

# Amur Minerals

## Recovery abounds

On 10 February, Amur announced a 50kt (or 6.8%) headline increase in contained resource nickel tonnes, but a 214kt (or 41.7%) underlying increase (ie at a constant cut-off grade). This follows the January announcement of metallurgical test results by Gipronickel on a c half tonne sample of ore from Maly Kurumkon-Flangovy. Over seven metals, average recoveries were 13.0% higher than those derived from earlier bench-scale tests. The results represent the first production-scale test work from the Kun-Manie licence area and, owing to their larger size, are expected to be more reflective of actual production processes.

Year end	Revenue (\$m)	PBT* (\$m)	EPS* (c)	DPS (c)	P/E (x)	Yield (%)
12/14	0.0	(2.5)	(0.6)	0.0	N/A	N/A
12/15	0.0	(1.9)	(0.4)	0.0	N/A	N/A
12/16e	0.0	(4.0)	(0.8)	0.0	N/A	N/A
12/17e	0.0	(4.0)	(0.3)	0.0	N/A	N/A

Note: \*PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments.

## Resource now >1Mt contained Ni (9.3Moz AuE)

Based on our end-FY16 cash estimate, we calculate an enterprise value for Amur of US\$56.3m, which equates to US\$73.47 per total nickel resource tonne. That being the case, a headline resource increase of 50.0kt Ni should have added US\$3.7m in (pro rata) value to Amur, while a like-for-like increase of 213.7kt should have added US\$15.7m – cf an estimated cost of drilling of c US\$1.3m.

## Positive results follow earlier mining optimisation

The Gipronickel results follow the conclusion of a trade-off study by Runge Pincock Minarco (RPM) in December 2016, which was designed to optimise returns according to whether ore blocks are mined by open pit or underground methods. In this case, compared to an earlier expectation of approximately 50:50 open pit:underground mining, the study determined an economically optimum return from approximately 25:75 open pit:underground and therefore suggests a material reconfiguration of the mine plan compared to the operational blueprint of 2015.

## Valuation: Increases by 34.5-61.3% to 39-51c

Edison's forecasts and valuations are necessarily still based on Amur's 2015 operational blueprint. Fully diluted at the current share price of 8.99p, we estimate updated valuations of the concentrate, low-grade matte, high-grade matte and refined metal options for Kun-Manie of 39c, 51c, 41c and 50c, respectively (vs 29c, 34c, 26c and 31c, previously), using a 10% discount rate and at our long-term nickel price of US\$22,355/t (assuming 80:20 debt:equity funding). However, Amur estimates that the results of Gipronickel's metallurgical test work alone could result in revenues being "increased by as much as 10% for nickel and 6% for copper", which adds between 20.0% (for the refined metal option) and 33.3% (for the concentrate option) to the above numbers. Stated alternatively, assuming equity dilution at the current share price, Amur's shares offer investors post-dilution internal rates of return of 30.7-36.6% over 17 years in US dollar terms.

## Gipronickel met test results & resource update

### Metals & mining

7 March 2017

Price **8.94p**

Market cap **£53m**

US\$1.2277/£

Net cash (US\$m) at 30 June 2016 11.5

Shares in issue 594.4m

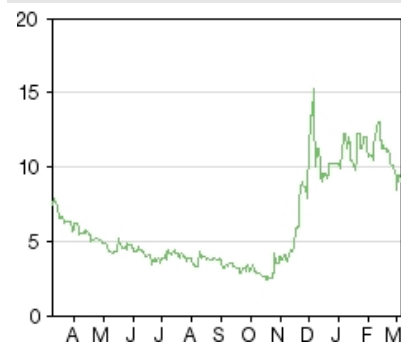
Free float 80%

Code AMC

Primary exchange AIM

Secondary exchange N/A

### Share price performance



% 1m 3m 12m

Abs (23.1) (32.5) 14.6

Rel (local) (25.0) (37.7) (2.4)

52-week high/low 15.2p 2.4p

### Business description

Amur Minerals is an exploration and development company focused on base metal projects in Russia's Far East. The company's principal asset is the Kun-Manie nickel sulphide deposit in the Amur Oblast, comprising almost a million tonnes of contained nickel equivalent in at least five deposits.

### Next events

Road desktop study H117

### Analyst

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**Amur Minerals is a research client of Edison Investment Research Limited**

## Mineral resource estimate upgrade

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Amur had a record field season in 2016, drilling 80 holes of 19,400.8m in aggregate length compared to a target of 15,000m. In so doing, the company confirmed the presence of continuous mineralisation along a 3,000m strike length at MKFL (cf 2,100m previously). Of the 59 (15,213.3m) resource definition holes, those intersecting ore grade mineralisation recorded an average mineralised thickness of 13.5m per interval, an average cumulative thickness of 23.6m per hole and an average length weighted grade of 0.76% Ni and 0.21% Cu (using a 0.2% nickel cut-off grade). In addition, the previously identified high grade structure (defined as >0.5% Ni) has been confirmed to exist along the entire 3,000m strike length of MKFL, with an average mineralised thickness of 10.5m per interval, an average cumulative thickness of 19.7m per hole and an average length weighted grade of 0.90% Ni and 0.25% Cu.

