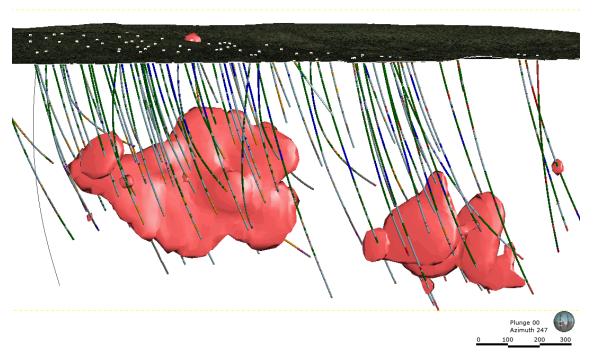


Boliden Summary Report

Mineral Resources and mineral Reserves | 2019

Nautanen



Prepared by Hans Årebäck and Brendon Dean

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1 SUMMARY

Mineral resources in Nautanen at 2019-12-31 are summarized below. No changes occurred since last year.

Classification			2019					2018		
	Tonnage	Au	Ag	Cu	Mo	Tonnage	Au	Ag	Cu	Mo
	(kton)	(g/t)	(g/t)	(%)	(g/t)	(kton)	(g/t)	(g/t)	(%)	(g/t)
Measured Mineral Resource										
Indicated Mineral Resource	8 200	0,9	5	1,66	86	8 200	0,9	5	1,66	86
Inferred Mineral Resource	7 500	0,6	7	1,47	81	7 500	0,6	7	1,47	81
Total Mineral Resource	15 700	0,7	6	1,57	84	15 700	0,7	6	1,57	84

Table 1. Mineral resources in Nautanen at 2019-12-31

1.1 Competence

This report is a summary of several internal reports on Nautanen. Contributors and responsible Competent Person are listed in Table 2.

Table 2. Contributors and responsible competent persons for this report

Description	Contributors	Responsible CP
Compilation of this report	Hans Årebäck	Hans Årebäck
Geology	Brendon Dean	Hans Årebäck
Resource estimations	Brendon Dean	Hans Årebäck

Hans Årebäck works for Boliden as a Senior Project Manager at Business Development and is a member FAMMP¹. Hans Årebäck has over 20 years of experience in the Exploration and Mining industry.

2 GENERAL INTRODUCTION

This report is issued annually to inform the public (shareholders and potential investors) of the mineral assets in Nautanen held by Boliden. The report is a summary of internal reports for Nautanen. Boliden method of reporting Mineral Resources and Mineral Reserves intends to comply with the Pan-European Standard for reporting of Exploration results, Mineral Resources and Mineral Reserves (The PERC Reporting standard 2017). It is an international reporting standard that has been adopted by the mining associations in Sweden (SveMin), Finland (FinnMin) and Norway (Norsk Bergindustri), to be used for exploration and mining companies within the Nordic counties.

2.1 Pan-European Standard for Reporting of Exploration Results, Mineral Resources and Mineral Reserves – The PERC Reporting Standard

PERC is the organisation responsible for setting standards for public reporting of Exploration Results, Mineral Resources and Mineral Reserves by companies listed on markets in Europe. PERC is a member of CRIRSCO, the Committee for Mineral Reserves International Reporting Standards, and the PERC Reporting Standard is fully aligned with the CRIRSCO Reporting Template.

¹ Fennoscandian Association for Metals and Minerals Professionals

The PERC standard sets out minimum standards, recommendations and guidelines for Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves in Europe.

2.2 Definitions

Public Reports on Exploration Results, Mineral Resources and/or Mineral Reserves must only use terms set out in the PERC standard.

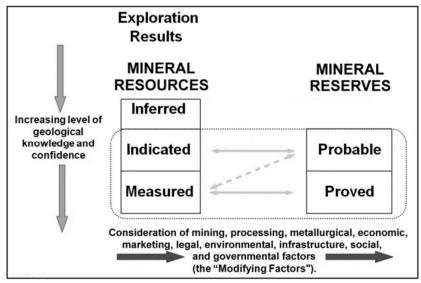


Figure 1. General relationship between Exploration Results, Mineral Resources and Mineral Reserves (PERC 2017).

