

Environmental Monitoring Report

Semiannual Report
June 2017

IND: Railway Sector Investment Program

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

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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 2016 - March 2017

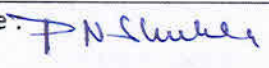



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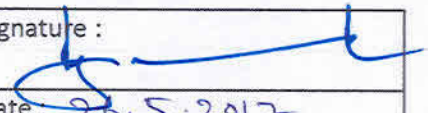
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	Track Doubling and Electrification on Critical Routes
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Abbreviations

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
Gol	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 8th semi-annual environmental monitoring report on implementation of Environmental Management Plan (EMP) in 5 railway up gradation projects taken up under the Railway Sector Investment Program (RSIP) by the Government of India with financial assistance from Asian Development Bank. Rail Vikas Nigam Limited (RVNL) is the Implementing Agency. 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 constructions were in progress in 14 packages in the beginning of the period. In the month of June 2016 contracts of three construction packages of RT-1, RT-3 and HT-2 have been terminated because of continuous nonperformance.

The present semiannual report highlights the compliance status on environmental safeguards as per contract agreement and specifications in packages where works are in progress for the period from October 2016 to March 2017. It covers the status of compliance with environmental loan covenants, compliance with environmental regulations of the Government and policies of ADB, implementation of provisions of EMP stipulated in the contract specifications, 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, and 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. In most of the packages the contractors have obtained all the requisite licenses and permits.

The pollution control measures applied by the contractors at different construction and plant sites were found satisfactory in all the construction packages. Whenever high dust generation is recorded, the contractor is taking necessary corrective measures at site.

The contractors have shown improvement in borrow area operation and management. The team of Contractor and PMC are putting their efforts for resolving the discrepancies in borrow area detailing in construction package ST-3. Special attention has been given towards restoration of all the borrow areas after use. For the terminated projects, the PMC should verify all the restoration works at borrow areas, plant site, campsites , other allied sites and take appropriate action for completion of restoration works in consultation with RVNL.

With continuous effort of PMC and PIU, the contractors have improved the living conditions at labour camps but this aspect require further improvement and also regular monitoring by the PMC for maintaining the same in order.

After October, 2016 the pace of works has significantly increased in all the construction packages. During past six month deterioration in general safety including worker's safety at site has been recorded almost in all the construction packages. Such lapses are primarily due to lack of planning, lack of adequate supervisory staff for monitoring safety and poor monitoring by the PMC on this aspect. A number of subcontractors have been engaged in all the construction packages in order to speed up the progress and they are to be equipped to handles safety issues. However, It is the responsibility of the main contractor to ensure safety at site for their own workforce as well as those of sub-contractor's work force. Provision of safe access and appropriate PPE is required to be ensured in all the construction packages where works are in progress.

Absence of PMC's Environmental Officer in some of the construction packages and inadequate time spent by the PMC's Environmental Officer at sites has affected the effective monitoring of EMP implementation at site and record keeping as well as reporting. Since the construction activities have accelerated, it is important that the PMC's Environmental Officer spend more time at site for inspection to maintain the effectiveness of implementation of environmental safeguards measures.

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

Monitoring of environmental attributes in terms of Air, Water and Noise quality was conducted as per environmental monitoring plan in most of the construction packages. The test results reflect that there is no significant load of pollution on these attributes due to project construction during the reporting period.

Earth, blanket material ,sand, stone aggregates and blasts used in construction of doubling project are procured from designated borrow areas and quarries in all packages. Debris generated during construction of bridges and station buildings are required to be disposed to designated waste disposal sites in most of packages.

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:

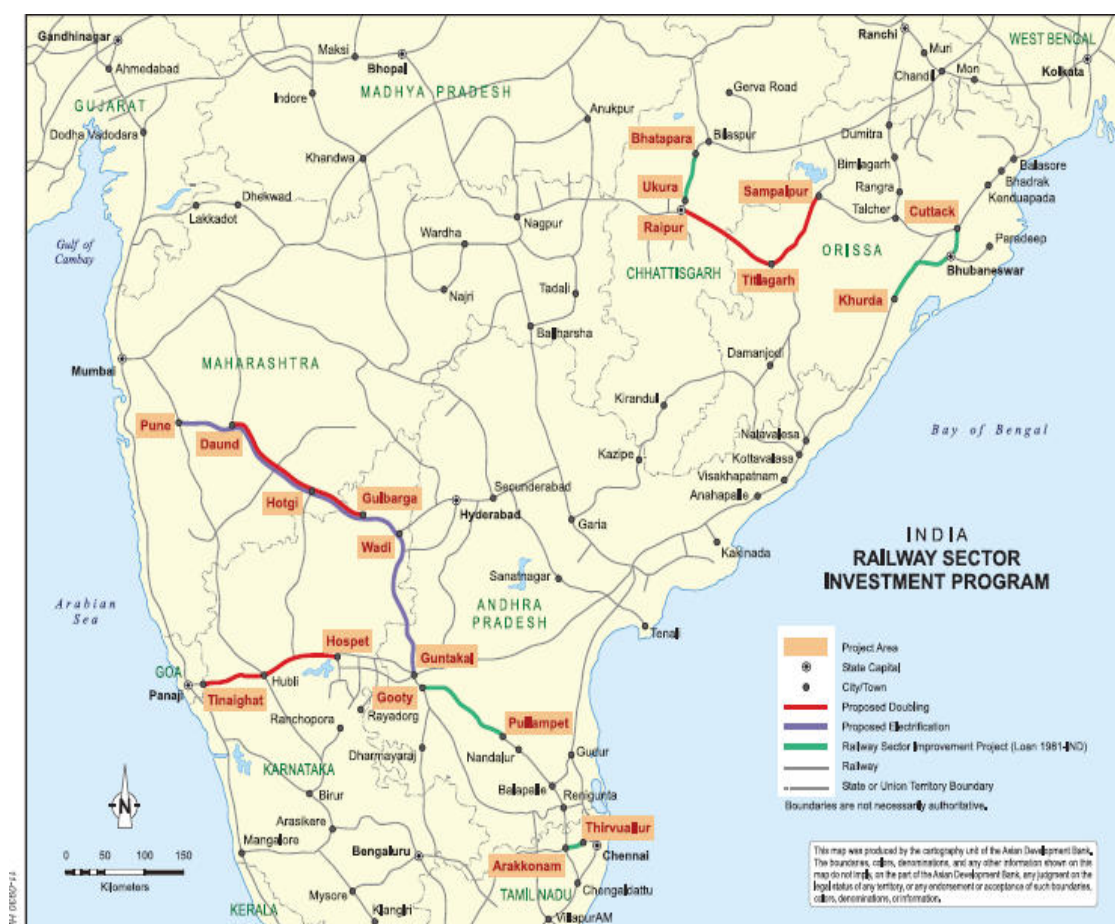


Figure 1: Map of India showing Track Doubling and Electrification Projects

These projects have been further divided into 17 construction packages. 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.

1.2 Active contracts

The works contracts have been awarded for 15 packages out of 17. The contracts for packages PG-4 and PG-5 of Electrification of Pune-Guntakal have been awarded in February 2017. For each construction package, a PMC has been engaged for monitoring of contractor's activities. A list of contractors and PMCs along with dates of commencement of works in each package is presented in Table 2. The new contract for RT-1 in place of terminated contract is expected to be finalized at the end of June 2017. Further, preparation for invitation of new tenders for other two terminated contracts of RT-3 and HT-2 is in process.

Most of PMCs are mobilized and functional.

	Projects/Packages	Contractor	PMC	Date of start of Construction works
A. Daund-Gulabarga project				
(i)	DG-1: Bhigwan - Mohol	IL & FS - Kalindee (JV)	M/s Feedback Infra	15/06/2012
(ii)	DG-2: Hotgi - Gulbarga	SMSIL-MBPL-BRAPL (JV)	Voyants Solutions	16/04/2016
B. Sambalpur-Titlagarh 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 project				
(i)	RT-1: Titlagarh-Lakhana	IVRCL-MRT terminated on 13/06/2016. (JV)	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-Tarmat-Durga (JV) terminated on 21/06/2016	URS Scott Wilson	22/08/2012
D. Hospet-Tinaighat project				
(i)	HT-1: Hospet-Harlapur	Larsen and Toubro	Voyants Solutions	05/08/2012
(ii)	HT-2: Harlapur-Dharwad	Railone-Tarmat-Durga (JV) terminated on 17/06/2016	Voyants Solutions	05/08/2012
(iii)	HT-3: Kambarganavi-Tinaighat	GVR-GEW (JV)	STUP Consultants	01/08/2012

	Projects/Packages	Contractor	PMC	Date of start of Construction works
E. Pune-Guntakal electrification project				
(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	ISOLUX-BRAPL (JV)	Yet to be awarded	15/04/2017
(v)	PG-5: Solapur-Gulbarga	ISOLUX-BRAPL (JV)	Yet to be awarded	15/04/2017

Table 2: List of contractors and PMCs along with dates of commencement

Egis India, Egis Rail and TUC RAIL (JV) has been appointed by RVNL as General Consultant to oversee the overall progress and compliance of the project and their contract is expiring on 20/05/17.

1.3 Site activities during the reporting period

Following table depicts the status of progress of major activities during the reporting:

Packages	Major works in progress
A. Daund-Gulbarga project	
DG-1	<ul style="list-style-type: none"> ○ CRS inspection for the subsections of milestone-1 from Mohol to Vakav done on 09/01/2017 and Commissioning done on 04/02/2017. ○ Earth work for the subsections from Kurduvadi to Bhalwani is in progress. ○ Earthwork in cutting and hard rock cutting in progress from Washimbe to Bhigwan subsections. ○ All bridges completed in the subsections from Vakav to Madha, Madha to Wadsing and Wadsing to Kuduwadi subsections except for bridge protection works for the bridges in Wadsing to Kuduwadi subsection. ○ Also the work of minor bridges in the subsection from Dhavalas to Kem are in progress. ○ Major bridge, Br No 358/2 in Dhavalas to Kem subsection: RCC Boxes for new line completed and jacketing of the existing bridge structure is in progress. ○ Ballast supply in progress for the subsections from Vakav to Jeur.

Packages	Major works in progress
	<ul style="list-style-type: none"> ○ Track linking works in progress for the subsections from Vakav to Kurduvadi. ○ All the works between Vakov and Wadshinge are nearing completion except S&T works in progress.
DG-2	<ul style="list-style-type: none"> ○ All work from Tilati to Akalkot Road subsection (11 Km) commissioned on 29/03/2017. ○ Formation completed for the subsection from Akalkot to Nagansur and track-linking including welding of rails completed for 4.2Km ○ Kulali-Gaudaon subsection: Earthwork top layers is in progress. ○ Kulali-Dudhani subsection: Blanketing in progress. ○ Nagansur to Boroti subsection: Track-linking completed for about 1.5 Km ○ Construction of minor bridges for the subsection from Nagansur to Kulali in progress. ○ Collection of ballast for the subsections from Akalkot to Gulbarga in progress. ○ Major bridge work at 511/2 and 532/2 started. ○ Station building work at Gulbarga, Nagansur and Boroti in progress and nearing completion ○ Major bridge no. 553/1 (Savalgi to Hunsihadgil subsection) - Raft slab completed for 3 spans and construction of web-walls is in progress ○ Bridge no. 532/1 (Kulali-Gaudaon subsection) : Testing of pile completed and 15 piles completed out of 30 piles to be done ○ Nagansur to Boroti subsection: Track-linking completed for about 1.5 Km ○ Boroti Station yard: Service building - slab completed and Platform construction is in progress. ○ Nagansur Station yard: Service building - slab and plastering of walls completed, works of platform, hard-rock cutting at approaches of Nagansur station and retaining-wall is in progress. ○ Pug-mill machine of 200 tonnes per hour capacity for blending of blanketing materials is being erected near Savalgi station, operation of pug-mill expected by April 2017.
B. Hospet-Tinaighat project	
HT-1	<ul style="list-style-type: none"> ○ Commissioning of the subsection from Bannikoppa to Bhanapur completed on 25/12/2016. ○ Engine rolling done on 22/03/2017 from in the subsection from Hospet station (Km 143/220) to major bridge no 104 (Km 138+917). ○ Koppal station yard: Outdoor S&T works and S&T building completed. ○ Major Bridge 104: Hand-railing, trolley refuge works and wearing coat is in progress. ○ Munirabad station building completed except for few finishing works in progress. ○ Pre-NI works completed for Koppal station yard. ○ Outdoor S & T works completed for Bhanapur station yard.

Packages	Major works in progress
	<ul style="list-style-type: none"> ○ Supply of ballast and track works in the subsections from Bhanapur to Hospet.
HT-2	<p>The contract has been terminated in June 2016 due to poor performance of the contractor.</p> <p>Some small contracts without ADB financing have been awarded for execution of the balance works in the subsections from Annigeri to Hebsur (16 Km) and the works have commenced. Completion expected by December 2017.</p> <p>The subsections from Hubli to Dharwar (20 Km) and that from Harlapur to Annigeri (23 Km) would be executed through 2 new contracts under ADB financing (1 for civil works and 1 for outdoor signaling) for which tenders were floated in February 2017, finalization and commencement of works expected by October 2017.</p>
HT-3	<ul style="list-style-type: none"> ○ Pre-NI works completed for the subsections from Shivathan to Londa and from Londa Tinaighat station, CRS inspection also done on 27/03/2017 and commissioning expected by end of May 2017. ○ Earthwork in cutting, filling, blanketing and bridge protection works in progress for the subsections from Tavargatti to Nagargalli and completed for the subsections from Londa to Tinaighat. ○ Track linking works in progress for the subsection from Tavargatti to Nagargalli. ○ Dressing of embankment slopes in progress for the subsections from Londa to Tinaighat. ○ Load testing completed for major bridge no. 91.
C. Raipur-Titlagarh project	
RT-1	<p>The works contract was terminated in June 2016 due to non-performance of the contractor. The JV partner of the contractor executing outdoor S&T works is retained.</p> <p>The balance works between Titlagarh and Kantabanji (33 Km) are executed through several small contracts without ADB financing while the outdoor S&T works continues to be financed by ADB. Works completed in this subsections and CRS inspection was also completed on 16/03/2017, expected to be commissioned by mid of May 2017.</p> <p>The tender for new contract for execution of all balance works from Kantabanji to Lakhna (40 Km) is floated and is expected to be finalized by end of May 2017, the duration of this new contract is 18 months.</p>
RT-2	<ul style="list-style-type: none"> ○ Earthwork in filling and blanketing are in progress in the subsection from Nawapara to Lakhna and at Komakhan station yard. ○ Work of minor bridges in subsections from Komakhan to Khariar Road and from Nawapara to Lakhana. Also, minor bridge works completed for the subsections from Bhimkhoj to Bagbahera and Bagbhara to Komakhan.