Of note is the fact that the headline grades of the holes drilled during the 2016 field season were higher both on average and specifically within the high grade domain than those recorded in the Kun-Manie May 2016 resource estimate. Cumulative widths in excess of 20m in the western extension of MKFL also compare with widths of c 12m elsewhere in the deposit. All MKFL drill identified mineralisation has now been conducted at a spacing deemed by SRK to be suitable for the definition of indicated resources.

On 10 February, Amur announced an updated mineral resource estimate, as compiled by consultants RPM. Unlike the previous resource estimate, dating from May 2016, which was calculated at a cut-off grade of 0% nickel, the new resource estimate was calculated at a cut-off grade of 0.4% Ni. As a result, sub-economic mineralisation is no longer included in the global resource inventory. A comparison between the January 2017 mineral resource estimate (at a cut-off grade of 0.4% Ni) and the May 2016 mineral resource (at a cut-off grade of 0% Ni) is as follows:


**Exhibit 1: Kun-Manie mineral resource estimate, January 2017 vs May 2016 (0.4% cut-off grade, excluding Gornyy)**

Orebody	January 2017 mineral resource estimate											Change vs May 2016 mineral resource estimate (units)*										
	Tonnage (Mt)	Ni (%)	Ni (t)	Cu (%)	Cu (t)	Co (%)	Co (t)	Pt (g/t)	Pt (t)	Pd (g/t)	Pd (t)	Tonnage (Mt)	Ni (%)	Ni (t)	Cu (%)	Cu (t)	Co (%)	Co (t)	Pt (g/t)	Pt (t)	Pd (g/t)	Pd (t)
<b>Kubuk</b>																						
Measured	0.0	0.00	0	0.00	0	0.000	0	0.00	0.0	0.00	0.0	0.0	0.00	0	0.00	0	0.000	0	0.00	0.0	0.00	0.0
Indicated	3.6	0.87	31,320	0.21	7,560	0.016	576	0.18	0.6	0.19	0.7	-0.1	0.11	2,820	0.03	260	0.016	576	-0.02	-0.1	0.00	0.0
Total M&I	3.6	0.87	31,320	0.21	7,560	0.016	576	0.18	0.6	0.19	0.7	-0.1	0.11	2,820	0.02	260	0.016	576	-0.02	-0.1	0.00	0.0
Inferred	10.9	0.74	80,660	0.20	21,800	0.015	1,635	0.16	1.7	0.14	1.5	-11.1	0.28	-23,840	0.05	-10,300	0.015	1,635	0.02	-1.3	0.02	-1.2
Total	14.5	0.77	111,980	0.20	29,360	0.015	2,211	0.16	2.4	0.15	2.2	-11.2	0.25	-21,020	0.05	-10,040	0.015	2,211	0.02	-1.4	0.02	-1.2
<b>Ikenskoe</b>																						
Measured	10.1	0.66	66,660	0.18	18,180	0.011	1,111	0.21	2.1	0.25	2.5	-7.4	0.15	-21,940	0.04	-6,020	0.011	1,111	0.03	-1.0	0.06	-0.9
Indicated	6.3	0.61	38,430	0.14	8,820	0.011	693	0.20	1.3	0.25	1.6	-5.5	0.22	-7,570	0.04	-2,580	0.011	693	0.06	-0.4	0.09	-0.4
Total M&I	16.4	0.64	105,090	0.16	27,000	0.011	1,804	0.21	3.4	0.25	4.1	-13.0	0.18	-29,610	0.04	-8,600	0.011	1,804	0.04	-1.5	0.06	-1.4
Inferred	4.7	0.84	39,480	0.20	9,400	0.016	752	0.19	0.9	0.23	1.1	-1.2	0.06	-6,620	0.01	-2,000	0.016	752	0.00	-0.2	0.03	-0.1
Total	21.1	0.69	144,570	0.17	36,400	0.012	2,556	0.20	4.3	0.25	5.2	-14.2	0.17	-36,230	0.04	-10,700	0.012	2,556	0.03	-1.6	0.06	-1.5
