NEAB's WORK AT TJOSÅS, 2009-2015

Tjosås,one of the two massive sulphide layers at Tjo7. The upper part is mostly pyrite while the lower is high in sphalerite.

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CONTENT

Appended CD with the files necessary for printing a copy of this report

SUMMARY

NEAB has since 2009 explored for gold-rich Volcanic Hosted Massive Sulphide (VHMS) mineralisation in SW-Norway's Hardanger Fjord district. Such mineralisation occurs at Tjosås where NEAB's grab samples (table 1) have returned up to 36.9 ppm gold and significant grades of base-metals. Prior to 2013 NEAB had only mapped Tjosås's old workings and taken some grab-samples but during 2013-15 soil geochemistry (table 2) and general fieldwork were carried out. This has led to the delineation of a +3300 m long mineralised stratigraphic level (figures 1 & 2 - see appended map at back of report). Lenses of massive sulphides with sometimes good grades have been found at four segments (figures 3 & 4) along the main mineralised stratigraphic level but their thicknesses range from only 2 to 50 cm.

Nothing really interesting was found in 2015 and omnipresent layers of graphite-schist renders commonly used EM geophysical methods more or less futile, so it's difficult to see how to progress with Tjosås. There is one opening, though.

This report is an update of the 2014 report. A number of errors in that report have been corrected and only little of it has been omitted in the new one. The 2014 report can thus be discarded.

DISTRICT GEOLOGY

The Hardanger district's VHMS mineralisation is mostly associated with two island arcs: the Mundheim Group and the Ølve-Varaldsøy Group (figure 5). The island arcs are comprised of sediments and bimodal volcanics and were obducted and thrusted into their present positions during the Caledonian Orogeny during which they underwent greenschist facies metamorphism. The Ølve-Varaldsøy Group is especially well-endowed with regard to VHMS occurrences but they also occur in the Mundheim Group. The district's occurrences generally consist of massive pyrite ± magnetite ± pyrrhotite ± chalcopyrite, sphalerite and galena, and they are generally hosted in chloritised, sericitised and silicified volcanics, in many cases close to rhyolite. Some of them are quite enriched in gold (table 3), not least Tjosås. The basement comprises Proterozoic gneisses which outcrop in abundance on the eastern side of the Hardanger Fjord.

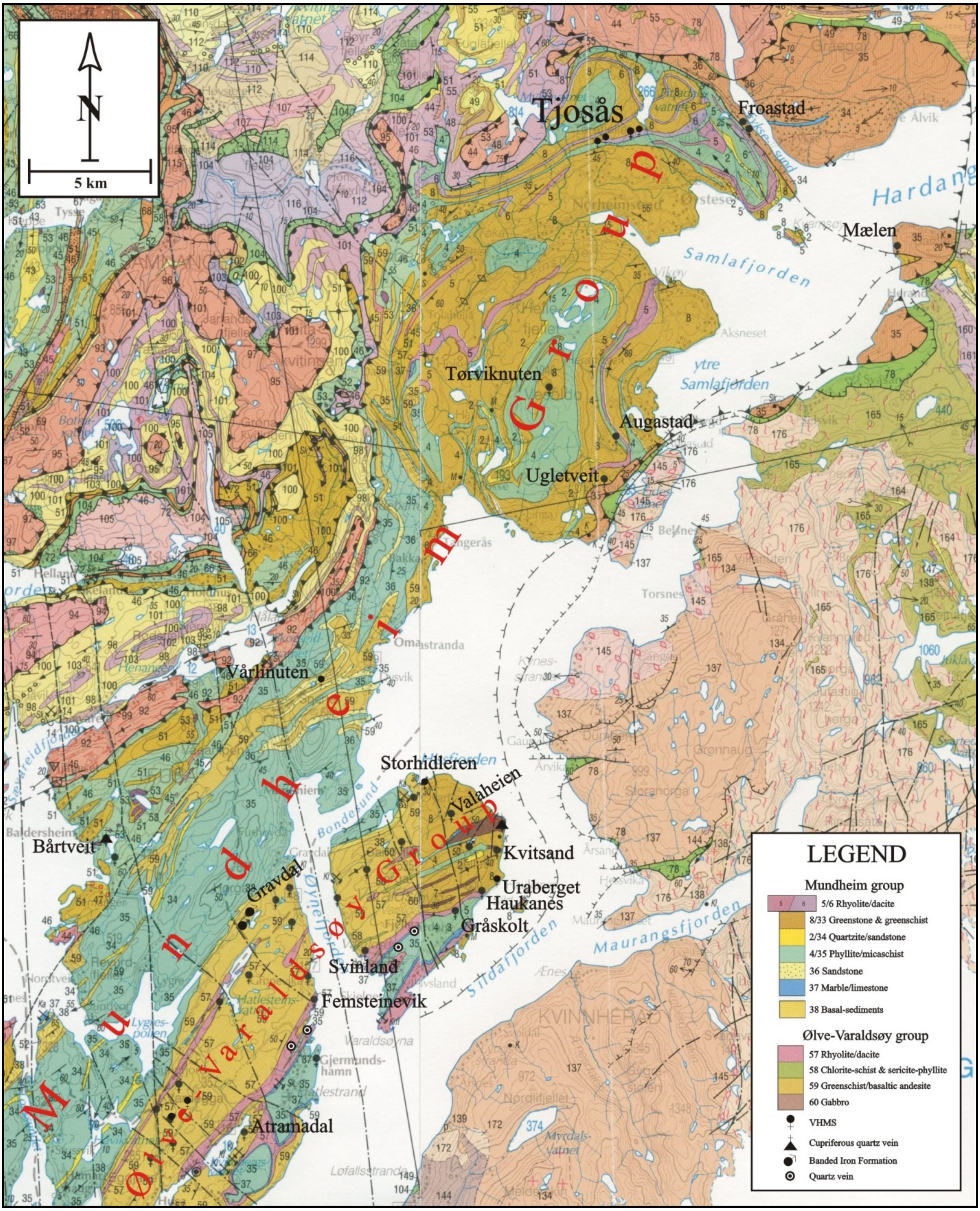

Figure 5: Geological map showing the Mundheim and Ølve-Varaldsøy groups – island arcs obducted during the Caledonian orogeny. Most of the known occurrences and deposits are also shown – Tjosås is the northernmost. NEAB has since 2009 investigated all the known occurrences and deposits except 4-5 which have not been located.

Occurrence	# of samples	Au	Max Au	Ag	Cu	Zn	Pb	Cu+Zn+Pb	As	Sb	Bi	Fe	Mo
		ppm	ppm	ppm	%	%	ppm	%	ppm	ppm	ppm	%	ppm
Storhidleren core	1	33,9	33,9	23	0,03	0,02	145	0,06	307	<5	6	28	239
Storhidleren 30 kilo	1	23,9	23,9	41	0,02	0,02	295	0,07	1300	135	3	21	190
Storhidleren chip	22	14,0	130,0	17	0,01	0,04	230	0,07	326	24	2	16	157
Storhidleren grab	21	12,2	45,3	31	0,02	0,02	279	0,07	1250	37	u.d.	23	99
Vardtjønnbekken	2	10,3	11,0	27	0,89	5,27	1858	6,35	93	3	6	35	10
Tjosås	16	4,6	36,9	31	0,99	8,96	5576	10,50	164	21	8	18	18
Godejord	11	4,8	15,9	106	2,66	8,49	2821	11,44	30	5	10	13	20
Flatskarvåsen	3	2,7	4,8	5	3,08	0,02	3	3,10	185	18	29	22	10
Haukanes	7	2,5	9,7	35	1,14	4,25	1728	5,56	402	9	3	31	80
Skyttemyr	8	2,4	7,2	33	3,45	3,60	84	7,06	274	4	63	15	5
Raudvatnet	5	2,4	7,3	122	0,62	5,14	4724	6,23	86	12	7	7	38
Uraberget	2	2,0	2,4	54	1,51	3,33	839	4,92	1145	11	14	37	117
Svinland	3	1,5	4,3	28	0,58	3,68	3911	4,65	1567	16	4	26	30
Brennfjellmyra	5	1,4	3,3	2	1,19	0,03	13	1,23	40	0	33	5	2
Tilset	4	1,3	4,7	23	2,12	0,06	10	2,18	3	0	19	19	0
Femsteinevik	2	1,3	1,8	52	1,50	2,94	2105	4,65	175	u.d.	48	31	50
Kvitsand	8	1,2	2,9	15	2,31	0,28	644	2,65	215	7	73	21	63
Hestkletten	3	1,2	3,1	62	4,74	5,69	13554	11,78	10367	56	157	21	19
Tjørnvollmyran	5	1,2	3,3	27	4,89	1,52	3776	6,79	10	0	67	19	25
Tømmeråsfjellet	2	1,1	1,7	1	0,01	0,04	15	0,05	591	0	0	17	1
Børskneppen	8	1,1	3,6	8	3,33	0,12	54	3,45	1	1	16	13	2
Øytrø	10	1,1	2,1	49	0,69	6,83	1721	7,69	2009	7	4	12	2
Gråskolt	4	1,0	1,4	47	1,82	2,63	1710	4,62	475	5	u.d.	33	38
Løvlibekk	6	0,9	2,0	14	1,99	0,16	16	2,15	7	3	18	13	4
Ramfjell	3	0,9	1,9	4	1,57	0,31	3	1,88	9	5	5	13	5
Våraviken	5	0,8	1,8	62	1,59	8,60	19728	12,16	236	92	250	28	16
Mannfjell	14	0,7	3,7	29	0,97	3,95	385	4,96	69	2	5	14	2
Rosset	13	0,7	5,3	17	1,06	2,37	396	3,47	63	2	11	16	4
Forneset	3	0,6	1,9	49	0,96	0,01	11	0,98	4	1	7	9	428
Fines	17	0,6	6,9	38	2,62	0,63	5123	3,76	11	3	40	13	72
Søndre Geitryggen	12	0,6	3,1	20	1,06	1,18	501	2,29	52	0	11	18	16
Nygruven	5	0,6	1,3	19	0,87	3,15	2987	4,32	58	2	10	22	2
Storenga	2	0,6	1,1	11	0,96	1,18	1660	2,30	386	15	20	19	0
Gullberg	3	0,6	1,2	24	4,10	0,22	157	4,33	98	0	15	28	10
Rundhaugen	5	0,5	1,3	12	3,20	0,93	724	4,20	95	10	59	28	2
Varglibusta	3	0,5	1,5	4	1,57	0,03	11	1,60	0	1	5	13	1
Mælen	5	0,5	1,2	26	0,80	1,77	2803	2,85	466	5	12	36	6
Visletten	10	0,5	2,1	26	0,45	2,87	1884	3,51	46	3	11	17	1
Nya Solskinn	6	0,5	1,0	10	4,92	1,67	337	6,63	1	19	70	30	4

Table 3: Average contents of samples from Norwegian VHMS occurrences with at least one sample >1 ppm gold and average gold content >0.5 ppm gold. The occurrences marked with green were sampled by NEAB and are located in the Mundheim or Ølve-Varaldsøy groups (figure 5). The other occurrences were sampled by NGU and the data comes from a database with 2744 samples from 2-300 VHMS individual occurrences. NGU's samples are from outcrops and dumps, as are NEAB's. Data on sulphur content are incomplete and were omitted but contents of Fe+base metals indicate the contents of sulphur. Both Storhidleren and Tjosås stand out because of their high average and maximum gold contents. Storhidleren is noticeable by being practically devoid of base metal while Tjosås has the table's highest zinc content. On the whole, the Hardanger district's VHMS occurrences are overrepresented among auriferous Norwegian VHMS occurrences.