2.2.1 Mineral Resource

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.

2.2.2 Mineral Reserve

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource.

It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

3 NAUTANEN

Nautanen Cu-Au project is located in central Norrbotten, about 15 km northwest of the Aitik copper mine and 7 km east of the Fe-oxide mine in Malmberget (Figure 2, 3). Small-scale mining (open pits and underground workings) took place in the area between 1902 and 1907 by Nautanens Kopparfält AB. A total of 71 835 tonnes of ore was mined and processed in Nautanen of which 5 746 tonnes of copper concentrate and 4 635 tonnes of iron concentrate was produced.

Exploration by a number of companies has occurred periodically since 1950's and onwards. Boliden received its first exploration permit in 2009 and subsequently conducted ground geophysics, field mapping, sampling and kax-till drilling over the area, prior to commencing diamond drilling in 2011. Since 2011 Boliden has completed 97,910m drilling in over 170 drillholes.

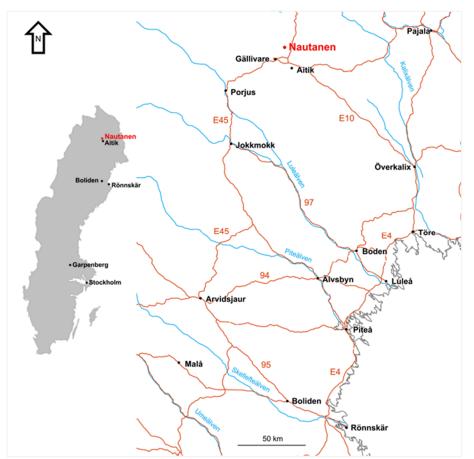


Figure 2. Map showing location of Nautanen in northern Sweden, relatively close to Aitik mine and Gällivare

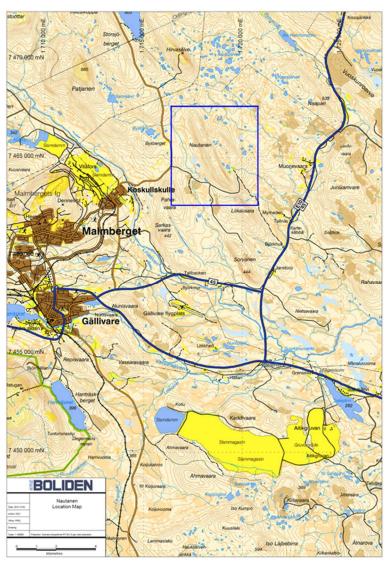


Figure 3. Topographic map showing the location of Nautanen relative to Aitik, Malmberget and Gällivare (grid in RT90)

3.1 Major changes 2019

No major changes during 2019. Exploration, technical and environmental studies (ongoing pre-feasibility study) continued during 2019. The mineral resource estimate in Nautanen is from 2016.

3.2 Location

Nautanen Cu-Au project is located in central Norrbotten, about 15 km northwest of the Aitik copper mine (100% owned by Boliden) and 7 km east of the Iron oxide mine (100% owned by LKAB) in Malmberget (Figure 2, 3). Due to the proximity of Gällivare and the current mining operation in Aitik and Malmberget the area provide excellent infrastructure and labour force The deposit is situated on the eastern slope of a north-north-west linear topographic high which reaches 545m but remains below the tree line. To the south, an east-west gully marks the boundary between the hills of Nautanen and Liikavaara, to the north flat swamps and the stream of Nietsajoki occupies the area between Nautanen and the hill of Hirvasåive.

3.3 History

Exploration at Nautanen started in 1898 when the deposit was discovered in outcrop. Nautanen was initially worked as a series of small scale mines between 1902 and 1907 by Nautanens Kopparfält AB. The company adopted a very progressive approach to the establishment of the company and the community at Nautanen, with the provision of planned housing, school, shop, brewery and other facilities.