Packages	Major works in progress
	<ul style="list-style-type: none"> Major bridge no. 116: Piling for foundation of piers completed. Piling for foundation of abutments and construction of pier-shaft is in progress. Major bridge no. 161: Piling for foundation of piers - 79 piles out of 90 piles completed. Piling for foundation of abutments also completed and pier-shaft is in progress. Major bridge no. 124: Casting of all bed-block completed for all piers and abutments. Ballast supply in the subsections from Arand to Bhimkhoj and that from Bhimkhoj to Bagbahara. Track linking works in progress in the subsections from Bhimkhoj to Bagbahara and Bagbahara to Komakhan. Construction of service buildings is in progress at all station yards. Construction of FOB at Arand station: foundations completed, erection of fabricated steel structure nearing completion.
RT-3	<p>The contract was terminated in June 2016 due to nonperformance of the contractor.</p> <p>A few balance works that are critical for commissioning of priority subsections are being planned for execution through small contracts for works of passenger amenities, service buildings, minor bridges and fabrication of steel girders for important bridge no.77 (Mahanadi River). Few of those small contracts were awarded during September 2016 - October 2016 and works commenced. These small contracts would be executed without ADB financing.</p> <p>The new contract for the balance works, with ADB financing, is floated (technical bid opened on 28/03/2017), finalization of contractor and commencement of works is likely by October 2017 with completion duration of 30 months.</p>
D. Sambalpur-Titlagarh project	
ST-1	<ul style="list-style-type: none"> Steel girder fabrication work: Only 113 MT structural steel procured during this quarter against balance requirement of 1176 MT and about 557 MT has been taken up for fabrication. Fabrication of 15 nos of 30.5m span girders have been completed during this period Bridge no. 76: piling for foundation of abutment, A2 is in progress and pier-cap completed for pier-23 and pier-24. Bridge no 293: Pier-cap completed for pier-13 (with this all substructure works completed). Erection of girders for span-13 and span-14 completed during this period (in total, girders for 14 spans erected out of total scope of 15 spans). Bridge no. 331: substructure for pier-1 completed during this quarter (with this all substructure works completed except for pier-cap for pier-1). Bridge no. 406: All girder erection completed (span-1, span-2, span-3 and span-5 completed during this period).

Packages	Major works in progress
	<ul style="list-style-type: none"> ○ Road over Bridges: bridge no. 423A-abutment A2 and return-wall for abutment A1 completed during this period. ○ Bridge no. 438: 58 pile-foundations done during this period (total 133 pile-foundations completed till date out of 180 to be done) and pier-shaft including pier-cap completed for pier, P9, P11, P12, P13 and abutment, A2. ○ Road over Bridges: bridge no. 439A: Fabrication of 24m span girder has been started.
ST-2	<ul style="list-style-type: none"> ○ The subsection from Hirakud to Godbagha (10 Km) has been inspected by CRS on 17/03/2017. ○ Earthwork, blanketing, slope-dressing of formation and minor bridge works in progress in Godbhaga to Attabira and Attabira to Suktapalli subsections. ○ Piling foundation works in progress for both abutments at major bridge 198 in Bargah to Barpali subsection ○ Track linking works, outdoor S&T works, construction of service buildings, fabrication of steel for FOB and other passenger amenity works in progress in the subsections from Godbhaga to Suktapalli. ○ Foot-over-Bridge completed at Godbhaga.
ST-3	<ul style="list-style-type: none"> ○ Balance works of earthwork in cutting, filling, blanketing and ballast supply is in progress in all subsections from Dungripali to Balangir. ○ Turfing of formation slopes is in progress in the subsections from Khaliapali to Losingha. ○ Major bridge no. 235: casting of deck-slab completed for span-2 and span-3, second stage stressing and grouting of PSC girders completed for all spans except for span-3. ○ Side-drain construction, Flash-butt welding of rails and other track linking works is in progress in subsections from Khaliapali to Losingha. ○ Two days training for horizontal drilling with trenchless method for power line crossing under the track has been given to contractor staff. ○ Back-filling for all bridges in the subsection from Barapali to Dungriplai completed and track-linking works in progress in this subsection. ○ Works for construction of service building (Relay room) at Khaliapali station started and foundation is in progress. Also roof-slab for S&T rooms on either end of Dungripali station completed.
ST-4	<ul style="list-style-type: none"> ○ Balance earthwork in cutting, filling, hard rock cutting, blanketing and minor bridge works is in progress for the subsection from Balangir to Deogan Road. ○ Earthwork in filling is in progress for the subsection from Sikir to Titlagarh. ○ Major bridge no. 363: abutments at both ends completed upto bed-level and is in progress above bed-level. Bed-block for pier-1 to pier-4 completed. ○ Major bridge no. 387: Completed. Casting of bed-block for both the abutments, fixation of bearings and casting of deck-slab completed during this period.

Packages	Major works in progress
E. Pune-Guntakal electrification project	
PG-1	<ul style="list-style-type: none"> Joint checking with railway traction department officials completed, approval of EIG obtained, CRS inspection completed on 19/03/2017 for the works in the subsections from Daund to Bhigwan (26 km), including trial runs during which speeds upto 115 kmph was touched and is commissioned now. 37 nos of insulated overlaps, 18 nos of uninsulated overlaps, 19 nos of isolators, 121 nos of ATD (Anti-Tensioning Device) and 18 nos of turnouts completed between Daund and Bhigwan. SSP at Boribal and Maltan stations completed. Construction of building for OHE depot and Power supply Installations (PSI) completed at Gulbarga. Construction of building for OHE depot completed and TSS at Martur Power supply Installations (PSI) in progress in the subsections from Wadi to Guilbarga.
PG-2	<ul style="list-style-type: none"> All works completed in Wadi - Chiksugur section including electrification of siding to Raichur Thermal Power Station. EIG approval obtained and CRS inspection expected during next quarter period. Charging of TSS at Krishna done on 09/11/2016 - OHE is now fed by electricity through Krishna TSS since 10/11/2016 and thus feed extension from Wadi end is shut now.
PG-3	<ul style="list-style-type: none"> Subsections from Guntakal to Adoni: 78 nos of bracket erection, 15 nos of boom erection, 21 nos of guy-rod erection, 10 nos of anti-creep installations, 10 nos of ATD (Anti-tensioning devices) erection completed and balance dropper and clipping, earthing/bonding for track and OHE installations of the subsection from Guntakal to Adoni are in progress. TSS at Mantralayam Road: Control room construction completed. Transformers erected on plinth and foundation works for equipment completed. Erection of equipment and works of incoming power line by local state electricity department is in progress. Raichur Yard: Tower Car Shed – Roofing completed, flooring and track works are in progress. Subsections from Adoni to Raichur: 362 nos of bracket erection completed and upright erection of masts including boom erection, guy-rod erection, erection of anti-creep arrangements, counter weight erection, wiring of catenary and contact wires are in progress during this quarter. All track bonding works completed in Raichur Yard. Bracket fabrication completed for Adoni yard. Tower wagon checking for 34 spans at Km 562 All subsections from Adoni to Raichur made ready for EIG inspection.

Table 3: Major works in progress

This period has seen completion/commissioning of few sections and subsections: Mohol to Vakav of DG-1, Tilati to Akalkot Road of DG-2, Daund to Bhigwan of PG-1,

CRS inspection completed, testing and commissioning of few sections and subsections: Hirakud to Godbhaga of ST-2, Titlagarh to Kantabanji of RT-1, Shivathan to Tinaighat of HT-3.

New tenders in place of the terminated non-performing contracts of RT-1, RT-3 and HT-2 are in process. Few works in all terminated packages RVNL were already started awarding small contracts through single or limited tenders.

Most of PMCs looking after the works are mobilized and functional. New PMC for DG-1 is mobilised and is fully functional now. The contracts of existing PMCs of RT-1 and RT-3 has been extended upto 31/07/2017 and tenders are being floated for new PMCs in place of these existing PMCs.

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. In category-B projects, the proposed project’s potential adverse environmental impacts are site specific. The different project activities have potentials of small to medium scale localized impacts on different environmental components that can be mitigated with implementation of suitable mitigation measures. Being Category-B projects, all projects require only Initial Environmental Examination (IEE) for meeting the environmental requirements under ADB’s policy. Separate IEE report has been prepared for each Project covered under RSIP and Environmental mitigation and monitoring plan have been formulated based on the findings of the environmental study with respect to the anticipated potential environmental impacts. 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

This semi-annual report 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 April 2016 to September 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 covering compliance with statutory requirements of each project, conditions of EMP stipulated in contract conditions and assessment of performance and effectiveness of implementation as well as monitoring of environmental attributes at different representative sites. 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 in sections 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 monitoring of compliance of EMP and its performance is carried out through following tasks:

- (i) Site inspections by Environmental Officers of PMC, Environmental Expert of GC and Nodal Officers of PIU
- (ii) Review of Contractor’s and PMC’s documents related to implementation of Environmental safeguards
- (iii) The status reports submitted by the PMC’s on environmental compliance
- (iv) Monitoring of selected environmental parameters identified as indicators

4.1 Institutional Arrangement for EMP Implementation

Following key players are involved in ensuring environmental compliance in the project at different levels:

- The contractor
- Project Management Consultant (PMC)
- Project Implementation Unit (PIU) of RVNL
- General Consultant
- RVNL Head quarter

The monitoring of environmental safeguards at site during construction is being undertaken at different levels. The contractors are responsible for implementation of environmental safeguard measures at site during construction on day to day basis following the contract specifications on Environmental mitigation measures.

Each contractor has appointed its EHS expert to ensure implementation of environmental safeguards measures as stipulated in the EMP and contract documents.

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 there is provision of Environmental Officers 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 technical guidance to the contractor for implementation of the EMP and preparation of checklists/formats/reports etc.
- Provide feedback and recommendations to Project Manager
- Reporting and recording keeping on environmental safeguards issues

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

- Overall progress monitoring on EMP implementation,
- Review the compliance with statutory requirements,
- Preparation of quarterly and semi-annual reports,
- Providing trainings for capacity enhancement of RVNL, PMC and contractors staff on environmental issues.

The General Consultant has appointed Dr. Surjit Singh Deepak as their Environmental Expert.

The Environmental Expert of General Consultant conducts periodical site inspection and reviews environmental progress based on actual site visit and information supplied by the PMC. Time to time training workshops on Environmental implementation have been conducted for PMC and the contractors as capacity building measures on effective implementation and monitoring of EMP in the project during construction.

Records of all persons of RVNL, PMC and contractors who attended training workshop on environment conducted by General Consultant have been maintained.

Reporting formats have been developed which are to be filled up by the contractor and PMC 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 and addressing the public grievances on environmental issues.

4.2 Deployment of Environment Officers of PMCs

The Environmental Officers of PMC undertake inspections and monitoring of environmental activities on regular basis. For monitoring and reporting related to environmental activities various checklists and formats are being used.

For the PMC contracts signed before 2016, the input of the Environmental Officer of PMC is intermittent. It will be full time for the new contracts. The list of PMC's Environmental Officers in different construction packages and their status of mobilization at the end of March 2017 is provided in the following table:

Project	Package	Name of PMC	Name of Environmental Officer of PMC	Remarks
Pune–Guntakal (PG)	PG-1	Voyants Solutions	Mr. Srikant Ahire	Spending on average 5 to 7 days at this site. In addition to PG-1 he is engaged for HT-1, HT-2 and HT-3.
	PG-2	Voyants Solutions	-	Mr B. Asif Basha, Environmental Officer looking after PG-2 and PG-3 packages, left the project in the month of August 2016. Since then no Environmental Officer of PMC is available at site.
	PG-3	Voyants Solutions	-	
Daund-Gulbarga (DG)	DG-1	Feedback infra	P Sivaraman	New PMC appointed in January 2017 has deployed full time Environmental Officer since March 2017. Environmental Officer from previous PMC has been rarely visiting the site during the contract period.
	DG-2	Voyants Solutions	Mr. P. Suresh Babu	New PMC mobilized at site in the month of August 2016. The input

Project	Package	Name of PMC	Name of Environmental Officer of PMC	Remarks
				of Environmental Officer of PMC is on continuous basis in the new contract.
Hospet-Tinaighat (HT)	HT-1	Voyants Solutions	Mr. Srikant Ahire	
	HT-2	Voyants Solutions	Mr. Srikant Ahire	
	HT-3	STUP Consultants	Mr. Srikant Ahire	
Raipur-Titlagarh (RT)	RT-1	URS Scott Wilson	-	No Environmental Officer available after August 2015. Penalty has been imposed on PMC.
	RT-2	STUP Consultants	Mr. Gagan Parida	Also covering the package of ST-2.
	RT-3	URS Scott Wilson	Mr. Maheshwar Parida	RVNL has directly engaged an Environmental Officer because PMC failed to mobilize their Environmental Officer. Mr Parida has been appointed on 27/08/2016. His contract period has been expired in March 2017.
Sambalpur- Titlagarh (ST)	ST-1	CDM Smith	Dr. Santosh Kumar Sahu	
	ST-2	STUP Consultants	Mr. Gagan Parida	-
	ST-3	CDM Smith	Dr. Santosh Kumar Sahu	
	ST-4	BARSYL	-	Mobilisation of new Environmental Officer is pending after resignation of previous one in August 2016.

