Boliden Summary Report

Resources and Reserves | 2018

Tara Mines

Prepared by
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1 SUMMARY

In 2018, the major changes to the Mineral Resources and Mineral Reserves comprised:

- Addition of new Inferred Resources at the Tara Deep satellite deposit.
- Reduction in Indicated Mineral Resources as a combination of, changeover in estimation systems, transfer of resources to reserves and write-offs.
- Addition of new Reserves such that only a 0.5Mt reduction occurred since 2017, despite a mining depletion of 2.2Mt.

Table 1. PERC Classified Mineral Resources and Mineral Reserves as 31st December 2018. Comparative figures classified according to JORC shown for 2017. Note: The Resources are additional to the Reserves.

		2018			2017	
Classification	**kton**	**Zn (%)**	**Pb (%)**	kton	Zn (%)	Pb (%)
Mineral Reserves						
Proved	**1 600**	**6,7**	**1,8**	2 900	6,7	1,6
Probable	**17 400**	**5,6**	**1,5**	16 600	5,7	1,4
Total	**19 000**	5,7	1,5	**19 500**	5,8	1,4
Mineral Resources						
Measured				400	5,6	2,3
Indicated	**2 200**	**6,2**	**1,6**	6 200	6,2	1,9
Total M&I	2 200	6,2	1,6	6 600	6,2	1,9
Inferred	**20 900**	**7,4**	**1,7**	15 500	7,5	1,9

2 GENERAL INTRODUCTION

This report is issued annually to inform the public (shareholders and potential investors) of the mineral assets in Boliden Tara Mines, Navan, Ireland. The report is a summary of the internal Competent Persons Reports. The Boliden method of reporting Mineral Resources and Mineral Reserves complies 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.

This report is the first Mineral Resources and Mineral Reserves summary report for Boliden Tara Mines based on the PERC Reporting standard. Until 2017, Boliden largely used the FRB standard (Fennoscandian Review Board) classification system but in Boliden Tara Mines the JORC system was used for the previous 20 years. Boliden consider that these previous estimations are accurate enough to be directly reported under PERC.

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

PERC is the organization 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.

The PERC standard sets out minimum standards, recommendations and guidelines for Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves in Europe (see http://www.percstandard.eu/)

2.2 Definitions

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

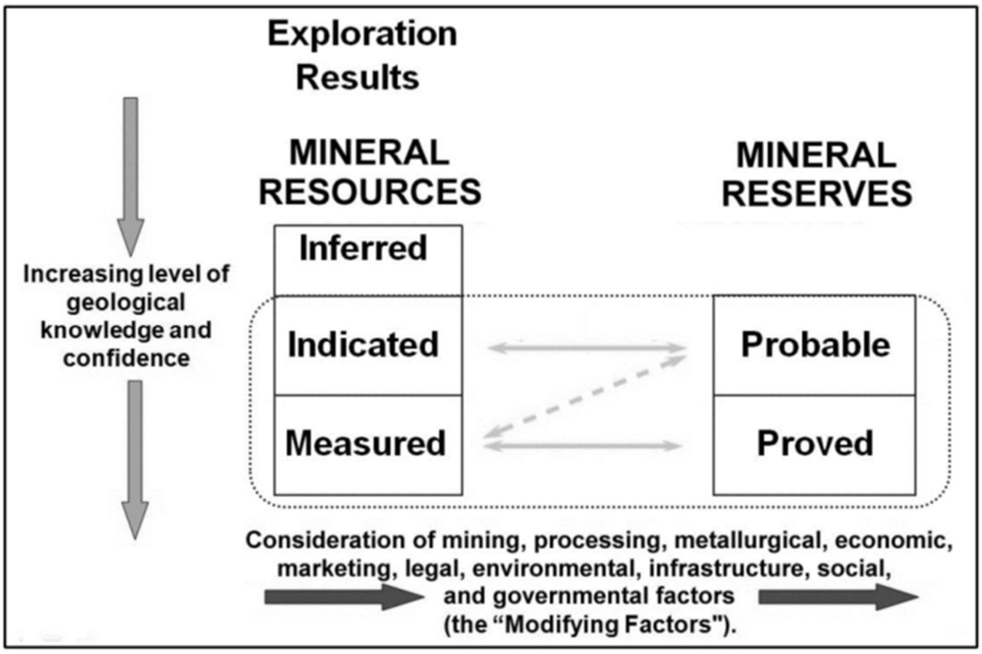

Figure 1. General relationship between Exploration Results, Mineral Resources and Mineral Reserves (PERC 2017).

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.