A concentrator was established on site to process the ore, with concentrate loaded and hoisted to Koskullskulle on a cable car. By 1907 test work was underway to construct a new "English-style" concentrator. However, this coincided with strike action and a lower grade material production within the existing mines. Despite exploration drilling and trenching, consolidation of the mines with those in the Liikavaara field and the acquisition of an additional mine in northern Norway, the company went bankrupt (Geijer, 1917).

The historic mines at Nautanen extracted a total of 71,835 t of ore producing 5,746 t of copper concentrate and 4,635 t of iron concentrate, the amount of gold produced remains unknown (Geijer, 1917). The mining took the form of underground drifting and levels connected via winzes as well as steep sided open pits and trenches.

A map compiled by Boliden in 2012 showing historical mine workings is presented in Figure 4

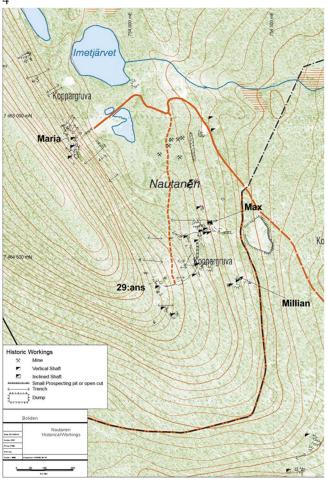


Figure 4.Nautanen historical mine workings

Further exploration was conducted by SGAB (Sveriges Geologiska AB) from 1951 – 1985. Drilling focused on shallow targets in Nautanen and culminated in an estimate on the areas around the historic mines (Table 3). They determined Nautanen to consist of at least two zones of mineralisation, an A-Zone (rich chalcopyrite-magnetite mineralisation) and a C-Zone which had characteristics more common to Aitik deposit (Danielsson, 1985). The mineralised zones defined in this study were complicated and often truncated by faulting. Boliden does not treat these historic estimates as a current or relevant Mineral Resource estimate.

Table 3. Results from SGAB Malmberäkning at Nautanen (Danielsson, 1985)

Zone	Tonnage	Cu Au		Ag	
	(Mt)	(%)	(g/t)	(g/t)	
А	0.63	2.36	1.3	11	
С	2.3	0.34	0.3	-	

Exploration work resumed in the late 1990's with North Atlantic Resources (NAN) acquiring the target. Boliden has no knowledge work conducted and no company reports are available. However, drillhole information (collar, survey, geology and assay) has been acquired by Boliden. The focus appears to have been testing a geophysical anomaly (magnetic) that is present at Nautanen with the aim of delineating a near surface copper-gold resource.

In early 2000 Phelps Dodge conducted field mapping, geophysical surveys, soil sampling and drilling in Nautanen area. Boliden were contracted as consultants to Phelps Dodge to conduct a ground electromagnetic (EM) survey over the target which resulted in the identification of an EM anomaly coincident with the historical mining area at Nautanen. Phelps Dodge drilled a total of 3 071 m at Nautanen and Liikavaara in 2003 and 2004, with a further 524 m drilled in 2005 when Teck Cominco joined them in a Joint Venture.

Boliden acquired the target in 2009 and subsequently conducted ground geophysics, field mapping, sampling and kax-till drilling over the area, prior to commencing diamond drilling in 2011.

Boliden has continued with exploration and internal technical-, environmental- and economical studies of Nautanen since then. At the moment an internal pre-feasibility is ongoing.

3.4 Ownership

Boliden owns 100% of all the exploration permits in the area. There are no historic royalties connected to Nautanen.

3.5 Permits

The Nautanen resource lies entirely within Boliden's exploration permit, Nautanen nr 1001, Table 4. The permit became ten years old in August of 2019, an application for extension is currently being assessed by Bergsstaten. Exploration is allowed to continue during this application period.

Table 4. Exploration permit in Nautanen

Name	Active from	Expires	Minerals
Nautanen nr 1001	2009-08-18	2019-08-18	Copper

3.6 Geology

3.6.1 Regional

Northern Norrbotten forms one of the major ore districts within Sweden and is a major producer of Fe, Cu and Au. It is situated approximately 250km north of the Skelleftea district and covers an area of approximately 20,000km2. Deposits within the district consist of the massive Kiruna-type apatite-iron ore deposits (IOA) (Kiruna, Malmberget) and epigenic Cu (Aitik, Phatohavare), as well as Iron Skarn and IOCG deposits (Sahavaara, Tapuli, Gruvberget) (Wanhaninen, 2005). These deposits are hosted in Karelian and Svecofennian units (2.2 - 1.8Ga) which overlie Archaean basement (Martinsson, O., & Wanhainen, C., 2004).

