

# Initial Environmental Examination

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India: Visakhapatnam-Chennai Industrial Corridor  
Development Program – Tranche 2

Widening of Anakapalli to Atchuthapuram Road

Package No: VCICDP/APRDC/07

Prepared by Government of Andhra Pradesh for the Asian Development Bank.



## CURRENCY EQUIVALENTS

(as of 17 November 2022)

Currency unit	–	Indian rupee (₹)
₹1.00	=	\$0.012
\$1.00	=	₹81.54

## ABBREVIATIONS

ADB	-	Asian Development Bank
APPCB	-	Andhra Pradesh Pollution Control Board
APRDC	-	Andhra Pradesh Road Development Corporation
BC	-	Bituminous Concrete
BGL	-	Below Ground Level
BOD	-	Biological Oxygen Demand
BIS	-	Bureau of Indian Standard
CPCB	-	Central Pollution Control Board
COVID19	-	Corona Virus Infectious disease of 2019
DBM	-	Dense Bituminous Macadam
DO	-	Dissolved Oxygen
DOE	-	Department of Environment
PMSC	-	Project Management and Supervision Consultant
EA	-	executing agency
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EMOP	-	Environmental Monitoring Plan
ESO	-	Environmental and Safety Officer
GOAP	-	Government of Andhra Pradesh
GSB	-	Granular Subbase
IEE	-	initial environmental examination
IMD	-	Indian Meteorological Department
IS	-	Indian Standard
MFF	-	Multi Tranche Financial Facility
MOEF	-	Ministry of Environment and Forests
MSL	-	Mean Sea Level
MW	-	Mega Watt
NSDP	-	Net State Domestic Product
NGO	-	Non-government organization
NH	-	National Highway
NO <sub>x</sub>	-	oxides of nitrogen
PIU	-	Project Implementation Unit
PWD	-	Public Works Department
RF	-	Reserve Forest
ROW	-	right-of-way
WMM	-	Wet Mix Macadam

## **WEIGHTS AND MEASURES**

dBa	-	decibels
°C	-	degree Celsius
km	-	kilometer
lpcd	-	liter per capita per day
m	-	meter
mgl	-	meter below ground level
mm	-	millimeter
ml	-	million liters per day
km <sup>2</sup>	-	square kilometer

## **NOTE**

In this report, "\$" refers to United States dollars.

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## EXECUTIVE SUMMARY

**Project Description.** The Asian Development Bank (ADB) approved on 20 September 2016 a multi-tranche financing facility (MFF) worth \$500 million and a policy-based loan (PBL) worth \$125 million for the Visakhapatnam–Chennai Industrial Corridor Development Program (VCICDP). ADB also approved on that day technical assistance (TA) worth \$1 million for Capacity Development for Industrial Corridor Management in Andhra Pradesh and, on 26 September 2016, ADB administration of a \$5 million grant from the Urban Climate Change Resilience Trust Fund under the Urban Financing Partnership Facility.

The VCICDP complements ongoing Government of Andhra Pradesh efforts to enhance industrial growth and create high-quality jobs. It has three outputs: (i) corridor management strengthened and ease of doing business improved, (ii) Visakhapatnam–Chennai Industrial Corridor (VCIC) infrastructure strengthened, and (iii) institutional capacity, human resources, and program management enhanced. The MFF and grant support priority infrastructure investments in the VCIC, and the PBL and TA support policy reform and institutional development in the state. The Department of Industries and Commerce (DOIC) of the Government of Andhra Pradesh is the MFF executing agency. The implementing units are Andhra Pradesh Industrial Infrastructure Corporation (APIIC), Transmission Corporation of Andhra Pradesh, Andhra Pradesh Road Development Corporation (APRDC), and Greater Visakhapatnam Municipal Corporation (GVMC).

**Impact and Outcome.** The impact of VCICDP will be an increased contribution of the manufacturing sector to the state's GDP, trade, and employment. The outcome will be enhanced growth and competitiveness of the VCIC. The Program-based Loan (PBL) will support policy reforms and institutional development in the state's industrial sector (Output 1); and the multitranche financing facility (MFF – two tranches) will support priority infrastructure investments in VCIC (Outputs 2 and 3). The VCICDP will develop two industrial clusters in the Visakhapatnam node—Rambilli and Nakapalli—and two clusters in the Srikalahasti–Chittoor node: Naidupeta and Chittoor–South.

**Outputs.** The outputs of Tranche 2 of VCICDP are:

**(1) Output 1: Visakhapatnam industrial node infrastructure strengthened.** This will (i) develop internal infrastructure in the start-up area of the 160-hectare Rambilli industrial cluster; (ii) develop internal infrastructure in the start-up area of the 441-hectare Nakkapalli industrial cluster with a bulk water transmission line; (iii) widen the 13.8 kilometer (km) Atchuthapuram–Anakapalli road with features friendly to the elderly, women, children, and persons with disabilities (EWCD) for better access to National Highway 16; (iv) improve a 4.4 km access road to the Nakkapalli cluster with EWCD-friendly features; and (v) improve awareness and knowledge among the community members including women in Rambilli and Nakapalli industrial clusters and along Atchuthapuram to Anakapalli roads. Internal infrastructure in these clusters will include roads, storm water drains, water supply systems, and electric power distribution systems. Target industries in the Visakhapatnam node include pharmaceuticals, transport equipment, electronics and information technology, and textiles.

**(2) Output 2: Srikalahasti–Chittoor industrial node infrastructure strengthened.** This will (i) develop internal infrastructure in the start-up area of the 938-hectare Chittoor–South industrial cluster, (ii) improve a 9.5 km access road to the Chittoor–South industrial cluster with EWCD-friendly features, (iii) improve an 8.7 km access road to the Naidupeta industrial cluster with EWCD-friendly features, and (iv) improve awareness and knowledge among the community

members including women in Chittoor–South industrial cluster. Internal infrastructure in the start-up area of the Chittoor–South cluster will include internal roads, storm water drains, water supply systems, and electric power distribution systems. Target industries in the Srikalahasti–Chittoor node include machinery, food processing, electronics and information technology, and textiles.

**(3) Output 3: Sustainable, green, and integrated industrial development enhanced.** This will (i) roll out an updated marketing action plan for investment promotion; (ii) enhance skills of people including socially vulnerable and economically weak people; (iii) establish green corridor model operational guidelines at industrial cluster level; (iv) develop a disaster risk management plan to strengthen industrial cluster resilience under extreme weather; (v) formulate a plan for the sustainable operation and maintenance (O&M) of start-up industrial clusters; (vi) roll out a toolkit with gender-responsive and socially inclusive guidance, to integrate industrial and urban planning including industry housing in areas adjacent to industrial clusters; (vii) prepare and implement gender mainstreaming guidelines of DOIC; and (viii) disseminate knowledge of innovative corridor program designs including gender equality and socially inclusive intervention results, to other industrial clusters across the region.

This IEE for package VCICDP/APRDC/07 pertains to the output 1 for the Visakhapatnam node for the Widening of Anakapalli to Atchuthapuram Road.

**Purpose of the Initial Environmental Examination.** ADB requires the consideration of environmental issues in all aspects of the Bank’s operations, and the requirement for environmental assessment are described in ADB’s Safeguard Policy Statement (SPS), 2009. The subproject selection criteria in the MFF’s Environmental Assessment and Review Framework (EARF) have been used for screening to ensure the succeeding subprojects will not be potential Category A for environment. Project 2 of the MFF is Category B for environment per ADB SPS, 2009 and requires preparation of initial environmental examination (IEE) report.

This IEE has prepared for Package No. APRDC/07 Anakapalli-Atchuthapuram road following the EARF, Government of India laws and policies, and ADB SPS environmental requirements. This IEE will be included in the bid and contract documents. Under EIA Notification 2006 (amended 2009, 2011, and 2013) all new state highways, or expansion of existing state highway outside hilly terrain above 1000m above mean sea level (amsl) and or ecologically sensitive areas are exempted from the process of obtaining environmental clearance.

**Subproject Scope.** APRDC has finalized the design standards for roads in rural and built-up areas which will be applicable to VCICDP subprojects to ensure safety of road users. As the roads under the project are intended to improve better connectivity to VCIC, it is intuited that all the roads under the projects would be developed at least to 4-lane standard. The improvement schemes so suggested on the basis of the study would relieve traffic congestion along the route and bring about savings in vehicle operating and total transportation costs. The improved road conditions would promote user comfort, safety and environmental standards. In addition to the above the better road condition will help to decrease the air and noise pollutions and reduce GHG emissions.

Package No. APRDC/07 Atchuthapuram–Anakapalli road improvement subproject includes widening of the existing 2-lane carriageway to 4-lane configuration. There are about 47 culverts along the project out of which 33 are pipe culverts and balance 14 are slab/arch culverts for the total length of road of 13.78 kilometers (km) Two minor bridges are also proposed for reconstruction (Details of structures proposed along the road are listed in separate annexure.) Road safety expert was engaged during project design and several elements as advised have

been incorporated such as provision of high mast lights, provision of signage, speed limits, footpaths for pedestrian safety, etc. Sufficient length of crash barriers along with Road Signages are being provided throughout the project in line with APRDC's design standards for roads.

**Description of the Environment.** The 13.78 km Anakapalli-Atchuthapuram road is in Visakhapatnam District, Andhra Pradesh and lies between 17°- 15' and 18°-32' Northern latitude and 18°-54' and 83°-30' in Eastern longitude. It is bound on the north partly by the Orissa State and partly by Vizianagaram District, on the south by east Godavari District, on the West by Orissa State and on the East by Bay of Bengal.

There are no protected areas, forests, wetlands, mangroves, or estuaries in or near the subproject locations. Atchuthapuram–Anakapalle road is not passing through any wildlife sanctuary, national park, tiger reserve, protected area or any other similar eco-sensitive areas. There are no physical cultural resources along the 13.78 km road stretch. Area sensitive receptors are recorded in the IEE.

**Potential environmental impacts and mitigation measures.** The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are localized and likely to be associated with the construction process at isolated locations and are produced because the process is invasive, involving excavation, obstruction at specific construction locations, and earth movements; and (iii) being located mainly along roads and built-up area will not cause direct impact on terrestrial biodiversity values. The potential adverse impacts can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Civil works will be implemented by contractors to be engaged by APRDC. The design and requirements are in accordance with Indian Bureau of Standards which follows international good practices.

During construction, impacts will likely arise from the earthworks, materials storage, construction wastes, workers camp/s, and disturbance to residents, businesses, and traffic. These temporary impacts are common for construction activities in urban areas, and there exist well-developed methods for their effective mitigation. Contractor and subcontractor will be required to submit a site-specific environmental management plan (SEMP) prior to start of works and to ensure: The contractor will identify the source of construction material and procure from approved sources. This material includes aggregate sand and borrowed earth. (Details of borrow areas are mentioned in Table 2 and 3 of this IEE and details of aggregate suppliers are mentioned in point 101 of this IEE).

The contractor will source the material from authorized suppliers in the vicinity of the subproject. The contractor will include a copy of valid licenses of these suppliers in the monitoring reports submitted to APRDC. The following will be adhered to during project implementation: (i) earthworks will be conducted during the dry season to avoid difficult working conditions that prevail during the monsoon; (ii) stockyards are located at least 300 m away from watercourses; (iii) fuel and lubricant storage areas are located away from drainage; (iv) construction wastes are minimized and disposal facilities are identified; (v) locations of workers camps, if needed are approved by implementing agency; (vi) wastewater are prevented from entering into streams, watercourses, or irrigation channels; (vii) open burning of solid wastes is strictly prohibited and strict segregation, reuse and recycling activities within the construction site and workers camp; (viii) area sensitive receptors are factored in work schedule and construction methodology; (ix) coordinate with social safeguards team for potential disturbances to roadside shops and vendors;

and (x) traffic management and road signages are coordinated with APRDC and local traffic police.

During operation, impacts will likely arise from road safety issues, and repair and maintenance activities. To address road safety issues, the design of the road follows APRDC design standards and VCICDP Project 2 includes engagement of road expert during the design phase to prepare the road safety program. Potential impacts during maintenance phase will include repair and maintenance activities similar in nature with construction impacts but of lesser duration and significance.

**Environment Management Plan.** This IEE includes an environmental management plan (EMP) to avoid and mitigate potential impacts and risks identified in the environmental assessment. The EMP covers general mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

As this IEE and EMP is included in the bid and contract documents, the contractor and subcontractors are required to (i) comply with the measures relevant to the contractor in the IEE and the EMP; (ii) make available a budget for all such environmental measures; (iii) provide the implementing agency with a written notice of any unanticipated environmental risks or impacts that arise during construction, implementation or operation of the subproject that were not considered in the IEE and the EMP; (iv) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and (v) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.

The contractor will be required to submit a submit to the project implementing unit (PIU) the site-specific environmental management plan (SEMP) prior to start of works to ensure site-specific conditions and mitigation measures are appropriate, practical and applicable. The SEMP will include (i) mitigation measures in line with the EMP included in this IEE including; (ii) contractor's roles and responsibilities in obtaining statutory clearances, stakeholders engagement, consultations, and grievance redressal; (iii) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (iv) monitoring program as per SEMP; and (v) budget for SEMP implementation. PIU will review the SEMP, supervise its implementation, and advise contractors on any corrective actions, if required. A copy of the approved SEMP will be kept on-site and available to stakeholders at all times.

**Indicative EMP Cost.** Based on the mitigation measures and monitoring program as specified in the EMP of this IEE, the indicative budget for implementation is **₹1,23,28,000**. The cost includes cost towards compensatory afforestation for 1657 trees that will be impacted, monitoring for air quality, water quality, and noise levels for baseline and during construction, capacity building, workforce, administrative and other costs (such as public consultation and information disclosure, and GRM implementation). The costs to implement mitigation measures related to construction and execution of works (signs, barricades, warning systems, traffic management, occupational health and safety, waste management and disposal, etc.) are to be covered as part of the civil works.

**Consultation, Disclosure, and Grievance Redress Mechanism.** The stakeholders were involved during the IEE through public consultations and on-site discussions. The views expressed by stakeholders were incorporated in the IEE and project design. IEE will be made

available to the public through the ADB and APRDC websites, and contractors during construction period. The consultation process will continue during project implementation to ensure that stakeholders are fully engaged in the project and can participate in its development and implementation. A grievance redress mechanism is described within IEE to ensure that public grievances are recorded and addressed quickly.

**Implementation Arrangement.** The implementation arrangements put in place for the MFF, and Project 1 will continue for Project 2. Program management unit (PMU) established within Directorate of Industries by DOIC (EA), is responsible for planning, implementation, monitoring and supervision, and coordination of MFF. PMU is supported by Project implementation units (PIUs) established in Andhra Pradesh Road Development Corporation (APRDC) which will implement road infrastructure subprojects under Project 2. PMU and PIUs are supported by a Project Management and Supervision Consultant (PMSC). The institutional roles and responsibilities of PMU and PIUs are established to ensure environmental safeguards are implemented and complied with during design, construction, and operation phases. PMU is staffed with safeguards officers to oversee and ensure environmental and social safeguards compliance. APRDC has three environmental safeguards managers (one each in Rajahmundry, Vizag and Tirupati) to oversee the day-to-day implementation of SEMP by the contractors and ensure safeguards compliance. PMSC team with an environment specialist and a health and safety specialist based in PMU and supported by two field-based environmental engineers in Vizag and Chittoor Nodes will assist APRDC and PMU in implementation, monitoring, and reporting on environmental safeguards. Contractors will be responsible for implementing the mitigating measures during the design/construction phase, and APRDC and PMU will be responsible for monitoring.

**Monitoring and Reporting.** PMU will be responsible for overall environmental safeguards compliance of the project. APRDC, with support from PSMC, will submit monthly monitoring reports to PMU. PMU will consolidate the monthly reports and will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

**Conclusions and Recommendations.** Based on the findings of the IEE, the Anakapalli-Athchuthapuram road improvement subproject is unlikely to cause any significant, irreversible or unprecedented environmental impacts. The potential impacts localized, temporary in nature and can be addressed through proven mitigation measures. Hence, the classification of the subproject as Category B per ADB SPS, 2009 is confirmed and no additional study or environmental assessment is required to be conducted.

The Contract for this package has been awarded and any changes during implementation in the alignment / design will be included and IEE shall be updated accordingly.

Recommendations are as follows:

- IEE including EMP was part of the bid and contract document.
- Obtained statutory clearances prior to award of contract and ensured conditions/requirements are incorporated in the subproject design and documents.
- during bidding stage, orientation on the environmental safeguard requirements is provided to interested bidders.
- upon mobilization of the contractors, PMU and PIU to provide a safeguards orientation per IEE and project administration manual.

- contractor to appoint environmental safeguards nodal person responsible for environmental safeguards compliance, occupational health and safety and core labor standards.
- Prepare and implement tree management plan for removal of trees in road right of way and to carryout afforestation
- Conduct baseline monitoring of air, noise, water etc before the start of civil works, and conduct periodically during the works as per the environmental monitoring plan
- submit to PIU the site-specific EMP (SEMP) and other subplans as required; and
- PMU and PIU to closely monitor contractor's implementation of the SEMP and provide guidance on corrective actions on a timely manner.

## I. INTRODUCTION

### A. Background

1. The Visakhapatnam-Chennai Industrial Corridor Development Program (VCICDP) has been taken by the Government of Andhra Pradesh (GoAP) with ADB loan assistance to support infrastructure development, and policy and institutional reforms to stimulate economic growth and employment generation. will complement the ongoing efforts of the GoAP to enhance industrial growth and create high quality jobs. The VCICDP comprises a multitranche financing facility (MFF), a grant, and a policy-based loan (PBL). The MFF and the grant will support priority infrastructure investments in the Visakhapatnam-Chennai Industrial Corridor (VCIC) and the PBL will support policy reforms and institutional development in the state.

2. The road improvement subprojects that have been identified for the MFF include: (i) Rajangaram–Samarlkot (also known as “ADB Road”, 29 km), (ii) Anakapalli–Atchuthapuram (13.78km), and (iii) connectivity roads to the industrial clusters of Nakkapalli, Rambilli and Chittoor. Project 1 of the MFF includes Rajangaram–Samarlkot (ADB Road) while Project 2 will include Anakapalle–Atchuthapuram road improvement and three connectivity roads. The implementing agency is the Andhra Pradesh Road Development Corporation (APRDC)2.

### B. Purpose of the Initial Environmental Examination

3. ADB requires the consideration of environmental issues in all aspects of the Bank’s operations, and the requirement for environmental assessment are described in ADB’s Safeguard Policy Statement (SPS), 2009. The subproject selection criteria in the MFF’s Environmental Assessment and Review Framework (EARF) have been used for screening to ensure the succeeding subprojects will not be potential Category A for environment. Project 2 of the MFF is Category B for environment per ADB SPS, 2009 and requires preparation of initial environmental examination (IEE) report.

4. This IEE has been prepared for Package No. APRDC/07 Atchuthapuram–Anakapalli road following the EARF, Government of India laws and policies, and ADB SPS, 2009 environmental requirements. This IEE will be included in the bid and contract documents. The subproject is not listed under Schedule 1 of the Government of India’s Environment Protection Act (EPA) and Environment Protection Rules (EPR) therefore this IEE is not required to be approved by the Andhra Pradesh State Environmental Impact Assessment Authority (SEIAA). However, the subproject requires to meet Government of India requirements related to prevention of pollution, occupational health and safety, and labor standards. A section on required statutory clearances is included in this IEE.

5. **Name and Address of the Individual Institution Preparing the Report.** The project proponent is:

Project Management Unit  
Visakhapatnam-Chennai Industrial Corridor Development Program  
Commission on Industries  
Government of Andhra Pradesh

6. The subproject will be implemented by APRDC through its network at district level. The detailed project preparation has been assigned to Roughton International Ltd, UK in association with SATRA Infrastructures Management Services Private Ltd. The IEE report has been prepared

by APRDC with support from technical assistance consultants and Detailed Project Report consultants (M/s SATRA Infrastructures Management Services Pvt Limited with address at Centre Pont Building near Rasoolpura Metro Station, Begumpet, Hyderabad).

7. Initial screening and identification of potential impacts were conducted using ADB's rapid environmental assessment (REA) checklist (Appendix 1) and the scope of the IEE was determined using a "No Mitigation Scenario - Scoping Checklist" (Appendix 2). The study team visited the road alignment and nearby areas to identify the potential impacts (both positive and negative), met local people and conducted meetings, brainstorming sessions, field examinations, and data gathering.

8. The IEE report follows the recommended outline per ADB SPS and primarily:

- (i) meets both Government of India's EPA and EPR.
- (ii) provides information on the project and its environmental requirements.
- (iii) provides the baseline physical, ecological, cultural and socioeconomic environments and resources in and surrounding the project's area of influence.
- (iv) identifies and assesses potential environmental impacts arising from the implementation of the project.
- (v) recommends measures to avoid, mitigate, and compensate the adverse impacts.
- (vi) presents information on stakeholder consultations and participation during project preparation.
- (vii) recommends a mechanism to address grievances; and
- (viii) includes an environmental management plan.

## II. DESCRIPTION OF THE SUBPROJECT

### A. Need and Relevance of the Subproject

9. VCICDP is vital from the point of connecting various industrial corridors to the national highways for the ease in transportation of goods and inviting various industries by providing infrastructure facilities like water supply, power, roads and other related goods and services. The Atchuthapuram–Anakapalli road connects the Visakhapatnam-Chennai Industrial Corridor Cluster to a national highway, i.e., NH16 and this road needs upgrading and expansion from 2 lanes to 4 lanes to meet the needs of existing and upcoming clusters.

10. The implementation of the road widening subproject will bring about the following direct benefits:

- (i) improved quality of life for the rural population in the subproject influence area (10 km radial distance from the Anakapalli-Atchuthapuram Road) - this will result to better access to markets, health, education and other facilities; and the derived stimulus for local economic activity.
- (ii) The proposed widening would increase the connectivity of the industrial cluster with the nearby areas.
- (iii) a more efficient and safe road transport system through reduced travel times, reduced road accidents, reduced vehicle operating and maintenance costs and reduced transportation costs for goods; and
- (iv) intra-state connectivity to Visakhapatnam, Kakinada, Ongole and Nellore districts and also port connectivity to Kakinada port and Krishnapatnam port.

11. **Project Location and Coordinates.** Figures 1 and 2 provide the photographs of key road stretches and Figure 3 shows the map of the 13.78 km road alignment. The project area lies between latitude 17041' 23" north and longitude 8300'8.45" east and latitude 17033'50" north and longitude 82 058'44.57" east.

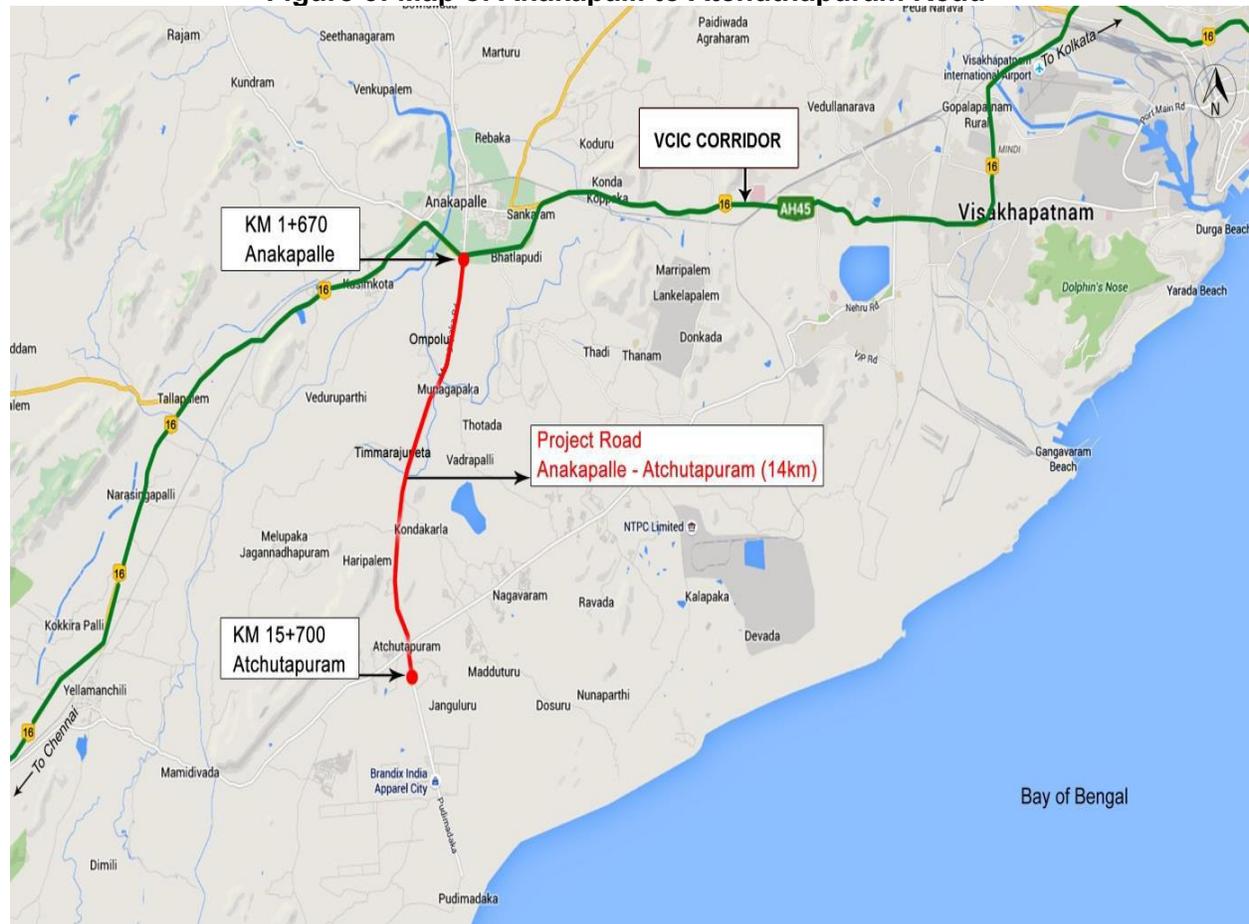
**Figure 1: SubprojectJunctions - (Start) NH-16 junction at Anakapalli (km 1+670)  
Atchuthapuram Junction (junction with Yellamanchili- Gajuwaka road)**



**Figure 2: End of the project road (km 15+700), about 1.1 km from Atchuthapuram  
Junction**



**Figure 3: Map of Anakapalle to Atchuthapuram Road<sup>1</sup>**



<sup>1</sup> Google link to access the road alignment showing existing receptors at both side of the existing road.  
<https://www.google.com/maps/place/Anakapalle/@17.6792874,83.0005702,1152m/data=!3m1!1e3!4m5!3m4!1s0x3a3971f5ce96dcf9:0x7ff16d0cf5f2e07718m2!3d17.6839233!4d83.0017492>

Figure 3a: Google Map of road alignment



Figure 3b: Map showing the project road traversing from Ankapalli to Atchutapuram

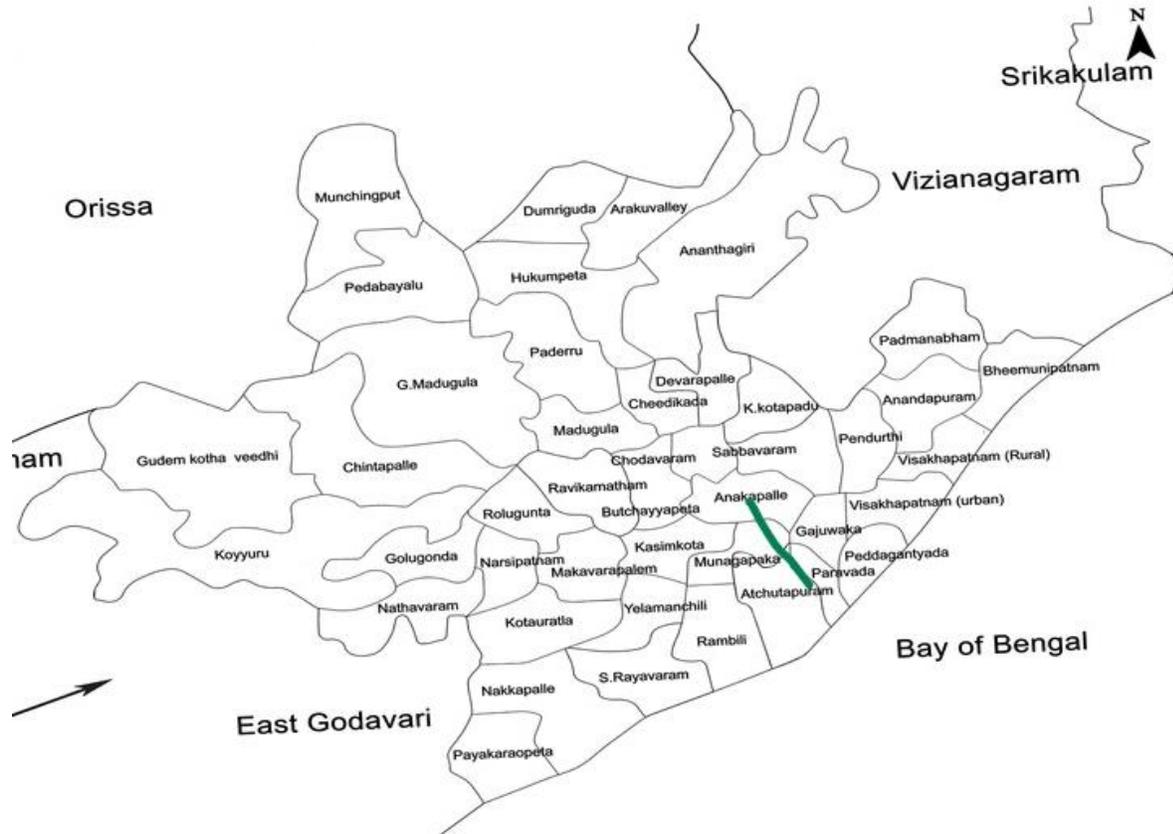


Figure 3b: District Map showing the Road traversing

## B. Existing Scenario

12. **Road Type.** The Anakapalli–Atchuthapuram Road, throughout its entire length, is having flexible carriageway with 5.5 meters (m) pavement and earthen shoulder on either side. The terrain is flat, and the embankment is relatively low (average 0.4m) except at few locations, where the embankment height observed is about 1.5m on average.

13. **Right-of-way.** The existing right-of-way (ROW) established varies mostly between 18m and 30 m however, there are stretches/isolated locations where ROW is only between 12m and 15 m.

14. **Pavement Condition.** The type and extent of surface distress were evaluated using the detailed visual inspection (DVI) method. Road measurement data acquisition system (ROMDAS) mounted with lasers were used for the determination of pavement roughness along the entire length of the road. Distresses such as cracking, potholes and raveling are recorded for an interval of 200m. The average roughness observed is international roughness index (IRI) 4.76. The overall condition rating is: 0% - very good, 0% - good, 2.07% - fair, 20.69% - mediocre, and 77.24% - poor.

15. **Bridges and culverts.** There are no major bridges in the Anakapalli–Atchuthapuram Road. The 2 canal bridges identified are minor bridges. There are 47 culverts along the road alignment, out of which 33 are pipe culverts and the rest 14 are slab/arch culverts.

16. **Bypasses/Re-alignment Requirements.** There are no bypasses or major re-alignments anticipated along the Anakapalli–Atchuthapuram Road.

17. **Junctions and Rail-road Crossing.** There are two major junctions, and no railway crossing is found on the project Anakapalli–Atchuthapuram Road.

### C. Subproject Scope

18. **Subproject Selection.** The Anakapalli–Atchuthapuram road improvement subproject has been selected based on EARF and project selection criteria such as population, industry growth, poverty index, existing water supply infrastructure, and potential impacts to protected areas and physical cultural resources.

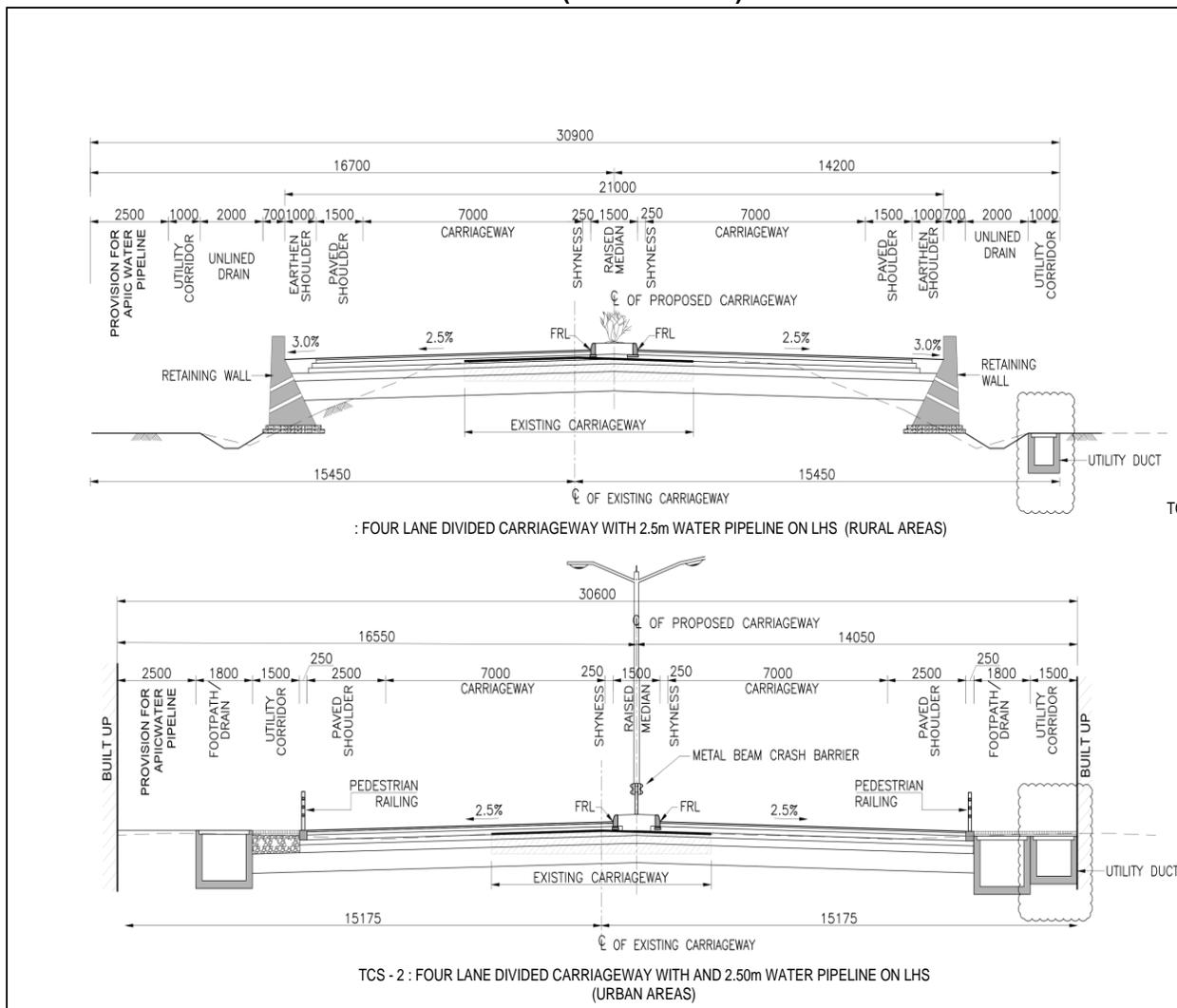
19. **Components.** Figures 4 to 7 provides the cross-section drawing per detailed engineering design. The Anakapalli–Atchuthapuram road improvement subproject will include the following:

- (i) **widening of Anakapalli–Atchuthapuram road from the existing 2-lane to 4-lane configuration** - horizontal geometry will be based on Indian Roads Congress (IRC) standard 38 –1988 “Guidelines for Design of Horizontal Curves for Highways and Design Tables (First Revision)” and vertical geometry will be based on IRC SP 23–1993 and existing gradients throughout the alignment satisfies the stipulated IRC standards and the vertical curves which determine the sight distance and driving comfort was maintained as per the proposed design speed of 100 (Ruling), 80 (Minimum 65 km/hr adopted for shorter length project road stretches (<20km length));
- (ii) **flyover**—a 4-lane flyover with length of 610 m will be constructed at Atchuthapuram Junction to avoid displacement of people and impacts on land and existing properties, assets, and businesses.
- (iii) **drainages** - side drains unlined, lined and lined with cover.
- (iv) **junctions** - major junctions at start will be taken up by NHAI and the junction at end points is designed as grade-separated junction as per the traffic forecast and relevant IRC codes including IRC 92–1985 for design of interchanges.
- (v) **pavement** - pavement profile for the main carriageway and paved shoulder will have a 200mm, 250mm, 80mm, and 40mm thicknesses for GSB, WMM, DBM, and BC, respectively. Pavement profile for the service road will have a 150 mm, 250 mm, 50 mm, and 30 mm thicknesses for GSB, WMM, DBM, and BC, respectively.
- (vi) **Pedestrian facilities-** Pedestrian facilities will be adequately provided in urban sections and at major intersections. Pedestrian-vehicular conflict can be effectively studied through the indicator suggested in IRC 103-1988, ‘Guidelines for Pedestrian Facilities’. The code suggests some form of control measure at mid blocks and intersections where the indicator  $PV^2$  is greater than or equal to  $2 \times 108$ . Where ‘P’ is the peak hour pedestrian volume and ‘V’ is the number of vehicles in that peak hour. The analysis was undertaken separately for the intersection where traffic surveys were conducted. LED lamps (double arm) around 229nos, transformers are being provided in the median along the project length for safe movement of pedestrians during the night.

- (vii) **lay-byes/parking areas and wayside amenities-** may be required based on present and projected traffic volume considerations. Bus bays and rest areas will be constructed at required locations.
- (viii) **road safety measures-** per IRCSP44–1996 like road delineators, signage, metal beam crash barriers (at sharp curves and bridge approaches) and guideposts (to delineate the edge of formation);
- (ix) **reconstruction of existing irrigation canal, water supply and utilities -** provision of utility duct along the road<sup>2</sup> and cross duct for crossing cables without digging the road.

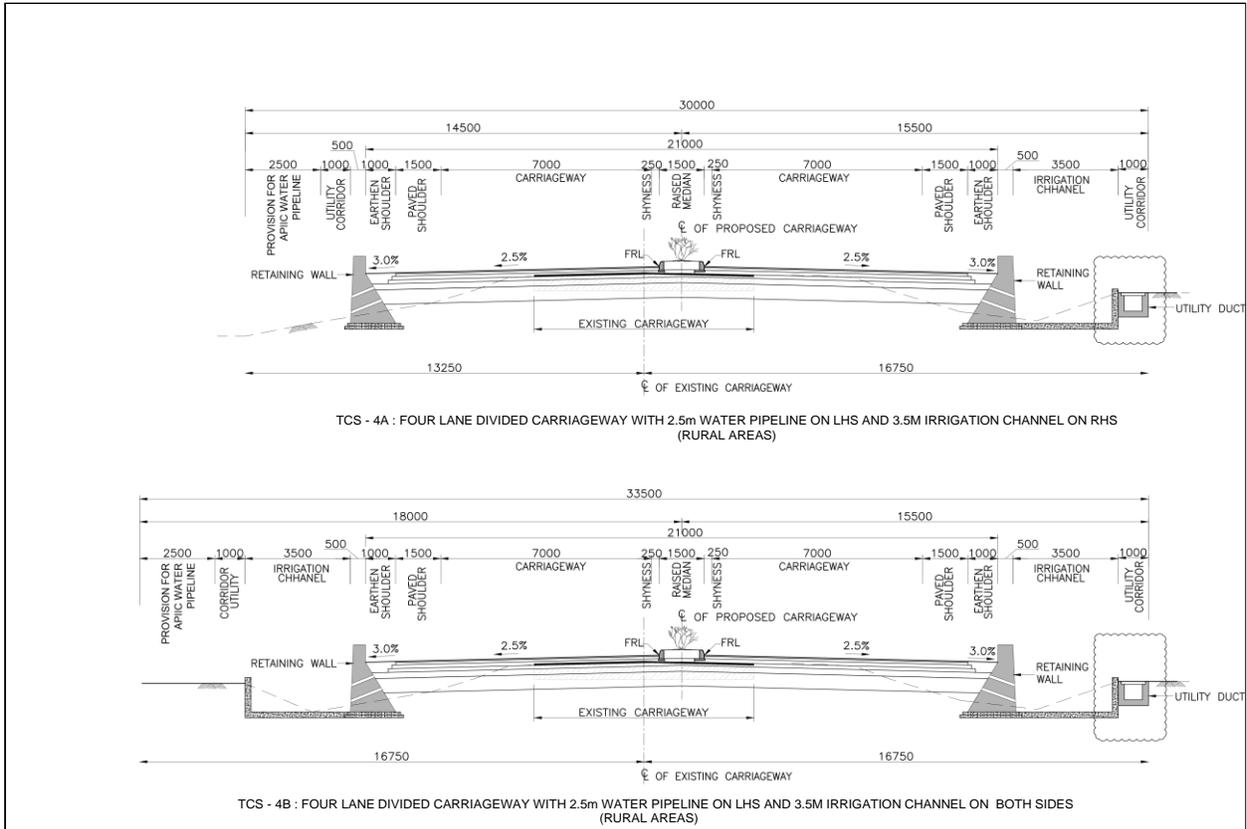
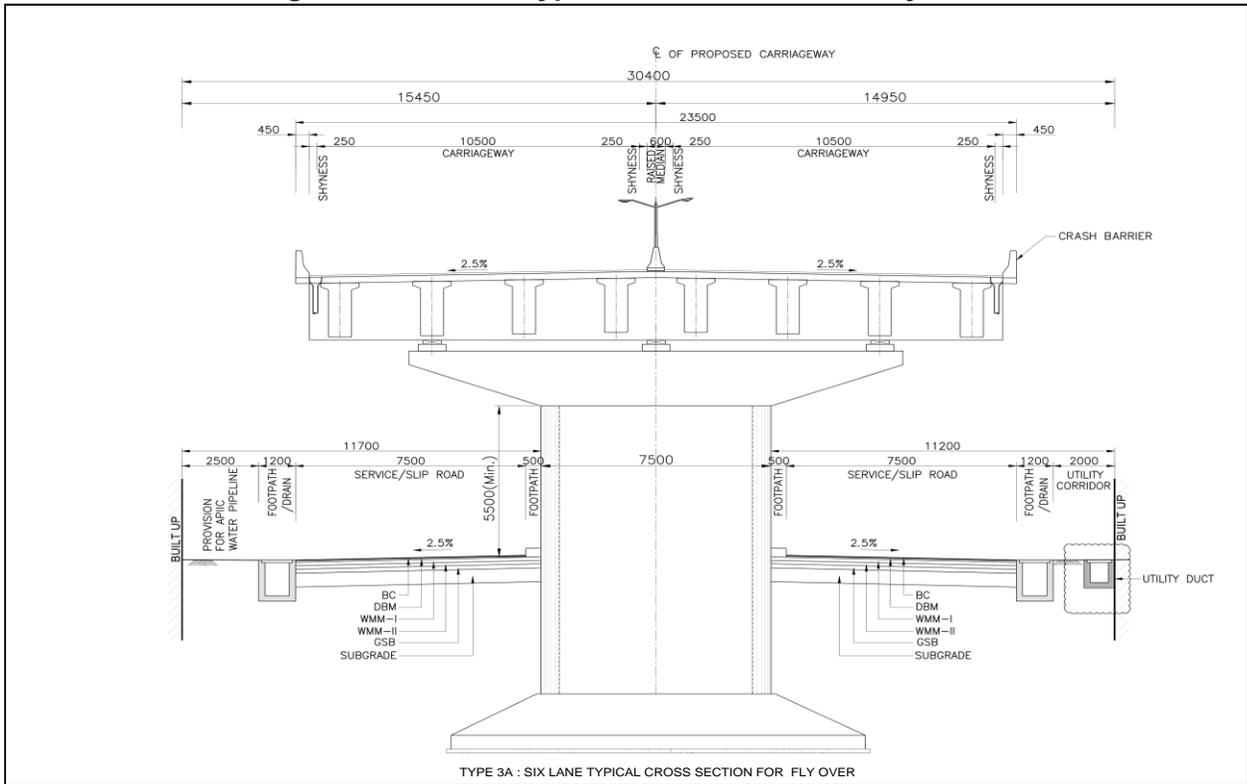
20. The Anakapalli-Atchuthapuram Road improvement subproject will be implemented in 24 months and as one construction package (Package No. VCICDP/APRDC/07).

**Figure 4: Four Lane divided Carriageway with 2.5 m Water Pipeline on LHS (Rural Areas) and LHS (Urban Areas)**

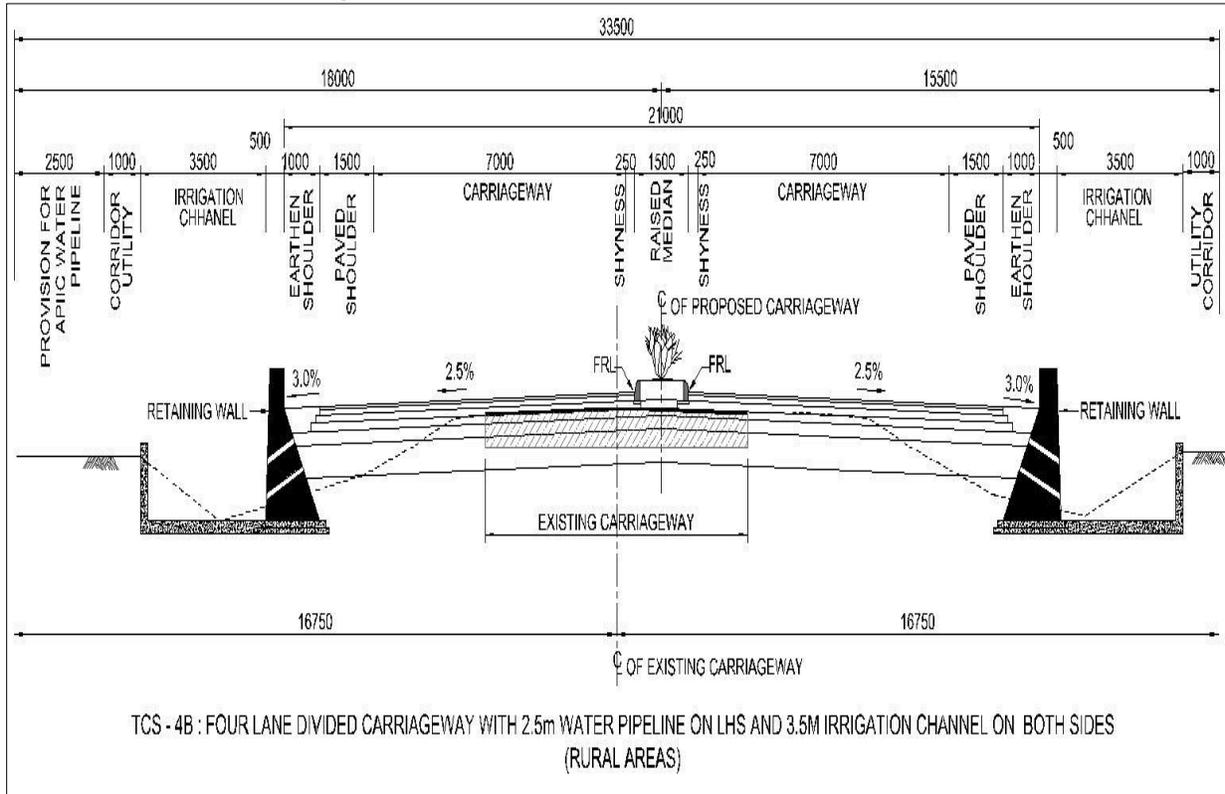


<sup>2</sup> As replacement for existing water supply pipes and irrigation canal along the Anakapalli–Atchuthapuram road, the subproject will include (i) pipe laying of water pipeline to Andhra Pradesh Special Economic Zone (APSEZ) (width 2.5m) in the left hand side ROW; (ii) improvement of existing irrigation canal in the road ROW (total of 3.5 km) at various locations along the road; and (iii) provision of utility corridor of width 1.0m to 1.5m along the ROW.