Table 4: List of Environmental Officers of PMC deputed at various subprojects

The PMC's Environmental Officer was not available in project packages RT-1, PG-2, PG-3, and ST-4 during part the reporting period. This is affecting compliance monitoring, record keeping and reporting on environmental safeguards.

RVNL has directly engaged an Environmental Officer, Mr. Maheshwar Parida in package RT-3 for assisting the PMC's team of RT-3. RVNL earlier planned to engage the same person for package RT-1 but could not appoint him till March, 2017.

In package DG-1, the new PMC has mobilised their Environmental Officer at site in December, 2016. The input of Environmental Officer of PMC in package DG-1 and DG-2 is full time. So the efficiency of compliance monitoring and reporting is likely to be enhanced in these packages.

In construction package PG-2 and PG-3 the Environmental Officer of PMC, Mr B. Asif Basha left the project in August 2016. A new Environmental Officer is required in these packages for ensuring effective monitoring of environmental compliance.

The PMC of ST-1 and ST-3, have engaged a new Environmental Officer in September, 2016 but the input of the Environmental Office is limited to only 2 days in a month which is not adequate for monitoring of environmental safeguards and reporting.

After termination of construction packages RT-1, RT-3 and HT-2, Environmental Officer of PMC at those packages has to take on additional tasks like verification of restoration work on demobilization of plants and camps, collection and compilation of records on environmental safeguards and investigation including reporting of any safeguards issues raised due to termination.

5. Environmental performance monitoring

As discussed in the previous section, different environmental performance indicators have been identified for assessing the effectiveness of environmental compliances. These indicators are assessed 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 and 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 comparison 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 Schedule 4 of the Framework Finance Agreement (FFA) stipulates the environmental considerations whereas the schedules 4 and 5 of Loan Agreement (Ordinary Operations) stipulates the requirements of environmental safeguards in RSIP under RVNL. The status of project compliance on environment safeguards as per stipulated agreement with the Government of India and ADB is presented in the following Table 5.

S.N.	Loan Covenants	Status of Compliance
A.	FRAMEWORK FINANCING AGREEMENT	

S.N.	Loan Covenants	Status of Compliance
1	<p>Schedule 4 A. 1(iv):</p> <p>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.</p> <p>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.</p>	<p>Complied.</p> <p>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 has been incorporated in bidding documents of all the projects.</p> <p>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.</p>
2	<p>Schedule 4 A. 1(iv):</p> <p>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.</p>	<p>Complied</p> <p>The necessary approvals and licenses in each project including their renewals have been ensured. The status of clearances/approvals/ licenses upto September 2016 is presented in Table 3.</p>
B.	LOAN AGREEMENT (ORDINARY OPERATIONS)	

S.N.	Loan Covenants	Status of Compliance
3	<p>Schedule 4 B: Approval Procedure</p> <p>2. All projects will be prepared and processed in accordance with the procedures set out below.</p> <p>(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.</p>	<p>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.</p>
	<p>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</p> <p>(a) Obtained the final approval of the IEE from the relevant Environment Authority of the Borrower</p> <p>(b) Incorporated the relevant provisions from the EMP into the Works contract.</p>	<p>Complied</p> <p>The approved EMP has been incorporated into work contract of all the construction packages under RSIP.</p>
4	<p><u>Schedule 5: Execution of Project; Financial Matters:</u></p> <p>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</p>	<p>Complied</p> <p>No Hot Mix Plant has been installed in any of the contract packages.</p>
5	<p><u>Schedule 5: Execution of Project; Financial Matters:</u></p> <p>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</p> <p>(a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, the RP and the IPP (to the extent they concern</p>	<p>Complied</p> <p>Being complied.</p> <p>The compliance with the mitigation measures stipulated in the EMP is</p>

S.N.	Loan Covenants	Status of Compliance
	<p>impacts on affected people during construction), and any corrective or preventive actions set out in a Safeguard Monitoring Report.</p> <p>(b) Make available a budget for all such environmental and social measures; and</p> <p>(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.</p>	<p>constantly monitored in each construction package and necessary corrective actions are being taken at site.</p> <p>Environmental monitoring and mitigation costs allocated/incorporated in contract agreement</p> <p>No such risks or impacts observed during the reporting period from April 2016 to September 2016</p>
6	<p><u>Schedule 5: Execution of Project; Financial Matters:</u></p> <p><u>Safeguards Monitoring and Reporting (Para 13) :</u></p> <p>The Borrower shall do the following and shall cause MOR and RVNL to the following:</p> <p>(a) Submit Semi-annual Safeguards Monitoring Reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission.</p> <p>(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.</p> <p>(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.</p>	<p>The semi-annual report has been prepared as per the guidelines and submitted.</p> <p>No such unanticipated environmental risks or impacts occurred during the reporting period</p> <p>No breach of compliance recorded in any of the projects till date.</p>

Table 5: Compliance status with Loan Covenants

5.1.2 Compliance with state and national statutes and regulations

In the project packages where works are in progress there is the requirement of statutory permits and licenses under different acts and rules pertaining to environmental safeguards in India. None of the projects under RSIP comes under the purview of EAI Notification, 2006 hence no environmental clearance is required for these projects. During the reporting quarter the contractors have shown improvement in all the construction packages with respect to observance with regulatory requirements compared to last reporting period.

The permits and licenses required under the projects are mainly labour license, quarry license, NOC from State Pollution Control Board for stone crusher plant, batch mix plant, wet mix plant, permission for tree felling, etc. The following Table depicts the package wise compliance status of various required statutory permissions under different rules and regulations pertaining to environment for the reporting period.

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	Contract terminated in June 2016							
	HT-3	Kambarganavi-Tinaighat	NA	Obtained	Obtained and renewed	Obtained	Obtained	Applied for renewal to Pollution Control Board, renewal awaited. Plant is not operational	Obtained
Sambalpur-Titlagarh	ST-1	Major bridges	NA	Obtained	Obtained and renewed	NA	NA	NA	Obtained for Concrete mix plants established at Hirapur camp site and Mahanadi bridge site. CFO for new batch mix plant at Santala is pending with Pollution Control Board. Plant at Ong River Bridge and Sonagarh dismantled.

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
	ST-2	Sambalpur-Barapali	Forest Clearance for temporary diversion of 0.044 ha area is in process	Obtained	Obtained and renewed	NA (The contractor is procuring materials from third party licensed quarry)	NA	The renewal of the NOC is pending (Presently the plant is temporarily handed over to contractor's own Highway Division and the crushed ballast from this plant is not in use for this package)	Obtained
	ST-3	Barapali-Bolangir	NA	Obtained	Obtained	NA	NA	NA	Obtained
	ST-4	Bolangir-Titlagarh	Forest Clearance for temporary diversion of 5.768 ha area is in process	Obtained	Obtained and renewed	NA	NA	NA	CFO expired, renewal in process
	RT-1	Contract terminated in June 2016							

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
Raipur-Titlagarh	RT-2	Lakhana-Arand	NA	Obtained	Obtained	NA (Boulders are being procured from third party having valid license)	NA	NA	Obtained
	RT-3	Contract terminated in June 2016							
Daund-Gulbarga	DG-1	Bhigwan-Mohol	NA	Obtained	Obtained and renewed	Obtained	Not obtained. Presently procuring ballast from third party licensed quarry	Stone crusher plant shifted to another location at Kem village. Fresh NOC required. Applied for, NOC is awaited.	NA
	DG-2	Hotgi-Gulbarga	NA	NA	Obtained	NA	NA	NA	Obtained
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
	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

EMP is an integral part of all the contract documents and the EMP provisions have been included under particular conditions of the contract of all the construction packages. 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 based on actual observations made at site and feedback received from the respective PMC.

During the reporting period, 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 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 sites

Generation of dust is the major source of air pollution associated with civil construction activities. Gaseous emission is another source of air pollution which occurs due to operation of heavy machineries and construction vehicles. In general pollution control measures adopted at site is satisfactory. Water sprinkling is applied for controlling dust generation. The dust control measures in all the package found to be satisfactory except for construction packages ST-3 and ST-4. The contractor has to carry out regular water sprinkling on the earthen beds to control dust emission due to movement of vehicles and equipments on the bed. Special attention is required along the settlement area and forest region.

The other measures for controlling dust such as transportation of materials in covered dumpers to avoid dust generation and spillage of materials along the roads has been found to be satisfactory. The vehicles and equipments are maintained on regular basis to maintain emissions within permissible levels. The Pollution Under Control (PUC) certificates for all the vehicles used in the project are being monitored at regular intervals.

It has been ensured in all the packages that the equipment service stations, storage sites of chemicals and other materials as well as labour camps are established away from water body / natural waterways to avoid chances of water contamination.

5.2.2 Compliance with pollution control measures at plant sites

Mainly two kinds of plants have been established by the contractors in track doubling projects. These plants are stone crusher units and batching plant/concrete mix plant. Earlier the stone crusher units and were established in construction packages HT-3, DG-1, ST-2 and RT-1. During the reporting quarter none of the stone crusher plants is operational due to various reasons. In construction package HT-3 the Contractor has suspended the production of crushed ballast since 2014 due to availability of extension of NOC from the Pollution Control Board and started procuring the ballast from the third party to meet the requirement for the project. In construction package ST-2 the contractor has transferred their stone crusher plant after producing ballast of required quantity to their own Highway Division for their use. In construction package DG-1 NOC from Pollution Control Board is required for their stone crusher unit shifted to new place in Kem village. The stone crusher unit of construction package RT-1 is abandoned by the Contractor due to termination of the contract. The PMC has been advised to collect the requisite license and permits of that Agency to ensure that materials are procured only from licensed agency. All the contractor are procuring ballast and aggregates from third party agencies.

Batching/ ready mix plants have been established in packages HT-1, HT-3, DG-1, DG-2, RT-2, ST-1, ST-2 and ST-4. The batching plant of HT-1 at Tungbhadra Bridge and of ST-1 at Sonegarh Bridge and Ong river locations have been dismantled due to completion of major concreting works in this section. The dust control at all the operational batching plants were satisfactory during the reporting period except for the batching plant at Saintala bridge in ST-1 where the dust control measures require improvement. All the contractors have been advised to always observe suitable dust control measures as per Pollution Control Board's norms at all their plants all the time.

For power supply at plant site and camp sites Contractors have established advance unit of low emission noiseless gensets. The gaseous emission and noise level have been observed to be in control.

There is no significant noise generating activity in the project affecting major change in noise level in the surrounding area.

At the plant sites of all the construction packages where work is in progress, it has been ensured that drums of diesel and other petroleum products are stored on impervious platforms with catch-drain in order to avoid land contamination. Further, all flammable liquids are kept in secure store protected from electric sparks and open flames. The good quantity of spent oil (used mobil oil etc) are stored separately in drums for use as shuttering oil. All unused spent oil is generally sold out to vendor and not stored for long time at sites.

All the contractors have been advised to always observe suitable dust control measures as per Pollution Control Board's norms at all their plants all the time.

5.2.3 Compliance with EMP Implementation at quarry site and borrow areas

Presently none of the contractors is operating their own stone quarry. All the contractors are procuring stone materials from third party licensed stone quarry. The borrow areas for soil for embankment and granular materials for blanketing are required in doubling of track projects.

