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Rio Tinto Exploration India Private Limited  
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## Final Relinquishment Report on the Tadpatri Reconnaissance Permit, Andhra Pradesh, India

RP No. GOMs.No 264

March 2011

Rio Tinto Report Number: 28858



*Contact of Granite and Ultramafic rock*

Copies to:

Directorate of Geology and Mining, Hyderabad, Andhra Pradesh  
Indian Bureau of Mines, Nagpur,  
Geological Survey of India, Kolkata

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## 1. Summary

This report comprises all the activities carried out by Rio Tinto Exploration India Pvt Ltd (RTEIPL) on the exploration for diamond and other mineral commodities within the Tadpatri Reconnaissance Permit.

It includes all geological geophysical and geochemical data collected by the company within the RP area during the tenure.

In compliance with the provisions of MINES AND MINERALS. (DEVELOPMENT AND REGULATION) ACT (MMDR), 825km<sup>2</sup> which is 50%, of the initially granted 1650 km<sup>2</sup> Tadpatri Reconnaissance permit area was relinquished when the tenement expired on 27/12/2010.

A total of 238 gravel and 238 stream sediments were collected at an average sample density of 8-10 Km<sup>2</sup>. These samples were processed for kimberlitic indicator minerals and multi-element geochemistry, respectively. The sample observation results have been declared and positive grains from 121 samples were sent for further probe analysis.

1760 Line km of geophysical survey was conducted in the Northern and the South-eastern blocks of the permitted area. The data of the Ground magnetic survey conducted, has been compiled and studied for future assessments on the area. No targets of interest were found.

Desktop analysis of geological maps, satellite imageries and review of older exploration data have been also carried out during this tenure. No significant mineral occurrence is being reported during this period from Tadpatri RP.

A plan was underway to follow up catchments that yielded moderate priority indicators but owing to monsoons and poor ground accessibility the work could not be completed within the available time. Please refer Plan 1-NDbg0903 that shows the original area of grant and area retained after the first relinquishment.

The results of samples collected within this area did not indicate the possibility of kimberlitic intrusion.

The prospectively of the area is not encouraging. Therefore Rio Tinto will not be applying for PLAs in the Tadipatri tenement.

## 2. Introduction

This progress report pertains to all exploration activities for diamond and other mineral commodities carried out by Rio Tinto Exploration India Limited in the Tadpatri RP during the period from 28/12/2007 to 27/12/2010.

RP Name	RP Number	RP Granted	Date of RP Execution	Initial Area Granted (km <sup>2</sup> )	Date of 1st Relinquishment	Retained Area (km <sup>2</sup> )	Relinquished Area (km <sup>2</sup> )	Date of Final Relinquishment
Tadpatri RP	RP No. G.O.Ms.No 264	October 2007	28 <sup>th</sup> December 2007	1650	27 <sup>th</sup> December 2009	825	825	27 <sup>th</sup> December 2010

Table1: Summary of Tadpatri Tenement

Complimentary periodic reporting has been completed and submitted as per the terms of the RP grant that includes:

- 1<sup>st</sup> Biannual Progress Report was compiled on Exploration of the Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit for the period from 28/12/2007 to 27/06/2008 and was submitted on 27/09/2008.
- 2<sup>nd</sup> Biannual Progress Report was compiled on Exploration of the Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit for the period from 28/06/2008 to 27/12/2008 and was submitted on 27/03/2009.
- 3<sup>rd</sup> Biannual Progress Report was compiled on Exploration of the Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit for the period from 28/12/2008 to 27/06/2009 and was submitted on 27/09/2009.
- 4<sup>th</sup> Biannual Progress Report was compiled on Exploration of the Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit for the period from 28/06/2009 to 27/12/2009 and was submitted on 27/03/2010.
- 1<sup>st</sup> partial relinquishment Report on relinquishing 825 Sqkm and retaining 825 Sq km area of Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit was submitted on 27/03/2010.
- 5<sup>th</sup> Biannual Progress Report was compiled on Exploration of the Tadpatri (RP No. G.O.Ms.No 264) Reconnaissance permit for the period from 28/12/2010 to 27/06/2010 and was submitted on 27/09/2010.

All the above reports have been submitted to the relevant Government Departments.

