# Alphamin Announces a 46\% Increase in the Mpama South Inferred Mineral Resource Estimate 

written by Raj Shah | June 3, 2022 June 3, 2022 (Source) - Alphamin Resources Corp. (AFM:TSXV, APH:JSE AltX, "Alphamin" or the "Company"), a producer of $4 \%$ of the world's mined tin ${ }^{1}$ from its high-grade operation in the Democratic Republic of Congo, is pleased to announce an updated Mpama South Mineral Resource estimate.

## HIGHLIGHTS

- Mpama

South updated Inferred Resource up 46\% to 4.99Mt based on assays from 22 additional extensional drillholes. Mpama South Mineral Resource now stands at:

- 0.84 Mt @ 2.53\% Sn for 21.4 kt contained tin in the Indicated category; and
- 4.99 Mt @ $2.50 \% \mathrm{Sn}$ for 124.7 kt contained tin in the Inferred category
- Significant additional resource growth potential at Mpama South
- Mpama South in-fill drilling on track for completion by July 2022, extension drilling recommences in June 2022
- Mpama South early development works in progress - project completion expected to increase Alphamin's annual contained tin production from the current 12,000tpa to $\sim 20,000 t p a$, approximating $6.6 \%$ of the world's mined tin ${ }^{1}$


## Mpama South Updated Mineral Resource Estimate

The updated Mineral Resource for Mpama South follows two months after the previous update announced on 29 March 2022 and three months after the Maiden Mineral Resource announced $7^{\text {th }}$ March 2022. The update is based on further receipt of assays for another 22 extensional drillholes completed subsequent to the previous estimate which was based on 102 drillholes. The updated Mineral Resource is presented in Figure 1.

Following the receipt of assays for the additional 22 drillholes, an updated Mineral Resource Estimate (MRE) for the Mpama South project was completed. The MRE now includes results from 124 drillholes as well as 6 drillholes in the Wedge area from the earlier drilling to 2015. The MRE was estimated using the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Best Practice Guidelines (2019) and is reported in accordance with the 2014 CIM Definition Standards.

Figure 1: Updated Mpama South Mineral Resource Progression and Additional Expansion Potential


Source: Alphamin 2022
The Mineral Resource is classified into the Indicated and Inferred categories and is reported at a base case tin grade of $1.0 \%$, which satisfies reasonable prospects for economic extraction. Mpama South Inferred Resources increased by 46\% to 4.99Mt. The Mineral Resource Statement with an effective date of 31 May 2022 is presented in Table 1:-

Table 1: Updated Mpama South Mineral Resources effective date 31 May 2022

| Classification | Tonnes (millions) | Sn \% | Sn Tonnes <br> (thousands) |
| :---: | :---: | :---: | :---: |
| Indicated $^{2}$ | 0.84 | 2.53 | 21.4 |
| Inferred $^{3}$ | 4.99 | 2.50 | 124.7 |

Mineral Resources that are not Mineral Reserves do not have a demonstrated economic viability and require advanced studies and economic analysis to prove their viability for extraction.

The MRE for Mpama South does not include a substantial quantity of subsequent drilling containing characteristic high grade visual cassiterite. Around 27 additional drillholes have been drilled within and beyond the limits of the updated MRE presented in Figure 1. The majority of these are part of an infill drilling campaign targeting conversion of Inferred Resources to Indicated Resource confidence. The infill campaign commenced in March 2022 and will be completed by July 2022. An updated MRE is expected to be announced in Q3 2022.

Extensional drilling down dip and in the shallower northern portion of Mpama South will re-commence in June 2022 to carry on extending known mineralisation which is still open in multiple directions. The Company targets releasing expanded Mpama South MRE updates throughout the remainder of the drilling phases in

2022 as assays are received.
The MRE has been completed by Mr. J.C. Witley (BSc Hons, MSc (Eng.)) who is a geologist with 33 years' experience in base and precious metals exploration and mining as well as Mineral Resource evaluation and reporting. He is a Principal Resource Consultant for The MSA Group (an independent consulting company), is registered with the South African Council for Natural Scientific Professions (SACNASP) and is a Fellow of the Geological Society of South Africa (GSSA). Mr. Witley has the appropriate relevant qualifications and experience to be considered a "Qualified Person" for the style and type of mineralisation and activity being undertaken as defined in National Instrument 43-101 Standards of Disclosure of Mineral Projects.

## Early-Works Progress on the Development of Mpama South

Early works completed to date since the Company's announcement of the development decision on $29^{\text {th }}$ March 2022 are as follows:

- EPCM contract awarded to Obsideo (who successfully executed the fine tin plant in 2021)
- Long lead time plant capital orders have been placed as well as steel structure orders
- Mpama South access road completed and site clearing commenced
- Bidding completed and under evaluation for bulk earthworks and civil contracts


## Qualified Persons

Mr Jeremy Witley, Pr. Sci. Nat., B.Sc. (Hons.) Mining Geology, M.Sc. (Eng.), is a qualified person (QP) as defined in National Instrument 43-101 and has reviewed and approved the scientific and technical information contained in this news release. He is
a Principal Mineral Resource Consultant of The MSA Group (Pty.) Ltd., an independent technical consultant to the Company.

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## CAUTION REGARDING FORWARD LOOKING STATEMENTS

Information in this news release that is not a statement of historical fact constitutes forward-looking information. Forward-looking statements contained herein include, without limitation, statements relating to the anticipated future exploration and resource estimation activities and outcomes and the timing thereof and expected increases in tin production from the development of the Mpama South deposit. Forward-looking statements are based on assumptions management believes to be reasonable at the time such statements are made. There can be no assurance that such statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. Accordingly, readers should not place undue reliance on forwardlooking statements. Although Alphamin has attempted to identify important factors that could cause actual results to differ materially from those contained in forward-looking statements, there may be other factors that cause results not to be as anticipated, estimated or intended. Factors that may cause actual results to differ materially from expected results described in forward-looking statements include, but are not limited to: uncertainty of future exploration and assay results and consistency with past results and expectations; uncertainties related to the technical and
economic parameters applied in the Mpama South Preliminary Economic Assessment regarding forecasted tin prices, the tin grade mined and processing recoveries as well as operating costs; uncertainties inherent in estimates of Mineral Resources, global geopolitical and economic uncertainties, volatility of metal prices, uncertainties with respect to social, community and environmental impacts, uninterrupted access to required infrastructure, adverse political events, impacts of the global Covid-19 pandemic as well as those risk factors set out in the Company's Management Discussion and Analysis and other disclosure documents available under the Company's profile at www.sedar.com. Forward-looking statements contained herein are made as of the date of this news release and Alphamin disclaims any obligation to update any forward-looking statements, whether as a result of new information, future events or results or otherwise, except as required by applicable securities laws.

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## Appendix 1: SAMPLE PREPARATION, ANALYSES AND QUALITY CONTROL AND QUALITY ASSURANCE (QAQC)

For sample preparation, analyses and quality control and quality assurance, see the Company's news release dated 07 March 2022 entitled "ALPHAMIN ANNOUNCES MAIDEN MINERAL RESOURCE ESTIMATE AND POSITIVE PRELIMINARY ECONOMIC ASSESSMENT FOR MPAMA SOUTH"

## Appendix 2: SIGNIFICANT INTERCEPTS (0.5\% Sn lower threshold)

Mpama South Drillholes prefixed "BGH"
Mpama North Drillholes prefixed "MND"

