ORI-10

RIO TINTO

Rio Tinto Exploration India Limited

(Previously Known as ACC Rio Tinto Exploration Ltd.)

A member of the Rio Tinto Group

Final Relinquishment Report for Exploration of the Bargarh Reconnaissance Permit (RP 72) Orissa, India

Report No: 27737 (volume 1 of 2)

Author: Prabir Sengupta

Date: July 2008

Submitted:
- Secretary, Department of Commerce & Industries, Government of Orissa, Bhubaneshwar.
- Directorate of Geology & Mining Government of Orissa, Bhubaneshwar
- Indian Bureau of Mines, Nagpur.
- Geological Survey of India, Calcutta.

Distribution:
- RTX Library, Bangalore
- RTE, Belmont (Digital)

SUMMARY

This is the Final Relinquishment Report on the exploration for diamonds and other mineral commodities carried out in the Bargarh Reconnaissance Permit (Bargarh RP), executed on 29/04/2005, for the period of April, 2005 to April 2008, in compliance of Section 16 of the Mineral Concessions Rules, 1961.

As per the requirements of the MMRD Act and as per a letter addressed to the DMG Orissa dated 27th April 2007, about 50% of the permit was relinquished with only 676 km^2 of the original 1360 km^2 permit area being retained at the end of 2nd year of exploration.

Exploration completed including over 197 heavy mineral gravel samples and 126 –80# stream sediment geochemical samples and 162 soil samples collected at a nominal spacing of one sample per 5 to 25 square kilometres, providing for regional coverage over 1360km^2 of the permit area. To facilitate the exploration over the Reconnaissance Permit (RP), airborne geophysical data was purchased from the Orissa State Government. This survey was flown by World Geoscience in the early 1990's at a nominal line spacing of 250m at a mean terrain clearance of 80m. Airborne geophysical data included total field and reduced-to-pole (RTP) magnetics which was interpreted in house to identify areas of interest which could be attributed to any intrusive signature. 185 line km of ground magnetics was also conducted.

Approximately 100,000 heavy mineral grains recovered from the gravel samples were subsequently analysed for major oxide elements by manual and automated scanning electron microprobe. Mineral chemistries of the indicators identified a few anomalous catchment areas with probable deep mantle intrusive sources where as majority of the area returned indeterminate or crustal chemistries. The anomalous catchments were then followed up by prospecting, soil sampling and ground magnetic survey. While few target areas had been identified, test drill holes couldn't be carried out due delay of permissions from respective forest departments. Three applications for grant of prospecting licenses have been lodged covering an area of 70.25 sq.km.

INTRODUCTION

This progress report pertains to all exploration activities for diamonds and other mineral commodities carried out by Rio Tinto Exploration India Limited (RTX) which was previously known as ACC Rio Tinto Exploration Ltd. in the Bargarh RP RP during the period of 29th April 2005 to 29th April 2008. The 1360 km^2 area of Bargarh RP was granted to RTX on the 28th October 2004 and was consequently executed on 29th April 2005.

The Bargarh RP area is located within the west central part of Orissa State, approximately 55 km west of Bargarh town. The field area is accessed from Raipur via the Indian National Highway No. 6 (NH6) and National Highway No. 217 (NH 217) to the nearest town of Khariar Road.

Summaries of exploration activities during this period are detailed in table 1. This report compliments previous biannual report including:

- ACC Rio Tinto Exploration Limited (October 2005); 1st Bi-annual Progress Report for Exploration of the Bargarh Reconnaissance Permits For the period 29/04/2005 to 29/10/2005.
- Rio Tinto Exploration India Limited (April 2006); 2nd Bi-annual Progress Report for Exploration of the Bargarh Reconnaissance Permits For the period 29/10/2005 to 29/04/2006.
- Rio Tinto Exploration India Limited (October 2006); 3rd Bi-annual Progress Report for Exploration of the Bargarh Reconnaissance Permits For the period 29/04/2006 to 29/10/2006.
- Rio Tinto Exploration India Limited (April 2007); 4th Bi-annual and part relinquishment Report for Exploration of the Bargarh Reconnaissance Permits For the period 29/10/2006 to 29/04/2007.
- Rio Tinto Exploration India Limited (October 2007); 5th Bi-annual Progress Report for Exploration of the Bargarh Reconnaissance Permits For the period 29/04/2007 to 29/10/2007.