Exploration completed during the 3 year tenure includes an extensive gravel sampling programme. A total of 238 gravel samples weighing between 25 and 30 kg, (-1mm fraction) were collected and processed at the company's Dense Media Separation facility. Field sample data collection ledgers for these samples are listed in Appendix 1 and observation reports from the mineral processing facility, listed in Appendix 3. A total of 1798 mineral grains have been probed from 121 samples after observation. The probed grains of potentially kimberlitic and non kimberlitic indicator minerals recovered from these samples are listed in Appendix 5.

An additional 238, -80 mesh stream sediment geochemical samples were collected from the same sample site as the primary reconnaissance gravel samples and assayed for a combination of 32 lithophile, chalcophile and precious metal elements and a total of 5 rock samples were collected for whole rock geochemistry analysis. Processing of the former samples was not undertaken, however the results of the latter are attached in the Appendix 5

In addition to this, an extensive ground magnetic survey totalling 1760 line kilometers, was completed. Processing and interpretation of the data and planning of field activities based on the results was also conducted during this reporting period.

Tadpatri RP in Andhra Pradesh is located in Survey of India's 1:250,000 scale toposheet numbers 57F and 57J, and covers an area of 1650 km<sup>2</sup>. Out of the total granted area, 1343 km<sup>2</sup> is in the Anantapur district and 307 km<sup>2</sup> in the Cuddapah district. Please refer Plan No 1-NDbg0903 for details.

The total population of aforementioned two districts is around 62,42,545 (Census of India 2001-Data) out of which 25% population live in urban areas. There are approximately 233 inhabited villages under the RP area of which 198 villages are in Anantapur district and 35 are in Cuddapah district. The area has a literacy rate of about 56% (National Informatics Centre website).

Puttaparthi is the nearest airstrip to the tenement area. The RP area is also well connected by road and railway network system. It can be easily accessible by metal roads from Anantapur town. National highways viz. NH-7 and NH-205 are the major roads access to the tenement. Anantapur is the major railhead proximate to the RP area having 24hrs railway connectivity. Other major towns in the proximity are Gooty (~50 km), Guntakal (~80 km), Tadpatri (~50 km), and Pullivendala (~70km).

About 15% of the RP area is covered by reserved forest, most of which is degraded thin crowned forest. Forest cover occupies part of the RP in the north and the south. Most of the forest has mixed flora mainly characterized by bamboo, firewood, beedi leaves and timber. There are also numerous isolated peaks and rocky clusters designated as forest property, which are however, devoid of any vegetation.

### 3. Geomorphology

The region exhibits pediplained topography. Geomorphology of the area varies from gently rolling terrain in the eastern half of the tenement, to hills and NW-SE trending ridges in the central to western half of the RP area. The overall relief is over 300 m, with the highest altitude in the south western part of the RP at ~ 550 m and the lowest altitudes in the eastern part of the RP of about 230m.

The general slope of the area is towards the east, controlled by the catchments of Penner and Chitravati Rivers. Local drainages have lithological and structural controls.

Soil type in the RP area is mainly residual in-situ leached or proximal alluvial. At some places in the south-eastern part of the tenement black soil with variable thickness also occurs.

### 4. Regional Geology

The Tadpatri RP is located in the the Eastern Dharwar Craton of the Peninsular Indian Shield, a stable continental region. The Dharwar Craton occupies the lowest stratigraphic position in the Indian shield covering an area of about 450,000 km<sup>2</sup>. The Dharwar Craton is divided into two blocks viz. Western Dharwar Craton (WDC) and Eastern Dharwar Craton (EDC) separated by the Chitradurga Shear Zone (Ramakrishnan et al. 2008). The geology is dominated by the Peninsular Gneissic Complex (PGC) and granite greenstones occupying narrow linear belts. Dyke swarms of different petrographic characters and ages traverse the Craton, pointing to the brittleness of the upper crust.

The Dharwar Craton experienced large scale deposition of Meso to Neoproterozoic platformal sediments represented by the Cuddapah, Kaladgi and Bhima Basins. The Cuddapah Basin, the largest of all, is situated at the eastern margin of the Craton in contact with the Eastern Ghat Mobile Belt.

Numerous kimberlites and lamproites intruded the Precambrians in the EDC and the Cuddapah Basin clustered in Ananatapur and Mahbubnagar Districts. Lamproites are confined to the Cuddapah Basin (Chelima and Zangamarajupalle) and its NE margin Rammanapeta etc. (Rao et al, 2004). In this region of the Wajrakarur Kimberlite Field, Rio Tinto has also reported several kimberlites (RTEI, Biannual progress report, 2003).