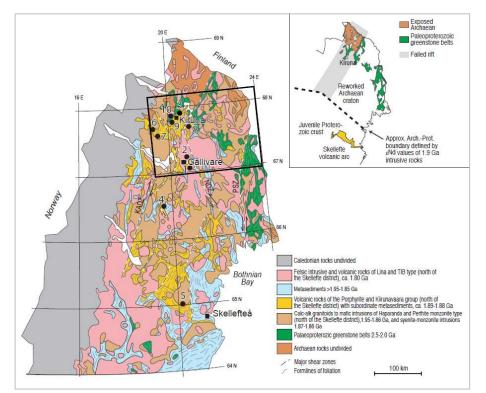


Figure 5. General geology of northern Sweden and the location of mineral deposits in northern Norrbotten (Black box). Insert highlights the location of the Archaean-Proterozoic boundary zone and aulacogen. 1. Aitik 2. Malmberget 3. Kiirunavaara 4. Vaikijaur 5. Tallberg 6. Tjårrojåkka 7. Lieteksavo 8. Gruvberget 9. Phatohavare 10. Viscaria. KADZ = Karesuando Arjeplog Deformation Zone, NDZ = Nautanen Deformation Zone, PSZ = Pajala Shear Zone (Wanhaninen, 2005)

3.6.2 Local

The Nautanen deposit lies within the larger Aitik-Malmberget field.

The Aitik deposit represents a Palaeoproterozoic porphyry-style system exhibiting characteristics of a late-stage IOCG overprinting event. Aitik is hosted within a belt of supracrustal rocks consisting of volcaniclastics, volcanics and intrusives with an intermediate affinity all of which have been metamorphosed to amphibolites facies (Wanhaninen, 2005). These rocks form part of what is regionally known as the Muorjevaara Group, and form the bulk of bedrock in the east of the field (Martinsson & Wanhainen, 2004).

Later stage intrusions have affected the entire area, with diorite and granodioritic rocks of the Haparanda suite located within the Muorjevaara group and gabbroic layered intrusions, such as Dundret more common in the Kirrunavaara suite. The entire field is surrounded and locally intruded, or arguably "sheeted-over", by the Lina granite and its associated pegmatites which are ubiquitous throughout the area.

The Muorjevaara supracrustals group is crosscut by a major north-north-west oriented crustal scale structure, termed the Nautanen Deformation Zone (NDZ), which is known to host large numbers of sulphide showings, a few of which have been worked historically for Cu-Au. This NDZ hosts the Nautanen and Aitik deposits. The zone is typically inferred to be a steep, near-vertical structure with an undetermined amount of displacement along it, within which a strong fabric or foliation has been developed.

3.6.3 Property

The Nautanen deformation zone is composed of numerous rock types complicated by the intense nature of alteration that is pervasive throughout the zone.

Generally speaking the rocks of the NDZ consist of mafic to intermediate volcaniclastics and volcanic rocks, with some minor intrusive units (McGimpsey, 2010).

Rock types in the Nautanen resource area have been divided into four main groups:

- 1 Amphibole biotite gneiss: This unit is the most abundant to occur at Nautanen, typically it occurs in the hanging wall to mineralization (i.e. in the east). The rock is interpreted to represent a zone of calcic alteration, dominated by hornblende and actinolite with pervasive magnetite.
- 2 Biotite gneiss: This unit is typically interbedded with the amphibole-biotite gneiss however gradually comes to dominate more in the central areas of Nautanen and forms a gradational series with banded biotite gneiss on its lower contact. The unit occurs in the western footwall as rare lenses. The rock is interpreted to represent a zone of intense potassic alteration dominated by biotite.
- 3 Banded biotite gneiss: This unit is distinctive within the sequence at Nautanen and its proximity to mineralization in the southern lens of Nautanen North means that it forms an excellent marker horizon even though volumetrically it is a relatively minor component of the sequence. The unit distinctive appearance is produced by its

increased feldspar content and lenses of biotite. The upper contact of the unit is in nearly all cases a transitional one from Biotite gneiss, with the lower contact often a sharp, possibly structural, contact with garnet sericite schist.