2.3 Competence

The 2018 Reserves and Resources were estimated and compiled by a team of geologists and engineers, outlined in Table 1. John Ashton took the role of overall competent person and coordinated actions and contributions from other staff involved. John Ashton is a Member of the Institute of Materials, Minerals and Mining and a Professional Member of the Institute of Geologists Ireland. He has greater than 5 years' experience in the estimation of resources and reserves in carbonate hosted Zn-Pb deposits. Borja Arias is a Member of the Australasian Institute of Mining and Metallurgy, and has greater than 5 years' experience globally in reserve estimation in base metal deposits, with several years based at the Navan Deposit.

Table 2. Contributors and responsible competent persons for this report

Description	Contributors	Responsible CP
Compilation of this report		John Ashton
Geology		John Ashton
Resource estimations	Sofia Höglund, Finn Oman, Arthur Watts, Ian McGimpsey	John Ashton
Reserve estimations	Borja Arias, Paddy McConnell	Borja Arias
Mineral Processing	George Wilkinson	John Ashton
Mining	Nils Steen, Paddy McConnell	John Ashton
Environmental and legal permits	Paschal Walsh	John Ashton

3 BOLIDEN TARA MINES

Boliden Tara Mines is located in Navan, Co. Meath Ireland, ca 50km NW of Dublin (Fig. 2). The Navan Orebody was discovered in late 1970 and has been in production since 1977 at rates up to 2.6 mtpy, and is currently the largest Zn mine in Europe. It is a world-class carbonate-hosted Zn-Pb deposit comprising a series of complex tabular lenses within Lower Carboniferous Limestones and ignoring depletion, would be over 130Mt in size. It is mined by underground trackless methods comprising open stoping with some room and pillar methods.

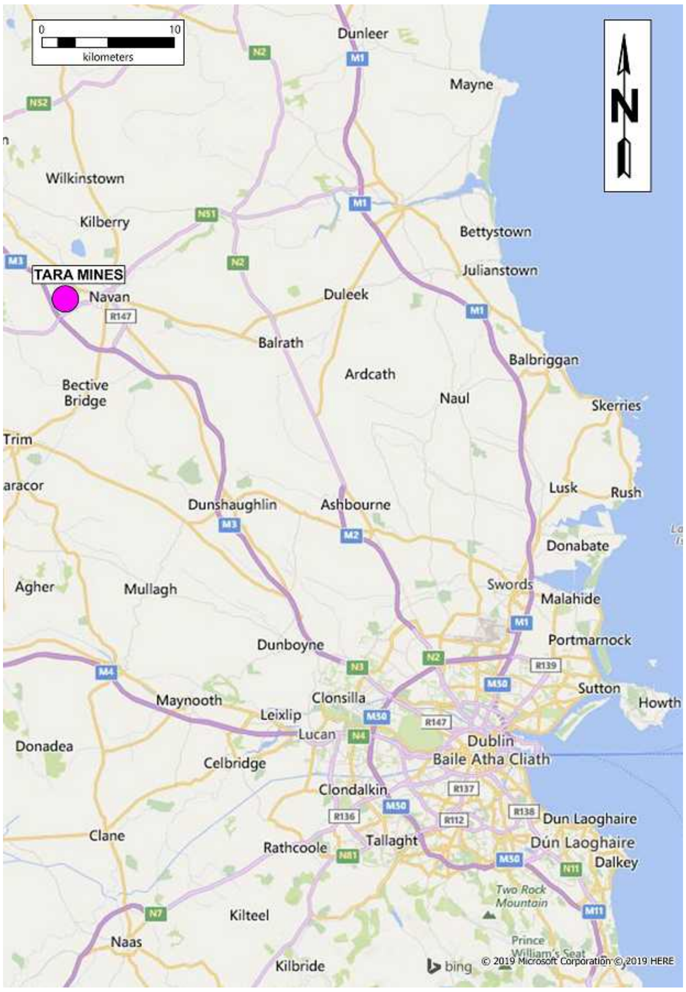

Figure 2. Map of Eastern Ireland showing Navan, the Boliden Tara mine and Dublin.

3.1 Major changes

A number of important developments occurred during 2018:

- Boliden Tara was given permission to extend the tailings dam (TMF6) by the relevant permitting authorities, Meath County Council and the Environmental Protection Agency, following an appeals process. Construction of the tailings dam extension has proceeded smoothly and could enable Boliden Tara to mine until at least 2027 at currently scheduled rates.

- Continuing drilling in the new Tara Deep Satellite deposit increased the resource by 5Mt to 18.2 Mt grading 7.6% Zn and 1.6% Pb In addition an access drift was mined ca 600m towards this area from the existing mine.