## 5. Prospect Geology

The RP area covers part of the Eastern Dharwar Craton. The Peninsular Gneissic Complex (PGC) is the oldest litho unit in the RP comprising of granite gneiss and hornblende biotite gneiss. The intrusion of the Closepet Granite consists of granite and granodiorite plutons in the PGC and during the Paleo-proterozoic lead to the process of cratonisation (Ramakrishnan et al 2008). Multiple swarms of dolerite and gabbro dykes trending NE –SW and NW-SE of Lower Proterozoic age intrude the older crystallines.

The Dharwar Craton is overlain non-conformably by Mesoproterozoic platformal sediments of the Cuddapah Super Group. The oldest lithounits of the Cuddapah Basin comprising the Gulcheru and Vempalle Formation of the Papaghani Group are exposed in the NNW part of the RP area, having a thickness of approximately 1760m (Ramakrishnan et al 2008). The Gulcheru Formation comprises basal conglomerate, quartzite and interbedded shale where as the the Vempalle Formation encompasses Kuppapalle volcanics (basic sills), dolomite and quartzite.

The Chitravati Group disconformably overlies the Papaghani Group with the lower Pullivendala and Tadpatri Formations having a total thickness of approximately 4675m (Ramakrishnan et al. 2008). The Pullivendala Formation mainly comprises of quartzite and basal conglomerate. The Tadpatri Formation is characterized by shale (purple and grey), carbonates, dolomites and basic sills. Please refer to Plan No 2-NDbg0827 for details

## 6. Regional Reconnaissance of Indicator Mineral (Gravel) Sampling Program

A total of 238 reconnaissance gravel samples were collected. , Gravel samples have been collected from streams draining the entire permit area at a sample density averaging 1 nominal sample in 8 km<sup>2</sup>. Each sample is collected by manual evacuation of gravel and sand from trap sites in the 2<sup>nd</sup> to 4<sup>th</sup> order streams, sieved on site to –1mm and weighted to approximately 30 kg. Indicator mineral results from the laboratory is likely to include mineral grain counts for the kimberlite indicator minerals including garnet, chromite, ilmenite and chrome-diopside plus volume estimates for over 40 other associated and non associated mineral species. Major element mineral geochemistry of each of the kimberlitic indicator mineral samples (up to 50 grains mineral from each sample) would be analysed by Mineral Liberation Analyzer (MLA) techniques. The chemistry would be plotted on standard discrimination plots to identify any potential kimberlite associated mantle phase minerals like pyrope, chromites, micro-ilmenite or chrome diopside. Refer Plan No. NDbg0829.

## 7. 80# Stream Sediment Geochemistry

A total of 238 stream sediment samples were collected for multi-element suite of 32 lithophile, chalcophile and precious metals by Multi-acid digest including both ICP-MS & ICP-ES finish to fully optimize detection limits. Elements and detection limits planned for each 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 (0.5ppm); Co (2 ppm); Cr (2 ppm); Cu (2 ppm); Fe (100 ppm); K (10 ppm); La (0.5ppm) Mg (10 ppm); Mn (5 ppm); Mo (0.1 ppm); Na (10 ppm); Nb (0.2 ppm); Ni (2 ppm); P (5 ppm); Pb (0.5 ppm); Sb (0.5 ppm); Sr (2 ppm); Ta (1ppm); Te (0.2 ppm); Ti (10 ppm); V (2 ppm); Y (0.05ppm); W (0.1 ppm); Zn (2 ppm); Zr (10 ppm). These samples were not analysed during the life of the Tadipatri RP.

## 8. Soil Sampling

Based on the high priority catchment delineation, a total of 55 infill samples were planned to be collected. Due to the poor weather conditions, only 23 infill samples peripheral to anomalous catchments were taken and have not been processed. Refer Plan No NDbg0972.

## 9. Geophysical Survey

A total of 1760 line km of ground magnetic surveying was completed over the Tadpatri permit.

Ground magnetic survey was completed using GEM Systems GSM-19W magnetometers operating in "walkmag" mode with a reading taken every one second, equating to a station spacing of 1-2m, with a survey line spacing of 150m. A magnetic base station, positioned central to the individual grids, measured diurnal variations at 20-second intervals.

Raw field data were corrected for diurnal variations and manually filtered to remove cultural noise from the data. The filtered data were then reduced to magnetic pole (RTP) to remove the effects of geomagnetic inclination and declination on the anomaly geometry. Discrete anomalies representing possible intrusive sources were then identified for follow-up. A total of thirteen low priority targets were identified for ground follow-up, however none proved to be sourced by kimberlite clan lithologies. Please Refer to Plan No 4- NDbg0916 – Ground Geophysics survey TMI Map.