| Hole | Easting | Northing | RLm | Azi <br> ( ${ }^{\circ}$ ) | $\begin{aligned} & \operatorname{Dip} \\ & \left({ }^{\circ}\right) \end{aligned}$ | From | To | Sn \% | $\begin{array}{\|c\|} \hline \text { Width } \\ \hline(\mathrm{m})^{1} \end{array}$ | Sample Position |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | GPS | GPS |  |  |  |  |  |  |  | mid_x | mid_y | mid_z |
| BGH017 | 582535 | 9884822 | 732 | 55 | -10 | 237.8 | 238.8 | 4.99 | 1.00 | 582,732 | 9,884,966 | 678.6 |
| BGH018 | 582535 | 9884822 | 732 | 93 | 0 | 141.2 | 144.4 | 2.07 | 3.15 | 582,691 | 9,884,820 | 727.9 |
|  |  |  |  |  |  | 145.8 | 151.0 | 0.76 | 5.25 | 582,696 | 9,884,820 | 727.9 |
| BGH019 | 582535 | 9884822 | 732 | 85 | -5 | 147.0 | 152.0 | 2.05 | 5.00 | 582,696 | 9,884,837 | 715.8 |
| BGH020 | 582535 | 9884822 | 732 | 84 | -15 | 160.6 | 164.4 | 1.45 | 3.80 | 582,704 | 9,884,846 | 689.3 |
|  |  |  |  |  |  | 169.3 | 171.1 | 5.42 | 1.80 | 582,711 | 9,884,846 | 687.7 |
| BGH021 | 582535 | 9884822 | 732 | 93 | -15 | 109.2 | 110.3 | 3.20 | 1.10 | 582,654 | 9,884,821 | 700.1 |
|  |  |  |  |  |  | 164.6 | 167.3 | 3.29 | 2.72 | 582,708 | 9,884,818 | 687.6 |
| BGH022 | 582554 | 9884785 | 732 | 90 | 0 | 75.0 | 80.5 | 3.99 | 5.53 | 582,633 | 9,884,784 | 729.3 |
|  |  |  |  |  |  | 109.0 | 110.0 | 1.35 | 1.00 | 582,664 | 9,884,785 | 729.9 |
|  |  |  |  |  |  | 119.2 | 122.1 | 2.22 | 2.88 | 582,676 | 9,884,785 | 730.1 |
| BGH023 | 582535 | 9884822 | 732 | 75 | -15 | 171.4 | 174.3 | 1.72 | 2.89 | 582,710 | 9,884,859 | 683.7 |
|  |  |  |  |  |  | 175.9 | 178.0 | 1.09 | 2.15 | 582,714 | 9,884,860 | 683.0 |
| BGH024 | 582554 | 9884785 | 732 | 103 | -5 | 127.7 | 129.6 | 0.54 | 1.90 | 582,679 | 9,884,749 | 717.2 |
|  |  |  |  |  |  | 138.0 | 142.0 | 1.13 | 4.05 | 582,690 | 9,884,746 | 716.2 |
| BGH025 | 582535 | 9884822 | 732 | 55 | -20 | 212.3 | 213.4 | 0.60 | 1.15 | 582,724 | 9,884,919 | 662.3 |
|  |  |  |  |  |  | 218.0 | 221.5 | 2.29 | 3.45 | 582,731 | 9,884,921 | 660.7 |
|  |  |  |  |  |  | 222.7 | 223.7 | 13.05 | 1.00 | 582,734 | 9,884,923 | 659.9 |
|  |  |  |  |  |  | 228.0 | 234.8 | 2.73 | 6.80 | 582,741 | 9,884,926 | 658.0 |
| BGH026 | 582554 | 9884785 | 732 | 113 | -10 | 103.7 | 108.0 | 3.30 | 4.29 | 582,649 | 9,884,735 | 713.7 |
|  |  |  |  |  |  | 134.8 | 136.5 | 3.72 | 1.65 | 582,676 | 9,884,722 | 708.6 |
|  |  |  |  |  |  | 161.0 | 162.5 | 5.61 | 1.50 | 582,699 | 9,884,711 | 704.5 |
| BGH030 | 582554 | 9884785 | 732 | 115 | -20 | 110.0 | 111.4 | 7.24 | 1.40 | 582,655 | 9,884,753 | 692.2 |
|  |  |  |  |  |  | 141.9 | 152.5 | 4.85 | 10.60 | 582,686 | 9,884,745 | 680.0 |
|  |  |  |  |  |  | 158.0 | 161.2 | 3.61 | 3.20 | 582,699 | 9,884,742 | 675.3 |
|  |  |  |  |  |  | 174.5 | 175.8 | 11.03 | 1.35 | 582,713 | 9,884,738 | 670.5 |
| BGH032 | 582554 | 9884785 | 732 | 125 | -20 | 177.0 | 178.7 | 1.70 | 1.72 | 582,692 | 9,884,684 | 671.3 |
|  |  |  |  |  |  | 182.0 | 188.3 | 3.00 | 6.25 | 582,697 | 9,884,679 | 669.1 |
|  |  |  |  |  |  | 190.3 | 193.0 | 0.95 | 2.75 | 582,702 | 9,884,676 | 667.2 |
|  |  |  |  |  |  | 194.4 | 202.0 | 1.37 | 7.60 | 582,707 | 9,884,672 | 665.3 |
|  |  |  |  |  |  | 203.5 | 208.0 | 2.67 | 4.50 | 582,713 | 9,884,668 | 663.2 |


| BGH034 | 582554 | 9884785 | 732 | 115 | -25 | 174.8 | 178.0 | 11.99 | 3.20 | 582,689 | 9,884,696 | 653.3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 195.7 | 200.0 | 1.21 | 4.30 | 582,706 | 9,884,686 | 644.8 |
|  |  |  |  |  |  | 202.4 | 206.7 | 1.86 | 4.28 | 582,711 | 9,884,683 | 642.3 |
|  |  |  |  |  |  | 208.0 | 213.3 | 1.40 | 5.30 | 582,716 | 9,884,680 | 640.1 |
|  |  |  |  |  |  | 216.3 | 221.3 | 1.42 | 5.05 | 582,722 | 9,884,676 | 637.3 |
|  |  |  |  |  |  | 225.7 | 231.0 | 0.70 | 5.35 | 582,730 | 9,884,671 | 634.0 |
| BGH027 | 582544 | 9884822 | 732 | 68 | -27 | 212.4 | 214.0 | 0.58 | 1.65 | 582,729 | 9,884,879 | 634.0 |
|  |  |  |  |  |  | 226.0 | 229.3 | 1.32 | 3.30 | 582,741 | 9,884,883 | 628.4 |
|  |  |  |  |  |  | 235.5 | 236.6 | 1.54 | 1.13 | 582,749 | 9,884,885 | 625.2 |
| BGH028 | 582554 | 9884785 | 732 | 90 | -10 | 125.0 | 126.0 | 1.72 | 1.00 | 582,676 | 9,884,772 | 700.9 |
|  |  |  |  |  |  | 136.1 | 137.2 | 1.85 | 1.08 | 582,687 | 9,884,770 | 698.4 |
|  |  |  |  |  |  | 140.3 | 142.0 | 1.03 | 1.72 | 582,691 | 9,884,770 | 697.4 |
|  |  |  |  |  |  | 147.5 | 151.3 | 2.88 | 3.79 | 582,699 | 9,884,769 | 695.5 |
| BGH029 | 582544 | 9884822 | 732 | 93 | -25 | 126.0 | 128.4 | 4.66 | 2.35 | 582,663 | 9,884,826 | 678.5 |
|  |  |  |  |  |  | 178.9 | 184.1 | 1.25 | 5.15 | 582,713 | 9,884,827 | 657.7 |
|  |  |  |  |  |  | 193.7 | 196.1 | 3.95 | 2.35 | 582,726 | 9,884,827 | 653.0 |
| BGH031 | 582544 | 9884822 | 732 | 75 | -25 | 208.0 | 211.5 | 0.99 | 3.53 | 582,729 | 9,884,876 | 639.9 |
|  |  |  |  |  |  | 219.4 | 222.4 | 1.16 | 2.98 | 582,739 | 9,884,879 | 636.0 |
| BGH033 | 582544 | 9884822 | 732 | 60 | -27 | 259.0 | 265.5 | 7.32 | 6.46 | 582,756 | 9,884,929 | 612.8 |
|  |  |  |  |  |  | 268.5 | 270.5 | 1.02 | 1.99 | 582,762 | 9,884,931 | 610.0 |
| BGH035 | 582554 | 9884785 | 732 | 90 | -25 | 152.0 | 165.0 | 2.96 | 13.00 | 582,686 | 9,884,816 | 665.0 |
|  |  |  |  |  |  | 171.0 | 173.6 | 1.47 | 2.60 | 582,703 | 9,884,815 | 657.4 |
|  |  |  |  |  |  | 176.6 | 180.1 | 2.40 | 3.48 | 582,709 | 9,884,814 | 654.9 |
| BGH036 | 582544 | 9884822 | 732 | 65 | 0 | 147.5 | 151.4 | 2.31 | 3.90 | 582,687 | 9,884,878 | 724.8 |
|  |  |  |  |  |  | 156.6 | 160.7 | 0.93 | 4.02 | 582,696 | 9,884,881 | 724.7 |
| BGH037 | 582554 | 9884785 | 732 | 105 | -30 | 154.0 | 157.0 | 3.81 | 3.00 | 582,680 | 9,884,741 | 647.5 |
|  |  |  |  |  |  | 194.6 | 197.6 | 1.54 | 2.95 | 582,712 | 9,884,730 | 626.0 |
|  |  |  |  |  |  | 208.0 | 211.2 | 1.29 | 3.23 | 582,723 | 9,884,726 | 619.3 |
|  |  |  |  |  |  | 216.3 | 220.2 | 2.79 | 3.90 | 582,730 | 9,884,723 | 615.1 |
|  |  |  |  |  |  | 222.4 | 226.7 | 1.77 | 4.30 | 582,735 | 9,884,721 | 612.1 |
| BGH038 | 582544 | 9884822 | 732 | 75 | -30 | 151.7 | 154.6 | 5.22 | 2.90 | 582,677 | 9,884,851 | 654.3 |
|  |  |  |  |  |  | 218.3 | 223.7 | 3.38 | 5.35 | 582,735 | 9,884,861 | 621.4 |
|  |  |  |  |  |  | 226.7 | 231.5 | 1.95 | 4.80 | 582,743 | 9,884,862 | 617.6 |


