

STATE REVIEWS



Indian Minerals Yearbook 2018

(Part- I)

57th Edition

STATE REVIEWS
(Karnataka)

(FINAL RELEASE)

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KARNATAKA

Mineral Resources

Karnataka has the distinction of being the principal gold producing State in the country. The State is the sole producer of feldspar and one of the leading producer of iron ore, chromite, dolomite, dunite, kyanite and shale. Karnataka hosts the country's 79% vanadium ore, 72% iron ore (magnetite), 65% corundum, 42% tungsten ore, 36% asbestos, 27% limestone, 21% gold ore (primary), 20% granite (dimension stone), 20% manganese ore, 17% dunite, 13% kyanite and 10% PGM (metal) resources as per National Mineral Inventory, 2010.

The important mineral-occurrence found in the State are **bauxite** in Belagavi, Chikkamagaluru, Uttara & Dakshina Kannada and Udupi districts; **china clay** in Bengaluru, Belagavi, Ballari, Bidar, Chikkamagaluru, Dharwad, Gadag, Hassan, Haveri, Kolar, Uttara & Dakshina Kannada, Shivamogga and Tumakuru districts; **chromite** in Chikkamagaluru, Hassan and Mysuru districts; **dolomite** in Bagalkot, Belagavi, Vijayapura, Chitradurga, Mysuru, Uttara Kannada and Tumakuru districts; **dunite/pyroxenite** in Chikkamagaluru, Hassan and Mysuru districts; **feldspar** in Bengaluru, Belagavi, Chitradurga and Hassan districts; **fireclay** in Bengaluru, Chitradurga, Dharwad, Hassan, Kolar, Shivamogga and Tumakuru districts; **gold** in Chitradurga, Dharwad, Gadag, Kalaburagi, Hassan, Haveri, Kolar, Raichur and Tumakuru districts; **iron ore (haematite)** in Bagalkot, Ballari, Vijayapura, Chikkamagaluru, Chitradurga, Dharwad, Gadag, Uttara Kannada, Shivamogga and Tumakuru districts; **iron ore (magnetite)** in Chikkamagaluru, Hassan, Uttara & Dakshina Kannada and Shivamogga districts; **kyanite** in Chikkamagaluru, Chitradurga, Kodagu, Mandya, Mysuru, Shivamogga and Dakshina Kannada districts; **limestone** in Bagalkot, Belagavi, Ballari, Vijayapura, Chikkamagaluru, Chitradurga, Davangere, Gadag, Kalaburagi, Hassan, Mysuru, Uttara & Dakshina Kannada, Shivamogga, Tumakuru and Udupi districts; **magnesite** in

Kodagu, Mandya and Mysuru districts; **manganese ore** in Belagavi, Ballari, Chikkamagaluru, Chitradurga, Davangere, Uttara Kannada, Shivamogga and Tumakuru districts; **ochre** in Ballari and Bidar districts; **quartz/silica sand** in Bagalkot, Bengaluru, Belagavi, Ballari, Chikkamagaluru, Chitradurga, Davangere, Dharwad, Gadag, Kalaburagi, Hassan, Haveri, Kolar, Koppal, Mandya, Mysuru, Uttara & Dakshina Kannada, Raichur, Shivamogga, Tumakuru and Udupi districts; **Quartzite** in Belagavi district; and **talc/steatite/soapstone** in Ballari, Chikkamagaluru, Chitradurga, Hassan, Mandya, Mysuru, Raichur and Tumakuru districts.

Other minerals that occur in the State are **asbestos** in Chikkamagaluru, Hassan, Mandya, Mysuru and Shivamogga districts; **barytes** and **pyrite** in Chitradurga district; **calcite** in Belagavi, Vijayapura and Mysuru districts; **copper** in Chikkamagaluru, Chitradurga, Kalaburagi, Hassan, Uttara Kannada, Raichur and Shivamogga districts; **corundum** in Bengaluru, Ballari, Chitradurga, Coorg, Hassan, Mandya, Mysuru and Tumakuru districts; **fuller's earth** in Belagavi and Kalaburagi districts; **granite** in Bagalkot, Bengaluru, Bellari, Vijayapura, Chamrajanagar, Chikkamagaluru, Chitradurga, Kodagu, Dharwad, Gadag, Kalaburagi, Hassan, Kolar, Koppal, Mandya, Mysuru, Uttara & Dakshina Kannada, Raichur, Tumakuru and Udupi districts; **graphite** in Kolar and Mysuru districts; **gypsum** in Kalaburagi district; **molybdenum** in Kolar and Raichur districts; **nickel** in Uttara Kannada district; **Platinum Group of Metals** in Davangere district; **sillimanite** in Hassan, Mysuru and Dakshina Kannada districts; **silver** in Chitradurga and Raichur districts; **titanium minerals** in Hassan, Uttara Kannada and Shivamogga districts; **tungsten** in Gadag, Kolar and Raichur districts; **vanadium** in Hassan, Uttara Kannada and Shivamogga districts; and **vermiculite** in Hassan, Mandya and Mysuru districts (Table - 1).

Exploration & Development

The details of exploration activities conducted by GSI for gold, iron ore & rare earth elements and by various State Governments agencies/Central Government Undertaking (MECL) during 2017-18 are furnished in Table - 2.

