

4 Exploration & Development

1 GOVERNMENT'S POLICY

The National Mineral Policy 2008, for non-fuel and non-coal minerals which replaces the National Mineral Policy, 1993 focuses on the various aspects of mineral industry such as: regulation of minerals, role of State in mineral development, survey and exploration, database of mineral resources and tenements, strategy of mineral development, etc. Among other things, it lays strong emphasis on the following:

- * To exploit the country's potential fully, systematic regional and detailed exploration will be carried out using state-of-art techniques in a time bound manner. Zero-waste mining will be the national goal and mining technology will be upgraded to ensure exploration and utilisation of entire run-of-the-mine.
- * To make regulatory environment conducive to private investment, procedures for grant of mineral concessions, such as Reconnaissance Permit, Prospecting Licence and Mining Lease shall be transparent and seamless with security of tenure guaranteed. Prospecting and mining shall be recognised as independent activities with transferability of concessions playing a key role in mineral development.
- * To attract large investments and high technology, a new concession, namely, Large Area Prospecting Licence (LAPL) will be introduced. Duration of all concessions will be rationalised and areas of operations enlarged suitably within each State.
- * IBM will maintain a digitised database comprising a Resource Inventory and a Tenement Registry. The Tenement Registry will give information of leasehold and freehold areas in terms of greenfield, brownfield and relinquished areas, etc. Data filing will be rigorously applied and concession holders will be monitored.

Lock-in arrangement will be assured and the data will be released to prospectors after integration.

- * Prospecting being a high risk venture, access to risk funds from capital markets will be facilitated.

This policy initiative is expected to encourage greater involvement of private sector in survey and exploration of minerals.

The High-Level Committee constituted by the Government of India which brought out the National Mineral Policy, 2008 has recommended amendments to the MMDR Act, 1957 with the purpose of providing necessary initiatives to attract investment and participation of private and public sectors in areas of exploration and exploitation of minerals. In a latest development, the Government of India has uploaded the draft of MMDR Act, 1957 at its website for suggestions and comments, before it is placed in the Parliament for deliberations and accordance of assent.

2 ORGANISATIONS INVOLVED

GSI, AMD, DGMs of various states, public sector companies like NMDC, MECL, MOIL, etc. continued their efforts for surveying, mapping and exploration of new deposits and reassessment of old deposits/ mines during 2006-07 and 2007-2008.

In oil sector, ONGC, OIL and a few joint ventures and private companies were engaged in exploration of onshore and offshore areas.

2.1 IBM

IBM, as a facilitator to the Mineral Industry (a) provides technical consultancy services for conducting feasibility studies, environment impact assessments, environment management plans, etc.; (b) carries out mining research project on need-based aspects of mining; (c) conducts mineral beneficiation studies including mineralogical testing and chemical analysis; and (d) prepares mineral maps.

IBM prepared multimineral leasehold maps, with forest overlays on 1:50,000 scale, totalling 113, during 2006-07 in respect of Karnataka and 120 maps during 2007-08 covering parts of Maharashtra and Tamil Nadu. Forest overlays are prepared in collaboration with Forest Survey of India.

During 2006-07 and 2007-08, the various studies conducted by IBM were 73 and 66 ore dressing investigations, 50,579 and 46,804 chemical analysis, 2,409 and 2,390 mineralogical studies and 21 and 22 in-plant studies, respectively.

Indian Bureau of Mines undertakes preparation of National Inventory of mineral resources on a quinquennial basis. Under this programme, implementation of UNFC system was adopted in 2002 replacing the earlier resource classification based on Indian system. IBM has updated the mineral resources in respect of 65 minerals based on UNFC system as on 1.4.2005.

2.2 GSI

GSI pursued its systematic geological mapping in 2007-08 and had completed about 1,316 sq km large-scale mapping, 33.89 sq km detailed mapping and 69,936 m drilling as against preceding year's achievement of 1,394 sq km large-scale mapping, 31.96 sq km detailed mapping and 70,426 m drilling during 2006-07.

2.2.1 Reserves Established

Reserves/resources established in the course of mineral exploration during 2006-07 are furnished below:

i) About 2,290 million tonnes resources of coal in various coalfields of Chhattisgarh, Madhya Pradesh, Maharashtra and Orissa were estimated.

ii) In Anjanahalli block, a tentative resources of 0.1 million tonne of ore containing 1.65 g/t Au and in Anjanahalli East block 0.38 million tonnes ore containing 1.7 g/t Au were estimated in Tumkur district, Karnataka.

iii) In Rajasthan, about 4.78 million tonnes of gold ore resources containing 1.32 g/t Au were estimated in Delwara West Block, Bhutia gold prospect in Banswara district and in Dugocha block, Udaipur district additional resources of about 0.16 million tonne of gold ore was estimated.

iv) About 1.32 million tonnes base metal resources having 7.6% Zn, 1.73% Pb, 0.75% Cu, 131 ppm Cd and 77 ppm Ag were estimated in Muariya block, Betul district, Madhya Pradesh. In Thanewasna copper prospect Chandrapur district Maharashtra, about 1.13 million tonnes Cu ore having 1.1% Cu for a true width of 3.61 m, were estimated over a strike length of 1.08 km. This is in addition to the resources already established in FS 1979-81. Besides, about 0.35 million tonnes Cu ore resources, with 0.67% Cu was estimated in Duparpeth-Karangi block, Chandrapur district, Maharashtra.

v) A tentative resources of 0.52 million tonnes PGE ore was estimated with Pt + Pd values ranging from 0.52 to 0.93 ppm in Hanumalapura (block A & B), Davangere district, Karnataka.

vi) About 1.97 million tonnes Bauxite resources were estimated in Kadalia block, Keonjhar district, Orissa.

vii) Resources of manganese ore were estimated in Keonjhar district, Orissa, in the various areas viz, NE extension of Lasarda block (2.47 million tonnes ore containing 20 to 36.65% Mn); Lasarda and Pacheri blocks (1.08 million tonnes Mn ore during 2006-07), total resources in these blocks stand to 7.86 million tonnes with average grade of 26.15% Mn; Lasarda North extension block (2.76 million tonnes ore with 25.29% Mn); Kendudihi-Parulipoda block (0.7 million tonnes ore with average 22.27% Mn); and Pacheri south block (0.19 million tonnes ore with average 25.51% Mn).

viii) In Lum-Syrman block, Jaintia hills district, Meghalaya, a total of 280.8 million tonnes limestone resources were estimated.

Reserves and resources established in the course of mineral exploration during 2007-08 are furnished below:

i) About 2,760 million tonnes resources of coal in various coalfields of Andhra Pradesh, Madhya Pradesh and Orissa were estimated.

ii) About 0.09 million tonnes gold ore resources were estimated containing 0.93 g/t Au in Baghmara block, Sonkaran area, Raipur district, Chhattisgarh.

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iii) About 5.36 million tonnes gold ore resources with 2.09 g/t Au were estimated in Delwara West Block Bhukia gold belt Banswara District, Rajasthan. The total gold ore resources in Bhukia area have been augmented from 55.22 million tonnes ore with 1.87 g/t Au to 60.58 million tonnes ore with 1.89 g/t Au.

iv) Reassessment of Copper ore resources was done in Sikar district, Rajasthan in areas viz, Baniwali-ki-Dhani 20.18 million tonnes from 18.17 million tonnes, Kundla-ki-Dhani 2.7 million tonnes from 1.93 million tonnes, Dokan block, 42.41 million tonnes from 16.85 million tonnes; and Dokan north block 19.96 million tonnes from 5.6 million tonnes.

v) About 0.043 million tonnes iron ore resources were estimated in Pathuripeth, Madhyapur area, Keonjhar district, Orissa. In Ghoraburhani, Sundergarh district, Orissa about 6.2 million tonnes iron ore resources having 55 to 60.6% Fe were estimated.

vi) About 1.49 million tonnes flux grade limestone resources were estimated in Nirwa area, Katni district, Madhya Pradesh.

2.2.2 Survey

Marine Survey

GSI continued its offshore geoscientific studies both in Exclusive Economic Zone (EEZ) and Territorial Waters (TW) along the East and West Coasts of India. Surveys in the near-shore zones (00 m - 10 m isobaths) were carried out using hired small mechanical boats.

During 2006-07, a total of fifteen cruises were undertaken using three vessels.

The following marine geoscientific surveys were carried out during 2006-07 Field Season:

1. Three cruises aboard R.V. Samudra Manthan both within and beyond EEZ covered studies on:
 - a) Geomorphological and Tectonic set up of Comorin Ridge off Kanyakumari,
 - b) Bathymetry and Magnetic survey off (i) Kakinada-Visakhapatnam, (ii) Ongole and (iii) Pondicherry-Nagapattinam,
 - c) Monitoring of Barren and Narcondam island volcano.

2. Six cruises aboard R.V. Samudra Kaustubh within the TW off the East coast covered:

- a) Studies on the Seabed Morphology and Depositional Environment off Ganga Delta.
- b) Geotechnical appraisal of the shelf of Nagavalli River mouth, North, North Andhra Pradesh and parametric evaluation of the continental shelf.
- c) Placer Mineral Resource Evaluation in Geotechnical investigation off Mahanadi River and Parametric Evaluation of Mahandi-Dhamra river mouths.
- d) Monitoring of coastal processes and shoreline changes off Godavari Delta-Visakhapatnam Sector.
- e) Mapping of the seabed within the TW off Tamil Nadu Coast (ST-188).

3. Six cruises aboard R.V. Samudra Shaudikama within the TW off the west coast covered

- a) Studies on Geotechnical investigation around the Vengurla Fishing Harbour, Maharashtra,
- b) Mapping of the seabed within the TW off Maharashtra coast (Virar to Santa Cruz), Mumbai.
- c) Parametric studies within the TW off Kerala coast between Azhikod and Ambalapusha ,
- d) Geotechnical investigation off Badagara, Kerala.
- e) Preliminary evaluation of relict sands beyond territorial waters off Kerala coast between Bepore and Kannur.

During 2007-08, a total of fifteen cruises were undertaken using three vessels.

The following marine geoscientific surveys were carried out during 2007-08 Field Season:

1. Eight cruises aboard R.V. Samudra Kaustubh coastal research vessel were launched in the TW covered:

- a) Sea bed morphology and depositional environment off Ganga prodelta area.
- b) Multibeam bathymetry off Chhatrapur, Orissa.
- c) Evaluation of coastal processes and monitoring of shoreline changes off Mahanadi delta.

d) Placer mineral resource evaluation in the TW off Isakalapalem, Andhra Pradesh.

e) Geotechnical investigation and parametric study of the sea bed north of Mahanadi river.

f) Multibeam bathymetry off Chhatrapur & Sonapurapeta.

g) Geotechnical appraisal of inner shelf off Dibbalapalem to Santapalle, North Andhra Pradesh coast.

h) Mapping of sea bed within TW off Tamil Nadu.

2. Seven cruises aboard R.V. Samudra Shaudikama within the TW off the west coast were undertaken. The studies include:

a) Mapping of the sea bed within the gulf of Kachchh off Mandvi, Gujarat.

b) Mapping of the sea bed within the gulf of Kachchh off Okha, Gujarat.

c) Geotechnical appraisal off Murud-Janjira, Maharashtra.

d) Investigation for construction sand within the TW off Ponnani & Chavakkad, Kerala coast.

e) Geotechnical appraisal off Chellanum, Kerala

f) Parametric studies within the TW off Kerala coast between Ambalapuzha and Anjengo (Ambalapuzha- Karunagapalli sector); and

g) Parametric studies within the TW off Kerala coast between Ambalapuzha and Anjengo (Karunagapalli - Anjengo sector).

3. No cruise could be undertaken on board RV Samudra Manthan due to major overhauling of the ship.

Airborne Survey

GSI pursued airborne geophysical surveys for generating database employing magnetic and gamma ray spectrometric techniques. The surveys followed up by data processing, preparation of aerogeophysical maps and interpretations help in ground evaluation and add information to geological maps that would aid prospecting and exploration for minerals. The data from the aerial surveys thus form important backup for refining the geological understanding of an area with focus on identification of

favourable locales of mineralisation, crystal structure, etc.

During 2006-07, aerogeophysical multisensor data was acquired by surveying over an area of 9,035 sq km involving 18,071 line km in Nagpur-Wardha valley area of Maharashtra and 5,353 sq km involving 10,706 line km in Baihar-Katru area in parts of Madhya Pradesh and Chhattisgarh were covered using the Twin Otter Airborne Survey System (TOASS) by GSI.

During 2007-08, aerogeophysical multisensor data was acquired surveying over an area of 31,625 sq km involving 15,992 line km. in western offshore area between Kanyakumari, Tamil Nadu and South of Kannur, Kerala and 1,818 sq km involving 3,636 line km. in Kanker-Dhamtari area in Bastar Craton, Central India, Chhattisgarh were covered using TOASS by GSI.

Since the acquisition and induction of TOASS, a total of 45,2061 line km over an area of 2,403,015 sq km was covered by multisensor surveys involving magnetic, spectrometric, radiometric and electromagnetic methods up to the field season 2007-08, in the following areas: Mamandur (Tamil Nadu), Aladahalli, Gadag, Wajrakarur-Vedavathi basin (Karnataka and Andhra Pradesh), Agartala-Silcher (for ONGC in Tripura and Assam), Ratnagiri (Maharashtra), Siliguri-Guwahati (for ONGC in West Bengal and Assam), Tosham-Singhana (Haryana and Rajasthan), Sukinda-Baripada (Orissa), Bundi-Bharatpur (Rajasthan), Agucha-Malpura-Chaksu (Rajasthan), Moradabad-Bareilly (for OIL in Uttar Pradesh and Bihar), Satyamangalam (Tamil Nadu), Hindoli (Rajasthan), Bhilwara (Rajasthan), Gangapur-Nasirabad (Rajasthan), Chhattisgarh basin (Chhattisgarh and Orissa), Betul-Chhindwara (Madhya Pradesh), Narayanpet-Raichur (Andhra Pradesh), Hungund-Mudhol (Karnataka), Lalitpur (Uttar Pradesh), Mahoba-Panna (Uttar Pradesh and Madhya Pradesh), Nalgonda-Mahaboobnagar (Andhra Pradesh), Bangalore-Penukonda (Karnataka and Andhra Pradesh), Mulbagal-Tambalpalle (Karnataka and Andhra Pradesh), Nagpur-Wardha valley area (Maharashtra) and Baihar-Katru area (Madhya Pradesh and Chhattisgarh).

Ground evaluation of aerogeophysical data with the help of aerial photos and imageries, mostly by detailed mapping, sampling, pitting and trenching, and wherever necessary, by drilling, was carried out in parts of Andhra Pradesh, Chhattisgarh, Orissa and Meghalaya. This exercise was aimed to identify the anomalies and target areas for basemetals, gold and to search for kimberlite/lamprorite bodies.

2.3 MECL

The highlights of exploration carried out by MECL during 2006-07 are given below:

- (i) A total of 51,748 m promotional drilling on behalf of Coal India Ltd, in the state of Andhra Pradesh, Madhya Pradesh and Maharashtra was carried out and about 1,426 million tonnes resources were estimated. A total of 31,843 m contractual drilling on behalf of Tata Steel, NTPC, WCL and JAL was carried out in Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa and West Bengal.
- (ii) About 90 million tonnes of lignite resources were established in Rajasthan and 562 million tonnes in Tamil Nadu.
- (iii) Detailed exploration for base metal was carried out in promising areas of Betul district, Madhya Pradesh, Nagpur district, Maharashtra and Bhilwara, Chittorgarh and Rajsamand districts of Rajasthan. A total of 18,631 m drilling was carried out in 91 boreholes. In Kolari-Bhanori area, Nagpur district, Maharashtra, a total of 3.14 million tonnes resources of zinc ore was estimated with 7.93% Zn. Besides, tungsten resources of 1.3 million tonnes with 0.18% WO₃ was also estimated. In Dariba block, Chittorgarh district, Rajasthan, a total of 2.63 million tonnes ore resources with 0.8% Cu were estimated. In North Sidesar Ridge, Rajsamand district, Rajasthan, a total of 3.84 million tonnes ore resources with 1.60% Pb and 3.76% Zn were estimated over 600 m strike length.
- (iv) Exploration of gold was carried out in Ghari-Dongri area, Balaghat district, Madhya

Pradesh, by drilling 801 m in 5 boreholes. Mineralised vein quartz was established over 2 km strike length.

The highlights of exploration carried out by MECL during 2007-08 are given below:

- (i) For the exploration of coal, MECL conducted a total of about 55,717 m promotional drilling on behalf of Coal India Ltd in the state of Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Maharashtra. A total of 36,163 m contractual drilling on behalf of CMDCL, NTPC, WCL, WBMDTC and OMC was carried out in Chhattisgarh, Jharkhand, Maharashtra, Orissa and West Bengal. About 3,609 million tonnes resources were estimated.
- (ii) For the exploration of lignite, MECL conducted a total of about 37,865 m promotional drilling on behalf of Ministry of Coal and 48,235 m contractual drilling on behalf of NLC in various lignite fields, namely, Neyveli, Barmer and Bikaner, etc. in 2007-08. About 395 million tonnes of lignite resources were established in Rajasthan.
- (iii) Exploration for base metal was carried out in promising areas of Singhbhum (East) and Ranchi districts, Jharkhand and Bhilwara, Chittorgarh, Dausa and Jhunjhunu districts, Rajasthan. A total of 16,167 m drilling was carried out in 70 boreholes. In Sanganer area, Bhilwara district, Rajasthan about 17.21 million tonnes resources of copper ore with 0.32% Cu was estimated. In Devtalai (Phase-II), Chittorgarh district, Rajasthan, a total of 1.58 million tonnes copper ore resources with 1.15 to 1.35 % Cu were estimated.
- (iv) Detailed exploration was carried out in Bhukia (East) block, Banswara district, Rajasthan by drilling 1,763 m in 9 boreholes. Three major gold bearing loads having thickness from 2 to 15 m with average grade of about 2 g/t Au were encountered up to 250 m depth for over 700 m strike length.

3 MINERALWISE EXPLORATION ACTIVITIES

3.1 Petroleum and Natural Gas

The Government of India has formulated a New Exploration Licensing Policy (NELP) to accelerate and expand exploration of oil and gas in the country. A total of 162 blocks have been awarded in various rounds of NELP during 2000-2006. Exploration under NELP has shown positive results with big gas discoveries in Krishna, Godavari and North East Coast basins besides, discoveries in Cambay basin.

3.1.1 ONGC

ONGC continued its operations for exploration of oil and gas. Out of 26 identified sedimentary basins in onshore and offshore areas of the country, exploration was continued in Cambay Basin, Gujarat, Rajasthan, Upper Assam, Tripura in Assam-Arakan foothills and Vindhyan/Gondwana (Madhya Pradesh), Krishna-Godavari (Andhra Pradesh), Cauvery (Tamil Nadu) and in East Coast and West Coast offshore areas.

During 2006-07, ONGC acquired a total of 9,751 GLK/LK of 2D seismic data of which 1,238 GLK is onland and 8,513 LK is in offshore. During the same period, 24,1735 sq km of 3D seismic data was also acquired which included 3,398 sq km in on-land and 20,775 sq.km in offshore areas. ONGC's 87 exploratory wells comprised - 65 wells to a total depth of 149,148 m in onland areas and 22 wells to a total depth of 76,468 in offshore areas.

During 2006-07, 41 new structures were taken up for drilling of which 28 were completed during the year. In addition, 5 prospects taken up in the previous year were also completed in 2006-07. Nine hydrocarbon finds, namely, UD - 1(KG-DWN-9812) & KG-DW-S-1 in KG offshore; Deloli, Mehraj, & Wadsar in Western Onland; Kalyanpur in A&AA, Adichapuram in Cavery onland and SB-14 in Western offshore were made in 2006-07. As a result of these exploratory efforts, ONGC added 169.52 million tonnes of hydrocarbons and 65.56 million tonnes of ultimate reserves in areas under its operations.

During 2007-08, ONGC acquired a total of 8,157 GLK/LK of 2D seismic data of which 996 GLK is on land and 7,161 LK is in offshore. During the same period, 19,359 sq km of 3D seismic data was also acquired which included 4,489 sq km in onland and 14,870 sq km in offshore areas. ONGC drilled 99 exploratory wells which included 71 exploratory wells to a total depth of 167,267 m in onland areas and 28 wells to a total depth of 84,313 m in offshore areas.

During 2007-08, ONGC made 14 new hydrocarbon finds, namely Disanmukh-3, Babejia-1, Kunjaban-2, Sundalbari-2 in Assam and Assam Arakan basin, Karjan-9 in western offshore, B-12-11, B-55-5, BNP-2 & B-7-2 in western offshore, Upddi-1 & East Rangapuram-1, in Krishna Godavari onland, GS-48 in Krishna Godavari offshore, MN-DWN-98/3 A1 (MDW-4A) & MN-DWN-98/3/B (MDW-5) were made during 2007-08. As a result of these exploratory efforts, ONGC added 182.23 million tonnes of hydrocarbons and 63.82 million tonnes of ultimate reserves in areas under its operations.

3.1.2 OIL

(A) Significant discoveries of oil/gas struck by OIL in various districts of Assam, during 2006-07 are given below:

- i) Presence of oil was established in Santi structure within the Lakadong Therria formation in Tinsukia district.
- ii) Baghjan structure in Tinsukia district was discovered during 2002-03. The well produced gas on testing. A fresh drilling on the said structure established presence of hydrocarbon.
- iii) In Tinsukia district, Assam, a well namely, Berekure encountered significant pay of hydrocarbon within Paleocene-Lower Eocene formation. On testing, the well produced commercial oil.

(B) Significant discoveries of oil/gas struck by OIL in various districts of Assam, during 2007-08 are given below:

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| <p>i) Presence of heavy oil was established in two prospective sands in Tipam formation in South Chandmari structure, Tinsukia district,</p> <p>ii) Oil was discovered in lower Tipam sand in Sapkaint structure of Tinali area in Dibrugarh district, Assam.</p> <p>iii) Presence of gas was established in Barail sand, Khatkhati structure in Sivasagar district, Assam.</p> <p>iv) In Eastern part of North Hapjan structure, Tinsukia district, Assam oil was established in Lakadong Therria sand.</p> <p>v) Oil was produced on testing Makum-North Hapjan structure in Tinsukia district, Assam.</p> | <p>vi) Occurrences of Hydrocarbon bearing sand ranges were established in S-W Kathaloni structure, in Dibrugarh district, Assam.</p> <p>vii) Presence of hydrocarbon bearing sand ranges within Barail formation was found in Makum-North Hapjan structure, Dibrugarh district, Assam.</p> <p>viii) Log analysis revealed presence of hydrocarbon bearing sand ranges within Lakadong Therria and Langpar formation, in SW Baghjan structure, Tinsukia district, Assam.</p> |
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The physical achievements of the exploration activities by ONGC and OIL during 2006-07 and 2007-08 are given in Table-1(A) and Table 1(B), respectively.