## 10. Results of the Exploration

### 10.1 Geologic Interpretation

Satellite image interpretation was done on overlays of TM false colour imagery at 1:250,000 scale. The basic line-work was digitised and subsequently a geological/structural compilation overlay was also completed. Published 1: 250,000 scale geological maps were then used to support the geological compilation. Interpretation of the RP area was supported by 1:100,000 scale plots of the IRS panchromatic imagery, and merged TM-IRS imagery. The data was interpreted in terms of regolith cover and structural features. Analysis of remote sensed data including LANDSAT TM imagery and the high-resolution IRS panchromatic imagery has not identified any feature that is attributable to kimberlite intrusion.

The IRS imagery was also used to interpret local structural features in anomalous catchments and in areas of magnetic anomalies.

### 10.2 KIM Gravel Sampling

Gravel sampling began in March 2008. Samples were initially collected at a spacing of approximately 1 sample per 10 sq. km. Positive results were further evaluated by

additional follow-up gravel samples at closer sample spacing. All samples were processed by magnetic and heavy liquid techniques to recover kimberlitic indicator minerals (KIMs). The +0.3-0.85mm paramagnetic heavy mineral concentrates were observed in full with individual KIM grains, namely pyrope, chromite, micro-ilmenite and chrome-diopside. Frequently less than fifty KIMs would be recovered from a 30kg sample that typically may contain several tens of other non-KIM grains. Suspected as well as confirmed KIMs were subsequently probed by scanning electron microscope and/or Mass Analysing SEM, with the data plotted on standard mineral chemistry plots to establish any kimberlite/ diamond association. The +0.3-0.85mm non-magnetic fraction of samples returning positive indicator minerals were further processed and observed for diamonds. All samples were dispatched to the Rio Tinto Laboratories for processing, observation, and analysis.

Locations of all indicator mineral samples within the RP area are given in Plan No 3-NDbg0829-Gravel Sample location

Observation results for a total of 238 samples have been declared and 1798 grains from 121 samples were probed using Mineral Liberation Analyzer (MLA) techniques and Laser Ablation Microprobe (LA-ICPMS). Refer Appendix 5. No kimberlites have been found till date.

### 10.2.1 Pyrope Garnet Results

The Majority of the samples in the relinquished area are devoid of garnets except two samples. Most of the garnets fall on the Lherzolitic zone and the Calcic-Eclogitic varieties with few being Wehrlitic and one falling in the Harzburgitic field. Please refer Appendix 5 for individual grain chemistry.

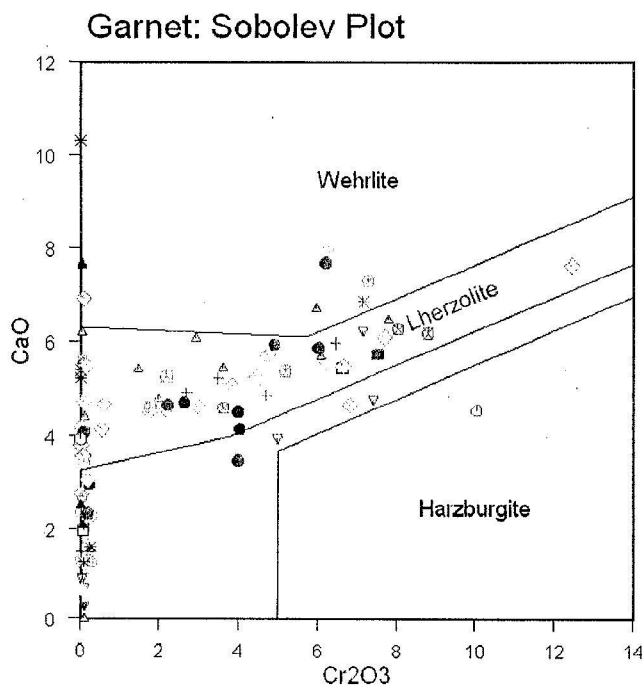


Figure 1: Garnet Sobolev Cr2O3 vs. CaO plot for all garnets probed

### 10.2.2 Chromite Results

Chromites in the relinquished area are dominated by shallow magmatic non-kimberlitic varieties, however a cluster of chromites show a strong mantle trend, which may be of kimberlitic origin. The Diamond Inclusion field has just one chromite. Please refer Appendix 5 for individual grain chemistry