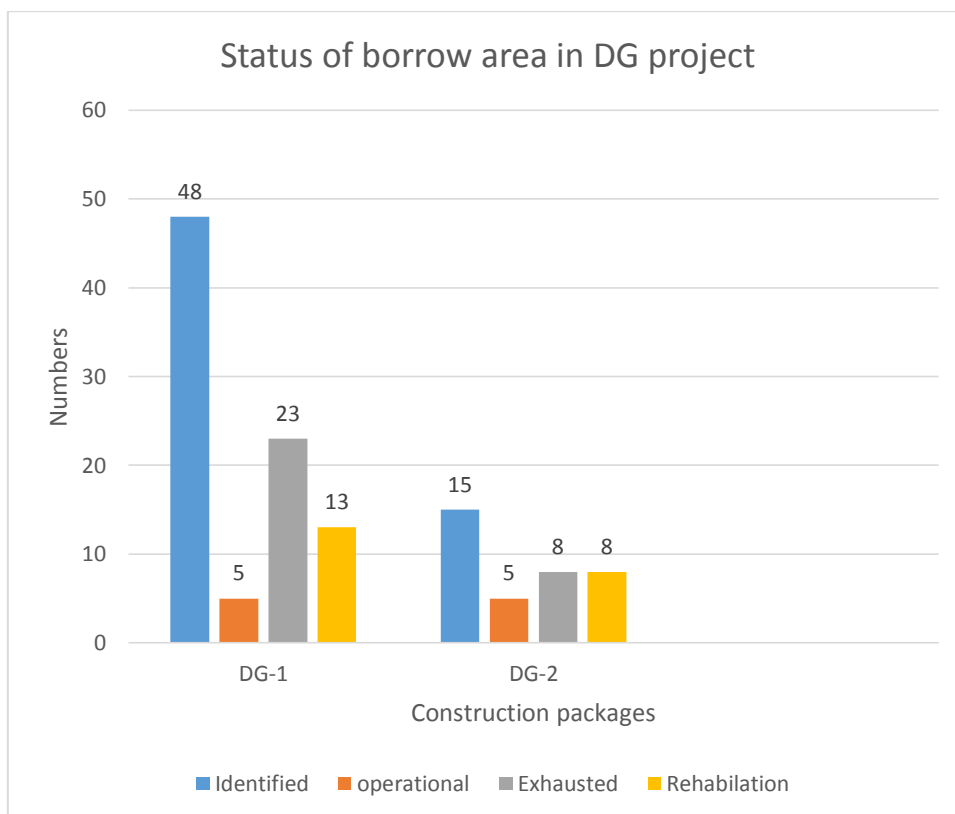
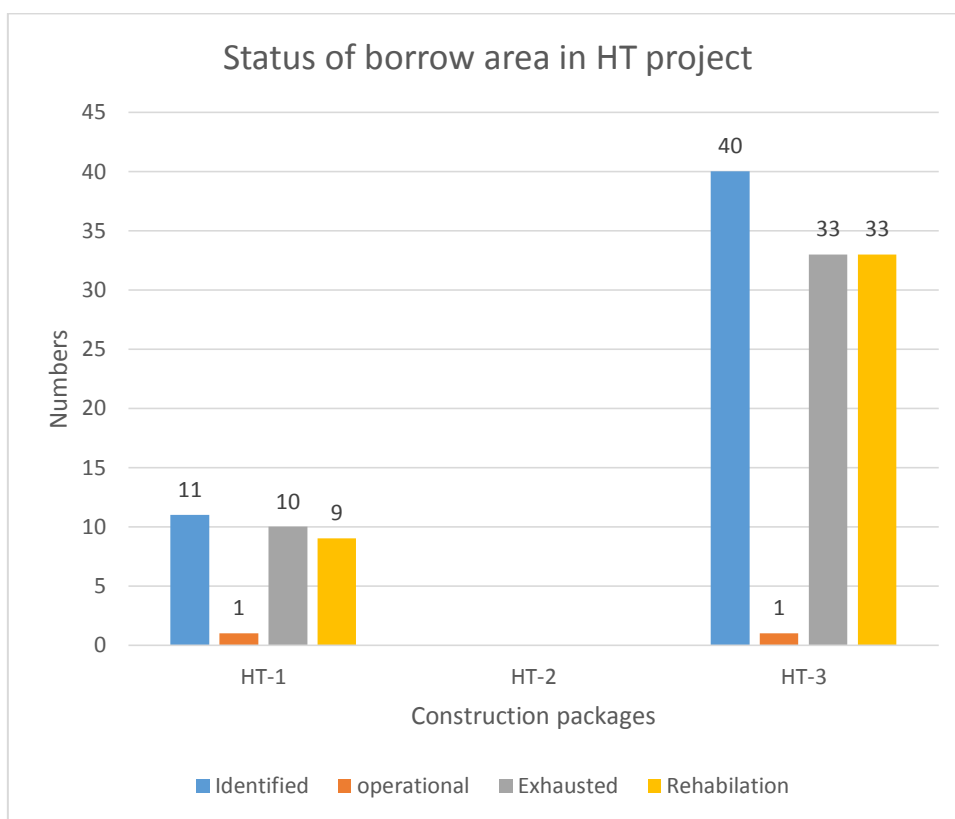
The following Table 7 and Figure 2 reflect package wise status of borrow area operation and rehabilitation till end of March, 2017:

Package	Total borrow areas identified	No. of borrow areas operational	No. of borrow areas exhausted	No. of borrow areas rehabilitated	Remarks
RT-1	Contract terminated				Contract of RT-1 has been terminated. The PMC has to verify on site and maintain the record of all the borrow areas. As per previous record, out of total 45 identified borrow areas 34 borrow areas were operated out of which only 23 borrow area were rehabilitated as per land owner's requirement.
RT-2	74	10	64	64	Out of 10 operational borrow areas material extraction from only 4 borrow areas is in progress. 6 borrow areas have been retained by the contractor for future use.
RT-3	Contract terminated				Out of 11 identified borrow areas, 3 were found unsuitable, 5 were not operated and 2 have been exhausted and 1 was left due to rock boulders inside the borrow area. The contract has been terminated. The PMC has to verify on site and maintain the record of all the borrow areas.
ST-1	Not required				
ST-2	46	0	46	46	Completed borrow areas have been restored as per land owner's requirements.

Package	Total borrow areas identified	No. of borrow areas operational	No. of borrow areas exhausted	No. of borrow areas rehabilitated	Remarks
ST-3	116	0	116	116	The PMC has to submit verification report on the borrow area details and rehabilitation status. The data not matching with ground condition. PMC has record of only 4 nos. of borrow areas
ST-4	31	6	25	25	Updated data is not available with PMC
HT-1	11	1	10	9	
HT-2	-	-	-	-	The contract has been terminated. The PMC has to verify on site and maintain the record of all the borrow areas
HT-3	40	1	33	33	Only 34 borrow areas operated
DG-1	48	5	23	13	<p>Out of total 48 borrow area identified, 16 have been not used. Out of remaining 32 borrow area, 5 borrow areas are operational and 4 borrow areas have been kept on hold for future use. The extraction of materials is over for a total number of 23 borrow areas.</p> <p>Out of 23 completed borrow areas, 14 have been rehabilitated, the same is pending for 9 completed borrow areas.</p>
DG-2	15	5	8	8	Out of 15 identified borrow areas, material extraction of 8 borrow areas is over, material extraction from 5 borrow areas

Package	Total borrow areas identified	No. of borrow areas operational	No. of borrow areas exhausted	No. of borrow areas rehabilitated	Remarks
					is under progress whereas 2 borrow areas have been kept for future extraction of earth.
PG-1	-				Soil has been utilized for filling to raise the level of the area for TSS building and foundation for transformers in Martur. Earth extracted from borrow areas has not been declared by the contractor.
PG-2	Not required				
PG-3					At Mantralyam soil has been utilized for filling to raise the level of the area for TSS building and foundation for transformers. Earth extracted from borrow areas has not been declared by the contractor.

Table 7: Status of borrow areas operations and rehabilitation



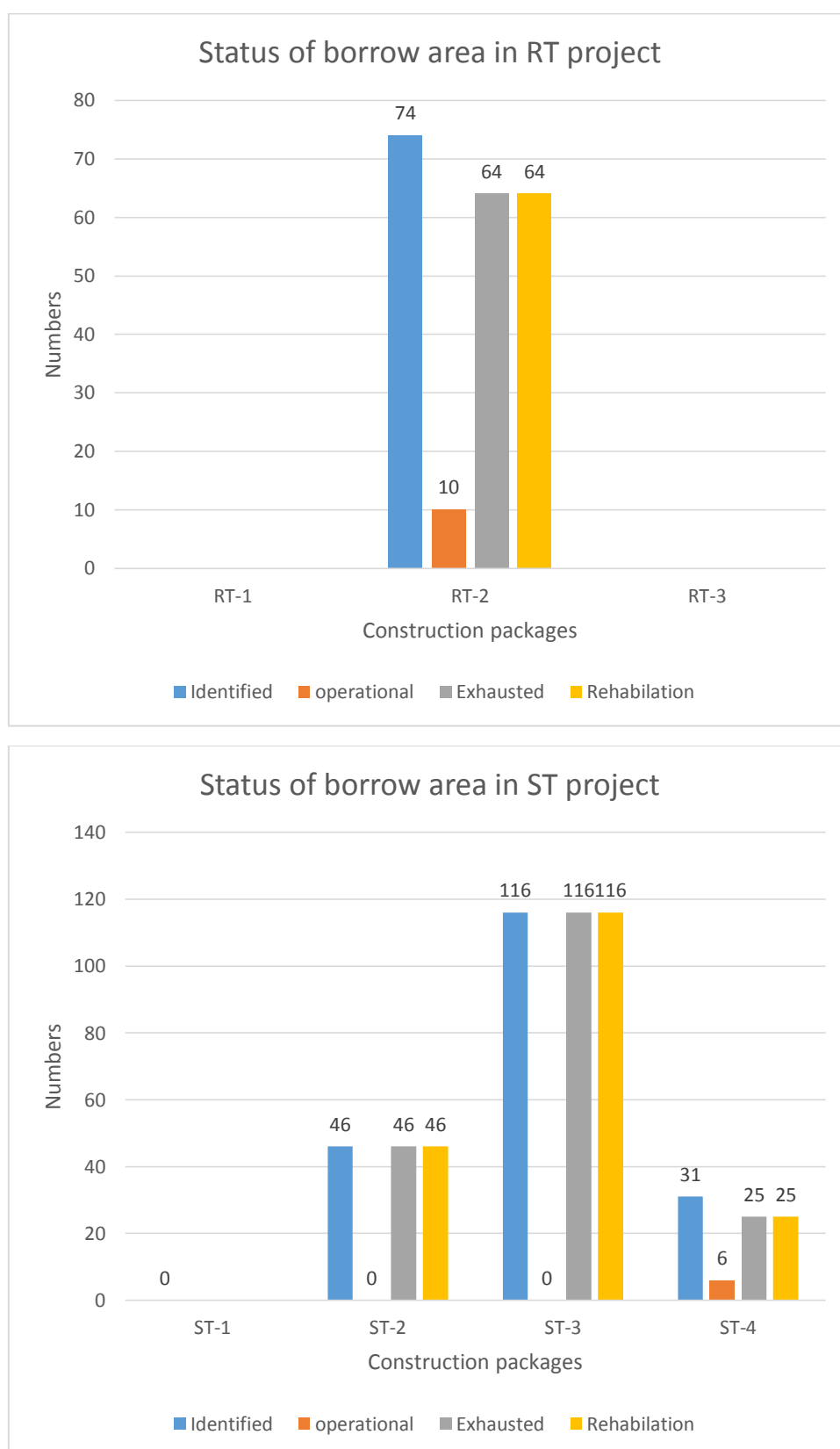


Figure 2: Status of borrow area operation and rehabilitation in different projects

The construction contracts of packages RT-1, RT-3 and HT-2 have been terminated and new contracts for balanced work are yet to be awarded. Earlier the PMCs of these construction packages were advised to verify the restoration status of utilized borrow areas and to collect documents in order to avoid local conflict. The PMCs of packages RT-1 and RT-3 have initiated verification of the borrow areas for the status of restoration activities. Due to non availability of Environmental Officer in construction package RT-1 the verification of documents of the utilised borrow areas and the physical verification could not be completed till end of the reporting period.

In package RT-2 a total number of 74 borrow areas have been utilized for soil and blanketing materials till end of the reporting period. Out of 74 borrow areas, material extraction is over in 64 borrow areas and all the exhausted borrow areas has been rehabilitated satisfactorily as per landowner's requirement. Material extraction from 4 borrow areas is in progress whereas balance 6 borrow areas have been retained by the contractor for future use.

In package DG-1 a total number of 48 borrow areas had been identified by the contractor for borrowing of earth for the project. Out of total 48 borrow area identified, 16 have been not used. Out of remaining 32 borrow area, 5 borrow areas are operational and 4 borrow areas have been kept on hold for future use. The extraction of materials is over for a total number of 23 borrow areas. The contract has rehabilitated 13 borrow areas as per land owner's requirement. However restoration activities of remaining 10 borrow area is pending.

As reported by the PMC, in construction package HT-1 restoration of all the exhausted borrow areas has been completed except for the borrow area located at Tungbhadra Dam. As informed by the PMC the Dam Authorities have inspected the site and expressed their satisfaction. However, the Contractor has not taken any satisfaction letter from the Dam Authority with respect to site restoration.

In HT-3 package, a total number of 34 borrow areas have been utilised for meeting the earth requirement in the project. Material extraction from 33 borrow area have been completed and they have been rehabilitated as per landowner's requirement.

As per information provided by the PMC, in ST-2, a total number of 46 borrow areas have been used for material extraction and all the borrow areas have been rehabilitated. In ST-3 package, as informed by PMC, a total number of 116 borrow areas have been operated for earth extraction and all of them have been rehabilitated. The record review reflects inconsistency in borrow area detailing and not matching with the actual site conditions. The concerned PMC has not succeeded in collecting the correct records of borrow area utilized in ST-3 for different sections. As informed by PMC of ST-4, a total number of 31 borrow areas have been identified out of which 25 borrow areas have exhausted and rehabilitated as per landowner's requirement. Material extraction from remaining 6 borrow areas is in progress.

In packages PG-1 and PG-3, soil has been used for raising the ground level for construction of Traction substation (TSS) near Martur and Mantralaya Railway Stations respectively. In both the packages the contractors have not declared the source of materials/borrow area. The PMC of these packages are also not aware about the material source.

5.2.4 Debris/ Waste Management:

The debris generation is mainly due to excavation works for roadbed, pile works and building construction. The debris due to project activities consists mainly of soil. Most of the soil suitable for construction are being stacked on adjacent ground within the railway land for reuse in embankment slopes, temporary access road, horticulture purpose and for backfilling of borrow areas. Black cotton soil is also generated mainly in construction package DG-1, DG-2, HT-1 and ST-2 packages. Although these black cotton soils are not suitable for construction but is good for cultivation. These soils are being taken up by the local farmers for use in their agriculture field. So most of the soil are reused for various purpose. The balance debris are to be disposed off.

In the cutting section of DG-1 in Washimbe section, at Km 532.900 in DG-2 and at Km 689 in ST-3, rock boulders are generated in order to clear the site for the proposed alignment of track laying. The entire rock boulder generated in DG-2 and ST-3 has been reused for stone pitching at embankment slope and filling of wing-wall of bridges. Huge quantity of rock has been generated in Washimbe section of DG-1, these rock boulders have been stacked within the railway boundary at a safe distance from the track. Being the property of the railway department, the direction of the railway department is required for any use of these boulders, or the Railway Department may auction this to some agency for their use.

The debris generated in HT-1 and HT-3 has been removed from the site in the commissioned section. In package PG-1, PG-2 and PG-3 most of the debris have been utilized for filling up of the undulated area within the TSS building compound for proper leveling of ground within the building campus. In HT-2, removal of debris from the substantially completed section is still pending. No action has been taken during the reporting period as the contract has been terminated and no contractor was available at site. The debris from the forest area at camp site and laboratory of package ST-3 has been cleared during the reporting quarter. Disposal of waste materials from labour camps in the adjacent land is still observed in construction package DG-1 and ST-1. This requires proper attention to avoid contamination of land beyond the boundary of labour camps.