Table – 1 (A) : Exploration for Petroleum & Natural Gas by ONGC and OIL, 2006-07

Agency/location/State	Seismic Survey		Drilling			
			Exploratory		Development	
	2D(GLKM)	3D(SQKM)	Wells	Meterage	Wells	Meterage
ONGC : Total	9751	24172	87	225616	178	401874
Onland : Total	1238	3398	65	149148	134	276380
Western Region						
Gujarat	102	921	32	57463	96	165801
Rajasthan	81	117	1	3619	-	-
Madhya Pradesh	167	-	-	-	-	-
Eastern Region						
Assam (incl. Nagaland & Meghalaya)	251	232	6	25410	14	58419
Central Region						
Tripura	32	139	1	8502	3	7815
West Bengal	-	48	-	-	-	-
Northern Region						
Himachal Pradesh	51	-	1	2819	-	-
Southern Region						
Andhra Pradesh	554	726	12	25955	15	29501
Tamil Nadu	-	1215	12	25380	6	14844
Offshore : Total	8513	20775	22	76468	44	125494
East Coast Offshore	8172	13654	10	45104	1	1956
West Coast Offshore	341	7121	12	31364	43	123538
OIL						
Onland : Total	1185	923	9	42066	14	52753
Assam & Arunachal Pradesh	357	923	6	34326	13	51739
NEF	57	-	-	-	-	-
Rajasthan	-	-	3	7740	1	1014

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Table – 1(B) : Exploration for Petroleum & Natural Gas by ONGC and OIL, 2007-08

Agency/location/State	Seismic Survey		Drilling			
			Exploratory		Development	
	2D(GLKM)	3D(SQKM)	Wells	Meterage	Wells	Meterage
ONGC : Total	8157	19359	99	251580	224	482227
Onland : Total	996	4488	71	167267	163	308575
Western Region						
Gujarat	103	1241	36	54967	120	199552
Rajasthan	-	181	2	2479	-	-
Madhya Pradesh	67	-	-	-	-	-
Eastern Region						
Assam (incl. Nagaland & Meghalaya)	198	435	11	43830	24	57624
Mizoram	109	-	-	-	-	-
Central Region						
Tripura	36	186	6	11230	1	2552
West Bengal	-	154	-	-	-	-
Bihar	483	-	-	-	-	-
Northern Region						
Uttar Pradesh	-	-	-	3196	-	-
Southern Region						
Andhra Pradesh	-	703	9	31936	12	29157
Tamil Nadu	-	1588	7	19629	6	19690
Offshore : Total	7161	14870	28	84313	61	173652
East Coast Offshore	1907	10815	11	34407	1	939
West Coast Offshore	5254	4055	17	49906	60	172713
OIL						
Onland : Total	2458	1145	6	41580	19	79712
Assam & Arunachal Pradesh	143	918	5	39930	15	69190
NEF	11	227	-	-	-	-
Rajasthan	-	-	1	1650	4	10522

3.1.3 Private Sector

Reliance Industries Ltd, Gujarat State Petroleum Corporation and Videocon Industries Ltd are engaged in petroleum and natural gas exploration. Reliance was the largest acreage holder in private sector. The company had another very successful year in 2007-08. It surpassed its previous records and had 9 offshore discoveries. Of these, 7 were gas discoveries, and one oil discovery and another one contained both oil and gas. These discoveries were across four offshore basins viz, Mahanadi, Krishna, Cauvery and Gujarat-Saurashtra. With these, the inventory of discovered block with Reliance stands at 37 reflecting a success ratio of 63%. In order to assess their commercial values, appraisal process was underway. Information on exploration and development work by other private sector companies is not available.

3.2 Coal

The agencies engaged in exploration for coal during 2006-07 and 2007-08 were mainly GSI, CMPDI, MECL and State Directorates of Geology & Mining.

3.2.1 GSI

The GSI continued its operations for search and assessment of coal resources in the country through regional exploration in coalfields of Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa and West Bengal. An additional resources of 2,290 million tonnes and 2,760 million tonnes of coal have been assessed from the data generated from regional exploration during 2006-07 and 2007-08, respectively.

i) Details of exploration during 2006-07:

In Andhra Pradesh, GSI carried out investigation by drilling mainly in southern part of Godavari coalfield, where seam zones of lower Kamthi formation were intersected in Penaballi and Gattugudem blocks, Khammam district. In Penaballi block seam zone (6.90 m to 20.05 m thick) was intersected between 355.20 m and 495.10 m depth. Besides, queen seam of Barakar formation was also recorded between 528.70 m and 538.80 m depth. In Gattugudem block coal zone was intersected within 600 m depth.

In Chhattisgarh, exploration was continued in Mand-Raigarh, Hasdo-Arand and Tatapani-Ramkola and Bishrampur coalfields.

In Nayadih block of Mand-Raigarh coalfield, ten Barakar coal seams with 0.29 to 8.30 m thickness have been intersected between 70.13 & 411.66 m depth. In Sithra-Kurekela area of the same coalfield, nine Barakar coal seams with 8.41 to 10.20 m thickness have been intersected between 102.39 and 665.28 m depth. In Saidu block, Hasdo-Arand coalfield, four regional coal seams have been intersected within a depth range of 15.58 to 187.94 m having thickness from 1.51 to 9.07 m. In Tatapani-Ramkola coalfield regional coal seams have been established in Reonti block (1.49 to 11.28 m thick) between 289.69 and 493.94 m depth. In Ulia Gamhardih area, in the east of confines of Bishrampur coalfield, Surguja district, coal seams (0.54 to 11.17 m thick) have been intersected between 10.35 m and 171.40 m depth.

In Jharkhand, exploratory drilling was carried out in Brahmani (Dumka district), South Karanpura (Hazaribagh district) and East Bokaro (Bokaro district) coalfields. Four coal seams have been established in Salbadra-Gomarpahari sector. Brahmani coalfield with reported thickness varying from 4 to 58 m. In Gosaipahari-Siulibana block, Brahmani Coalfield, 0.5 to 14 m thick coal seams occurring between 102-604 m depth were recorded. In Pokharia-Paharpur block, Brahmani coalfield, 0.5 to 26.35 m thick coal seams occurring between 205-572 m depth were recorded. In Muditoli block of East Bokaro coalfield, eleven coal seams have been intersected between 352 to 813 m depth. Occurrences of two coal seams have been established in Binja block. South Karanpura coalfield having thickness from 0.84 and 1.5 m and depth range

between 252 and 302 m depth. Three coal seams of thickness 0.6 to 1 m were intersected between 409-440 m depth.

In Madhya Pradesh, GSI continued its efforts for locating superior-grade coal as well as coal with coking propensity in Singrauli, Sohagpur and PENCH valley coal fields.

In Tendudol block, Singrauli coalfield, seven regional Barakar coal seams (0.7 to 16.45 m thick) were intersected between 508.24 and 742.00 m depth. Four coal seams (0.78-5.65 m thickness) of Raniganj formation were intersected between 38.8 and 167.15 m depth. Strike continuity of these seams established for over a strike length of 2 km towards South. In Shahpur and Bicharpur (south) block, Sohagpur coalfield, a number of regional coal seams of thickness varying from 0.44 to 5.06 m were established within 38.6 and 289 m depth. In Maiki block of Sohagpur coalfield two regional Barakar coal seams (1.4 to 6.72 m thick) were also intersected from 406.65 m to 516.30 m depth. In Pathakhuri-Pipariya area, PENCH valley coalfield, boreholes intersected seven horizons (0.65 to 3 m thick) of Barakar formation between 437 and 480 m depth.

In Maharashtra, regional exploration by drilling was carried out in Wardha valley and Kamptee coalfields. In Pipla-Kewalram area, Kamptee coalfield, the Barakar formation was intersected at 249.35 m depth and other coal horizon (2.6 m thick) at 252.6 m depth.

In Orissa, as a result of exploration in Jalatap, Sardhapur (North) and Phulajhari block, Talcher coalfield, ten regional Barakar coal seams (1 to 27.85 m thick) were intersected at depth range from 13.17 to 605.46 m. In Jamujhar-Brahmanbil block of same coalfield, four seams (1.08 to 5.96 m thick) were intersected between 292 and 366 m depth. In Kudanali NE block, four coal seams (0.6 to 2.3 m thick) were intersected between 40.50 and 80.92 m depth. In Kuraloi (A) Block. Ib River coalfield, five regional Barakar coal seams (3.05 to 53.13 m thick) were recorded between 57.30 and 577.61 m depth. Two Raniganj coal seams (3.25 to 2.08 m thick) were also found within 8.2 to 36.60 m depth.

In West Bengal, exploration was carried out in the Raniganj and Birbhum coalfields. In Nabasan

block, Raniganj coalfield seven coal seams were recorded varying in thickness from 0.50 to 4.74 m between 291 and 343 m depth. Besides, in Kapasdanga-Bharkata block, Birbhum coalfield four regional coal seams (40 to 86 m thick) were intersected between depth range of 300 and 720 m.

ii) Details of exploration during 2007-08:

In Andhra Pradesh, GSI continued investigation by drilling mainly in southern sub-basin of Godavari coalfield, in Khamman and West Godavari districts where seam zones of lower Kamthi formation, varying in thickness from 0.50 to 0.85 m were intersected between 71.75 and 304.90 m depth.

In Chhattisgarh, exploration was continued in Mand-Raigarh, Hasdo-Arand and Tatapani-Ramkola coalfields. In Nayadih block of Mand-Raigarh coalfield, ten Barakar coal seams with 0.36 to 8.58 m thickness have been intersected between 124.78 and 364.36 m depth. In Chainpur block of the same coalfield, eleven Barakar coal seams with 0.89 to 12.23 m thickness have been intersected between 40.36 and 726.20 m depth. In Saidu block, Hasdo-Arand coalfield, four regional coal seams have been intersected within a depth range of 65.99 to 212.62 m having thickness from 0.80 to 9.63 m. In Parogia (west) block of same coalfield, 95.30 m drilling was conducted. The work was suspended due to non-availability of forest clearance. In Tatapani-Ramkola coalfield, five regional coal seams have been established in Reonti block (1.48 to 27.33 m thick) between 246.59 to 729.80 m depth.

In Jharkhand, exploratory drilling was carried out in Brahmani (Dumka district), South Karanpura (Hazaribagh district) and East Bokaro (Bokaro district) coalfields. Three coal seams have been established in Pokharia-Poharpur block, Brahmani coalfield with reported thickness varying from 7.30 to 21.25 m between 199.95 and 321.40 m depth. In Gosaipahari-Siulibana block, three coal seams (16 to 27.35 m thick) were recorded between 193.55 and 407.30 m depths. In Muditoli block of East Bokaro Coalfield, one regional Barakar coal seam having 8.2 m thickness was intersected at 1,075 m depth. In Binja block of South Karanpura coalfield, five coal seams (>40 cm thick) were intersected, of which one belonged to Barren measures and other to Barakar formation. The maximum thickness of individual seam was recorded at 1.00 m.

In Madhya Pradesh, GSI continued its efforts for locating superior-grade coal as well as coal with coking propensity in Singrauli, Sohagpur and Pench valley coal fields. In Tendudol block, Singrauli coalfield, four regional Raniganj coal seams (1.22 to 5.64 m thick) were revealed at a shallow depth between 49.21 and 157.10 m. Besides, seven regional Barakar coal seams (1.61 to 4.45 m thick) were also intersected between 476.34 to 719 m depth. In Maiki block of Sohagpur coalfield, three regional Barakar coal seams (1.25 to 3.60 m thick) were also intersected between 399.81 m to 476.85 m depth. Both strike and dip continuity of these coal seams were established for more than one km. In Merkhi block of Sohagpur coalfield, four regional coal seams (1.25 to 2.80 m thick) have established a dip continuity of two km at depth range of 225.55 to 363.70 m. In Bagbardiya block of Pench valley coalfield, five coal horizons (0.25 to 2.50 m thick) were intersected between 371.25 to 381.60 m depths.

In Orissa, as a result of exploration in Jalatap block, Talcher coalfield, three regional Barakar coal seams (7.84 to 35.46 m thick) were intersected at depth range from 432 to 521 m. In Jamujhari-Brahmanbil block of same coalfield, ten seams (<1 to 25.91 m thick) were intersected between 65.30 and 591.15 m depth. In Kudanali NE block five coal seams (2.77 to 31.70 m thick) were intersected between 40.50 and 452.22 m depth. In Kuraloi (A) North Block, Ib River coalfield, five regional Barakar coal seams (1.38 to 39.88 m thick) were recorded between 43.69 and 533.04 m depth. In Piplimal-Khairkuni block five Barakar coal seams (1.71 to 29.57 m thick) were intersected between 17.14 and 265.98 m depths.

In West Bengal, exploration was carried out in the Raniganj and Birbhum coalfields. In Nabasan block, Raniganj coalfield eleven coal seams were recorded varying in thickness from 0.65 to 8.35 m between 558.35 and 657.70m depth. Besides, in Kapasdanga-Bharkata block, Birbhum coalfield one regional coal seams (17.35 m thick) was intersected between depth range of 600.10 and 646.60 m.

The additional resources estimated by GSI in various coalfields during 2006-07 and 2007-08 are given in Table - 2(A) and Table - 2(B).

Table – 2 (A) : Additional Resources Estimated by GSI in Various Coalfields, 2006-07 (Up to June 2007)

(In million tonnes)

State/Coalfield/Block	Additional resources
Chhattisgarh	
(A) Hasdo-Arand Coalfield/Pendrakhi	387.46
Madhya Pradesh	
(A) Sohagpur Coalfield	
(i) Chainpa	99.29
(ii) Malachua	169.24
(B) Singrauli Coalfield/Budher	326.60
Maharashtra	
(A) Wardha Valley Coalfield/ Ashtona - Kothurla - Mangli	73.23
Orissa	
(A) Talcher Coalfield/Tentuloi	1234.32
Total	2290.14

Table – 2 (B) : Additional Resources Estimated by GSI in Various Coalfields, 2007-08 (Up to June 2008)

(In million tonnes)

State/Coalfield/Block	Additional resources
Andhra Pradesh	
(A) Godavari Coalfield/ Bangaruchikala Allapalli	26.00
Madhya Pradesh	
(A) Sohagpur Coalfield/Shahpur	180.00
(B) Singrauli Coalfield/Majhauri (South)	78.00
Orissa	
(A) Ib-River Coalfield	
i) Kuraloi (A)	386.00
ii) ENE of Khaaraiparha	168.00
(B) Talcher Coalfield/Saradhapur	26.00
Total	2760.00

3.2.2 CMPDI

CMPDI in its exploration programme has been laying emphasis on proving power grade and superior grade non-coking coals in CIL and Non-CIL Blocks. Additionally, Promotional Drilling at nominal charges was carried out in North Karanpura and Tawa Valley coalfields.

Detailed exploration is carried out in potential areas identified through Regional/Promotional Exploration. Such blocks are taken up for detailed drilling to bring the reserves into Proved category to increase the confidence level. The Geological Reports of such detailed exploration form the basis of Mine feasibility Studies/Mining Plans and formulation of Project Reports for mining. Some of the Captive Mining block allocatees are also undertaking detailed drilling in blocks allotted to them as per the guidelines of Ministry of Coal (MoC). In addition, the MoC's Plan scheme of detailed drilling in non-CIL Blocks aims at covering exploration of the blocks in order to reduce the time lag between allotment and development of blocks. The scheme is continuing on plan-to-plan basis and it is envisaged to undertake 13.50 lakh metre of drilling in Non-CIL blocks during the XI Plan through CMPDI as well as outsourcing.

During April to December, 2007, CMPDI carried out 105,141 m of promotional drilling and 28,601 m detailed drilling in non-CIL blocks. During April to December, 2008, CMPDI achieved 79,919 m promotional drilling and 36,729 m of detailed drilling in Non-CIL/Captive mining blocks.

3.2.3 MECL

During 2006-07 and 2007-08, MECL carried out regional exploration for coal on promotional as well as contractual basis in different parts of the country. For CIL, promotional work for coal was carried out in areas in Andhra Pradesh, Madhya Pradesh, Chhattisgarh and Maharashtra. About 51,748 m and 55,717 m promotional drilling was carried out respectively, during 2006-07 and 2007-08. MECL carried out exploratory drilling for coal on contractual basis, involving 31,843 m and 36,163 m, respectively, during 2006-07 and 2007-08. The details are given in Tables- 3 (A) and 3(B).

MECL estimated 1,426 million tonnes and 3,609 million tonnes resources of coal in various coalfields as per the geological reports submitted during 2006-07 and 2007-08, respectively. The details are given in Tables - 4 (A) and 4(B).

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Table – 3(A) : Exploratory Drilling for Coal by MECL, 2006-07

State/District	Block/Coalfield	Drilling (m)
A. Promotional-on Behalf of Ministry of Coal		
Andhra Pradesh/ Khammam & West Godavari	Chitalpudi Godavari Valley Coalfield	4896
	Gaveridevipetta Godavari Valley Coalfield	5193
-do-	Paloncha Godavari Valley Coalfield	2314
-do-	Raghavapuram Godavari Valley Coalfield	4151
-do-	Ramnagaram Godavari Valley Coalfield	1658
Madhya Pradesh/ Sidhi	Narwatola, Sohagpur Coalfield	11605
-do-	Naukariya Sohagpur Coalfield	6620
-do-	Naukariya - E Sohagpur Coalfield	9184
Maharashtra/ Nagpur	Hardoli Katol/Kamptee Coalfield	6127
B. Contractual-on Behalf of IISCO		
West Bengal	Ramnagore Raniganj Coalfield	3607
C. Contractual-on Behalf of NTPC		
Chhattisgarh	Tillaipalli Mandraigarh Coalfield	22434
Jharkhand	Parki Parwadih North Karanpura Coalfield	2026
Orissa	Dulunga Ib Valley Coalfield	2202
D. Contractual-on Behalf of WCL		
Madhya Pradesh	Jharna PK Valley Coalfield	715
E. Contractual-on Behalf of JAL		
Madhya Pradesh	Ameliya North Singarauli Coalfield	859
Total		83591

Table – 3 (B) : Exploratory Drilling for Coal by MECL, 2007-08

State/District	Block/Coalfield	Drilling (m)
A. Promotional-on Behalf of Ministry of Coal		
Andhra Pradesh/ Khammam & West Godavari	Chitalpudi Godavari Valley Coalfield	2353
	Gaveridevipetta Godavari Valley Coalfield	362
-do-	Paloncha Godavari Valley Coalfield	68
-do-	Jagareddygudam Godavari Valley Coalfield	6713
-do-	Somavaram Godavari Valley Coalfield	7658
Assam	West of Tirap Makum Coalfield	564
Chhattisgarh	Banai, Mand-Raigarh Coalfield	2501
Madhya Pradesh/ Sidhi	Marwatola Sohagpur Coalfield	182
-do-	Naukariya Sohagpur Coalfield	2968
-do-	Chaka (E of Naukariya) Sohagpur Coalfield	9432
-do-	Naukariya - E Sohagpur Coalfield	33
-do-	Patnar (N of Marwah - II) Sohagpur Coalfield	8147
-do-	Arjuni (N of Marwah - I) Sohagpur Coalfield	9121
Maharashtra/ Nagpur	Hardoli Katol/Kamptee Coalfield	977
-do-	Khapri Katol/Kamptee Coalfield	2576
-do-	Sukhli Katol/Kamptee Coalfield	2063
B. Contractual-on Behalf of CMDCL		
Chhattisgarh	Gare Pelma Mand Raigarh Coalfield	5984

(Contd.)

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Table - 3 (B) (Concl'd.)

State/District	Block/Coalfield	Drilling (m)
C. Contractual-on Behalf of NTPC		
Chhattisgarh	Tillaipalli Mand Raigarh Coalfield	16615
Jharkhand	Parki Parwadih North Karanpura Coalfield	1083
Orissa	Dulunga Ib Valley Coalfield	1135
D. Contractual-on Behalf of WCL		
Madhya Pradesh	Pench PK Valley Coalfield	1071
E. Contractual-on Behalf of WBMDTC		
West Bengal	Kulti Raniganj Coalfield	9070
F. Contractual-on Behalf of APMDC - OMC		
West Bengal	Nuagaori - Teleshahi Talchir Coalfield	1205
Total		91880

Table – 4 (A) : Additional Resources Estimated by MECL in Various Coalfields, 2006-07

(In million tonnes)	
State/Coalfield/Block	Additional resources
Andhra Pradesh	
Godavari Valley Coalfield	
Siddavaram	243.03
Ramnagar	206.11
Madhya Pradesh	
Singarauli Coalfield	
Dongrital Ph. I & II Main Basin	569.04
Orissa	
Jharia Coalfield	
Bijahan block	327.05
Sikkim	
Ranjit Valley Coalfield	
Namchi	73.45
West Bengal	
Raniganj Coalfield	
Mahatadih-Raidih	6.95
Total	1425.63

Table – 4 (B) : Additional Resources Estimated by MECL in Various Coalfields, 2007-08

(In million tonnes)	
State/Coalfield/Block	Additional resources
Andhra Pradesh	
Singareni Coalfield	
Raghavapuram block	696.83
Chhattisgarh	
Mand Raigarh Coalfield	
W of Basin Phatehpur	1546.46
E of Basin Phatehpur	899.89
Madhya Pradesh	
Singarauli Coalfield	
Amelia (N) block	123.25
P.K. Valley Coalfield	
Jharna Extension block	7.35
Sikkim	
Ranjit Valley Coalfield	
Namchi Extension block	27.78
Meghalaya	
Darangiri Coalfield	
Darang block	62.74
Orissa	
Ib Valley Coalfield	
Dulanga block	245.14
Total	3609.44

3.2.4 Singareni Collieries Company Ltd (SCCL)

SCCL carried out detailed explorations covering eight exploratory blocks each during 2006-07 and 2007-08, in Godavari Valley coalfield, Andhra Pradesh. A total of 87,469 m and 79,380 m drilling was achieved and coal reserves of the order of 393.94 million tonnes and 187.20 million tonnes were proved during 2006-07 and 2007-08, respectively.

3.2.5 State Directorates

The details of exploration for coal carried out by the State Directorates of Geology and Mining of various states during 2006-07 and 2007-08 are given in Tables - 5(A) and 5(B).

3.3 Lignite

GSI, MECL, DMG, Rajasthan and GMDC conducted investigation for lignite.

3.3.1 GSI

GSI continued regional exploration in the East Coast lignite fields of Tamil Nadu and the Tertiary sequence in Palana basin, and Nagaur South sub basin, Rajasthan to identify and assess the lignite potentiality.

a) Details of lignite exploration carried out by GSI during 2006-07

In Tiyanur sector, Ramanathapuram district, Tamil Nadu, three regionally persistent lignite seams (0.6 to 13.40 m thick) were intersected within a depth range of 339.8 to 407.0 m. In Tirumangalam sector, Nagapattinam district, five seams having thickness 0.5 to 24.5 m were intersected from 310.0 to 458.3 m depth.

In Rajasthan, one lignite seam of 0.8m thickness was recorded at 105.6 m depth in

Borana East area, Jaisalmer district. Besides, exploration was initiated in Hadda area, Bikaner district and Phalki area, Nagaur and Pali districts.

b) Details of lignite exploration carried out by GSI during 2007-08

In Bogalur block, Ramanathapuram district, Tamil Nadu, two regionally persistent lignite seams (0.5 to 10.90 m thick) were intersected between 316 to 344 m depth.

In Rajasthan, exploration carried in Halda area, Bikaner district, revealed a thin (0.3 m thick) lignite seam at a depth of 137.1 m. In Phalki area, Nagaur and Pali districts, two seams (0.30 and 0.55 m thick) were intersected between 80.05 and 86.85 m depth with strike continuity of 1 km.

3.3.2 MECL

MECL carried out exploration for lignite in Rajasthan and Tamil Nadu and established 652.61 million tonnes and 394.60 million tonnes resources respectively, during 2006-07 and 2007-08 with CVC (calorific value) varying from 1000 to 3000 kcal/kg. Promotional drilling was carried out in Tamil Nadu and Rajasthan. The details of exploratory drilling during 2006-07 and 2007-08 are given in Tables - 6 (A) and 6(B), respectively.

3.3.3 State Directorate

Particulars of exploration carried out by DMG, Rajasthan during 2006-07 and 2007-08 are given in Tables - 7(A) and 7(B), respectively.

3.3.4 GMDC

GMDC carried out exploration for lignite in its Panandhro and Surka (North) lignite mines. Particulars of exploration carried out by GMDC are given in Tables - 7(A) and 7(B), respectively.