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Table – 1 : Reserves/Resources of Minerals as on 1.4.2015: Karnataka

| Mineral | Unit | Reserves | | | | | Remaining resources | | | | | Total resources (A+B) | | |
|-----------------|-------------|------------------|----------|---------|--------------|-----------------------|---------------------|----------|--------------------|---------------------|--------------------|-----------------------|--------------------------|--------------|
| | | Proved STD111 | Probable | | Total (A) | Feasibility STD211 | Pre-feasibility | | Measured STD331 | Indicated STD332 | Inferred STD333 | | Reconnaissance STD334 | Total (B) |
| | | | STD121 | STD122 | | | STD221 | STD222 | | | | | | |
| Asbestos | tonne | - | - | - | - | - | - | - | 2441037 | 5841420 | - | 8282457 | 8282457 | |
| Barytes# | tonne | - | - | - | 78296 | 14252 | - | - | - | 15175 | - | 243943 | 243943 | |
| Bauxite | '000 tonnes | 126 | 3140 | 4389 | 2468 | 864 | 10 | 82 | 2220 | 35603 | - | 41246 | 45635 | |
| Calcite# | tonne | - | - | - | 31800 | - | 15900 | - | 14400 | 51547 | - | 113647 | 113647 | |
| China clay# | '000 tonnes | 330 | 472 | 802 | 1768 | 747 | 2683 | 220360 | 443 | 24803 | 6030 | 256834 | 257636 | |
| Chromite | '000 tonnes | 315 | 340 | 727 | 300 | 230 | 96 | - | 20 | 259 | - | 905 | 1631 | |
| Copper | | | | | | | | | | | | | | |
| Ore | '000 tonnes | 314 | 557 | 872 | 64 | - | 2445 | 1750 | 6833 | 22701 | - | 33793 | 34665 | |
| Metal | '000 tonnes | 352 | 419 | 771 | 0.49 | - | 16.04 | 22 | 65.77 | 117.49 | - | 221.79 | 229.50 | |
| Corundum | tonne | - | - | - | 64920 | 756 | 53590 | 13 | 38 | 27575 | 52675 | 199566 | 199566 | |
| Dolomite# | '000 tonnes | 28609 | 5910 | 40612 | 16264 | 6684 | 9202 | 8519 | 76244 | 455337 | 13482 | 585731 | 626344 | |
| Dunite# | '000 tonnes | 3074 | 18 | 3282 | 0 | 0 | 34 | 23909 | - | 4606 | - | 28549 | 31831 | |
| Felspar# | tonne | - | - | - | 103675 | 73613 | 107055 | 25000 | 135133 | 177300 | 3900 | 625676 | 625676 | |
| Fireclay# | '000 tonnes | 146 | - | 146 | 247 | 340 | 2003 | - | 226 | 8832 | - | 11648 | 11794 | |
| Fullers earth## | tonne | - | - | - | - | - | 58200 | - | 551640 | 1557156 | - | 2166996 | - | |
| Gold | | | | | | | | | | | | | | |
| Ore | | | | | | | | | | | | | | |
| (Primary) | tonne | 10395000 | 2499000 | 422100 | 1270536 | 1303000 | 1078661 | 24979968 | 8204595 | 16020324 | 37673000 | 90530084 | 103846184 | |
| Metal | | | | | | | | | | | | | | |
| (Primary) | tonne | 53.34 | 7.77 | 0.42 | 61.53 | 3.85 | 8.53 | 120.73 | 28.67 | 38.29 | 43.78 | 249.09 | 310.62 | |
| Granite## | | | | | | | | | | | | | | |
| (Dimension | | | | | | | | | | | | | | |
| Stone) | '000 cum | 26363 | 19389 | 21836 | 67587 | - | - | 238 | 1231625 | 8012784 | 25659 | 9270306 | 9337893 | |
| Graphite | tonne | - | - | - | 140827 | 18750 | 48821 | - | 41605 | 149403 | - | 399406 | 399406 | |
| Gypsum# | '000 tonnes | - | - | - | - | - | - | - | - | 3784 | - | 3784 | 3784 | |
| Iron Ore | | | | | | | | | | | | | | |
| (Haematite) | '000 tonnes | 416684 | 46169 | 87394 | 518155 | 48231 | 211632 | 248299 | 44094 | 669239 | 176956 | 1916607 | 2466854 | |
| Iron Ore | | | | | | | | | | | | | | |
| (Magnetite) | '000 tonnes | 319 | 127 | - | 120022 | - | 18375 | 1498957 | 479372 | 5345018 | 340000 | 7801744 | 7802190 | |
| Kyanite | tonne | - | - | - | 637460 | 15930 | 113630 | 386247 | 1610502 | 10531529 | - | 13295298 | 13295298 | |
| Limestone | '000 tonnes | 461049 | 2154 | 1113795 | 497136 | 559903 | 1355522 | 1572501 | 13920771 | 34952588 | - | 52858420 | 54435419 | |
| Magnesite | '000 tonnes | 1264 | 125 | - | 1389 | 190 | 391 | 88 | 10 | 3179 | 168 | 4592 | 5981 | |

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Table-1 (Concl'd)