- Planning permission was granted by Meath County Council for mining a part of the orebody (part of the 'Crown Pillar') close to surface in the up-dip eastern, Nevinstown section of the deposit.

3.1.1 Technical studies

The main technical issue of importance in 2018 was the switchover from a legacy, partly 2D system of resource estimation (in-house developed stratigraphic slicing) to a full 3D system, using Leapfrog3D for geological modelling, Datamine for block modelling and Deswik for resource and reserve definition and scheduling.

3.2 Location

The Boliden Tara Mine is located 2km NW of the town of Navan in Co Meath Ireland and 50 km north west of Dublin (Fig. 2). The area comprises gently rolling farmland with a mild Atlantic climate. The mine is well served by motorway and rail links to Dublin airport and port. The orebody extends from near surface for ca 5km WSW to depths of nearly 1km. A satellite deposit, termed 'Tara Deep' was discovered in 2012, occurs at depths of 1-2 km below surface and is currently a major focus for exploration and development. The distribution of resources and reserves, the mined out areas and the location of Tara Deep is shown in Figure 3.

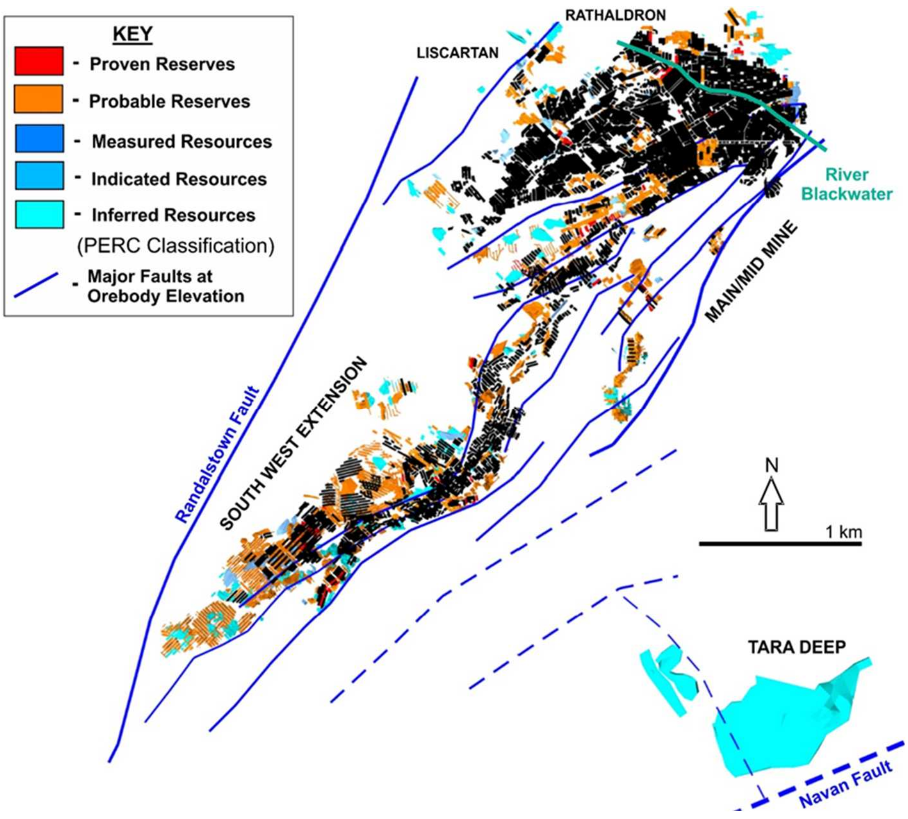

Figure 3. Resource and reserve distribution in the Navan Orebody, showing mined out areas, principal faults and the location of Tara Deep.

3.3 History

The Navan Orebody was discovered in 1970 and production started in 1977. Production has been scheduled at rates up to 2.6 mtpy in recent years with the preceding 10 years production shown in Table 3.

Table 3. Milled tonnages and grades from Boliden Tara Mines over the period 2009-2018

