposedly is locally accompanied by
 prisms of cummingtonite, biotite forms tiny fascicular
 bundles or schlieren which follow the lamination.
 Layering: 45°.

96.42 - 96.58 m: amphibole bear. biotite - qtz -
 epidote schist

(meta - mafic tuff, spitite)
 similar: 92.50 - 94.62 m, but enriched in biotite
 forming bow - tie aggregates and fascicular bundles
 which tend to be parallel forming the foliation.
 Knife sharp contact.

95.92 - 100.82: Magnetite bear. plagioclase - epidote - amphibole
 schist

(meta - intermittent basalt flow)
 gn with interstices being yellowish, abundant black
 spots, medium crystalline, strong foliation which
 locally results in a compositional lamination, amphibole
 forms fascicular bundles max. 0.7 cm large which
 closely are packed and alternate with schlieren of
 granoblastic plagioclase and epidote, magnetite
 supp. accompanied by ilmenite makes up 2 to 3% by
 volume of the rock by variable distribution, it
 forms xenomorphic crystal aggregates being minor
 1 mm which have sutured boundaries, locally mt gets
 remobilized and fills or joins small faults.
 Minor faults: 97.05m, 97.15 m, 97.40 m, 98.40 m,
 98.60 - 98.70 m.

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Schistosity: 96.80 m 45°, 98.10 m 30°, 99.00 m 65°.

99.09 - 99.15m: magnetite bear. quartzite

(meta - chert)

chemical
analysis
99.09-99.30mgr with faint bluish tint, dense, extremely fine
grained, ghost - like lamination by trains of granu-
les of mt.

Sharp boundaries.

99.15 - 99.30 m: amphibole - qtz - fspar rock/schist
(felsic tuff)gngr, fine crystalline, granoblastic qtz - fspar
mosaic with scattered fascicular bundles of amphibole
forming the foliation, mt displays a low - grade
dissemination, the tiny spots sometimes have idio-
morphic outlines, pyrite makes up 1 to 2 % of the
total and mostly forms coarse grains.

Gradual footwall.

100.40 - 100.50m: partly biotitization of amphibole
results in a medium to coarse crystalline qtz - fs-
par - amohibole - biotite rock which contains a low -
grade dissemination of py (3 Vol.-%).A
chemical
analysis
100.40-100.50m100.50 - 100.60 m: epidote - amphibole - qtz gneiss
(chertly meta - tuff)gn with bluishgr and slightly reddish brown and
yellowish bands, strong variation in structure,
composition and texture, banded, alternation of mm-
thick magnetite - qtz layers with cm - thick bands
composed of amphibole or epidote and amphibole, the
latter occurs with a distinct porphyroblastic tex-
ture caused by the growth of amphibole which forms
max. 0.4 cm large prisms randomly being oriented
in a fine grained matrix of qtz and epidote, the
other layers are even grained and have either a
nematoblastic or granoblastic texture.

Gradual contact.

100.82 - 100.93: Amphibole quartzite

(meta - sulphide bear. chert)

gr with gn and brown gn stripes, dense, fine grained,
quartzite is irregularly interlayered by schlieren
or layers of fine - fibrous amphibole carrying achemical
analysis
100.82-100.93m

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AA

medium - grade pyrite mineralization mainly as
triangles of granules, hanging wall and footwall of
the section show biotitization and chloritization
in a coarse crystalline biotite - chlorite schist.
Sharp boundaries.

100.93 - 104.65: Qtz - biotite - epidote - plagioclase - amphibolite
(meta - basalt flow)

Sample: 2000D/7
101.65 m
thin section

lightgn, coarse crystalline, partly with distinct
leopard texture, crystal aggregates composed of
either amphibole or biotite and amphibole as bundles
or imperfect spherulites of cm - size are scattered
within a lightgn matrix composed in decreasing order
of plagioclase, epidote and amphibole the compounds
being significantly finer grained than the phases which
form the crystal aggregates.
Sharp tectonic contact at footwall.

104.65 - 104.85: Fault or shearzone
milky qtz with laminae of slickensided biotite and
chlorite.

104.85 - 106.20: Qtz - plagioclase amphibolite
(meta - mafic volcanic sediment with fine fragments
of amphibolite)
similar: 81.20 - 84.20 m.
105.10 - 105.20 m: calcareous amphibole bear. epidote - biotite - qtz - fspar rock/schist
(meta - felsic to intermediate volcanic, supp.
tuff)
gr with brown rods and clots, crudely schistose, lepidoblastic
texture with poorly developed porphyritic texture,
closely packed fascicular bundles or imperfect spherulites
of biotite forming the foliation surrounded by a matrix of
qtz, fspar and epidote, amphibole displays slightly porphyritic
crystals which are sparse, the needles always not oriented,
carbonate forms 0.2 cm large subidiomorphic porphyroblasts
which equally are distributed, spots of cp are a local
exception.

Schistosity: 45°.

Sharp boundaries.

106.20 - 106.45: Plagioclase amphibolite

(meta - basalt flow)

similar: 107.12 - 110.80 m, but medium crystalline.

106.45 - 107.12: Biotite - qtz - plagioclase rock

(meta - felsic volcanic)

gr, extremely fine grained with poorly developed porphyritic texture, granoblastic qtz - fspar mosaic with scattered tiny flakes of biotite which locally have the tendency to form bundles, the biotite crystals or crystal aggregates always are parallel and cause a poor foliation of the rock, pyrite occurs as rare subidiomorphic blasts max. 0.2 cm across. Sharp slightly sheared contact.

107.12 - 110.80: Biotite bear. epidote - qtz - plagioclase -amphibolite

(meta - basalt flow)

grgn, coarse crystalline, massive but with lowermost part being schistose, here also enriched in biotite, crudely developed leopard - texture, distinct lineation of mafic mineral compounds, coarse crystal aggregates of amphibole or biotite and amphibole as imperfect spherulites but also fascicular bundles surrounded by a matrix composed of qtz, plagioclase and epidote.

Schistosity: 110.70 m 80°.

Sharp contact.

110.80 - 112.05: Qtz - epidote - biotite schist

(meta - volcanic sediment, tuff)

grbrown with faint yellowish tint, slight compositional banding which follows no regulation, lepidoblastic texture, interlocking qtz and epidote crystals as stripes, schlieren and lenses in alternation with bundles, cluts and bands of biotite, the latter often being disformable with the foliation of the rock, bio-

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tite in places further creates net - work like features.

Sharp distorted contact.

- 112.05 - 113.25: Epidote - garnet - sericite - biotite - fspar - qtz schist / gneiss
 (meta cherty felsic tuff with epiclastic sedimentary impurity)
 (comparable with: 232.60 - 233.00 m BH 635 G and 156.45 - 165.35 m BH 768 G)
 gr, often with faint yellowish tint, abundant brown and black rods and spots, poorly developed flaser and lenticular structure sometimes even mm - or cm - banded, porphyritic texture, interlocking qtz crystals as schlieren, lenses and laminae in alternation with bands and schlieren composed of qtz, fspar, biotite-sericite and epidote, the minerals are fine crystalline with the exception of biotite which forms fascicular bundles, bow - tie aggregates and imperfect spherulites of max. 0.15 cm size, the crystal aggregates being disformable with or parallel to the compositional layering, garnet as submegascopic crystals equally is distributed but has a tendency to be enriched within the phyllosilicate rich bands, magnetite displays a low - grade dissemination as often idiomorphic crystals within the lower halfpart of the section, it is nearly absent from the upper part, pyrite forms sparse single crystals.
 Layering : 85° - 90°.
 Gradual contact.
- Sample: 2000D/8
 112.80m
 thinsection
- Magnetite
 tuff
 marker

- 113.25 - 113.90: Garnet - sericite - biotite - chlorite - magnetite - qtz rock / gneiss
 (meta - cherty tuff supp. with epiclastic sedimentary impurity)
 (comparable with: 232.60 - 233.00 m BH 635G and 156.45 - 165.35 m BH 768G)
 gr to grgn with abundant black and reddishbrown spots, crude development of compositional banding, alternation of laminated sections composed of lay-
- Magnetite
 tuff
 marker

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DDH 2000 D

Sample: 2000D/9
113.45m
thinsection

ers of magnetite - quartzite which often carry sulphides, mt bear. amphibolite, quartzite and biotite - chlorite schist with cm and dm- thick massive units composed in decreasing order of qtz, magnetite, chlorite, biotite, sericite and garnet, the latter intercalations are characterized by a distinct porphyroblastic texture which is caused by the frequent occurrence of idiomorphs of mt max. 0.3 cm across, garnet max. 0.1 cm in diameter and sericite max. 0.4 cm large and biotite which forms huge bundles of locally 1.0 cm size, the porphyroblasts are scattered in a finer crystalline matrix of qtz, chlorite and epidote. Layering: 85°. Sharp contact.

113.90 - 114.25: Amphibole bear. qtz - biotite - epidote rock
(meta - mafic tuff, spilite)

brown, yellow, heterogeneous, compositional cm - banding as irregular alternation of layers composed of qtz - amphibole - epidote, biotite and biotite - epidote or amphibole - epidote, amphibole tends to form randomly oriented idiomorphs the prisms max. 0.7 cm long forming an open framework of touching and sometimes crosscutting crystals, the interstices are filled by fine grained epidote and qtz, biotite is present as imperfect spherulites which may coalesce forming discrete bands.

Banding: 85°.

Sharp contact.

114.25 - 114.85: Biotite - epidote - qtz amphibolite
(meta - mafic volcanic, supp. tuff)

gn with faint yellowish tint and several brown schlieren or clots, medium-crystalline, homogeneous crudely schistose, closely packed fascicular bundles of amphibolite surrounded by fine grained granoblastic epidote and qtz, biotite forms bundles and imperfect spherulites of less 0.15 cm size which

are variably distributed, they sometimes are grouped around minor faults forming disformable biotite bands.

Sharp contact.

114.85 - 115.65: Epidote - biotite - amphibole - qtz gneiss (banded amphibolite)

(meta - cherty mafic tuff)

alternate gn and gr with often distinct yellowish tint cm - banding composed of alternate qtz, qtz - amphibole and amphibole - qtz - epidote bands, porphyroblastic texture due to amphibole which forms needles of 0.3 cm long dimension mainly being aligned along the compositional banding.

Banding : 70°.

Gradual contact.

115.65 - 117.30: Calcareous chlorite bear. qtz - plagioclase - epidote - amphibole schist

(meta - weakly altered mafic volcanic tuff)

grgn with faint yellowish tint, crude development of compositional banding, medium - crystalline, in places with porphyroblastic texture, idiomorphic crystals of amphibole max. 0.4 cm long tend to be oriented but sometimes are not directed forming an open framework of touching crystals the interstices of which being filled by fine - grained interlocking crystals of qtz, fspar and epidote, carbonate displays idioblasts max. 0.4 cm across which like to join each other forming cm - thick bands or lenses rich in carbonate crystals.

Gradual contact.

117.30 - 119.80: High calcareous epidote - chlorite bear. qtz - plagioclase - biotite schist / rock

(meta - tuff)

Sample: 2000D/10

117.95 m

thinsection

grbrown with abundant gr spots, massive as well as schistose in places chaotically folded, porphyritic texture, biotite forms bundles of max. 0.25 cm long dimension which sporadically are accompanied by chlor-

ite, the crystal aggregates are surrounded by a mosaic of qtz and fspar which contain locally epidote, carbonate displays multi - crystal porphyroblasts on average 0.25 cm across - max. 0.4 cm large - which nearly are equally distributed; clusters of milky qtz occur at: 118.35 - 118.50 m and 118.60 m.

Folding: 117.30 m strongly folded, 118.50 - 119.30 m strong disharmonic and isoclinal folding with infolded 115.65 - 117.70 m rock.

Gradual contact.

119.80 - 126.10 : Biotite - qtz - plagioclase - epidote amphibole gneiss

(meta - intermittent basalt flows with spilite intersections, may be hyaloclastite)

Sample: 2000D/11

122.35 m

thinsection

alternate grgn, gr, brown and lightyellow, non-rhythmic mm- nad cm- compositionale banding with often superimposed flaser - structure or lamination, mostly gradual contacts but also nebulous boundaries between layers, alternation of cm- thick bands of fine - crystalline epidote bear. plag.- amphibolite with nematoblastic texture, seams composed of qtz, epidote and biotite, schlieren and laminae of biotite - epidote or qtz - plagioclase - epidote and schlieren or bands composed of epidote, amphibole, plagioclase and biotite, the compounds are fine - to medium- crystalline with biotite always being slightly coarser, the latter tends to form bundles of 0.15 cm size but sometimes displays imperfect spherulites, the crystal aggregates often being deformed and parallel to the compositional banding, garnets occur within sparse crystals of 0.1 to 0.4 cm size.

Layering: 119.95 m 80°, 120.30 m 90°, 120.75 - 120.85 m faultzone, 120.95 m 80°, 121.60 m 80°, 122.30 m 80°, 123.30 m 85°, 124.15 m 80°, 124.25 - 124.65 m isoclinal folding, 125.30 m 85°.

Gradual contact.

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126.10 - 128.90: Amphibole - epidote - biotite - qtz - fspar rock/
gneiss

(meta - mafic tuffs and flows)

rocks similar 115.65 - 117.20 m, 117.30 - 119.80 m
and 119.80 - 126.10 m in close alternation as a res-
ult of folding, rocks strongly folded and often
sheared and locally brecciated.

128.90 - 129.90: Plagioclase - biotite - epidote rock

(meta - leucobasalt spilite)

Sample: 2000p/12

129.40m

thinsection

chemical

analysis

128.90-130.30m

brown with abundant yellowishgr needles, medium-
to coarse- crystalline, blastoporphyritic texture
(trachytic), abundant needles of saussuritized
plagioclase average 0.7 cm in long dimension are
scattered in a matrix composed of biotite, epidote
plagioclase and qtz, the prisms show a poorly devel-
oped linear preferred orientation, sulphides as py
and po are present sporadically forming small dis-
crete crystals.

Slight lineation: 65°.

Sharp contact as bedding fault line.

129.90 -130.30: Biotite - garnet - amphibole - epidote - qtz -
fspar rock

(meta - keratophyr or rhyolite)

gr with light yellowish tint, homogeneous, por-
phyritic texture, prisms of amphibole, max. 0.4
cm long and not oriented as well as tiny fascicular
bundles and bow - tie shaped aggregates of biotite
are scattered in abundant matrix of fine - grained
granoblastic fspar, epidote and qtz, pyrite amounts
to 1 Vol.-% of the rock and forms xenomorphic crystals.
Knife sharp footwall.

130.30 - 174.90: Schistose amphibolite

(meta-basalt flow with zones of amygdaloidal ba-
salt; comparable with variolitic basalt at Tverr-
fjellet and section 59.90 - 77.70 m of BH 635G)

gn, fine - grained nematoblastic texture, homogene-
ous with sparse cm - thick conformable and disfor-

Sample : 2000D/13

amyg - amf.

thinsection

mable interlayers rich in biotite, chlorite and epidote (meta - nontronite, saponite), occasionally mm - thick bands of milky qtz and qtz fracture fillings, clusters of milky qtz especially between 142.30 - 143.00 m, several interlayers with vesiculated basalt abundant - stretched and flattened augen on average 0.3 cm in long dimension composed of plagioclase and epidote - at: 143.20 - 143.40 m, 144.20 - 144.22 m, 144.72 - 144.74 m, 144.93 - 145.00 m, 147.25 - 147.35 m, 148.25 - 148.30 m, 150.85 - 151.35 m, 151.73 - 152.04 m, 155.43 - 155.80 m, 157.30 - 157.65 m, 160.80 - 161.05 m, 162.05 - 162.15 m, 163.20 - 163.95 m. Foliation a. banding: 134.70 m 60°, 139.30 m 45°, 143.00 m 45°, 147.20 m 45°, 150.40 m 50°, 152.30 m 90°, 157.45 m 45°, 159.30 m 55°, 160.70 m 45°, 162.40 m 45°, 163.20 m 45°, 165.90 m 45°, 168.00 m 50°.

Folded contact.

166.45 - 167.30 : slightly calcareous - biotite - epidote - amphibole - fspar - qtz - chlorite

gneiss (banded amphibolite)

(meta - mafic tuff)

alternate gn and gr, cm - banding with sharp layering contact, bands composed of epidote and chlorite which often contain schlieren and laminae of biotite or randomly oriented porphyroblasts of amphibole on average 0.4 cm in long dimension alternate with lenses and bands of fine - grained granoblastic qtz, fspar and carbonate.

Layering: 60° to 70°.

Sharp contacts with surrounding amphibolite.

174.90 - 176.70: Calcareous qtz - biotite - chlorite schist

(meta - mafic volcanic sediment, supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)

brownish gn with white spots, flaser structure, close alternation of interlocked qtz crystals as lenses

Sample : 2000D/13

amyg - amf.

thinsection

mable interlayers rich in biotite, chlorite and epidote (meta - nontronite, saponite), occasionally mm - thick bands of milky qtz and qtz fracture fillings, clusters of milky qtz especially between 142.30 - 143.00 m, several interlayers with vesiculated basalt abundant - stretched and flattened augen on average 0.3 cm in long dimension composed of plagioclase and epidote - at: 143.20 - 143.40 m, 144.20 - 144.22 m, 144.72 - 144.74 m, 144.93 - 145.00 m, 147.25 - 147.35 m, 148.25 - 148.30 m, 150.85 - 151.35 m, 151.73 - 152.04 m, 155.43 - 155.80 m, 157.30 - 157.65 m, 160.80 - 161.05 m, 162.05 - 162.15 m, 163.20 - 163.95 m. Foliation a. banding: 134.70 m 60°, 139.30 m 45°, 143.00 m 45°, 147.20 m 45°, 150.40 m 50°, 152.30 m 90°, 157.45 m 45°, 159.30 m 55°, 160.70 m 45°, 162.40 m 45°, 163.20 m 45°, 165.90 m 45°, 168.00 m 50°.

Folded contact.

166.45 - 167.30 : slightly calcareous - biotite - epidote - amphibole - fspar - qtz - chlorite gneiss (banded amphibolite)
(meta - mafic tuff)

alternate gn and gr, cm - banding with sharp layering contact, bands composed of epidote and chlorite which often contain schlieren and laminae of biotite or randomly oriented porphyroblasts of amphibole on average 0.4 cm in long dimension alternate with lenses and bands of fine - grained granoblastic qtz, fspar and carbonate.

Layering: 60° to 70°.

Sharp contacts with surrounding amphibolite.

174.90 - 176.70: Calcareous qtz - biotite - chlorite schist

(meta - mafic volcanic sediment, supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)

brownish gn with white spots, flaser structure, close alternation of interlocked qtz crystals as lenses

mable interlayers rich in biotite, chlorite and epidote (meta - nontronite, saponite), occasionally mm - thick bands of milky qtz and qtz fracture fillings, clusters of milky qtz especially between 142.30 - 143.00 m, several interlayers with vesiculated basalt abundant - stretched and flattened augen on average 0.3 cm in long dimension composed of plagioclase and epidote - at: 143.20 - 143.40 m, 144.20 - 144.22 m, 144.72 - 144.74 m, 144.93 - 145.00 m, 147.25 - 147.35 m, 148.25 - 148.30 m, 150.85 - 151.35 m, 151.73 - 152.04 m, 155.43 - 155.80 m, 157.30 - 157.65 m, 160.80 - 161.05 m, 162.05 - 162.15 m, 163.20 - 163.95 m. Foliation a. banding: 134.70 m 60°, 139.30 m 45°, 143.00 m 45°, 147.20 m 45°, 150.40 m 50°, 152.30 m 90°, 157.45 m 45°, 159.30 m 55°, 160.70 m 45°, 162.40 m 45°, 163.20 m 45°, 165.90 m 45°, 168.00 m 50°.

Folded contact.

166.45 - 167.30 : slightly calcareous - biotite - epidote - amphibole - fspar - qtz - chlorite gneiss (banded amphibolite)
(meta - mafic tuff)

alternate gn and gr, cm - banding with sharp layering contact, bands composed of epidote and chlorite which often contain schlieren and laminae of biotite or randomly oriented porphyroblasts of amphibole on average 0.4 cm in long dimension alternate with lenses and bands of fine - grained granoblastic qtz, fspar and carbonate.

Layering: 60° to 70°.

Sharp contacts with surrounding amphibolite.

174.90 - 176.70: Calcareous qtz - biotite - chlorite schist

(meta - mafic volcanic sediment, supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar.)

brownish gn with white spots, flaser structure, close alternation of interlocked qtz crystals as lenses

with schlieren or layers composed of fine - fibrous chlorite and fascicular bundles of biotite forming the foliation, abundant idiomorphs of carbonate max. 0.4 cm across which locally are deformed. Schistosity: 45°, uppermost part with small scale isoclinal and disharmonic folding. Gradual contact.

176.70 - 178.30: Schistose amphibolite

(meta - mafic volcanic sediment with coarse mafic and felsic fragments, matrix support sediment; possible subaqueous debris flow / lahar or hyaloclastite)

similar: 208.00 - 217.10 m.

Schistosity: 45°.

Gradual contact.

178.30 - 188.15: Slightly calcareous qtz - amphibole - biotite - chlorite schist

(meta - mafic volcanic sediment with medium size mafic fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar.

Similar: 49.70 - 54.80 m, 5 to 10% by volumen fragments.

Sharp footwall.

188.15 - 189.30: Calcareous epidote bear. qtz - fspar - biotite - amphibole gneiss

(meta - mafic tuff, similar banded amphibolite)
grgn with light coloured bands and lenses, laminated, porphyroblastic texture, interlocking qtz - fspar crystal aggregates with or without epidote and carbonate as lenses and layers in alternation with schlieren and laminae of biotite and occasional trains of granules of amphibole, amphibole mainly forms idiomorphs max. 0.7 cm long which tend to be not oriented thus forming an open framework of touching or crossing crystals, the inter-

stices are filled by granoblastic qtz, fspar, epidote and/or carbonate.

Layering, foliation: 45° - 50° .

Gradual footwall.

189.30 - 192.25: Slightly calcareous chlorite bear. epidote - biotite - amphibole gneiss

(intermittent basalt flows with spilite intersections or mafic tuff)

gn with white and brown stripes and schlieren, locally being yellowish gn, distinct cm - banding with superimposed lamination and local transition into laminated rock, in places the banding is irregular having similarities with a "blastopsephitic texture" (fragment basalt), cm - thick layers of fine - fibrous schistose amphibolite which again is laminated by interlocked elongate qtz and carbonate or schlieren of biotite alternate with granoblastic qtz - carbonate bands lesser 1 cm thick and laminae or schlieren of biotite; the uppermost portion (189.30 - 189.70) shows a distinct mm - as well as cm - banding composed of alternate qtz - carbonate, amphibole and qtz - epidote layers which always have sharp contacts, pyrite occurs as single crystals max. 0.3 cm across, ilmenite forms a low - grade dissemination of minute crystals between: 189.45 - 189.47 m and 190.50 - 190.75 m.

Lamination: 60° .

Sharp footwall.

192.25 - 193.10: Biotite bear. amphibole schist

(meta - basalt flow)

gn, fine crystalline, nematoblastic texture, cross-cutting veins of qtz locally being accompanied by accessory carbonate, biotite is most abundant within the lower portion where it forms imperfect sperulites max. 0.3 cm large while it elsewhere occurs as widely scattered tiny bundles which strongly are aligned along the major plane of foliation.

Gradual footwall.

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193.10 - 195.55: Calcareous qtz - fspar - biotite - chlorite - amphibole schist

(meta - mafic volcanic sediment, tuff)
brownishgn, medium - crystalline, porphyroblastic texture, slight compositional and textural changes, biotite mainly is concentrated within the lower portion while chlorite is enriched within the upper part of the section, amphibole increase in size up-section from max. 0.4 cm at lower levels to max. 1.0 cm within the upper portion the needles constitute an open framework of sometimes crosscutting prisms what is most distinct in the upper parts, the interstices of the framework are filled by fine-fibrous crystal aggregates of chlorite, fine-grained granoblastic qtz which locally are accompanied by crystals of epidote and bundles or imperfect spherulites of biotite, carbonate either exists as fine crystals joining qtz or forms scattered idio-blasts max. 0.2 cm across.
Comp. banding: 70°.
Gradual footwall.

195.55 - 199.95: Slightly calcareous chlorite - qtz - fspar amphibolite

(meta - mafic volcanic sediment with fine mafic and some coarse felsic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar or may be lapilli tuff)
gn, in places grgn to even greenishgr, massive with crude development of mineral preferred orientation, mainly chlorite - qtz - fspar amphibolite but locally gradually passing into calcareous amphibole - qtz - fspar rock with ghost - like gneissic texture, always little distinction between fragments and matrix due to compositional and textural similarities of both, cm - large rounded elongate clasts of fine - fibrous amphibole and sparse clasts of amphibole - qtz - fspar rock (rhyolite) embedded

in abundant matrix composed in decreasing order of amphibole, chlorite, qtz, fspar and carbonate, amphibole tends to form imperfect spherulites but too fascicular bundles which may be stretched forming a slight foliation, its habit locally cause a slight leopard texture, carbonate when present forms scattered idiomorphs max. 0.2 cm across; the lowermost portion (195.55 - 195.85 m) is marked by a distinct cm - banding which is the result of sedimentation of large felsic fragments - amphibole - qtz - fspar rock of fine - grained granoblastic texture with amphibole forming imperfect spherulites and fascicular bundles max. 1.2 cm in long dimension and needles always being poorly directed - which are embedded in a matrix of the kind described above.

Minor faults: 196.15m, 197.30 m, 197.70 m, 198.10 - 198.40 m, 198.70 m, 199.00 m, 199.20 m, 199.35 m, 199.40 m.

Lamination: 85°.

Sharp footwall marked by clusters of milky qtz.

199.95 - 201.75: Epidote bear. biotite - amphibole gneiss

(intermittent basalt flows with spilite intersections)

alternate gn and brown stripes, sometimes gr layers with faint yellowish tint, cm - banding with local transition into laminated rock, rhythmic alternation of bands of fine - crystalline schistose amphibolite with layers or laminae composed of either biotite or biotite and epidote or qtz and epidote, the latter have a lepidoblastic or porphyritic texture due to biotite which tends to form fascicular bundles or coarse crystal aggregates often showing a preferred orientation, the footwall portion contains several clusters of milky qtz thus it displays a chaotic texture .

Layering: 80°.

Sharp footwall.

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201.75 - 203.00: Slightly calcareous amphibole bear. biotite -
qtz - fspar - epidote rock

(meta - felsic to intermediate tuff of high
spilitization)

lightyellowishgn with gr streaks and lenses and
brown rods, lumbs and clusters, chaotic texture
seems to be stressinduced, locally crude devel-
opment of mm - layering which is strongly deformed
bands and clusters composed of qtz, fspar
and epidote which occasionally are joined by fasci-
cular bundles of biotite max. 0.3 cm large and
not oriented alternate irregularly with clust-
ers and streaks of biotite and laminae of qtz,
amphibole is restricted as porphyroblasts to the
stratigraphically lowermost and uppermost por-
tions the needles and imperfect radiating aggre-
gates are max. 0.2 cm large and oriented at random.
Sharp footwall marked by clusters of qtz.