4 Garnet sericite gneiss/schist: This unit forms the bulk of the footwall at Nautanen, and is probably the dominant rock type of the Nautanen hill. Its lower contact has yet to be observed, but likely it is a structural one which juxtaposes it against amphibole-biotite gneiss. This unit acts as the main host rock to the high grade mineralization at Nautanen, with mineralization typically located adjacent to its upper contact. Locally the unit exhibits strong gneissosity and schistosity, which are inferred to be zones of structural deformation. In places a possible porphyritic texture can be observed but is not ubiquitous. The rock is interpreted to represent a zone of intense potassic-calcic alteration.

3.6.4 Mineralization

The Nautanen deposit has undergone a limited amount of research work over the years, with the majority of authors coming to the conclusion that it represents an IOCG-style of mineralization, with possible early ground preparation related to the porphyry-style event which is speculated to have formed Aitik. Dating work by Smith et al., 2009 indicates that the deposit was formed between 1800-1750 Ma as part of a suite of IOCG deposits in Norrbotten which all show a strong association with zones of structural deformation.

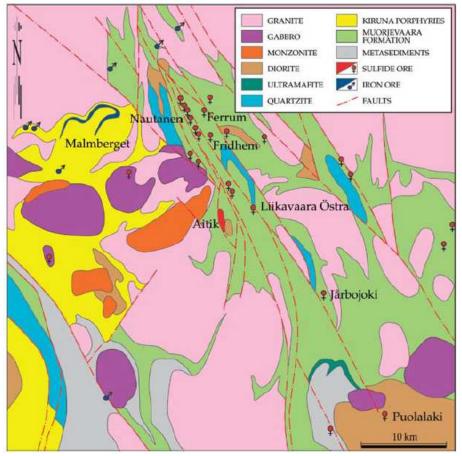


Figure 6.Geology of the Gällivare area (Martinsson & Wanhainen, 2004)

Mineralization at Nautanen is hosted within the volcanosedimentary units and has no clear link to intrusions.

The mineralization has been sub-divided into five main groups:

- 1 High Grade 1 (HG1): Almost the entire resource lies within this sub-vertical to steeply east dipping NNE striking structure. Mineralogy consists of chalcopyrite with minor magnetite and pyrrhotite appears disseminated however can be structurally controlled at a small scale in microfractures. Typically HG1 contains a higher grade, 20-100cm wide "Pebble Breccia" with rounded clasts of replaced garnets. HG1 can be further divided in the "southern lens" which appears to be lithologically controlled by the contact between the banded biotite gneiss and garnet sericite schist, and the "northern lens" which appears structurally controlled within a dilational jog and associated sheeted vein system. The banded biotite unit in the "southern lens" pinches out into a series of narrow splays closer to the "northern lens", however alteration is continuous, even across the 200m gap in mineralization
- 2 High Grade 2 (HG2): This zone sits in the hanging wall above HG1 south lens, approximately 100-150m to the east. Mineralogy consists of chalcopyrite-magnetitepyrite disseminated however locally massive magnetite occurs. Only a single drillhole intersection was included in the 2016 resource estimate, a number of intersections have since been drilled that require interpretation before being added to the next resource estimation. HG2 appears more structurally complex compared to the relatively planar HG1.
- 3 Disseminated Cu (LG): A zone of elevated Cu mineralization envelopes both HG1 and HG2, and is rather continuous along strike. Mineralization consists of chalcopyrite, pyrite, magnetite and molybdenite. In cross-section, the zone appears like a vertically tilted Aitik-like mineralisation, with the shallower levels pinching out before reaching the surface. At depth, the zone can reach widths greater than 100m and is a potential host of undiscovered high grade lenses.
- 4 Tourmaline vein system: this mineralisation also exists in the hanging wall to the HG1 south lens and is interpreted to overprint the HG2 mineralisation. It exists as either a series of sheeted quartz tourmaline veins or an en echelon vein array that stikes roughly north-south with a dip of 70□ east. Individual veins can contain copper grades of up to 1% however economic widths have yet to be identified.
- 5 Fe-skarn and disseminated magnetite: This mineralization style has only occasionally observed at Nautanen, massive to semi massive magnetite is found in association carbonate and a clinoamphibole-diopside skarn assemblages with minor epidote (Jansson, 2013). Zones of massive magnetite can be up to 1-2m in width and grade out into a stockwork-like magnetite mineralization with minor disseminated sulphides which include molybdenite.