	TONNAGE	**GRADE**			**ZINC CONCENTRATE**				**LEAD CONCENTRATE**				**SILVER**	
Year	**Milled**	**Zn**	**Pb**	**Fe**	**Tonnes**	**Zn**	**%**	**Metal**	**Tonnes**	**Pb**	**%**	**Metal**	**g/t**	**t**
		%	**%**	**%**		**%**	**Rec**			**%**	**Rec**			
2009	2 507 900	7,91	1,52	3,41	344 328	53,9	93,6	185 558	41 020	57,5	61,9	23 567	51	2,09
2010	2 592 821	6,97	1,39	3,45	315 855	53,0	92,5	167 334	34 459	53,7	51,2	18 515	39	1,34
2011	2 486 357	7,04	1,36	3,00	307 410	53,3	93,7	163 935	33 679	58,8	58,5	19 787	27	0,92
2012	2 502 278	7,00	1,44	2,87	305 170	54,4	94,8	166 021	40 807	55,2	62,4	22 517	41	1,67
2013	2 493 240	7,05	1,46	2,74	297 944	55,9	94,7	166 462	38 604	56,1	59,5	21 672	31	1,20
2014	2 286 701	6,92	1,55	2,69	267 242	56,0	94,5	149 646	41 940	53,1	62,8	22 262	58	2,43
2015	2 196 814	6,37	1,25	2,71	242 777	54,8	95,1	133 034	34 400	50,0	62,7	17 182	37	1,27
2016	2 602 863	5,96	1,15	2,70	267 851	55,2	95,3	147 797	37 091	52,8	65,6	19 582	29	1,08
2017	2 310 634	5,92	1,14	2,71	239 038	54,6	95,4	130 580	31 258	54,7	54,9	17 083	43	1,34
2018	2 200 154	6,28	1,20	2,72	242 264	54,4	95,3	131 742	29 299	57,0	63,3	16 712	40	1,16
Total	**24 179 762**	**6,75**	**1,35**	**2,91**	**2 829 879**	**54,5**	**94,4**	**1 542 109**	**362 557**	**54,9**	**61,0**	**198 879**	**40**	**15**

3.4 Ownership

Boliden Tara Mines DAC is wholly owned subsidiary of the Boliden Group, Sweden.

3.5 Permits

The Boliden Tara operation has a number of permits that include:

- Five Prospecting Licences granted by the Department of Communications, Climate Action and the Environment that extend outwards from the mine for several kilometers and convey exclusive rights to explore and apply for State Mining Facilities. These are renewed every six years, subject to official review and fulfillment of licence commitment expenditures on a two-yearly basis.

- State Mining Facilities comprising four Leases and four Licences granted by the Department of Communications, Climate Action and the Environment. These facilities will need renewal between 2021 and 2023. Currently terms are variable with recent facilities being granted with royalties to the Irish State varying from 3.25 to 3.75% of Net Smelter Return. Deliberation from the Department of Communications, Climate Action and the Environment is awaited regarding licences from few small un-licensed areas in the SW part of the deposit.

- Planning permissions from Meath County Council have been granted for the entire footprint of the mine and tailings management facility. This includes, most recently, permission to extract part of the near-surface ‘Crown Pillar’ at Nevinstown.

- An Industrial Emissions licence from the Environmental Protection Agency was granted in September 2018.

Tara Deep is covered by a Prospecting Licence and the underground exploration development is exempt from Planning Permission. Tara Deep will require planning, licence review and State Mining Facilities in due course. Boliden Tara Mines have reasonable expectations that application for new permits and renewals of existing permits will be granted by the relevant authorities.

3.6 Geology

The Navan Orebody is a world-class carbonate-hosted Zn-Pb deposit comprising complex tabular lenses within Lower Carboniferous limestones and excluding depletion, would be over 130Mt in size. Detailed descriptions of the geology are available in a number of publications of which Ashton et al., (2015) is the most recent. The discovery of the Tara Deep satellite and outline geology are summarized in Ashton et al., (2018).

3.6.1 Regional

Central Ireland comprises generally flat lying sequences of Lower Carboniferous limestones with common inliers of sedimentary Lower Palaeozoic and Devonian rocks. The limestones are cut by numerous, locally syn-depositional NW to ENE trending major normal faults and these control the location of several carbonate hosted Zn-Pb deposits, of which Navan is by far the largest.

3.6.2 Local

In eastern Ireland, the Carboniferous Limestones are part of the Dublin Basin, a significant feature that after extensional basin-margin faulting and later Hercynian inversion, exposes some large Lower Paleozoic inliers at its margins and exhibits some outliers of Namurian and later Permo-Triassic sediments.

3.6.3 Property

The Navan Orebody is located on the footwall (northern) side of a major south-dipping normal fault that constitutes a basin margin controlling feature. The orebody itself is controlled by a complex array of Lower Carboniferous normal faulting and slides on the uplifted footwall of this major fault. The orebody generally dips at about 10-15 degrees to the WSW and comprises several, locally stacked, tabular stratiform to stratabound lenses, oriented in general concordance with the host limestones. The mineralization ranges from a few meters to over 70m in vertical thickness. A major slide and overlying debris flow cuts the orebody obliquely and is also mineralized. The orebodies are effectively masked from the surface by a thick succession of deep-water calc-turbidites that comprise the Dublin Basin.

