



NATURAL RESOURCES ASSESSMENT

Geological Survey of India
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Additional Director General & Head, NM-II

Dated: 29/07/2019

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No. /M-II/FSP Guidelines/GSI/FS 20-21/2019

To,

**The Additional Director General & HoD,
Geological Survey of India
SR/ WR/ ER/ CR/ NR/ NER
Hyderabad/ Jaipur /Kolkata /Nagpur /Lucknow /Shillong**

**Sub: Formulation of Annual Programme of GSI for Natural Resource Assessment (Mission-II)
for the FS 2020 -21**

NOTIFICATION AND GUIDELINES

Sir,

The Annual Programme of GSI for the Field Season 2020-21 commencing from April 2020 is to be formulated immediately at the Regions for Mission-II (IIA & IIB) projects, for which following guidelines may be consulted carefully. This is in addition to the guidelines given by the DDG, PSS, P&M, GSI, CHQ, Kolkata vide letter no. /1/1/FSP/Genl./2020-21/46F dated the 20th June 2019.

While drafting the Annual Programme for 2020-2021 in Project Mode, the following points are to be taken into consideration:

1. Field visits should be taken by the Geoscientist/s before proposing the mineral exploration item to assess the mineral potentiality and workability of the project in case the proposing Geoscientist is not conversant with the area of G4-stage proposal. This may please be followed mandatorily for G2- and G3-stage proposals.
2. All the codes / standard items of Mission-II are to be given in Project mode as per the standard format of GSI OCBIS portal. Formulation and approval through FSPMIS are mandatory.
3. All the FSP programmes of Mission-II (excluding drilling) are to be formulated as per the target norm given in the table (for two geologists) below. However, for drilling items the target has to be fixed as per revised drilling target norm for in-house rigs of GSI.
4. In case of mineral exploration for gold, PGE, REE, an average of 1 km strike length with 100m borehole separation along strike for G3 and a borehole spacing of 200m along strike for basemetal, graphite, tin-tungsten-molybdenum should be considered for the NQT. A wider area must be proposed for LSM & DM for bauxite, limestone, glauconite etc., for acquiring geological continuity of larger area and balancing the work quantum to the field party.
5. To avoid large quantum of exploratory drilling in G3 stage exploration with 100m spacing for gold, PGE, REE at one go without ascertaining the chemical results, it has been suggested initially to carryout 200m spacing of boreholes and after confirming the mineralization with chemical results, infill boreholes with 100m spacing and few second level boreholes are suggested. The ADG & HoD, DDG & RMH-II of the concerned Region and Mission-II HQ., will follow up the matter for speedy chemical analysis to keep the drilling momentum at the site. However, field party is directed to submit the samples regularly and obtain the permission from Mission-II HQ., for close spaced boreholes (infill boreholes of 100m spacing) and second level drilling.

6. The ADG & HoD of a Region along with DDG & RMH-IIs are requested to decide the LSM, DM and Drilling for the remaining commodities like, Sillimanite, Kyanite, Andalusite, Pyrophyllite, Diaspore, Dimension stone, Dolomite, Dunite, Clay etc., ensuring full engagement of a Geoscientific & Drilling team for a period on one year.
 7. In G3 stage investigations, Phase - I, drilling of boreholes should be undertaken by the Region with a wide separation (e.g., 200m separation, G3 stage, gold, PGE, REE investigation) of boreholes along the strike as written against the commodity. After ensuring the existence of mineralization in these boreholes, the 100m infill boreholes and few second level boreholes needs to be justified and appropriate approvals is essentially required from NMH-II.
 8. Mission-II and HoDs of the Regions will ensure the chemical analysis of sparsely spaced boreholes for taking appropriate decisions on close spaced and second level drilling in G3 stage investigations for gold, PGE, REE exploration.
 9. Approval of boreholes for G2 stage will continue as per current practice for all the mineral commodities.
- Suggested NQT for LSM, DM and drilling for the FS 2020-21 onwards:

Target for LSM & DM for FS 2020-21

| Commodity | Geological Environment | LSM on 1:12,500 scale (sq.km) G4 - Stage | DM (G3 stage) | | Drilling in meters | | |
|-----------|---|--|---------------|--------|--|--|---|
| | | | Area (sq.km) | Scale | G3 Stage | | G2 Stage |
| | | | | | Phase - I | Phase - II | |
| Gold | Primary Au mineralization | 100 | 1.0 or more | 1:1000 | First level BHs (60 m vertical depth) to be planned at 200m spacing. | Infilling first level BHs (60 m vertical depth) to be planned at 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). |
| | Placer Au | 100 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| Ni-PGE | Primary Greenstone / Primary Mafic-Ultramafic | 100 | 1.0 or more | 1:1000 | First level BHs (60 m vertical depth) to be planned at 200m spacing. In rare case based on the disposition of MZ, 30m vertical depth may be considered for first level intersection. | Infilling first level BHs (60 m vertical depth) to be planned at 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. In rare case based on the disposition of MZ, 60 m vertical depth may be considered for second level intersection. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). |
| | Supergene Type | 100 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| REE | Primary, Igneous | 100 | 1.0 or more | 1:2000 | First level BHs (60 m vertical depth) to be planned at 200m spacing. | Infilling first level BHs (60 m vertical depth) to be planned at 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). |
| | Secondary Mineralization | 100 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| Basemetal | Primary Deposits (Proterozoic) | 100 | 1.0 or more | 1:2000 | First level BHs (60 m vertical depth) to be planned at 200m spacing. | | First & second level infill boreholes with 100m strike separation and few third level boreholes (180 m vertical depth). |
| | Primary Deposits (Archaean) | 100 | 1.0 or more | 1:2000 | | | |
| Graphite | Regular & Irregular | 100 | 2.0 or more | 1:2000 | | | |
| | Primary mineralization | 100 | 1.0 or more | 1:2000 | | | |

| | | | | | | | |
|----------------------------------|---|-----|-------------|--------|---|-------------------------------------|--|
| Tin, Tungsten, Molybdenum | Secondary deposits (Tin) | 100 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| Iron | Meta-sedimentary & meta igneous terrain | 100 | 2.0 or more | 1:2000 | First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. The separation may be closer for smaller bands based on the field observations and disposition of the bands. | | First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth). |
| Manganese | Meta-sedimentary or Supergene | 100 | 2.0 or more | 1:2000 | First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. | | First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth). |
| Chromite | Meta-sedimentary, meta-igneous | 100 | 2.0 or more | 1:2000 | The separation may be closer for smaller bands based on the field observations and disposition of the bands. | | |
| Limestone | Irregular habit | 150 | 4.0 or more | 1:4000 | | On 400m grid | On 200m grid |
| | Regular habit | 150 | 4.0 or more | 1:4000 | | On 800m grid | On 400m grid |
| Potash / Glaucinite | Irregular habit | 150 | 4 or more | 1:4000 | | On 400m grid | On 200m grid |
| | Regular habit | 150 | 4 or more | 1:4000 | | On 800m grid | On 400m grid |
| Bauxite | Irregular | 150 | 4 or more | 1:4000 | | On 400m grid | On 200m grid |
| | Regular | 150 | 4 or more | 1:4000 | | On 800m grid | On 400m grid |

LSM and DM Targets for Jammu and Kashmir (J&K) and North Eastern Regions (NER)

| Commodity | Geological Environment | LSM on 1:12,500 scale (sq.km) G4 - Stage | DM (G3 stage) | | Drilling in meters | | |
|---------------|---|--|---------------|--------|--|--|--|
| | | | Area (sq.km) | Scale | G3 Stage | | G2 Stage |
| | | | | | Phase - I | Phase - II | |
| Gold | Primary Au mineralization | 50 | 1.0 or more | 1:1000 | First level BHs (60 m vertical depth) to be planned at 150m - 200m spacing. | Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). |
| | Placer Au | 50 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| Ni-PGE | Primary Greenstone / Primary Mafic-Ultramafic | 50 | 1.0 or more | 1:1000 | First level BHs (60 m vertical depth) to be planned at 150m - 200m spacing. In rare case based on the disposition of MZ, 30m vertical depth may be considered for first level intersection. | Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100 m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. In rare case based on the disposition of MZ, 60 m vertical depth may be considered for second level intersection. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). In rare case based on the disposition of MZ, 90 m vertical depth may be considered for third level intersection. |
| | Supergene Type | 50 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |
| REE | Primary, Igneous | 50 | 1.0 or more | 1:2000 | First level BHs (60 m vertical depth) to be planned at 150m - 200m spacing. | Infilling first level BHs (60 m vertical depth) to be planned at 75m - 100m spacing. Two to three second level BHs (120 m vertical depth) along positive profile. | First & second level infill boreholes with 50m strike separation and few third level boreholes (180 m vertical depth). |
| | Secondary Mineralization | 50 | 2.0 or more | 1:4000 | 400m x 400m grid, depth till bedrock. | Infills for making 200m x 200m grid | On 100m x 100m grid. |