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Table – 5 (A) : Exploration for Coal by Various State Directorates of Geology & Mining, 2006-07

State/ District	Location	Geological mapping		Drilling		Remarks
		Area (sq km)	Scale	Boreholes	Meterage	
Assam						
Karbi Anglong	Amlakhi	0.2	-	04	120	One coal seam (0.30 to 2.0 m thick) was encountered in base of sandstone of Jaintia group up to depth of 12.5 m.
Chhattisgarh						
Korba	Saila-Pali area (Saila block)	190	1:50,000	8	1348.65	A total of 11 coal seams of Barakar formation were intersected having G&C grade coal. A total of 195.40 million tonnes coal resources were estimated
Raigarh	Dhaurabhata, Gare Sector - IA	-	-	2	671.45	Coal seams of lower Gondwana (Barakar formation) are exposed in the area. Total 13 coal horizons (0.60 to 16.52 m thick encountered between 104.95 & 325 m depth).
Surguja	Sankargarh	40	1:50,000	3	282	A total of 7 carbonaceous bands were encountered in Barakar formation up to 195.60 m depth. A tentative 41.75 million tonnes resources of F grade coal were assessed.
Jammu & Kashmir						
Udhampur	Around Katla	-	-	01	120	-
Madhya Pradesh						
Anuppur	Rajnagar	-	-	17	2046.20	Production support drilling for CMPDIL was carried out. C & D grade coal horizons were intersected.
-do-	Jamuna-Kotma	-	-	39	3224.35	Drilling for CMPDIL was undertaken. Coal horizons of B to D were proved.
Maharashtra						
Chandrapur	Bhandak-Kesurli	5.5	1:5,000	-	1140.10	About 56.38 million tonnes of resources were estimated so far.
-do-	Kondha (E) block	5.0	1:25,000	-	1170.90	About 44.95 million tonnes of resources were estimate so far.
-do-	Nandori and Nandori South	25.00	1:25,000	-	4796.50	About 29.52 million tonnes resources were estimated. Workable seams (7.25 to 18 m thick) encountered within 106 to 309 m depth.
-do-	Pauna -	4.5	1:5,000	3	472.35	Coal horizon did not intersect.

(Contd.)

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Table - 5 (A) (Concl'd.)

State/ District	Location	Geological mapping		Drilling		Remarks
		Area (sq km)	Scale	Boreholes	Meterage	
Chandrapur	East of Ekarjuna area	45.00	1:25,000	-	2038.55	A total of 56.00 million tonnes resources were estimated so far.
-do-	Takli	-	-	-	1480.70	A total of 4.57 million tonnes resources were estimated.
Nagpur	Shirpur Pipardol	0.32	1:5,000	-	181.10	Five coal seams were intersected between 160.99 and 330.63 m depth.
-do-	Makardhokda Block 5	0.64	1:5,000	-	1083.55	About 10.80 million tonnes resources were estimated.
-do-	Nand-Panjrepar	-	-	-	2493.20	About 5.77 million tonnes reserves were estimated so far.
-do-	Dahegaon-Phukeshwa	0.16	1:5,000	-	326.25	Coal seams ranging in thickness from 0.65 to 2.53 m were located
Nagpur and Wardha	Girad-Siri Bela-Ashta area	-	1:50,000	-	156.5	Three boreholes drilled so far did not intersect coal horizons.
Yavatmal	Dara-Parsoda	-	-	-	378.50	About 2.50 million tonnes resources were estimated.
-do-	Jhari-Jamni Adkoli - Paunar	2.5	1:5,000	-	1531.15	About 4.84 million tonnes resources were estimated.
Wardha	Wadner-Shehapur	1.1 1.44	1:25,000 1:5,000	-	1887.40	About 1.56 million tonnes resources were estimated so far.
Nagaland Tuensang	Block-B of Konya sector of Tuensang coal belt	-	-	-	177	Exploratory drilling in the block intersected two coal seams.
Mon	Mongchen village	-	-	-	-	As a result of preliminary exploration 7 coal exposures were identified, one of which was 6 m thick.
Wokha	Coal bearing areas in district	57	1:50,000	-	-	Two coal seams having thickness 1.4 m and 4.60 m were encountered.
Orissa Angul	Talcher west & Nandira block Talcher coalfield	-	-	14	1264.05	Exploration conducted on behalf of CMPDI. In Talcher West Block seams occur at depth at 85.50 to 121.72 m having 15.55 to 20.40 m thickness. In Nandira block seams (3.88 to 18.90 m thick) occur at depth of 33.12 to 106.65 m.

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Table – 5 (B) : Exploration for Coal by Various State Directorates of Geology & Mining, 2007-08

State/ District	Location	Geological mapping		Drilling		Remarks
		Area (sq km)	Scale	Boreholes	Meterage	
Chhattisgarh						
Korba	Saila-Pali area (Saila block)	25	1:50,000	8	703.6	About 14 coal seams were intersected. A total of 51.15 million tonnes coal resources were estimated.
Raigarh	Dhaurabhata Garae Sector -IA	-	-	2	1562.25	Thirteen coal horizons were intersected. About 42.24 million tonnes coal resources were estimated.
Madhya Pradesh						
Anuppur	Rajnagar	-	-	14	2024.20	Production support drilling for CMPDIL was carried out. Coal horizons of 0.3 to 2.5 m were intersected.
-do-	Jamuna- Kotma	-	-	25	1807.10	Production support drilling for CMPDIL was undertaken. Coal horizons having 0.25 to 7.56 m were encountered
Maharashtra						
Chandrapur	Nandori and Nandor South ,	-	-	-	3982	About 29.11 million tonnes resources were estimated. Workable seams were encountered at a depth range between 105.6 to 309.26 m.
do-	East of Ekarjuna	20	1:25,000	-	2079.2	About 1.40 million tonnes resources were estimated.
-do-	Takli & Wilson	-	-	-	1600.8	A total of 2.36 million tonnes resources were estimated.
Nagpur	Makardhokada block	0.64	1:5,000	-	2748.15	Six coal seams were intersected between 30 and 420 m. About 7.96 million tonnes resources were estimated.
-do-	Nand- Panjrepar	1	1:5,000	-	2753.05	About 3.70 million tonnes resources were estimated.
Yavatmal	Jhari-Jamni Adkoli-Paunar	15 2	1:25,000 1:5,000	-	3225.15	About 4.47million tonnes resources were estimated.
Orissa						
Angul	Talcher west and Jagannath blocks of Talcher coalfield	-	-	12	1834.60	In Talcher west block, seam-I occurs at depth of 86.02 to 170.90 m having 18.66 to 21.05 m thickness. In Jagannath block, seam occurs at a depth of 119.51 & 171.85 m with thickness from 10.0 to 16.7 m.
Jharsuguda	Eastern part of Madhupur block in Ib river Coalfield	2.50	1:4,000	12	195	Coal seams were encountered in seven boreholes. A total 107.33 m bore samples were generated for analysis.

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Table – 6 (A) : Exploratory Drilling for Lignite by MECL, 2006-07

Lignite field/Block	Drilling (m)
A. Promotional-on Behalf of Ministry of Coal	
Neyveli Lignite Field	
Nachiyargudi	2249
Eastern part of Nayveli	460
Thiruvarur	2658
West Coast Lignite Field	
Udipi	438
Barmer Lignite Field	
South of Nimba	6611
Kurla East	6028
Bikaner Lignite Field	
Dosarana	2473
Bigga-Abhaysingpura	2725
Lanadesar Chhota	1730
Jayal	258
B. Contractual-on behalf of NLC	
Neyveli Lignite Field	
Jayamkondam	12032
Bikaner Lignite Field	
Riri	13844
Bithnock	10635
Halda	1349
Surat Lignite Field	
Valia	858
C. Contractual-on behalf of RSMML	
Barmer Lignite Field	
Girla	3242
Jalipa	2630
Total	69782

Table – 6 (B) : Exploratory Drilling for Lignite by MECL, 2007-08

Lignite field/Block	Drilling (m)
A. Promotional-on Behalf of Ministry of Coal	
Neyveli Lignite Field	
Nachiyargudi	7130
Barmer Lignite Field	
East of Kurla	7765
Kagau East	1519
Bikaner Lignite Field	
Bikaner-Palana	12065
Ramsar-Sinthal	7364
Nagau Basin (Scouting)	2023
B. Contractual-on Behalf of NLC	
Neyveli Lignite Field	
Jayamkondam (N&S)	16757
Bikaner Lignite Field	
Riri	1792
Bithnock	4819
Halda	2571
Surat Lignite Field	
Valia	8645
C. Contractual-on Behalf of BLMC	
Barmer Lignite Field	
Jalipa	8651
Total	81101

Table – 7 (A) : Exploration for Lignite by State DMG and State Undertaking, 2006-07

Agency/State District/Location	Mapping		Drilling		Sampling (No.)	Result
	Area (sq km)	Scale	No. of boreholes	Meterage		
DMG, Rajasthan						
Bikaner						
Ambasar, Gigasar	135	1:50,000	19	2769	51	4.12 million tonnes resources of lignite were estimated.
Lakhasar Lumbasar	100	1:50,000	7	1239	29	Carbonaceous clay was encountered in four boreholes. Exploration is continued.
Mokha, Dharnoke, etc.	100	1:50,000	-	-	-	Carbonaceous cuttings were observed in some tube wells located around five km east of village Chak-Vijaysingpura.
Nagaur	100	1:50,000	-	-	-	No indication of lignite was observed.
Ninbri-Chanda- Watana						
Lunitas, Baragaon, etc.	100	1:50,000	-	-	-	Lignite occurrences were found N/V Bargaon and clay occurrences were found N/V Phalki, Bargaon, Basni, etc.
GMDC						
Gujarat						
Kachhh						
Panandhro Village	-	-	-	-	-	Balance geological reserves of lignite estimated at 22 million tonnes and of limestone at 63 million tonnes.

EXPLORATION & DEVELOPMENT

Table – 7 (B) : Exploration for Lignite by State DMG and State Undertaking, 2007-08

Agency/State District/Location	Mapping		Drilling		Sampling (No.)	Result
	Area (sq km)	Scale	No. of boreholes	Meterage		
DMG, Rajasthan						
Barmer						
Uttarlai	120	1:50,000	120	-	3	Occurrences of carbonaceous shale observed. Besides, occurrences of Gypsum bed also observed.
Bhurtiya	18	1,10,000	18			
	1.5	1:2,000	1.5			
Bikaner						
Ambasar, Gigasar, etc.	-	-	12	1689	16	1.19 million tonnes of lignite reserves were estimated.
Ranasar, Pabusar, etc.	-	-	6	921	9	Lignite bed not encountered in boreholes.
Kuchor, Augani, etc.	520	1:50,000	-	-	-	Carbonaceous cutting observed in some tube-wells at the depth of 90 to 140 m.
Bholasar, Saroopdesar, etc.	520	1:50,000	-	-	-	-do-
Jagla-Bhawatsar, etc.	510	1:50,000	-	-	-	Tubewells N/V Mahayon-ki-Dhani and Surpura encountered lignite.
Kolayat Hadlu, etc.	510	1:50,000	-	-	-	One Tubewell N/V Knetolai Bhurj encountered lignite.
Tamil Nadu						
Ramanathapuram						
Bogalur Block	-	-	-	-	-	Two regional lignite seams ranging in thickness from 0.5-10.9 m were intersected within a depth range of 316 m and 344 m.
GMDC, Gujarat						
Bhavnagar						
Surka (N)	-	-	23	328	-	107 million tonnes of lignite reserves. were estimated.
Kachchh						
Panandhro	-	-	1	87.45	-	A total of 14 million tonnes geological reserves of lignite and 63 million tonnes of limestone were estimated.

3.4 Non-Ferrous Metals

BASE METALS

GSI, MECL and State Directorates conducted investigations for copper, lead and zinc ores in different parts of the country during 2006-07 and 2007-08..

3.4.1 GSI

The details of exploration activities carried out by GSI during 2006-07 and 2007-08 are given in Tables - 8(A) and 8(B).

3.4.2 MECL

MECL carried out detailed exploration for base metals in promising areas in the states of Jharkhand, Madhya Pradesh, Maharashtra and Rajasthan. Details of exploration carried out by MECL during 2006-07 and 2007-08 are given in Tables - 9(A) and 9(B).

3.4.3 State Directorate

Investigation of base metals was carried out by DMG, Government of Rajasthan, in selective areas of a number of districts in the State. Details of exploration activities carried out by DMG, Rajasthan during 2006-07 and 2007-08 are given in Tables - 10(A) Table 10(B).

EXPLORATION & DEVELOPMENT

Table – 8 (A) : Exploration for Base Metals by GSI, 2006-07

State/District/ Base Metal	Name of block	Details of exploration	Results
Gujarat			
BASE METAL Panchmahal & Vadodara	Khandia - Masabar and its extension areas	Preliminary investigation for polymetallic sulphide mineralisation by mapping	Presence of chalcopyrite, bornite and galena specks have been reported from the quartz veins in the impure limestone pocket at the old working pit in Masabar area. In course of mapping malachite stains were recorded at different places, especially near quartz veins.
Haryana			
COPPER Mahendragarh	Golwa	Investigation carried out by drilling	A mineralised zone averaging 0.40% Cu x 7.5m and 0.35% Cu x 4.0m has been intersected in the 2nd level borehole GEBH-5 and GEBH-6 respectively at a vertical depth of 120 m, confirming the depth persistence of mineralisation intersected in first level (60 m vertical depth) boreholes. Sulphide mineralisation is visible in the form of specks/disseminations of bornite, chalcopyrite and rarely chalcocite in drill cores.
-do-	N of Gangutana	Preliminary exploration by Channel Sampling	The investigation recorded copper mineralisation averaging 0.39 % Cu x 17.5m and 0.30 % x 12.5m respectively. Six 1st level boreholes at 200 m apart has been planned to intersect sulphide mineralisation at 100m vertical depth.
Madhya Pradesh			
LEAD, ZINC & COPPER Betul	Biskhan	Investigation carried out by drilling	Borehole BK-1 intersected two sulphide rich zones, represented by disseminations and veinlets of sphalerite with chalcopyrite and pyrite, between 22.75 m and 75.00 m depth and 141.50 m and 156.60 m depth. Within the first zone two massive sphalerite bands hosted in biotite rich quartz muscovite schist have been intersected between (i) 41.10m and 41.16 m and (ii) 46.72 m and 46.80 m depths.
-do-	Khari area	Investigation by detailed mapping on 1:2000 scale	The analytical results are awaited.
-do-	Muariya	-	The earlier estimated resource of 0.80 million tonnes has been revised in the final report of area. Now, the total resources of ore has been placed at 1.32 million tonnes with 7.60% Zn, 1.73% Pb, 0.75% Cu, 131 ppm Cd and 77 ppm Ag.
Chhindwara	Belkhedhi	Geological mapping on 1:12,500 scale and bed rock samples	Disseminations of sphalerite, galena and chalcopyrite have been observed in garnetiferous quartz-chlorite-biotite schist.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (A) (Contd.)

State/District	Name of block	Details of exploration	Results
Maharashtra			
COPPER			
Chandrapur	Dubarpeth-Karanji	Exploration by drilling 02 boreholes	The investigation was continued to probe the continuity of mineralisation in depth. Borehole DPG-6 went barren while DPG-7 intersected one copper zone of 1.48 m width and 0.70% Cu. A drill indicated resource of 0.35 million tonnes of ore with an average grade of 0.67% Cu for a true width of 3.63m has been estimated over a strike length of 363 m. This resource is in addition to the already established resource in FS 1979-81.
-do-	Thanewasna	Assessment of copper and associated mineralisation by drilling	A number of copper mineralised zones intersected in boreholes. The maximum value of 3.66% Cu has been recorded between 135.30 m and 137.40 m depth in borehole TWC-1. A drill indicated resource of 1.13 million tonnes of ore with a grade of 1.1% Cu for a true width of 3.61 m has been estimated over a strike length of 1.08 km. This resource is in addition to the resources established during 1978-79.
Chandrapur and Gadchiroli	South extension of Thanewasna block	Preliminary exploration by soil sampling	The investigations revealed absence of any surface evidence for sulphide mineralisation. Analysis of the soil samples from B-horizon on 25 m x 100 m grid indicated feeble values for Cu ranging from 10 ppm to 100 ppm, Pb from 20 ppm to 125 ppm and Zn from 40 ppm to 225 ppm.
Rajasthan			
COPPER, LEAD & ZINC			
Alwar	Todi-ka-Bas	Channel sampling along profile section	Samples analysed 169 ppm to 1600 ppm Cu. SP survey picked up discrete anomalies with limited axis of 100 m to 200 m length over the garnet amphibolite schist.
Chittorgarh	Jabarkiya	Exploration by drilling	The first borehole JBK-1 intersected four zones of chalcopyrite mineralisation with 0.20% to 0.49% Cu and width ranging from 1.0 m to 3.15 m. Stray values of gold between 0.11 g/t and 0.21 g/t have also been recorded.
Dausa	Dogeta-Basri	Channel sampling and analysis	Chemical analysis of channel samples from profile section CS-1 has indicated copper value ranging from 59 ppm to 1500 ppm. SP survey has picked up anomaly of the order of -26 m V. High amplitude magnetic anomaly has also been detected along the same profile. Localised feeble chargeability, resistivity and SP anomalies were detected near old workings.
-do-	Dhani-Basri	Re-estimation of resources	Earlier reported (2004-05) resource of 3.20 million tonnes of copper-gold ore of probable and possible categories with 1.56 g/t gold and 1.09% copper has been recalculated and the present total resource is 3.80 million tonnes with 1.18% copper and 1.53 g/t gold.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (A) (Contd.)

State/District	Name of block	Details of exploration	Results
Jhunjhunu	Manaksas - Jodhpura South Khetri Copper belt	Large scale mapping, sampling and geo- physical survey	IP surveys have picked up three anomaly zones. The central anomaly zone is associated with low resistivity and feeble magnetic anomaly. Another IP anomaly in western part extends for over 400 m strike length and is corroborated by low resistivity, low SP and feeble magnetic signals. Available analytical data of geochemical samples have indicated moderate values of copper.
- do -	Neori West	Investigation by drilling 703.40 m in two boreholes	Pyrite veins, stringers, chunks are present from 194.00m to 252.00 m depth. Specks and stringers of chalcopyrite are present from 326.00 m to 332.55 m depth with 0.3% to 0.5% Cu (V.E.) in borehole NEO-1A.
- do -	Pacheri Kalan, NE of Khetri Copper belt	Investigation by drilling	Pyrite veins and few chalco-pyrites specks were noticed between 218 to 224.45 m depth with 0.20 to 0.30 % Cu.
Pali	Kot area	Mapping on 1:10,000 scale, soil sampling on 200 x 200 m grid	The analytical results of the soil samples are awaited. No surface indication of basemetal mineralisation has been observed in the area.
Rajsamand	Gangas block Jasma-Bhupal Sagar belt	Exploration by drilling	About six mineralised zones having 2 to 9.60 m thickness were recorded in the boreholes. About 0.80 million tonnes ore resources with 0.5% Cu were estimated.
Sikar	Halowala-Johra block(Phase II), South Khetri Copper belt	Exploration by drilling	In borehole HJ-5 a mineralised zone of 6.45 m was intersected with 0.2 to 0.3% Cu.
-do-	Mina-ka-Nangal	Exploration by drilling	Two zones of mineralisation manifested by malachite stains and presence of bornite have been delineated on the surface. Borehole MNH-1 intersected a zone showing disseminations, streaks, stringers of chalcopyrite, pyrite, bornite, covellite intermittently from 73.70 m to 102.50 m depth. The second borehole MNH-2 intersected fine disseminations of chalcopyrite, pyrite and bornite from 60.00 m to 63.00 m depth with 0.2 to 0.3% Cu (VE).

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (A) (Concl'd.)

State/District	Name of block	Details of exploration	Results
Sikar	Panchokharkhara area	Drilling of two boreholes completed. The third borehole is in progress.	The first borehole intersected three mineralized zones; MZ-1 from 17.35m to 23.35 m depth with Cu content varying from 0.13% to 0.30% and silver from 6 ppm to 12ppm, MZ-2 from 61.50 m to 71.50 m depth with Cu content ranging from 0.11% to 0.28% and MZ-3 from 74.50 m to 82.50 m depth with Cu content 0.11% to 0.64% and with Ag from 5 ppm to 7ppm. The second borehole (PKB-2) intersected MZ-1 from 42.50 m to 51.50 m depth and MZ-II from 104.00 m to 156.00 m depth (Cu 0.1% to 0.3% VE). Besides, in between MZ-1 and MZ-2, a zone of bornite has been intersected from 59.50 to 78.50 m depth (Cu content 0.1% to 0.2% V.E.).
-do-	Baleshwar-Dariba belt	Mapping on 1:10,000 scale bedrock sampling and SP surveys	Mineralised zone extends for about 4 km on the western limb and 2 km on the eastern limb with a width of 20 m to 25 m. Analytical results of bed rock samples from the western limb show copper values ranging from 193 ppm to 0.11% and for the eastern limb the value ranges from 163 ppm to 0.39% Cu. SP surveys has reflected an elongated 1.1 km long anomaly zone with corroborating high chargeability and low resistivity over gossans which was earlier probed by drilling.
-do-	Halowala-Johra block, South Khetri Copper belt	Spillover drilling to complete a borehole	In borehole 3, mineralised zones hosted in silicified biotite gneiss and quartz carbonate rock were intersected which are 6.20 m, 9.15 m and 14.50 m wide with 0.43%, 0.2% to 0.5% and 0.5% to 0.8% Cu (V.E.), respectively.
-do-	Baniwala-ki-Dhani Kundla-ki-Dhani, Dokan and Dokan N blocks	Revision of earlier reported resources based on exploration carried out during 2003-04 & 2005-06	In Baniwala-ki-Dhani block, earlier copper ore resource was reported to be 5 million tonnes which has been augmented to 18.17 million tonnes with a grade of 0.45% Cu, thus, there is augmentation of 13.17 million tonnes ore resources in the block. In the Dokan block ore resources has been calculated to be 25.56 million tonnes with a grade of 0.38% Cu. In Dokan North block and Kundla-Ki-Dhani block, ore resources has been calculated as 5.60 million tonnes with 0.30% Cu and 1.93 million tonnes with 0.28% Cu, respectively.
Udaipur	Bara-Sarpatia Block, Parsola area	Drilling of five boreholes	From intersection in the first four boreholes it has been found that the oxidised zone continues with diminishing average width towards depth. In the borehole SBH-5 primary sulphides, mainly pyrite was intersected at the contact between dolomitic marble and Mn-Phyllite at 250 m vertical depth. This yrtiferous zone (about 15m wide) corresponds to the oxidised zone on the surface.

EXPLORATION & DEVELOPMENT

Table – 8 (B) : Exploration for Base Metals by GSI, 2007-08

State/District/ Base Metal	Name of block	Details of exploration	Results
Haryana			
COPPER			
Mahendragarh	N of Gangutana	Exploration by drilling 05 boreholes at 200 m	A low grade copper mineralised zone of 19.50 m, 11.50 m and 14.50 m interval width has been intersected in boreholes GGBH-1, GGBH-2 and GGBH-3 averaging 0.35% Cu, 0.37% Cu and 0.26% Cu respectively. The borehole GGBH-4 has not intersected the mineralised zone. However, boreholes GGBH-5 and GGBH-6 located north of GGBH-4 have intersected 9.0 m and 7.5 m wide zones averaging 0.18% Cu. The mineralisation has been established over a cumulative strike length of 1.4 km. to the north of Gangutana village.
Himachal Pradesh			
LEAD & ZINC			
Solan	Motipur - Narag area	Exploration by drilling & geo-physical survey by SP & IP method	The first borehole intersected sporadic disseminations of galena and pyrite between 21.0 and 58.30 m depth.
Sirmur	Ambola area, Tons Valley	Exploration by drilling & geo-physical survey	The first borehole AS-1, which is in progress, has intersected six mineralised zones in dolomitic marble between 57.15 m and 84.00 m depth. Of the six mineralised zones four are dominant in sphalerite and the remaining two contain both galena and sphalerite. The visual estimation of total metal content (Zn + Pb) in the six zones varies between 2% and 3%.
Madhya Pradesh			
LEAD & ZINC			
Betul	Biskhan - Khari	Exploration by drilling four boreholes to check the strike continuity and depth persistence of mineralisation	The borehole BBKH-1 and BBKH-2 intersected mineralised zone from 49.70 m to 63.70 m (13 m true thickness) with 0.3% Zn and from 120 m to 163 m (43 m true thickness) with 0.5 to 1.5% Zn respectively. Low grade mineralisation, 0.1% to 0.2% Zn (VE), has been intersected in the borehole BBKH-3. Borehole BBKH-4 is under progress.
Chhindwara	Jamgaldehri- Chordongri	Investigation by visual examination and IP/resistivity survey	The investigation revealed the presence of one 600 m x 300 m lensoid body of hydrothermally altered felsic volcanic rock, which is the host for basemetal mineralisation in Betul Belt, to the south of Jangaldehyri village. IP/resistivity surveys revealed resistivity values from 500 to 4000 Ohm-m corresponding to chargeability values of the order of 5 to 18 mV/V.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (B) (Contd.)