3.6.4 Mineralization

Although there a number of important lenses and fault blocks at Navan, >95% of the mineralization occurs as sphalerite and galena in partly dolomitized limestones as complexly-textured replacements, veining and open-space infill where Zn:Pb ratios are typically around 4 or 5 to 1. Gangue mineralization comprises subsidiary calcite, pyrite, marcasite, dolomite and barite. The remainder of the mineralization occurs as massive pyritic lenses containing sphalerite and galena hosted by debris-flow conglomerates that overlie the deposit. This material contains often abundant fine-grained pyrite which has the potential of degrading the normally excellent metallurgy if not blended with normal run of mine ore.

3.7 Exploration procedures and data

Exploration at Navan comprises surface exploration and underground exploration. Surface exploration comprises several geochemical and geophysical techniques, and most recently, 2D seismic surveys have been extraordinarily effective in providing structural profiles through the host geology. The primary exploration tool is deep diamond drilling and this extensively uses navigational deflection drilling enabling many intersections to be drilled from a single 'mother' hole with resultant benefits to timing and reduced impact on the environment. Underground diamond drilling is performed from specially mined hanging-wall drifts located 10s of meters above the orebody and subsequently used for ventilation, dewatering, geotechnical and backfill purposes. Most underground diamond drilling is for delineation for upgrading Inferred to Indicated resources. Subsequent in-stope drilling is used to upgrade Indicated to Measured Resources prior to production.

3.7.1 Drilling techniques

Drilling comprises wireline diamond drilling with NQ diameter core for surface holes and AQ or BQ core for underground core. Core recovery is typically close to 100%.

3.7.2 Downhole surveying

Down hole surveying is accomplished either by Contractor or Exploration staff using Reflex electronic multi-shot equipment (the host rocks at Navan are not magnetic). Short production holes are generally not surveyed and are frequently vertical or fairly steeply inclined.

3.7.3 Sampling

All surface (NQ diameter) core is split prior to sampling and most core is retained for possible future examination. All underground core (AQ diameter) is sampled whole and the remainder completely discarded. Sampling is governed by ore-waste contacts and mineralization styles though it is noted that the mineralization at Navan is extremely variable in its distribution and textural styles, so it is impossible to aim for strict homogeneity in material sampled. Sample length typically ranges from 0.5 to 2m and averages around 1.5m. All samples are recorded in mineral logs where textural styles and a visual estimate of Zn+Pb% is recorded. Although very large emphasis is placed on recording the geology and grades of development faces at Navan and this material is used for interpretation, it is not currently used for resource grade estimation.

3.7.4 Density

Density is estimated from a set of multiple regression equations that relate density to sample Zn, Pb and Fe grades and which were created by experimental work relating measured density to assays. In general, the density of the ore is not much higher than the host rock (e.g. 2.8-3.2), unless high Pb and/or Fe grades are present and in these areas the regression curves take these variances into effect.

3.7.5 QAQC

Samples are sent to an on-site laboratory for comminution and assay via conventional processes (crushing, milling, XRF assay etc). This laboratory is also used for environmental, mining and metallurgical work and has trained staff and full detailed QA/QC procedures, including external lab checks, standards etc. Core samples are subject to checks between estimated Zn+Pb% grades and assayed Zn+Pb% grades. In the case of disparity, samples are re-analyzed and in the case of surface drill holes the split core is re-examined to check the assay estimate. In the case of Tara Deep core (a new project), all mineralized coarse rejects from the in-house lab are independently comminuted and assayed in an external laboratory (ALS Loughrea, Co Galway).

3.8 Exploration activities

The bulk of exploration activities in 2018, material to the Reserves and Resources, focused on surface drilling at Tara Deep where ca 17km yielded over 20 resource grade intersections that were used to update the Inferred Resources at year-end. Underground drilling was below budget in 2018 and did not have any material effect on the 2018 Reserves and Resources.

3.9 Mining methods, processing and infrastructure

The Boliden Tara Mine at Navan started development in 1974 with production commencing in 1977. Over the years, the mining methods evolved from top-slice and bench to various types of open stoping. Milling is straightforward and comprises standard froth flotation to give Zn and Pb concentrates which are railed to Dublin Port and subsequently to smelters overseas. The majority of the Zn concentrate goes to Boliden smelters in Norway and Finland.

Since startup, the mine has mined and processed nearly 95Mt of ore and established much confidence in the processes running from exploration and mine geology, through planning, mining and backfill to milling operations. As the mine gets deeper, increasingly thinner areas of ore are being encountered and this requires continual focus on costs and optimal mining methods.