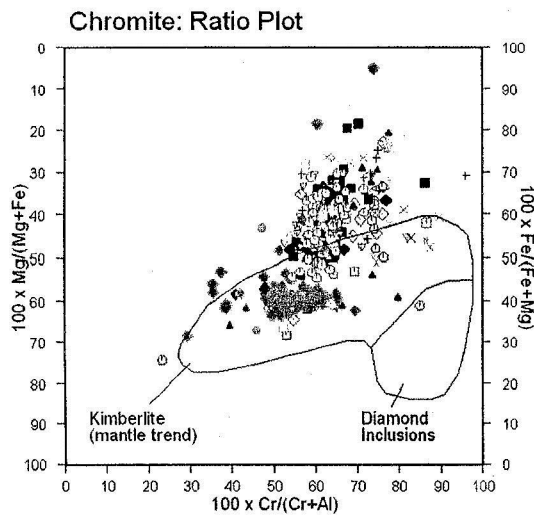


Figure 2: Chromite Gurney MgO vs. Cr<sub>2</sub>O<sub>3</sub> plot for all chromites probed

### 10.2.3 Picro-Ilmenite Results

Since just a couple of Ilmenites were recovered, analysis of their plots has not revealed any concrete information on their genesis. However, their mineral chemistry has been included in the Appendix 5.

Ground Geophysical survey was completed in parts of the Tadipatri tenement that came out with encouraging gravel sample results. In total 1760 line Km were completed during the period under review. Doleritic sills intrusive within the Mesoproterozoic Cuddapah sediments provide a noisy magnetic background. Other subtle magnetic anomalies that were ground checked have no obvious targets for follow up.

### 10.3 Future Activities

Based on the results of the exploration program Rio Tinto does not feel there is further scope for detailed exploration in the tenement. Hence there are no plans to apply for any Prospecting Licenses within the Tadipatri tenement.

## 11. Health and Safety

Rio Tinto Group policies on Health and Safety are designed to minimise the risk of injury or occupation illnesses. A minimum management requirement at all of the company-managed operations is to ensure full compliance with the Rio Tinto Standards. The goal is for zero work related injuries or occupation illnesses. Minimum prerequisites require that all work activities be based on risk assessments ensuring that effective controls and safe work procedures exist for all hazardous activities.

Further the standards require a system for ensuring that employees are trained, equipped and where applicable, certified to carry out their work according to the applicable safe work procedures, and that their competence has been tested. Personal protective equipment of international standards has been issued to each of the employees relevant to their conditions of working. All drivers employed are specially trained in 4WD driving and safety by international driving consultants. All field staffs are also trained in advanced



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first aid by international trainers. Rio Tinto organises periodic refresher courses of these training programme maintain the standards.

## **12. Environment**

Rio Tinto's Environmental Policy aims to prevent or otherwise minimise, mitigate and rehabilitate any effects that the group's operations have on the environment. The internal environmental systems adapted by Rio Tinto has been accredited with ISO 14001 certification. Although exploration activities in reconnaissance permits are essentially non-invasive to the environment, the same rigor and level of compliance to the standards, systems and procedures is followed.

An environment management plan was put in place for field activities. This plan was constantly updated as the program developed. The plan evaluated potential environmental impacts associated with the activities and provided procedures to prevent or minimize impacts. In case where an impact was unavoidable or accidental, appropriate rehabilitation procedures were in place. Relevant exploration personnel including those of contractors were inducted and trained in these procedures. Control systems include incident reporting and annual environmental reporting to first-line management and corporate audits.

The current period work carried out was essentially non-invasive to the environment. However, a strict monitoring of any requirement for site rehabilitation during sampling was completed, and wherever required the site rehabilitation was done immediately after sampling.

## **13. Community Relations**

Rio Tinto has a strong commitment to maintaining good relations with the community amongst where it works and to respect the laws, customs and traditions of the society. Local people were employed in the exploration team to work as field assistants, drivers and other staff positions. The exploration geologists visited many of the villages prior to sampling to explain about the work being carried out by RTX to the local community. Simultaneously, local field assistants were coached with regard to exploration so that they can communicate our activities to the local people in the field.

During the current period of the exploration activity, specific community relation policies were undertaken which includes distribution of community briefing sheets, employment of local people for work, relationships with preferred local suppliers/services, regular consultation with stakeholders and development of internal system of recording, reporting and monitoring of community activities.