| | | | | | | | |
|---------------------------|---|----|-------------|---------|--|--|---|
| Basemetal | Primary Deposits (Proterozoic) | 50 | 1.0 or more | 1:2000 | First level BHs (60 m vertical depth) to be planned at 200m spacing. | | First & second level infill boreholes with 100m strike separation and few third level boreholes (180 m vertical depth). |
| | Primary Deposits (Archaean) | 50 | 1.0 or more | 1:1000 | | | |
| Graphite | Regular & Irregular | 50 | 2.0 or more | 1.:2000 | | | |
| Tin, Tungsten, Molybdenum | Primary mineralization | 50 | 1.0 or more | 1:2000 | 400m x 400m grid, depth till bedrock. | | Infills for making 200m x 200m grid |
| | Secondary deposits (Tin) | 50 | 2.0 or more | 1:4000 | | | |
| Iron | Meta-sedimentary & meta igneous terrain | 50 | 2.0 or more | 1:2000 | First level (30 m vertical depth) boreholes with 200m separation and 3 second level (60m vertical depth) boreholes. The separation may be closer for smaller bands based on the field observations and disposition of the bands. | | First & second level infill boreholes with 100m strike separation and few third level boreholes (90 m vertical depth). |
| Manganese | Meta-sedimentary or Supergene | 50 | 2.0 or more | 1:2000 | | | |
| Chromite | Meta-sedimentary, meta-igneous | 50 | 2.0 or more | 1:2000 | | | |
| Limestone | Irregular habit | 50 | 3.0 or more | 1:4000 | On 200m grid | | On 100m grid |
| | Regular habit | 50 | 3.0 or more | 1:4000 | On 400m grid | | On 200m grid |
| Bauxite | Irregular | 50 | 3.0 or more | 1:4000 | On 150m - 200m grid | | On 100m grid |
| | Regular | 50 | 3.0 or more | 1:4000 | On 400m grid | | On 200m grid |

10. Project formulation is to be initiated from the level of Projects / State Units / Divisions and the programmes are to be scrutinized by respective Regional Mission Head-II. The HoD's of the Region shall evaluate all the programmes in terms of the technical content, availability of man power, budget and logistic requirement and submit the draft FSP to National Mission Head - II for scrutiny and recommendations for approval.
11. The Mission - II project proposals are to be formulated on **TOP PRIORITY** and submitted to NM-II latest by **31st August 2019** through the concerned RMH-II/ HoD after thorough scrutiny with proper justifications.
12. Leasehold areas are to be excluded. Proposals falling forest areas may also be proposed for starting the forest approval process by the Region as the approval from GSI is essentially required for obtaining the forest permission. However, these proposals may have be considered for the next FS after obtaining all the clearances.
13. A number of requests were received for block modification, change in the co-ordinates, change in title, NQT etc during the previous FSPs mainly due to incomplete understanding of the target site. Hence it is advised to ensure the exploration suitability of the area by field visits if not seen by the proposing Geoscientist.
14. Please keep scope for additional 10% of the samples of each project in the NQT to be submitted to the chemical laboratories. The PSS of Regions were to identify the suitable chemical lab for check analysis by interacting with the concerned Lab heads.
15. The Mission-II target assigned to each Region for FS 2020-21, should commensurate with commitments of GSI, which is given by the office of the DDG, PSS, P&M. It's a request from this office that during IPR every Region must come with 10 % additional number of proposals (which will contain G2, G3 and G4 stages programmes) after scrutiny and justifications, so that if any proposal is dropped during IPR, a substitute can be discussed from the list of additional proposals.
16. Emphasis should be given to critical minerals viz., copper, gold, diamond, nickel, REE & RM, PGE, Lead & Zinc & so on., and the strategic minerals viz., tungsten, tin, molybdenum, cobalt, bismuth, lithium, antimony, cadmium, fluorite, germanium, gallium, vanadium etc., while proposing the mineral exploration projects.
17. Possibility of targeting Ga, REE etc in bauxite and gold, vanadium, titanium in BIF as per genetic association should be considered. In addition, new target regions of REE in sediments, peat beds, zones of saprolite etc., and for nickel in ochres formed at basal portions of mafic ultramafic derived laterites should be looked for proposing the projects.