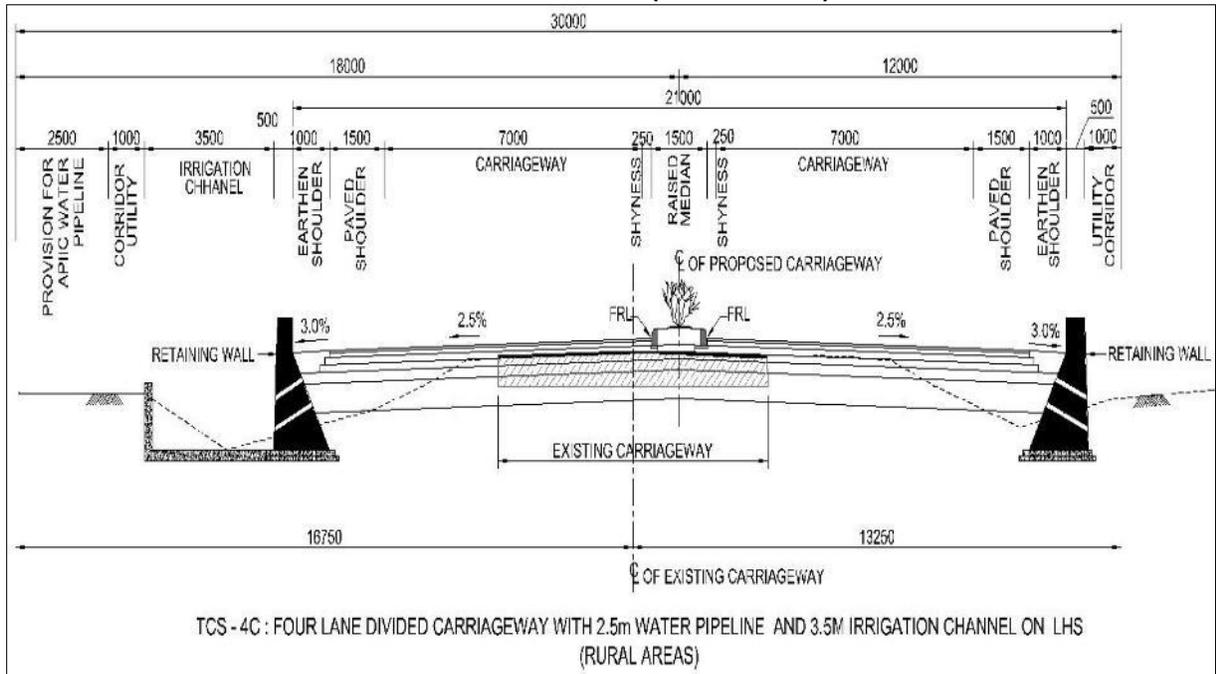
**Figure 5: Six Lane Typical Cross Section for Flyover**



**Figure 6: Four Lane divided Carriageway with 2.5 m Water Pipeline on LHS and 3.5 m Irrigation Channel on both sides (Rural Areas)**



**Figure 7: Four Lane divided Carriageway with 2.5 m Water Pipeline and 3.5 m Irrigation Channel on LHS (Rural Areas)**



21. **Construction materials required and borrowed area.** The different materials required for constructions of proposed road are mentioned in the table below:

**Table 1: Quantity of construction materials required for the Anakapalli–Atchuthapuram Road (from km 1+670 to km 15+450)**

SN	Item Description	Unit	Approx. Quantity
1	Fine aggregates	Cum	12,847
2	Course aggregates	Cum	262,937
3	Steel	MT	3,150
4	Cement	MT	9,775
5	Bitumen	MT	3,720
6	Earth from Borrow Area	Cum	3,19,392

22. The quantity of borrow soil required is 3,19,392 cubic meters of soil. The borrow areas, locations have already been identified. The table below enumerates the 3 Government land identified locations for the subproject. 6 acres of land will be for borrow soil. Road alignments are situated as such that no habitations nor forest areas will be encroached upon.

23. The quarries, sources of fine and coarse aggregates, are available in the vicinity of the proposed road. These quarries are situated in isolated areas, away from human and animal habitation alike. Contractor will identify the borrow areas for earth required at the time of construction. The contractor will have written agreement with the landowners for borrow area and rehabilitation will be done as per their agreement. The safety aspect of the borrow area shall be maintained as per IRC. And for quarry the contractor will procure aggregates from approved quarry by the mining dept. (Any other necessary approval and clearances will be obtained by the contractor). All prescribed precaution and mitigation measures will be implemented during construction period.

**Table 2: Details of Borrow Areas**

B.A. No.	Chainage (km)	Lead (km)	Side	Ownership details	Available quantity
			(LHS / RHS)		
B.A-1	7+100	0.4	LHS	Government land, Chuchukonda Village	Hills – adequate
B.A-2	9+000	2.1	RHS	Government land, Vadrapalle Village	Hills – adequate
B.A-3	11+700	1.3	LHS	Government land, Chowdapalle Village	Hills – adequate

LHS = left-hand side, RHS = right-hand side.

**Table 3: Location of Borrow Areas**

B.A. No.	XCL-CH_KM	SIDE	LEAD_DIST	Easting	Northing
BA-01	7.1	LHS	0.4 km	82o59'03.27"E	17o36'44.52"N
BA-02	9	RHS	2.1 km	82o57'28.55"E	17o35'35.18"N
BA-03	11.7	LHS	1.3km	82o58'56.90"E	17o34'46.02"N

km = kilometer, LHS = left-hand side, RHS = right-hand side.

### III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

#### A. ADB Safeguard Policy Statement

24. ADB SPS requires borrowers to meet a set of requirements (Safeguards Requirements 1) when delivering environmental safeguards for projects supported by ADB. The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process. Hence, APRDC is required to comply with these requirements. Summary of the step-by-step process is discussed below in this section. Detailed discussions are provided in the ADB SPS.<sup>3</sup>

25. **Screening and Categorization.**<sup>4</sup> Subprojects are to be screened for their expected environmental impacts and are assigned to a specific category (Footnote 6). Categorization is to be based on the most environmental sensitive component. However, for subproject(s) with component(s) that can trigger Category A or with potentially significant adverse impacts that are diverse, irreversible, or unprecedented, PMU shall examine alternatives to the subproject's location, design, technology, and components that would avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks, and to meet Category B categorization. The rationale for selecting the subproject location, design, technology, and components will be properly documented, including, cost-benefit analysis, taking environmental costs and benefits of the various alternatives considered into account. The "no action" alternative will be also considered. In general, criteria that can trigger subproject's 'Category A' are in Section V below.

26. **Environmental Assessment.** Environmental assessment shall include description of environmental and social baseline to provide an understanding of current conditions forming the benchmark against which subproject impacts are assessed. Environmental impacts and risks will be analyzed for all relevant stages of the project cycle, including design and planning stage, construction, operations, decommissioning, and post-closure activities such as rehabilitation or restoration. The structure and composition of the typical IEE report is provided in Annex to Appendix 1 of ADB SPS. The IEEs of sample subprojects prepared during the ADB loan processing stage<sup>5</sup> may be used as model documents for VCICDP subprojects.

27. **Environmental Planning and Management.** The PMU and PIUs shall prepare environmental management plan (EMP) to be included in the IEE report. The EMP shall describe and address the potential impacts and risks identified by the environmental assessment. The level

<sup>3</sup>ADB. 2009. *Safeguard Policy Statement*. Manila.

<sup>4</sup> Per ADB SPS, (i) **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required. (ii) **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible and, in most cases, mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required. (iii) **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed. (iv) **Category FI:** A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary.

<sup>5</sup> Subproject packages for which IEEs have been prepared during project processing include (i) APIIC/05: Providing water supply to industrial clusters/NIMZs in southern region (including Krishnapatnam node and Sri City, (ii) APIIC/06: Development of major infrastructure and utilities in start-up area of Chittoor south cluster, (iii) APIIC/09 Development of major infrastructure and utilities in Start-up area of Nakkapalli cluster (iv) APIIC/08 Development of major infrastructure and utilities in Start-up area of Atchuthapuram (Rambilli) cluster (v) APIIC/07: Providing bulk water supply and summer storage of 95 MLD to Atchuthapuram cluster, and (vi) APRDC/07: Widening of Atchuthapuram-Anakapalli Road to 4 lane,.

of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the subproject's impact and risks. The EMP shall include the proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

28. **Public Disclosure.** APRDC, through PMU, shall submit to ADB for disclosure on ADB website so affected people, other stakeholders, and the public can provide meaningful inputs into the subproject design and implementation:<sup>6</sup>

- (i) final IEE upon receipt;
- (ii) a new or updated EIA/IEE and corrective action plan prepared during subproject implementation, if any; and
- (iii) environmental monitoring reports submitted during subproject implementation upon receipt.

29. **Consultation and Participation.** PMU and PIUs shall carry out meaningful consultation<sup>7</sup> with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

30. **Grievance Redress Mechanism.** APRDC, through PMU, shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the subproject's environmental performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

31. **Monitoring and Reporting** shall monitor, measure and document the progress of implementation of the EMP. If necessary, PMU will identify the necessary corrective actions, and reflect them in a corrective action plan. PMU will prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

32. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, PMU shall update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

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<sup>6</sup> Per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

<sup>7</sup> Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

33. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the subproject the PMU and PIUs shall apply pollution prevention and control technologies and practices consistent with international good practices, as reflected in internationally recognized standards. When the Government of India regulations differ from these levels and measures, PMU shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

34. **Occupational Health and Safety.** PMU<sup>8</sup> shall ensure that workers<sup>9</sup> are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. PMU shall ensure to take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

35. PMU shall ensure to apply preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.<sup>10</sup> PMU shall also adhere to necessary protocols in response to emerging infectious diseases such as the corona virus disease (COVID-19) consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

36. **Community Health and Safety.** PMU shall ensure to identify and assess the risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and will establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

37. **Physical Cultural Resources.** PMU is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. Such resources likely to be affected by the subproject will be identified, and qualified and experienced experts will assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

38. **Environmental Audit.** When the subproject involves existing activities or facilities, PMU is responsible to ensure that relevant external experts will perform environmental audits to determine the existence of any areas where the subproject may cause or is causing

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<sup>8</sup> In case where responsibility is delegated to subproject contractors during construction phase, PMU shall ensure that the responsibilities on occupational health and safety as described herein are included in the contract documents.

<sup>9</sup> Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

<sup>10</sup> World Bank Group, 2007. *Environmental, Health, and Safety General Guidelines*. Washington, DC.

environmental risks or impacts. If the subproject does not foresee any new major expansion, the audit constitutes the environmental assessment for the subproject.

39. **Bidding and Contract Documents.** IEEs and EMPs are to be included in bidding and contract documents and verified by the PIUs. The PMU and PIUs shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all other conditions required by ADB,<sup>11</sup> and (ii) to submit to PIU, for review and approval, a site-specific environmental management plan (SEMP), including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per SEMP; and (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP. A copy of the EMP or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP or SEMP constitutes a failure in compliance and shall require corrective actions.

40. **Conditions for Award of Contract and Commencement of Work.** PMU shall not award any Works contract for a subproject until (i) relevant provisions from the EMP are incorporated into the Works contract; and (ii) the IEE is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance of such IEE. For "design, build, and operate" type contracts, PMU shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the Works contract; and (ii) the IEE is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance of such IEE.

## B. Government Environmental Legislations

41. The Ministry of Environment, Forests and Climate Change (MoEFCC) has the overall responsibility to set policy and standards for the protection of environment along with the Central Pollution Control Board (CPCB). This includes air, noise and water quality standards and the requirements for the preparation of Environmental Impact Assessment (EIA) statements for development projects. The list of statutes, policies, regulations and responsible agencies is given below in Table 4.

**Table 4: List of Statutes, Policies, Regulations and Responsible Agencies**

Sl. No.	Agency	Statute / Policy
1	Ministry of Environment and Forests	Environment (Protection) Act 1986
		Forest (Conservation) Act, 1927 Forest (Conservation) Act, 1980 (as amended in 1998) Forest (Conservation) Rules, 1981
2	Pollution Control Boards (State)	Water (Prevention and Control of Pollution) Act 1974 as amended in 1988  Air (Prevention and Control of Pollution) Act 1981 as amended in 1987

<sup>11</sup> Contractors to comply with (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

Sl. No.	Agency	Statute / Policy
3	Environment and Forest Department	Wildlife (Protection Act), 1972
4	Department of Transport; and Department of Policy	Motor Vehicle Rules, 1989 Motor Vehicle Act, 1988 Rules of Road Regulations, 1989
5	Archaeological Survey of India, Directorate of Archaeology	Ancient Monuments and Archaeological Sites and Remains Act, 1958
6	Revenue Department	Land Acquisition Act, 1894

42. The following requirements are particularly important for the subproject and need special attention in order to avoid any delays for a project:

- (i) Under EIA Notification 2006 (amended 2009, 2011, and 2013) all new state highways, or expansion of existing state highway outside hilly terrain above 1000 m above mean sea level (amsl) and or ecologically sensitive areas are exempted from the process of obtaining environmental clearance.
- (ii) Further, under the same notification, it is stated that any state highway projects will be treated as category A if located in whole or in part within 5 km from of: (a) protected areas notified under the Wildlife (Protection) Act, 1972; (b) critically polluted areas as notified by the CPCB from time to time; (c) notified eco-sensitive areas; and (d) 5 km from interstate boundaries and international boundaries.
- (iii) As per the Forest Conservation Rules (1981, amended 2003) a forestry clearance from Department of Forests is required for diversion of forest land for non-forest purpose. Processing of the forestry clearance entails two stages: stage I and stage II. Amongst other requirements stage I clearance requires the applicant to make payments for compensation of forestry land that will be acquired and trees that will be cut under the project. Accordingly, timely allocation of budget for this purpose by the applicant is necessary to expedite the clearance process.
- (iv) Cutting of trees in non-forest land require a tree cutting permit from the local forestry department. All trees cut under a project must be compensated by compensatory afforestation as required by the State Forest Department.
- (v) Placement of hot-mix plants, quarrying and crushers, batch mixing plants, discharge of sewage from construction camps requires No Objection Certificate (CTE and CTO) from State Pollution Control Board prior to establishment.
- (vi) Permission from Central Ground Water Authority is required for extracting groundwater for construction purposes.

**Table 5: Applicable Government of India Environmental Legislations and Specific Requirements**

SN	Legislation	Requirements for the Subproject	Applicability
1	National Environment Policy (NEP), 2006	Project should adhere to the NEP principle of enhancing and conservation of environmental resources and abatement of pollution	The policy governing the environmental rules and legislations and is applicable to all the subprojects.
2	EIA Notification, 2006	Environmental Clearance (EC)	This subproject is not included in Schedule 1 of EIA Notification therefore does not need

SN	Legislation	Requirements for the Subproject	Applicability
			environmental clearance from SEIAA.
3	Water (Prevention and Control of Pollution) Act, 1974 amended 1988 and its Rules, 1975	<ul style="list-style-type: none"> <li>• Consent for establishment (CFE) and consent for operation (CFO) from APPCB; and</li> <li>• Compliance to conditions and disposal standards stipulated in the CFE and CFO</li> </ul>	Applicable to construction activities of the subproject
4	Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules 1982	<ul style="list-style-type: none"> <li>• CFE and CFO from APPCB as applicable; and</li> <li>• Compliance to conditions and emissions standards stipulated in the CFE and CFO.</li> </ul>	<p>Applicable to construction activities of the subproject.</p> <p>For the subproject, the following will require CFE and CFO: (i) diesel generators; (ii) and (iii) vehicles emitting air pollutants.</p>
5	<p>Environmental (Protection) Act, 1986 amended 1991 and the following rules/notifications:</p> <ul style="list-style-type: none"> <li>• Environment (Protection) Rules, 1986 including amendments;</li> <li>• Municipal Solid Wastes (Management and Handling) Rules, 2000;</li> <li>• Noise Pollution (Regulation and Control) Rules, 2000;</li> <li>• Environmental Standards of CPCB; and</li> <li>• Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2009.</li> </ul>	<ul style="list-style-type: none"> <li>• Solid waste and sludge generated at proposed facilities shall be disposed in accordance with the MSWM Rules;</li> <li>• Compliance with noise standards;</li> <li>• Compliance to environmental standards (discharge of effluents);</li> <li>• Restriction of activities (including construction, tree cutting, etc.) in the notified zones. There are no eco sensitive zones in or near the subproject locations;</li> <li>• Rules defines and classifies hazardous waste provides procedures for handling hazardous waste;</li> <li>• Requires Pollution Control Board's consent for handling hazardous waste; and</li> <li>• Procedure for storage of Hazardous waste and provides procedures for recycling, reprocessing or reuse, import and export of hazardous waste.</li> </ul>	Applicable to construction activities of the subproject

SN	Legislation	Requirements for the Subproject	Applicability
6	<p>Contract Labour (Regulation and Abolition) Act, 1970</p> <p>The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979</p>	<ul style="list-style-type: none"> <li>• Department of Labour, GoAP as principle employer;</li> <li>• Contractor shall register with Labour Department, GoAP if inter-state migrant workmen are engaged;</li> <li>• Adequate and appropriate amenities and facilities shall be provided to workers including housing, medical aid, traveling expenses from home and back, etc.;</li> </ul>	Contractors to obtain license from designated labour officer
7	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996	<ul style="list-style-type: none"> <li>• Cess should be paid at rate not exceeding 2% of the cost of construction as may be notified;</li> <li>• The employer is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc.; and</li> <li>• The employer has to obtain a registration certificate from the Registering Officer</li> </ul>	Applicable to any building or other construction work and employ 10 or more workers
8	The Child Labour (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in all the subprojects.	No child below 14 years of age will be employed or permitted to work in all the subprojects.
9	Minimum Wages Act, 1948	All construction workers should be paid not less than the prescribed minimum wage.	Applicable to construction activities of the subproject
10	Workmen Compensation Act, 1923	Compensation for workers in case of injury by accident.	Applicable to construction activities of the subproject
11	Equal Remuneration Act, 1979	Equal wages for work of equal nature to male and female workers.	Applicable to construction activities of the subproject
12	AP State Environment Policy	<ul style="list-style-type: none"> <li>• Follows the National Environment Policy, 2006; and</li> <li>• Project implementation should adhere to the policy aims.</li> </ul>	Applicable to construction activities of the subproject

SN	Legislation	Requirements for the Subproject	Applicability
13	The Motor Vehicles Act, 1988	<ul style="list-style-type: none"> <li>• Standards for vehicular pollution and prevention control. The authority also checks emission standards of registered vehicles, collects road taxes, and issues licenses;</li> <li>• In August 1997, the Pollution under Control Certificate (PUC) program was launched in an attempt to crack down on the vehicular emissions in the States; and</li> <li>• All the vehicles that will be used in construction of the subproject will have to comply with the PUC norms set down under this act</li> </ul>	Applicable to construction activities of the subproject
17	Public Liability and Insurance Act 1991	Protection from hazardous materials and accident	Applicable to construction activities of the subproject
18	National Environment Appellate Authority Act (NEAA) 1997	Grievance's process and procedures	Applicable to construction activities of the subproject
19	Explosive Act 1984 – for transporting and storing diesel, bitumen, etc.	Safe transportation, storage and use of explosive material	Applicable to construction activities of the subproject
20	Permission for use of water for construction purpose from irrigation department	Use of surface water for construction	<p>Applicable to construction activities of the subproject</p> <p>To be obtained prior to initiation of any work involving use of surface water for construction</p>
21.	CRZ Notification, 2019	Proposed project road/identified borrow areas may attract CRZ Notification, 2019	Contractor is not allowed to procure construction material from CRZ notified areas.
22.	Minor Mineral and concession Rules	For opening new quarries. Regulate use of minor minerals like stone, soil, river sand etc.	Applicable
23	The Mining Act (1952)	The mining act has been notified for safe and sound mining activity. The construction of road subprojects will require aggregates. These will be procured through mining from riverbeds and quarries	Applicable

43. **Government Regulatory Body.** The Andhra Pradesh Pollution Control Board (APPCB) is the main state-level regulatory agency that is responsible environment protection and pollution control. APPCB through its 19 Regional Offices across the state regulates environmental protection related activities. Subproject towns across the Visakhapatnam Chennai Industrial Corridor are under the jurisdiction of different Regional Officer's and they will monitor the Subprojects operation and compliance with the standards.

44. APPCB monitors the environmental parameters to check whether or not it meets the standards stipulated in its consent order. Surveillance monitoring by APPCB staff, at least once a year, by visiting the project sites and collecting the sample and testing at APPCB laboratory, and specific monitoring in case of public complaints.

45. **ADB SPS Additional Requirements on Pollution Control, Health and Safety.** Following requirements of ADB SPS, PMU and PIUs shall apply pollution prevention and control technologies and practices consistent with international good practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

**Table 6: Applicable WHO Ambient Air Quality Guidelines**

Table 1.1.1: WHO Ambient Air Quality Guidelines <sup>7, 8</sup>		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO <sub>2</sub> )	24-hour	125 (Interim target-1) 50 (Interim target-2)
	10 minute	20 (guideline) 500 (guideline)
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM <sub>10</sub>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM <sub>2.5</sub>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

**Table 7: World Bank Group's Noise Level Guidelines**

Table 1.7.1- Noise Level Guidelines <sup>54</sup>		
Receptor	One Hour L <sub>Aeq</sub> (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational <sup>55</sup>	55	45
Industrial; commercial	70	70

### C. International Environmental Agreements

46. Table 8 below lists the relevant international environmental agreements that India is party to, and their relevance to various subprojects under VCICDP.

**Table 8: International Environmental Agreements Relevant to Subproject**

International Environmental Agreement	Years	Relevant Provisions	Remarks
Ramsar Convention on Wetlands of International Importance	1971	The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. According to the Ramsar list of Wetlands of International Importance, there are 25 designated wetlands in India which are required to be protected.	There is one Ramsar site in Andhra Pradesh i.e. Kolleru lake is situated 260 kms away from the project area.
Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal	1989	To protect human health and the environment against the adverse effects of hazardous wastes. This aims at (i) reduction of hazardous waste generation, promotion of environmentally sound management (ii) restriction of transboundary movements, and (iii) a regulatory system for transboundary movements.	Wastes generated from the construction sites may fall in hazardous waste category. The waste will be managed in accordance with the country laws and will be disposed within the country, and therefore will not attract this convention
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	1972	This Convention defines and provides for the conservation of the world's heritage by listing the natural and cultural sites whose value should be preserved.	Not applicable for the subproject. There are a few places of worship of local significance which will be shifted in consultation with the stakeholders. The details are provided in the RP prepared for the subproject.

<b>International Environmental Agreement</b>	<b>Years</b>	<b>Relevant Provisions</b>	<b>Remarks</b>
Convention on Biological Diversity	1992	This provides for a framework for biodiversity and requires signatories to develop a National Biodiversity Strategy and Action Plan.	Not applicable for the subproject. There are no critically endangered species in the immediate vicinity of the subproject and subproject activities are not expected to have significant impact on the biodiversity of the area.
United Nations Framework Convention on Climate Change (UNFCCC),	1993	The UNFCCC is an international environmental treaty with the main objective to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. India signed the UNFCCC on 10 June 1992 and ratified it on 1 November 1993. The project will ensure that all construction activities will not significantly increase the GHG emissions and ensure that design of all infrastructure are resilient climate change impacts.	Not applicable to the subproject. The subproject will help in reduction of the GHG emissions during the operation phase as less traffic congestion is expected once Atchuthapuram–Anakapalli road is operational.

#### IV. ANALYSIS OF ALTERNATIVES

##### A. With- and Without-Project Alternatives

47. **‘Without-project’ or ‘do-nothing’ Alternative’.** In the absence of the proposed subproject, the road will continue to have frequent traffic congestions, reduced flow of traffic (commercial as well as domestic), regular maintenance costs on existing roads and inadequate access to ports and other key towns and commercial centers in the state.

48. **With Project Alternative.** The proposed subproject will be the best alternative to overcome the afore mentioned threats that is likely to occur in the absence of this subproject. With the implementation of the subproject, the following direct benefits will be experienced:

- (i) improved quality of life for the rural population in the project influence area (10 km radial distance from the Atchuthapuram–Anakapalli road): this as a result of better access to markets, health, education and other facilities; and the derived stimulus for local economic activity.
- (ii) a more efficient and safe road transport system through reduced travel times, reduced road accidents, reduced vehicle operating and maintenance costs and reduced transportation costs for goods; and
- (iii) intra-state connectivity to Visakhapatnam, Kakinada, Ongole and Nellore districts and also port connectivity to Kakinada port and Krishnapatnam port.

49. The ‘with project’ alternative will contribute to the realization of the industrial clusters as part of the industrial corridor.

## B. Location and Design Alternatives

50. In general, the horizontal alignment of the project road follows that of the center line of the existing road. The project road is a part of VCIC corridor known as ADB road located in East Godavari district of Andhra Pradesh. The topography of the region is plain terrain. The land use is mixed with habitations at few settlements, Industrial and agriculture in rural area. Most of the project road is covered by roadside vegetation. However, density is fair i.e., 55 trees/km. It is found that about 2,232 trees (1,224 on the left side, and 1,008 on the right side) in the direction of Anakapalli to Atchuthapuram exist within a corridor of 15 m either side of center line of road.

51. The improvement work includes widening of the existing carriageway to 4 lane configurations. The benefits of the widened road will be improved road safety, lower vehicle operating costs and decreased journey times. The initial proposed road was re-aligned with sections of road to be widened on both sides to minimize the impact on people, structure and places of worship.

52. In a number of locations, the road design has taken into account the location of the trees along the road edge. At some locations along the project road, vegetation including trees, obscure visibility. Where the design team consider this to be unsafe, trees will have to be removed. Where visibility is not an issue, trees may still have to be removed to accommodate road widening. However, as many trees as possible are being retained by a measured design.

## V. DESCRIPTION OF THE ENVIRONMENT

53. A brief description about the existing environment, including its physical and ecological resources, economic development of the region, and issues relating to quality of life are presented in this section. Broad aspects on various environmental parameters (geology, soil, topography, climate, land use, water resources, water quality, air quality, noise quality, tourism, cultural resources etc.) which are likely to be affected (direct or indirect) by the proposed road improvement project are covered. These aspects are covered in broader geographic extent to present the entire project region.

### A. Physical Environment and Resources

54. **Topography, Geology, and Soil.** Andhra Pradesh is the eighth largest state of the country has a geographical area of 1.6 lakh km<sup>2</sup>, which constitutes 5.05% of the land area of the country. The project area lies between latitude 17°41' 23" north and longitude 83°00' 8.45" east and latitude 17°33' 50" north and longitude 82° 05' 44.57" east.

55. The proposed project road between Anakapalli to Atchuthapuram is situated on alluvial coastal plain of south. The soil type in the area is predominantly red loamy soils. Atchuthapuram is located approximately at 7 kms in northwest direction of the shoreline.

56. **Climate.** The climate of Andhra Pradesh varies considerably, depending on the geographical region. Monsoons play a major role in determining the climate of the state. Summers last from March to June. In the coastal plain, the summer temperatures are generally higher than the rest of the state, with temperature ranging between 20 °C and 41 °C. July to September is the season for tropical rains in Andhra Pradesh. The state receives heavy rainfall from the southwest monsoon during these months. About one third of the total rainfall in Andhra Pradesh is brought by the northeast monsoon. October and November are when low-pressure systems and tropical

cyclones from the Bay of Bengal, along with the northeast monsoon, bring rains to the southern and coastal regions of the state. November, December, January, and February are the winter months in Andhra Pradesh. Since the state has a long coastal belt, the winters are not very cold. Winter temperature ranges from 12 °C to 30 °C.

57. The Visakhapatnam district has a tropical maritime climate. Average annual rainfall is 1116 mm, and monthly rainfall ranges from nil rainfall in January to 207.5mm in October. October is the wettest month of the year. The mean seasonal rainfall distribution is 673.5 mm during southwest monsoon (June–September), 271.8 mm. during northeast monsoon (October–December), 10.9 mm. rainfall in Winter (January–February) and 159.6 mm in summer (March–May). The percentage distribution of rainfall, season-wise, is 60.36% in southwest monsoon, 24.36% in northeast monsoon, 0.97% in winter and 14.3 % in summer.

58. The salient climatic features of the state are as follow: (i) average annual rainfall is 1116 mm (ii) humidity – 72 to 84%, (iii) wind – light to moderate, and (iv) mean temperature – summer-32.8-34 °C; winter-17.5-19.3 °C.

59. **Water Resources and Water Quality.** Groundwater occurs in almost all geological formations. From the ground water point of view, the aquifers in the district can be broadly classified into hard formations (khondalites, charnockites, granitic gneisses etc.,) and soft formations (sand stones and alluvium). Ground water occurs underunconfined to semi-confined conditions in the hard formations, while it occurs under unconfined to confined conditions in soft formations. The yields in the weathered zones of hard formations range from 25 to 100 m<sup>3</sup>/day. The bore wells drilled in the hard formations, generally tap the fractured and fissured zones. The yields of the bore wells in these formations range between 5 to 25 m<sup>3</sup>/hr. Sand stones are exposed in the small, isolated places around Nakkavanipalem and Elamanchili. In these formations, ground water occurs under both unconfined and confined conditions. The depthof dug wells in alluvium formations ranges from 2 to 10 meters below ground level (mbgl) and the yields generally ranges from 40 to 250 m<sup>3</sup>/day. The depth of filter points/tube wells varies from 9 to 35 m with discharges ranging from 15 to 30 m<sup>3</sup>/hour.

60. The transmissivity values of the aquifers in the consolidated formations generally vary from 1 to 772 m<sup>2</sup>/day, whereas specific capacity ranges from 1 to 290 lpm/mdd. The depth to water level maps show varied water level zones due to underlying terrain and different geological makeup with complex types of hydrogeomorphical structures present in the district. Pre-monsoon (May 2012) depth to water level map reveals, in general, the water levels are deep particularly in the hilly area of the district. Water levels vary from 5 to 10 mbgl, except at Chintapalli, where water level recorded at 15.78 mbgl. In the southern part of the district i.e., near to the coast, the water levels are comparatively shallow (<5.00m), except in Payakaraopeta and Nakkapallimandals where it is in between 5 and 10m bgl. The total annual ground water recharge in the district is estimated to be 78,383 ha.m.(command area = 11,794 ham and non-command area = 66,689 ham) and the net annual ground water availability in the district after allowing the unavoidable natural discharges is 71,689 ham(command area 10,683 ham. And in non-command area 61,006 ham). Groundwater quality in the district is potable and suitable for domestic, industrial and irrigation purposes, in general, except for a few locations.

61. Construction of artificial recharge structures like check-dams, contour trenches, percolation tanks and water conservation structures like sub-surface dykes are feasible in the areas where water levels are declining, and considerable exploitation of ground water resources is taking place viz. Munagapaka and Payakaraopetamandals. Rooftop Rainwater Harvesting is to be implemented I Urban areas wherever deepening of water levels is taking place. Along the

coast, large number of rainwater conservation structures may be constructed to prevent intrusion of seawater.

62. All mandals fall under the Safe category per district groundwater resources. Hence, no area/mandal has been notified. (Source: Ground water brochure, Visakhapatnam district, Andhra Pradesh by CGWB, Ministry of Water Resources).

**Table 9: Details/Locations**

<b>Water Quality Monitoring</b>				
<b>S. No.</b>	<b>Sampling code</b>	<b>Sampling Location</b>	<b>Latitude</b>	<b>Longitude</b>
–	SW - 1	Sarada River Upstream near	'7°40''5.00"N	'2°59''0.74"E
–	SW - 2	Sarada River Downstream	'7°38''1.01"N	'2°56''7.01"E
–	SW - 3	Tank near Achyuthapuram	'7°33''0.77"N	'2°58''0.89"E
–	SW - 4	Tank near Timmarajupeta	'7°37''2.85"N	'2°58''3.74"E
–	GW - 1	Borewell near Achyuthapuram	'7°33''2.18"N	'2°58''8.81"E
–	GW - 2	Borewell near Timmarajupeta	'7°37''8.21"N	'2°58''1.20"E
–	GW - 3	Borewell near Kondakarla	'7°35''8.26"N	'2°59''3.34"E
–	GW - 4	Borewell near Munugapaka	'7°38''6.17"N	'2°59''3.07"E

**Table 10: Physical-Chemical and Bacteriological Characteristics of Surface Water at Selected Locations in the Study Area**

S.No.	Parameters	Unit	Test Method	Tolerance Limits IS: – 296 - 1982	CPCB Water Quality Criteria			Result			
				Class C	Class A	Class B	Class C	SW-1	SW-2	SW-3	SW-4
1	pH	-	4500-H+B	6.5-8.5	6.5 - 8.5	6.5 - 8.5	8	7.7	7.7	8.1	
2	Temperature	°C	2550. B	--	--	--	--	25.1	25.9	25	26
3	Electrical Conductivity	µmos/cm	2510-B	--	--	--	--	520	1290	680	2520
4	Turbidity	NTU	2130. B	--	--	--	--	0.18	5.2	0.12	4.8
5	Chlorides as Cl-	mg/L	4500-Cl-.B	600	--	--	--	40	255	55	450
6	Color	Pt-co-	2120. B	300	--	--	--	5	15	5	20
7	Boron as B	mg/L	3120-B	--	--	--	--	0.01	1.03	0.07	6.41
8	Sulphates as SO42-	mg/L	4500-SO42-.E	400	--	--	--	19	47	52	44
9	Nitrates as NO3	mg/L	PDA	50	--	--	--	1.16	3.7	5.7	11.2
10	Nitrites as NO2	mg/L	4500-NO2-.B	--	--	--	--	BDL	BDL	0.846	BDL
11	Fluoride as F-	mg/L	4500-F-.C	1.5	--	--	--	0.767	0.81	1.32	0.945
12	Total Dissolved Solids at 180°C	mg/L	2540.C	1500	--	--	--	310	720	412	1540
13	Calcium as Ca	mg/L	3500-Ca.B	--	--	--	--	35	24	50	112
14	Magnesium as Mg	mg/L	3500-Mg.B	--	--	--	--	48	8	26	55
15	Mercury as Hg	mg/L	3500-Hg.B	--	--	--	--	BDL	BDL	BDL	BDL
16	Arsenic as As	mg/L	3120-B	0.2	--	--	--	BDL	BDL	BDL	BDL
17	Iron as Fe	mg/L	3120-B	50	--	--	--	BDL	0.36	0.05	6.3
18	Lead as Pb	mg/L	3120-B	0.1	--	--	--	BDL	BDL	BDL	BDL
19	Zinc as Zn	mg/L	3120-B	15	--	--	--	BDL	0.07	BDL	0.12
20	Cadmium as Cd	mg/L	3120-B	--	--	--	--	BDL	BDL	BDL	BDL
21	Total Chromium as Cr	mg/L	3120-B	--	--	--	--	BDL	3.1	BDL	0.05
22	Nickel as Ni	mg/L	3120-B	--	--	--	--	BDL	BDL	BDL	BDL
24	Total Coliform	MPN/100mL	9221A and B	5000	50 or less	500 or less	5000 or less	>1600	280	>1600	130
25	Fecal Coliform	MPN/100mL	9221 E	--	--	--	--	110	33	79	17
26	E. Coli	Presence / Absence	9221 F	--	--	--	--	Present	Absent	Present	Absent
27	Odor	TON	2150. B	--	--	--	--	No odor is observed			

S.No.	Parameters	Unit	Test Method	Tolerance Limits IS: – 296 - 1982	CPCB Water Quality Criteria			Result			
				Class C	Class A 6 mg/l or more	Class B 5 mg/l or more	Class C 4 mg/l or more	SW-1	SW-2	SW-3	SW-4
28	Dissolved Oxygen	mg/L	4500-O.C	4				6.2	5.8	6.5	6.1
29	Biochemical Oxygen Demand for 5 days 20o C	mg/L	5210-B	3	2 mg/l or less	3 mg/l or less	3 mg/l or less	6	4	BDL	3
30	Ammoniacal Nitrogen as N	mg/L	4500-NH3 - C	--	--	--	--	BDL	BDL	BDL	BDL
31	Total Suspended Solids at 105o C	mg/L	2540. D	1500	-	-	-	12	13	8	15
32	Total Phosphates	mg/L	4500-P-D	--	--	--	--	BDL	BDL	BDL	0.079
33	Chemical Oxygen Demand	mg/L	5220. D	--	--	--	--	20	30	16	20
35	Sodium as Na	mg/L	3500-Na.B	--	--	--	--	40	240	73	435
36	Potassium as K	mg/L	3500-K.B	--	--	--	--	3.4	2	5	1.5
37	Carbonates as CO3	mg/L	2320. B	--	--	--	--	NIL	NIL	NIL	NIL
38	Bicarbonates as HCO3	mg/L	2320. B	--	--	--	--	186	100	206	530

Source: DPR report for the subproject; sampling conducted in Jan-Feb 2019

**Table 11: Physical-Chemical and Bacteriological Characteristics of Ground water at Selected Locations in the Study Area**

S. No	Parameters	Unit	Test Method	IS: 10500	IS: 10500	Result			
				Requirement (Acceptable Limit)	Permissible Limits	GW-1	GW-2	GW-3	GW-4
1.	Color	Pt-co-	2120. B	5	15	<5	<5	<5	<5
2.	Odor	TON	2150. B	Agreeable	Agreeable	-	No odor observed	-	No odor observed
3.	pH	-	4500-H+B	6.5 to 8.5	No relaxation	7.3	7.5	6.9	8
4.	Taste	FTN	2160. B	Agreeable	Agreeable	-	No flavor observed	-	No flavor observed
5.	Turbidity	NTU	2130. B	1	5	0.04	0.2	0.04	0.25
6.	Total Dissolved Solids at 180o C	mg/L	2540.C	500	2000	1100	1020	1580	1195
7.	Aluminum as Al	mg/L	3120-B	0.03	0.2	BDL	0.47	BDL	0.32
8.	Anionic Detergents	mg/L	IS:13428:2005K	0.2	1	BDL	<0.2	BDL	<0.2

S. No	Parameters (as MBAS)	Unit	Test Method	IS: 10500	IS: 10500	Result			
				Requirement (Acceptable Limit)	Permissible Limits	GW-1	GW-2	GW-3	GW-4
9.	Barium as Ba	mg/L	3120. B	0.7	No relaxation	0.048	0.14	0.03	0.27
10.	Boron as B	mg/L	3120-B	0.5	1	0.03	0.36	0.15	0.21
11.	Calcium as Ca	mg/L	3500-Ca.B	75	200	54	122	97	116
12.	Chlorides as Cl-	mg/L	4500-Cl-.B	250	1000	193	212	171	297
13.	Copper as Cu	mg/L	3120-B	0.05	1.5	BDL	BDL	BDL	BDL
14.	Fluoride as F-	mg/L	4500-F-.C	1	1.5	1.63	0.905	0.518	0.87
15.	Residual free chlorine	mg/L	4500-Cl-.B	0.2	1	BDL	BDL	BDL	BDL
16.	Iron as Fe	mg/L	3120-B	0.3	No relaxation	0.091	0.08	0.97	0.0.7
17.	Magnesium as Mg	mg/L	3500-Mg.B	30	100	102	50	40	55
18.	Manganese as Mn	mg/L	3120-B	0.1	0.3	0.05	BDL	BDL	0.05
19.	Mineral oil	mg/L	IS:3025 (part 39)	0.5	No relaxation	Absent	Absent	Absent	Absent
20.	Nitrates as NO3	mg/L	4500-NO3-.B	45	No relaxation	11	20	132	20
21.	Phenolic compounds as C6H5OH	mg/L	5530-D	0.001	0.002	BDL	BDL	BDL	BDL
22.	Selenium as Se	mg/L	3120-B	0.01	No relaxation	BDL	BDL	BDL	BDL
23.	Silver as Ag	mg/L	3120. B	0.1	No relaxation	0.07	BDL	0.25	BDL
24.	Sulphates as SO42-	mg/L	4500-SO42-. E	200	400	191	29	93	48
25.	Sulfide as S2-	mg/L	4500. S2- G	-	-	BDL	BDL	BDL	BDL
26.	Total Alkalinity as CaCO3	mg/L	2320. B	200	600	294	536	464	541
27.	Total Hardness as CaCO3	mg/L	2340. C	200	600	555	510	406	515
28.	Zinc as Zn	mg/L	3120-B	5	15	0.087	1.86	0.59	0.27
29.	E. Coli	Presence or Absence/ 100 mL	9221 F	-	-	<1.8	Absent	<1.8	Absent
30.	Total Coliform	MPN/100 mL	9221A and B	-	-	<1.8	<1.8	<1.8	<1.8
31.	Fecal Coliform	MPN/100 mL	9221 E	-	-	<1.8	<1.8	<1.8	<1.8
32.	Electrical Conductivity	µmhos/cm	2510-B	-	-	1780	1680	2600	1950

S. No	Parameters	Unit	Test Method	IS: 10500	IS: 10500	Result			
				Requirement (Acceptable Limit)	Permissible Limits	GW-1	GW-2	GW-3	GW-4
33.	Chemical Oxygen Demand	mg/L	5220. D	-	-	10	10	10	16
34.	Nitrites as NO2	mg/L	4500-NO2-.B	-	-	0.05	BDL	0.11	0.11
35.	Sodium Na	mg/L	3500 Na.B	-	-	10	199	189	285
36.	Potassium as K	mg/L	3500. K.B	-	-	11	1.2	4	2.3

Source: DPR report prepared for the subproject; sampling conducted in Jan-Feb 2019

## 1. Observations on Surface water (Tank & River) quality

63. The baseline quality of water based on the results of the surface water quality monitoring within the study area, it was observed that:

- (i) ph, of all the sources was found within the acceptable limits.
- (ii) Parameters like chlorides, fluorides, sulphates, nitrates, boron etc. were also observed within acceptable limits.
- (iii) No heavy metal contamination was observed in any of the samples.
- (iv) The TDS value is observed slightly high at SW4.
- (v) The BOD value is observed slightly high at SW1 and SW2, due to anthropogenic sources in the nearby vicinity.
- (vi) Also, the presence of E. coli was observed at SW1 and SW3 locations.

64. The quality of water at locations SW2 to SW4 can be compared with class C and it can be used as drinking purpose after conventional treatment followed by disinfection.

## 2. Observations on quality of Ground Water

65. The area in the proximity of sea. The aquifer comprises of saline water containing high TDS. The wells located near the surface water bodies are only yielding relatively good quality water. It was observed and confirmed from chemical analysis of groundwater samples that:

- (i) No heavy metal contamination was observed in any of the samples.
- (ii) No presence of E. coli was reported in any of the samples.
- (iii) Fluoride and magnesium (Mg) were slightly higher at GW1.
- (iv) Nitrates (NO<sub>3</sub>) was higher than the permissible limits at GW3.

66. **Flood Data.** Andhra Pradesh is most vulnerable to cyclones, heavy rains, and floods including drought due to its widespread and peculiar geographic location. AP's total coastal area is spread over 92,906 km<sup>2</sup> in 9 coastal districts- PottiSreeRamulu Nellore, Prakasam, Guntur, Krishna, West Godavari, East Godavari, Visakhapatnam, Vizianagaram and Srikakulam.

67. The project district Visakhapatnam exposed to many cyclonic winds, tsunami and floods. The rainy months also often leads to vector and water borne diseases.

68. **Area Prone to Floods.** However, the historical flood data review and preliminary investigation shows the flood is not a major hazard for the city due to its topographical conditions (steep slopes along the west east direction make ideal conditions of natural drainage in case of heavy rainfall). In the recent past, some areas of city have experienced the localized ponding of rainwater to drainage clogging. Some of these include Palavalasa and areas near airport (which has been developed on reclaimed swap land). However, the historical data shows that there is no flood hazard in the city. Moreover, the project road is 6 km away from the sea and 15 km away from the Visakhapatnam district. Hence flood hazard is not anticipated in the subproject location.

69. **Air Quality.** Location-specific issues of air pollution (particularly in the project areas) is anticipated, nevertheless, still within permissible limits. Dust, vehicular emissions are the main causes of pollution in the roadside settlements, villages. Industrial air pollution is mainly confined to areas in the coastal region, where most industries are located. The levels of pollution are far lower and smaller in scale and air pollution is not a significant issue in rural areas because road traffic is very low. In the project area there are no major industrial activities taking place and also

the density of traffic on project road is very less. Impacts to air quality during construction are likely to result from three main sources: (i) emissions from construction equipment including delivery trucks; (ii) fugitive dust from earthmoving operations and demolition; and (iii) localized increased traffic congestion in construction areas.

70. As the subproject area passes along the nearby agriculture lands and industrial areas having a number of trees all along the road, the ambient air quality is found within the permissible limits.