5.2.5 Compliance with safety requirements at site

During the reporting period, the progress of works accelerated in all the active construction packages. Workers safety at site is generally satisfactory in construction packages of PG-1, PG-2, PG-3 and HT-3. Workers safety has deteriorated in remaining packages compared to the last reporting period. This is mainly due to pressure of work progress, subletting of works to smaller contractors and inadequate supply of PPEs compared with strength of workforce at site. However, it is the responsibility of the main contractor to ensure adequate supply of PPEs to all the workers. Respective PMCs have to play proactive role in monitoring of safety at site particularly in construction packages of HT-1, HT-2, ST-3 and ST-4, where number of subcontractors have been found working without proper safety arrangements.

Adequate firefighting arrangements and safe storage of materials have been ensured at all the work sites, fabricating yards, workshops and other allied sites in most of the construction packages. Refilling of existing fire extinguisher cylinders is required to be ensured in ST-1, ST-2 and HT-3 packages. It has

been insisted to maintain First Aid Kits with all essential items at all the activity area including work area, workshops, stockyard, camp site and plant sites.

All the contractors have shown improvement in providing First Aid kits and their maintenance with all essential items at different locations, including construction sites, workshops, stockyard, camp site and plant sites.

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.

5.2.6 Compliances of EMP at workers/labour camps

In all the packages local labourers are preferred except for the labourers requiring special skills. During the reporting period labour camps were operational in packages HT-1, DG-1, DG-2, RT-2 and in all ST packages.

During the reporting period labour camps are operational in construction packages HT-1, DG-1, DG-2, RT-2 and in all ST packages. During the reporting period mostly local labourers have been engaged in all the construction packages where works are in progress.

In construction package DG-1 two labour camps, one at contractors base camp at Kurdwadi and one labour camp in Kalindi section chainage 386/200 are operational. The basic facilities at Kurdwadi camp is satisfactory. In labour camp of Kalindi section around 25 laborers reside in 6 dwelling units in the camp. This labour camp lacks toilet and bathroom as well as waste management facilities. The contractor carries out periodical spraying of insecticide and pesticides around the labour camp. Other labour camps previously provided in DG-1 has been dismantled. In DG-2 package the contractor has provided prefabricated camps for their labourers and operators at Sawalgi and Nathansoor with all basic facilities and maintained satisfactorily.

In package ST-1 labour camps have been provided at four locations. In general the facilities provided in labour camps are found to be satisfactory. In newly constructed labour camp at Saintala bridge lacks drinking water facility, toilet, bathrooms, and waste management system. In other camp sites waste collection and disposal facilities have improved at these labour camps compared to last reporting period. In ST-2 package a labour camp has been provided at Suktapali batching plant. No improvement has been recorded in general hygienic conditions, waste collection and disposal. There is requirement of provision of water facility at toilets and bathrooms. The contractor has provided one toilet unit but is not functional. In package ST-3 a labour camp has been provided at Rugudukhal village near batching plant. The camp lacks basic facilities of toilet, bathroom, proper drinking water facilities and waste management system. Requirement of improvement in general hygienic conditions including sanitation facilities such as toilets and bathroom units with septic tank and soak pit was highlighted in the previous reporting period. The contractor has not shown any improvement during the report period in this aspect. In package ST-4 the labour camp situated at Saintala requires improvement in respect of sanitation and other basic amenities. General hygienic condition at labour camp near Jonk River Bridge and Bagbahara in RT-2 require improvement. Water connections has not been provided to newly constructed toilets at camp near Jonk River.

In HT-3, PG-1, PG-2 and PG-3 the contractors keep their migrant labourers (operators and other skilled labourers) in rented houses in the town area. Mobile toilets have also been provided for labourers in packages PG-1, PG-2 and PG-3 at work sites.

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 ensured in packages ST-1, ST-2, ST-4, HT-1 and HT-3.

5.2.7 Other Environmental Safeguards Measures:

a. Rainwater Harvesting Structures

There is provision for implementation of rainwater harvesting systems in the station buildings and staff quarters in all the contracts. Rainwater harvesting system has been provided only in package HT-1 at Sompur Road Railway Station building and in HT-3 at Alnawar Railway Station building. In construction packages PG-1, PG-2 and PG-3 number of staff quarters have been constructed without rainwater harvesting system. The concerned PMC has been asked to ensure constructions of rainwater harvesting system as per provision of contract conditions. In remaining projects where construction of staff quarters and station buildings are under progress the PMC has been advised to ensure construction of rain water harvesting system in upcoming structures.

b. Tree Plantation:

In different construction packages tree plantation has been included as environmental enhancement measures and to compensate the losses due to tree felling. During the reporting quarter no progress has been made towards tree plantation. The status of tree plantation till the end of reporting period, i.e. March, 2017 is presented in the Table 8. All the contractors have been advised to submit their action plan for carrying out tree plantation including identification of land within Railway right of way for plantation and maintenance of samplings as per contract agreement. The PMC has been advised to ensure plantation as ongoing process and to monitor survival rates of all the planted trees.

Construction Package	Required number of trees to be planted	Total number of trees planted
1. Daund-Gulbarga Track Doubling Project		
DG-1	6500	1300
DG-2	6500	Nil
2. Hospet-Tinaighat Track Doubling Project		
HT-1	7000	1048
HT-2	Contract Terminated	
HT-3	8000	2600
3. Sambalpur-Titlagarh Track Doubling Project		

ST-1	Nil	Nil
ST-2	15058	10000
ST-3	130366	10719
ST-4	14396	Nil
4. Raipur-Titlagarh Track Doubling Project		
RT-1	Contract Terminated	
RT-2	3447	Nil
RT-3	Contract Terminated	
5. Pune-Guntalkal Electrification Project		
PG-1	Nil	Nil
PG-2	Nil	Nil
PG-3	Nil	Nil

Table 8: Projectwise Status of Tree Plantation as per BOQ

5.2.8 Health check-up and AIDS awareness camps for workers

In the RVNL projects HIV/AIDS awareness camps are required to be organized by the contractor in all the construction packages at every two months. Although the HIV/AIDS awareness programme have been organized in all the construction packages but the periodicity as per contract agreement is not maintained in most of the construction packages. During the reporting period HIV/AIDS awareness programme was organized in construction packages DG-1, RT-2, HT-1, ST-1, ST-2, ST-3 and ST-4. The PMC has to play proactive role for ensuring such awareness programme on regular basis.

In most of the construction packages the contractor is also organizing health checkups for their workers jointly with the HIV/AIDS awareness programme. During the medical checkups general blood tests, blood pressure measurement and distribution of medicines were carried out. This helps in confidence building among the workers.

5.3 Monitoring of environmental quality attributes

In order to assess the additional pollution load on environmental components due to various construction activities, monitoring of environmental attributes in terms of air quality, water quality and noise levels has been carried out by the contractor as per agreed environmental monitoring plan. The monitoring results reflect that the project activities do not have any significant additional load on pollution in the area.

During the reporting period monitoring of environmental quality in terms of air, water and noise levels have been carried out in all the live construction packages except PG-1, PG-2 and PG-3 of packages of Pune–Guntakal project. Following table depicts the status of monitoring carried out in different construction packages during reporting period of six months:

S. No	Project/ Construction Package	Monitoring of Environmental Components			Monitoring Agency
		Air Quality	Water Quality	Noise Level	
1.	Daund-Gulbarga Doubling Project				
(i)	DG-1	Air quality monitoring was conducted in the month of November 2016 and March, 2016 at 3 locations	water quality monitoring was conducted in the month of November, 2016 and March, 2017 at two locations	Noise level monitoring was carried out in November, 2016 and March, 2017 at three locations	Care Labs, Hyderabad
(ii)	DG-2	Air quality monitoring was conducted in the month of March 2017 at one location near batching plant	water quality monitoring was conducted for borewell water at Sawalgi Camp site in the month of March 2017	Noise level monitoring was carried out at one location near hard rock cutting area in March, 2017	Care Labs, Hyderabad
2.	Hospet-Tinaighat Doubling Project				
(i)	HT-1	Air quality monitoring was conducted in the month of January 2017 at one location	water quality monitoring was conducted at one location in the month of January 2017	Noise level monitoring was carried out at one location at work site near Koppal Railway Station	Sri Krishna Aqua Engineering Works, Hubli
(ii)	HT-2	Contract Terminated			
(iii)	HT-3	Monthly air quality monitoring was carried out in January, February and March, 2017 at 3 locations	Monthly monitoring for water quality was carried out in January, February, March, 2017 at crusher plant site	Monthly noise monitoring was conducted in January, February and March, 2017 at 3 locations	Altus Eco Management Private Limited, Bangalore
3.	Raipur-Titlagarh Doubling Project				
(i)	RT-1	Contract terminated. No Monitoring carried out during reporting period.			

S. No	Project/ Construction Package	Monitoring of Environmental Components			Monitoring Agency
		Air Quality	Water Quality	Noise Level	
(ii)	RT-2	Air quality monitoring was conducted in the month of January, 2017 at 3 locations.	Water quality monitoring was conducted in the month of January, 2017 at 3 locations.	Noise level monitoring was carried out at three locations in January, 2017	Global Tech Enviro Experts Pvt. Ltd., Bhubaneswar
(iii)	RT-3	Air quality monitoring was conducted in the month of January, 2017 at one location near batching plant at Mahanadi Bridge location.	Water quality monitoring was conducted in the month of January, 2017 at 4 locations.	Noise level monitoring was carried out at 4 locations in January, 2017	Centre for Envitech and Management Consultancy Pvt. Ltd., Bhubaneswar
4. Sambalpur-Titlagarh Doubling Project					
(i)	ST-1	Ambient air quality monitoring was carried out in the month of November, 2016 at 2 locations	Water quality monitoring was carried out in the month of November, 2016 at 2 locations	Noise level monitoring was carried out in the month of November, 2016 at 3 locations	Visiontek Consultancy Services Pvt. Ltd., Bhubaneswar
(ii)	ST-2	Air quality monitoring was carried out in the month of November 2016 and March, 2017 at 4 locations. Test results of March, 2017 not submitted	Water quality monitoring was carried out in the month of November 2016 and March, 2017 at 4 locations. Test results of March, 2017 not submitted	Noise level monitoring was carried out in the month of November 2016 and March, 2017 at 4 locations. Test results of March, 2017 not submitted	Centre for Envitech and Management Consultancy Pvt. Ltd., Bhubaneswar
(iii)	ST-3	Air quality monitoring was carried out in the month of November, 2016 at 4 locations	Water quality monitoring was carried out in the month of November 2016 at 1 location	Noise level monitoring was carried out in the month of November 2016 at 4 locations	Centre for Envitech and Management Consultancy Pvt. Ltd., Bhubaneswar

S. No	Project/ Construction Package	Monitoring of Environmental Components			Monitoring Agency
		Air Quality	Water Quality	Noise Level	
(iv)	ST-4	Ambient air quality monitoring was carried out in the month of November, 2016 at 4 locations.	Water quality monitoring was carried out in the month of November, 2016 at 4 locations.	Noise level monitoring was carried out in the month of November, 2016 at 4 locations.	Centre for Envitech and Management Consultancy Pvt. Ltd., Bhubaneswar
5.	Pune-Guntakal Railway Electrification				
(i)	PG-1	No monitoring has been carried out during report period.			
(ii)	PG-2	No monitoring has been carried out during report period.			
(iii)	PG-3	No monitoring has been carried out during report period.			

Table 9: Status of Monitoring of Environmental Attributes during last 6 months

5.3.1 Ambient Air Quality Monitoring:

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

S. No.	Project/Subproject	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)	Kurduvadi batching plant	22.11.2016	98	60	-	-	38	0.61
(ii)	Kalinde batching plant		88	52	-	-	33	0.55
(iii)	Vakas station		160	58	-	-	42	0.70
(i)	Jinti-310/50	17.03.2017	134	78	-	-	49	630
(ii)	Near batching plant		86	62	-	-	34	575
(iii)	Kem-Dhavalas-359/1-Bridge		160	70	-	-	42	680
2. Package DG-2								
(i)	Batching Plant at Savalgi Camp (Ch. 555/500 RHS)	23.03.2017	-	61	45	26	39	-
ii. Raipur-Titlagarh Project								
1. Package RT-2								
(i)	Bagbahara Office Complex	20/01/2017	-	64.3	30.2	9.2	12.2	-
(ii)	Bhimkhoj Railway Station		-	63.4	29.6	9.4	12.4	-
(iii)	Arand Railway Station		-	61.2	28.7	9.2	11.5	-
2. Package RT-3								

(i)	Batching Plant (Mahanadi bridge)	21/01/2017	-	66.3	31.2	8.1	11.2	-
iii. Hospet-Tinaighat project								
1. Package HT-1								
(i)	Koppal Railway Station (CH- 103+300)	06/01/2017	-	46.4	22.7	14.8	12.6	-
2. Package HT-3								
(i)	Near the Ramnagar stone Crusher	05/01/2017	-	78	-	17	10	-
(ii)	Near Alnavar Railway Station		-	68	-	20	14	-
(iii)	RMC Plant yard		-	68	-	12	8	-
(iv)	Near the Ramnagar stone Crusher	05/02/2017	-	78	-	22	10	-
(v)	Near Alnavar Railway Station		-	58	-	20	14	-
(vi)	RMC Plant yard		-	60	-	14	8	-
(vii)	Near the Ramnagar stone Crusher	10/03/2017	-	66	-	16	8	-
(viii)	Near Alnavar Railway Station		-	46	-	18	8	-
(ix)	RMC Plant yard		-	52	-	8	-	-
iv. Sambalpur – Titlagarh Project								
1. Package ST-1								
(i)	Bridge no. 438 Near batching plant	16.11.2016	462.0	112.2	-	5.8	41.2	0.55
(ii)	Bridge no. 438 Near construction site		440.3	98.8	-	5.5	43.2	0.60
2. Package ST-2								
(i)	Near batching plant	29.11.2016	-	63.8	35.2	12.6	17.4	<1
(ii)	Near Godabhaga Railway station		-	58.2	28.2	11.4	16.8	<1

(iii)	Near Attabira Railway station		-	83.1	47.1	15.2	19.4	<1
(iv)	Near Debahal		-	74.5	40.2	13.2	16.8	<1
3. Package ST-3								
(i)	Near batching plant	16.11.2016 and 17.11.2016	-	69.2	36.4	12.1	17.2	<1
(ii)	Near JT-68		-	71.3	37.2	14.8	18.6	<1
(iii)	Near bridge no. 235		-	63.6	32.5	11.6	15.4	<1
(iv)	Near bridge no. 296		-	52.9	27.8	10.2	14.8	<1
4. Package ST-4								
(i)	Near Batching plant	18.11.2016 and 19.11.2016	-	78.3	40.1	12.4	16.2	<1
(ii)	Near km no. 697/7 (Deogaon station)		-	75.2	38.6	10.2	14.4	<1
(iii)	Near km no. 691/11 (Jalia)		-	62.6	29.2	6.8	10.2	<1
(iv)	Kuchapalli (Near 105 LC)		-	66.8	34.8	9.6	12.4	<1

Table 10: Construction package-wise ambient air quality at different locations

The concentration of Suspended Particulate Matters (SPM) was monitored in construction packages DG-1 and ST-1 only. The concentration of SPM was found in the range of $86 \mu\text{gm}^{-3}$ to $160 \mu\text{gm}^{-3}$ in ST-1 whereas at bridge No. 438 at Saintala the SPM concentration was found in the range of $440.3 \mu\text{gm}^{-3}$ to $462.00 \mu\text{gm}^{-3}$, which is considered high concentration.