| BGH039 | 582554 | 9884785 | 732 | 100 | -22 | 112.1 | 113.0 | 2.12 | 0.92 | 5 | 9,884,755 | 687.6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 116.3 | 121.0 | 3.33 | 4.65 | 582,661 | 9,884,753 | 686.1 |
|  |  |  |  |  |  | 145.0 | 166.0 | 2.20 | 21.00 | 582,696 | 9,884,744 | 674.2 |
|  |  |  |  |  |  | 174.5 | 176.0 | 0.95 | 1.50 | 582,713 | 9,884,739 | 668.9 |
| BGH040 | 582544 | 9884822 | 732 | 60 | -30 | 232.0 | 233.0 | 0.95 | 1.00 | 582,725 | 9,884,922 | 618.2 |
|  |  |  |  |  |  | 273.7 | 277.1 | 3.79 | 3.35 | 582,761 | 9,884,937 | 600.0 |
| BGH041 | 582500 | 9884847 | 732 | 55 | -25 | 340.0 | 344.5 | 3.03 | 4.50 | 582,807 | 9,885,002 | 599.5 |
| BGH042 | 582544 | 9884822 | 732 | 60 | -35 | 277.4 | 280.0 | 1.93 | 2.65 | 582,751 | 9,884,922 | 569.4 |
|  |  |  |  |  |  | 308.5 | 312.0 | 0.62 | 3.50 | 582,776 | 9,884,932 | 552.6 |
|  |  |  |  |  |  | 313.0 | 315.6 | 1.52 | 2.55 | 582,779 | 9,884,933 | 550.5 |
| BGH043 | 582544 | 9884822 | 732 | 100 | -10 | 102.5 | 104.2 | 2.69 | 1.65 | 582,644 | 9,884,808 | 709.0 |
|  |  |  |  |  |  | 123.0 | 124.0 | 1.06 | 1.00 | 582,663 | 9,884,805 | 704.8 |
|  |  |  |  |  |  | 163.6 | 167.0 | 2.82 | 3.36 | 582,704 | 9,884,798 | 696.7 |
| BGH044 | 582500 | 9884847 | 710 | 70 | -35 | 330.0 | 334.1 | 1.31 | 4.13 | 582,764 | 9,884,941 | 533.4 |
| BGH045 | 582544 | 9884822 | 732 | 100 | -20 | 120.7 | 121.8 | 31.55 | 1.10 | 582,656 | 9,884,806 | 687.4 |
|  |  |  |  |  |  | 156.0 | 159.4 | 0.56 | 3.40 | 582,689 | 9,884,799 | 674.7 |
|  |  |  |  |  |  | 176.7 | 183.6 | 3.24 | 6.92 | 582,708 | 9,884,795 | 668.1 |
| BGH046 | 582544 | 9884822 | 732 | 100 | -30 | 195.2 | 206.0 | 2.85 | 10.82 | 582,712 | 9,884,795 | 630.5 |
|  |  |  |  |  |  | 212.5 | 215.2 | 1.90 | 2.65 | 582,723 | 9,884,793 | 623.7 |
|  |  |  |  |  |  | 218.0 | 220.6 | 7.16 | 2.60 | 582,728 | 9,884,792 | 620.8 |
|  |  |  |  |  |  | 225.0 | 226.0 | 4.36 | 1.00 | 582,733 | 9,884,791 | 617.7 |
| BGH047 | 582565 | 9884535 | 718 | 60 | 0 | 121.6 | 124.6 | 0.91 | 2.99 | 582,653 | 9,884,879 | 739.2 |
|  |  |  |  |  |  | 147.1 | 148.1 | 1.28 | 1.00 | 582,675 | 9,884,889 | 741.1 |
| BGH048 | 582567 | 9884509 | 727 | 90 | 0 | 140.8 | 143.1 | 0.90 | 2.30 | 582,708 | 9,884,496 | 727.7 |
|  |  |  |  |  |  | 146.5 | 148.0 | 0.74 | 1.47 | 582,713 | 9,884,495 | 728.0 |
| BGH049 | 582565 | 9884535 | 718 | 65 | -15 | 145.4 | 147.4 | 4.27 | 2.00 | 582,689 | 9,884,599 | 674.5 |
| BGH050 | 582567 | 9884509 | 727 | 105 | -5 | 160.0 | 161.4 | 1.06 | 1.38 | 582,722 | 9,884,469 | 711.7 |
| BGH051 | 582565 | 9884535 | 718 | 40 | 0 | 134.8 | 137.0 | 2.23 | 2.20 | 582,662 | 9,884,630 | 712.3 |
|  |  |  |  |  |  | 151.0 | 156.3 | 1.20 | 5.30 | 582,675 | 9,884,642 | 711.4 |
|  |  |  |  |  |  | 164.2 | 169.5 | 3.95 | 5.27 | 582,685 | 9,884,651 | 710.8 |
|  |  |  |  |  |  | 171.3 | 172.6 | 4.08 | 1.30 | 582,688 | 9,884,655 | 710.6 |
| BGH052 | 582567 | 9884509 | 727 | 120 | 0 | 205.9 | 207.1 | 1.86 | 1.20 | 582,732 | 9,884,385 | 722.9 |