| Mineral | Unit | Reserves | | | | | Remaining resources | | | | | Total resources (A+B) | | |
|----------------------------|----------------|------------------|----------|--------|-----------------------|-----------------|---------------------|--------------------|---------------------|--------------------|--------------------------|-----------------------|--------------|----------|
| | | Proved STD111 | Probable | | Feasibility STD211 | Pre-feasibility | | Measured STD331 | Indicated STD332 | Inferred STD333 | Reconnaissance STD334 | | Total (B) | |
| | | | STD121 | STD122 | | STD221 | STD222 | | | | | | | |
| Manganese Ore | '000 tonnes | 9196 | - | 150 | 9346 | 14003 | 10225 | 11430 | 1498 | 7306 | 54333 | 2923 | 101718 | 111064 |
| Molybdenum Ore | tonne | - | - | - | - | - | - | - | - | - | 1320900 | - | 1320900 | 1320900 |
| Contained MoS ₂ | tonne | - | - | - | - | - | - | - | - | - | 1718.70 | - | 1718.70 | 1718.70 |
| Nickel Ore | million tonnes | - | - | - | - | - | - | - | - | - | 0.23 | - | 0.23 | 0.23 |
| Ochre | tonnes | - | - | - | - | - | - | 1766367 | - | - | - | 20000 | 1786367 | 1786367 |
| Pt. Group of Metals | tonne | - | - | - | - | - | - | - | - | - | - | 1.50 | 1.50 | 1.50 |
| Pyrite | '000 tonnes | - | - | - | - | - | - | - | - | - | 3000 | - | 3000 | 3000 |
| Quartzite# | '000 tonnes | 231 | - | - | 231 | 69 | 48 | 592 | - | - | 4914 | 1730 | 7353 | 7584 |
| Quartz-Silica Sand# | '000 tonnes | 7975 | 417 | 1807 | 10199 | 15904 | 6695 | 9448 | 94 | 52 | 52077 | 525 | 84794 | 94993 |
| Sillimanite | tonne | - | - | - | - | - | - | - | - | - | 982725 | - | 982725 | 982725 |
| Silver Ore | tonne | 10620000 | 1730000 | - | 12350000 | - | - | 69462 | - | - | 314150 | - | 383612 | 12733612 |
| Metal | tonne | 2.71 | 0.24 | - | 2.95 | - | - | 0.48 | - | - | 2.92 | - | 3.40 | 6.35 |
| Talc-Steatite-Soapstone# | '000 tonnes | 46 | 53 | 182 | 280 | 58 | 78 | 251 | 11 | 208 | 1196 | - | 1800 | 2081 |
| Tungsten Ore | tonne | - | - | - | - | - | - | - | 15361152 | 11805499 | 172921 | 9338246 | 36677818 | 36677818 |
| Contained WO ₃ | tonne | - | - | - | - | - | - | - | 2915 | 1775 | 142 | 1403 | 6235 | 6235 |
| Vanadium Ore | tonne | - | - | - | - | - | 500000 | 4000000 | - | - | 14884430 | - | 19384430 | 19384430 |
| Metal | tonne | - | - | - | - | - | 700 | 5600 | - | - | 43197.55 | - | 49497.55 | 49497.55 |
| Vermiculite | tonne | - | - | - | - | 13550 | 22520 | 29450 | - | 1562 | 66658 | - | 133740 | 133740 |

Figures rounded off.

Declared as Minor Mineral vide Gazette notification dated 10.02.2015.

Minor Mineral before Gazette notification dated 10.02.2015.

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Table – 2 : Details of Exploration Activities in Karnataka, 2017-18