TJOSÅS

The VHMS-mineralisation at Tjosås is hosted by dacite and phyllite/mica-schist (according to NGU's geological map, figures 1, 5 & 6) belonging to the Mundheim Group. Pyrite is the dominant sulphide followed by sphalerite and minor chalcopyrite and galena. Pyrrhotite is uncommon. The sulphides are generally somewhere between fine- and medium-grained. The massive sulphide layers are generally folded and boudinaged. NEAB has now gathered 49 ore and rock samples at Tjosås (table 1). The sixteen ore samples average 4.6 ppm Au, 31 ppm Ag, 9.0% Zn, 1.0% Cu and 0.6% Pb. With regards to metal value, these ore samples are in county Hordaland seconded only by samples from Storhidleren. Alteration is primarily chloritisation, sericitisation and silicification but carbonatisation also occurs. The mineralisation is located on a SSE sloping mountain side (figures 3 & 6) overlooking the Hardanger Fjord. It is best described as a +3300 m long stratigraphic level, or rustzone, with sporadic massive sulphides (figure 4). The terrain is more or less vegetated with plenty of small bogs and small and sporadic outcrops. The mineralised level's lowermost outcrop is at 270 m above sea level while the uppermost is at 700 m.

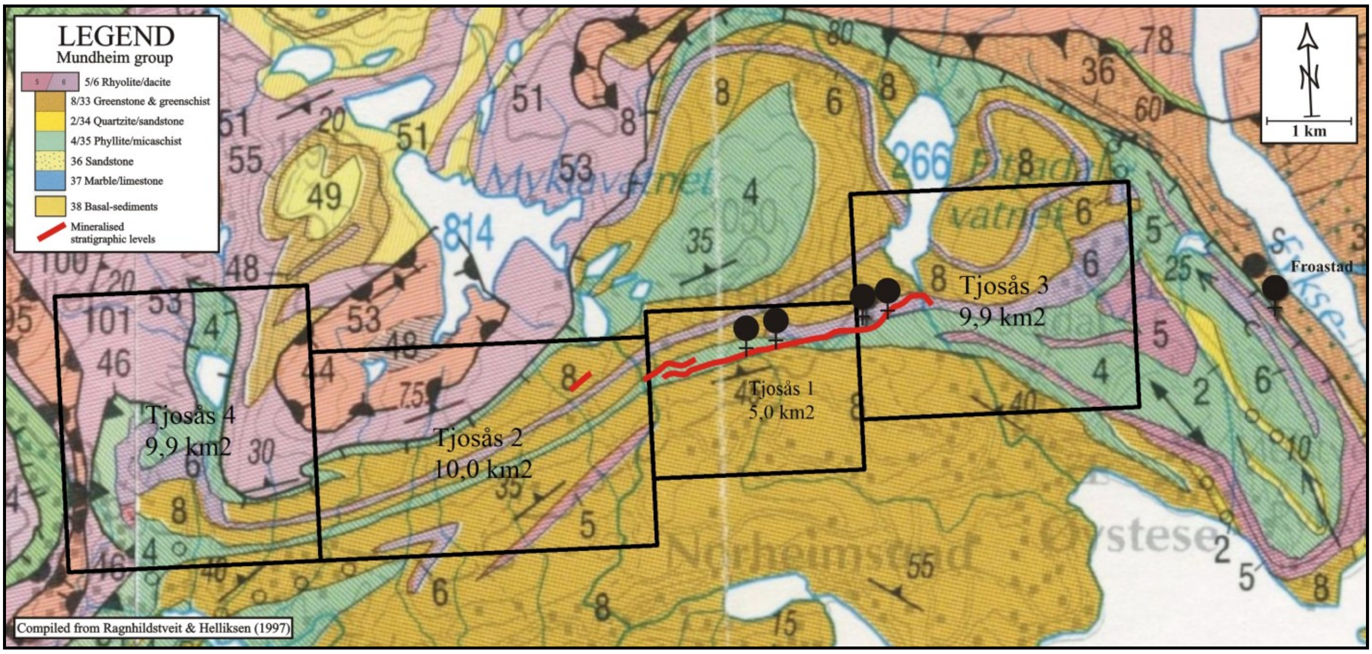

Figure 6: Geological map showing the Norheimsund-Øystese area and the main mineralised stratigraphic level (the longest) at Tjosås. The sulphide mineralisation at Froastad was investigated in 2015 but is of no further interest.NEAB's four exploration licenses are also shown.

History

In 1883 Norges Bergverksdrift wrote that "last year, on land belonging to the farms Tjosaas and Stues, some occurrences with cupriferous pyrite and galena in quartz were test mined by English Robert Milburn. In an undated report (Hagen), Tjosås is said to be too poor to warrant further investigation. Two geologists from the Norwegian Geological Survey (NGU) passed Tjosås in 1977 and took two samples returning 0.28% & 1.2% Cu, 0.37% & 0.52% Pb and 5.7% & 1.4% Zn, respectively. NGU concluded that Tjosås was of some interest because of its relatively high zinc content but did not analyze the two samples for gold.

Old workings and other outcrops along the main mineralised stratigraphic level

The following is a short description of the old workings and the other outcrops which together define the + 3300 m long main mineralised level.

Tjo1	343122	6699551
Tjo2	343102	6699547
Tjo4	343077	6699537
Tjo5	343053	6699519
Tjo6	342196	6699421
Tjo7	341957	6699370
Tjo8	343410	6699540
Tjo9	342288	6699419
Tjo10	342893	6699496
Tjo11	342838	6699485
Tjo12	342391	6699437
Tjo13	341799	6699330
Tjo14	343168	6699555
Tjo15	341662	6699319
Tjo18	343888	6699785
Tjo19	343835	6699777
Tjo20	341383	6699258
Tjo21	341314	6699217
Tjo22	341108	6699236
Tjo23	341090	6699221
Tjo24	344190	6699867
Tjo25	344259	6699782

Table 4: The old workings' and outcrops' UTM-coordinates.

Tjo1, Tjo2, Tjo4, Tjo5

The richest part of the main mineralised stratigraphic level can be followed for about 75 m along strike between Tjo1 and Tjo5. Figure 7 shows the old workings – it appears that the eastern adit is too far south to intersect the massive part of the mineralisation but there is the same chlorite-sericite alteration as in the other old workings. The mineralisation is best seen at Tjo2 and Tjo5. At Tjo2 are two 10-15 cm thick layers of massive and fine-grained sulfide (mostly sphalerite) whereas I at Tjo5 only noticed one 5 cm thick layer – but judging from 30 cm thick (across banding) specimens in the dump, there is/was more than is seen in outcrop. The sulfide layers are pyritic and have more sphalerite than any other VHMS in the district. Chalcopyrite and galena are also common but there is much less of them than of sphalerite. The alteration is the typical – sericitisation, chloritisation, silicification and pyritisation. In addition there is carbonatisation. NEAB has not carried out any whole-rock geochemistry but the host rock seems to an intermediary volcanic rock which because of the metamorphosis and alteration can be characterised as a phyllite.

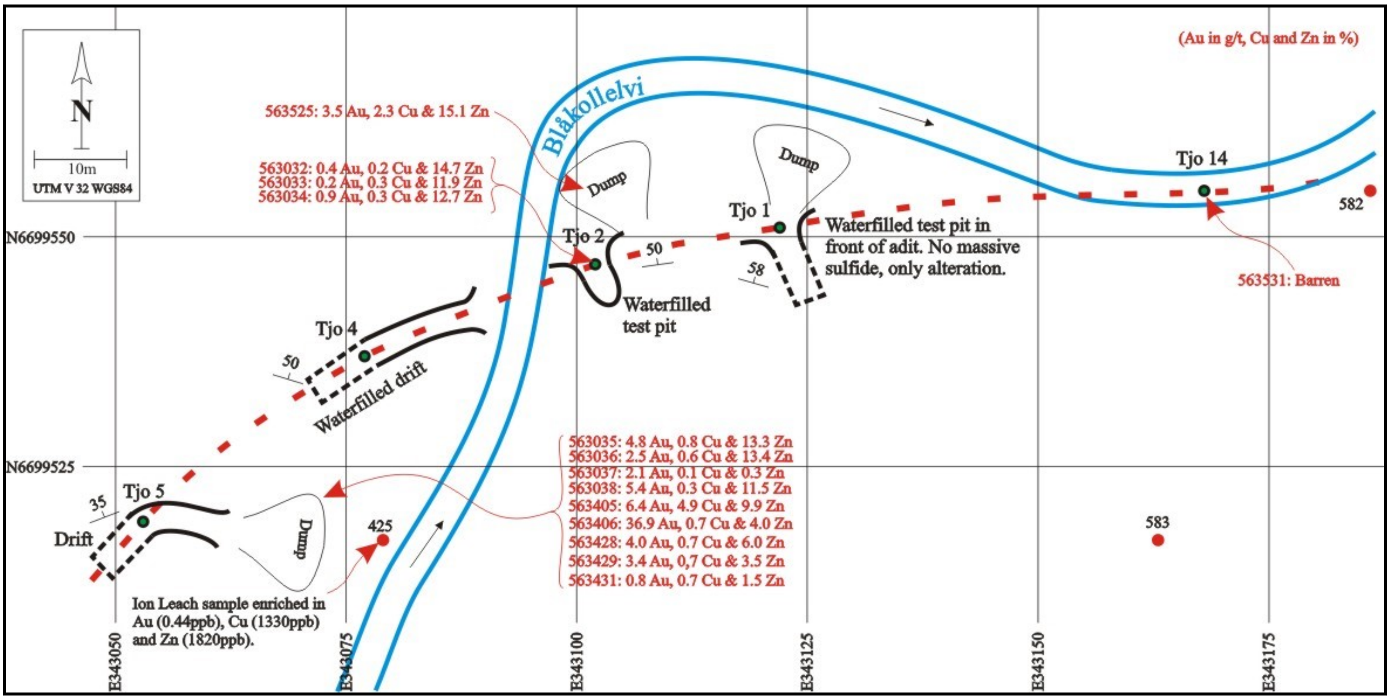

Figure 7: Map showing the old workings at Tjosås proper, and the ore samples' contents of gold, copper and zinc. An Ion Leach sample enriched in gold, copper and zinc was taken downhill from the dump outside Tjo5.

