Environmental Monitoring Report

Semiannual Report
September 2016

IND: Railway Sector Investment Program

Prepared by Ministry of Railways for the Government of India and the Asian Development Bank.

Indian Government
Ministry of Railways
Asian Development Bank

Multitranche Financing Facility No. 0060-IND
Loan No. 2793-IND, 3108-IND
Railway Sector Investment Program
Track Doubling and Electrification on Critical Routes

Environmental Monitoring Report
Semi Annual Report: October 2015 - March 2016




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Abbreviations

ADB	Asian Development Bank
AIDS	Acquired Immuno Deficiency Syndrome
CtE	Consent to Establish
CtO	Consent to Operate
EMP	Environmental Management Plan
FFA	Framework Financing Agreement
GC	General Consultant
GoI	Government of India
HIV	Human Immunodeficiency Virus
IA	Implementing Agency
IEE	Initial Environmental Examination
IPP	Indigenous Peoples Plan
MFF	Multitranche Financing Facility
MoR	Ministry of Railways
NOC	No Objection Certificate
PMC	Project Management Consultant
RP	Resettlement Plan
RSIP	Railway Sector Investment Program
RVNL	Rail Vikas Nigam Limited
SPS	Safeguard Policy Statement
STD	Sexually Transmitted Diseases

Executive Summary

The present report is the 6th semi-annual environmental monitoring report on implementation of Environmental Management Plan (EMP) in 5 railway upgradation projects taken up under the Railway sector Program (RSIP) by the Government of India with financial assistance from Asian Development Bank. The following projects have been included under Multitranche Financing Facility No.0060-IND:

1. Doubling of Daund - Gulbarga
2. Doubling of Sambalpur - Titlagarh
3. Doubling of Raipur - Titlagarh
4. Doubling of Hospet - Tinaighat
5. Electrification of Pune - Guntakal

The above projects are further divided into 17 construction packages. The contracts of 15 construction packages have been awarded and the construction are in progress in 14 packages. The contract of one construction package of Daund-Gulbarga track doubling project (DG-2), which was terminated earlier, has been awarded for the balance work to new contractor M/s SMSIL-MBPL-BRAPL (Jv) in the month of February 2016. The contractor is initially stage of mobilization and work will start in April 2016.

This report describes the compliance status on environmental safeguards as per contract agreement and specifications in different construction packages where works are in progress for the period from October 2015 to March 2016. It covers the status of EMP implementation, compliance with environmental regulations of the Government and policies of ADB, compliance with environmental loan covenants and the performance of the safeguards measures.

During the reporting period no significant noncompliance has been observed with respect to implementation of environmental safeguards. The pollution control measures at different locations are found to be satisfactory. It has been ensured that the contractors comply with the conditions of the regulatory authorities as well as the EMP. Some lapses have been observed in different projects especially with respect to workers safety, labour camp facilities, borrow area management, debris management and non availability/ inadequate monitoring by Environmental Officers of PMCs.

The status of statutory permissions and licenses are being continuously monitored to ensure statutory compliances by the contractors. In most of the packages the contractors have obtained all the requisite licenses and permits except for a few batching plants where No Objection Certificate (NOC) is required from Pollution Control Board. The contractors have already applied for NOC but follow up is required for getting them from Pollution Control Board.

No improvement in worker's safety has been observed in any of the project compared to the last reporting period. The lapses are more pronounced among the labourers of sub-contractors which is a matter of concern. With the pressure of progress the risk of lapses increased if not monitored properly. Improvements of labour camp facilities such as toilets with septic tank and soak pits, drainage system, collection and disposal facilities of wastes and general housekeeping at camp sites are required in some of the packages.

Periodical health check ups and HIV/AIDS awareness camps have been initiated in all the construction packages, but some contractors are not maintaining the periodicity of the HIV/AIDS awareness programme as per conditions of the contract.

At allied sites such as borrow areas, the compliances with the safeguard requirements have been ensured in all the packages. Special attention has been given towards restoration of all the borrow areas after use.

Except for few construction packages the PMC has not shown improvement in record keeping, reporting and monitoring of contractors activities with respect to environmental safeguards compared to last reporting period even after continuous persuasion. There is provision of an Environmental Officer in each PMC for carrying our regular monitoring of EMP compliance at different sites. Site visit of Environmental Officer of PMC is irregular in most of the packages. The duration and frequency of site inspection by PMC's Environmental officer is required to be increased for adequate monitoring of compliances at all the working sites including camps, borrow areas, quarry sites and plant sites.

It was felt necessary to provide another training on EMP implementation and monitoring to fill the gaps in EMP implementation. Refresher training workshops were conducted by the General Consultant in all the packages involving all the key players in implementation of EMP: RVNL, PMC and Contractor’s staff.

1. Background

1.1 Railway Sector Investment Programme and Multi Tranche Financing Facility

The Ministry of Railway (MoR), Government of India has taken up 5 projects of doubling of existing single railway track and electrification under Railway Sector Investment Programme (RSIP) with financial assistance of Asian Development Bank (ADB) under Multi Tranche Financing Facility. The total track length involved is about 1500 km spread across the states of Maharashtra, Karnataka, Andhra Pradesh, Chhattisgarh and Odisha. Under this programme, 4 doubling projects and 1 electrification project have been included.

A Framework Financing Agreement was signed on 8th July 2011 between Government of India through the MoR and ADB for the implementation of the RSIP. The total cost of the RSIP covered by this framework agreement is expected to be 1,144.6 million equivalents USD, out of which 500 million USD (43.7%) will be financed by ADB and remaining 644.6 million USD by India.

Rail Vikas Nigam Limited (RVNL) is the Implementing Agency for those projects.

The location of the projects is shown as red and blue in the map (Figure 1) here under:

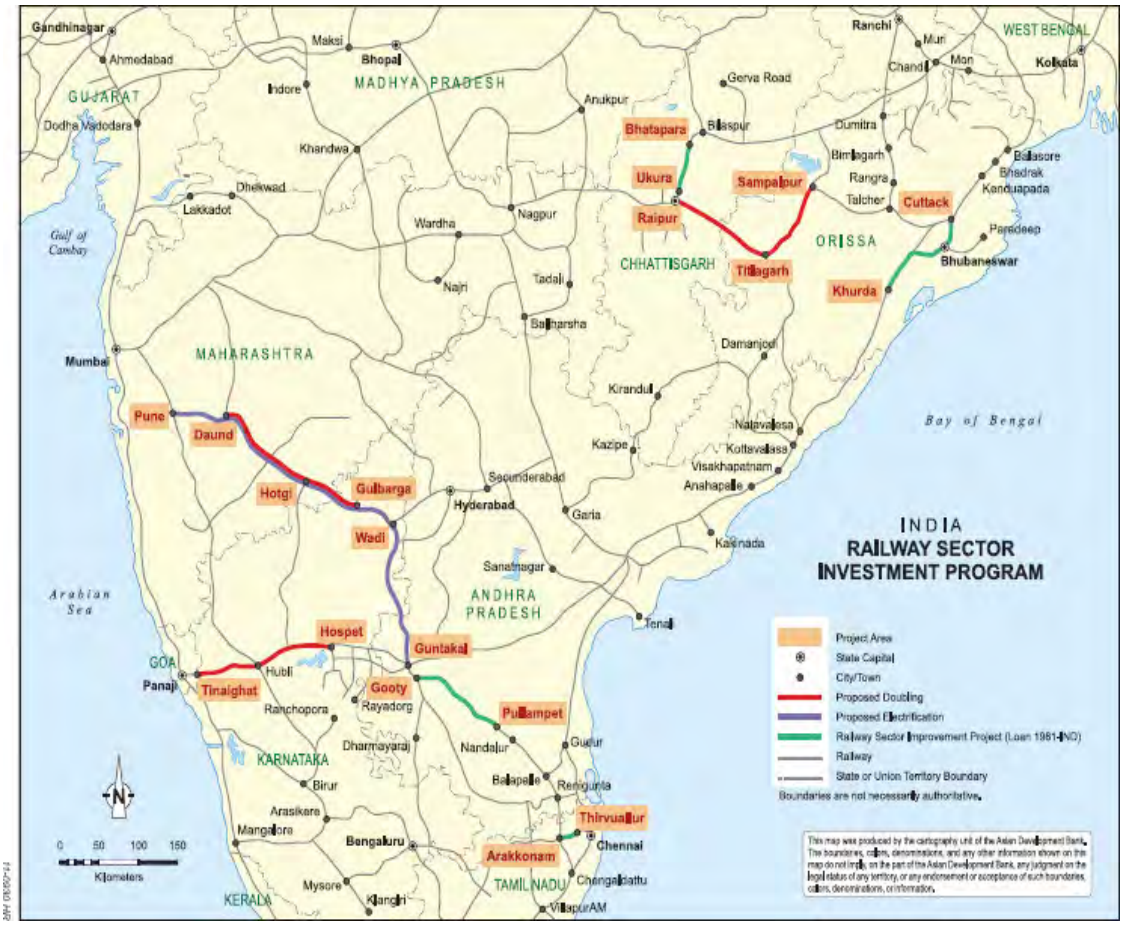


Figure 1: Map of India showing Track Doubling and Electrification Projects

These projects have been further divided into 17 construction packages and 15 package wise contracts have already been awarded to contractors. The details of projects and subprojects (construction packages) and their locations are presented in the following table:

S No.	Project	Length (km)	Package	State
i.	Doubling of Daund - Gulbarga (DG)	224	DG-1: Bhigwan-Mohol DG-2: Hotgi-Gulbarga	Maharashtra and Karnataka
ii.	Doubling of Sambalpur – Titlagarh (ST)	182	ST-1: All Major Bridges ST-2: Sambalpur-Barapali ST-3: Barapali-Bolangir ST-4: Bolangir-Titlagarh	Odisha
iii.	Doubling of Raipur – Titlagarh (RT)	203	RT-1: Titlagarh-Lakhana RT-2: Lakhana-Arand RT-3: Arand-Raipur	Odisha and Chhattisgarh
iv.	Doubling of Hospet – Tinaighat (HT)	229	HT-1: Hospet-Hariapur HT-2: Harlapur-Dharwar HT-3: Kambarganavi-Tinaighat	Karnataka
v.	Electrification of Pune-Guntakal (PG)	641	PG-1: Pune-Bhigwan & Gulbarga-Wadi PG-2: Wadi-Raichur PG-3: Raichur-Guntakal PG-4: Bhigwan-Mohol PG-5: Mohol-Gulbarga	Maharashtra, Karnataka and Andhra Pradesh

Table 1: List of Track Doubling and Electrification Projects

The scope of projects (i) to (iv) above is to provide a second line along the existing single line by constructing the roadbed and either extending or constructing new bridges, providing facilities for passenger and staff, laying track, signalling and telecommunications and general electrical works. For project number (v) the scope is to provide overhead Railway electrification.

The contracts for packages ST-2, ST-3 and ST-4 of Sambalpur-Titlagarh project have been taken out from ADB funding and are executed under self-financing.

1.2 Active contracts

The works have been awarded for 15 packages. The contracts for packages PG-4 and PG-5 of Electrification of Pune-Guntakal project will be awarded at the end of 2016. The works are in progress in all the packages except for package DG-2: Hotgi-Gulbarga in which the contract has been terminated in the month of April 2015 due to non performance of the contractor. A new contract

has been awarded in February 2016 so that works will resume in April 2016. A package wise list of contractors and PMCs along with dates of commencement is presented in following table:

	Projects/Packages	**Contractor**	**PMC**	**Date of start of works**
A. Daund-Gulabarga track doubling project				
(i)	DG-1: Bhigwan - Mohol	IL & FS - Kalindee (JV)	SOWIL	15.06.2012
(ii)	DG-2: Hotgi - Gulbarga	New contract has been awarded to M/s SMSIL-MBPL-BRAPL (JV) on 17/02/2016 for balance works between Akalkot Road and Gulbarga.	SN Bhobe & Associates	16.04.2016
B. Sambalpur-Titlagarh track doubling project				
(i)	ST-1: Major Bridges	Rahee-Agrawal	CDM Smith	16.08.2012
(ii)	ST-2: Sambalpur-Barapalli	Larsen and Toubro	STUP Consultants	20.04.2014
(iii)	ST-3: Barapalli-Bolangir	Larsen and Toubro	CDM Smith	20.04.2014
(iv)	ST-4: Bolangir-Titlagarh	Larsen and Toubro	BARSYL	20.04.2014
C. Raipur-Titlagarh track doubling project				
(i)	RT-1: Titlagarh-Lakhana	IVRCL-MRT	URS Scott Wilson	22.08.2012
(ii)	RT-2: Lakhana-Arand	ARSS Infrastructure Projects	STUP Consultants	09.02.2015
(iii)	RT-3: Arand-Raipur	Railone-Tarmet-Durga (JV)	URS Scott Wilson	22.08.2012
D. Hospet-Tinaighat track doubling project				
(i)	HT-1: Hospet-Harlapur	Larsen and Toubro	Voyants Solutions	05.08.2012
(ii)	HT-2: Harlapur-Dharwad	Railone-Tarmat-Durga (JV)	Voyants Solutions	05.08.2012
(iii)	HT-3: Kambarganavi-Tinaighat	GVR-GEW (JV)	STUP Consultants	01.08.2012
E. Pune-Guntakal electrification project				

	Projects/Packages	Contractor	PMC	Date of start of works
(i)	PG-1: Pune-Bhigwan+Gulbarga-Wadi	KEC International Ltd. - KIEL (JV)	Voyants Solutions	12.09.2012
(ii)	PG-2: Wadi-Raichur	Larsen and Toubro-Bharat Rail Autom(JV)	Voyants Solutions	24.10.2012
(iii)	PG-3 : Raichur - Guntakal	Larsen and Toubro-Bharat Rail Autom(JV)	Voyants Solutions	24.10.2012
(iv)	PG-4: Bhigwan-Solapur	Yet to be awarded		
(v)	PG-5: Solapur-Gulbarga	Yet to be awarded		

Table 2: Package wise list of contractors and PMCs along with dates of commencement

RVNL has also engaged a General Consultant. Egis India, Egis Rail and TUC RAIL (JV) has been appointed as General Consultant to oversee the overall progress and compliance of the project.

1.3 Site activities during the reporting period

Following table depicts major activities in the period in each package.

Construction Packages	Major works in Progress
A. Daund-Gulbarga track doubling project	
DG-1	○ Finishing and dressing of slopes at the stretch of deep rock cutting work done near Washimbe. ○ Minor bridges between Mohol - Kurudwadi - 95 % completed ○ Station platform works started at Angar and Vakov and in progress at Malikpeth. ○ Major bridges: bridges nos386/2, 383/1 completed. ○ Ballast supply between Mohol to Kurudwadi. ○ Station building at Wadsinge station yard is in progress.
DG-2	New contract has been awarded to M/s SMSIL-MBPL-BRAPL (JV) on 17/02/2016 for balance works between Akalkot Road to Gulbarga. The Contractor is in initial stage of mobilisation. Construction of camp site is in progress.
B. Hospet-Tinaighat track doubling project	
HT-1	○ Noninter locking activities and commissioning of subsection from Harlapur to Bannikoppa has been done in January 2016. ○ Major Bridge 104: casting of all balance girders completed and launching of 34 nos. girders completed, balance 2 nos. girders is in progress.