State/District	Name of block	Details of exploration	Results
Chhindwara	Khirki, Kaneri and Borkhap areas	Geological mapping, bedrock and soil sampling	During detailed mapping host rock for basemetal mineralisation measuring about 600 m x 70 m has been delineated. Large scale mapping in Borkhap area, 700m west of Borkhap village, revealed the presence of five parallel bands of host rock mainly acid volcanics and its altered variants similar to the host rock of basemetal mineralisation in Betul belt. Soil samples of host rock indicated average Zn values between 300 to 400 ppm.
Maharashtra			
COPPER			
Chandrapur	Dubarpeth-Karanji Block	Exploration by drilling to explore the depth continuity of orebody	The boreholes were planned to intersect the mineralised zone at third level (~180 m) but none of the boreholes showed promising results except presence of sporadic dissemination of sulphide minerals in the mineralised zone. Samples have been sent for chemical analysis.
-do -	Govindpur copper prospects	Geophysical Survey and Soil Sampling	The geophysical resistivity and IP survey carried out at about 150 m north-east of an old working near Govindpur. Analytical results of soil samples have indicated copper values up to 75 ppm and zinc up to 100 ppm.
Meghalaya			
BASE METAL			
Ri-Bhoi	SW of Umpyrtha	Exploration to establish the strike continuity of polymetallic mineralisation intersected earlier in a couple of boreholes.	The area is covered with thick soil. However, biotite gneiss is the dominant lithounit with subordinate sillimanite schist, belonging to Archaean Gneissic Complex. The analytical results of samples are awaited.
Rajasthan			
COPPER, LEAD & ZINC			
Alwar	Todi-ka-Bas area	Drilling in three boreholes	The first borehole has intersected four mineralised zones with (i) 4.05 m x 0.47% Cu, (ii) 1.0 m x 0.24% Cu, (iii) 4.0 m x 0.26% Cu and (iv) 1.0 x 1.12% Cu at 0.2% Cu cut-off between depths 239.85 m and 276.05 m. The second borehole has intersected disseminations, stringers, streaks and occasional fracture filling of pyrite, pyrrhotite, chalcopyrite, bornite, covellite intermittently between 180.95 m and 376.80 m depths. The maximum width of the sulphide zone is 45.40 m (201.50 m - 246.90 m). Samples have been collected and sent for analysis.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (B) (Contd.)

State/District	Name of block	Details of exploration	Results
Bhilwara	Salampura block, pur-Banera belt	Drilling was commenced in the block	The area was being investigated to test the prominent geochemical anomalous zone for Cu,Pb and Zn. extending over a strike length of 1.6 km.
Jhunjhunu	Maota block Central Khetri belt	Large scale mapping, sampling and geochemical survey	The magnetic, SP, IP and resistivity surveys carried out has picked up high chargeability zones with peak values of the order of 33 to 42 mV/V in the sulphide rich zones. The analytical results are awaited.
Pali	Kot area	Bed rock and soil sampling	The analytical results received so far did not indicate presence of any mineralised zone.
-do-	Dhikan block	Geophysical survey and soil sampling to test 1500 m long and 3 to 4 m thick gossan zone with old working	Analytical results of 78 channel samples from 5 profiles covering a strike length of about 500 m indicated presence of Cu from 153 ppm to 0.77% and Zn from 28 ppm to 0.20% over a width varying from 2.50 m to 7.50 m. The geophysical survey indicated a peak IP anomaly corresponding to the low resistivity value of which may be attributed to sulphide mineralisation. The geophysical anomalies corroborated the geochemical anomaly.
Sikar	Mina-Ka-Nangal	Drilling three boreholes	Six boreholes have been completed. First three boreholes drilled in the northern part of the block in 2006-07 intersected the two mineralised zones with fine dissemination of chalcopyrite, pyrite and bornite. However, the three boreholes drilled in the southern part during 2007-08 did not intersect any promising mineralised zone.
-do-	Panchokharkhara	Drilling of three boreholes	Three boreholes drilled in 2006-07 intersected mineralised zone, however the three boreholes drilled in 2007-08 in south-western part of the block did not intersect significant mineralisation.
-do-	Dariba block	Geological mapping and drilling in one borehole	The detailed mapping revealed presence of several discontinuous mineralised zones having malachite stains in siliceous biotite rich marble and amphibole marble with occasional disseminations of dusty chalcopyrite grains and covellite.
-do-	Nimod area	Exploration by drilling and channel sampling to test the earlier established mineralised zones extending for more than 3 km strike length.	The first borehole NBH-1 was planned to test potential of marble with malachite stains along fracture planes. Chemical analytical data of core samples so far received indicated sporadic low (0.1%Cu) values. The borehole NBH-2 drilled in northern strike continuity of NBH-1 intersected feeble mineralisation in amphibole marble, besides, specks of chalcopyrite hosted in dolomitic marble at 223.50 m depth.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 8 (B) (Concl'd.)

State/District	Name of block	Details of exploration	Results
Sikar	Nimod extension block	Exploration by detailed mapping and sampling	In course of detailed mapping, mineralised zone manifested by the presence of bornite, chalcocite, chalcopyrite and pyrite in amphibole marble and dolomitic marble has been observed. The width of the mineralised zone is about 20 m. Analytical results show poor copper, lead and zinc values.
- do -	Mahawa block	Geological mapping and sampling to examine 800 m long and 30 to 35 m wide mineralised zone analysing up to 0.74% Cu delineated during 2005-06	In course of mapping one 10 m-15 m wide zone showing malachite stains in amphibole rich portion of calc-silicate rock has been observed. Analytical results of the samples are awaited.
- do -	Halowala Johra West Block, South Khetri Copper belt	Drilling seven boreholes to examine NW part of a 1200 m long shear zone showing copper-gold mineralisation over a strike length of 350 m in the south eastern end.	The first five boreholes intersected copper zones varying in width from 1.0 m to 16.0 m with metal content from 0.3% to 1.3% Cu and the sixth borehole failed to intersect any significant mineralisation. During the present follow-up investigation in the remaining 600 m strike length in the northwestern end of the shear zone, one more borehole (HJ-7) was drilled which intersected occasional sulphide mineralisation at different depths from 128.50 m to 164.50 m
-do -	Baniwala-ki-Dhani, Kundla-ki-Dhani, Dokan and Dokan N Block	Re-estimation of the resources which were calculated based on the drilling during	In Baniwala-ki-Dhani, earlier copper resources were reported to be 18.17 million tonnes with a grade of 0.45% Cu which have been augmented to 20.18 million tonnes with an overall grade of 0.47% Cu. In Kundla-ki-Dhani block the earlier ore resources of 1.93 million tonnes with 0.28% Cu have now been recalculated to 2.71 million tonnes with an overall grade of 0.37% Cu. In Dokan block ore resources earlier was calculated to be 25.56 million tonnes with a grade of 0.38% Cu. After recalculation the resource is now 42.41 million tonnes with an overall grade of 0.40% Cu. In Dokan North block the earlier resources of 5.60 million tonnes with 0.30% Cu have been recalculated to 19.96 million tonnes with an overall grade of 0.37% Cu.
Udaipur	Beras-wali-ka-Khera, and Anjani-Bedalwa area	Re-evaluation of aerogeophysical anomalies and integrated survey for base metal	In Beras area, mineralisation in the form of chalcopyrite, malachite stains and old workings over dolomitic marble has been traced for about 600 m. The lithological and stream sediment samples collected from Wali ka Khera and Beras have analysed 0.15% to 0.19% Cu and 3% Cu respectively.

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Table – 9 (A) : Exploration for Base Metals by MECL, 2006-07

State/ District	Block	Mapping		Samples collected	Drilling		Remarks
		Scale	Area (sq km)		Bore- holes	Metre- rage	
Jharkhand							
Singhbhum (East)	Ramachandra Pahar	1:1000	1	1112	18	3000	Exploratory drilling has proved occurrences of five lodes. A total of 2.02 million tonnes of ore resources with 0.88% cu was estimated at 5% cut off.
Madhya Pradesh							
Betul	Banskhapa- Piparia Block	1:1000	1	-	6	1250	Exploration activities established presence of lean Pb-Zn mineralisation.
Maharashtra							
Nagpur	Kolari- Bhanori	1:1000	2	942	14	2264	Three major bands of host rock identified over accumulative strike length of 940, within 250 m depth from surface. A total of 3.14 million tonnes of ore reserves with 7.93% Zn was estimated. Besides, tungsten ore resources of 1.36 million tonnes with 0.18% W was also established
Rajasthan							
Bhilwara	Sanganer Prospect	1:2000	5	804	17	2604	Exploratory work established mineralisation over 1500 m strike length within 100 m depth from surface. Thickness of ore zone varied from 2 to 9 m having 1.02 to 1.43% cu.
- do -	Devtalai	1:1000	1	794	17	3003	Exploration work established quartz vein over 700 m strike length within 200 m depth from surface. Thickness of ore zone varies from 1 to 2.5 m having 0.50 to 2.93% Cu.
Chittorgarh	Dariba	1:1,000	1	362	15	2375	Three major lodes were identified, of which central & eastern lodes are promising. A total of 2.635 million tonnes ore resources with 0.80% Cu were estimated.
Rajsamund	North Sidesar Ridge	1:1000	1	960	11	3900	In Block-II majore lodes were identified. A total of 3.84 million tonnes ore resources with 1.60% Pb and 3.76% Zn were estimated over 600 m strike length.
-do-	Latio-ka- Khera	1:2000	0.92	870	11	3235	Occurrences of promising lodes over strike length of 800 m were established. A total of 7.32 million tonnes ore resources with 1.2% Pb and 4.92% Zn were estimated.

EXPLORATION & DEVELOPMENT

Table – 9 (B) : Exploration for Base Metals by MECL, 2007-08

State/ District	Block	Mapping		Samples collected	Drilling		Remarks
		Scale	Area (sq km)		Bore- holes	Metre- rage	
Jharkhand Singhbhum (East)	Dhobani mine area	1:1000	1.25	1500	20	4000	Thickness of lode varying from 3 to 4 m with 0.8 to 1% Cu.
Rajasthan Bhilwara	Sanganer Prospect	-	-	100	2	268	Detailed exploration established 2 to 9 m thick mineralised zone over 1500 m strike length at 100 m depth from the surface. The grade of ore varies from 1.02 to 1.43% Cu.
Chittorgarh	Devtalai (Phase-II)	1:1000	1	794	17	3003	Detailed exploration established quartz vein at 200 m depth from the surface having strike length over 700 m. The grade of ore varies from 0.50 to 2.93% Cu.
Dausa	Dhani- Basri.	1:1000	1	714	16	4215	Two main lodes varying in thickness from 6.17 to 12.60 m with (+)1% Cu were established. Besides presence of gold up to 1 g/t of ore was also recorded.
Jhunjhunu	Satkui Prospect	1:2000	1.5	330	6	2972	About 2 to 3 m thick mineralised zone having 0.80 to 1% Cu were intersected.

Table – 10 (A) : Exploration for Base Metals by DMG, Rajasthan, 2006-07

District	Village	Mapping		Samples	Drilling		Remarks
		Scale	Area (sq km)		Bore- holes	Metre- rage	
Ajmer	Naulakha Tantiya Hathibatta etc.	-	-	187	3	713	Mineralised zones having chalcopyrite, Arsenopyrite, etc. were intersected at places in 3 boreholes. Analysis of core samples showed Cu 5 ppm to 1.62%, Zn 2.5 to 121 ppm, Ag 0.9 to 16 ppm and Au 0.045 to 0.289 ppm.
-do-	Chhachundra, Bandanwara,etc	1:50,000 1:10,000 1:2,000	100 15 1	225	1	280	Analysis of core samples showed Cu 37 ppm to 0.25%, Zn 15 to 4075 ppm, Ag 0.9 to 69 ppm, Au 0.4 to .74 ppm Pb 28 to 962 ppm, and Co 37 ppm to 0.19%.
Bharatpur	Khankhera and Kaiar	1:50,000 1:10,000 1:2,000	50 10 1	12	-	-	Primary indication of copper mineralisation in the form of malachite stains was noticed at Khankhera.
Jaipur	Mord and Javali	-	-	-	1	139	-
Sirohi	Golia and Pipela	1:50,000 1:10,000 1:2,000	100 10 1	328	-	-	Extension of base metal mineralisation has been located in the north and north-east of Golia village.

EXPLORATION & DEVELOPMENT

Table – 10 (B) : Exploration for Base Metals by DMG, Rajasthan, 2007-08

District	Village	Mapping		Samples	Drilling		Remarks
		Scale	Area (sq km)		Bore- holes	Metre- rage	
Ajmer	Naulakha Tantiya etc.	-	-	643	2	628	Ore resources of about one million tonnes containing 1% Cu was estimated.
- do -	Chawandia, Bandarwara, Chhachundra, etc.	1:50,000 1:10,000 1:2,000	100 10 1	63	2	504	Analytical results showed Cu 18 to 5250 ppm, Pb 95 to 284 ppm, Zn 31 to 70 ppm, and Co 22 to 175 ppm.
Alwar	Lohit Isra-ka-Bas, etc.	1:50,000 1:10,000 1:2,000	150 10 1	60	-	-	Base metal indication in the form of melachite and azurite staining was found in the area.
Bhilwara	Kanpura Tonkarwar, Atalpura etc.	1:50,000 1:10,000 1:20,000	150 10 1	122	-	-	-
Chittorgarh	Satola, Bhervi & Dhotapani	1:50,000 1:10,000	150 10	32	-	-	An old working was located in 300 x 10 m area.
Jaipur	Morda, Jawal, etc.	-	-	192	3	396	Analytical results were awaited.
-do-	Ladera, Devpura etc.	1:50,000 1:10,000 1:4,000	110 10 1	44	-	-	Indication of base metals was found in the form of melachite and azurite staining, gossan, etc.
Pali	Jadan, Kharadi, etc.	1:50,000 1:10,000	100 20	5	-	-	Analytical results indicated Pb 1299 ppm, Cu 440 pm, Zn 482 ppm and Ag 17 ppm.
Sikar	Kairpura, Badala etc.	1:50,000 1:10,000 1:4000	100 10 1.1	53	-	-	Base metal indication noted in debris of three wells N/V Banrara and Kairpura.
Sirohi	Pindwara	1:1000 1:2,000	10 1	55	-	-	In the Darvot/Banas river two Gossanised bands found exposed for a length of about 1.5 km.
Udaipur	Kodarwadia Barothi and Savankuri	1:50,000 1:10,000 1:2,000	100 10 2	58	-	-	Analysis of samples showed Cu 16 to 760 ppm, Pb 84 to 500 ppm and Zn 30 to 100 ppm

BAUXITE

3.4.4 GSI

Preliminary appraisal of bauxite resources of Bonai-Keonjhar belt in parts of Keonjhar and Sundergarh districts, Orissa was initiated by GSI in 2003-04 covering Kotalia, Malangtoli and other plateaus. The investigation was completed in 2005-06. During 2006-07, about 1.97 million tonnes resources of bauxite were estimated in Kotalia block over a strike length of 6 km, having average grade of 48.34% Al_2O_3 , 4.04% SiO_2 , 2.5% TiO_2 and 24.54% LOI.

3.4.5 MECL

MECL commenced exploration for bauxite in Lupungpai block in Gumla district, Jharkhand in January 2007. A total of 35 m drilling was carried out in two boreholes. The work was suspended due to law and order problems. Analytical results of 2 boreholes indicated bauxite horizons having 2 to 4 m thickness and Al_2O_3 50-52%.

3.4.6 NALCO

During 2006-07 and 2007-08, National Aluminium Co. Ltd carried out exploration in North Block Part-II and Central Block Sector-I of Panchpatmali bauxite deposit in Orissa by drilling 8,547.48 m. Thickness of bauxite bearing laterite cappings varies from less than 1m to more than 50 m. Average width of the zone is around 800 m. A total of about 15 million tonnes of bauxite reserves was estimated.

3.4.7 State Directorates

During 2006-07, DGM, Chhattisgarh, carried out exploration for bauxite in Bandhatola block of Kabirdham district by mapping 122 sq km and 1.36 sq km areas on 1:50,000 and 1:4,000 scale, respectively. A total of 55 lakh tonnes of bauxite resources was estimated in Duldula and Akalijharia areas. In Pandharia tehsil of Kabirdham district, DGM carried out exploration by mapping 1,770 sq km on 1:50,000 scale and collecting 279 samples. About 25 pockets of bauxite were identified in the area. Tentatively, about 11 million tonnes resources of metallurgical

grade bauxite were estimated. In Patharai Sarbhanga area of Mainpat plateau about 2.04 sq. km area was mapped on 1:5,000 scale and 2,670 m drilling was carried in 246 boreholes. About 6 lakh tonnes bauxite resources having 42 to 55% Al_2O_3 were estimated.

Directorate of Geology, Orissa, carried out exploration for bauxite in Tadapani area near Ramgarh in Koraput district, by mapping 1.47 sq km on 1:2000 scale and collecting 186 samples for geochemical analysis. About 2 to 6 m thick bauxite horizons were identified in the area.

During 2007-08, DGM, Chhattisgarh, continued exploration for bauxite in Bandhatola area of Kabirdham district by mapping 0.34 sq km on 1:4,000 scale and collecting 44 samples. Few occurrences of bauxite were noted. In Pondi area of Kabirdham district, DGM mapped 151.55 sq km. on 1:50,000 scale and collected 74 samples for analysis. Preliminary results showed Al_2O_3 contents varying from 33 to 58.8% in bauxite. In Patharia west area of Surguja district, exploration was carried out by mapping 2.08 sq.km on 1:4,000 scale, drilling 2,078.35 m in 199 boreholes and collecting 758 samples for analysis. About five lakh tonnes bauxite resources having 41 to 54.5% Al_2O_3 were estimated.

In 2007-08, DGM, Maharashtra conducted exploration for bauxite by mapping 46 sq km on 1:25,000 scale in Gangpur area of Kolhapur district. A total of about 2.8 million tonnes of bauxite and 4 million tonnes of laterite resources were estimated.

Directorate of Geology Orissa, carried out exploration in Ushabali plateau in Kandhamal district by mapping 27 sq km and 1.81 sq km on 1:12,500 and 1:2,000 scales and collecting 312 samples for analysis. Bauxite occurrences as blanket below laterite capping were found having thickness from 1 to 8.4 m.

Commissioner of Geology and Mining, Gujarat carried out exploration for bauxite by drilling 411.95 m in 19 boreholes at 400 m grid interval in and around village Bhatia, Jamnagar district. All the boreholes indicated negative result.

3.4.8 BALCO

In 2006-07, BALCO drilled 283 boreholes in Bodai Daldali bauxite mine in Kabirdham district and a total of about 6.3 million tonnes of bauxite reserves at the end of 2006-07 was estimated. Similarly, about 8.97 million tonnes of bauxite reserves at the end of 2006-07 were also estimated in Mainpat bauxite mine in Kabirdham district, Chhattisgarh.

3.5 Ferrous Minerals

CHROMITE

3.5.1 State Directorate

During 2006-07, Directorate of Geology, Orissa, carried out regional exploration in Kakudia, Giringamali and Ragada areas by mapping 40 sq km on 1:25,000 scale and collecting 120 samples. Analysis of few samples showed poor result. In Kalhakata-Sankatpalli area, Keonjhar district, Directorate mapped 53 sq km on 1:25,000 scale and collected 69 samples. Three ultramafic bodies were located without chromite occurrence.

3.5.2 FACOR and OMC

During 2006-07 and 2007-08, FACOR explored their Kathpal and Ostopal chromite mines in Dhenkanal district, Orissa by mapping and drilling. As on 1.4.2008, the total mineable reserves of chromite in Katpal mine was estimated at 2.2 million tonnes and in Ostopal at 52.8 million tonnes.

During 2007-08, OMC carried exploration in South Kaliapani area in Jajpur district, Orissa by detailed mapping of 40 hectares, drilling 1,104 m in 16 boreholes and collecting 100 samples. About 1.2 lakh tonnes reserves were estimated. In Bangur and Baniapank areas of Keonjhar district, Orissa, OMC carried out 55 hectares of detailed mapping, drilled 3,845 m in 5 boreholes and collected 333 samples. About 60,000 tonnes reserves were estimated in Bangur area. However, in Baniapank area no significant ultrabasic rock or chromite was found.

IRON ORE

3.5.3 GSI

During 2006-07, GSI carried out investigation by geophysical survey to delineate magnetite occurrences around Manjos village, Jamui district, Bihar. A dipolar nature of magnetic anomaly has been picked up having 400 m to 800 m width.

In Chhattisgarh, GSI carried out exploration for iron ore in Aridongri area, Kanker district, by detail mapping and drilling. An iron ore body of 550 m strike length and width of 4 m to 5 m with Fe content varying from 57.22 to 69.50% was established.

In Jharkhand, exploration for iron ore in parts of Ghatkuri block within Iron Ore Group (IOG), West Singhbhum district was carried out by mapping 20 sq km and collecting 86 bed rock samples from Lutuburu and Pansiraburu area. Owing to procedural problems in getting forest clearance in a reasonable time frame, drilling could not be taken up in the area. In Chunga, Rajhara and Sokra area in Palamau district, assessment of iron ore was carried out by detail mapping and sampling. Five magnetite bodies of 75 m x 5 m to 100 m x 10 m dimensions associated with amphibolite were sampled.

In Karnataka, GSI continued investigation by drilling for the iron ore in NMDC block in parts of Sandur Schist belt, Bellary district. One borehole intersected four mineralised zones of 1.93 m, 8.60 m, 7.40 m and 1.15 m true width having Fe contents of 58.24%, 62.24%, 58.55% and 59.08% respectively, whereas in another borehole, six mineralised zones of 0.85 m to 12.45 m width having Fe content in the range of 50.58% to 55.65% were intersected. On the basis of surface studies, tentatively about 8 million tonnes iron ore resources with >55% Fe has been assessed. Regional search for iron ore, in parts of Hungund belt, Bagalkot and Bellary districts, was carried out in three blocks namely Kamatagi South block, Kamatagi Southeast block and Kamatagi West block. The work has established nine BIF bands with an average width of 50 m in Kamatagi South block; 13 parallel BIF bands of 20 to 40 m width in

Kamatagi Southeast block, in which third and seventh bands are very rich in hematite; and in Kamatagi West block nine BIF bands of 10 to 30 m width were identified. Regional targeting of iron ore in parts of Gadag belt, Gadag district, was carried out in two blocks namely Block-1 and Block-2. In Block-1 a number of parallel BIF bands of 7 to 8 m width have been identified, whereas in Block -2, two BIF bands of 12 to 15 m width were identified. Iron content was observed to be varying from 50 to 60%.

In Orissa, GSI carried out iron ore investigation in Burhipada, Juang and Pangaposi blocks, north west of Tomka -Daitari belt, Keonjhar district. One borehole intersected iron ore body from 0.00 to 3.0 m, 4.00 to 5.50 m and 8.80 m to 9.60 m depths. Iron ore investigation was continued by drilling in the north west of Tomka-Daitari belt around Pathuripenth-Pathergada area in Keonjhar District. A small iron ore body of 0.5 m to 6.0 m width and 30 m to 200 m length associated with BMQ with 60.75 to 65.50% Fe content has been identified near Ghutang and Pathargada area. Iron ore investigation in the north western parts of Tomka-Daitari belt around Bhoka-Mankadamunda area in Keonjhar district, was carried out. The ferruginous shale near Mankadamunda hill with 300 to 400 m length and 100 to 150 m width showed enrichment of iron content varying from 51.75 to 58.37%.

In Tamil Nadu, investigation for iron ore in four blocks i.e. Valliappanpatti block, Rajampalayam block, Manipudur block and Aniyapurampudur block between Valayapatti and Rajampalayam in Namakhal district, was carried out and samples were collected from banded magnetite quartzite which occurs as linear alternate bands of magnetite and quartzite within garnet pyroxenite gneiss. Out of 38 samples analysed so far, 7 showed more than 40% total Fe and 21 samples have analysed between 35% and 40% Fe. About 14.03 million tonnes of magnetite ore resources with Fe content of 31 to 37% has been assessed.