Figure 8: Some of the old workings at Tjosås. There is about 75 meters from Tjo1 to Tjo5. Tjo4 is behind vegetation. The creek Blaukollelvi crosses the mineralisation.

Figure 9: Tjo5, massive sphalerite and pyrite with traces of chalcopyrite and possibly galena. Matrix is quartz and minor chlorite. The sample is not analysed but has in excess of 20% zinc.

Figure 10: Tjo5, sample 563405. Massive chalcopyrite, pyrite and sphalerite in quartz matrix. 6.4 ppm gold, 74 ppm silver, 4.9% copper, 9.9% zinc and 0.4% lead.

Tjo6

At UTM E342196, N6699421, c. 900 meters WSW of the above old workings is a 2m^3 test pit. There is 40-50 cm of almost massive pyrite hosted in sericite-quartz schist. A +8 m thick rust zone occurs in erratic outcrops to the south of the test pit and can be followed at least 65 m towards west. This test pit was shown to me by Dagfinn Kjosås (figure 11) who is a local farmer and part owner of the land. Three ore samples were taken: 563115-16 & 563130. They have the same elements as the samples from the main occurrence (Tjo1-5) but there are less of the valuable ones despite the samples having higher sulphide content (table 1). One of them has almost 1.5% zinc and 1 ppm gold, however, so they are not completely barren. Some of NEAB's richest Ion Leach samples (with regard to gold, zinc, uranium and arsenic) come from the immediate surroundings of this test pit – one of them (437) was taken a few meter behind Dagfinn Tjosås, i.e. in the hanging wall of the test pit. Strike/dip is 57º/60ºW.

Figure 11: The test pit at Tjo6 and part owner of the area farmer Dagfinn Kjosås standing on weathered ore.

Tjo7

Tjo7 is a vividly coloured alteration zone (figure 12). The Ion Leach sample 552 was taken approximately 17 m SE of the top of the rusty part of the outcrop and is NEAB's richest. The alteration zone mainly consists of sericite and quartz with disseminated pyrite, but more important are two 5-15 cm thick tectonised layers of massive sulphide. The layers can be followed through the whole outcrop but their thicknesses vary considerably because of deformation. The upper layer consists of pyrite which downwards becomes increasingly rich in sphalerite (frontpage). The lower layer is semi-massive to massive sphalerite (figure 13). In the middle of the waterfall is a 4-5 cm big grain of chalcopyrite. The outcropping massive mineralisation at Tjo7 is equal to what is seen in outcrops at Tjo1-5 and blasting could probably result in samples of similarly high grades. Three chip-samples were taken: 563522 consists of fragments of the very weathered but relatively sulphide-rich parts of the rustzone c. 20 meter to the west of the waterfall, 563523 consists of the rustzone at the waterfall but excluding the two sulphide layers, and 563524 consists of the two massive sulphide layers.

Figure 12: The rustzone at Tjo7 under which NEAB's richest Ion Leach sample was taken in 2013.

Figure 13: Massive sphalerite with rounded fragments of silicates at Tjo7. Fragments of this layer went into sample 563524 together with fragments from the less zinc-rich sulphide layer depicted on the frontpage. It would have been better with two separate samples.

Tjo8

Tjo8 is a roadcut at UTM E343412, N6699542, i.e. at the gravel road (figure 14) leading up to Nystøl. There is about 2 meters of sericite-quartz schist with disseminated pyrite. A sample of the roadcut (563420) has 0.16 ppm gold but else nothing. Embedded in the gravel road less than 4 m from the roadcut were two ore specimens. The larger (figure 15) weighed 4-5 kilos and contained a folded layer of almost massive and very iron rich sphalerite. The specimen was crushed and the high-grade fragments together with another walnut-sized fragment of massive, iron rich sphalerite went into sample 563432 which returned 15.9% zinc and 0.7% copper, but no gold.

Figure 14: The roadcut with its slightly rusty outcrop of sericite-quartz with disseminated pyrite.

Figure 15: The largest of the two ore specimens found embedded in the gravel road at the roadcut.

Tjo9

At Tjo 9 the main mineralised stratigraphic level occurs in a c. 10 meter long south-facing outcrop. Thickness is uncertain but exceeds 1 meter. The alteration is chloritic and sericitic, and there is disseminated pyrite in a rather inaccessible part of the outcrop. Sample 563526 is of the most pyritic part – barren, as it turned out. Ion Leach sample 650 has 1 ppb gold and 1880 ppb lead – clearly anomalous. Strike/dip is 70˚/60˚N.

Figure 16: The rusty outcrop at Tjo9.

Tjo10

The main mineralised stratigraphic level is c. 120 thick in this outcrop. The alteration is primarily sericitic and there are only traces of sulphides. Strike/dip is 78˚/76˚N. One sample, 563527, was taken of the most rusty part. Three Ion Leach samples, 430, 628 and 648, have been taken downhill from Tjo10. The closest has very little while the other two are very high in one or more of the elements gold, copper, lead, bismuth, antimony and molybdenum. This may indicate that the main mineralised stratigraphic level in this area is a little to the south of the rusty outcrop in figure 17.

Figure 17: The rusty outcrop at Tjo10.

Tjo11

The 120 cm thick rusty, sericitic outcrop occurs at a creek, c. 55 m west of Tjo10. There are only traces of sulphides – pyrite, it seems. Strike/dip is 92˚/40˚N. One sample, 563528, was taken of the rustzone. An Ion Leach sample, 649, was taken 15 m to the west and below the rustzone. Both samples are barren.

Figure 18: The rusty outcrop at Tjo11.

Tjo12

Tjo12 is a north-facing sericitic outcrop at the southern margin of an elongated bog, approximately 200 m east of the test pit at Tjo6. There is disseminated pyrite and one sample, 563529 (0.19% lead), was taken. Strike/dip is 100˚/32˚N.

Figure 19: The rusty outcrop at Tjo12 – looking east. The elongated bog to the left (north) of the outcrop may be caused by the bedrock underneath being relatively softer and thus more eroded.

Tjo13

This 30-35 cm thick, rusty and sericitic/chloritic outcrop with traces of pyrite occurs in a creek approximately 160 m west of Tjo7 and almost under the high voltage pover line. One sample (563529) of the outcrop was taken, and an Ion Leach sample (651) was taken right underneath the rustzone a few m to the west of the creek. With regards to arsenic, both samples are the richest taken at Tjosås. Strike/dip is 90˚/66˚N. Raising the adjacent power line pylon involved minor blasting of a layer of massive graphite.

Figure 20: The rusty outcrop at Tjo13.

Tjo14

The mineralisation at Tjo14 consists of 20-30% pyrite hosted in quartz-chlorite. The thickness of the main mineralised stratigraphic level at Tjo14 is 1.5-2.0 meter. One sample, 563531, of the richest part was taken but has nothing but pyrite. Strike/dip is 120˚/30˚N.

Figure 21: The outcrop at Tjo14. The test pit at Tjo1 is c. 45 meters from this outcrop.

Tjo18, Tjo19

Tjo18 and Tjo19 are the eastern and western ends, respectively, of one of the better outcrops of the main mineralised stratigraphic level which here is 3-4 m thick. Sample 563539 consists of fragments from the four or five 1-4 cm thick, concordant veins of massive, coarse-grained pyrrhotite with traces of chalcopyrite. Sample 563539 is a sample of sericite with disseminated pyrite. Strike/dip is 46°/30°N at Tjo18 and 34°/20°N at Tjo19. In the footwall of Tjo19 is a c. 10 cm thick layer of almost pure graphite.

Figure 22: One of the four-five coarse-grained massive pyrrhotite>>chalcopyrite layers at Tjo19. Sample 563540 is made up of fragments from this layer and the outcrop's other sulphide layers. These massive sulphide layers are not traditional VHMS-style.

Figure 23: The main mineralised stratigraphic level between Tjo18 and Tjo19.

Figure 24: Tjo18-19. Sericite with disseminated pyrite. The brownish bands are semi-massive pyrite. Sample 563539 comes from this outcrop.

<u>Tjo15 and Tjo20</u>

Those are two rusty outcrops which were noticed while Ion Leach sampling (underneath them), and as the samples are among some of the best (samples 652, 653 and 662, figures 1 & 48) with regard to gold, copper and lead, there is little doubt that the outcrops are parts of the main mineralised stratigraphic level.

Tjo21
This outcrop is a minor rustzone with sericite, chlorite and traces of sulphides.

Tjo22-Tjo23
Starting from the creek at Tjo22, the mineralised stratigraphic level can be followed towards SW until Tjo23. There is the usual sericite and chlorite but also graphite, the content of which increases towards southwest where its thickness exceeds 20-25 cm. There are only traces of pyrite. Four Ion Leach samples (673, 680-81 and 716) were taken approximately on or underneath this part of the mineralised stratigraphic level. They have relatively high copper contents and one of them has more cobalt (415ppb) than any other sample from Tjosås.