<b>Vodorazdelny</b>																						
Measured	0.6	0.74	4,440	0.22	1,320	0.012	72	0.29	0.2	0.32	0.2	-0.2	0.17	-260	0.05	-80	0.012	72	-0.01	0.0	0.02	0.0
Indicated	3.2	0.85	27,200	0.21	6,720	0.017	544	0.16	0.5	0.16	0.5	-1.6	0.19	-4,000	0.04	-1,480	0.017	544	0.06	-0.1	0.06	-0.1
Total M&I	3.8	0.83	31,640	0.21	8,040	0.016	616	0.18	0.7	0.19	0.7	-1.8	0.19	-4,260	0.04	-1,560	0.016	616	0.04	-0.1	0.04	-0.1
Inferred	1.0	0.81	8,100	0.22	2,200	0.016	160	0.17	0.2	0.16	0.2	1.0	0.81	8,100	0.22	2,200	0.016	160	0.17	0.2	0.16	0.2
Total	4.8	0.83	39,740	0.21	10,240	0.016	776	0.18	0.9	0.18	0.9	-0.8	0.19	3,840	0.04	640	0.016	776	0.04	0.1	0.04	0.1
<b>Maly Kurumkon</b>																						
Measured	0.0	0.00	0	0.00	0	0.000	0	0.00	0.0	0.00	0.0	0.0	0.00	0	0.00	0	0.000	0	0.00	0.0	0.00	0.0
Indicated	57.5	0.77	442,750	0.22	126,500	0.015	8,625	0.15	8.6	0.16	9.2	-10.9	0.35	157,550	0.10	42,300	0.015	8,625	0.05	2.0	0.06	2.3
Total M&I	57.5	0.77	442,750	0.22	126,500	0.015	8,625	0.15	8.6	0.16	9.2	-10.9	0.35	157,550	0.10	42,300	0.015	8,625	0.05	2.0	0.06	2.3
Inferred	3.4	0.80	27,200	0.22	7,480	0.017	578	0.16	0.5	0.15	0.5	-18.8	0.43	-54,200	0.10	-18,120	0.017	578	0.06	-1.4	0.05	-1.5
Total	60.9	0.77	469,950	0.22	133,980	0.015	9,203	0.15	9.2	0.16	9.7	-29.7	0.37	103,350	0.10	24,180	0.015	9,203	0.06	0.7	0.06	0.8
<b>Total measured</b>	<b>10.7</b>	<b>0.66</b>	<b>71,100</b>	<b>0.18</b>	<b>19,500</b>	<b>0.011</b>	<b>1,183</b>	<b>0.21</b>	<b>2.3</b>	<b>0.25</b>	<b>2.7</b>	<b>-7.6</b>	<b>0.15</b>	<b>-22,200</b>	<b>0.04</b>	<b>-6,100</b>	<b>0.011</b>	<b>1,183</b>	<b>0.03</b>	<b>-1.1</b>	<b>0.05</b>	<b>-1.0</b>
<b>Total indicated</b>	<b>70.6</b>	<b>0.76</b>	<b>539,700</b>	<b>0.21</b>	<b>149,600</b>	<b>0.015</b>	<b>10,438</b>	<b>0.16</b>	<b>11.0</b>	<b>0.17</b>	<b>12.0</b>	<b>-18.1</b>	<b>0.32</b>	<b>148,800</b>	<b>0.10</b>	<b>38,500</b>	<b>0.015</b>	<b>10,438</b>	<b>0.05</b>	<b>1.5</b>	<b>0.05</b>	<b>1.7</b>
<b>Total M&amp;I</b>	<b>81.3</b>	<b>0.75</b>	<b>610,800</b>	<b>0.21</b>	<b>169,100</b>	<b>0.014</b>	<b>11,621</b>	<b>0.16</b>	<b>13.3</b>	<b>0.18</b>	<b>14.7</b>	<b>-25.7</b>	<b>0.30</b>	<b>126,700</b>	<b>0.08</b>	<b>32,500</b>	<b>0.014</b>	<b>11,621</b>	<b>0.04</b>	<b>0.3</b>	<b>0.05</b>	<b>0.7</b>
<b>Total inferred</b>	<b>20.0</b>	<b>0.78</b>	<b>155,440</b>	<b>0.20</b>	<b>40,880</b>	<b>0.016</b>	<b>3,125</b>	<b>0.17</b>	<b>3.4</b>	<b>0.16</b>	<b>3.3</b>	<b>-30.1</b>	<b>0.21</b>	<b>-76,560</b>	<b>0.04</b>	<b>-28,320</b>	<b>0.016</b>	<b>3,125</b>	<b>0.05</b>	<b>-2.7</b>	<b>0.05</b>	<b>-2.6</b>
<b>Grand total</b>	<b>101.3</b>	<b>0.76</b>	<b>766,240</b>	<b>0.21</b>	<b>209,980</b>	<b>0.015</b>	<b>14,746</b>	<b>0.16</b>	<b>16.7</b>	<b>0.18</b>	<b>18.0</b>	<b>-55.8</b>	<b>0.28</b>	<b>50,040</b>	<b>0.07</b>	<b>4,080</b>	<b>0.015</b>	<b>14,746</b>	<b>0.04</b>	<b>-2.4</b>	<b>0.05</b>	<b>-1.9</b>