18. While proposing the new items, it should be ensured that there is no overlapping of the mapping area (LSM & DM) to be demarcated even for different commodity. However, mineral exploration to a next stage (G4 to G3 or G3 to G2) for a similar or different commodity can be taken up without duplicating the mapping target on similar scale.
19. The geophysical component has to be incorporated in the NQT with appropriate methodologies for almost all G3 stage exploration. The limestone, bauxite and other bulk minerals are excluded from the approach.
20. Regolith samples & hydrogeochemical samples are to be included in the NQT. These samples are to be collected where alterations are observed in the surface and the number of samples may be fixed depending upon the mineral commodity.
21. The review of the project proposal will be taken up with the State Units through Video Conference from 5th to 15th September, 2019. The concerned Supervisory Officer's will make a detailed presentation of the proposed project with proper justification.
22. In OCBIS, about 4000 characters are allowed as background information in a proposal. In the first paragraph, the previous work of the area may be briefed in about 1000 characters. The mineral potentiality related information of a particular target area worked out by the Geoscientist/s may be explained in 2000 characters. In the last paragraph, another 1000 characters information on proposed work and its components to meet the objectives of the item may be written.
23. Pitting & Trenching: The separation of trenches and pits should be based on the local geological set up, disposition of the mineralised zones and its potentiality. An exercise of coinciding the trenches and pits with the expected borehole profile to be made as it makes the borehole cross-section profiles clearer during resource estimation in addition to planning the boreholes by understanding surface manifestation of mineralization. Close spaced PT may be taken up in the case of highly erratic mineralisation. The planned BH profiles should have the significant surface value (PT or systematic channel / groove samples).
24. Bed Rock Samples (BRS): It includes, channel sample, chip sample, grab sample, groove sample etc collected from the site lithology. The fresh bed rock samples should represent the geological domain of the target Region. The analysis is targeted to geochemical classification of rocks, comparing with the already established fertile lithology, tectonic discriminations, petrogenesis, mineral potentiality etc. Accordingly, specific selection of oxide and trace elements is to be done as per the need. All the targeted elemental/ oxides should be mentioned in the proposal.
25. Mentioning of specific chemical elements for Whole Rock Analysis, BRS, Stream Sediment, Soil etc., is to be made judiciously to optimise the analytical workload. Again, the core samples may be requested for a target element/s in order to enable the Chemical team to give the results within a week for planning subsequent bore hole. Later, the targeted paragenetic assemblage may be obtained from the Lab for further interpretations.

| | |
|----------------------------|---|
| Whole Rock Analysis | Acidic Rocks Major oxides: SiO ₂ , TiO ₂ , Al ₂ O ₃ , MgO, MnO, CaO, Na ₂ O, K ₂ O, FeO (t), P ₂ O ₅ , LOI Trace Elements: Cr, S, Ni, Ba, Rb, Sr, Ga, Zr, Nb, Ta REEs: La, Ce, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Yb, Lu |
| | Intermediate Rocks Major oxides: SiO ₂ , TiO ₂ , Al ₂ O ₃ , MgO, MnO, CaO, Na ₂ O, K ₂ O, FeO (t), P ₂ O ₅ , LOI Trace Elements: Cr, S, Ni, Ba, Rb, Sr, Ga, Zr, Nb, Ta REEs: La, Ce, Nd, Sm, Eu, Gd, Tb, DY, Ho, Er, Yb, Lu |
| | Basic Rocks Major oxides: SiO ₂ , TiO ₂ , Al ₂ O ₃ , MgO, MnO, CaO, Na ₂ O, K ₂ O, FeO (t), FeO, P ₂ O ₅ , LOI Trace Elements: S, Cr, Ni, Sc, V, Cu, Zn, Ga, As, Rb, Sr, Y, Zr, Nb, Ba, Ce, Pb, Th, U, Y, Zr, Nb, Ba REEs: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb |
| | Ultrabasic Rocks Major oxides: SiO ₂ , TiO ₂ , Al ₂ O ₃ , MgO, MnO, CaO, Na ₂ O, K ₂ O, FeO (t), FeO, P ₂ O ₅ , LOI Trace Elements: S, As, Ba, Rb, Sr, Th, Zr, Nb, Y, V, Cr, Ni, Cu, Pb, Zn, Ga, Sc REEs: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu |
| BRS | Lead-zinc: Zn, Pb, Cu, Ag, As, Co, Sb, S, As, Ba, Ni, Ca, Hg, K, Na |