71. Ambient air quality tests were conducted along the subproject area AAQ testing was done during February 2019 and two times in one week and the results are enumerated in the table below. Monitoring was conducted at six locations. Monitoring stations are located in the main residential and commercial areas located close to the proposed road.

**Table 12: Ambient Air Quality Monitoring Locations**

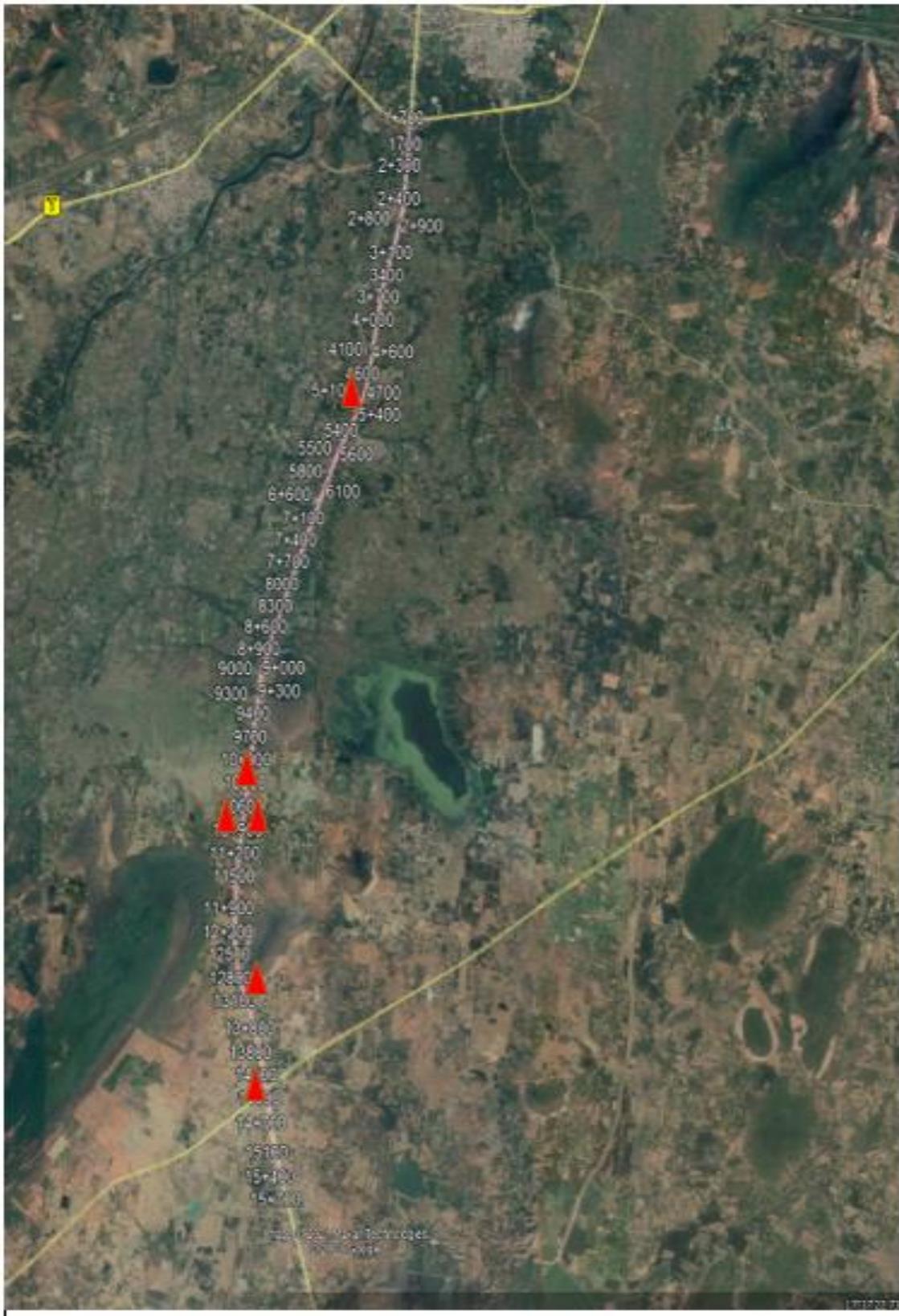
Station Code	Name of the Monitoring location	Distance W.R.T center line (km)	Coordinates	Category
1	Atchyuthapuram	0.1	'7°33''1.21"N, '2°58''0.92"E	Commercial
2	Andalapalle	0.2	'7°34''1.23"N, '2°58''9.38"E	Residential
3	Haripalem	1.25	'7°35''2.73"N, '2°57''1.76"E	Residential
4	Kondakarla	0.8	'7°35''3.09"N, '2°59''0.97"E	Residential
5	Timmarajupeta	0.5	'7°37''0.23"N, '2°58''7.66"E	Commercial
6	Ummalada	1.4	'7°38''4.63"N, '2°58''3.74"E	Residential

**Table 13: Summary of Ambient Air Quality Data Monitoring**

	Name of the Monitoring location	PM <sub>10</sub>			PM <sub>2.5</sub>			SO <sub>2</sub>			NO <sub>x</sub>		
		Max	Min	Standard	Max	Min	Standard	Max	Min	Standard	Max	Min	Standard
1	Achyuthapuram	88	69	100	50	25.6	60	35	26	80	13.2	18.5	80
2	Andalapalle	91	71	100	48	31.3	60	9.6	12.3	80	13.5	18.2	80
3	Haripalem	93	77	100	47	34.1	60	8.9	13.6	80	12.8	19.9	80
4	Kondakarla	87	64	100	43	34.1	60	10.2	11.6	80	14.3	17.0	80
5	Timmarajupeta	93	74	100	51	32.6	60	26	18	80	23.2	27.3	80
6	Ummalada	90	73	100	48	34.7	60	11.1	18.0	80	15.5	24.4	80

NO<sub>x</sub> = oxides of nitrogen, PM = particulate matter, SO<sub>2</sub> = Sulphur Dioxide.

Figure 7b: Legends Air and Noise Monitoring Location



72. Dust, vehicular emissions are the main causes of pollution in the roadside settlements, villages. Industrial air pollution is mainly confined to areas in the coastal region, where most industries are located. The levels of pollution are far lower and smaller in scale and air pollution is not a significant issue in rural areas because road traffic is very low. In the project area there are no major industrial activities taking place and also the density of traffic on project road is very less. The air quality is reported within permissible limits in these areas.

73. Negative air quality impacts during construction are likely to result from three main sources, viz.(i) emissions from construction equipment, including delivery trucks; (ii) fugitive dust from earth-moving operations and demolition; and (iii) local increased traffic congestion in construction areas.

74. It is observed that all the AAQ values were found to be well within the limits as per the National standards at all the monitoring locations. In comparison with WHO standards, particulate matter (PM10 and PM2.5) in the ambient air is exceeding the guideline limit of 50  $\mu\text{g}/\text{m}^3$  and 25  $\mu\text{g}/\text{m}^3$  respectively. Oxides of sulphur and nitrogen are within the limits, except at one location where SO2 levels are slightly higher.

75. **Noise Level.** Reconnaissance survey results show that noise is neither an issue nor a problem, except where the project road passes through the settlements, market areas, junctions at village areas, and busy junctions. However, ambient noise quality is expected to be well within the permissible limits. Noise is anticipated during construction activities, such as operation of heavy machinery, blasting works, the haulage of construction materials to the construction yard and the general activities at the yard itself. Concrete mixing and material movements will be the primary noise generating activities and, most likely, will be uniformly distributed over the entire construction period. Noise barriers and other measures - for example the prohibition of certain types of construction activity and the appropriate timing of construction activities - may be required to mitigate these effects.

76. Noise monitoring in the subproject locations were conducted including junctions and near habitations. Noise monitoring was conducted during the month of Feb 2019 for 24hrs (from morning 6 am to 10 pm and from 10pm to 6 am)  
The details are as enumerated below.

**Table 14: Table Noise quality monitoring locations**

S.No.	Name of the Monitoring location	Distance W.R.T center line (km)	Coordinates	Category
1	Achyuthapuram	0.1	'7°33'1.21"N, '2°58'0.92"E	Commercial
2	Andalapalle	0.2	'7°34'1.23"N, '2°58'9.38"E	Residential
3	Haripalem	1.25	'7°35'2.73"N, '2°57'1.76"E	Residential
4	Kondakarla	0.8	'7°35'3.09"N, '2°59'0.97"E	Residential
5	Timmarajupeta	0.5	'7°37'0.23"N, '2°58'7.66"E	Commercial
6	Ummalada	1.4	'7°38'4.63"N, '2°58'3.74"E	Residential

**Table 15: Table Summary of Noise level data**

S. No.	Name of the station with code	Limits in dB(A)		Winter Season 2018-2019	
		Day time	Night time	Day time noise levels in dB(A) Day Leq	Night time noise levels in dB(A) Night Leq
1	Achyuthapuram	65	55	62.6	45.0

S. No.	Name of the station with code	Limits in dB(A)		Winter Season 2018-2019	
		Day time	Night time	Day time noise levels in dB(A) Day Leq	Night time noise levels in dB(A) Night Leq
2	Andalapalle	55	45	50.2	41.1
3	Haripalem	55	45	49.0	42.6
4	Kondakarla	55	45	52.4	43.3
5	Timmarajupeta	65	55	47.7	41.5
6	Ummalada	55	45	51.8	40.2

dB(A) = decibels.

77. The noise levels were found to be well within the national standards and were found to also comply with the limits as prescribed by the WBG-EHS guidelines at all the locations.

78. **Traffic surveys and data analysis.** Various traffic surveys including Classified Traffic Volume Count (CVC), Origin and Destination survey and Intersection Turning Movements survey, etc., were carried out for along the project road in the month of June–July 2015. The summary of present traffic volume is presented as below.

**Table 16: Present Traffic along Project Road Vehicle Type/ Location (Taken at km 2+800)**

	Average Daily Traffic	Annual Average Daily Traffic
Car/ Jeep/Van/Taxi	398	434
Two-wheeler	6,356	6,928
3wh(pass)	3,019	3,291
Buses	540	583
Light Motor Vehicle	215	232
LCV/2Axle/MAV	673	726
Tractor /Tractor with Trailer	37	37
Cycle/Cycle Rickshaw/Animal Drawn	574	574
Total Passenger Vehicles	10,529	11,469
Total Freight Vehicles	711	765
Total fast-moving Vehicles	11,240	12,234
Total slow-moving Vehicles	575	570
Total Vehicles	11,815	12,804
Total PCU	10,748	11,635

## B. Ecological Resources

79. **Vegetation.** The forests are moist and of the dry deciduous type. The common species available are Guggilam, Tangedu, Sirimanu, Kamba, Yagisa, Nallamaddi, Gandra, Vepa. Bamboo shrubs are sparsely scattered. There is, however, a quiescent decline in the forest area due to podu<sup>12</sup> practice, indiscriminate grazing and browsing. Regeneration programs are being carried out to address the issue of forest decline. Chinthapalli Teak Plantation is an off shoot of the podu practice. The latest caper in this regeneration program is the rising of teak, silver trees, and coffee plantations, as the agency areas have been found agronomically suitable for coffee growth. Coffee plantations have been raised in about 10,000 Acres in Chinthapalli, Minimuluru,

<sup>12</sup> Podu is a form of shifting cultivation using slash-and-burn methods. Traditionally used on the hill-slopes of Andhra Pradesh, it is similar to the jhum method found in north-east India and the bewar system of Madhya Pradesh. Since the 1930s, there have been attempts to restrict its use in order to conserve forests and permit growth of commercial tree species such as teak. In the 1980s, it remained the principal method of tilling land for some tribal communities in districts such as East Godavari, West Godavari and, most prevalently, Srikakulam.

Devarapalli and Ananthagiri regions by different agencies for different purposes. This was mandated by the Forest Department to conserve soil, by the Coffee board to evolve cultures suited to on-traditional areas and by the Girijan Corporation and the I.T.D.A. to wean out practice“of "Podu Cultivation.” Devarapalli is around 55 kms, Ananthagiri is around 109 kms and Chintapal 35 graha around 112 kms from Atchuthapuram. There is a reserved forest Panchadarla ava which is around 300 to 500 m from Mungapaka. However, there are no endangered species in the reserved forest areas (As informed by the Forest department people)

80. **Wildlife and Protected Area Network.** Atchuthapuram–Anakapalli road does not pass through the forest area and wildlife/protected area network. A biodiversity proximity assessment using the IBAT<sup>13</sup> was conducted for the Atchuthapuram–Anakapalli alignment area. This report provides an indication of the potential biodiversity-related feat–res - protected areas, key biodiversity areas and species - close to the specified location. It provides an early indication biodiversity concern and can provide valuable guidance in making decisions. Based on initial assessment no protected areas and key biodiversity areas or features were observed in the radial distance of up to 5 km. The IBAT study was generated in 2018 by ADB (Appendix 12) and lists no major protected or key –bio-diversity areas with 5 kms of site. The detailed list of various IUCN category species found near the area have also been provided in the detailed study provided in Appendix 12.

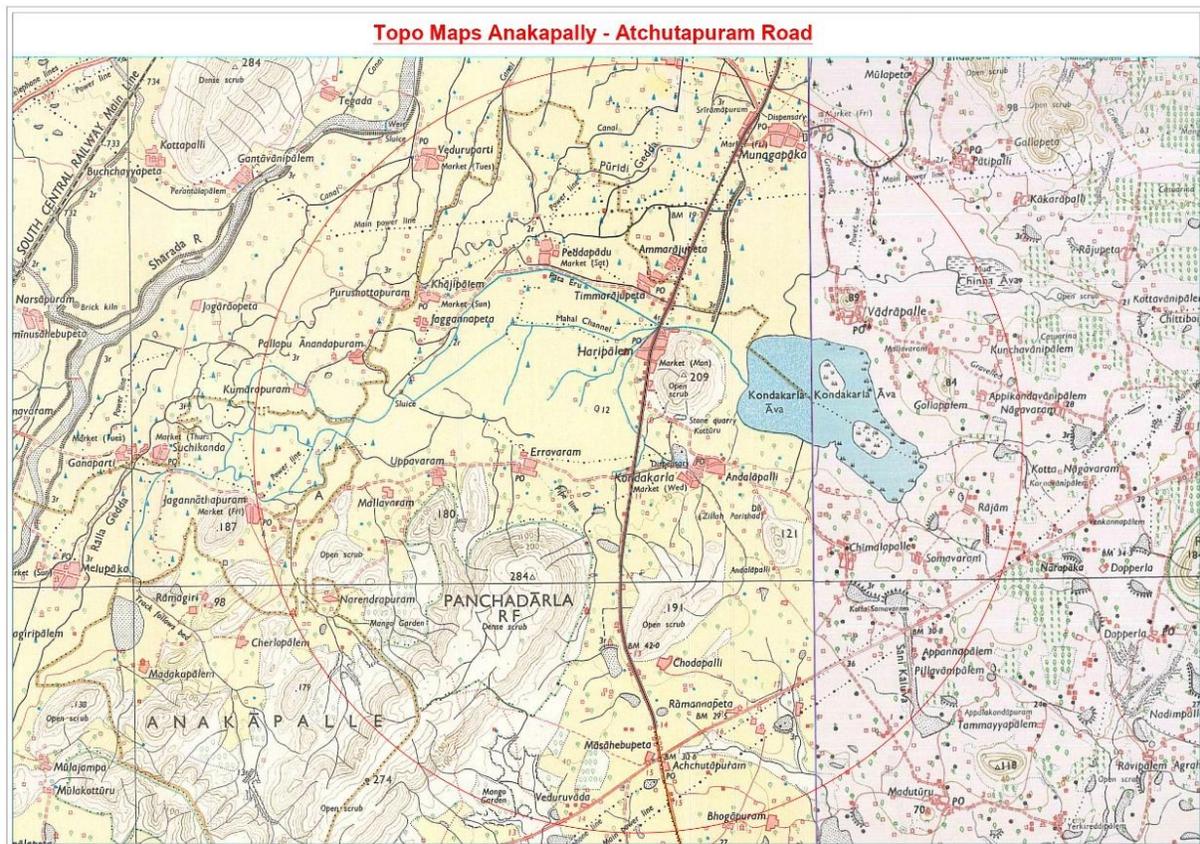
81. Further discussions with the local people and forest officials revealed that there are no critically endangered species found close to the subproject site.

82. There is however an area frequented by birds (Kondakarla Bird area) at a distance of 3 km interior of the proposed road mostly during the winter season. It is an Irrigation tank with palm-trees, lotus flowers and picturesque views. The potential impact on this lake from the proposed road may be mainly from any construction activity or material storage / workers movement / facilities near the lake. The noise generated as a result of construction activities may impact the birds. The other associated impacts are dust generation and solid waste disposal. These impacts are temporary and cease upon after the completion of construction activity.

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<sup>13</sup> IBAT (Integrated Biodiversity Assessment Tool) proximity assessment report conducted on 27 June 2018 has been provided as Appendix.

**Figure 8: Toposheet depicting 5 km Buffer Map of Subproject Road**



83. Adequate measures have been included in the EMP to avoid any close activity to these areas. As per forest department officials this lake is a Irrigation water tank under the control of Irrigation department and this is not notified under wildlife act. However, there is proposal to convert this area to wetland conservation. Flora and fauna in this area are Shelducks, Common Teals, Northern Pin Tails and Asian Open Bills also *Typha angustata*, *Nymphoides indica*, *Azolla filiculoides*, *Pistia stratiotes* are found here. The proposed road is around 3 kms from this tank

84. **Details of Trees Along the Project Road.** A tree inventory carried out within corridor of impact shows that about 1,657 trees in the direction of Anakapally to Atchuthapuram of different species exist within a corridor of 15 m either side of centerline of road. The details of tree species, girth size and location of which side of road is included as separate annexure (Appendix 16). The detailed strip map and other details of trees shall be obtained from the contractor under tree management plan. This shall be submitted by the contractor as a part of SSEMP.

**Figure 9: Location of Trees along the Road**



85. **Agriculture and Forestry.** Agriculture is the main livelihood of nearly 70% of the households. Though Visakhapantam City is industrially developing, the areas away from the city continue to be backward. Rice is a staple food of the people and Paddy is therefore the principal food crop of the district followed by ragi, bajra and jowar and cash crops such as sugarcane, groundnut, *Sesamum niger* and chilies are important. Since there is no major irrigation system, only about 36% of the cropped area is irrigated under the ayacut of the medium irrigation system and minor irrigation tanks. The rest of the cultivated area is covered with dry crops, depending upon the vagaries of the monsoon. Crop productivity is low.

86. The Project Road passes through 11 villages, some of them are Nagalapalli, Ompolu, Jaggaya37graharamharam, Andalapalle, Ummalada, Munagapaka, Timmarajupeta, Haripalem, Kondakarla, Atchuthapuram and Chodipalli.

**Table 17: Land use Pattern Table**

S. No	Chainage		Land Use	Remarks
	From	To		
1	0	1	Barren	Settlements
2	1	2	Barren and Agricultural	Settlements
3	2	3	Barren and Agricultural	Settlements
4	3	4	Barren and Agricultural	Settlements
5	4	5	Agricultural	
6	5	6	Barren and Agricultural	Settlements
7	6	7	Agricultural	

S. No	Chainage		Land Use	Remarks
	From	To		
8	7	8	Agricultural	Settlements
9	8	9	Barren and Agricultural	Settlements
10	9	10	Barren	Settlements
11	10	11	Barren and Agricultural	
12	11	12	Barren	
13	12	13	Barren and Agricultural	
14	13	14	Barren and Agricultural	
15	14	15.727	Barren and Agricultural	Settlements

### C. Economic Development

87. **Fisheries.** Fishing is another important economic activity of the population living in about 59 fishery villages and hamlets on coastline stretching to a length of 132 km covering 11 coastal mandals. About 13,000 fishermen families get their livelihood from marine, inland and brackish water fishing besides catching fish living around Thandava and Raiwada reservoirs.

88. **Roadways.** The district has a road length of 4,721 km of which the NH5 runs to a length of 134.28 km., state highway at a length of 355 km and balance forms the road maintained by R&B Panchayat Raj Institutions.

89. **Railways.** Visakhapatnam railway Station is a major railway station located in Visakhapatnam, Andhra Pradesh, India. The railway station is under the control of East Coast Railway of Indian Railways. It stands on the Howrah-Chennai main line, though the mainline bypasses Visakhapatnam Central Station. Consequently, a suburban halt on the mainline near Vizag Steel Plant, known as Duvvada, is being developed into a major station to improve services for the city.

90. **Seaways.** On the east coast of India, Visakhapatnam serves as the gateway waterway for Andhra Pradesh. It has one of the country's largest ports, and the oldest shipyard on the east coast. It is a land-locked harbor connected to the sea by a channel cut through rock and sand. Visakhapatnam is one of the busiest ports in India. Vizag Seaport owns two berths in the Inner Harbor; berth EQ-8 is fully mechanized and berth EQ-9 berth is not. Both berths are capable of handling Panamax vessels. The shipyard at Visakhapatnam is the largest in India. On the Chennai-Kolkata corridor, the city is also a hub for ground traffic. The Gangavaram Port is 'India's deepest seaport.

91. **Mineral Resources.** The District has mineral deposits of bauxite apatite (rock phosphate) calcite, crystalline limestone confined to tribal tracts. Bauxite deposits at Sapparla, Jerrila and Gudem of G.K.Veedhi Mandal are considered to be the largest in the country. Bauxite deposits are also identified at Galikonda, Katuki, Chittemgodndi of Araku group deposits, Katamrajukonda of Gurthedu sub-group of deposits. Phosphate Apatite is available in Kasipatnam village of Ananthagirimandal. Rich deposits of crystalline limestone and Calcite are mapped in Borra Caves and along the Valley up to Araku from Borra and around Valasi village of Ananthagirimandal. Ruby Mica is another mineral available in the District essential for electrical and electronic industries. The mineral occurs in the form of phlogopite and is confined to Borra tract.

92. Quartz is another mineral found mostly in Bheemunipatnam, Padmanabham, Devarapalli, K. Kotapadu and Ananthagirimandals. Vermiculate found near Kasipatnam of Ananthagirimandal. Clay deposits near Malivalasa of Arakumandal are identified. Limeshell useful for manufacture of

chemical grade lime is also available in the district. Red and Yellow ochre deposits are also identified in Araku and Ananthagirimandals.

93. **Industries.** Industrial Development is conspicuous in Visakhapatnam urban agglomeration with the largescale industries like Hindustan Shipyard, Hindustan Petroleum Corporation, Coromandel Fertilizers, Bharat Heavy Plates and Vessels, L.G. Polymers Ltd., Hindustan Zinc Plant and the recent giant Visakhapatnam Steel Plant and a host of other ancillary industries. The Visakhapatnam Steel Plant is the biggest with an authorized share capital of ₹7466 crores with a licensed capacity of 2.8 MT of saleable steel 3.0 MT of Pig Iron and 8.32 lakhs tons of by-product. Approximately 25,000 persons will be employed. The project has provided employment to 16,300 persons to date. On the countryside, agro-based industries like sugar factories, jute mills and rice mills are built besides brick and tile units. There are several special economic zones and industrial corridors such as, VSEZ, APSEZ, APIIC, Aganumpudi Industrial Park, Visakha Dairy, JNPC, Brandix Apparel City etc., are located in and around the city.

94. **Tourism and Cultural Resources.** Visakhapatnam is famous for its natural harbor, ship building unit, steel plant, and oil refineries. Andhra Pradesh is also known for its Dolphin Nose hills, (40 kms from the project influence area) Rama Krishna beach, (40-45 kms from the project influence area) and Rushi Konda beach (50-55 km from the project influence area). Bhimunipatnam is 60 kms from the project influence area and is famous as a natural seaport. Simhachalam (45-50 kms from the project influence area) lies in the outskirts of the main city and is famous for the Srivaraha Narasimha Swamy Temple. Thotlakonda (60 kms from the project influence area) lies to the north of Visakhapatnam which consists of a Buddhist Monastic Complex remnants and rock cut cistronthe hilltop at Mangamaripeta. Bavikonda is another famous Hilltop Buddhist Monastic Complex remnant site near Thotlakonda along the beach road to Bhimili from Vizag. Gudilova is famous for the temple of Lord Shiva and Lord Ranganatha Swamy located on a small hillock between two big hills in outskirts of Visakha city along the eastern Ghats. It is also a natural picnic spot along the state highway of Pendurthi and 7 km from Anandapuram of Visakhapatnam.

95. The Borra Caves, also called Borra Guhalu, which means “something that has bored into the ground (borra) and caves (guhalu),” are located on the east coast of India, in the Ananthagiri hills of the Araku valley (100 kms away from the project influence area) .The Kondakarla Ava, cradled in the foothills of the Eastern Ghats, 50 km from Vizag on Sankaram (Buddhist Place)- Etikoppaka (Craft Village)- Kondakarla Ava Circuit, (15 kms from the project influence area) is the second largest fresh water lake in the state. It has been recognized as ecotourism destination and is home to an array of flora and fauna.

96. **Energy and Electric Power Potential.** There are several power plants in and around Visakhapatnam district. Simhadri Super Thermal Power Plant of NTPC Limited is expanding from 1,000 to 2,000 MW at a cost of ₹50 billion (US\$740 million). Hinduj as has begun construction of a 1,070-MW thermal power plant in Visakhapatnam district at a cost of ₹70 billion (US\$1 billion).

## VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### A. Beneficial Impacts

97. The immediate benefits of road construction and improvement will come in the form of direct employment opportunities during construction for the roadside communities specially those engaged as wage laborers and petty contractors and suppliers of raw materials.

98. Improvement of the Anakapalli-Athchuthapuram section to four-lane configuration will result in connectivity to the National Highway, smooth flow of traffic to benefit different stakeholders, reduction in travel time and lower vehicle operating cost, i.e., per kilometer vehicle operating cost from the general improvement work and an absolute saving in cost due to reduction in fuel consumption for the existing traffic. Improved access and reduced travel times and costs will be major stimuli to economic growth, particularly in semi-urban and rural areas. The better access of agricultural goods to market will be particularly important and a major contributor to poverty reduction.

99. Increased labor mobility will also occur. There is also the likelihood of the relocation of homes and businesses to new road-side locations.

100. The long-term effects of these roads on poverty reduction are, consequently, expected to be significantly positive.

101. During operation stage, road-side economic activities supporting transport like gasoline stations, automotive repair shops, lodging, and restaurants will increase due to increased number of vehicles. Increase in agro-industrial activities is also expected to take advantage of improved access to urban centers where there are higher demands and better prices of agricultural products.

### B. Potential Negative Impacts

102. Initial screening and identification of potential impacts were conducted using ADB's rapid environmental assessment (REA) checklist (Appendix 1) and the scope of the IEE was determined using a "No Mitigation-Scenario - Scoping Checklist" (Appendix 2). The study team visited the road alignment and nearby areas to identify the potential impacts (both positive and negative), met local people and conducted meetings, brainstorming sessions, field examinations, and data gathering. The succeeding paragraphs provide the potential negative impacts for pre-, during construction, and maintenance phases. Avoidance and mitigation measures are also discussed to ensure potential negative impacts are insignificant, site-specific and can be managed using established internationally accepted practices.

### C. Pre-Construction Impacts

103. **Location and Design Issues.** The Atchuthapuram-Anakapalli road is not located in any eco-sensitive areas. There is no major bottleneck along Atchuthapuram-Anakapalli road requiring realignment/bypasses. Proposed widening will follow the existing alignment. As a result, minimal acquisition of any agricultural land is required. Impact on private and community structure is also reduced. Road and alignment design have considered all major preconstruction impacts and taken avoidance measures at an early stage of planning to have minimal impact due to location.

104. The improvements to the existing road for 4-lane configuration will require the need to cut vegetation along the project road. This will inevitably have a more significant impact and this matter is discussed in the following sections.

105. The road design team has taken into account the need for: (i) optimum siting and control of quarries; (ii) providing adequate cross-drainage structures/drains; (iii) providing side-drainage structures; (iv) mechanized construction methods and thereby, for example, reduced use of firewood for heating bitumen; (v) maximizing safety and thereby reducing traffic accidents; (vi) reducing travel times and, thereby, fuel consumption and emissions; (vii) Increased accessibility for residents to education, health facilities, markets etc., and for others who might come as tourist or other purposes; and Improving the socio-economic conditions of residents in the project area of influence.

106. As part of the engineering works for this work, the following have been the guiding principles in determining preliminary alignments and other matters concerning route. These principles are implemented during detailed design wherever possible and, if this is not possible, the appropriate adjustments shall be made on site during the construction phase:

- (i) **Alignment:** Final alignment has been determined to avoid / minimize land acquisition, impact on structures, impact on water bodies, archaeological/cultural sites, interference with water sources, shifting of existing utilities etc.;
- (ii) **Water bodies:** construction of culverts and bridges during lean flow period. If technically not feasible toe walls/retaining walls will be installed. Aggregate will be procured from existing licensed quarries;
- (iii) **Tree Cutting:** restrict tree cutting to formation width. To the extent possible, road has been aligned on other side of dense vegetation/mature trees; A total of 1657 trees have been enumerated in proposed ROW. However, the tree cutting will be restricted to toe line of the formation width. The mandatory compensatory plantation will be done on 1:2 basis during the project implementation. A tree management plan shall be prepared, and its implementation monitored and reported in the SEMRs submitted to ADB. Tree management plan will also include details of presence of birds, nests etc., on ROW trees. All trees with nests should be marked. Before removal of trees a confirmatory survey should be conducted to reconfirm that there are no nests that will be impacted by tree cutting. In unlikely case of any protected species spotted, tree cutting should be stopped until further investigations are made, and mitigation measures are worked out and IEE updated and cleared by ADB. Irrespective of protected status, no bird nests should be disturbed, and tree should not be cut until the breeding time is concluded and fledglings fly off. Tree cutting shall be scheduled to avoid breeding season in consultation with forest department.
- (iv) **Construction material Sourcing:** Borrow areas have been identified at non-agricultural land. Quarrying is not proposed as material will be sourced from 02 nos. existing licensed quarries: (a) Sri Venkateswara Stone Crusher, Anakapalli. Lead – 8.2 km from Ch. 0+000 (b) Vijayalakshmi Stone Crusher, Anakapalli. Lead – 10 km from Ch. 0+000
- (v) **Dust and air pollution:** No new borrow areas/quarry sites to be opened for the project. Aggregates will be sourced from existing licensed quarries. Waste disposal sites and asphalt mixing sites have been sited away from habited areas;
- (vi) **Noise and Vibration:** Time regulation for construction near sensitive receptors and residential areas. No crusher operation near these locations;

- (vii) **Soil Erosion Cut and fill:** The design attempted to equalize cut and fill. Adequate erosion control measures included in design;
- (viii) **Construction Camp and Waste Disposal:** No such facility is sited near any water bodies, forest area, and settlements; and
- (ix) **Natural Hazards:** The project area is not located in a high seismic zone or high-risk zone from natural hazards perspective.

**Table 18: Type of Potential Impacts at Pre-Construction**

S. No.	Environmental Issue	Measures to be taken
1	Alignment	Final alignment should be determined so as to minimize land acquisition and the impact on people, animals and to avoid unfavorable geological condition and cultural relics.
2	Soil erosion	Temporary and permanent drainage systems should be designed to minimize the soil erosion.
3	Dust and air pollution	Borrow sites, waste disposal sites and asphalt mixing sites should be identified – keeping in mind environmental issues such as dust generation and noise pollution.
4	Cultural heritage	Any archaeological sites/remains identified along the alignment should be intimated to ASI prior to construction.

107. Construction camps, related contractor's facilities, borrow pits, and quarries will be established and be located in environmentally sound and socially safe areas. It is expected that construction materials for the road works will be mined only from approved quarries.

108. The following criteria will be applied when locating borrow areas:

- (i) Borrow areas are not to be established in ecologically sensitive areas;
- (ii) Villagers are to be consulted with respect to location of all borrow areas – these should ensure the safety of local communities and, if possible, should incorporate beneficial post construction features for the villages; and
- (iii) Borrow areas are to be located away from the Corridor of Impact of Anakapalli – Atchuthapuram road as well as 500 m away from settlements, so as to minimize visual impacts.

109. Regarding the setting-up of construction camps for laborers:

- (i) These should be located at least 500m away from settlements;
- (ii) Living accommodation and ancillary facilities should be erected and maintained to standards and scales approved by the Engineer-in-Charge; and
- (iii) Toilets and urinals should be provided in accessible places away from the Hot mix plant and mixing yard.

110. There are no adverse impacts expected on historical places/monuments. There are few religious structures/small places of worship which are coming within ROW and adjacent to existing carriageway. Adequate care will be taken to relocate these structures. Also, earthworks associated with the actual road construction/improvement works or deriving from secondary sites such as quarries or borrow pits, may reveal sites or artefacts of cultural/archaeological significance. In the event of such discovery, the concern authorities (Archaeological Survey of India) should be informed and the requirement to take such action should be incorporated in contract documents.

111. To minimize loss of vegetative cover and/or trees and soil erosion the following mitigation measures are adopted during the detailed design and construction stage of the project:

- (i) The detail engineering design study is carried out for widening proposal in order to minimize the need for tree felling or removal of vegetation.
- (ii) The detailed engineering design shall identify areas prone to erosion and include land stabilization as part of the design. While no major changes are expected, any future minor change in alignment or modifications will be included in the final IEE prepared by the contractor's engineer during project implementation.
- (iii) The detail engineering studies, and construction activities will strictly enforce the environmental conditions put as part of the Environmental clearance and Consent conditions from the SPCB; and
- (iv) The improvement of road will be done by adopting Environmentally Friendly Road Construction (EFRC) methods.

#### D. Construction Phase Impacts

112. **Climate and Air Quality.** The potential sources of air emission during the construction phase of the project are: (i) earth works during site preparation; (ii) operation of equipment, machines and vehicles; (iii) transport of construction materials; and (v) combustion of hydrocarbons particularly from the hot mix plants and process of heating bitumen. Most of the emissions will be in the form of coarse particulate matter which will settle down in close vicinity of construction site.

**Table 19: Impact on Air Quality during Construction Stage**

S. No	Impact	Source
1	Generation of dust (SPM)	(i) Transportation and tipping of cut-material - while the former will occur over the entire stretch between the cutting location and disposal site, the latter is more location specific and more intense; (ii) Transportation of raw materials from quarries and borrow sites; (iii) Stone crushing, handling, and storage of aggregates in asphalt plants. (iv) Site levelling, clearing of trees, materials loading/unloading at construction site, construction of bridges. (v) Concrete batching plants. (vi) Hot mix plants – due to the mixing of aggregates with bitumen; and (vii) Construction of structures and allied activities
2	Generation of polluting gases including SO <sub>2</sub> , NO <sub>x</sub> and HC	(i) Hot mix plants; (ii) Large construction equipment, trucks and asphalt producing and paving equipment; (iii) The movement of heavy machinery, oil tankers etc. on steep slopes will cause much higher emissions of gases; (iv) Toxic gases released through the heating process during bitumen production; and (v) Inadequate vehicle maintenance and the use of adulterated fuel in vehicles.

HC = hydrocarbons, NO<sub>x</sub> = Oxides of Nitrogen, SO<sub>2</sub> = Sulphur Dioxide.

113. The stone aggregate will be sourced from licensed quarries. No new quarries shall be open for the project. The pollution related aspects to these quarries are independently complied

by the quarry owners. The aggregate will be transported in the tarpaulin covered trucks. The following are the mitigation measures:

- (i) Vehicles delivering loose and fine materials shall be covered;
- (ii) Loading and unloading of construction materials in covered area or provisions of water fogging around these locations;
- (iii) Storage areas should be located downwind of the habitation area;
- (iv) Water shall be sprayed on earthworks periodically;
- (v) Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory;
- (vi) Hot mix plants should be located at least 1.5 km from the nearest habitation, school, hospital, archaeological site, forest, rivers, streams and lakes, 500 m from ponds, and national highway, 250 m from state highway, unless otherwise required by statutory requirements after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by APPCB to ensure enough dispersion of exit gases;
- (vii) Bitumen emulsion and bitumen heaters should be used to extent feasible;
- (viii) Only crushers licensed by APPCB shall be used;
- (ix) LPG should be used as fuel source in construction camps instead of wood;
- (x) Regular water sprinkling of unpaved haulage roads<sup>2</sup>;
- (xi) Mask and other PPE shall be provided to the construction workers;
- (xii) Diesel Generating sets shall be fitted with adequate height as per regulations (Height of stack = height of the building +  $0.2 \sqrt{\text{KVA}}$ . Low Sulphur diesel shall be used in DG sets as well as machineries; and
- (xiii) Contractor should submit a dust suppression and control program to the APRDC prior to construction.

114. **Noise and Vibration.** The existing noise in the project area is within the permissible limits. During the construction period, noise will be generated from the operation of heavy machinery, the haulage of construction materials to the construction yard and the general activities at the yard itself. Concrete mixing and material movements will be primary noise generating activities and, most likely, will be uniformly distributed over the entire construction period. These construction activities are expected to produce noise levels in the range of 80 – 95 dB(A). Piling will not be required as per the design of the flyover section. Noise impact along the flyover section during construction and operation of the flyover are expected and suitable measures are proposed for mitigation. The sensitive receptors along the flyover alignment will be provided adequate protection in the form of installation of the noise buffers if required. Noise and vibration from construction and operation phase will be unavoidable but the impact will only be temporary and minimal and will only impact locations close to the alignment. In construction sites within 500 meters of a settlement, noisy operations should cease between 22:00 and 06:00 hrs. Regular maintenance of construction vehicles and machinery must also be undertaken to reduce noise.

115. Further to minimize noise impacts near sensitive receptors (particularly schools), operation of excavator and other heavy machineries will be carried out mostly during off-hours (7 am to 9 am and 3.30 pm to 7 pm) and on holidays (Saturday and Sundays). Baseline noise will be established for all sensitive areas prior to construction and follow up noise monitoring will be carried out during the construction.

116. Noise modelling shall be conducted during the construction stage to confirm future noise levels in critical traffic areas such as flyovers and nearby sensitive receptors. Accordingly needs for noise barriers shall be established and suitable mitigation measures planned.

117. Provision for Noise barrier locations along the alignment will be made based on the willingness of the school/temple or religious structures and authorities and technical feasibility. The Noise barriers can be constructed from earth, concrete, masonry, wood, metal, and other materials. To effectively reduce sound transmission through the barrier, the material chosen must be rigid and sufficiently dense (at least 20 kilograms/square meter). All noise barrier material types are equally effective, acoustically, if they have this density. To effectively reduce the noise coming around its ends, a barrier should be at least eight times as long as the distance from the home or receiver to the barrier.

118. **Noise impact and mitigation measures proposed for the Flyover Section.** The construction and operation of Anakapalli Flyover (km 14+100 to km 15+200) will have potential noise impact on the sensitive receptors near the alignment. Key sensitive receptors and their locations identified near the flyover is as below:

- (i) 14+200 – RHS (School)
- (ii) 14+600 – LHS (Temple)
- (iii) 15+500 – LHS (School)

119. Details of the receptors and location is provided in the Flyover Strip Plan attached as Appendix 14.

120. It will be ensured that noise barriers at suitable locations will be provided based on the results of the noise monitoring conducted and location of sensitive receptors along the flyover alignment. It is proposed that suitable noise barriers will be installed at selected sensitive receptor locations along the subproject road. Site specific design of the noise barriers will be prepared and included in the final SEMP and provided to the Contractor for implementation.

**Table 20: Sample of Noise Barriers for proposed Flyover during operation phase**

1.		Noise barriers may be installed at locations where the flyover is closest to the sensitive receptors.
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<p>2.</p>		<p>Height of noise barriers to be sufficient to ensure noise from moving traffic is well absorbed and deflected.</p>
<p>3.</p>		<p>Noise barriers to ensure that sensitive locations / public places are provided adequate buffer from operational noise.</p>

4.		Junction curves to be protected with noise from high speeding vehicles.
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**Table 21: Likely Impact on Noise Quality in the Vicinity of the Project Area**

Impact	Source
Increased noise levels causing discomfort to local residents, workers and local fauna.	<ul style="list-style-type: none"> <li>• Mobilization of heavy construction machinery;</li> <li>• Accelerations/decelerations/gear changes – though the extent of impact will depend on the level of congestion and smoothness of the road surface;</li> <li>• Excavation work for foundations;</li> <li>• Construction of structures and other facilities;</li> <li>• Crusher plants, Hot mix plants; and</li> <li>• Loading, transportation and unloading of construction materials.</li> </ul>

121. Typical noise levels associated with various construction activities and equipment are presented in Table 22 below:

**Table 22: Typical noise levels of principal construction equipment's (Noise Level in dbA at 50 Feet)**

Construction Equipment		Construction Equipment	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
Excavation and earth moving		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
		Cement and dump trucks	83-94
Front end loader	72-84	Front end loader	72-84
Dump truck	83-94	Dump truck	83-94
Jack hammer	81-98	Paver	86-88
Scraper	80-93		

Construction Equipment		Construction Equipment	
Grading and compaction		Landscaping and cleanup	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
Paving		Front and end loader	
Paver	86-88	Dump truck	72-84
Truck	83-94	Paver	83-94
Tamper	74-77		86-88

Source: U.S. Environmental Protection Agency, noise from Construction Equipment and Operations. Building Equipment and Home Appliance. NJID. 300.1 (31December 1971).

122. The noise levels indicated for various construction activities/equipment, while far exceeding permissible standards will occur only intermittently and be only temporary.

123. **Vibration:** The proposed subproject road passes through surrounding agricultural areas for nearly 70% of its length. There are a few settlements close to the junction areas and proposed flyover. Majority of the structures are permanent RCC structures and any potential impacts due to vibration is expected to be minimal. The asset details as gathered for a sample of settlements and surrounding structures is provided below.

**Table 23: Type of Settlements / Structures along the Subproject Alignment**

S. No	Survey No.	Name of Village	Plinth Area (in ft <sup>2</sup> )	Floor	Type of Structure
1	199-2	Chodapalli	387.36	GF	GI Sheet
			645.60	GF	GI Sheet
2	199-2	Chodapalli	944.19	GF	AC Sheet
3	199-2	Chodapalli	809.04	GF	RCC
4	199-2	Chodapalli	451.92	GF	RCC
5	199-2	Chodapalli	1591.08	GF	RCC
			1591.08	FF	RCC
6	199-2	Chodapalli	497.11	GF	RCC
7	199-2	Chodapalli	595.57	GF	RCC
			595.57	FF	RCC
8	199-3	Chodapalli	753.20	GF	RCC
9	199-3	Chodapalli	753.20	GF	RCC
10	195-4	Chodapalli	739.75	GF	RCC
11	195-4	Chodapalli	186.69	GF	RCC
			168.02	FF	RCC

S. No	Survey No.	Name of Village	Plinth Area ( in ft <sup>2</sup> )	Floor	Type of Structure
12	195-4	Chodapalli	186.69	GF	RCC
			168.02	FF	RCC
13	195-4	Chodapalli	186.69	GF	RCC
			168.02	FF	RCC
14	195-4	Chodapalli	344.32	GF	RCC
15	195-4	Chodapalli	361.54	GF	RCC
16	195-3	Chodapalli	647.75	GF	RCC

Note: Buildings towards Anakapalli on L/s (between Km.14/540 to Km.14/360 = 180.00 M of A-P Road).

124. Any potential vibration impacts are also avoided through suitable design of the flyover structure as was also permissible due to the excellent quality of soil available in the area. From the design drawings it can be seen that only open foundation is proposed for all the piers and abutments of flyover structure and no piling activity will be required. The proposed open foundation has a base width of 14 m x 9.6 m is paced on the middle of the 30.4 m wide ROW. The open foundation structure will have 8.2m space from the edge of the ROW and that would be sufficient for providing adequate shore protection for the less 6m deep foundation.

125. Since the anticipated post-construction volumes of traffic on the project road is expected to below, impacts from higher noise levels will have little significance even though present noise levels in these areas are low. In these areas, the noise produced during construction will also not have a significant impact if proper mitigation measures are taken. Mitigation measures include:

- (i) The Contractor shall adequately compensate in a timely manner for any damage to property/services and life caused by activities.
- (ii) All equipment shall be timely serviced and properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection which will favor lower sound power levels. Construction equipment and machinery shall be fitted with silencers and maintained properly;
- (iii) Stationary noise making equipment shall be placed along un-inhabited stretches;
- (iv) Timing of noisy construction activities shall be regulated near sensitive receptors;
- (v) Maximum construction activities shall be undertaken during night-time weekends when there are minimal activities by the sensitive receptor, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards;
- (vi) If the above-mentioned schemes prove to be inadequate, the provision of temporary noise barrier shall be made near identified sensitive locations or near the noise source during construction;
- (vii) Protection devices (ear plugs or ear muffs) shall be provided to the workers operating in the vicinity of high noise generating machines;
- (viii) Noise measurements should be carried out to ensure the effectiveness of mitigation measures; and
- (ix) Develop a mechanism to record and respond to complaints on noise.

126. **Impact on Land and Soil, Topography and Aesthetics.** Activities like clearing of vegetation, waste/debris disposal, and establishment of labour camps may change the topography and appearance of the landscape. Mitigation measures include:

- (i) Cut materials should be used to widen the road or disposed in an environmentally acceptable manner;
- (ii) Cut slopes should be re-vegetated immediately after widening activities;
- (iii) Borrow areas, if required should be rehabilitated and brought back as far as possible to their previous appearance. Some borrows shall be converted into ponds to compensate loss of water bodies. This will also enhance the local aesthetics;
- (iv) Cut off material should be used to widen the road or disposed of at proper disposal sites;
- (v) Provision and allocation of proper waste disposal bins and sites are required; and
- (vi) Supply of cooking gas should be provided by the contractor to eliminate the use of fire wood.

127. **Loss of Productive Soil and Change in Land Use.** Road widening and improvement is limited to available ROW and encroachment on agricultural land is expected to be minimal. Following set of mitigation measures will be implemented with regards to conversion of agricultural lands. Mitigation measures include:

- (i) The topsoil from the productive land shall be preserved and reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion; and
- (ii) Ensured that the land taken on lease for access road, borrow areas, construction camp is restored back to its original land use.

128. **Soil Erosion/Silt Runoff.** Soil erosion may take place near cutting areas, at steep and uncompacted embankment slope, and wherever vegetation is cleared. Accumulated eroded soil will result to siltation, embankment damage, and drainage problem. Loss of soil due to runoff from earth stockpiles may also lead to siltation. Mitigation measures include:

- (i) Bank protection measures shall be taken at erosion prone areas.
- (ii) Provision of side drain to guide the water to natural outfalls;
- (iii) Retaining walls with parapets and breast walls have been included in the design to check erosion;
- (iv) When soil is spread on slopes for permanent disposal, it shall be buttressed at the toe by retaining walls;
- (v) Side slopes of the embankment shall not be steeper than 2H: 1V. Turfing of embankment slopes shall be done along the stretch; and
- (vi) IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration.