The above report has been submitted with the relevant government institutions and is further archived with RTX in Bangalore.

Table 1: Summary of exploration completed by RTX on the Bargarh RP

Name (District)	Granted RP Area km^2	Date of Execution	Heavy Mineral Samples	Heavy Mineral grains recovered	Geochemical Samples	Geophysics (line kms)	Drilling (meters)
Bargarh RP	Granted 1360 Retained 676	29 April 2005	197	103783	126 Stream Sediment 162 Soils	185	Nil

1 GEOMORPHOLOGY

The area exhibits diverse topography. It can be divided into

a) The eastern fringe of the Chattisgarh plateau – an approximating tableland with the elevation varying between 280 – 300 m, rising to 350 m towards the plateau margin. At places the detached parts of Chattisgarh plateau occurs as cuestas.

b) The pediplained rolling granite gneiss country east of the Chattisgarh plateau, with elevations varying between 300 – 350 m

c) Mounds of granite gneiss, occurring at times as tors rising between 450 – 640 m over the pediplains.

The drainage is controlled by Mahanadi River occurring just east of the Bargarh RP and flowing northeast. Ong Nadi and Jonk Nadi are two main tributaries to the Mahanadi River, which flow within the RP area.

2 REGIONAL GEOLOGY

The regional geology of the area has been established by the systematic geological mapping carried out by the Geological Survey of India (GSI). Our source of information includes the 250,000 scale published geological maps by the GSI and discussion with GSI geologists. The Archean-Palaeo-proterozoic Bundeli Granitoids batholith (also called Dongargarh Granitoid elsewhere in the Bastar Craton) occurs in the western part of the area. Rocks of Archean Sonakhan Greenstone Belt occur as vestigial enclaves within the Bundeli Granitoid. Sonakhan lithology consists of metaultramafites, mafic and felsic volcanics, argillites and greywackes alongwith banded iron formation and ferruginous cherts. The Sonakhan Greenstone Belt is known to rest over Archean Baya Gniessic Complex (also known as Bengpal Gneissic Complex elsewhere in the Bastar Craton). Enclaves of Baya Gneisses are found within the Bundeli batholith in the RP area. Bundeli Granitoids show magmatic fabrics including plagioclase phenocryst alignment, magmatic flow orientation, K-feldspar megacrysts and occasional rapakivi texture. Platformal sediments of Chattisgarh Supergroup overlie the rocks of Bastar craton. These sub horizontally to steeply disposed; mildly metamorphosed sediments were deposited over the Archaean crystallines of Bastar Craton during Mesoproterozoic to Neoproterozoic times in Chattisgarh Basin.

3 RESULTS OF EXPLORATION

3.1 Collation of Available Database

RTX has purchased all the available 250,000 geological maps of the RP area from the Geological Survey of India (GSI) and topographic maps from the Survey of India (SOI). Other available and published geological, geophysical and land information data from GSI and other agencies are also being collated. Relevant data have been appropriately geo referenced and stored in the digital format for incorporation into a GIS database of the area. Other data purchased and processed include the Landsat TM data, IRS digital data and airborne magnetic survey data. These images have helped in the planning and selection of the indicator mineral sample sites and have provided the base for structural interpretations and regolith terrain mapping.

3.2 Geology

Geological traversing in combination with other exploration activities has found the regional 1:250,000 geological mapping of the GSI to be accurate and sufficient for the interpretation of most of the regional and prospect datasets. A compilation geological plan has been presented in NDbg0798.

The RP area comprises of geological formations ranging from Archaean to Neoproterozoic. Stratigraphically the area can be classified into oldest Baya gneiss (basement), Sonakhan greenstone belt, undifferentiated granitoids of Bastar craton, Eastern Ghats Mobile Belt and rocks of Chattisgarh Supergroup.