Source: Amur Minerals, Edison Investment Research. Note: \*Totals compare to May 2016 mineral resource estimate reconfigured to exclude Gornyy; M&I = Measured and Indicated. Totals may not add up owing to rounding.

Of note, within this context, is the material increase in the resource at Maly Kurumkon, as a result of the exploration conducted during the 2016 field season and despite the increase in the cut-off grade. This contrasts with three other deposits (Vodorazdelny, Ikenskoe and Kubuk), at which no additional drilling has been conducted since May 2016 and at which the changes in resources therefore only reflected a recalculation based on a higher cut-off grade. As expected, in these cases, the higher cut-off grade resulted in a decline in the overall ore tonnage, an increase in the in-situ grade of nickel and a proportionately smaller decline in the number of contained nickel tonnes. One interpretation of the 2016 field season therefore is that it has more than replaced hitherto sub-economic resources with economic ones. Note that no recalculation was performed at Gorny, which is a relatively small deposit and the only one with an average grade below the 0.4% cut-off grade at the time of the H116 mineral resource estimate. As a result, Gorny has been excluded from the above table, although future drilling may result in its re-inclusion once again, at a later date.

Nevertheless, direct comparison may be made between three deposits, for which a range of resource estimates were provided at varying cut-off grades (including 0.4% Ni) in Q216:

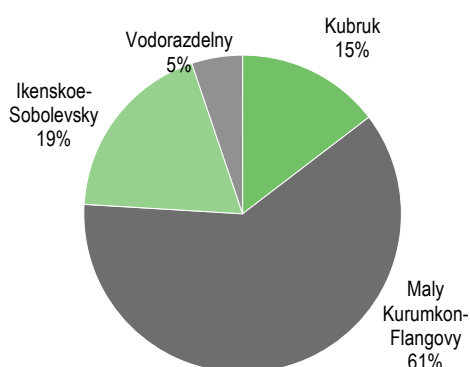
**Exhibit 2: Total resource increase, by area, constant 0.4% cut-off grade**

	January 2017 total resource			Change vs May 2016 (units)			Change vs May 2016 (%)		
	Tonnage (Mt)	Grade Ni (%)	Contained Ni (t)	Tonnage (Mt)	Grade Ni (%)	Contained Ni (t)	Tonnage (%)	Grade Ni (%)	Contained Ni (%)
Kubuk	14.5	0.77	111,980	1.0	0.06	16,480	7.4	8.8	17.3
Ikenskoe	21.1	0.69	144,570	3.4	-0.12	1,970	19.2	-15.4	1.4
Maly Kurumkon	60.9	0.77	469,950	27.9	-0.06	195,250	84.5	-7.0	71.1
<b>Sub-total</b>	<b>96.5</b>	<b>0.75</b>	<b>726,500</b>	<b>32.3</b>	<b>-0.05</b>	<b>213,700</b>	<b>50.3</b>	<b>-5.7</b>	<b>41.7</b>

Source: Amur Minerals, Edison Investment Research

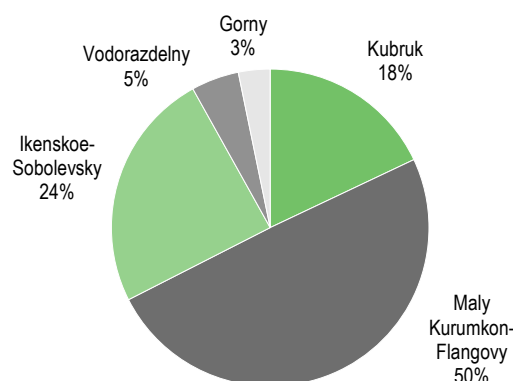
As such, whereas the headline increase in resources (Exhibit 1) is 50,040t (+6.8% including Gorny or +10.3% excluding Gorny from May 2016 estimate) of contained nickel, compared to the previous resource, once the change in cut-off grades is taken into account, the underlying like-for-like change is 213,700t, or 41.7%, of contained nickel. Of note, once again, is the disproportionate increase in the resource at Maly Kurumkon on account of the exploration work performed in 2016, compared to the three other deposits, as a result of which it now comprises 61% of the Kun-Manie resource (cf 50% previously):

**Exhibit 3: Kun-Manie resource by area, January 2017**



Source: Amur Minerals, Edison Investment Research

**Exhibit 4: Kun-Manie resource by area, May 2016**



Source: Amur Minerals, Edison Investment Research

In nickel and gold (as an illustrative exercise) equivalent, Amur's total mineral resource can therefore be stated as follows (at prevailing metals' prices at the time of writing):

**Exhibit 5: Kun-Manie total mineral resource estimate, nickel and gold equivalent**

	Tonnage (Mt)	Grade	Contained metal
Nickel equivalent	101.3	1.03% NiE	1.0Mt
Gold equivalent	101.3	2.86g/t AuE	9.3Moz

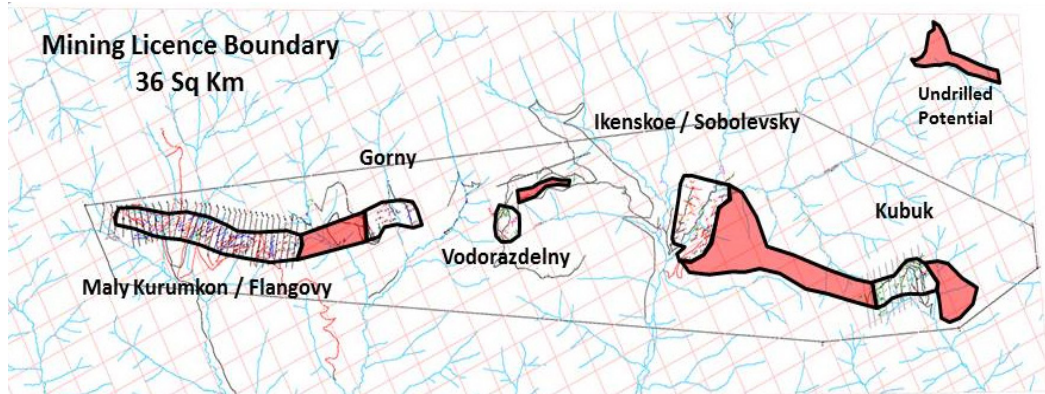
Source: Edison Investment Research, Amur Minerals

Based on our end-FY16 cash estimate, Edison estimates an enterprise value for Amur of US\$56.3m, which equates to US\$73.47 per total nickel resource tonne. That being the case, a headline resource increase of 50.0kt Ni should have added US\$3.7m in (pro rata) value to Amur, while a like-for-like increase of 213.7kt should have added US\$15.7m – compared to an estimated cost of the associated drilling of c US\$1.3m (being 15,213.3m of resource definition drilling at management’s all-in estimate of drilling costs of US\$75-100 per metre drilled).