129. **Borrow Areas and Quarries.** Need for opening borrows areas and quarries are not anticipated. However, if requirement emerged, it may cause some adverse impacts if left unrehabilitated. It may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air, and noise pollution. Opening of new quarries is not envisaged due to the proposed subproject. Quarry material will be sourced from existing licensed quarries<sup>8</sup>. The dredging and use of dredged

material, if involved, may have its impact in terms of localized sedimentation level increase and dispersion of pollutants present in the dredged material in the river water. Contractor is required to submit a borrow area management plan including the details on top soil conservation, procedures for opening/closing and restoration of borrow area etc. The plan is required to be approved by the Engineer. Detailed borrow area management plan Will be provided post award of Contract and before commencement of work by the Contractor. Mitigation measures include:

- (i) Borrow areas if required, shall not be located near forest areas. The edges of borrow sites shall be no closer than 3 m from any fence line or boundary.
- (ii) Adequate clearance shall be provided for the construction of catch drains.
- (iii) Borrow sites shall have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Cut batter slopes shall not be steeper than 3 to 1 and shall be left by the Contractor in a tidy and safe condition to the satisfaction of the Engineer. Written clearance from the landowner/village head shall be obtained before leaving a site.
- (iv) Obtain statutory approval from competent authority as detailed in chapter II (recent policy initiatives on mining of minor mineral)
- (v) Borrow pits shall be selected from barren land/wasteland to the extent possible.
- (vi) Borrow areas should not be located on cultivable lands except in the situations where landowners desires to level the land. The topsoil shall be preserved and depth shall be restricted to the desired level.
- (vii) Borrow areas should be excavated as per the intended end use by the owner.
- (viii) The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.
- (ix) The dredged material from the river bank shall be tested for presence of heavy metals and other pollutants before its reuse.
- (x) The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%, to the extent possible, borrow areas shall be sited away from habited areas. Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil.
- (xi) Monitoring of rehabilitation plan of borrow areas.

130. **Compaction and Contamination of Soil.** Compaction of haulage roads and construction camp area due to movement of construction vehicles, machineries and equipment, and due to sitting of construction camps and workshops. Soil may get contaminated due to inappropriate disposal of liquid waste (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery.

131. Soil may also get contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps. Sub soil contamination may also be attributed to scarified bitumen wastes, operation of the emulsion sprayer and laying of hot mix, storage and stock yards of bitumen and emulsion, excess production of hot mix and rejected materials. Mitigation measures include:

- (i) Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils;
- (ii) Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fueling areas, "oil interceptors" shall be provided. Oil and grease spill and oil-soaked materials are to be collected

- and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to APPCB/ MoEF authorized refiners;
- (iii) Movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route;
  - (iv) Approach roads shall be designed along the barren and hard soil area to reduce the compaction induced impact on soil;
  - (v) The productive land shall be reclaimed after construction activity;
  - (vi) Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp; and
  - (vii) Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. Non-biodegradable and non-sellable waste shall be disposed of to an authorized land fill site. If land fill site not available then burial of the waste in a secured manner shall be ensured.

**132. Surface Water –resources - Siltation and Deterioration in Surface Water Quality.** The temporary pollution of water bodies from spillage of chemicals and oil at construction sites and waste from construction camps may occur. Accidental oil and chemicals spills can contaminate the ponds close to alignment. Mitigation measures include

- (i) Construction works near waterways/water bodies shall not be undertaken during the monsoon season;
- (ii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (iii) No construction camp within 500m of any water body;
- (iv) Locate all parking, repair, and fuel and hazardous material storage area away from any water body. Vehicle parking and maintenance areas shall have waterproof floors from which drainage is collected and treated to legal standards;
- (v) Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge;
- (vi) Collect all waste oil, store in sealed damage-proof containers and dispose it to recyclers;
- (vii) All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up;
- (viii) Temporary retention ponds, interception drains, and silt traps are installed to prevent silt laden water from entering adjacent water bodies/waterways; and
- (ix) The slopes of embankments leading to water bodies should be modified and re-channelized to prevent entry of contaminants.

**133. Alteration of Surface Water Hydrology/Drainage.** Diversion of rivers and major streams construction is not envisaged. Reconstruction/new construction of culverts will be done during lean flow period. Diversion of some nallahs may be required for a very short period and their courses will be maintained as soon as construction is completed.

**134. Groundwater.** Water for construction purpose will be sourced mainly through river sources. Suitable arrangement for drinking water in the campsite will be managed by contractor without affecting availability to local community. The area is not classified as critical semi-critical or overexploited by CGWB. However, uncontrolled abstraction can deteriorate the situation. Contamination of groundwater is not envisaged since construction camps, if any will have septic tanks or mobile toilets depending on the number of workers in the camp. Mitigation measures include:

- (i) Requisite permission shall be obtained for abstraction of groundwater.
- (ii) The contractor shall make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.

135. **Impact due to Construction Debris/Waste.** Debris can be generated by dismantling of pavement. Quarry dust and unused iron bars or damaged support structures constitute significant wastes. Mitigation for solid waste from construction camp has been given in construction camp section. Mitigation measures include:

- (i) The existing bitumen surface can be utilized for paving of crossroads, access roads, and paving works in construction sites and camps, temporary traffic diversions, haulage routes etc.;
- (ii) All excavated materials from roadway, shoulders, verges, drains, cross drainage and the like will be the property of the APRDC and will be used for backfilling embankments, filling pits, and landscaping;
- (iii) Unusable debris material should be suitably disposed at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner;
- (iv) Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site;
- (v) Following consideration shall be made during selection of dumping sites;
- (vi) 1.5 km from habitation and forest areas and 500 m from ponds;
- (vii) Dumping sites do not contaminate any water sources, rivers etc.;
- (viii) Public consent from the village council has to be obtained before finalizing the location; and
- (ix) Form works will be re-used to the extent possible, more than 20 times as dictated by good practice. All stripped formworks will be examined for any damage and rectified in the workshop for re-use.

136. **Ecological Resources –Terrestrial.** There are no national parks, wildlife sanctuaries or any other similar eco-sensitive areas in the subproject location. No wildlife movement was reported/observed. Subproject road is a part of an existing state highway and passes through local villages and commercial areas over its length of 20 km. No diversion of forest land is required. The land next to the ROW stretches is owned by private individuals and about 1657 trees are likely to be affected. There is an area frequented by birds mostly during the winter season called Kondarkala Ava.<sup>14</sup> To avoid any air / dust / noise related impacts in this area, necessary measures are outlined in the EMP such as use of IS approved equipment, no noisy construction during nighttime, avoiding material stacking and storage close to the area and efficient management of traffic near residential and these areas.

137. **Impacts due to Construction Camp and Immigration of Workers.** Poor siting and improper management of construction camp may lead to several adverse impacts on environment viz: (i) loss of vegetation due to use of wood as fuel for cooking; (ii) deterioration in nearby surface water quality; (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste; and (iv) poor sanitation may result to transmission of communicable diseases among the workers and the host communities to include sexually transmitted disease, diseases from improper handling and supply of foodstuffs, poor water supply, insect-borne diseases, and alcoholic and drug. Mitigation measures include:

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<sup>14</sup> Refer Appendix 18 for existing site pictures of Kondarkala Ava

- (i) No productive land will be utilized for construction camp. All sites must be graded, ditched, and rendered free from depressions to avoid water stagnation;
- (ii) Accommodation and ancillary facilities including recreational facility for workers shall be erected and maintained to standards and scales approved by the resident engineer. All camps should maintain minimum distance of 500 m from habitation and water bodies;
- (iii) All construction camps shall be provided sanitary toilet with provision of septic tanks attached with soak pits. Storm water drains shall be provided for the flow of used water outside the camp. Drains and ditches shall be treated with bleaching powder on a regular basis. Garbage bins must be provided in the camp and regularly emptied and disposed of in a hygienic manner. LPG cylinders shall be provided as fuel source for cooking to avoid any tree cutting;
- (iv) At every workplace, the Contactor will ensure that a readily available first-aid unit;
- (v) Workplaces away from regular hospitals shall have indoor health units. Suitable transport shall be provided to approach the nearest hospital. At every workplace an ambulance containing the prescribed equipment and nursing staff shall be provided;
- (vi) The Contractor will ensure the good health and hygiene of all workers to prevent sickness and epidemics. These include the HIV/AIDS prevention program to reduce the risk and transfer of HIV virus. Activities under the program include monthly information, education, and communication campaigns to workers, drivers, delivery crew, and communities on the risk;
- (vii) The Contractor will provide adequate and safe water supply for the use of the workers. The Contractor will ensure that all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations. No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community; and
- (viii) Migrant workers may be the potential carriers of various diseases. Local community may get exposed to the diseases carried by migrant workers. Regular health check-up and immunization camps shall also be organized for the workers and nearby population.

138. **Safety of Construction Workers and Accident Risk to Local Community.** The following safety aspects: (i) safety of construction workers, (ii) safety of road users including pedestrians and cyclists, (iii) safety to cattle, (iv) safety of local community including additional measures required for the safety of children, women, elderly, and persons with disabilities, (iv) unsafe/ hazardous traffic conditions due to construction vehicle movement need to be considered during design and construction stage, and (v) conduct of safety audit. Impact and mitigations due to blasting operation as already been detailed in Noise and Vibration section.

139. Requirement of underpasses for cattle is not envisaged as movement of the cattle will be alongside the road for accessing any water pond or grazing area, which is the present practice. Water ponds are available for livestock drinking along both sides of the road and the subproject will not impact any restriction on the movement of local community and livestock.

140. Pedestrian crossings, shelter area and level crossings will be incorporated along the road and finalized during the detailed design. This will be based on the result of the traffic study that is being conducted for estimating the traffic flows and estimated traffic volumes over time once the subproject is completed. Mitigation measures include:

- (i) During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances (iii) welding (iv) electrical works etc.;
- (ii) Contractor shall arrange all PPEs for workers, first aid and firefighting equipment at construction sites. An emergency plan shall be prepared duly approved by engineer in charge to respond to any instance of safety hazard;
- (iii) To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan shall be drawn up by the concessionaire. Traffic in construction zones shall be managed as per the provisions of IRC SP 55.
- (iv) After construction is completed in a particular zone, it shall be opened for normal operation. All diversions/access roads should be closed before start of normal operation; and
- (v) Use of retro-reflectorized traffic signs, and cantilever/gantry type overhead signs, thermoplastic road marking paints, delineators, traffic cones, empty bitumen drums, barricades, and flagmen will be used to ensure traffic management and safety. Conduct of regular safety audit on safety measures adopted during construction. The audit will cover manpower and their safety, machinery, temporary works, equipment and vehicles, materials storage and handling, construction procedures, environment, site safety guidelines, and miscellaneous services.

141. VCICDP Health and safety plan<sup>15</sup> in response to COVID-19 is an integral part of the environmental management plan (EMP).

- (i) The H&S plan may be updated as and when new guidelines are issued by the governments, and international organizations such as WHO and ADB.
- (ii) All the contractors be advised to prepare site-specific plan compliant with government circulars, guidelines and public health advisories, elaborating the arrangements and measures for implementation of the H&S plan.
- (iii) These site-specific plans should be shared with ADB after PMU approval. In accordance with the government guidelines, the respective agreed measures are in place before resumption of the specific activity at project sites and congregation of workers at the project site and camps. The implementation of the contractor's approved site-specific plans is properly monitored by the project consultants and the PMU/PIUs.

142. **Obstruction and Disruption of Traffic.** Disruption of access to infrastructure or social resource due to construction activity will cause nuisance and to a certain extent additional cost to the public in terms of longer travel period due to diversion or heavier traffic. It will also pose risk of accident to road users (pedestrians and motorist especially at night if these blockages and disruption are not clearly demarcated. Works may pose greater risk to children, women, elderly persons, and persons with disabilities. Mitigation measures include:

- (i) The contractor will submit a Traffic Plan to the Project Engineer at least two weeks before the construction starts that will result to obstruction. This Plan will recommend for approval, the safe and convenient temporary diversion of traffic during construction, design of barricades, delineators, signs, markings, lights, and

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<sup>15</sup> Please refer Appendix 17.

- flagmen, among others Traffic plan shall include measures and safe passages for the safety of road users, including measures that are required to ensure safety of children, women, elderly persons and persons with disabilities.
- (ii) For widening of existing carriageway and part of it will be used for passage of traffic, paved shoulder will be provided on one side of the existing road by the contractor with the following minimum requirements:
    - (iii) At least one 3.5 m lane to remain to traffic at all times;
    - (iv) The surface used by the through traffic will be firm bituminous compacted surface free of defect;
    - (v) The maximum continuous length over which construction under traffic may take place is limited to 750 m;
    - (vi) Construction activity will be restricted to only one side of the existing road;
    - (vii) On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. These paved diversions will comply with standards on junctions and temporary cross drainage; and
  - (viii) Transportation of quarry material to the construction sites through heavy vehicles shall be done through existing major roads to the extent possible. This will restrict wear and tear to the village/minor roads. Small vehicles/un-motorized vehicle can also be used for its further transportation to the construction sites from temporary storage areas.

143. **Transport and Storage of Materials.** The construction material primarily will consist of aggregate, sand, cement, bitumen, lubricating oil and fuel for vehicle and construction equipment. These will be primarily stored temporarily at construction camps. The oils, fuels, and chemicals will be stored on concreted platform with spills collection pits. The cement will be stored under cover. All these temporary storage areas will be located at least 150m away from the habitat.

144. **Impact on Land and Private Properties.** The assessment made in resettlement plan shall be referred for exact loss of private properties and measures to compensate such losses. Besides monetary compensation for any loss of private trees, compensatory afforestation and extensive plantation is incorporated in the EMP. Income restoration measures/livelihood options for vulnerable group/resource poor sections and other affected persons as recommended by social development/resettlement expert shall be implemented and the details are provided in the RP prepared for the project.

145. **Impact on Common Property Resources (CPRs).** There are various types of community structures/ facilities/utilities along the proposed alignment (Table 24). Geometric adjustments have been made to minimize the loss to any such facilities. Alternate access has to be provided to these structures during construction stage. All community structures likely to be dismantled shall be suitably relocated. For exact extent of impact on these structures and mode of compensation, resettlement / land acquisition plan shall be referred.

**Table 24: List of Affected Common Property Resources along the Anakapalli-Atchuthapuram Road**

Asset No	Chainage location	Name of The Village	Side	Distance from the centreline (m)	Affected Property
1	2380	Nagulapally	L	12.5	Shiva Temple
2	2400	Nagulapally	R	11	Devi PerantaluKotalu

Asset No	Chainage location	Name of The Village	Side	Distance from the centreline (m)	Affected Property
3	2645	Nagulapally	L	5	Satthamma Temple
4	2790	Nagulapally	R	7.5	Sri Kasi Anapurneswari Temple
5	2840	Nagulapally	L	8.5	Human Temple
6	2850	Nagulapally	L	10	Bus-stand
7	2900	Nagulapally	R	12	Z.P.P.S School
8	3120	Nagulapally	R	6.5	Vinayaka Temple
9	3820	Ompolu	R	6.5	PydimambaandVinayaka Temple
10	4740	Munagapaka	L	8	PasaraMaramma Thalli Temple
11	5530	Munagapaka	R	13.5	Church Compound
12	5590	Munagapaka	R	6	MusiliThalli Temple
13	5635	Munagapaka	R	8.5	Human Temple
14	5650	Munagapaka	R	5.7	Bus-stand
15	5680	Munagapaka	R	13	Pump House
16	5700	Munagapaka	R	5	Shivalam
17	6240	Munagapaka	R	11.3	Maridamma Thalli Temple
18	7430	Munagapaka	R	6	Maridamba Thalli Temple
19	7720	Munagapaka	L	7	Anajaneya Swami Temple
20	7815	Munagapaka	R	3.2	Mutyalamma Temple
21	8260	Munagapaka	R	5	MamidiMahalakshmi
22	8635	Kondlakarla	L	8.5	Yellaramma Temple
23	8640	Kondlakarla	L	13.5	Vinayaka Temple
24	8670	Kondlakarla	R	6.5	Hunuman Temple
25	12955	Chodapalli	R	3	Chodamambica Temple
26	13410	Chodapalli	R	8	ParadesimambaPucca
27	13415	Chodapalli	L	10.8	ParadesimambaPucca
28	13705	Chodapalli	R	3.8	Paradesimamba Semi Pucca
29	14105	Mosayyapeta	R	12.3	School Compound Wallsand Toilets
30	14150	Mosayyapeta	R	12.4	Panchayat Pucca
31	14160	Mosayyapeta	R	12.5	School
32	14260	Mosayyapeta	R	3.5	Nukambica Temple

**Table 25: Picture / Details of key Common Property Resources in Anakapalli-Atchuthapuram Road**

	Affected Common Property Resources	Image
1	Shiva Temple: It is a type of Religious CPR in Nagulapallyvillage located on left side at chainage 2.38km at a distance of 12.5m	

	<b>Affected Common Property Resources</b>	<b>Image</b>
2	Sri Kasi Annapurneshwari Temple: It is a type of Religious CPR in Nagulapally village located on right side at chainage 2.79km at a distance of 7.5m.	 A photograph of the Sri Kasi Annapurneshwari Temple. The temple is a traditional South Indian structure with a highly ornate, multi-tiered gopuram (tower) featuring intricate carvings and colorful decorations. The main shrine is enclosed by a blue and white wall with a central entrance. The temple is situated in a lush green area with trees in the background.
3	Hanuman Temple: It is a type of Religious CPR in Nagulapally village located on left side at chainage 2.84km at a distance of 8.5m	 A photograph of the Hanuman Temple. The temple is a simple, single-story structure with a prominent archway (prabhavali) above the entrance. The archway is decorated with colorful statues of Lord Hanuman and other deities. The temple is surrounded by a low wall and is set against a clear blue sky.
4	ZPPS SCHOOL: It is a type of CPR in Nagulapally village located on right side at chainage 2.9 km at a distance of 12m.	 A photograph of the ZPPS School. The school is a two-story building with a red and white facade. It is surrounded by a concrete wall and a gate. There are several motorcycles parked outside the gate. The school is situated in a green area with trees in the background.
5	Vinayaka Temple: It is a type of Religious CPR in Nagulapally village located on right side at chainage 3.12km at a distance of 6.5m.	 A photograph of the Vinayaka Temple. The temple is a simple structure with a green door. A man in a striped shirt is standing in front of the temple, holding a pink sign that reads 'Vinayaka Temple' and 'L.H.S.'. Another person is partially visible in the foreground. The temple is situated in a green area.
6	Musili Thalli Temple: It is a type of Religious CPR in Munagapaka village located on left side at chainage 5.590km at a distance of 6m	 A photograph of the Musili Thalli Temple. The temple is a small, simple structure with a yellow and blue facade. It is situated in a green area with trees in the background. The temple is partially covered by a simple roof structure.

	<b>Affected Common Property Resources</b>	<b>Image</b>
7	Busstand: It is a type of CPR in Munagapaka village located on right side at chainage 5.650km at a distance of 5.7m.	
8	Shivalayam Temple: It is a type of Religious CPR in Munagapaka village located on right side at chainage 5.7km at a distance of 5m.	
9	Chodambika Temple: It is a type of Religious CPR in Chodapallivillage located on right side at chainage 12.955km at a distance of 3m	
10	School Compound walls and Toilets: It is a type of school CPR in Mosayyapetavillage located on right side at chainage 14.105km at a distance of 12.3m	
11	Nukambika Temple: It is a type of Religious CPR in Mosayyapetavillage located on right side at chainage 14.260km at a distance of 3.5m	

CPR = Common Property Resources, km = kilometre, m = meter.

146. **Impact on historical monuments / religious structures.** There are no adverse impacts expected on historical places/monuments. However, there are few religious structures/idols which

are coming within ROW and adjacent to existing carriageway. Care must be taken to relocate these structures. Also, earthworks associated with the actual road construction / improvement works or deriving from secondary sites such as quarries or borrow pits, may reveal sites or artefacts of cultural/archaeological significance. In the event of such discovery, the concern authorities (Archaeological Survey of India) should be informed and the requirement to take such action should be incorporated in contract documents.

## **E. Operation and Maintenance Phase Impacts**

147. **Road Maintenance.** Lack of proper maintenance may deteriorate the road condition over the years resulting into numerous problems such as rise in accidents, disruption of transportation services, tree survival. APRDC must allocate adequate resources and logistics to ensure that the road is being maintained and intended benefits are generated thereof.

148. **Road Safety.** There may be potential safety risks associated with transportation of hazardous chemicals, raw materials, wastes, etc. by industrial trucks. Improper traffic management, poor road maintenance or potential accidents caused by heavy truck or trolley movement may pose potential risk to the nearby community.

149. The traffic control plans shall be established which will contain details of diversions; traffic safety arrangements, safety measures for nighttime traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least number of people and other vehicles on the road. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.

150. On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road. The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "Engineer". Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.

151. **Soil Erosion and its Cumulative Impacts.** The consequences of soil erosions are far wider than repair and maintenance of the road. Along the project road, the inflow of water into ponds during rains causes erosion of the embankment besides seepage of water into embankments and subgrade resulting in softening of the subgrade. This may also increase siltation in water bodies. Project design includes provisions of retaining walls/retaining walls for the protection. Regular checks shall be made to ensure its effectiveness.

152. **Air Pollution.** Likely rise in traffic after road improvement may cause air and noise pollution in the vicinity of the project. Vehicular emission will be the principle source of pollution during operation stage. Atchuthapuram–Anakapalli road is located in thickly vegetated and open agricultural land which will provide adequate dispersion dynamics of gaseous pollutants. Vegetation acts as sink to air pollutants. Further, the improved road condition will facilitate free flow of traffic thereby reducing the emission level significantly.

153. **Noise Pollution.** Noise level is likely to increase due to increased traffic. Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch and speed limitation and honking restrictions may be enforced near sensitive locations.

The effectiveness of noise mitigation should be monitored and if need be, solid noise barrier shall be placed.

154. **Water Pollution.** Accidental oil spillage, washing of vehicles, used engine oils can contaminate the nearby water bodies. Expansion joints and drainage spouts may be choked due to silt and vegetation growth. In order to prevent water pollution, washing of vehicles near streams and ponds will be prohibited. Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.

155. **Ribbon Development/Encroachment of ROW.** Increase in economic activities results in ribbon development along highways. This may cause congestion to road users and increase in accident. APRDC shall explore options like avenue plantation and/or fencing and initiating regulatory provisions to stop encroachment of ROW.

#### **F. Indirect, Induced and Cumulative Impacts**

156. The volume of vehicle movements that will be generated and the likely closure/blocking of some roads/lanes during construction will cause traffic build-up and choke points. There will be slower mobility, longer travel time, slower delivery of goods, people and services than usual during this time. A greater number of people will be exposed to safety hazards from traffic and constricted road space. Coupled with disruption of economic activities and social services from interrupted power supply due to relocation of power poles and/or accidental damages, production outputs will suffer some slowdown. Severe dust falling on vegetation would have some effect on the fields. Apart from the applicable mitigation measures for direct impacts during construction, the coordination with the relevant community and village authorities, social service institutions and business associations should enable further mitigation of indirect and induced the impacts. As such, the proposed road works will not generate cumulative impacts of high magnitude and significance in terms of dust, noise, water resources contamination, soil contamination, impact on aquatic habitats, traffic, blocking of accesses, health and safety hazards and disruption to social services and economic activities. The grievance redress mechanism will be disclosed (through public meetings, display at strategic places and media) to the communities affected by the cumulative impacts.

157. While the project is already located close to urban and semi-urban areas, better and available employment opportunities and transport operations may lead to rapid urbanization in future. The key drivers of impact due to rapid urbanization are (i) people influx; and (ii) vehicle influx.

158. **People Influx.** As population increases exponentially due to rapid and unplanned urbanization, chances are local ecosystem would be unable to cope with the extra stress due to increase in resource utilization load. The major category of impact because of people influx can lead to impacts on Water (usually the case when resource is already in a depleted state and unable to sustain the load due to heightened people influx and may lead to further degradation in water quality of surface water or on the depletion of groundwater table); Solid Waste (In-adequate collection measures and capacity for treatment of municipal solid waste, excessive load on treatment system might lead to disposal of untreated or partially treated waste directly drained to water stream); Land (change in land usage, land use area and available catchment area lead to higher run-off thus causing depletion of water table and removal of top nutrients from soil).

159. **Vehicle Influx.** The movement of goods and people would also increase due to better transport operations and a wider road network. There may be an impact on the air quality because of increased emissions. The increase influx of vehicle would cause increase in PM, SOX, NOX levels in ambient air. The GHG emissions are also likely to increase. Fast flow of traffic may also result in increased probability of road accidents. However, an element of the same may also be reduced due to less congestion and smooth flow of traffic. Mitigation measures include:

- (i) The water quality and level of ground water need to be checked at regular intervals to see any sign of deterioration so that it gives the authorities time to take appropriate measures;
- (ii) Following building codes stringently and mandating municipal waste segregation;
- (iii) RFID tagged internal combustion vehicles to cap their numbers and levying additional toll tax / cess for their entry into the area may be considered;
- (iv) Promoting uptake of electric vehicles and setting up allied infrastructure. Framing an EV policy in line with state policy to increase its use and provide incentives; and
- (v) Conducting Air and Noise Modelling Studies and comparing them with the traffic projections for the area and plan pro-active measures for reduction / control of air and noise emissions.

160. **Adaptation to Climate Change.** A separate climate risk assessment has been conducted for the overall VCICDP project considering climate risks to project subcomponents located in areas prone to potential cyclones, heavy rains and flooding. While the subproject components do not face significant climate risks, suitable mitigation measures highlighted in the climate risk study will be considered for implementation.

161. **Greenhouse Gas Emissions.** Greenhouse gas (GHG) emissions that will be generated from the construction and operation of the project facilities are expected to be minimal. Emissions during construction will derive from the use of energy, including gasoline, diesel and electricity, by construction machinery and vehicles and by consumption of construction materials, traffic congestion for short durations, etc. Loss of tree cover will also contribute towards reduction of carbon sink. After construction is completed, twice the number of trees will be planted as per the regulatory norms. GHG emissions are expected to be reduced due to increased tree plantations, reduced traffic congestion and implementation of measures such as solar lights along the road sections and near junction areas.

## **G. Unanticipated Impacts during Construction and Operation**

162. In the event, unanticipated impacts become apparent during project implementation, APRDC through PMU will: (i) inform and seek ADB's advice; (ii) assess the significance of such unanticipated impacts; (iii) evaluate the options available to address them; and (iv) update the IEE including EMP. ADB will help the borrower mobilize the resources required to mitigate any adverse unanticipated impacts or damage.

**Disaster management.** In cases of emergency or disaster, Under the Section 39 and 40 of National Disaster Management Act 2005, it is mandatory on the part of Departments of the State Government, to adopt a continuous and integrated process of planning, organizing, coordinating, and implementing measures which are necessary and expedient for prevention as well as mitigation of disasters. APRDC shall follow the 'Departmental Disaster Management Plan for Roads & Buildings Department' also accessible at ([https://apsdma.ap.gov.in/dmplans\\_files/department\\_dmplans/Departmental%20Disaster%20Management%20Plan%20for%20Roads%20&%20Buildings%20Department.pdf](https://apsdma.ap.gov.in/dmplans_files/department_dmplans/Departmental%20Disaster%20Management%20Plan%20for%20Roads%20&%20Buildings%20Department.pdf))

## VII. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

163. Meaningful consultations were carried out during detailed design and IEE preparation. All the five principles of information dissemination, information solicitation, integration, coordination, and engagement into dialogue were incorporated in the consultation process. A framework of mitigating different environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially at the micro level by setting up a dialogue with the village people from whom information on site facts and prevailing conditions were collected. This will be continued during the implementation of the project through grievance redress mechanism.

164. Public consultations were held to allow the incorporation of relevant views of the stakeholders in the final project design, mitigation measures, implementation issues, and enhance the distribution of benefits. Stakeholder's consultations were held with intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design and implementation. Informal meetings, interviews were organized covering the entire project design stage. Consultations provide affected public a platform to ensure incorporation of their concerns in the decision-making process and foster co-operation among officers of APRDC, the community and the stakeholders to achieve a cordial working relationship for smooth implementation of the project. It inculcates the sense of belongingness in the public about the project.

165. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinions were sought particularly in identifying and mitigating any potential adverse impact.

166. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. Questionnaire survey/discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders and experts. In addition, personal discussions with officials, on site discussion with affected stakeholders, and reconnaissance visits have also been made to the project area.

167. All types of stakeholders were identified to ensure as wide coverage as possible like Residents, shopkeepers and businesspeople who live and work along the road specially the project affected persons, road users/commuters, executing agency, government institutions whose remit includes areas or issues affected by the project (state environment and forest department, Pollution Control Board (PCB), Irrigation Department, Public Health Engineering (PHED) Department and most importantly the beneficiary community in general.

168. **Summary of issues.** The informal consultation generally started with explaining the project, followed by an explanation to potential impacts. Participant's views were gathered regarding all aspects of the environment which may have direct or indirect impact on local people. Key issues discussed were:

- (i) Awareness and extent of the project and development components;
- (ii) Benefits of the project for the economic and social upliftment of community;
- (iii) Labor availability in the project area or requirement of outside labour;
- (iv) Local disturbances due to project construction work;

- (v) Necessity of tree felling etc. at project sites;
- (vi) Impact on water bodies, water logging and drainage problem if any;
- (vii) Environment and health;
- (viii) Flora and fauna of the project area; and
- (ix) Socio-economic standing of the local people.

169. Consultations were held at prominent villages where higher number of settlements are affected. At these two locations the nearest vicinity villagers were presented, participated in the public consultation meetings. Local community welcomed the decision of road widening and improvement proposal. The perceived several benefits like faster and cheaper connectivity, improved accessibility to better infrastructure facilities, reduction in migration, increased economic activities and appreciation in value of land and many others. But at the same time they apprehended that the risk of accident, air and noise pollution will increase due to high traffic density after widening. Main demand and suggestions made by the participants were the following:

- (i) Adequate compensation and rehabilitation assistance to affected households;
- (ii) House sites for Relocation families;
- (iii) Road safety measures;
- (iv) Extensive plantation;
- (v) Protection of common properties such as Schools, Temples, Graveyards etc.;
- (vi) Restriction on honking near built-up areas and sensitive receptors;
- (vii) Lighting in built-up areas and sensitive receptors;
- (viii) Measures to minimize air and noise pollution;
- (ix) Providing health and hospital facility at the junctions and crowded locations;
- (x) Bus Shelters construction; and
- (xi) Parking areas in markets and truck lay-byes near industries.

170. Design considerations have been made to incorporate most of the suggestions and demands of the local people. Environmental and community health and safety issues are included in the EMP prepared for the subproject and adequate implementation of mitigation measures will be ensured. Compensation and Rehabilitation related issues will be addressed through implementation of the RP prepared for the subproject.

171. **Consultation with women and vulnerable groups.** Further consultations with only women and vulnerable households (female headed households, households below poverty line etc.) were conducted as part of the social safeguards studies. The purpose of these exclusive discussions was to ensure women were aware about the project and understand their concerns and expected benefits out of the project. The women expressed a number of both key benefits and concerns that they perceive out of this subproject.

172. The Atchuthapuram–Anakapalli road improvement subproject will have positive impact as it will increase the frequency and quality of the transportation which will not only improve the accessibility issue but will also increase the value of land. They were also of opinion that the augmentation of the road network would help in creating employment opportunities for the local people. However, the women participants did voice their concerns regarding the safety of them and their children as they were of opinion that the widening of the road would increase the frequency of the vehicles which would lead to the risk regarding accidents. They were informed that adequate provisions for road safety and have been integrated in the road design by the technical design team to address the accident risks. The other negative impacts that they raised was the increase in the level of air and noise pollution as a result of the project. In response they

were informed that air and noise issues will be minimal. And necessary measures to reduce noise levels such as speed control, tree plantation and noise barriers will be installed in locations with sensitive receptors. Further details on the discussions held with women are provided in the RAPs.

173. The Atchuthapuram–Anakapalli road improvement subproject envisages that stakeholder consultations will continue during the subproject period and concerned stakeholders will be invited and encouraged to participate. PMU and APRDC will maintain rapport with the municipality. PMU and PIU will be open to the public to discuss matters concerning the progress of the projects, adverse impacts, mitigation measures and environmental monitoring and grievances. The stakeholder consultations in future will be as follows.

- (i) during construction, if there is a change in design, alignment, and location, COI and APRDC will hold at least one public consultation to solicit perceived impacts, issues, concerns and recommendations from affected communities;
- (ii) before construction, COI and APRDC will conduct an information, education and communication (IEC) campaign among the affected communities about the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of COI and APRDC, and status of compliance with the government's environmental safeguard requirements. billboards about the subproject, implementation schedule and contact details of the executing agency, COI-ES, APRDC and contractors will be set up at strategic locations. the grievance redresses procedure and details will be posted at the offices of COI, APRDC and municipality;
- (iii) during construction, regular random interviews will be conducted by APRDC every month to monitor environmental concerns of subproject communities;
- (iv) during operation, periodic random interviews will be conducted by APRDC to monitor the environmental concerns of subproject communities; and
- (v) the public consultations and information disclosure will be continuous throughout the project cycle. COI and APRDC will be responsible for designing and implementing such aspects on the ground.

**Table 26: Public Consultation held at Anakapalli on 14 November 2018**

Activity	Public Consultation
Place	Revenue Divisional Office, Anakapalli
Date & Time	14.11.2018, 10:00 a.m. to 02:00 p.m.
Participants	Mr. Suryarao, Special Dy. Collector, APRDC Mr. Srinivas, Dy, Executive Engineer, R & B Department Mr. Ashik Hussain Mohammed, Director, SATRA Mr. Malleswararao, Tahsildar, Munagapaka Ms. Bhargavi, AEE, R & B Mr. Veerraaju, Social Development and Gender Specialist, PMSC Mr. Abraham Santhosh, Public Communications Specialist, PMSC Community Leaders and Public from Nagulapalli, Munagapaka, Thimmarajupeta and Haripalem Villages. Print media of Anakapalli.
Purpose of the consultation	To present and to seek views of public on designs prepared by SATRA on Widening & strengthening of Achuthapuram – Anakapalli Road.
Proceedings of the meeting	
Introduction: Mr. Ashik Hussain Mohammed, Director, SATRA informed the participants that, SATRA has revised the earlier 120 feet Achuthapuram - Anakapalli road designs to 100 feet road as per the directions from APRDC. Mr. Suryarao, Special Dy. Collector, APRDC requested the participants to share their views on the designs. Mr.D.A. Santhosh requested the participants to present views village-wise and one after another in order to discuss each issue in detail.	

Nagulapalli Village – Mr. M. Nagasanyasi (Mobile No. 9030541921)

- The villagers of Nagulapalli are facing severe hardships due to narrow road and frequent accidents.
- The road from Anakapalli and Achuthapuram should be limited to 100 feet and should be 50 feet from the centre of the road.
- Dividers should be constructed in way that people can walk on it.
- Median strips should be provided at Nagulapalli junction, Palakendram and Vinayaka Temple.

Munagapaka, - A.G. Atchayya Naidu, (Mobile No. 9949719628)

- The irrigation cum drain channels which flow from 4/2 to 5/6 right side and 4/6 to 5/6 left side of the Anakapalli-Achuthapuram Road need to be maintained. Agriculture fields receive water from Sarada river and also excess water is drained through them.
- Culverts which exists all along the road need to be maintained.
- In the design presented by SATRA, the land acquisition from 5/0 to 6/0 k.m is mainly planned on left side of the road. As, it is planned to construct a new bridge besides the old Munagapaka bridge instead of demolishing the old, more land from left side of the road is required.

Munagapaka – Mr. Somasundar (Mobile No. 9642754459)

- Service roads on both sides of the road are required. The villagers are ready to give another 3 meters for the project, if required.

Munagapaka – Mr.P.V. Ramana (Mobile No. 9652737888)

- At the road curve located near Munakapaka village, land acquisition is shown more at right side of the road. Need to re-examine the right side shifting of the road at the curve.

Nagulapalli - Mr. Srinivas

- Underpasses to be provided at the village, mainly at village junction. If required, additional land will be provided by the villagers.

Thimmarajupeta – Mr. Venkataramana (Mobile No. 9030981424)

- Existing Irrigation channels need to maintained in the proposed road.
- Access roads to fields and village to be constructed.

Thimmarajupeta – Mr. Bramaji (Mobile No. 9030981424)

- Signal need to be provided at village junctions.
- Service roads need to be provided.

Thimmarajupeta – Mr. Chinnababu (Mobile No. 9701737476)

- SATRA Consultants and APRDC Officials need to come to village and show villagers how 100 feet road will affect the houses and shops in the village.

Haripalem – Mr. K. Suryanarayana (Mobile No. 9290808018)

- Old bridge at Haripalem should be dismantled first and new bridge should be constructed at the same place instead of constructing a new bridge besides old one.
- Service roads and berms are required

Haripalem – Mr..Suryanarayana (Mobile No. 9652247355)

- 100 feet road should include service roads and passages

Replies to the issues raised by the Public

Mr. Suryarao – SDC, APRDC

<ul style="list-style-type: none"> <li>The DPR Consultants, APRDC and Irrigation Department Officials, PMSC Consultants would visit the villages on 16.11.2018 to physically inspect the changes proposed by the public and examine the possibilities of incorporating them in the designs.</li> </ul>
<p><u>Mr. Ashik Hussain Mohammed, Director, SATRA Consultants</u></p> <ul style="list-style-type: none"> <li>Many design items are changed taking into consideration the views of public expressed during previous public consultations. Minimum road safety norms to be maintained to avoid accidents.</li> </ul>
<p><u>Outcome of the Public Consultation</u></p>
<p>Issues and concerns of the public on designs prepared by SATRA on Widening &amp; Strengthening of Achuthapuram - Anakapalli road (VCICDPT2-APRDC/07) are recorded.</p>

174. The details of this public consultation are attached as Appendix 9.

**Table 27: Public Consultation at Munagapaka**

	<b>Govt. Participants</b>	<b>Public Participants</b>	
<p>Venue: The Co-Operative Bank Meeting Hall at Munagapaka</p> <p>Date: 12 October 2015</p> <p>Time: 11:00 AM</p>	<p>From the Government Department (GoAP): Mr. Subbarao and Bargavi, Assistant Executive Engineers, A.P. Road Development Corporation (APRDC), Anakapalli Division.</p> <p>From the DPR Consultants: Er.A. Madhava Reddy, Environmental Specialist, Mr. P. Devaraju, Social and RandR Specialist, Mr. Praveen Technical Expert.</p>	<p>Potential Project Affected Persons, The Village heads, Public, Representatives, The Residential House Owners, Landowners, Retried Government Employs, Shop Owner's, Housewife's, Widows, Village Youth groups, Agriculture Labours, Businessmen's, Private Employs, Government Employs, Vulnerable People and etc.</p>	<p>The Villagers Participated from the Affected Villages at Munagapaka Venue are Munagapaka Anakapalli, Gangadevipeta, Vummalada, Nagulapally, Ompolu, Haripalem, Thimmarajupeta.</p> <p>Nearly about 350 Persons attended the Public Consultation and Participated.</p> <p>The Public Consultation convened by the Munagapaka President T. Ramanababu as the Chairperson of the Meeting.</p> <p>The APRDC Assistant Executive Engineers, Sri Subbarao and Bargavi Presided as the Chief Guest of the Meeting. The Social and Environmental Experts and Technical Team from Roughton and Satra Consultants participated.</p>

175. The participants list is enclosed (Appendix 10) with name of the person, nature of affecting designation with mobile numbers with signature. The Village Representatives Vummalada-Surpanch, Nagulapally-Surpanch, Ompolu-Surpanch, Haripalem-Surpanch, B. Prasad and Others Participated.

176. The Public Consultation started at 11:00 AM with the welcome speech. The Executive Engineer narrated the importance of VCICDP to the participants and requested every participant to express their views, opinion, suggestions, and objections regarding the proposed road either social or environmental issues.

177. The Social Environmental and Technical Team of Roughton and Satra consultants, explained clearly about the project social, environmental issues and nature of affecting of settlements, common property resources (CPRs), water bodies, trees, and etc., The Technical Expert informed about the technical specification of proposed road such as existing ROW and proposed ROW, Curves improvements and importance of usage of existing ADB Road and the proposed ROW at village sections in order to reduce the affecting settlement and LA to the participants.

178. The Chairperson requested the participants to respond one by one based on the nature of affecting. The participants positively responded and started questioning, expressing their views, suggestions, alternative practices etc.

179. The entire program was exclusively video graphed with audio recording, right from the starting of the program to the disbursing of participants. In this record the participants voice captured and documented in the form of compact disk (CD)s, the local media also covered the programmed in major Telugu newspapers. The key issues discussed in the public consultations:

- (i) Brief introduction of the project, importance, implementation and funding agency;
- (ii) Loss of structure like Residential, Commercial, Residential and Commercial, CPRs and others;
- (iii) Loss of Agriculture Lands;
- (iv) Compensation of for the affecting structures and lands;
- (v) Affecting of CPRs;
- (vi) Resettlements and Rehabilitation sites;
- (vii) Road safety and health (HIV/AIDS);
- (viii) Gender issues; and
- (ix) Vulnerable persons if any.

180. **Participants Suggestions.** The villagers expressed their apprehensions on how compensation and rehabilitation would be done in cases where there was land acquisition. The process for the same was explained during the consultations. They were also informed that the process will be transparent, and the details will be publicly disclosed in the RP prepared for the subproject. The villagers were also informed that environmental issues relating to community health and safety, air and noise pollution and loss of trees along the ROW will be managed through effective implementation of the EMP prepared for the subproject.



Section of the Participants during the Consultations at Munagapaka Village



Section of the Participants during the Consultations at Munagapaka Village

## Figure 10: Public Consultation and Participation

181. **Information Disclosure.** The approved IEE report (in English), will be available at the offices of COI, ICG, and WUSC for the perusal of interested parties. Copies may be made available upon formal request. The IEE and environmental monitoring reports will be disclosed on ADB's, COI's and APRDC's website.

### VIII. GRIEVANCE REDRESS MECHANISM

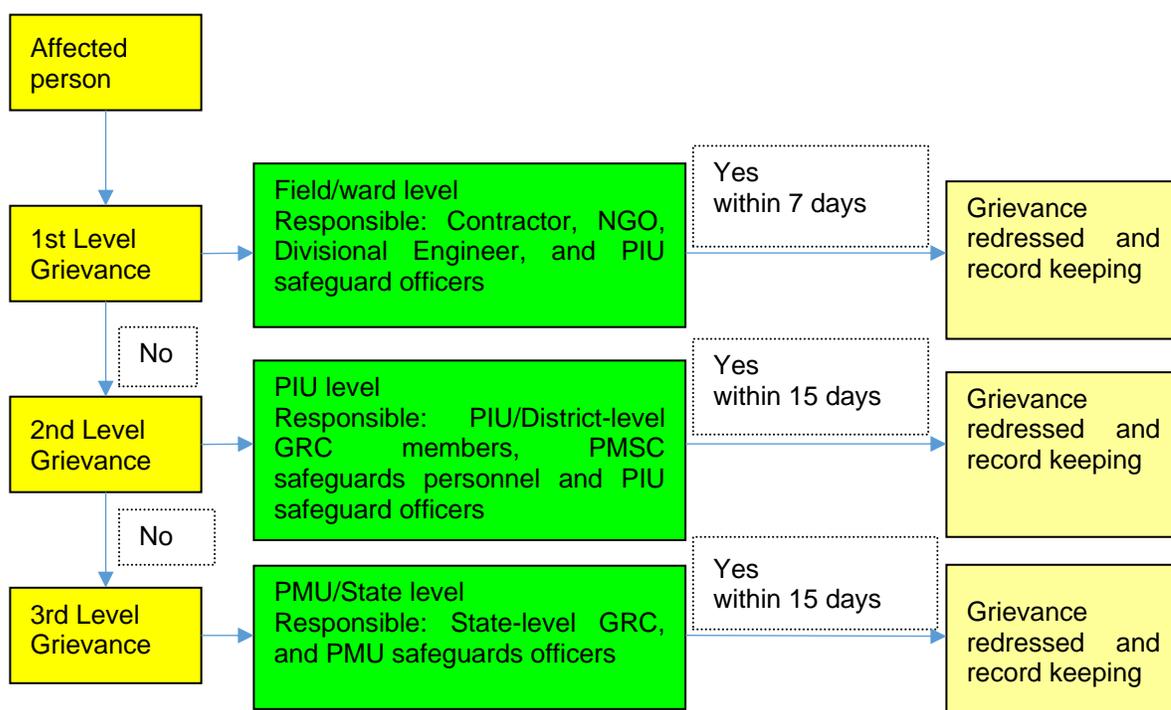
182. **Project grievance redress mechanism.** A project-specific, three-tier GRM covers both environment and social issues. The GRM has been established to receive, evaluate, and facilitate the resolution of affected persons' concerns, complaints, and grievances about the social and environmental performance at project level. The GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns related to the project. Assessment of the GRM designed and implemented for Project 1 shows that the system was effective in timely resolution of grievances in a transparent manner.<sup>16</sup> The GRM will be disclosed to the affected communities and households prior to the mobilization of contractors in any subproject areas. The project GRC, supported by the PMSC consultants as well as the PMU and PIU safeguard officers will be responsible for timely grievance redress on environmental and social safeguards issues and responsible for registration of grievances, related disclosure, and communication with the aggrieved party. A complaint register will be maintained at field unit, PIU, and PMU levels with details of complaint lodged, date of personal hearing, action taken and date of communication sent to complainant. Contact details, procedures and complaint mechanism will be disclosed to the project affected communities at accessible locations and through various media (i.e., leaflets, newspapers, etc.). Samples of draft project leaflets, grievance registration forms and monitoring templates are in the resettlement framework.