Construction Packages	Major works in Progress
	○ Finishing works for major bridge no. 61, 62, 63, 70, 77, 78 and 86A. ○ Machine packing of ballast in Bannikoppa to Bhanapur subsection. ○ S&T service buildings at Bhanapur, Koppal and Munirabad are in progress. ○ Ballast supply in various subsections. ○ Thorough sleeper renewal/replacement in station yards. ○ About 10KM cable laying completed at Bhanapur yard.
HT-2	○ Earthwork in filling, cutting and blanketing in Hubli-Dharwad subsections. ○ Major bridges: bridge no. 10, bridge no. 24, Bridge no. 35, and bridge no.36 in progress in milestone-2 and milestone-3. ○ Concreting for platform construction – earthwork and wall at Sisvinhalli and Annigeri station yards. ○ Construction of retaining wall in Annigeri-Hulkoti subsection. ○ Considerable progress in supply of ballast in milestone-3. ○ Construction of minor bridges nos. 12, 23, 33A, 37, 38, 39, 40, 41, 233, 235, 241 and 243 in progress in milestone-2 and milestone-3. ○ Permanent Way linking work in Hulkot-Harlapur subsections.
HT-3	○ Engine rolling done for 4.8 km from Londa to Shivathan station. ○ Earthwork in filling, cutting and blanketing works in Devarayi-Nagargalli subsection, Shivathan yard and Londa – Tinaighat subsection. ○ Major bridge no. 3: pier and abutment-shaft concreting in progress. ○ Major bridge no. 87: slab concreting. ○ Side drain construction in Shivathan – Londa subsection. ○ Permanent Way linking work in progress in Alnavar-Tavargatti and Devarayi-Londa subsections. ○ Construction of staff quarters is in progress at Alnavar and Londa station yards. ○ Slab casting completed for S&T service building at Shivathan station yard and first floor at Londa station.
C. Raipur-Titlagarh track doubling project	
RT-1	○ Balance formation work in progress in Turekela-Muribahal and Titlagarh-Muribahal subsections. ○ Minor bridges: bridges no. 270, 271 from station Turekala Road to Kantabanji, bridges no. 284, 285, 286, 287, 289, 290, 294, 302 and 303 from station Kantabanji to Muribahal, bridges no. 308, 310 and 311 from Muribahal to Rehenbhata stations are in progress. ○ Major P-Way fittings and fixtures procured by the contractor received at site during January 2016 and PSC sleepers supply by RVNL received at site during February 2016. ○ Track linking and Flash-Butt Welding of rails, earthwork for platform

Construction Packages	Major works in Progress
	including erection and grouting of counterfort wall segments is in progress in priority subsection from Titlagarh to Muribahal.
RT-2	○ Works of earthwork in cutting, filling and blanketing are in progress in subsections from Arand station to Komakhan station and works also started in Khariar Road-Lakhna sub-section. ○ Minor bridges no. 117, 118, 119, 120, 121, 122, 123, 125, 126, 127, 128, 129, 154, 158, 159 completed including wing wall construction and bridge nos. 124, 134, 135, 139, 154, 158, 159, 161, 185,186 are in progress. These bridges are in subsections from Bhimkhoj to Khariar Road and from Nawapara to Lakhna. ○ Establishment of workshop, camp-office and batching plant in progress at major bridge no.161 (Jonk river) and pile-foundation works commenced. ○ Foot-Over-Bridge in progress at Arand station. ○ Station building works in progress at Arand, Bhimkhoj, Bagbahara, Komakhan and Nawapara. ○ Construction of staff quarters at Komakhan station is in progress. ○ Ballast supply for track works in Arand-Bhimkhoj-Bagbahara-Komakhan subsections continues and track linking works in progress from Arand to Bhimkhoj
RT-3	○ Major Bridge no. 77: pier-shaft concreting for piers, P1 to P5 is in progress; Final lift for shaft of abutment, A1 and pier, P20 completed. Fabrication yard for steel girder established near bridge. ○ Station buildings and S&T service building construction at Mahasamund, Belsonda, Arang Mahanadi and Lakholi. ○ Ballast supplies near Mandirhasaud and Arang Mahanadi station yards. ○ Procurement of few supply materials for S&T shunt signals, miscellaneous materials and cables for general electrical works.
D. Sambalpur-Titlagarh track doubling project	
ST-1	○ Steel girder fabrication work ○ Road over Bridges: RCC box completed at bridge no. 358A, concreting for abutment/retaining wall lifts including bed-block casting completed for bridge no. 439A. ○ Bridge no. 76: 8 nos. girder erection completed out of 25 nos. total required. Concreting for about 40 pier-shaft lifts done while three pier-caps cast. Work at pier, P13 started. ○ Bridge no 293: Concreting for pier-shafts at P10, P11, P13, P14 and abutment, A2 while piers, P8, P9, P10 and A2 completed. Girder erection completed for span-1 to span-5 and span-7 to span-8. ○ Bridge no. 331: Piling for P3 is in progress and erection of 5 girders of 30.5m spans completed.

Construction Packages	Major works in Progress
	○ Bridge no. 406: concrete piling work for P3, pile-shaft for P1 to P5, pile-cap for P8 and A2 completed, girder erection completed for P8-P9 and P9-A2 is in progress. ○ Works mobilized for bridge no. 438 and piling works in progress for piers, P11 to P13 and abutment, A2. ○ Girder launching at bridge no. 239 started.
ST-2	○ Track linking and engine-rolling completed for Hirakud-Godbhaga subsection ○ Track-linking work is in progress in Attabira-Suktapali subsection. ○ Blanketing in progress between Hirakud and Godbagha and Attabira and Sultapali. ○ Ballast supply for the subsections Hirakud-Godbhaga and Suktapali-Bargah Road. ○ Earthwork in Suktapali station yard. ○ Station building works in progress at Attabira and Suktapali stations. ○ Major bridge no. 116: launching of pre-cast PSC girders, casting of slabs, ballast-retainer walls and construction of return-walls is in progress. ○ Casting of pre-cast counterfort wall segments for high-level platforms is in progress. ○ S&T works: About 6 km of trenching and cable laying done for signal related works while about 54 km cable laid for telecom works.
ST-3	○ Earthwork in cutting, filling, blanketing and minor bridges in all subsections. ○ Construction of station building at Dungripali station yard is in progress. ○ Major bridges: - bridge no. 220 : construction of return wall and balance RCC box concreting is in progress - bridge no. 235: casting and stressing of pre-cast PSC girders for span-1 to span-4 ○ Construction of minor bridges: bridge no. 222 to 224, 227 to 231, 233, 234, 236, 237, 240, 241, 248, 249, 250, 256, 257 and 258 completed. ○ S&T works: Work of diversion of infringing S&T cables between Dungripali and Khaliapali and Khaliapali and Losinga completed. Trenching and cable laying of about 9 km for telecom done. ○ Track linking activities, welding of rail panels in subsection of Barpali to Dungripali including Dungripali yard.
ST-4	○ Earthwork in cutting, filling, blanketing and minor bridge works in Balangir to Deogan Road and Saintala to Badmal subsections. ○ Hard rock cutting and supply of ballast in Balangir to Deogan Road subsection, Saintala and Deogan Road station yards. ○ Major bridges: - bridge no. 363: concreting for pier-shaft lifts in piers, P1, P2 and P3, precast ballast-retainer and PSC slabs completed.

Construction Packages	Major works in Progress
	- bridge no. 387: concreting for abutment-shaft lifts in both the abutments, A1 and A2 and also the return wall construction. ○ Construction of S&T relay rooms and Station-end service buildings are in progress at Deogaon Road and Saintala station yards. ○ S&T works: Diversion of infringing existing working S&T cables between Balangir to Deogaon Road and Deogaon Road to Saintala subsections. Trenching and laying of S&T cable for about 11 km done.
E. Pune-Guntakal electrification project	
PG-1	○ Construction of TSS/Daund: All major activities completed. Joint checking for testing of all equipment and relay testing is to be done. ○ Construction of TSS/Martur: 25 KV transformer foundations and transformer erection completed. Earth filling up to the foundation level is under progress. Construction of control room building completed. Doors and windows are to be fixed. ○ Construction of OHE/PSI depot at Gulburga: All major activities completed. ○ OHE Wiring, dropper-wiring and clipping activities between Hiranandur and Martur under progress. ○ Anti-theft charging with 2.2KV power AC single phase was provided for wiring completed in subsection from Daund to Bhigwan.
PG-2	○ Construction of staff quarters at Krishna and Yadgiri in progress. ○ All switching stations completed. ○ Joint inspection/checking with Railway Traction Distribution staff for all OHE and power supply installations completed and rectifications or modifications are being attended.
PG-3	○ Construction of Nagarur TSS: All major activities completed. ○ Construction of staff quarters at Raichur and Adoni are in progress. ○ Construction of Mantralayam TSS: all major activities are in progress. Earth filling is the major item nearing completion.

Table 3: Major works in progress

2. Environmental Categorisation of the projects

All the 5 projects have been classified under "Category- B" projects in accordance with the ADB categorization criteria based on ADB's Environmental Assessment Guidelines 2003, and Safeguard Policy Statement 2009. The project components will only have small-scale, localized impacts on the environment, and can be mitigated with implementation of suitable mitigation measures. So the projects required only Initial Environmental Examination (IEE) for meeting the environmental requirements under the ADB's policy. For each project under RSIP, a separate IEE report has been prepared, and based on the findings of the study with respect to the anticipated environmental impacts, an Environmental Management Plan (EMP) has been formulated for mitigating and managing the anticipated adverse environmental impacts and enhancing the efficiency of environmental components wherever it is possible. This IEE report was prepared on the basis of detailed screening and analysis of all environmental parameters, field investigations and stakeholder consultations to meet the requirements for environmental assessment process and documentation per ADB's Safeguard Policy Statement 2009. The recommended EMP has been included in the bidding and contract documents of each construction package. A separate budgetary allocation for implementation of EMP has also been included in the contracts.

3. Scope of the Present Report

The present report is semiannual report on environmental monitoring which describes the compliance status on environmental safeguards during project execution as per contract agreement and specifications in all the construction packages where works are in progress for the period from October, 2015 to March, 2016. The scope of this report is mainly to present the compliance status on environmental safeguards during construction in all the 15 construction packages in progress, which covers the compliance with statutory requirements, conditions of EMP stipulated in contract conditions and assessment of performance and effectiveness of implementation and monitoring of environmental safeguard measures at site. The information presented in this report is mainly based on observations made during field inspections jointly carried out by the employer, the engineer and the contractor, and periodical inspections by the General Consultant as well as the records provided by the PMC and contractor of respective construction package.

4. Approach and methodology adopted for monitoring of compliance with EMP

The responsibility for implementing environmental safeguards at site during construction lies primarily with the contractors. Each contractor has appointed their EHS experts in their respective construction package to ensure implementation of environmental safeguards measures as stipulated in the EMP and contract documents.

For ensuring effective implementation of environmental safeguards and monitoring the compliances with the requirements stipulated in EMP and the contract, RVNL has appointed a Project Management Consultant (PMC) for each construction package with supervisory role including monitoring of compliance of environmental safeguard measures implemented by the contractor as per conditions of Contract Agreement, EMP and prevailing environmental statutes and regulations.

In PMC teams Environmental Officers have been appointed in each construction package whose primary responsibilities are to:

- Serve as the primary point of contact for environmental matters
- Manage the development, evaluation and oversight of the EMP implementation
- Provide feedback and recommendations to Project Manager
- Reporting and recording keeping

The Environmental Officers of PMC undertakes inspection and monitoring of environmental activities along with quality control activities on regular basis. For monitoring and reporting related to environmental activities various checklists and formats are being used.

It is also to be ensured that the monitoring of components such as ambient air quality, water quality and noise levels are being carried out in accordance with environmental monitoring plans provided in the EMP.

The input of the Environmental Officer of PMC is intermittent. The list of PMC's Environmental Officers in different construction packages and their status of mobilization in March 2016 is provided in the following table:

Project	Subproject/ Package	Name of PMC	Name of Environmental Officer of PMC	Remarks
Electrification of Pune –Guntakal (PG)	**PG-1**	Voyants Solutions	Mr. Srikant Ahire	Spending average 5 to 7 days at this site. In addition to PG-1 he is now engaged for HT-1, HT-2 and HT-3.
	PG-2	Voyants Solutions	Mr. B.Asif Basha	-
	PG-3	Voyants Solutions	Mr. B. Asif Basha	-
Track doubling of Daund-Gulbarga (DG)	**DG-1**	Sowil Limited	Mr. Rakesh Katdare	The PMC claims that they have signed the agreement with Mr Rakesh Katdare as their Environmental Officer in December, 15 but the environmental Officer has not been physically seen at the site.
	DG-2	-	-	No Environmental Officer of PMC

				available. New PMC is expected to be mobilized from June, 16
Track doubling of Hospet-Tinaighat (HT)	**HT-1**	Voyants Solutions	Mr. Srikant Ahire	Joined the project on 1st February, 2016. He is required to spend minimum 5 days in each package for ensuring proper monitoring and report preparation.
	HT-2	Voyants Solutions	Mr. Srikant Ahire	
	HT-3	STUP Consultants	Mr. Srikant Ahire	
Track doubling of Raipur-Titlagarh (RT)	**RT-1**	URS Scott Wilson	Nil	No environmental Officer available after August, 2015. Penalty has been imposed on PMC.
	RT-2	STUP Consultants	Mr. Gagan Parida	He is also looking after packages ST-2 and ST-4
	RT-3	URS Scott Wilson	Nil	No environmental Officer available after August, 2015. Penalty has been imposed on PMC.
Track doubling of Sambalpur-Titlagarh (ST)	**ST-1**	CDM Smith	Mr. Rakesh Satpathi	Site visit is irregular
	ST-2	STUP Consultants	Mr. Gagan Parida	-
	ST-3	CDM Smith	Mr.Rakesh Stapathi	Site visit is irregular
	ST-4	BARSYL	Mr. Gagan Parida	-

Table 4: List of Environmental Officers deputed at various subprojects

RVNL has appointed a General Consultant (GC) to monitor the overall progress of the projects including performance of safeguard measures related to environmental protection. There is provision of an Environmental Expert in the GC team with following responsibility:

- Overall progress monitoring on EMP implementation,
- Review the compliance with statutory requirements,
- Preparation of quarterly and semiannual reports,

- Providing trainings for capacity enhancement of RVNL, PMC and Contractors staff on environmental issues.

A guideline on general construction Environmental Health and Safety (EHS) measures to be followed / implemented based on EMP requirements in the RSIP projects has been prepared and issued by the General Consultant to the Contractors and PMCs. Reporting formats have been developed which are to be filled up by the Contractor and PMC on compliance with EMP to compile information on safeguards on a monthly basis to maintain effectiveness of monitoring as well as uniformity in reporting in all the construction packages.

RVNL has nominated Environmental Focal Persons both at corporate level as well as at all the 5 PIUs to oversee the implementation of environmental safeguards, coordination with stakeholders, government officials and regulatory authorities on environmental issues, addressing the public grievances on environmental issues.

5. Environmental performance monitoring

For effective monitoring of environmental compliance, environmental performance indicators have been identified which areassessed qualitatively and quantitatively on periodic basis during project execution. The various environmental indicators selected are based on physical, chemical and biological parameters. The parameters selected as performance indicators are as follows:

(i) Compliance with loan covenants
(ii) Compliance with state and national statutes & regulations
(iii) Compliance with the Environmental Management Plan
(iv) Monitoring of environmental quality in terms of air,water and noise quality at critical locations and comparision with baseline environmental quality and state/National Standards

5.1 Compliance with loan covenants, state and national statutes and regulations

5.1.1 Compliance with covenants stipulated in the Loan Agreement

The Framework Finance Agreement (FFA) was signed between the Government of India and ADB on 8th July, 2011.

The Schedule 4 of the FFA stipulates the environmental considerations whereas the schedules 4 and 5 of Loan Agreement (Ordinary Operations) stipulates the requirements of environmental safeguards. The project's compliance to requirements on environment safeguards is as follows:

S.N.	Loan Covenants	Status of Compliance
A.	**FRAMEWORK FINANCING AGREEMENT**	
1	**Schedule 4 A. 1(iv):** The project will also be environmentally and socially sound and include measures to mitigate any possible environment and social impacts in accordance with the safeguard framework-1 prepared (Schedule 5) and Safeguard Policy Statement (SPS) 2009. For each project, a poverty and social analysis will be conducted in accordance with ADBs guidelines on poverty and social assessment. Similarly, an environmental assessment will be carried out for each project in accordance with the SPS 2009. All measures and requirements set forth in the respective initial environmental examination. ("IEE"), environment impact assessment ("EIA") and environmental management plan ("EMP"), and any corrective or preventative actions set forth in a safeguards monitoring report, MOR and RVNL shall ensure that all bidding documents and contracts for works contain provisions that require contractors to comply with the measures and requirements relevant to the contractor set forth in the IEE/EIA, the EMP, the RP and the IPP (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in the safeguards monitoring report.	Complied. Initial Environmental Examination (IEE) report has been prepared for each project under RSIP on the basis of detailed screening and analysis of all environmental parameters, field investigations and stakeholder consultations to meet the requirements for environmental assessment process and documentation as per ADB's Safeguard Framework and ADB's SPS 2009. The Environmental Management and Monitoring Plan have been formulated for all the projects and are the part of tender documents. During construction it has been ensured that all the necessary permits/ approvals/ licenses are obtained. Adequate actions on environmental safeguard have been undertaken during construction in accordance with the EMP.
2	**Schedule 4 A. 1(iv):** For each project, all necessary Government approvals will be obtained, including MOR, Ministry of Environment and Forest, Pollution Control Boards, and other relevant agencies, as applicable.	Complied The necessary approvals and licenses in each project have been ensured. The status of clearances/approvals/ licenses up to September 2015 is presented in Table 3.
B.	**LOAN AGREEMENT (ORDINARY OPERATIONS)**	

S.N.	Loan Covenants	Status of Compliance
3	**Schedule 4 B:.Approval Procedure** 2. All projects will be prepared and processed in accordance with the procedures set out below. (i) MOR will select a possible project from railway priority, which is part of the existing network implemented by the MOR. MOR will then conduct a feasibility study for the project including its cost estimate, technical and economic analysis. MOR will also prepare (a) an initial poverty and social assessment (IPSA) and fill out a checklist for (b) involuntary resettlement; (c) indigenous people; and (d) complete the Rapid Environmental Assessment (REA) checklist for screening of environmental issues.	Rapid Environmental Assessment has been prepared for all the selected projects and accordingly categorization of all the 5 projects has been done. The projects have been categorized as "Category-B" projects based on environmental issues and hence only IEE was required for the projects. The IEE reports have been approved by ADB and disclosed to the public on website.
	Schedule 4: Conditions for Award of Contract: Para 6: The Borrower shall not award any works contract for any part of the project which involves environmental impacts until RVNL has (a) Obtained the final approval of the IEE from the relevant Environment Authority of the Borrower (b) Incorporated the relevant provisions from the EMP into the Works contract.	Complied The approved EMP has been incorporated into all the contract agreements for all the construction packages.
4	**<u>Schedule 5: Execution of Project; Financial Matters:</u>** **Environment Para 7 (b)** The Borrower shall ensure, and cause to MOR and RVNL to ensure, that works under a contract shall not be commenced in the relevant section, until forestry clearance and permits from Pollution Control Boards for Operation of Hot Mix Plants are obtained	Complied No Hot Mix Plant has been installed in any of the contract packages.
5	**<u>Schedule 5: Execution of Project; Financial Matters</u>:** **Safeguards related Provisions in Bidding Documents and Works Contract: Para 12:** The Borrower shall ensure, and cause MOR and RVNL to ensure that all bidding documents and contracts for works contain provisions that require Contractors to (a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, the RP and	Complied Being complied. The compliance with the mitigation

S.N.	Loan Covenants	Status of Compliance
	the IPP (to the extent they concern impacts on affected people during construction), and any corrective or preventive actions set out in a Safeguard Monitoring Report.	measures stipulated in the EMP is constantly monitored in each construction package and necessary corrective actions are being taken at site.
	(b) Make available a budget for all such environmental and social measures; and	Environmental monitoring and mitigation costs allocated/incorporated in contract agreement
	(c) Provide the Borrower and ADB with a written notice of any unanticipated environmental, resettlement or indigenous people risks or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, the RP or the IPP.	No such risks or impacts observed during the reporting period from October, 2015 to March, 2016
6	**Schedule 5: Execution of Project; Financial Matters:** **Safeguards Monitoring and Reporting (Para 13) :** The Borrower shall do the following and shall cause MOR and RVNL to the following:	
	(a) Submit Semi-annual Safeguards Monitoring Reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission.	The semi-annual report has been prepared as per the guidelines.
	(b) If any unanticipated environmental and/or social risk and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, the RP or the IPP promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan.	No such unanticipated environmental risks or impacts occurred during the reporting period
	(c) Report any actual or potential breach of compliance with the measures and requirements set forth in the EMP, the RO or the IPP promptly after becoming aware of the breach.	No breach of compliance recorded in any of the projects till date.