Tjo24-Tjo25
Tjo24-Tjo25 are the endpoints of a semicontinuous and almost flatlying rustzone (locally greenish because of minor fuchsite) at the foot of an overhanging rockface. The alteration is mostly chloritic but sericite also occurs. Traces of pyrite and pyrrhotite occur sporadically. Getting representative samples from the outcrops was potentially dangerous so instead three Ion Leach samples (669-71) were taken from the top of the scree just below the rustzone. With regard to gold, copper and mercury, they are well above the medians for these elements.

Other mineralised stratigraphic levels

There is more than one mineralised stratigraphic level at Tjosås. They have the usual hallmarks of a VHMS-related rustzone and seven of them (***A-G)*** are marked on most of this report's maps and will be shortly commented on in the following.

Rustzone A
At a gravel road at UTM E344766, N6699541 is a rusty outcrop (the easternmost on the maps) which perhaps is a part of the main mineralised stratigraphic level. A part of the outcrop (strike/dip: 100˚/48˚N) is a dm-thick layer of fuchsite (a chrome-containing mica) which occasionally also has minor pyrite/pyrrhotite. Host rock is rhyolite. Two samples were taken of the fuchsite. They have no precious or base metals but they average 0.11% chromium (table 5). In 2009-11 NEAB investigated a VHMS mineralisation about 10 km south of Tjosås (figure 5). The mineralisation is called Tørviknuten and some of NEAB's samples have fuchsite both with and without associated sulphide mineralisation. The presence of fuchsite at Tjosås and Tørviknuten suggests a common origin – i.e. the fuchsite at Tjosås is probably also VHMS-related.

Figure 25: The outcrop with sericite and fuchsite with traces of pyrite and pyrrhotite.

Sample	Locality	Sample description	Au	Ag	Cu	Zn	Pb	As	Fe	Ni	Co	Cr	S
563536	Tjosås	Somewhat weathered fuchsite with quartz.	0.01	2.4	0.01	0.01	6	6	7	3	18	1330	0.2
563537	Tjosås	Fuchsite, qz and chlorite. Traces of py+po.	<0.001	1.3	0.01	0.01	7	9	6	205	57	914	3.7
563162	Tørviknuten	Semi-massive py in fuchsite/chlorite.	0.12	3.3	0.05	0.03	28	189	18	311	33	2190	20.0
563168	Tørviknuten	Greenish qz and chlorite.	0.02	<0.5	0.01	0.01	21	8	1	129	17	834	0.2
563414	Tørviknuten	Sericite w. green silicate and 15-20% diss. py.	0.02	<0.5	0.00	0.01	63	189	7	26	7	600	7.3

Table 5: The three samples from Tørviknuten are from a VHMS-mineralisation which locally has fuchsite. The two samples from Tjosås have similar amounts of chrome.

Rustzone B

The VHMS-style alteration-/rustzone with chlorite and disseminated pyrite outcrops on the eastern bank of the river, at UTM E344107, N6699671. The outcrop resembles the outcrops of the main mineralised stratigraphic level. Strike/dip is 120°/68°N. A sample, 563534, has 9% iron and 5% sulphur, else nothing of interest. The rustzone was not found on the river's opposite side despite there is no sign of faulting.

Figure 26: Rustzone B.

Rustzone C

This unimpressive rustzone was noticed in 2009 but no sampling was done as it looks completely barren – but it is VHMS-related.

Rustzone D

This rustzone was first noticed in 2014 when two quite gold-, mercury- and copper-rich Ion Leach samples (654 and 658) were taken at it. In 2015 the rustzone was tracked westwards and more Ion Leach samples were taken, one of them has more silver than any other Ion Leach sample from Tjosås. The outcrops are quite similar to the ones of the main mineralised stratigraphic level but there is only weak dissemination of pyrite. The easternmost of the outcrops is dominated by graphite.

Figure 27: A sericite-rich outcrop of Rustzone D.

Rustzone E

In the westernmost and largest of the three gullies is a 1-1½ m thick rustzone rich in quartz and sericite and with almost semimassive pyrite and pyrrhotite in some floats (563460-61) having fallen down from an inaccessible part 20-30 m above the creek. The rustzone may be part of the mineralised stratigraphic level but I could not track it out of the steep-walled gully.

Figure 28: Sample 563461 from Rustzone E – barren, unfortunately.

Rustzone F

This rustzone outcrops over more than 250 m and is c. 1 meter at its thickest. Compared to the other rustzones, this one is more quartz-rich. Else there is the usual sericite and less chlorite. Two samples (563456-7) were taken one of which has 0.26 g/t gold and 0.15% zinc.

Figure 29. Rustzone F.

Rustzone G

Most of this rustzone is inaccessible but at its foot lies plenty of boulder-sized quartz-sericite floats. A representative sample (563458) returned nothing of interest.

Figure 30. The steep mountainside with Rustzone G and the floats beneath it.

Figure 31. Sample 563458 from rustzone G.

Float 563538

This chloritic float was found embedded in a tractor road. Part of it is semi-massive pyrite resembling VHMS-style mineralisation. The sample (563538) has 12% iron and 9.6% sulphur, else nothing of interest. The site was passed several times in 2015 but no more floats were found.

Figure 32. The gravel road and float 563538 to the right of the GPS.

Ion Leach Sampling

A total of 225 Ion Leach samples have now been taken at Tjosås. During 2012-13 NEAB also used the Ion Leach method in Norrbotten, Sweden, where 905 samples from 29 targets were taken. A couple of years ago NEAB asked AlsChemex if it could provide a case study showing the kind of metal contents that could be expected when applying the Ion Leach method to a known mineralisation but none was available. Instead NEAB got some data from a broadly comparable method, MMI (Mobile Metal Ions), that had been tested on a large Finnish Cu-Ni deposit. As is shown in table 6, the gold and copper contents at Tjosås are comparable to the Finnish results.

Target area # of samples	Stat	Au	Ag	Cu	Pb	Zn	Ni	U	Fe	As	Mo
		ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb
Swedish Norrbotten 917	Median	0,08	2	188	76	150	54	14	41	6	5
	Maximum	5,51	31	2990	4920	2470	385	523	602	80	203
	Max/med	**69**	**13**	**16**	**65**	**16**	**7**	**38**	**15**	**13**	**43**
Finnish MMI 62	Median	0,07	3	360	30	30	350	7	n.a.	n.a.	9
	Maximum	2,30	24	16500	100	240	14300	12	n.a.	n.a.	9
	Max/med	**33**	**10**	**46**	**3**	**8**	**41**	**2**	**n.a.**	**n.a.**	**1**
Tjosås 225	Median	0,12	5	568	415	160	66	29	110	20	6
	Maximum	3,61	56	22300	12600	11100	729	820	913	3300	172
	Max/med	**30**	**11**	**39**	**30**	**69**	**11**	**28**	**8**	**165**	**31**

Table 6: Median and maximum contents of selected elements and pH from NEAB's 917 Swedish Ion Leach samples (from 33 targets), 62 Mobile Metal Ion samples from a very large Finnish copper-nickel mine, and the 225 Ion Leach samples from Tjosås. Relative to the Swedish and Finnish samples, the Tjosås samples have higher median contents of gold, silver, copper, lead and arsenic but surprisingly not zinc despite the fact that the highest zinc content (11100 ppb) of all NEAB's Ion Leach samples comes from Tjosås which is a quite zinc-rich mineralisation.

Sample conditions

There are some important differences between the sample conditions and the soils from Northern Sweden and Tjosås, respectively:

- outcrops are very common at Tjosås so thickness of overburden rarely exceeds 1-2 meters and the average is probably only ½-1 meter. Indeed, some samples from Tjosås are partly weathered bedrock, i.e. saprolite. Thinner overburden should lead to higher contents of metal ions.

- Norrbotten is rather flat and the altitude difference between the lower- and uppermost samples from each of the 29 targets rarely exceeds 20-30 m. Tjosås, however, is hilly and the altitude difference between the lower- and uppermost samples is 430 m. The altitude differences at Tjosås have led to differing vegetation and soil development which no doubt influences the soil's ability to retain metal ions – probably leading to larger variance.

- at Tjosås are many strike-parallel outcrop ridges which block the flow of groundwater and thus shield some areas from influx of metal ions from adjacent weathering mineralisation. This probably leads to larger variance.

- average precipitation in Norrbotten is around 500 mm whereas it is around 2000 mm in the Bergen area. Groundwater flow is thus much higher at Tjosås than in Norrbotten and this probably leads to lower contents of metal ions at Tjosås, i.e more rapid dilution and removal of dissolved metal ions.

- earth worms are sometimes seen when digging holes at Tjosås, especially in the lower-lying and more vegetated areas in the SE part of the sampled area. The earth worms homogenize the soil and make it look like soil from a ploughed field. The earth worms' action probably lowers the content of metal ions in soil samples.

- soil from Tjosås is on average more fine-grained and more micaceous than soil from Norrbotten. NEAB knows from target 84 (Lahenpää) in Norrbotten that fine-grained and clayey soils are capable of holding higher concentrations of metal ions.

Some of the above differences cancel out each other but it is still thought that a mineralisation will lead to considerably higher contents of metal ions in the soil at Tjosås than it would in a soil from Norrbotten.

Figures 33-47 show that the samples coming from the c. 400 wide area between Tjo11 and Tjo12 have almost no high contents of any of the most relevant elements. This is most likely because much of that area is covered by bogs, because it is rather flat, and because overburden seems to be thicker than elsewhere in the sampled area. The area including the old workings Tjo1, 2, 4, 5, Tjo14 and Tjo8 is also not ideal for Ion Leach sampling because the main mineralised stratigraphic level in this area runs very close to or in the creek which makes the "ion-contaminated" area very small.

It is seen that many of the samples with high contents are south of the main mineralised stratigraphic level. This is because the groundwater on its way downhill mobilizes the metallic ions and redeposits them a little farther downhill.

The ore samples' zinc:copper ratio is c. 10:1 whereas the Ion Leach samples' copper-zinc ratio is 1.2:1. The same goes for other pairs of elements. Evidently, some ions are more easily retained or accumulated in the soil than others.

Elemental associations in rich samples
Many of the Ion Leach samples are taken at or close to the Au-Ag-Cu-Zn-Pb mineralised stratigraphic level and one might think that then the samples should also be enriched in most of those elements. However, samples rich (here arbitrarily defined as being among the fifteen richest) in any one of the elements Au, Ag, Cu, Zn or Pb are not always enriched in the other four elements (tables 7 & 23).