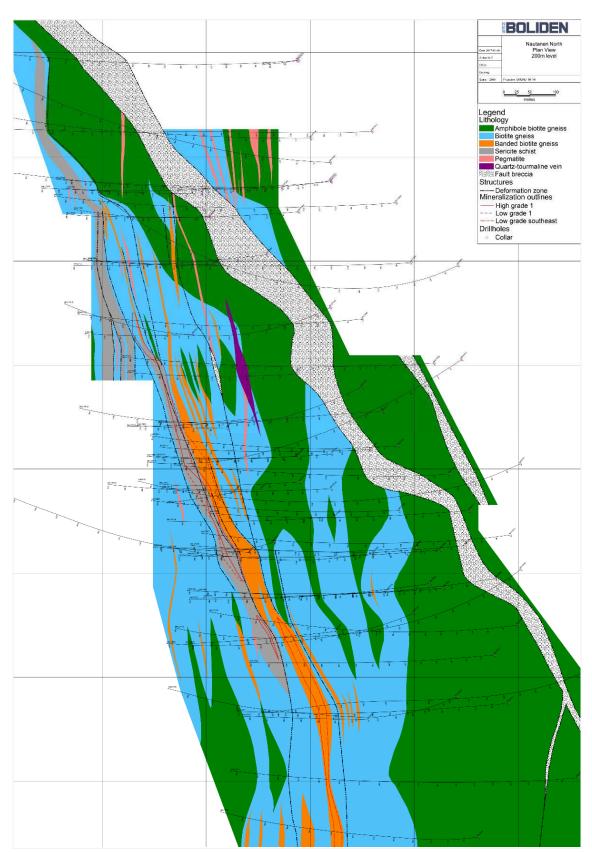


Figure 7. Plan view of the geological interpretation of the Nautanen resource drilling at the 200m level

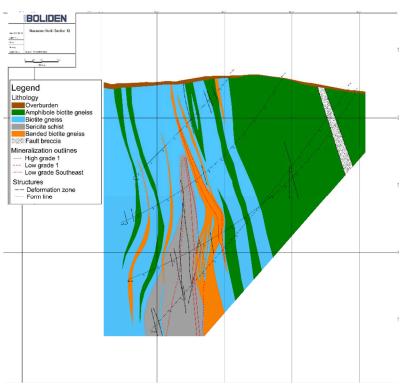


Figure 8. North looking section of the geological interpretation of the Nautanen resource drilling at 7466675N

3.7 Exploration procedures and data

Diamond drilling assay data is used for mineral resource estimation. NQ2 diameter drilling is performed by drilling contractor Kati and supervised by Boliden personnel. The current practice is to measure all drillholes for deviation with north seeking gyro, however this tool is often unavailable due to difficulties operating in northern latitudes. In these cases, a non-north seeking reflex gyro is used and a start azimuth is measured from the side of the drill rig with a DGPS, or with a downhole probe after the rig has moved.

A compass cannot be used at Nautanen due to the high magnetite content.

The drill core is logged by Boliden geologists and sampled by ALS laboratories personnel at Måla. Standard samples, blanks and duplicates are inserted into every sample batch to ensure that the quality of the assay results are satisfactory. Sample assaying is carried out by ALS laboratories in Piteå and duplicate check assays performed by ACTLABS/MS Analytical/ACME. QAQC (Quality Assurance Quality Control) protocol is implemented all the way through from drilling to assaying. In Boliden opinion, the QAQC results demonstrate that the Nautanen deposit assay database is sufficiently accurate and precise for Mineral Resource estimate.