Baya Gneissic Complex: Oldest known rocks (age 3.5 billion years) in the area exposed towards north and north-western part of the RP. Also known as Bengpal Gneissic Complex elsewhere in the Bastar Craton Enclaves of Baya Gneisses is found within the Bundeli batholith in the RP area. The gneissic complex varies from tonalitic to granodioritic in composition with restites predominantly of amphibolite, metaultramafite and banded hematite quartzite, fibrolite quartzite, fuchsite quartzite, mica schist etc. These gneisses are traversed by aplites, leucogranite and pegmatites. The preserved structure of earlier deformation phase higher metamorphic grade separates it from the Sonakhan schist belt. (Das 1990)

Undifferentiated Granite: Bastar Craton is a greenstone-granite province where greenstone components occur as enclaves within oldest dated tonalite gneiss (3.5 to 3.0 Ga, Rb-Sr and Pb-Pb) (M Hussain 2004), and younger greenstone belts intruded by batholithic granites dated between 2.6 and 2.4 Ga (Rb-Sr and Pb-Pb) (Sarkar 1989). The Archean-Palaeoproterozoic Bundeli Granitoids batholith (known as Dongargarh Granitoid elsewhere in the Bastar Craton) occurs in the western part of the area. The granitoid intrude into Archaean Baya Gneissic Complex (also known as Bengpal Gneissic Complex elsewhere in the Bastar Craton), enclaves of which are found within the batholith. Coarse-grained porphyritic granite, biotite granodiorite, quartz rich leucocratic granite metasomatic granite and granophyres are the major rock types in the RP area.

Sonakhan Greenstone belt: The Sonakhan Greenstone Belt rests unconformably over Archaean Baya Gneissic Complex, exposed in the northern part of Bargarh RP.

Sonakhan lithology consists of meta-ultramafites, amphibolites metabasalt pillowed metabasalt, metamorphosed differentiated basic suite, pyroclastics, schistose ignimbrites, acid tuff and schistose rhyolites and sulphide bearing auriferous ferruginous chert followed by a major break which is marked by conglomerate. Argillite –greywacke suite overlies the previous succession and is further intruded and overlapped by younger undeformed-unmetamorphosed basic and acid intrusives. (Das 1990)

Eastern Ghats: The Eastern Ghats Mobile belt occupies the south-eastern part of the RP. The granite-greenstone belts of the Singhbhum-Orissa Craton

bound this granulite belt to the north and Bastar craton to the west. The western extents of the Eastern Ghats Mobile Belt characterised by 2-pyroxene granulites, khondalites, leptynites, enderbites and charnockites, occurs in the eastern part of the tenement. The contact with the Bastar Craton is somewhat irregular and gradational, however is considered to be a thrust contact with the EGMB thrusted over the Bastar Craton.

Khondalite suites of rocks are the major components found along the western contact; however mafic-ultramafic complexes, series of alkaline rocks and massif anorthosites also form part of the Eastern Ghat orogeny. The shear zone is characterised by mylonitic foliation and stretching lineation. (Bhattacharya et al 2005).

Proterozoic Rocks Of Chattisgarh Supergroup These sub-horizontally disposed, mildly deformed sediments were deposited in a number of isolated basins in the Meso- to Neoproterozoic times. The sediments are multiple cycles of sandstone, shale and limestones lying unconformably over the Archaean-Palaeo-Proterozoic rocks of Bastar Craton.

The Singhora sub-basin (called Singhora Proto-basin by GSI geologists) occupies the north-western part of the area. Lithostratigraphically this is part of Chattisgarh Supergroup. These are multiple cycles of arenite-argillite-carbonate lithologies, and interbedded volcaniclastics. The sediments of Singhora Group were deposited over the Archean crystallines of Bastar Craton during later part of Meso Proterozoic times in a NNE trending embryonic sub-basin, which enlarged to Chattisgarh Basin during the Neoproterozoic. The shallow marine shelf bar sequence consists of minor logically and texturally mature sandstones with subordinate siltstones, mudstones and conglomerates. The provenance analysis reveals that the clastics were derived from granites and granite–gneisses of a continental block tectonic provenance. (Dutta 2005)

Younger Intrusives including Alkaline intrusives: According to Mukhpadhyay et al, 2004, 13 types of dykes have been reported in this area, which include dolerite, gabbro, harzburgite, lherzolite, rhyolite porphyry, analcime syenite, quartz syenite, trachyte, micro monzonite, micro monzosyenite (Nanda et al 2000) and olivine basalt dyke at Parkom (Das et al 1985). These dykes exhibit various width and length varying from 20m and 2.5 km and represent N-S to NNE- SSW trend.