In West Bengal, GSI carried out geophysical survey for magnetite in Saltora-Mejia block, Bankura district. In 41 traverses a total strike

length of 3.9 km was covered. The survey indicated that all the anomalies are falling in and around Bankura anorthosite complex.

During 2007-08, GSI had taken up preliminary investigation for low grade iron ore in Aridongri area, Kanker district, Chhattisgarh, sponsored by Chhattisgarh Mineral Development Corporation Limited. The mapping revealed three iron ore bands in BIF at the contact of BIF and metapelites. The cumulative strike length of bands mapped was about 1-2 km and its width varied from 2-3 m to as much as 30 m. Analytical results of these three bands indicated Fe content ranging from 58.47% to 69.39%. Alumina and silica are well within permissible limit. Drilling could not be taken up due to non-availability of forest clearance.

In Karnataka, GSI continued exploration during 2007-08 in selected free hold areas of NMDC block in parts of Sandur Schist belt, Bellary district. Drilling has been completed and the exploration has come to an end. Based on 45%, 50%, and 55% Fe cut-off grade, drill-indicated resources have been calculated at 2.98 million tonnes x 56.80% Fe, 2.36 million tonnes x 59.79% Fe, and 2.15 million tonnes x 60.58% Fe respectively (G-3 UNFC system). This includes the resource of 8 million tonnes of iron ore which was given in last year (G-4 UNFC system).

A reconnoitry survey for iron ore resources was taken up in parts of Gadag belt, Gadag district. Few BHQ bands with iron ore pockets near Papanashi Tanda and Singatarayanakere Tanda were identified. In course of the present investigation in Singatarayanakere Tanda a total of eight BHQ bands with 3 km to 5 km length and 4 m to 12 m width have been delineated.

In Orissa, GSI carried out exploration for iron ore in the Ghoraburhani block, Sundergarh district. The iron ore body at Ghoraburhani-Sagasahi area has a total strike length of 1.95 km with 40 m - 250 m surface width. Detailed mapping in Sagasahi area delineated two separate iron ore bands of which the northern band extends discontinuously for about 250 m with surface width varying from 40 m to 70 m and the southern band extends for 500 m with a surface width of 150 m to 250 m. The southern band extends along strike up to Ghoraburhani where drilling has been

carried out. Boreholes drilled so far have intersected iron ore bands varying in thickness from 0.5 m to 49.25 m with 55.37% to 64.37% Fe. A resource of 6.20 million tonnes of iron ore with 55% to 60.60% Fe has been estimated in Ghoraburhani block. In Pathuripenth-Madhyapur area, Kendujhar district, which was explored during FS 2006-07, a resource of 0.043 million tonnes of iron ore has been estimated.

In Rajasthan, six blocks of iron ore deposits in the southeastern part of the Khetri belt in Junjhunu and Sikar districts were identified during aeromagnetic data evaluation followed by geological studies. The blocks are (i) between Papra and Bagholi (ii) Karath (iii) Thoi-Pritampuri (iv) Southwest of Raipur (v) Kalipahari-Tonda and (vi) South of Patan. A cumulative strike length of about 5 km having average width of about 2 m has been evaluated. Magnetite-haematite ore from Bagholi and Karath have analysed 44.10% to 53.80% Fe. XRD analysis of the ores indicated mineralogy of 63% to 98% haematite, up to 37% magnetite and up to 5% goethite. At Pritampuri-Thoi, iron ore bands in micaceous quartzite vary in Fe content between 30.55% and 42.58% while those in calc-silicate with albitite contain Fe up to 35.49%.

In Tamil Nadu, GSI carried out investigation in Tirruvannamalai district, to assess the potential of BMQ bands exposed in Kelur and Chengam for use as iron ore. A total of nine BMQ bands having a cumulative strike length of about 10 km have been identified during large scale mapping in south of Kelur. These bands have been sampled systematically by making grooves across their width at approximately 500m strike interval. Four bands with a cumulative strike length of 2.6 km have been prospected of which three bands with a total strike length of 1 km have assayed average 39% total Fe.

3.5.4 State Directorates

During 2006-07, DGM, Chhattisgarh carried out exploration for iron ore in Bailadila area in Dantewara district by mapping 102 sq km on 1:50,000 scale and collecting 82 samples. About 5 million tonnes iron ore resources were estimated

in the area containing 60-66% Fe. In Rowghat area in Kanker district, DGM conducted mapping on 1:50,000 scale covering 168 sq km area and collected 60 samples. About 15 million tonnes of iron ore resources containing 64 to 66% Fe were estimated. In Aridongri area, Kanker district, DGM carried out exploration by mapping 80 sq km and 0.17 sq km on 1:50,000 and 1:4,000 scales and collecting 60 samples. About 1.10 million tonnes of iron ore resources containing 64 to 68% Fe were estimated in the area. In Chelikama, Bachhrukona, Khara, Nachaniya, etc. areas in Kabirdham and Rajnandgaon, DGM carried out exploration by mapping 101 sq km and 0.5 sq km on 1:50,000 and 1:4,000 scales respectively and collected 281 samples for analysis. Six new localities of iron ore having strike length of about 15 km and width about 5 km were identified. A total of 39.35 million tonnes iron ore resources were estimated. In Pandharia tehsil of Kabirdham district, 1,770 sq km area was mapped on 1:50,000 scale and about 1.15 million tonnes of iron ore resources were estimated.

During 2007-08, DGM, Chhattisgarh carried out six investigations for iron ore in Northern part of Kabirdham and Rajnandgaon districts by mapping on 1:50,000 scales and collecting 388 samples. About 2.83 million tonnes of iron ore resources were estimated in the area.

In 2007-08, Directorate of Geology, Jharkhand, carried out exploration for iron ore in Sasangadh area in Singhbhum (West) district by mapping 4.6 sq km and 0.24 sq km on 1:50,000 and 1:2,000 scales, respectively, and collected 55 samples. About 4.85 million tonnes resources of iron ore were estimated to a depth of 10 m. In Ganalata hill, DGM carried out detailed mapping on 1:2,000 scale covering 3.5 sq km and collected 18 samples. About 156.8 million tonnes of iron ore resources were estimated in the area.

DGM, Karnataka in 2007-08 carried out exploration for iron ore in Melanahalli, C.N. Halli, etc. areas by mapping 100 sq km on 1:50,000 scale and collected 15 samples. About 2 million tonnes of iron ore resources were estimated in the area up to workable depth of 20 m.

DGM, Maharashtra, during 2006-07 and 2007-08 conducted exploration for iron ore in Padve-

Majgaon area of Sindudurg district. Mineralised zone (20 m wide) extending for over a length of 250 m with depth persistence of 50 m was proved in the area.

In 2006-07 and 2007-08, Directorate of Geology, Orissa, conducted exploration for iron ore by mapping and drilling in Dhaltapahar area near Dengula in Sundergarh district. Drilling revealed the thickness of iron ore bands varies between 18.6 and 32.9 m. A total of about 2.65 million tonnes of iron ore resources were estimated. During 2007-08, State Directorate conducted mapping for iron ore exploration on 1:25,000 scale and covered 54 sq km area in Hirapur, Saragurha, etc. areas of Nabrangpur district. Eight iron ore bands of about 20 m average thickness with a cumulative length of 3,850 m were delineated.

In 2006-07, DMG, Rajasthan conducted mapping and sampling for the exploration of iron ore in Bogali, Tonda, etc. areas of Jhunjhunu district and Kharab, Morija-Bonal, etc. areas in Jaipur district. A total of about 46.5 million tonnes resources of iron ore in Jaipur district and about 19.8 million tonnes in Jhunjhunu district were estimated.

3.5.5 NMDC

During 2006-07, NMDC carried out detailed exploration in Bailadila sector, Dantewara district, Chhattisgarh. In Bailadila deposit No. 11 B, core drilling of 1,000 m was carried in nine bore holes. As on 1.4.2007, the total reserves of iron ore was estimated at 190.6 million tonnes (Deposit No.14), 63.1 million tonnes (Deposit No. 11-C), 147.3 million tonnes (Deposit No.11-B) and 247.7 million tonnes (Deposit No.10). During 2007-08, NMDC investigated in Bachel and Kirundurg complex of Bailadila Iron Ore Mine, Dantewara district, Chhattisgarh. A total of 2,976 m was drilled in 30 boreholes. The total iron ore reserve at Deposit No.14 was estimated at 185.95 million tonnes and at Deposit No.11-C at 65.68 million tonnes. In Donimalai Iron Ore Mine, Bellary district, Karnataka, about 720 m drilling was carried out involving twelve boreholes in 2007-08. About 10 million tonnes of iron ore reserves were estimated.

3.5.6 SAIL

During 2006-07 and 2007-08, SAIL carried out exploration in Dalli-Rajahara mine, Durg district, Chhattisgarh by detailed mapping and collecting a total of 121 samples for analysis. Besides, SAIL also drilled one borehole involving 14 m in Gua Iron Ore Mine, Singhbhum (West), Jharkhand. In Bolani Iron Ore Mine, Keonjhar district, Orissa, about 13 sq km area was mapped on 1:2000 scale.

3.5.7 OMC

During 2007-08, OMC carried out detailed exploration for iron ore in their five leasehold areas in Keonjhar district, Orissa. Exploration was carried out by mapping 116 hectares on 1:500 scale, drilling 10,564 m in 564 boreholes and collecting 6,752 samples.

3.5.8 M/s V.M. Salgaocar & Bro. Pvt. Ltd

During 2006-07 and 2007-08, the company carried out detailed mapping on 1:2,000 scale in their leasehold areas at Velguem/Surla mine, Sancordem Malpona mine and Siagao mine, Goa. During exploration, a total of 349.94 hectares area was mapped and 2,003 m drilling was done in 37 boreholes. As on 1.4.2007, total mineable ore reserves estimated were 14.28 million tonnes in Velguem/Surla mine, 9.3 million tonnes in Sancordem-Malpona mine and 10.8 million tonnes in Siago mine.

3.5.9 Mysore Minerals Ltd

In 2006-07, Mysore Minerals Ltd conducted exploration for iron ore in its leasehold area at Jambunathanahalli in Bellary district, Karnataka and estimated a total of 6.05 million tonnes of iron ore reserves.

MANGANESE ORE

3.5.10 GSI

During 2006-07, GSI continued search for potential manganese ore bands/bodies within manganiferous zone/horizon in the eastern part of the Eastern Ghat granulite belt covering parts of Angul, Boudh and Ganjam districts, Orissa.

Three discontinuous patches of manganiferous zone at Boirani and Barsar in the western part, Nuagaon in the eastern part and east of Sapa Pankal in the intervening areas were delineated and sampled. The manganese ore bodies occur associated with garnetiferous quartzite and calc-silicates.

In northeastern extension of Lasarda (Bolani) block, Bonai-Keonjhar belt, Keonjhar district, Orissa, exploration by drilling was continued. Nine boreholes (2 in FS 2006-07) were drilled which intersected six manganese ore zones having 0.50 m to 14.0 m thickness and grade of 20.00% to 36.56% Mn. A resource of 2.47 million tonnes ore is estimated with an average grade of 24.61% Mn.

Manganese ore resources estimated by GSI in 2006-07 in the earlier explored blocks in the state of Orissa are : Lasarda and Pacheri blocks, 1.08 million tonnes with average grade of 26.15% Mn; Lasarda North Extension block 2.76 million tonnes with an average grade of 25.29% Mn; Kendudihi-Parulipada block 0.70 million tonnes with an average grade of 22.27% Mn and Pacheri South block 0.19 million tonnes with an average grade of 25.51% Mn.

During 2007-08, GSI carried out exploration in Orissa, for manganese in Bolani block, Bonai-Keonjhar belt, Keonjhar district. Exploration by drilling has brought out good intersection of ore zones with thickness varying between 0.20 m and 6.10 m in eight boreholes. Total cumulative thickness of such ore zones is 39.30 m. Based on results of eight boreholes drilled in this block, a resource of 0.65 million tonne Mn ore has been estimated at 20% Mn cut off.

In Lasarda North Extension (Bolani) block, investigated during FS 2006-07, an additional resource of 1.365 million tonnes of Mn ore with 20% cut-off having an average grade of 26.42% Mn has been estimated. In addition to this, 0.39 million tonnes of manganese mineralisation with marginal grade (15-20 % Mn) has been calculated in this block.

3.5.11 State Directorate

DMG, Karnataka, carried out exploration for manganese ore during 2007-08, in and around Kellur village, district Gadag by mapping 150 sq km on 1:50,000 scale and collecting 24 samples for analysis. A preliminary assessment of 25,000 tonnes resources was also made in the area to a workable depth of 10 m.

3.5.12 MOIL

During 2006-07 and 2007-08, MOIL carried out 6,330 m exploratory drilling involving 32 boreholes in their seven leasehold areas situated in Balaghat district, Madhya Pradesh and in Bhandara and Nagpur districts, Maharashtra. The reported reserves in their Balaghat, Madhya Pradesh mines were Bharweli (22.01 million tonnes), Dongri Buzurg (8.32 million tonnes) and Tirodi (1.72 million tonnes).

As on 1.4.2008, about 4.63 million tonnes of total reserves was reported in Chikla extension in Bhandara district, Maharashtra. In Nagpur, Maharashtra, MOIL reported in situ reserves as on 1.4.2008 in Kandri (2.24 million tonnes), Gumgaon (5.18 million tonnes) and Beldongri (0.49 million tonnes).

3.5.13 OMC

During 2007-08, OMC carried out detailed exploration in their mines located in Keonjhar district, Orissa. The exploration was carried out by mapping 27 hectares on 1:500 scale, drilling 3,426 m in 95 boreholes, and collecting 1,902 samples for analysis.

3.6 Strategic Metals

MOLYBDENUM

3.6.1 GSI

In Kanigiri area, Prakasam district, Andhra Pradesh, investigation for molybdenum and associated rare earth elements was taken up in 2006-07. The sporadic mineralisation of molybdenum recorded along a north-south trending shear zone in Kanigiri granite near Devangnagar. Bedrock and soil samples have been collected for analysis. The investigation was

continued during 2007-08. Out of 25 samples for which analytical results have been received so far, three samples have indicated 45.49 ppm, 47.65 ppm and 105.40 ppm Mo and rest of the samples showed <5ppm Mo. The potential of the area will be known only after receipt of all the analytical results of the samples.

TUNGSTEN

3.6.2 GSI

During 2006-07, GSI carried out investigation for tungsten around Wyndhamganj and Baghisoti, Sonbhadra district, Uttar Pradesh. Interbanded phyllite and quartzite of the Parsoi Formation of the Mahakoshal Group are intruded by numerous quartz veins. Around Baghisoti, an intrusive body of granite occurs all along the border in which numerous quartz veins have been mapped and sampled. Analytical results are awaited.

3.7 Rare Metals

3.7.1 GSI

During 2006-07, GSI carried out investigation for rare metals in Govindgarh block, Ajmer district, Rajasthan. The strike lengths of pegmatites in the area vary from a few meters to 500 m and width from 0.2 m to 20 m. Apart from ferrysicklerite (Li-bearing phosphate), a few wolframite and columbite-tantalite bearing pegmatites have also been identified. The channel samples collected from Ruparel area analysed Li from 5 ppm to 450 ppm, Cs from 10 ppm to 470 ppm and Rb from 38 ppm to 150 ppm. The channel samples of Pagara analysed 5 ppm to 110 ppm Li, <10 ppm to 350 ppm Cs and Rb from 70 ppm to 1100 ppm. So far, no pollucite has been noticed in the samples.

3.7.2 AMD

During 2006-07, Atomic Minerals Directorate for Exploration & Research (AMD) carried out exploration for Rare Metals and Rare Earths in Orissa and Chhattisgarh. The highlights of works carried out are:

1. Niobium-Tantalum, lepidolite, beryl and corundum bearing pegmatites were located in Badmal-Rampur-Kamalpur tract, Sambalpur district, Orissa.

2. Ilmenite, rutile, niobium-tantalum and cassiterite bearing pegmatites were located in Pujaripara-Katekalyan tract, South Bastar and Dantewada districts, Chhattisgarh.

3. Additional niobium-tantalum reserves were estimated in Kawrgaon-Kot Walgara and Usapora areas, Bastar district, Chhattisgarh.

4. Niobium-tantalum and beryl recovery operations continued in Pandikimal and Jangapara in Jharsuguda district, Orissa and Bodena in Bastar district, Chhattisgarh.

During 2007-08, AMD continued the recovery operations of niobium and beryl in Pandikimal and Jangapara in Jharsuguda district, Orissa and Bodena in Bastar district, Chhattisgarh.

3.8 Beach Sand Minerals

3.8.1 AMD

For ilmenite, rutile, zircon, monazite (including rare earth elements) and other heavy minerals, AMD carried out exploratory surveys in the beach sands of eastern and southern coastal areas in 2006-07 and 2007-08. It completed reconnaissance survey over 45.65 sq km and 134.58 sq km area, respectively, in 2006-07 and 2007-08 and detailed survey over 17.12 sq km area in parts of Orissa, Andhra Pradesh, Tamil Nadu and Kerala in 2006-07. The highlights of the exploration activities are as follows:

2006-07

- (a) Continuation of detailed investigations in beach mineral sand deposit in Brahmagiri, Orissa to upgrade resource category, indicated 8-10% of total heavy minerals (THM).

- (b) Detailed investigations in Narsapur beach mineral sand deposit, East Godavari district, Andhra Pradesh, to upgrade resource category, indicated 5-10% of THM.

- (c) Survey in Athirampattinam area, Tamil Nadu indicated 2-5% of total heavy minerals in beach sand and 5-10% of total heavy minerals in red sand.

2007-08

(a) Exploration along the coastal tract in Sindhudurg district, Maharashtra resulted in identifying two stretches-one with 10-40% THM and second with 5-10% THM.

(b) About 40 inland placer sand bodies identified in Puri district, Orissa contain 2-10% THM. Red sediments in Ganjam district, Orissa have 13-49% THM.

(c) Survey along Ponnai-Beyppore tract in Northern Kerala show THM concentration varying from 4-25%.

3.8.2 GSI

GSI carried out seabed mapping and placer mineral investigations within the territorial waters of India in 2006-07 and 2007-08. The surveys within Territorial Waters (TW) comprised Ganga Delta, off Chhatrapur and Chilka, Puri in Orissa coast, seabed mapping off West Bengal,

3.8.3 State Directorates

During 2006-07 and 2007-08, Directorate of Geology, Orissa, carried out regional assessment covering a coastal length of 1.05 km with average width of 2 km. Geomorphological and land use mapping was conducted on 1:2,000 scale for delineation of placer zone around Udegiri north east sector along Puri coast. The area contains heavy minerals like ilmenite, rutile, zircon, monazite, garnet and sillimanite. In 2006-07 and 2007-08, a total of 4,503 m was drilled in 65 boreholes, covering 7 gridlines with grid density of 150 m along and 30 m across the coast. A total of 4,503 samples were collected at 1 m interval from the boreholes to ascertain the heavy mineral concentration in the area.

In 2007-08, to ascertain potential blocks of heavy minerals concentration, pilot scale sampling along Puri coast from southwest of Brahmagiri up to Astaranga was undertaken. The exploration was

confined to an area extending over a coastal length of 85 km and average width of 2.3 km.

Auger drilling of 805 m has been achieved in 479 boreholes. Analysis of 15 samples resulted in total heavy minerals concentration varying from 8% to 20%. The heavy minerals indicated ilmenite, rutile, zircon, garnet, sillimanite and monazite.

3.9 Platinum Group of Metals**3.9.1 GSI**

In Karnataka, investigation for PGE mineralisation was continued in Hanumalapura (Blocks - A & B) which forms a part of Magyathahalli - Tavaregere - Masanikere mafic - ultramafic complex during 2006-07. So far, a total of 11 boreholes have been completed and a total strike length of 1.8 km mineralized zone has been established (1km during 2005-06 & 800 m in 2006-07). Six boreholes covering a strike length of 1km have indicated a tentative resource of 0.84 million tonnes of PGE ore with Pt + Pd values ranging from 0.50 ppm to 2.93 ppm in which 0.546 million tonnes has been augmented during 2006-07. Another investigation for PGE mineralisation was taken up by GSI, during 2006-07 in the northern part (Block-D) of Hanumalapura block (Block-A) which forms a part of Magyathahalli-Tavaregere-Masanikere mafic-ultramafic complex. One titaniferous-vanadiferous magnetite band associated with talc- chlorite schist, talc-tremolite-chlorite schist, meta-anorthositic gabbro and metagabbroic anorthosite has been identified. Analytical results of bed rock samples are awaited.

Investigation in the mafic - ultramafic complex of Kaiga-Mothimakki - Biroligudda-Suryakalyanigudda areas, Uttar Kannad district, indicated that the major peaks of the area are occupied by gabbro, anorthosite, pyroxenite and vanadiferous magnetite. Analytical results are awaited.

In Tamil Nadu, two investigations of PGE were taken up in 2006-07 one in Chettiyampalayan -

Tasampalayam sector in Sittampundi Layered Ultramafic Complex, Namakkal district; and another in Mettupalaiyam Ultramafic Complex, Solavanur-Velliyankadu sector, Coimbatore and Erode districts. The Chettiyampalayam block has been divided into four sectors (C1, C2, C3 and C4). Six samples out of fourteen collected from C1 sector have analysed high values of PGE ranging from 0.31 ppm to 1.78 ppm. The rest of the samples have analysed PGE values from 0.29 to 1.02 ppm. In Mettupalaiyam Ultramafic Complex the chromiferous pyroxenites, the carrier of PGE mineralisation, occur as lenses, dismembered bands, stringers, veins and veinlets within anorthositic gabbro/gabbro anorthosite over a strike length of 13 km between Solavanur-Kurumbapalayam and Mallanayakkampalayam in Coimbatore and Erode districts. Four such bands have been traced. Trench samples from one band has analysed PGE values from 1.40 to 3.16 ppm.

In Karnataka, GSI continued investigation for PGE mineralisation in Hanumalapura block-A in Davangere district, during the FS 2007-08. Three first series boreholes (HNP-12 to 14) were drilled and the mineralised zone was proved for a total strike length of 2.0 km. Two second series boreholes (HNP-15 & 16) were planned to intersect the mineralised zone at 100 m vertical depth. Due to law and order problem the borehole no. HNP-16 could not be completed and the investigation has been discontinued. In Hanumalapura part of Block-B & Block-C of Tavaregere - Masanikere - Magyathahalli areas, Davanagere district, investigation was carried out by geological mapping, trenching and sampling. Variants of mafic-ultramafic complex were brought out and bedrock samples collected. Analytical results were awaited. Due to law and order problem, the work has been discontinued.

In the mafic-ultramafic complex of Kaiga-Mothimakki-Biroligudda-Suryakalynigudda areas, Uttar Kannad district, investigation was continued during FS 2007-08. At places, gabbro - ultramafic variants with sulphide disseminations

were recorded and samples collected. Analytical results were awaited.

During 2007-08, GSI continued investigation for platinoid group of elements mineralisation in Mettupalaiyam Ultramafic Complex, Solavanur-Karappadi sector, Coimbatore and Erode districts, Tamil Nadu. In Solavanur Block, where samples from one trench in metapyroxenite band yielded 1.39-3.15 ppm (Total Pt, Pd, Rh, Ir, Ru), systematic exploration was carried out by detailed mapping, trenching and sampling. Total three parallel metapyroxenite bands have been delineated in the area. The central band II represents the main metapyroxenite with malachite encrustations. This mineralised metapyroxenite band has been traced for a strike length of more than 900 m with maximum width of 7 m. Moderate PGE values, 0.24 ppm Pt and 0.52 ppm Pd for 225 m over a width of 6.0 m was delineated. Maximum PGE value recorded was 0.27 ppm Pt and 0.86 ppm Pd.

Investigation initiated in FS 2006-07 in Chettiyampalayam block Namakkal district, Tamil Nadu was continued during FS 2007-08. Based on the available analytical data a prominent mineralised zone has been traced for about 900 m strike length. The average grade/width of this zone is 1.68 ppm (Pt+Pd)/1.55 m in the eastern part, 1.11 ppm (Pt+Pd)/2.20 m in the central part and 0.70 ppm (Pt+Pd)/1.20 m in the western part.