| BGH053 | 582565 | 9884535 | 718 | 40 | -15 | 173.7 | 176.9 | 9.58 | 3.20 | 582,685 | 9,884,653 | 669.2 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 178.6 | 181.4 | 4.07 | 2.88 | 582,688 | 9,884,656 | 667.9 |
|  |  |  |  |  |  | 192.4 | 196.9 | 3.28 | 4.45 | 582,698 | 9,884,666 | 664.0 |
|  |  |  |  |  |  | 198.9 | 206.8 | 2.45 | 7.91 | 582,704 | 9,884,671 | 661.8 |
|  |  |  |  |  |  | 207.5 | 209.5 | 5.04 | 1.97 | 582,708 | 9,884,675 | 660.3 |
|  |  |  |  |  |  | 214.7 | 216.0 | 2.32 | 1.35 | 582,713 | 9,884,680 | 658.6 |
| BGH054 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH055 | 582565 | 9884535 | 718 | 80 | -15 | 145.0 | 146.0 | 0.62 | 1.00 | 582,705 | 9,884,549 | 682.7 |
| BGH056 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH057 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH058 | 582565 | 9884510 | 727 | 95 | -5 | 153.4 | 155.6 | 1.98 | 2.25 | 582,717 | 9,884,501 | 703.9 |
| BGH059 | 582567 | 9884536 | 718 | 95 | 0 | 165.0 | 166.0 | 3.63 | 1.00 | 582,732 | 9,884,528 | 714.4 |
| BGH060 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH061 | 582567 | 9884536 | 727 | 130 | -10 | 157.6 | 159.2 | 1.22 | 1.62 | 582,719 | 9,884,525 | 677.7 |
| BGH062 | 582567 | 9884537 | 718 | 95 | -15 | 154.0 | 156.0 | 2.18 | 2.00 | 582,695 | 9,884,589 | 650.2 |
| BGH063 | 582782 | 9884646 | 829 | 270 | -70 | 186.3 | 194.4 | 0.82 | 8.12 | 582,719 | 9,884,661 | 650.5 |
|  |  |  |  |  |  | 197.4 | 202.5 | 1.12 | 5.03 | 582,715 | 9,884,661 | 641.8 |
|  |  |  |  |  |  | 205.0 | 209.1 | 0.83 | 4.05 | 582,712 | 9,884,661 | 635.4 |
|  |  |  |  |  |  | 211.1 | 218.9 | 2.06 | 7.77 | 582,709 | 9,884,661 | 628.3 |
|  |  |  |  |  |  | 220.4 | 222.6 | 0.86 | 2.15 | 582,706 | 9,884,661 | 622.5 |
|  |  |  |  |  |  | 231.0 | 233.0 | 0.87 | 2.00 | 582,701 | 9,884,661 | 613.0 |
| BGH064 | 582888 | 9884976 | 839 | 270 | -50 | 220.8 | 222.6 | 0.63 | 1.80 | 582,746 | 9,884,976 | 668.9 |
| BGH065 | 582913 | 9885057 | 819 | 270 | -60 | 271.0 | 276.0 | 2.93 | 4.95 | 582,769 | 9,885,057 | 586.1 |
|  |  |  |  |  |  | 291.6 | 292.6 | 1.70 | 1.00 | 582,759 | 9,885,057 | 570.9 |
| BGH066 | 582888 | 9884976 | 839 | 270 | -60 | 276.0 | 278.6 | 8.49 | 2.59 | 582,754 | 9,884,965 | 596.1 |
|  |  |  |  |  |  | 300.0 | 301.0 | 1.78 | 1.00 | 582,742 | 9,884,965 | 576.6 |
| BGH067 | 582913 | 9885057 | 819 | 270 | -67 | 295.8 | 300.5 | 3.21 | 4.72 | 582,789 | 9,885,065 | 548.1 |
|  |  |  |  |  |  | 303.0 | 304.6 | 1.56 | 1.62 | 582,786 | 9,885,065 | 543.1 |
|  |  |  |  |  |  | 337.0 | 338.0 | 0.55 | 1.00 | 582,769 | 9,885,068 | 514.3 |
| BGH068 | 582913 | 9885057 | 819 | 270 | -50 | 247.0 | 248.2 | 2.10 | 1.20 | 582,749 | 9,885,051 | 633.1 |
|  |  |  |  |  |  | 251.8 | 255.1 | 1.75 | 3.30 | 582,745 | 9,885,051 | 628.8 |
| BGH069 | 582888 | 9884976 | 839 | 270 | -70 | 321.8 | 324.7 | 3.84 | 2.93 | 582,779 | 9,884,962 | 534.7 |
| BGH070 | 582913 | 9885057 | 819 | 270 | -73 | 331.0 | 336.4 | 3.00 | 5.35 | 582,802 | 9,885,040 | 505.2 |
| BGH071 |  |  |  |  | No | signif | icant | interc | pts |  |  |  |
| BGH072 | 582852 | 9884845 | 831 | 270 | -67 | 274.6 | 279.7 | 2.70 | 5.10 | 582,749 | 9,884,847 | 574.0 |
|  |  |  |  |  |  | 290.4 | 294.8 | 3.61 | 4.40 | 582,742 | 9,884,847 | 560.0 |


| BGH073 | 582731 | 9884691 | 838 | 280 | -60 | 121.0 | 123.0 | 0.72 | 2.00 | 582,671 | 9,884,702 | 731.9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BGH074 | 582944 | 9885130 | 798 | 270 | -67 | 278.9 | 283.9 | 2.85 | 5.03 | 582,810 | 9,885,137 | 551.2 |
|  |  |  |  |  |  | 285.5 | 289.1 | 1.60 | 3.61 | 582,807 | 9,885,138 | 546.3 |
|  |  |  |  |  |  | 294.5 | 297.3 | 7.14 | 2.79 | 582,802 | 9,885,139 | 539.1 |
|  |  |  |  |  |  | 299.7 | 303.3 | 0.53 | 3.69 | 582,799 | 9,885,139 | 534.5 |
| BGH075 | 582731 | 9884691 | 838 | 270 | -70 | 115.4 | 116.7 | 6.76 | 1.25 | 582,690 | 9,884,690 | 729.4 |
|  |  |  |  |  |  | 119.5 | 120.8 | 15.22 | 1.30 | 582,688 | 9,884,690 | 725.7 |
|  |  |  |  |  |  | 125.1 | 129.8 | 3.56 | 4.71 | 582,684 | 9,884,690 | 719.3 |
|  |  |  |  |  |  | 162.6 | 164.6 | 8.94 | 2.08 | 582,667 | 9,884,689 | 687.8 |
| BGH076 | 582752 | 9884801 | 849 | 300 | -40 | 108.0 | 109.0 | 0.84 | 1.00 | 582,682 | 9,884,844 | 779.6 |
|  |  |  |  |  |  | 118.8 | 119.5 | 3.71 | 0.65 | 582,675 | 9,884,848 | 772.7 |
|  |  |  |  |  |  | 128.2 | 131.0 | 2.82 | 2.85 | 582,668 | 9,884,852 | 765.8 |
|  |  |  |  |  |  | 136.7 | 137.0 | 0.97 | 0.30 | 582,663 | 9,884,855 | 761.0 |
| BGH077 | 582944 | 9885130 | 798 | 270 | -72 | 316.8 | 321.2 | 2.57 | 4.36 | 582,830 | 9,885,130 | 501.7 |
|  |  |  |  |  |  | 323.0 | 328.4 | 2.56 | 5.36 | 582,827 | 9,885,130 | 495.8 |
|  |  |  |  |  |  | 329.1 | 330.1 | 0.52 | 1.07 | 582,825 | 9,885,130 | 492.4 |
|  |  |  |  |  |  | 335.3 | 337.4 | 9.63 | 2.11 | 582,822 | 9,885,130 | 486.5 |
|  |  |  |  |  |  | 339.8 | 340.1 | 7.07 | 0.30 | 582,820 | 9,885,131 | 483.4 |
| BGH078 | 582752 | 9884801 | 849 | 280 | -40 | 102.0 | 106.0 | 1.88 | 4.00 | 582,674 | 9,884,816 | 782.6 |
|  |  |  |  |  |  | 108.0 | 109.0 | 0.62 | 1.00 | 582,671 | 9,884,817 | 779.7 |
|  |  |  |  |  |  | 115.0 | 117.2 | 0.80 | 2.15 | 582,665 | 9,884,818 | 774.8 |
| BGH079 | 582852 | 9884845 | 831 | 270 | -73 | 290.2 | 294.4 | 1.00 | 4.25 | 582,765 | 9,884,842 | 552.6 |
|  |  |  |  |  |  | 296.3 | 302.3 | 9.46 | 6.00 | 582,763 | 9,884,841 | 546.1 |
|  |  |  |  |  |  | 304.8 | 305.7 | 18.75 | 0.89 | 582,761 | 9,884,841 | 540.5 |
|  |  |  |  |  |  | 312.0 | 313.0 | 1.08 | 1.00 | 582,758 | 9,884,841 | 533.8 |
|  |  |  |  |  |  | 316.9 | 321.6 | 4.65 | 4.73 | 582,755 | 9,884,840 | 527.5 |
|  |  |  |  |  |  | 322.6 | 328.0 | 5.41 | 5.43 | 582,753 | 9,884,840 | 522.0 |
|  |  |  |  |  |  | 329.0 | 329.5 | 1.59 | 0.53 | 582,751 | 9,884,840 | 518.4 |
|  |  |  |  |  |  | 340.7 | 341.4 | 4.29 | 0.74 | 582,747 | 9,884,839 | 507.6 |
| BGH080 | 582944 | 9885130 | 798 | 270 | -75 | 339.9 | 343.6 | 1.05 | 3.70 | 582,853 | 9,885,141 | 469.2 |
|  |  |  |  |  |  | 345.0 | 346.6 | 4.11 | 1.55 | 582,851 | 9,885,141 | 465.5 |
|  |  |  |  |  |  | 360.7 | 361.0 | 11.95 | 0.30 | 582,846 | 9,885,143 | 451.5 |
| BGH081a | 583022 | 9885299 | 776 | 270 | -50 | 269.0 | 274.6 | 1.99 | 5.56 | 582,838 | 9,885,306 | 578.6 |
|  |  |  |  |  |  | 275.6 | 275.9 | 0.64 | 0.30 | 582,835 | 9,885,307 | 576.0 |