| | |
|---|---|
| (Multi-elemental analysis) & Placer | Tungsten: W, Mo, Zn, Pb, u, Ba, Sb, B, K, S |
| | Gold: Au, As, S, As, Ag, Bi, Co, Cu, Pb, Sb, Be, Mo, Co, Zn, Fe |
| | Copper: Cu, Au, Ag, Pb, Zn, Co, Mo, S, As, Sb, Ca, K, Na, Bi, Ba, Te, Hg, Mn |
| | Molybdenum: Mo, Pb, Cu, U, Zn, Ag, Mo |
| | Manganese: Co, Ni, Mo, Zn, W, As, Ba, V |
| | Laterite/ Bauxite (Mafic-ultramafic protolith): Ni, Co, Fe, Cr, V |
| | Laterite/ Bauxite (acidic protolith): Al, Nb, Ti, Ga, Be |
| | Tin: Sn, W, Ag, Zn, Pb, S, Cu, Mo, Ag |
| | Granitite rocks: Ba, Li, W, Mo, Sn, Zr, U, Th, Ti |
| | Carbonatites: Ti, Nb, Ta, P, F, REE |
| | Alkaline rocks: Ti, Nb, Ta, Zr, REE, F, P |
| | Mafic rock: Ti, V, Sc |
| | Ultramafic rock: Cr, Co, Ni, Cu |
| | Pegmatites: Li, Rb, Cs, Be, REE, Nb, Ta, U, Th, Zr, Hf, Sc |
| Phosphorites: P ₂ O ₅ , U, V, Mo, Ni, Ag, Pb, F | |
| Sedimentary associated with Black shales: U, Cu, Pb, Zn, Cd, Ag, Au, B, Mo, Ni, As, Bi, Sb, V | |
| Secondary Dispersion Media (Multi-elemental) Soil/Stream Sediments/ Groundwater | The paragenetic group including pathfinders in these respective media related to the target mineralization. |
| | Placers (Gold, Tin): Au, Cu, Sn, W |


26. A review meeting is proposed at NM-II, Nagpur between 17th to 22nd of September 2019 (each Region one day) to review the Mission-II project proposals before taking up the Internal Peer Review (IPR) at CHQ, Kolkata.
27. All the DDG & RMH-II's of the Regions along with the Director, RMH-II will make the presentation of the proposed project with proper justification, which will be finalized after the deliberation at this end. The necessary corrections, modifications and suggestions needs to be attended by the concerned Region at NM-II, Nagpur and the finalized project proposal will be recommended to PSS, P&M, CHQ for approval.

All the Geoscientists are advised to carefully go through the guidelines stated above before formulating the programmes.


 (D. Mohan Raj)
 Additional Director General & Head,
 NM-II, GSI, Nagpur

Copy for information to:

1. The ADG, PSS, GSI, CHQ, Kolkata - 16
2. The DDG, P&M, GSI, CHQ, Kolkata - 16
3. The DDG & RMH-II, GSI, SR / WR / ER / CR / NR / NER
Hyderabad / Jaipur / Kolkata / Nagpur / Lucknow / Shillong
4. The ADG, IT (Attn: Director, Geo-data Division), GSI, CHQ, Kolkata with a request to upload the Notification & Guidelines in GSI Portal.


 (D. Mohan Raj)
 Additional Director General & Head,
 NM-II, GSI, Nagpur