The PM₁₀ in ambient air was measured in DG-1, DG-2, HT-1, HT-3, RT-2, RT-3, ST-1, ST-2, ST-3 and ST-4 packages. The concentration of PM₁₀ was found within the permissible limit at all the measured locations except in ST-1 at Batching Plant at Saintala Bridge No. 438 where it exceeded the maximum permissible limit in the month of November ($112.2 \mu\text{gm}^{-3}$). Overall the concentration of PM₁₀ varied between $46.00 \mu\text{gm}^{-3}$ at Alnawar Railway station in HT-1 to $78 \mu\text{gm}^{-3}$ at Ramnagar Stone crusher plant of HT-3 and Jinti in DG-1 (Ch. 310/50). At all the measured locations the concentration of PM₁₀ was observed within the permissible limit of $100 \mu\text{gm}^{-3}$ except at Saintala Bridge No. 438 in ST-1.

The PM_{2.5} was monitored in construction packages HT-1, RT-2, ST-2, ST-3 and ST-4.

The concentration of PM_{2.5} at all the measured locations varied between $19.2 \mu\text{gm}^{-3}$ in at Banavapur Railway Station in HT-1 to maximum $46.5 \mu\text{gm}^{-3}$ in ST-2 near Attabira Railway station. The concentrations of PM_{2.5} at all the measured locations were found within the permissible level of $60 \mu\text{gm}^{-3}$.

The concentration of other measures parameters (SO₂, NO_x and carbon monoxide) were well within the permissible limit. Overall the concentration SO₂ in the air was found in the range from 5.5 µgm⁻³ to 26.7 µgm⁻³, whereas those of NO_x was observed in the range from 8 µgm⁻³ to 49 µgm⁻³.

5.3.2 Water quality Monitoring

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. However the total dissolved solids exceeded the desirable limit but within permissible limit in the borewell water samples of construction packages DG-1 in the sample of Kalindi Camp borewell and in water sample of DG-2 at Savalgi camp. HT-1, HT-3, PG-1, PG-2 and PG-3. The total hardness was also observed exceeding the desirable limit of 200 mg/l in the borewell samples taken from Savalgi Camp of DG-2 but was found within the permissible level as per IS 10500:2012. Similarly, the concentration of Ca and Mg was also exceeded the desirable limit in the water sample of DG-2, but within maximum permissible limit. The Contractor has established RO system for using the water from this source for drinking purpose in order to bring down the TDS and hardness within the range of desirable limit. The package wise water quality monitoring results are presented in following tables.

Parameters	Unit	Sampling locations (DG-1)				Standards as per IS: 10500:2012
		Samples of 22.11.2016		17/03/2017		
		Drinking water at Kurdwari Camp	Borewell water at Construction Camp	Drinking water at Kurdwari Camp of Kalindi	Borewell water at Construction Camp of Kalindi	
PH	-	7.8	7.2	6.8	7.7	6.5-8.5
Color	Hazen	1.0	1.0	1.0	1.0	Max. 5.0
Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	NTU	<0.1	<0.1	<1.0	1.0	Max. 1.0
Total Dissolved Solids	mg/l	46	124	160	664	Max. 500
Total Hardness as CaCO ₃	mg/l	18	40	84	98	Max. 200
Chlorides as Cl	mg/l	10	28	20	64	Max. 250
Iron as Fe	mg/l	<0.01	<0.01	<0.01	<0.01	Max. 0.3

Parameters	Unit	Sampling locations (DG-1)				Standards as per IS: 10500:2012
		Samples of 22.11.2016		17/03/2017		
		Drinking water at Kurdwari Camp	Borewell water at Construction Camp	Drinking water at Kurdwari Camp of Kalindi	Borewell water at Construction Camp of Kalindi	
Residual free chlorine	mg/l	0.2	0.2	<0.1	<0.1	Max. 0.2
Coli forms	MPN/100ml	<2/Absent	<2/Absent	<2/Absent	<2/Absent	Absent/100ml
Escherichia Coli	--	<2/Absent	<2/Absent	<2/Absent	<2/Absent	Absent/100ml

Table 11: Water quality monitoring data of package DG-1

Parameters	Unit	Sampling locations (DG-2, date of sampling: 22/03/2017)	Standards as per IS: 10500:2012
		555/500 RHS Bore well Water-Sawalgi Camp	
PH	-	7.3	6.5-8.5
Color	Hazen	1.0	Max. 5.0
Electrical conductivity	--	1,023	-
Turbidity	NTU	1.0	Max. 1.0
Total Dissolved Solids	mg/l	618	Max. 500
Total Hardness as CaCO ₃	mg/l	410	Max. 200
Non Carbonate Hardness as CaCO ₃	mg/l	115	-
Calcium as Ca	mg/l	112	Max. 75
Magnesium as Mg	mg/l	31.6	Max. 30
Alkalinity to Phenolphthalein as CaCO ₃	mg/l	Nil	-
Alkalinity to Methyl orange as CaCO ₃	mg/l	295	Max. 200

Parameters	Unit	Sampling locations (DG-2, date of sampling: 22/03/2017)	Standards as per IS: 10500:2012
		555/500 RHS Bore well Water-Sawalgi Camp	
Chlorides as Cl	mg/l	132	Max. 250
Sodium as Na	mg/l	46	-
Potassium as K	mg/l	4.0	-
Sulphates as SO ₄	mg/l	52	Max. 200
Nitrates as NO ₃	mg/l	38	Max. 45
Iron as Fe	mg/l	0.08	Max. 0.3
Fluoride as F	mg/l	0.7	Max. 1.0
Silica as SiO ₂	mg/l	5.2	-
Total bacterial Count	Cfu/ml	07	Not specified
Coli forms	MPN/100ml	< 2/Absent	Absent/100ml
Escherichia. Coli	MPN/100ml	< 2/Absent	Absent/100ml

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

Parameters	Unit	Sampling location(HT-1, date of sampling: 06/01/2017)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Koppal Railway Station		
pH		7.26	6.5-8.5	6.5-8.5
Odour		Agreeable	Agreeable	Agreeable
Turbidity	NTU	0.1	1	5
Colour	Hazen	<5	5	15
Taste		Agreeable	Agreeable	Agreeable
Electrical conductivity	µS/cm	816	Not Specified	Not Specified
Total Dissolved Solids	mg/l	440	500	2000
Total Hardness (as CaCO ₃)	mg/l	356	300	600

Total Alkalinity (as CaCO ₃)	mg/l	296	200	600
Calcium (as Ca)	mg/l	89	75	200
Chloride (as Cl)	mg/l	56	250	1000
Magnesium (as Mg)	mg/l	32.44	30	100
Sulphate (as SO ₄)	mg/l	63.1	200	400
Nitrate (as NO ₃ -N)	mg/l	7.12	45	No relaxation
Fluoride (as F)	mg/l	0.81	1	1.5

Table 13: Water quality monitoring data of package HT-1

Parameters	Unit	Borewell water at Ram Nagar Stone Crusher Plant in HT-3			Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Sample of 12/01/2017	Sample of 12/01/2017	Sample of 14/03/2017		
pH	-	7.55	7.8	7.6	6.5-8.5	No relaxation
Colour	-	4	4	4	5	25
Odour	NTU	Odourless	Odourless	Odourless	Unobjectionable	-
Taste	Hazen	Agreeable	Agreeable	Agreeable	Agreeable	-
Turbidity NTU	-	4.3	4.8	3.6	5	10
Total hardness	mg/l	235	268	260	300	24
Iron as Fe	mg/l	0.2	0.2	0.2	0.3	10
Chloride as Cl	mg/l	12	12	12	250	1000
Residual free chlorine	mg/l	-	-	-	0.2	-
Dissolved solids	mg/l	66	68	66	500	2000
Calcium as Ca	mg/l	15	16	15	75	200
Magnesium as Mg	mg/l	-	-	-	0.2	-
Copper as Cu	mg/l	0.02	0.02	0.02	0.05	1.5

Manganese as Mn	mg/l	-	-	-	0.1	0.3
Sulphates as SO ₄	mg/l	0.5	0.5	0.5	200	400
Nitrates as NO ₃	mg/l	0.25	0.26	0.25	45	100
Flouride	mg/l	0.01	0.01	0.01	1	1.5
Alkalinity	mg/l	18	20	26	200	600

Table 14: Water Quality monitoring data of package HT-3

Parameters	Unit	Sampling locations (RT-2, date of sampling: 20.01.2017&21.01.2017)			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	21.6	22.4	23.7	-	-
Appearance	-	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.6	1.2	0.6	1	5
pH	-	7.54	7.36	7.12	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	480	412	321	-	-
Total Solids	mg/l	266.4	228.1	167.2	-	-
Suspended Solids	-	3.1	2.8	4.6	-	-
Total Dissolved Solids	mg/l	263.3	225.3	162.6	500	2000
Chloride (as Cl)	-	20.1	18.3	14.1	250	1000
Ammonical Nitrogen (NH ₃ -N)	mg/l	ND	ND	ND		
Nitrite Nitrogen (NO ₃ -N)	-	1.8	0.8	1.1	-	-
Nitrate Nitrogen (NO ₃ -N)	-	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.6	4.4	4.2	-	-

Parameters	Unit	Sampling locations (RT-2, date of sampling: 20.01.2017&21.01.2017)			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)		
C.O.D	-	2.6	4.2	2.2	-	-
Oil & grease	mg/l	ND	ND	ND	0.01	0.03
Phosphate (as PO4)	-	0.004	ND	ND		
Sulphate (as SO4)	-	18.6	14.3	4.6	200	400
Fluoride (as F)	-	0.12	0.17	0.11	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	0.23	0.12	0.18	-	-
Sodium	-	21.2	14.2	10.1	-	-
Potassium	-	1.1	1.1	0.6	-	-
Total Alkalinity	-	112	102	84	200	600
Total Hardness (as CaCO3)	-	108	98	88	200	600
Calcium Hardness (as CaCO3)	-	96	76	72	200	600
Magnesium Hardness (asCaCO3)	-	12	22	16	30	100

Table 15: Water quality monitoring data of package RT-2

Parameters	Unit	Sampling locations (RT-3, date of sampling: 20/01/2017)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant (Bore well) Mahanadi River	Belsonda Railway Station (Bore well)	Arang office complex (Bore well)	Lakholi Railway Station (Tube well)		
Temperature	°C	22.8	29.7	23.2	22.6	-	-
Appearance	-	Colorless	Colorless	Colorless	Colorless	-	-
Turbidity	NTU	0.10	1.0	0.9	1.0	1	5
pH	-	7.89	7.12	7.14	7.23	6.5-8.5	6.5-8.5
Conductivity	µmhos/cm	160	378	740	628	-	-
Total Solids	mg/l	94.3	218.3	418.8	325.8	-	-
Suspended Solids	-	5.1	4.3	5.1	4.4	-	-
Total Dissolved Solids	mg/l	89.2	214.0	413.7	321.4	500	2000
Chloride (as Cl)	-	11.3	18.3	41.3	28.9	250	1000
Ammonical Nitrogen (NH ₃ -N)	mg/l	ND	ND	ND	ND		
Nitrite Nitrogen (NO ₃ -N)	-	0.9	1.7	2.9	2.4	-	-
Nitrate Nitrogen (NO ₃ N)	-	ND	ND	ND	ND	45	No relaxation
Dissolved Oxygen	-	4.6	4.4	6.0	4.0	-	-
C.O.D	-	2.5	1.3	1.4	1.4	-	-
Oil & grease	mg/l	ND	ND	ND	ND	0.01	0.03
Phosphate (as PO ₄)	-	0.012	ND	0.010	0.002		
Sulphate (as SO ₄)	-	4.4	11.1	22.6	6.8	200	400
Fluoride (as F)	-	0.18	0.06	0.10	0.06	1.0	1.5
B.O.D. (3-days at 27 deg C)	-	0.3	0.4	0.6	0.3	-	-
Coliform	-	Absent	Absent	ND	ND	Absent	Absent