3.9.1 Mining methods

In most areas of the mine open-stopes are designed parallel to the strike direction of the orebody such that in-stope development is sub-horizontal, whereas in the upper-near surface sections the open stopes are along dip and may necessitate slightly more complex development. In both cases, ore thicknesses up to about 20m can be mined via a single footwall drift with blast-hole drilling drilled upwards. Thicker ore necessitates hanging-wall drifts. In both cases, development is advanced to the end of the stope, and a slot crosscut created from where a raise is blasted using longhole techniques to the orebody hanging wall. Subsequent longhole blasting opens up a slot over full stope width and subsequent long-hole blasting creates a blasted ore muck pile in the developing stope which is mostly mucked-out using remote control and increasingly tele-remote operations. Areas of weak ground, often related to faulting may occur in the back and/or sidewalls of stopes. These are secured using various cable bolts patterns. Once a stope is complete, it is backfilled with hydraulically placed cemented sand-fraction tailings and then the intervening pillars are mined employing broadly similar methods. Stopes vary from 12 to 20m in width. Areas of drift height ore are extracted by low profile open stoping and referred to as ‘room and pillar’ stopes.

3.9.2 Mineral processing

In the underground mining operations, the ore is crushed in the primary crushing stations before hoisting to the surface and is transferred by a conveyor system to the coarse ore storage building. Ore processing in the mill is achieved by grinding, flotation, and dewatering. These processes are automated, monitored and controlled by a process control system. The grinding circuit, including an autogenous mill, is designed to reduce the ore particle size to a size range suitable for separation, typically in the 10 to 75 micron range, and a maximum size less than 120 microns. The finely ground ore slurry is pumped from the grinding circuit to flotation cells where lead concentrate is recovered firstly and then followed by zinc concentrate. Following flotation, concentrates are dewatered using thickening and filtration in Metso pressure filters. The final concentrates are rail transported to Dublin and then shipped to various smelters in Europe, with the bulk of the Zn concentrate going to Boliden's smelters at Kokkola (Finland) and Odda (Norway).

3.9.3 Infrastructure

Access to underground operations is through a major decline located in the shaft pillar area, which also contains the main production hoist. Subsidiary access-drifts then enter mining blocks that contain the stopes and are then used for truck haulage of ore to several underground crushers feeding conveyors that take the ore to the base of the main production shaft and then to surface. The coarse fraction of the mill waste product is used for backfill while the remnant tailings are pumped 2km to a tailings management facility.

3.10 Prices, terms and costs

Boliden's planning prices, which are an expression of the anticipated future average prices for approximately 10 years, are presented in Table 4.

Table 4. Long term planning prices currently used in Boliden

	Planning prices, 2018
Copper	USD 6,600/tonne
Zinc	USD 2,400/tonne
Lead	USD 2,100/tonne
Gold	USD 1,200/tr.oz
Silver	USD 17/tr.oz
Molybdenum	USD 8/lb
Nickel	USD 16,000/tonne
Palladium	USD 1,000/tr.oz
Platinum	USD 1,000/tr.oz
Cobalt	USD 25/lb
Tellurium	USD 30/kg
USD/SEK	7.50
EUR/SEK	8.85
EUR/USD	1.18

Table 5 shows the value of Zn, Pb grades in net smelter return US dollar values over the last 10 years and the beneficial effect of increasing metal prices in recent years.

Table 5. Changes in Net Smelter Return US $ values for a range of Zn/Pb/Fe grades (2009 to 2018).

Zn %	Pb %	Fe %	okt-18	okt-17	okt-16	okt-15	sep-14	sep-13	okt-12	okt-11	okt-10	okt-09
10,0	2,0	3,0	$ 176,8	$ 160,3	$ 157,3	$ 165,9	$ 160,9	$ 161,1	$ 161,1	$ 141,6	$ 129,9	$ 127,0
9,0	1,9	3,0	$ 159,7	$ 144,9	$ 142,2	$ 150,0	$ 145,5	$ 145,6	$ 145,6	$ 127,8	$ 116,7	$ 118,2
8,0	1,7	2,5	$ 142,0	$ 128,9	$ 126,5	$ 133,4	$ 129,4	$ 129,4	$ 129,4	$ 114,1	$ 102,6	$ 105,0
7,0	1,6	2,0	$ 125,8	$ 114,3	$ 112,2	$ 118,3	$ 114,9	$ 114,7	$ 114,7	$ 101,6	$ 89,8	$ 92,7
6,0	1,5	1,7	$ 109,3	$ 99,4	$ 97,6	$ 103,1	$ 100,1	$ 99,8	$ 99,8	$ 88,6	$ 77,0	$ 80,1
5,0	1,2	1,7	$ 89,5	$ 81,3	$ 79,8	$ 84,2	$ 81,7	$ 81,5	$ 81,5	$ 71,9	$ 62,1	$ 64,9
4,0	1,0	1,3	$ 71,9	$ 65,3	$ 64,1	$ 67,6	$ 65,6	$ 65,4	$ 65,4	$ 57,6	$ 48,6	$ 51,0
3,0	0,7	1,0	$ 52,9	$ 48,0	$ 47,1	$ 49,7	$ 48,1	$ 48,0	$ 48,0	$ 41,7	$ 34,8	$ 35,7
2,0	0,5	1,0	$ 34,9	$ 31,6	$ 31,0	$ 32,7	$ 31,7	$ 31,5	$ 34,0	$ 26,5	$ 21,9	$ 21,4
1,0	0,3	1,0	$ 17,1	$ 15,5	$ 15,3	$ 16,1	$ 15,6	$ 15,6	$ 15,6	$ 11,6	$ 9,2	$ 8,7