In Uttar Pradesh, during 2007-08, GSI carried out preliminary investigation for PGE and associated minerals in Kakarwaha area, Lalitpur district.

3.9.2 State Directorates

DGM, Nagaland, during 2006-07, carried out exploration for PGE in the ophiolite belt, gabbroic, ultramafites and volcanic rocks by sampling around Ziphu-Moke-Changsulizu nala and New Thewati-Layati nala and altogether 45 samples were sent to IBM, Nagpur for analysis.

During 2007-08, DGM, Chhattisgarh, carried out reconnaissance survey for search of high

value minerals in mafic and ultra-mafic rocks. A total of 530 sq km was surveyed on 1:50,000 scale, and collected 175 samples in Kondagaon-Pharasaon area, Bastar district. No significant mineralisation has been observed in the area.

DGM, Uttar Pradesh, during 2007-08, carried out exploration for PGE in Ikona-Dangli area, Lalitpur district. Incidence of platinum and palladium along with iridium and rhodium have been recorded within Precambrian mafic/ultramafic complex. At Ikona, peridotite and associated rocks form continuous E-W trending bodies with width between 80-90 m extending up to 2 km. The analyses of 100 samples indicated presence of four PGE zones in boreholes IKBH-1, 2, 3. Two zones of 3.23 m and 6.66 m thickness were found in IKBH-1 at 25 m and 32 m depth with average concentration of 1.63 ppm PGE in the former and 2.74 ppm in the latter, while one mineralised zone is found in IKBH-2 of 20.54 m thickness with average PGE values of 3.39 ppm. Borehole IKBH-3 contains one mineralised zone of 10.57 m thickness at a depth of 62 m having average 4.27 ppm of PGE. A total of 577 samples from IKBH-3 and 4 from Ikona area were prepared and sent to IBM, Nagpur for PGE analysis.

3.10 Diamond

GSI, NMDC and Directorate of Geology, Orissa were engaged in exploration for diamond in 2006-07 and 2007-08.

3.10.1 GSI

In Andhra Pradesh during 2006-07, GSI carried out search for kimberlites in Hossur-Tuggali, Kurnool district and Gooty block, Anantapur district, through reconnaissance mapping and sampling. Analysis of stream sediment samples did not yield any kimberlite specific indicator minerals.

In Peberu block in Tungabhadra basin, Mahaboobnagar district, GSI carried out mapping and sampling. Two kimberlite bodies

were discovered close to Chagapuram village. Analysis of the samples yielded kimberlite specific minerals like chrome diopside, pyrope garnet, micro-ilmenite and chrome-spinel. The EPMA analysis of 7 pyrope grains has shown high chrome value (Cr_2O_3 , 3% to 8%) of G-9 variety.

In Timasamudram-Mauktikapuram block, Anantapur district, investigation was carried out by geological and ground geophysical surveys for locating additional kimberlite bodies in the area. The surveys have led to the discovery of two new kimberlite bodies along the ENE-WSW trending lineament. The kimberlites yielded chrome diopside, spinels and micro-ilmenite. Detailed electro magnetic surveys were also carried out and a few conductive zones were delineated.

GSI carried out search for primary source rocks for the placer diamonds in terrace gravels along the Munneru River basin in parts of Krishna & Khammam districts was carried out by mapping and sampling. Preliminary study of the heavies indicates presence of chromite, ilmenite, pyroxene and basic lithic fragments in addition to corundum, zircon and spinel.

In order to test the diamondiferous nature of Mantralayam kimberlite pipe, occurring on the north bank of Tungabhadra River near Nadigadda Malkapur, 100 cu m of pitting was carried out in five pits and about 76 tonnes of bulk samples from weathered kimberlite material was collected for processing. Processing of 38 tonnes of kimberlite pipe did not yield diamond.

In Karnataka, search for kimberlite in Gulbarga, Raichur and Bellary districts, was continued through mapping and sampling. Two stream sediment samples yielded indicator minerals like micro-ilmenite, chrome-spinel, garnet and phlogopite.

In 2006-07, GSI carried out search for kimberlite clan rocks (KCR) in parts of Bargarh district, Orissa, and in adjoining area of Mahasamund district, Chhattisgarh, by large scale mapping and sampling. Indicator minerals like

garnet, ilmenite, and chrome diopside have been picked up from processed stream sediment samples. Two suspected micro-diamond grains have been identified. Confirmation of these minerals by SEM-EDX is awaited.

In 2007-08, GSI carried out search for kimberlite in Chagapuram sub block, Mahaboobnagar district, Andhra Pradesh. Two new kimberlite bodies (CGK-3 and 4) were discovered. CGK-3 (approx. 650 x 200 m) is located about 2.5 km SE of Maldakal and CGK-4 (approx 150 x 100 m) is located at 1 km NW of Penchukalpadu village. The heavy minerals recovered from these pipes are picro ilmenite, chrome spinel, chrome pyrope and chrome diopside in the order of decreasing abundance. Three boreholes have been drilled to test the depth extension and to collect core samples for petromineralogical and chemical characterisation of the Chagapuram pipes. Detailed magnetic surveys carried out in the area indicated variation of -495 nT to +86 nT along with a linear feature extending in NNW-SSE direction. In order to assess the diamondiferous nature of the Chagapuram kimberlite pipe, sixty tonnes of available well dump material from pipe CGK-1 was collected.

In Rajoli block in Mahaboobnagar and Kurnool districts, GSI carried out systematic regional stream sediment sampling to the south of Tungabhadra River. Processing and study of the heavy mineral concentrates from these stream sediment samples did not yield any kimberlite specific heavy minerals.

In Peruru block, Anantapur district, one stream sediment sample from Gangampalli area yielded a few grains of suspected kimberlite indicator minerals like picro-ilmenite and chrome spinel. Detailed sampling carried out in the upstream area also yielded picro-ilmenite and chrome spinel. The source rock for the suspected kimberlitic indicator minerals probably lies in the

catchment zone of the streams falling in the area between SSE of Gangampalli and to the west of the NNW-SSE trending ridge of Ramagiri schist belt at Ramagiri. This area falls at the contact zone between the rocks of Ramagiri schist belt and Peninsular Gneissic Complex (PGC). Incidentally the kimberlite pipe (CC-3) discovered earlier falls in the proximity of the eastern contact of this schist belt with PGC.

In Chhattisgarh, GSI carried out search for kimberlite clan rocks in Purur and Kochwahi area, Kanker-Durg- Dhamtari districts, during FS 2007-08. Heavy mineral concentrate, suspected ilmenite, spinel and garnet were identified from stream sediments. Laboratory studies are in progress.

In Madhya Pradesh, GSI had taken up regional search for kimberlite and related rocks in parts of Shivpuri and Datia districts during FS 2007-08. Stream sediment samples were collected from 2nd and 3rd order streams. Samples evaluated so far did not indicate presence of any indicator minerals for kimberlite.

In Orissa, GSI carried out search for kimberlite/lamproite bodies (KCR) in parts of Jharsuguda, Sambalpur and Sundargarh districts, during FS 2007-08 to test the four target blocks identified in FS 2005-06. Four small suspected ultramafic bodies were identified in the area. Pitting is under progress to reveal KCR body. EPMA analysis of the samples collected during FS 2005-06 yielded 11 garnet grain of G-5 variety suggesting their derivation from eclogite/ kimberlite field.

3.10.2 NMDC

In 2006-07, NMDC continued investigation for locating kimberlite bodies in their PL areas in Anantapur district, Andhra Pradesh. In Anumpalli PL area about 347.56 tonnes of kimberlite bulk sample were collected and processed. 26 number of diamond weighing 3.15 carats were recovered. In Venkatampalli PL area, NMDC drilled 644 m in

18 boreholes. About 31.27 tonnes samples were collected and 14 number of diamond weighing 1.55 carats were recovered after processing. In Chigicherla PL area, a total 2,080 m drilling was done in 65 boreholes. About 132.29 tonnes of samples were collected. NMDC studied all the EPMA data (652 sample grains) in 8 PL prospects of Kalyandurg area and anomaly maps were developed.

In 2007-08, NMDC continued investigation in PL areas of Anantapur district of Andhra Pradesh. In Anumpalli PL area, kimberlite resources of 3.5 million tonnes were estimated up to a depth of 60 m and 4 nos. of diamond weighing 0.27 carats were recovered. In Venkatampalli PL area, about 0.55 million tonne kimberlite resources were estimated up to 90 m depth. The incidence of diamond was found at 7.89 carats per hundred tonnes of kimberlite. In Chigicherla PL area, about 5.57 million tonnes resources of kimberlite were estimated up to 90 m depth and four numbers of diamond weighing 1.72 carats were also recovered. In Kalyandurg area, NMDC generated anomaly maps for 10.57 line km of ground magnetic data in all the 8 PL areas.

3.10.3 State Directorates

In 2006-07, Directorate of Geology, Orissa carried out investigation for primary sources of diamond in and around Katpal area of Koraput district. Directorate of Geology, Orissa, carried out exploration by mapping 120 sq km on 1:50,000 scale and collected 64 samples. Processing and analysis of gravel samples were in progress. In 2006-07 and 2007-08, Directorate conducted exploration for diamond in Arkhali, Baharumunda and Santoshpara areas in Nuapada district. In all 14 sq km area was mapped on 1:50,000 scale and 0.2 sq km on 1:2,000 scale. About 100 samples were also collected from the area in 2006-07, while about 30 sq km area was mapped on 1:50,000 scale and about 2 sq km on 1:2,000 scale in 2007-08.

In 2007-08, Directorate of Geology and Mining, Uttar Pradesh, carried out search for

diamond in ancient paleo-channels of Baghain river with the help of photogeological mapping. One grain of diamond weighing 64.8 mg was recovered from the pit near village Barband along Baghain river. A total of 8 pits were sunk. One diamond grain each of variable size and weighing 22.6 to 88 mg was recovered from three pits.

3.11 Precious and Semi-precious Stones

State Directorate

In 2006-07, Directorate of Geology, Orissa, carried out preliminary exploration to locate gem stones around Shagarha and Dhanrakurhaki areas in Kalahandi district. In all, 102 sq km area was mapped on 1:50,000 scale and 29 samples were collected. Investigation revealed two occurrences of gem iolites, near Shagarha and one near Dharakurhaki.

3.12 Gold

The GSI, MECL, HGML and State Directorates were engaged in the exploration for gold during 2006-07 and 2007-08. An account of exploration work done by GSI is given in Tables-11(A) and 11 (B). The details of exploration carried out by MECL, State Directorates and HGML are given in Tables - 12(A) and 12 (B).

3.13 Industrial Minerals

The details of exploration work carried out for industrial minerals by GSI and State Governments during 2006-07 and 2007-08 are given in Tables - 13(A) and 13(B).

3.14 Decorative Dimension Stones

State Directorates

The details of exploration work carried out for marble, granite, sandstone and decorative dimension stones by State DGM's during 2006-07 and 2007-08 are furnished in Tables - 14(A) and 14(B).

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Table – 11 (A) : Exploration for Gold by GSI, 2006-07

State/District	Location	Details of work done	Results obtained/Remarks.
Andhra Pradesh			
Cuddapah	Veligallu green stone belt	Exploration by Detailed mapping, pitting/trenching and sampling.	Visible sulphide minerals (mostly pyrite and rarely arsenopyrite) and sulphur encrustation were noticed near to the old working within the BIF in Mallayakonda hill. Another old working in the form of pits was seen within the metabasalt east of Gutamidapalle. A zone of rich sulphide mineralisation was noticed for about 150 m strike length within the silicified esetasalt near the contact with granitoid. Analytical results of 168 geochemical samples were received, of which 10 samples showed gold concentration ranging from 0.02 to 0.21 g/t and the analytical result of trench samples is awaited.
Kurnool	Aspari area	Exploration by large scale mapping pitting/trenching and sampling	A brecciated and silicified quartz reef of 300 m length and 25 m width within granite with disseminations of pyrite, arsenopyrite and chalcopyrite was demarcated north of Devanbanda. The analytical result of quartz samples showed gold values below 0.02g/t. A total of 106 numbers of soil and pit samples collected from the 700 m wide shear zone along the eastern side of the area indicated gold value ranging from 0.03 to 0.45g/t.
Nellore	Nellore Schist belt	Exploration by large scale mapping pitting/trenching and sampling	Surface indications for mineralisation such as limonitisation, sericitisation, chloritisation, epidotisation and tourmalinisation were recorded from the area. Out of 95 samples, 7 soil samples gave anomalous gold value ranging from 0.03-0.07g/t.
Chhattisgarh			
Raipur	Baghmara Block Sonakhan area	Investigation by drilling	In bore hole BM-8, sulphide mineralisation comprising pyrite, arsenopyrite and minor chalcopyrite is intersected between 161.80 m and 164.85 m depth whereas in borehole BM-9 mineralisation was intersected between 124.80 m and 145.00 m depth in sheared metabasic rock traversed by quartz veins. Drilling and trenching indicated continuation of gold mineralisation in the western part. Samples from one trench indicated mineralisation of 5 m width having gold values ranging from 0.20 to 2.1 g/t. Out of 13 core samples from borehole BM-8 four indicated high gold value ranging from 0.6 to 3.30 g/t.
Jharkhand			
Ranchi	Hepsal-Lungtu Block	Investigation by drilling	Boreholes have indicated several visual mineralised zones, represented by disseminations of pyrite/arsenopyrite within quartz vein traversing schistose quartzite, which have been intersected between 53.85 m and 173.25 m depth. Analytical results are awaited.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (A) (Contd.)

State/District	Location	Details of work done	Results obtained/Remarks.
Jharkhand			
Ranchi	Kathadih-Sindaori Block	Investigation by drilling	The work indicated six mineralised zones, represented by quartz/carbonate veins traversing ferruginous/phyllitic quartzite with disseminations of pyrite and arsenopyrite, were identified at various depth from 26.00 m to 172 m in first borehole. A few grains of gold were recorded at a depth of 100.0m (4.05g/t x 2.00 m). Another zone, having dissemination of chalcopyrite and stringers of sphalerite, were recorded between 104.00 m and 106.00 m depth. Analytical results are awaited.
-do-	Between Chota Nagpur Gneissic Complex and Dalma volcanics in Saraikela - Kharswan area	Large-scale mapping, pitting/trenching and collecting 60 geochemical samples, including bed rock and soil samples	The area comprises rocks of the Chaibasa formations of Singhbhum group. The results of chemical analysis were awaited.
Singhbhum West	Sausal-Buru-Goikera block	Detailed mapping and collection of about 100 geochemical samples	Analytical result of 25 samples has been received. The result is not encouraging (Au < 0.1 g/t).
-do-	Pahardih Extension	Drilling three boreholes in the eastern continuity of the mineralised zone covering 300 m strike length.	The mineralised zone, comprising quartz carbonate veins traversing quartz chlorite schist, was intersected in first 2 boreholes were sampled and sent for chemical analysis. Analytical results are awaited. Towards south another mineralised zone of 300 m x 50 m has been established on the basis of trenching, which yielded gold values ranging from 0.03 to 0.35 g/t.
Karnataka			
Chitradurga	Paramanhilli North Block	Detailed mapping, pitting/trenching and sampling	Detailed mapping has brought out a zone of carbonated metabasalt of 50m length and 1-2 m width with high incidence of sulphide dissemination. Analytical result of groove samples collected from trenches indicated Au value ranging from 0.13 to 0.72g/t.
Dharwar	Bangargatti block, (North & South Sector)	Detailed mapping, pitting, trenching and sampling.	Five mineralised zones within BIF with an average width of 1.5 m for a length of 140-550 m are demarcated. The mineralised zones are silicified, sheared, brecciated and intruded by pervasive quartz veins having pyrite and pyrrhotite disseminations. Bed rock and trench samples from BMQ bands have indicated gold values from 0.03 to as high as 35.00 g/t.
Dharwar & Uttar Kannad	Maruthipura-Attigere block	Detailed mapping pitting/trenching and sampling	Six bands of banded magnetite chert/quartzite with varying width from 6-16 m have been identified. The bands are silicified, brecciated and intruded by quartz veins. Analysis of bed rock samples showed Au values ranging from 0.02-1.49g/t and trench samples from 0.02 to 1.34 g/t.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (A) (Contd.)

State/District	Location	Details of work done	Results obtained/Remarks.
Tumkur	Ajjanahalli East Block (Central Sector)	Drilling six boreholes each of about 140-170 m depth covering 600 m strike length at an interval of 100 m	A tentative resource of gold ore of about 0.10 million tonnes with a grade of 1.65 g/t Au over 3.85 m thickness has been estimated from Ajjanahalli central sector. The investigation will be continued and the block will be redesignated as Ajjanahalli block-B in 2007-08. In Ajjanahalli East block (North sector), a resource of 0.38 million tonnes of gold ore with grade of 1.70 g/t Au over 4.82 m thickness has been estimated in F.S. 2006-07. Thus, the total resource of this block has been augmented from 0.293 million tonne in 2005-06 to 0.673 million tonne with an average grade of 1.83 g/t Au.
-do-	Ajjanahalli East Block North Extension (South Sector)	Detailed mapping, pitting/trenching and sampling	Detailed mapping has revealed the continuation of all the six mineralised bands of the BIF, identified in already explored North sector block. Sheared metabasalt with the BIF bands of sulphide and carbonate facies are the principal rock types. Systematic trenching at 30 m interval is being carried out to demarcate the mineralised zone.
-do-	Ajjanahalli Central Block	Detailed mapping, pitting/trenching and sampling	Strike continuity of six mineralised zones brought out in block-A & B has been established. Analytical result of trench samples has indicated the presence of gold varying from 0.05 to 10 g/t.
Kerala Wyanad	Edathil and Kazhakattur (Mananthavadi-Talapuzha area Wayanad gold belt.	Large scale mapping, pitting/trenching and sampling	Trenching brought out a 14 m wide quartz vein in the southern part of Edathil which contains sulphide rich zone containing pyrite, native sulphur and limonitic box work.
Maharashtra Bhandara	In Sakoli group of rocks around Umrajhari area	Large scale mapping, pitting/trenching and sampling	A zone of quartz veins, near to the anomalous zone identified by stream sediment sampling, has been demarcated. A few old workings and dumps of slag material containing sulphide minerals have been found in the area. Quartz veins are gossanised at places and contain specks of pyrite and chalcopyrite. Analytical results of samples are awaited.
Rajasthan Ajmer and Bhilwara	Bhatiwar - Borana - Raipur and Surgati - Kumeri areas	Large scale mapping and sampling	Analytical result of stream sediment, panned concentrate and bed rock samples from Bhatiwar-Borana-Raipur and Surgati-Kumeri areas did not indicate any gold mineralisation. However, the bed rock samples collected along the major shear zones show anomalous gold values. In Raipur-Ghata area, samples of vein quartz and amphibolite show gold values ranging from 0.05 to 0.07 g/t.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (A) (Concl.)

State/District	Location	Details of work done	Results obtained/Remarks.
Banswara	Delwara west block (Bhukia gold belt)	Investigation by drilling and sampling In total, 8 boreholes (DWB-1 to 8) have been drilled and sampled	Analytical result of the core samples of the boreholes indicated that width of the mineralised zone varies from 1.10 m to 16.65 m with Au ranging from 0.64 to 4.49 g/t. Besides gold, Cu mineralisation of 1.00 m to 7.00 m thickness containing 0.10% to 0.89% Cu is also recorded. A gold ore resource of 4.78 million tonnes with 1.32 g/t gold has been estimated in this block.
-do-	Gundelpara block, (Bhukia gold belt)	Investigation by drilling and sampling Two boreholes (GNP-1 & 2) were drilled and two boreholes (GNP-3 & 4) are in progress.	In GNP-1 two auriferous zones of 2.0 m and 36.00 m width with an average of 1.06 g/t and 1.87 g/t gold value have been intersected, whereas in GNP-2 an auriferous zone of 15.00 m width with an average of 1.67 g/t gold has been intersected.
-do-	NW & SE part of Gundelpara village (Bhukia gold belt)	Detailed mapping pitting/trenching and sampling	Five gossan zones of approximately 100 m to 250 m length and 10-15 m width have been identified. Analytical results of 250 channel samples across the gossan zones indicated 29 ppm -0.78% Cu, < 25 ppb to 0.12% Co, <50ppm - 238 ppm Zn and <25-229 ppm Ni. The analytical results of the channel samples indicated gold values ranging from 0.05-0.54 g/t.
-do-	Pathara Block	Investigation by drilling	Drilling indicated sporadic disseminations of sulphides represented by mainly chalcopyrite, pyrrhotite and pyrite within the chlorite schist and dolomitic marble.
Udaipur	Dugocha Main and Dugocha North block	Final report prepared	An additional resource of 0.16 million tonnes of gold ore was estimated, which elevates the final resources of Dugocha Main block to 0.48 million tonnes with an average grade of 2.24 g/t Au and that of Dugocha North block to 0.25 million tonnes with an average grade of 1.91 g/t Au.
Tamil Nadu Krishnagiri	Naripally area	Detailed mapping, pitting/trenching and sampling	Analytical result so far received indicated gold values ranging from 0.03 to 0.07 g/t in schistose amphibolite and 0.04 to 0.41 g/t in limonitised vein quartz.
Uttar Pradesh Jhansi	Around Babina	Preliminary search for gold in BIF within banded gneissic complex by mapping and sampling	Thin quartz veins at the contact with granite show little oxidation. Analytical results of samples are awaited.
West Bengal Bankura	Rudra area	Prospecting in the Singhbhum Group of rocks by large scale mapping and sampling	The host rock for gold is mafic and felsic volcanic rocks traversed by quartz veins. Result of pan concentrate from stream sediment samples showed gold flakes. Two soil samples of Hansadungri analysed 0.04 and 0.10g/t gold and three samples of Rajsoli area analysed 0.03, 0.04 and 0.03 g/t gold.

EXPLORATION & DEVELOPMENT

Table – 11 (B) : Exploration for Gold by GSI, 2007-08

State/District	Location	Details of work done	Results obtained/Remarks.
Andhra Pradesh			
Cuddapah	Shivapuram & Guttamidapalle (Veligallu green stone belt)	Mapping and sampling	Surface manifestations like sulphide mineralisation and alteration (silicification) have been noticed. Analytical results so far obtained indicated gold values ranging from 32 ppb to 0.44g/t.
Nellore	South western margin of Nellore schist belt	Analysis of samples collected during 2006-07	Out of 446 soil and bed rock samples collected during FS 2006-07, 14 samples have shown anomalous gold values ranging from 30 ppb to 0.21g/t. Available analytical results, obtained during 2007-08, indicated gold values of 43 ppb and 70 ppb.
Warangal	Ghanpur schist belt	Preliminary investigation by trenching and collection of samples	Six stream sediment samples out of 205 numbers indicated gold value ranging from 25 to 88 ppb. Analytical results of trench samples are awaited.
Chhattisgarh			
Raipur	Bagmara Block Sonakhan area	Estimation of resources	About 0.09 million tonnes ore resources having average 0.93 g/t Au was estimated for western sector based on first level of boreholes.
Jharkhand			
Ranchi	Hepsel-Lungtu Block	Investigation by drilling four boreholes and sampling	In Borehole LHP-1, four mineralized zones were intersected at 12.50 m to 63.75 m, 98.65 m to 99.10 m, 112.20 m to 113.70 m and 165.00 m to 167.50 m depths with gold values ranging from 0.65 to >1g/t. In other boreholes, a number of mineralised zones were intersected between 21.45 m and 187.50 m depth. Analytical results of core samples are awaited.
-do-	Kothadih-Sindaury Block	Exploration by drilling six boreholes and sampling	Sulphide mineralisation in the form of pyrite and arsenopyrite was observed at various depths. Analytical results of core samples from borehole PKS-1 indicated four significant mineralised zones occurring at 27.00 m (0.40 g/t x 2.00 m), 51 m (0.30 g/t x 4.70 m), 100 m (4.0 g/t x 2.0 m) and 117 m (0.15 g/t x 2.00 m) depths. Analytical results from core samples of other boreholes are awaited.
Saraikela-Kharswan and Ranchi	Chhotanagpur and Dalma	Preliminary exploration in volcano sedimentary sequence in Chhotanagpur gneissic complex and Dalma volcanics	Analytical results of bed rock samples received, so far, indicated gold values ranging from 50 ppb to 1g/t, whereas soil samples yielded <25ppb gold. The stream sediment samples and trench samples showed gold values ranging from 0.10g/t to >1 g/t and from 50 ppb to 0.25g/t respectively.
-do-	East of Sindaury to Urmal	Preliminary investigation in volcano sedimentary sequence	Petrological study of biotite-quartz-sericite schist showed hydrothermal alteration in the form of silicification, carbonatisation, sericitisation, chloritisation and epidotisation. Analytical results are awaited.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (B) (Contd.)