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|--|---------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| GSI | | | | | | | |
| REE | | | | | | | |
| Koppal | Koppal Syenite | 1:12500 | 150 | - | 220 | 1179 | Reconnaissance survey for delineating the REE-bearing zone around Koppal Syenite, Koppal district was taken up by mapping of 150 sq km on 1:12500 scale with systematic 200 cu m trenching and collection of 100 trench samples, 101 BRS, 13 petrochemical samples, 10 XRD, 46 PS, 25 soil and 25 HM. In the area rocks of migmatite, alkali pyroxenite/ amphibolite, variants of syenite, basic dykes like gabbro and dolerite and acidic younger intrusive like quartz, aplite & pegmatite vein were exposed. The analytical result revealed that the total REE (tREE) in BRS varied from 43.58 to 2469.41 ppm. Highest values were noticed over mafic rock in the southern part of the area. In trench samples REE value varied from 178.33 ppm to 1,801.72 ppm. The tREE value in the soil sample varied from 313.48 to 2,991.38 ppm. |
| Raichur & Kalaburagi | Shorapur, Rastapur, Jalibenchi, Wanadurg and Hosaker | 1:12500 | 100 | - | - | 344 | Reconnaissance survey for delineating the REE-bearing zones around Shorapur, Rastapur, Jalibenchi, Wanadurg and Hosakeri was carried out by mapping of 100 sq km area on 1:12500 scale along with pitting/ trenching of 200 cu m, besides collection of 101 BRS, 107 PTS, 50 SS, 44 PS, 32 petrochemical study and 10 for EPMA samples. The major litho-domains exposed in the area were Peninsular Gneissic Complex-II, Closepet Granite, Younger Intrusives and Bhima group, more dominantly occupied by Closepet Granite. |
| Kimberlite (Diamond) | | | | | | | |
| Ballari & Chitradurga | Kotturu block | - | - | - | - | 164 | Reconnaissance survey was carried out to locate kimberlite in Kotturu Block, Ballari and Chitradurga districts. Lineament map and drainage map of the study area were prepared. A total of 154 SSS, 05 PS and 05 petrochemical samples were collected. An outcrop of Talc-tremolite-actinolite schist rock was noted 800 m SW of village Hunsekotte. Samples processing were carried out and only 1 mm - 0.5 mm and 0.5 mm - 0.3 mm size fractions were taken up for further concentration and heavy mineral studies. Heavy mineral study was carried out to identify the kimberlite indicator. About 24 suspected grains from SSS were studied by EPMA which includes 07 garnet, 07 ilmenite, 05 diopside and 05 spinel. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---|----------------|---------|-----------------|---------------------|----------|-------------------|--|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Raichur | Gabbur block | - | - | - | - | - | In Raichur district, reconnaissance survey to locate KCR in Gabbur block was carried out based on a few geophysical anomalous zones reported by the airborne magnetic and spectrometric studies of the Narayanpet - Raichur area. Most of the heavy minerals recovered are non-kimberlitic and of crustal origin and include amphibole, pyroxene, ilmenite, spinel, tourmaline, zircon, etc. The analytical result showed the presence of microdiamond with nitrogen impurities. The cathodoluminescence imaging carried out to study the details and growth structures of the grains. |
| Bagalkot | Bagalkot block | 1:50000 | 720 | - | - | 204 | Reconnaissance survey to locate kimberlites in Bagalkot block was carried out by aerial reconnaissance studies of 750 sq km area and reconnaissance survey of 720 sq km area on 1:50000 scale. A total of 182 stream sediment samples were systematically collected and processed for heavy minerals. A total of 08 petrological samples were collected and studied and 05 rock samples were analysed for whole rock and trace elements. About 20 grains belonging to 9 stream sediment samples were analysed by EPMA. Those suspected grains included garnet, ilmenite and diopside. |
| Gold and Associated Minerals | | | | | | | |
| Ballari | Sirigiri block | 1:12500 | 132 | - | - | 80 | During reconnaissance survey for gold and associated minerals in this block, large-scale mapping of 132 sq km on 1:12500 scale with collection of 364 samples was carried out. A total of five bands of BIF have been observed in the schist belt intercalated with meta-argillite, phyllite, greywacke and acid volcanics. The area has undergone at least three phases of deformation. The possible zones of gold mineralisation have been marked by hydrothermal alterations in the form of wide spread epidotisation, sulphidisation, carbonatisation and silicification in pink granite. The analytical results of 80 bed rock samples did not show any encouraging gold values except three spot values, i.e., 62 ppb, 88 ppb and 400 ppb collected from sheared pink granite. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|---|-------------------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Gold and Polymetals | | | | | | | |
| Chitradurga | North of Madanyakk-1:12500 anahalli and Bullanahalli- Chikkannanahalli area | 1:12500 | 100 | 19 | 856.1 | 789 | During reconnaissance survey for gold and polymetals north of Madanyakkanahalli in and around Bullanahalli-Chikkannanahalli areas, mapping of 100 sq km area on 1:12500 scale was carried out besides systematic pitting/trenching, bedrock sampling and scout drilling. |
| Gold | | | | | | | |
| | Lingannanahalli North and South block | 1:1000 | 1.00 | 1 | 110 | 25 | A total of 1.00 sq km area on 1:1000 scale was covered by detailed mapping in two blocks viz., Lingannanahalli North and South blocks. The litho units observed in the area were phyllite, BIF, granophyre, banded magnetite quartzite and a few blue quartz veins. Two BRS samples from Lingannanahalli South Block showed gold values of 2,500 ppb and 450 ppb. A borehole drilled to a depth of 110 m depth encountered four mineralised zones that had pyrite and arsenopyrite dissemination. A total of 25 core samples were collected for analysis. |
| Raichur | Chikka-Honakuni area | 1:12500 1:1000 | 100 1.02 | - - | 468 - | 2 - | Reconnaissance survey for gold and associated minerals was taken up around Chikka-Honakuni area. Two locations of 100 sq km area on 1:12500 scale and 1.02 sq km area on 1:1,000 scale were mapped for the study. The lithologies identified were felsic volcanic rock and granite intruded by quartz reef and basic dyke. The litho-units exposed in this area included felsic volcanic, pegmatitic granite and metabasic rock. The felsic volcanic was light to dark grey and was enriched in magnetite and was intruded by numerous linear pink, K-felspar-bearing, porphyritic granite which were found to be pegmatitic at places. During Ground Geophysical surveys, 20 lkm IP & resistivity and 27 lkm of magnetic survey were carried out in the area. The anomaly maps showed 3 NNW-SSE high chargeability zones with old working situated in the south-east part of the central IP anomaly. Scout drilling of 468 m was completed. BRS samples showed Au values < 25 ppb. About 93 PTS were analysed of which two samples showed Au values of 5.6 ppm and 2.5 ppm while the remaining samples showed Au values less than 150 ppb. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|--|---------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Gold | | | | | | | |
| Tumakuru | Ajjanahalli Block F | - | - | 8 | 1201.40 | - | Preliminary exploration for gold was carried out in this block. Ajjanahalli Block-F, is characterised by several higher order congruous antiform and synform with relatively low inter limb angle. The mineralisation is characterised by sulphide dissemination along with quartz-carbonate veins/vein lets within the sheared BIF. A total of 1201.40 m of drilling was carried out in 8 boreholes (KTAF-1 to 8) and 450 core samples were collected. Chemical analysis of Borehole KTAF-1 showed high gold values 0.112 ppm / 0.5 m (42.75 m to 43.25 m), 0.324 ppm/ 0.5 m (85.35 m to 85.85 m) and 0.13 ppm/ 0.5 m (139.50 m to 140.0 m). In borehole KTAF-2, gold values as high as 0.16 ppm/ 1.5 m (102 m to 103.5 m) and 0.14 ppm/ 2 m (107.5 m to 109.5 m) were established. The Au mineralisation is confined to sheared/ brecciated BIF with quartz-carbonate veins/ veinlets having sulphides like pyrrhotite, pyrite, arsenopyrite and chalcopyrite. The favorable loci for mineralisation were low strain domains. |
| | Rangaswamy Betta Yemmebetta Lakshmipura & Tarikers arch | 1:12500 | 114 | - | - | - | Reconnaissance survey was carried out for gold around this area. An area of 114 sq km was mapped on 1:12500 scale with collection of a total of 508 samples. The major rock units exposed in the area were granite gneiss and migmatites while the schist belt comprised amphibolites, talc-tremolite-actinolite schist, calc-silicates, metapelites, banded magnetite quartzite, grunerite-bearing BIF, banded manganiferous formation with intermittent ferruginous phyllite and chlorite schist. Gold mineralisation was mostly associated with BIF along with sheared quartz veins and pegmatites. Alteration was seen in the form of limonitisation, sericitisation and sulphidisation. The Au values in BRS samples near Laxmipura area varied from 100 ppb to 565 ppb. |
| | Timmanahalli Block Sleemanabad areas | 1:1000 | 1.50 | - | - | 325 | A reconnaissance Survey for gold was carried out in Timmanahalli block. An area of 1.5 sq km was mapped on 1:1000 scale and 25 samples were collected. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|-----------------------------------|------------------|---------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | Gold mineralisation here was sporadic in nature. Out of 290 samples, only 07 samples showed encouraging Au value of >100 ppb and the highest value recorded was 975 ppb. All the gold values were reported from BIF samples collected from different bands which indicate that the mineralisation is restricted to BIF. The BIF samples which yielded values were characterised by the presence of fine disseminated pyrites. The other sulphides associated with mineralised BIF were arsenopyrite and chalcopyrite. The ore microscopic and EPMA studies carried out suggest the presence of invisible gold (lattice gold) associated with pyrite. |
| Limestone (flux grade) | | | | | | | |
| Kalaburagi | Wadi area | 1:4000 | 5.5 | - | - | - | G2 stage general exploration for flux-grade limestone was carried out in this area. A block, measuring 5 sq km area was proposed. The main target lithology is the stylolytic limestone, which some earlier workers have mentioned to be flux grade. A cumulative total of 916.75 m of drilling is completed in 20 boreholes. In almost all the boreholes, stylolitic limestone is intersected. The depth range of intersection of stylolitic limestone is from 4 m to 36 m with an average thickness of 15 m to 20 m. Towards the northern part of the block intersection of stylolitic unit is at higher depths. |
| Bagalkot | Hanamaneri block | 1:4000 | 4.3 | 24 | 1200.0 | 594 | G2 stage exploration for Limestone was carried out in NW of Hanamaneri block. The area is comprised of grey limestone, variegated limestone, grey/white dolomite and argillite. All the litho-units contain limited intercalated marl and argillite. The grey limestone that occur as bands vary from a few mm to 30 cm and was found to be alternating with marl. Carbonate veins traversed along/ across grey limestone. Eighteen boreholes had intersected grey limestone, variegated limestone with intercalation of marl/ dolomite/ argillite bands/ laminae; 4 boreholes intersected grey/ white dolomite and 3 boreholes intersected weathered limestone/ dolomite. Analytical results showed CaO values ranging between 38.42% and 52.40% / 26.10% and 48.60% respectively. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|-------------------|---------|-----------------|---------------------|----------|-------------------|--|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Bagalkot | West of Varchagal | 1:4000 | 3.4 | 17 | 817.0 | 29 | G3 level preliminary exploration for limestone/ dolomite was carried out in the west of Varchagal area. During drilling, seven boreholes intersected dolomite unit, six boreholes intersected alternating units of dolomite and soil horizon, three boreholes intersected ferruginous/ calcretised/ lateritic zone with soil horizon and one borehole intersected an argillite dominant unit with thin lamellae of limestone. The analytical results of 4 core samples indicated CaO value ranging between 25 and 39.04%, MgO between 16.02 and 19.05%, SiO ₂ was around 1%, Al ₂ O ₃ ranged from 0.19 to 0.31%, Fe ₂ O ₃ from 0.24 to 0.40%, Na ₂ O from 0.13 to 0.18%, K ₂ O from 0.09 to 0.18%, MnO was 0.01 and P ₂ O ₅ was <0.01%. |
| | East of Varchagal | 1:4000 | 2.2 | - | 809.5 | - | G3 level exploration for SMS grade limestone was carried out in the east of Varchagal area. Lithology showed limestone, dolomite and shale. All the boreholes intersected limestone units that comprised of grey limestone, pink limestone, argillite units and variegated limestone. Based on the drilling data of boreholes, it was observed that the eastern portion of the block had a thick soil cover of around 5-7 m while western portion had an average soil thickness of 3 m. Presence of a fractured/ weathered/ eroded (pothole) zone of around 20 m thick overlying limestone/ dolomite/ shale was observed below the soil cover. Grey limestone samples analysed CaO values up to 52%. |
| Kalaburagi | Bahmanhalli area | - | - | 20 | 916.75 | - | Two stage exploration for flux-grade limestone was carried out around this area. A block measuring 5 sq km area was proposed for study. Stylolitic limestone was intersected in almost all the boreholes. The depth range of intersection of stylolitic limestone varied from 4 m to 36 m with an average thickness of 15 to 20 m. Towards the northern part of the block intersection of stylolitic unit was at higher depths. |