Currently mining and milling costs are of the order of 70 US$/t and even material near the resource grade cutoff of 5% Zn+Pb is potentially economic.

3.11 Mineral Resources

Mineral Resources are defined by mineralization defining intersections of at least 5% Zn+Pb at thicknesses of 4m or more. Breakdown of resources into confidence intervals is largely based on diamond drill hole spacing but also based on the experience of the geologist. In brief, the confidence levels are defined as follows:

- Inferred Resources: Usually defined by surface drilling: centers ranging from 40-120m.
- Indicated Resources: Defined by surface and underground drilling: centers 40-15m
- Measured Resources: Defined by surface and underground drilling: centers 15m or less.

3.12 Mineral Reserves

Mineral Reserves are the scheduled, diluted recoverable resources selected by the planning engineer for mining so that Measured Resources would be classified as Proven Reserves and Indicated Resources would be classified as Probable Reserves. In practical terms the Probable Reserves, having been drilled-off from hanging-wall drift drilling would need an additional program of in-stope drilling to be classified as Proven Reserves. Dilution and recovery factors are applied to resources during conversion to reserves. These factors vary depending on the unit being mined, its size, ore thickness, location etc. Table 6 illustrates resources and reserves in 2018 and 2017.

Table 6. Mineral Resources and Mineral Reserves Boliden Tara Mines DAC December 31st 2018. . Note: The Resources are additional to the Reserves

	2018			2017		
Classification	kton	Zn (%)	Pb (%)	kton	Zn (%)	Pb (%)
Mineral Reserves						
Proved	**1 600**	**6,7**	**1,8**	2 900	6,7	1,6
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Measured				400	5,6	2,3
Indicated	**2 200**	**6,2**	**1,6**	6 200	6,2	1,9
Total M&I	**2 200**	**6,2**	**1,6**	6 600	6,2	1,9
Inferred	**20 900**	**7,4**	**1,7**	15 500	7,5	1,9

3.13 Comparison with the previous year

The comparison of annual resource and reserve figures at Navan is always a highly complex exercise and is affected by many factors, including: metal prices, costs and high levels of reinterpretation following significant diamond drilling campaigns. In particular, there is a large amount of material in and near the orebody that has grades running in the 3 to 6% Zn+Pb range and more of this material is discovered by drilling every year. The degree to which this material is scheduled has a large effect on resource and reserve classification. The changes in resources and reserves since 2017 are a complex mix of the following factors:

Resources:

- Addition of 5Mt at Tara Deep.
- Transfer of resources to reserves resulting from better prices and more confident scheduling.
- Losses and somewhat smaller gains resulting from changes in estimation methods resulting from the use of new computer systems.
- Write-offs of some pillar areas.

Reserves:

- Depletion of 2.2Mt.
- Conversion of resources to reserves via underground diamond drilling, and scheduling.
- Conversion of resources to reserves as a result of a combination of delineation and infill drilling, scheduling, metal price increases, new computer systems and more comprehensive scheduling.

3.14 Reconciliation

The mill and mine reconciliation for 2018 is shown in Figure 4.