## The forthcoming 2017 field season

After a 2016 field season focused on MKFL, Amur is now targeting Kubuk in the forthcoming 2017 field season. The existing Kubuk resource is contained within a 1km strike length.

**Exhibit 6: The five currently defined exploration areas at Kun-Manie**



Source: Amur Minerals

Currently, 10,000m of drilling is planned in the area of the existing resource to upgrade a 10.9Mt inferred resource block into the indicated category (similar to MKFL drilling in the 2016 field season). The inferred block is currently the largest single continuous block of inferred resources within Kun-Manie and will account for c 6,000m of (in-fill) drilling by the company’s LF90 drill rig working at depths typically exceeding 200m. In addition, a minimum of seven metallurgical holes are planned, totalling a further 1,500-2,000m. The remaining c 1,000m will then be conducted as 1) step-out drilling over an additional 1km of strike length extension to the east of the existing resource and 2) to the west of the existing resource area in the 3km gap between Ikenskoe-Sobolevsky and Kubuk in an initiative to prove continuity between the two. NB In the event of continuity, this is likely to prove the deepest part of the orebody within Amur’s licence area.

A total of 5,000m of drilling are also planned for Amur’s LF70 drill rig at Ikenskoe-Sobolevsky (where holes are typically shallower – eg less than 200m). Approximately 2,000-2,500m is planned for completion on the Sobolevsky part of the deposit, located to the south and east of the currently defined drill identified mineralisation, with the objective of expanding the resource in the direction of Kubuk. As at Kubuk, additional drilling will also be completed to generate a metallurgical sample for this deposit.

Beyond the availability of water from the Maya River, Amur plans to complete six to eight holes to establish potential sources of groundwater for industrial use to process the ore. Finally, drilling will also be completed at Maly Kurumkon-Flangovy to establish potential water inflow rates within the planned open pits and underground operations in order to establish dewatering requirements for the mine.

Inevitably, the amount of drilling completed will be weather dependent. Typically, c 15,000m of drilling can be completed by two drill rigs in four to five months. However, sufficient supplies have been procured to support 20,000m of drilling, should the opportunity for an extended season present itself. Additional equipment purchased to facilitate the completion of work necessary for the

ongoing development of Kun-Manie includes a 25t truck mounted crane, a Caterpillar 320D2L excavator, a Caterpillar D6R11 bulldozer, a water well drilling truck, Ural trucks (for fuel, drop side loading and personnel transport), portable cabins, drill water pumps and additional power generators at cost of c US\$1.04m.

At an average cost of US\$40/m for drilling alone, this 15,000m programme is anticipated to have a total direct cost of c US\$0.6m.

The 2017 field season is anticipated to conclude the major period of Amur's exploration activity. In due course, Amur intends to explore the 900m gap between the MKFL and Gorny ore-bodies (of which 400m lies on the easternmost side of the MKFL area and 500m lies within the Gorny area). If drilling of these extensions proves successful (ie intersects mineralisation), Amur believes that it is possible that the MKFL and Gorny deposits will prove to be one larger deposit with a strike length of up to 5km.

## Met test work, trade-off studies and exploration

On 11 January, Amur announced the results of Gipronickel's metallurgical test programme on a c half tonne sample of ore derived from half core from three drill holes located within the Maly Kurumkon-Flangovy (MKFL) deposit, which comprises the majority (55% by ore tonnage) of its Kun-Manie production licence area.

### Summary metallurgical test work results

The Gipronickel results represent the first production scale test work from the Kun-Manie licence area and, owing to their larger size, are expected to be more reflective of the actual production process than those calculated in bench-scale tests previously conducted by SGS. Flotation test work on the sulphide ores by SGS was concluded on 12 samples covering six incremental grade ranges distributed throughout the JORC-drilled areas of MKFL and Kubuk. The results of these tests were released to the market in August 2016 and are summarised in Exhibit 7, below, for an average 0.7% nickel grade and are compared to the Gipronickel results for the half tonne bulk sample (actually 443.9kg), which had an actual nickel grade of 0.7% nickel.

**Exhibit 7: MKFL metallurgical recovery comparison, Gipronickel vs SGS (%)**

Recovery (%)	Nickel	Copper	Cobalt	Platinum	Palladium	Silver	Gold
SGS (average recovery at 0.7% Ni grade)	69.2	77.9	53.3	49.5	58.3	49.5	53.4
Gipronickel (0.7% Ni grade)	80.6	83.8	61.4	59.6	82.3	70.5	63.7
Difference (percentage points)	+11.4	+5.9	+8.1	+10.1	+24.0	+21.0	+10.3

Source: Amur Minerals, Edison Investment Research

In addition to issues of comparability with SGS's result, the 0.7% Ni grade of the half tonne sample also approximates the 0.75% Ni average grade of the mineable reserve calculated by RPM in its open pit/underground production trade-off study. Notwithstanding its larger size, recoveries from the Gipronickel half tonne sample are self-evidently materially higher than the results achieved by SGS (see Exhibit 7). In part, this may be attributed to the fact that the SGS test work involved coarse pulverisation of the samples and included older material that is likely to have partially oxidised, resulting in lower recoveries. In addition, however, Gipronickel employed a two-stage grinding process such that, after initial grinding and concentrate generation, the reject stream was reground to allow for the recovery of a second concentrate.