Parameters	Unit	Sampling locations (RT-3, date of sampling: 20/01/2017)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant (Bore well) Mahanadi River	Belsonda Railway Station (Bore well)	Arang office complex (Bore well)	Lakholi Railway Station (Tube well)		
Kjeldhal Nitrogen	mg/l	0.42	0.09	0.28	0.4	-	-
Sodium	-	4.9	12.3	28.9	14.2	-	-
Potassium	-	0.5	0.7	2.0	1.4	-	-
Total Alkalinity	-	58	102	188	110	200	600
Total Hardness (as CaCO ₃)	-	68	108	112	116	200	600
Calcium Hardness (as CaCO ₃)	-	56	92	89	98	200	600
Magnesium Hardness (asCaCO ₃)	-	12	14	23	18	30	100

Table 16: Water quality monitoring data of package RT-3

Parameters	Unit	Sampling locations (ST-1, date of sampling: 17.11.2016)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Drinking water At Camp		
Colour	Hazen	Colourless	5	15
Odour	-	Unobjectionable	Agreeable	Agreeable
Taste	-	Agreeable	Agreeable	Agreeable
Turbidity	NTU	<2	1	5
pH Value	-	7.2	6.5-8.5	6.5-8.5
Total Hardness (as CaCO ₃)	mg/l	42.0	300	600
Iron (as Fe)	mg/l	0.16	0.3	No relaxation
Chloride (as Cl)	mg/l	21.0	250	1000
Fluoride as F	mg/l	0.022	1	1.5

Residual, free Chlorine	mg/l	ND	0.2	1.0
Total Dissolved Solids	mg/l	156.0	500	2000
Calcium (as Ca)	mg/l	11.2	75	200
Magnesium (as Mg)	mg/l	3.4	30	100
Copper (as Cu)	mg/l	<0.05	0.05	1.5
Manganese (as Mn)	mg/l	<0.005	0.1	No relaxation
Sulphate (as SO ₄)	mg/l	8.4	200	400
Nitrate (as NO ₃)	mg/l	0.18	45	No relaxation
Phenolic Compounds (as C ₆ H ₅ OH)	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	<0.01	0.05	No relaxation
Zinc (as Zn)	mg/l	<0.05	5	15
Anionic detergent	mg/l	<0.2	0.2	-
Hexavalent Chromium as Cr+6	mg/l	<0.05	<0.05	No relaxation
Mineral Oil	mg/l	<0.01	0.01	No relaxation
Total Alkalinity (as CaCO ₃)	mg/l	38.0	200	600
Aluminium (as Al)	mg/l	<0.001	0.03	No relaxation
Boron (as B)	mg/l	<0.01	1	No relaxation
Poly Aromatic Hydrocarbon as PAH	µg/l	<0.0001	-	-

Table 17: Water quality monitoring data of package ST-1 at Hirapur Base Camp

Parameter	Unit	Sampling locations (ST-1, date of sampling: 17.11.2016)	Standards as per IS-2296: 1992 Class – 'C'
		Surface water quality at Saintala Nallah	
Dissolved Oxygen	mg/l	5.7	4

BOD (3) days at 27°C (max)	mg/l	2.1	3
Total Coli form	MPN/100 ml	360	5000
pH Value	-	6.8	6.0-9.0
Colour (max)	Hazen	8	300
Total Dissolved Solids	mg/l	120.0	1500
Copper as Cu (max)	mg/l	0.22	1.5
Iron as Fe (max)	mg/l	0.43	0.5
Chloride (max)	mg/l	23.0	600
Sulphates (SO ₄) (max)	mg/l	2.8	400
Nitrate as NO ₃ (max)	mg/l	1.1	50
Fluoride as F (max)	mg/l	0.2	1.5
Phenolic compounds as C ₆ H ₅ OH (max)	mg/l	<0.001	0.005
Cadmium as Cd (max)	mg/l	<0.001	0.01
Selenium as Se (max)	mg/l	<0.001	0.05
Arsenic as As	mg/l	<0.001	0.2
Cyanide as CN (max)	mg/l	ND	0.05
Lead as Pb (max)	mg/l	<0.01	0.1
Zinc as Zn (max)	mg/l	0.14	15
Hexa Chromium as Cr	mg/l	<0.05	0.05
Anionic Detergents (max)	mg/l	<0.2	1.0

Table 18: Water quality monitoring data of package ST-1 at Saintala Nallah

Parameters	Unit	Sampling locations (ST-2, date of sampling: 29.11.2016)				Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Attabira Railway Station	Godbhaga Railway Station	Batching plant (BW-1)	Batching plant (BW-2)		
Colour	Hazen	<5	<5	<5	<5	5	15
Odour	-	AL	AL	AL	AL	Agreeable	Agreeable
Taste	-	AL	AL	AL	AL	Agreeable	Agreeable
Turbidity	NTU	<0.05	<0.05	<0.05	<0.05	1	5
pH Value	-	7.8	7.7	6.6	6.9	6.5-8.5	6.5-8.5

Total Hardness (as CaCO ₃)	mg/l	96	90	70	110	300	600
Iron (as Fe)	mg/l	<0.05	0.1	0.14	0.2	0.3	No relaxation
Chloride (as Cl)	mg/l	32	23	21	41	250	1000
Residual, free Chlorine	mg/l	ND	ND	ND	ND	0.2	1.0
Total Dissolved Solids	mg/l	331.5	271.3	234.6	370.4	500	2000
Calcium (as Ca)	mg/l	20.0	18.0	16.03	24.05	75	200
Magnesium (as Mg)	mg/l	11.7	10.9	7.3	12.1	30	100
Copper (as Cu)	mg/l	<0.03	<0.03	<0.03	<0.03	0.05	1.5
Manganese (as Mn)	mg/l	<0.05	<0.05	<0.05	<0.05	0.1	No relaxation
Sulphate (as SO ₄)	mg/l	12.3	6.3	5.8	14.2	200	400
Nitrate (as NO ₃)	mg/l	1.6	1.8	1.2	2.1	45	No relaxation
Fluoride (as F)	mg/l	0.21	<0.05	0.12	0.22	1	1.5
Phenolic Compounds (as C ₆ H ₅ OH)	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	<0.003	<0.003	<0.003	<0.003	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	<0.05	<0.05	<0.05	<0.05	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 CaCO ₃)	mg/l	145	120	80	150	200	600
Aluminium (as Al)	mg/l	<0.01	<0.01	<0.01	<0.01	0.03	No relaxation
Boron (as B)	mg/l	<0.2	<0.02	<0.2	<0.2	1	No relaxation

Table 19: Water quality monitoring data of package ST-2 at Different locations

Parameters	Unit	Sampling locations (ST-3, date of sampling: 17.11.2016)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Loisingha staff mess-2		
Colour	Hazen	<5	5	15
Odour	-	AL	Agreeable	Agreeable
Taste	-	AL	Agreeable	Agreeable
Turbidity	NTU	<0.05	1	5
pH Value @ 25 deg C	-	6.8	6.5-8.5	6.5-8.5
Total Hardness (as CaCO ₃)	mg/l	52	300	600
Iron (as Fe)	mg/l	0.1	0.3	No relaxation
Chloride (as Cl)	mg/l	1.5	250	1000
Residual, free Chlorine	mg/l	ND	0.2	1.0
Total Dissolved Solids	mg/l	112.2	500	2000
Calcium (as Ca)	mg/l	10.4	75	200
Magnesium (as Mg)	mg/l	6.3	30	100
Copper (as Cu)	mg/l	<0.03	0.05	1.5
Manganese (as Mn)	mg/l	<0.05	0.1	No relaxation
Sulphate (as SO ₄)	mg/l	<5	200	400
Nitrate (as NO ₃)	mg/l	1.8	45	No relaxation

Fluoride (as F)	mg/l	<0.05	1	1.5
Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	<0.001	0.001	No relaxation
Mercury (as Hg)	mg/l	<0.001	0.001	No relaxation
Cadmium (as Cd)	mg/l	<0.003	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	<0.05	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 CaCO ₃)	mg/l	85	200	600
Aluminium (as Al)	mg/l	<0.01	0.03	No relaxation
Boron (as B)	mg/l	<0.2	1	No relaxation

Table 20: Water quality monitoring data of package ST-3 at Losingha Camp

Parameters	Unit	Sampling locations (ST-4, date of sampling: 17.11.2016)	Desirable Limit IS 10500-2012	Permissible Limit in absence of Alternate Source IS 10500-2012
		Batching plant		
Colour	Hazen	<5	5	15
Odour	-	AL	Agreeable	Agreeable
Taste	-	AL	Agreeable	Agreeable
Turbidity	NTU	<0.05	1	5
pH Value @ 25 deg C	-	7.1	6.5-8.5	6.5-8.5
Total Hardness (as CaCO ₃)	mg/l	180	300	600
Iron (as Fe)	mg/l	0.12	0.3	No relaxation
Chloride (as Cl)	mg/l	45	250	1000
Residual, free Chlorine	mg/l	ND	0.2	1.0
Total Dissolved Solids	mg/l	440.7	500	2000

Calcium (as Ca)	mg/l	36.1	75	200
Magnesium (as Mg)	mg/l	21.9	30	100
Copper (as Cu)	mg/l	<0.03	0.05	1.5
Manganese (as Mn)	mg/l	<0.05	0.1	No relaxation
Sulphate (as SO ₄)	mg/l	7.2	200	400
Nitrate (as NO ₃)	mg/l	0.5	45	No relaxation
Fluoride (as F)	mg/l	0.43	1	1.5
Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	<0.001	0.001	No relaxation
Mercury (as Hg)	mg/l	<0.001	0.001	No relaxation
Cadmium (as Cd)	mg/l	<0.003	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	<0.05	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 CaCO ₃)	mg/l	120	200	600
Aluminium (as Al)	mg/l	<0.01	0.03	No relaxation
Boron (as B)	mg/l	<0.2	1	No relaxation

Table 21: Water quality monitoring data of package ST-4 at Batching Plant

5.3.3 Noise level monitoring:

The noise pollution level has been recorded at different locations in construction packages DG-1, HT-1, HT-3, RT-2 and ST-1, ST-2, ST-4, PG-1, PG-2 and PG-3 during reporting period. The test results of ST-4 has not been submitted by the Contractor. The average equivalent noise level at different locations is presented in following table:

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (night time) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
I. Daund-Gulbarga project (DG)							
	Package DG-1	Kurduvadi-RL-CH-378/900 km	21.11.2016	51.1	48.6	75	70
		Kalinde batching plant (Br. No. 386/2)		57.0	47.6	75	70
		Chobhepimpri Crusher		62.8	44.7	75	70
1		Kurduvadi batching plant	17/03/2017	54.0	50.6	75	70
		Kalindee batching plant		58.4	50.1	75	70
		Kem-Dhavalas-359/1-Bridge		54.3	50.4	75	70
2.	Package DG-2	Hard rock cutting area at Ch. 532/900	23/03/2017	72.3	-	75	70
II. Hospet-Tinaighat project							
1.	Package HT-1	Koppal Railway Station	06/01/2017	54.5	46.9	75	70
2.	Package HT-3	Near the RMC plant yard Khanapur	05/01/2017	56	-	75	-
		Near the crusher area Uttar Kannada		69	-	75	-
		Near Alnavar Railway Station		60	-	75	-
		Near the RMC plant yard Khanapur	15/02/2017	57	-	75	-

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (night time) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
		Near the crusher area Uttar Kannada		70	-	75	-
		Near Alnavar Railway Station		57	-	75	-
		Near the RMC plant yard Khanapur	10/03/2017	40	-	75	-
		Near the crusher area Uttar Kannada		64	-	75	-
		Near Alnavar Railway Station		60	-	75	-
III. Raipur-Titlagarh project							
2.	Package RT-2	Aranda Rly Station	20/01/2017	56.8	-	75	70
		Near Bhimkhoj Railway Station		54.5	-	75	70
		Near Bagbahar Office Complex		54.7	-	75	70
3.	Package RT-3	Batching plant	21/01/2017	58.3	-	75	70
		Near Belsunda Railway Station		56.8	-	75	70
		Near Arang Railway Station		56.9	-	75	70
		Near Lakholi Railway Station		58.0	-	75	70
IV. Sambalpur-Titlagarh project							
1	Package ST-1	Near Batching plant	17.11.2016	74.3	61.2	75	70
		Near construction site		74.8	63.2	75	70
		Near D.G. Set		71.0	50.6	75	70
		Near Batching plant	29.11.2016	64.3	54.3	75	70

S. No	Project/ Subprojects	Location	Date of monitoring	Equivalent Noise level (day time)LeqdB(A)	Equivalent Noise level (night time) LeqdB(A)	Prescribed limit LeqdB(A)	
						Day time	Night time
2.	Package ST-2	Near Godabhaga Railway station		64.9	54.5	75	70
		Near Attabira Railway station		64.7	54.8	75	70
		Near Debahal		64.2	54.6	75	70
3	Package ST-3	Near Batching plant	16.11.2016 and 17.11.2016	64.4	51.7	75	70
		Near JT-66		64.8	55.8	75	70
		Near bridge no. 235		64.7	55.3	75	70
		Near bridge no. 296		64.9	55.9	75	70
4	Package ST-4	Near Batching plant	18.11.2016 and 19.11.2016	63.8	53.7	75	70
		Near km no 697/7 (Deogaon station)		61.9	53.5	75	70
		Near km no. 691/11 (Jalia)		60.5	48.7	75	70
		Kunchapalli (Near 105 LC)		63.1	51.6	75	70

Table 22: Ambient noise levels at different construction packages

The results reflect that during the monitoring period the daytime noise levels varied between minimum 51.1 dBAeq at Kurdwadi Railway Station in DG-1 to maximum 74.8 dB Leq at Bridge Construction site in ST-1. At all the measured locations, the noise levels were recorded within the prescribed limit (75 dBAeq) for industrial/commercial areas. The night time noise levels were recorded in construction packages DG-1, HT-1, ST-1, ST-2, St-3 and ST-4. No nighttime noise levels were recorded in construction package DG-2, HT-3, RT-2 and RT-3. The nighttime noise level were recorded in the range from minimum 44.7 dBAeq to maximum 63.2 dBAeq which are lower than the prescribed limit of 70 dBAeq.