	Au	Ag	Cu	Pb	Zn	Fe	Mo	Co	As	Hg	Bi	U	Sb	Se	pH
Au															
Ag	3														
Cu	5	2													
Pb	1	2	1												
Zn	4	4	2	**3**											
Fe	0	1	2	1	2										
Mo	2	2	4	4	3	5									
Co	0	3	1	2	1	3	2								
As	1	4	3	3	4	6	7	3							
Hg	4	1	5	1	1	4	2	3	3						
Bi	1	1	3	3	2	6	9	1	6	2					
U	3	2	1	1	2	2	5	2	4	2	4				
Sb	1	2	3	4	2	5	7	3	8	4	8	3			
Se	2	1	4	1	2	3	6	1	5	2	6	4	5		
pH	3	3	3	0	3	3	4	3	5	3	5	2	4	3	

*Table 7: Each number in the table represents the number of samples that are among the 15 (or 17 and 18 in two cases) most enriched in the elements of the corresponding row and column. That is, the number where the zinc-row crosses the lead-column is "**3**", which means that three of the 15 most lead-rich samples are also among the 15 most zinc-rich samples. Statistically that value should be between 1 or 2 if the 15 highest contents were distributed totally at random. Among many things, the table shows that samples rich in molybdenum are enriched in many other elements as well, and that samples rich in cobalt are rarely enriched in any of the other elements.*

The appended figures (33-48) show as graduated circles the contents of Au, Ag, Cu, Pb, Zn, Fe, Mo, Co, As, Hg, Bi, U, Sb, Se, ph and the 27 best samples with regard to Au, Ag, Cu, Pb and Zn. The contents listed in tables 8-23 are written on the maps.

The red numbers in tables 8-22 are contents that are among the 15 highest contents for the above elements. Some samples, e.g. 437, 552, 625, 638 are enriched in five of the fourteen elements whereas other samples are only enriched in one element.

Gold

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
638	High in chlorite, grey.	3,61	33	464	1495	3580	56	8	6	28	0,6	0	114	0,9	31	7,8
430	Grey, high in muscovite.	2,81	7	955	1110	50	148	28	13	26	0,7	0	123	0,8	18	8,3
653	Ligh-brown, fgr, micaceous.	2,30	8	1500	578	280	49	9	26	28	0,9	0	64	0,5	29	7,2
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
654	Brown, fgr, beneath rustzone.	1,38	13	4840	71	670	88	3	41	6	5,7	0	20	0,5	25	7,7
658	Grey, fgr, micaceous.	1,35	13	2090	420	380	128	5	19	15	3,2	0	21	1,2	54	7,2
446	Grey, fgr sand.	1,09	10	378	392	90	93	8	60	98	0,9	0	87	1,3	35	7,7
662	Olive-green, fgr, micaceous, beneath rustzone.	1,09	16	5190	244	190	67	20	14	28	2,2	0	121	1,2	58	7,8
710	Greenish, chloritic, fgr.	1,08	19	5460	40	50	143	39	25	13	1,7	0	67	0,8	54	7,0
614	Dark grey, fgr.	1,05	4	1130	302	80	8	15	6	9	0,3	0	12	0,0	22	6,0
436	Light brown, mgr sand.	1,04	17	1580	513	1200	130	10	9	40	0,8	0	98	0,7	81	7,9
650	Grey, fgr, clayey.	1,03	13	214	1880	120	118	15	10	35	1,2	3	28	1,5	32	7,8
695	Chloritic, grey-green, mgr.	0,87	15	3760	332	400	114	8	50	32	0,6	0	38	1,3	56	8,5
738	Grey, fgr.	0,83	6	1510	192	190	187	12	33	21	1,2	0	60	1,2	64	7,8
462	Grey, fgr sand.	0,77	17	524	399	90	33	6	10	35	0,6	0	165	0,0	41	7,6

Table 8: On average the samples with high gold contents have only slightly higher contents of the base metals. Among all NEAB's Ion Leach samples, the 3.61 and 2.81 ppb samples are only surpassed by one other sample – from Sjungberget in Norrbotten with 5.5 ppb. Three samples with +1 ppb gold were taken far above the main mineralised stratigraphic level, and two of them are associated with one and the same rustzone – figure 33.

Silver

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
672	Brown, clayey. Beneath rustzone.	0,38	56	878	217	150	140	5	44	5	0,9	0	12	0,0	17	7,5
638	High in chlorite, grey.	3,61	33	464	1495	3580	56	8	6	28	0,6	0	114	0,9	31	7,8
651	Light-brown, fgr, micaceous.	0,54	32	1450	1940	500	355	11	129	3300	0,7	0	78	2,4	39	7,4
703	Brown-grey, fgr, under rustzone with graphite.	0,74	31	2430	1650	60	117	37	39	157	0,6	0	158	0,8	64	7,0
443	Reddish, fgr sand.	0,21	30	1110	590	640	162	17	15	209	0,4	0	43	1,3	43	8,0
693	Red-brown, fgr.	0,68	30	913	116	140	59	4	20	22	0,2	0	47	0,0	24	6,9
566	Mgr, grey-brown.	0,40	29	917	419	910	143	17	21	61	1,2	3	78	1,2	37	7,9
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
652	Dark-brown, fgr, somewhat organic, beneath rustzone.	0,27	28	855	12600	310	48	2	18	37	0,4	0	29	0,5	6	5,8
580	Quite organic and high in chlorite.	0,09	28	808	224	80	64	3	81	5	0,8	0	25	0,7	14	6,6
681	Brown, fgr, possibly beneath rustzone.	0,37	22	2290	76	250	150	7	150	63	1,2	0	39	1,4	42	7,8
710	Greenish, chloritic, fgr.	1,08	19	5460	40	50	143	39	25	13	1,7	0	67	0,8	54	7,0
631	Light brown, mgr.	0,10	19	1080	591	90	135	6	147	45	1,2	0	22	0,8	37	8,2
640	Grey, clayey.	0,12	18	497	579	11100	32	8	40	15	0,5	0	307	0,9	27	7,5
611	Brown, fgr, clayey.	0,41	18	942	62	80	132	5	17	7	1,4	0	21	0,7	48	7,5

Table 9: There is a weak association between high silver, gold, copper, zinc and arsenic contents. Figure 34 shows a rather clear association between high silver contents and the central part of the main mineralised stratigraphic level.

Copper

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
679	Dark-grey, mgr.	0,46	13	6120	99	140	88	14	51	20	1,3	0	90	0,7	62	7,4
710	Greenish, chloritic, fgr.	1,08	19	5460	40	50	143	39	25	13	1,7	0	67	0,8	54	7,0
662	Olive-green, fgr, micaceous, beneath rustzone.	1,09	16	5190	244	190	67	20	14	28	2,2	0	121	1,2	58	7,8
654	Brown, fgr, beneath rustzone.	1,38	13	4840	71	670	88	3	41	6	5,7	0	20	0,5	25	7,7
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
617	Brown, fgr.	0,25	10	4370	139	160	77	4	62	67	0,8	0	108	0,0	52	6,3
675	Brown-grey, fgr, somewhat organic.	0,35	10	4100	2060	130	187	7	15	25	1,8	0	32	2,1	64	7,7
441	Grey, fgr sand.	0,23	3	3820	567	220	198	4	112	30	0,7	0	18	1,2	47	7,4
695	Chloritic, grey-green, mgr.	0,87	15	3760	332	400	114	8	50	32	0,6	0	38	1,3	56	8,5
705	Olive-grey, fgr.	0,53	12	3670	140	140	123	18	27	21	0,6	0	53	1,9	81	7,5
700	light-brown, mgr.	0,30	8	3620	159	240	129	172	14	21	1,4	3	58	1,6	62	7,1
663	Dark-grey, fgr, somewhat organic.	0,27	6	3580	273	150	13	3	19	14	0,8	0	27	0,0	29	6,6
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
680	Dark-grey, mgr.	0,14	9	3150	895	80	127	8	34	20	0,9	0	33	0,5	37	7,3

Table 10: The 22300 ppb value is extremely high, even surpassing the highest value from a very large Finnish Ni-Cu deposit (table 6). The same sample also has the highest silver and lead contents, and one of the highest gold contents. High copper contents are relatively often asssociated with high gold contents. See also figure 35.

Lead

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
652	Dark-brown, fgr, somewhat organic, beneath rustzone.	0,27	28	855	12600	310	48	2	18	37	0,4	0	29	0,5	6	5,8
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
698	Brown-grey, fgr.	0,12	3	1680	6330	400	62	11	99	48	0,0	4	143	0,0	42	6,9
618	Grey, fgr.	0,27	10	565	6220	270	208	35	31	114	1,1	3	60	2,5	41	7,1
667	Dark-grey, fgr.	0,08	2	707	6050	430	96	6	65	37	1,3	0	47	1,5	32	6,2
637	Dark grey, fgr.	0,07	2	501	3270	200	145	4	43	35	0,9	0	51	1,4	36	6,7
586	High in chlorite, greenish.	0,03	3	211	3080	720	224	21	68	22	0,3	0	30	1,0	16	5,4
584	High in chlorite, brownish.	0,10	2	1320	2990	600	98	4	152	16	1,3	0	10	1,2	25	6,8
587	Fgr, brownish.	0,02	2	436	2790	120	23	5	81	8	0,8	0	21	0,6	20	6,8
721	Greenish, chloritic, fgr.	0,11	4	430	2520	160	106	27	26	25	0,8	0	110	2,4	35	6,5
665	Dark-grey, fgr, micaceous.	0,16	5	1040	2460	670	41	4	32	18	0,8	0	48	1,5	36	7,4
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
707	Grey-brown, fgr.	0,08	2	277	2280	190	211	5	21	32	0,8	0	31	1,4	36	7,3
645	Reddish, mgr.	0,18	7	719	2270	530	189	12	168	12	1,1	0	23	1,4	25	6,7
717	Grey, fgr.	0,07	4	364	2110	250	74	9	40	16	1,0	0	60	1,2	32	7,2

Table 11: The samples with high lead content are with 2-3 exceptions not particularly enriched in other elements. Many of the highest lead contents are concentrated along and just south of the main mineralised stratigraphic level, figure 36.