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Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|--------------------------------------|---|---------|-----------------|---------------------|----------|-------------------|--|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Copper and REE | | | | | | | |
| Raichur | Machanur block Lingasugur taluk | - | 2.0 | - | 800 | 264 | During preliminary exploration for delineation of copper and REE mineralisation in Lingasugur taluk, detailed mapping of 2.0 sq km and drilling of 800 m were carried out. The different types of mineralisation found in the host granite included disseminations of sulphides, stockwork zones and veinlets, represented mainly by 1 mm-thick veinlets with quartz-chlorite ± specularite ± pyrite and chalcopyrite and 2 cm-thick veins composed of quartz-chlorite-carbonate-pyrite ±chalcopyrite ±bornite ±sphalerite. The main sulphides in the area were present as chalcopyrite, pyrite and bornite. Three first level boreholes intersected mineralisation at vertical depth of 60 m and 200 m were drilled. The fourth borehole of second level is under progress at 313.0 m inclined depth in the mineralised zone. A total of 264 samples were generated and sent for analysis. Chemical analysis of 46 samples confirmed a weighted average of 0.15% Cu over 23.0 m with maximum and minimum of 0.7 and 140 ppm respectively. |
| Multi-metallic Mineralisation | | | | | | | |
| Chitradurga | Around Nerlakere, Maddakere, Gollarahalli & Kachipura area | - | - | - | - | - | Reconnaissance survey for multi-metallic mineralisation was taken up in and around Nerlakere, Maddakere, Gollarahalli, Kachipura areas. The area was found to be occupied by gneisses with several enclaves of ultramafic rock. The conglomerate horizon 50 to 100 m wide was traced to be extending over a length of nearly 2 km. Samples collected from Banded Ferruginous chert exhibited a few anomalous value for gold (180 ppb to 400 ppb). Chemical analysis of a few stream sediment samples recorded Au values ranging from 49 to 64 ppb. Samples collected from talc chlorite schist showed Cr value ranging from 500 to 3,300 ppm and Ni from 400 to 1,300 ppm. |
| MECL Iron ore | | | | | | | |
| Chitradurga | M/s Milan- minerals(ML-1842), K.K.Kaval village, Hosadurga Taluka. | 1:1000 | 0.9955 | 28 | 2114.0 | 2762 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. The manganese ore reserves/resources were estimated at |