Table 5: Compliance status with Loan Covenants

5.1.2 Compliance with state and national statutes and regulations

The requirement of statutory permits/clearances and the summary of status of compliance with state and national statutes and regulations in each package of all 5 projects till March 2016 is presented in Table 3.

The statutory permits and licenses have been obtained from the relevant authority in almost all the construction packages. In package ST-1 of Sambalpur-Tinaighat doubling project, CtO for batching plants at Sonegarh (bridge No. 406) is still pending and is under process by the Pollution Control Board. The Contractor of ST-1 has applied for CtE for new batching plant at bridge number 438, where erection of the plant is under progress. The pending CtO for batching plant at Mahanadi (bridge No. 76) has been obtained by the contractor. The batching plant which was earlier operational at Ong River (bridge No. 293) has been dismantled. The CtO of Batching plant at Hirapur main base camp has been renewed.

In construction package RT-2 of Raipur-Titlagarh project the CtO is pending for batching plant and wetmix plant at Saintala. For batching plant at Bagbahara application for CtE and CtO have been submitted by the contractor to State Pollution Control Board and are under process. Renewal of CtO for stone crusher plant at Ramnagar in construction package HT-3 of Hospet-Tinaighat project has been applied for and approval is awaited.

Name of the project	Sub project	Section	Clearance for Diversion of Forest land Under Forest Conservation Act, 1980	Permission for Tree Felling Under Forest Conservation Act, 1980	Labour License Under Labour Rules	Quarry License From Department of Mines and Geology	Env Clearance for Quarry Under (Environment Protection) Act	NOC for Stone Crusher Plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974	NOC for Batching plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974
Hospect-Tinaighat	HT-1	Hospet-Harlapur	NA	Obtained	Obtained and renewed	Obtained	Obtained	Obtained. Plant yet to be commissioned	Obtained
	HT-2	Harlapur-Dharwar	NA	NA	Obtained and renewed	Not obtained (The Contractor is presently not operating their own quarry and is procuring the materials from third party licensed quarry)	Not obtained (The Contractor is presently not operating their own quarry and is procuring the materials from third party licensed quarry)	Not yet obtained (The stone crusher plant erected by the Contractor is presently non operational and is procuring the materials from third party)	NA
	HT-3	Kambarganavi-Tinaighat	NA	Obtained	Obtained and renewed	Obtained	Obtained	Applied for renewal to Pollution Control Board	Obtained
Sambalpur-Titlagarh	ST-1	Major bridges	NA	Obtained	Obtained and renewed	NA	NA	NA	Obtained and renewed for 1 plant at Hirapur Camp site, and Mahanadi

Name of the project	Sub project	Section	Clearance for Diversion of Forest land Under Forest Conservation Act, 1980	Permission for Tree Felling Under Forest Conservation Act, 1980	Labour License Under Labour Rules	Quarry License From Department of Mines and Geology	Env Clearance for Quarry Under (Environment Protection) Act	NOC for Stone Crusher Plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974	NOC for Batching plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974
									Bridge at Hirakud. applied for CtO for batching plant at Sonegarh bridge (Bridge No. 406) and CtE for new plant at Bridge No. 438..
	ST-2	Sambalpur-Barapali	NA	Obtained	Obtained and renewed	NA (The Contractor is Procuring materials from third party licensed quarry)	NA	Obtained and renewed	Obtained and renewed
	ST-3	Barapali-Bolangir	NA	Obtained	Obtained	NA	NA	NA	Obtained
	ST-4	Bolangir-Titlagarh	NA	Obtained	Obtained and renewed	NA	NA	NA	Obtained, applied for renewal
Raipur-Titlagarh	RT-1	Titlagarh-Lakhana	NA	Obtained	Obtained	Obtained	Obtained	Obtained	NA
	RT-2	Lakhana-Arand	NA	Obtained	Obtained	NA (Boulders are	NA	NA	Applied for CtE and CtO for plants at

Name of the project	Sub project	Section	Clearance for Diversion of Forest land Under Forest Conservation Act, 1980	Permission for Tree Felling Under Forest Conservation Act, 1980	Labour License Under Labour Rules	Quarry License From Department of Mines and Geology	Env Clearance for Quarry Under (Environment Protection) Act	NOC for Stone Crusher Plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974	NOC for Batching plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974
						being procured from third party having valid license)			Bagbahara and Jonk River bridge site to Chattisgarh State Pollution Control Board
	RT-3	Arand-Raipur	NA	Obtained	Obtained and renewed	NA	NA	NA	Obtained
Daund-Gulbarga	DG-1	Bhigwan-Mohol	NA	Obtained	Obtained and renewed	Obtained	Obtained	Stone crusher plant shifted to another location at Kem village. Fresh NOC required. Application yet to be submitted by the Contractor	NA
	DG-2	Hotgi-Gulbarga	**Contract for Balance work awarded to M/s SMSIL-MBPL-BRAPL (JV) on 17/02/2016. The Contractor is in the initial stage of mobilisation**						
Pune-Guntakal	PG-1	Pune-Bhigwan and Gulbarga-Wadi	NA	NA	Obtained and renewed	NA	NA	NA	NA
	PG-2	Wadi-Raichur	NA	NA	Obtained and renewed	NA	NA	NA	NA

Name of the project	Sub project	Section	Clearance for Diversion of Forest land Under Forest Conservation Act, 1980	Permission for Tree Felling Under Forest Conservation Act, 1980	Labour License Under Labour Rules	Quarry License From Department of Mines and Geology	Env Clearance for Quarry Under (Environment Protection) Act	NOC for Stone Crusher Plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974	NOC for Batching plant from PCB under Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution)Act, 1974
	PG-3	Raichur-Guntakal	NA	NA	Obtained and renewed	NA	NA	NA	NA

Table 6: Status of Statutory Clearance, Licenses and Permits pertaining to Environment

5.2 Compliance with the Environmental Management Plan

In all the packages the EMP is a part of contract documents and included under particular conditions of the contract. The contractor has to follow the stipulated environmental safeguards as per EMP during construction activities. The compliance with the safeguards requirements is being constantly monitored by PMC and PIU at site. The performance of implementation of EMP is assessed by the General Consultant.

During the reporting period, the following major environmental issues were reviewed and the contractors were instructed to take remedial measures when required:

- Pollution control measures at all potential sources including construction zones and plant sites
- Borrow area/ quarry operations and rehabilitation
- General safety at different sites including construction site, plant site, borrow areas, stockyards, etc.
- Maintenance of facilities and general housekeeping at each construction camp sites.
- Medical facility at camps, construction sites and plant sites
- HIV/AIDS awareness and health check up programme
- Supply and use of Personal Protection Equipment (PPE) for all the workers at all worksites
- Maintenance of general public safety.
- Periodical monitoring of environmental attributes such as air quality, water quality and, noise levels at different locations during construction

5.2.1 Compliance with pollution control measures at construction and plant sites

In general in the construction packages where civil works are in progress, the main source of air pollution is dust. Gaseous emission is other source of air pollution which occurs due to operation of heavy machineries and construction vehicles. The contractors have established their own stone crusher units in packages DG-1 of Daund-Gulbarga project, HT-3 of Hospet-Tinaighat project, ST-2 of Sambalpur-Titlagarh project and RT-1 in Raipur-Titlagarh project. In package HT-2 the contractor had initially established one stone crusher plant, but it was closed due to non availability of valid permission from Pollution Control Board and the contractor is procuring ballast from third party. The stone crusher unit of HT-3 package has not been operational from last six months as the validity of the NOC from Pollution Control Board has expired. The contractor has applied for renewal of NOC from Pollution Control Board. The Pollution Control Board has instructed them not to operate the plant till their formality for the approval is over.

In all the operational stone crusher plants water sprinklers have been installed to control dust. The dust control measures at stone crusher of all the packages where they are operational have been found to be satisfactory.

Batching plants have been established in construction packages HT-1 and HT-3 of Hospet-Tinaighat project, DG-1 of Daund-Gulbarga project, RT-3 of Raipur-Titlagarh project, ST-1, ST-2 and ST-4 packages of Sambalpur-Titlagarh project.

The dust control at batching plants in DG-1, RT-2 and RT-3, ST-2 and ST-4 is satisfactory. However the use of appropriate nasal masks is required by the workers engaged in loading cement in batching plant as preventive measure against fine cement dust.

In construction packages HT-1, HT-3, ST-1 and ST-2 improvement in dust control measures is required at batching plant. Dust generation has been observed near the cement loading point and the workers involved in cement loading are directly exposed to the fine dust. All the contractors have been advised to observe the dust control measures as per Pollution Control Board's norms at all their plant all the time.

At all the campsites and plant sites advance Diesel Generator (DG) sets (Low emission and noiseless) have been installed. The gaseous emission and noise level have been observed to be in control.

The siting criteria of these plants have been followed as per norms in all the construction packages. The dust control measures at different locations have been found to be satisfactory during the reporting period. Regular water sprinkling in all the construction zones are being ensured to control dust generation effectively. In construction packages where stone crusher plants and batching plants are installed, installation of dust suppression system at plant and their maintenance has been ensured. Regular sprinkling of water at conveyor belt, jaw crusher and within the plant premises and on earthen roads is carried out to control dust emission. For ensuring that emission from heavy construction vehicles is controlled, the contractors are required to get valid PUC certificates on periodical basis.

At plant site drums of diesel and other petroleum products are stored on impervious platforms in all the projects in order to avoid land contamination. The spent oils are stored separately in drums and are sold to authorized vendors.

The first aid boxes have been provided at all the plant sites except in package ST-1 and ST-3 where first aid boxes are required to be maintained with all essential first aid items at all the batching plants. The fire fighting equipments have been provided at all the plant sites of all the construction packages except for packages ST-1 and ST-3 where such arrangements are required at all the batching plants.

In ST-1 slurry generated during piling works for bridge construction is found to be disposed off in the river bed. The contractor has been instructed to dispose off slurry including debris away from the river bed to avoid contamination of water. In HT-1 the construction materials have been stacked in the natural waterway adjacent to the contractor's main camp at Alnawar, which may result into obstruction of water flow, contamination of water and damage to the stacked materials especially during rains. The waste water as well as solid wastes from kitchen of this camp are directly discharged into the natural waterway. This may add to the water contamination as well as land contamination on downstream site. The contractor has been advised to shift all the materials from the waterway and clear all the garbage from it . Provision of soak pit and collection and disposal of garbage is also required to avoid water and land contamination.

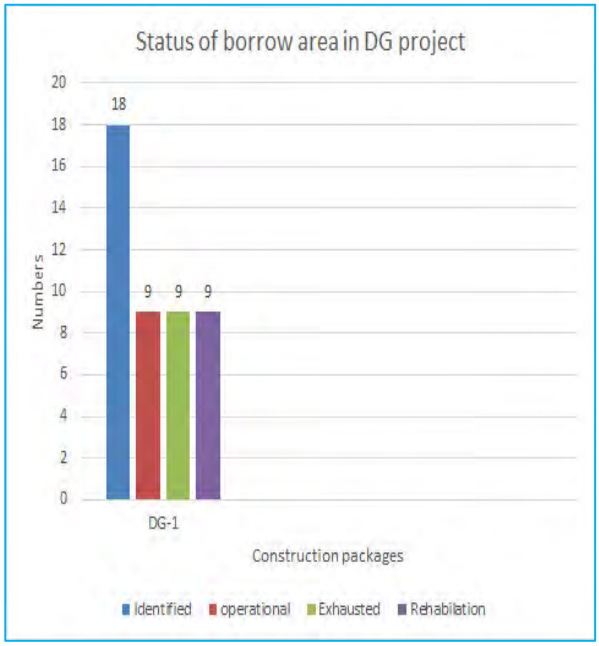
There is no major noise generating source at stone crusher units. Gensets installed at all different plant locations and camp sites are advanced units with noiseless equipments. The stone crusher units have been erected away from habitation area. During site inspection no workers working at

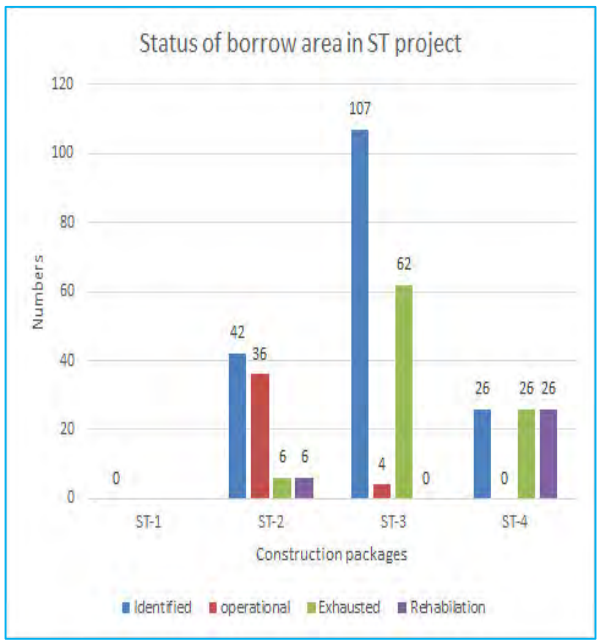
stone crusher plants were found using ear plugs as protection measures against noise pollution. Use of hard hats and safety boot by workers are required to be ensured in packages DG-1 and ST-2.

5.2.2 Compliance with EMP Implementation at quarry site and borrow areas

The contractors have opened their own quarry in package HT-3, RT-1 and DG-1. It has been ensured that the contractor has obtained all the statutory clearances and licenses for the quarry sites. In packages HT-1, RT-2, RT-3, ST-2, ST-3, ST-4 ballast is being procured from third party licensed quarries. In Pune-Guntakal Electrification Project no borrow area or quarry are required.

The borrow areas for soil and granular materials are required in doubling of track projects. It is being ensured that the borrow areas are operational only after obtaining written consent of the landowners. It is being ensured that the proposed quarry sites and borrow areas conform to the contract specification as well as the MoEF guidelines. Special care was taken in selection of quarry borrow area away from environmentally sensitive areas. However, incase any borrow area is proposed in the vicinity of environmental sensitive area site specific study of environmental impacts and formulation of their mitigation measures will be included before commencement activities of in such areas. It has been emphasized that all the proposed borrow areas are devoid of any sensitive socio-environmental features and any adverse socio-environmental impact due to their operation is avoided. The rehabilitation of all the proposed area after completion of the material extraction has been insited upon in order to help in enhancing the physical environmental condition of the area producing overall socio-economic benefits. Contractors are being continuously motivated to comply with such requirement of EMP but presently control by PMC is not sufficent. The rehabilitation activities of completed borrow areas have been taken up as per landowners or community requirements. The measures taken for controlling fugitive dust emission during the excavation, loading and transportation of materials at all the operational quarries and borrow areas are satisfactory. A graphical presentation depicting summary of status of borrow area operation and rehabilitation in different projects till March, 2016 is given in Figure-2.





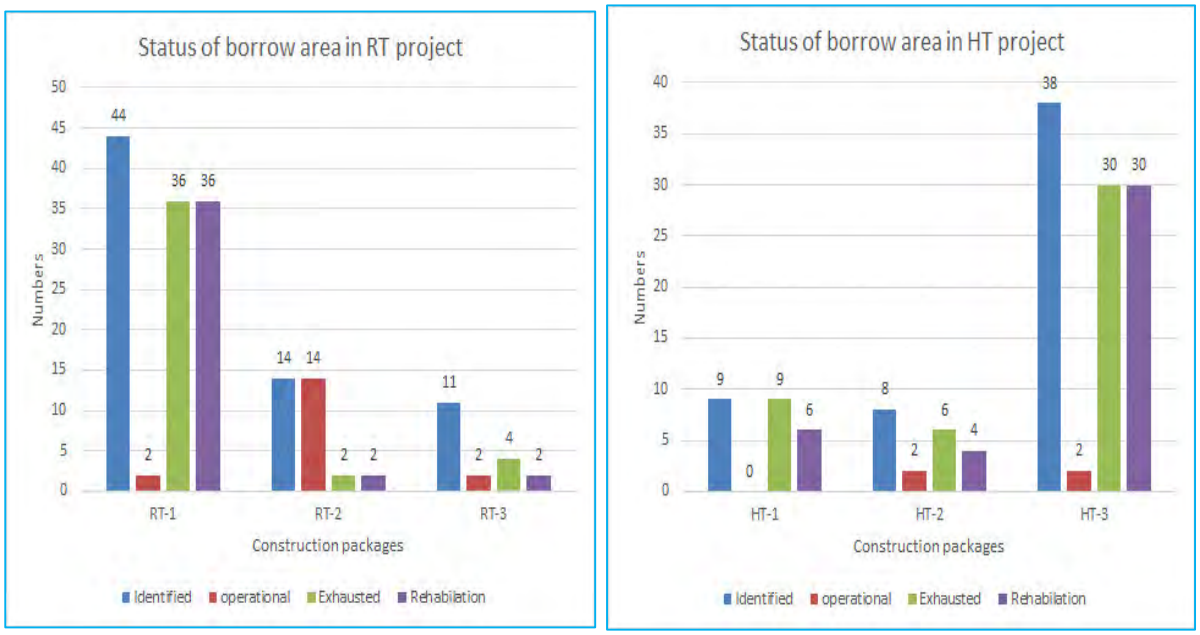


Figure 2: Status of Borrow Area Operation and Rehabilitation in Different Projects

As per information provided by the PMC, in DG-1 material extraction from 9 borrow areas is over and the same have been rehabilitated as per land owners requirement.