203.00 - 206.00: Slightly calcareous qtz - amphibole - biotite -
chlorite schist / gneiss

(meta - mafic volcanic sediment)

grgn with abundant brown schlieren and rods and
locally white spots, the lower portion shows a
poorly defined cm - banding, otherwise exists a
distinct mineral preferred orientation but some
intersections are massive, medium to coarse cry-
stalline, the lower portion displays a close asso-
ciation of idiomorphs of amphibole max. 0.5 cm
long and schlieren of fine - fibrous chlorite
which alternate with lenses and laminae composed
of fine - grained granoblastic qtz which often is
accompanied by scattered idiomorphs of carbonate
being max. 0.2 cm in diameter, the stratigraphi-
cally upper parts show a lepidoblastic texture,
scattered rodlike and bow - tie shaped crystal
aggregates of fine - fibrous chlorite is in close
association with fascicular bundles and schlieren
of biotite, the phyllosilicates form a light frame-
work with interstices being filled by fine - grained

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granoblastic qtz and epidote, amphibole only locally occurs remaining at subordinate amounts, it displays max. 1.0 cm long prisms being equally distributed and not oriented, carbonate in places exists as 0.2 cm large idiomorphs.

Schistosity: 75°.

Sharp footwall.

206.00 - 208.00: Slightly calcareous qtz - biotite - fspar - epidote rock

(meta - felsic to intermediate tuff of high spilitization)

Sample:2000D/14

207.50 m

thinsection

same as: 201.75 - 203.00 m, but with no amphibole.

Sharp contact to underlying rock.

208.00 - 217.10: Slightly calcareous chlorite - biotite - qtz - amphibole rock

(meta - mafic volcanic sediment with coarse fragments and supp. with epiclastic sedimentary impurity; possible slightly distal facies of subaqueous debris flow/ lahars)

Sample:2000D/20

209.60 m

thinsection

grgn, chaotic texture, subrounded elongate medium - and coarse fragments of fine - crystalline schistose epidote - qtz rock, and amphibole - qtz - fspar rock (rhyolite) are scattered in sparse matrix composed of either qtz or qtz with epidote or fine fibrous amphibole or chlorite with biotite or sporadic of carbonate, within the phyllosilicate matrix biotite displays giant bundles, bow - tie shaped aggregates and imperfect spherulites which often are discordant to the major plane of foliation, both matrix and felsic fragments rarely contain spots of py.

Strongly sheared rock between: 212.40 - 212.60 m and 212.90 - 213.20 m, foliation indicated by preferred orientation of fragments at: 85°.

Sharp footwall marked by a cm - thick band of milky qtz.

217.10 - 224.95: High calcareous amphibole - qtz - biotite - chlorite - schist

(meta - mafic volcanic sediment partly with fine

DDH 2000 D

fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar)

Sample : 2000D/15
221.80 m
thinsection

similar: 16.90 - 19.00 m and 49.70 - 54.80 m, but with abundant rounded elongate felsic clasts composed in decreasing order of fspar, qtz, carbonate and accessory chlorite and biotite between: 221.65 - 222.20 m and 223.00 - 223.55 m, the fragments are embedded in a phyllosilicate matrix of fine - fibrous chlorite which contains scattered schlieren and imperfect spherulites of biotite while carbonate occurs as idiomorphs max. 0.15 cm across the crystals locally being stretched, carbonate mainly is concentrated between: 220.75 - 221.85 m and 224.05 - 224.95 m forming idiomorphs max. 0.3 cm across, prisms of amphibole max. 0.7 cm long embedded without any orientation within phyllosilicate are restricted to sections: 222.25 - 222.40 m, 223.55 - 224.00 m.

Schistosity: 218.10 m 75°, 219.30 m 65°, 220.00 m 61°, 220.30 m 60°, 220.50 m ∇ , 221.70 m 52°, 22.50 m 70°, 223.80 m 48°, 224.70 m 53°.

Gradual boundary with following rock.

224.95 - 230.20: Slightly calcareous epidote - biotite bear. chlorite - qtz - fspar amphibole

(meta - mafic volcanic sediment with fine and sparse medium size mafic as well as felsic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar or may be lapilli tuff)

similar: 195.55 - 199.95 m, but with no intercalations of calcareous amphibole - qtz - fspar rock, fine-grained fragments but locally medium-grained clasts of vesicular schistose amphibolite and epidote - amphibole - qtz - fspar rock (rhyolite).

Schistosity: 225.40 m 58°, 226.00 m 59°, 226.80 m 75°, 227.80 m 63°, 229.30 m 75°, 229.80 m 71° 230.10 m 64°.

Gradual footwall.

DDH 2000 D

fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar)

Sample : 2000D/15
221.80 m
thinsection

similar: 16.90 - 19.00 m and 49.70 - 54.80 m, but with abundant rounded elongate felsic clasts composed in decreasing order of fspar, qtz, carbonate and accessory chlorite and biotite between: 221.65 - 222.20 m and 223.00 - 223.55 m, the fragments are embedded in a phyllosilicate matrix of fine - fibrous chlorite which contains scattered schlieren and imperfect spherulites of biotite while carbonate occurs as idiomorphs max. 0.15 cm across the crystals locally being stretched, carbonate mainly is concentrated between: 220.75 - 221.85 m and 224.05 - 224.95 m forming idiomorphs max. 0.3 cm across, prisms of amphibole max. 0.7 cm long embedded without any orientation within phyllosilicate are restricted to sections: 222.25 - 222.40 m, 223.55 - 224.00 m.

Schistosity: 218.10 m 75°, 219.30 m 65°, 220.00 m 61°, 220.30 m 60°, 220.50 m ∇ , 221.70 m 52°, 22.50 m 70°, 223.80 m 48°, 224.70 m 53°.

Gradual boundary with following rock.

224.95 - 230.20: Slightly calcareous epidote - biotite bear. chlorite - qtz - fspar amphibole

(meta - mafic volcanic sediment with fine and sparse medium size mafic as well as felsic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar or may be lapilli tuff)

similar: 195.55 - 199.95 m, but with no intercalations of calcareous amphibole - qtz - fspar rock, fine-grained fragments but locally medium-grained clasts of vesicular schistose amphibolite and epidote - amphibole - qtz - fspar rock (rhyolite).

Schistosity: 225.40 m 58°, 226.00 m 59°, 226.80 m 75°, 227.80 m 63°, 229.30 m 75°, 229.80 m 71° 230.10 m 64°.

Gradual footwall.

DDH 2000 D

fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar)

similar: 16.90 - 19.00 m and 49.70 - 54.80 m, but with abundant rounded elongate felsic clasts composed in decreasing order of fspar, qtz, carbonate and accessory chlorite and biotite between: 221.65 - 222.20 m and 223.00 - 223.55 m, the fragments are embedded in a phyllosilicate matrix of fine - fibrous chlorite which contains scattered schlieren and imperfect spherulites of biotite while carbonate occurs as idiomorphs max. 0.15 cm across the crystals locally being stretched, carbonate mainly is concentrated between: 220.75 - 221.85 m and 224.05 - 224.95 m forming idiomorphs max. 0.3 cm across, prisms of amphibole max. 0.7 cm long embedded without any orientation within phyllosilicate are restricted to sections: 222.25 - 222.40 m, 223.55 - 224.00 m.

Schistosity: 218.10 m 75° , 219.30 m 65° , 220.00 m 61° , 220.30 m 60° , 220.50 m ∇ , 221.70 m 52° , 22.50 m 70° , 223.80 m 48° , 224.70 m 53° .

Gradual boundary with following rock.

224.95 - 230.20: Slightly calcareous epidote - biotite bear. chlorite - qtz - fspar amphibole

(meta - mafic volcanic sediment with fine and sparse medium size mafic as well as felsic fragments, matrix support sediment; possible distal facies or upper succession of subaqueous debris flow / lahar or may be lapilli tuff)

similar: 195.55 - 199.95 m, but with no intercalations of calcareous amphibole - qtz - fspar rock, fine-grained fragments but locally medium-grained clasts of vesicular schistose amphibolite and epidote - amphibole - qtz - fspar rock (rhyolite).

Schistosity: 225.40 m 58° , 226.00 m 59° , 226.80 m 75° , 227.80 m 63° , 229.30 m 75° , 229.80 m 71° 230.10 m 64° .

Gradual footwall.

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230.20 - 231.75: Schistose amphibolite

(meta - basic flow)

gn, fine - grained, nematoblastic texture, some mm - thick bands of qtz, in places fascicular bundles of biotite which locally form discontinuous layers or tiny schlieren; interlayer of biotite - amphibole - chlorite schist (supp. debris flow; similar: 49.70 - 54.80 m) at: 231.26 - 231.36 m, schistosity: 230.70 m 88°, 230.70 m 60° by biotite, 231.60 m 85°. Gradual footwall.

231.75 - 232.45: High calcareous amphibole bear. chlorite - biotite - epidote - qtz rock/gneiss

C

(meta tuff)

chemical
analysis

232.05-232.26m

gr with yellowish and brownishgn or brown stripes, laminated with sometimes web - like texture, in places chaotically folded, laminae, schlieren and flasers of phyllosilicates (chlorite a. biotite) in alternation with cm - thick bands or sometimes lenses of epidote - quartzite which contain abundant carbonate, the felsic bands carry in places amphibole porphyroblasts which are oriented at random, a low - grade pyrite mineralization mainly as trains of granules is found between 232.05 - 232.26 m, otherwise pyrite is rare forming scattered subidiomorphic crystals.

Banding: 68°.

Sharp contact to following rock.

232.45 - 235.30: Slightly calcareous qtz - amphibole - biotite - chlorite schist

(meta - mafic volcanic sediment with fine fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible more distal facies or middle succession of subaqueous debris flow/lahar) similar: 49.70 - 54.80 m, but here more flaser and lenticular texture, fragments of granoblastic epidote - qtz rock, slightly porphyroblastic amphibole bear. qtz - fspar rock and schistose amphibolite.

Schistosity: 85°, strongly stressed between: 234.45 - 234.53 m and 234.58 m 85°, 235.35 - 235.66 m 75°,

235.77 m 70°, 236.20 m 45°.

235.30 - 241.10: Calcareous biotite - qtz - epidote - amphibole rock / gneiss

C

(meta - mafic volcanic, reworked supp. hyaloclastite)

gn with white stripes and intersections being gr with faint yellowish tint, chaotic texture predominates locally with distinct compositional cm - banding, abundant subrounded flattened and stretched fragments of fine - fibrous schistose amphibolite which carries accessory biotite and idiomorphs of carbonate 0.15 cm across and of non-homogeneous distribution and clasts of meta - keratophyr composed of epidote and qtz or epidote, amphibole and qtz, they are of granoblastic texture but are distinctly porphyroblastic by occurrence of amphibole which tends to form scattered not oriented idiomorphs max. 0.4 cm long, the matrix is sparse to abundant and displays locally a coarse-crystalline biotite - amphibole schist but mainly is composed in variable frequency of biotite, amphibole, epidote, carbonate and qtz and shows a granoblastic or porphyroblastic texture.

Fault: 239.90 m 45°.

Schistosity, layering: 236.30 m 74°, 236.70 m 66°, 237.30 m 78°, 237.45 - 237.80 m ~~78°~~, 237.90 m 74°, 238.50 m 67°.

Gradual footwall.

241.10 - 251.85: Calcareous epidote bear. amphibole - qtz - biotite - chlorite schist

(meta - mafic volcanic sediment with coarse fragments and supp. with epiclastic sedimentary impurity, matrix support sediment; possible slightly distal facies or lower succession of subaqueous debris flow / lahar)

similar: 49.70 - 54.80 m, but with additional epidote joining qtz, fspar and carbonate, fragments of fine - fibrous schistose amphibolite which may

be vesiculated and calcareous amphibole - qtz - epidote rock (felsic volcanic) which displays a distinct granoblastic texture, carbonate occurs as scattered idiomorphs on average 0.2 cm across, amphibole forms fascicular bundles of max. 0.4 cm long dimension which parallel the major foliation of the host rock, scarce clasts composed of amphibole - epidote - qtz - plagioclase (felsic volcanic) with poorly defined porphyroblastic texture due to amphibole which forms scattered not oriented prisms being 0.15 cm long.

Schistosity: 241.80 m 90° , 242.30 m 85° , 243.10 m 85° , 244.60 m 76° , 245.10 m 75° , 245.35 - 245.65 m ϕ , 245.95 m ϕ , 246.50 m 76° , 247.10 m 80° , 248.10 m 80° , 250.00 m 70° .

Gradual footwall.

251.85 - 258.10: Schistose amphibolite with interlayers of amphibole bear. qtz - biotite - chlorite - epidote rock (meta - mafic volcanic, reworked supp. hyaloclastite)

gn-white striping with intersections being gn with faint yellowish tint, dm - banding, fine crystalline schistose amphibolite containing abundant qtz and qtz - carbonate bands which mostly are conformable with the major plane of foliation is interstratified by conformable and disformable layers max. 200 cm thick composed of epidote, chlorite, biotite, qtz and amphibole (at: 251.85 - 253.90 m, 254.00 - 254.10 m, 254.50 - 254.70 m, 254.95 - 255.25 m, 255.60 - 256.35 m, 256.55 - 257.30 m), the relative proportions of the constituents vary strongly from layer to layer but also within each layer what is due to the chaotic conditions regarding structure and texture, amphibole tends to occur as idiomorphic of max. 0.5 cm length being scattered within a mosaic of fine-grained granoblastic epidote and qtz, the crystals are not oriented, it sometimes forms radiating aggregates or discontinuous trains of granules, biotite often displays giant bundles max. 0.5 cm long

and 0.3 cm wide which form bands or clusters of irregular shape, pyrite occurs sporadically as 0.2 cm large spots.

Layering: 254.20 m 75°, 255.10 m 90°, 255.80 m 75°, 257.50 m 90°, 257.65 m 85°.

Sharp contact to following rock.

258.10 - 261.10: Amphibole - sericite bear. epidote - biotite - chlorite - qtz schist / gneiss

(meta - mafic volcanic sediment mixed by epiclastic sediment, some interlayers of meta - felsic tuff)
gngr to grgn with sometimes distinct yellowish tint, flaser to lenticular structure with local transition into cm - banded rock, interlocking epidote and qtz crystals as schlieren lenses and bands in alternation with schlieren, lenses and laminae composed of fine - fibrous chlorite which is associated by biotite forming mm- thick bands or schlieren always being parallel the major foliation, amphibole occurs as scattered idiomorphs, the needles on average 0.2 cm long and not oriented, it in general is within phyllosilicates but is associated with qtz and epidote in the supposed felsic tuff layers, here too some pyrite exists as scattered elongate crystals on average 0.2 cm large, it is most frequent within 258.75 - 258.80 m remaining lesser 2 Vol.-%; a thin band of meta - basalt flow (epidote - biotite bear. fspar - qtz - amphibole schist) is found at 260.00 - 260.35 m, the rock being fine crystalline showing a distinct nematoblastic texture, a laminaeation caused by parallel streaks of biotite is poorly developed.

Schistosity, layering: 258.75 m 55°, 258.10 m 48°, 259.50 m 49°, 260.00 m 58°, 260.45 m 60°, 261.00 m 60°.

Sharp distorted contact to following rock.

261.10 - 264.10: Schistose amphibolite

(meta - mafic volcanic, reworked supp. hyaloclastite)

gn, fine crystalline, nematoblastic texture, abundant disconformable bands composed of coarse crystalline amphibole, biotite, epidote and qtz predominately of chaotic texture (same as: 251.85 - 253.90 m), sometimes clusters or trains of flakes of biotite, occasionally cm - large clusters of qtz with carbonate.

Faults and mylonitic zones: 261.70 m, 262.60 m, 262.75 - 262.90 m, 263.10 m, 263.25 - 263.50 m, 263.60 - 263.70 m.

Fault contact to following rock.

264.10 - 265.40: Slightly calcareous amphibole bear. biotite - chlorite schist

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible distal facies or upper succession of subaqueous debris flow / lahar)

similar: 16.90 - 19.00 m, strongly deformed lower as well as upper portion, the middle zone shows a consistent schistosity of 63° to core - axis. Sharp footwall.

265.40 - 266.80: Epidote bear. sericite - biotite - amphibole - qtz fspar rock / gneiss

(meta - arenite/qtz - pelite with mafic volcanic impurity)

gr with faint greenish tint and brown as well as gn needles, porphyritic texture in places porphyroblastic textural and compositional banding, nonrhythmic alternation of sericite - biotite - qtz rock (meta - qtz - pelite / arenite) and layers of amphibole - qtz - fspar rock or amphibole - sericite - qtz rock distinct separation of biotite and amphibole, the former display scattered or imperfect sperulites max. 0.15 cm large and randomly oriented, amphibole occurs as idioblasts, the needles on average 0.3 cm long and equally distributed while not oriented, a low - grade dissemination of idioblasts of pyrite lesser 1% of the mode exists between:

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265.75 - 265.95 m.

Banding: 265.70 m 85°, 266.10 m 75°.

Sharp footwall.

266.80 - 269.50: Calcareous to high calcareous amphibole - biotite - chlorite schist

(meta - mafic volcanic sediment supp. with epiclastic sedimentary impurity; possible slightly distal facies or upper to middle succession of subaqueous debris flow / lahar).

Similar: 49.70 - 54.80 m, but with scattered subidiomorphic carbonate crystals max. 0.15 cm across

Schistosity: 267.10 m 85°, 267.35 m 55°, 268.00 m 45°, 268.30 m 67°, 269.30 m 67°.

Gradual border to following rock.

Epiclastic sedimentary section

269.50 - 270.50: Chlorite bear. qtz - fspar rich biotite - sericite schist

(meta - pelite with felsic volcanic impurity)
gr with faint greenish tint and abundant brown schlieren and rods, porphyritic texture, crude development of compositional banding, often with distinct lenticular structure, interlocking qtz and qtz - fspar crystals as lenses and layers in alternation with bands composed of fine crystalline sericite and chlorite and distinctly coarser biotite, the latter forms fascicular bundles or imperfect spherulites of max. 0.2 cm size which tend to be not oriented but locally are flattened and stretched thus parallel and sometimes form laminae.

Lamination: 75° - 80°.

Gradual footwall.

270.50 - 272.50: Qtz - chlorite - biotite - sericite schist

(meta - paraconglomerate, supp. tilloide)
gr with often distinct gn tint and brown schlieren and rods blastopsephitic texture, locally cm -

banded, isolated stretched and flattened rounded fragments of fine - grained granoblastic quartzite more than 2 cm long dimension are embedded in abundant matrix composed of fine - crystalline sericite and chlorite and containing fascicular bundles or imperfect spherulites of biotite max. 0.3 cm large which are oriented at random but may also be stretched and parallel, intervalls with little or no fragments are similar: 269.50 - 270.50 m.

Schistosity and fragment orientation: 75° - 80° .
272.08 - 272.38 m: high calcareous chlorite bear. biotite - sericite schist / rock

(meta - pelite)

gr with greenish tint, crudely schistose, homogeneous, porphyroblastic texture, idiomorphs of carbonate 0.1 cm across and bundles of biotite being poorly directed embedded in a matrix of fine crystalline chlorite and sericite, carbonate and biotite show highest concentration in the middle of the layer.

Sharp contacts to the surrounding.

272.50 - 278.30: Chlorite bear. qtz - fspar rich biotite-sericite schist
(meta - pelite with felsic volcanic impurity)

same as: 269.50 - 270.50 m but locally with coarser bundles of biotite - max. 0.3 cm large.

Minor faults at: 275.70 m, 275.78 m, faultzone at: 272.80 - 273.00 m.

Lamination: 75° - 80° .

Sharp footwall.

275.60 - 275.85: High calcareous biotite bear. sericite schist

(meta - pelite)

similar: 272.08 - 272.38 m but with minor biotite forming only tiny fascicular bundles which poorly are oriented.

278.30 - 279.50: Garnet bear. biotite - sericite schist

(meta - pelite)

darkgr, fine crystalline, poorly developed lenticular structure, widely spaced seams and lenses of carbonate in alternation with layers composed of fine-crystalline sericite forming the foliation, biotite occurs as scattered fascicular bundles max. 0.1 cm large which often are oriented, garnet forms scattered idiomorphs average 0.3 cm across. Minor faults: 278.70 m, 278.96 m, 279.10 - 279.20m, 279.35 - 279.45 m. Schistosity: 85° - 90° . Gradual footwall.

279.50 - 281.55: Slightly carbonaceous biotite bear. sericite - quartzite

(meta - arenite)

gr, fine-grained granoblastic, laminated, alternation of mm - thick laminae of sericite - biotite and seams of graphite containing minor sulphide with cm- thick layers of phyllosilicate-poor quartzite, the rock looks strongly foliated with frequent occurrence of bedding fault lines.

Fault - zone: 290.20 - 290.50 m.

Schistosity: 75° - 85° .

Bedding fault line as lying contact.

281.55 - 283.75: Garnet - biotite - sericite schist

(meta - pelite)

gr with brown and reddish brown spots, porphyritic to porphyroblastic texture, poorly developed lamination and lenticular to flaser structure, interlocked qtz crystals accompanied by scattered tiny flakes of biotite as lenses or layers / laminae in alternation with bands and schlieren of fine-crystalline sericite which contains abundant scattered fascicular bundles of biotite max. 0.1 cm large and mostly being not oriented, they sometimes may be concentrated forming laminae or cm - thick intercalations, garnet (almandine) displays scattered idiomorphs average 0.2 cm across which are not equally distributed.

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Some tiny faults: 281.80 - 281.95 m, 282.20 m.

Schistosity: 85° - 90°.

Gradual footwall.

283.70 - 284.40: Slightly carbonaceous garnet - biotite bear. sericite quartzite

same as: 279.50 - 281.55 m.

Partly slightly mylonized: 283.85 - 283.90 m.

Layering: 85° - 90°.

284.40 - 284.60: Garnet - biotite - sericite schist

(meta - pelite)

same as: 281.55 - 283.75 m, but with more qtz and lesser biotite.

284.60 - 286.65: Calcareous amphibole bear. garnet - qtz - fspar - biotite - sericite schist

(meta - pelite with interbeds of felsic volcanic)
gr with greenish tint and abundant brown schlieren and rods, dm - layering as nonrhythmic alternation of meta - pelite bands and layers of meta - felsic (keratophyr) volcanic, always gradual contacts, the pelite sections are similar 281.55 - 283.75 m but have biotite bundles being 0.2 cm long, garnet is equally distributed being average 0.1 cm across, carbonate forms scattered subidioblastic crystals or displays crystal aggregates as lenses and clusters of irregular shape, the keratophyric layers are crudely mm- to cm-banded and show a distinct porphyroblastic texture caused by amphibole which forms randomly oriented prisms max. 0.4 cm long and garnet as scattered idioblasts average 0.4 cm across which in places form huge crystal aggregates, biotite is present as fascicular bundles.

Layering: 85°.

Gradual footwall.

286.65 - 299.30 : Garnet-biotite - sericite schist

(meta - pelite)

similar: 281.55 - 283.75 m but biotite only being

oriented at random and max. 0.3 cm in size, varying qtz - amount thus sometimes reaching qtz - mica schist.

Minor faults at: 271.71 m, 287.75 m, 290.66 m, 290.80 m, 290.93 m, 291.40 m, 291.83 m, 292.40 - 292.45 m, 292.87 m, 295.04 m, 295.10 - 295.25 m. Gradually passing into hanging rock.

299.30 - 301.40: Slightly carbonaceous garnet - biotite bear. sericite quartzite

similar: 279.50 - 281.55 m.

Lamination at 75° - 80° , in places tiny bedding fault lines.

Gradual footwall.

301.40 - 304.50: Slightly carbonaceous qtz - biotite - sericite schist

(meta - pelite)

gr with several darkgr or even black bands and laminae, porphyritic texture, distinctly banded and laminated, nonrhythmic alternation of cm - but often dm - thick layers of metapelite similar 286.55 - 299.30 m and laminae and bands - max. 4 cm thick - of carbonaceous meta - pelite which is very poor in biotite, the contacts between the layers are sharp but locally may be gradual, a local phenomenon are network - like features of carbonaceous meta - pelite within meta - pelite.

Minor faults often with slickensided graphite: 301.80 m, 302.00 m, 302.50 m, 302.60 m, 302.80 m, 303.45 m. Lamination: 80° - 85° .

Gradual footwall.

304.50 - 309.50: Slightly carbonaceous sericite - biotite - quartzite
(meta - qtz - pelite/arenite with intercalations containing graphite)

gr with abundant darkgr laminae and nearly black bands, porphyritic texture, laminated, cm - thick layers composed of fine crystalline qtz and sericite which are accompanied by scattered fascicular

bundles max. 0.1 cm large of biotite which are oriented at random alternate with laminae of graphite phyllite being closely isoclinally folded, bands of graphite with max. 6 cm thickness which show a biotite lamination are sporadically intercalated, they occur mainly with sharp contacts. Local occurrence of bedding fault lines. Lamination at 80°, between 307.00-308.80m) at 60°. Gradual footwall.

309.50 - 311.95: Fspar - sericite bear. garnet - biotite - qtz schist
(meta - arenite supp. with hydrothermal silica and felsic volcanic impurity)
gr with brown rods and reddish brown streaks, porphyritic texture, ghost - like mm - banding composed of alternate fine grained granoblastic qtz layers or lenses and bands or lenses of fine crystalline sericite - qtz which carry abundant fascicular bundles of biotite often being not oriented, garnet being of tiny occurrence forms closely packed trains of granules (laminae) , scattered tiny grains of po are always present, several cm- to dm- thick interlayers of biotite - qtz - fspar rock with indistinct gneissic texture, biotite forms here fascicular bundles or imperfect spherulites of max. 0.2 cm size which are oriented at random.
Minor faults: 309.85 m.
Milky qtz band: 311.26 - 311.60 m.
Lamination: 85°.

311.95 - 325.85: Biotite - sericite schist
(meta - pelite)
same as: 281.55 - 283.75 m, within 324.30 - 325.50 m strongly schistose with biotite being flattened and stretched and aligned along the major plane of foliation, from 325.50 m downsection decreased in phyllosilicates and increased in qtz and with abundant fspar and epidote (keratophyric), low - grade dissemination of idiomorphic pyrite.
Schistosity: 75° to 80°. Gradual footwall.

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DDH 2000 D

325.85 - 333.30: High calcareous epidote - amphibole - qtz - fspar
C rock / ngeiss

(banded amphibolite)

grgn, crude development of layering but with poorly defined mineral orientation, porphyroblastic texture, amphibole and carbonate form scattered porphyroblasts within a fine - grained matrix composed of epidote, qtz and fspar, the amphibole prisms on average are 0.5 cm long and form an open framework of not crosscutting or touching crystals they sometimes are parallel forming a slight foliation, carbonate displays idiomorphs on average 0.4 cm across, py sporadically occurs as 0.2 cm large idiomorphic crystals.

Layering and schistosity: 326.15 m 70°, 326.90 m 67°, 327.90 m 65°, 328.80 m 64°, 329.50 59°, 330.80 m 59°, 331.60 m 61°, 332.80 m 65°, from 332.60 several small faults gradually passing into mylonite (tectonic breccia).