### Mass-pull considerations

Gipronickel will progress its analysis of the metallurgical characteristics of the Kun-Manie ore bodies via the processing of a 7.5t bulk sample recovered in the 2016 drill programme, which is currently inventoried in Amur's core and storage sample facility in Khabarovsk. In the meantime, the

Gipronickel results also indicate a higher recovery to concentrate than previously calculated and higher concentrate grades of 8.58% Ni and 2.10% Cu. An improved mass-pull of 6.6% (vs 7.0% previously) implies the production of 394kt of concentrate on average per annum from 6.0Mt of ore, compared to 420kt previously and a consequent reduction in fleet transport and in capex (eg via a smaller concentrate treatment facility) in the event that Amur opts for a toll smelting development option. Further capex savings (eg via the requirement for a smaller flash furnace) are also possible in the event that Amur opts for a matte or refinery development option.

## RPM open pit/underground production trade-off study

Amur's metallurgical test work announcement follows the release of the results of a trade-off study between open pit and underground mining, conducted by RPM in late December, which identified a potential mineable reserve of 44.5Mt of ore at grades of 0.75% Ni and 0.19% Cu at MKFL (cf a mineable reserve of 45.5Mt identified in Amur's preliminary economic assessment (PEA), at an average grade of 0.53% Ni and 0.15% Cu). Key differences between the RPM study and the original PEA are a materially higher underground component of the overall mining operation and also materially higher grades overall, as shown below:

<b>Exhibit 8: RPM mining trade-off study results cf original PEA</b>					
Area	Parameter	RPM study	PEA	Change (units)	Change (%)
Underground	Ore (Mt)	31.7	28.1	3.6	12.8
	Ni grade (%)	0.79	0.49	0.30	61.2
	Cu grade (%)	0.19	0.15	0.04	26.7
Open pit	Ore (Mt)	12.85	17.4	-4.55	-26.1
	Ni grade (%)	0.63	0.59	0.04	6.8
	Cu grade (%)	0.18	0.16	0.02	12.5
Total	Ore (Mt)	44.5	45.5	-1.0	-2.2
	Ni grade (%)	0.75	0.53	0.22	41.5
	Cu grade (%)	0.19	0.15	0.04	26.7
	Contained Ni (kt)	332.2	241.0	91.2	37.8
	Contained Cu (kt)	83.5	69.3	14.2	20.4
	Waste	43.7	47.3	-3.6	-7.6
	Strip	3.40	2.73	0.67	24.5
	Ni to conc (kt)	251.7	192.8	58.9	30.5
	Cu to conc (kt)	65.4	62.4	3.0	4.8

Source: Amur Minerals, Edison Investment Research

The RPM study assumes that the nickel and copper are together recovered into an aggregate 2.5Mt of concentrate (ie a 5.6% mass-pull) containing an average of 9.9% Ni and 2.9% Cu (ie based on SGS, rather than Gipronickel, grade-recovery curves, above). In addition, the RPM study may prove conservative in that it assumes Western Australian underground mining costs, contributing to a total operating cost of US\$40.02 per ore tonne. It also did not include the results of 2016 field season considered above.

## Implications

Amur's continuing focus on the high-grade domains within the ore-body in conjunction with the results of the RPM mining trade-off study, in particular, are changing management's perception of the likely mining outcome at Kun-Manie, with an increasing focus on underground operations. Where before Kubuk has been presumed to support both open pit and underground operations, it is now increasingly presumed to be predominantly open pit (although there could be a small, start-up open pit) with the result that the mine plan is evolving from the 50:50 underground:open pit operation envisaged in the most recent operational blueprint (on which Edison's valuations are based) into something closer to a 75:25 production split. Even this may understate the extent of ultimate underground mining, given that reserves are calculated with reference to Australian

underground mining costs, which could prove to be in the order of 100% higher than Russian ones. Using the 0.4% cut-off grade and a metallurgical recovery of 80%, Amur now projects the break-even price of nickel for Kun-Manie to be US\$3.40/lb based on Russian mining costs and US\$5.70/lb based on Australian mining costs (cf a price of US\$5.03/lb Ni at the time of writing).

## Capex

In addition to the mine plan, capex estimates relating to the project are also continuing to evolve. Amur has recently completed a survey of the terrain to be covered by the proposed access road to site, for example, including identifying sources of gravel and bridge locations. Notable developments in this respect are reported to be that it may be possible to utilise existing (albeit primitive) logging roads for part of the distance. In addition, initial indications are that the average cost of the road is likely to be in the order of US\$400,000 per kilometre in mountainous regions and c US\$150,000 per kilometre in other areas – both of which are substantially less than the company's currently budgeted US\$1m per kilometre. Although the precise savings cannot be established in the absence of specific and detailed road design, Amur does nevertheless anticipate a substantial reduction in this capital cost category with a significant portion of the decrease being attributable to the c 50% devaluation of the Russian rouble since the compilation of the original estimate. Note that Amur is currently compiling detailed topographic maps along the entire planned road route for use in the commissioning of a desktop study to develop more accurate costings in respect of its construction, prior to 'walking the course' as soon as the spring thaw sets in.