- (i) **1st Level grievance.** The phone number of the PIU office should be made available at the construction site signboards. The contractors and field unit staff can immediately resolve onsite, seek the advice of the PIU safeguard manager (social safeguards and communications/environment safeguards) as required, within seven days of receipt of a complaint/grievance.
- (ii) **2nd level grievance.** All grievances that cannot be redressed within 7 days at field/ward level will be reviewed by the GRC at district level-headed by Joint Collector. GRC will attempt to resolve them within 15 days. The PIU safeguard manager (social safeguards and communications/ environment safeguards) will be responsible to see through the process of redressal of each grievance.
- (iii) **3rd Level Grievance.** All grievances that cannot be redressed within 15 days at district level will be reviewed by the GRC at state level-headed by the project director, PMU with support from district GRC, PMU officer - social safeguard and communications/officer-environmental safeguards, and PMC environment and social safeguards specialists. GRC will attempt to resolve them within 15 days. The PMU officer - social safeguard and communications will be responsible to see through the process of redressal of each grievance pertaining to social safeguards.

<sup>16</sup> Regular recording and resolution of grievances at field level indicates that the GRM structure is working effectively. No major grievance was received for project 1 and the GRM helped smoothen the process of project implementation. Hence the proposed architecture for the project 2 of VCICDP GRM remains similar, with some refinement and strengthening for the industrial startup areas, through (a) provision of help desks at each startup area which would serve as accessible platforms for grievance registration for local communities and (b) ensuring indigenous peoples' representation in the GRM structure at district level, for Chittoor–South startup area.

183. The multi-tier GRM for the project is outlined below (Figure 4), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration.

**Figure 11: Grievance Redress Mechanism – Visakhapatnam–Chennai Industrial Corridor Development Program**



GRC = grievance redressal committee, PIU = project implementation unit, PMU = project management unit, PMSC = project management and supervision consultant.

#### A. Grievance Redressal Committee

184. GRC consists of two-levels, one at district level and another at state/PMU level, to receive, evaluate and facilitate the resolution of displaced persons concerns, complaints and grievances. GRC at district level will receive, evaluate, and facilitate the resolution of displaced persons concerns, complaints, and grievances. The GRC will provide an opportunity to the affected persons to have their grievances redressed prior to approaching the State level LARR Authority, constituted by GOAP in accordance with Section 51(1) of the RFCTLARR Act, 2013. The GRC is aimed to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address displaced person's concerns without allowing it to escalate resulting in delays in project implementation. In case of any indigenous peoples impacts in subprojects, the GRC (at district level) must have representation of the affected indigenous people community, the chief of the tribe or a member of the tribal council as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) or an independent indigenous peoples expert or an NGO working with indigenous people groups. GRC will also ensure that grievance

mechanism established is gender inclusive in receiving and facilitating resolution of the IPs' concerns.

185. The GRC will continue to function, for the benefit of the displaced persons, during the entire life of the project including the defects liability period. The entire resettlement component of the project has to be completed before the construction starts, and pending grievances resolved. Other than disputes relating to ownership rights and apportionment issues on which the LARR Authority has jurisdiction, GRC will review grievances involving all resettlement benefits, relocation, and payment of assistances. The GRCs will function out of each district where the subprojects are being implemented. The existing setup for coordination, monitoring, and grievance redress at district level which meets once a month, will be used for Project 2 of VCICDP. The GRC chaired by Joint Collector, will comprise of the Divisional/Project Engineer acting as its member secretary and the following members: (i) Revenue Divisional Officer/Sub-Collector of the division; (ii) project director, District Rural Development Agency; (iii) Chief Executive Officer, Zilla Parishad; (iv) District Panchayat Officer; (v) District Education Officer; (vi) District Medical and Health Officer; (vii) District Level representative of power distribution companies; and (viii) Superintendent, Rural Water Supply Panchayat Raj Department, three members from affected persons (with at least one being a woman affected person), team leader of the implementing consulting agency/NGO. The contact details of the GRC, PIUs safeguards manager, and the resettlement plan implementation NGO/agency will be included in the brochures to be circulated among all affected people as a first step in resettlement plan implementation.

186. The project director, PMU will be the appellate authority who will be supported by the PMSC and Safeguard Officer (social safeguards and communications/ environment safeguards) of PMU and concerned PIUs to make final decisions on the unresolved issues. Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

187. **Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at ADB headquarters or the ADB India Resident Mission. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.<sup>17</sup>

188. **Record-keeping.** Each of the PIUs of each town/city will keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions, and the date these were affected and final outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMU office, PIU offices, and on the web, as well as reported in monitoring reports submitted to ADB on a semi-annual basis. The sample grievance registration format is attached as Appendix 8.

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<sup>17</sup> ADB. [Accountability Mechanism](#).

189. **Periodic review and documentation of lessons learned.** The PMU Officer (social safeguard and communications/environmental safeguards) will periodically review the functioning of the GRM in each nodes and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

190. **Costs.** Costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the concerned PIU at town level while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

191. **Capacity building.** Regular capacity building activities on social safeguards are proposed, including quarterly training for safeguards officers of PIUs in year 1, followed by semiannual training in years 2 and 3 of project implementation, and semiannual training for at least 40 staff of PMU, PIUs, and resettlement NGO in the first 3 years of project implementation. Capacity building training will be undertaken by PMSC social safeguards coordinator on safeguards issues of the projects, resettlement framework of VCICDP and ADB Safeguards Policy. The PIU safeguards managers will be further supported by the PMSC experts through on the job training for resettlement plan updating, implementation, complaint resolution and report writing on safeguards.

192. **Civil works contracts.** The PIUs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all (i) applicable labor laws and core labor standards on prohibition of child labor as defined in national legislation for construction and maintenance activities, on equal pay for equal work of equal value regardless of gender, ethnicity or caste, on elimination of forced or bonded labor; and (ii) the requirement to disseminate information on infectious diseases such as coronavirus disease and sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites. Relevant provisions of the GESI AP will be shared with the contractors' responsibilities by the PMU and PIUs. Contractors will carry out all environmental and social mitigation and monitoring measures outlined in their contract and will maintain grievance registers and place GRM signboards at work sites. PMSC specialists will assist the PMU and PIUs in monitoring contractor's compliance activities.

193. **Prohibited investment activities.** Pursuant to ADB's Safeguard Policy Statement (2009), ADB funds may not be applied to the activities described on the ADB Prohibited Investment Activities List set forth at Appendix 5 of the Safeguard Policy Statement (2009).

## IX. ENVIRONMENTAL MANAGEMENT PLAN

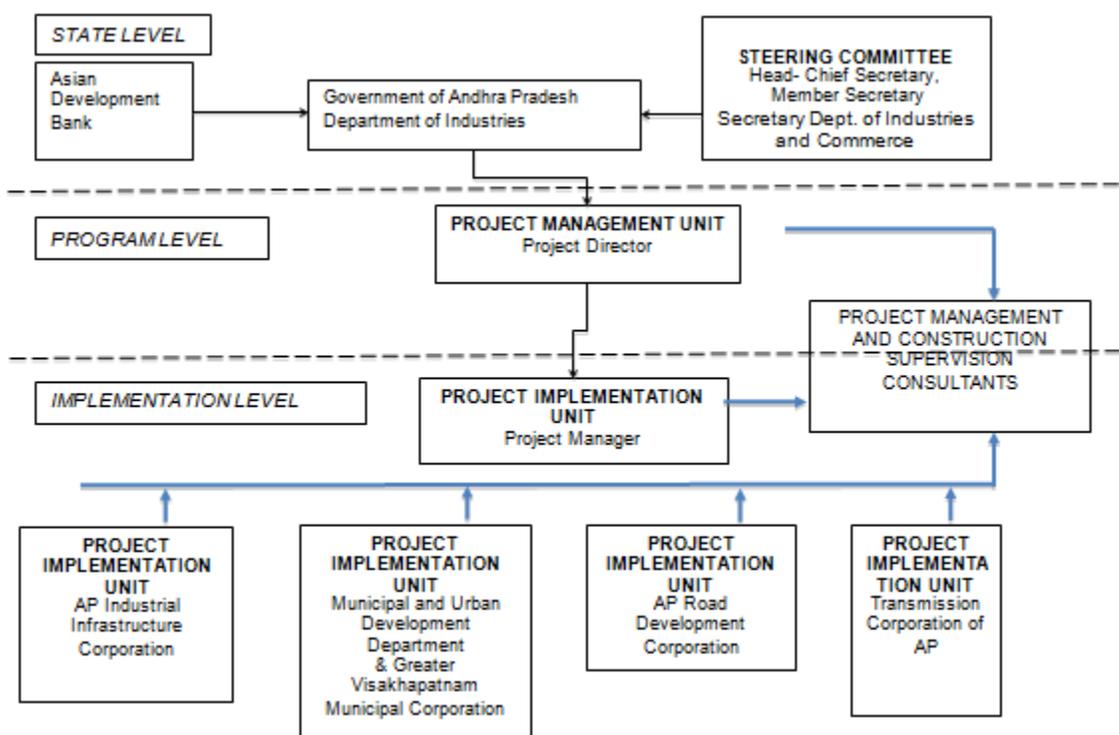
### A. Institutional Arrangement

194. The effective implementation and close supervision of the environmental management to mitigate the environmental impacts, which are likely to arise due to the construction and operational phases of the Industrial area could be achieved through a suitable institutional mechanism. A proper institutional mechanism to understand and implement appropriate environmental management measures during various stages of the project is a pre-requisite and has a strong bearing for the overall success of the project management. Implementation of the Environmental Management measures shall become easy once an environmentally responsible Team with institutional arrangement and responsibilities are in place.

195. DOI is the executing agency. A PMU is established within the Directorate of Industries, which is under the DOI, for planning, implementation, monitoring and supervision, and coordination for both the PBL and MFF. PIUs, established in APIIC, APRDC, GVMC, and APTransco, will be responsible for implementing the MFF. PMU has recruited PMSC to provide support in implementation of VCICDP.

196. PMU will support PIUs in implementation, management and monitoring of the project. PMU and PIUs will be assisted by PMSC respectively. PIUs will appoint construction contractors to build infrastructure. Once the infrastructure is built and commissioned, the PIUs will operate and maintain the infrastructure. At state-level a Project Steering Committee (PSC) will be established to provide overall policy direction for the implementation of VCICDP.

**Figure 12: Visakhapatnam-Chennai Industrial Corridor Development Program Subproject Implementation Arrangements**



197. The GOAP will ensure that all the requirements prescribed in Schedule 5 of the framework financing agreement, and the following frameworks that have been prepared with respect to the Facility are complied with during the processing and implementation of VCICDP: (i) environmental assessment and review framework (EARF), (ii) resettlement framework, and (iii) indigenous peoples planning framework (IPPF).

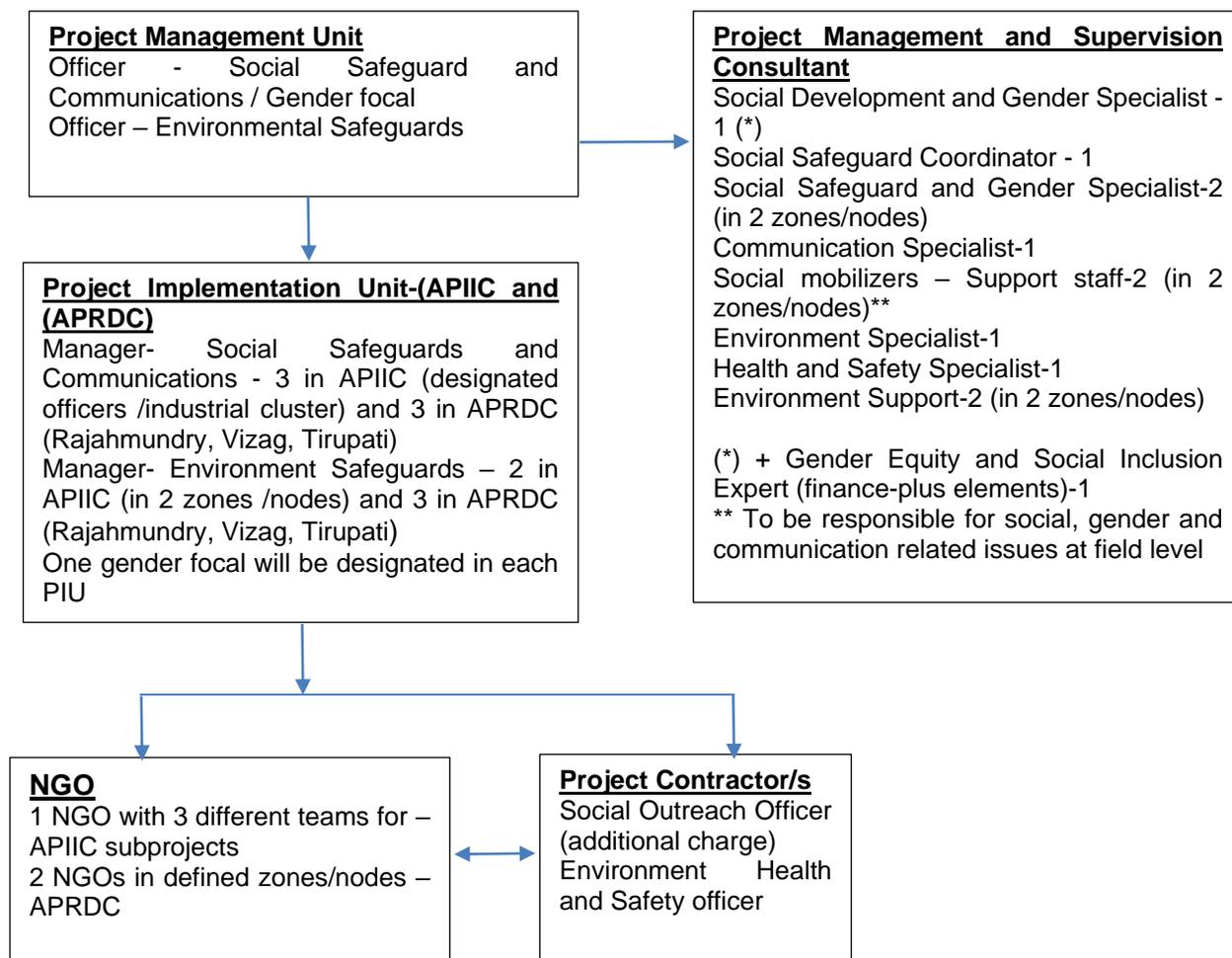
198. The safeguard frameworks cover the Facility specific information and requirements in accordance with ADB's Safeguard Policy Statement, 2009: (i) the general anticipated impacts of subprojects likely to be financed under the Facility on the environment, involuntary resettlement, and indigenous peoples; (ii) the safeguard criteria that are to be used in selecting projects; (iii) the requirements and procedure that will be followed for screening and categorization, impact assessments, development of management plans, public consultation and information disclosure, and monitoring and reporting; (iv) the institutional arrangements (including budget and capacity

requirements) and government's and ADB's responsibilities and authorities for the preparation, review and clearance of safeguard documents.

199. The applicability and relevance of each safeguard framework for Tranche 2 has been reviewed and updated to ensure relevance and consistency with all applicable laws and regulations in India and Safeguard Policy Statement, 2009 as amended from time to time. In the event that there is a discrepancy between the laws and regulations of India and ADB safeguard policies, the ADB safeguard policies will prevail. In addition, Government of India will carry out due diligence works on ongoing projects to assess the status of compliance with the safeguards-related plans and frameworks. For each project, GOAP is required to submit safeguard monitoring reports semiannually covering all the aspects and issues from perspectives of environment, land acquisition, and resettlement and indigenous people.

200. All executing and implementing agencies will ensure that VCICDP is implemented with active participation of all stakeholders, using participatory practices, and consultation will continue throughout implementation of the Investment Program. Disclosure of relevant information to these stakeholders will continue throughout implementation of the Investment Program. Safeguards will be the responsibility of the PMU and the respective PIUs. The PMU and PIUs will be supported by experts as part of the PMSC and resettlement plan implementation nongovernment organizations (NGOs). The safeguards implementation organogram is provided in Figure 5.

**Figure 13: Safeguards Organogram – Visakhapatnam–Chennai Industrial Corridor Development Program**



APIIC = Andhra Pradesh Industrial Infrastructure Corporation, APRDC = Andhra Pradesh Road Development Corporation, NGO = nongovernment organization.

## **B. Safeguard Implementation Arrangement**

201. **Safeguards Implementation Arrangements.** The implementation arrangements put in place for the MFF, and Project 1 will continue for Project 2. Program management unit (PMU) established within Directorate of Industries by DOIC (EA), is responsible for planning, implementation, monitoring and supervision, and coordination of MFF. PMU is supported by Project implementation units (PIUs) established in Andhra Pradesh Industrial Infrastructure Corporation (APIIC) and Andhra Pradesh Road Development Corporation (APRDC), which will respectively implement industrial infrastructure and road sector subprojects under Project 2. PMU and PIUs are supported by a Project Management and Supervision Consultant (PMSC). Described below are the institutional roles and responsibilities of PMU and PIUs /APRDC to ensure environmental safeguards are implemented and complied with during design, construction, and operation phases. PMU is staffed with an environmental safeguards officer to oversee and ensure environmental safeguards compliance. APRDC has environmental safeguards managers (in Rajahmundry, Vizag and Tirupathi) to oversee the day-to-day implementation of SEMP's by the contractors and ensure safeguards compliance. PMSC team with an environment specialist and a health and safety specialist based in PMU and supported by two field-based environmental engineers one in each Nodes<sup>18</sup> will assist APRDC and PMU in implementation, monitoring and reporting on environmental safeguards. Contractors will be responsible for implementing the mitigating measures during the design/construction phase, and APRDC and PMU will be responsible for monitoring.

202. **Program Management Unit (PMU).** Key tasks and responsibilities of the PMU environmental safeguards officer with the support of PMSC are as follows:

- (i) confirm existing IEEs/EMPs are updated based on detailed designs and that new IEEs/EMPs are prepared in accordance with the EARF and subproject selection criteria related to safeguards;
- (ii) confirm whether IEEs/EMPs are included in bidding documents and civil works contracts;
- (iii) provide oversight on environmental management aspects of subprojects;
- (iv) ensure SEMP's prepared by contractors are cleared by PIUs prior to commencement of civil works;
- (v) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the SEMP's;
- (vi) facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (e.g., Location Clearance Certificates, Environmental Clearance Certificates etc.), as relevant;
- (vii) Oversee and ensure compliance with labour regulations and ADB SPS prohibited list by contractors and their subcontractors and suppliers etc..
- (viii) supervise and provide guidance to the PIUs to properly carry out the environmental monitoring and assessments as per the EARF;
- (ix) review, monitor and evaluate the effectiveness with which the SEMP's are implemented, and recommend necessary corrective actions to be taken as necessary;

<sup>18</sup> The environmental engineers may be based at Vizag and Chittore /Vijaywada supporting the subprojects in two ends of the VCIC corridor.

- (x) consolidate monthly environmental monitoring reports from PIUs and submit semi-annual monitoring reports to ADB;
- (xi) ensure timely disclosure of final IEEs/SEMPs in locations and in a form and language accessible to the public and local communities; and
- (xii) address any grievances brought about through the Grievance Redress Mechanism (GRM) in a timely manner.

203. **Project Implementation Units.** In APRDC Head Office, the safeguards managers of APRDC currently working on a World Bank Project will coordinate all environmental and social aspects of the projects. In APTransco, given the isolated locations of the proposed sub projects, the subprojects are under different Superintending Engineers and will implement the subprojects through respective circle offices and a special projects cell. The respective Senior Engineers will be deputed/designated as safeguard compliance officers covering both environment and social safeguards. In APIIC, the Senior Engineer will be deputed/designated as safeguard compliance managers in addition to the environmental engineer. In GVMC, the Deputy Engineer will be deputed/designated as safeguard compliance officer in addition to the environmental engineer.

**Table 28: PIU Environmental Safeguard Manager Tasks and Responsibilities**

<b>PIU Environmental Safeguard Manager</b>	<b>Tasks and Responsibilities</b>
Environmental Safeguards –APRDC	include IEEs/EMPs in bidding documents and civil works contracts; (ii) review and approve SEMP prepared by contractors; oversee day-to-day implementation of SEMP by contractors including compliance with all government rules and regulations; (iv) take necessary action for obtaining rights of way; (v) oversee environmental monitoring by contractors; Ensure that workers are paid and treated according to the labour legislations and ADB's SPS prohibited list requirements (vii) take corrective actions when necessary;
<b>PIU Environmental Safeguard Manager</b>	<b>Tasks and Responsibilities</b>
	(vii) submit monthly environmental monitoring reports to PMU; conduct continuous public outreach and awareness building related to environmental management; address grievances brought about through the GRM in a timely manner; and (x) organize an induction course for the training of contractors in environmental management to be delivered by PMSC consultants
Senior Engineer Cum Compliance Officer (DE Level) – APTransco	Ensure complete payment and other resettlement assistants provided to the affected people prior to displacements (physical and economical) and starts of civil works in the affected areas; (ii) Coordinate with Safeguard Manager of PMU and ensure all social/environmental requirements if any are met.
Senior Engineer Cum Compliance Officer – APIIC	(iii) Coordinate with Safeguard Manager and ensure all social/environmental requirements are met.

Environmental Engineer - APIIC (not exclusive to this project)	include IEEs/EMPs in bidding documents and civil works contracts; (ii) review and approve SEMP's prepared by contractors; oversee day-to-day implementation of SEMP's by contractors including compliance with all government rules and regulations; (iv) take necessary action for obtaining rights of way; (v) oversee environmental monitoring by contractors; (vi) Ensure that workers are paid and treated according to the labour legislations and ADB's SPS prohibited list requirements (vii) take corrective actions when necessary; (viii) submit monthly environmental monitoring reports to PMU; conduct continuous public outreach and awareness building related to environmental management; address grievances brought about through the GRM in a timely manner; and organize an induction course for the training of contractors in environmental management to be delivered by PMSC consultants.
Deputy Engineer Cum Compliance Officer - GVMC	(i) Coordinate with Safeguard Manager and ensure all social/environmental requirements are met.
Environmental Engineer - GVMC	include IEEs/EMPs in bidding documents and civil works contracts; (ii) review and approve SEMP's prepared by contractors; oversee day-to-day implementation of SEMP's by contractors including compliance with all government rules and regulations; (iv) take necessary action for obtaining rights of way; (v) oversee environmental monitoring by contractors; (vi) take corrective actions when necessary; (vii) submit monthly environmental monitoring reports to PMU; conduct continuous public outreach and awareness building related to environmental management; address grievances brought about through the GRM in a timely manner; and (x) organize an induction course for the training of contractors in environmental management to be delivered by PMSC consultants

204. **Project Management and Supervision Consultants.** The PMU and PIUs will be assisted by PMSC which will be staffed with environmental, health and safety and social safeguard specialists to provide required assistance and regular progress report on safeguards implementation. The environmental specialist will have overall responsibility in implementation of environmental safeguards, including appropriate monitoring and reporting responsibilities. The PMSC environment specialist will provide support for both Project 1 and Project 2 subprojects. Key tasks and responsibilities of the PSMC environmental specialist is as follows:

- (i) Update the EARF as required;
- (ii) Update the IEEs including site- and subproject-specific EMPs for VCICDP subprojects; Prepare the IEEs and EMPs for subproject components;
- (iii) Supervise EMP implementation;
- (iv) Prepare a monitoring report of final site- and subproject-specific EMPs and communicate with the stakeholders, including ADB on the progress, of the subprojects including environmental safeguards compliance;
- (v) Prepare semi-annual environmental safeguards compliance reports; and
- (vi) Support the implementing agencies in preparing periodic financing requests and necessary environmental safeguard reports for subsequent tranches.
- (vii) Establish a system to monitor environmental safeguards of the Project; prepare

- indicators for monitoring important parameters of safeguards;
- (viii) Ensure all requisite approvals and no objection certificates are in place to allow implementation, and that these are renewed in a timely manner where required;
  - (ix) Ensure that provisions and conditions of all necessary permits, consents, NOCs, etc., are incorporated in the IEEs;
  - (x) Take proactive action to anticipate the potential environmental impacts of the Project to avoid delays in implementation;
  - (xi) Assist PIUs in the establishment of GRC for IEE implementation;
  - (xii) Support the PIUs and PMU in the GRM implementation to address any grievances submitted in a timely manner and establish record keeping system for complaint and redressal status of the project;
  - (xiii) Assist the PIUs and PMU in the project GRM mechanism and complaint solution;
  - (xiv) Assist the PIUs and PMU for GRM record keeping for first tier complaint and redressed actions;
  - (xv) Ensure that the relevant environmental mitigation measures specified in the updated EMP will be incorporated into bidding documents and approved by the ADB prior to the issuance of the invitation for bidding;
  - (xvi) Closely monitor and supervise to ensure that all mitigation measures and monitoring requirements set out in the EMP are implemented and complied with throughout the project implementation, and when required, prepare or recommend necessary corrective actions to be taken and monitor its implementation;
  - (xvii) Conduct regular monitoring and ensure that contractors and their subcontractors comply with labour legislations and ADB SPS Prohibited list requirements; ensure that workers are paid and treated according to the labor legislations
  - (xviii) Provide on-the-job training programs to PIU staff involved in Project implementation for strengthening their capacity in managing and monitoring environmental safeguards; and
  - (xix) Assist the PIUs' safeguards officer to sensitize the turnkey contractors on ADB SPS, EARF, and GRM during detailed design and civil works implementation.

**205. Civil works contracts and contractors.** IEEs including EMPs are to be included in bidding and contract documents and verified by the PIUs and PMU. The PMU and PIUs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable laws and regulations relating to environment, health and safety; (ii) reinstate pathways, other local infrastructure, and agricultural land to at least to their pre-project condition upon the completion of construction; (iii) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation, international treaties for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; (c) no discrimination in respect of employment and occupation; (d) allow freedom of association and effectively recognize the right to collective bargaining, and (e) elimination of forced labor; and (iv) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

**206.** The contractor will be required to appoint a full-time Environment, Health and Safety (EHS) supervisor on-site to implement the EMP. Prior to start of construction, Contractor will be required to prepare and submit to PIU, for review and approval. a Site-specific EMP (SEMP). No works can commence until SEMP is approved by PIUPMU. Contractors will carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts. The contractor will be required to undertake day-to-day monitoring of the SEMP implementation and submit reports to the PIU on a monthly basis. A copy of the EMP/approved SEMP will always be

kept on-site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP/SEMP constitutes a failure in compliance and will require corrective actions. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. Key responsibilities of the EHS supervisor are:

- (i) Prepare SEMP and submit to PMU/PIU for approval prior to start of construction;
- (ii) Ensure implementation of SEMP and report to PIU/PMSC on any new or unanticipated impacts; seek guidance from the PMU/PIU/PMSC to address the new or unanticipated impact in accordance with the EARF, and ADB SPS;
- (iii) Ensure that necessary pre-construction and construction permits are obtained;
- (iv) Conduct orientation and daily briefing sessions to workers on environment, health and safety;
- (v) Ensure that appropriate worker facilities are provided at the workplace and labor camps as per the contractual provisions;
- (vi) Carry out site inspections on a regular basis and prepare site-inspection checklists/reports;
- (vii) Record EHS incidents and undertake remedial actions;
- (viii) Conduct environmental monitoring (air, noise, etc.,) as per the monitoring plan
- (ix) Prepare monthly EMP monitoring reports and submit to PIU;
- (x) Comply with labour legislations, and ensure that subcontractors also implement labor legislations requirements, through cascading of requirements to subcontractors—HR policy, labor management requirements, any worksite specific grievance redress mechanism.
- (xi) Work closely with PIU Safeguards Officer and PMDSC Environmental Engineer to ensure communities are aware of project-related impacts, mitigation measures, and GRM; and
- (xii) Coordinate with the PIU and PMDSC on any grievances received and ensure that those are addressed in an effective and timely manner.

**Table 29: Institutional Roles & Responsibility: Environmental Safeguards**

Phase	PMU / PIUs	PMSC	ADB
Appraisal stage of all Subprojects under the investment program	PMU / PIUs to review the REA checklists and draft EIA/IEE. PMU / PIUs to submit draft EIA/IEE to ADB for review and approval. PMU / PIUs to disclose on its website the approved EIA/IEE. PMU / PIUs to ensure disclosure of information throughout the duration of the subproject.	PMSC to conduct REA for each subproject using checklists and to prepare EIA/IEE	ADB to review the REA checklists and reconfirm the categorization. ADB will review and approve EIA reports (Category A) and IEE reports (Category B) subprojects. ADB to disclose on its website the submitted EIA/IEE report.

<b>Phase</b>	<b>PMU / PIUs</b>	<b>PMSC</b>	<b>ADB</b>
Detailed Design Phase of all Subprojects under the investment program	PMU / PIUs with the assistance of PMSC to incorporate the EMP, environmental mitigation and monitoring measures into contract documents. PMU / PIUs to obtain all applicable consents/permits/clearances PMU to submit to ADB final IEE for approval and disclosure at ADB website.	PMSC to revise the IEE and EMP in accordance with detailed design changes if warranted. PMSC to ensure incorporation of EMP in bid documents and contracts. PMSC to prepare inventory of utilities to be affected by the subproject.	ADB will review and approve updated EIA reports (Category A) and IEE reports (Category B) subprojects. ADB to disclose on its website updated EIA/IEE report.
Pre-construction Phase of all Subprojects under the investment program	PMU / PIUs to conduct public consultation and disclosure during IEE process and comments will be reflected in the IEE report. PMU / PIU to monitor the disclosure and public consultation. PIU and PMSC to approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes. PMU to submit to ADB in prescribed format semi-annual Environment Monitoring Report 6 months after Loan effective date.	PMSC to ensure statutory clearances and permits from government agencies/other entities are obtained prior to start of civil works. PMSC to ensure disclosure of information prior to start of civil works and throughout the duration of the construction period. PMSC to approve contractor's site-specific environmental plan (such as traffic management plan, waste management plan, locations for camp sites, storage areas, lay down areas, and other sites/plans specified in the EMP). PMSC to conduct	

Phase	PMU / PIUs	PMSC	ADB
		baseline environmental conditions and inventory of affected trees	
Construction Phase of all Subprojects under the investment program	PMU / PIUs will review 6-monthly monitoring and EMP implementation report including the status of Project compliance with statutory clearances and with relevant loan covenants and submit the 6-monthly report to ADB and seek permission to disclose the same in the investment program web site.	PMSC to monitor the implementation of mitigation measures by Contractor. PMSC to prepare monthly progress reports including a section on implementation of the mitigation measures (application of EMP and monitoring plan) PMSC (as per EMP) will conduct environmental quality monitoring during construction stage (ambient air and noise, and water quality). PMSC to prepare the six-monthly monitoring report on environment by focusing on the progress in implementation of the EMP and issues encountered and measures adopted, follow-up actions required, if any.	ADB to review the 6 monthly report, provide necessary advice if needed to the PMU and approve the same. ADB to disclose on its website environmental monitoring reports.
Pre-operation Phase (Commissioning and Defect Liability Period)	PMU / PIUs to review monitoring report of PMSC on post-construction activities by the contractors as specified in the EMP PMU / PIU to review applicable consents requirements submit 6-monthly environmental monitoring report until project completion	PMSC to apply for the CTOs prior to commissioning. PMSC to monitor and approve post-construction activities by the contractors as specified in the EMP. prepare 6-monthly environmental monitoring report until project completion	ADB to review the 6 monthly report, provide necessary advice if needed to the PMU and approve the same. ADB to disclose on its website environmental monitoring reports.
Operation Phase of all Subprojects under the investment program	PIUs to conduct monitoring, as specified in the environmental monitoring plan. APPCB to monitor the compliance of the standards regarding drinking water quality, ground water, ambient air, effluent quality from treatment plant, noise, as applicable. submit 6-monthly environmental monitoring report until project completion	prepare 6-monthly environmental monitoring report until project completion	ADB to review the 6 monthly report, provide necessary advice if needed to the PMU and approve the same. ADB to disclose on its website environmental monitoring reports.

Notes: APPCB = Andhra Pradesh State Pollution Control Board, PMSC = Project Management Consultants, CTE = Consent to Establish, CTO = Consent to Operate, PMSC = Design and Supervision Consultant, EIA = Environmental Impact Assessment, EMP = Environmental Management Plan, IEE = Initial Environmental Examination, PMU = Project Management Unit; PIU = Project Implementation Unit; REA = Rapid Environmental Assessment

**207. Institutional Capacity and Development.** To enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effects, as well as create awareness amongst workers and public, the training and awareness program is planned. The PMSC environmental safeguards specialist is responsible for training PMU and APRDCs on environmental awareness and management in accordance with both ADB and government requirements.

**Table 30: Training Program for Environmental Management**

<b>S. No</b>	<b>Target group</b>	<b>Subprojects</b>	<b>Method</b>	<b>Time frame</b>
1	All staff of APRDC including PIU project staff involved in implementation of the project	Environmental Overview: Environmental Regulations, subproject related provisions of various Acts/ Guideline Procedures of EC and FC, process and methodology for IEE, EMPs	Lecture scum interaction	Before beginning of the implementation of the subproject.
2	Managers (Env) at PIU, Supervision Consultant's Environmental Specialists and Select NGOs	Implementation of EMPs: Basic features of an EMP, Planning, designing and execution of environmental mitigation and enhancement measures, monitoring and evaluation of environmental conditions – during construction and operation	Workshops and Seminars	Before the construction begins
3	Environmental officer, design team, Supervision Consultant, Construction Contractors' staff	Environmentally Sound Construction Practices: Clean construction technology, alternative materials and techniques for construction, Waste Management and minimization in construction, pollution control devices and methods for construction sites and equipment, Environmental clauses in contract documents and their implications, protection of flora and fauna Environmental monitoring during construction	Workshops and Site visits	Before the construction

S. No	Target group	Subprojects	Method	Time frame
4	PIU and Supervision Consultant, NGOs and Community representatives	Monitoring Environmental Performance during Construction: Air, Water, Soil and Noise, tree survival Monitoring requirement and techniques, Evaluation and Review of results, Performance indicators and their applicability possible corrective actions, reporting requirements and mechanisms	Lectures, Workshop and site visits	During initial phases of construction
5	PIU and Supervision Consultant, NGOs and Community representatives	Long-term Environmental Issues in Project Management: Designing and implementing Environmental surveys for ambient air, noise, biological and water quality surveys, data storage, retrieval and analysis, contract documents and environmental clauses, risk assessment and management, contingency planning and management and value addition	Workshops and seminars	During Implementation of the subproject
6	Public/contractors workers	Awareness programs on environmental protection and measures being implemented by APRDC and their role in sustaining the measures taken including for noise pollution, air pollution, safety, soil conservation, and agricultural productivity enhancement	Workshops	During the course of construction and operations
7	APRDC Staff, Supervision Consultant, Engineering Staff of Contractor.	Restoration of sites viz borrow areas, construction Camps, Crushing units, HMP etc. and Reporting Formats/procedure	Lecture / Presentations	Before contractor demobilization

### C. Environmental Management Plan and Monitoring Program

208. A general environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PMO, RPMO, PIUs, consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-

active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

209. The contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved EMP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE, EMP and site-specific EMP(SEMP). The contractor shall allocate budget for compliance with these IEE, EMP and SEMP measures, requirements and actions. The contractor will be required to submit to PIU, for review and approval, SEMP including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program per EMP. No works can commence prior to approval of SEMP.

210. **Environment Monitoring Program.** The monitoring and evaluation are critical activities in implementation of the Project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. Environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and these results in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMP. The broad objectives are:

- (i) To evaluate the performance of mitigation measures proposed in the EMP;
- (ii) To evaluate the adequacy of environmental assessment;
- (iii) To suggest ongoing improvements in management plan based on the monitoring and to devise fresh monitoring on the basis of the improved EMP;
- (iv) To enhance environmental quality through proper implementation of suggested mitigation measures; and
- (v) To meet the requirements of the existing environmental regulatory framework and community obligations.

211. **Performance Indicators.** The significant physical, biological and social components affecting the environment at critical locations serve as wider/overall Performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring because of their regulatory importance and the availability of standardized procedures and relevant expertise. A comprehensive monitoring plan for all performance indicators has been prepared for all stages. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. Performance indicators requiring quantitative measurements are:

- (i) Air Quality with respect to PM<sub>2.5</sub>, PM<sub>10</sub>, CO, NO<sub>x</sub> and SO<sub>2</sub> at selected location;

- (ii) Water Quality with reference to DO, BOD, Oil and grease, COD, Suspended Solids and Turbidity, Alkalinity rivers/streams and water bodies at selected points;
- (iii) Noise levels at sensitive receptors (schools, hospitals, community/religious places); and
- (iv) Survival rates of trees planted as compensatory plantation to compensate for removal of roadside trees.

212. **Ambient Air Quality (AAQ) Monitoring.** Ambient air quality parameters recommended for monitoring road development projects are PM<sub>2.5</sub>, PM<sub>10</sub>, Carbon Monoxide (CO), Oxides of Nitrogen (NO<sub>x</sub>) and Sulphur Dioxide (SO<sub>2</sub>). These are to be monitored, right from commencement of construction activity at selected locations of plants and machinery, crushers on sites, excavation works etc. Data should be generated once in a season excluding monsoon in accordance with the National Ambient Air Quality Standards.

213. **Water Quality Monitoring.** The physical and chemical parameters recommended for analysis of water quality relevant to road development projects are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, Chloride, Lead, Zinc and Cadmium. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are given in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at locations identified along the project road during construction and operation phase in accordance with the Indian Standard Specifications – IS10500: 1991.

214. **Noise Level Monitoring.** The measurements for monitoring noise levels would be carried out at sensitive receptors and construction sites along the project roads. The Ambient Noise Standards formulated by the WHO for the day and night time will be complied with.

215. **Tree Management Plan:** The contractor shall prepare tree management plan as part of EMP, which shall include (i) inventory of trees required to be removed for project, with details on size (girth), type and age (ii) proposed plan for compensatory afforestation/tree plantation, with details on proposed area/land identified for plantation, proposed type of saplings to be planted, nurseries identified and any other relevant requirements in line with Forest department/horticulture department. The contractor shall also include proposed timelines for plantation program as part of tree management plan. Tree management plan will also include details of presence of birds, nests etc., on ROW trees. Before removal of trees a confirmatory survey should be conducted to reconfirm that there are no protected bird species that will be impacted by tree cutting. In unlikely case of any protected species spotted, tree cutting should be stopped until further investigations are made, and mitigation measures are worked out and IEE updated and cleared by ADB. Irrespective of protected status, no bird nests should be disturbed, and tree should not be cut until the breeding time is concluded and fledglings fly off. Tree cutting shall be scheduled to avoid breeding season in consultation with forest department.

216. **Success of Re-vegetation.** Compensatory plantation will be taken up in lieu of tree cutting at 1:2 basis. These compensatory plantations will have to be monitored by the implementing agency with the help of the Forest Department. Such monitoring will be conducted through random samples. Such sampling should cover at least 5% of the area planted up. 75% survival rate shall be ensured.

**Table 31: Environmental Management Plan for Atchuthapuram-Anakapalli Road – 4 Lane Widening**

Project Stage / Activity	Potential Impacts	Mitigations Measures	Location	Responsibility during Implementation	Responsibility during Monitoring
1. Pre-Construction Stage					
Widening options of project road	Location on agricultural land, dense forests, wildlife habitat, unstable sites and religious/cultural sites.  Change in widening option determined during the detailed design stage changing the scope or scale of environmental impacts predicted in the IEE.	Widening on other side of agricultural land, dense forests, wildlife habitat and unstable sites. Widening should avoid religious/cultural sites. Additional environment studies for new alignments (if required).	Entire project length	APRDC / PMSC	APRDC
Location of construction camps and contractor facilities	Location in inappropriate locations such as close to the local communities, community drinking water source etc.	Construction camps should be located at least 500m away from community areas and away from water resources, and at least 1 km away from reserve / protected forest stretches. Village Forest Management Committees should be consulted before locating temporary project facilities	Project construction sites	APRDC / PMSC	APRDC
Location of quarry sites	Location in prohibited areas, forest areas	Only government approved quarry sites should be planned for project use	Environmentally and technically suitable sites near the project road	APRDC / PMSC	APRDC /Department of Geology and Mines

<b>Project Stage / Activity</b>	<b>Potential Impacts</b>	<b>Mitigations Measures</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
		Quarries should not be located in reserved/protected forest stretches			
Location of borrow pits	Location in unstable areas or close to village	Location in environmentally sound areas and away from villages Borrow areas should not be located in the locations of reserve / protected forest stretches.	Environmentally and technically suitable sites and near the project road	APRDC / PMSC	APRDC
Obtaining appropriate NOC/permits	Delays in processing permits causing further delay in initiation of project construction	Processing of NOC/permits on a timely basis.		APRDC / PMSC	PMU
Preparation of project detailed design and contract bidding documents	Exclusion of environmental management and mitigation measures hence lack of EFRC during construction	Incorporation of all mitigation measures into the project detailed design and contract bidding documents		APRDC / Design Consultant	PMU
Removal of encroachment /structures along the road.	Loss of livelihood and structures.	Compensation against loss of structures and should be rehabilitated as per the provisions of resettlement plan.	locations where resettlement required	APRDC / PMSC	PMU
COVID-19 Response	Spread of infection which causes serious symptoms like difficulty in breathing, chest pain and loss of speech or movement. If not	Taking cognizance of situation at time of mobilization, the Contractor shall undertake a COVID risk assessment of project area and prepare a	All work sites, camps, offices, facilities etc.,	APRDC / PMSC / Contractor	PMU / Contractor

Project Stage / Activity	Potential Impacts	Mitigations Measures	Location	Responsibility during Implementation	Responsibility during Monitoring
	treated, it will lead to death	<p>COVID Response and Management Plan (C-R&amp;MP) and submit to PMU and PMSC for approval. The preparation of C-R&amp;MP shall consider guidance of Government of India, World Health Organization, International Labour Organization, International Financial Corporation and World Bank's interim guidance note etc. The key points on COVID Response and Management measures is at <b>Appendix17</b>. The contractor shall submit a Monthly monitoring and progress report to PMU and PMSC.</p>			
2. Construction Stage					
Earth removal from borrow areas	Scarring of landscape due to improper disposal of debris Soil erosion Disruption of local drainage Siltation in nearby water bodies, hence, negative effects on aquatic ecology	Disposal of debris at proper disposal site Proper re-vegetation of borrow areas Provision of appropriate drainage structures / facilities	Borrow area, water bodies	Contractor	APRDC

<b>Project Stage / Activity</b>	<b>Potential Impacts</b>	<b>Mitigations Measures</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
Removal of vegetation and uprooting of trees (about 1657)	Change in micro level habitat/environment. Soil erosion. Scarring of landscape.	Removal of only necessary vegetation. Re-vegetation of the space available within ROW immediately after earth removal activities. Prepare and implement tree management plan Conduct confirmatory surveys of birds, and nests to identify protected species If any protected species spotted, tree cutting should be stopped until further investigations are made, and mitigation measures are worked out and IEE updated and cleared by ADB. Irrespective of protected status, no bird nests should be disturbed, and tree should not be cut until the breeding time is concluded and fledglings fly off. Tree cutting shall be scheduled to avoid breeding season in consultation with	Entire project length with vegetation.	Contractor / Forest Department	APRDC

<b>Project Stage / Activity</b>	<b>Potential Impacts</b>	<b>Mitigations Measures</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
		forest department. Removal of trees should be compensated with planting new trees at 1:2 ratio on available space along the road.			
Construction of culverts and bridges	Disruption of local stream course and aquatic hydrology.	Construction during dry season. Provision of appropriate drainage facilities and stream diversion structures.	Bridge / culvert location	Contractor/ APRDC	APRDC
Relocation of cultural properties	Disturbance to religious sentiments of the local communities	Religious structures should be left undisturbed, shifting (if required) shall be done in full cooperation with local people.	Locations of temples/shrines at km	Contractor/ APRDC / local community leaders	APRDC
Construction at sensitive locations	Increased noise level during construction and operation.  Vibrational impacts due to running of heavy equipment and compacting during construction & heavy truck movements during operations.  Noise modelling shall be conducted during	Construction of suitable noise barriers at these locations.  Vibration measurement and analysis for key receptors in the area of influence  Noise barriers shall be provided as	Locations of schools, religious properties.  Flyover / Junction improvement works  Flyover / Junction improvement	Contractors / APRDC  Contractors / APRDC  Contractors / APRDC	APRDC  APRDC

<b>Project Stage / Activity</b>	<b>Potential Impacts</b>	<b>Mitigations Measures</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
	the construction stage to confirm future noise levels in critical traffic areas such as flyovers and nearby sensitive receptors.	needed based on results of the noise modelling.	works, near sensitive receptors		

**Table 32: Operations and Maintenance Phase**

<b>Project Stage / Activity</b>	<b>Potential Impact</b>	<b>Mitigation Measure</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
<p>1.1 Anticipated risk of vehicle-animal collision and human-animal Conflict.</p> <p>1.2 Accidents / Incidents / Traffic Safety</p>	Accidents / Incidents due to heavy vehicular movement.	<p>Mitigative measures may include (rumble strips, informatory /cautionary signage, solar street lighting, etc.)</p> <p>Traffic control measures, including speed limits, will be enforced strictly. Further encroachment of squatters within the ROW will be prevented. Monitor/ensure that all safety provisions included in design and construction phase are properly maintained</p> <p>Highway patrol unit(s) for round the clock patrolling. Phone booth for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible.</p> <p>Tow-way facility for the breakdown vehicles if possible.</p>	At crossing locations	APRDC	APRDC To keep record of all such incidents / accidents
2.1 Air pollution due to due to vehicular movement	Air Pollution due to traffic	<p>Roadside tree plantations shall be maintained at least with 70% survival rate.</p> <p>Regular maintenance of the road will be done to ensure good surface condition</p> <p>Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.</p> <p>Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.</p>	Throughout the Road	APRDC/Contractor	As per statutory requirements  Site inspection

Project Stage / Activity	Potential Impact	Mitigation Measure	Location	Responsibility during Implementation	Responsibility during Monitoring
		Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment.			
3.1a Noise due to movement of traffic	Increased Noise / Inconvenience / disturbance to the community	<p>Effective traffic management and good riding conditions shall be maintained</p> <p>Speed limitation to 40 km/hour and honking restrictions near sensitive receptors</p> <p>Construction of noise barriers near sensitive receptors with consent of local community. Site specific design of the noise barriers will be prepared and included in the final SEMP and provided to the Contractor for implementation.</p> <p>The effectiveness of the multi-layered plantation should be monitored and if need be, solid noise barrier shall be placed. Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building near road.</p> <p>Regular monitoring of nearby receptors close to flyovers, junction areas.</p>	Sensitive receptors as identified in IEE	APRDC/Contractor	<p>Noise monitoring as per noise rules, 2000</p> <p>Discussion with people at sensitive receptor sites</p> <p>Discussion with people at sensitive receptor sites / APRDC</p>
3.1b Vibration due to running of heavy trucks and increased traffic	Vibrational impacts on nearby structure(s)		Flyover and junction areas.		