333.30 - 335.10: Tectonic breccia












335.10 - 424.15: Slightly calcareous - biotite - amphibole - chlorite schist

(meta - mafic volcanic sediment with medium size and coarse mafic and sparse felsic fragments, matrix support sediment; possible slightly distal or lower to middel succession of subaqueous debris flow / lahar or agglomeratic basalt) (comparable with sample SNØ - 26)

Sample:2000D/17
421.50 m
thinsection

similar: 49.70 - 54.80 m, concentration of coarse clasts thus rock similar 75.35 - 79.20m at: 346.65 - 352.60 m, sections with only fine clasts at: 344.40 - 344.90 m, 345.60 - 346.70 m, 357.60 - 358.50 m, 382.40 - 395.20 m, 399.55 - 401.00 m, 407.20 - 411.25 m, 416.55 - 417.70 m, 419.60 - 421.10 m, 422.00 - 423.30 m; schistosity and fragment lineation: 337.00 m 70°, 340.00 m 60° frag., 341.00 m 63° frag., 342.70 m 64° frag., 344.50 m 59°, 346.50 m 62°, 349.50 m 62° frag., 351.30 m

Strongly fold-
ed and de-
formed
360.70-391.90m

61° frag., 352.60 m 64° frag., 353.50 m 58°,
355.50 m 58° frag., 357.40 m 66°, 357.85 m 58°,
359.30 m 80°, 359.75 m 65°, 360.00 m 53°, 360.55 m
77°, 361.05 - 361.55 m , 361.75 m 17°, 361.95 -
362.30 m , 362.40 m 30°, 362.40 - 362.85 ∇ , 363.
00 m 45°, 363.05 - 363.75 m , 363.80 m 40°, 364.
00 - 363.35 m , 364.50 m 30°, 364.90 - 265.95 m
, 365.95 - 367.40 m , 367.40 m 45°, 367.40 -
367.80 m ∇ , 367.80 - 368.75 m , 368.80 m 45°,
369.20 m 65°, 369.40 - 370.30 m , 370.50 m 30°,
370.80 45°, 371.20 m 45°, 371.30 - 371.70 m ,
371.80 m 80°, 371.85 - 372.10 m ∇ , 372.30 - 372.70
m , 372.70 - 391.60 m , 391.90 - 394.20 m strong-
ly schistose 50°, 397.50 m 75°, 407.50 m 67°,
408.00 m 57°, 409.50 m 45°, 410.50 m 30°, 411.50 m
50°, 418.70 m 55°, 420.20 m 50°, 420.50 m 55°;
mylonitic rock 335.45 - 335.73 m; faults: 338.17 m,
338.66 - 338.73 m, 339.23 m, 339.28 - 339.44 m,
340.90 m, 339.23 m, 339.28 - 339.44 m, 340.90 m,
341.70 m, 343.97 - 344.16 m, 350.35 m, 350.44 m,
349.75 - 349.81 m, 352.43 - 352.49 m, 358.00 -
358.16 m, 358.70 - 359.88 m, 365.32 - 365.48 m,
367.91 - 367.97 m, 368.86 m, 368.95 m, 371.48 -
371.75 m, 380.20 m, 381.10 m, 381.70 - 381.79 m,
382.15 m, 382.48 m, 384.18 m, 384.70 - 385.20 m,
390.60 m, 391.45 - 391.56 m, 397.95 - 398.00 m,
399.95 - 400.03 m, 400.45 m, 401.53 m.
403.45 - 407.20 m: Biotite - chlorite - epidote
qtz - fspar amphibole schist / gneiss

(intermittent basalt flows, leucobasalt)

(comparable with sample SNØ-04)

lightgreen, medium - grained, crude development of
cm - layering mainly as a result of modal changes
of biotite, nematoblastic texture, average 0.4 cm
large prisms of amphibole with preferred orienta-
tion forming the foliation are embedded in a fine -
grained matrix composed of epidote, qtz and fspar,
biotite displays fascicular bundles or bow - tie
crystal aggregates which parallel the amphibole
needles, py as tiny spots is present throughout.

Schistosity and layering: 403.60 m 71°, 403.70 m 55°, 403.85 - 404.50 m ∇ , 404.80 m 56°, 407.20 m 67°.

Sharp hanging wall and gradual footwall.

411.25 - 416.55 m: biotite - chlorite - epidote bearing qtz - fspar amphibolite

(intermittent basalt flows, leucobasalt) (similar SNØ-04)

see: 403.45 - 407.20 m, but more distinctly cm - banded, the contacts between individual layers being sharp, alternation of bands of schistose qtz - fspar amphibolite and amphibole bearing qtz - fspar biotite - chlorite schist with distinct lepidoblastic texture, sporadic interlayers of amphibole qtz - fspar rock (keratophyr).

Layering: 412.70 m 63°, 413.50 m 45°, 414.30 m 46°, 415.30 m 55°, 416.10 m 42°.

Sharp hanging wall.

Gradual footwall.

424.15 - 434.90 : Amphibole schist

(meta - basalt flow)

gn, extremely fine to fine-grained, homogeneous, rare lenses and leaves of qtz and qtz - carbonate or carbonate, variolitic amphibolite with 0.5 cm large flattened and stretched fspar eyes at: 431.00 - 431.20 m, 431.60 - 431.70 m, 432.05 - 432.10 m, scattered xenomorphic and hypomorphic - both often with sutured boundaries - and sporadically idiomorphic crystals of ilmenite max. 0.2 cm in diameter between: 427.80 - 431.00 m, 431.30 - 431.50 m, 431.80 - 433.20 m, tiny spots of py at: 433.80 - 434.80 m. Strongly tectonized rock between: 424.15 - 427.80 m, 430.40 - 430.80 m, 431.90 - 433.80 m.

Schistosity and lineation of fspar-eyes and il-crystals: 428.20 m 62°, 428.30 m 58°, 431.10 m 54°, 431.70 m 67°, 434.50 m 62°.

Gradual footwall.

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434.90 - 435.60: High calcareous amphibole - qtz - sericite - chlorite schist (banded amphibolite)
grgn, medium - grained, crude development of layering, lenticular structure occurs where porphyroblasts of carbonate have been flattened and stretched, nematoblastic texture but porphyroblastic texture within stratigraphically lower portion, amphibole as idioblasts the needles on average 0.3 cm long and either parallel or not oriented is embedded in a matrix composed of fine - fibrous phyllosilicates and fine - grained qtz and carbonate, the latter displays scattered idioblasts forming a spotted texture of the rock within the lower portion of the layer, rare cm - thick interlayers of exhalative qtz.

Mineral orientation, layering: 435.10 m 88°, 435.50 m 85°.

Sharp lying contact.

435.60 - 435.70: Amphibole schist

(meta - basic flow)

gn, extremely fine - grained, homogeneous with some nodules of qtz.

435.70 - 442.10: Plagioclase amphibolite

(meta - basic flow)

grgn, medium - grained within lower portion being coarse grained, crude development of leopard texture, amphibole tends to form bundles or imperfect spherulites which caused a slight foliation, the crystal aggregates are embedded within a fine-grained mosaic of qtz - fspar and epidote the latter being more frequent within the coarse grained portion. Gradual contact with following amphibolite.

442.10 - 445.15: Amphibole schist

(meta - basalt flow)

gn, fine - grained, homogeneous with rare nodules of qtz of irregular shape, low - grade sulphide mineralization as scattered xenomorphic pyrite which

sometimes is accompanied by bigger spots of po
between: 442.50 - 442.90 m.

Strongly stressed and partly mylonized between:
443.20 - 443.50 m.

Gradual footwall.

445.15 - 460.00: Plagioclase amphibolite

(meta - basic flow)

see: 435.70 - 442.10 m, here medium - grained in
places gradually changing to coarse - grained, occ-
asionally qtz and/ or nodules of milky qtz, inter-
sections of schistose amphibolite being extremely
fine - grained at: 448.45 - 449.30 m.

Gradual contact with following altered amphibolite.

460.00 - 462.25: Calcareous qtz - fspar - amphibole - chlorite

(chlorite - amphibole) schist/rock

A/C

(meta - altered basaltic volcanic, flow) (simi-
larities with altered basalts at hanging wall of
Tverrfjell ore)

chem. analysis
460.20-462.25m

gn, medium - grained, in places crudely develop-
ed lamination, gradual increase in the amount
of amphibole upsection, the mode of chlorite chan-
ges inversely with that of amphibole, chlorite,
however, is most abundant between: 460.80 - 461.20
m, amphibole forms idiomorphs, the prisms on aver-
age 0.4 cm long and generally lack orientation but
sometimes are slightly parallel, the crystals lie in a
groundmass composed of interleaved fine - fibrous
chlorite and interlocked fine - grained qtz, fs-
par and carbonate, pyrite is found in minor amounts
and displays xenomorphic to hypidiomorphic cry-
stals, sometimes nodules or veins of milky qtz,
foliation: 461.10 m 45°, layering at: 461.60 m 72°,
contact at 462.25 m 53°.

Knife - sharp contact marked by a band of milky qtz.

462.25 - 462.70: High calcareous amphibole bearing chlorite schist/
rock

AA/C

(meta - highly altered basaltic volcanic)

DDH 2000 D

(similar sample 4/14 BH 4 Tverrfjell mine)
 lightgrn, hanging portion massive with distinct
 spotted appearance, the fine - fibrous chlorite
 groundmass sporadically contains tiny spherulites
 of amphibole and carries abundant scattered cry-
 stals of carbonate which mostly are hypidiomor-
 phic and are on average 0.1 cm across, pyrite
 forms a low - grade dissemination while ilmenite
 occurs as frequent tiny spots, it is accompanied
 by minor mt, this section gradually passes into
amphibole bear. chlorite or amphibole - chlorite
schist which carries little carbonate, no py and
 minor spots of ilmenite, amphibole forms max. 0.5 cm
 large needles which always are aligned along the
 major plane of foliation.
 Schistosity: 462.70 m, 48°.
 Sharp contact as bedding fault line.

462.70 - 466.00: Calcareous amphibole bear. chlorite - biotite -
 sericite schist

C (meta - pelitic sediment with basic volcanic im-
 purity; supposedly with hydroth. alternation)
 lightgn, with in places giant white spots, strong-
 ly schistose with in places crenulation cleavage,
 crude lamination, locally being strongly deformed
 by small-scale disharmonic or isoclinal folding
 interleaved biotite as streaks and discontinuous
 bands closely alternate with layers composed of
 fibrous chlorite , carbonate appears as giant hyp-
 idiomorphic and idiomorphic crystals being equally
 distributed between: 462.90 - 464.00 m, 464.90 -
 465.00 m, 465.40 - 465.55 m, 465.80 - 466.00 m,
 amphibole only sporadically is present forming
 average 0.5 cm large needles which are oriented
 at random.
 Schistosity: 463.00 m 51°, 463.40 m 20°, 462.70 -
 462.85 m *mm*, 464.00 - 464.70 m, *mm* 465.00 m 48°,
 465.40 m 52°, 465.50 m 20°, small faults: 463.25
 m, 464.30 m, 464.70 - 464.75 m, 465.00 - 465.30 m.

avd. Tverrfjellet

DDH 2000 D

466.00 - 466.20: High calcareous chlorite bear. qtz - fspar - amphibole gneiss/rock

C (meta - basic volcanic tuff)

sample:2000D/18
466.10 m
thinsection

lightgn, the lowermost section being white/gn striped upper portion massive and homogeneous, even - grained but with scattered idiomorphs or crystal aggregates of carbonate which are max. 0.2 cm in diameter, the stratigraphically lower section crudely is laminated, the layering being due to the tendency of carbonate to form trains of granules which closely alternate with stripes or bands of qtz - fspar - amphibole, the latter is present as idiomorphs of 0.1 to 0.2 cm length which form a slight foliation, pyrite is most abundant but remains to subordinate amount near the footwall, its mode gradually decreases upsection.

Lamination : 466.15 m 58°.

Gradual footwall.

466.20 - 466.60: Slightly calcareous amphibole - sulphide - qtz - fspar gneiss

chemical
analysis
466.15-466.60m.

(meta - keratophyr with sulphide layers)
gr, cm - banding composed of alternate sulphide pore keratophyr layers and bands of high - grade sulphide (py, po) rich in quartz, granoblastic texture throughout, amphibole forms small idiomorphs max. 0.2 cm long which tend to be parallel forming a slight foliation, carbonate appears within 0.1 cm large hypidimorphic crystals which are equally distributed but sometimes form trains of granules.

Layering: 466.20 m 66°, 466.55 m 85°.

Sharp footwall as bedding fault line.

466.60 - 466.72: High calcareous amphibole schist

(meta - basalt tuff / flow)

C

gn with scarce white stripes, medium - crystalline, nematoblastic texture, laminated by discontinuous flasers and lenses of carbonate, irregular carbonate veining is due to intense fracturing

(tectonization).

lamination: 62°,

several small faults with little or no dislocation.

Sharp lying contact marked by a cm - band of qtz - carbonate.

466.70 - 466.75: Slightly calcareous amphibole - biotite - chlorite schist

AA

(meta - altered basaltic volcanic)

gn with brownish spots, medium - grained, lepidoblastic to nematoblastic texture, scarce stretched spots of carbonate.

Schistosity: 60°.

Bedding fault line as footwall contact.

466.75 - 466.85: Calcareous sericite - qtz - fspar - amphibole gneiss

(meta - cherty mafic tuff)

lightgn, partly with white or slightly yellowish stripes and bands, fine - grained, crudely developed mm- and cm - layering with always gradual contacts, bands of sericite - amphibole, amphibole bear. epidote qtz - fspar and qtz - carbonate in rhythmic alternation, rare mm - large spots of py and po, low impregnation of mt.

Layering: 64°.

Discordant fault contact.

466.85 - 467.30: Calcareous chlorite bear. biotite - sericite schist
(meta pelite)

lightgn with brownish flasers and stripes, strongly sheared rock characterized by disharmonic folding, laminae, flasers and irregular formed aggregates of biotite, alternate with layers of fine - fibrous chlorite - sericite, xenomorphic mainly round crystals of carbonate max. 0.1 cm across are equally distributed but sporadically form trains of granules. Nebulous border to underlying rock.

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DDH 2000 D

467.30 - 467.70: High calcareous amphibole schist

(meta - basalt tuff / flow)

same as: 466.60 - 466.72 m, but with nodules of milky qtz.

Lamination: 80°.

Gradual footwall.

467.70 - 467.80: High calcareous biotite - sericite schist

(meta - pelite or tuffaceous meta - pelite)

lightgn with brownish flasers and white spots, crudely developed flaser structure, slightly porphyric biotite is strongly aligned along the major foliation of the rock which is formed by fibrous sericite, carbonate displays round crystals max. 0.1 cm across which are equally distributed but in places form discontinuous layers.

Schistosity: 78°.

Sharp lying contact.

467.80 - 468.10: Garnet - amphibole - fspar - qtz gneiss

(meta - chert, silicate facies banded iron formation)

lightgn with redbrown tint, banded rock composed of cm - thick layers of amphibole - garnet - qtz, garnet - qtz - fspar - amphibole and amphibole - qtz - fspar and minor bands of quartzite and laminae of garnet, the contacts of the layers tend to be gradual but locally they may be knife-sharp, the rock is fine - grained and shows a distinct foliation formed by idioblasts of amphibole the needles on average 0.2 cm long which parallel the layering of the rock, amphibole instead may be oriented at random within qtz - fspar dominated bands (quite keratophyric looking), pyrite forms minute spots and is present throughout but grades lesser 1Vol-%, ilmenite forms a low - grade dissemination within the hanging portion, a slight mt mineralization is indicated from susceptibility measurements.

Layering 74°.

Sharp footwall.

avd. Tverrfjellet

DDH 2000 D

468.10 - 469.15: Slightly calcareous amphibole schist

(meta - basalt flow)

gn, fine - grained, discontinuous laminae as well as tiny spots of carbonate, locally cm -thick bands or nodules of irregular shape of qtz and carbonate, slightly stressed rock cut by several small faults.

Schistosity: 74°.

Sharp footwall.

469.15 - 470.15: Slightly calcareous amphibole - sericite bear. biotite - qtz schist

(meta - felsic tuffite locally with mafic volcanic impurity)

browngr with intersections being browngr, medium - crystalline, lenticular to flaser structure locally being merged by shearing or disharmonic folding, nodules of qtz are surrounded by flasers of fascicular bundles of biotite, amphibole sporadically is present forming subidioblastic porphyroblasts of max. 0.4 cm long dimension which are oriented at random, pyrite rarely occurs but displays a low-grade dissemination together with po between:

469.65 - 469.70 m.

Schistosity or layering : 66°.

Gradual footwall.

470.15 - 470.95: Calcareous biotite bear. amphibole schist

(meta - basalt flow)

gn with white and brown stringers and spots, fine - crystalline, crudely laminated by mm - thick discontinuous layers of carbonate and stripes of biotite which always is accompanied by some chlorite, pronounced orientation of amphibole which partly may be less conspicuous, minute xenomorphic spots of carbonate are concentrated within the central part of the sequence, pyrite forms frequent spots, flasers and lenses.

Schistosity and lamination: 80°.

Gradual footwall.

avd. Tverrfjellet

DDH 2000 D

470.95 - 471.27: Calcareous qtz - biotite schist

(meta - felsic tuff)

grbrown, lenticular - to flaser structure, elongate, qtz - carbonate aggregates alternate with discontinuous layers of parallel biotite flakes, sporadically some idiomorphs of carbonate being 0.2 cm across, rock is strongly mylonized between: 471.05 - 471.15 m.

Schistosity: 85°.

Sharp footwall.

471.27 - 471.50: Slightly calcareous biotite bear. amphibole schist

(meta - basalt flow)

same as: 470.15 - 470.95 m.

Layering: 85°,

Nebulous contact to underlying rock.

471.50 - 471.62: Amphibole - qtz - fspar - biotite rock/schist

(meta - felsic to intermediate tuff)

grbrown, medium - grained, gently foliated, lepidoblastic texture, interlocking qtz - fspar of irregular shape in close alternation with slightly oriented flakes of biotite and prisms of amphibole, the latter gradually increases in mode downsection.

Indistinct contact to underlying rock.

471.62 - 471.73: Amphibole - fspar - qtz gneiss

(meta - cherty mafic tuff)

gr with gn stripes, cm - banded, alternation of fine - grained granoblastic qtz or qtz - fspar layers with bands or trains of granules of medium to coarse amphibole, the ellipsoidal or prismatic porphyroblasts being oriented at random, they surround either qtz or fspar - qtz and sulphide, po makes up 5 to 7 Vol.-% of the rock, it predominately is bound to amphibole but too forms fuzzy layers within felsic bands.

Layering: 62°.

Sharp footwall.

avd. Tverrfjellet

DDH 2000 D

471.73 - 472.75 : Garnet bear. biotite - epidote - fspar - qtz rock
(meta - keratophyr)

chemical
analysis

471.73-472.90m.

darkgr with brownish stringes, fine - grained, granoblastic texture, slightly schistose due to dimensional preferred orientation of biotite, the tiny biotite flakes may be equally distributed but in places form discontinuous layers or network-like features, the latter supposedly a result of a late deformation, rare idioblasts of garnets max. 0.15 across are restricted to the stratigraphically upper parts of the layer, mt forms a low- to medium - grade dissemination, the crystals being submegascopic.

Schistosity: 74° - 78°.

Gradual footwall.

472.75 - 474.65: Epidote - amphibole - qtz - fspar gneiss
(meta - keratophyr)

chemical
analysis

472.90-474.17m.

gr with huge green prisms and stellates, nonrhythmic cm- to dm- layering composed of fine - grained granoblastic qtz - fspar bands which contain not oriented slightly porphyritic prisms of amphibole and layers of epidote - amphibole - qtz - fspar rock characterized by porphyroblasts of amphibole which are oriented at random and constitute in places radiating aggregates, the amphibole crystals predominately are elliptical in outline and reach maximum 1.5 cm lengths, epidote mostly is concentrated within areas affected by stress, subordinate pyrite forming spots of irregular shape and discontinuous laminae is found between: 472.95-473.05 m and 474.02 - 474.15 m, mt displays a medium - grade locally dissemination, the crystals being submegascopic.

Banding: 472.95 m 52°, 473.50 m 66°, 474.20 m 82°.

Minor faults: 473.96 m, 474.00 m, 474.12 m, 475.46 - 475.50 m, 475.56 m.

Gradual footwall.

avd. Tverrfjellet

DDH 2000 D

474.65 - 482.59: Amphibole schist

(meta - basalt flow)

gn, fine - grained, predominately with nematoblastic texture, often with irregular qtz - veining, qtz is accompanied by crystal- aggregates of biotite within stratigraphically lower parts, tiny spots of ilmenite occur between: 474.65 - 478.20 m and 480.10 - 481.80 m, pyrite forms rare xenomorphic spots; dm insections of high epidote - qtz - plagioclase - amphibole schist with amphibole being medium - grained at: 474.88 - 475.00 m, 475.45 - 476.15 m, 476.87 - 476.90 m, 480.90 - 481.20 m, 481.40 - 481.50 m, 481.80 - 481.90 m and 482.15 - 482.30 m.

Sharp contact at footwall.

482.59 - 483.20: Magnetite - quartzite

(meta - chert, oxide facies iron formation)
gr with slight bluish tint, dense, finest low - grade dissemination of mt, crude development of layering due to streaks and schlieren or trains of granules of po.

Lamination: 68°.

Sharp footwall.

483.20 - 483.38: Amphibole - epidote - qtz - fspar gneiss

(banded amphibolite, meta - mafic tuff)

gn to yellowishgn, layered, close alternation of fine - grained granoblastic epidote - qtz - fspar layers and bands of porphyric amphibole, the crystals being oriented at random and locally form radiation aggregates, pyrite makes up 2Vol-% of the rock and mainly is concentrated within the lower portion of the section, it forms elongated crystals or crystal aggregates and often fills the interstices of the amphibole blasts.

Layering: 67°.

Sharp footwall.

DDH 2000 D

483.38 - 485.05: Biotite - chlorite - bear. qtz - fspar amphibolite
(meta - basalt flow)

chemical
analysis
483.85-484.45m.

AA

grgn, medium - grained, distinct foliation of mafic compounds parallel to axial plane, crude development of leopard texture, homogeneous, closely packed ellipsoidal crystal aggregates composed of fibrous amphibole or amphibole and chlorite surrounded by fine - grained granoblastic qtz and fspar, biotite is restricted to a interlayer with weak to strong rock alternation which extends from 483.75 to 484.45 m, the highest alternation with biotite - schist and amphibole - chlorite schist both containing subordinate py is centered around 484.20 - 484.40 m. Layering, foliation: 75°.

485.05 - 494.40: Chlorite - qtz - plagioclase - amphibolite
(meta - basalt flow with local alteration)
grgn, locally browngr coloured, medium - but sometimes coarse - grained, often with distinct leopard texture which is most conspicuous parallel to the lineation, closely spaced crystal aggregates composed of either amphibole or amphibole and chlorite surrounded by fine - grained granoblastic qtz - fspar which locally contains abundant epidote, dm - thick intersections of weakly sometimes strongly altered rock situated at: 485.40 - 485.55 m, 485.90 - 486.75 m, 493.00 - 494.40 m, the sections have gradual contacts with the surrounding, the most characteristic mineral is biotite which forms multi-crystal pseudomorphs (fascicular bundles or bow-tie crystal shapes) after amphibole and chlorite thus the original texture of the rock is continuous despite areas where biotite forms closely spaced parallel streaks the orientation being stressinduced.
Sharp footwall contact.

A and AA

494.40 - 507.90: Chlorite bear. qtz - fspar amphibolite
(meta - basalt flows, intermittent flows)

chemical
analysis
494.52-495.67m
and
502.54-503.35m

same as: 483.38 - 485.05 m, but locally similar
485.05 - 494.40 m, here often with subordinate
or higher amount of biotite, within 504.00-505.35m
and 506.70 - 507.90 m strong biotitization
which decreases upsection, scattered mm - large
idioblasts of garnet are characteristic for the
stratigraphically upper zone with biotitization,
pyrite forms a low - grade dissemination at:
495.54 and at 499.50 m, slightly higher pyrite
content is found within 502.54 - 503.35 m; a
layer, characterized by cm - large nodules of dense
quartz surrounded by chloritic amphibole schist
which contains abundant idioblasts of pyrite; dm -
thick interlayers of qtz - fspar - biotite schist
(meta - felsic tuff) which may locally contain
minute spots of garnet, oriented acicular amphi-
bole or fine - fibrous chlorite are found at:
494.55 - 494.90 m, 495.05 - 495.55 m, 501.45 -
501.85 m, 505.35 - 505.70 m, the grainsize of the
mafic crystal phase ranges from fine to coarse,
the fabric may be massive or schistose (layer at:
495.55 - 495.90 m is strongly disharmonic folded),
the stratigraphically lowest section is dis-
tinctly cm - banded, qtz and fspar form mm - large
round and/or ellipsoidal crystal aggregates which
alternate with fascicular or imperfect spherulitic
biotite, mm - large idioblasts of mt which makes up
2Vol-% of the rock are restricted to the layer at
495.05 - 495.55 m, this layer contains too a fin-
est low - grade dissemination of py.
Layering: 505.60 m 75°.

503.35 - 503.45 m: magnetite - quartzite

(meta - chert, oxide facies
iron formation)

same as: 482.59 - 483.20 m but
without po.

507.90 - 508.20: Garnet bear. biotite - chlorite - amphibole schist
(meta - basalt flow)

gr with brown and reddish brown streaks, fine -

DDH 2000 D

grained, strongly disharmonic folded, fine - fibrous amphibole is interlaminated by trains of granules of tiny crystals of garnet which are accompanied by streaks and clots of fibrous biotite and chlorite.

Gradually passing into underlying rock.

508.20 - 508.60: Garnet - biotite - qtz - fspar rock

(meta - felsic tuff)

same as: 495.55 - 495.90 m,

brownishgr, fine - grained with slightly porphyric biotite which has a tendency towards parallelism , crude development of compositional banding, in places some acicular amphibole the amount gradually decreasing towards upsection, rare tiny spots of pyrite and locally ilmenite.

Foliation a. layering: 38°.

Gradual footwall.

508.60 - 508.85: Garnet - chlorite - amphibole schist

(altered meta - basalt flow)

gr, porphyroblastic texture, porphyric amphibole needles on average 0.3 cm long slightly being oriented embedded in a matrix of fine - fibrous chlorite, garnet forms 0.1 cm large idiomorphs which equally are distributed but sporadically form trains of granules, occasionally mm - thick interlayers rich in qtz and fspar which rarely carry some pyrite.

Lamination: 48°.

Knife - sharp disconformable footwall.

508.85 - 509.40: Quartzite, altered amphibolite and sulphide mineralization

(bounded meta - chert or migrated - nodule, vein - quartz)

chaotic structure, irregular alternation of white dense quartzite and garnet - chlorite - amphibolite or coarse - grained biotite - chlorite schist, always knife - sharp contacts between quartzite and

chemical
analysis
507.95-
508.85m.

A

chemical
analysis
508.85-509.40m.

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partly A and
AA

mafic layers, po forms clusters which contain little pyrite and sporadically streaks of cy, the sulphide content does not exceed 10 Vol-%. Sharp footwall contact, 45°.

509.40 - 509.65: Biotite - amphibolite

A

(meta - basalt flow, weakly altered)
same as: altered sections within 485.05 - 494.40 m, near footwall gradually passing into schistose amphibolite which is extremely fine-grained and show a nematoblastic texture, here tiny hypidio-morphic spots of ilmenite equally being distributed. Knife-sharp footwall.

509.65 - 509.80: Magnetite - quartzite

(meta - chert, oxide facies iron formation)
same as: 482.59 - 483.20 m but without po mineralization.
Knife-sharp footwall.

509.80 - 510.80: Garnet bear. magnetite - amphibole schist

chemical
analysis
509.80-510.80m.