Sakri: A GSI reported cluster of dykes of probable alkaline – ultramafic affinity are located towards the south-western part of the RP area. Macrocrystic rocks with pseudomorphs of olivine macrocrysts and phlogopite, diopside as groundmass, aegerine ilmenite as minor phases, quartz and calcite as secondary minerals are seen.

3.3 Reconnaissance Heavy Mineral (Gravel) Sampling

A total of 197 gravel samples have been collected from active drainages with catchments ranging from 5 to 25 km^2 area.

Each gravel sample comprised approximately 20 kg to 30kg of –1mm sand collected by hand from heavy mineral concentration zones within the active stream sediment bed load. All samples are processed at the company's specialist processing facilities by dense media separation, magnetic and heavy liquid techniques with mineral concentrates manually observed for any potential kimberlitic indicators.

The following table gives an analysis of observation and major oxide SEM mineral chemistries (table 2) of kimberlitic indicator minerals in the gravel samples collected from the RP area.

Detailed SEM major oxide results for all heavy mineral indicators are listed appendix 4.

Table 2: Summary of kimberlitic indicator minerals and positive samples based on major element oxide SEM data from regional gravel samples

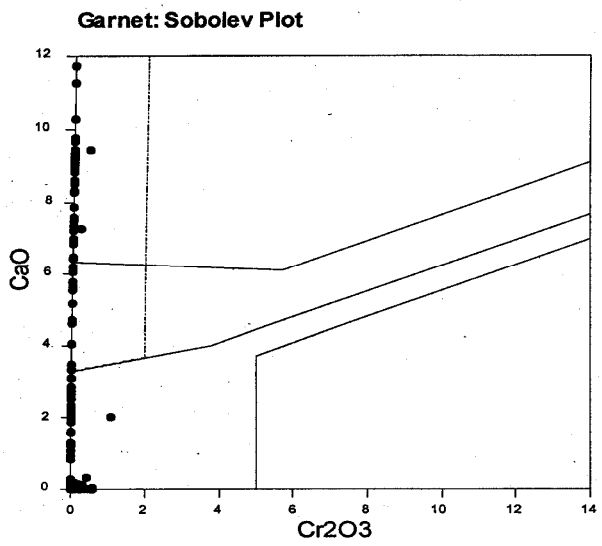
	Pyrope	Mantle Chromite	Picro Ilmenite	Chrome Diopside
No of grains	0	3580	0	0
Maximum grain count	0	391	0	0
No of positive samples	0	76	0	0
% of positive samples	0%	38%	0%	0%

3.3.1 Heavy Mineral Sample Diamond Results

7 micro diamonds were identified on caustic fusion of heavy mineral concentrates.

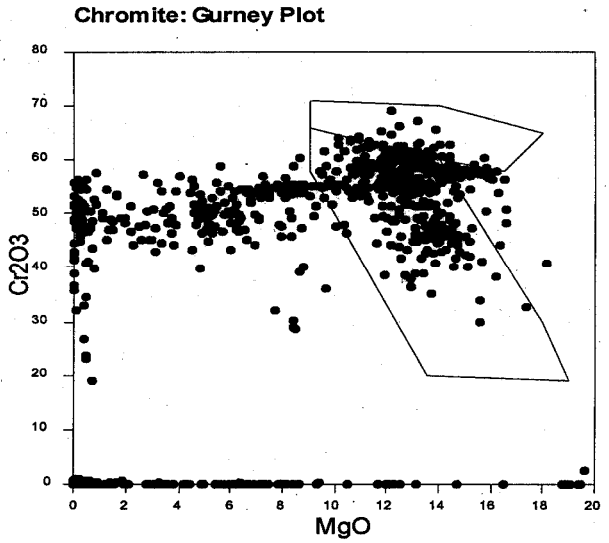
3.3.2 Heavy Mineral Sample Garnet Results

All garnet grains tested by probing returned no kimberlitic pyrope in any of the samples. The garnets are dominated by grossular, spessartine and almandine.