| BGH082a | 583013 | 9885209 | 752 | 270 | -50 | 263.8 | 266.3 | 3.43 | 2.47 | 582,836 | 9,885,222 | 556.0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 268.4 | 269.2 | 3.32 | 0.80 | 582,833 | 9,885,223 | 553.5 |
|  |  |  |  |  |  | 277.0 | 277.3 | 15.65 | 0.30 | 582,827 | 9,885,224 | 547.9 |
| BGH083 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH084 | 583023 | 9885299 | 776 | 270 | -57 | 279.0 | 280.9 | 6.25 | 1.95 | 582,857 | 9,885,307 | 552.8 |
|  |  |  |  |  |  | 283.1 | 286.3 | 1.28 | 3.25 | 582,854 | 9,885,307 | 549.2 |
| BGH085 | 583023 | 9885299 | 776 | 270 | -65 | 294.7 | 298.4 | 0.83 | 3.70 | 582,890 | 9,885,304 | 512.9 |
| BGH086 | 583013 | 9885208 | 752 | 270 | -57 | 275.4 | 280.8 | 3.07 | 5.43 | 582,847 | 9,885,214 | 530.1 |
|  |  |  |  |  |  | 286.1 | 286.5 | 18.90 | 0.46 | 582,841 | 9,885,215 | 524.4 |
| BGH087 | 583023 | 9885299 | 777 | 270 | -75 | 263.8 | 264.3 | 0.59 | 0.53 | 582,946 | 9,885,305 | 525.0 |
| BGH088 | 583012 | 9885208 | 752 | 270 | -67 | 297.7 | 299.5 | 11.93 | 1.72 | 582,876 | 9,885,221 | 487.3 |
|  |  |  |  |  |  | 301.0 | 301.8 | 6.79 | 0.77 | 582,875 | 9,885,221 | 485.0 |
|  |  |  |  |  |  | 303.7 | 304.0 | 2.47 | 0.30 | 582,873 | 9,885,222 | 483.0 |
|  |  |  |  |  |  | 305.7 | 306.0 | 1.66 | 0.30 | 582,872 | 9,885,222 | 481.4 |
|  |  |  |  |  |  | 307.2 | 307.6 | 6.66 | 0.35 | 582,871 | 9,885,223 | 480.2 |
|  |  |  |  |  |  | 308.3 | 308.9 | 12.15 | 0.67 | 582,871 | 9,885,223 | 479.2 |
|  |  |  |  |  |  | 309.5 | 309.8 | 1.98 | 0.31 | 582,870 | 9,885,223 | 478.3 |
|  |  |  |  |  |  | 310.4 | 310.7 | 17.65 | 0.33 | 582,869 | 9,885,223 | 477.6 |
|  |  |  |  |  |  | 313.0 | 313.9 | 2.82 | 0.85 | 582,868 | 9,885,224 | 475.3 |
|  |  |  |  |  |  | 324.5 | 324.9 | 5.77 | 0.38 | 582,861 | 9,885,226 | 466.3 |
|  |  |  |  |  |  | 325.4 | 325.8 | 10.40 | 0.40 | 582,861 | 9,885,226 | 465.6 |
| BGH089 | 582951 | 9885352 | 779 | 270 | -50 | 198.0 | 199.0 | 4.58 | 1.00 | 582,822 | 9,885,357 | 628.9 |
|  |  |  |  |  |  | 202.7 | 203.5 | 12.25 | 0.80 | 582,819 | 9,885,357 | 625.5 |
|  |  |  |  |  |  | 205.1 | 205.5 | 7.96 | 0.44 | 582,818 | 9,885,357 | 623.7 |
|  |  |  |  |  |  | 217.5 | 218.5 | 31.90 | 1.00 | 582,809 | 9,885,358 | 614.1 |
| BGH090 | 582951 | 9885423 | 769 | 270 | -50 | 168.8 | 170.5 | 2.45 | 1.68 | 582,843 | 9,885,424 | 638.3 |
|  |  |  |  |  |  | 170.9 | 171.5 | 12.55 | 0.60 | 582,842 | 9,885,424 | 637.1 |
|  |  |  |  |  |  | 173.0 | 173.3 | 5.05 | 0.33 | 582,841 | 9,885,424 | 635.6 |
| BGH091 | 582951 | 9885352 | 779 | 270 | -65 | 222.1 | 223.5 | 4.02 | 1.40 | 582,850 | 9,885,358 | 581.3 |
| BGH092 | 583021 | 9885430 | 752 | 270 | -55 | 193.5 | 193.9 | 17.15 | 0.38 | 582,913 | 9,885,431 | 591.9 |
| BGH093 | 583013 | 9885345 | 759 | 270 | -70 | 224.3 | 224.8 | 4.06 | 0.50 | 582,932 | 9,885,341 | 549.9 |
|  |  |  |  |  |  | 225.8 | 226.7 | 1.81 | 0.92 | 582,931 | 9,885,341 | 548.3 |
|  |  |  |  |  |  | 227.7 | 228.3 | 2.75 | 0.60 | 582,930 | 9,885,341 | 546.7 |
| BGH094 | 582990 | 9885055 | 810 | 270 | -65 | 381.0 | 384.8 | 3.84 | 3.81 | 582,808 | 9,885,054 | 473.5 |
|  |  |  |  |  |  | 389.7 | 390.3 | 5.95 | 0.51 | 582,805 | 9,885,054 | 467.4 |
|  |  |  |  |  |  | 408.5 | 411.0 | 5.82 | 2.55 | 582,795 | 9,885,054 | 450.4 |


| BGH095 | 582960 | 9884759 | 831 | 270 | -60 | 391.6 | 399.6 | 4.56 | 8.03 | 582,773 | 9,884,762 | 482.7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 400.0 | 401.0 | 1.85 | 1.00 | 582,770 | 9,884,761 | 478.6 |
|  |  |  |  |  |  | 405.0 | 412.0 | 4.47 | 6.97 | 582,766 | 9,884,761 | 471.9 |
|  |  |  |  |  |  | 414.0 | 414.3 | 1.36 | 0.30 | 582,763 | 9,884,761 | 467.2 |
| BGH096 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH097 | 583013 | 9885345 | 759 | 270 | -58 | 242.0 | 245.5 | 1.10 | 3.50 | 582,879 | 9,885,344 | 555.7 |
|  |  |  |  |  |  | 247.0 | 250.1 | 2.66 | 3.10 | 582,876 | 9,885,344 | 551.8 |
| BGH099 | No sig |  |  |  |  |  |  |  |  |  |  |  |
| BGH100 | 583013 | 9885345 | 759 | 270 | -79 | 226.8 | 231.3 | 2.09 | 4.51 | 582,965 | 9,885,347 | 535.2 |
|  |  |  |  |  |  | 233.1 | 235.0 | 1.58 | 1.92 | 582,964 | 9,885,347 | 530.3 |
| BGH101 | 582990 | 9884975 | 813 | 270 | -65 | 387.4 | 388.6 | 2.66 | 1.25 | 582,802 | 9,884,968 | 474.7 |
|  |  |  |  |  |  | 392.3 | 394.7 | 1.49 | 2.35 | 582,799 | 9,884,968 | 470.1 |
|  |  |  |  |  |  | 396.0 | 398.2 | 0.53 | 2.24 | 582,797 | 9,884,968 | 467.1 |
|  |  |  |  |  |  | 402.7 | 410.2 | 3.68 | 7.46 | 582,792 | 9,884,967 | 459.3 |
|  |  |  |  |  |  | 423.6 | 425.5 | 13.48 | 1.84 | 582,781 | 9,884,967 | 444.5 |
| BGH102 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH103 | 582951 | 9885423 | 767 | 270 | -64 | 161.9 | 167.0 | 1.71 | 5.17 | 582,882 | 9,885,425 | 618.5 |
|  |  |  |  |  |  | 167.8 | 172.1 | 1.11 | 4.29 | 582,880 | 9,885,425 | 613.4 |
|  |  |  |  |  |  | 173.4 | 177.0 | 1.71 | 3.65 | 582,877 | 9,885,425 | 608.7 |
| BGH104 | 582985 | 9885054 | 811 | 270 | -72 | 459.4 | 463.0 | 10.19 | 3.65 | 582,829 | 9,885,047 | 378.1 |
|  |  |  |  |  |  | 464.8 | 465.1 | 8.35 | 0.30 | 582,827 | 9,885,047 | 374.8 |
|  |  |  |  |  |  | 471.4 | 475.5 | 1.72 | 4.15 | 582,823 | 9,885,046 | 367.3 |
|  |  |  |  |  |  | 477.6 | 478.0 | 0.96 | 0.42 | 582,821 | 9,885,046 | 363.5 |
|  |  |  |  |  |  | 485.9 | 486.2 | 2.12 | 0.37 | 582,817 | 9,885,045 | 356.3 |
| BGH105 | 582963 | 9884842 | 834 | 270 | -70 | 406.5 | 407.0 | 0.98 | 0.48 | 582,807 | 9,884,837 | 458.9 |
|  |  |  |  |  |  | 410.2 | 413.0 | 1.20 | 2.80 | 582,805 | 9,884,836 | 454.6 |
|  |  |  |  |  |  | 416.9 | 421.4 | 1.66 | 4.45 | 582,802 | 9,884,836 | 447.9 |
|  |  |  |  |  |  | 421.8 | 425.0 | 4.33 | 3.21 | 582,800 | 9,884,836 | 444.1 |
|  |  |  |  |  |  | 427.7 | 431.3 | 0.80 | 3.55 | 582,797 | 9,884,836 | 438.7 |
|  |  |  |  |  |  | 434.6 | 437.4 | 1.11 | 2.77 | 582,794 | 9,884,835 | 433.0 |
|  |  |  |  |  |  | 442.3 | 442.6 | 1.98 | 0.30 | 582,791 | 9,884,835 | 427.3 |
|  |  |  |  |  |  | 446.0 | 446.3 | 1.24 | 0.30 | 582,789 | 9,884,834 | 424.1 |
|  |  |  |  |  |  | 453.7 | 454.0 | 0.62 | 0.30 | 582,785 | 9,884,834 | 417.4 |
|  |  |  |  |  |  | 457.8 | 459.9 | 5.03 | 2.17 | 582,783 | 9,884,833 | 413.0 |
|  |  |  |  |  |  | 461.7 | 462.6 | 0.91 | 0.93 | 582,781 | 9,884,833 | 410.2 |
| BGH106 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |


| BGH107 | 582991 | 9884982 | 814 | 270 | -75 | 496.9 | 502.2 | 8.21 | 5.21 | 582,826 | 9,884,984 | 343.4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BGH108 | 582963 | 9884905 | 828 | 270 | -62 | 377.2 | 377.5 | 11.95 | 0.31 | 582,786 | 9,884,895 | 495.2 |
|  |  |  |  |  |  | 381.5 | 381.8 | 7.40 | 0.30 | 582,784 | 9,884,895 | 491.5 |
|  |  |  |  |  |  | 385.3 | 387.5 | 4.50 | 2.20 | 582,781 | 9,884,895 | 487.6 |
|  |  |  |  |  |  | 391.0 | 395.0 | 2.09 | 3.96 | 582,777 | 9,884,894 | 482.1 |
|  |  |  |  |  |  | 401.0 | 402.0 | 1.44 | 1.00 | 582,773 | 9,884,894 | 475.1 |
|  |  |  |  |  |  | 405.3 | 409.4 | 2.40 | 4.05 | 582,769 | 9,884,893 | 470.3 |
| BGH109 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH110 | 582963 | 9884905 | 828 | 270 | -73 | 459.2 | 467.4 | 1.00 | 8.14 | 582,799 | 9,884,879 | 397.0 |
|  |  |  |  |  |  | 468.1 | 476.7 | 10.35 | 8.58 | 582,795 | 9,884,878 | 389.2 |
|  |  |  |  |  |  | 485.5 | 486.2 | 10.30 | 0.70 | 582,788 | 9,884,876 | 377.8 |
|  |  |  |  |  |  | 489.8 | 490.9 | 2.01 | 1.12 | 582,786 | 9,884,875 | 374.0 |
| BGH111 | 582959 | 9884759 | 831 | 270 | -55 | 334.4 | 341.3 | 4.24 | 6.89 | 582,768 | 9,884,745 | 553.1 |
|  |  |  |  |  |  | 342.4 | 350.0 | 4.92 | 7.65 | 582,762 | 9,884,745 | 547.0 |
|  |  |  |  |  |  | 352.5 | 357.3 | 0.67 | 4.75 | 582,756 | 9,884,744 | 540.6 |
|  |  |  |  |  |  | 358.3 | 361.3 | 0.63 | 3.03 | 582,753 | 9,884,744 | 537.0 |
|  |  |  |  |  |  | 362.7 | 367.2 | 0.58 | 4.50 | 582,749 | 9,884,744 | 533.3 |
|  |  |  |  |  |  | 368.0 | 370.2 | 3.15 | 2.16 | 582,746 | 9,884,743 | 530.4 |
| BGH112 | 582870 | 9885354 | 790 | 270 | -55 | 130.3 | 130.6 | 2.32 | 0.30 | 582,797 | 9,885,360 | 681.8 |
|  |  |  |  |  |  | 135.3 | 135.7 | 5.69 | 0.44 | 582,794 | 9,885,360 | 677.7 |
| BGH113 | 582910 | 9885205 | 780 | 270 | -62 | 213.0 | 216.6 | 0.94 | 3.60 | 582,810 | 9,885,204 | 590.1 |
|  |  |  |  |  |  | 229.0 | 230.0 | 4.49 | 1.00 | 582,803 | 9,885,204 | 577.3 |
| BGH114 | 582870 | 9885354 | 790 | 270 | -63 | 138.5 | 138.9 | 4.40 | 0.36 | 582,807 | 9,885,358 | 666.2 |
|  |  |  |  |  |  | 143.3 | 143.6 | 6.84 | 0.30 | 582,805 | 9,885,358 | 662.1 |
|  |  |  |  |  |  | 147.0 | 147.6 | 3.83 | 0.65 | 582,803 | 9,885,358 | 658.8 |
|  |  |  |  |  |  | 151.5 | 151.8 | 0.82 | 0.30 | 582,801 | 9,885,358 | 655.0 |
| BGH115 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| BGH116 | 582886 | 9884671 | 818 | 270 | -58 | 285.4 | 292.0 | 3.51 | 6.63 | 582,727 | 9,884,661 | 577.7 |
|  |  |  |  |  |  | 292.5 | 294.0 | 1.04 | 1.54 | 582,724 | 9,884,660 | 574.2 |
| BGH117 |  |  |  |  | No | signif | icant | interc | epts |  |  |  |
| BGH118 | 582842 | 9885430 | 769 | 270 | -60 | 95.0 | 95.9 | 2.05 | 0.90 | 582,795 | 9,885,430 | 686.6 |
|  |  |  |  |  |  | 100.6 | 100.9 | 0.95 | 0.30 | 582,792 | 9,885,430 | 682.1 |
| BGH119 | 582842 | 9885430 | 769 | 270 | -75 | 103.0 | 105.0 | 2.33 | 2.00 | 582,814 | 9,885,431 | 669.5 |
| BGH120 | 582886 | 9884671 | 818 | 270 | -70 | 323.0 | 327.4 | 0.98 | 4.41 | 582,746 | 9,884,662 | 528.2 |
|  |  |  |  |  |  | 330.3 | 334.4 | 1.92 | 4.14 | 582,741 | 9,884,662 | 522.6 |
| BGH121 | significant inter |  |  |  |  |  |  |  |  |  |  |  |