(meta - mafic tuff/flow)
gn, medium - crystalline, imperfect banding composed of cm- thick layers of garnet - magnetite - amphibole schist, and streaks of fine - grained granoblastic magnetite, trains of granules of garnet and mm- thick bands or flasers of sulphide which normally carry abundant qtz, amphibolite layers have nematoblastic texture, the garnet forms slightly porphyric idiomorphic crystals which equally are distributed, the sulphide (py) - content of the section amounts to 2 Vol.-%. Gradual footwall.

510.80 - 511.70: Biotite bear. qtz - fspar amphibolite

(meta - basalt flow)
lightgn, medium - grained, slightly foliated, indistinct leopard texture, fascicular to bow - tie shaped crystal aggregates of amphibole and biotite in close alternation with mm- large irregular for-

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med crystal aggregates of qtz and fspar, rare spots of py.
Gradual footwall.

511.70 - 522.25: Schistose amphibolite

(meta intermittent basalt flows)

gn locally grgn, mostly fine - grained with nematoblastic texture but locally medium - grained with tendency towards leopard texture, biotite as fascicular bundles occurs from 515.10 upsection, it may either be equally distributed or is enriched within mm- sometimes cm- thick layers which carry abundant qtz and occasionally chlorite, scattered xenomorphic crystals of ilmenite - max. 0.1 cm across are found between 512.80 - 513.15 and 512.00-512.38 m, high amount of epidote is found with 511.80 - 511.97 m, here acicular amphibole - needles on average 0.2 cm long - form an open framework of touching and crosscutting crystals within a fine - grained mosaic of epidote and supp. qtz. Gradual footwall contact.

AA

511.70 - 511.80 m: biotite chlorite schist

(meta - highly altered mafic volcanic)

browngn, porphyroblastic texture, max. 0.3 cm large bow - tie shaped and imperfect spherulitic crystal aggregates of biotite surrounded by interleaved, fine - fibrous chlorite which seems to be oriented, a medium - grade dissemination of py occurs at 511.77 m.

chemical
analysis

512.38-512.57m.

512.38 - 512.57 m: Garnet bear. magnetite - amphibole schist

(meta - mafic tuff/flow)

same as: 509.80 - 510.80 m, even richer in mt.

515.10 - 515.66 m: amphibole bear. qtz - fspar - biotite schist

(meta-felsic tuff) same as: felsic tuff within 494.40-507.90 m, here massive without garnet but scattered hyidioto idiomblasts of fspar max. 0.2 cm across, amphibole and subordinate chlorite are concentrated within the lower portion of the layer gradually.

decreasing upsection.

Sharp hanging wall, gradual footwall.

516.30 - 517.00 m: epidote bear. qtz - fspar - biotite schist

(meta - felsic tuff)

same as: 471.50 - 471.62 m but with no amphibole, crude lamination due to tendency of biotite to form streaks and lenses which are closely packed and alternate with fine - grained granoblastic interlocked qtz - fspar which sporadically are associated by epidote.

Lamination: 66° being in places strongly deformed, folded.

Sharp hanging wall and footwall.

518.35 - 518.53 m: amphibole qtz - fspar rock

(meta - keratophyr)

gr - milky - with gn needles massive porphyroblastic texture, scattered prisms of amphibole max. 0.2 cm long embedded in a matrix of fine - grained granoblastic qtz and fspar, amphibole needles show a faint orientation, rare spots of py.

Indistinct contacts to surrounding amphibolite.

522.25 - 523.70: Amphibole - biotite - sericite schist

(tuffaceous meta - pelite)

gr with faint greenish tint, crude development of flaser and lenticular structure, porphyroblastic texture, biotite forms fascicular bundles or incomplete spherulites max. 0.3 cm large which are scattered through a matrix of fine - fibrous sericite forming the foliation, average 0.4 cm long needles of amphibole randomly oriented are equally distributed, amphibole gradually increases in mode upsection.

Gradual footwall.

523.70 - 558.70: Biotite - sericite schist

(meta - pelite)

gr with faint greenish tint, homogeneous schist alternates with sections being banded and sections

which are characterized by flaser or lenticular structure, the banded areas show a cm - layering composed of bands of fine - fibrous sericite poor in biotite, layers of qtz - biotite - sericite schist and qtz dominated bands with tiny streaks of biotite and sericite which cause a superimposed imperfect lamination, the layering contacts are always sharp but sporadically seem to be gradual upwards, porphyroblastic texture throughout, scattered biotite forming fascicular bundles, bow - type crystal aggregates and incomplete spherulites being max. 0.2 cm large, the biotite clots are in most of the cases not oriented (cross - mica) they are in places interlocking thus constituting discontinuous layers or streaks which tend to be aligned along one or another plane of foliation, biotite equally is distributed it sometimes however may increase to such an amount to form a sericite - biotite interlayer, carbonate mainly lacks but is found as scattered hypidite - and idiomorphs max. 0.2 cm across between 527.55 - 528.30 m, 531.70 - 532.05 m, and 557.15 - 557.35 m, a scarcity is the occurrence of porphyroblasts of amphibole the needles being max. 0.5 cm long and not oriented.

537.55 - 539.35: biotite - sericite - amphibole - qtz rock

(meta - greywacke or coarse - grained sandstone) darkgr with faint greenish tint, medium - grained, massive, scattered cm - large elongate qtz - clasts with indistinct borders to the surrounding embedded in a matrix of fine - grained qtz and sericite and slightly porphyritic amphibole - needles max. 0.15 cm long - and/or biotite which forms fascicular bundles or bow - tie aggregates, both mafic crystal phases are not oriented, amphibole and biotite seem to exclude themselves.

Strongly tectonized between 538.75 - 539.35 m. Gradual hanging wall and tectonic footwall contact. 556.70 - 558.70 m: biotite - sericite schist

sample: 2000D/19
19a 538.00m
19b 537.67m

chemical
analysis
557.90-
558.17m.

(meta - pelite or psephite with abundant matrix)
(paraconglomerate ?)

gr with faint greenish tint and deepbrown streaks and layers, laminated, some intersections with lenticular structure (blastopsephitic texture ?), here cm - large nodules of elliptical shape composed of either carbonate or qtz - carbonate surrounded by fine - fibrous sericite which contains crystal aggregates of biotite with sparce orientation; within 557.90 - 558.17 m carbonate - biotite-chlorite schist (AA - type schist) layer contains a low - grade dissemination and minor lumbs of po the latter being closely connected to streaks of po.

558.70 - 560.03: Biotite bear. amphibole sericite - fspar - qtz schist

(meta - qtz - pelite with volcanic impurity)
gngr, crudely developed flaser to lenticular structure which becomes more distinct within the stratigraphical lower portion of the layer, here alternation of felsic compounds as layers, lenses and streaks with bands and flasers of phyllosilicates carrying abundant porphyroblasts of amphibole on average 0.4 cm long which are oriented at random, the hanging portion looks quite massive and homogeneous with amphibole prisms being more abundant and equally distributed.

Gradual hanging wall with at least sudden appearance of amphibole, 72°, knife-sharp footwall, 62° supp. bedding fault line.

560.03 - 574.10: Plag. amphibolite

(meta - basalt flow)

lightgn, medium - grained with stratigraphically lowermost portion being slightly increased in grain-size, crude development of mineral orientation - lineation of prismatic amphibole, slight compositional changes upsection: decrease in felsic compounds increase in amphibole, lowermost portion

568.10 - 574.10 m with poorly defined leopard texture and with abundant oval nodules (mandels) of qtz or plagioclase which on average are 0.4 cm in size.

Intersections being strongly sheared: 560.10 - 560.75 m and 564.70 - 564.75 m.

Sharp footwall, 45°.

574.10 - 574.36: Sulphide - quartzite

chemical
analysis
574.10-
574.36m.

(meta - exhalite (volcanochemite))

gr with lustre of sulphide, web - like sulphide mineralization (50 Vol-%) composed of py which gradually decreases upsection and po and fine - grained granoblastic qtz which fills the open spaces of the web.

Sharp footwall.

574.36 - 574.66: Biotite bear. amphibole - fspar - qtz rock

(meta - keratophyr)

lightgr, porphyroblastic texture, decrease in amphibole upsection, porphyric needles of amphibole max. 0.5 cm long and randomly oriented in a fine - grained granoblastic qtz - fspar matrix which carries abundant tiny fascicular bundles of biotite, rare crosscutting trains of coarse crystalline biotite which is accompanied by fibrous chlorite and locally by carbonate, scarce spots of py and po.

Gradual footwall.

574.66 - 575.30: Biotite - chlorite bear. plag. amphibolite

partly AA

(interfingering of meta - basalt and altered tuff)

grgn with browngrn streaks, nonrhythmic alternation of medium - grained plag. amphibolite with imperfect leopard texture with stripes and layers or crosscutting veins composed of coarse crystalline biotite fine - fibrous chlorite and - only locally - idiomorphs of carbonate and minor spots of sulphide (po, py).

Sharp footwall, 60°.

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575.30 - 683.18: Schistose amphibolite

(meta - basalt flow)

gr, extremely fine - grained with intersections being fine - grained, homogeneous with scarce mm-thick bands or discontinuous layers of carbonate which sometimes crosscut the major plane of foliation, sporadically cm-thick interlayers of biotite - carbonate which contain elongate spots or trains of granules of py, scattered interlocked elongate plagioclase crystals as lenses of max. 0.2 cm long dimension (vug fillings) between: 620.60 - 626.00 m, finest dissemination of ilmeneite - 3 Vol-% - between: 675.50 - 677.30 m; several streaks and giant spots of py, the sulphide grading 1 to 2% by volume of the rock, between: 682.90 - 683.18 m; carbonate banding: 577.00m 66°, 579.90 m 79°, 582.90 m 45°, 578.00 m 60°.

629.80 - 630.60 m: slightly calcareous biotite bear. amphibole - chlorite - sericite - qtz - plag. gneiss

(banded amphibolite, meta - mafic tuff)

lightgn, cm - banding composed of alternate layers of biotite - chlorite - sericite schist, slightly calcareous amphibole-qtz - fspar rock and amphibole-chlorite - sericite schist, the continuous banding in places is interrupted by intercalations of schistose amphibolite which are max. 10 cm thick and have sharp contacts with surrounding rock, the cm - banded sections display a porphyroblastic texture caused by randomly oriented idiomorphs of amphibole being max. 0.4 cm long which are locally replaced by biotite.

Sharp contact.

655.05 - 655.45 m: qtz - fspar - chlorite - amphibole gneiss

(banded amphibolite, meta - mafic tuff)

gn, crude development of layering due to slight compositional changes, distinct porphyroblastic texture which is caused by the tendency of amphibole to form coarse ellipsoidal prisms which dis-

play an open framework of touching crystals the interstices being filled by fine - fibrous chlorite and fine - grained granoblastic qtz.

Sharp contact.

683.18 - 684.17: Amphibole - qtz - fspar rock

(meta - keratophyr, flow)

chemical
analysis
682.90-
684.17m.

gr with distinct reddish tint, homogeneous with crude development of gneissic texture, slightly schistose, interlocking elongate qtz- fspar or fspar crystals as layers or lenses in alternation with slightly porphyric acicular amphibole forming the foliation, py mainly is concentrated within the lowermost portion forming streaks and elongate giant spots, it here amounts to 1 Vol-%. Foliation: 75°.

Small faults at: 684.05 m, 683.88 m, 683.84 m.

Sharp hanging wall with 82° to core axis, bedding fault line as footwall contact.

684.17 - 689.90: Calcareous amphibole schist

(intermittent basalt flows with mafic tuff interlayers)

gn, fine - grained, nematoblastic texture, homogeneous, carbonate forms mm- layers or trains of granules normally conformable with the major plane of foliation within the stratigraphical upper part, it occurs as spotted carbonate - scattered idio- blasts on average 0.4 cm across - within the foot- wall section, here it is strongly enriched, py is found as tiny spots throughout its amount being lesser 1 %, interlayers of mafic tuff at: 685.05- 685.15 m, 686.30 - 686.35 m, 688.18 - 688.48 m, 689.40 - 689.90 m.

Calcareous to high calcareous chlorite bear. qtz - plag. amphibole gneiss/rock

A

gn to lightgn with abundant white spots, medium - grained, crude development of compositional band- ing, idiomorphs of carbonate max. 0.4 cm across be- ing equally distributed but sometimes forming trains

DDH 2000 D

of granules or layers, low - grade dissemination of py forming xeno - to hypidiomorphic crystals or bigger elongated crystal aggregates.

Mainly sharp contacts with surrounding basalt, sometimes slight gradations - contact to lying sericite schist - or bedding fault lines.

689.90 - 701.60: Biotite - sericite schist

(meta - pelite)

gr with faint greenish tint, crudely laminated, streaks and flasers and discontinuous laminae of biotite in alternation with fine - crystalline qtz - sericite, biotite sporadically forms fascicular bundles or immature spherulites both being not oriented, the uppermost portion is strongly disharmonic folded with in places lenticular structure and contains abundant qtz - nodules by strongly foliated sericite and biotite, intersections with high amount in scattered idiomorphs of carbonate max. 0.4 cm across between : 693.70-694.80 m.

Schistosity : 693.00 m 72°, 695.50 m 50°, 696.50 m 72°, 701.40 m 80°.

701.60 end of DDH.

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Occurrence of sulphide

- 59.80 - 60.10 m : sparse spots of cp
 91.25 - 91.45 m : spots, stringers, net - work features of py, 1 Vol.-%.
- * 94.87 - 94.89 m : big crystals of py joining amphibole crysts, 10 Vol.-%.
- 99.15 - 99.30 m : coarse grains of py, 1 to 2 Vol.-%
 100.40 - 100.50 m : scattered grains of py, 3 Vol.-%
 100.82 - 100.93 m : some schlieren of py
 105.10 - 105.20 m : sparse spots of cp
 106.45 - 107.12 m : sparse crystals of py
 112.05 - 113.25 m : sparse crystals of py
 128.90 - 129.90 m : sparse discrete crystals of py and po
 129.90 - 130.30 m : spotted py, 1 Vol.-%
 189.30 - 192.25 m : single crystals of py
 231.75 - 232.45 m : sparse crystals of py
 232.05 - 232.26m: trains of granules of py, 2 Vol.-%
- 251.85 - 258.10 m : sparse spots of py
 265.75 - 265.95 m : idiomblasts of py, < 1 Vol.-%
 325.50 - 325.85 m : low - grade dissemination of py, < 1 Vol.-%
 325.85 - 333.30 m : sparse spots of py
 403.45 - 407.20 m : spots of py, < 1 Vol.-%
 433.80 - 434.80 m : sparse tiny spots of py
 442.50 - 442.90 m : scattered py and po, 1 Vol.-%
 460.00 - 462.25 m : spots of py
 462.25 - 462.75 m : low - grade dissemination of py, 2 Vol.-%
- * 466.20 - 466.60 m : several stripes of nearly massive py and po
 466.75 - 466.85 m : sparse spots of py and po
 467.80 - 468.10 m : minute spots of py, < 1 Vol.-%.
 469.15 - 470.15 m : sparse spots of py and po
 470.15 - 470.95 m : frequent spots, flasers and lenses of py, 1 to 2 Vol.-%.
- * 471.62 - 471.73 m : big crystals of po surrounded by amphibole, 5 - 7 Vol.-%
- 472.75 - 474.65 m : sparse spots of py
 474.65 - 482.59 m : sparse spots of py
 482.59 - 483.20 m : streaks, schlieren and trains of granules of po, 1 Vol.-%
 483.20 - 483.38 m : crystals of py, 2 Vol.-%
 484.20 - 484.40 m : sparse crystals of py
 495.54 m : crystals of py
 499.50 m : crystals of py
 502.54 - 503.35 m : dissemination of py, 5 Vol.-%
 508.20 - 508.60 m : sparse spots of py
- * 508.85 - 509.40 m : clusters of po, little py and sparse schlieren of cp, 10 Vol.-%
- * 509.80 - 510.80 m : schlieren and streaks of py, 2 Vol.-%
 511.77 m : dissemination of py, 5 Vol.-%
- * 512.38 - 512.57 m : schlieren and streaks of py, 2 Vol.-%
 518.35 - 518.53 m : sparse crystals of py
 557.90 - 558.17 m : lumbs and spots of po, streaks of cp, < 1 Vol.-%
- * 574.10 - 574.36 m : web-like py mineralization with po, 50 Vol.-%
 574.36 - 574.66 m : sparse crystals of py and po
 682.90 - 683.18 m : streaks and giant spots of py, 1 to 2 Vol.-%
 683.18 - 684.17 m : streaks and elongate spots of py, < 1 Vol.-%
 684.17 - 689.90 m : tiny spots of py, < 1 Vol.-%
 685.05 - 685.15 m : dissemination of py, < 1 Vol.-%

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686.30 - 686.35 m : dissemination of py, < 1 Vol.-%
688.18 - 688.48 m : dissemination of py, < 1 Vol.-%
689.40 - 689.90 m : dissemination of py, < 1 Vol.-%

* stands for high concentration of sulphides

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Occurrence of oxides

90.70 - 91.18 m : spotted ilmenite, 5 Vol.-%
91.25 - 91.45 m : magnetite chert
94.90 - 95.92 m : magnetite chert
95.92 - 100.82 m : spotted mt, 2 Vol.-%, supp. some ilmenite
99.09 - 99.15 m: magnetite chert
112.60 - 113.25 m : low - grade dissemination of mt
113.25 - 113.90 m : idiomorphs of mt, 10 - 15 Vol.-%
189.30 - 189.47 m : low - grade dissemination of ilmenite
190.50 - 190.75 m : low - grade dissemination of ilmenite
427.80 - 431.00 m : spotted ilmenite, 5 Vol.-%
431.30 - 431.50 m : spotted ilmenite, 5 Vol.-%
431.80 - 433.20 m : spotted ilmenite, 5 Vol.-%
462.25 - 462.75 m : abundant ilmenite, 8 Vol.-%, some mt
466.75 - 466.85 m : low - grade dissemination of mt
467.80 - 468.10 m : low - grade dissemination of ilmenite, some mt
471.73 - 472.75 m : dissemination of mt
472.75 - 474.65 m : dissemination of mt
474.65 - 478.20 m : dissemination of ilmenite
480.10 - 481.80 m : dissemination of ilmenite
482.59 - 483.20 m : magnetite chert
495.05 - 495.55 m : idiomorphs of mt, 2 Vol.-%
503.35 - 503.45 m : magnetite chert
508.20 - 508.60 m : sparse crystals of ilmenite
509.65 m : crystals of ilmenite
509.65 - 509.80 m : magnetite chert
509.80 - 510.80 m : mt - rich amphibolite
512.38 - 512.57 m : mt - rich amphibolite
675.50 - 677.30 m : dissemination of ilmenite, 3 Vol.-%

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Sediments with carbon content

279.50 - 281.55 m, 283.70 - 284.40 m, 299.30 - 301.40 m,
301.40 - 304.50 m, 304.50 - 309.50 m, 325.50 - 325.85 m.

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Samples for chemical analysis

			%Cu	%Zn	%S
91.18	-	91.45 m	: 0.03,	0.03,	—
94.75	-	94.91 m	: 0.02,	0.02,	1.85
94.91	-	95.98 m	: 0.04,	0.02,	0.19
99.09	-	99.30 m	: 0.02,	0.03,	0.04
100.40	-	100.50 m	: 0.03,	0.03,	—
100.82	-	100.93 m	: 0.04,	0.02,	2.73
128.90	-	130.30 m	: 0.04,	0.02,	—
460.20	-	462.25 m	: 0.03,	0.03,	—
466.15	-	466.60 m	: 0.09,	0.02,	15.5
469.57	-	469.75 m	: 0.06,	0.02,	0.47
471.62	-	471.73 m	: 0.06,	0.02,	4.84
471.73	-	472.90 m	: 0.03,	0.03,	—
472.90	-	474.17 m	: 0.03,	0.03,	—
483.20	-	483.38 m	: 0.10,	0.02,	2.09
483.85	-	484.45 m	: 0.04,	0.02,	0.58
494.52	-	495.67 m	: 0.02,	0.02,	—
502.54	-	503.35 m	: 0.14,	0.18,	2.97
507.95	-	508.85 m	: 0.03,	0.03,	—
508.85	-	509.40 m	: 0.14,	0.01,	8.80
509.80	-	510.80 m	: 0.06,	0.03,	0.92
511.70	-	511.80 m	: 0.05,	0.03,	0.10
512.38	-	512.57 m	: 0.03,	0.01,	—
557.90	-	558.17 m	: 0.05,	0.03,	0.25
574.10	-	574.36 m	: 0.04,	0.01,	29.7
682.90	-	684.17 m	: 0.03,	0.02,	—
684.17	-	685.17 m	: 0.03,	0.02,	—
686.30	-	687.30 m	: 0.03,	0.02,	—
687.30	-	688.30 m	: 0.03,	0.02,	—
688.30	-	689.30 m	: 0.02,	0.02,	—
689.30	-	689.40 m	: 0.06,	0.02,	—

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Suzeptibility measurements DDH 2000 D (sciutrex SM - 5)ResultsSuzeptibility:

15.50	0.0	68.50	0.0	103.50	0.0	140.50	0.0
16.50	0.1	69.50	0.1	104.50	0.0	141.50	0.0
17.50	0.1	70.50	0.0	105.50	0.0	142.50	0.0
18.50	0.0	71.50	-0.1	106.50	0.0	143.50	0.0
19.50	0.1	72.50	0.0	107.50	0.0	144.50	0.1
20.50	0.0	73.50	0.0	108.50	0.0	145.50	0.1
21.50	0.0	74.50	0.0	109.50	0.0	146.50	0.1
22.50	0.0	75.50	0.0	110.50	0.1	147.50	0.1
23.50	0.0	76.50	0.0	111.50	0.0	148.50	0.1
24.50	0.0	77.50	0.0	112.30	0.1	149.50	0.1
25.50	0.0	78.50	0.0	112.50	3.9	150.50	0.1
26.50	0.0	79.50	0.0	112.60	4.2	151.50	0.1
27.50	0.1	80.50	0.0	112.80	1.2	152.50	0.0
28.50	0.1	81.50	0.1	113.00	3.1	153.50	0.0
29.50	0.0	82.50	0.0	113.10	4.0	154.50	0.0
30.50	0.0	83.50	0.0	113.25	4.5	155.50	0.0
31.50	0.0	84.50	0.0	113.35	6.5	156.50	0.0
32.50	0.0	85.50	0.0	113.40	22.0	157.50	0.1
33.50	0.1	86.50	0.0	113.50	1.9	158.50	0.0
34.50	0.0	87.50	-0.1	113.60	0.0	159.50	0.0
35.50	0.0	88.50	0.0	113.80	0.0	160.50	0.0
36.50	0.0	89.50	0.0	113.90	0.3	161.50	0.1
37.50	0.1	90.50	0.1	114.00	0.3	162.50	0.1
38.50	0.1	91.00	0.0	114.20	0.1	163.50	0.0
39.50	0.1	91.20	0.1	114.35	0.0	164.50	0.0
40.50	0.0	91.30	29.0	114.50	0.1	165.50	0.0
41.50	0.0	91.40	21.0	115.30	0.1	166.50	0.1
42.50	0.0	91.50	0.1	115.50	0.2	167.50	0.1
43.50	0.0	92.30	0.1	116.50	0.2	168.50	0.1
44.50	0.0	92.70	0.1	117.50	0.1	169.50	0.0
45.50	0.1	93.00	0.1	118.50	0.2	170.50	0.1
46.50	0.0	93.50	0.0	119.50	0.4	171.50	0.1
47.50	0.0	93.70	0.1	119.90	0.3	172.50	0.1
48.50	0.1	94.50	0.1	120.50	0.4	173.50	0.1
49.50	0.0	94.60	0.0	121.50	0.3	174.50	0.1
50.50	0.0	94.85	0.0	122.50	0.1	175.50	0.1
51.50	0.0	94.95	47.0	123.50	0.1	176.50	0.1
52.50	0.1	95.10	36.0	124.50	0.1	177.50	0.0
53.50	0.1	95.30	48.0	125.50	0.1	178.50	0.0
54.50	0.1	95.50	0.2	126.50	0.1	179.50	0.0
55.50	0.0	95.60	53.0	127.50	0.1	180.50	0.0
56.50	0.1	95.70	39.0	128.50	0.0	181.50	0.2
57.50	0.0	95.80	55.0	129.50	0.0	182.50	0.2
58.50	0.0	96.00	0.5	130.50	0.0	183.50	0.1
59.50	0.0	96.50	0.1	131.50	0.0	184.50	0.1
60.50	0.1	97.50	4.3	132.50	0.0	185.50	0.0
61.50	0.1	98.50	0.7	133.50	0.0	186.50	0.1
62.50	0.1	99.15	2.3	134.50	0.1	187.50	0.1
63.50	0.0	99.30	2.1	135.50	0.0	188.50	0.1
64.50	0.1	99.50	6.8	136.50	0.1	189.50	0.1
65.50	0.0	99.70	2.5	137.50	0.0	190.50	0.0
66.50	0.0	100.50	3.0	138.50	0.1	191.50	0.0
67.50	0.0	101.50	0.0	139.50	0.0	192.50	0.1