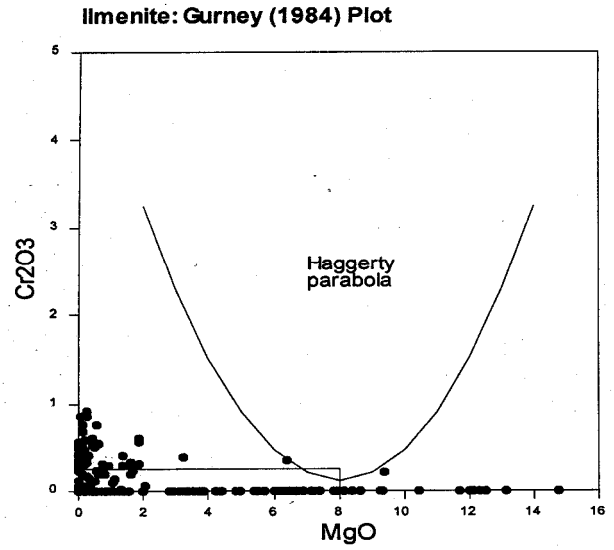
3.3.3 Heavy Mineral Sample Chromite Results

Mineral chemistries of probed chromite grains are predominantly consistent with a shallow magmatic paragenesis with one fractionated trend centred on approximately 40-60% Cr_2O_3. The population exhibit variable MgO of 0-18% with the higher MgO varieties overlapping into the fields of mantle-sourced chromites.



3.3.4 Heavy Mineral Sample Ilmenite Results

Probing of ilmenite grains in samples did not identify any kimberlitic Picro ilmenite.



3.3.5 Heavy Mineral Sample Chrome Diopside Results

No chrome Diopside was identified from the observation of heavy mineral concentrates.

3.4 Geochemical Exploration:

126 Stream Sediment samples and 162 soil samples of ~150gm each sieved to –80# were collected from the first and second order creeks and different soil horizons on targets within the RP area. Samples were analysed for a total of 38 elements by total acid digest and ICP-OES and ICP-MS (*=ICP-MS) techniques. Elements analysed and detection limits are as follows: Ag* (0.1 ppm), Al (10 ppm), As* (0.5 ppm), Ba (10 ppm), Bi* (0.1 ppm), Ca (10 ppm), Cd* (0.1 ppm), Ce (0.5 ppm), Co (2 ppm), Cr (2 ppm), Cs (0.1 ppm), Cu (2 ppm), Fe (100 ppm), Ga (0.1 ppm), K (10 ppm), In (0.05 ppm), La (0.5 ppm), Mg (10 ppm), Mn (5 ppm), Mo* (0.1 ppm), Na (10 ppm), Nb* (0.1 ppm), Ni (2 ppm), P (5 ppm), Pb* (0.5 ppm), Rb (0.1 ppm), Sb* (0.5 ppm), Se (0.5 ppm), Sr (2 ppm), Te (0.2 ppm), Ta (0.2 ppm), Ti (10 ppm), Tl (0.1 ppm), V (2 ppm), W* (0.1 ppm), Y (0.05 ppm), Zn (2 ppm), Zr (10 ppm). Complete assay result is listed in Appendix 2.

3.4.1 Stream Sediment Geochemical Results

126 Stream sediment samples were collected within anomalous catchments, from the first and second order streams. No base metal anomalism is defined in the area. The analysis of stream sediment samples appears to be concurrent with the regional geology. Contact between granite and Eastern Ghat Mobile Belt (EGMB) and within EGMB exhibit high concentration of rare Earths elements, indicating possible alkaline source within Eastern Ghat mobile belt. Elevated Nb, Ce and La characterize the basement gneisses. Stream sediment sample locations are given in Plan NDbg0796 and a summary statistics is included in Table 2.

3.4.2 Soil Geochem Results

162 soil samples over various airborne and ground geophysical targets were collected. The analysis of some soil samples collected over the targets revealed some anomalous area while others appear to be concurrent with the regional geology. Summary statistics of the soil samples are listed in the following table and sample locations are given in Plan NDbg0797.