Zinc

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
640	Grey, clayey.	0,12	18	497	579	11100	32	8	40	15	0,5	0	307	0,9	27	7,5
638	High in chlorite, grey.	3,61	33	464	1495	3580	56	8	6	28	0,6	0	114	0,9	31	7,8
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
623	Grey, fgr.	0,26	8	1610	972	2290	107	11	40	42	1,2	0	89	2,1	42	7,7
425	Grey, mgr sand.	0,44	11	1330	875	1820	83	6	33	17	1,2	0	38	1,2	35	7,8
463	Grey, mgr sand.	0,13	6	708	1510	1230	55	6	27	29	0,7	0	46	1,4	34	7,8
436	Light brown, mgr sand.	1,04	17	1580	513	1200	130	10	9	40	0,8	0	98	0,7	81	7,9
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
445	Grey, mgr sand.	0,33	7	1480	373	960	175	5	52	555	1,0	0	34	1,2	32	7,6
566	Mgr, grey-brown.	0,40	29	917	419	910	143	17	21	61	1,2	3	78	1,2	37	7,9
586	High in chlorite, greenish.	0,03	3	211	3080	720	224	21	68	22	0,3	0	30	1,0	16	5,4
431	Brown, fgr sand.	0,24	9	2210	743	720	31	1	54	9	0,5	0	37	0,0	23	6,9
714	Brown, mgr.	0,05	7	1400	397	710	23	4	6	21	0,7	0	40	0,8	51	7,2
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
665	Dark-grey, fgr, micaceous.	0,16	5	1040	2460	670	41	4	32	18	0,8	0	48	1,5	36	7,4

Table 12: There is c. ten times more zinc than copper in Tjosås's ore samples but this is not reflected by the 15 most copper- and/or zinc-rich Ion Leach samples which have much more copper than zinc. See also figure 37.

Iron

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
634	Somewhat organic, high in chlorite.	0,15	2	126	129	120	429	8	17	52	0,9	3	24	1,2	34	5,8
459	Brown, mgr sand.	0,02	1	70	209	130	380	2	17	52	0,5	0	14	0,7	36	7,1
562	Mostly fgr. Brownish.	0,68	9	1230	1410	180	368	11	83	89	2,1	0	38	1,4	53	7,0
651	Light-brown, fgr, micaceous.	0,54	32	1450	1940	500	355	11	129	3300	0,7	0	78	2,4	39	7,4
702	Light-brown, fgr.	0,33	14	1300	966	110	354	18	93	36	1,3	0	106	1,3	50	6,7
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
559	Reddish mgr sand.	0,16	3	362	140	100	326	10	19	70	1,9	0	29	1,1	29	7,0
583	Fgr, clayey, light-brown.	0,40	4	362	802	160	317	9	111	14	0,2	3	28	0,8	9	5,3
724	Brown, somewhat organic, fgr.	0,02	1	62	599	410	315	2	30	21	0,8	0	5	0,9	16	6,1
624	High in chlorite, red-brown.	0,73	15	438	790	120	300	10	28	42	1,1	0	18	0,9	38	7,3
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
560	Fgr, dark brown.	0,17	3	195	80	190	298	9	22	37	1,2	0	18	1,0	28	6,7

Table 13: One would intuitively expect that samples with high contents of base metals would also be high in iron, but that is not the case. Instead, the iron-rich samples are enriched in arsenic, molybdenum, mercury, bismuth and antimony. See also figure 38.

Molybdenum

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
700	light-brown, mgr.	0,30	8	3620	159	240	129	172	14	21	1,4	3	58	1,6	62	7,1
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
710	Greenish, chloritic, fgr.	1,08	19	5460	40	50	143	39	25	13	1,7	0	67	0,8	54	7,0
703	Brown-grey, fgr, under rustzone with graphite.	0,74	31	2430	1650	60	117	37	39	157	0,6	0	158	0,8	64	7,0
694	Grey, fgr.	0,19	5	187	431	250	167	36	14	24	1,6	3	104	1,3	69	6,9
618	Grey, fgr.	0,27	10	565	6220	270	208	35	31	114	1,1	3	60	2,5	41	7,1
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
430	Grey, high in muscovite.	2,81	7	955	1110	50	148	28	13	26	0,7	0	123	0,8	18	8,3
721	Greenish, chloritic, fgr.	0,11	4	430	2520	160	106	27	26	25	0,8	0	110	2,4	35	6,5
736	Grey, fgr.	0,24	8	823	822	110	122	25	112	81	1,5	3	122	3,0	97	7,2
731	Grey-brown, fgr.	0,05	2	39	1370	530	168	23	10	22	0,5	4	27	1,0	25	6,6
586	High in chlorite, greenish.	0,03	3	211	3080	720	224	21	68	22	0,3	0	30	1,0	16	5,4

Table 14: The majority of the 15 most molybdenum enriched samples are also enriched in several other elements (plenty of red numbers in the table 17 and relatively high numbers in table 7), especially with arsenic, selenium and antimony, so molybdenum is clearly a part of the main mineralised stratigraphic level. See also figure 39.

Cobalt

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
673	Olive-green, fgr, beneath rustzone.	0,28	5	2770	515	430	167	5	415	51	2,9	0	31	2,3	35	7,9
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
626	Clayey, brown.	0,07	4	582	1045	380	42	3	239	7	0,7	0	22	0,8	17	6,9
575	Mgr, grey.	0,13	4	1170	635	340	74	12	226	106	0,9	0	39	1,2	27	7,6
660	Brown, fgr,micaceous.	0,15	2	683	1090	420	40	1	220	3	0,8	0	5	1,6	14	5,6
645	Reddish, mgr.	0,18	7	719	2270	530	189	12	168	12	1,1	0	23	1,4	25	6,7
664	Light-brown, fgr, micaceous.	0,19	16	1910	461	440	59	8	158	32	2,4	0	34	2,4	55	7,1
584	High in chlorite, brownish.	0,10	2	1320	2990	600	98	4	152	16	1,3	0	10	1,2	25	6,8
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
681	Brown, fgr, possibly beneath rustzone.	0,37	22	2290	76	250	150	7	150	63	1,2	0	39	1,4	42	7,8
442	Grey, fgr sand.	0,00	0	492	1640	370	153	4	149	22	0,6	0	11	0,8	34	6,5
631	Light brown, mgr.	0,10	19	1080	591	90	135	6	147	45	1,2	0	22	0,8	37	8,2
701	Brown, fgr,	0,10	1	592	894	240	68	11	138	22	0,9	0	139	1,4	32	6,6
635	High in chlorite, reddish.	0,11	6	443	684	140	99	8	135	61	1,1	0	48	1,7	31	7,5
651	Light-brown, fgr, micaceous.	0,54	32	1450	1940	500	355	11	129	3300	0,7	0	78	2,4	39	7,4

Table 15: As is also shown in table 7, the 15 samples richest in cobalt are not often enriched in that table's other elements. The ore samples (table 1) are almost completely devoid of cobalt - with the proverbial exception, in this case sample 563540 which has 407 ppm cobalt (table 1). All this taken into consideration, one would not expect the cobalt-rich Ion Leach samples showing any affinity to the main mineralised stratigraphic level but several of them do (figure 40). The four westernmost sample lines have very little cobalt.

Arsenic

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
651	Light-brown, fgr, micaceous.	0,54	32	1450	1940	500	355	11	129	3300	0,7	0	78	2,4	39	7,4
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
567	Fgr, brownish.	0,40	8	448	251	160	211	8	25	670	1,1	0	43	0,8	13	6,3
565	Fgr, grey.	0,26	6	1230	548	220	131	7	52	667	1,1	0	187	1,4	66	7,2
445	Grey, mgr sand.	0,33	7	1480	373	960	175	5	52	555	1,0	0	34	1,2	32	7,6
551	Mgr, reddish sand, regolith.	0,33	13	199	313	120	145	18	38	374	0,7	5	28	2,4	26	7,9
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
443	Reddish, fgr sand.	0,21	30	1110	590	640	162	17	15	209	0,4	0	43	1,3	43	8,0
668	Brown-grey, fgr.	0,26	10	1690	1810	180	123	14	58	192	1,1	0	63	1,0	43	6,3
703	Brown-grey, fgr, under rustzone with graphite.	0,74	31	2430	1650	60	117	37	39	157	0,6	0	158	0,8	64	7,0
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
618	Grey, fgr.	0,27	10	565	6220	270	208	35	31	114	1,1	3	60	2,5	41	7,1
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6

Table 16: The maximum content of arsenic in all NEAB's Swedish samples is a mere 80 ppb but the maximum content at Tjosås is a whopping 3300 ppb. This particular arsenic-rich sample, 651, was taken 1-2 m downhill from an outcrop which has the highest arsenic contents (1170 ppm) in any rock or ore sample from Tjosås. The fifteen highest arsenic contents are also enriched in molybdenum and antimony. The highest arsenic contents are in the central part of the sampled area (figure 41) - as is also the case with many other elements. Most of the ore samples are also enriched in arsenic – especially the two samples from Tjo7 (table 1).

Mercury

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
654	Brown, fgr, beneath rustzone.	1,38	13	4840	71	670	88	3	41	6	5,7	0	20	0,5	25	7,7
461	Lightbrown, fgr sand.	0,08	6	604	48	270	64	2	22	10	3,8	0	11	0,0	13	7,1
671	Brown, clayey. Beneath rustzone.	0,12	5	1990	346	440	218	8	122	18	3,7	0	12	1,4	31	6,3
658	Grey, fgr, micaceous.	1,35	13	2090	420	380	128	5	19	15	3,2	0	21	1,2	54	7,2
673	Olive-green, fgr, beneath rustzone.	0,28	5	2770	515	430	167	5	415	51	2,9	0	31	2,3	35	7,9
439	Grey, mgr sand.	0,24	12	505	189	80	119	16	44	64	2,4	0	45	1,1	54	7,7
664	Light-brown, fgr, micaceous.	0,19	16	1910	461	440	59	8	158	32	2,4	0	34	2,4	55	7,1
712	Light-brown, under rustzone.	0,07	14	336	21	120	91	5	18	17	2,3	0	31	0,6	60	7,3
662	Olive-green, fgr, micaceous, beneath rustzone.	1,09	16	5190	244	190	67	20	14	28	2,2	0	121	1,2	58	7,8
562	Mostly fgr. Brownish.	0,68	9	1230	1410	180	368	11	83	89	2,1	0	38	1,4	53	7,0
648	Light-brown, fgr, micaceous.	0,05	4	1070	1300	190	116	12	95	26	2,0	0	52	1,6	28	7,2
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
559	Reddish mgr sand.	0,16	3	362	140	100	326	10	19	70	1,9	0	29	1,1	29	7,0
670	Dark-grey, clayey, beneath rustzone.	0,22	8	1700	477	650	66	4	71	9	1,9	0	8	0,9	17	7,6
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
675	Brown-grey, fgr, somewhat organic.	0,35	10	4100	2060	130	187	7	15	25	1,8	0	32	2,1	64	7,7

Table 17: The contents of mercury are almost as low as gold's. It is seen that samples rich in mercury are also relatively often rich in gold, copper and iron. Compared to the mercury content in NEAB's 917 samples from Norrbotten, Tjosås's mercury content is only slightly higher. None of the ore or rock-samples has mercury content above the detection limit. See also figure 42.