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DDH 2000 D

193.50	0.0	250.50	0.1	304.50	0.1	361.50	0.1
194.50	0.0	251.50	0.0	305.50	0.0	362.50	0.0
195.50	0.0	252.50	0.1	306.50	0.1	363.50	0.0
196.50	0.0	253.50	0.0	307.50	0.0	364.50	0.0
197.50	0.1	254.50	0.0	308.50	-0.1	365.50	0.0
198.50	0.2	255.50	0.1	309.50	0.1	366.50	0.0
199.50	0.1	256.50	0.1	310.50	0.1	367.50	0.0
200.50	0.0	257.50	0.0	311.50	0.1	368.50	0.0
201.50	0.0	258.50	0.0	312.50	0.1	369.50	0.0
202.50	0.0	258.78	0.3	313.50	0.0	370.50	0.0
203.50	0.1	259.50	0.0	314.50	0.0	371.50	0.0
204.50	0.0	260.50	0.0	315.50	0.1	372.50	0.0
205.50	0.0	261.50	0.0	316.50	0.1	373.50	0.1
206.50	0.2	262.50	0.0	317.50	0.1	374.50	0.1
207.50	0.6	263.50	0.0	318.50	0.0	375.50	0.1
208.20	0.1	264.50	0.0	319.50	0.1	376.50	0.0
208.50	0.0	265.50	0.0	320.50	0.1	377.50	0.0
209.50	0.0	265.85	0.0	321.50	0.1	378.50	0.0
210.50	0.0	266.50	0.0	322.50	0.2	379.50	0.1
211.50	0.2	267.50	0.0	323.50	0.1	380.50	0.1
212.50	0.1	268.50	0.0	324.50	0.1	381.50	0.1
213.50	0.1	269.50	0.1	325.50	0.1	382.50	-0.1
214.50	0.0	270.50	0.2	326.00	0.0	383.50	0.0
215.50	0.1	271.50	0.1	326.50	0.3	384.50	-0.1
216.50	0.1	272.50	0.1	327.50	0.0	385.50	0.0
217.50	0.1	273.50	0.0	328.50	0.1	386.50	0.0
218.50	0.0	274.50	0.0	329.50	0.1	387.50	0.0
219.50	0.0	275.50	0.0	330.50	0.2	388.50	0.0
220.50	0.1	276.50	0.1	331.50	0.0	389.50	-0.1
221.50	0.0	277.50	0.1	332.50	0.6	390.50	0.0
222.50	0.1	278.50	0.0	333.20	0.1	391.50	-0.1
223.50	0.0	279.50	0.0	333.50	0.2	392.50	0.0
224.50	0.0	280.50	0.1	334.50	0.0	393.50	0.0
225.50	0.1	281.50	0.1	335.50	0.1	394.50	0.1
226.50	0.0	282.50	0.1	336.50	0.2	395.50	0.0
227.50	0.1	283.50	0.0	337.50	0.4	396.50	0.0
228.50	0.0	284.50	0.0	338.50	0.2	397.50	0.0
229.50	0.1	284.90	0.1	339.50	0.0	398.50	0.0
230.50	0.1	285.30	0.1	340.50	0.0	399.50	0.0
231.50	0.2	285.50	0.0	341.50	0.0	400.50	0.0
232.10	1.1	286.30	0.0	342.50	0.0	401.50	0.0
232.50	0.0	286.50	0.0	343.50	0.1	402.50	0.0
233.50	0.1	287.50	0.0	344.50	0.1	403.50	0.0
234.50	0.4	288.50	0.0	345.50	0.1	404.50	0.0
235.50	0.3	289.50	0.0	346.50	0.1	405.50	0.0
236.50	0.2	290.50	0.0	347.50	0.1	406.50	-0.1
237.50	0.2	291.50	0.0	348.50	0.1	407.50	0.0
238.50	0.1	292.50	0.1	349.50	0.1	408.50	0.0
239.50	0.1	293.50	0.1	350.50	0.0	409.50	0.0
240.50	0.0	294.50	0.0	351.50	0.0	410.50	0.0
241.50	0.0	295.50	0.1	352.50	0.1	411.50	0.0
242.50	0.0	296.50	0.0	353.50	0.1	412.50	0.1
243.50	0.0	297.50	0.0	354.50	0.0	413.50	0.1
244.50	0.0	298.50	0.0	355.50	0.0	414.50	0.0
245.50	0.0	299.50	0.0	356.50	0.1	415.50	0.0
246.50	0.1	300.50	0.1	357.50	0.1	416.50	0.0
247.50	0.1	301.50	0.1	358.50	0.1	417.50	0.0
248.50	0.1	302.50	0.1	359.50	0.1	418.50	0.0
249.50	0.0	303.50	0.2	360.50	0.1	419.50	0.0

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DDH 2000 D

420.50	0.0	465.80	0.2	481.60	0.1	509.50	0.0
421.50	0.0	466.00	0.0	482.15	0.3	509.60	0.0
422.50	0.0	466.20	1.9	482.30	0.1	509.75	2.6
423.50	0.0	466.50	0.3	482.45	0.1	509.90	1.4
424.50	0.0	466.55	0.7	482.60	10.0	510.05	52.0
425.50	0.0	466.70	0.1	482.70	6.0	510.15	24.0
426.50	0.0	466.80	0.5	482.90	4.7	510.25	29.0
427.50	0.0	467.20	0.1	483.00	6.0	510.40	23.0
428.50	0.1	467.50	0.0	483.15	6.3	510.50	33.0
429.50	0.0	467.70	0.0	483.25	0.4	510.60	11.0
430.50	0.0	467.95	0.7	483.35	6.0	510.75	0.1
431.50	0.0	468.10	0.3	483.50	0.1	511.50	0.0
432.50	0.0	468.20	0.0	483.90	0.0	511.75	0.0
433.50	0.0	468.50	0.0	484.10	0.3	511.90	0.0
434.50	0.0	469.40	0.0	484.25	0.8	512.20	0.0
435.50	0.0	469.60	0.0	484.35	1.2	512.40	38.0
436.50	0.0	469.70	0.6	484.55	0.0	512.50	1.7
437.50	0.0	469.90	0.0	485.50	0.0	513.50	0.1
438.50	0.0	470.50	0.0	486.50	0.1	514.50	0.0
439.50	0.0	470.80	0.0	487.50	0.0	515.50	0.0
440.50	0.0	471.20	0.0	488.50	0.0	516.20	0.1
441.50	0.1	471.45	0.0	489.50	0.0	517.00	0.1
442.50	0.0	471.55	0.0	490.50	0.0	517.50	0.1
443.50	0.1	471.70	2.4	491.50	0.1	518.50	0.1
444.50	0.0	471.80	2.4	492.50	0.1	519.50	0.0
445.50	0.0	471.90	1.7	493.50	0.1	520.50	0.0
446.50	0.0	472.00	1.3	494.25	0.1	521.50	0.1
447.50	0.0	472.10	1.8	494.50	0.4	522.40	0.1
448.50	0.0	472.20	3.0	494.70	1.1	523.50	0.0
449.50	0.0	472.35	0.8	494.85	0.9	524.50	0.0
450.50	0.0	472.50	1.0	495.00	0.1	525.50	0.1
451.50	0.0	472.60	2.3	495.10	1.6	526.50	0.1
452.50	0.0	472.70	2.1	495.30	1.8	527.50	0.0
453.50	0.0	472.80	3.1	495.50	0.1	528.50	0.0
454.50	0.0	472.90	1.7	495.80	0.1	529.50	0.0
455.50	0.0	473.00	3.8	496.50	0.0	530.50	0.1
456.50	0.0	473.10	1.0	497.40	0.0	531.50	0.0
457.50	0.0	473.25	1.6	498.50	0.0	532.50	0.1
458.50	0.0	473.40	4.0	499.50	0.1	533.50	0.0
459.50	0.0	473.50	6.9	500.50	0.1	534.50	0.0
461.00	0.0	473.60	2.7	501.50	0.1	535.50	0.1
461.50	0.1	473.70	6.0	502.00	0.1	536.50	0.1
461.70	0.1	473.80	7.8	502.50	0.0	537.50	0.1
461.80	0.1	473.90	4.6	502.80	0.9	538.50	0.0
461.90	0.2	474.00	3.1	502.90	1.4	539.50	0.1
462.00	0.1	474.10	9.2	503.10	1.9	540.50	0.1
462.10	0.4	474.20	0.1	503.20	0.8	541.50	0.0
462.20	0.4	474.40	0.3	503.30	1.0	542.50	0.0
462.30	0.5	474.60	0.2	503.45	0.0	543.50	0.0
462.45	0.1	474.70	2.4	504.50	0.1	544.50	0.0
462.50	0.3	475.20	0.0	505.50	0.3	545.50	0.0
462.60	0.1	475.50	0.1	506.50	0.1	546.50	0.0
462.80	0.3	476.00	1.4	507.00	0.0	547.50	0.1
463.00	0.4	476.50	0.1	507.50	0.0	548.50	0.0
463.40	0.4	477.50	0.1	508.50	0.4	549.50	0.1
463.80	0.1	478.50	0.2	508.70	12.0	550.50	0.1
464.50	0.0	479.50	0.0	508.95	1.6	551.50	0.1
465.00	0.0	480.50	0.1	509.10	1.4	552.50	0.1
465.60	0.3	481.50	0.1	509.30	4.3	553.50	0.1

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DDH 2000 D

554.50	0.1	607.50	0.1	666.50	0.1
555.50	0.1	608.50	0.1	667.50	0.2
556.50	0.1	609.50	0.1	668.50	0.0
557.50	0.1	610.50	0.1	669.50	0.1
558.00	0.1	611.50	0.1	670.50	0.1
558.50	0.0	612.50	0.1	671.50	0.1
559.50	0.0	613.50	0.1	672.50	0.1
560.50	0.0	614.50	0.2	673.50	0.0
561.50	0.0	615.50	0.1	674.50	0.0
562.50	0.1	616.50	0.1	675.50	0.0
563.50	0.0	617.50	0.1	676.50	0.0
564.50	0.0	618.50	0.1	677.50	0.1
565.50	0.0	619.50	0.1	678.50	0.0
566.50	0.0	620.50	0.1	679.50	0.0
567.50	0.0	621.50	0.1	679.50	0.0
568.50	0.0	622.50	0.1	680.50	0.0
569.50	0.2	623.50	0.1	681.50	0.0
570.50	0.1	624.50	0.1	682.00	0.0
571.50	0.2	625.50	0.1	682.50	0.0
572.50	0.1	626.50	0.1	683.20	0.1
573.50	0.2	627.50	0.1	683.50	0.1
573.80	0.2	628.50	0.1	684.00	0.2
574.15	2.2	629.50	0.2	684.50	0.0
574.30	0.1	630.50	0.1	685.50	0.0
574.40	0.0	631.50	0.1	686.30	0.0
574.50	0.0	632.50	0.1	686.50	0.0
574.80	0.5	633.50	0.0	687.50	0.0
575.50	0.1	634.50	0.1	688.20	0.1
576.50	0.1	635.50	0.1	688.50	0.1
577.50	0.0	636.50	0.1	689.50	0.1
578.50	0.1	637.50	0.1	689.80	0.8
579.50	0.1	638.50	0.1	690.10	0.1
580.50	0.1	639.50	0.1	690.50	0.1
581.50	0.0	640.50	0.1	691.50	0.1
582.50	0.1	641.50	0.1	692.50	0.2
583.50	0.0	642.50	0.0	693.50	0.5
584.50	0.0	643.50	0.1	694.50	0.1
585.50	0.0	644.50	0.0	695.50	0.2
586.50	0.0	645.50	0.1	696.50	0.4
587.50	0.0	646.50	0.0	697.50	0.3
588.50	0.0	647.50	0.2	698.50	0.1
589.50	0.1	648.50	0.1	699.50	0.6
590.50	0.0	649.50	0.1	700.50	0.2
591.50	0.0	650.50	0.1	701.50	0.2
592.50	0.1	651.50	0.1		
593.50	0.1	652.50	0.0		
594.50	0.0	653.50	0.1		
595.50	0.0	654.50	0.0		
596.50	0.0	655.50	0.0		
597.50	0.1	656.50	0.0		
598.50	0.1	657.50	0.1		
599.50	0.0	658.50	0.1		
600.50	0.1	659.50	0.2		
601.50	0.1	660.50	0.2		
602.50	0.0	661.50	0.2		
603.50	0.1	662.50	0.2		
604.50	0.0	663.50	0.1		
605.50	0.0	664.50	0.0		
606.50	0.0	665.50	0.0		

RAILROAD PROFILE

(Hjerinn)

southern part

183.10 m southprolonging from point

527850 6899650 UTM grid, zone 32

Top map. 1519 III Hjerinn

By: Dr. F.D. Priesemann

southwards
downsection

- 0.00 - 4.80 : Magnetite - biotite quartzite
(meta - chert, oxide and silicate facies iron formation)
alternate gr with bluish tint and browngr, mm- to cm-compositional banding with some interlayers being dm-thick, always sharp layering contacts, more or less rhythmic alternation of dense magnetite quartzite with biotite phyllite to biotite schist, sparse intercalations of magnetite poor quartzite, discontinuous band of pyrite bear. sericite schist at 1.40 - 1.42 m.
Dip: 0.00 75° N, 2.00 m 74° N, 4.80 m 80° N .
Sharp footwall.
- 4.80 - 5.48 : Qtz - plagioclase rich biotite - amphibole schist
(meta - basalt, flow)
gn, medium - grained, nematoblastic texture, biotite as tiny flakes and discontinuous layers always parallel the major plane of foliation, rare spots of hypidomorphic py.
Dip: 5.48 m 70° N.
Sharp footwall.
- 5.48 - 6.07 : Magnetite quartzite
(meta - chert, oxide facies banded iron formation)
darkgr sporadically with distinct bluish tint, dense, laminated, close alternation of magnetite quartzite and mt - barren quartzite, rare mm- thick crosscutting veins of epidote.
Dip: 6.07 m 79° N.
Sharp footwall.
- 6.07 - 8.50 : Schistose amphibolite, amphibolite
(meta - basalt, flow)
gn, fine-to medium-grained, partly with nematoblastic texture, crudely layered by tiny bands of qtz - carbonate, pyrite is present occasionally , it slightly is enriched (< 2 Vol.-%) between 7.83 - 7.91 m.
Dip: 8.00 m 80° N.

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southwards
downsection

- 8.50 - 15.17 : Amphibole bear. biotite - sericite - chlorite schist
(meta - mixed mafic volcanic and epiclastic sedimentary layer)
gn to grgn, layered with flaser-structure caused by nodules of qtz and carbonate which equally are distributed
amphibole forms slightly porphyric needles which are parallel to the planar fissility of the rock, minor bands of carbonate are present between 8.62 - 8.78 m and 9.76 - 10.52 m, a qtz - keratophyr interlayer with low - grade dissemination of pyrite occurs at 9.00 - 9.05 m, pyrite is somewhat enriched (2 Vol.-%) between 12.27 - 12.57 m.
Dip: 12.00 m 83° N.
- 15.17 - 15.24 : Magnetite quartzite
(meta - chert, oxide facies banded iron formation)
blackish with distinct bluish tint, extremely fine - grained, dense, laminated by medium - grained schistose amphibolite which in places shows idiomorphs of carbonate, dust-like magnetite is found within chert as well as in amphibolite, latter carries occasionally some pyrite which forms discontinuous laminae.
Dip: 15.24 m 81° N.
- 15.24 - 16.76 : Schistose amphibolite
(meta - basalt, flow)
gn, medium - grained, nematoblastic texture, sometimes with crudely developed flaser - structure being due to scattered, tiny nodules of qtz or carbonate.
Dip: 16.86 m 83° N.
Sharp footwall contact.
- 16.76 - 16.81 : Magnetite - quartzite
(meta - chert, oxide facies banded iron formation)
same as: 15.17 - 15.24 m.
- 16.81 - 18.79 : Amphibolite
(meta - basalt, flow)
gn, fine - to medium - grained, sporadically with epidote veining, rare spots of py.
Dip: 17.10 m 85° N.

southwards
downsection

- 18.79 - 19.63 : Qtz - rich biotite bear. sericite - chlorite schist
(meta - altered mafic volcanic tuff)
AA gn to grgn, fine - crystalline, near footwall keratophyr increase in grain size towards coarse - grained rock, distinct compositional layering with sparse laminae of biotite.
- 19.63 - 19.65 : Amphibole bear. qtz - fspar rock
(meta - keratophyr)
gr to slightly greenishgr, fine - grained granoblastic with not oriented slightly porphyric needles of amphibole, low - grade dissemination (± 3 Vol.-%) of py.
Dip: 19.63 m 76° N.
- 19.65 - 19.71 : Schistose amphibolite
(meta - basalt, flow)
gn, fine - grained, nematoblastic texture.
- 19.71 - 19.88 : Amphibole - qtz - fspar gneiss
(meta - keratophyr with intermittent mafic tuff)
gr to gngr, fine - grained granoblastic qtz - fspar layers which carry slightly porphyric needles of amphibole being oriented at random alternate with laminae of fine - grained amphibolite, pyrite makes up on average 10 Vol.-% of the rock, it occurs as finest dissemination within qtz - kera. and amphibole layers but too forms discontinuous laminae.
Dip: 19.88 m 78° N.
- 19.88 - 20.05 : Schistose amphibolite
(meta - basalt, flow)
gn, fine - to medium - grained, nematoblastic texture, rare spots of pyrite.
- 20.50 - 21.28 : Calcareous qtz - rich biotite bear. sericite - chlorite schist
(meta - altered mafic volcanic tuff)
AA/C gn to lightgn, fine - crystalline, compositional layering with stringers and lenses of carbonate.
Dip: 20.80 m 78° N.

southwards
downsection

- 21.28 - 21.44 : Amphibole bear. qtz - fspar rock
(meta - keratophyr)
same as: 19.71 - 19.88 m , band of massive pyrite.
Dip: 21.30 m 71° N.
- 21.44 - 21.62 : Magnetite - quartzite
(meta - chert, oxide facies banded iron formation)
darkgr with bluish tint, extremely fine - grained,
dense, mm - alternation of magnetite rich and magnetite poor quartzite bands.
Dip: 21.62 m 80° N.
- 21.62 - 22.37 : Amphibolite
(meta - basalt, flow)
gn fine - grained with intersections being medium - grained, homogeneous but sometimes distinctly layered, lenses and stringers of carbonate throughout, medium - grade dissemination (10 Vol.-%) of pyrite at : 21.79 - 22.05 m.
Dip: 22.00 m 77° N.
- 22.37 - 22.43 : Magnetite quartzite
(meta - chert, oxide and sulphide facies banded iron formation)
same as: 21.44 - 21.62 m, occasionally mm - thick bands of massive pyrite.
Dip: 22.40 m 77° N.
- 22.43 - 24.33 : Plagioclase amphibole schist
(meta - basalt , flow)
gn, medium - grained, nematoblastic texture rare spots of pyrite.
Dip: 22.70 m 79° N.
- 24.33 - 24.83 : Biotite bear. qtz - rich amphibole schist
(meta - basalt , flow)
gn, predominately fine - grained, laminated with in places flaser - structure which is due to the tendency of quartz and biotite to form nodules and flasers res-

southwards
downsection

pectively, rare spots of pyrite.
Gradual contact to underlying rock.

- 24.83 - 25.33 : Amphibole bear. qtz - rich sericite - chlorite schist
(meta - tuffite)
gn, laminated with superimposed flaser - structure,
rare spots of py.
Dip: 25.00 m 79° N.
- 25.33 - 25.35 : Pyrite - sericite - amphibole schist
(meta - slightly altered mafic tuff with sulphide
impregnation)
gn, fine - grained, preferred orientation of sericite
and amphibole, medium - grade dissemination of pyrite
(< 15 Vol.-%).
- 25.35 - 25.50 : Sericite bear. qtz - amphibole schist
(meta - mafic tuffite)
gn to grgn, fine - as well as medium - grained, flaser-
structure, porphyroblastic texture due to coarse prisms
of amohibole being surrounded by fine - fibrous seri-
cite and fine - grained qtz, rare spots of pyrite.
Gradual footwall.
- 25.50 - 29.50 : Amphibole bear. qtz - rich chlorite - biotite - seri-
cite schist
(meta - tuffaceous pelitic sediment)
lightgn, porphyroblastic texture, mm - large porphyro-
blasts of amphibole which randomly are oriented decrease
in amount towards downsection, thus the rock gradually
passes into underlying pelitic schist which carries no
amphibole, biotite forms slightly porphyric crystals
which sporadically are aligned along the major foli-
ation of the rock.
Dip: 26.00 m 73° N, 29.50 m 79° N.
- 29.50 - 55.10 : Biotite bear. sericite schist
(meta - pelite)
gr with slight greenish tint, often with flaser struc-

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southwards
downsection

ture, locally passing into laminated rock, porphyroblastic texture, interlocking qtz crystals as layers or lenses in alternation with layers composed of fibrous, parallel sericite, biotite forms porphyroblasts and fascicular aggregates which are oriented at random, it is equally distributed thus cause a spotted appearance of the rock, pyrite sometimes occurs forming max. 0.2 cm large xenomorphic crystals.

Dip: 53.00 m 85° N.

Gradual footwall.

55.10 - 58.52 : High calcareous biotite bear. sericite schist
(meta - pelite)

same as: 29.50 - 55.10 m but with scattered idiomorphs of carbonate on average 1 mm across, locally cross-cutting carbonate veins, the mode of carbonate varies strongly without exceeding 20% by volume of the rock.

Dip: 56.00 m 79° N, 58.00 m 84° N.

Gradual footwall.

58.52 - 60.70 : Slightly calcareous biotite bear. sericite schist
(meta - pelite)

same as: 55.10 - 58.52 m but with lesser carbonate (< 1 Vol.-%).

Dip: 59.00 m 81° N.

Gradual footwall.

60.70 - 61.70 : Calcareous biotite - sericite schist
(meta - pelite)

same as: 55.10 - 58.52 m but with lesser carbonate.

61.22 - 61.30: Biotite bear. qtz - fspar rock

(meta - felsic tuff)

gr, fine - grained granoblastic, crudely developed foliation by slight orientation of biotite flakes, low - grade dissemination of idiomorphic crystals of py on average 0.1 cm across and fine - grained aggregates of po, sulphide amounts to max. 10% by volume of the rock.

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southwards
downsection

- 61.70 - 61.88 : Slightly carbonaceous biotite - sericite bear. pyrite fspar - qtz rock
(meta- sulphide - rich felsic volcanic)
lightgr, medium - grained granoblastic, mm- interlayers composed of carbonate - biotite - sericite with subordinate graphite and bands and lenses of carbonate, medium-grade dissemination of mm - large idiomorphic crystals of pyrite, pyrite crystals in places tends to coalesce forming fine - grained flasers and laminae which are conformable with the phyllosilicate layers, the sulphide amount estimates to 10 to 15 Vol.-%.
Dip: 61.70 m 77° N.
- 61.88 - 63.08 : Slightly calcareous biotite bear. sericite schist
(meta - pelite)
same as: 58.52 - 60.70 m.
62.56 - 62.62: Biotite bear. qtz - fspar rock
same as: 61.22 - 61.30 m.
- 63.08 - 63.43 : Slightly calcareous quartz - schist
(meta - quartz - sandstone with pelitic impurity)
lightgr with slightly greenish streaks, flaser-structure, interlocking elongate qtz crystal layers or lenses in alternation with streaks of fine - fibrous sericite, carbonate forms sparse layers of mm to cm thickness.
Dip: 63.00 m 88° N.
Gradual footwall.
- 63.43 - 76.20 : Calcareous sericite schist
(meta - pelite with marble layers)
same as: 29.50 - 55.10 m but only locally with cross - biotite, frequent mm- to cm- thick bands of carbonate.
Dip: 64.00 m 81° N.
Gradual footwall.
- 76.20 - 78.70 : Carbonate - biotite bear. qtz - rich sericite schist
(meta - qtz - rich pelite)
same as: 29.50 - 55.10 m, carbonate always is bound to qtz thus rarely it forms discontinuous layers of mm- to

southwards
downsection

cm thickness.

Dip: 73.00 m 84° N.

Gradual footwall.

- 78.70 - 79.40 : Calcareous biotite - sericite schist
(meta - pelite with marble layers)
same as: 63.43 - 76.20 m but richer in biotite which tends to be oriented parallel to the major foliation/ lamination of the rock.
Gradual footwall.
- 79.40 - 87.80 : Slightly calcareous biotite bear. sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m but with rare cm- thick bands of carbonate which sometimes crosscut the major foliation.
Dip: 80.00 m 84° N.
- 87.80 - 88.52 : Po - mineralization
87.80 - 88.06: biotite - fspar - qtz rock
(meta - felsic tuff supp. not meta - chert)
brownishgr, gently foliated, interlocknig
qtz - fspar sometimes being accompanied by carbonate as lenses in close alternation with interlayered fascicular or bow - tie shaped biotite which occasionally forms wavy layers, low-grade dissemination of po and rare flasers or lenses of interlocking granular po, total sulphide amount: 5 Vol.-%.
- 88.06 - 88.52: biotite bear. quartzite
(meta - chert)
gr, fine - grained granoblastic, scattered mm - large biotite flakes with preferred orientation, low - grade dissemination of po, sometimes flasers and lenses of interlocking fine - grained po, sulphide amount varies between 5 and 10 Vol.-%.

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southwards
downsection

- 88.52 - 88.96 : Biotite - sericite schist
(meta - pelite)
browngr, laminated, close alternation of mm- thick layers or discontinuous bands composed of either biotite or sericite or qtz, rare spots of po.
- 88.96 - 89.06 : Sericite - biotite bear. quartzite
(meta - chert with minor amount in pelitic sediment, silicate facies iron formation)
gr with brown streaks, mainly fine - grained granoblastic, crude development of layering due to tendency of biotite and sericite to form streaks and minute bands being in alternation with granular qtz layers and flasers and lenses of po, additional po as finest dissemination, sulphide content amounts to 15 Vol.-%.
Dip: 89.00 m 85° N.
- 89.06 - 98.10 : Calcareous biotite - sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m but with biotite being oriented parallel to the major foliation of the rock, scattered idiomorphs of carbonate, rare spots of po.
- 98.10 - 93.10 : Slightly calcareous biotite - sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m but locally with scattered idiomorphs of garnet.
Dip: 90.00 m 84° N.
- 93.10 - 93.85 : Calcareous biotite - sericite schist
(meta - pelite with marble layers)
same as: 78.70 - 79.40 m.
- 93.85 - 96.90 : Slightly calcareous biotite - sericite schist
(meta - pelite)
same as: 89.10 - 93.10 m.
- 96.90 - 98.00 : Calcareous biotite - sericite schist
(meta - pelite with marble layers)
same as: 78.70 - 79.40 m.

southwards
downsection

- 98.00 - 111.30 : Slightly calcareous biotite bear. sericite schist
(meta - pelite)
same as: 79.40 - 87.80 m
101.73 - 101.85 : laminae with low - grade po - mineral-
ization, sulphide amounts to 1 Vol.-%
104.90 - 105.15 : low - grade dissemination of po,
1 Vol.-%.
- 111.30 - 113.30 : Sericite - biotite rich quartzite
(meta - quartz - sandstone with pelitic impurity)
same as: 63.08 - 63.43 m but only laminated and with-
out carbonate.
Dip: 111.30 m 88° N.
- 113.30 - 159.40 : Biotite bear. qtz - rich sericite schist
(meta - siltstone)
same as: 29.50 - 55.10 m but with a distinct lamination,
biotite crystal aggregates show a preferred orientation,
a scarcity are small lenses of carbonate.
Dip: 133.00 m 86° N.
- 159.40 - 161.85 : Biotite - sericite bear. quartzite
(meta - qtz - sandstone with interbeds of meta - pelite
and coarse - grained meta - sandstone)
gr, distinctly layered, thick bands of quartzite with
pelite impurity alternate with laminae of biotite -
sericite schist and coarse - grained micaceous quartzite,
the latter is characterized by elongate clasts of qtz or
qtz - fspar max. 1.0 cm in length which are embedded in
a quartz matrix with scattered flakes or crystal aggre-
gates of biotite and lesser abundant of sericite, the
contacts between the different layers tend to be sharp,
crosscutting veins of carbonate of mm- sometimes cm-
thickness are rarely developed.
Dip: 160.50 m 80° N.
Sharp footwall.
- 161.85 - 163.75 : Slightly carbonaceous biotite - sericite bear. quartzite
(meta - coarse grained sandstone/greywacke)

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southwards
downsection

gr, blastopsammitic texture, foliated with linear preferred orientation of elongate clasts and mica flakes, gradual decrease in relict sedimentary grain - size upsection, the continuous gradation however locally is interrupted by banded sections of alternate coarse - grained and medium - to fine - grained greywacke layers, furthermore micaceous streaks exist far down in the coarse - grained basis, the fabric of the rock is that of felsic elongate clasts of predominately blue qtz which are equally distributed within a quartz matrix with scattered flakes or streaks of biotite and sericite. Dip: 161.85 m 82° N, 162.50 m 81° N, 163.00 m 80° N. Gradual footwall.

- 163.75 - 164.65 : Fragment horizon
biotite - sericite - fspqr qtz rock
(meta - paraconglomerate supp. meta - tilloide)
gr with light gr clasts, blastopsephitic texture, poorly stratified, foliated with linear preferred orientation of elongate clasts and mica flakes, stretched and flattened subrounded to rounded fragments of vein - qtz - qtz - sandstone and supp. qtz - keratophyr with long dimensions being lesser than 15 cm are scattered in a greywacke matrix with blastopsammitic texture (same as: 161.85 - 163.75), the amount of coarse clasts more suddenly decreases within the hanging portion forming a poorly defined gradation upsection.
Dip: 163.75 m 79° N.
Sharp footwall.
- 164.65 - 165.65 : Qtz - rich biotite - sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m but with biotite showing a preferred orientation.
Dip: 165.00 m 81° N.
- 165.65 - 166.05 : Calcareous biotite - sericite quartzite
(meta - coarse grained sandstone/greywacke)
same as: 161.85 - 163.75 m.
Dip: 166.00 m 82° N.