In ST-2, out of 42 identified borrow areas 6 borrow areas are exhausted and rehabilitated. PMC is required to start collecting satisfaction letter from the land owners after completion of rehabilitation works for all those closed borrow areas. In ST-3 package, GC has found that there is inconsistency in borrow area detailing and not matching with the actual site conditions. Clarification has been requested. Also good top soil is not being preserved from most of borrow areas for slope protection work of embankment. As informed by PMC of ST-4, 26 borrow areas have been rehabilitated by converting them into agricultural land.

In package RT-1 as per information provided by the PMC altogether 45 borrow areas have been identified for material extraction, out of which materials extraction is completed from 36 borrow areas. All these 36 borrow areas are closed and rehabilitated as per land owner's requirement. In RT-2 package 14 borrow areas are operational and the contractor has not submitted relevant documents of permission and agreement letter with land owners for some of borrow areas in use. Similarly in RT-3 package, all borrow areas where extraction of materials have been completed require to be rehabilated as per plan.

Photographic record of all the borrow area are required to reflect original condition of land before borrowing of materials, during extraction of materials and after completion and rehabilitation of borrow area in entire HT project. In HT-1, no action has been taken for rehabilitation of borrow areas at Huligudi and Tadkal as per requirement of owners. Also, fencing around periphery of the borrow area at Tunbhadra Dam is required as protection measure. Haphazard excavation has been observed in the borrow area. Slope of excavation should match with the general ground slope to ensure uniform sloping towards reservoir. At HT-2 package, permit of borrow area at Dharwad

needs to be collected from the owner of the borrow area. Rehabilitation of completed borrow areas have to be taken up in priority and compliance report must be submitted by the contractor. In HT-3 package, the access of borrow area at Bamankoppa is located in reserved forest area and so requires permission from forest department for using the area as access. The lapses in non compliance to the EMP with respect to borrow area operation may be attributed to inadequate monitoring by the PMC at such sites.

5.2.3 Compliance with safety requirements at site

Workers safety at site is satisfactory in construction packages PG-1, PG-2, PG-3, HT-1, RT-1 and ST-2. In addition to use of safety gears, effort has been made to ensure safe access to the work zone and a safe working platform, however this requires improvement in construction sites of bridge locations in ST-1, construction packages DG-1, ST-3, ST-4, HT-2, RT-2 and RT-3. Non- observance of safety norms by the sub-contractors is still a concern in all these packages.

Adequate firefighting arrangements and safe storage of materials have also been ensured at all the work sites, fabricating yards, workshops and other allied sites in most of the construction packages except for package ST-1, ST-2 , RT-3 and HT-3 where refilling of existing fire extinguisher cylinders is required. It has been insisted to maintain First Aid Kits with all essential items at all the activity area including construction zones, workshops, stockyard, camp site and plant sites. Although first aid boxes have been provided at all the locations, regular replacements of consumed items are not practiced in some of the packages.

In almost all construction packages safety awareness training is held on regular basis to make the workers aware about the importance of the safety while working adjacent to live railway.

5.2.4 Traffic and Public Safety

No improvement has been observed with respect to general safety arrangement near railway track compared to last period. Since doubling work involves construction of new track adjacent to live railways, safety fencing has been provided along existing track in all projects. However, there is need of regular maintenance of fencing at most of packages. Additional protection measures have been followed by providing flagman, look outs, hooters and warning sign boards at all level crossings, curves and approaches of major bridges etc. Suitable barriers have been installed across the new embankment, preferably adjoining the manned/unmanned level crossings in most of packages to regulate the entry for the vehicles during the working hours. It is to be ensured that those barriers are manned by authorized representatives of contractors. Further, watchmen are deployed on both sides of all major work sites with red flags and hooters/whistle to keep a watch on the approaching trains and alert the workers well in time with the use of hooters/whistle. In construction packages HT-2 in Hubli-Dharwad section safety signboards and barricading are required to be provided at junctions of temporary approach and public roads at some locations. In construction package DG-1, deep cutting of rocks has taken place at Washimbe section. Hard barricading is required on the top of cutting for the safety of running traffic and vehicles. All work areas around excavated pits, trenches, openings, scaffoldings and storage material etc., require to be well cordoned/barricaded at sub stations and workshops in PG-2 and PG-3.

5.2.5 Compliances of EMP at workers/labour camps

The majority of labourers engaged in all the construction packages are local labourers except for some requiring special skills. Migrant workers were also engaged for performing various construction activities during the reporting period in all the construction packages except construction packages HT-3, RT-1 and RT-2. In construction package RT-1 migrant labourers were working till October, 2015 afterwards no migrant labourers have been engaged for works. Among local labourers participation of female labourers has also been observed in construction packages DG-1, HT-1, HT-3, RT-1 and RT-2. Among migrant labourers female migrant labourers were reported in construction package DG-1.Labour camps for migrant labors have been provided in all the construction packages where migrant workers have been engaged.

In package PG-1 the migrant labourers have been accommodated in railway containers as well as in rented house with all basic facilities. In construction packages PG-2 and PG-3 all the migrant labourers have been accommodated in rented houses in Krishna, Saidpur, Raichur, Yadgir and Adoni towns. In construction packages DG-1, HT-1, ST-1, ST-2, ST-3, ST-4, RT-2 the contractors have provided labour camps.

In construction packages ST-1 labour camps have been provided at four locations. In general the facilities provided in labour camps have been found to be satisfactory. Improvement is required with respect to waste collection and disposal. In ST-2 package labour camp has been provided at Suktapali batching plant. General hygienic conditions, waste collection and disposal, require improvement. Water facility at toilets and bathrooms must be provided. In package ST-3 labour camp has been provided at plant site, but lacks sanitation facilities and toilets with septic tank and soak pit. The labourers are forced to go in open field in adjacent forest area. In package ST-4 labour camp situated at Saintala requires improvement in respect of sanitation and other basic amenities.

In construction package DG-1 labour camps including sub-contractors labour camp have been provided at 4 locations. The labour camp provided at Malikpet railway station is without proper dwelling units and basic facilities of drinking water, electric supply, toilets, sanitation arrangements, cooking arrangements. At this camp female labourers are also residing along with their children. This site requires immediate attention for improvement in general standards.

In construction package HT-3 one labour camp was constructed earlier near contractor's main camp site at Alnawar. Presently no migrant labourers are engaged by the contractor and the camp was in abandoned stage. The contractor is not intending to use this camp further hence this camp has been dismantled and the site is restored. The contractor is planning to use this land as their stockyard. One camp is located at batching plant complex with dwelling units for plant and vehicular operators with all the basic facilities.

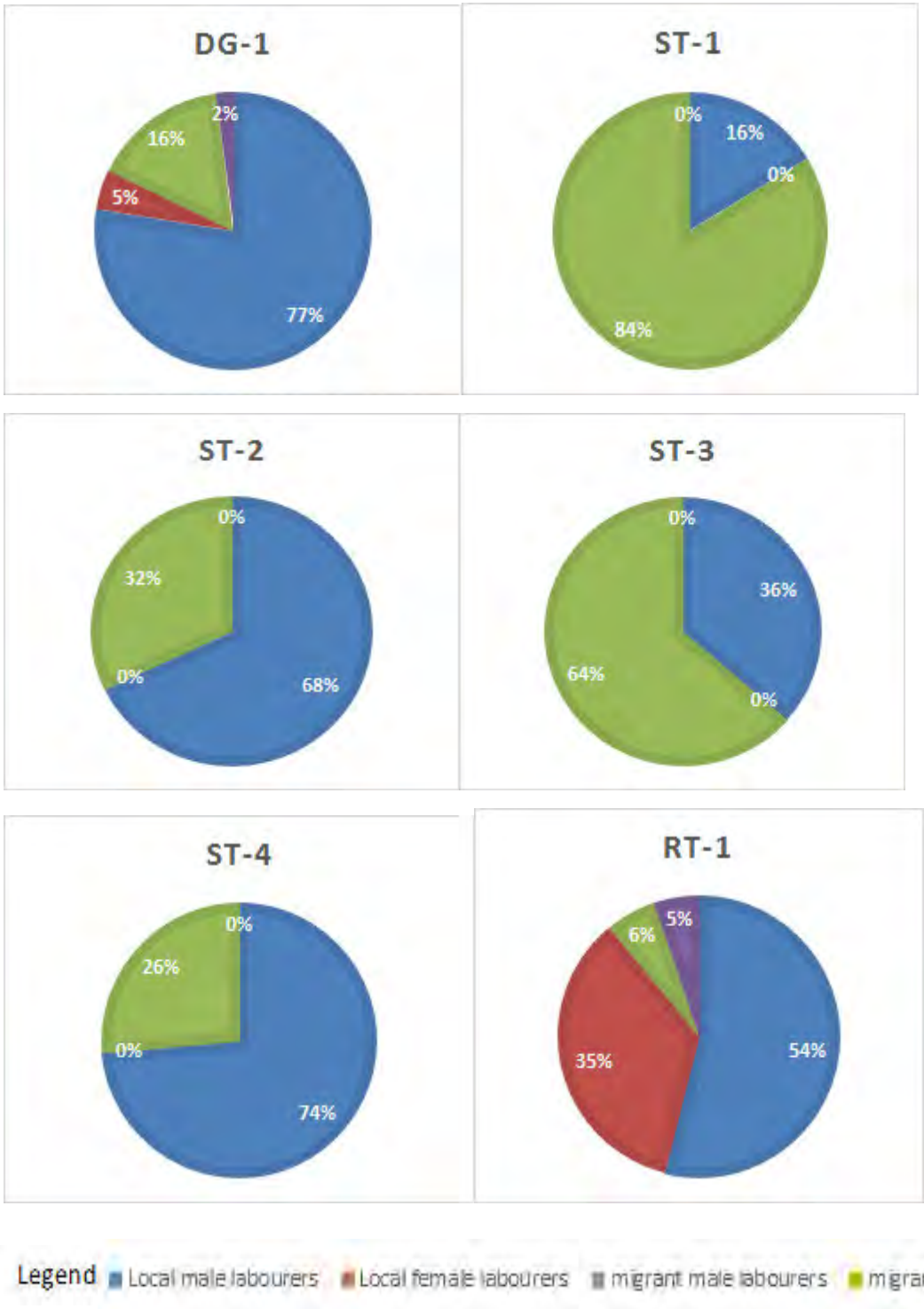
In construction package RT-1 labour camp was initially provided at Pipalwal village, which has been now dismantled and the site is cleared. After October, 2015 the contractor has engaged only local labourers.

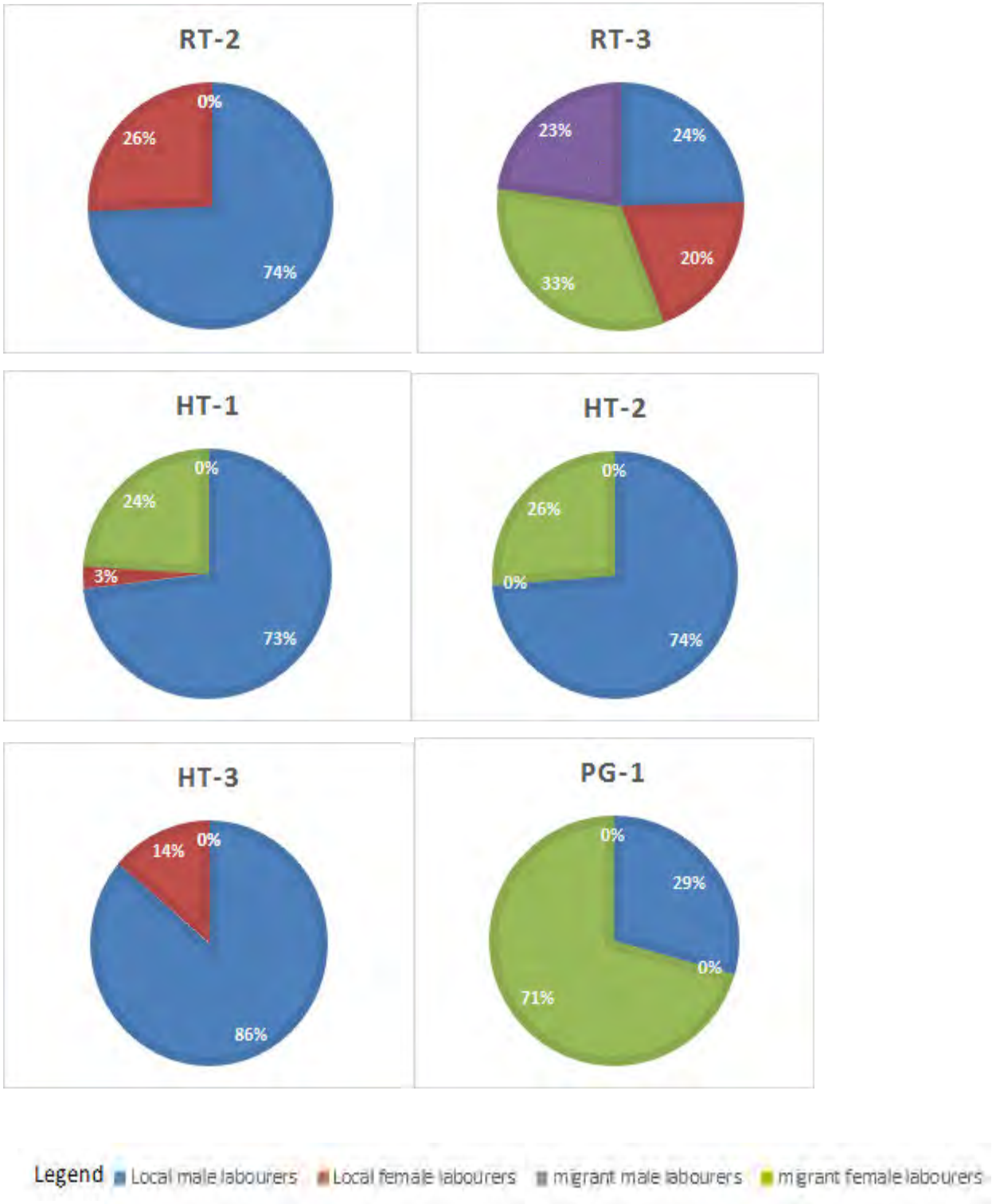
Periodical cleaning of all water storage tanks particularly for drinking water at labour camps, office premises and Engineer's quarters as well as periodical application of insecticides and pesticides in

and around the camp sites have been insisted upon in all the projects. It has been carried out in packages ST-1, ST-2, ST-4 and HT-1.

It has been recorded that garbage generated at all the camp sites are spread here and there despite of installation of garbage bins causing littering of surrounding land as well as creating unhygienic conditions in all the camps. The contractors have been advised to improve and maintain general hygienic condition in all the camps.

Status of male and female labourers engaged in different projects:

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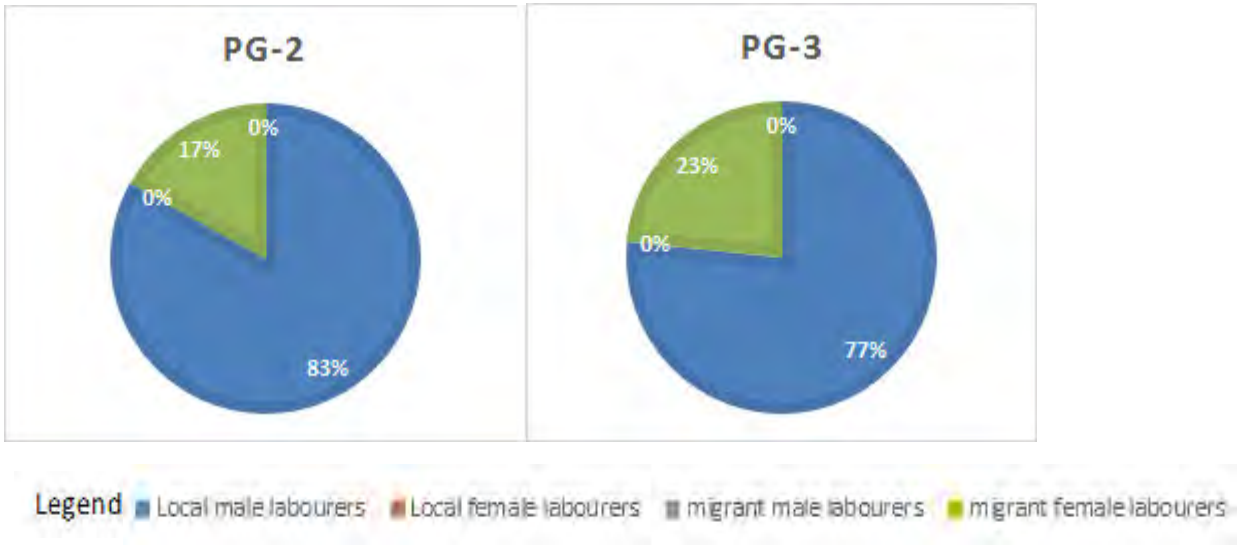

Figure 2: Details of local and migrant labourers engaged in different project packages

5.2.6 Debris management

The debris generated while excavating for road bed consist mainly of good earth suitable for formation work. Generally the excavated earth is stacked on adjacent ground within the railway land for reuse in embankment slopes, temporary access road, horticulture purpose and for backfilling of borrow areas. Clearance of debris from site generated during piling and foundation work for Important bridges in ST-1 and at bridge construction in ST-3 as well as from completed sections of DG-1, HT-1 and HT-2 require improvement. Cutting at Washimbe in construction package DG-1 has generated huge quantity of boulders, which are stacked within the railway land along the cutting area. It is intended to reuse these boulders for generating ballast however, consent from Railway Department is awaited. The unusable materials require proper disposal from the site.