## Funding

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At the same time as advancing the technical aspects of the project, Amur has been cultivating its relationships with parastatal and banking organisation. These include:

- In March 2016, Amur signed a non-binding Heads of Terms with the Russian government's Far East & Baikal Development Fund to advance discussions regarding state financing for infrastructure needs, primarily the 320km long road from the Ulak rail terminal on the BAM railway to the Kun-Manie site and the 15-50km power line extension to alternative planned furnace smelter sites for treatment of the sulphide concentrate. Additionally the fund has expressed a broader interest in financing additional project requirements, such as the DFS. This development follows an earlier mandate, signed between the company and the fund on 10 August 2015, whereby the fund was engaged to provide investment advisor services to the company, including funding alternatives related to other sovereign funds as well as private enterprises within Russia and select Asian countries. Within the context of this framework, in May 2016, the fund organised a high level meeting entitled "Economic and Investment Cooperation in the Far East" between Amur and a number of interested parties to discuss options and considerations for funding and participation in the development of Kun-Manie. Apart from a number of Russian economic agencies, these included the Korean Ministry of Strategy & Finance (International Economic Cooperation Division), the Korea Investment Corporation (Private Equity Team) and the Korea Exim Bank (Business Team).
- In November, Amur announced the signing of a Financial Advisory Agreement with the newly established Russian Far East Investment & Export Agency to enable it to work in partnership with the agency to attract financing from within Russia, India and China.
- In September, at the Eastern Economic Forum, Amur announced the signing of a non-binding Letter of Intent with IG Copper to investigate potential synergies in processing the companies' respective sulphide concentrates.
- In October, Amur signed a non-binding Memorandum of Understanding with Jinchuan (the largest producer of nickel in China and the third largest internationally) whereby the latter's



technical team began an effective due diligence process to assess the potential for assisting Amur in the development of Kun-Manie in the area of EPCM.

Ahead of development funding therefore, Amur already has relationships with a range of sovereign funds, parastatal organisations, Chinese funds, western and Russian banks and overseas corporations.

## Valuation

In the absence of an updated mine plan, Edison's forecasts and valuations are necessarily still based on Amur's 2015 operational blueprint, although Amur estimates that the results of Gipronickel's metallurgical test work alone could result in revenues being "increased by as much as 10% for nickel and 6% for copper" (note: to which end, readers are specifically directed towards Exhibit 11). At the same time, given the size of the newly defined resource and substantially higher grades, the previously projected annual production of nickel and copper at Kun-Manie could, in management's opinion, "be increased by as much as 68% for nickel and 54% for copper".

With this caveat in place, in our most recent valuation of Amur, we estimated values of the concentrate, low-grade matte, high-grade matte and refined metal options for Kun-Manie of 29c, 34c, 26c and 31c, respectively, using a 10% discount rate and at our long-term nickel price of US\$22,355/t (and assuming 80:20 debt:equity funding). Updating these valuations to reflect Amur's prevailing share price (vs c 5p previously) modifies these estimates to 39c, 51c, 41c and 50c, respectively, as shown below:

**Exhibit 9: AMC equity valuations by development scenario and discount rate**

US cents per share (post-dilution)	0%	5%	10% (base case)	15%	20%	25%	30%	IRR (%)
Toll smelting – US\$140m in equity fund-raising required	96	60	39	26	18	13	10	32.4
Low-grade matte – US\$175m in equity fund-raising required	133	80	51	34	23	16	12	36.6
High-grade matte – US\$220m in equity fund-raising required	110	65	41	26	18	12	9	30.7
Refinery – US\$301m in equity fund-raising required	133	79	50	33	22	16	11	35.3

Source: Edison Investment Research. Note: Assuming 80% maximum financial leverage. Excludes warrant funding.

An analysis of the major component parts contributing to the change in our valuations of the separate development options is as follows:

**Exhibit 10: Development option valuation changes, by component (US cents/share)**

Development option	Last published	Change in share price and forex rates	2016 evolution into 2017	Other	Current valuation	Change (%)
Toll smelting	29	+11	+4	-5	39	+34.4
Low-grade matte	34	+15	+5	-3	51	+50.0
High-grade matte	26	+12	+4	-1	41	+57.7
Refinery	31	+16	+5	-2	50	+61.3

Source: Edison Investment Research

Once again, the low-grade matte option prevails as the most efficient deployment of capital, although investors should note that this could change if the resource and mine plan are materially reconfigured as a result of the advancement of high-grade production from underground (which seems increasingly likely).

As previously, the above valuations were conducted at Edison's long-term metals price forecasts of US\$10.14/lb Ni, US\$2.75/lb Cu, US\$13.52/lb Co, US\$1,123/oz Pt and US\$768/oz Pd and are sensitive to them to the following extent:

**Exhibit 11: Valuation sensitivity to metals prices, by development option (US cents/share)**

Development option	Metals prices -10%	Base case*	Metals prices +10%	Ni +10%, Cu +6%
Toll smelting	25	39	52	52
Low-grade matte	38	51	63	63
High-grade matte	30	41	52	51
Refinery	38	50	61	60

Source: Edison Investment Research. Note: \*See Exhibits 9 and 10 (above).