Bismuth

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
551	Mgr, reddish sand, regolith.	0,33	13	199	313	120	145	18	38	374	0,7	5	28	2,4	26	7,9
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
731	Grey-brown, fgr.	0,05	2	39	1370	530	168	23	10	22	0,5	4	27	1,0	25	6,6
698	Brown-grey, fgr.	0,12	3	1680	6330	400	62	11	99	48	0,0	4	143	0,0	42	6,9
694	Grey, fgr.	0,19	5	187	431	250	167	36	14	24	1,6	3	104	1,3	69	6,9
736	Grey, fgr.	0,24	8	823	822	110	122	25	112	81	1,5	3	122	3,0	97	7,2
729	Grey, fgr.	0,11	3	211	568	250	74	15	14	55	1,5	3	269	3,0	112	6,7
700	light-brown, mgr.	0,30	8	3620	159	240	129	172	14	21	1,4	3	58	1,6	62	7,1
566	Mgr, grey-brown.	0,40	29	917	419	910	143	17	21	61	1,2	3	78	1,2	37	7,9
650	Grey, fgr, clayey.	1,03	13	214	1880	120	118	15	10	35	1,2	3	28	1,5	32	7,8
618	Grey, fgr.	0,27	10	565	6220	270	208	35	31	114	1,1	3	60	2,5	41	7,1
634	Somewhat organic, high in chlorite.	0,15	2	126	129	120	429	8	17	52	0,9	3	24	1,2	34	5,8
595	Somewhat organic, fgr, dark-brown.	0,18	3	317	487	170	154	16	19	33	0,7	3	45	1,8	26	5,8
583	Fgr, clayey, light-brown.	0,40	4	362	802	160	317	9	111	14	0,2	3	28	0,8	9	5,3

Table 18: Only 17 of the 225 Ion Leach samples have Bi above detection level but still this table has a lot of red numbers. There is a clear association between bismuth, iron, arsenic, antimony, molybdenum and high pH. See also figure 43.

Uranium

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
735	Grey-brown, fgr.	0,04	4	518	321	160	77	18	29	22	0,5	0	820	0,7	50	7,3
640	Grey, clayey.	0,12	18	497	579	11100	32	8	40	15	0,5	0	307	0,9	27	7,5
729	Grey, fgr.	0,11	3	211	568	250	74	15	14	55	1,5	3	269	3,0	112	6,7
437	Reddish, mgr sand.	0,10	9	227	75	2340	867	50	292	1450	0,6	0	214	0,5	14	7,7
565	Fgr, grey.	0,26	6	1230	548	220	131	7	52	667	1,1	0	187	1,4	66	7,2
462	Grey, fgr sand.	0,77	17	524	399	90	33	6	10	35	0,6	0	165	0,0	41	7,6
703	Brown-grey, fgr, under rustzone with graphite.	0,74	31	2430	1650	60	117	37	39	157	0,6	0	158	0,8	64	7,0
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
698	Brown-grey, fgr.	0,12	3	1680	6330	400	62	11	99	48	0,0	4	143	0,0	42	6,9
722	Dark-brown, quite organic but no better than this site.	0,26	7	672	117	60	23	10	20	58	0,3	0	143	0,0	58	7,7
701	Brown, fgr,	0,10	1	592	894	240	68	11	138	22	0,9	0	139	1,4	32	6,6
641	Grey, clayey.	0,21	5	632	1080	360	49	4	20	13	0,5	0	125	1,6	29	7,4
430	Grey, high in muscovite.	2,81	7	955	1110	50	148	28	13	26	0,7	0	123	0,8	18	8,3
736	Grey, fgr.	0,24	8	823	822	110	122	25	112	81	1,5	3	122	3,0	97	7,2
662	Olive-green, fgr, micaceous, beneath rustzone.	1,09	16	5190	244	190	67	20	14	28	2,2	0	121	1,2	58	7,8

Table 19: There are rather few red numbers in this table so uranium is not often associated with the other elements. Some samples taken at Tjo6 have high contents of both uranium and, oddly, calcium. As the uranium contents of the ore samples are below detection level, and as high uranium contents in Ion Leach samples occur erratically, the uranium is not associated with the main mineralised stratigraphic level.

Antimony

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
552	Grey, mgr sand. At rustzone.	1,44	29	22300	7670	1120	198	12	70	107	1,9	0	95	4,4	52	7,6
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
585	Mgr, brownish.	0,12	7	507	1760	250	165	8	94	29	1,3	0	33	3,9	38	7,2
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
729	Grey, fgr.	0,11	3	211	568	250	74	15	14	55	1,5	3	269	3,0	112	6,7
736	Grey, fgr.	0,24	8	823	822	110	122	25	112	81	1,5	3	122	3,0	97	7,2
596	High in chlorite, regolith.	0,06	3	322	728	310	148	8	122	25	1,0	0	99	3,0	37	6,7
568	Dark-grey, fgr.	0,45	13	999	450	270	115	7	32	21	1,7	0	55	2,8	31	6,7
618	Grey, fgr.	0,27	10	565	6220	270	208	35	31	114	1,1	3	60	2,5	41	7,1
721	Greenish, chloritic, fgr.	0,11	4	430	2520	160	106	27	26	25	0,8	0	110	2,4	35	6,5
651	Light-brown, fgr, micaceous.	0,54	32	1450	1940	500	355	11	129	3300	0,7	0	78	2,4	39	7,4
664	Light-brown, fgr, micaceous.	0,19	16	1910	461	440	59	8	158	32	2,4	0	34	2,4	55	7,1
551	Mgr, reddish sand, regolith.	0,33	13	199	313	120	145	18	38	374	0,7	5	28	2,4	26	7,9

Table 20: Several of the antimony-rich samples are also enriched in many of the other elements, e.g. arsenic, bismuth, mercury and selenium – elements often entering into sulphosalts. See also figure 45.

Selenium

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
729	Grey, fgr.	0,11	3	211	568	250	74	15	14	55	1,5	3	269	3,0	112	6,7
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
736	Grey, fgr.	0,24	8	823	822	110	122	25	112	81	1,5	3	122	3,0	97	7,2
705	Olive-grey, fgr.	0,53	12	3670	140	140	123	18	27	21	0,6	0	53	1,9	81	7,5
436	Light brown, mgr sand.	1,04	17	1580	513	1200	130	10	9	40	0,8	0	98	0,7	81	7,9
632	Grey, fgr.	0,18	4	407	620	80	267	7	107	93	1,6	0	58	1,7	77	5,6
455	Grey, fgr sand.	0,32	15	1020	191	20	73	5	9	96	0,9	0	46	1,0	74	7,6
561	High in chlorite, greenish/brownish.	0,40	13	952	2320	380	465	113	47	1385	1,0	4	83	10,2	70	6,8
694	Grey, fgr.	0,19	5	187	431	250	167	36	14	24	1,6	3	104	1,3	69	6,9
733	Grey-brown, fgr.	0,25	5	1520	294	280	37	4	19	24	0,6	0	50	0,6	68	7,3
565	Fgr, grey.	0,26	6	1230	548	220	131	7	52	667	1,1	0	187	1,4	66	7,2
675	Brown-grey, fgr, somewhat organic.	0,35	10	4100	2060	130	187	7	15	25	1,8	0	32	2,1	64	7,7
738	Grey, fgr.	0,83	6	1510	192	190	187	12	33	21	1,2	0	60	1,2	64	7,8
703	Brown-grey, fgr, under rustzone with graphite.	0,74	31	2430	1650	60	117	37	39	157	0,6	0	158	0,8	64	7,0

Table 21: The most selenium-rich samples are not much higher than the median value but some of the over-all best (in the sense that they are very enriched in many elements) samples are also high in selenium. See figure 46.

pH

Sample	Comments	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb	pH
695	Chloritic, grey-green, mgr.	0,87	15	3760	332	400	114	8	50	32	0,6	0	38	1,3	56	8,5
709	Grey, chloritic, mgr.	0,48	10	2390	13	160	73	13	65	8	1,3	0	84	1,2	45	8,4
625	High in chlorite, grey.	0,11	8	4680	1325	700	326	54	108	343	0,4	20	110	15,3	108	8,3
622	Grey, mgr.	0,15	7	1390	68	430	41	7	43	72	0,6	0	80	0,6	31	8,3
430	Grey, high in muscovite.	2,81	7	955	1110	50	148	28	13	26	0,7	0	123	0,8	18	8,3
631	Light brown, mgr.	0,10	19	1080	591	90	135	6	147	45	1,2	0	22	0,8	37	8,2
628	High in chlorite, mgr, grey.	0,45	13	2430	1470	270	298	35	30	152	1,8	9	143	3,1	52	8,1
454	Lightbrown, mgr sand.	0,09	5	328	584	60	52	6	56	34	1,0	0	55	1,3	37	8,1
639	Grey, mgr.	0,13	9	425	506	630	39	5	14	38	0,6	0	65	1,0	35	8,1
553	Fgr, yellowish, clayey.	0,64	9	3450	755	420	913	31	150	745	1,8	6	95	3,9	104	8,0
443	Reddish, fgr sand.	0,21	30	1110	590	640	162	17	15	209	0,4	0	43	1,3	43	8,0
696	Grey, mgr.	0,36	16	2900	1080	390	66	12	83	20	0,8	0	46	1,5	40	8,0
436	Light brown, mgr sand.	1,04	17	1580	513	1200	130	10	9	40	0,8	0	98	0,7	81	7,9
566	Mgr, grey-brown.	0,40	29	917	419	910	143	17	21	61	1,2	3	78	1,2	37	7,9
673	Olive-green, fgr, beneath rustzone.	0,28	5	2770	515	430	167	5	415	51	2,9	0	31	2,3	35	7,9
551	Mgr, reddish sand, regolith.	0,33	13	199	313	120	145	18	38	374	0,7	5	28	2,4	26	7,9
600	High in Chlorite. Light-brown.	0,11	5	175	803	160	104	6	9	14	0,7	0	34	1,0	22	7,9

Table 22: The pH of the 225 samples ranges from 4.6 to 8.5 and evenly distributed around pH= 7. Oxidation of sulphide mineralisation generates acid, i.e. H^+ ions and lowers the overburden's pH. One might therefore assume that low pH would be associated with high contents of the metals (especially iron) associated with the main mineralised stratigraphic level. This is not the case, on the contrary. This could e.g. be caused by the sub-cropping sulphide mineralisation being too small to lower pH, or that there is sufficient carbonate in the ore or host rock to neutralize the acid, or that groundwater (it's very rainy in this part of Norway) flushes out H^+ ions as soon as they are formed. Figure 47 shows that 11 of the 17 high-pH samples are on or just downhill from the main mineralised stratigraphic level. The large majority of the high-calcium samples (and to some extent also the high-magnesium samples) are associated with the samples with pH>7. All in all there are reasons to believe that the carbonate in the ore is responsible for the high pH in the samples. This is backed by the high carbonate content of some ore specimens – especially the gold-rich ones.