State/District	Location	Details of work done	Results obtained/Remarks.
Karnataka			
Dharwar	Bangargatti (North and South sectors)	Detailed mapping and collecting 135 trench samples and 100 bed rock samples	Detailed mapping has delineated three such bands. The bands are highly silicified, sheared, oxidised and limonitised. Fresh sulphides like pyrite and pyrrhotite are recorded in the quartz veins. Results of chemical analysis are awaited.
Dharwar and Uttar Kannad	Maruthipura Attigere block	Detailed mapping and collection of 147 trench samples and 117 bed rock samples	Nine BIF bands were traced during large scale mapping. The bands have 2 to 16 m width and are highly folded and sheared at places. Analysis were received for a few samples indicating a range of 0.22 g/t for bedrock and 0.50-1.57g/t Au for trench samples.
Tumkur	Ajjanahalli block-B (previously Ajjanahalli east block- central sector)	Exploration by drilling and sampling. A total of fourteen boreholes have been completed in the block to intersect six mineralised zones.	Two levels of drilling have been planned for these mineralised zones at 60 m and 100 m below the surface. Among these zones, two zones are promising and are having persistent gold values both on the surface and sub-surface. The gold values of drill core samples range from 0.43 g/t x 1.92 m to 1.82 g/t x 4.21 m true width.
-do-	Ajjanahalli block -C	Exploratinn by drilling, trenching and sampling	One borehole was drilled to a depth of 166.70 m which intersected weak mineralised zones between 30.20 m and 151.60m. After completion of the borehole in the C block, exploration was carried out by systematic trenching to generate more surface data. This block has been merged with Ajjanahalli block-E and entire block has been renamed as Block-C.
-do-	Ajjanahalli block - E (previously Ajanahalli East Block- North Extension and South sector)	Detailed mapping and sampling	Detailed mapping in this block has brought out all the six mineralised BIF bands seen in the northern part. Old workings were found within the third BIF band. The trenches have exposed the sheared BIF with quartz-carbonate veins and having oxidised sulphides. The maximum assay value is 6.00 g/t Au with 2.00 m width has been recorded in the trench samples. The investigation has been completed. This block has been merged with Ajjanahalli block 'C' and entire block has been renamed as Block 'C'.
-do-	Ajanahalli block-D (previously Ajanahalli Central block)	Detailed mapping, trenching and sampling. Detailed mapping and trenching have brought out eight parallel mineralised zones, which are highly sheared with quartz- carbonate veins and oxidised sulphides.	A maximum gold value of 4.11 g/t with 2.00 m width has been recorded. There are old workings found in the mineralised zones. The bed rock samples have yielded gold value up to 2.60 g/t. A scout borehole was drilled in the block, which intersected the gold mineralisation for more than 17.00 m width. Analytical results of the samples are awaited block.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (B) (Contd.)

State/District	Location	Details of work done	Results obtained/Remarks.
Rajasthan Banswara	Delwara west block, Bhukia gold belt	Exploration by drilling and sampling. Five sub parallel mineralised zones (zone-1 to V) have been demarcated from east to west in the area. Altogether 14 boreholes (DWB-1 to 14) have been drilled since 2005-06.	Boreholes DWB-1 to 7, 9 and 11 intersected 5 to 24 sulphide zones of 1.00 m to 56.80 m width corresponding to the surface zones. It confirmed the strike continuity of mineralised zones III, IV and V for a strike length of 900 m. Borehole DWB-8 has intersected 10 sulphide zones of 1.35 m to 25.95 m thickness between 100.55 m and 345.80 m depth and confirmed the depth continuity of the zones intersected in DWB-1. Boreholes DWB-10 and 12 intersected 23 and 13 sulphide zones respectively with thickness varying from 1.00 to 55.25 m and confirmed the depth continuity of zone I and II. Drilling in boreholes DWB-13 and 14 is under progress. Analytical result of core samples of boreholes DWB-1 to 8 indicated gold values ranging from 0.51 g/t to 5.85 g/t with thickness varying from 1.00 to 20.75 m at 0.50 g/t cutoff and Cu values range from 0.11% to 0.38% with 1.00 m - 26.75 m thickness at 0.10% cutoff. Besides, analytical result also indicated values of Pb from <50 to 97 ppm, Zn from <10 to 115 ppm, Ni from <25 to 681 ppm, Co from <25 to 1500 ppm and silver from <5 ppm to a maximum of 8 ppm. The item has been extended to 2008-09 with enhancement of drilling target. During the 2007-08, a resource of 5.36 million tonnes gold ore was estimated in Delwara West block with 2.09g/t gold. Hence, from beginning, total gold ore resource in Bhukia area has been augmented from 55.22 million tonnes with 1.87 g/t Au to 60.58 million tonnes with 1.89 g/t Au. The stage of exploration corresponds to G-3 of UNFC system.
-do-	Gundelapara block	Exploration by drilling seven boreholes and core sampling	The boreholes proved subsurface continuity of mineralised zones whose width vary from 1.10 m to 31.10 m with sulphide content ranging from 5% to 25% (by visual estimation). Pyrrhotite is the main sulphide mineral along with subordinate amounts of chalcopyrite and arsenopyrite. Analytical result of the core samples, so far received, has indicated the presence of 1.50 m thick gold mineralised zone with 1.05 g/t Au at 0.50 g/t cut off.
-do-	North western and south eastern parts of Gundelapara village	Preliminary exploration by mapping and sampling	Five gossan zones have been identified in the northwestern part and four in the south eastern part which occur as isolated patches and thin bands. The gossan bands are 150 m in length and 20 m in width and are seen along the contact of marble and amphibolite and also within the marble. Nine channels were cut through the gossan zone. The analytical results so far received from 5 channel samples have indicated several gold mineralised zones ranging in width from 1.00 m to 20.50 m with gold content varying from 1.19 g/t to 3.60 g/t and copper zone ranging in width from 1.50 m to 2.00 m with Cu content varying from <0.05% to 1.20%.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 11 (B) (Concl.d.)

State/District	Location	Details of work done	Results obtained/Remarks.
Dungarpur	Bharkundi area	Preliminary exploration by traversing and sampling	The surface mineralised zones/gossans are confined within dolomite along NE-SW fracture and its width varies from 12 m to 20 m within which the old workings are confined. A total of fifteen old workings of varying dimension were identified. Nine channels were cut across the oxidised zones. The analytical results received so far from these channel samples indicated gold content up to 1.0 g/t. More analytical results are awaited.
Udaipur	Dugocha West block	Investigation by drilling three bore holes and sampling	Borehole DCHW-1 has intersected significant zones of sulphide mineralisation in the form of massive segregations, disseminations and stringers in dolomite at 60.02 m, 68.50 m to 108.30 m depths with visual estimation of 40 to 60% total sulphides (pyrrhotite + chalcopyrite and pyrite). Borehole DCHW-2 intersected semi massive to massive sulphide zones in dolomite with 60-90% total sulphide in the form of pyrrhotite with minor pyrite and chalcopyrite between 174.00 and 177.20 m depth and with 20-50% sulphides between 177.20 and 180.80 m depth. Borehole DCHW-3 intersected semi massive to massive sulphide zones in dolomite between 108.75 and 119.60 m depth with 50-90% sulphide made up essentially of pyrrhotite with minor chalcopyrite, pyrite and arsenopyrite. Analytical results of the samples are awaited.
Tamil Nadu Tiruvannamalai	Around Polur	Investigation for gold associated with BIF	An oxidised zone characterised by presence of goethite and limonite with sulphides like chalcopyrite, pyrite was demarcated. Samples were collected and sent for analysis. Analytical results are awaited.
Uttarakhand Chamoli	Around Malari	Investigation for gold mineralisation in basal conglomerate of Ralam was initiated	The investigation is continued.
West Bengal Bankura	Rudra area along the north eastern extremity of Singhbhum Proterozoic Fold Belt	Mapping and collection of bed rock and soil samples	The mineralisation is vein type restricted within the felsic tuff and tremolite schist. Analytical result of the soil samples showed anomalous gold values ranging from 31 ppb to 0.26g/t at two localities viz. Hansadungri and Rajsol. Only one bed rock sample of quartz vein yielded gold value of >1g/t.
-do-	Around Tilakanali and Kelapathar	Prospecting for gold within Singhbhum group and Chhotanagpur Gneissic complex	Quartz veins were observed with box work and stains of azurite and malachite. Sulphides are present along the alteration zones in amphibolites and schists. Analytical results are awaited.

EXPLORATION & DEVELOPMENT

Table – 12 (A) : Exploration for Gold by MECL, HGML and State Directorates, 2006-07

State / District	Location	Agency	Details of work done	Results obtained
Karnataka				
Raichur	Hutti	HGML	Drilling of 721 m and collection of 13,459 samples were done.	Total 8.27 million tonnes reserves were estimated with 6.04 g/t Au.
-do-	Uti	HGML	About 3 sq.km area was mapped on 1:2000 scale and 1,417 samples were collected.	Total 0.5 million tonnes reserves were estimated with 2.53 g/t Au.
-do-	Hirabuddini	HGML	About 0.36 sq.km area was mapped on 1:1000 scale and 3,372 samples were collected.	Total 0.449 million tonnes of ore reserves was estimated with 5.5 g/t Au.
Madhya Pradesh				
Balaghat	Garhi-Dongri	MECL	Drilling of 801 m in 5 boreholes and collecting 2,184 samples.	Significant mineralisation was encountered in one borehole which ranged from 2.24 to 2.85 g/t Au over 2 m width. In other borehole gold values showed between 0.26 and 0.75 g/t.
Rajasthan				
Banswara	Bhukia-East Block	MECL	A total of 1,093 m drilling with matching geological and laboratory work was achieved.	Sulphide mineralisation was intersected in boreholes.
Dungarpur	Padar, Ajhera, etc.	DMG	Mapping 100, 5 and 0.5 sq km on 1:25,000, 1:10,000 and 1:2,000 scale, respectively, and collection of 699 samples.	Analysis of spot samples revealed Au content 0.16 ppm to 1.5 g/t and Ag 5.0 to 62.2 g/t
Rajsamand	Gangrar, Puthol, etc.	DMG	Mapping 200 sq km, 10 sq km and 1.5 sq km on 1:50,000, 1:10,000 and 1:2000 scale, respectively, and collecting 138 samples.	Analysis of spot samples indicated Au 0.162 ppm and Ag up to 98.1 ppm.
Udaipur	Kel-ki-Kui Kodar-Wadia, etc.	DMG	Mapping 205 sq km, 21 sq km and 1.5 sq km on 1:50,000, 1:10,000 and 1:2,000, respectively, and collecting 170 samples.	Analysis of samples indicated Au 0.12 to 2.75 ppm, Ag 0.2 to 1.6 ppm, Cu 15 to 7,515 ppm, Zn 49 to 1,620 ppm and Pb 17.5 to 78.5 ppm.

EXPLORATION & DEVELOPMENT

Table – 12 (B) : Exploration for Gold by MECL, HGML and State Directorates, 2007-08

State / District	Location	Agency	Details of work done	Results obtained
Jharkhand				
Ranchi	Parasi Central block	MECL	Mapping 1 sq km on 1:1,000 scale, drilling 1,709 m in 9 boreholes and collecting 133 samples.	Width of mineralisation intersected in B.H. varies from 1.5 m to 4.0 m, having 1.48 to 3.26 g/t Au. Mineralisation was proved for 700 m up to 150 m depth.
Karnataka				
Raichur	Hutti	HGML	Underground mapping of 5,520 m on 1:400 scale., drilling 1,424 m in 45 boreholes, and collecting 11,500 samples.	As on 1.4.2008, about 8.27 million tonnes gold ore reserves were estimated with 6.04 g/t Au.
-do-	Uti	HGML	Mapping 3 sq km on 1:2,000 scale and collected 3,963 samples.	1.76 million tonnes mineable reserves of gold ore were estimated with 2.53 g/t Au.
-do-	Hira-Buddini	HGML	Mapping 4.06 sq km on 1:1,000 scale.	About 0.45 million tonnes mineable reserves of gold ore estimated with 5.59 g/t Au.
Rajasthan				
Banswara	Bhukia (East)	MECL	Mapping 0.56 sq km on 1:1,000 scale, drilling 1,763 m in 9 boreholes and collecting 2,043 samples.	Three major gold bearing lodes having thickness varying from 2 to 15 m encountered up to 250 m depth over a strike length of 700 m. Average grade of ore is about 2 g/t Au.
-do-	Kharwa, Unalwala, etc.	DMG	Mapping 100 sq km, 10 sq km & 1.2 sq km on 1:50,000, 1:10,000 and 1:2,000 scales, respectively, and collecting 28 samples.	Indication of gold was noticed in dolomite - graphite schist.
-do-	Padar, Amjhera, etc.	DMG	Mapping 50 sq km, 10 sq km & 1 sq km on 1:50,000, 1:10,000 and 1:2,000 scales, respectively, and collecting 22 samples.	Indication of gold, iron ore and manganese ore was noticed.
Jaipur	Gumanpura, Ramsinghpura, etc.	DMG	Mapping 15 sq km on 1:10,000 scale and collecting 869 samples.	Analytical results were awaited.
-do-	Matasula Gol, Pahapur, etc.	DMG	Mapping 20 sq km & 2.5 sq km on 1:10,000 and 1:2,000 scales, respectively, and collecting 48 samples.	Analytical results revealed presence of Au, Ag, and Cu.
Uttar Pradesh				
Sonbhadra	Hardi & Piprha area	DGM	A total of 5.25 sq km area was mapped on 1:5,000 scale.	Analytical results of groove samples showed presence of gold between 0.002 to 0.323 ppm, stream sediments, 0.002 to 0.098 ppm Au and pan concentrates showed gold up to 4.38 g/t.

EXPLORATION & DEVELOPMENT

Table – 13 (A) : Exploration for Industrial Minerals by GSI, DGMs and Central/State Undertakings, 2006-07

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Geological Survey of India							
BARYTES							
Andhra Pradesh							
Cuddapah	Mangampeth Area	-	-	-	-	-	All the four test bore holes drilled intersected carbonaceous tuff host rock for barytes and the first borehole intersected thin barytes bands along with carbonaceous tuff. The drilling has not indicated any promising results.
CLAY							
Rajasthan							
Nagaur	Junjala-Padeli Khera Narnolia area	-	-	-	-	-	On the basis of earlier borehole data of lignite exploration, a potential clay zone has been reported.
DOLOMITE							
Chhattisgarh							
Kabirdham	Pandharia Teh.	1:50,000	1,770	-	-	-	About 1.77 million tonnes of dolomite resources were estimated.
GRAPHITE							
Tamil Nadu							
Sivaganga	Pavandi-Arsanur and Usilampatti area	-	-	-	-	-	In Arasanuv block presence of mineralisation proved for a strike length of 1 km. The average width of the zone is about 12 m. A resources of 0.76 million tonnes of graphite (13% FC) has been estimated. In the western extension of Arasanur block a new block named Kiranur block was investigated but the results were not encouraging.
LIMESTONE							
Madhya Pradesh							
Katni	Niwar Area	-	-	-	-	-	Two major limestone bands were mapped near Mohania village. Flux grade limestone bands intersected in two boreholes.
Meghalaya							
Jaintia Hills Block	LumSyrman	-	-	-	-	-	About 280.8 million tonnes of limestone resources were estimated.
Orissa							
Sundergarh	Purkapali, Katopada & Gangajal area	-	-	-	-	-	Five different dolomite/limestone bands spread over a strike length of 3.5 to 4 km have been delineated.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Tamil Nadu Cuddalore	Uchichimedu Area	-	-	-	-	-	Limestone band extending for about 14 km in strike length was established. About 33.74 million tonnes cement grade limestone was assessed.
PHOSPHORITE							
Madhya Pradesh Sidhi	Gara-Amarpur Area	-	-	-	-	-	Ferruginised chert breccia band which is at places phosphatic in nature was traced for about 3 km from Baskati to Panina. Analytical result show P_2O_5 varying from 7.5 to 13% in Panina area and 2 to 6% in Buskati area.
Uttar Pradesh Sonbadra	Kangara Area	-	-	-	-	-	Interbedded Chert breccia porecellanite and shale have been traced up to a strike length of 450 m with width varying from 12 to 17 m. Analytical result of bed rock samples showed 760 ppm to 5800 ppm P_2O_5 .
State Directorate of Geology & Mining							
AGATE							
Maharashtra Jalna	Around Nandi village	1:50,000 1:5,000	35 5	-	-	-	Occurrences of agate identified near Math Jalgaon, Bhiwandi Bodka villages.
BENTONITE & OTHER MINERALS							
Rajasthan Barmer	Mokhab Amardhan ki-Dhani; Jat-ki- Dhani, Amarsingh ki-Dhani, etc.	1:50,000 1:10,000 1:2000	205 15 2	-	-	12	Due north of Mokhab up to 0.5 m thick bed of Bentonite deposits occur in 0.075 sq km area N/V Amarsingh-ki-Dhani exposure of silicious earth was located in a trench.
CALCITE							
Rajasthan Sirohi	Rajpura	1:50,000 1:10,000 1:2,000	75 10 1.5	-	-	59	About 1,500 tonnes of calcite were estimated.
CHINA CLAY							
Kerala Kollam	Kadavattu Mulavana village	1:1000	0.1725	5	154.5	32	0.9 million tonnes of china clay resources were estimated.
-do-	Kanjirrokode area Mulayane village	1:1000	0.0025	3	81	11	Thickness of china clay bed ranges between 3.05 to 13.5 m. About 0.45 lakh tonnes of china clay resources were estimated.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Kasargod	Moonu Road Malpacheri Baukalam	-	-	4	93	-	The average thickness of china clay bed is 8 m. About 2.5 million tonnes reserves of china clay were estimated.
-do-	Paivalike village	-	-	10	355.4	-	0.04 km area was covered by exploratory drilling. The average thickness of china clay bed is 18 m. About 14 million tonnes reserves of china clay were estimated.
-do-	Kommangala Padavu. Pajvalike and Okardi village	-	-	5	212	-	The average thickness of clay ranges from 12 to 30 m. About 4 million tonnes resources of china clay were estimated.
-do-	Erikkulam village	-	-	3	80.5	-	About 24 million tonnes resources of china clay were estimated.
Thiruvanan- tapuram	Bishop Thoppu, Velloor village	-	-	3	90	-	Drilling conducted on behalf of M/s. Ashapura Mines Chem. Ltd, and 3 lakh tonnes of china clay reserves were estimated.
DOLOMITE							
Andhra Pradesh							
Khammam	Bonakal, Chintakani, etc.	-	-	-	-	-	Reconnaissance survey carried out. Investigation is under progress.
Chhattisgarh							
Kabirdham (Kawardha)	Pandharia tehsil	1:50,000	1770	-	-	279	About 1.77 million tonnes of dolomite resources were estimated.
Madhya Pradesh							
Dewas	Udainagar Bogli area	1:50,000 1:4,000	205 2	21	840	270	Depth persistence of dolomite deposit has been confirmed up to 51.3 m depth and a total of about 19 million tonnes of dolomite resources were estimated.
Jabalpur	Ritteri area	1:50,000 1:4,000	510 2.13	24	820	310	Analytical results are awaited.
Rajasthan							
Udaipur	Jhalon-ka- Guda, Piproch, etc	1:50,000 1:10,000 1:2000	50 10 2.5	-	-	180	The dolomite band is about 1.5 km in length, 75 to 150 m in width and assumed depth is about 30 m.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
KYANITE							
West Bengal							
Purulia	Salboni Icchadih	1:50,000	4	-	-	5	-
LATERITE							
Andhra Pradesh							
East Godavari	Pandirimamdikot, Kodaaliwka, & Veukura	-	-	-	-	-	Reconnaissance survey is under progress.
LIMESTONE							
Assam							
NC Hills	New Umrongshu	-	1	2	232	125	The total thickness of limestone bands is about 90 to 98 m. The strike extension of the deposit is about 1000 m.
Chhattisgarh							
Kabirdham	Pandharia Tehsil	1:50,000	1770	-	-	279	Eight localites of limestone of different dimensions have been located and 69.21 million tonnes of limestone resources were estimated.
Himachal Pradesh							
Shimla	Saibhag	1:2000	0.7	1	75.15	-	Work is under progress.
-do-	Gumma and Rohana	1:2000	0.7	2	210.0	-	Work is under progress.
Madhya Pradesh							
Morena	Sehadpur Kailaras	-	-	-	-	-	A total of about 108 million tonnes of limestone resources were estimated.
Rajasthan							
Ajmer	Kayampura, Magra, etc	1:50,000 1:10,000 1:2,000	200 15 2	7	447	153	Cement grade limestone of varying dimensions explored by drilling in Magra, Brijpura and Raghnandanapura areas.
Ajmer & Pali	Hemdai Kam, Rawat-Ki- Dhani, etc.	1:50,000 1:10,000 1:2,000	150 15 1	-	-	5	Elongated mounds of calcite marble/ limestone of dimension 100-400 x 30-100 m N/V Hemdai was mapped.
Baran	Chureliya	1:50,000 1:10,000 1:2,000	100 15 1	-	-	34	About 0.5 million tonnes resources of limestone were estimated.
Bundi	Balapura, Kunwanti, Bardha, etc	1:50,000 1:10,000 1:3,088	150 16 2.1	-	-	35	About 1.30 million tonnes resources of cement grade limestone were estimated.
Chhittorgarh	Phalwa, Dhanora, Papri, etc.	1:50,000 1:10,000 1:2000	50 5 1.5	9 5	586	529	About 60 million tonnes resources of cement grade limestone were estimated.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Chhittorgarh	Bhatkotri Lasrawan, etc.	-	-	14	645	-	A total of about 516 million tonnes resources were estimated of which 220 million tonnes in Javda block and 296 million tonnes in Bhatkotri block.
Jaisalmer	Sam & Sagron ki Basti	1:10,000 1:2,000	15 4	36	1063	632	210.44 million tonnes of limestone resources were estimated.
Jhunjhunu	Gothra	-	-	-	-	425	A total 6.09 million tonnes resources of limestone under inferred category were estimated.
Nagaur	Somna, Khanwar, etc.	1:10,000 1:2,000	10 2	-	-	35	Potential deposits of chemical/cement grade limestone identified and about 35 million tonnes of tentative geological resources were estimated.
Rajsamand	Karoli ki Dhanil: Mando-ki- Dhani,etc.	50,000 1:10,000 1:2,000	7.5 5 1.1	-	-	30	Three dolomitic limestone bands were identified.
Sirohi	Rajpura and Jharoli	1:50,000 1:10,000 1:2000	7.5 10 1.5	-	-	59	About five million tonnes resources of cement grade limestone were estimated.
Tamil Nadu Tirunelveli	Illanguram Parpadi and Irraipuvvari	-	-	9	183.6	262	Chemical analysis of samples indicatead CaO 10.81 to 52.12%. Work is under progress.
PYROPHYLLITE/SILLIMANITE							
Maharashtra Chandrapur	Walni- Katgaon	1:50,000	22	-	733	-	About 0.29 million tonnes resources of pyrophyllite-silimanite were estimated in the area.
West Bengal Purulia	Jinamanipur	1:50,000	10	-	-	5	-
QUARTZ AND FELSPAR							
West Bengal Purulia	Kultane, Jambad etc.	-	-	-	-	-	Quartz and felspar occurs as pegmatite bodies in granitic country rock.
ROCK PHOSHPATE							
Rajasthan Banswara	Lorda, Kushalgarh etc.	1:50,000 1:10,000	150 10	-	-	60	Deposits of dolomite with phosphatic stromatolite were identified.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
SILICA MINERALS							
Rajasthan							
Alwar	Narka, Dhauli Senthali, etc.	1:50,000 1:10,000	100 10	-	-	30	Resources of ferrugeneous quartzite 0.76 million tonnes massonary stone 19.25 million tonnes and chert one million tonnes were estimated.
Banswara	Chhuja, Panchpura, etc.	1:50,000 1:10,000 1:2000	60 10 0.70	-	-	-	About two million tonnes resources of quartzite phyllite were estimated.
Bharatpur	Gadhaner, Kharwar, Ulanda, etc	1:50,000 1:10,000 1:2000	150 15 1	-	-	24	5.46 million tonnes of silica sand resources were estimated.
Bhilwara	Bawas river in parts of Kotri-Jahaj- pur tehsil	1:50,000 1:10,000 1:4000	150 5 0.5	-	-	22	45 million tonnes of bajri deposition along Banas river in Kotri-Jahajpur segments were estimated.
Chittorgarh	Manji-ka-Garha, Minana, etc	1:50,000 1:10,000 1:2000	100 8 0.5	-	-	90	In the south of village Minana, a quartzite band with strike length of about 25000 m and average width of about 200 m were located.
Dausa	Banswara, Kundal & Chobriwala, etc.	1:50,000 1:10,000 1:2,000	150 10 1	-	-	30	Tentative geological resources of silica sand were estimated at 75,000 tonnes in Bhanwala, 1,58,000 tonnes in Kundal and 1,26,000 tonnes in Chobriwala.
Dungarpur	Sagwaha, Bhantia, etc	1:50,000 1:10,000 1:2,000	110 6 0.82	-	-	18	About 0.31 million tonnes of sand and 0.43 million tonnes of quartzite resources were estimated.
Jaisalmer	Lathi, Bhadriya, etc.	1:50,000 1:10,000	150 10	-	-	20	About 2.0 sq km area in Lathi area, overlain by lime kankar were demarcated.
Jaipur, Sikar Jhunjhunu & part of Alwar	Part of Banganga river	1:50,000 1:10,000	5 24	-	-	-	Bajri was locataed in Banganga river from Monoharpura to Ajuhpora in Jaipur district.
Kanauli	Khirkhira, Baniya, etc.	1:50,000 1:10,000 1:2,000	100 10 1	-	-	28	A total of 12.5 million tonnes resources of silica sand were estimated.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (A) (Concl'd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Rajsamand	Swaradi, Samar Naka, Kheri, etc.	1:50,000 1:10,000 1:4,000	7.5 5 1.10	-	-	30	Pegmatite veins in nine clusters for about 1,760 m length, 20 m width and 15 m depth containing quartz and felspar in 40:60 ratio were identified.
-do-	Relmagra	1:50,000	7.5	-	-	17	Banas river course was mapped and seven million tonnes reserves of Bajri estimated.
West Bengal							
Purulia	Kaliasotu, Mahisnadi, etc.	1:50,000	4	-	-	5	-
WOLLASTONITE							
Rajasthan							
Ajmer and Pali	Hemdai Rawat-ki- Dhani, etc.	1:50,000 1:10,000 1:2,000	150 15 1	-	-	5	Thin bed of wollastonite bearing skarn (65 m x 8-10 m) was located.
<u>Mysore Minerals Ltd</u>							
DOLOMITE							
Karnataka							
Bagalkot	Katagere	-	-	-	-	-	Total of about 99.88 million tonnes of reserves were estimated.
-do-	Naralakere	-	-	-	-	-	Total 10.35 million tonnes of reserves were estimated.
LIMESTONE							
Bagalkot							
-do-	Muddapura	-	-	-	-	-	Total 9.7 million tonnes of reserves were estimated.
-do-	Lokapura	-	-	-	-	-	Total 26.24 million tonnes of reserves were estimated.
-do-	Chikkashellikere	-	-	-	-	-	Total 32.91 million tonnes of reserves were estimated.
Belgam	Yadwad	-	-	-	-	-	Total 25.87 million tonnes of reserves were estimated.
<u>MECL</u>							
Mizoram							
Koasib	Saipum Block	1:1000	0.12	-	-	-	Shell Limestone occurring in the area is found suitable for manufacturing of polished slabs/tiles. A total of about 0.21 million tonnes resources were estimated.
<u>RSMML</u>							
ROCK PHOSPHATE							
Rajasthan							
Udaipur	Rajpura Dariba Mine	1:1000	124.84	-	-	-	Work is in progress.