In ST-1, there is problem of clearance of muck generated during piling work for important bridges. Above problem of disposal of muck persists since start of piling work and needs attention. Stacking of debris materials in haphazard manner has been observed in construction package PG-1 at newly constructed SSP building at Hadaspur. In HT-2 debris removal is required in substantially completed section. The debris generated at camp site and laboratory of package ST-3 is disposed off in the adjacent forest area. The contractor has been instructed to clear the debris from forest land and to dispose debris materials away from forest area in designated disposal site.

5.2.7 Health check-up and AIDS awareness camps for workers

Periodical health check ups and HIV/AIDS awareness camps are organized by the contractor in all the construction packages. As per Particular Condition of the Contract, the contractor has to organize HIV/AIDS awareness programme at every two months interval in their respective contract. The contractors of packages PG-2, PG-3, HT-1 ST-2, ST-2 and ST-4 are maintaining the periodicity of the HIV/AIDS awareness programme but in rest of the construction packages this requires improvement. So far no HIV/AIDS positive case has been reported.

5.2.8 Environmental training

It was felt necessary to organize refresher training workshop on EMP implementation in RVNL projects for PIU, Contractor and RVNL supervisory staff in different construction packages in order to strengthen the implementation procedures on environmental mitigation measures and to eliminate the lapses recorded during various site inspections. During the reporting period Environmental Expert of GC conducted training workshops for all the construction packages During the training the requirements of EMP implementation, its importance to the projects, contractual commitments for compliances as well as ADB policy on Environmental Safeguards were discussed. The general observations on EMP implementations in different project packages were also explained in the training along with necessary corrective measures requirements.

Place	Date of Training	Project	Participant Project Package
Daund	28.12.2015	Pune-Guntakal Electrification	PG-1, Section-1

Place	Date of Training	Project	Participant Project Package
		Project	
Gulbarga	29.12.2016	Pune-Guntakal Electrification Project	PG-1, Section-2
Sambalpur	19.01.2016	Sambalpur-Titlagar Doubling Project	ST-1, ST-2, ST-3 and ST-4
Kurdwadi	30.01.2016	Dound-Gulbarga Doubling Project	DG-1
PMC Office - RT-2	25.02.2016	Raipur-Titlagarh Doubling Project	RT-1, RT-2 and RT-3
Hubli	1.04.2016	Hospet-Tinaighat Doubling Project	HT-1, HT-2 and HT-3

Table 7: Training Workshops on EMP Implementation in RVNL Packages during reporting period

5.4 Monitoring of environmental quality attributes

There is requirement of periodical monitoring of environmental attributes in terms of air, water, noise quality in all the construction packages with an objective to assess the additional pollution load on environmental components due to construction of the project. The periodical monitoring of environmental attributes is being carried out by the contractor as per agreed environmental monitoring plan.

During the reporting period monitoring of environmental quality in terms of air, water and noise levels have been carried out in all the construction packages except for construction packages HT-1 and ST-4. In construction package HT-3, as informed by the PMC the environmental monitoring has been carried out in March, 2016 but the test results have not yet been submitted by the contractor. Following table depicts the period of monitoring carried out in different construction packages during those six months:

S. No.	Project/ Construction Package	Monitoring of Environmental Components		
		Air Quality	Water Quality	Noise Level
1.	**Daund-Gulbarga Doubling Project**			
(i)	DG-1	Ambient air quality monitoring was carried out in the month of October, 2015 and March, 2016 at 2 locations.	Water quality monitoring was carried out in the month of October, 2015 March, 2016 at 2 locations.	Noise level monitoring was carried out in the month of October, 2015 and March, 2016 at 2 locations.

S. No.	Project/ Construction Package	Monitoring of Environmental Components		
		Air Quality	**Water Quality**	**Noise Level**
(ii)	**DG-2**	Contract for Balance work awarded to M/s SMSIL-MBPL-BRAPL (JV) on 17/02/2016. The Contractor is in the initial stage of mobilization.		
2.	**Hospet-Tinaighat Doubling Project**			
(i)	**HT-1**	No monitoring has been carried out during reporting period.		
(ii)	**HT-2**	It has been reported by PMC that the monitoring was conducted at Dondur Cam, Dharwad site and Work sites in the month of November, 2015 but test results were not submitted. No monitoring has been carried out afterwards till end of March, 2016		
(iii)	**HT-3**	Ambient air quality monitoring was carried out in the month of March, 2016. Report awaited.	Water quality monitoring was carried out in the month of March, 2016. Report awaited.	Noise level monitoring was carried out in the month of March, 2016. Report awaited.
3.	**Raipur-Titlagarh Doubling Project**			
(i)	**RT-1**	Ambient air quality monitoring was carried out in the month of November, 2015 and March, 2016 at 6 locations.	Water quality monitoring was carried out in the month of November, 2015 and March, 2016 at 6 locations.	Noise level monitoring was carried out in the month of November, 2015 and March, 2016 at 6 locations.
(ii)	**RT-2**	Ambient air quality monitoring was carried out in the month of November, 2015 and March, 2016 at 3 locations.	Water quality monitoring was carried out in the month of November 2015 and March, 2016 at 3 locations.	Noise level monitoring was carried out in the month of November, 2015 and March, 2016 at 3 locations.
(iii)	**RT-3**	Ambient air quality monitoring was carried out in the month of November, 2015 and March, 2016 near batching plant at 1 location.	Water quality monitoring was carried out in the month of November 2015 at 3 locations and in March 2016 at 4 locations.	Noise level monitoring was carried out in the month of November, 2015 and March, 2016 at 3 locations.
4.	**Sambalpur-Titlagarh Doubling Project**			
(i)	**ST-1**	Ambient air quality monitoring was carried out in the month of January, 2016 at 2 locations.	Water quality monitoring was carried out in the month of January, 2016 at 2 locations.	Noise level monitoring was carried out in the month of January, 2016 at 2 locations.

S. No.	Project/ Construction Package	Monitoring of Environmental Components		
		Air Quality	**Water Quality**	**Noise Level**
(ii)	**ST-2**	Ambient air quality monitoring was carried out in the month of January, 2016 at 4 locations.	Water quality monitoring was carried out in the month of January, 2016 at 4 locations.	Noise level monitoring was carried out in the month of January, 2016 at 4 locations.
(iii)	**ST-3**	Ambient air quality monitoring was carried out in the month of January, 2016 at 4 locations.	Water quality monitoring was carried out in the month of January, 2016 at 4 locations.	Noise level monitoring was carried out in the month of January, 2016 at 4 locations.
(iv)	**ST-4**	No monitoring carried out since January 2015.	No monitoring carried out since January 2015.	No monitoring carried out since January 2015.
5.	**Pune-Guntakal Railway Electrification**			
(i)	**PG-1**	The ambient air quality monitoring was carried out in the month of November, 2015 at 4 locations.	Water quality monitoring was conducted in the month of November, 2015 at two locations.	Noise level monitoring was carried out in November, 2015 at 4 locations.
(ii)	**PG-2**	The ambient air quality monitoring was carried out in the month of January, 2016 at 2 locations.	Water quality monitoring was conducted in the month of January, 2016 at 2 locations.	Noise level monitoring was carried out in January, 2016 at 2 locations.
(iii)	**PG-3**	The ambient air quality monitoring was carried out in the month of January, 2016 at 2 locations.	Water quality monitoring was conducted in the month of January, 2016 at 2 locations.	Noise level monitoring was carried out in January, 2016 at 2 locations.

Table 8: Status of Monitoring of Environmental Attributes during last 6 months

(a) *Air quality monitoring results*:

The monitoring results reflect that the project activities do not have any significant additional load on pollution in the area. Package wise test results of air quality monitoring are presented in following table:

S. No.	Project-wise Monitoring Location	Date of Sampling	Concentration of air quality parameters					
			SPM (μgm^{-3})	PM10 (μgm^{-3})	PM2.5 (μgm^{-3})	SO2 (μgm^{-3})	NOx (μgm^{-3})	CO (mgm^{-3})
i. Daund – Gulbarga project								
	1. Package DG-1							
(i)	Km 384 (Wadsinge)	13.10.2015	136	57	-	-	43	0.498
(ii)	Level Crossing No. 43		78	43	-	-	36	0.509
(iii)	Kurduvadi batching plant	02.03.2016	123	64	-	-	35	502
(iv)	Vakas station		151	72	-	-	63	595
ii. Sambalpur – Titlagarh project								
	1. Package ST-1							
(i)	Near PMC office	19.01.2016	500	150	-	120	120	10
(ii)	Near batching plant		500	150	-	120	120	10
	2. Package ST-2							
(i)	Near Kattapali	08.01.2016 & 09.01.2016	-	52.6	29.1	11.5	16.2	<1
(ii)	Near batching plant		-	68.3	36.8	16.2	20.1	<1
(iii)	Near bridge no. 160		-	61.7	30.4	12.5	17.3	<1
(iv)	Near stone crusher plant		-	76.1	42.3	17.3	21.5	<1
	3. Package ST-3							
(i)	Near batching plant	11.01.2016 & 12.01.2016	-	63.8	34.1	13.2	19.1	<1
(ii)	Near bridge no. 235		-	56.7	30.3	12.1	17.2	<1
(iii)	Near JT-68		-	53.7	29.2	11.9	17.2	<1
(iv)	Near bridge no. 220		-	58.1	31.7	12.7	17.9	<1
iii. Raipur-Titlagarh project								
	1. Package RT-1							
(i)	Office complex, Kantabanji	19.11.2015 to	-	63.7	35.5	9.8	13.4	0.411

S. No.	Project-wise Monitoring Location	Date of Sampling	Concentration of air quality parameters					
			SPM (μgm^{-3})	PM10 (μgm^{-3})	PM2.5 (μgm^{-3})	SO2 (μgm^{-3})	NOx (μgm^{-3})	CO (mgm^{-3})
(ii)	Crusher plant at Harishankar Road	21.11.2015	-	75.8	45.7	10.8	14.7	0.447
(iii)	Near Turekela Railway Station		-	56.1	29.9	10.2	11.6	0.312
(iv)	Near Muribahal Railway Station		-	59.3	34.1	9.9	12.8	0.389
(v)	Near Rehenbhata Railway Station		-	62.2	35.8	10.3	13.5	0.417
(vi)	Office Complex, Kantabanjhi	18.03.2016 to 19.03.2016	-	67.9	38.1	10.1	14.3	463
(vii)	Crusher plant at Harishanakar Road		-	71.8	43.8	10.6	14.3	412
(viii)	Near Tureikela Railway Station		-	59.8	32.5	9.7	11.2	307
(ix)	Near Muribahal Railway Station		-	58.2	33.8	9.7	12.2	369
(x)	Near Rehenbhata Railway Station		-	65.3	37.2	10.8	14.1	403
(xi)	Harishankar Railway Station		-	68.7	39.5	10.5	13.8	427
2. Package RT-2								
(i)	Bagbahar Office Complex	18.11.2015	-	52.5	29.8	10.1	12.2	-
(ii)	Bhimkhoj Railway Station		-	55.6	30.7	9.9	12.5	-
(iii)	Aranda Railway Station		-	49.1	29.6	9.7	12.5	-
(iv)	Bagbahar Office Complex	17.03.2016	-	60.4	33.4	9.7	13.1	-
(v)	Bhimkhoj Railway Station		-	61.2	34.7	9.8	13.9	-
(vi)	Arand Railway Station		-	56.8	32.2	9.5	12.7	-
3. Package RT-3								

S. No.	Project-wise Monitoring Location	Date of Sampling	Concentration of air quality parameters					
			SPM (μgm^{-3})	PM10 (μgm^{-3})	PM2.5 (μgm^{-3})	SO2 (μgm^{-3})	NOx (μgm^{-3})	CO (mgm^{-3})
(i)	Batching plant at Mahanadi bridge	17.11.2015	-	56.3	31.4	9.4	11.5	-
(ii)	Batching plant at Mahanadi bridge	16.03.2016	-	64.3	36.7	9.2	13.6	-
iv. Pune Guntakal Electrification project								
	1. Package PG-1							
(i)	At work place area	24.11.2015	192	63	32.5	7.8	23.5	0.142
(ii)	Near TSS	24.11.2015	206	67	33.0	8.3	19.8	0.124
(iii)	At OHE Depot site	26.11.2015	181	58	27.6	9.1	21.5	0.122
(iv)	Near Contractors' Office	24.11.2015	170	53	24	8.2	17.6	0.108
	2. Package PG-2							
(i)	Saidapur Railway Station	30.01.2016	-	55.3	23.0	8.1	11.7	BDL
(ii)	Krishna type II quarters building		-	55.0	23.4	7.3	11.6	BDL
	3. Package PG-3							
(i)	Mantralayam TSS Building	30.01.2016	-	60.1	24.2	8.0	11.6	BDL
(ii)	Raichur Quarters Type II Building		-	58.3	21.9	7.7	11.7	BDL
Prescribed Limit for National Ambient Air Quality (MoEFCC, Govt. of India)			-	100	60	80	80	4.00

Table 9: Construction package-wise ambient air quality at different locations

(b) Water quality monitoring results

The samples of water from different sources were collected and tested for physico chemical characteristics in different construction packages as described in the previous section during reporting period as per environmental monitoring plan. The test results reflect that all the measured parameters were within the permissible limit as per IS 10500-2012. The packagewise water quality monitoring results are presented in following tables.

Parameters	Unit	Sampling locations(DG-1, date of sampling: 13.10.2015)	Standards as per IS: 10500:2012
		384 (Wadsinge) Drinking water	
PH	-	7.1	6.5-8.5
Color	Hazen	1.0	Max. 5.0
Odour	--	Agreeable	Agreeable
Taste	--	Agreeable	Agreeable
Turbidity	NTU	0.9	Max. 1.0
Total Dissolved Solids	mg/l	526	Max. 500
Total Hardness as CaCO3	mg/l	160	Max. 200
Chlorides as Cl	mg/l	82	Max. 250
Iron as Fe	mg/l	0.01	Max. 0.3
Residual free chlorine	mg/l	<0.1	Max. 0.2
Coli forms	MPN/100ml	Absent	Absent/100ml
Escherichia Coli	--	Absent	Absent/100ml

Parameters	Unit	Sampling locations(DG-1, date of sampling: 13.10.2015)	Sampling locations (DG-1, date of sampling: 29.02.2016/02.03.2016)		Standards as per IS: 456-2000
		384 (Wadsinge) Construction water	Kalinde camp construction water	Kurduwadi office construction water	
PH	-	7.1	7.3	7.8	Shall not be less than 6.0
Total Suspended Solids	mg/l	<1.0	4.0	6.0	2000 Max

Parameters	Unit	Sampling locations(DG-1, date of sampling: 13.10.2015)	Sampling locations (DG-1, date of sampling: 29.02.2016/02.03.2016)		Standards as per IS: 456-2000
		384 (Wadsinge) Construction water	Kalinde camp construction water	Kurduwadi office construction water	
Organic solids	mg/l	48	36	68	200 Max
In organic solids	mg/l	560	518	760	3000 Max
Sulphates as SO3	mg/l	42	48	78	400 Max
Chlorides as Cl	mg/l	110	108	138	500 Max
ml of 0.02N NaOH consumed to neutralize 100ml of water using Phenolphthalein as indicator	ml	Nil	Nil	Nil	Shall not be more than 5 ml.
ml of 0.02 H2SO4 consumed to neutralize 100ml of water using Methyl orange as indicator	ml	0.8	0.2	0.4	Shall not be more than 25 ml.