<b>Project Stage / Activity</b>	<b>Potential Impact</b>	<b>Mitigation Measure</b>	<b>Location</b>	<b>Responsibility during Implementation</b>	<b>Responsibility during Monitoring</b>
4.1 Water logging due to blockage of drains, culverts or streams	Land / health impacts	Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams. Monitoring of water borne diseases due to stagnant water bodies.	Near surface Water bodies/cross drains/side drains	APRDC/Contractor	Site observation
5.1 Vegetation	Green Cover maintenance	Planted trees, shrubs, and grasses to be properly maintained. The tree survival audit to be conducted at least once in a year to assess the effectiveness.	Project tree plantation sites	APRDC/Contractor	Records and field observations. Information from Forestry Department
6.1 Accident Risk due to uncontrolled growth of vegetation	Aesthetic maintenance	Maintain shoulder completely clear of vegetation. Regular maintenance/trimming of plantation along the roadside No invasive plantation near the road.	Throughout the Project route	APRDC/Contractor	Visual inspection  Check accident records
7.1 Transport of Dangerous Goods	Community Safety	Existence of spill prevention and control and emergency responsive system Emergency plan for vehicles carrying hazardous material	Throughout the project stretch	APRDC/Contractor	Review of spill prevention and emergency response plan Spill accident records

**Table 33: Site Specific Environmental Management Plan for Road Section Atchuthapuram (1.670 km) to Anakapalli (15.450 km)**

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
1.0 Construction Stage								
1.1 Preparatory activities	Submit appointment letter of contractor's Environmental Engineer to PIU / PMU	ADB Project requirement	All contractors and sub-contractors	Approvals, attendance	PMU SEMR		Contractor/ company	APRDC / PMU
	Environmental Engineer (EE) will engage with PMSC and PMU Safeguard Officer to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary. EE will prepare Contractors Environmental Implementation Plan based on the approved EMP, EMOP, and agreements reach during the meeting with PMSC and PMU-EO. Request PMSC copy of monthly monitoring formats and establish deadlines for submission.							

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	EE will submit for PMSC approval an action plan to secure all permits and approvals needed to be secured during construction stage which include but not limited to: i) operation of crushers and hot mix plants, ii) transport and storage of hazardous materials (e.g. fuel, lubricants, explosives), iii) waste disposal sites, iv) temporary storage location, iv) water use, and v) emission compliance of all vehicles.							
	Arrangements to link with government health programs on hygiene, sanitation, and prevention of communicable diseases will also be included in the action plan.							

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	EE will submit for approval of PMSC the construction camp / Worker's temporary sanitation and rest area layout, utilities shifting, etc. before its establishment.							
	No works will be initiated by the contractor until the site induction training is carried out by the EE / PMSC.							
1.2 Site induction	Site induction training includes but not limited to: i) discussion and review of EMP and EMoP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs	ADB Project requirement	All contractors and sub-contractors	Approvals, attendance	PMU SEMR		Contractor/ Company	APRDC / PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM.							
2.0 Air Pollution								
2.1 Dust Generation due to construction activities and transport, storage and handling of construction materials	Contractor to submit location and layout plan for storage areas of construction materials agreed by Transport, loading and unloading of loose and fine materials through covered vehicles. Paved approach roads. Storage areas to be located downwind of the habitation area. Water spraying on earthworks, unpaved haulage roads and other dust prone areas. Provision of PPEs to workers.	MORT and H Specifications for Road and Bridge works, Air (P and CP) Act 1974 and Central Motor and Vehicle Act 1988 General Conditions of Bid Document	Throughout project road	MI: PM10 level measurements Complaints from locals due to dust  PT: PM10 level < 100 g/m <sup>3</sup> Number of complaints should be zero.	Standards CPCB methods Observations Public consultation  Review of monitoring data maintained by contractor	Included in civil works cost	Contractor	APRDC/PMU
2.2 Emission of air pollutants	Regular maintenance of	The Air (Prevention and	Asphalt mixing plants,	MI: Levels of HC,	Standards CPCB methods	Included in civil	Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
(SPM, SO <sub>2</sub> , NO <sub>x</sub> , CO) from vehicles due to traffic congestion and use of equipment and machinery	machinery and equipment. Batching, asphalt mixing plants and crushers at downwind (1 km) direction from the nearest settlement. Only crushers licensed by the APPCB shall be used DG sets with stacks of adequate height and use of low Sulphur diesel as fuel. LPG should be used as fuel source in construction camps (if any) instead of wood Ambient air quality monitoring Contractor to prepare traffic management and dust suppression plan duly approved by APRDC.	Control of Pollution) Act, 1981 (Amended 1987) and Rules 1982	crushers, DG sets locations	SO <sub>2</sub> , NO <sub>2</sub> , and CO. Status of PUC certificates  PT: SO <sub>2</sub> and NO <sub>2</sub> levels are both less than 80ug/m <sup>3</sup> . PUC certificate of equipment and machinery is valid.	Review of monitoring data maintained by contractor	works cost		
<b>3.0 Noise &amp; Vibration</b>								
3.1 Disturbance to local residents and sensitive receptors due to excessive noise from construction activities and	Site specific design of the noise barriers will be prepared and included in the final SEMP and provided to the Contractor for	Legal requirement Noise Pollution (Regulation and	Throughout project section especially at construction sites, residential and identified	MI: day and night Noise levels. Number of complaints from local people	As per Noise rule, 2000 Consultation with local people	Included in civil works costs	Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
<p>operation of equipment and machinery</p> <p>3.2 No activity or disturbance near the Kondarkala bird lake to avoid any air / dust / noise related impacts.</p> <p>3.3 Vibrational impact to structures near settlements, flyover construction areas.</p>	<p>implementation. All equipment to be timely serviced and properly maintained. Construction equipment and machinery to be fitted with silencers and maintained properly. Only IS approved equipment shall be used for construction activities. Timing of noisy construction activities shall be done during night time and weekend near schools, implement noisy operations intermittently to reduce the total noise generated. Manage existing traffic to avoid traffic jams and accumulation of noise beyond standards. Restrict construction near residential, built up and forest areas construction today light hours. Honking restrictions near sensitive areas PPEs to workers</p>	<p>Control) Rules, 2000 and amendments thereof + Clause No 501.8.6. MORT and H Specifications for Road and Bridge works</p>	<p>sensitive locations.</p> <p>Flyover construction area / Settlements</p>	<p>PT: Zero complaints or no repeated complaints by local people. Average day and night time noise levels are within permissible limits for work zone areas.</p> <p>Regular monitoring for sensitive structures.</p>	<p>Review of noise level monitoring data maintained by contractor Observation of construction site.</p> <p>Vibration meters / installation of vibration sensors on vulnerable building structures.</p>	<p>Included in civil work costs.</p>	<p>APRDC</p>	<p>APRDC/MU</p>

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
Noise modelling near Flyover and other sensitive receptors areas to be conducted.	Noise monitoring as per EMoP.  Regular monitoring for identified sensitive structures near the construction sites / flyover construction area.  Suitable Noise barriers, mitigation measures to be implemented based on results of modelling.		Flyover / sensitive receptors area	Regular Monitoring of noise	Regular monitoring of noise	APRDC budget / contingency		
4.0 Land and Soil								
4.1 Land use Change and Loss of productive / topsoil	Non-agricultural areas to be used as borrow areas to the extent possible. If using agricultural land, topsoil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion. Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use.	Project requirement	Throughout the project section and borrow areas  Land identified for camp, storage areas etc.	MI: Borrow pit locations/Top soil storage area  PT: Zero complaints or disputes registered against contractor by land owners	Review borrow area plan, site visits	Included in civil works cost	Concessionaire	APRDC / PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
4.2 Borrow area management	No new borrow area will be opened. Use existing licensed quarries for securing construction material. If any NEW borrow area has to be opened, obtain EC from SEIAA before opening any new borrow area. Comply to EC conditions of SEIAA Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. Depths of borrow pits to be regulated and sides not steeper than 25%. Topsoil to be stockpiled and protected for use at the rehabilitation stage. Transportation of earth materials through covered vehicles. Follow IRC recommended practice for borrow pits (IRC 10: 1961) for identification of location, its operation	IRC Guidelines on borrow areas and for quarries (Environmental protection Act and Rules, 1986; Water Act, Air Act) +Clause 305.2.2 MORTH Specifications for Road and Bridgeworks Guidelines for Borrow Areas management	Borrow sites location	MI: Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Number of accidents. Complaints from local people.  PT: No case of non-compliance to conditions stipulated by APPCB. Zero accidents. Zero complaints	Review of design documents and site observations  Compare site conditions with APPCB conditions.	Included in civil works cost	Contractor	APRDC / PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	and rehabilitation Borrow areas not to be dug continuously. To the extent borrow areas shall be sited away from habited areas. Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.							
4.3 Quarry Operations	Aggregates will be sourced from existing licensed quarries. Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to APRDC. The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA. Obtain environmental clearance from	Clause No.111.3 MORTH Specifications for Road and Bridge works Guidelines VI for Quarry Areas Management Environmental Protection Rules	New Quarry if needed	MI: Existence of licenses quarry areas from which materials to be sourced and Existence of a quarry redevelopment plan  PT: Quarry license is valid.: No case of noncompliance to consent conditions and air quality	Review of design documents, contractor documents and site observation. Compliance with SEIAA conditions in case of opening new quarries.	Included in civil works cost	Contractor	APRDC / PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	SEIAA in case of opening new quarry			meets the prescribed limit				
4.4 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction. Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction. Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads. Land taken for construction camp and other temporary facility shall be restored to its original conditions	Design requirement	Parking areas, Haulage roads and construction yards.	MI: Location of approach and haulage roads Presence of destroyed/compacted agricultural land or land which has not been restored to its original condition PT: Zero occurrence of destroyed/compacted land and undestroyed land	Site observation	Included in civil works cost	Contractor	APRDC / PMU /CSC
4.5 Contamination of soil due to leakage/ spillage of oil, bituminous	Construction vehicles and equipment will be maintained and refuelled in such a fashion that oil/diesel	Design requirement	Fuelling station, construction sites, and construction	MI: Quality of soil near storage area Presence of	Site observation	Included in civil work cost.	Contractor	APRDC/PMU /CSC

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
and non-bituminous debris generated from demolition and road construction	<p>spillage does not contaminate the soil. Fuel storage and refuelling sites to be kept away from drainage channels. Unusable debris shall be dumped in ditches and low-lying areas.</p> <p>To avoid soil contamination Oil Interceptors shall be provided at wash down and refuelling areas.</p> <p>Waste oil and oil soaked cotton/ cloth shall be stored in containers labelled 'Waste Oil' and 'Hazardous' sold off to MoEF/SPCB authorized vendors</p> <p>Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit.</p> <p>Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board</p>		<p>camp and disposal location.</p>	<p>spilled oil or bitumen in project area</p> <p>PT: Soil test conforming to no – contamination . No sighting of spilled oil or bitumen in construction site or camp site</p>				

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
5.0 Water Resources								
5.1 Sourcing of water during Construction	Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority. Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.  Water intensive activities not to be undertaken during summer season.	CGWA Guidelines	Throughout the Project section	MI: Approval from competent authority Complaints from local people on water availability  PT: Valid approval from competent authority. Zero complaints from local people.	Checking of documentation  Talk to local people	Included in civil work cost	Contractor	APRDC/PMU
5.2 Disposal of water during construction	Provisions shall be made to connect roadside drains with existing nearby natural drains.	Clause No.1010 EP Act 1986 MORT&H Specifications for Road and Bridgeworks	Throughout the Project section	MI: Condition of drainage system in construction site. Presence /absence of water logging in project area.  PT: Existence of proper drainage system. No water logging in project area	Standards methods. Site observation and review of documents	Included in civil work cost	Contractor	APRDC /PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
5.3 Alteration in surface water hydrology	Existing drainage system to be maintained and further enhanced. Provision shall be made for adequate size and number of cross drainage structures esp. in the areas where land is sloping towards road alignment.	Design requirement, Clause No 501.8.6. MORTandH Specifications	Near all drainage channels, river/nallah crossings etc.	MI: Proper flow of water in existing streams and rivers  PT: No complain of water shortage by downstream communities. No record of overtopping/ water logging	Review of design documents  Site observation	Included in civil works cost	Contractor	APRDC/PMU
6.0 Management of Construction Waste/Debris								
6.1 Selection of Dumping Sites	Contractor to submit a waste/spoil disposal plan and get it approved by PMSC / PMU. Unproductive/wastelands shall be selected for dumping sites away from residential areas and water bodies Dumping sites must be having adequate capacity equal to the amount of debris generated. Public perception and consent from the	Design Requirement, MORTandH guidelines and General Conditions of Contract Document	At all Dumping/Disposal Sites	MI: Location of dumping sites Number of public complaints.  PT: No public complaints. Consent letters for all dumping sites available with contractor	Field survey and interaction with local people. Review of consent letter	Included in civil works cost.	Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	local community / village Panchayats has to be obtained before finalizing the location.							
6.2 Reuse and disposal of construction and dismantled waste	<p>The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. Unusable and non-bituminous debris materials should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority.</p> <p>The bituminous wastes shall be disposed in secure landfill sites only in environmentally</p>	Design Requirement, MORTH guidelines and General Conditions of Contract Document	Throughout the project corridor	<p>MI: Percentage of reuse of existing surface material</p> <p>Method and location of disposal site of construction debris</p> <p>PT: No public complaint and consent letters for all dumping sites available with contractor</p>	<p>Contractor records</p> <p>Field observation</p> <p>Interaction with local people</p>	Included in civil works cost.		

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed. Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.							
7.0 Traffic Management and Safety								
7.1 Management of existing traffic and safety	Detailed Traffic Management Plan shall be submitted by the contractor and approved by the PMSC. The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least	Design requirement and IRC: SP: 27 -1984, Report Containing Recommendation of IRC Regional Workshops on Highway Safety  The Building and other Construction workers Act 1996 and Cess Act of 1996 Factories Act 1948+Section 6 of	Throughout the project road especially at intersections.	MI: Traffic management plan. Presence/ absence of safety signs, traffic demarcations, flag men etc. on site. Complaints from road users. No of accidents  PT: No complaints. No accidents due to poor traffic management. Traffic signs, demarcation	Review traffic management plan Field observation of traffic management and safety system Interaction with people in vehicles using the road	Included in civil works cost.	Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>number of people and other vehicles on the road. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road. The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "Engineer". Use of adequate signage's to ensure traffic management and safety. Conduct</p>	Employer's Requirement of Bid Document		lines etc. present in appropriate locations on site				

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	of regular safety audit on safety measures.							
7.2 Pedestrians, animal movement	Temporary access and diversion, with proper drainage facilities. Access to the schools, temples and other public places must be maintained when construction takes place near them. Fencing wherever animal movement is expected. Large number of box culverts has been proposed. All structures having vertical clearance above 2 m and not catering to perennial flow of water may serve as underpass for animals	Same as above	Near habitation on both sides of schools, temples, hospitals, graveyards, construction sites, haulage roads, diversion sites.	MI: Presence/absence of access routes for pedestrians. Road signage Number of complaints from local people  PT: Easy access to schools, temples and public places. Zero complaints	Field observation Interaction with local people	Included in civil works cost.	Contractor	APRDC/PMU
7.3 Occupational health and safety of construction workers	Contractors to adopt and maintain safe working practices. Usage of fluorescent and retro refractory signage, in local language at the construction sites	Same as above	Construction sites	MI: Availability of Safety gears to workers  Safety signage Training records on safety	Site observation  Review records on safety training and accidents	Included in civil works cost	Obligation of Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>Training to workers on safety procedures and precautions.</p> <p>Mandatory appointment of safety officer.</p> <p>All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.</p> <p>Provision of PPEs to workers.</p> <p>Provision of a readily available first aid unit including an adequate supply of dressing materials.</p> <p>The contractor will not employ any person below the age of 18years</p> <p>Use of hazardous material should be minimized and/or restricted.</p> <p>Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.</p>			<p>Number of safety related accidents</p> <p>PT: Zero fatal accidents. Zero or minor nonfatal accidents.</p>	Interact with construction workers			

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>Accident Prevention Officer must be appointed by the contractor.</p> <p><b>COVID-19.</b> Taking cognizance of situation at time of mobilization, the Contractor shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&amp;MP) and submit to PMU and PMSC for approval. The preparation of C-R&amp;MP shall consider guidance of Government of India, World Health Organization, International Labour Organization, International Financial Corporation and World Bank's interim guidance note etc. The key points on COVID Response and Management measures is at Appendix 17.</p>							

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	The contractor shall submit a Monthly monitoring and progress report to PMU and PMSC.							
7.4 Community health and safety	Restrict access to construction sites only to authorized personnel. Physical separation must be provided for movement of vehicular and human traffic. Adequate signage must be provided for safe traffic movement. Provision of temporary diversions and awareness to locals before opening new construction fronts.	Same as above	Construction sites	MI: Safety signs and their location Incidents of accidents  Complaints from local people  PT: Zero incident of accidents. Zero complaints.	Site inspection  Consultation with local people	Included in civil works cost	Contractor	APRDC/PMU
8.0 Site restoration and rehabilitation								
8.1 Clean-up Operations, Restoration and Rehabilitation	Contractor will prepare site restoration plans, which will be approved by the 'Engineer'. The clean-up and restoration operations are to be implemented by the	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	MI: Condition of camp, borrow areas and construction sites, Presence/absence of construction material/debris	Site observation  Interaction with locals  Issue completion certificate after	Included in civil works cost.	Contractor	APRDC/PMU

Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	Monitoring indicators (MI) / Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>contractor prior to demobilization. All construction zones including riverbeds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer.</p> <p>All the opened borrow areas will be rehabilitated and 'Engineer' will certify</p>			<p>s after completion of construction works on site. PT: Clean and tidy sites. No trash or debris left on site. Site restored and levelled.</p>	<p>restoration of all sites are found satisfactory</p>			

217. Environmental monitoring will be done during construction on three levels:

- (i) Monitoring the development of project performance indicators by APRDC;
- (ii) Monitoring implementation of mitigation measures by the Contractor; and
- (iii) Overall regulatory monitoring of environmental issues by COI.

218. In addition to regular monitoring on-site (at the project level) on EMP implementation of the mitigation measures, monitoring of key environmental parameters is proposed. Table below presents the indicative environmental monitoring program for the project, which includes environmental parameters, with a description of the sampling stations, the frequency of monitoring, applicable standards, and responsible agencies. This will be finalized based on site-specific EMP and monitoring program is commensurate to the impacts of the subproject.

**Table 34: Environmental Monitoring Plan**

Environmental Features	Aspect to be monitored	Time and Frequency of Monitoring	Location	Responsible Party
Physical Environment				
Air and Noise	Level of PM10, PM2.5 and SO2 and NOx  Noise levels on dB (A) scale	Before commencement of any construction activities Once in every section while construction is ongoing Once after completion of construction activities	At selected locations	APRDC
Vibration	Vibration measurement and analysis of vulnerable structures	Identification of key sensitive receptors / vulnerable structures before start of construction.  Measurement and analysis of vibrational impacts during construction and operation.	Flyover / Key junctions	APRDC
Water bodies	Concentration of sediments and presence of construction debris	Before start of construction activities During construction activities in the vicinity of each water body Once after completion of construction activities	Major water bodies	APRDC
	pH, BOD, COD, DO, TDS, NO3 and coliform	Same as above	Major water bodies	APRDC

<b>Environmental Features</b>	<b>Aspect to be monitored</b>	<b>Time and Frequency of Monitoring</b>	<b>Location</b>	<b>Responsible Party</b>
	Length of line drainage structures constructed and strengthened	During construction activities in the vicinity of each water body	Full length of project road	APRDC
	Length of damaged or missing line drains	Before start of construction activities Once after completion of construction activities	Full length of project road	APRDC
	Total number, type, and lengths of cross drainage structures including bridges constructed or strengthened	Before start of construction activities Once a year during construction activities Once after completion of all construction activities	Full length of project road	APRDC
	Number of weak cross drainage structures	Before start of construction activities Once a year during construction activities Once after completion of all construction activities	Full length of project road	APRDC
Geology	Number of cases of illegal quarrying or mining	Once a year after completion of construction activities	Entire project length	APRDC
<b>Ecological Resources</b>				
Flora	Total area of vegetative cover	Before start of construction activities Once a year during construction activities	Entire project section	APRDC
	Total number of trees	Before start of construction activities Once a year during construction activities	Entire project section	APRDC
	Average tree density	Before start of construction activities Once a year during construction activities Once after completion of all construction activities and thereafter once every year for 5-10 years depending on budget availability	Full length of project location	APRDC

Environmental Features	Aspect to be monitored	Time and Frequency of Monitoring	Location	Responsible Party
Social Environment				
Health	Number of accidents among construction workers	During construction activities	All construction sites along project road	APRDC, Contractor, local health officials
	Number of accidents due to moving traffic amongst local community members	Before start of construction activities Once a year during construction activities Once every year after completion of construction activities	All villages along project road	APRDC, Contractor, local health Officials
Travel time	Time taken to travel within each road section	Before start of construction activities After construction activities	Full length of project road	APRDC, Contractor,
	Number and extent of travel delays	During construction activities (throughout the year)	Full length of project road	APRDC, Contractor,

#### D. EMP Implementation Cost

219. Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacity building program is included as part of the project. EMP implementation budget is shown below in table below:

**Table 35: Environmental Management Plan Implementation Budget**

SI No	Activity	Amount in (₹)	To be included in budget under	Remarks
1	Tree cutting and compensatory afforestation activities			
	Compensatory afforestation (1:2 basis by forestry department) 1657 total trees	66,28,000	APRDC under VCIC project	No. of trees to be planted = 3314 @ 2000/tree (including maintenance for 5 years)  Contractor to assign the VSS Committee for carrying out the additional 1:2 plantation

SI No	Activity	Amount in (₹)	To be included in budget under	Remarks
2	Monitoring activities	As specified in the monitoring plan	Included in Contractors cost	To be ensured in BOQ and during implementation.
	Monitoring (air, water, noise, soil)	10,00,000	BOQ of Civil Works cost	
3	Training	5,00,000	APRDC under VCIC project	
4	Noise Barrier to be designed and installed by the contractor. To be installed at flyover of length about 1000 running meter.	4,500,000	APRDC	In case noise level exceeds the permissible limit, APRDC shall include this item as variation.
	<b>Total</b>	<b>12,328,000</b>		

### E. Staffing Requirement and Budget

220. Costs required for implementing EMP will cover the following activities:

- (i) updating IEE, preparing and submitting reports and public consultation and disclosure;
- (ii) application for environmental clearances; and
- (iii) implementation of EMP, environmental monitoring program, and long-term surveys.

221. Environmental monitoring during construction will also be straightforward and will involve periodic site observations and interviews with workers and others, plus checks of reports and other documents. This will be conducted by PMU-ESS assisted by the PMU environmental safeguard officer. Therefore, no separate budget is required from PMU-ESS.

222. The cost of mitigation measures and surveys during construction will be incorporated into the contractor's costs, which will be binding on him for implementation. The contractors will conduct the surveys.

**Table 36: Training Program for Environmental Management**

Items	Pre-construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staff	Experiences and best practices sharing
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and Government of India and how the project will meet these requirements	To build the capacity of the staff for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and Government of India	To share the experiences and best practices aimed at learning lessons and improving implementation of EMP
Contents	Module 1: Orientation ADB Safeguards Policy Statement	Roles and responsibilities of officials/contractors/consultants	Experiences on EMP implementation –

Items	Pre-construction	Construction	
	Government of India Environmental Laws and Regulations  Module 2: Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements Review of environmental assessment report to comply with ADB requirements Incorporation of EMP into the project design and contracts	towards protection of the environment Environmental issues during construction Implementation of EMP Monitoring of EMP implementation Reporting requirements	issues and challenges Best practices followed
Duration	1 day	1 day	1 day on a regular period to be determined by COI, APRDC, and PMSC
Participants	Executing and implementing agencies, COI, and COI staff (technical and environmental) involved in the project implementation	COI APRDC Contractors	COI APRDC Contractors

## X. MONITORING AND REPORTING

223. DOI will monitor and measure the progress of EMP implementation. The monitoring activities will correspond with the project's risks and impacts. In addition to recording information on the work and deviation of work components from original scope, PMU, APRDC, and PMSC will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

224. APRDC / PMSC will submit monthly monitoring and implementation reports to PMU, who will take follow-up actions, if necessary. DOI will submit semi-annual monitoring reports to ADB. The suggested monitoring report format is in Appendix 11. A site inspection checklist is attached at Appendix 13, which is to be filled by the PMSC/APRDC supervising staff and attached to monthly reports. Subproject budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

225. Compliance with loan covenants will be screened by the Department of Industries, Government of Andhra Pradesh.

226. ADB will review project performance against the DOI, GoAP, commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be

commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

## **XI. CONCLUSIONS AND RECOMMENDATION**

227. The Anakapalli-Athchuthapuram road improvement subproject is unlikely to cause any significant, irreversible or unprecedented environmental impacts. The potential impacts are localized and temporary in nature and easy to mitigate.

228. Subproject road is not located in any environmentally sensitive areas. It does not passthrough any reserve forest area and no diversion of forest land is required. Widening and improvement will mostly be accommodated within available land. Land acquisition is required only for curve important and locations where protection works are proposed.

229. The environmental impacts attributable to the upgrading of the road sections pertains to tree cutting, temporary deterioration of environmental attributes/ambient during construction phase from land clearing, camp operations and community and occupational health and safety. These impacts are easily mitigated by adopting good construction practices and effective implementation of Environmental Management Plan (EMP). During operation stage, the main impacts are increase in mobile emissions, noise level, accident risk to motorist, pedestrian and animals. Road safety measures are proposed as per IRC: SP: 44-1996 like road delineators, signage, metal beam crash barriers and guideposts etc. Toe walls and stone pitching has been proposed on embankment slopes where ponds are abutting to avoid seepage into sub grade and erosion of road embankment. Any potential development induced impacts in future are not anticipated to be significant as the influx of people working at subproject area and its surroundings will not be substantial so as to lead to any major stress on the eco-system. There is no largescale influx of people expected in future due to the subproject as it is already a habited area, however stress on factors such as traffic congestion and safety will be minimized.

230. In general, the subproject received immense support from local people. The local people appreciate that improved connectivity will bear out several socio-economic positive benefits resulting to improved quality of life. The improved and widened road will also enable reduction in traffic congestion and improved safety along the road corridor.

231. The initial environmental examination of the subproject ascertains that the project is unlikely to cause any significant environmental impacts. No additional studies or need of undertaking detailed EIA is envisaged at this stage. The Executing Agency and APRDC shall ensure that EMP and EMoP are included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The same shall be revised, if necessary, during project implementation or if there is any change in the project design and with approval of ADB.

232. Recommendations are as follows:

- (i) ensure IEE including EMP is part of the bid and contract document;
- (ii) obtain statutory clearances prior to award of contract and ensure conditions/requirements are incorporated in the subproject design and documents;
- (iii) during bidding stage, orientation on the environmental safeguard requirements are provided to interested bidders;
- (iv) upon mobilization of the contractors, PMU and PIU to provide a safeguards orientation per IEE and project administration manual;

- (v) prepare and implement tree management plan for removal of trees in road right of way and for afforestation
- (vi) Conduct baseline monitoring of air, noise, water etc before the start of civil works, and conduct periodically during the works as per the environmental monitoring plan
- (vii) contractor to appoint environmental safeguards bnodal person responsible for environmental safeguards compliance, occupational health and safety and core labor standards;
- (viii) submit to PIU the site-specific EMP (SEMP) and other subplans as required; and
- (ix) PMU and PIU to closely monitor contractor's implementation of the SEMP and provide guidance on corrective actions on a timely manner.

### Appendix 1: Rapid Environmental Assessment Checklist

**Instructions:**

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

Country/Project Title:

Sector Division:

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area adjacent to or within any of the following environmentally sensitive areas?			
Cultural heritage site		x	No cultural heritage site is located within the road ROW or vicinity.
Protected Area		x	The subproject road not located inside or adjacent to any notified protected area.
Wetland		x	None
Mangrove		x	None
Estuarine		x	None
Buffer zone of protected area		x	None
Special area for protecting biodiversity		x	No special biodiversity area is located within Atchuthapuram–Anakapalli road.
Potential Environmental Impacts Will the Project cause...			

Screening Questions	Yes	No	Remarks
encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	x		No encroachment of historical places. However, some religious structures and places of worship exist along the project road which may get partially impacted or relocated in consultation with the stakeholders. Disfiguration of landscape is not envisaged since it is widening / expansion / reconstruction of existing roads. Cut and fills are required only to improve the vertical profile of the road.
encroachment on precious ecology (e.g., sensitive or protected areas)?		x	No National Parks, wildlife sanctuaries or similar eco-sensitive areas along the project road. Kondarkola bird sanctuary is located at a distance of 3 km. from the road alignment. Adequate measures to avoid any activity near the area during construction have been provided in the EMP.
alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		x	There is no perennial waterway being crossed by the sub-project road. All culverts construction will be done during lean flow period. There is no waterway or water bodies near cut and fill locations.
deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		x	A temporary earthen bund or silt fencing will be provided around the construction site to avoid any sedimentation in nearby areas during rainfall. Adequate sanitary facilities and drainage will help to avoid this possibility.
increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	x		Air pollution level is likely to be increased for short duration during construction period. Appropriate distance from settlement area and wind direction will be considered to locate air polluting facility like stone crushing unit etc. Use of environment friendly equipment/machineries will help to reduce air pollution.

Screening Questions	Yes	No	Remarks
risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?	x		Workers may be exposed to dust and noise during construction activities. However, the exposure levels are likely to be short. Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Traffic on road will be managed by implementation of adequate traffic management plan as provided in the EMP. No occupational health hazard is anticipated during operation phase.
noise and vibration due to blasting and other civil works?	x		Blasting is not involved. Ambient noise level is expected to increase in the range of 80-90 db (a) due to various construction activities, maintenance workshops, and earthmoving equipment. Although this level of noise exceeds national standards, their occurrence will be intermittent and co-terminus with the project construction. All stationary noise making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. Quarry material will be procured from existing licensed quarries. Opening and operation of new quarry is not envisaged.
dislocation or involuntary resettlement of people?		x	Minimal since widening / improvement work will mostly be accommodated within available ROW.
dislocation and compulsory resettlement of people living in right-of-way?		x	Minimal since widening / improvement work will mostly be accommodated within available ROW.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	No significant impact is envisaged. Please refer RP prepared for the subproject.
other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	x		Deterioration in ambient air quality will be localized and temporarily during construction. Regular water sprinkling to reduce the dust emission up to negligible standard will be practiced. Noise barriers at sensitive receptors and community place will be provided to avoid any stress. Extensive plantation along the highway and improved road conditions will improve the air quality of the area.

Screening Questions	Yes	No	Remarks
hazardous driving conditions where construction interferes with pre-existing roads?	x		Traffic management plan as provided in the EMP will be implemented by the contractor to prevent any hazardous driving condition in such situations.
poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	x		Proper provisions for sanitation, health care and solid waste disposal facilities as included in the EMP will form a part of contract documents.
creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?		x	No such risk anticipated. Borrow areas are mostly from upland and digging is minimal hence ponding of water is not envisaged.
accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?	x		Road widening and improvement will be undertaken along existing roads currently being used.
increased noise and air pollution resulting from traffic volume?	x		Increase in noise and air pollution is expected during construction phase from road travel, materials handling, earth moving, and fumes from heavy equipment and processing plants. During operation, increase in traffic may result in more vehicles emitting fumes.
increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?		x	This may happen due to accidental spillage. Adequate safety provisions have been proposed to avoid such situation.
social conflicts if workers from other regions or countries are hired?		x	Most of the workers will be locally hired.
large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		x	No such scenario is envisaged.
risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	x		Road construction involves handling of hazardous substances like fuel, lubricants and bitumen which poses risk during transport and storage.
community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.	x		Adequate measures have been adopted to mitigate such risks. Awareness will be created amongst people and workers through information disclosure, safety signage and public consultation about safety aspects.

### A Checklist for Preliminary Climate Risk Screening

Country/Project Title: IND/VCICDP-2: Widening of Atchuthapuram to Anakapalli Road to 4 Lane

Sector: Urban and Water Supply

Subsector:

Division/Department: SAUW / SARD

Screening Questions		Score	Remarks <sup>a</sup>
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	While the average rainfall in the area is not very high, this region has experienced cyclones in the past. The last cyclone being in 2016.
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g., prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g., construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g., hydro-power generation facilities) throughout their design lifetime?	0	

<sup>a</sup>If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high-risk project.

Result of Initial Screening (Low, Medium, High): Medium

Other  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Prepared by: \_\_\_\_\_

## Appendix 2: “No Mitigation Measures Scenario” Checklist

Widening of Atchuthapuram–Anakapalli Road to 4 Lane  
VCICDP–Project 2

### Checklist 1: Scoping Checklist Part 1 - Questions on Project Characteristics

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc.)?				
1.1	Permanent or temporary change in land use, landcover or topography including increases in intensity of land use?	Yes	Land	Not significant
1.2	Clearance of existing land, vegetation and buildings?	Yes, partly	Land	Not significant
1.3	Creation of new land uses?	Yes, partly	Land (widening of existing road in the available ROW)	Not significant
1.4	Pre-construction investigations e.g., boreholes, soil testing?	Yes	Land, conducted and found ok	Not significant
1.5	Construction works?	Yes	Land, widening of road	Not significant
1.6	Demolition works?	No, partly only in some cases	Land,	Not significant
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	Land	Not significant
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes	Land	Not significant
1.9	Underground works including mining or tunneling?	No	Land, construction material to be sourced from exiting quarries, no new quarry to be mined.	Not significant
1.10	Reclamation works?	No	No	Not significant
1.11	Dredging?	No	No	Not significant
1.12	Coastal structures e.g., seawalls, piers?	No	No	Not significant
1.13	Offshore structures?	No	No	Not significant
1.14	Production and manufacturing processes?	No	No	Not significant
1.15	Facilities for storage of goods or materials?	Yes, temporary	Land, during construction	Not significant
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes, temporary	Land, during construction	Not significant

<b>No.</b>	<b>Questions to be considered in Scoping</b>	<b>Yes/No/?</b>	<b>Which Characteristics of the Project Environment could be affected and how?</b>	<b>Is the effect likely to be significant? Why?</b>
1.17	Facilities for long term housing of operational workers?	No	No	Not significant
1.18	New road, rail or sea traffic during construction or operation?	No, existing road to be widened	Land	Not significant
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc.?	No	Land	Not significant
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No, partial disturbance during construction	Land / Air	Not significant
1.21	New or diverted transmission lines or pipelines?	No	No	Not significant
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	No	Not significant
1.23	Stream crossings?	No	No	Not significant
1.24	Abstraction or transfers of water from ground or surface waters?	No, temporary water use during construction	Land / water	Not significant
1.25	Changes in waterbodies or the land surface affecting drainage or run-off?	No	No	Not significant
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Land / Air	Not significant
1.27	Long term dismantling or decommissioning or restoration works?	No	Land	Not significant
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	No	No	Not significant
1.29	Influx of people to an area in either temporarily or permanently?	Yes, temporary during construction	Land / Water	Not significant
1.30	Introduction of alien species?	No	No	Not significant

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1.31	Loss of native species or genetic diversity?	No	No	Not significant
1.32	Any other actions?			
2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?				
2.1	Land especially undeveloped or agricultural land?	Yes, construction material	Land	Not significant
2.2	Water?	Yes, during construction	Water	Not significant
2.3	Minerals?	No	No	Not significant
2.4	Aggregates?	Yes	Land	Not significant
2.5	Forests and timber?	No	Land	Not significant
2.6	Energy including electricity and fuels?	Yes	Land /Air	Not significant
2.7	Any other resources?			
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes, temporarily during construction	Land	Not significant
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (e.g., insect or water borne diseases)?	No	Water	Not significant
3.3	Will the project affect the welfare of people e.g., by changing living conditions?	Yes		Not significant
3.4	Are there especially vulnerable groups of people who could be affected by the project e.g., hospital patients, the elderly?	No		Not significant
3.5	Any other causes?			
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes		Not significant
4.2	Municipal waste (household and or commercial wastes)?	Yes		Not significant
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes		Not significant
4.4	Other industrial process wastes?	Yes		Not significant
4.5	Surplus product?	Yes		Not significant

<b>No.</b>	<b>Questions to be considered in Scoping</b>	<b>Yes/No/?</b>	<b>Which Characteristics of the Project Environment could be affected and how?</b>	<b>Is the effect likely to be significant? Why?</b>
4.6	Sewage sludge or other sludges from effluent treatment?	Yes		Not significant
4.7	Construction or demolition wastes?	Yes		Not significant
4.8	Redundant machinery or equipment?	Yes		Not significant
4.9	Contaminated soils or other material?	Yes		Not significant
4.10	Agricultural wastes?	No		Not significant
4.11	Any other solid wastes?	No		Not significant
<b>5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?</b>				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes		Not significant
5.2	Emissions from production processes?	No		Not significant
5.3	Emissions from materials handling including storage or transport?	Yes		Not significant
5.4	Emissions from construction activities including plant and equipment?	No		Not significant
5.5	Dust or odors from handling of materials including construction materials, sewage and waste?	Yes		Not significant
5.6	Emissions from incineration of waste?	No		Not significant
5.7	Emissions from burning of waste in open air (e.g. slash material, construction debris)?	No		Not significant
5.8	Emissions from any other sources?	No		Not significant
<b>6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?</b>				
6.1	From operation of equipment e.g. engines, ventilation plant, crushers?	Yes		Not significant
6.2	From industrial or similar processes?	Yes		Not significant
6.3	From construction or demolition?	Yes		Not significant
6.4	From blasting or piling?	No		Not significant
6.5	From construction or operational traffic?	Yes		Not significant
6.6	From lighting or cooling systems?	Yes		Not significant
6.7	From sources of electromagnetic radiation	Yes		

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	(consider effects on nearby sensitive equipment as well as people)?			
6.8	From any other sources?			
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes, temporarily during construction		Not significant
7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?	Yes	Land / water	Not significant
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Yes	Air	Not significant
7.4	From any other sources?			
7.5	Is there a risk of long-term build-up of pollutants in the environment from these sources?	No	Air	Not significant
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires etc. from storage, handling, use or production of hazardous or toxic substances?	No, no explosives are expected to be used for blasting, etc.	Land / Air	Not significant
8.2	From events beyond the limits of normal environmental protection e.g., failure of pollution control systems?	No		Not significant
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (e.g., floods, earthquakes, landslip, etc.)?	Yes, during cyclones	Land / Water	Not significant
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, structure, social groups etc.?	No		Not significant
9.2	By resettlement of people or demolition of homes or communities or community facilities e.g., schools, hospitals, social facilities?	No		Not significant

<b>No.</b>	<b>Questions to be considered in Scoping</b>	<b>Yes/No/?</b>	<b>Which Characteristics of the Project Environment could be affected and how?</b>	<b>Is the effect likely to be significant? Why?</b>
9.3	Through in-migration of new residents or creation of new communities?	No		Not significant
9.4	By placing increased demands on local facilities or services e.g., housing, education, health?	No		Not significant
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes		Not significant
9.6	Any other causes?	No		Not significant
Question - Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
9.1	Will the project lead to pressure for consequential development which could have significant impact on the environment e.g., more housing, new roads, new supporting industries or utilities, etc.?	Yes, partly due to better connectivity and roads, local activity may increase in terms of commercial work or more ingress of people in the surroundings	Land / Water / Air	Not significant in the immediate future.
9.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g., supporting infrastructure (roads, power supply, waste or wastewater treatment, etc.) housing development extractive industries supply industries other?	Yes	Land / Water / Air	Not significant in the immediate future.
9.3	Will the project lead to after-use of the site which could have an impact on the environment?	No		Not significant

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
9.4	Will the project set a precedent for later developments?	Yes		
9.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?	No		Not significant

**Checklist 2: Scoping Checklist Part 2 - Characteristics of the Project Environment  
(Environmental Sensitivity)**

Question - Are there features of the local environment on or around the Project location which could be affected by the Project? <ul style="list-style-type: none"> <li>• Areas which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project?</li> <li>• Other areas which are important or sensitive for reasons of their ecology e.g. <ul style="list-style-type: none"> <li>• Wetlands,</li> <li>• Watercourses or other waterbodies,</li> <li>• the coastal zone,</li> <li>• mountains,</li> <li>• forests or woodlands</li> </ul> </li> <li>• Areas used by protected, important or sensitive species of fauna or flora e.g., for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project?</li> <li>• Inland, coastal, marine or underground waters?</li> <li>• Areas or features of high landscape or scenic value?</li> <li>• Routes or facilities used by the public for access to recreation or other facilities?</li> <li>• Transport routes which are susceptible to congestion or which cause environmental problems?</li> <li>• Areas or features of historic or cultural importance?</li> </ul>	No
Question - Is the Project in a location where it is likely to be highly visible to many people?	Yes
Question - Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No
Question - Are there existing land uses on or around the Project location which could be affected by the Project? For example: <ul style="list-style-type: none"> <li>• Homes, gardens, other private property,</li> <li>• Industry,</li> <li>• Commerce,</li> <li>• Recreation,</li> </ul>	Yes, partial relocation of houses; relocation of places of worship; cutting of trees

<ul style="list-style-type: none"> <li>• public open space,</li> <li>• community facilities,</li> <li>• agriculture,</li> <li>• forestry,</li> <li>• tourism,</li> <li>• mining or quarrying</li> </ul>	
Question - Are there any plans for future land uses on or around the location which could be affected by the Project?	No
Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?	Yes, some settlements at small stretches along the existing alignment.
Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project? <ul style="list-style-type: none"> <li>• hospitals,</li> <li>• schools,</li> <li>• places of worship,</li> <li>• community facilities</li> </ul>	Yes, places of worship
Question - Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project? For example: <ul style="list-style-type: none"> <li>• groundwater resources,</li> <li>• surface waters,</li> <li>• forestry,</li> <li>• agriculture,</li> <li>• fisheries,</li> <li>• tourism,</li> <li>• minerals.</li> </ul>	No
Question - Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage e.g., where existing legal environmental standards are exceeded, which could be affected by the project?	No
Question - Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g., temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?	Yes, the project area is prone to having cyclonic storms during monsoons.
Question - Is the Project likely to affect the physical condition of any environmental media? <ul style="list-style-type: none"> <li>• The atmospheric environment including microclimate and local and larger scale climatic conditions?</li> <li>• Water – e.g., quantities, flows or levels of rivers, lakes, groundwater. Estuaries, coastal waters or the sea?</li> <li>• Soils – e.g., quantities, depths, humidity, stability or erodibility of soils?</li> <li>• Geological and ground conditions?</li> </ul>	No
Question - Are releases from the Project likely to have effects on the quality of any environmental media?	No

<ul style="list-style-type: none"> <li>• Local air quality?</li> <li>• Global air quality including climate change and ozone depletion</li> <li>• Water quality – rivers, lakes, groundwater. Estuaries, coastal waters or the sea?</li> <li>• Nutrient status and eutrophication of waters?</li> <li>• Acidification of soils or waters?</li> <li>• Soils</li> <li>• Noise?</li> <li>• Temperature, light or electromagnetic radiation including electrical interference?</li> <li>• Productivity of natural or agricultural systems?</li> </ul>	
<p>Question - Is the Project likely to affect the availability or scarcity of any resources either locally or globally?</p> <ul style="list-style-type: none"> <li>• Fossil fuels?</li> <li>• Water?</li> <li>• Minerals and aggregates?</li> <li>• Timber?</li> <li>• Other non-renewable resources?</li> <li>• Infrastructure capacity in the locality - water, sewerage, power generation and transmission, telecommunications, waste disposal roads, rail?</li> </ul>	No
<p>Question - Is the Project likely to affect human or community health or welfare?</p> <ul style="list-style-type: none"> <li>• The quality or toxicity of air, water, foodstuffs and other products consumed by humans?</li> <li>• Morbidity or mortality of individuals, communities or populations by exposure to pollution?</li> <li>• Occurrence or distribution of disease vectors including insects?</li> <li>• Vulnerability of individuals, communities or populations to disease?</li> <li>• Individuals' sense of personal security?</li> <li>• Community cohesion and identity?</li> <li>• Cultural identity and associations?</li> <li>• Minority rights?</li> <li>• Housing conditions?</li> <li>• Employment and quality of employment?</li> <li>• Economic conditions?</li> <li>• Social institutions?</li> </ul>	No

### Checklist 3: Significance of Impacts

Questions to be Considered	
1. Will there be a large change in environmental conditions?	No
2. Will new features be out-of-scale with the existing environment?	No
3. Will the effect be unusual in the area or particularly complex?	No
4. Will the effect extend over a large area?	No
5. Will there be any potential for transboundary impact?	No
6. Will many people be affected?	No

7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?	No
8. Will valuable or scarce features or resources be affected?	No
9. Is there a risk that environmental standards will be breached?	No
10. Is there a risk that protected sites, areas, features will be affected?	No
11. Is there a high probability of the effect occurring?	No
12. Will the effect continue for a long time?	No
13. Will the effect be permanent rather than temporary?	No
14. Will the impact be continuous rather than intermittent?	No
15. If it is intermittent will it be frequent rather than rare?	No
16. Will the impact be irreversible?	No
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No

### Appendix 3: Applicable Ambient Air Quality Standards for India Projects

Parameter	Location <sup>a</sup>	Applicable Standards Per ADB SPS <sup>e</sup> ( $\mu\text{g}/\text{m}^3$ )
PM10	Industrial Residential, Rural and Other Areas	20 (Annual) <sup>c</sup> 50 (24-hr) <sup>c</sup>
	Sensitive Area	20 (Annual) <sup>c</sup> 50 (24-hr) <sup>c</sup>
PM25	Industrial Residential, Rural and Other Areas	10 (Annual) <sup>c</sup> 25 (24-hr) <sup>c</sup>
	Sensitive Area	10 (Annual) <sup>c</sup> 25 (24-hr) <sup>c</sup>
SO2	Industrial Residential, Rural and Other Areas	50 (Annual) <sup>b</sup> 20 (24-hr) <sup>c</sup> 500 (10-min) <sup>c</sup>
	Sensitive Area	20 (Annual) <sup>b</sup> 20 (24-hr) <sup>c</sup> 500 (10-min) <sup>c</sup>
NO2	Industrial Residential, Rural and Other Areas	40 (Annual) <sup>b</sup> 80 (24-hr) <sup>b</sup> 200 (1-hr) <sup>c</sup>
	Sensitive Area	30 (Annual) <sup>b</sup> 80 (24-hr) <sup>b</sup> 200 (1-hr) <sup>c</sup>
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) <sup>b</sup> 4,000 (1-hr) <sup>b</sup> 100,000 (15-min) <sup>d</sup>
	Sensitive Area	2,000 (8-hr) <sup>b</sup> 4,000 (1-hr) <sup>b</sup> 100,000 (15-min) <sup>d</sup>
Ozone (O3)	Industrial Residential, Rural and Other Areas	100 (8-hr) <sup>b</sup> 180 (1-hr) <sup>b</sup>
	Sensitive Area	100 (8-hr) <sup>b</sup> 180 (1-hr) <sup>b</sup>
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) <sup>b</sup> 1.0 (24-hr) <sup>b</sup>
	Sensitive Area	0.5 (Annual) <sup>b</sup> 1.0 (24-hr) <sup>b</sup>
Ammonia (NH3)	Industrial Residential, Rural and Other Areas	100 (Annual) <sup>b</sup> 400 (24-hr) <sup>b</sup>
	Sensitive Area	100 (Annual) <sup>b</sup> 400 (24-hr) <sup>b</sup>
Benzene (C6H6)	Industrial Residential, Rural and Other Areas	5 (Annual) <sup>b</sup>
	Sensitive Area	5 (Annual) <sup>b</sup>
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual) <sup>b</sup>
	Sensitive Area	0.001 (Annual) <sup>b</sup>
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual) <sup>b</sup>
	Sensitive Area	0.006 (Annual) <sup>b</sup>
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual) <sup>b</sup>

Parameter	Location <sup>a</sup>	Applicable Standards Per ADB SPS <sup>e</sup> ( $\mu\text{g}/\text{m}^3$ )
		Sensitive Area

<sup>a</sup> Sensitive area refers to such areas notified by the India Central Government.