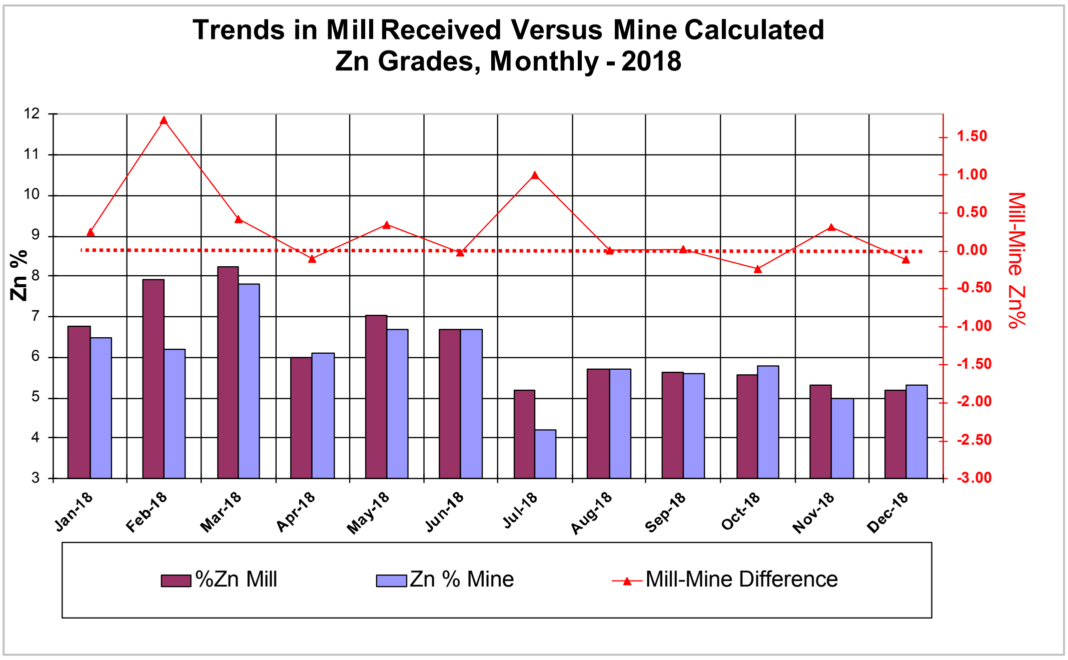

Figure 4. Milled versus mined Zn grades 2018

A comparison between mine and mill Zn grades for the previous 10 years is shown in Figure 5.

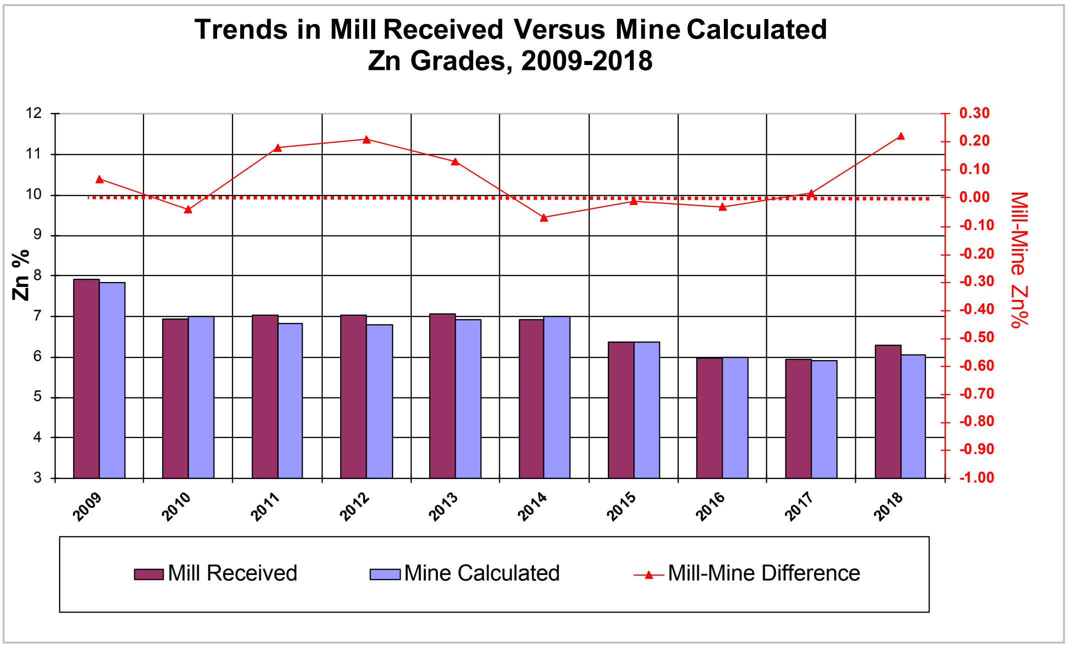

Figure 5. Trends in Mill Received versus Mine calculated Zn grades, 2009-2018

In general, the match between mine and mill grades is excellent. There is a tendency for grades to show significant variation between months; but averaged over time the figures match well. In 2018 the Zn grade of ore milled was slightly higher than the mine estimate.

4 REFERENCES

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