| BGH122 | 582853 | 9885112 | 780 | 275 | -65 | 153.4 | 157.5 | 1.50 | 4.09 | 582,786 | 9,885,123 | 640.6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 158.1 | 161.9 | 1.26 | 3.81 | 582,784 | 9,885,123 | 636.5 |
|  |  |  |  |  |  | 162.8 | 165.0 | 1.66 | 2.25 | 582,783 | 9,885,123 | 633.1 |
| BGH123 | 582960 | 9884759 | 831 | 270 | -70 | 432.0 | 437.1 | 1.96 | 5.05 | 582,789 | 9,884,746 | 432.8 |
|  |  |  |  |  |  | 438.5 | 438.8 | 1.20 | 0.30 | 582,787 | 9,884,746 | 429.3 |
| BGH124 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND001 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND002 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND003 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND004 | 583392 | 9886283 | 682 | 270 | -52 | 524.8 | 525.1 | 0.67 | 0.30 | 582,994 | 9,886,250 | 347.0 |
| MND005 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND006 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND007 | 583100 | 9886210 | 726 | 270 | -75 | 402.0 | 402.5 | 0.58 | 0.45 | 582,987 | 9,886,211 | 340.5 |
| MND009 | 582881 | 9886200 | 752 | 270 | -65 | 96.4 | 96.8 | 2.28 | 0.40 | 582,842 | 9,886,200 | 667.3 |
| MND010 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND011 | 583103 | 9886211 | 726 | 270 | -83 | 419.3 | 428.0 | 21.85 | 8.74 | 583,021 | 9,886,194 | 312.7 |
|  |  |  |  |  |  | 430.6 | 438.9 | 17.52 | 8.30 | 583,018 | 9,886,193 | 302.0 |
| MND012 | 582950 | 9886140 | 765 | 270 | -60 | 64.7 | 65.4 | 12.20 | 0.65 | 582,916 | 9,886,142 | 699.8 |
| MND013 | 582945 | 9886142 | 759 | 270 | -50 | 142.7 | 143.0 | 10.05 | 0.28 | 582,852 | 9,886,146 | 651.2 |
|  |  |  |  |  |  | 177.0 | 178.0 | 1.02 | 1.00 | 582,829 | 9,886,146 | 625.5 |
| MND014 | No significant intercepts |  |  |  |  |  |  |  |  |  |  |  |
| MND015a | 582950 | 9886140 | 755 | 270 | -70 | 172.3 | 172.7 | 6.34 | 0.36 | 582,887 | 9,886,144 | 594.8 |
| MND016 | 583063 | 9886162 | 741 | 270 | -50 | 249.4 | 253.0 | 0.62 | 3.58 | 582,895 | 9,886,161 | 554.1 |
| MND017 | 583195 | 9886171 | 744 | 270 | -50 | 385.0 | 386.0 | 1.02 | 1.00 | 582,947 | 9,886,165 | 450.1 |
| MND018 | 583063 | 9886162 | 740 | 270 | -60 | 284.7 | 285.0 | 11.70 | 0.30 | 582,912 | 9,886,160 | 498.4 |
| MND019 | 583196 | 9886171 | 744 | 270 | -64 | 432.2 | 444.0 | 25.94 | 11.76 | 582,992 | 9,886,162 | 357.3 |
|  |  |  |  |  |  | 445.0 | 445.6 | 15.30 | 0.55 | 582,988 | 9,886,162 | 351.2 |
| MND020 | 583196 | 9886171 | 744 | 270 | -72 | 484.9 | 492.3 | 7.08 | 7.36 | 583,024 | 9,886,160 | 288.3 |
|  |  |  |  |  |  | 495.0 | 499.3 | 7.50 | 4.25 | 583,020 | 9,886,159 | 280.6 |
| MND021 | 583195 | 9886171 | 744 | 270 | -57 | 425.3 | 425.6 | 10.50 | 0.30 | 582,962 | 9,886,178 | 388.9 |
| MND022a | 583244 | 9886211 | 741 | 270 | $-73$ | 547.0 | 558.3 | 7.62 | 11.30 | 583,060 | 9,886,205 | 220.5 |
|  |  |  |  |  |  | 559.0 | 565.9 | 16.37 | 6.85 | 583,056 | 9,886,205 | 211.4 |
|  |  |  |  |  |  | 567.7 | 569.5 | 1.31 | 1.83 | 583,054 | 9,886,205 | 205.7 |
| MND023 | 583204 | 9886236 | 738 | 270 | -75 | 511.6 | 524.7 | 21.27 | 13.10 | 583, 038 | 9,886,208 | 249.3 |
|  |  |  |  |  |  | 527.0 | 528.4 | 2.35 | 1.42 | 583,033 | 9,886,207 | 240.8 |

1. Apparent widths, not true thickness

## Appendix 3: Checklist of Assessment and Reporting Criteria

| Drilling techniques | All drillholes were diamond drill cored and drilled from surface (most intersections drilled using NQ size), holes drilled orientated in an east-west direction were angled between $-60^{\circ}$ and $-70^{\circ}$. Holes collared in the west were drilled out in fan patterns into the side of a hill and angled between $0^{\circ}$ and minus $35^{\circ}$. |
| :---: | :---: |
| Logging | All of the drillholes were geologically logged by qualified geologists. The logging is of an appropriate standard for grade estimation. |
| Drill sample recovery | Core recovery in the mineralised zones was observed to be very good and is on average 97\%. |
| Sampling methods | Half core samples were collected continuously through the mineralised zones after being cut longitudinally in half using a diamond saw. Drillhole samples were taken at nominal 1 m intervals, which were adjusted to smaller intervals in order to target the cassiterite vein zones. Lithological contacts were honoured during the sampling. MSA's observations indicated that the routine sampling was performed to a reasonable standard and is suitable for evaluation purposes. |

At the on-site ABM laboratory (managed by Anchem), samples were first checked off against the submission list supplied and then weighed and oven dried for 2 hours at 105 degrees Celsius. The dried samples were crushed by jaw crusher to $75 \%$ passing 2 mm , from which a 250 g riffle split was taken. This 250 g split was pulverised in ring mills to $90 \%$ passing $75 \mu \mathrm{~m}$ from which a sample for analysis was taken. Samples were homogenised using a corner-to-corner methodology and two samples were taken from each pulp, one of 10 g for on-site laboratory assaying and another 150 g sample for export and independent accredited 3rd party laboratory assaying.
Received samples at ALS Johannesburg are checked off against the list of samples supplied and logged in the system. Quality Control is performed by way of sieve tests every 50 samples and should a sample fail, the preceding 50 samples are ground in a ring mill pulveriser using a carbon steel ring set to $85 \%$ passing
$75 \mu \mathrm{~m}$. Samples are analysed for tin using method code ME-XRF05 conducted on a pressed pellet with $10 \%$ precision and an upper limit of $5,000 \mathrm{ppm}$. The over-limit tin samples are analysed as fused disks according to method ME-XRF15c, which makes use of pre-oxidation and decomposition by fusion with 12:22 lithium borate flux containing 20\% Sodium Nitrate as an oxidizing agent, with an upper detection limit of $79 \% \mathrm{Sn}$.
Prior to the 2021 drilling the assays were also conducted at ALS Global in Johannesburg where samples were analysed for tin using fused disc ME-XRF05 with 10\% precision and an upper limit of 10000 ppm . This was reduced to $5,000 \mathrm{ppm}$ from 2014
onwards. Over limit samples were sent to Vancouver for ME-XRF10 which uses a Lithium Borate 50:50 flux with an upper detection limit of $60 \%$ and precision of $5 \%$.

ME-ICP61, HF, HN03, HCL04 and HCL leach with ICP-AES finish was used for 33 elements including base metals. ME-OG62, a four-acid digestion, was used on high grade samples for $\mathrm{Pb}, \mathrm{Zn}, \mathrm{Cu} \& \mathrm{Ag}$.
External quality assurance of the laboratory assays for the Alphamin samples was monitored. Blank samples (299), certified reference materials (434) and duplicate
samples (357) were inserted with the field samples accounting for approximately 11\% of the total sample set.
The QAQC measures used by Alphamin revealed the following:

- Blank samples indicated that no significant contamination occurred overall. Low levels of contamination (mostly <200 ppm Sn) mostly occurred, however 12 values between 229 ppm and 1,285 ppm were returned. Given the high grades at Bisie, the levels of contamination are not significant.
- Five different CRMs were used with expected values between $0.18 \%$ and $31.42 \% \mathrm{Sn}$. The lower grade CRMs were prepared by Ore Research and Exploration (OREAS) and the two high grade CRMs $(4.19 \%$ and $31.42 \%$ Sn) by the Bureau of Analysed Samples Ltd (BCS). In general, ALS returned values within the tolerance limits (three standard deviations) for the OREAS CRMs, although slightly lower than the expected values.

Assays of the highest grade BCS CRM were mostly outside of the three standard deviation limits but within $\pm 4 \%$ of the expected value. The update assays of the high grade BCS-355 CRM were within $\pm 2 \%$ of the expected value with an overall low bias relative to the CRM expected value. For the $5.07 \%$ Sn BCS CRM, assays were consistently lower than the expected value by as much as $7 \%$. This trend continued
for the update assays with an average under-assay of $5 \%$ relative to the CRM expected value. Overall, the CRMs results indicate a slight negative bias for the ALS assays.