Table 10: Water quality monitoring data of package DG-1

Parameters	Unit	Sampling locations (ST-1, date of sampling: 19.01.2016)		Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Bore well water	Drinking water from aqua guard		
Colour	Hazen	CL	CL	5	15
Odour	-	U/O	U/O	Agreeable	Agreeable
Taste	-	AL	AL	Agreeable	Agreeable
Turbidity	NTU	<2	<2	1	5
pH Value	-	6.7	7.2	6.5-8.5	6.5-8.5
Total Hardness (as CaCO3)	mg/l	76.0	40.0	300	600
Iron (as Fe)	mg/l	0.26	0.11	0.3	No relaxation
Chloride (as Cl)	mg/l	28.0	34.0	250	1000
Fluoride as F	mg/l	0.03	0.021	1	1.5

Residual, free Chlorine	mg/l	ND	ND	0.2	1.0
Total Dissolved Solids	mg/l	331.0	196.0	500	2000
Calcium (as Ca)	mg/l	19.2	8.8	75	200
Magnesium (as Mg)	mg/l	6.8	4.4	30	100
Copper (as Cu)	mg/l	<0.05	<0.05	0.05	1.5
Manganese (as Mn)	mg/l	<0.005	<0.005	0.1	No relaxation
Sulphate (as SO4)	mg/l	11.9	9.4	200	400
Nitrate (as NO3)	mg/l	2.1	0.1	45	No relaxation
Phenolic Compounds (as C6H5OH)	mg/l	<0.001	<0.001	0.001	No relaxation
Mercury (as Hg)	mg/l	<0.001	<0.001	0.001	No relaxation
Cadmium (as Cd)	mg/l	<0.001	<0.01	0.01	No relaxation
Selenium (as Se)	mg/l	<0.001	<0.001	0.01	No relaxation
Arsenic (as As)	mg/l	<0.001	<0.001	0.01	0.05
Cyanide (as CN)	mg/l	ND	ND	0.05	No relaxation
Lead (as Pb)	mg/l	<0.01	<0.01	0.05	No relaxation
Zinc (as Zn)	mg/l	<0.05	<0.05	5	15
Anionic detergent	mg/l	ND	ND	0.2	-
Hexavalent Chromium as Cr+6	mg/l	<0.05	<0.05	<0.05	No relaxation
Mineral Oil	mg/l	ND	ND	0.01	No relaxation
Total Alkalinity (as CaCO3)	mg/l	68.0	38.0	200	600
Aluminium (as Al)	mg/l	<0.001	<0.001	0.03	No relaxation
Boron (as B)	mg/l	<0.01	<0.01	1	No relaxation
Poly Aromatic Hydrocarbon as PAH	µg/l	<0.0001	<0.001	-	-

Table 11: Water Quality monitoring data of package ST-1

Parameters	Unit	Sampling locations (ST-2, date of sampling: 08.01.2016 & 09.01.2016)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Crusher plant	Dug well	Batching plant	Attabira Railway Station		
Colour	Hazen	CL	CL	CL	CL	5	15
Odour	-	U/O	U/O	U/O	U/O	Agreeable	Agreeable
Taste	-	AL	AL	AL	AL	Agreeable	Agreeable
Turbidity	NTU	<0.05	<0.05	<0.05	<0.05	1	5
pH Value	-	6.8	6.6	6.7	7.6	6.5-8.5	6.5-8.5
Total Hardness (as CaCO3)	mg/l	110	90	102	90	300	600
Iron (as Fe)	mg/l	0.16	0.12	0.25	<0.01	0.3	No relaxation
Chloride (as Cl)	mg/l	50	45	48	26	250	1000
Residual, free Chlorine	mg/l	ND	ND	ND	ND	0.2	1.0
Total Dissolved Solids	mg/l	211	201	203.4	232	500	2000
Calcium (as Ca)	mg/l	22.0	18.0	20.4	20.0	75	200
Magnesium (as Mg)	mg/l	13.4	11.0	12.4	9.7	30	100
Copper (as Cu)	mg/l	<0.03	<0.03	<0.03	<0.03	0.05	1.5
Manganese (as Mn)	mg/l	<0.005	<0.005	<0.005	<0.005	0.1	No relaxation
Sulphate (as SO4)	mg/l	21	20	13.6	11.5	200	400
Nitrate (as NO3)	mg/l	2.8	2.1	5.6	1.82	45	No relaxation
Fluoride (as F)	mg/l	0.21	0.26	0.13	0.2	1	1.5
Phenolic Compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001	<0.001	0.001	No relaxation
Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	0.001	No relaxation

Cadmium (as Cd)	mg/l	<0.01	<0.01	<0.01	<0.01	0.01	No relaxation
Selenium (as Se)	mg/l	<0.001	<0.001	<0.001	<0.001	0.01	No relaxation
Arsenic (as As)	mg/l	<0.001	<0.001	<0.001	<0.001	0.01	0.05
Cyanide (as CN)	mg/l	ND	ND	ND	ND	0.05	No relaxation
Lead (as Pb)	mg/l	<0.07	<0.07	<0.07	<0.07	0.05	No relaxation
Zinc (as Zn)	mg/l	<0.05	<0.05	<0.05	<0.05	5	15
Chromium (as Cr+6)	mg/l	<0.05	<0.05	<0.05	<0.05	0.05	No relaxation
Mineral Oil	mg/l	<0.05	<0.05	<0.05	<0.05	0.01	No relaxation
Total Alkalinity (as CaCO3)	mg/l	50	40	60	140	200	600
Aluminium (as Al)	mg/l	<0.01	<0.01	<0.006	<0.006	0.03	No relaxation
Boron (as B)	mg/l	<0.2	<0.2	<0.2	<0.2	1	No relaxation

Table 12: Water quality monitoring data of package ST-2

Parameters	**Unit**	**Sampling locations (ST-3, date of sampling: 15.01.2016)**	**Desirable Limit IS 10500-2012**	**Permissible Limit in absence of Alternate Source IS 10500-2012**
		Batching plant		
Colour	Hazen	CL	5	15
Odour	-	U/O	Agreeable	Agreeable
Taste	-	AL	Agreeable	Agreeable
Turbidity	NTU	<0.05	1	5
pH Value @ 25 deg C	-	7.3	6.5-8.5	6.5-8.5
Total Hardness (as CaCO3)	mg/l	170	300	600
Iron (as Fe)	mg/l	0.22	0.3	No relaxation
Chloride (as Cl)	mg/l	60	250	1000

Residual, free Chlorine	mg/l	ND	0.2	1.0
Total Dissolved Solids	mg/l	383	500	2000
Calcium (as Ca)	mg/l	36.1	75	200
Magnesium (as Mg)	mg/l	19.4	30	100
Copper (as Cu)	mg/l	<0.03	0.05	1.5
Manganese (as Mn)	mg/l	<0.005	0.1	No relaxation
Sulphate (as SO4)	mg/l	22.4	200	400
Nitrate (as NO3)	mg/l	1.1	45	No relaxation
Fluoride (as F)	mg/l	0.43	1	1.5
Phenolic Compounds (as C6H5OH)	mg/l	<0.001	0.001	No relaxation
Mercury (as Hg)	mg/l	<0.001	0.001	No relaxation
Cadmium (as Cd)	mg/l	<0.01	0.01	No relaxation
Selenium (as Se)	mg/l	<0.001	0.01	No relaxation
Arsenic (as As)	mg/l	<0.001	0.01	0.05
Cyanide (as CN)	mg/l	ND	0.05	No relaxation
Lead (as Pb)	mg/l	<0.07	0.05	No relaxation
Zinc (as Zn)	mg/l	<0.05	5	15
Chromium (as Cr+6)	mg/l	<0.05	0.05	No relaxation
Mineral Oil	mg/l	<0.05	0.01	No relaxation
Total Alkalinity (as CaCO3)	mg/l	120	200	600
Aluminium (as Al)	mg/l	<0.006	0.03	No relaxation
Boron (as B)	mg/l	<0.2	1	No relaxation

Table 13: Water quality monitoring data of package ST-3

Parameters	Unit	Sampling locations (RT-1, date of sampling: 20.11.2015/21.11.2015)						Desirable limit IS 10500-2012	Permissible limit in absence of Alternate Source IS 10500-2012
		Crusher plant, Harisankar Road	Office complex, Kantabanji (Bore well)	Muribahal Railway Station	Harisankar Road Railway Station	Turekela Railway Station	Rehenbhata Railway Station (Tube well)		
Temperature	°C	27.9	29.4	29.7	30.1	30.6	29.7	-	-
Appearance color	-	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	1.3	1.3	1.6	2.0	1.9	1.8	1	5
pH	-	7.08	7.42	6.78	6.96	6.63	7.42	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	620	1240	470	1345	470	360	-	-
Total Solids	mg/l	346	624.5	263	815.2	271	213	-	-
Suspended Solids	-	5.4	5.5	4.7	8.6	8	11	-	-
Total Dissolved Solids	mg/l	340.6	619	258.3	806.6	263	202	500	2000
Chloride (as Cl)	-	26	128	12	39	31	24	250	1000
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	2.9	3.1	1.7	3.1	3.2	3.1	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.8	4.4	4.8	4.4	4.4	4.4	-	-
C.O.D	-	3.6	3.6	3.2	6.4	5.6	6.4	-	-
Oil & grease	mg/l	ND	ND	ND	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	ND	ND	0.02	0.02	0.04	0.04		
Sulphate (as SO4)	-	8.5	48.3	9.7	21.6	6.3	9.1	200	400
Fluoride (as F)	-	0.58	0.14	0.21	0.83	0.34	0.76	1.0	1.5

Parameters	Unit	Sampling locations (RT-1, date of sampling: 20.11.2015/21.11.2015)						Desirable limit IS 10500-2012	Permissible limit in absence of Alternate Source IS 10500-2012
		Crusher plant, Harisankar Road	Office complex, Kantabanji (Bore well)	Muribahal Railway Station	Harisankar Road Railway Station	Turekela Railway Station	Rehenbhata Railway Station (Tube well)		
B.O.D. (3-days at 27 deg C)	-	0.8	0.4	0.8	1.2	0.8	1.6	-	-
Coliform	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.22	0.21	0.18	0.23	0.28	0.28	-	-
Sodium	-	24.6	24.8	15.9	31.4	11.3	14.3	-	-
Potassium	-	1.7	1.9	1.8	2.4	0.92	0.76	-	-
Total Alkalinity	-	126	146	118	172	116	116	200	600
Total Hardness (as CaCO3)	-	160	406	140	531	228	160	200	600
Calcium Hardness (as CaCO3)	-	148	390	128	498	208	132	200	600
Magnesium Hardness (asCaCO3)	-	12	16	12	33	20	28	30	100

Table 14: Water quality monitoring data of package RT-1 for November, 2015

Parameters	Unit	Sampling locations (RT-1, date of sampling: 18.03.2016/19.03.2016						Desirable limit IS 10500-2012	Permissible limit in absence of Alternate Source IS 10500-2012
		Crusher plant, Harisankar Road	Office complex, Kantabanji (Bore well)	Muribahal Railway Station	Harisankar Road Railway Station	Turekela Railway Station	Rehenbhata Railway Station (Tube well)		
Temperature	°C	32.4	31.7	30.9	31.2	30.6	30.4	-	-
Appearance color	-	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	1.2	1.1	1.4	1.7	1.6	1.4	1	5
pH	-	6.75	7.53	6.79	6.76	6.58	7.28	6.5-8.5	6.5-8.5

Parameters	Unit	Sampling locations (RT-1, date of sampling: 18.03.2016/19.03.2016						Desirable limit IS 10500-2012	Permissible limit in absence of Alternate Source IS 10500-2012
		Crusher plant, Harisankar Road	Office complex, Kantabanji (Bore well)	Muribahal Railway Station	Harisankar Road Railway Station	Turekela Railway Station	Rehenbhata Railway Station (Tube well)		
Conductivity	µmhos /cm	640	1320	490	1450	420	510	-	-
Total Solids	mg/l	364.1	668.9	286.2	830.2	248.8	302.2	-	-
Suspended Solids	-	6.1	5.9	3.5	7.0	5.8	7.2	-	-
Total Dissolved Solids	mg/l	358	663	282.7	823.2	243	295	500	2000
Chloride (as Cl)	-	18.9	142.8	14.2	86.3	21.3	19.2	250	1000
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	2.4	3.6	1.4	3.4	2.4	1.9	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.8	4.4	4.0	4.4	4.4	4.0	-	-
C.O.D	-	3.2	3.6	3.2	6.4	5.2	3.6	-	-
Oil & grease	mg/l	ND	ND	ND	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	ND	ND	0.02	0.02	0.02	ND	-	-
Sulphate (as SO4)	-	8.1	57.4	10.9	42.1	5.7	8.2	200	400
Fluoride (as F)	-	0.19	0.22	0.24	0.83	0.26	0.34	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.8	0.4	0.8	1.2	0.4	0.8	-	-
Coliform	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.12	0.32	0.21	0.21	0.18	0.12	-	-

Parameters	Unit	Sampling locations (RT-1, date of sampling: 18.03.2016/19.03.2016						Desirable limit IS 10500-2012	Permissible limit in absence of Alternate Source IS 10500-2012
		Crusher plant, Harisankar Road	Office complex, Kantabanji (Bore well)	Muribahal Railway Station	Harisankar Road Railway Station	Turekela Railway Station	Rehenbhata Railway Station (Tube well)		
Sodium	-	15.9	36.2	17.5	36.1	10.1	11.4	-	-
Potassium	-	1.5	3.1	1.6	2.7	0.86	0.68	-	-
Total Alkalinity	-	104	196	124	188	82	98	200	600
Total Hardness (as CaCO3)	-	107	424	148	548	102	144	200	600
Calcium Hardness (as CaCO3)	-	93	403	132	510	88	126	200	600
Magnesium Hardness (asCaCO3)	-	14	21	16	38	14	18	30	100

Table 15: Water quality monitoring data of package RT-1 for March, 2016

Parameters	Unit	Sampling locations (RT-2, date of sampling: 18.11.2015)			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Arand Railway Station (Tube well)	Bhimkhoj Railway Station (Tube well)	Bagbahar office Complex (Tube well)		
Temperature	°C	27	28	27	-	-
Appearance	-	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.8	1.4	0.8	1	5
pH	-	6.93	7.12	6.68	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	760	510	400	-	-
Total Solids	mg/l	398.4	202.4	174.6	-	-
Suspended Solids	-	5.4	13.2	7.6	-	-
Total Dissolved Solids	mg/l	393	289.2	167	500	2000
Chloride (as Cl)	-	78	30	34	250	1000

Parameters	Unit	Sampling locations (RT-2, date of sampling: 18.11.2015)			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Arand Railway Station (Tube well)	Bhimkhoj Railway Station (Tube well)	Bagbahar office Complex (Tube well)		
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	6.1	5.2	7.6	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.4	4.0	4.2	-	-
C.O.D	-	3.6	4.4	2.4	-	-
Oil & grease	mg/l	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	0.005	ND	ND		
Sulphate (as SO4)	-	31.6	8.3	7.3	200	400
Fluoride (as F)	-	0.08	0.29	0.19	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.4	0.4	0.4	-	-
Coliform	-	ND	ND	ND	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.4	0.4	0.2	-	-
Sodium	-	29.2	25.4	16.2	-	-
Potassium	-	6.2	4.2	3.3	-	-
Total Alkalinity	-	182	174	88	200	600
Total Hardness (as CaCO3)	-	202	192	140	200	600
Calcium Hardness (as CaCO3)	-	168	154	104	200	600

Parameters	Unit	Sampling locations (RT-2, date of sampling: 18.11.2015)			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Arand Railway Station (Tube well)	Bhimkhoj Railway Station (Tube well)	Bagbahar office Complex (Tube well)		
Magnesium Hardness (asCaCO3)	-	34	38	36	30	100

Table 16: Water quality monitoring data of package RT-2 for November, 2015

Parameters	Unit	Sampling locations (RT-2, date of sampling: 17.03.2016)			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Arand Railway Station (Tube well)	Bhimkhoj Railway Station (Tube well)	Bagbahar office Complex (Tube well)		
Temperature	°C	30.9	31.2	30.1	-	-
Appearance	-	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.8	1.4	0.8	1	5
pH	-	7.31	7.24	6.55	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	510	420	340	-	-
Total Solids	mg/l	279.7	235	177.3	-	-
Suspended Solids	-	3.4	3.2	4.6	-	-
Total Dissolved Solids	mg/l	276.3	231.8	172.7	500	2000
Chloride (as Cl)	-	23.7	21.7	12.2	250	1000
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	2.1	1.2	1.1	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.4	4.0	4.2	-	-
C.O.D	-	3.2	4.4	2.4	-	-

Parameters	Unit	Sampling locations (RT-2, date of sampling: 17.03.2016)			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Arand Railway Station (Tube well)	Bhimkhoj Railway Station (Tube well)	Bagbahar office Complex (Tube well)		
Oil & grease	mg/l	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	0.005	ND	ND		
Sulphate (as SO4)	-	18.6	14.3	5.2	200	400
Fluoride (as F)	-	0.12	0.19	0.13	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.4	0.4	0.4	-	-
Coliform	-	ND	ND	ND	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.21	0.16	0.16	-	-
Sodium	-	19.2	15.4	11.2	-	-
Potassium	-	1.2	1.2	0.7	-	-
Total Alkalinity	-	124	116	88	200	600
Total Hardness (as CaCO3)	-	128	112	92	200	600
Calcium Hardness (as CaCO3)	-	106	98	78	200	600
Magnesium Hardness (asCaCO3)	-	22	14	14	30	100