Density data used in the late-2016 resource estimate has been collected from multipycnometer measurements on sample pulps from within the zones of mineralization. This data has been used to produce a density formula for the ore lens based on sulphur and copper content, however analysis of this method has questioned its suitability. To rectify this, both multipycnometer measurements on pulps, and physical specific gravity measurements on whole core were taken from infill drillholes in 2018, over continuous intervals of mineralization.

3.8 Exploration activities

Nautanen resource exploration in 2019 focused on infill drilling of the HG1 north and south lenses, as well as testing for up-plunge extensions closer to the surface.

Infill drilling of both the north and south lens of the HG1 zone for the most part intersected mineralization as predicted by the model, thus proving the continuity of the ore zone and upgrading large parts of the resource to indicated category. Two drillholes on the northern margin of the south lens intersected wider and higher grade mineralization than expected. This should result in an increase in tonnage and a reduction in the gap between the two lenses. This gap may now be only 100m wide at -50m level.

Up-plunge extensional drilling of the south HG1 lens did not result in any major changes to the mineralization model but did aid in better defining the outer margins of the resource and overall southerly plunge of the orebody. The shallowest intersection of 150m below surface was intersected during 2019. The HG1 south lens remains open down-plunge to the south. This will be tested by drilling in 2020.

Up-plunge extensional drilling of the north HG1 lens extended the known mineralization a further 200m, and also identified mineralization immediately to the north. The shallowest intersection to date lies 325m below surface, however the ore body is likely to be disrupted by a late fault breccia zone above the drilling. Further drilling is required to test this area of faulting and to test for extensions to the north where the mineralization still remains open.

The increased drillhole density throughout the resource has increased our understanding of the western parallel HG2 mineralization and it is anticipated that more of this structure can be incorporated in to the up-coming updated resource estimation.

A total of 39 NAUTN drillholes for 18,650m were completed in 2019. To date, 173 drillholes totaling 97,910m have been drilled on the project, however some of these are drilled at the Bratt and Sorvanen prospects around the historical mines to the south.

Field Exploration drilling in 2019 was conducted on a number of targets between Aitik and Nautanen with high gravity anomalies. This drilling comprised of four drillholes totaling 3,245m.

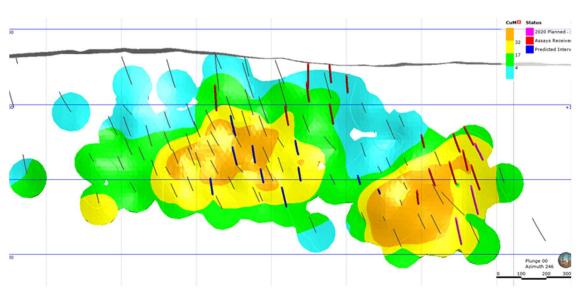


Figure 9. West looking longitudinal section view of Nautanen. Contours show copper percent multiplied by width of intersection. Red pierce points show 2019 drillholes with assays received. Blue pierce points show 2019 drillholes with predicted grades. Magenta pierce points show 2019 drillholes which will be completed in 2020.

3.9 Prices, terms and costs

Anticipated operational costs at an underground operation in Nautanen and processing in Aitik existing process plant is set to a minimum of 350 SEK/t. For the mineral resource estimate, a cut-off grade of 0.9% copper was used. This correspond to a Net Smelter Return (NSR) of about 350 SEK/t using Boliden long-term planning prices at the time of the mineral resource estimate (2016), Table 5.