(Contd)

STATE REVIEWS

Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|--|---------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | 11.133 million tonnes (mt.) with the average grade of 13.99% Mn, 29.11% Fe, 24.89% SiO ₂ and 1.92% Al ₂ O ₃ . Iron ore reserves/resources were estimated at 0.436 million tonnes with average grade of 47.32% Fe, 13.74% SiO ₂ , 3.11 Al ₂ O ₃ , 5.87% Mn and 5.78% MnO ₂ at 45% Fe cut-off. |
| Ballari | Shri P.Abu Bakar Mine (ML-2183) Siddapur village of NEB Range, Sandur Taluka. | 1:1000 | 0.1385 | 10 | 965.0 | 1068 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. The iron ore resources were estimated at 0.343 million tonnes over a strike length of 165.0 m with 48.84% Fe, 19.40% SiO ₂ and 5.42% Al ₂ O ₃ under Measured and Indicated Categories (331/332). |
| | M/s Associated Mining Company (ML-2434), Ramandurg village | 1:1000 | 0.1014 | 6 | 615.5 | 593 | G2 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. The iron ore resources were estimated at 0.787 million tonnes over a strike length of 178.0 m with Fe 52.05%, SiO ₂ 14.01% and Al ₂ O ₃ 6.70% at 45% cut-off. Resources at 35% Fe cut-off have been estimated at 5.611 million tonnes with grade of Fe 39.99%, SiO ₂ 34.4% and Al ₂ O ₃ 4.29% under Indicated Category. |
| Tumakuru | Smt.Kamalabai (ML-1442) Manchikatte village | 1:1000 | 0.1344 | 5 | 460.0 | 865 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. A total of |

(Contd)

STATE REVIEWS

Table – 2 (Contd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|---|---------|-----------------|---------------------|----------|-------------------|---|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| | | | | | | | 0.639 million tonnes net resources with average grade of 6.85% Mn, 7.25% MnO ₂ have been estimated at 10% Mn cut-off. |
| Tumakuru | M/s.Matha Minerals (ML- 2600), Kondli & Mudalpalya Village | 1:1000 | 1.2916 | 23 | 1723.0 | 3854 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. Iron ore net reserves of 0.995 million tonnes has been estimated with average grade 48.05% Fe, 15.98% SiO ₂ and 5.58% Al ₂ O ₃ at 45% Fe cut-off. A total of 2.795 million tonnes net reserves with average grade of 36.57% Fe, 33.69% SiO ₂ and 4.55% Al ₂ O ₃ have been estimated at 35% Fe cut-off. Manganese ore reserves have been estimated at 1.442 million tonnes with average grade of 10.97% Mn. |
| | M/s.Canara Minerals (ML-2635) Gubbi village | 1:1000 | 0.1152 | 13 | 1196.0 | 3353 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map on the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. A net reserve of 1.387 million tonnes iron ore with average grade of 51.78% Fe, 11.46% SiO ₂ and 4.89% Al ₂ O ₃ have been estimated at 45% cut-off. At 35% Fe cut-off, a net 2.579 million tonnes reserves have been estimated with average grade of 44.47% Fe, 21.71% SiO ₂ and 4.14% Al ₂ O ₃ . Manganese ore reserves have been estimated at 0.718 million tonnes with average grade of 11.08% Mn under Measured/Indicated Category. |
| Ballari | M/s S.B. Minerals (ML-2515), Vysankera village | 1:1000 | 0.7125 | 5 | 474.0 | 558 | G3 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map on the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area and associated minerals with quantification as per threshold values, exploration in |

(Contd)

STATE REVIEWS

Table – 2 (Concl'd)