Twentyseven rich samples

If one sort out the 25 richest samples for each of the elements Au, Ag, Zn, Pb and Cu and then select the samples which are among the 25 richest with regard to at least two of the elements, one is left with the 27 samples listed below.

Sample	UTM E	UTM N	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb
552	341971	6699360	1,44	29	22300	7670	1120
651	341799	6699330	0.54	32	1450	1940	500
703	338334	6697793	0,74	31	2430	1650	60
638	342190	6699391	3.61	33	464	1495	3580
436	342194	6699373	1,04	17	1580	513	1200
654	341356	6699337	1.38	13	4840	71	670
662	341383	6699253	1,09	16	5190	244	190
710	338396	6698073	1.08	19	5460	40	50
640	342217	6699361	0,12	18	497	579	11100
566	341739	6699304	0.40	29	917	419	910
586	343282	6699515	0,03	3	211	3080	720
625	342346	6699374	0.11	8	4680	1325	700
665	341446	6699191	0,16	5	1040	2460	670
443	342042	6699351	0.21	30	1110	590	640
584	343181	6699449	0,10	2	1320	2990	600
645	342937	6699442	0.18	7	719	2270	530
553	341939	6699423	0,64	9	3450	755	420
695	340229	6699206	0.87	15	3760	332	400
696	340267	6699261	0,36	16	2900	1080	390
652	341698	6699317	0.27	28	855	12600	310
709	338396	6698035	0,48	10	2390	13	160
705	338352	6697883	0.53	12	3670	140	140
693	340255	6699138	0,68	30	913	116	140
679	341010	6699198	0.46	13	6120	99	140
675	340915	6699274	0,35	10	4100	2060	130
650	342294	6699419	1.03	13	214	1880	120
462	342323	6699423	0.77	17	524	399	90

Table 23: The 27 best Ion Leach samples with regard to contents of Au, Ag, Cu, Pb and Zn. Green numbers are the five richest samples for each of the elements, red numbers are among the five to fifteen highest contents for the same elements, and black numbers are still lower contents. The locations of the twenty samples are shown in figure 48.

When plotting the 27 best samples (figure 48) it is seen that most of them are associated with the main mineralised stratigraphic level. Rustzone D accounts for 2 of the 27 best samples, and west of the gullies are 7 which are not related to a known rustzone – more about them in the conclusion.

Eastern versus western samples.

When viewing figures 33-46, the impression is that the eastern samples (defined as samples along the mineralised stratigraphic level) are somewhat more enriched in the relevant elements than the western samples. This impression is supported by table 24. However, many of the 27 richest samples are from the western part of the sampled area (figure 48) and, importantly, they occur in clusters.

Area	Stat	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	Fe ppm	Mo ppb	Co ppb	As ppb	Hg ppb	Bi ppb	U ppb	Sb ppb	Se ppb
Tjosås n=225	Median	0,12	5	568	415	160	110	6	27	20	0,8	0	29	0,9	31
	Maximum	3,61	56	22300	12600	11100	913	172	415	3300	5,7	20	820	15,3	112
	Max/med	30	11	39	30	69	8	31	15	165	7		28	17	4
Tjosås east n=169	Median	0,13	6	621	450	160	115	6	30	22	0,9	0	27	1	30
	Maximum	3,61	56	22300	12600	11100	913	113	415	3300	5,7	20	307	15	108
	Max/med	28	9	36	28	69	8	20	14	150	6		11	15	4
Tjosås west n=56	Median	0,08	3,8	442	316	155	103	5,9	20	16	0,7	0	42	0,8	33
	Maximum	1,08	31	5460	6330	710	354	172	138	157	2,3	4	820	3	112
	Max/med	14	8	12	20	5	3	29	7	10	4		20	4	3

Table 24: Samples from the eastern part of Tjosås are one average slightly more enriched than their western counterparts.

CONCLUSION, DISCUSSION AND FURTHER WORK

General prospecting in 2015 increased the strike length of the main mineralised stratigraphic level from +2700 m to +3300 m. Other mineralised stratigraphic levels were found as well but they have only disseminated pyrite.

The Ion Leach sampling shows that the main mineralised stratigraphic level does not continue westwards beyond the gullies - at least not in the phyllite/mica-schist which host it to the east.

The work carried out so far does not indicate the presence of any significant sub-cropping mineralisation, and further work along similar lines will most likely only result in more of the same. Geophysical exploration for blind mineralisation is severely hampered by omnipresent graphite-schist and a newly erected high-voltage powerline which make commonly used EM-methods futile. Alternative methods such as airborne gravimetry may under special conditions work but will be costly..

However, if one for some other reason happens to pass the Hardanger district, it is suggested to spend two fielddays and do general fieldwork and Ion Leach sampling around 7 of the 27 best Ion Leach samples (figures 49 & 50). Those 7 samples are quite enriched in gold, silver, copper and lead, and they may be associated with a topographic low at Norheimsdalen. One could imagine that the topographic low is caused by erosion of soft rocks such as ore or alteration zones. All included, this activity would cost around 35 KSEK – less than what NEAB saves by letting its four Tjosås exploration licenses expire.

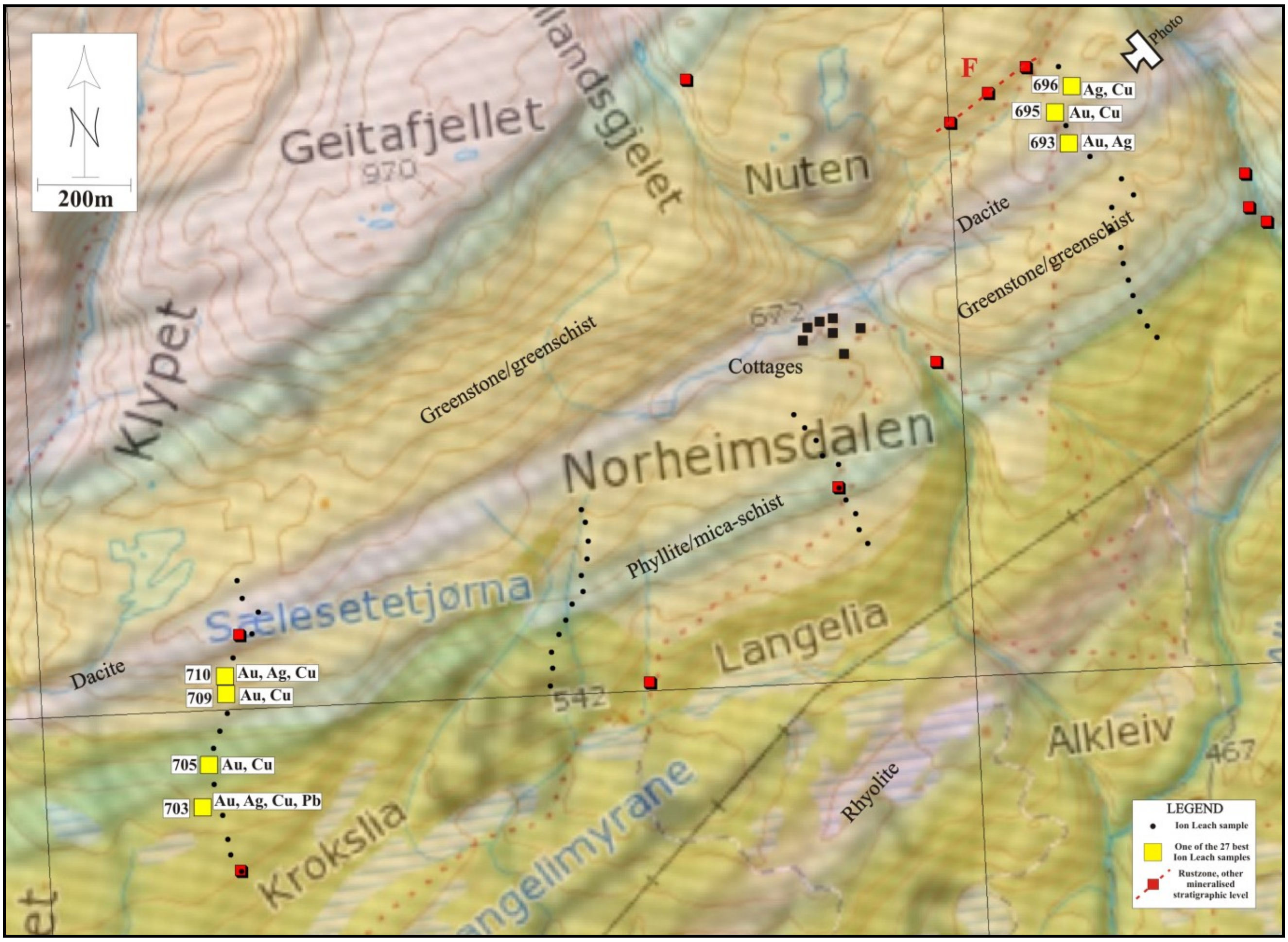

Figure 49: Norheimsdalen and 7 samples highly enriched in Au, Ag, Cu and Pb.

Figure 50: Norheimsdalen seen from NE.