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southwards
downsection

- 166.05 - 173.65 : Slightly calcareous biotite - sericite - rich quartzite
(meta - fine to medium grained qtz - sandstone interstratified by coarse greywacke layers)
gr, blastopelitic to blastosammitic texture, distinct grain - size banding composed of alternate fine crystalline phyllosicate dominated layers and medium - grained biotite - sericite rich quartzite bands with poorly developed clastic texture, rare interlayers of coarse - grained meta - sandstone/greywacke with distinct blastosammitic texture (similar:161.85 - 163.75 m), locally veinlets or idiomorphs of carbonate.
Dip: 170.00 m 82° N.
- 173.65 - 174.50 : Fragment horizon
biotite - sericite - fspar - qtz rock
(meta - paraconglomerate supp. meta - tuffaceous)
same as: 163.75 - 164.65 m but with sharp hanging wall.
- 174.50 - 183.10 : Micaceous quartzite
(meta - qtz - sandstone)
gr, laminated with poorly developed lenticular or flaser structure, often strongly isoclinally folded, interlocking qtz - crystals as cm- thick layers and lenses in alternation with mm- thick bands of interleaved sericite which sometimes is accompanied by biotite and garnet.
Dip: 175.00 m 82° N.
Sharp footwall.
- 183.10 : Slightly calcareous biotite - sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m.

No outcrops
end of profile

RAILROAD PROFILE

(Hjerinn)

northern part

243.00 m northprolonging from point

527850 6899650 UTM grid, zone 32

Top. map. 1519 III Hjerinn

By: Dr. F.D. Priesemann

avd. Tverrfjellet

northwards
upsection

- 0.00 - 9.20 : Amphibole bear. biotite - sericite schist
(meta - pelite with basic volcanic impurity)
gr with faint greenish tint, laminated, porphyro-
blastic texture, close alternation of qtz-dominated
bands with phyllosilicate layers, slightly porphyric
amphibole and biotite, the latter forming fascicular
bundles, being parallel to the major plane of foli-
ation, the mode of amphibole decreases gradually up-
section, rare spots of py.
Dip: 5.00 m 80° N.
- 9.20 - 11.80 : Calcareous biotite - sericite schist
(meta - pelite)
gr with faint greenish tint, laminated, close alter-
nation of qtz-dominated bands with phyllosilicate
layers, biotite forms slightly porphyric crystals
which tend to be aligned along the major plane of
foliation, tiny scattered idiomorphs of carbonate,
rare spots of py.
- 11.80 - 22.20 : Qtz-rich biotite bear. sericite schist
(meta - pelite)
same as: 29.50 - 55.10 m (southern part) but nor-
mally with parallel biotite, in places mm- or even
cm- thick bands of carbonate, sporadically cm- thick
veins or layers of remobilized milky qtz.
Dip: 12.00 m 80° N.
- 22.20 - 43.00 : Carbonate bear. qtz - biotite - sericite schist
(meta - pelite)
same as: 9.20 - 11.80 m but with higher qtz amount
and minor carbonate.
Dip: 28.00 m 81° N, 36.00 m 83° N.
- 43.00 - 45.70 : Qtz rich biotite - sericite schist
(meta - pelite)
similar: 11.80 - 22.20 m.
Dip: 43.00 m 80° N.

avd. Tverrfjellet

northwards
upsection

- 45.70 - 135.00 : Biotite sericite bear. quartzite
(meta - qtz - sandstone with pelitic impurity)
same as: 174.50 - 183.10 m (southern part) but no
garnet, dissemination of idiomorphic crystals of mt
on average 0.07 cm across between: 58.00 - 59.00 m,
62.00 - 68.00 m, 68.00 - 73.00 m, 102.00 - 109.00 m.
Dip: 58.00 m 86° N, 72.00 m 81° N, 82.00 m 83° N,
106.00 m 80° N, 120.00 m 88° N, 134.00 m 82° N.
- 135.00 - 135.80 : Qtz - biotite - sericite schist
(meta - pelite)
similar: 29.50 - 55.10 m (southern part) but qtz-
enriched.
- 135.80 - 142.00 : Biotite - sericite rich quartzite
(meta - qtz - sandstone with pelitic impurity)
similar: 174.50 - 183.10 m (southern part) but no
garnets, locally with interlayers of quartzphyllite.
- 142.00 - 146.00 : Qtz rich biotite - sericite schist
(meta - pelite)
similar: 29.50 - 55.10 m (southern part) but strong-
ly isoclinally folded, varying qtz-amount sometimes in-
creasing to from a micaceous quartzite, medium - grade
dissemination of py (5 - 10 Vol.-%) mainly as idiomor-
phic crystals average 0.04 cm across.
Dip: 146.00 m 90°.
- 146.00 - 150.00 : Biotite - sericite rich quartzite
(meta - qtz - sandstone with pelitic impurity)
similar: 174.20 - 183.10 m (southern part) but no
garnets.
- 150.00 - 151.50 : Biotite - magnetite - qtz rock
(meta - chert, silicate and oxide facies iron forma-
tion)
darkgr, fine - grained, crudely schistose, biotite
forms tiny idiomorphic crystals which equally are dis-
tributed, high - grade dissemination of mt.
Dip: 150.50 m 78° S.

northwards

upsection

151.50 - 151.60 : Qtz rich biotite - sericite schist

(meta - pelite)

same as: 142.00 - 146.00 m.

151.60 - 160.00 : Qtz - biotite - sericite schist

(meta - pelite)

same as: 135.00 - 135.80 m.

Dip: 158.00 m 90°.

160.00 - 201.00 : No outcrop.

201.00 - 205.00 : Biotite - sericite schist

(meta - pelite)

same as: 29.50 - 55.10 m (southern part) but often
with parallel biotite.

Dip: 201.00 m 90°.

205.00 - 240.50 : Biotite - sericite rich quartzite

(meta - qtz - sandstone with pelitic impurity)

same as: 135.80 - 142.00 m.

Dip: 205.00 m 88° S, 226.00 m 87° S, 235.00 m 87° S,
240.00 m 82° S.240.50 - 243.00 : Qtz rich biotite - sericite schist

(meta - pelite)

same as: 135.00 - 135.80 m.

Dip: 242.00 m 81° S.

243.00 : No outcrop, end of profile.

SVÅNI (E6) PROFILE

(north of Grønbakken)

northern part

starting point: 531200 6906300 UTM grid, zone 32

Top. map. 1519 1V SNØHETTA

June 1985

By: Dr. F.D. Priesemann .

- 0.00 - 3.50 : Calcareous biotite bearing epidote - plagioclase - qtz - chlorite - amphibole rock
(meta - basalt, flow, weakly altered)
A/C grgn, coarse-grained, leopard-texture, fan-shaped biotite - chlorite - amphibole crystal aggregates of max. 1.0 cm lengths and 0.3 cm widths are scattered within a matrix of calcareous chlorite bearing epidote - amphibole - fspar - qtz of decussate texture which contains slightly porphyric amphibole of minor 0.2 cm length which always is strongly aligned with a slight foliation.
Sharp hanging wall.
- Sample: SNØ-18
Thinsection
whole rock
analysis
- 3.50 - 3.70 : Mt - bearing epidote - amphibole quartzite
(oxide-silicate facies iron-formation)
gr with slightly bluish tint, extremely fine-grained, mm- as well as cm- layering, alternate magnetite - qtz, epidote - amphibole and magnetite - amphibole - qtz bands and flasers, amphibole always being slightly porphyric (average 0.4 cm lengths) is strongly aligned with the compositional banding.
Shape hanging wall.
- 3.50 - 12.15 : Plagioclase amphibole schist
(meta - basalt, flow)
gn to grgn, medium-grained, dm- or m- thick intersections of calcareous epidote - plagioclase - qtz - chlorite amphibolite (same as: 0.00 - 3.50 m) which shows gradual borders to the surrounding plag. amphibole schist.
Sharp hanging wall.
- 12.15 - 13.15 : Biotite - amphibole bearing quartzite
(partly silicate facies iron formation)
bright, dense qtz with slight bluish tint, extremely fine-grained, interlaminated or sometimes boudined by mm - thick bands of biotite - amphibole, mica-flakes and prisms of amphibole are strongly aligned with the compositional banding, qtz - layers sporadically carry idiomorphic pyrite.
Sharp hanging wall.

- 13.15 - 17.50 : Biotite bearing and biotite - rich plagioclase - qtz - amphibole rock
Sample: SNØ-17 (meta - basalt, flow)
Thinsection grgn, medium-grained, lepidoblastic texture, prisms of
whole rock amphibole on average 0.3 cm long always being aligned
analysis with a slight foliation of the rock, biotite forms
multi-crystal porphyroblasts being equally distributed and showing a preferred orientation parallel to the crudely developed foliation, footwall is without any biotite and shows a stockwork of trondhjemite.
Gradual hanging wall.
- 17.50 - 18.00 : Biotite bearing amphibole - sericite - qtz schist
(meta - tuffite, may be tuffaceous meta - pelite)
darkgr, nematoblastic texture, scattered prisms of amphibole on average 0.3 cm long are strongly aligned with the major plane of foliation, fine-fibrous sericite.
Sharp hanging wall, bedding fault line.
- 18.00 - 18.50 : Epidote - chlorite - biotite - sericite - plagioclase - amphibole - qtz gneiss
(metamorphosed cherty tuff or tuffite with interlayers of basaltic composition)
gr, gngr, lightgn, medium- to coarse- grained, porphyroblastic to lepidoblastic texture, mm- to cm - banded, alternate bright qtz, epidote - amphibole, amphibole, chlorite - biotite - sericite - amphibole and qtz - amphibole layers, porphyroblasts of biotite and amphibole both randomly oriented, amphibole prisms max. 1.5 cm long sometimes forming sperolites which are parallel to the compositional banding, fine-fibrous chlorite and extremely fine grained and dense qtz.
Sharp hanging wall.
- 18.50 - 27.00 : Amphibole bearing biotite - sericite schist
(meta - pelite)
gr, fine-grained, porphyroblasts of biotite and amphibole, latter forms thin needles of max. 1.5 cm length

being randomly oriented, biotite equally distributed and not oriented cause spotted appearance of the rock.

27.00 - 40.00 :

Fragment horizon

high calcareous amphibole bearing epidote - biotite - chlorite schist

C

(meta paraconglomerate supp. meta - tilloide)
yellowishgn, predominately with chaotic structure, stratified, containing beds of **paraconglomerate** grading from sandy mudstone to pebbly mudstone which alternate with dm- to mm- thick discontinuous layers of qtz-rich biotite - sericite schist which may contain clasts, rounded highly deformed and stretched fragments of calcareous epidote - amphibole - biotite - chlorite - qtz rock (supp. basic volcanic debris), carbonate, amphibole bearing qtz - fspars gneiss (qtz - keratophyr) and quartz - feldspathic rock/gneiss (supp. granitic debris) embedded in a matrix of high calcareous chlorite - biotite schist and in places phyllosilicate - rich carbonate, chlorite mainly being fine-crystalline while biotite forms multi - crystal porphyroblasts which randomly are oriented, carbonate occurs as scattered idiomorphic crystals within the mica schist while it forms layers or irregular shaped aggregates within the mica-rich carbonate matrix, fragments grade from 1.0 to 10 cm in length with widths ranging between 0.3 cm and 3.0 cm (average size 5 x 1.5 cm).

Sharp hanging wall.

146/36° SW at 30.00 m.

40.00 - 51.00 :

Slightly calcareous sericite - plagioclase - biotite - qtz schist/gneiss

(meta - arenite/-pelite)

gr to browngr, porphyroblastic texture, crudely layered, porphyroblasts of biotite mainly of ellipsoidal shape and randomly oriented but partly parallel the major plane of foliation cause spotted appearance of the rock, some cm - thick discontinuous interlayers of sericite - biotite - qtz schist which is distinctly fine-grained as host rock and shows strongly aligned mica-flakes,

lenses and flasers of sericite bearing quartzite
(sandy mudstone or meta - greywacke) occur near the
footwall of the succession, rock has a distinct grainy
appearance giving evidence of being a metamorphosed
coarse - grained greywacke (comparable with greywacke -
layers from meta - tillioid from railroad profile:
161.85 - 163.75 m (south), 165.65 - 166.05 m (south)
and locations at Tverrfjellet.

Sharp hanging wall.

142/34° SW 48.00 m, fracturing 198/66 E.

51.00 - 52.00 :

Biotite - sericite schist

(meta - pelite)

gr, porphyroblastic texture, scattered porphyroblasts
of biotite preferably cross major foliation cause
spotted appearance of the rock.

Sharp hanging wall.

52.00 - 56.00 :

Fragment horizon

mica - schist

(meta - paraconglomerate supp. meta - tillioid)

grgn, nodular - structure, stratified, containing lay-
ers of sandy mudstone and pebbly mudstone which alter-
nate in a nonrhythmic manner with contacts always be-
ing gradational, rounded highly deformed and flatten-
ed clasts of qtz - fspar rock and carbonaceous qtz -
fspar rock (supp. qtz - keratophyr) as well as milky
qtz and chlorite - sericite - qtz - fspar rock (basic
volcanic debris) of average 2 cm length and 0.7 cm
thickness (max. 20 x 3.5 cm) are scattered within a
matrix of calcareous sericite - chlorite - biotite
schist which in places carries some needles of amphi-
bole; biotite and chlorite form porphyroblasts which
scarcely are aligned with the plane of foliation.

Gradual hanging wall.

134/40° SW at 54.00 m, fracturing 2/72° E.

56.00 - 73.00 :

Amphibole - garnet bearing biotite - sericite schist

(meta - pelite)

gr, porphyroblastic texture, scattered porphyroblasts
of biotite (cross - mica) cause spotted appearance of

the rock, amphibole as huge needles of max. 4 cm length forming spherulites which lie within the plane of foliation, they partly are so abundant as to form garnet-schist, garnet forms tiny idiomorphic crystals which truly are equally distributed.

73.00 - 119.00 : Slightly calcareous and calcareous garnet - biotite - sericite schist

Sample: SNØ-16

Thinsection

whole rock

analysis

Partly C

(meta - pelite)

gr, porphyric - texture, crudely laminated in places, porphyroblasts of biotite (cross - mica) equally distributed cause spotted appearance of the rock, strong variation in the mode of carbonate mainly changing gradually from subordinate amount to possibly 10 to 15 Vol. - %, mainly scattered idiomorphic crystals only sporadically forming discontinuous layers, occasional occurrence of lense - shaped (clasts ?) calcareous garnet bearing quartzite which contains some tiny spots of idiomorphic py.

Sharp hanging wall.

120/30° SW at 94.00 m, 88/27° S at 112.00 m, 92/24° S at 98.00 m, 104/32° S at 103.00 m.

119.00 - 129.00 : Fragment horizon

mica - schist and calcareous mica - schist

(meta - paraconglomerate supp. meta - tilloide)

(partly very similar to meta - tilloides from Hjerkinnhø and Tverrfjellet)

Sample: SNØ-15

chem. analysis

of carbonate

Partly C

stratified, containing beds of tilloide which are inter-layered by discontinuous bands of carbonate, calcareous biotite - sericite schist (meta - pelite) and high calcareous amphibole - qtz - fspar gneiss (mixed volcanic - sedimentary rock) ; meta - tilloide: gr to gngr, all stages between sandy mudstone and pebbly mudstone, no sorting but sometimes a crude stratification, rounded greatly deformed and flattered fragments of carbonate and quartz - feldspatic gneiss / rock of 50 cm length and 0.1 to 5 cm thickness (average 6 x 1 cm) are scattered through a matrix consisting predominately of biotite - amphibole (porphyroblasts randomly oriented) and

qtz, with high amount of carbonate clasts the content of carbonate (idiomorphic crystals) and chlorite within the matrix increases while amphibole often is absent; meta - pelite: gr, spotted appearance due to scattered porphyroblasts of biotite which randomly are oriented wavy - lenticular structure; mixed volcanic - sedimentary layers: gngr, distinct compositional banding of alternate bands of carbonate and high calcareous amphibole - qtz - fspar rock as well as calcareous amphibolite, amphibole - qtz - fspar rock is characterized by idiomorphic crystals of carbonate which are equally distributed and prisms of amphibole of average 0.4 cm length being randomly oriented, amphibolite layers show fine - crystalline amphibole which always parallels the compositional banding.

129.00 - 169.00 : Slightly calcareous biotite - sericite schist
(meta - pelite)

gr to greenishgr, porphyroblastic - texture, porphyric biotite as cross - mica cause spotted appearance of the rock, sporadically some coarse (max. 2.0 cm long) needles of amphibole which often are parallel to the slaty cleavage of the rock, cm - thick discontinuous interlayer with subordinate sulphide occurs close to the border to fragment horizon.

Sharp hanging wall.

134/30° SW at 159.00 m.

169.00 - 173.00 : Biotite - quartzite
(meta - arenite) (same as: 83.40 - 87.54 m BH 10 and at southslope of Tverrfjellet)

gr, with brown spots, fine - grained granoblastic qtz with porphyric biotite crystals being equally distributed, latter predominately are parallel the main foliation but also crosscut it.

Sharp hanging wall.

124/33° SW.

173.00 - 238.00 : Amphibole schist

Sample: SNØ-13 (meta - basalt, flow)

and SNØ-14

gn, medium - grained, some intersections being coarse-

Thinsection
whole rock
analysis

grained, amphibole - needles subparallel to the plane of schistosity, coarse - grained rock varieties often with distinct leopard - texture which is due to fan - shaped crystal aggregates of amphibole being of cm - size which are surrounded by plagioclase, qtz and epidote (see SNØ-13).
Sharp hanging wall.

238.00 - 248.00 :

Sample:SNØ-12

Thinsection
whole rock
analysis

Sericite - amphibole - plagioclase - qtz - rock/schist
(meta - basalt, flow)
lightgr, fine - grained with slightly porphyric amphibole prisms of max. 0.3 cm length often being parallel to the plane of foliation, crude development of layering due to modal changes of amphibole and plagioclase or qtz.

248.00 - 250.50 :

Fragment horizon
amphibole schist

(meta - basic lapilli tuff or volcanic debris flow)
gn, poorly sorted, rounded to subrounded greatly deformed and flattened fragments of fine - grained amphibolite, mainly medium - crystalline plagioclase - amphibolite and amphibole qtz - plagioclase rock embedded in a matrix variable in composition but mostly being basaltic consisting of carbonate, amphibole, plagioclase and minor sericite, amphibole is the most prominent mineral forming prisms of average 1.0 cm length which are randomly oriented.

250.50 - 370.00 :

Sample:SNØ-11

Thinsection
whole rock
analysis

Amphibole schist, plagioclase amphibolite
(meta - basalt, flow)
gn, medium - grained with minor intersection being fine - grained, often with distinct leopard - texture, some interlayers of agglomeratic basalt or basaltic lapilli tuff, sometimes sericite - amphibole - plagioclase - qtz rock / schist (leuco basalt, flow) (similar :
238.00 - 248.00 m), near footwall contact towards mica - schist abundant high - calcareous epidote - sericite - biotite - fspar - amphibole - qtz gneiss (banded amphibolite, supp. basaltic tuff)
123/43° SW at 251.00 m, 120/42° SW at 365.00 m.

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- Thinsection
whole rock
analysis
- grained, amphibole - needles subparallel to the plane of schistosity, coarse - grained rock varieties often with distinct leopard - texture which is due to fan - shaped crystal aggregates of amphibole being of cm - size which are surrounded by plagioclase, qtz and epidote (see SNØ-13).
Sharp hanging wall.
- 238.00 - 248.00 : Sericite - amphibole - plagioclase - qtz - rock/schist
(meta - basalt, flow)
Sample:SNØ-12
Thinsection
whole rock
analysis
lightgr, fine - grained with slightly porphyric amphibole prisms of max. 0.3 cm length often being parallel to the plane of foliation, crude development of layering due to modal changes of amphibole and plagioclase or qtz.
- 248.00 - 250.50 : Fragment horizon
amphibole schist
(meta - basic lapilli tuff or volcanic debris flow)
gn, poorly sorted, rounded to subrounded greatly deformed and flattened fragments of fine - grained amphibolite, mainly medium - crystalline plagioclase - amphibolite and amphibole qtz - plagioclase rock embedded in a matrix variable in composition but mostly being basaltic consisting of carbonate, amphibole, plagioclase and minor sericite, amphibole is the most prominent mineral forming prisms of average 1.0 cm length which are randomly oriented.
- 250.50 - 370.00 : Amphibole schist, plagioclase amphibolite
(meta - basalt, flow)
Sample:SNØ-11
Thinsection
whole rock
analysis
gn, medium - grained with minor intersection being fine - grained, often with distinct leopard - texture, some interlayers of agglomeratic basalt or basaltic lapilli tuff, sometimes sericite - amphibole - plagioclase - qtz rock / schist (leuco basalt, flow) (similar : 238.00 - 248.00 m), near footwall contact towards mica - schist abundant high - calcareous epidote - sericite - biotite - fspar - amphibole - qtz gneiss (banded amphibolite, supp. basaltic tuff)
123/43° SW at 251.00 m, 120/42° SW at 365.00 m.

Thinsection
whole rock
analysis

grained, amphibole - needles subparallel to the plane of schistosity, coarse - grained rock varieties often with distinct leopard - texture which is due to fan - shaped crystal aggregates of amphibole being of cm - size which are surrounded by plagioclase, qtz and epidote (see SNØ-13).
Sharp hanging wall.

238.00 - 248.00 :

Sample:SNØ-12

Thinsection
whole rock
analysis

Sericite - amphibole - plagioclase - qtz - rock/schist
(meta - basalt, flow)
lightgr, fine - grained with slightly porphyric amphibole prisms of max. 0.3 cm length often being parallel to the plane of foliation, crude development of layering due to modal changes of amphibole and plagioclase or qtz.

248.00 - 250.50 :

Fragment horizon
amphibole schist

(meta - basic lapilli tuff or volcanic debris flow)
gn, poorly sorted, rounded to subrounded greatly deformed and flattened fragments of fine - grained amphibolite, mainly medium - crystalline plagioclase - amphibolite and amphibole qtz - plagioclase rock embedded in a matrix variable in composition but mostly being basaltic consisting of carbonate, amphibole, plagioclase and minor sericite, amphibole is the most prominent mineral forming prisms of average 1.0 cm length which are randomly oriented.

250.50 - 370.00 :

Sample:SNØ-11

Thinsection
whole rock
analysis

Amphibole schist, plagioclase amphibolite
(meta - basalt, flow)
gn, medium - grained with minor intersection being fine - grained, often with distinct leopard - texture, some interlayers of agglomeratic basalt or basaltic lapilli tuff, sometimes sericite - amphibole - plagioclase - qtz rock / schist (leuco basalt, flow) (similar : 238.00 - 248.00 m), near footwall contact towards mica - schist abundant high - calcareous epidote - sericite - biotite - fspar - amphibole - qtz gneiss (banded amphibolite, supp. basaltic tuff)
123/43° SW at 251.00 m, 120/42° SW at 365.00 m.

Thinsection
whole rock
analysis

grained, amphibole - needles subparallel to the plane of schistosity, coarse - grained rock varieties often with distinct leopard - texture which is due to fan - shaped crystal aggregates of amphibole being of cm - size which are surrounded by plagioclase, qtz and epidote (see SNØ-13).

Sharp hanging wall.

238.00 - 248.00 :

Sample:SNØ-12

Thinsection
whole rock
analysis

Sericite - amphibole - plagioclase - qtz - rock/schist
(meta - basalt, flow)

lightgr, fine - grained with slightly porphyric amphibole prisms of max. 0.3 cm length often being parallel to the plane of foliation, crude development of layering due to modal changes of amphibole and plagioclase or qtz.

248.00 - 250.50 :

Fragment horizon
amphibole schist

(meta - basic lapilli tuff or volcanic debris flow)
gn, poorly sorted, rounded to subrounded greatly deformed and flattened fragments of fine - grained amphibolite, mainly medium - crystalline plagioclase - amphibolite and amphibole qtz - plagioclase rock embedded in a matrix variable in composition but mostly being basaltic consisting of carbonate, amphibole, plagioclase and minor sericite, amphibole is the most prominent mineral forming prisms of average 1.0 cm length which are randomly oriented.

250.50 - 370.00 :

Amphibole schist, plagioclase amphibolite
(meta - basalt, flow)

gn, medium - grained with minor intersection being fine - grained, often with distinct leopard - texture, some interlayers of agglomeratic basalt or basaltic lapilli tuff, sometimes sericite - amphibole - plagioclase - qtz rock / schist (leuco basalt, flow) (similar : 238.00 - 248.00 m), near footwall contact towards mica - schist abundant high - calcareous epidote - sericite - biotite - fspar - amphibole - qtz gneiss (banded amphibolite, supp. basaltic tuff)
123/43° SW at 251.00 m, 120/42° SW at 365.00 m.

370.00 - 375.00 : Garnet bearing biotite - sericite schist

(meta - pelite)

gr, porphyroblastic - texture, porphyric biotite as cross - mica equally distributed, cause spotted appearance of the rock occasionally lense - shaped accretions of sulphide (pyrite).

Sharp hanging wall.

375.00 - 376.00 : Biotite - amphibole bearing quartzite

(meta - arenite)

0 - 1 m
(true thickness)

whitegr, well - layered, cm - thick often discontinuous qtz - bands interlaminated by mm - layers dominated by phyllosilicates (biotite some sericite) carrying sometimes huge needles (max. 1.5 cm) of amphibole which always are sub - parallel the compositional banding.

Sharp hanging wall.

121/44° SW.

376.00 - 376.70 : Amphibole - qtz - fspar gneiss

(meta - qtz - keratophyr)

0 - 50 m
(true thickness)

grwhite, within places rusty staining, fine - grained with porphyroblasts of amphibole (max. 2.0 cm long) being randomly oriented, crudely cm - layered, rare spots of sulphide (pyrite), meta - qtz - keratophyr

0 - 35 m
(true thickness)

locally is accompanied by magnetite - quartzite (oxide facies iron formation); footwall occasionally consists of :

0 - 35 m
(true thickness)

amphibolite, plag. - amphibolite, garnet bearing sericite - biotite - amphibole - fspar - qtz gneiss

(meta - basalt, tuff / flow)

gn to grgn, medium - grained in places even coarse grained, very variable lithology within a few meters of strike grading from amphibolite to banded amphibolite with cm - layering composed of alternate sericite - biotite - qtz - amphibole and amphibole - qtz bands.

127/48° SW.

376.70 -

Garnet bearing chlorite - sericite schist

(meta - pelite)

greenishgr, porphyroblastic texture, porphyric biotite

as cross - mica being equally distributed, biotite cause spotted appearance of the rock, in places inter-layers of high calcareous amphibole - chlorite - sericite schist characterized by randomly oriented needles of amphibole (average 1.0 cm long) which partly are replaced by biotite and scattered idiomorphic crystals of carbonate.

108/37° S at 386.00 m.