| Agency/ Mineral/ District | Location | Mapping | | Drilling | | Sampling (No.) | Remarks Reserves/Resources estimated |
|---------------------------------|---|---------|-----------------|---------------------|----------|-------------------|--|
| | | Scale | Area (sq km) | No. of boreholes | Meterage | | |
| Chitradurga | Smt. R.Razian Khanum,1:10000.1254 (ML-2557), Dodda Byalodakere Village, Hosadurga Taluka. | | | 14 | 885.0 | 1179 | accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources etc. A total of 0.322 million tonnes of iron ore resources have been estimated with 54.38% Fe, 17.72% SiO ₂ and 3.36% Al ₂ O ₃ at 45% Fe cut-off and 7.328 million tonnes with average grade of 37.80% Fe, 39.53% SiO ₂ and 2.58% Al ₂ O ₃ at 35% Fe cut off. |
| Gold Kolar | Kolar Gold Field (KGF) | 1:1000 | 1.55 | 66 | 1055.80 | 2175 | G1 level of exploration was carried out with the objective of boreholes fixation, preparation of geological map of the mine lease area, to assess the strike and depth continuity of iron ore in the lease area, determination of lumps & fines ratio, determination of mineralised area & associated minerals with quantification as per threshold values, exploration in accordance with Mineral (Evidence of Mineral Contents) Rules-2015 and estimation of resources. A net reserve of 0.985 million tonnes iron ore have been estimated over a strike length of 600 m with average grade of Fe 48.25%, SiO ₂ 17.59% and Al ₂ O ₃ 3.93% at 45% Fe cut-off. Besides, a net reserves of 0.548 million tonnes of manganese ore with 13.66% Mn, 26.32% SiO ₂ and 25.19% Al ₂ O ₃ have been estimated at 10% Mn cut-off. G2 level exploration in Kolar Gold Field (KGF), Kolar was carried out with the following objectives: (i) resources estimation of 6 dumps (except Kennedy's Dump) under the Measured/Indicated Categories, (ii)The exploration of smaller dumps, (iii) re-assessing of existing tonnage and grade, (iv) value addition of BGML assets and (v) firming of gold recovery through beneficiation and recovery of by-products, if any. The study area lied in KGF extending from mine Dump no.13 in the north to Mysuru Mine Dump (Dump No.1) in south. An area of 1.55 sq km was mapped on 1:1000 scale. A total of 66 boreholes were drilled to a cumulative depth of 1,055.80 m. Shallow pitting of 25 cu m was done in 25 pits of dimension 1 m x 1 m x 1 m and 2,175 samples were collected for various analysis. Besides, beneficiation study was also carried out in 5 samples. The resources estimated by 2D grid model through MINEX software in dumps were placed at 32.262 million tonnes with an average grade of 0.75 g/t Au under Indicated Category. The project was taken up by MECL for Ministry of Mines. |

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Production

Gold, iron ore, manganese ore and limestone are the important minerals produced in Karnataka. The value of minor minerals production was estimated at ` 1,321 crore for the year 2017-18.

The number of reporting mines in Karnataka

was 140 during 2017-18 in the case of MCDR Minerals (Table-3).

Mineral-based Industry

The present status of each Mineral-based Industry is not readily available. However, the important mineral-based industries in organised sector in the State are given in Table - 4.

**Table – 3 : Mineral Production in Karnataka, 2015-16 to 2017-18
(Excluding Atomic Minerals)**

(Value in ` '000)

| Mineral | Unit | 2015-16 | | | 2016-17 | | | 2017-18 (P) | | |
|---------------------|--------|--------------|----------|-----------------|--------------|----------|-----------------|--------------|----------|-----------------|
| | | No. of mines | Quantity | Value | No. of mines | Quantity | Value | No. of mines | Quantity | Value |
| All Minerals | | 160 | | 55849293 | 155 | | 68734490 | 140 | | 95012436 |
| Bauxite | t | 2 | 12050 | 5423 | 2 | 386 | 171 | 2 | - | - |
| Chromite | t | 3 | 1808 | 10884 | 3 | 785 | 3768 | 3 | - | - |
| Gold Ore | t | - | 558803 | - | - | 576699 | - | - | 545077 | - |
| Gold | kg | 3 | 1310 | 3178752 | 3 | 1580 | 4316986 | 3 | 1640 | 4738070 |
| Iron Ore | '000 t | 69 | 25036 | 34659850 | 63 | 26483 | 44516153 | 53 | 28724 | 70398115 |
| Manganese Ore | t | 11 | 145623 | 410733 | 9 | 261372 | 1159755 | 9 | 294711 | 1456474 |
| Silver* | kg | - | 122 | 4048 | - | 169 | 6639 | - | 173 | 6609 |
| Graphite (r.o.m.) | t | 1 | - | - | 1 | - | - | - | - | - |
| Kyanite | t | 1 | - | - | 1 | - | - | 1 | - | - |
| Limestone | '000 t | 66 | 27062 | 4325671 | 69 | 29751 | 5475530 | 66 | 30052 | 5155861 |
| Limeshell | t | 2 | 1221 | 1258 | 2 | 4003 | 7779 | 1 | 760 | 1475 |
| Magnesite | t | 2 | 8161 | 39962 | 2 | 8391 | 34997 | 2 | 8419 | 43120 |
| Minor Minerals® | | - | - | 13212712 | - | - | 13212712 | - | - | 13212712 |

Note: The number of mines excludes Minor Minerals.

** Recovered at Raichur and Tumakuru during refining of gold.*

@ Figures for earlier years have been repeated as estimates because of non-receipt of data.

STATE REVIEWS

Table – 4 : Principal Mineral-based Industries in Karnataka

| Industry/plant | Capacity ('000 tpy) |
|--|---------------------|
| Abrasives | |
| Grindwell Norton Ltd, Bengaluru. | NA |
| Sri Sadguru Abrasives Pvt. Ltd, Mache, Distt Belagavi. | 24 (t) |
| Alumina | |
| Hindalco Industries Ltd, Belagavi. | 350 (alumina) |
| Cement | |
| ACC Ltd, Wadi (Wadi & Wadi New), Distt Gulbarga. | 6030 |
| ACC Ltd, Kudithini, Ballari (G). | 1100 |
| ACC Ltd, Thondebhavi, Distt Chikkaballapur (G). | 1660 |
| Bagalkot Cement Industries Ltd, Distt Bagalkot. | 600 |
| Chettinad Cement, Kallur, Distt Kalaburagi. | 2500 |
| Dalmia Cement, Yadwad, Distt Belagavi. | 4000 |
| Heidelberg Cement India Ltd, (Formerly Mysore Cements Ltd) Ammasandra, Distt Tumakuru. | 510 |
| J. K. Cement Ltd, Muddapur, Distt Bagalkot. | 3000 |
| JSW Cement, Vijayanagar, Distt Ballari. | 600 |
| Kesoram Industries, Vasavadatta Cement, Sedam, Distt Kalaburagi. | 5750 |
| Kalaburagi Cement Pvt. Ltd (formerly Vicatsagar) Chatrasala, Distt Kalaburagi. | 2290 |
| Ramco Cement Ltd, Mathodu, Distt Chitradurga. | 290 |
| UltraTech Cement, Raj Shree Cement, Malkhed, Distt Kalaburagi. | 3200 |
| UltraTech Cement, Ginigera, Distt Koppal (G). | 1300 |
| Ceramic | |
| Ceramic Products Ltd, Khanapur, Distt Belagavi. | 5 |
| H&R Johnson (India) Ltd, Hubballi. | 47.72 |
| Murudeshwar Ceramics Ltd, Dharwad. | 115 |
| (Contd) | |