Table 17: Water Quality monitoring data of package RT-2 for March, 2016

Parameters	Unit	Sampling locations (RT-3, date of sampling: 17.11.2015)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant (Bore well)	Belsunda Railway Station (Bore well)	Arang office complex (Bore well)	Lakholi Railway Station (Tube well)		
Temperature	°C	28	26	27	27	-	-
Appearance	-	Colorless	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.7	0.8	0.6	0.6	1	5

pH	-	7.39	7.72	7.32	7.32	6.5-8.5	6.5-8.5
Conductivity	μmhos/cm	360	400	690	650	-	-
Total Solids	mg/l	196.3	225.9	383.6	358.4	-	-
Total Dissolved Solids	mg/l	192	220	379	352	500	2000
Chloride (as Cl)	-	34.2	36	66	36	250	1000
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	3.8	4.9	3.5	3.2	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.4	4.8	4.0	4.0	-	-
C.O.D	-	1.8	1.6	3.2	1.6	-	-
Oil & grease	mg/l	ND	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	0.006	ND	0.004	0.004		
Sulphate (as SO4)	-	6.8	4.2	21.2	7.8	200	400
Fluoride (as F)	-	0.21	0.04	0.02	0.04	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.4	0.4	0.8	0.4	-	-
Coliform	-	Absent	Absent	ND	ND	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.3	0.2	0.3	0.3	-	-
Sodium	-	5.2	4.6	3.2	37.2	-	-
Potassium	-	1.3	1.7	4.1	5.5	-	-
Total Alkalinity	-	152	162	221	216	200	600
Total Hardness (as CaCO3)	-	186	176	272	204	200	600

Calcium Hardness (as CaCO3)	-	162	138	260	166	200	600
Magnesium Hardness (asCaCO3)	-	24	38	12	38	30	100

Table 18: Water Quality monitoring data of package RT-3 for November, 2015

Parameters	Unit	Sampling locations (RT-3, date of sampling: 16.03.2016)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant (Bore well) Mahanadi River	Belsunda Railway Station (Bore well)	Arang office complex (Bore well)	Lakholi Railway Station (Tube well)		
Temperature	°C	32.1	31.3	31.2	30.4	-	-
Appearance	-	Colorless	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.8	1.2	0.9	1.0	1	5
pH	-	7.58	7.26	7.14	7.19	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	180	410	840	640	-	-
Total Solids	mg/l	106.2	230.8	418.8	352.5	-	-
Suspended Solids	-	4.3	5.3	5.1	5.2	-	-
Total Dissolved Solids	mg/l	101.9	225.5	413.7	347.3	500	2000
Chloride (as Cl)	-	10.2	22.3	41.3	32.3	250	1000
Ammonical Nitrogen (NH3-N)	mg/l	ND	ND	ND	ND		
Nitrite Nitrogen (NO2-N)	-	0.8	1.9	2.9	2.7	-	-
Nitrate Nitrogen (NO3N)	-	ND	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.8	4.4	4.0	4.0	-	-
C.O.D	-	2.8	1.4	2.8	1.6	-	-
Oil & grease	mg/l	ND	ND	ND	ND	0.01	0.03

Parameters	Unit	Sampling locations (RT-3, date of sampling: 16.03.2016)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant (Bore well) Mahanadi River	Belsunda Railway Station (Bore well)	Arang office complex (Bore well)	Lakholi Railway Station (Tube well)		
Phosphate (as PO4)	-	0.014	ND	0.012	0.003		
Sulphate (as SO4)	-	4.8	12.2	24.2	7.5	200	400
Fluoride (as F)	-	0.21	0.09	0.12	0.08	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.4	0.4	0.8	0.4	-	-
Coliform	-	Absent	Absent	ND	ND	Absent	Absent
Kjeldhal Nitrogen	mg/l	0.36	0.08	0.25	0.2	-	-
Sodium	-	5.2	14.6	33.2	16.4	-	-
Potassium	-	0.6	0.9	2.1	1.6	-	-
Total Alkalinity	-	56	112	188	122	200	600
Total Hardness (as CaCO3)	-	72	116	142	128	200	600
Calcium Hardness (as CaCO3)	-	62	102	210	102	200	600
Magnesium Hardness (asCaCO3)	-	10	14	32	26	30	100

Table 19: Water quality monitoring data of package RT-3 for March, 2016

Parameters	Unit	Package PG-1 Sampling locations (Date of sampling: 26.11.2015)		Standards IS 10500-2012	
		Wadi store area (Drinking water)	Daund Office (Drinking water)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
Color	Hazen units	0.1	0.4	5	15

Parameters	Unit	Package PG-1 Sampling locations (Date of sampling: 26.11.2015)		Standards IS 10500-2012	
		Wadi store area (Drinking water)	Daund Office (Drinking water)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
Taste	-	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	NTU	0.05	0.1	1	5
Total Dissolved Solid	mg/l	914	930	500	2000
Electrical conductivity	µS/cm	1580	1437	-	-
Total Alkalinity (as $CaCO_3$)	mg/l	186	260	200	600
pH value at 25 deg C	-	7.10	7.60	6.5 to 8.5	No relaxation
Total Hardness as $CaCO_3$	mg/l	596	570	200	600
Calcium as Ca	mg/l	140	120.0	75	200
Magnesium (as Mg)	mg/l	59.8	65.6	30	100
Copper (as Cu)	mg/l	<0.01	<0.01	0.05	1.5
Iron as (Fe)	mg/l	0.08	0.08	0.3	No relaxation
Manganese (as Mn)	mg/l	<0.01	<0.01	0.1	0.3
Chloride as Cl	mg/l	232	230	250	1000
Sulphate (as SO_4)	mg/l	110	157	200	400
Nitrate (as NO_3)	mg/l	6.8	4.5	45	No relaxation
Fluoride (as F)	mg/l	0.45	0.80	1.0	1.5
Phenolic compounds	mg/l	<0.001	<0.001	0.001	0.002
Mercury (as Hg)	mg/l	<0.0005	<0.0005	0.001	No relaxation
Cadmium (as	mg/l	<0.001	<0.001	0.003	No relaxation

Parameters	Unit	Package PG-1 Sampling locations (Date of sampling: 26.11.2015)		Standards IS 10500-2012	
		Wadi store area (Drinking water)	Daund Office (Drinking water)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
Cd)					
Selenium (as Se)	mg/l	<0.001	<0.001	0.01	No relaxation
Arsenic as (As)	mg/l	<0.01	<0.01	0.01	0.05
Cyanide as (CN)	mg/l	<0.005	<0.005	0.05	No relaxation
Lead (as Pb)	mg/l	<0.001	<0.001	0.01	No relaxation
Zinc (as Zn)	mg/l	0.85	0.15	5	15
Total Chromium (as Cr^{+6})	mg/l	<0.03	<0.03	0.05	No relaxation
Mineral Oil	mg/l	<0.01	<0.01	0.05	No relaxation
Residual Chlorine	mg/l	<0.10	0.20	0.2	1.0
Total Coliform	MPN/100 ml	Absent	Absent	Absent	Absent
E.Coli	Nos./100 ml	Absent	Absent	Absent	Absent

Table 20: Water Quality monitoring data of package PG-1 for November, 2015

Parameters	Unit	Sampling locations (Date of sampling: 23.01.2016)				Standards IS 10500-2012	
		Construction Package PG-2		Construction Package PG-3		Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Saidapur Railway Station	Krishna Type II Quarters Building	Mantralayam TSS building	Raichur Quarters Type II Building		
Color	-	Colorless	Colorless	Colorless	Colorless	5	15
Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable

Parameters	Unit	Sampling locations (Date of sampling: 23.01.2016)				Standards IS 10500-2012	
		Construction Package PG-2		Construction Package PG-3		Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Saidapur Railway Station	Krishna Type II Quarters Building	Mantralayam TSS building	Raichur Quarters Type II Building		
pH	-	7.70	7.8	7.20	8.1	6.5-8.5	6.5-8.5
Turbidity	NTU	0.5	0.8	0.4	0.5	1	5
Alkalinity (as $CaCO_3$)	mg/l	389.8	320	400	273.3	200	600
Total Dissolved Solid	mg/l	1242	748	1412	800	500	2000
Total Hardness as $CaCO_3$	mg/l	426.2	325.2	464.6	368.0	200	600
Calcium as Ca	Mg/l	127.6	72.0	127.6	97.7	75	200
Magnesium (as Mg)	mg/l	26.0	35.2	35.3	30.1	30	100
Sulphate (as SO_4)	mg/l	230.0	72.1	195	90.0	200	400
Chloride as Cl	mg/l	328.1	131.0	473.0	153.7	250	1000
Nitrate (as NO_3)	mg/l	4.0	1.56	2.50	3.0	45	No relaxation
Iron as (Fe)	mg/l	BDL	BDL	BDL	BDL	0.3	No relaxation
Fluoride (as F)	mg/l	0.98	0.77	0.98	1.1	1.0	1.5
Copper (as Cu)	mg/l	BDL	BDL	BDL	BDL	0.05	1.5
Manganese (as Mn)	mg/l	BDL	BDL	BDL	BDL	0.01	No relaxation
Mercury (as Hg)	mg/l	BDL	BDL	BDL	BDL	0.001	No relaxation
Cadmium (as Cd)	mg/l	BDL	BDL	BDL	BDL	0.01	No relaxation
Lead (as Pb)	mg/l	BDL	BDL	BDL	BDL	0.05	No relaxation
Chromium (as Cr^{+6})	mg/l	BDL	BDL	BDL	BDL	0.05	No relaxation
Selenium (as Se)	mg/l	BDL	BDL	BDL	BDL	0.01	No relaxation

Parameters	Unit	Sampling locations (Date of sampling: 23.01.2016)				Standards IS 10500-2012	
		Construction Package PG-2		Construction Package PG-3		Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Saidapur Railway Station	Krishna Type II Quarters Building	Mantralayam TSS building	Raichur Quarters Type II Building		
Zinc (as Zn)	mg/l	BDL	BDL	BDL	BDL	5	15
Coliform	MPN/100 ml	Absent	Absent	Absent	Absent	1/100 ml	-

Table 21: Water Quality monitoring data of package PG-2 and PG-3 for January, 2016

(C) *Noise level monitoring results*

The noise pollution level has been recorded at different locations in variousconstruction packages during reporting period. At all the locations the noise levels were found within the permissible limit for the industrial area.

The average noise levels at different locations in different packages is presented in following table:

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (nighttime) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
I.	**Daund-Gulbarga project (DG)**						
1	**Package DG-1**	Near 384 (Wadsinge)	13.10.2015	61.8	43.4	75	70
		KEM		59.4	48.0	75	70
		Kurduvadi batching plant	29.02.2016/ 01.03.2016	59.2	37.7	75	70
		Hard rock cutting area (308)		65.2	37.8	75	70
II.	**Sambalpur-Titlagarh project (ST)**						
1.	**Package ST-1**	Near PMC office	19.01.2016	63.9	53.0	75	70
		Near batching plant		72.2	59.4	75	70

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (nighttime) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
2.	**Package ST-2**	Near Kattapali	08.01.2016 & 09.01.2016	50.9	40.8	75	70
		Near batching plant		65.2	44.4	75	70
		Near bridge No. 160		47.2	39.3	75	70
		Near stone crusher plant		66.9	51.3	75	70
3.	**Package ST-3**	Near batching plant	11.01.2016 & 12.01.2016	57.4	46.8	75	70
		Near bridge no. 220		55.3	39.3	75	70
		Near bridge no. 235		55.2	44.0	75	70
		Near JT-68		48.2	36.9	75	70
III.	**Raipur-Titlagarh project**						
1.	**Package RT-1**	Contractor's Office complex	19.11.2015 to 21.11.2015	53.9	-	75	70
		Crusher plant at Harishankar Road		72.0	-	75	70
		Harishankar Railway Station		54.0	-	75	70
		Near Turekela Railway Station		52.0	-	75	70
		Near Muribahal Railway Station (Station platform)		52.05	-	75	70
		Near Rehenbhata Railway Station (Station building work)		53.0	-	75	70
		Office complex	18.03.2016 to	52.1	-	75	70

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (nighttime) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
		Crusher plant at Harishankar Road	19.03.2016	53.2	-	75	70
		Harishankar Railway Station		52.8	-	75	70
		Near Turekela Railway Station		50.5	-	75	70
		Near Muribahal Railway Station (Station platform)		52.0	-	75	70
		Near Rehenbhata Railway Station		52.6	-	75	70
2.	**Package RT-2**	Aranda Rly Station	18.11.2015	49.3	-	75	70
		Near Bhimkhoj Railway Station		49.4	-	75	70
		Near Bagbahar Office Complex		50.4	-	75	70
		Aranda Rly Station	17.03.2016	49.3	-	75	70
		Near Bhimkhoj Railway Station		49.4	-	75	70
		Near Bagbahar Office Complex		50.4	-	75	70
3.	**Package RT-3**	Batching plant	17.11.2015	49.3	-	75	70
		Near Belsonda Railway Station		51.6	-	75	70
		Near Arang Railway Station		52.8	-	75	70

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (nighttime) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
		Near Lakholi Railway Station		48.6	-	75	70
		Batching plant	16.03.2016	51.7	-	75	70
		Near Belsunda Railway Station		52.0	-	75	70
		Near Arang Railway Station		51.8	-	75	70
		Near Lakholi Railway Station		52.0	-	75	70
IV.	**Pune Guntakal Electrification project**						
1.	**Package PG-1**	At TSS site	26.11.2015	55.4	42.2	75	70
		Work place area		48	40.8	75	70
		At OHE depot site		48.7	40.9	75	70
		Near office	24.11.2015	48.1	40.5	75	70
1.	**Package PG-2**	Saidapur Railway Station	23.01.2016	55	45	75	70
		Krishna Type II Quarters Building		55	45	75	70
2.	**Package PG-3**	Mantralayam TSS building	23.01.2016	55	45	75	70
		Raichur Quarters Type II Building		55	45	75	70

Table 22: Ambient noise levels at different construction packages recoded during reporting period

6. Public complaints on environmental and safety issues of project

RVNL has established an Environmental Grievance Redressal Mechanism for addressing public complains with respect to environmental and safety issues of the project. Grievance redressal register is required to be maintained at all the PIU office of RVNL and at all the construction packages for registering the public complains/grievances on environmental issues. During the reporting period public complains were received with respect to borrow areas in construction package ST-2 and related to safety fencing in package RT-2, however these complains have not been recorded in the register. The environmental grievance register has been maintained only in HT project packages. In remaining project packages this is required to be maintained.

7. Environmental performance rating

Based on the periodical site inspections by GC and PMC, PMC's report on EMP compliance status, assessment of compliance to the requirement of EMP of the Contract, overall performance rating has been done for the project which is indicated below:

Sl. No.	Activity	Performance Rating
Compliance with Statutory Rules and Regulations		
1	Construction schedule integrating EMP	Satisfactory.
2	Licenses and permits for plants and equipments and quarry	Good.
3	Labour licenses	Good.
4	Site selection / clearance	Satisfactory.
Construction Related Compliance		
5	Traffic safety measures	Needs improvement in DG-1, RT-2 and Hubli-Dharwad section of HT-2. Satisfactory in rest of the construction packages.
6	Housekeeping and hygiene at construction sites	Satisfactory.
7	Labour/construction camps and facilities	General hygienic conditions need improvement in all labour camps. In construction packages DG-1, RT-3 and ST-3 the basic facilities are required to be provided in the camp including cots/beds, drinking water facilities toilets, septic tanks with soak pits, drainage facilities. Satisfactory in other construction packages.

Sl. No.	Activity	Performance Rating
8	Medical facilities and health checkups of workers	Satisfactory in DG-1, PG-1, PG-2, PG-3, RT-1, ST-2, and HT-1. Requirements improvement in HT-2, HT-3, ST-1, ST-3, ST-4, RT-2 and RT-3.
9	Dust Control:	
	(A) At plant site	Need improvement at batching plant in HT-1, HT-3, ST-1 and ST-2. Satisfactory in rest of the packages.
	(B) At construction sites	Satisfactory in all the packages.
10	Stock piling of topsoil	Satisfactory.
11	First aid facilities	Require improvement in packages ST-1, RT-3, HT-2 and HT-3. Satisfactory in other packages.
12	Personal Protective Equipment (PPE)	Good in PG-2, PG-3, satisfactory in construction packages PG-1, ST-2, ST-3 and ST-4, PG-1, RT-1, HT-3 and HT-1. Require improvement in HT-2, DG-1 and RT-3. Improvement required for the workers of subcontractors.
13	Proper storage and handling of chemicals and waste oils	Satisfactory.
14	Sanitation and waste management	Require improvement in all the construction packages.
15	Employment for local villagers / residents	Satisfactory.
16	Safety measures during execution of works	Satisfactory in HT-1, RT-1, PG-1, PG-2, PG-3, ST-2, ST-3 and ST-4. Needs improvement in ST-1, DG-1, RT-3, HT-2 and HT-3.
17	Emergency response system	Satisfactory.
18	Borrow area operation and rehabilitation	Satisfactory.
19	Debris clearance from site	Satisfactory in DG-1, PG, HT-1, HT-3 and RT require improvement in HT-2, ST-1, ST-2, ST-3 and ST-4.
20	Awareness programme on HIV/AIDS and other STD for workers	Good in PG-2, PG-3, ST-1, ST-4 and RT-2. In remaining packages the awareness camps are required to be organized periodically as per the contract conditions. No schedule is maintained.
21	Monitoring of environmental quality	Good in PG-2 and PG-3 where periodicity of monitoring has been ensured as per Environmental Monitoring Plan. Satisfactory in

Sl. No.	Activity	Performance Rating
		construction packages ST-1, ST-2, ST-4, RT-1, RT-2 and RT-3. Require improvement in HT-1, HT-2, HT-3 and ST-4. In HT-1 no monitoring has been conducted during reporting period. In HT-2 it has been reported by PMC that the monitoring was conducted in the month of November, 2015 but test results were not submitted . In HT-3 monitoring has been reported in March, 2016 but test results not yet submitted.
22	Record keeping and reporting by PMC's Environmental Officer	The Environmental Officer of PMC is available in all the packages except in RT-1 and RT-3. The duration and frequency of site inspection by PMC's Environmental officer is good in Construction Packages PG-1, PG-2, PG-3, ST-2 and ST-4. However in remaining packages this requires improvement. The site visit of Environmental Officer of PMC is irregular in construction packages ST-1 and ST-3.
23	Mobilisation status of environmental and safety officer of PMC	The PMCs currently have an Environmental Officer in all the packages except RT1 and RT3. The duration and frequency of site inspection by PMC's Environmental officer is good in Construction Packages PG-1, PG-2, PG-3, ST-2 and ST-4. However in remaining packages this requires improvement. The site visit of Environmental Officer of PMC is irregular in construction package DG-1, ST-1 and ST-3. In construction package RT-1 and RT-3 the Environmental Officer of PMC has not been available from August onwards and his replacement is pending.
24	Appointment of focal environmental officer at corporate level and PIU level	Good

Table 23: Performance Rating on Compliance with the Environmental Management Plan in Different Construction Packages

Some site photographs indicating mitigation measures being implemented and also examples of good practices and bad practices has been provided as Annexure I.