SVANI (E6) PROFILE

(north of GRØNBAKKEN)

southern part

starting point: 531200 6906300 UTM grid, zone 32

Top. map. 1519 1V SNØHETTA

Okt. 1984 / June 1985

By: Dr. F.D. Priesemann

avd. Tverrfjellet

0.00 - 2.00 : Amphibole schist

(meta - basalt, flow)

gn, fine - to medium-grained with minor intercalations being coarse - grained, granoblastic - to nematoblastic - texture, crude development of layering due to changes in either amphibole or plagioclase content, coarse - grained layers with leopard - texture similar 0.00 - 3.50 m (north).

Sharp hanging wall.

Dip 43° SW at 2.00 m.

2.00 - 2.20 : Magnetite - quartzite

(oxide facies iron formation)

darkgr with slightly bluish tint, dense quartz with high-grade dissemination of magnetite which sometimes constitutes an indistinct layering.

Sharp hanging wall.

2.20 - 4.70 : Calcareous plagioclase amphibolite

(meta - basalt, flow)

grgn, medium - grained, crude development of leopard - texture due to scattered prisms of amphibole mainly of 0.5 cm length which are randomly oriented, idiomorphic crystals of carbonate being equally distributed.

Gradual hanging wall.

4.70 - 30.10 : Amphibole schist

(meta - basalt, flow, crudely developed pillow - structure)

gn, mainly medium - grained, sometimes thin interlayers of plagioclase amphibolite, rare bands or flasers of carbonate, within hanging portion some stringers of biotite often accompanied by carbonate, rare spots of py, somewhat higher pyrite amount (1 Vol.-%) within 19.50 - 20.00 m, medium - grade dissemination of mt within 17.00 - 17.02 m.

Gradual hanging wall.

Dip 39° SW at 12.50 m, dip 30° SW at 14.00 m.

Sample: SNØ-19

Thinsection

whole rock

analysis

- 30.10 - 39.00 : Biotite bearing epidote - plagioclase - qtz - chlorite-amphibolite
 (meta - basalt, flow, weakly altered)
 grgn, coarse - grained, leopard texture, lenticular chlorite - amphibole multi - crystal - aggregates of average 1.2 cm length and 0.2 cm width surrounded by a matrix of epidote-amphibole - plagioclase - qtz.
 Sharp hanging wall.
 Dip 47° SW at 33.50 m.
- 39.00 - 45.30 : Slightly calcareous amphibole schist
 (meta - basalt, flow, crudely developed pillowstructure)
 gn, medium - grained with sections more coarse - grained, m- alternation of amphibole schist and plagioclase-amphibole schist mainly with gradual borders between, sometimes carbonate veining, crosscutting features of qtz - carbonate - epidote of cm - thickness rarely developed.
 Sharp hanging wall.
 Dip 40° SW at 43.60 m.
- 45.30 - 55.50 : Slightly calcareous biotite bearing epidote - plagioclase - qtz - chlorite amphibolite
 (meta - basalt, flow)
 Sample: SNØ-20
 Thinsection same as: 30.10 - 39.00 m (south), contact to hanging
 whole rock mica - schist with low - grade dissemination of po and
 analysis py.
 Sharp hanging wall.
 Dip 45° SW at 48.70 m.
- 55.50 - 57.15 : Sericite bearing fspar - biotite - qtz rock / schist
 (meta - pelite)
 True thickness brown gn, fine - grained, lepidoblastic texture, scattered
 50 cm ed crystals of slightly porphyric biotite which show a
 Sample SNØ-01 preferred orientation, discontinuous laminae of fine -
 SN 531225 crystalline magnetite sporadically present, interlayers
 6906243 of dense quartzite (oxide facies iron formation) which
 Thinsection carries tiny flakes of biotite and subordinate magnetite,
 latter mainly is concentrated at the contacts to mica
 schist, very rare spots of py and / or po.

Sharp hanging wall.

Dip 45° SW at 55.50 m.

57.15 - 59.70 : Slightly calcareous biotite bearing epidote - plagioclase - qtz - chlorite amphibolite

Sample: SNØ-21 (meta - basalt, flow)

Thinsection same as: 30.10 - 39.00 m (south), at hanging wall slightly increased in biotite, some spots of py.

whole rock Sharp hanging wall.

A

59.70 - 59.85 : Sericite - biotite bearing pyrite - qtz rock

True thickness (metamorphosed sulphide facies exhalite)

10 cm

Sample: SNØ-02

SN 531225

6906240 chem.

analysis

medium - grained, granoblastic texture, high - grade

dissemination of pyrite, mainly idiomorphic crystals

of 0.1 cm size, phyllosilicates show a preferred orientation and cause a slight schistosity.

Sharp hanging wall.

59.85 - 63.90 : Amphibole bearing magnetite quartzite

True thickness (oxide facies iron formation)

2.40 m

darkgr with slightly bluish tint, fine - grained, dense

mt - quartzite develops a crude cm - to dm - layering

which is caused by modal changes of magnetite, tiny bands

of amphibole - rich mt - quartzite are interlaminated

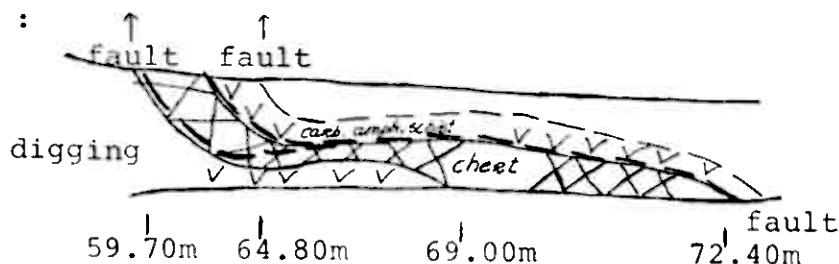
with amphibole forming coarse needles which always are

parallel the compositional banding.

Sharp hanging wall.

Dip 42° SW at 61.40 m.

64.80 - 73.30 :



- 73.30 - 76.60 : Sericite bearing amphibole - qtz fspar rock
Sample:SNØ-22 (meta - basic andesite)
Thinsection greenishgr, porphyroblastic texture, slightly porphyric am-
whole rock phibole needles of max. 0.4 cm length randomly oriented.
analysis Gradual hanging wall.
Dip 27° W at 74.90 m.
- 76.60 - 91.00 : Amphibole schist
Sample:SNØ-23 (meta - basalt, flow, distinct pillow - structure)
Thinsection gn, fine - towards medium - grained, slight changes in
whole rock the mode of plagioclase, sometimes irregular carbonate
analysis accompanied by biotite.
Sharp hanging wall.
126/45° SW at 89.30 m.
- 91.00 - 91.15 : Amphibole bearing magnetite - quartzite
True thickness (oxide facies iron formation)
10 cm bluish/black, extremely fine - grained, dense mt - quart-
Sample:SNØ-03 zite interlamianted by amphibole - rich mt - quartzite
SN 531175 and flasers of milky - white qtz which in places forms
6906195 Thin- web - like features supposedly as a result of deformation.
and polished Sharp hanging wall.
section Dip 47° SW at 91.00 m.
- 91.15 - 93.00 : Epidote bearing biotite - amphibole - qtz - plagioclase
rock / gneiss
Sample:SNØ-24 (meta - basic andesite)
Thinsection whitegr, crude lamination due to slightly porphyric am-
whole rock phibole and biotite which mainly are aligned with the
analysis major plane of foliation and tend to form discrete layers
of mm- thickness or trains of granules, amphibole prisms
are on average 0.3 cm long and form thin needles, biotite
sporadically displays crystals aggregates (cluts) which
crosscut the lamination.
Sharp hanging wall.
- 93.00 - 101.60: Carbonate bearing plagioclase - amphibole schist
Sample:SNØ-25 (meta - basalt, flow)
Thinsection gn, medium - grained, nematoblastic texture, rare spots
whole rock of carbonate equally distributed, sometimes carbonate
analysis veining. Sharp hanging wall.

101.60 - 102.70 : High calcareous biotite - sericite - amphibole - qtz - plagioclase schist

(meta - basic tuff or tuffite)

C grgn, mainly coarse - grained, porphyroblastic texture, crudely mm- to cm- layered due to modal changes from Fe - Mg silicate domination to quite felsic composition, mainly gradual changes, biotite often forms crystal aggregates which may be aligned with the compositional banding, amphibole characteristically develops porphyroblasts of max. 1 cm length which are oriented at random, spotted carbonate but also mm - bands, lenses and stringers.

Sharp hanging wall.

102.70 - 107.00 : Biotite bearing - qtz - plagioclase - amphibole schist

(meta - basalt, supp. lapilli tuff)

grgn to greenishgr, medium - grained, spotted appearance, scattered lenticular particles of qtz - plagioclase and plagioclase on average 0.3 cm in diameter, small amount of lense - shaped clasts of amphibolite with nematoblastic texture grading 0.5 to 2.2 cm in length and 0.2 to 0.4 cm in width, lapilli strongly deformed and flattened always being parallel to the major plane of foliation, matrix is composed of plagioclase and amphibole, latter forms 0.4 cm long discrete needles which are oriented at random as well as crystal aggregates of cm - size which often crosscut the schistosity, the hanging portion of the layer is characterized by the random occurrence of extremely sheered and flattened fragments of amphibole bear. qtz - plagioclase which grade from 3 x 0.4 cm to 13 x 1.5 cm in size, the clasts are embedded in a matrix of equal composition which here shows a distinct lepidoblastic texture.

Sharp hanging wall.

107.00 - 108.50 : Amphibole schist

(meta - basalt, flow)

gn, fine - to medium - grained, distinct nematoblastic texture.

Sharp hanging wall.

Dip 53° SW at 107.00 m.

108.50 - 135.00 : Biotite bearing plagioclase - amphibole rock / gneiss
(meta - basaltic pyroclastic rock or basic volcanic debris flow)
Sample: SNØ-26
Thinsection grgn, grainy appearance, scattered highly deformed and streched fragments of basaltic composition grading 5.5 x 1.0 cm to 0.5 x 0.2 cm in size, abundant subrounded to slightly deformed fragments of vesicular basalt (scoria?) (pores being filled by plagioclase) which may reach sizes of 20 x 7 cm, fragments are embedded in a matrix very similar to that of lapilli tuff of 102.70 - 107.00 m. Hanging wall bedding fault line.
whole rock
analysis

135.00 - 144.00 : Amphibole - qtz - fspar rock / gneiss
(meta - leucobasalt, tuff, may be intermittent flows, beds of basaltic pyroclastic rock or basic volcanic debris flow) (leucobasalt same as: TVN IV 37)
Sample: SNØ-04
SN531220 690178
Thinsection gngr, medium - grained with intersections being fine - grained, some layers of coarse - grained appearance, pre-dominantly with lepidoblastic texture, cm- to dm- layering with superimposed mm- to cm- lamination, banding is caused by textural and compositional changes which take place slowly but may too happen in advance and variations in grainsize, amphibole forms slightly porphyric needles of max. 0.4 cm length, they may be oriented at random but normally are subparallel to the banding of the rock, fine - grained beds often show a distinct rusty staining which points to a slight sulphide mineralization, rare interlayers of basaltic lapilli tuff (same as: 102.70 - 107.00 m) which always have sharp contacts to the surrounding leucobasalt, section starts with a fragment horizon of 40 cm thickness which is characterized, by scattered, highly deformed and streched qtz and qtz - fspar clasts of 10 x 1.5 cm size being embedded in a matrix of amphibole - qtz - plagioclase with the same characteristics as being found in the following banded rock.
Sharp hanging wall, strongly deformed schist (see below)
160/35° SW at 135.00 m, dip 46° SW at 140.00 m.
whole rock
analyses

- 144.00 - 144.10 : Qtz - chlorite - biotite bearing sericite schist
 (strongly deformed meta - pelite) (similar sericite bearing qtz - fspar - chlorite - biotite schist of NIVÅ IV Tverrfjell - mine)
 gr to browngr, wavy - lenticular structure due to tendency of qtz to form lense - shaped crystal - aggregates wavy sericitic surfaces being slickensided.
 Sharp wavy hanging contact.
- 144.10 - 145.60 : Calcareous chlorite bearing amphibole - biotite - sericite schist
 (tuffaceous meta - pelite)
 C gr, porphyroblastic texture, porphyroblasts of amphibole and biotite are scattered through a fine - crystalline matrix of qtz and sericite, amphibole has a tendency to form lense - shaped crystal - aggregates which are on average 0.5 cm in diameter and are oriented at random, spotted carbonate, crystals show idiomorphic outlines.
 Gradual hanging wall.
- 145.60 - 147.60 : Biotite - amphibole - chlorite - qtz - fspar rock/gneiss
 (meta tuffite)
 Sample:SNØ-05
 SN 531220 690176
 Thinsection
 whole rock
 analysis
 gr, porphyroblastic - to lepidoblastic texture, crude lamination caused by the tendency of biotite and amphibole to form discontinuous trains of granules, porphyroblasts of amphibole mainly parallel to the major plane of foliation but sometimes oriented at random, prisms on average 1.0 cm long often standing alone but sometimes closely joined by coarse crystals or crystal-aggregates of biotite.
 Gradual hanging wall.
- 147.60 - 150.10 : Calcareous chlorite bearing amphibole - biotite - sericite schist
 (tuffaceous meta - pelite)
 same as: 144.10 - 145.60 m (south)
 Gradual hanging wall.
 148/42° SW at 150.00 m.

- 150.10 - 150.40 : Quartz - sericite schist
(meta - pelite)
gr, fine - grained, wavy - lenticular structure, mica-
ceous streaks surround lense - shaped nodules of qtz.
Gradual hanging wall.
Dip 43° SW at 151.30 m.
- 150.40 - 152.30 : High calcareous biotite - sericite schist
(meta - pelite)
C gr, porphyroblastic texture, scattered porphyroblasts
of biotite randomly oriented cause spotted appearance
of the rock, carbonate as idiomorphic crystals equally
distributed, rare veinlets of qtz accompanied by car-
bonate.
Sharp hanging wall.
Dip 52° SW at 152.30 m.
- 152.30 - 152.42 : Micaceous quartzite
(meta - arenite)
gr, fine - grained, scattered streaks of sericite
surrounded by equigranular qtz, rare flakes of para-
llel biotite which in places develop a crude cm -
layering.
Sharp hanging wall.
- 152.42 - 155.10 : Biotite - sericite schist
(meta - pelite)
gr, porphyroblastic texture, in parts laminated,
Sample: SNØ-32 scattered porphyroblasts of biotite in places crystal
Thinsection aggregates always being oriented at random, cause
whole rock spotted appearance of the rock.
analysis Gradual hanging wall.
- 155.10 - 155.90 : Quartz - sericite schist
(meta - pelite)
same as: 150.10 - 150.40 m (south)
Sharp hanging wall.
Dip 51° SW at 155.90 m.

155.90 - 156.25 : High calcareous biotite - sericite schist

(meta - pelite)

C

same as: 150.40 - 152.30 m (south)

Gradual hanging wall.

156.25 - 156.40 : Biotite - fspar - qtz rock

(supp. meta - qtz - keratophyr)

gr, with in places greenish or brownish tint, porphyroblastic texture, crude lamination due to parallel micaceous streaks composed of porphyric crystals of biotite, subordinate pyrite forming tiny crystals being equally distributed.

Sharp hanging wall.

Dip 50° SW at 156.30 m.

156.40 - 157.10 : Slightly calcareous biotite - sericite schist

(meta - pelite)

gr, fine - grained, crude development of lamination due to parallel streaks of slightly porphyric biotite. Sharp hanging wall which in places contains sheared meta - pelite which is very similar the sericite schist from 144.00 - 144.10 m (south).

157.10 - 160.10 : High calcareous epidote - biotite - chlorite bearing amphibole - plagioclase - quartz gneiss (banded amphibolite)

(meta - basic tuff or tuffite with cherty interlayers)

Sample: SNØ-33

Thinsection

whole rock

analysis

(taken near
footwall)

gr, greenishgr, gn, porphyroblastic and lepidoblastic texture, distinctly mm - to cm - layered, caused by compositional and textural changes which mainly happen in advance, alternate qtz - plag. - chlorite - amphibole, amphibole - plag. - qtz, epidote - plag. - qtz, biotite and carbonate bands or lamina, distinct porphyroblasts of amphibole max. 3.0 cm in length throughout, prisms are oriented at random but sometimes parallel the layering of the rock, carbonate rarely forms slightly porphyric idiomorphic crystals which equally are distributed, within hanging portion the mode of amphibole gets so abundant as to form plag. amphibole schist which leads to overlying amphibole schist.

Gradual hanging wall.

157/50° SW at 157.10 m, dip 49° SW at 159.00 m.

- 160.10 - 171.00 : Amphibole schist
(meta - basalt, flow)
gn, fine - grained, nematoblastic texture.
Sharp hanging wall.
- 171.00 - 179.60 : Slightly calcareous biotite bearing epidote - qtz - plagioclase - amphibole schist
(meta - basalt, flow may be pyroclastite)
slightly grgn, medium - grained, nebuous structure,
Epidote laminated but often with flaser structure, nemato-
Partly C blastic texture, epidote - qtz - plagioclase as well
as biotite carbonate form streaks and sporadically cm -
thick layers which in places constitute an open frame-
work filled by amphibole schist, amphibole normally
gets distinctly coarser grained at the borders to epi-
dote - qtz - plagioclase the prisms often prolonging
for several mm into the felsic material.
Sharp hanging wall.
Dip 43° SW at 175.00 m.
- 179.60 - 181.00 : Biotite - sericite quartzite
(meta - arenite)
whitegr, laminated, alternate phyllosilicate layers
and nearly pure qtz bands, strongly foliated.
Sharp hanging wall.
Dip 52° SW at 179.60 m.
- 181.00 - 187.00 : Slightly calcareous biotite - sericite schist
(meta - pelite)
gr, slight flaser - structure due to accretion of qtz
into mm- to cm- large lenses and flasers, scattered por-
phyroblasts of biotite oriented at random cause spotted
appearance of the rock, subordinate amount of garnets
being 0.2 cm in diameter within footwall portion.
- 187.00 - 203.00 : No outcrop

203.00 - 207.50 : Garnet - biotite bearing sericite - amphibole - fspar
qtz gneiss

Sample: SNØ-34

Thinsection

whole rock

analysis

(meta - qtz - keratophyr)

gr, porphyroblastic texture, cm- to dm- layering with superimposed mm- to cm- lamination, banding is caused mainly by textural changes due to the crystallization status of amphibole but too results from compositional changes and futher is due to variations in the degree of foliation, amphibole is the most prominent mineral and occurs as idiomorphs being tabular and prismatic that may reach 3 cm lengths, the crystals are oriented at random and form an open framework of touching and crosscutting needles, they sometimes are concentrated in distinct layers to form trains of granules, only sometimes the prisms get oriented parallel to the layering of the rock, biotite mainly forms individual laminae which are discontinuous, it sporadically accompanies amphibole as single crystals, qtz and plagioclase and sericite form a fine - grained equi - granular mosaic, they in places form discrete layers which look as being of clastic sedimentary origin, the meta - qtz - keratophyr gradually passes into calcareous epidote - biotite bearing amphibole - fspar qtz gneiss which is similar to the banded amphibolite at hanging wall. Gradual hanging wall.

207.50 - 209.00 : High calcareous amphibole bearing biotite - chlorite - fspar - qtz gneiss

Partly A/C

(metamorphosed tuff or tuffite sequence, alternate felsic and basic to intermediate tuff or tuffite layers)
(comparable with sample TVN IV 11, 11 a, 11 b, 13, 13 b, 14, 14 b which immediately underly ore zone IV)

Sample: SNØ-07

SN 531200 6906135

Thinsection

gr, darkgr, gnbrown, slightly yellowish, distinctly cm - layered with occasional mm - lamination being superimposed, compositional and thus textural banding, alternate high calcareous biotite - chlorite, calcareous chlorite - biotite - fspar - qtz and phyllosilicate - carbonate bearing fspar - qtz layers which mainly have sharp contacts, some streaks of carbonate, biotite and chlor-

ite form slightly porphyric flakes which always are parallel to the banding of the rock, carbonate occurs as scattered idiomorphs which in places form trains of granules, carbonate has a clear tendency to accompany the phyllosilicates, tiny spots of sulphide are present throughout.

Gradual hanging wall.

209.00 - 230.00 : Calcareous to high calcareous epidote - biotite - chlorite - plagioclase - amphibole - qtz gneiss (banded amphibolite)

C (meta - basic tuff or tuffite with cherty layers)
whitegr to gn or grgn, medium - to coarse-grained, granoblastic - to porphyroblastic or lepidoblastic texture, cm- to dm layering, alternate carbonate, amphibole, plag. - qtz - amphibole, chlorite - amphibole, biotite, amphibole bear. plagioclase - qtz and qtz (cherty) bands, amphibole is the most prominent mineral as it forms porphyroblasts grading from 0.4 cm to 3.0 cm in length, the prisms are oriented at random but sometimes parallel the layering, spherulites are found being continuous with the compositional banding, biotite is slightly porphyric and randomly is oriented and tends to form trains of granules, carbonate is found as idiomorphic crystals within all types of layers but forms too discrete bands or lenses which sometimes are discordant to the layering, near hanging contact the banded amphibolite often gets interlayered by dm - thick bands of plagioclase - amphibole schist (intermittent basalt flows), a discontinuous low - grade py mineralization of 50 cm thickness is situated close to the lying amphibole schist, the pyrite dissemination occurs within a biotite - fspar - quartz gneiss (cherty meta - keratophyr) which shows a distinct lamination caused by a rhythmic repetition of mm - thick layers of biotite which often are discontinuous, biotite forms besides that porphyroblasts which randomly are oriented. Sharp hanging wall, develops in places a bedding fault line.

Sample: SNØ-35

Thinsection

whole rock

analysis

137/48° SW at 211.00 m, 133/51° SW at 228.00 m.

230.00 - 278.00 : Amphibole schist to plagioclase - amphibole schist
(meta - basalt, flow, crude development of pillow structure)

Sample: SNØ-27
Thinsection
whole rock
analysis

gn to grgn, fine - grained with sections being more medium - grained, here mainly plag. - amphibole schist, often crosscut by veinlets of epidote and carbonate, some dm - interlayers of calcareous epidote - amphibole - chlorite - biotite schist, gn, brown, gr, cm-

Sample: SNØ-28
Thinsection
whole rock
analysis

layered, alternate fine - grained amphibole bands and layers composed of carbonate - chlorite - amphibole and biotite which always are medium crystalline; sporadically interlayered sections of biotite - amphibole schist, gn, fine - fibrous amphibole, discontinuously banded by mm - layers of coarse - crystalline biotite which sometimes are composed to a web - like feature; near hanging contact meta - basalt gradually changes into amphibole - plagioclase - qtz schist/rock leucobasalt, flow, grgn, medium - grained, porphyroblastic texture, slightly porphyric amphibole prisms max. 0.4 cm long are randomly oriented.

257.00 - 257.20: magnetite banded quartzite (meta - chert), fine - grained, cm - layers of qtz in alternation with mm - bands or streaks of mt.

Sharp hanging wall, slightly tectonic.

131/44° SW at 230.00 m, 174/40° SW at 238.00 m,
159/55° SW at 275.00 m.

278.00 - 282.00 : Biotite - sericite schist
(meta - pelite)

gr, porphyric biotite as cross - mica cause spotted appearance of the rock, some cm - thick discontinuous layers of sericite - quartzite intercalated.

Gradual hanging wall.

160/59° SW at 278.00 m.

282.00 - 290.00 : Slightly calcareous chlorite bearing biotite - sericite-epidote - qtz - fspar - amphibole schist / gneiss

High epidote

(meta - basalt, flow may be pyroclastite)

similar: 171.00 - 179.60 m (south), epidote too forms discrete bands, flasers and lenses which often cross-

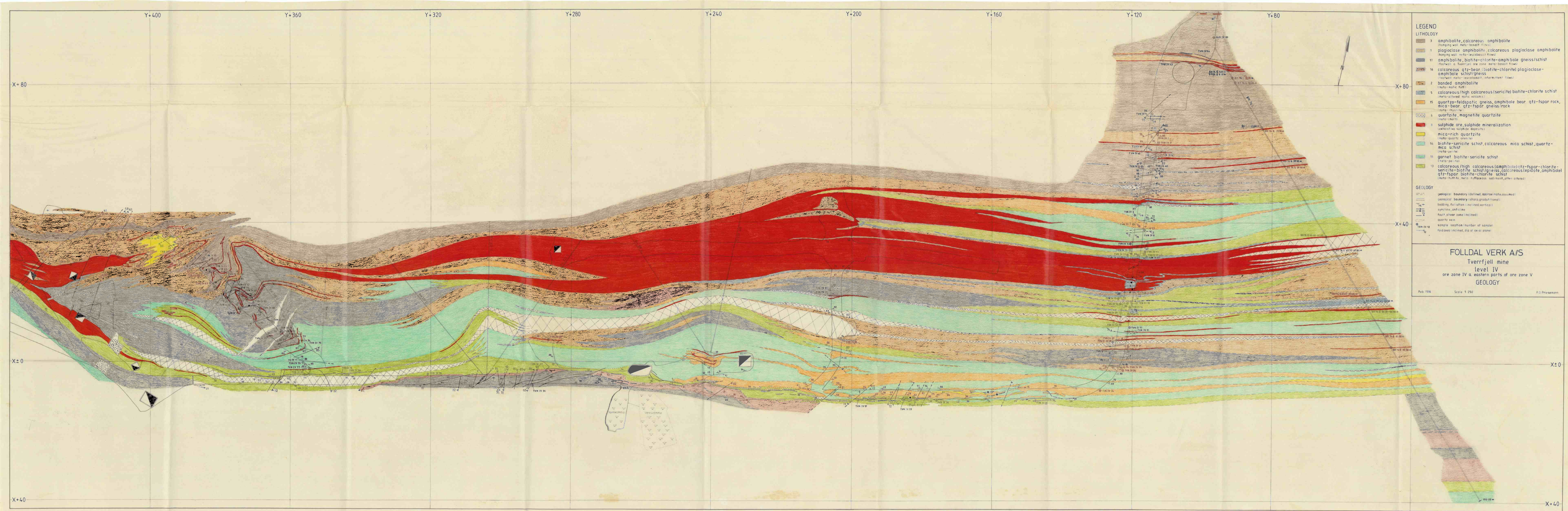
cut schistosity.

Gradual hanging wall.