EXPLORATION & DEVELOPMENT

Table – 13 (B) : Exploration for Industrial Minerals by GSI, DGMs and Central/State Undertakings, 2007-08

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Geological Survey of India							
GRAPHITE							
Tamil Nadu							
Shivganga	Arsanur and Usilampatti area	-	-	-	-	-	In Usilampatti west block high grade graphite gneiss band of 1.9 m width was recorded. In Arsanur West block two zones of low to high grade graphite mineralisation has been identified.
LIMESTONE							
Madhya Pradesh							
Katni	Niwara Area	-	-	-	-	-	About 1.49 million tonnes resources of flux grade limestone were estimated.
Rajasthan							
Jaisalmer	Netse Block	-	-	5	-	-	Boreholes intersected limestone bed.
PHOSPHORITE							
Gujarat							
Panchmahals	Clalvad-Ranjitpura area	-	-	-	-	-	The P ₂ O ₅ content in analysed limestone and dolomite samples varies from <1 to 12%.
Madhya Pradesh							
Sidhi	Basnati-Paniha area	-	-	-	-	-	A feruginised chert breccia band which is at places phosphatic in nature, was traced for about 3 km from Baskati to Panina. Analytical result showed P ₂ O ₅ content varying from 0.5 to 13%.
Uttarakhand							
Tehri Garhwal	Dhalwala-Singtali area	-	-	-	-	-	Mineralisation occurs as discontinuous small lenticular bodies interbedded in limestone and shale sequence of upper Krol and the contact of Krol and Tal formation. The analysis showed P ₂ O ₅ content ranging from 3.2 to 11.35%.
Rajasthan							
Pali	Khivandi area	-	-	-	-	-	Grab samples indicated presence of phosphorite. Analytical results were awaited.
State Directorate of Geology & Mining							
BENTONITE							
Rajasthan							
Barmer	N/V Bhadka, Akli, Nimlo, Nimbasar, etc.	1:50,000 1:10,000 1:2,000	350 15 3	-	-	-	Bentonite seen to occur N/V Akli, Tumbli etc. and siliceous earth seen to exposed due east of Jaseka gaon, Kotra, Pahari, etc.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (B) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
CALCITE							
Rajasthan							
Sirohi	N/V Dallapura,	1:50,000	100	-	-	57	About 0.5 million tonnes resources of calcite were estimated.
	Kambol, etc.	1:10,000	20				
		1:2,000	1				
CLAY							
Rajasthan							
Barmer	N/V Bhadka,	1:50,000	350	-	-	5	Up to 10.5 m thick white clay bed seen to occur in Tanka pits Nala-river cutting N/V Nimla Agoria, Nimsar, etc.
	Akli, Nimla,	1:10,000	15				
	Nimsar, etc.	1:2,000	3				
Dausa	N/V Haldina and Nangal Charan	1:10,000	4	-	-	-	White/grey clay pocket was marked in 80 x 3 m area and 22,800 tonnes of resources were estimated.
Nagaur	N/V Indawar, Lunias, etc.	1:50,000	300	-	-	-	2 to 6 m. thick clay bed observed in wells at lunias, Badgaon.
DOLOMITE							
Madhya Pradesh							
Dewas	Udainagar	1:50,000	228	40	1020.35	258	Aerial extension and depth persistence of deposit demarcated and total of about 108.6 million tonnes reserves estimated.
	Bagli Area	1:4,000	2.1				
GRAPHITE							
Jharkhand							
Palamau	Tabar, Nukta, Navwadi etc.	1:2,000	1.05	-	300	155	About 1.01 million tonnes of resources were estimated under indicated category.
GYPSUM							
Haryana							
Bhiwani Hissar	Garanpur, Kalan, Daryapur, etc.	-	-	-	-	17	Recorded gypsum deposit of variable thickness.
KAOLIN							
West Bengal							
Birbhum	Makdumnagar	-	-	-	-	-	4 pits dug out, kaolin bed found to occur below the layer of fireclay.
KYANITE							
West Bengal							
Purulia	Salboni Ichchadh	1:12,500	6	-	-	14	Ten pits dug out, report under preparation.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (B) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
LIMESTONE							
Chhattisgarh							
Kabirdham	Sohagpur- Udka area	1:50,000 1:4,000	135 0.52	10	185.1	98	About 6.92 lakh tonnes of limestone resources were estimated.
Rajnandgaon	Tekapar- Kalkasa area	1:50,000 1:4,000	25 0.48	5	178.25	58	Total 25.68 lakh tonnes of limestone resources were estimated.
-do-	Northern part of Kabirdham and Rajnandgaon district	1:50,000	2015	-	-	388	Total 2.83 million tonnes of iron ore and 5.5 million tonnes of limestone resources were estimated.
Himachal Pradesh							
Shimla	Salhag	-	-	3	399	-	Drilling on behalf of M/s. Cement India Ltd, was carried out.
-do-	Gumma & Rohana	-	-	2	192	-	Work under progress.
Jharkhand							
Ramgarh (West)	Sudi, Armadag, Kori, etc.	1:50,000 1:5,000	25 0.84	5	197.2	395	Total 10.8 million tonnes of resources of limestone were estimated under indicated category.
Singhbhum (West)	Gangabasa- Rajabasa	1:2,000	1	13	248.55	205	Total 1.63 million tonnes resources were estimated under indicated category.
Karnataka							
Gulbarga	Malkhed, Jawargi, etc.	-	-	2	388.5	400	Exploration was continued.
Tumkur	Melanahalli	-	-	4	388	100	Exploration was continued.
Maharashtra							
Chandrapur	Dhamangaon Vansadi, etc.	1:2,5000	42	-	-	-	-
Orissa							
Nuapada	Gararamura	-	-	10	509.6	418	Drilling revealed cumulative thickness of limestone band varying from 15.4 to 44.17 m.
Rajasthan							
Banswara	N/V Amarpura	1:50,000 1:10,000 1:2,000	150 10 1	-	-	18	Ten million tonnes resources of cement grade limestone were estimated.
Bhilwara Fatehgarh etc.	N/V Harpura, etc.	1:50,000 1:10,000 1:2,000	200 10 1	-	-	21	Calcitic lim inter-bedded with dolomite were located in the area.
Bhilwara and Chittorgarh	In between Kerpura and Barundi village	1:50,000 1:10,000 1:4,000	150 10 1	-	-	7	A limestone band of dimension 1000 m x 30 m was identified.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (B) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Chittorgarh	(i) Phalwa- Dhanora- Payri block	1:50,000	150	14	756	973	About 100 million tonnes resources of cement grade limestone in Phalwa-Dhanora-Payri block and 150 million tonnes in Gopalnagar-Bherusinghji-ka-Khera block were estimated.
		1:10,000	15				
	(ii) Gopalnagar- Bherusinghji-ka Khera	1:4,000	2.75				
Jaipur	N/V Ajitpura, Kujota, etc.	1:50,000	150	4	283	-	Concealed limestone bearing area of 600 x200 m inferred. About 20 million tonnes of limestone resources were computed in gap area.
		1:10,000	10				
		1:4,000	4				
Jaisalmer	N/V Sam and Sagron-ki- Basti, etc.	1:10,000	20	51	1643	1014	About 176 million tonnes of SMS grade and 176.5 million tonnes of cement grade limestone resources were assessed.
		1:2,000	7				
Nagaur	N/V Jayal, Kathoti, etc.	1:50,000	300	-	-	36	Limestone bands of varying dimensions were located N/V Jayal and a limekankar zone was identified N/V Khiyala.
		1:10,000	20				
		1:2,000	2				
-do-	Harima, Pitasar, etc.	1:10,000	30	-	-	75	Potential area for cement/chemical grade limestone was located.
		1:2,000	4				
-do-	N/V Godhan, and Bher	1:10,000	20	-	-	26	Bands of cement grade limestone were identified.
		1:2,000	4				
Rajsamand	N/VLasariya Barlachona Kukra etc.	1:50,000	150	-	-	135	About 21.52 million tonnes resources of cement grade limestone were estimated.
		1:10,000	10				
		1:2,000	1				
LATERITE							
Madhya Pradesh							
Mandsaur	Shamgarh, Suwasra, etc.	1:50,00	1599	-	-	87	Laterite bodies of varying dimensions demarcated and about 80 million tonnes of resources estimated.
Nagaland							
Wokha	Aitepyong- Pyochu	1:50,000	200	-	-	16	A number of mineable laterite deposits were located.
Rajasthan							
Baran	N/V Benta, Barara, etc.	1:50,000	150	-	-	12	About 15.9 million tonnes of laterite resources estimated.
		1:10,000	10				
		1:4,000	0.5				
MAGNESITE AND OTHER SKARN MINERALS							
Rajasthan							
Rajsamand	Sayon-ka- Khera, Chikalwas, etc.	1:50,000	100	-	-	50	Up to 2 cm thick magnesite veins in ultramafic band spread over 900 m strike length identified.
		1:10,000	10				
		1:4,000	1				

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (B) (Contd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
OCHRE							
Rajasthan							
Alwar	N/V Biderka	1:10,000	4	-	-	-	Red ochre deposit marked in 50 x 20 m area and 22,200 tonnes of resources were estimated.
PYROPHYLLITE/SILLIMANITE							
Maharashtra							
Chandrapur	Walni-Khatgaon	1:25,000	24	-	758.85	-	About 0.042 million tonnes resources were identified.
West Bengal							
Purulia	Jinamanipur	1:12,500	1.1	-	-	7	-
Jharkhand							
Jamtara	Gariyanala	1:2,000	0.38	-	-	20	-
ROAD METAL/BLACK STONE							
West Bengal							
Purulia	Kankarkinary	1:3960	1	-	-	-	One million tonnes of reserves estimated.
- do -	Kadam	1:3960	4	-	-	-	About 5.49 million tonnes of reserves were estimated.
SILICA MINERALS							
Haryana							
Bhiwani	Kalayana, Kheri, etc.	-	-	-	-	2	A band of ferruginous quartzite was observed along a strike direction.
Jharkhand							
Hazaribagh	Amritnagar, Charhi, etc.	1:50,000 1:2,000	100 0.35	-	-	6	About 1.68 million tonnes of quartz resources were estimated.
Rajasthan							
Ajmer	N/V. Morla, Adusia, etc.	1:50,000 1:10,000 1:2,000	150 15 1.5	-	-	22	-
-do-	N/V Jestika, Langarwas, Bamankedi, etc.,	1:50,000 1:10,000 1:2,000	100 10 1	-	-	24	4.57 million tonnes resources of silica sand were estimated.
Bharatpur	Tekri, Bundli, Bas Papra, etc.	1:50,000 1:10,000 1:2,000	150 15 1	-	-	33	0.52 million tonnes of silica sand and 37.5 million tonnes of masonry stone resources were estimated.
Dausa	N/V Biderka and Banwar	1:10,000	2	-	-	-	Quartz pockets were marked in 60 x 5 m area and 8,000 tonnes of reserves were estimated.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 13 (B) (Concl'd.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Jaisalmer	N/V Khuhra, Madasar, etc.	1:50,000	300	-	-	20	-
		1:10,000	10				
		1:2,000	2				
Jalore	N/V/ Bankli	1:50,000	100	-	-	13	Two Jasper veins of size 25 x 0.1 to 5 m and 100 x 3 to 5 m were seen.
		1:10,000	10				
		1:2,000	0.5				
Karauli	N/V Saimuda, Garain, Khirkhira, etc.	1:50,000	200	-	-	51	During 2006-07 and 2007-08 a total of about 30.3 million tonnes resources of silica sand were estimated.
		1:10,000	20				
		1:2,000	2				
Sirohi	N/V Bhimna Sarupganj, etc.	1:50,000	100	-	-	57	About 0.5 million tonnes resources of quartz were estimated.
		1:10,000	20				
		1:4,000	1				
Udaipur	N/V Gurli- Bambora- Panund, etc.	1:50,000	200	-	-	-	Occurrences of quartz veins and pegmatite bodies containing mainly felspar and quartz were located.
		1:10,000	20				
		1:2,000	1.5				
Orissa							
Mayurbhanj	Kesna, Sialgotheni, etc.	1:50,000	108	-	-	83	Four ultramafic bodies and seven quartz veins were located.
West Bengal							
Purulia	Kaliasota, Mahisnadi, etc.	1:12,500	1	-	-	9	Thin bands of glass sand found to occur sandwiched between sandstone layers.
-do-	Janipur	1:3,960	0.08	-	-	4	1.46 lakh tonnes of quartz resources were estimated.
-do-	Hirapur	-	-	-	-	12	Four test pits were dug out. Work is in progress.
WOLLASTONITE							
Rajasthan							
Jaipur	Jainagar Kabir-ki- Dhani, etc.	1:10,000	20	-	-	18	Wollastonite bearing skarn zone noted N/V Kaliba-ki-Dhani, Jingaur, etc.
		1:2,000	15				
Sikar	Rajpura- Dhandela	1:10,000	20	-	-	18	Wollastonite bearing skarn zone noted.
		1:2,000	1.5				

EXPLORATION & DEVELOPMENT

**Table – 14 (A) : Exploration for Granite, Marble and Other Dimension Stones
by State Directorates in 2006-07**

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Mete- rage		
CONSTRUCTION MINERALS							
Maharashtra							
Aurangabad	Phulambi	1:50,000	-	-	-	-	Suitable site for construction minerals were identified around Phulambi Dongargaon, Sultanwadi and Chincholi villages.
Jalgaon	Nandgaon	1:50,000	122	-	-	-	Suitable site for construction minerals were identified around Nandgaon Amalner, Deoli and Chahardi villages.
	Amalner and Deoli	1:5,000	2.2				
BUILDING STONE							
DMG, Rajasthan							
Baran	N/V Jhonpariya to Rajoriya	1:50,000 1:10,000 1:2,000	100 15 1	-	-	34	Total inferred resources of masonry stone estimated at 68 million tonnes.
Barmer	N/V Nausar, kamthai, Dhanna-ki-Dhani, etc.	1:50,000 1:10,000 1:2,000	200 20 2	-	-	40	Rhyolite seen to occur in the area from Bhalisar to Kamthai, Nausar and bank of Luni river. Syenite rock seen to occur at Goyana-Bhakar, Dhandli, etc.
-do-	N/V Mokhab, Amardham-ki-Dhani, etc.	1:50,000 1:10,000 1:2,000	205 15 2	-	-	-	Exposures of massive sandstone in an area of about 0.5 sq km were located.
-do-	N/V Duda, Beri, Nand Sheo-Ki-Magri, etc.	1:50,000 1:10,000 1:2,000	120 18 1.5	-	-	5	Pink coloured medium to coarse grained granite occurs in the area.
Churu	N/V Dunkar, Charvas, etc.	1:50,000 1:10,000	100 10	-	-	-	Ultrabasic rocks were found exposed in the nallah cutting in S-W of village Belra and granite rocks were found exposed in a number of open wells N/V Chhapar.

(Contd.)

EXPLORATION & DEVELOPMENT

Table - 14 (A) (Concl.d.)

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
Dhaulpur	N/V Kankrai	1:50,000	100	-	-	30	A total of 39.6 million tonnes sandstone resources were estimated.
	Totapura , etc.	1:10,000	15				
		1:2,000	2.5				
Jaipur	N/V Lakher,	1:50,000	315	-	-	-	Gap area for masonry stones were delineated.
	Arania, etc.	1:10,000	32				
Jaisalmer	N/V Pithla	1:10,000	15	-	-	-	Deposits of limestone suitable for flooring identified.
		1:2,000	3				
Jodhpur	Tambriya,	1:10,000	20	-	-	34	Isolated sandstone outcrops were identified.
	Kalan,	1:2,000	1				
	Bandra, etc.						
-do-	N/V Bedu,	1:10,000	10	-	-	20	Dolomitic marble deposit spread over about 4 sq.km., between villages Bedu-Bedu Kalan were identified.
	Suwap, etc.	1:2,000	3				
Nagaur	N/V Gumpaliya, Chapara, etc.	1:50,000	50	-	-	5	Occurrences of serpentine marble identified.
Pali	N/V Miniari, Bhiwani area	1:50,000	15	-	-	18	-
		1:10,000	10				
-do-	N/V Chaug, Rojra, Khidargaon, etc.	1:10,000	10	-	-	-	Deposits of blockable granite were located.
Sirohi	N/V Bhimana, Bharja, etc.	1:50,000	200	-	-	57	6 million tonnes of bajri resources in Banas river and its tributaries were assessed.
		1:10,000	10				
GRANITE							
DMG, Andhra Pradesh							
East Godavari	N/VChopparipalem, Jaderu, Nellipudi & Thungumadugula	-	-	-	-	-	Reconnaissance survey carried out. Investigation is under progress.
Medak	N/V Kukunur, Jukkal, Gadipeddapu, etc.	-	-	-	-	-	Reconnaissance survey carried out. Investigation is under progress.
Visakhapatnam	N/V Madigunta Nalanki, etc.	-	-	-	-	-	Reconnaissance survey carried out. Investigation is under progress.

EXPLORATION & DEVELOPMENT

**Table – 14 (B) : Exploration for Granite, Marble and Other Dimension Stones
by State Directorates in 2007-08**

Agency/ Mineral/ State/District	Location	Geological mapping		Drilling		Sampling	Remarks
		Scale	Area (sq km)	Bore- holes	Metre- rage		
BUILDING/DIMENSION STONE							
DMG, Karnataka							
Chikbaliapura	Dibburhalli, Thimmasandra, etc.	1:50,000	500	-	-	8	A total 0.64 million tones resources of granite to a workable depth of 20 m. were estimated.
Hassan	Hoskote, Uchangi etc.	1:50,000	600	-	-	5	A total of 0.35 million tonnes resources of dolomite to a workable depth of 20 m was estimated.
Orissa							
Khurdha	Kaluchua, Dhanias, etc.	1:50,000 1:25,000	202 14	-	-	62	Work is in progress.
DMG, Rajasthan							
Baran	N/V Benta, Rajput, etc.	1:50,000 1:10,000 1:4,000	150 10 0.5	-	-	2	About 2 million tonnes of sandstone resources were estimated.
Barmer	N/V Trisulia, Sanpa, etc.	1:50,000 1:10,000 1:2,000	350 30 5	-	-	15	Up to 30 m thick sandstone band exposed in an area of about 0.4 sq.km N/V Trisulia demarcated.
Bundi	N/V Murjadpura, Narayanpura, etc.	1:50,000 1:10,000	150 10	-	-	12	About 2.6 million tonnes resources of limestone suitable for flooring and 1.04 million tonnes of cement grade limestone resources were estimated. Besides, 22.5 million tonnes resources of sandstone were also estimated.
Dhaulpur	Dhanera, Baravli, etc.	1:50,000 1:10,000 1:2,000	150 15 2.05	-	-	25	A total of about 26 million tonnes of sandstone resources were estimated.
Jaisalmer	N/V Hansu-ki- Dhani, Soro-ki- Dhani, etc.	1:10,000 1:2,000	15 3	-	-	-	Limestone deposits suitable for its use as building stone were identified.
Jhalawar	N/V Borkheri Garra, etc.	1:50,000 1:10,000 1:4,000	100 10 2	-	-	10	About 9.63 million tonnes resources of sandstone estimated N/V Patlikhera.
Jodhpur	N/V Gopalsar Utamber, etc.	1:50,000 1:10,000 1:2,000	200 10 2	-	-	24	Blockable sandstone mapped in 1.50 sq.km area near Meghwalo-ki-dhani.
Directorate of Geology							
Orissa							
Khurda	Kaluchua Dhanias, etc.	1:50,000 1:25,000	202 14	-	-	62	Work is in progress.
DGM, Nagaland							
Phek	Old Avangkhu	1:4,000	2	-	-	-	About 8 million tonnes of granite resources suitable for dimensional stone were estimated.