8. Significant non-compliances

During the reporting period no major non compliance has been observed in any of the projects.

However minor observations have been recorded with respect to compliance with statutory requirements. In package ST-1 Consent to Operate (CtO) is required to be obtained from State Pollution Control Board for batching plants at Sonegarh (bridge No. 406), and well as CtO for their newly erected batching plant at bridge No. 438. The application for CtE and CtO has been submitted to the Pollution Control Board but the consent is pending at Pollution control Board. In package RT-2, for batching plant at Bagbahara CtE and CtO have been applied by the contractor and permission is awaited.

The living conditions in the labour camps are poor and this requires urgent improvement especially in package DG-1 in Malikpet camp and package ST-3. General house keeping and hygiene are require improvement in all the labour camps in all the construction packages.

Inadequate monitoring of environmental compliance during construction by PMC is a concern and this requires proper attention. Non availability of Environmental Officer of PMC in Packages RT-1 and RT-3 is a major concern. In construction package DG-1 though Environmental Officer of PMC has been engaged he is unavailable at site most of the time. In construction packages ST-1 and ST-3 also the site visit of Environmental Officer of PMC is irregular and inadequate.

The record keeping and reporting of PMC is poor in construction packages RT-1, RT-2, RT-3, DG-1 and ST-3. The insufficient availability of Environmental Officer is the main reason behind it. In HT-1, HT-2 and HT-3 the reporting was poor but is expected to improved after mobilization of PMC's Environmental Officer in these packages from February, 2016.

9. Any additional environmental issue and impact observed during implementation which were not covered earlier in IEE

No additional environmental issues and impacts observed during the reporting period.

10. Conclusion and recommendations

During the reporting period, the status of compliance with the requirements of environmental safeguards in all the construction packages, as stipulated under EMP and contract specifications are generally satisfactory except for the labour camp management, debris/waste management and workers safety, borrow area management as well as non availability/inadequate monitoring by Environmental Officers of PMCs and record keeping and reporting on environmental safeguards in some packages which require further attention. Gaps in implementation of safety at site is observed especially in subcontractors sections.

The measures for controlling pollution are found to be satisfactory in all the projects except for batching plants in HT-1, HT-3, ST-1 and ST-3 where dust control measures require more efforts. For controlling dust generation regular water sprinkling is being carried out in all the packages at different locations. To avoid water contamination, it is required that there is no direct discharge of waste water and dumping of waste/debris into any water body. However, in ST-1 slurry generated during piling works for bridge construction are found to be disposed in the river bed. The contractor has been instructed to dispose off slurry including debris away from the river bed to avoid contamination of water. Similarly in HT-1 construction materials have been stacked in the natural water way adjacent to the contractor's main camp at Alnawar and disposal of waste water and garbage has also been obseved in the same waterway. The contrcator of both the packages have been instructed to take necessary corrective measures.

The analysis of status of statutory compliances reflects that NOC from Pollution Control Board is pending for one batching plant in package ST-1 and for 2 batching plants in RT-2. For both the plants application has been submitted to the pollution control board and the approval is awaited. It is recommended to follow up with the regulatory authority to get them issued on priority basis to avoid violations.

Periodical monitoring of environmental attributes in terms of air, water and noise quality has been conducted in all the construction packages during the reporting period except for HT-1 and ST-4 packages. It has been suggested to all contractors to maintain the frequency of monitoring as stipulated in EMP. This requires proper attention by PMC to ensure the monitoring as per specified schedule.

Lapses in safety of workers have been recorded in different packages. This is mainly due to lack of proper monitoring by the contractor's supervisory staff and PMC and subletting of works. The situation is worse in construction packages DG-1, ST-1, ST-3, and RT-2. In construction packages PG-1, PG-2, PG-3, ST-2, ST-3 and ST-4 safety awareness training is held on regular basis to motivate the workers towards safety aspects during construction.

Additional attention is required to ensure that the workers of sub contractors are also using appropriate PPEs all the time during work.

Improvements of labour camp facilities such as toilets with septic tank and soak pits, drainage system, collection and disposal facilities of wastes and general housekeeping at camp site are required in construction packages DG-1, ST-2 and RT-3.

The first aid kits are available in all the packages but regular maintenance of adequate items in the first aid kits is missing in ST-1, HT-2, HT-3, DG-1 and RT-1.

In some of construction packages there is need to develop/restore exhausted borrow areas as per agreement with owner or bring the area in conformity to neighboring land use by leveling/landscaping, etc.

The HIV/AIDS awareness camps are organized in all the construction packages, however the periodicity of these programmes are required to be maintained as per contract specifications in some of the packages.

There is provision of an Environmental Officer in each PMC for carrying our regular monitoring of EMP compliance at different sites. However the input requirement of Environmental Officer of PMC is intermittent in nature as per the contract. Presently, one Environmental Officer is being shared in all three packages of HT. Similar arrangements have been made in construction package ST-2, ST-4 and RT-2; RT-1 and RT-3; PG-2 and PG-3; ST-1 and ST-3. The Environmental Officer of PMC of packages RT-1 and RT-3 has not been available since August 2015 owing to his resignation from the job and his replacement is pending. Except for construction packages PG-1, PG-2, PG-3, ST-2 and ST-4 site visit of Environmental Officer of PMC is irregular. In DG-1 the Environmental Officer has not visited the site for more than 5 months. This is not only affecting the monitoring efficiency but also the reporting on EMP compliance. The effectiveness of monitoring can be ensured only by spending adequate time in each package to cover all the areas of activities. In construction package HT-2 the work has been sub contracted to 5 subcontractors so this package requires more attention with respect to monitoring of EMP compliance by the PMC. The duration and frequency of site inspection by PMC's Environmental officer is required to be increased for adequate monitoring of compliances at all the working sites including camps, borrow areas, quarry sites and plant sites etc. Moreover the PMC's record keeping and reporting on environmental issues of the projects require more attention and improvement.

It was felt necessary to provide another training on EMP implementation and monitoring to fill the gaps in EMP implementation. Refresher training workshop was conducted by the General Consultant in all the project packages involving all the key players in implementation of EMP (RVNL, PMC and Contractor's staff).

Annexure I

Photographs indicating EMP Compliance Status in different projects

PHOTO CLIPS ON IMPLEMENTATION OF EMP AND SAFETY	
	
ST-2: Stone Crusher Unit	*ST-2: Batching Plant*
	
Air Sampling in ST-2 at Stone Crushet Unit	*Noise level monitoring in ST-2 at Stone Crusher unit*

RT-1: Fire fighting arrangement and provision of Catch drains at Diesel storage area at Stone Crusher Plant

RT-1: Regular water sprinkling within premise of stone crusher plan ensured to curb dust

ST-1: First Aid Kit at Batching Plant

ST-2: First Aid Kit at Batching Plant

HT-1: Construction works at Tungbhadra bridge: Use of PPE by workers

PG-1: Safety at works

ST-1: Use of PPEs by Workers at Fabrication Unit at Hirapur Camp

ST-1: Workers working on heigth without PPE

ST-1: Safe walkway over girder required at Bridge

DG-1: Workers without PPEs at site

RT-2: Barricadings at site of construction of station building at Mahasamund Railway Station for Public Safety

HT-2: Safety signboard provided at the public road located close to work site

HT-3: Borrow pit developed into agricultural field

HT-1: Borrow area rehabilitated to agriculture field near Halliguri Gate

RT-2: Borrow area rehabilitated to Paddy field

ST-4: Borrow Area at Community Pond; steps and side slopes required to be provided

ST-1: Labour Camp at Sonegarh Bridge

ST-1: LPG provided at Kitchen for cooking

ST-1: Toilet & Bathroom unit with water supply and septic tank with soakpit

ST-1: Engineer's Quarter Provided at Hirapur Camp

ST-2: Labour camp at Suktapalli require sanitation arrangements

ST-2: Toilet units at Suktapali require water arrangements and light

DG-1: Labour Camp at Kumbj near level crossing No. 43

RT-3: Labour Camp near Mahanadi bridge without basic facilities

DG-1: Labour Camp at Malikpet without basis facilities

HT-3: Labour Camp at Alnawar Camp dismantled and site restored

HT-3: Garbage disposal into water way at Alnawar base camp

HT-3: Materialls stacked at Alnawar base camp inside waterway required to be shifted

DG-1: Sleepers stacked over tree saplings at Malikpet railway station required to be shifted

ST-2: Stacking of crushed stone at tree at plant site posing risk of damage of tree

PG-1: Sprinkling insecticides at work site in PG-1

HT-1: Provision of Rainwater Harvesting in Station building at Sompur Road Railway Station Building

ST-4: Safety Training of workers at bridge workst

ST-2: PPE Training to Workers

ST-2: Fire safety training for workers

ST-2: Near track training for workers

PG-3: AIDS/HIV awareness camp for workers

HT-1: Health Checkup and HIV/AIDS Awareness camp

DG-1: Training Programme conducted by GC at Kurdwadi

PG-1: Training Programme conducted by GC at Gulbarga

ST-4: Information signboard for Environmental Grievance Redressal

RT-2: Information signboard for Environmental Grievance Redressal

Annexure II

Details of local and migrant labourers engaged by the contractors during October, 2015 to March, 2016

Month	Local labours (Mandys)			Migrated labours (Mandys)			Total local and migrated labours (Mandays)	%age of local labours
	Male labours	Female labours	Total labours	Male labours	Female labours	Total labours		
1. HT: Hospet – Tinaighat project								
Package HT-1								
October, 2015	4260	0	4260	1290	0	1290	5550	76.8
November, 2015	4350	0	4350	1380	0	1380	5730	75.9
Dec-15	4440	0	4440	1500	0	1500	5940	74.7
January, 2016	5250	600	5850	960	0	960	6810	85.9
February, 2016	2700	300	3000	1050	0	1050	4050	74.1
March, 2016	1050	0	1050	1050	0	1050	2100	50.0
Total	22050	900	22950	7230	0	7230	30180	76.0
Package HT-2								
Oct-15	1860	0	1860	960	0	960	2820	66.0
Nov-15	2220	0	2220	840	0	840	3060	72.5
Dec-15	1980	0	1980	750	0	750	2730	72.5
Jan-16	2130	0	2130	600	0	600	2730	78.0
Feb-16	1800	0	1800	0	0	0	1800	100.0
Mar-16	2250	0	2250	1200	0	1200	3450	65.2
Total	12240	0	12240	4350	0	4350	16590	
Package HT-3								
Oct-15	4205	725	4930	0	0	0	4930	100
Nov-15	4640	638	5278	0	0	0	5278	100
December – 2015	4495	783	5278	0	0	0	5278	100
January – 2016	4292	609	4901	0	0	0	4901	100
Feb-16	4060	667	4727	0	0	0	4727	100
Mar-16	4350	725	5075	0	0	0	5075	100
2. RT: Raipur – Titlagarh Project								

Month	Local labours (Mandys)			Migrated labours (Mandys)			Total local and migrated labours (Mandays)	%age of local labours
	Male labours	Female labours	Total labours	Male labours	Female labours	Total labours		
Pacakge RT-1								
Oct-15	1536	984	2520	1320	1176	2496	5016	50.2
Nov-15	2476	1535	4011	0	0	0	4011	100.0
December – 2015	2262	1449	3711	0	0	0	3711	100.0
January – 2016	1235	1032	2267	0	0	0	2267	100.0
Feb-16	2389	1417	3806	0	0	0	3806	100.0
Mar-16	2360	1556	3916	0	0	0	3916	100.0
Total	12258	7973	20231	1320	1176	2496	22727	89.0
Package RT-2								
October, 2015	1790	415	2205	0	0	0	2205	100
November , 2015	1840	415	2255	0	0	0	2255	100
December, 2015	1771	413	2184	0	0	0	2184	100
January, 2016	1521	560	2081	0	0	0	2081	100
February, 2016	1251	749	2000	0	0	0	2000	100
March, 2016	1040	624	1664	0	0	0	1664	100
Total	9213	3176	12389	0	0	0	12389	100
Package RT-3								
October, 2015	312	219	531	499	481	980	1511	35.1
November , 2015	470	245	715	615	358	973	1688	42.4
December, 2015	388	273	661	390	200	590	1251	52.8
January, 2016	250	193	443	230	207	437	880	50.3
February, 2016	119	247	366	285	179	464	830	44.1
March, 2016	178	211	389	291	163	454	843	46.1
Total	1717	1388	3105	2310	1588	3898	7003	44.3

Month	Local labours (Mandys)			Migrated labours (Mandys)			Total local and migrated labours (Mandays)	%age of local labours
	Male labours	Female labours	Total labours	Male labours	Female labours	Total labours		
3. ST: Sambalpur – Titlagarh project								
Package ST-1								
October, 2015	476	0	476	2236	0	2236	2712	17.6
November, 2015	484	0	484	2832	0	2832	3316	14.6
December, 2015								
January, 2016								
February, 2016	40	0	40	80	0	80	120	33.3
March, 2016								
Total	1000	0	1000	5148	0	5148	6148	16.3
Package ST-2								
October, 2015	3146	0	3146	2808	0	2808	5954	52.8
November, 2015	5825	0	5825	2325	0	2325	8150	71.5
December, 2015	6588	0	6588	3186	0	3186	9774	67.4
January, 2016	5575	0	5575	3000	0	3000	8575	65.0
February, 2016	6600	0	6600	2650	0	2650	9250	71.4
March, 2016	6864	0	6864	2392	0	2392	9256	74.2
Total	34598	0	34598	16361	0	16361	50959	67.9
Package ST-3								
October, 2015								
November, 2015								
December, 2015								
January, 2016								
February, 2016								

Month	Local labours (Mandys)			Migrated labours (Mandys)			Total local and migrated labours (Mandays)	%age of local labours
	Male labours	Female labours	Total labours	Male labours	Female labours	Total labours		
March, 2016	101	0	101	176	0	176	277	36.5
Package ST-4								
October, 2015	3250	0	3250	525	0	525	3775	86.1
November, 2015	2250	0	2250	550	0	550	2800	80.4
December, 2015	1350	0	1350	810	0	810	2160	62.5
January, 2016	1200	0	1200	800	0	800	2000	60.0
February, 2016	1875	0	1875	650	0	650	2525	74.3
March, 2016	1560	0	1560	780	0	780	2340	66.7
Total	11485	0	11485	4115	0	4115	15600	429.87395
4. PG: Pune Guntakal Electrification project								
Package PG-1								
October, 2015	1014	0	1014	2262	0	2262	3276	31.0
November, 2015	690	0	690	1725	0	1725	2415	28.6
December, 2015	962	0	962	1820	0	1820	2782	34.6
January, 2016	1075	0	1075	2325	0	2325	3400	31.6
February, 2016	925	0	925	2450	0	2450	3375	27.4
March, 2016	1125	0	1125	3375	0	3375	4500	25.0
Total	5791	0	5791	13957	0	13957	19748	29.3
Package PG-2								
October, 2015	3375	0	3375	1215	0	1215	4590	73.5
November, 2015	5250	0	5250	875	0	875	6125	85.7
December, 2015	5400	0	5400	1080	0	1080	6480	83.3
January, 2016	6000	0	6000	960	0	960	6960	86.2

	Local labours (Mandys)			Migrated labours (Mandys)			Total local and migrated labours (Mandays)	%age of local labours
Month	**Male labours**	**Female labours**	**Total labours**	**Male labours**	**Female labours**	**Total labours**		
February, 2016	6250	0	6250	1000	0	1000	7250	86.2
March, 2016	4725	0	4725	1175	0	1175	5900	80.1
Total	31000	0	31000	6305	0	6305	37305	83.1
Package PG-3								
October, 2015	2350	0	2350	625	0	625	2975	79.0
November, 2015	3750	0	3750	1125	0	1125	4875	76.9
December, 2015	4050	0	4050	1215	0	1215	5265	76.9
January, 2016	2640	0	2640	960	0	960	3600	73.3
February, 2016	3000	0	3000	625	0	625	3625	82.8
March, 2016	1175	0	1175	625	0	625	1800	65.3
Total	16965	0	16965	5175	0	5175	22140	76.6
Package DG-1								
October, 2015	215	0	215	0	0	0	215	100
November, 2015	151	15	166	25	4	29	195	85.1
Dec-15	191	13	204	29	5	34	238	85.7
January, 2016	250	19	269	85	10	95	364	73.9
February, 2016	231	15	246	62	8	70	316	77.8
March, 2016	234	14	248	60	5	65	313	79.2
Total	1272	76	1348	261	32	293	1641	82.1