## Financials

Amur's 2016 interim results reveal that it had a net cash position of US\$11.5m as at 30 June 2016, after US\$3.8m of cash outflows before financing activities – ie a cash burn rate of US\$0.6m per month. Cash outflow is forecast to reduce in H216 in the absence of any material capital investments in property, plant or equipment, such that Edison forecasts a year-end cash position of US\$9.3m as at 31 December 2016.

**Exhibit 12: Financial summary**

	US\$'000s	2010	2011	2012	2013	2014	2015	2016e	2017e
Year end 31 December		IFRS	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS
<b>PROFIT &amp; LOSS</b>									
Revenue		0	0	0	0	0	0	0	0
Cost of Sales		0	0	0	0	0	0	0	0
Gross Profit		0	0	0	0	0	0	0	0
EBITDA		(1,928)	(2,892)	(1,750)	(2,539)	(2,358)	(4,114)	(4,114)	(4,114)
Operating Profit (before GW and except.)		(1,928)	(2,892)	(1,750)	(2,539)	(2,358)	(4,114)	(4,114)	(4,114)
Intangible Amortisation		0	0	0	0	0	0	0	0
Exceptionals		(328)	(1,505)	(435)	(151)	1,158	1,184	88	0
Other		0	0	0	0	0	0	0	0
Operating Profit		(2,256)	(4,397)	(2,185)	(2,690)	(1,200)	(2,930)	(4,026)	(4,114)
Net Interest		0	(211)	(1,813)	(1,141)	(161)	2,224	144	140
Other		0	0	0	0	0	0	0	0
Profit Before Tax (norm)		(1,928)	(3,103)	(3,563)	(3,680)	(2,519)	(1,890)	(3,970)	(3,974)
Profit Before Tax (FRS 3)		(2,256)	(4,608)	(3,998)	(3,831)	(1,361)	(706)	(3,882)	(3,974)
Tax		0	0	0	0	0	0	0	0
Profit After Tax (norm)		(1,928)	(3,103)	(3,563)	(3,680)	(2,519)	(1,890)	(3,970)	(3,974)
Profit After Tax (FRS 3)		(2,256)	(4,608)	(3,998)	(3,831)	(1,361)	(706)	(3,882)	(3,974)
Average Number of Shares Outstanding (m)		193.9	271.8	345.1	387.2	431.2	445.7	527.5	1,230.5
EPS - normalised (c)		(1.0)	(1.1)	(1.0)	(1.0)	(0.6)	(0.4)	(0.8)	(0.3)
EPS - FRS 3 (c)		(1.2)	(1.7)	(1.2)	(1.0)	(0.3)	(0.2)	(0.7)	(0.3)
Dividend per share (c)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Margin (%)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EBITDA Margin (%)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operating Margin (before GW and except.) (%)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>BALANCE SHEET</b>									
Fixed Assets		14,151	13,903	17,928	18,955	12,035	12,162	15,162	22,703
Intangible Assets		13,685	13,503	17,084	18,318	11,783	11,513	14,513	14,513
Tangible Assets		466	400	844	637	252	649	649	8,190
Other receivables		0	0	0	0	0	0	0	0
Current Assets		7,215	7,386	8,389	11,074	9,090	11,355	11,168	139,997
Stocks		167	165	224	269	237	512	512	512
Trade Debtors		0	0	0	0	0	0	0	0
Cash		3,066	4,436	2,048	2,392	1,389	9,613	9,338	138,167
Other receivables/other		3,982	2,785	6,117	8,413	7,464	1,230	1,318	1,318
Current Liabilities		(109)	(102)	(119)	(123)	(407)	(539)	(539)	(539)
Creditors		(109)	(102)	(119)	(123)	(407)	(539)	(539)	(539)
Short term borrowings		0	0	0	0	0	0	0	0
Long Term Liabilities		0	0	0	0	0	(509)	(509)	(509)
Long term borrowings		0	0	0	0	0	0	0	0
Other long term liabilities		0	0	0	0	0	(509)	(509)	(509)
Net Assets		21,257	21,187	26,198	29,906	20,718	22,469	25,282	161,652
<b>CASH FLOW</b>									
Operating Cash Flow		(1,201)	(2,761)	(1,071)	(1,556)	(1,960)	(3,090)	(4,114)	(4,114)
Net Interest		0	0	0	0	0	0	144	140
Tax		0	0	0	0	0	0	0	0
Capex		(492)	(20)	(3,482)	(2,315)	(748)	(2,751)	(3,000)	(7,541)
Acquisitions/disposals		363	0	0	0	0	0	0	0
Financing		3,527	4,344	2,165	4,242	1,841	14,407	6,694	140,344
Dividends		0	0	0	0	0	0	0	0
Net Cash Flow		2,197	1,563	(2,388)	371	(867)	8,566	(276)	128,829
Opening net debt/(cash)		(997)	(3,066)	(4,436)	(2,048)	(2,392)	(1,389)	(9,613)	(9,338)
HP finance leases initiated		0	0	0	0	0	0	0	0
Other		(128)	(193)	0	(27)	(136)	(342)	0	0
Closing net debt/(cash)		(3,066)	(4,436)	(2,048)	(2,392)	(1,389)	(9,613)	(9,338)	(138,167)

Source: Amur Minerals sources, Edison Investment Research

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