Table - 4 (Contd)

| Industry/plant | Capacity ('000 tpy) |
|--|---|
| The Mysore Spongware Pipes Potteries Ltd, Solandavanahalli, Bengaluru. | 6 |
| Chemical | |
| Solaris Chem Tech Industries Ltd, Bhingana, Distt Uttara Kannada. | 59.4 (caustic soda), 52.3 (Cl), 133.7 (HCl), 24.0 (H ₃ PO ₄) |
| Fertilizer | |
| K. P. R. Fertilizers Ltd Halvarthi, Koppal. | 60 (SSP) |
| Mangalore Chemical & Fertilizers Ltd, Panambur, Mangaluru. | 379.5 (Urea), 260 (DAP), 40 (Complex) |
| Tungabhadra Fertilizers & Chemicals Ltd, Munirabad, Koppal. | 45 (SSP) |
| Iron & Steel | |
| JSW Steel Ltd, Vijayanagar, Distt Ballari. | 9200 (pellets), 720 (pig iron), 10000 (crude/liquid steel), 12950 (sinter) |
| Visvesvaraya Iron & Steel Ltd, Bhadravati, Distt Shivamogga. | 205 (pig iron), 118 (crude/liquid steel), 4.8 (refractory bricks) |
| Sunvik Steels Pvt. Ltd, Jodidevarahally, Distt Tumakuru. | 60 (sponge iron), 60 (TMT bar) |
| Pellets | |
| KIOCL, Mangaluru. | 3500 (pellets), 6700 (conc.), 227 (pig iron) |
| BMM Ispat, Danapur, Distt Ballari. | 2400 (pellets) |
| Xindia Steel, Koppal. | 800 (pellets) |
| Pig Iron | |
| Uni-Metal Ispat Ltd, Ballari. | 75 |
| Kalyani Ferrous Ind. Ltd, Koppal. | 120 |
| Kirloskar Ferrous Industries Ltd, Bevinahalli, Distt Koppal. | 240 |
| Sponge Iron | |
| Agrawal Sponge & Energy (P) Ltd, Kuduthini, Distt Ballari. | 72 |
| Balakundi Premium Steels Pvt. Ltd, Halakundi, Distt Ballari. | 34 |
| (Contd) | (Contd) |

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Table - 4 (Contd.)

| Industry/plant | Capacity ('000 tpy) |
|---|------------------------|
| Bellary Ispat (P) Ltd, Halakundi Distt Ballari. | 33 |
| Ballary Steel & Alloys Ltd, Ballari. | 60 |
| Benaka Sponge Iron Pvt. Ltd, Belagal, Distt Ballari. | 60 |
| Dhruvdesht Metasteel Pvt. Ltd, Hirebaganal, Distt Koppal. | 60 |
| Divya Jyoti Steel Ltd, Taranagar, Distt Ballari. | 30 |
| Embitee Iron & Steel Pvt. Ltd, Ballari. | 60 |
| Gayatri Metals Pvt Ltd, Belagal, Distt Ballari. | 30 |
| Janki Corp. Ltd, Sidiginamola, Distt Ballari. | 180 |
| Haryana Steel and Power, Shanthigrama, Distt Hassan. | 35 |
| Hare Krishna Metallica Pvt. Ltd, Hire Baganal, Distt Koppal. | 75 |
| Hospet Ispat Pvt. Ltd, Allanagar Bagnal Road, Distt Koppal. | 60 |
| Hothur Ispat Pvt. Ltd, Veniveerpur, Distt Ballari. | 60 |
| KMMI Steel Pvt. Ltd, Yerabanahally, Distt Ballari. | 120 |
| Mastek Steels Pvt. Ltd, Halakundi, Distt Ballari. | 105 |
| Noble Distillaries & Powers Ltd, Sirivar, Distt Ballari. | 72 |

(Contd)

Table - 4 (Concltd)

| Industry/plant | Capacity ('000 tpy) |
|---|------------------------|
| PGM Ferro Steel Pvt. Ltd, Hariganadani, Distt Ballari. | 60 |
| Popuri Steels Ltd, Halakundi, Distt Ballari. | 30 |
| Rayon Steel Pvt. Ltd, Veniverapur, Distt Ballari. | 60 |
| Renginemi Steel Pvt. Ltd, Halakundi, Distt Ballari. | 25 |
| Shree Venkateshwara Sponge & Power Ltd, Halakundi, Distt Ballari. | 30 |
| Yashshvi Steel & Alloys Ltd, Halakundi, Distt Ballari. | 30 |
| Ferro Alloys | |
| Dandeli Steel & Ferro Alloys Ltd, Dandeli. | 6 |
| Sandur Manganese & Iron Ore Ltd, Vyasankere Distt Ballari. | 24 |
| S.R. Chemicals & Ferro Alloys Ltd, Honaga, Distt Belagavi. | 0.3 |
| Thermit Alloys Pvt. Ltd, Shivamogga. | 1.2 |
| Petroleum Refinery | |
| MRPL, Mangaluru. | 15000 |
| <i>G; Grinding Unit</i> | |
| <i>Note: Data for fertilizer and cement industries is taken from Indian Fertilizer Scenario, FAI Statistics and Survey of Cement Industry & Directory respectively.</i> | |