<sup>b</sup> Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009.

<sup>c</sup> WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Global update 2005. WHO, 2006.

<sup>d</sup> Air Quality Guidelines for Europe Second Edition. WHO 2000.

<sup>e</sup> Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

### Appendix 4: Applicable Drinking Water Quality Standards for India Projects

Group	Parameter	Unit	Max. Concentration Limits <sup>d</sup>	Applicable Standards Per ADB SPS <sup>a</sup> , b, c
Physical	Turbidity	NTU	1 (5)	1 (5)
	pH		6.5 – 8.5	6.5 – 8.5
	Color	Hazen units	5 (15)	5 (15)
	Taste and Odor		Agreeable	Agreeable
	TDS	mg/l	500 (2,000)	500 (2,000)
	Iron	mg/l	0.3	0.3
	Manganese	mg/l	0.1 (0.3)	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01
	Cadmium	mg/l	0.003	0.003
	Chromium	mg/l	0.05	0.05
	Cyanide	mg/l	0.05	0.05
	Fluoride	mg/l	1 (1.5)	1 (1.5)
	Lead	mg/l	0.01	0.01
	Ammonia	mg/l	0.5	0.5
Chemical	Chloride	mg/l	250 (1,000)	250 (1,000)
	Sulphate	mg/l	200 (400)	200 (400)
	Nitrate	mg/l	45	45
	Copper	mg/l	0.05 (1.5)	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	200 (600)
	Calcium	mg/l	75 (200)	75 (200)
	Zinc	mg/l	5 (15)	5 (15)
	Mercury	mg/l	0.001	0.001
	Aluminum	mg/l	0.1 (0.3)	0.1 (0.3)
	Residual Chlorine	mg/l	0.2	0.2
	Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample
Total Coliform		MPN/100ml		

<sup>a</sup> Bureau of India Standard 10200: 2012.

<sup>b</sup> Health-based guideline values.

<sup>c</sup> Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

<sup>d</sup> Figures in parenthesis are maximum limits allowed in the absence of alternate source.

**Appendix 5: Criteria for Water Classification by CPCB**

<b>Designated Best Use</b>	<b>Class of Water</b>	<b>Criteria</b>
Drinking water source (with conventional treatment)	A	Total Coliforms MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4 mg/l or more Biochemical Oxygen Demand (BOD) 5 days 20°C 3 mg/L or less
Outdoor bathing (organized)	B	Total Coliforms MPN/100ml shall be 500 or less pH between 6.5 to 8.5 Dissolved Oxygen 5 mg/l or more Biochemical Oxygen Demand (BOD) 5 days 20°C 3 mg/L or less
Drinking Water Source (without conventional treatment)	C	Total Coliforms MPN/100 ml shall be 50 or less pH between 6.5 to 8.5 Dissolved Oxygen 6 mg/l or more Biochemical Oxygen Demand (BOD) 5 days 20°C 2 mg/L or less
Propagation of Wildlife	D	pH between 6.5 to 8.5 for Fisheries Dissolved Oxygen 4 mg/L or more Free Ammonia (as N) 1.2 mg/L or less
Irrigation, Industrial Cooling, Controlled Waste	E	pH between 6.0 to 8.5 Electrical Conductivity at 25°C Max 2250µ mhos/cm Sodium absorption ratio Max. 26 Boron, Max. 2 mg/L

### Appendix 6: Applicable Ambient Noise Level Standards for India Projects

Receptor/ Source	Applicable Standards Per ADB SPS <sup>c</sup> (dBA)	
	Day time	Night time
Industrial area	70 <sup>b</sup>	70 <sup>b</sup>
Commercial area	65 <sup>a</sup>	55 <sup>a</sup>
Residential Area	55 <sup>a</sup>	45 <sup>a</sup>
Silent Zone	50 <sup>a</sup>	40 <sup>a</sup>

<sup>a</sup> Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.

<sup>b</sup> Guidelines for Community Noise. WHO. 1999

<sup>c</sup> Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

**Appendix 7: Applicable Standards for Discharge of Environmental Pollutants (Effluent)**

<b>Pollutants</b>	<b>Units</b>	<b>Applicable Standard per ADB SPS<sup>a, b, c</sup></b>
pH	pH	6 – 9 <sup>b</sup>
BOD	mg/l	20 <sup>a</sup>
COD	mg/l	125 <sup>b</sup>
Total nitrogen	mg/l	10 <sup>b</sup>
Total phosphorus	mg/l	2 <sup>b</sup>
Oil and grease	mg/l	10 <sup>b</sup>
Total suspended solids	mg/l	<50 <sup>a</sup>
Total coliform bacteria	MPN b / 100 ml	400a <sup>b</sup>

<sup>a</sup> Environment (Protection) Amendment Rules, 2017

<sup>b</sup> Health-based guideline values

<sup>c</sup> Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

## Appendix 8: GO on GRM Government order no GO.RT.No. 163 dated 8 June 2018 for establishment of Grievance Redressal Mechanism

### GOVERNMENT OF ANDHRA PRADESH ABSTRACT

VCICDP - Establishment of Project Grievance Redress Mechanism (GRM) at three levels to cover both environmental and social issues - Orders - Issued.  
=====

#### INDUSTRIES AND COMMERCE (INFRA) DEPARTMENT

G.O.RT.No. 163

Dated: 08-06-2018

Read the following:

1. Facility Administrative Manual (FAM) of VCICDP.
2. From the Commissioner of Industries, Vijayawada, 15/1/2014/11427/VCIC-GRM. Dated:31-05-2018  
&&&

#### ORDER:

In the reference 2<sup>nd</sup> read above, the Commissioner of Industries has stated that at SI. No. 95, Page No. 42 of the Facility Administrative Manual of the VCICDP, the Project Grievance Redress Mechanism (GRM) is envisaged, wherein, it is directed to establish Project GRM at three levels to cover both Environmental and Social issues.

2. The Commissioner of Industries has proposed for establishment of Project Grievance Redress Mechanism at three levels with the following provisions and requested the Government to take a view on the establishment of Project GRM and issue orders:-

- a. The GRM shall be established and disclosed to the project affected communities.
- b. The Project Grievance Redress Committee, supported by the consultants of PMSC and Safeguard officers of both the PMU and PIUs, will be responsible for timely redress of grievances on Environmental and Social Safeguards issues.
- c. The Grievance Redress Committee is also responsible for Registration of Grievances, Related Disclosure and Communication with the aggrieved parties.
- d. A complaint register shall be maintained at the field unit, PIU and PMU levels with details of 1. Complaint lodged, 2. Date of Personal Hearing, 3. Action Taken and 4. Date of communication sent to the complainant.
- e. Contact Details, Procedure and Complaint Mechanism shall be disclosed to the Project Affected Communities at accessible locations and through various Media (Leaflets, Newspapers etc.,)

3. Government after careful examination of the proposal, hereby establish the Project Grievance Redress Mechanism at three levels is as follows:-

#### **1<sup>st</sup> Level Grievance:**

The Contact Number of the PIU office should be made available at the construction site signboards. The contractor and field unit staff can immediately resolve onsite, seek the advice of the PIU Safeguard Manager as required, within seven (7) days of receipt of the complaint / grievance.

#### **2<sup>nd</sup> Level Grievance:**

All grievances that could not be redressed within seven (7) days at Field / Ward level shall be reviewed by the GRC at District Level headed by Joint Collector of the respective District. GRC shall attempt to resolve them within fifteen (15) Days. The Safeguard Manager of the PIU shall be responsible to see through the process of redressal of each grievance.

(P.T.O)

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**3<sup>rd</sup> Level Grievance:**

All grievances that cannot be redressed within fifteen (15) days at District Level shall be reviewed by the Grievance Redressal Committee (GRC) at State Level headed by the Project Director, VCICDP PMU, with support from District GRC, PMU, Social Safeguards and Gender Officer (SSGO), Environmental Safeguard Officer of PMU. Environmental and Social Safeguard Specialists of PMSC shall coordinate the GRC to ensure that the grievances be resolved within fifteen (15) days. The SSGO of PMU shall be responsible to see through the process of redressal of each grievance pertaining to the Social Safeguards

4. Government hereby constitute the Grievance Redressal Committee (GRC) at District level with the following composition:

1.	Joint Collector of the Concerned District	Chairman
2.	Project Engineer of the concerned field unit	Member Secretary
3.	Revenue Divisional Officer (RDO) or sub-collector of the division	Member
4.	Project Director, DRDA	Member
5.	Chief Executive Officer, Zilla Parishad	Member
6.	District Panchayat Officer	Member
7.	District Education Officer	Member
8.	District Medical and Health Officer	Member
9.	District level representative of DISCOM	Member
10.	Superintendent Engineer, RWS Panchayat Raj Department	Member
11.	Three members from affected persons, with at least one of them a woman DP	Member
12.	Team Leader of the resettlement plan implementation support NGO or Agency	Member

5. The functions of the Grievance Redressal Committee (GRC) at District level are as follows:

- a) GRC at District Level shall receive, evaluate and facilitate the resolutions of displaced person's concerns, complaints and grievances.
- b) The GRC shall provide an opportunity to the affected persons to have their grievances redressed prior to approaching the State Level LARR Authority, constituted by the GoAP in accordance with Section 51 (1) of the RFCTLARR Act, 2013.
- c) The GRC is aimed to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address displaced person's concerns without allowing it to escalate resulting in delays in project implementation.
- d) The GRC shall meet once in every month and review and redress any grievances / complaints. Periodical monthly reports shall be submitted to the Project Director, VCICDP PMU in the prescribed proforma.

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- e) The GRC will continue to function, for the benefit of the displaced persons, during the entire life of the project including the defects liability period. The entire resettlement component of the project has to be completed before the construction starts, and pending grievances resolved. Other than disputes relating to ownership rights and apportionment issues on which the LARR Authority has jurisdiction.
  - f) GRC will review grievances involving all resettlement benefits, relocation and payment of assistances.
  - g) The GRCs will function out of each district where the subprojects are being implemented. The existing setup for coordination, monitoring and grievance redress at district level which meets once a month, will be used for VCICDP.
  - h) An annual fund of Rs.1.00 Lakhs shall be allocated to each GRC for their operations like convening monthly review meetings, preparing and distributing brochures, leaflets etc.
6. The Project Director, PMU, VCICDP shall be the Appellate Authority and shall be supported by the Safeguards Officer of PMU, VCICDP and the Team Leader of PMSC. This shall be the highest Grievance Redressal Mechanism at the project level.
7. The Project Monitoring Unit (PMU), Project Implementing Units (PIUs) and Grievance Redressal Committees (GRCs) shall update the status of complaints / grievances in the VCIC Web-Site.
5. The Project Director, PMU, VCICDP shall take further necessary action in the matter, accordingly.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

S.SOLOMON AROKIARAJ  
SECRETARY TO GOVERNMENT & CIP

To  
The Project Director, Project Monitoring Unit, VCICDP, Vijayawada.  
The Chairman and all the members through PD, PMU, Vijayawada.  
Copy to:  
The District Collectors, Visakhapatnam, East Godavari, Krishna  
and SPS Nellore.  
P.S. to Minister for Industries  
P.S. to Prl. Secretary to CM (GSP)  
Sc/Sf

//FORWARDED BY: ORDER//

SECTION OFFICER

## Appendix 9: Public Consultation

### ENVIRONMENTAL SURVEY

Practical View of the Community about Environmental Scenario

Km from: Anakapalli- Atchuthapuram

Consultation Questionnaire with general community response (Translated in English)

Q.1 What do you think about the quality of water from ponds, wells, rivers or Canal in your area?

Good/Satisfactory/Polluted -Satisfactory

Q.2 if the quality of water is polluted /poor then in your opinion what are its reasons?

Ingress of industrial effluent in the source Sewage leakage/discharge in the source Animal waterholes -Yes

Rainwater storage-Yes Others, please specify

Q.3 Is the noise level in your area disturbing/irritating?

Yes/No - No

Q.4 If the Noise level is disturbing/irritating then in your opinion, it is due to Vicinity of industry

Vehicular Traffic Construction work -Yes

Workshop/ scooter repair shop - Aviation zone

Others, please specify

Q.5 How, in your opinion, the noise level can be brought to satisfactory level in your area?

Using the Machinery equipment, which causes less noise as well as the good condition certificate from the authorities concerned.

Is the quality of air, which you breathe, is healthy and clean?

Yes/No Yes

are there any places of Archaeological/historical importance in your vicinity? If yes, please give details: Furnished in the Report

Is there any previous history of natural disaster viz. Floods, Drought, earthquake etc., in your area? If so, give details with year of occurrence and damage.

Flood Yes – Cyclone in 2016

Drought No

Earthquake No

Location:

Year:

Are any rare species of Birds, Animals etc., visiting your area during winter? If so,

Please give details and locations

Name of the Species:

Location:

Do you have any marketplace etc., in your area sand it is likely to be affected by proposed expansion of road? If yes, then which site do you suggest for relocation of the markets. Not much



**Public Consultation held at Anakapalli on 14 November 2018**

**SUMMARY OF STAKEHOLDER ENVIRONMENTAL SURVEY**

**Practical view of the community about environmental scenario from: Anakapalli - Atchuthapuram**

Consultation Questionnaire with general community response (Translated in English)

Q.1. What do you think about the quality of water from ponds, wells, rivers or canal in your area?

Good/Satisfactory/Polluted - **Satisfactory**

Q.2. If the quality of water is polluted /poor then in your opinion what are its reasons?

- (a) Ingress of industrial effluent in the source
- (b) Sewage leakage/discharge in the source
- (c) Animal waterholes -**Yes**
- (d) Rainwater storage -**Yes**

Others, please specify

Q.3. Is the noise level in your area disturbing/irritating?

Yes/No - **No**

Q.4. If the Noise level is disturbing/irritating then in your opinion it is due to Vicinity of industry

- (a) Vehicular Traffic Construction work -**Yes**
- (b) Workshop/ scooter repair shop –
- (c) Aviation zone

Others, please specify

Q.5. How, in your opinion the noise level can be brought to satisfactory level in your area?

- (a) Using the Machinery equipment, which causes less noise as well as the Good condition certificate from the authorities concerned - **Yes**

Is the quality of air which you breathe is healthy and clean?

Yes/No **Yes**

Q 6. Are there any places of Archaeological / historical importance in your vicinity? If yes, please give details: **Furnished in the Report**

Q 7. Is there any previous history of natural disaster viz. Floods, Drought, earthquake etc., in your area? If so, give details with year of occurrence and damage.

Flood **Yes**  
Cyclone in 2016

Drought No  
Earthquake No

Q 8. Are any rare species of Birds, Animals etc., visiting your area during winter? If so, Please give details and locations -**No**

Q 9. Do you have any marketplace etc., in your areas and it is likely to be affected by proposed expansion of road? If yes, then which site do you suggest for relocation of the markets. **Not much impact on market activity**

Q 10 Do you have any suggestion to improve the Environment W.R.T. Air, Water and Noise in your area? – **Follow and implement the pre-cautions mentioned in their port during the work execution.**

**Appendix 10: Public Consultation held at Munagapaka on 12 October 2015**

**STAKEHOLDER CONSULTATIONS**

**Consultation Methods**

Stakeholders	Consultation Method
Affected persons	Survey
Affected persons	Focus Group Discussions
Local Communities	Focus Group Discussions
Local Elected Members	Individual interview, discussion
Concerned Officials from Government	Individual meeting/interview, discussion
Affected persons and general public	Consultation Meetings

**Photographs of Community Consultations**



Section of the Participants during the Consultations at Munagapaka Village - October 2015



Section of the Participants during the Consultations at Munagapaka Village - October 2015



Consultations held in Anakapalli RDO Office - November 2018



Consultations at Site in Munagapaka - November 2018



Public consultation at Nagulapalli village



Media coverage of public consultation at Nagulapalli village



Public consultation at Atchuthapuram village



Public consultation at Atchuthapuram village

**A – Anakapalli**

<b>Table 25: Public Consultation held at Anakapalli on 14.11.2018</b>	<b>Activity</b>	Public Consultation
Place	Revenue Divisional Office, Anakapalli	
Date & Time	14.11.2018, 10:00 a.m. to 02:00 p.m.	
Participants	Mr. Suryarao, Special Dy. Collector, APRDC Mr. Srinivas, Dy, Executive Engineer, R & B Department Mr. Ashik Hussain Mohammed, Director, SATRA Mr. Malleswararao, Tahsildar, Munagapaka Ms. Bhargavi, AEE, R & B Mr. Veeraraaju, Social Development and Gender Specialist, PMSC Mr. Abraham Santhosh, Public Communications Specialist, PMSC Community Leaders and Public from Nagulapalli, Munagapaka, Thimmarajupeta and Haripalem Villages. Print media of Anakapalli.	
Purpose of the consultation	To present and to seek views of public on designs prepared by SATRA on Widening & strengthening of Achuthapuram – Anakapalli Road.	
Proceedings of the meeting		

Introduction: Mr. Ashik Hussain Mohammed, Director, SATRA informed the participants that, SATRA has revised the earlier 120 feet Achuthapuram - Anakapalli road designs to 100 feet road as per the directions from APRDC. Mr. Suryarao, Special Dy. Collector, APRDC requested the participants to share their views on the designs. Mr.D.A. Santhosh requested the participants to present views village-wise and one after another in order to discuss each issue in detail.

Nagulapalli Village – Mr. M. Nagasanyasi (Mobile No. 9030541921)

- The villagers of Nagulapalli are facing severe hardships due to narrow road and frequent accidents.
- The road from Anakapalli and Achuthapuram should be limited to 100 feet and should be 50 feet from the centre of the road.
- Dividers should be constructed in way that people can walk on it.
- Median strips should be provided at Nagulapalli junction, Palakendram and Vinayaka Temple.

Munagapaka, - A.G. Atchayya Naidu. (Mobile No. 9949719628)

- The irrigation cum drain channels which flow from 4/2 to 5/6 right side and 4/6 to 5/6 left side of the Anakapalli-Achuthapuram Road need to be maintained. Agriculture fields receive water from Sarada river and also excess water is drained through them.
- Culverts which exists all along the road need to be maintained.
- In the design presented by SATRA, the land acquisition from 5/0 to 6/0 k.m is mainly planned on left side of the road. As, it is planned to construct a new bridge besides the old Munagapaka bridge instead of demolishing the old, more land from left side of the road is required.

Munagapaka – Mr. Somasundar (Mobile No. 9642754459)

- Service roads on both sides of the road are required. The villagers are ready to give another 3 meters for the project, if required.

Munagapaka – Mr.P.V. Ramana (Mobile No. 9652737888)

- At the road curve located near Munakapaka village, land acquisition is shown more at right side of the road. Need to re-examine the right side shifting of the road at the curve.

Nagulapalli - Mr. Srinivas

- Underpasses to be provided at the village, mainly at village junction. If required, additional land will be provided by the villagers.

Thimmarajupeta – Mr. Venkataramana (Mobile No. 9030981424)

- Existing Irrigation channels need to maintained in the proposed road.
- Access roads to fields and village to be constructed.

Thimmarajupeta – Mr. Bramaji (Mobile No. 9030981424)

- Signal need to be provided at village junctions.
- Service roads need to be provided.

Thimmarajupeta – Mr. Chinnababu (Mobile No. 9701737476)

- SATRA Consultants and APRDC Officials need to come to village and show villagers how 100 feet road will affect the houses and shops in the village.

<p><u>Haripalem – Mr. K. Suryanarayana (Mobile No. 9290808018)</u></p> <ul style="list-style-type: none"> <li>• Old bridge at Haripalem should be dismantled first and new bridge should be constructed at the same place instead of constructing a new bridge besides old one.</li> <li>• Service roads and berms are required</li> </ul> <p><u>Haripalem – Mr..Suryanarayana (Mobile No. 9652247355)</u></p> <ul style="list-style-type: none"> <li>• 100 feet road should include service roads and passages</li> </ul>
Replies to the issues raised by the Public
<p><u>Mr. Suryarao – SDC, APRDC</u></p> <ul style="list-style-type: none"> <li>• The DPR Consultants, APRDC and Irrigation Department Officials, PMSC Consultants would visit the villages on 16.11.2018 to physically inspect the changes proposed by the public and examine the possibilities of incorporating them in the designs.</li> </ul> <p><u>Mr. Ashik Hussain Mohammed, Director, SATRA Consultants</u></p> <ul style="list-style-type: none"> <li>• Many design items are changed taking into consideration the views of public expressed during previous public consultations. Minimum road safety norms to be maintained to avoid accidents.</li> </ul>
Outcome of the Public Consultation
Issues and concerns of the public on designs prepared by SATRA on Widening & Strengthening of Achuthapuram - Anapalli road (VCICDPT2-APRDC/07) are recorded.

## B - Munagapaka

	<b>Govt. Participants</b>	<b>Public Participants</b>	
<p>Venue: The Co-Operative Bank Meeting hall at Munagapaka</p> <p>Date: 12 October 2015</p> <p>Time: 11:00 AM</p>	<p>From the Government Department (GoAP): Mr. Subbarao and Bargavi, Assistant Executive Engineers, A.P. Road Development Corporation (APRDC), Anapalli Division.</p> <p>From the DPR Consultants: Er.A.Madhava Reddy, Environmental Specialist, Mr. P. Devaraju, Social and RandR Specialist, Mr. Praveen Technical Expert.</p>	<p>Potential Project Affected Persons, The Village heads, Public, Representatives, The Residential House Owners, Landowners, Retried Government Employs, Shop Owner's, Housewife's, Widows, Village Youth groups, Agriculture Labours, Businessmen's, Private Employs, Government Employs, Vulnerable People and etc.</p>	<p>The Villagers Participated from the Affected Villages at Munagapaka Venue are Munagapaka Anapalli, Gangadevipeta, Vummalada, Nagulapally, Ompolu, Haripalem, Thimmarajupeta.</p> <p>Nearly about 350 Persons attended the Public Consultation and Participated.</p> <p>The Public Consultation convened by the Munagapaka President T. Ramanababu as the Chairperson of the Meeting.</p> <p>The APRDC Assistant Executive Engineers, Sri Subbarao and Bargavi Presided as the Chief Guest of the Meeting. The Social and Environmental Experts and Technical Team from Roughton and Satra Consultants participated.</p>

## Appendix 11: Sample Semi-Annual Environmental Monitoring Report Template

### SAMPLE Semi-Annual Environmental Monitoring Report Template

#### I. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009

#### II. PROJECT SAFEGUARDS TEAM

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

#### III. OVERALL PROJECT AND SUBPROJECT/PACKAGE PROGRESS AND STATUS

- Indicate (i) status of design – preliminary design or final design, (ii) status of implementation - under bidding, contract awarded but no works yet, contract awarded with works, civil works completed, or O&M

Package Number	Components/List of Works	Type of Contract (specify if DBO, DB or civil works)	Status of Implementation (specify if Preliminary Design, Detailed Design, On-going Construction, Completed Works, or O&M phase) <sup>19</sup>	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
					%Physical Progress	Expected Completion Date

- For package with awarded contract, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

#### Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	IEE Cleared by ADB	Contractor	HSE Nodal Person	Email Address	Contact Number

<sup>19</sup> If on-going construction, include %physical progress and expected date of completion

	(provide date)				

#### IV. STATUS OF IEE PER SUBPROJECT/PACKAGE

- Provide status of updated/final IEE<sup>20</sup> per package.

#### Package-wise Implementation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? <sup>21</sup> (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (provide date of submission)	Disclosed on project website (provide link)	Final IEE provided to Contractor/s (Yes/No)		

#### V. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS<sup>22</sup>

Package No.	Statutory Environmental Requirements <sup>23</sup>	Status of Compliance (Specify if obtained, submitted and awaiting approval, application not yet submitted)	Validity Date(s) (if already obtained)	Action Required	Specific Conditions that will require environmental monitoring <sup>24</sup>

#### VI. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

Schedule No. and Item (see Project Loan Agreement and list provisions relevant to environmental safeguards, core labor standards and occupational health and safety)	Covenant	Status of Compliance	Action Required

<sup>20</sup> IEE prepared based on preliminary design and cleared by ADB with condition that updated/Final IEE based on detailed design will be submitted.

<sup>21</sup> Works will not be allowed until SEMP/CEMP is approved by project implementation unit or project management unit.

<sup>22</sup> All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

<sup>23</sup> Specify statutory requirements: environmental clearance? Permit/consent to establish? Forest clearance? Workers/Labor permit, etc.

<sup>24</sup> Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.


**VII. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)**

- Confirm in IEE/s if contractors are required to submit site-specific EMP (SEMP)/construction EMPs (CEMP). If not, describe the methodology of monitoring each package under implementation.
- Provide over-all compliance of the contractors with SEMP/CEMP. This should be supported by contractors’ monthly monitoring reports to PIU(s) and/or verification reports of PIU(s) or project consultants. Include as appendix supporting documents such as **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.

**Overall Compliance with SEMP/CEMP**

Package No.	Status of SEMP/CEMP Implementation <i>(Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)</i>	Action Proposed and Additional Measures Required

- Provide description based on site observations and records:
  - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
  - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
  - Confirm spill kits on site and site procedure for handling emergencies.
  - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - Describe management of stockpiles in each work site (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs.
  - Provide information on workers labor camp(s). Provide photographs.
  - Provide information on work-related accidents and incidents. Describe actions implemented.
  - Provide information on if there are any activities being undertaken out of working hours and how that is being managed.
- Provide list of trainings on environmental safeguards, core labor standards, and OSH conducted during the reporting period. Include ADB-organized workshop, trainings, seminars, etc)

### Trainings, Workshops and Seminars Conducted

Date	Topic	Conducted by	No. of Participants (Total)	No. of Participants (Female)	Remarks

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).

### Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>25</sup>

Impacts (List from SEMP/CEMP)	Mitigation Measures (List from SEMP/CEMP)	Parameters Monitored (As identified in the SEMP/CEMP)	Method of Monitoring (Visual, Actual Sampling, etc)	Location of Monitoring (Provide GPS Coordinates) <sup>26</sup>	Date of Monitoring Conducted	Person Who Conducted the Monitoring
<b>Design Phase</b>						
<b>Pre-Construction Phase</b>						
<b>Construction Phase</b>						
<b>Operational Phase</b>						

## VIII. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS

- Confirm records of pre-work condition of roads, agricultural land or other infrastructure prior to starting to transport materials and construction.

Package No.	Status of Pre-Work Conditions (Recorded / Not Recorded)	Baseline Environmental Conditions (air, water, noise) Documented (Yes / No)	Action Proposed and Additional Measures Required

- Provide information on monitoring activities conducted during reporting period. If not conducted, provide justification. Compare results with baseline and internationally recognized standards.<sup>27</sup>

<sup>25</sup> Attach Laboratory Results and Sampling Map/Locations

<sup>26</sup> If GPS coordinate is not available, provide landmark(s) and/or chainage.

<sup>27</sup> ADB Safeguard Policy Statement (SPS) Appendix 1, para 33: During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's

**Air Quality Monitoring Results**

Site No.	Date of Testing	Site Location (Provide GPS Coordinates) <sup>28</sup>	Parameters (as required by statutory clearances or as mentioned in the IEE)			Remarks
			PM10 µg/m <sup>3</sup>	SO2 µg/m <sup>3</sup>	NO2 µg/m <sup>3</sup>	

**Water Quality Monitoring Results**

Site No.	Date of Sampling	Site Location	Parameters (as required by statutory clearances or as mentioned in the IEE)						Remarks
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	

**Noise Quality Monitoring Results**

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (as required by statutory clearances or as mentioned in the IEE)		Remarks
			Day Time	Night Time	

**IX. INFORMATION DISCLOSURE AND CONSULTATIONS**

- Confirm PMU/PIU/contractors provide project-related information to stakeholders, communities and/or affected people before and during construction works.<sup>29</sup>
- Provide information on consultations conducted during reporting period such dates, topics discussed, type of consultation, issues/concerns raised, safeguards team member present. Attach minutes of meetings (ensure English translation is provided), attendance sheet, and photos.

Date of Consultation	Location	Number of Participants (specify total, male and female)	Issues/Concerns Raised	Response to issues/concerns

**X. GRIEVANCE REDRESS MECHANISM**

Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in the SPS.

<sup>28</sup> If GPS coordinate is not available, provide landmark(s) and/or chainage.

<sup>29</sup> Check EMP requirement on information disclosure. At a minimum, PIU thru the contractor should notify communities/affected persons/sensitive receptors 7 days and again 1 day before start of works.

- **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (package-wise if applicable).
- **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

**XI. SUMMARY OF KEY ISSUES/CONCERNS IDENTIFIED DURING THE REPORTING PERIOD AND REMEDIAL ACTIONS**

- Provide corrective action plan which should include all issues/concerns, actions required to be implemented, responsible entities, and target dates.

**XII. STATUS OF CORRECTIVE ACTIONS FROM PREVIOUS SEMR(S)**

- Provide information on corrective actions to be implemented as reported in the previous SEMR(s). Include status of implementation of feedbacks/comments/suggestions as provided by ADB, if any.

**Corrective Action Plan Status**

Issues/Concerns	Corrective Action	Status	Remarks

**XIII. APPENDIXES**

- Photos
- Records of consultations
- Copies of environmental clearances and permits (if not provided in the previous SEMR)
- Environmental site inspection report (if not provided in the previous SEMR)
- Other

## Appendix 12: Proximity Report generated by the Integrated Biodiversity Assessment Tool (IBAT)



### Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Anakapalli-Atchuthapuram Road
Latitude/Longitude	17° 36' 13" North, 83° 0' 5" East
Date generated	27th June 2018
Generated by	asiandb
Company	ADB

## About this report

This report presents the results of a proximity analysis to identify the biodiversity features and species which are located within 1 km, 2 km and 5 km.

## Data used to generate this report

IUCN and UNEP-WCMC, 2017. *The World Database on Protected Areas (WDPA) [On-line], March 2018.*

BirdLife International (on behalf of the KBA Partnership), 2016. *Key Biodiversity Areas: December 2016 version.*

IUCN, 2017. *The IUCN Red List of Threatened Species grid analysis of range maps. Version 2017-3 (December).*

## Limitations

This report provides an indication of the potential biodiversity-related features - protected areas, key biodiversity areas and species - close to the specified location. It provides an early indication of potential biodiversity concerns and can provide valuable guidance in making decisions. For example, this information can be helpful when assessing the potential environmental risk and impact of a site, categorising investments/projects, preparing the terms of reference for an impact assessment, focusing attention on key species of conservation concern and sites of known conservation value, and reviewing the results of an impact assessment.

The report does not provide details of potential indirect, downstream or cumulative impacts. Furthermore, the report should be regarded as a “first-step”, providing a set of conservation values sourced from global data sets, and is not a substitute for further investigation and due diligence, especially concerning national and/or local conservation priorities.

For ultimate accuracy, distance calculations are performed by reprojecting the spatial data (as shown through the map viewer) to an equal distance projection, and so may not match precisely the results shown on the map.

## Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

### Features within 1 km

There are no features within 1 km.

### Features within 2 km

There are no features within 2 km.

### Features within 5 km

There are no features within 5 km.

### IUCN RED LIST OF THREATENED SPECIES

Given suitable habitat, the following species are potentially found close to the area of interest:

Taxonomic group	Scientific Name	Common Name	IUCN Red List category
Amphibians	<i>Duttaphrynusmelanostictus</i>	Black-spectacled Toad	LC
Amphibians	<i>Duttaphrynusstomaticus</i>		LC
Amphibians	<i>Euphlyctiscyanophlyctis</i>		LC
Amphibians	<i>Euphlyctishexadactylus</i>	Indian Green Frog	LC
Amphibians	<i>Fejervaryalimnocharis</i>	Asian Grass Frog	LC
Amphibians	<i>Hoplobatrachuscrassus</i>	Jerdon's Bullfrog	LC
Amphibians	<i>Hoplobatrachustigerinus</i>	Indian Bullfrog	LC
Amphibians	<i>Hydrophylaxmalabaricus</i>		LC
Amphibians	<i>Microhylaornata</i>	Ant Frog	LC
Amphibians	<i>Polypedates maculatus</i>	Himalayan Tree Frog	LC
Amphibians	<i>Sphaerothecabreviceps</i>		LC
Amphibians	<i>Sphaerothecadobsonii</i>		LC
Amphibians	<i>Sphaerothecarolandae</i>		LC
Amphibians	<i>Uperodonglobulosus</i>		LC
Amphibians	<i>Uperodonsystema</i>	Marbled Balloon Frog	LC
Amphibians	<i>Uperodontaprobanicus</i>	Sri Lankan Bullfrog	LC
Birds	<i>Accipiter badius</i>	Shikra	LC
Birds	<i>Acridotheresfuscus</i>	Jungle Myna	LC
Birds	<i>Acridotheres tristis</i>	Common Myna	LC
Birds	<i>Acrocephalusdumetorum</i>	Blyth's Reed-warbler	LC
Birds	<i>Acrocephalusstentoreus</i>	Clamorous Reed-warbler	LC
Birds	<i>Actitishypoleucos</i>	Common Sandpiper	LC
Birds	<i>Aegithina tiphia</i>	Common Iora	LC
Birds	<i>Aethopygasiparaja</i>	Crimson Sunbird	LC
Birds	<i>Alauda gulgula</i>	Oriental Skylark	LC

Taxonomic group	Scientific Name	Common Name	IUCN Red List category
Birds	<i>Alcedoatthis</i>	Common Kingfisher	LC
Birds	<i>Alcedomeninting</i>	Blue-eared Kingfisher	LC
Birds	<i>Alcippepoioicephala</i>	Brown-cheeked Fulvetta	LC
Birds	<i>Amandavaamandava</i>	Red Avadavat	LC
Birds	<i>Amaurornisphoenicurus</i>	White-breasted Waterhen	LC
Birds	<i>Anas crecca</i>	Common Teal	LC
Birds	<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck	LC
Birds	<i>Anastomusoscitans</i>	Asian Openbill	LC
Birds	<i>Anhinga melanogaster</i>	Oriental Darter	NT
Birds	<i>Anthracocerosalbirostris</i>	Oriental Pied Hornbill	LC
Birds	<i>Anthusgodlewskii</i>	Blyth's Pipit	LC
Birds	<i>Anthusrichardi</i>	Richard's Pipit	LC

Birds	<i>Anthusrufulus</i>	Paddyfield Pipit	LC
Birds	<i>Aquila rapax</i>	Tawny Eagle	LC
Birds	<i>Ardea alba</i>	Great White Egret	LC
Birds	<i>Ardea cinerea</i>	Grey Heron	LC
Birds	<i>Ardea intermedia</i>	Intermediate Egret	LC
Birds	<i>Ardea purpurea</i>	Purple Heron	LC
Birds	<i>Ardeolagrarii</i>	Indian Pond-heron	LC
Birds	<i>Artamusfuscus</i>	Ashy Woodswallow	LC
Birds	<i>Arundinaxaedon</i>	Thick-billed Warbler	LC
Birds	<i>Asioflammeus</i>	Short-eared Owl	LC
Birds	<i>Athene brama</i>	Spotted Owlet	LC
Birds	<i>Aythya ferina</i>	Common Pochard	VU
Birds	<i>Aythya fuligula</i>	Tufted Duck	LC
Birds	<i>Aythya nyroca</i>	Ferruginous Duck	NT
Birds	<i>Bubo bengalensis</i>	Rock Eagle-owl	LC
Birds	<i>Bubo coromandus</i>	Dusky Eagle-owl	LC
Birds	<i>Bubulcus ibis</i>	Cattle Egret	LC

Birds	<i>Burhinus indicus</i>	Indian Thick-knee	LC
Birds	<i>Butasturteesa</i>	White-eyed Buzzard	LC
Birds	<i>Butorides striata</i>	Green-backed Heron	LC
Birds	<i>Cacomantismerulinus</i>	Plaintive Cuckoo	LC
Birds	<i>Cacomantispasserinus</i>	Grey-bellied Cuckoo	LC
Birds	<i>Calandrelladukhunensis</i>	Eastern Short-toed Lark	LC
Birds	<i>Calidris alba</i>	Sanderling	LC
Birds	<i>Calidris minuta</i>	Little Stint	LC
Birds	<i>Calidris pugnax</i>	Ruff	LC
Birds	<i>Calidris ruficollis</i>	Red-necked Stint	NT
Birds	<i>Calidris temminckii</i>	Temminck's Stint	LC
Birds	<i>Calliope calliope</i>	Siberian Rubythroat	LC
Birds	<i>Caprimulgus affinis</i>	Savanna Nightjar	LC
Birds	<i>Caprimulgus asiaticus</i>	Indian Nightjar	LC
Birds	<i>Caprimulgus atripennis</i>	Jerdon's Nightjar	LC
Birds	<i>Caprimulgus indicus</i>	Jungle Nightjar	LC
Birds	<i>Carpodacus erythrinus</i>	Common Rosefinch	LC
Birds	<i>Cecropisdaurica</i>	Red-rumped Swallow	LC
Birds	<i>Centropus sinensis</i>	Greater Coucal	LC
Birds	<i>Cerylerudis</i>	Pied Kingfisher	LC
Birds	<i>Chaetornis striata</i>	Bristled Grassbird	VU
Birds	<i>Chalcophaps indica</i>	Grey-capped Emerald Dove	LC
Birds	<i>Charadrius dubius</i>	Little Ringed Plover	LC
Birds	<i>Charadrius hiaticula</i>	Common Ringed Plover	LC
Birds	<i>Charadrius mongolus</i>	Lesser Sandplover	LC
Birds	<i>Chlidoniashybrida</i>	Whiskered Tern	LC
Birds	<i>Chloropsisjerdoni</i>	Jerdon's Leafbird	LC
Birds	<i>Chrysocolaptesfestivus</i>	White-naped Woodpecker	LC
Birds	<i>Ciconia ciconia</i>	White Stork	LC
Birds	<i>Cinnyris asiaticus</i>	Purple Sunbird	LC

Birds	<i>Circus aeruginosus</i>	Western Marsh-harrier	LC
Birds	<i>Circus macrourus</i>	Pallid Harrier	NT
Birds	<i>Cisticola juncidis</i>	Zitting Cisticola	LC
Birds	<i>Clamatorcoromandus</i>	Chestnut-winged Cuckoo	LC
Birds	<i>Clamatorjacobinus</i>	Jacobin Cuckoo	LC
Birds	<i>Columba livia</i>	Rock Dove	LC
Birds	<i>Copsychussaularis</i>	Oriental Magpie-robin	LC
Birds	<i>Coracias benghalensis</i>	Indian Roller	LC
Birds	<i>Coracinamacei</i>	Indian Cuckooshrike	LC
Birds	<i>Corvus macrorhynchos</i>	Large-billed Crow	LC
Birds	<i>Corvus splendens</i>	House Crow	LC
Birds	<i>Coturnix coromandelica</i>	Rain Quail	LC
Birds	<i>Coturnix coturnix</i>	Common Quail	LC
Birds	<i>Cuculusmicropterus</i>	Indian Cuckoo	LC
Birds	<i>Cuculuspoliocephalus</i>	Lesser Cuckoo	LC
Birds	<i>Cyaneculasvecica</i>	Bluethroat	LC
Birds	<i>Cyornisrubeculoides</i>	Blue-throated Blue-flycatcher	LC
Birds	<i>Cyornisticelliae</i>	Tickell's Blue-flycatcher	LC
Birds	<i>Cypsiurusbalasiensis</i>	Asian Palm-swift	LC
Birds	<i>Dendrocittavagabunda</i>	Rufous Treepie	LC
Birds	<i>Dendrocygnabicolor</i>	Fulvous Whistling-duck	LC
Birds	<i>Dendrocygnajavanica</i>	Lesser Whistling-duck	LC
Birds	<i>Dicaeum agile</i>	Thick-billed Flowerpecker	LC
Birds	<i>Dicaeumerythrorhynchos</i>	Pale-billed Flowerpecker	LC
Birds	<i>Dicruruscaerulescens</i>	White-bellied Drongo	LC
Birds	<i>Dicrurusleucophaeus</i>	Ashy Drongo	LC
Birds	<i>Dicrurusmacrocerus</i>	Black Drongo	LC
Birds	<i>Dicrurusparadiseus</i>	Greater Racquet-tailed Drongo	LC
Birds	<i>Dumetiahyperythra</i>	Tawny-bellied Babbler	LC
Birds	<i>Egrettagarzetta</i>	Little Egret	LC

Birds	<i>Egretta alularis</i>	Western Reef-egret	LC
Birds	<i>Elanus caeruleus</i>	Black-winged Kite	LC
Birds	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	NT
Birds	<i>Eremopterix griseus</i>	Ashy-crowned Sparrow-lark	LC
Birds	<i>Eudynamis scolopacea</i>	Western Koel	LC
Birds	<i>Eumyias thalassinus</i>	Verditer Flycatcher	LC
Birds	<i>Falco amurensis</i>	Amur Falcon	LC
Birds	<i>Falco peregrinus</i>	Peregrine Falcon	LC
Birds	<i>Falco tinnunculus</i>	Common Kestrel	LC
Birds	<i>Francolinus pondicerianus</i>	Grey Francolin	LC
Birds	<i>Fregetta tropica</i>	Black-bellied Storm-petrel	LC
Birds	<i>Fulica atra</i>	Common Coot	LC
Birds	<i>Gallicrex cinerea</i>	Watercock	LC
Birds	<i>Gallinago stenura</i>	Pintail Snipe	LC
Birds	<i>Gallinula chloropus</i>	Common Moorhen	LC
Birds	<i>Gallus gallus</i>	Red Junglefowl	LC
Birds	<i>Geokichlacitrina</i>	Orange-headed Thrush	LC
Birds	<i>Glareolactea</i>	Little Pratincole	LC
Birds	<i>Glaucidium radiatum</i>	Jungle Owlet	LC
Birds	<i>Gracula indica</i>	Southern Hill Myna	LC
Birds	<i>Gracula religiosa</i>	Common Hill Myna	LC
Birds	<i>Gracula robusta</i>	Nias Hill Myna	CR
Birds	<i>Gracula venerata</i>	Tenggara Hill Myna	EN
Birds	<i>Gracupica contra</i>	Asian Pied Starling	LC
Birds	<i>Gymnoris xanthocollis</i>	Chestnut-shouldered Bush-sparrow	LC
Birds	<i>Gyps bengalensis</i>	White-rumped Vulture	CR
Birds	<i>Gyps indicus</i>	Indian Vulture	CR
Birds	<i>Halcyon pileata</i>	Black-capped Kingfisher	LC
Birds	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	LC
Birds	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	LC

Birds	<i>Haliasturindus</i>	Brahminy Kite	LC
Birds	<i>Harpactes fasciatus</i>	Malabar Trogon	LC
Birds	<i>Hierococcyxvarius</i>	Common Hawk-cuckoo	LC
Birds	<i>Himantopus himantopus</i>	Black-winged Stilt	LC
Birds	<i>Hirundorustica</i>	Barn Swallow	LC
Birds	<i>Hirundosmithii</i>	Wire-tailed Swallow	LC
Birds	<i>Hydrobatesmonorhis</i>	Swinhoe's Storm-petrel	NT
Birds	<i>Hydrophasianuschirurgus</i>	Pheasant-tailed Jacana	LC
Birds	<i>Hydroprogneaspia</i>	Caspian Tern	LC
Birds	<i>Hypothymisazurea</i>	Black-naped Monarch	LC
Birds	<i>Iduna caligata</i>	Booted Warbler	LC
Birds	<i>Ixobrychuscinnamomeus</i>	Cinnamon Bittern	LC
Birds	<i>Jynx torquilla</i>	Eurasian Wryneck	LC

Birds	<i>Ketupazeylonensis</i>	Brown Fish-owl	LC
Birds	<i>Kittacinclamalarica</i>	White-rumped Shama	LC
Birds	<i>Lalage melanopectera</i>	Black-headed Cuckooshrike	LC
Birds	<i>Laniuscristatus</i>	Brown Shrike	LC
Birds	<i>Laniusschach</i>	Long-tailed Shrike	LC
Birds	<i>Laniusvittatus</i>	Bay-backed Shrike	LC
Birds	<i>Larus brunnicephalus</i>	Brown-headed Gull	LC
Birds	<i>Larus ichthyaetus</i>	Pallas's Gull	LC
Birds	<i>Larvivorabrunnea</i>	Indian Blue Robin	LC
Birds	<i>Leptocomazeylonica</i>	Purple-rumped Sunbird	LC
Birds	<i>Limosalimosa</i>	Black-tailed Godwit	NT
Birds	<i>Lonchura striata</i>	White-rumped Munia	LC
Birds	<i>Loriculusvernalis</i>	Vernal Hanging-parrot	LC
Birds	<i>Malacocinclaabbotti</i>	Abbott's Babbler	LC
Birds	<i>Meropsorientalis</i>	Asian Green Bee-eater	LC
Birds	<i>Meropsphilippinus</i>	Blue-tailed Bee-eater	LC
Birds	<i>Microcarboniger</i>	Little Cormorant	LC