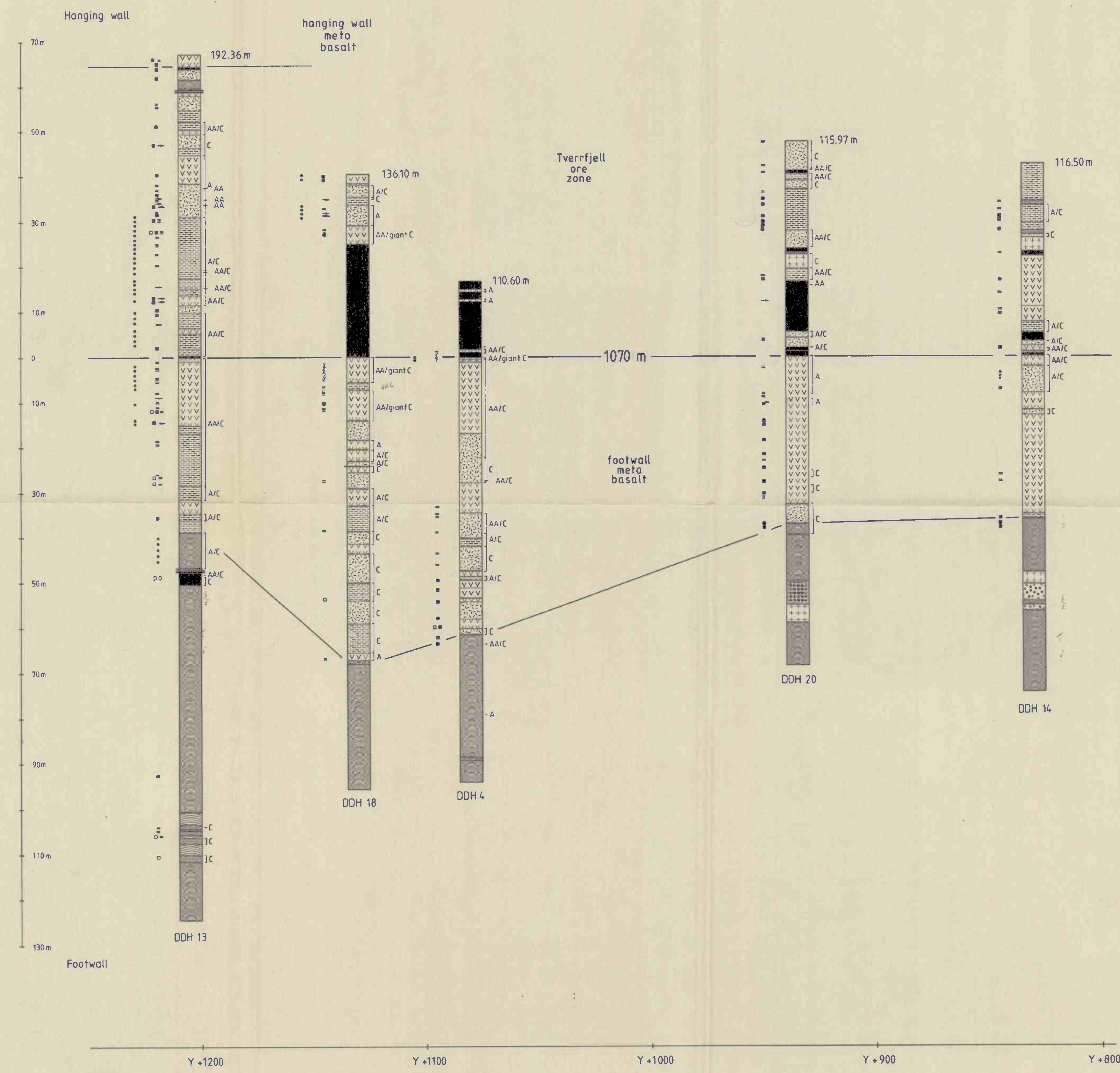
- 290.00 - 334.00 : Calcareous to high calcareous epidote - biotite - chlorite - plagioclase - amphibole - qtz gneiss
 (banded amphibolite)
 (meta - basic tuff or tuffite with cherty interlayers)
 same as: 209.00 - 230.00 m (south), between 331.50 - 333.50 m several interlayers of epidote - amphibole - quartzite (cherty tuff), layered rock with alternate qtz, epidote - qtz and amphibole or amphibole - qtz bands.
 Sharp hanging wall, strongly foliated, supp. bedding fault line.
 174/32° SW at 291.00 m, 157/34° SW at 232.00 m.
- C
 High epidote
 Sample:SNØ-36
 Thinsection
 whole rock
 analysis
 (middel portion)
- 334.00 - 339.00 : Schistose amphibolite to plagioclase-amphibole schist
 (meta amygdaloid basalt)
 gn, nematoblastic texture, cm - large deformed and stretched plagioclase crystals which equally are distributed.
 Sharp hanging wall.
 156/38° SW at 334.00 m.
- 339.00 - 340.60 : Calcareous epidote - plagioclase - qtz - amphibole schist
 (meta - basalt, supp. pyroclastite, stressed (?))
 gn to grgn, medium - grained, crude development of layering, latter possibly due to stress, alternate carbonate, epidote - amphibole and epidote - amphibole - plagioclase - qtz bands which often are discontinuous, amphibole forms prisms on average 0.7 cm long which mainly are aligned with the layering / foliation.
 Sharp hanging wall.
- High epidote
- 340.60 - 343.00 : Plagioclase amphibolite
 (meta - basalt, flow)
 grgn, medium - grained, porphyroblastic - texture, prismatic amphibole on average 0.5 cm long always randomly oriented.
- Sample:SNØ-29
 Thinsection
 whole rock
 analysis

- 343.00 - 377.00 : No outcrop
- 377.00 - 379.00 : Amphibole schist
 (meta - basalt, flow)
 gn, fine - grained, nematoblastic texture, some mm-
 flasers or laminae of carbonate which always are con-
 formable with the schistosity, abundant irregular dis-
 conformable bands and lamina of biotite - chlorite or
 epidote - plagioclase - amphibole which always carry
 prismatic amphibole on average 0.4 cm long.
 140/48° SW at 378.00 m.
- 379.00 - 387.50 : No outcrop
- 378.50 - 400.20 : Amphibole schist
 (meta - basalt, flow, partly may be pyroclastite)
 gn, fine - grained, nematoblastic texture, some flas-
 ers or laminae of epidote and/or carbonate often con-
 formable but sometimes crosscutting schistosity, spora-
 dically embedded crystal aggregates of biotite which
 often are accompanied by epidote, sometimes cm - or
 even dm - thick sections which are distinctly layered,
 banding consists of alternate epidote or epidote - am-
 phibole, biotite and carbonaceous plagioclase - qtz -
 amphibole layers, banded sections always are medium -
 grained and show a porphyroblastic texture with amphi-
 bole - prisms being randomly oriented.
 158/43° SW at 395.50 m.
- Sample: SNØ-30
 Thinsection
 whole rock
 analysis
- Spoadically
 high epidote
- 400.20 - 402.00 : Epidote - plagioclase - amphibole - qtz gneiss (banded
 amphibolite)
 (meta - basic tuff or tuffite)
 grgn, gr, lightgn, medium - grained, porphyroblastic
 texture, cm - layered, alternate amphibole, epidote -
 plagioclase - amphibole - qtz and carbonate bear. epi-
 dote - amphibole bands, typical porphyric amphibole
 which randomly is oriented.
- High epidote
- 402.00 - 407.00 : No outcrop.

- 407.00 - 421.00 : Amphibole schist
(meta - basalt, flow)
same as: 387.50 - 400.20 m (south),
151/45° SW at 408.00 m, 128/53° SW at 417.00 m,
130/54° SW at 420.00 m.
- 421.00 - 436.00 : No outcrop
- 436.00 - 452.00 : Slightly calcareous amphibole schist
(meta - basalt, flow)
same as: 387.50 - 400.20 m, spotted carbonate within
some sections.
145/51° SW at 438.00 m.
- 471.00 - 473.00 : Calcareous epidote - biotite - chlorite - plagioclase -
amphibole - qtz gneiss (banded amphibolite)
C
(meta - basic tuff or tuffite with cherty interlayers)
same as: 209.00 - 230.00 m.
129/42° SW at 453.00 m.
- 473.00 m end of profile



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LEGEND

LITHOLOGY

- amphibolite, schistose amphibolite (meta basalt flow)
- calcareous chlorite-qtz-amphibole-fspar gneiss/rock (banded amphibolite) (meta mafic tuff)
- biotite-chlorite bear. qtz-fspar gneiss/rock, amphibole-qtz-fspar gneiss (meta quartzkeratophyr tuff, meta rhyolite tuff)
- calcareous (± amphibole) qtz-fspar rich biotite-chlorite schist, calcareous sericite bear. biotite-chlorite-qtz-fspar rock/schist, calcareous chlorite-biotite-sericite-qtz-fspar rock/schist (meta tuffs, meta tuffites, predominately altered)
- quartzite, magnetite quartzite (meta chert)
- sulphide ore (exhalative sulphide deposit)
- (amphibole bear) mica rich quartzite (meta quartz arenite)
- chlorite bear. garnet-biotite-sericite schist (meta pelite)
- garnet-biotite-amphibole-sericite schist (meta pelite with volcanic impurity)
- calcareous mica schist, amphibole bear. mica schist (meta conglomeratic tillaide a meta greywacke)

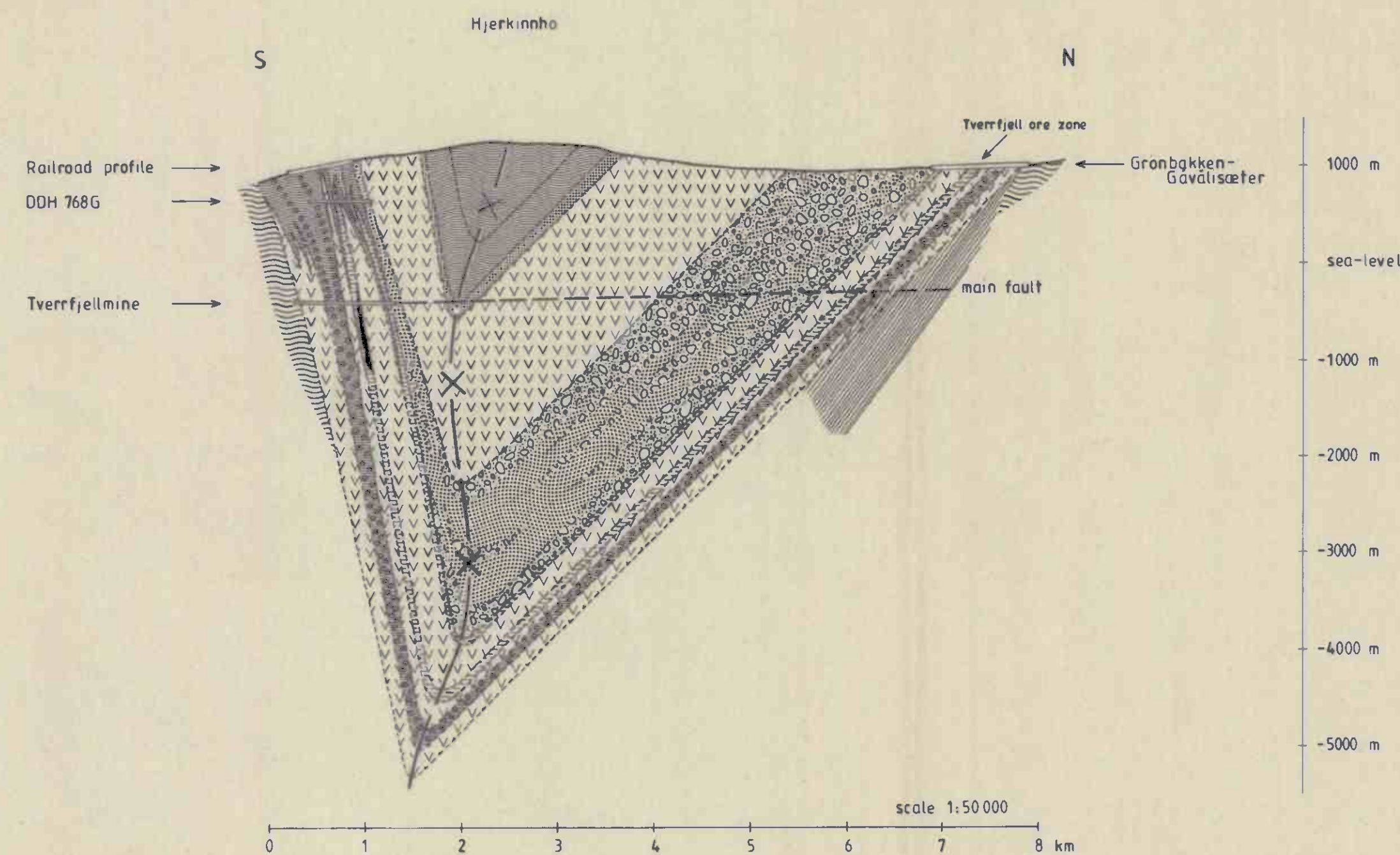
GEOLOGY

- geological boundary (sharp, gradational)
- fault
- occurrence of pyrite, pyrrhotite
- stockwork mineralization (pyrrhotite, chalcopyrite)
- scattered crystals of magnetite
- interlayers of chert
- chert with dusty magnetite
- C high carbonate content of rocks, often as spotted carbonate
- A weakly altered rock
- AA strongly altered rock
- giant C giant spots of carbonate

FOLLDAL VERK A/S

Tverrfjell mine

LONGITUDINAL SECTION ORE ZONE I



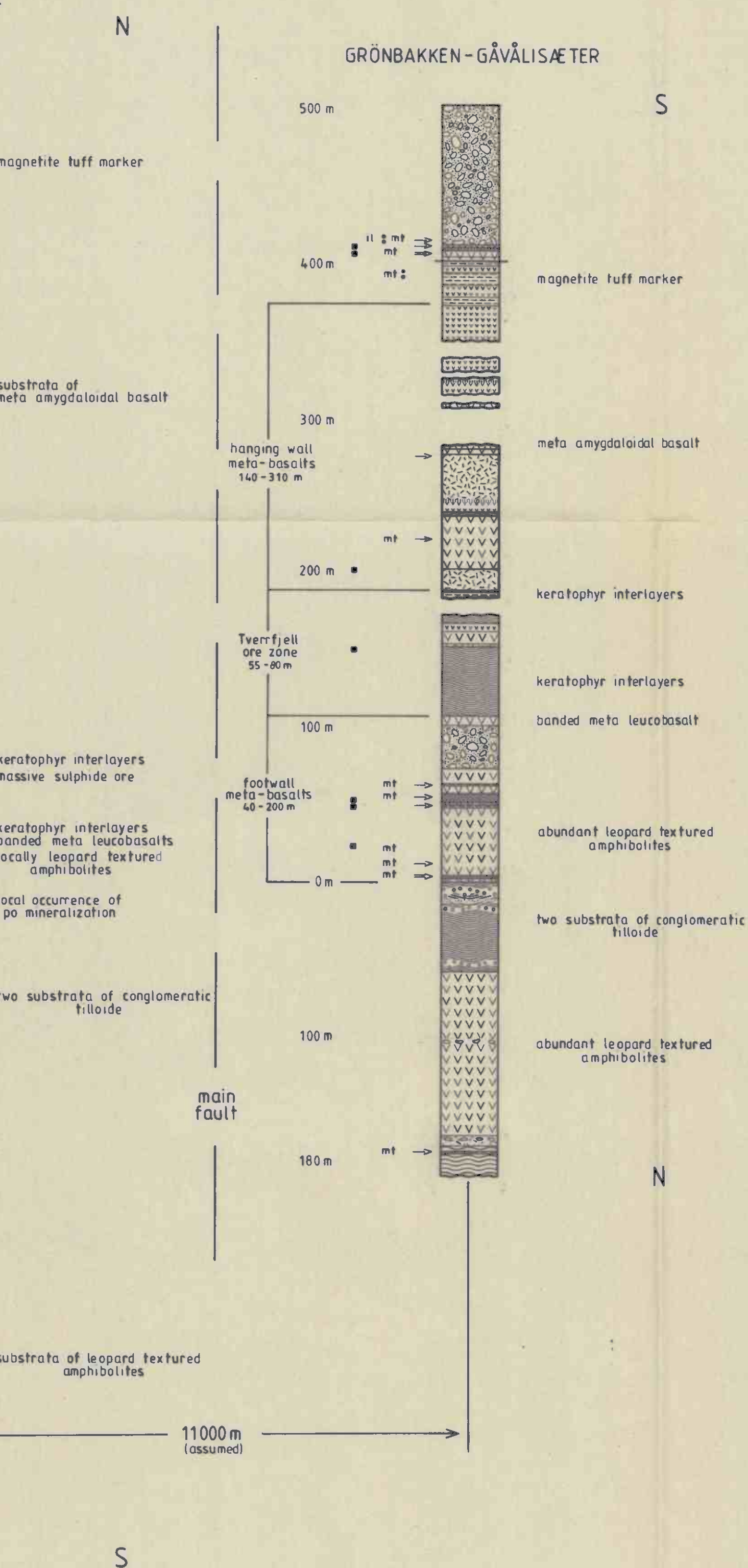
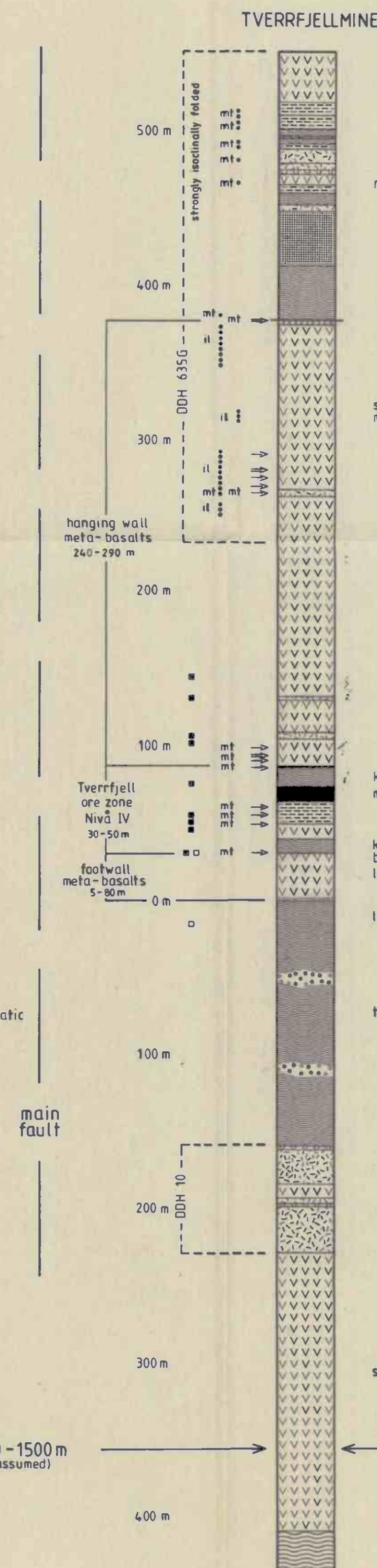
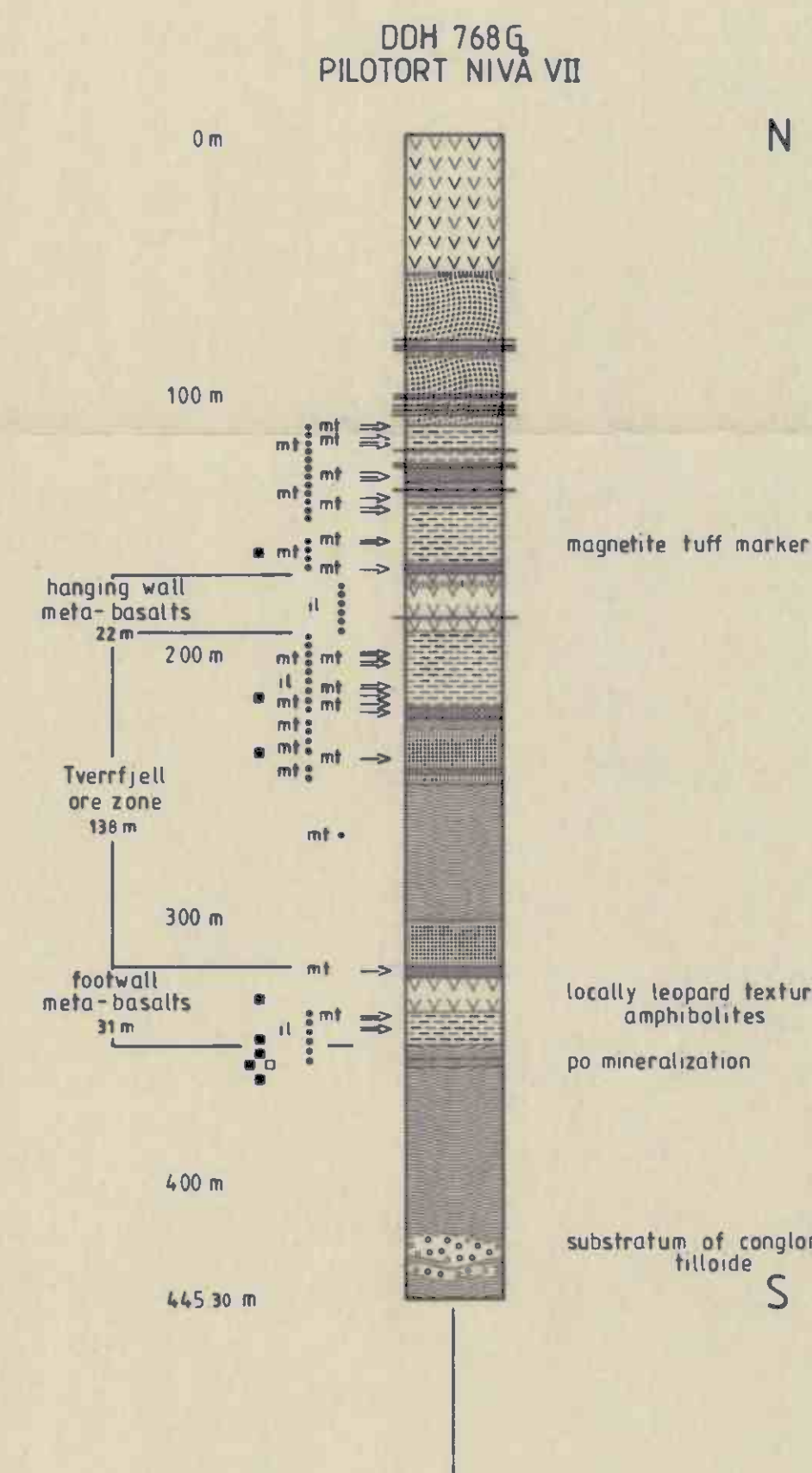
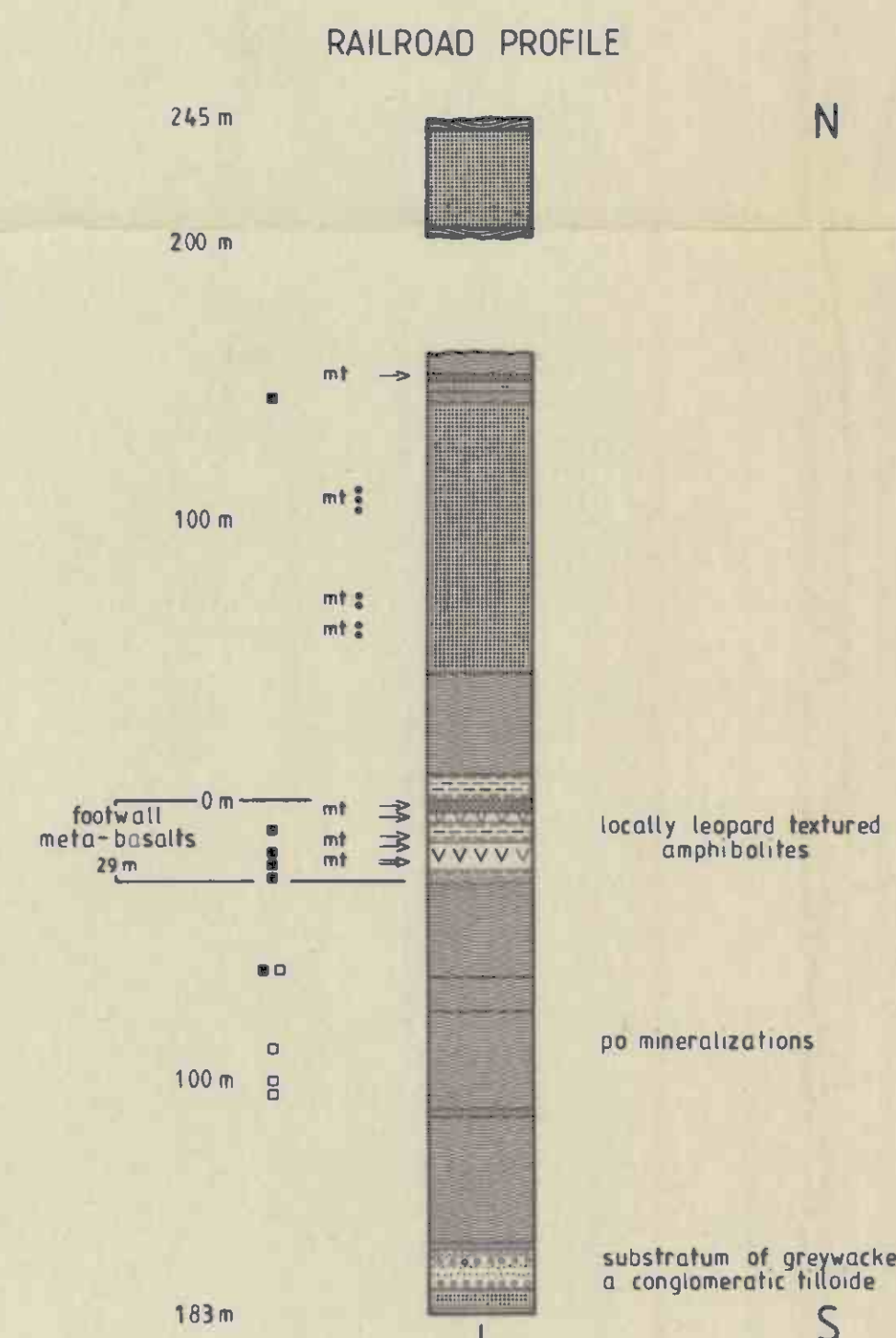
LEGEND

LITHOLOGY

- amphibolite, plagioclase amphibolite (meta basalt flow)
- mica-bearing amphibolite, plagioclase amphibolite fragmental volcanic rock (supp. meta basic lapilli tuff a. agglomerate)
- mica-rich epidote amphibolite fragmental volcanic rock (meta hyaloclastite)
- banded amphibolite (meta mafic tuff)
- banded amphibolite, amphibole-qtz-fspar rock, calcareous mica schist, calcareous mica-rich qtz-fspar gneiss/schist (meta mafic a. felsic tuffs, tuffites a. epiclastic sediments)
- (calcareous) biotite-chlorite schist fragmental rock, clasts of amphibolite, vesiculated amphibolite a. amphibole-qtz-fspar rock (supp. meta subaqueous lahar of dominantly volcanic-derived material)
- calcareous epidote-biotite-chlorite schist, calcareous epidote-biotite-sericite schist (meta mafic volcanic sediment with epiclastic sedimentary impurity, supp. distal facies of subaqueous debris flow/lahar)
- quartzite, magnetite quartzite (meta chert)
- quartzite, mica-banded quartzite (meta quartz arenite, supp. related to turbidity currents)
- chlorite-bearing biotite-sericite schist, amphibole garbenschist (meta pelitic sediment)
- calcareous mica schist, amphibole-bearing mica schist (meta conglomeratic tillaide a. meta greywacke)
- quartz phyllite, biotite-sericite schist (meta pelitic sediment)

GEOLOGY

- geological boundary (sharp, gradational)
- fault
- occurrence of pyrite, pyrrhotite
- occurrence of magnetite, ilmenite
- scattered crystals of magnetite, ilmenite
- chert layer
- chert layer with magnetite
- occurrence of graphite



FOLLDAL VERK A/S

HJERKINN PROJECT

CORRELATION OF LITHOLOGICAL PROFILES
FROM WEST AND EAST
OF THE MAIN FAULT