- Coarse duplicates show mostly excellent correlation, indicating minimal error in the process and a high degree of repeatability.

| Verification of sampling and assaying | The mineralisation in thirteen of the drillholes completed in 2021 at Mpama South were visually verified during a site-visits by the QP in August 2021 and several of the initial drillholes were examined during earlier site visits to Bisie. The QP observed the mineralisation in the cores and compared it with the assay results. It was found that the assays generally agreed with the observations made on the core. Core photos from the drilling programme have regularly been provided to the QP for inspection. <br> 105 pulp duplicates were sent to SGS (Johannesburg) in November 2021 for confirmation assaying. <br> - The pulp duplicates showed acceptable correlation with the ALS assays at both high- and low-grade ranges with an overall bias of near zero. <br> - Average bias for grade ranges $>1 \%$ is less than $1 \%$. <br> - Tendency for ALS to be higher ( $\sim 5 \%$ ) for the grade ranges less than $1 \%$. <br> - Inter-lab precision (after removal of $<0.10 \%$ ) is $85 \%$ within $10 \%$ error and $95 \%$ within 20\% error |
| :---: | :---: |
| Location of data points | The drillhole collar positions were surveyed using a differential GPS. Downhole surveys were completed using a multishot down-hole survey instrument (Reflex EZ-Track), or north seeking gyro (Reflex EZ-Gyro / Reflex Gyro Sprint-IQ). |
| ```Tonnage factors (in situ bulk densities)``` | Relative density measurements were made on the majority of recent drillhole samples using the Archimedes Principle of weight $n$ air versus weight in water. A regression formula of tin grade against relative density was developed and applied to the samples that did not have direct measurements. The assigned specific gravity was interpolated into the block model using ordinary kriging. |
| Data density and distribution | A total of 124 holes were drilled in Mpama South. An additional 6 holes previously drilled in the Wedge area of Mpama North have been included in the Mineral Resource. Holes were drilled steeply from east to west, along section lines spaced approximately 60 m to 80 m apart. Several sets of holes were drilled in a fan pattern into the side of a steep hill, with orientations spanning from the northeast to the southeast (from azimuth $045^{\circ}$ to $125^{\circ}$ ). These drillholes fans intersect the mineralisation 25 m to 40 m apart in most of the Mineral Resource area. |
| Database integrity | Data was provided as Excel files. MSA completed spot checks on the database and is confident that the Alphamin database is an accurate representation of the original data collected. |
| Dimensions | The mineralisation consists of seven zones, with a total extent of 950 m along strike. MZ1 has a strike length of 950 m and 500 m down-dip and MZ2 has a strike length of 650 m and 500 m down-dip. Together, these two zones account for $88 \%$ of the Mineral Resource. The zones occurring in the footwall and hangingwall of the MZ1 and MZ2 tend to be narrower and irregular in shape with strike lengths from 100 m to 300 m . MZ6, which is located to the south has a strike length of 270 m and a dip length of 110 m . |


| Geological interpretation | The mineralised intersections are clearly discernible in drill core. The Mineral <br> Resource is interpreted to occur as irregular veins and disseminations of cassiterite that when combined form tabular mineralised zones, dipping 65-70 to the east. The mineralised zones are hosted in chlorite schist that is the result of intense hydrothermal alteration associated with a fracture system. <br> MZ1 is the largest zone by volume of the Mineral Resource, with an extent of 950 m and an average thickness of $4.1 \mathrm{~m} . \mathrm{MZ2}$ is the second largest zone, with a strike length of 650 m and an average thickness of 3.4 m . However, the thicknesses of these two zones vary from as little as 1 m , up to 13 m thick. <br> Three smaller zones (MZ3 to MZ5) occur in the footwall of the main zones of mineralisation which progressively become narrower, moving away from the main zones. MZ3 thickness ranges from 1 m to 9 m with an average thickness of 1.5 m . MZ4 has an average thickness of 1 m , attaining a maximum thickness of 5 m . MZ5 has an average thickness of 1.2 m , ranging from 1 m to 5 m . All zones become narrower along the edges, where they pinch-out. <br> A narrow zone (MZ7) occurs in the hangingwall of the main mineralisation with an average thickness of 0.5 m and a maximum thickness of 4 m . <br> MZ6, which occurs to the south, tends to be lower in grade and has an average thickness of 4 m , ranging from 1 m up to 9 m . MZ6 is not part of the Mineral Resource. <br> A three-dimensional wireframe model was created for the seven zones of mineralisation based on a grade threshold of $0.40 \% \mathrm{Sn}$. MZ1 and MZ2 make up the main zone, which are the most consistent zones and occur within a persistent chlorite schist. Narrower less continuous zones occur above and below the main zone within chlorite-mica schists. |
| :---: | :---: |
| Domains | The mineralisation was modelled as seven tabular zones containing irregular vein style mineralisation. A hard boundary was used to select data for estimation in order to honour the sharp nature of vein boundaries. |
| Compositing | Sample lengths were composited to 1 m by length and density weighting. |
| Statistics and variography | Statistics for the seven estimation domains show distributions that are positively skewed with coefficients of variation (CV) ranging from 1.3 to 1.96 , the only exception being domain MZ7 which shows lower variability due to very few composites resulting in a CV of 0.79. <br> The two main zones (MZ1 and MZ2) have similar average tin grades (2.22\% and 2.11\% respectively). The smaller, footwall zones (MZ3 to MZ5) are higher in tin grade with averages ranging from $3 \%$ to $4.41 \%$ while MZ6 and MZ7 are lower in tin grade, with an average of $0.63 \%$ and $1.07 \%$ respectively. <br> Normal Scores semivariograms were calculated in the plane of the mineralisation, down-hole and across strike. Variograms were modelled for tin, with a range of 40 m within the plane of mineralisation and with a range of 3 m across the structures. |
| Top or bottom cuts for grades | Top caps were applied to outlier values, identified as breaks in the cumulative, probability plots. |
| Data clustering | Data clustering occurs where the fan drilling, collared on the western side of the deposit, intersect the surface drilling collared in the east, resulting in a data spacing of 25 m to 40 m towards the centre of the deposit. Outside of this area, the grid spacing becomes more regular, 60 m to 80 m along strike and 50 m down-dip. |
| Block size | A rotated block model with a parent cell of 10 mX by 10 mY by 2 mZ was used. Subcelling was used to divide the parent cells to a minimum sub-cell of 1 mX by 1 mY by 0.2 mZ to closely fit the narrow portions of the vein structures |


| Grade estimation | Tin, copper, lead, zinc, silver, arsenic and density were estimated using ordinary kriging. A minimum number of 5 and a maximum of 10 one metre composites were required for the tin and density estimates. A minimum of 5 and maximum of 8 composites were used for the other elements. <br> Estimation was carried out in three passes, with the first pass using search volumes coinciding with the variogram ranges. A second pass estimate expanded the search volumes by a factor of 1.5 to estimate blocks where insufficient samples were present for an estimate in the first pass. Where blocks remained un-estimated from the first two passes, a third pass, using an expansion factor of 10 was used to ensure all blocks in the model received a grade and density estimate. Dynamic Anisotropy was used to orientate the search volumes to the strike and dip of the individual mineralised zones. |
| :---: | :---: |
| Resource classification | Indicated Mineral Resources were declared where the drillhole spacing is approximately 40 m and where the geological model has low variability. The remainder of the interpreted model was classified as Inferred Mineral Resources, corresponding to areas informed by drilling spaced 50 m to 80 m apart with a maximum extrapolation of 20 m from the nearest drillhole. |
| Mining cuts and cut-off grade assumptions. | A minimum of 1 m was applied to the mineralisation model. The thickness, grade and steep dip implies that the Mineral Resource can be extracted using established underground mining methods similar to those applied at Mpama North. <br> A $1 \%$ cut-off grade was applied based on the Mpama North costs and prevailing tin price. <br> Isolated blocks above cut-off grade in dominantly low-grade areas of the model were not included in the Mineral Resource |
| Metallurgical factors or assumptions | The tin mineralisation occurs as cassiterite, an oxide of tin ( $\mathrm{SnO}_{2}$ ). At Mpama North gravity separation is used to produce a tin concentrate. The $\mathrm{Cu}, \mathrm{Zn}$ and Pb mineralisation occurs as sulphides, which are removed by flotation to create the cassiterite product. It is assumed that similar processes will be used to process the Mpama South mineralisation. |
| Legal aspects and tenure | Alphamin through its wholly owned DRC subsidiary, Alphamin Mining Bisie SA, has a Mining License PE 13155 which includes the Bisie Tin Mine. Alphamin has an 84.14 percent interest in ABM. The Government of the Democratic Republic of Congo (GDRC) has a non-dilutive, 5\% share in ABM. |
| ```Audits, reviews and site inspection``` | The following review work was completed by MSA: <br> - Inspection of approximately $20 \%$ of mineralised core intersections used in the Maiden Mineral Resource estimate. <br> - Database checks. <br> - Inspection of Mpama South drill sites in August 2021. <br> - On-site review of the exploration processes. <br> - Laboratory inspections. |

## ${ }^{1}$ Based on data obtained from International Tin Association Tin Industry Review Update 2021

${ }^{2}$ CIM Definition: An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying

Factors insufficient detail to support mine planning and evaluation of the economic viability of the deposit.
${ }^{3}$ CIM Definition: An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.