Metal/Exchange rate	Planning prices, 2016
Copper	USD 6 200/tonne
Gold	USD 1 100/tr.oz
Silver	USD 18/tr.oz
USD/SEK	7.50

Table 5. Boliden long term planning prices at the time of the Mineral Resource estimate

3.10 Mineral resources

The 2016 Nautanen Mineral Resource estimate was prepared in November 2016 (Degen, 2016). Grade estimates were interpolated into a 3-dimensional (3D) mineralisation block model using a 2D estimation approach after Bertoli et al. (2003) in commercially available software packages (Leapfrog, Datamine Studio, Snowden Supervisor). The project limits and coordinates were based upon the SWEREF99 TM system. Most of the deposit was delineated with drillholes drilled at approximately 50 degrees to the west. Drillholes were spaced at around 70 to 100 m of the target.

The resource estimate has used an updated drillhole database as at 01 October 2016 which includes all drillhole sample assay results together with interpretations of the prevailing geology that relates to the structure, lithology, alteration and the spatial distribution of Cu,

Au, Ag, Mo and S mineralisation. Interpolation parameters were based upon the geology, styles of mineralisation, drill hole spacing and geostatistical analysis of the data.

The blockmodel utilizes a block size of 10 m x 40 m x 40 m, with sub-blocks down to down to 2.5 m x10 m x 10 m. The block model framework parameters are reproduced in Table 6.

	Origin	Cell size	Number of cells
Х	752600	10	120
Y	7466110	40	55
Ζ	-400	40	30

Table 6. Block model framework parameters

The grade estimation used a length weighted Ordinary Kriging approach adapted from 2D Kriging, as described by Bertoli et al. (2003). A variogram model was established for Cu accumulations and verified for all other accumulations (Au, Ag, Mo and S) as well as length. A single normalised variogram model for all accumulations and length was used to run the estimation.

The search neighbourhood used was 100 m * 100 m * 13.3 m representing 2/3 of the range of the variogram model. The minimum number of composites used to estimate each block was 4, and the maximum 8. Where the first search did not yield enough composites to estimate the block, the search radii were doubled, and finally, multiplied by five, while the minimum and maximum sample requirements remained mostly unchanged. The minimum number of composites was dropped to one for the largest search ellipsoid.

Following the estimation of length and all accumulations, the grade estimate for each parameter was derived through the division of each grade accumulation estimate by the length estimate for the respective block.

Mineral Resource estimates were classified according to the following key indicators:

- Geological complexity
- Quality and quantity of informing data
 - Confidence in analytical results
 - o Confidence in borehole surveying
 - o Analytical data
 - Results of the geostatistical analysis, variography and Quantitative Kriging Neighbourhood Analysis (QKNA)
 - Metallurgical factors or assumptions
- Confidence in the block estimates

The Nautanen deposit has been classified as containing Inferred and Indicated Mineral Resource. Required drill pattern are for Inferred Mineral Resource $< 160 \times 160$ m and for Indicated Mineral Resource $< 80 \times 80$ m.

Figure 10 shows the deposit as classified block model.

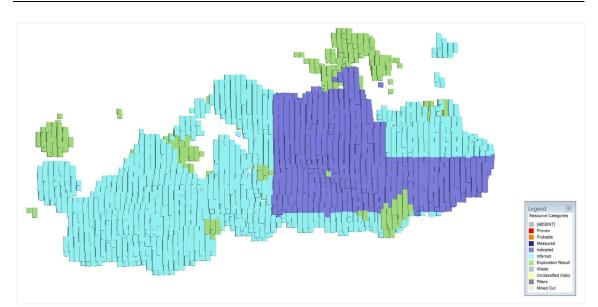


Figure 9. North (left) – south (right) longsection view of the classified Nautanen block model (blue: Indicated; cyan: Inferred; green: geol. potential).

The Nautanen Mineral Resource as of December 31, 2019 are given in Table 7. The Nautanen Mineral Resource is reported at a 0.9% Cu cut off grade for underground mining.

Table 7. Nautanen Mineral Resource statement Cu >= 0.9 %, demonstrating reasonable prospects for eventual
economic extraction (Nov. 11, 2016), figures are presented without dilution.

Mineral resource	TONNES	CU_PCT	AU_PPM	AG_PPM	MO_PPM	S_PCT
classification						
Indicated	8,200,000	1.66	0.85	5	86	3.1
Inferreed	7,500,000	1.47	0.61	7	81	2.5

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