6. Environmental and Safety training

The GC has conducted two rounds of training on implementation of environmental safeguards during construction and procedures for monitoring the compliances for PMCs, PIUs and Contractors staff

supervision. The PMC's Environmental Officer gives periodical training on Environmental measures in their respective project package.

The contractors of packages HT-1, ST-1, ST-2, ST-3, PG-2 and PG-3 organize regular trainings on different aspects of safety at different locations for their staff and labourers.

7. Public complaints on environmental and safety issues of project

Grievance Redress Committees (GRCs) have been established by RVNL to look into any public complaint during construction work with respect to environmental issues of the project. The public information signboards have been installed at strategic locations in all the construction packages for receiving the public complains. During the reporting period no formal public complain was received.

8. 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 on performance on EMP implementation has been done for the project which is indicated below:

Sl. No.	Activity	Performance rating	Remarks
Compliance with Statutory Rules and Regulations			
1	Action plan for EMP compliance	Satisfactory in PG-2, PG-3, DG-1, HT-1, HT-3 and ST-1. Requires improvement in remaining packages.	
2	Licenses and permits for plants and equipments and quarry	Good	
3	Labour licenses	Good	
4	Site selection / clearance	Satisfactory	
Construction Related Compliance			
5	Public/Traffic safety measures	Requires improvement in DG-1 and RT-2. Satisfactory in rest of the packages	Caution/Warning Signboards and barricading required near cross roads and on temporary access constructed for movement of machineries and construction vehicles. Public movement on such tracks may create hazardous situation.

Sl. No.	Activity	Performance rating	Remarks
6	Housekeeping and hygiene at construction sites	Require improvement in DG-1, ST-3, ST-4. Satisfactory in all other packages	Garbage collection and disposal as well as debris removal from site required in these packages.
7	Labour/construction camps and facilities	General hygienic condition is satisfactory in DG-2, ST-1 and ST-2. Need improvement in all other labour camps.	Special attention required in DG-1, and ST-3. Facilities at Toilets in RT-2 needs attention.
8	Medical facilities and health checkups of workers	Satisfactory in all the packages	
9	Dust Control:		
	(A) At plant site	Satisfactory in all the construction packages	
	(B) At construction sites	Satisfactory in all the packages except Package ST-3 and ST-4	Frequent water sprinkling over the earthen bed is required in construction package ST-3 and ST-4 to control dust due to movement of dumpers and machineries.
10	Stock piling of topsoil	Satisfactory in DG-1, HT-1, HT-3, RT-2 and ST-2. Require improvement in rest of the packages.	
11	Slope protection of high embankment and bridge approaches from soil erosion	Good in all packages	
12	First aid facilities	Satisfactory in all the construction packages	First Aid Box with all necessary first aid items required to be maintained at all time.
13	Personal Protective Equipment (PPE)	Satisfactory in ST-1, DG-1, DG-2 PG-1, PG-2 and PG-3, Require improvement in remaining construction packages.	Improvement requires in supply of adequate PPEs by the main contractor and their use during works. Attention required for the workers of subcontractors where use of PPE is almost

Sl. No.	Activity	Performance rating	Remarks
			neglected in most of the packages. The main contractor has to ensure workers safety for sub-contractor's too. Special attention is required at all Important and Major bridges for proper usage of hard hat, safety belts, safety jackets and safety boots etc.
14	Proper storage and handling of chemicals and waste oils	Satisfactory	
15	Sanitation and waste management	Require improvement in all the construction packages	Debris removal from site in substantially completed sections especially in DG-1, HT-1, HT-3, PG-1, PG-2 and PG-3 is required before commissioning. The contractor has to submit his disposal plan along with identification of disposal sites.
16	Employment for local villagers / residents	Good.	Mostly local labourers are engaged in the project except for the labourers requiring special skills.
17	Safety measures during execution of works	Satisfactory in PG-1, PG-2 and PG-3. Needs improvement in remaining packages	It is require to provide safe access as well as safe working platform is all the project packages
18	Emergency response system	Require improvement in ST-3, ST-4 and RT-2. Satisfactory in remaining packages	Display of Emergency contact numbers, training of staff to deal with emergency situation, and emergency vehicles required to be deployed in all the major bridge construction site and construction camp. All the sub-contractors must be trained properly for

Sl. No.	Activity	Performance rating	Remarks
			responding to emergency situation alongwith the contractors own workforce.
19	Borrow area operation and rehabilitation	Satisfactory in DG-1, RT-2, ST-2, HT-1 and HT-3. Require improvement in ST-3, ST-4, RT-1 and RT-3. In ST-1 and PG project packages no borrow area required.	PMC has to verify the correctness of information submitted by the contractor especially in RT-1, RT-3, ST-3, ST-4 and HT-2.
20	Debris clearance from site	Require improvement in DG-1, ST-2, ST-3, ST-4, HT-2 and RT-3 Satisfactory in remaining packages	All the debris must be removed and disposed off in designated area and a record of debris removal and disposal to be maintained by the respective PMC
21	Awareness programme on HIV/AIDS and other STD for workers	Good in DG-1, ST-1, ST-2 and HT-1, In remaining packages the awareness camps are required to be organized periodically as per the contract conditions	Bimonthly schedule required to be maintained as per contract specification.
22	Monitoring of environmental attributes	Satisfactory in HT-1, DG-1, DG-2 and RT-2,. Require improvement in packages ST-1, ST-2 and ST-3, ST-4, PG-1, PG-2 and PG-3	Periodicity of environmental monitoring is required to be ensured by the PMC. The monitoring schedule should be in consistent with the specified environmental monitoring plan specified in the contract.
23	Mobilisation status of Environmental Officer of PMC	The Environmental Officer of PMC is available in all the packages except in RT-1, ST-4, PG-2 and PG-3.	In PG-2 and PG-3 the Environmental Officer left the project in August 2016, No replacement has been arranged by the PMC.

Sl. No.	Activity	Performance rating	Remarks
		The duration and frequency of site visits by PMC's Environmental officer is good in DG-2, PG-1, HT-1, HT-2, HT-3 and ST-2. However in remaining packages this requires improvement	
24	Appointment of focal environmental officer at corporate level and PIU level	Good	
25	Record Keeping and Reporting of PMC	Satisfactory in RT-2, DG-1, DG-2, and ST-1. Require improvement in remaining packages	The record keeping and reporting on environmental compliance has deteriorated in construction packages PG-2 and PG-3 after leaving of PMC's Environmental Officer in this package. Similarly proper record keeping and reporting require improvement in Packages RT-1, RT-3, ST-3 and ST-4.

Table 23: Performance Rating on Compliance with the Environmental Management Plan

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

9. Significant non-compliances

During the reporting period no major non-compliance has been observed except for the non availability of PMC's Environmental Officer in package RT-1, PG-2, PG-3 and ST-4. General house-keeping in labour camps require improvement in almost all construction packages especially with respect to waste collection and disposal. It has been found that the contractors of most of the packages are lagging behind their plantation target. Trees are required to be planted in large numbers in most of packages to comply with the EMP and contract conditions. The Contractors have to maintain the tree plantation for one year to give requisite survival rate. The PMC is required to guide the contractor for preparation their action plan for plantation in the coming monsoon season, so that the plantation work is over this year. It is also important to check the survival of the plantation to meet the objective for environmental compensation and enhancement.

The living conditions in some 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 require improvement in all the labour camps.

Inadequate monitoring of environmental compliance during construction by PMC is a concern and this requires proper attention.

10. 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.

11. Conclusion and recommendations

During the reporting period most of the stipulated environmental safeguards measures have been implemented satisfactorily in all the construction packages. However few lapses have also been recorded which require proper attention and improvement. The contractors have shown some sign of improvement in implementation of environmental safeguards compared to last reporting period. In general the environmental and social safeguards of the projects are being implemented in compliance with the loan covenants, project agreement and contractors are complying with the mitigation measures described in the Environmental Management Plan (EMP).

The statutory/regulatory requirements are being strictly monitored for their compliance by the contractors. Efforts are being made to ensure that the contractor obtains all necessary licenses and permits from concerned agencies, including renewal when required.

The contractors have shown improvement in borrow area operation and management. The team of Contractor and PMC are putting their efforts for resolving the discrepancies in borrow area detailing in construction package ST-3. The contractors of construction packages DG-1, DG-2 and HT-1 have obtained environmental clearance for borrow areas. In other project packages the borrow areas are operational without environmental clearance. This aspect requires proper attention by the PMCs in their respective package.

With continuous effort of PMC and PIU, the contractors have improved the living conditions at labour camps but this aspect require further improvement on continuous basis.

In general worker's and public safety have deteriorated in all the projects in the reporting period because pace of construction works have geared up in almost all the construction packages. Such lapses are primarily due to lack of planning and inadequate supervisory staff with contractor for monitoring safety compliance. A number of subcontractors have been engaged in all the construction packages in order to speed up the progress and are poorly equipped to handles safety issues. It is the responsibility of the main contractor to ensure safety at site for their own workforce as well as those of sub-contractor's work force. Provision of safe access and appropriate PPE is required to be ensured in all the project packages where works are in progress.

Absence of PMC's Environmental Officer in many construction packages has affected the monitoring of EMP implementation at site and record keeping as well as reporting. Since the construction

activities have accelerated, it is important that the PMC's Environmental Officer spend more time at site for inspection to maintain the effectiveness of implementation of environmental safeguards measures. Absence of PMC's Environmental Officer in packages RT-1, PG-2, PG-3 and ST-4 for long period remains an issue. During the reporting period, no site inspection has been carried out by the Environmental Officer of PMC of HT-1, HT-2 and HT-3 since November 2016.

During the reporting period the management of air pollution in terms of dust control was found to be satisfactory in all the projects except in construction package of ST-3 and ST-4. Adequate measures have been taken at different sites to prevent water contamination and siltation of water bodies.

Haphazard stacking of debris materials have been observed in many packages. All the debris are required to be removed from sites especially those of substantially completed sections before commissioning. All the contractors had been instructed to submit their action plan for restoration of sites and debris removal indicating reuse plan, disposal site etc but till the end of the reporting quarter none of the contractor has submitted their action plan.

The contractors have not shown any improvement in tree plantation in all packages. The contractors have been instructed to submit their action plan for initiating phase wise plantation during contract period. This aspect is required to be monitored closely by the PMC and PIU, RVNL.

Provision of rainwater harvesting structures in building construction is an important component stipulated in contract. Till the reporting period such structures have been provided only in HT-1 at Sompur Road Railway Station building and in Alnawar Railway Station building in HT-3. It is required to be ensured that all the RWH structures as per BOQ are included in the schedule of construction for all packages.

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.

Annexure I

Photographs indicating EMP Compliance Status in different projects

	
<p>Air quality monitoring near Godbhaga station in ST-2</p>	<p>Air quality monitoring near batching plant in ST-2</p>
	
<p>Water quality monitoring near batching plant in ST-2</p>	<p>Noise level monitoring near Godbhaga station in ST-2</p>

	
<p style="text-align: center;">Plantation done at Kurduwadi in DG-1</p>	
	
<p>DG2: Operational borrow area at Ch. 519/300 in</p>	<p>DG-2: Rehabilitated borrow area at Ch. 492/100L: Converted to cultivable land</p>
	
<p>DG2: Borrow area at Boroti</p>	<p>RT2: Piling work at Jonk River</p>



ST2: Labour notice board installed near workers camp site



Dustbin facilities at worker camp site in ST-2



Toilet facilities at camp site at Suktal camp in ST-2



Use of insecticide and bleaching powder at Suktal camp in ST-2



Proper lighting facilities at labour camp site in ST-2



Health checkup camp for workers in ST-2



Tin sheds for workers at Suktapalli in ST-2



Labour camp at Suktapalli in ST-3



Noise level monitoring at Rougdikhal in ST-3



Labour camp at Saintala in ST-4



Labour camp at Saintala in ST-4



Housekeeping required at labour camp near Tungabhadra bridge in HT-1



RT2: Batching plant at Jonk River in RT-2



Restoration of borrow area at Tenghabasa in RT-2



Komakhan station yard at RT-2



GC Env.expert at RT-2



GC Env.expert at Major Br.161 on River Jonk at RT-2



Meeting with PMC and contractor officials of RT-2



Bridge work at Mahanadi River in ST-1: PPE in use



First Aid box at Suktapalli camp site in ST-2



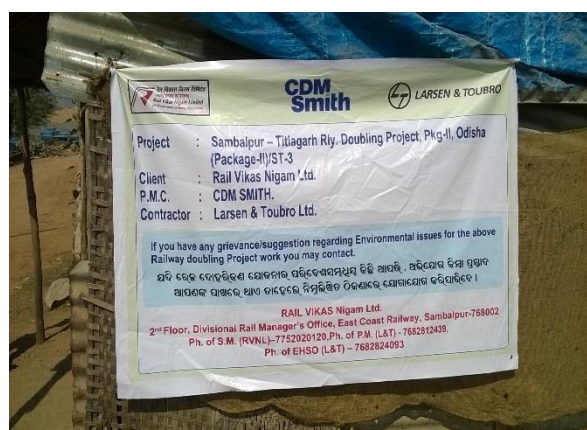
Launching work for FOB at Godbhaga Railway Station in ST-2



Hume pipes provided for water flow under approach road at Hirapur bridge in ST-1



Labourers working on bridge girder at Ong river in ST-1



Display Board for Grievance register in ST-3

Emergency contact numbers at Hirapur in ST-1



Workers without PPE at bridge construction in ST-4

No safety fencing along running Railway track in ST-4



ST3: Rock cutting section at Ch. 689/1

Workers seen without PPE at track welding in HT-1



Workers without helmet and boots in HT-1



Forest area on both side at Ch 125/7 in RT-2