Birds	<i>Micropternusbrachyurus</i>	Rufous Woodpecker	LC
Birds	<i>Milvus migrans</i>	Black Kite	LC
Birds	<i>Mirafraffinis</i>	Jerdon's Bushlark	LC
Birds	<i>Monticolacinclorhyncha</i>	Blue-capped Rock-thrush	LC
Birds	<i>Monticola solitarius</i>	Blue Rock-thrush	LC
Birds	<i>Motacilla alba</i>	White Wagtail	LC
Birds	<i>Motacilla cinerea</i>	Grey Wagtail	LC
Birds	<i>Motacillacitreola</i>	Citrine Wagtail	LC
Birds	<i>Motacilla flava</i>	Western Yellow Wagtail	LC
Birds	<i>Motacillamaderaspatensis</i>	White-browed Wagtail	LC
Birds	<i>Muscicapadaurica</i>	Asian Brown Flycatcher	LC
Birds	<i>Mycteria leucocephala</i>	Painted Stork	NT
Birds	<i>Neophron percnopterus</i>	Egyptian Vulture	EN
Birds	<i>Numenius arquata</i>	Eurasian Curlew	NT
Birds	<i>Numenius phaeopus</i>	Whimbrel	LC
Birds	<i>Nycticoraxnycticorax</i>	Black-crowned Night-heron	LC
Birds	<i>Oceanites oceanicus</i>	Wilson's Storm-petrel	LC
Birds	<i>Orioluskundoo</i>	Indian Golden Oriole	LC
Birds	<i>Oriolusxanthornus</i>	Black-hooded Oriole	LC
Birds	<i>Orthotomussutorius</i>	Common Tailorbird	LC
Birds	<i>Otusbakkamoena</i>	Indian Scops-owl	LC
Birds	<i>Pandion haliaetus</i>	Osprey	LC
Birds	<i>Parus major</i>	Great Tit	LC

Birds	<i>Passer domesticus</i>	House Sparrow	LC
Birds	<i>Pastor roseus</i>	Rosy Starling	LC
Birds	<i>Pavocristatus</i>	Indian Peafowl	LC
Birds	<i>Pelargopsis capensis</i>	Stork-billed Kingfisher	LC
Birds	<i>Pelecanusphilippensis</i>	Spot-billed Pelican	NT
Birds	<i>Perdica asiatica</i>	Jungle Bush-quail	LC
Birds	<i>Pericrocotuscinnamomeus</i>	Small Minivet	LC

Birds	<i>Pericrocotus flammeus</i>	Scarlet Minivet	LC
Birds	<i>Pernis ptilorhynchus</i>	Oriental Honey-buzzard	LC
Birds	<i>Phaenicophaeus tristis</i>	Green-billed Malkoha	LC
Birds	<i>Phaenicophaeus viridirostris</i>	Blue-faced Malkoha	LC
Birds	<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	LC
Birds	<i>Phalacrocorax carbo</i>	Great Cormorant	LC
Birds	<i>Phoenicopterus roseus</i>	Greater Flamingo	LC
Birds	<i>Phoenicurus ochrurus</i>	Black Redstart	LC
Birds	<i>Phylloscopus affinis</i>	Tickell's Leaf-warbler	LC
Birds	<i>Phylloscopus griseolus</i>	Sulphur-bellied Warbler	LC
Birds	<i>Phylloscopus humei</i>	Hume's Leaf-warbler	LC
Birds	<i>Picoides nanus</i>	Indian Pygmy Woodpecker	LC
Birds	<i>Pitta brachyura</i>	Indian Pitta	LC
Birds	<i>Platalea leucorodia</i>	Eurasian Spoonbill	LC
Birds	<i>Ploceus philippinus</i>	Baya Weaver	LC
Birds	<i>Pluvialis squatarola</i>	Grey Plover	LC
Birds	<i>Podiceps cristatus</i>	Great Crested Grebe	LC
Birds	<i>Porphyrioporphyrus</i>	Purple Swamphen	LC
Birds	<i>Prinia hodgsonii</i>	Grey-breasted Prinia	LC
Birds	<i>Prinia inornata</i>	Plain Prinia	LC
Birds	<i>Prinia socialis</i>	Ashy Prinia	LC
Birds	<i>Prinia sylvatica</i>	Jungle Prinia	LC
Birds	<i>Psilopogon haemacephalus</i>	Coppersmith Barbet	LC
Birds	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet	LC
Birds	<i>Psittacula eupatria</i>	Alexandrine Parakeet	NT
Birds	<i>Psittacula krameri</i>	Rose-ringed Parakeet	LC
Birds	<i>Ptyonoprogne concolor</i>	Dusky Crag Martin	LC
Birds	<i>Pycnonotus cafer</i>	Red-vented Bulbul	LC
Birds	<i>Pycnonotus flaviventris</i>	Black-crested Bulbul	LC
Birds	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	LC

Birds	<i>Pycnonotusluteolus</i>	White-browed Bulbul	LC
Birds	<i>Recurvirostraavosetta</i>	Pied Avocet	LC
Birds	<i>Rhipiduraaureola</i>	White-browed Fantail	LC
Birds	<i>Saxicola caprata</i>	Pied Bushchat	LC
Birds	<i>Saxicoloidesfulvicatus</i>	Indian Robin	LC
Birds	<i>Sitta frontalis</i>	Velvet-fronted Nuthatch	LC
Birds	<i>Spatula clypeata</i>	Northern Shoveler	LC
Birds	<i>Spatula querquedula</i>	Garganey	LC
Birds	<i>Spilopelia senegalensis</i>	Laughing Dove	LC
Birds	<i>Spilopeliasuratensis</i>	Western Spotted Dove	LC
Birds	<i>Sterna acuticauda</i>	Black-bellied Tern	EN
Birds	<i>Streptopeliadecaocto</i>	Eurasian Collared-dove	LC
Birds	<i>Strixleptogrammica</i>	Brown Wood-owl	LC
Birds	<i>Strix ocellata</i>	Mottled Wood-owl	LC
Birds	<i>Sturniamalabarica</i>	Chestnut-tailed Starling	LC
Birds	<i>Sturniapagodarum</i>	Brahminy Starling	LC
Birds	<i>Sylvia curruca</i>	Lesser Whitethroat	LC
Birds	<i>Sypheotides indicus</i>	Lesser Florican	EN
Birds	<i>Taccocualeschenaultii</i>	Sirkeer Malkoha	LC
Birds	<i>Tachybaptus ruficollis</i>	Little Grebe	LC
Birds	<i>Tadornaferruginea</i>	Ruddy Shelduck	LC
Birds	<i>Tephrodornispondicerianus</i>	Common Woodshrike	LC
Birds	<i>Tephrodornisvirgatus</i>	Large Woodshrike	LC
Birds	<i>Terpsiphone paradisi</i>	Indian Paradise-flycatcher	LC
Birds	<i>Thalasseus bengalensis</i>	Lesser Crested Tern	LC
Birds	<i>Treronbicinctus</i>	Orange-breasted Green-pigeon	LC
Birds	<i>Treronphoenicopterus</i>	Yellow-footed Green-pigeon	LC
Birds	<i>Tringaerythropus</i>	Spotted Redshank	LC
Birds	<i>Tringaglareola</i>	Wood Sandpiper	LC
Birds	<i>Tringanebularia</i>	Common Greenshank	LC

Birds	<i>Tringa ochropus</i>	Green Sandpiper	LC
Birds	<i>Tringatotanus</i>	Common Redshank	LC
Birds	<i>Turdoides striata</i>	Jungle Babbler	LC
Birds	<i>Turdus unicolor</i>	Tickell's Thrush	LC
Birds	<i>Turnix suscitator</i>	Barred Buttonquail	LC
Birds	<i>Turnix sylvaticus</i>	Common Buttonquail	LC
Birds	<i>Turnix tanki</i>	Yellow-legged Buttonquail	LC
Birds	<i>Tyto alba</i>	Common Barn-owl	LC
Birds	<i>Upupa epops</i>	Common Hoopoe	LC
Birds	<i>Vanellus indicus</i>	Red-wattled Lapwing	LC
Birds	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing	LC
Birds	<i>Zapornia akool</i>	Brown Crake	LC
Birds	<i>Zosterops alpebrosus</i>	Oriental White-eye	LC

Fishes	<i>Ablenneshians</i>	Flat Needlefish	LC
Fishes	<i>Acanthopagrus berda</i>	Picnic Seabream	LC
Fishes	<i>Acanthopagrus longispinnis</i>	Bengal Yellowfin Seabream	DD
Fishes	<i>Acanthurus lineatus</i>	Lined Surgeonfish	LC
Fishes	<i>Acanthurus mata</i>	Elongate Surgeonfish	LC
Fishes	<i>Acanthurus triostegus</i>	Convict Surgeonfish	LC
Fishes	<i>Acentronur tentaculata</i>	Shortpouch Pygmy Pipehorse	LC
Fishes	<i>Aesopiacornuta</i>	Unicorn Sole	LC
Fishes	<i>Aetobatus flagellum</i>	Longhead Eagle Ray	EN
Fishes	<i>Aetobatus narinari</i>	Spotted Eagle Ray	NT
Fishes	<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	VU
Fishes	<i>Aetomylaeus maculatus</i>	Mottled Eagle Ray	EN
Fishes	<i>Aetomylaeus nichofii</i>	Banded Eagle Ray	VU
Fishes	<i>Albula oligolepis</i>	Smallscale Bonefish	DD
Fishes	<i>Alectisciliaris</i>	African Pompano	LC
Fishes	<i>Alepes vari</i>	Herring Scad	LC
Fishes	<i>Alepisaurus ferox</i>	Long Snouted Lancetfish	LC

Fishes	<i>Alopiaspelagicus</i>	Pelagic Thresher	VU
Fishes	<i>Alopiassupercilius</i>	Bigeye Thresher Shark	VU
Fishes	<i>Alopias vulpinus</i>	Common Thresher Shark	VU
Fishes	<i>Ambassisurotaenia</i>	Bleeker's Glass Perchlet	LC
Fishes	<i>Amblyeleotriswheeleri</i>	Gorgeous Prawn-goby	LC
Fishes	<i>Amblypharyngodonmicrolepis</i>	Indian Carplet	LC
Fishes	<i>Anacanthus barbatus</i>	Bearded Leatherjacket	LC
Fishes	<i>Anguilla bengalensis</i>	Indian Mottled Eel	NT
Fishes	<i>Anguilla bicolor</i>	Shortfin Eel	NT
Fishes	<i>Anguilla marmorata</i>	Marbled Eel	LC
Fishes	<i>Anoplogastercornuta</i>	Common Fangtooth	LC
Fishes	<i>Anoxypristiscuspidata</i>	Narrow Sawfish	EN
Fishes	<i>Antennatusnummifer</i>	Big-spot Angler	LC
Fishes	<i>Aphareusfurca</i>	Small-toothed Jobfish	LC
Fishes	<i>Aphareusrutilans</i>	Rusty Jobfish	LC
Fishes	<i>Aplocheiluslineatus</i>	Striped panchax	LC
Fishes	<i>Aprionvirescens</i>	Green Jobfish	LC
Fishes	<i>Argyropelecushemigymnus</i>	Half-naked Hatchetfish	LC
Fishes	<i>Argyropsspiniifer</i>	King Soldier Bream	LC
Fishes	<i>Aristostomiaslunifer</i>		LC
Fishes	<i>Arius arius</i>	Threadfin Sea Catfish	LC
Fishes	<i>Arnoglossusmacrolophus</i>	Large-crested Lefteye Flounder	LC
Fishes	<i>Arothronleopardus</i>	Banded Leopardblowfish	DD
Fishes	<i>Atelomycterismarmoratus</i>	Coral Catshark	NT
Fishes	<i>Aurigequulafasciata</i>	Threadfin Ponyfish	LC
Fishes	<i>Auxisrochei</i>	Bullet Tuna	LC
Fishes	<i>Auxisthazard</i>	Frigate Tuna	LC
Fishes	<i>Avocettinainfans</i>	Avocet Snipe Eel	LC
Fishes	<i>Awaousgrammepomus</i>	Scribbled Goby	LC

Fishes	<i>Awaousmelanocephalus</i>	Largesnout Goby	DD
Fishes	<i>Bagariusyarrelli</i>		NT
Fishes	<i>Bahabachaptis</i>	ChaptisBahaba	DD
Fishes	<i>Balistes rotundatus</i>		LC
Fishes	<i>Banganaariza</i>	Ariza Labeo	LC
Fishes	<i>Bathyrocongervicinus</i>	Large-toothed Conger	LC
Fishes	<i>Benthalbellainfans</i>	Zugmayer'sPearleye	LC
Fishes	<i>Bentosemapterotum</i>	Skinnycheek Lanternfish	LC
Fishes	<i>Beryx splendens</i>	Splendid Alfonsino	LC
Fishes	<i>Bostrychus sinensis</i>	Four-eyed Sleeper	LC
Fishes	<i>Bothuspantherinus</i>	Leopard Flounder	LC
Fishes	<i>Brachirus pan</i>	Pan Sole	LC
Fishes	<i>Brachypleuranovaezeelandiae</i>	Yellow-dappled Flounder	LC
Fishes	<i>Bregmacerosnectabanus</i>		LC
Fishes	<i>Brevitrygon imbricata</i>	Scaly Whipray	DD
Fishes	<i>Callionymus sagitta</i>	Arrow-headed Darter Dragonet	LC
Fishes	<i>Canthigasterpetersii</i>		LC
Fishes	<i>Caranxsexfasciatus</i>	Bigeye Trevally	LC
Fishes	<i>Carcharhinus albimarginatus</i>	Silvertip Shark	VU
Fishes	<i>Carcharhinus amblyrhynchoides</i>	Graceful Shark	NT
Fishes	<i>Carcharhinus amboinensis</i>	Pigeys Shark	DD
Fishes	<i>Carcharhinus brevipinna</i>	Spinner Shark	NT
Fishes	<i>Carcharhinus dussumieri</i>	Widemouth Blackspot Shark	NT
Fishes	<i>Carcharhinus falciformis</i>	Silky Shark	VU
Fishes	<i>Carcharhinus hemiodon</i>	Pondicherry Shark	CR
Fishes	<i>Carcharhinus limbatus</i>	Blacktip Shark	NT
Fishes	<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	VU
Fishes	<i>Carcharhinus macloti</i>	Hardnose Shark	NT
Fishes	<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	NT

Fishes	<i>Carcharhinus sealei</i>	Blackspot Shark	NT
Fishes	<i>Carcharhinus sorrah</i>	Spottail Shark	NT
Fishes	<i>Carcharodon carcharias</i>	Great White Shark	VU
Fishes	<i>Caulophrynejordani</i>	Fanfin Angler	LC
Fishes	<i>Centriscusscutatus</i>	Grooved Razorfish	LC

Fishes	<i>Centropygefisheri</i>	Hawaiian Flame Angelfish	LC
Fishes	<i>Cephalopholisformosa</i>	Bluelined Hind	LC
Fishes	<i>Cephalopholissonnerati</i>	Tomato Hind	LC
Fishes	<i>Ceratiasholboelli</i>	Deepsea Angler	LC
Fishes	<i>Chaenogaleusmacrostoma</i>	Hooktooth Shark	VU
Fishes	<i>Chaenophrynedraco</i>		LC
Fishes	<i>Chaenophryneramifera</i>		LC
Fishes	<i>Chaetodon andamanensis</i>	Yellow Butterflyfish	DD
Fishes	<i>Chaetodon auriga</i>	Threadfin Butterflyfish	LC
Fishes	<i>Chaetodon collare</i>	Red-tailed Butterflyfish	LC
Fishes	<i>Chaetodon decussatus</i>	Indian vagabond Butterflyfish	LC
Fishes	<i>Chaetodon lunula</i>	Redstriped Butterflyfish	LC
Fishes	<i>Chaetodon octofasciatus</i>	Eight-striped Butterflyfish	LC
Fishes	<i>Chaetodon rafflesii</i>	Raffle's Butterflyfish	LC
Fishes	<i>Chaetodon semeion</i>	Decorated Butterflyfish	LC
Fishes	<i>Chaetodon triangulum</i>	Herringbone Butterflyfish	LC
Fishes	<i>Chaetodon trifasciatus</i>	Pinstriped Butterflyfish	LC
Fishes	<i>Chaetodon vagabundus</i>	Criss-cross Butterflyfish	LC
Fishes	<i>Channagachua</i>	Dwarf Snakehead	LC
Fishes	<i>Channamarulius</i>		LC
Fishes	<i>Chascanopsettalugubris</i>	Pelican flounder	LC
Fishes	<i>Chauliodussloani</i>	Sloane's Viperfish	LC
Fishes	<i>Chelonmacrolepis</i>	Largescale Mullet	LC
Fishes	<i>Chelonmelinopterus</i>	Otomebora Mullet	LC

Fishes	<i>Chelonodonpatoca</i>	Milkspotted Puffer	LC
Fishes	<i>Chiloscyllium griseum</i>	Grey Bamboo Shark	NT
Fishes	<i>Chiloscyllium indicum</i>	Ridgebacked Bamboo Shark	NT
Fishes	<i>Chiloscyllium plagiosum</i>	Whitespotted Bamboo Shark	NT
Fishes	<i>Chiloscyllium punctatum</i>	Grey Carpetshark	NT
Fishes	<i>Chlorophthalmus agassizi</i>	Agassiz's Thread-sail Fish	LC
Fishes	<i>Chrysiptera unimaculata</i>	One-spot Demoiselle	LC
Fishes	<i>Cirrhinus mrigala</i>	Mrigal	LC
Fishes	<i>Cirrhinus reba</i>	Reba Carp	LC
Fishes	<i>Cocotropus roseus</i>	Velvetfish	LC
Fishes	<i>Coiliane neglecta</i>	Neglected Grenadier Anchovy	LC
Fishes	<i>Cookeolus japonicus</i>	Longfinned Bullseye	LC
Fishes	<i>Coryphaena aequiselis</i>	Pompano Dolphinfish	LC
Fishes	<i>Coryphaena hippurus</i>	Common Dolphinfish	LC
Fishes	<i>Cosmocampus investigatoris</i>	Investigator Pipefish	LC
Fishes	<i>Cryptosaras couesii</i>	Triplewart Seadevil	LC

Fishes	<i>Cubiceps pauciradiatus</i>	Bigeye Cigarfish	LC
Fishes	<i>Cyclothone acclinidens</i>	Bent-tooth Bristlemouth	LC
Fishes	<i>Cyclothone braueri</i>	Brauer's Eye-nosed Fish	LC
Fishes	<i>Cyclothone microdon</i>	Small-toothed Portholefish	LC
Fishes	<i>Cyclothone pallida</i>	Bicolored Bristlemouth	LC
Fishes	<i>Cyclothone pseudopallida</i>	Slender Bristlemouth	LC
Fishes	<i>Desmodema polystictum</i>	Polka-dot Ribbonfish	LC
Fishes	<i>Diaphus splendidus</i>		LC
Fishes	<i>Diplophos taenia</i>	Pacific Portholefish	LC
Fishes	<i>Diretmus argenteus</i>	Silver Spinyfin	LC
Fishes	<i>Ditropichthys storeri</i>	Doublekeeled whalefish	DD
Fishes	<i>Doryrhamphus excisus</i>	Bluestripe Pipefish	LC
Fishes	<i>Dysalotus alcocki</i>		LC

Fishes	<i>Echiostomabarbatum</i>	Threadfin Dragonfish	LC
Fishes	<i>Eleotrisfusca</i>	Brown SpinecheekGudgeon	LC
Fishes	<i>Engyprosongrandisquama</i>	Largescale Flounder	LC
Fishes	<i>Entomacrodusepalzeocheilos</i>	FringelipRockskipper	LC
Fishes	<i>Entomacrodusstriatus</i>	Blackspotted Rockskipper	LC
Fishes	<i>Epinephelusbleekeri</i>	Duskytail Grouper	NT
Fishes	<i>Epinepheluscoioides</i>	Orange-spotted Grouper	NT
Fishes	<i>Epinepheluserythrus</i>	Cloudy Grouper	DD
Fishes	<i>Epinepheluslanceolatus</i>	Giant Grouper	VU
Fishes	<i>Esomusdanrica</i>	Flying barb	LC
Fishes	<i>Eteliscoruscans</i>	Deepwater Longtail Red Snapper	LC
Fishes	<i>Eubleekeria splendens</i>	Splendid Ponyfish	LC
Fishes	<i>Euprotomicrusbispinatus</i>	Pygmy Shark	LC
Fishes	<i>Eusphyrablochii</i>	Winghead Shark	EN
Fishes	<i>Euthynnusaffinis</i>	Kawakawa	LC
Fishes	<i>Exocoetus volitans</i>	Tropical Two-wing Flyingfish	LC
Fishes	<i>Exyriaspuntang</i>	Puntang Goby	LC
Fishes	<i>Forcipigerflavissimus</i>	Big long-nosed Butterflyfish	LC
Fishes	<i>Galeocerdo cuvier</i>	Tiger Shark	NT
Fishes	<i>Gazza minuta</i>	Toothed Ponyfish	LC
Fishes	<i>Gephyroberyxdarwinii</i>	Big Roughy	LC
Fishes	<i>Gigantactisvanhoeffeni</i>		DD
Fishes	<i>Glaucostegusgranulatus</i>	Sharpnose Guitarfish	VU
Fishes	<i>Glaucostegusobtusus</i>	Widenose Guitarfish	VU
Fishes	<i>Glaucostegus typus</i>	Giant Shovelnose Ray	VU
Fishes	<i>Glossogobiusgiuris</i>	Bareye Goby	LC
Fishes	<i>Glyphis gangeticus</i>	Ganges Shark	CR
Fishes	<u><i>Grammatobothuspolyophthalmus</i></u>	Threespot Flounder	LC
Fishes	<i>Gymnocaesiogymnoptera</i>	Slender Fusilier	LC

Fishes	<i>Gymnocranius griseus</i>	Grey Large-eye Bream	LC
Fishes	<i>Gymnurapoecilura</i>	Longtail Butterfly Ray	NT
Fishes	<i>Gymnuratentaculata</i>	Tentacled Butterfly Ray	DD
Fishes	<i>Gymnurazonura</i>	Zonetail Butterfly Ray	VU
Fishes	<i>Helcogrammaelliotti</i>	Red-eye Threefin	LC
Fishes	<i>Hemigymnus fasciatus</i>	Barred thicklip wrasse	LC
Fishes	<i>Hemigymnusmelapterus</i>	Blackedgethicklip wrasse	LC
Fishes	<i>Hemipristiselongata</i>	Snaggletooth Shark	VU
Fishes	<i>Heniochusacuminatus</i>	Pennant Coral Fish	LC
Fishes	<i>Heniochuspleurotaenia</i>	Indian Ocean Bannerfish	LC
Fishes	<i>Himantolophusgroenlandicus</i>	Atlantic Football-Fish	LC
Fishes	<i>Himantura marginata</i>	Blackedge Whipray	DD
Fishes	<i>Himantura uarnak</i>	Reticulate Whipray	VU
Fishes	<i>Hippichthysheptagonus</i>	Reticulated Freshwater Pipefish	LC
Fishes	<i>Hippocampus histrix</i>	Thorny Seahorse	VU
Fishes	<i>Hippocampus kelloggi</i>	Great Seahorse	VU
Fishes	<i>Hippocampus trimaculatus</i>	Three-spot Seahorse	VU
Fishes	<i>Idiacanthusfasciola</i>	Ribbon Sawtail Fish	LC
Fishes	<i>Inegocia japonica</i>	Japanese Flathead	LC
Fishes	<i>Iniistiusdea</i>	Black-spottuskfish	LC
Fishes	<i>Istiblenniusedentulus</i>	Smoothlipped Blenny	LC
Fishes	<i>Istigobiusornatus</i>	Ornate Goby	LC
Fishes	<i>Istiompax indica</i>	Black Marlin	DD
Fishes	<i>Istiophorusplatypterus</i>	Sailfish	LC
Fishes	<i>Isurusoxyrinchus</i>	Shortfin Mako	VU
Fishes	<i>Isuruspaucus</i>	Longfin Mako	VU
Fishes	<i>Johniuscoitor</i>	Big-eyed Jewfish	LC
Fishes	<i>Kajikia audax</i>	Striped Marlin	NT
Fishes	<i>Kali indica</i>		LC
Fishes	<i>Kali macrura</i>		LC

Fishes	<i>Katsuwonus pelamis</i>	Skipjack Tuna	LC
Fishes	<i>Kuhlia mugil</i>		LC
Fishes	<i>Kuhliarupestris</i>	Jungle Perch	LC
Fishes	<i>Kumocociusrodericensis</i>	Spiny Flathead	LC
Fishes	<i>Labeobata</i>	Minor Carp	LC
Fishes	<i>Labeoboggut</i>	Boggutlabeo	LC
Fishes	<i>Lagocephalusinermis</i>	Smooth Blasop	LC
Fishes	<i>Lagocephaluslagocephalus</i>	Oceanic Puffer	LC
Fishes	<i>Lagocephaluslunaris</i>	Lunartail Puffer	LC
Fishes	<i>Lagocephalusscleratus</i>	Silver-cheeked Toadfish	LC
Fishes	<i>Lagocephalusspadiceus</i>	Half-smooth Golden Pufferfish	LC
Fishes	<i>Lamiopsistemminckii</i>	Broadfin Shark	EN
Fishes	<i>Lamnostomaorientalis</i>	Oriental Snake Eel	LC
Fishes	<i>Lamnostomapolypophthalma</i>	Ocellated Sand-eel	LC
Fishes	<i>Leiognathusequulus</i>	Common Ponyfish	LC
Fishes	<i>Lepidocephalusguntea</i>	Peppered Loach	LC
Fishes	<i>Lepidocephalusthermalis</i>		LC
Fishes	<i>Liza tade</i>		DD
Fishes	<i>Loxodonmacrorhinus</i>	Sliteye Shark	LC
Fishes	<i>Lutjanus johnii</i>	John's Snapper	LC
Fishes	<i>Lutjanus lunulatus</i>	Lunartail Snapper	LC
Fishes	<i>Lutjanus lutjanus</i>	Bigeye Snapper	LC
Fishes	<i>Maculabatisgerrardi</i>	Whitespotted Whipray	VU
Fishes	<i>Manta birostris</i>	Giant Manta Ray	VU
Fishes	<i>Megachasma pelagios</i>	Megamouth Shark	LC
Fishes	<i>Megalops cyprinoides</i>	Indo-Pacific Tarpon	DD
Fishes	<i>Megatrygon microps</i>	Smalleye Stingray	DD
Fishes	<i>Melanocetus johnsonii</i>	Humpback Anglerfish	LC

Fishes	<i>Melanocetus murrayi</i>		LC
Fishes	<i>Melanostomiaspaucilaternatus</i>		LC
Fishes	<i>Microlophichthysmicrolophus</i>		LC
Fishes	<i>Mobulaeregoodootenkee</i>	Longhorned Pygmy Devil Ray	NT
Fishes	<i>Mobulajapanica</i>	Spinetail Devil Ray	NT
Fishes	<i>Mobulakuhlii</i>	Shortfin Devil Ray	DD
Fishes	<i>Mobularapacana</i>	Sicklefin Devil Ray	VU
Fishes	<i>Mobulathurstoni</i>	Bentfin Devil Ray	NT
Fishes	<i>Monopterus albus</i>	Rice swampeel	LC
Fishes	<i>Mugil cephalus</i>	Flathead Mullet	LC
Fishes	<i>Mustelusmosis</i>	Arabian Smoothhound	DD
Fishes	<i>Narcine lingula</i>	Chinese Numbfish	DD
Fishes	<i>Narcinemaculata</i>	Darkspotted Electric Ray	DD
Fishes	<i>Narcinetimlei</i>	Brown Numbfish	DD
Fishes	<i>Narkedipterygia</i>	Spottail Sleeper Ray	DD
Fishes	<i>Nasobrevirostris</i>	Palefin Unicornfish	LC
Fishes	<i>Nasounicornis</i>	Bluespine Unicornfish	LC
Fishes	<i>Nebriusferrugineus</i>	Tawny Nurse Shark	VU
Fishes	<i>Negaprionacutidens</i>	Sharptooth Lemon Shark	VU
Fishes	<i>Nemacheilusdenisoni</i>		LC
Fishes	<i>Nematalosagalathea</i>	Galathea Gizzard Shad	LC
Fishes	<i>Nemichthyscolopaceus</i>	Slender Snipe Eel	LC
Fishes	<i>Nemipterusfurcosus</i>	Fork-tailed Threadfin Bream	LC
Fishes	<i>Nemipterusperonii</i>	Notchedfin Treadfin Bream	LC
Fishes	<i>Nemipteruszysron</i>	Slender Threadfin Bream	LC
Fishes	<i>Neoceratiasspinifer</i>		LC
Fishes	<i>Neopomacentrustaeniurus</i>	Freshwater Damselfish	DD
Fishes	<i>Neotropiusatherinoides</i>		LC

Fishes	<i>Neotrygonkuhlii</i>	BluespottedMaskray	DD
Fishes	<i>Notolychnusvaldiviae</i>	Topside Lampfish	LC
Fishes	<i>Notopterusnotopterus</i>		LC
Fishes	<i>Odontaspis noronhai</i>	Bigeye Sand Tiger	DD
Fishes	<i>Omobranchus ferox</i>	Gossamer Blenny	LC
Fishes	<i>Omobranchus punctatus</i>	Japanese Blenny	LC
Fishes	<i>Omobranchusmithi</i>		VU
Fishes	<i>Ompokbimaculatus</i>		NT
Fishes	<i>Ophiocaraporocephala</i>	Spangled Gudgeon	LC
Fishes	<i>Ophisternonbengalense</i>	Bengal mudeel	LC
Fishes	<i>Oreichthysosuatia</i>		LC
Fishes	<i>Oryziasdancena</i>	Indian ricefish	LC
Fishes	<i>Osteobramavigorsii</i>	Godavari Osteobrama	LC
Fishes	<i>Ostorhinchus lateralis</i>	Humpback Cardinal	LC
Fishes	<i>Oxyurichthysmicrolepis</i>	Maned Goby	LC
Fishes	<i>Oxyurichthysophthalmonema</i>	Eyebrow Goby	LC
Fishes	<i>Oxyurichthystentacularis</i>		DD
Fishes	<i>Paracaesiosordida</i>	Dirty Ordure Snapper	LC
Fishes	<i>Parachaetodon ocellatus</i>	Sixspine Butterflyfish	LC
Fishes	<i>Parachiloglanishodgarti</i>	Torrent Catfish	LC
Fishes	<i>Paragaleusrandalli</i>	Slender Weasel Shark	NT
Fishes	<i>Paralepiselongata</i>	Barracudina	LC
Fishes	<i>Pateobatisjenkinsii</i>	Jenkins' Whipray	VU
Fishes	<i>Pellonaditchela</i>	Indian Pellona	LC
Fishes	<i>Pentherichthysatratus</i>		LC
Fishes	<i>Photonectes margarita</i>		LC
Fishes	<i>Photostomiasatrox</i>		LC
Fishes	<i>Pisodonophisboro</i>		LC

Fishes	<i>Platycephalus indicus</i>	Bartail Flathead	DD
Fishes	<i>Platytrectes apus</i>	Legless Sealsid	LC
Fishes	<i>Plectorhinchus gibbosus</i>	Brown Sweetlips	LC
Fishes	<i>Plicofollis dussumieri</i>	Blacktip Sea Catfish	LC
Fishes	<i>Pomacanthus annularis</i>	Bluering Angelfish	LC
Fishes	<i>Pomacanthus imperator</i>	Emperor Angelfish	LC
Fishes	<i>Pomacanthus semicirculatus</i>	Semicircle Angelfish	LC
Fishes	<i>Pomacanthus xanthurus</i>	Yellowface Angelfish	LC
Fishes	<i>Pomadasys argenteus</i>	Silver Javelin	LC
Fishes	<i>Poromitra megalops</i>	Ridgehead	DD
Fishes	<i>Prionace glauca</i>	Blue Shark	NT
Fishes	<i>Pristipomoides filamentosus</i>	Crimson Jobfish	LC
Fishes	<i>Pristipomoides multidens</i>	Goldbanded Jobfish	LC
Fishes	<i>Pristipomoides sieboldii</i>	Lavender Jobfish	LC
Fishes	<i>Pristipomoides zonatus</i>	Oblique-banded Snapper	LC
Fishes	<i>Pristis clavata</i>	Dwarf Sawfish	EN
Fishes	<i>Pristis pristis</i>	Largetooth Sawfish	CR
Fishes	<i>Pristis zijsron</i>	Green Sawfish	CR
Fishes	<i>Psammogobius biocellatus</i>	Sleepy Goby	LC
Fishes	<i>Psenes sarafurensis</i>	Banded Driftfish	LC
Fishes	<i>Pseudapocryptes elongatus</i>		LC
Fishes	<i>Pseudocarcharias kamoharui</i>	Crocodile Shark	NT
Fishes	<i>Puntius vittatus</i>		LC
Fishes	<i>Pygoplites diacanthus</i>	Royal Angelfish	LC
Fishes	<i>Rachycentron canadum</i>	Cobia	LC
Fishes	<i>Rasbora daniconius</i>	Slender Barb	LC
Fishes	<i>Rastrelliger faughni</i>	Island Mackerel	DD
Fishes	<i>Rastrelliger kanagurta</i>	Indian Mackerel	DD
Fishes	<i>Remora brachyptera</i>	Spearfish Remora	LC

Fishes	<i>Rhabdosargussarba</i>	Goldlined Seabream	LC
Fishes	<i>Rhinaancylostoma</i>	Bowmouth Guitarfish	VU
Fishes	<i>Rhincodon typus</i>	Whale Shark	EN
Fishes	<i>Rhizoprionodonacutus</i>	Milk Shark	LC
Fishes	<i>Rhizoprionodonoligolinx</i>	Grey Sharpnose Shark	LC
Fishes	<i>Rhynchobatuslaevis</i>	Smoothnose Wedgefish	VU
Fishes	<i>Rogadiuspristiger</i>	Thorny Flathead	LC
Fishes	<i>Rondeletialoricata</i>	Redmouth Whalefish	LC
Fishes	<i>Salmophasiabalookee</i>	Bloch Razorbelly Minnow	LC
Fishes	<i>Sarda orientalis</i>	Oriental Bonito	LC
Fishes	<i>Sauridatumbil</i>	Greater Lizardfish	LC
Fishes	<i>Scartellaemarginata</i>	Maned Blenny	LC
Fishes	<i>Scarusquoyi</i>	Quoy's Parrotfish	LC
Fishes	<i>Scatophagus argus</i>	Spotted Scat	LC
Fishes	<i>Scoliodonlaticaudus</i>	Spadenose Shark	NT

Fishes	<i>Scomberomorus commerson</i>	Narrow-barred Spanish Mackerel	NT
Fishes	<i>Scomberomorus guttatus</i>	Indo-Pacific King Mackerel	DD
Fishes	<i>Scomberomorus koreanus</i>	Korean Seerfish	LC
Fishes	<i>Scomberomorus lineolatus</i>	Streaked Seerfish	LC
Fishes	<i>Scopelarchoides danae</i>		LC
Fishes	<i>Scopelarchusanalis</i>	Blackbelly Pearleye	LC
Fishes	<i>Scopeloberyx robustus</i>	Longjaw Bigscale	DD
Fishes	<i>Scorpaenopsis venosa</i>	Raggy Scorpionfish	LC
Fishes	<i>Searsiakoefoedi</i>	Koefoed's Seersid	LC
Fishes	<i>Setarchesguentheri</i>	Deepwater Scorpionfish	LC
Fishes	<i>Sperataaor</i>	Long-whiskered Catfish	LC
Fishes	<i>Sphyrna lewini</i>	Scalloped Hammerhead	EN
Fishes	<i>Sphyrna mokarran</i>	Great Hammerhead	EN
Fishes	<i>Stegostomafasciatum</i>	Zebra Shark	EN

Fishes	<i>Sternoptyxdiaphana</i>	Diaphanous Hatchet Fish	LC
Fishes	<i>Sternoptyxpseudobscura</i>	Highlight Hatchetfish	LC
Fishes	<i>Stomiasaffinis</i>		LC
Fishes	<i>Stylephoruschordatus</i>	Tube-eye	LC
Fishes	<i>Synagrops japonicus</i>		LC
Fishes	<i>Syngnathoidesbiaculeatus</i>	Alligator Pipefish	LC
Fishes	<i>Synodusoculeus</i>	Large-eye Lizardfish	LC
Fishes	<i>Taaningichthysbathyphilus</i>	Deepwater Lanternfish	LC
Fishes	<i>Taenioidescirratu</i>	Whiskered Eel Goby	DD
Fishes	<i>Taeniurallymma</i>	Bluespotted Fantail Ray	NT
Fishes	<i>Taeniurosmeyeni</i>	Blotched Fantail Ray	VU
Fishes	<i>Takifugu oblongus</i>	Lattice Blaasop	LC
Fishes	<i>Telatrygonzuei</i>	Sharpnose Stingray	NT
Fishes	<i>Tenualosailisha</i>	Hilsa	LC
Fishes	<i>Terapontheraps</i>	LargescaledTerapon	LC
Fishes	<i>Tetraodon fluviatilis</i>	Green Pufferfish	LC
Fishes	<i>Tetrarogeniger</i>		LC
Fishes	<i>Thamnaconusmelanoproctes</i>	Blackvent Filefish	DD
Fishes	<i>Thryssagautamiensis</i>	Gautama Thryssa	DD
Fishes	<i>Thryssamystax</i>	Moustached Thryssa	LC
Fishes	<i>Thunnus albacares</i>	Yellowfin Tuna	NT
Fishes	<i>Thysanophryscelebica</i>	Celebes Flathead	LC
Fishes	<i>Torpedo panthera</i>	Panther Torpedo	DD
Fishes	<i>Torquigenerhypsologeneion</i>	Orange-spotted Toadfish	LC
Fishes	<i>Toxotesjaculatrix</i>	Banded Archerfish	LC
Fishes	<i>Trachyrhamphusbicoarctatus</i>	Double-ended Pipefish	LC
Fishes	<i>Trachyrhamphuslongirostris</i>	Long-head pipefish	LC
Fishes	<i>Triaenodonobesus</i>	Whitetip Reef Shark	NT
Fishes	<i>Trigonalampamiriceps</i>	Threelights Dragonfish	LC

Fishes	<i>Tylerius spinosissimus</i>	Spiny Blasop	LC
Fishes	<i>Uraspishelvola</i>	Whitetongue Jack	LC
Fishes	<i>Urogymnus asperrimus</i>	Porcupine Ray	VU
Fishes	<i>Valenciennellustripunctulatus</i>	Constellationfish	LC
Fishes	<i>Vinciguerrianimbaria</i>	Friiled Lighthouse Fish	LC
Fishes	<i>Wallago attu</i>		NT
Fishes	<i>Xestochilus nebulosus</i>		LC
Fishes	<i>Xiphiasetifer</i>	Hairtail Blenny	LC
Fishes	<i>Xiphias gladius</i>	Swordfish	LC
Fishes	<i>Xiphocheilus typus</i>	Blue-toothed tuskfish	LC
Fishes	<i>Zebrosomadesjardinii</i>	Indian Sailfin Tang	LC
Fishes	<i>Zebrosoma scopas</i>	Brushtail Tang	LC
Fishes	<i>Zenarchopterus dispar</i>	Feathered River-garfish	LC
Fishes	<i>Zenarchopterus gilli</i>		LC
Fishes	<i>Zenopsis conchifer</i>	Silvery John Dory	LC
Invertebrates	<i>Aciagrion occidentale</i>		LC
Invertebrates	<i>Acisomapanorpoides</i>	Grizzled Pintail	LC
Invertebrates	<i>Acropora irregularis</i>		DD
Invertebrates	<i>Actinopyga miliaris</i>	Harry Blackfish	VU
Invertebrates	<i>Aethriamantabrevipennis</i>		LC
Invertebrates	<i>Agriocnemis pygmaea</i>	Wandering Midget	LC
Invertebrates	<i>Allopatides dendroideus</i>		DD
Invertebrates	<i>Anaxephippiger</i>	Vagrant Emperor	LC
Invertebrates	<i>Anaxguttatus</i>	Lesser Green Emperor	LC
Invertebrates	<i>Anax indicus</i>		LC
Invertebrates	<i>Archibasisoscillans</i>		LC
Invertebrates	<i>Arctides regalis</i>	Royal Spanish Lobster	LC
Invertebrates	<i>Assimineawoodmasoniana</i>		LC

Invertebrates	<i>Auriculastrasubula</i>		LC
Invertebrates	<i>Bellamyia bengalensis</i>		LC
Invertebrates	<i>Biarctus sordidus</i>	Pygmy Slipper Lobster	LC
Invertebrates	<i>Bithynia cerameopoma</i>		LC
Invertebrates	<i>Bithynia pulchella</i>		LC
Invertebrates	<i>Bohadschiavitiensis</i>	Brown Sandfish	DD
Invertebrates	<i>Brachydiplaxsобрina</i>		LC
Invertebrates	<i>Brachythemiscontaminata</i>		LC
Invertebrates	<i>Bradinopygageminata</i>		LC

Invertebrates	<i>Ceriagrioncerinorubellum</i>		LC
Invertebrates	<i>Ceriagrioncoromandelianum</i>		LC
Invertebrates	<i>Ceriagrionolivaceum</i>		LC
Invertebrates	<i>Cerithiumcoralium</i>	Coral Cerith	LC
Invertebrates	<i>Clenchiellamicroscopica</i>		LC
Invertebrates	<i>Coelliccia didyma</i>		LC
Invertebrates	<i>Coeloserismayeri</i>		LC
Invertebrates	<i>Conus achatinus</i>		LC
Invertebrates	<i>Conus acutangulus</i>		LC
Invertebrates	<i>Conus amadis</i>		LC
Invertebrates	<i>Conus arenatus</i>	Sand-dusted Cone	LC
Invertebrates	<i>Conus articulatus</i>		LC
Invertebrates	<i>Conus aulicus</i>		LC
Invertebrates	<i>Conus bengalensis</i>	Bengal Cone	LC
Invertebrates	<i>Conus betulinus</i>		LC

Invertebrates	<i>Conus biliosus</i>		LC
Invertebrates	<i>Conus canonicus</i>		LC
Invertebrates	<i>Conus capreolus</i>		DD
Invertebrates	<i>Conus characteristicus</i>	Characteristic Cone	LC
Invertebrates	<i>Conus catus</i>		LC
Invertebrates	<i>Conus chaldaeus</i>		LC
Invertebrates	<i>Conus collisus</i>	Stigmatic Cone	LC
Invertebrates	<i>Conus consors</i>		LC
Invertebrates	<i>Conus coromandelicus</i>		LC
Invertebrates	<i>Conus coronatus</i>		LC
Invertebrates	<i>Conus cumingii</i>	Cuming's Cone	LC
Invertebrates	<i>Conus ebraeus</i>		LC
Invertebrates	<i>Conus eburneus</i>		LC
Invertebrates	<i>Conus episcopatus</i>		LC
Invertebrates	<i>Conus eximius</i>		LC
Invertebrates	<i>Conus figulinus</i>		LC
Invertebrates	<i>Conus flavidus</i>	Yellow Pacific cone	LC
Invertebrates	<i>Conus geographus</i>		LC
Invertebrates	<i>Conus glans</i>		LC
Invertebrates	<i>Conus hyaena</i>	Hyena Cone	LC
Invertebrates	<i>Conus inscriptus</i>	Engraved Cone	LC
Invertebrates	<i>Conus leopardus</i>		LC
Invertebrates	<i>Conus litoglyphus</i>		LC
Invertebrates	<i>Conus litteratus</i>		LC
Invertebrates	<i>Conus lividus</i>		LC

Invertebrates	<i>Conus longurionis</i>		LC
Invertebrates	<i>Conus lotoisii</i>		LC
Invertebrates	<i>Conus malacanus</i>	Malacca Cone	LC
Invertebrates	<i>Conus maldivus</i>	Maldive Cone	LC
Invertebrates	<i>Conus marmoreus</i>	Marbled Cone	LC
Invertebrates	<i>Conus miles</i>		LC
Invertebrates	<i>Conus miliaris</i>		LC
Invertebrates	<i>Conus mitratus</i>		LC
Invertebrates	<i>Conus monile</i>	Necklace Cone	LC
Invertebrates	<i>Conus nussatella</i>		LC
Invertebrates	<i>Conus obscurus</i>		LC
Invertebrates	<i>Conus pertusus</i>		LC
Invertebrates	<i>Conus quercinus</i>		LC
Invertebrates	<i>Conus rattus</i>		LC
Invertebrates	<i>Conus recluzianus</i>		LC
Invertebrates	<i>Conus sponsalis</i>	Sponsal Cone	LC
Invertebrates	<i>Conus striatellus</i>		LC
Invertebrates	<i>Conus striatus</i>		LC
Invertebrates	<i>Conus sulcatus</i>		LC
Invertebrates	<i>Conus suratensis</i>		LC
Invertebrates	<i>Conus terebra</i>		LC
Invertebrates	<i>Conus tessulatus</i>		LC
Invertebrates	<i>Conus textile</i>		LC
Invertebrates	<i>Conus tulipa</i>		LC
Invertebrates	<i>Conus vexillum</i>		LC

Invertebrates	<i>Conus virgo</i>		LC
Invertebrates	<i>Conus voluminalis</i>		LC
Invertebrates	<i>Conus zeylanicus</i>		LC
Invertebrates	<i>Coperamarginipes</i>		LC
Invertebrates	<i>Coperavittata</i>		LC
Invertebrates	<i>Cratillalineata</i>		LC
Invertebrates	<i>Cratillametallica</i>		LC
Invertebrates	<i>Diplacodestrivialis</i>		LC
Invertebrates	<i>Ellobiumaurisjudae</i>	Judas Ear Cassidula	LC
Invertebrates	<i>Epopthalmiavittata</i>		LC
Invertebrates	<i>Ferrissia verruca</i>		LC
Invertebrates	<i>Fungiacyclolites</i>		LC
Invertebrates	<i>Fungia fragilis</i>		LC
Invertebrates	<i>Gabbiaorcula</i>		LC
Invertebrates	<i>Gabbiastenothyroides</i>		LC
Invertebrates	<i>Gabbiatravancorica</i>		LC
Invertebrates	<i>Gibbularctusgibberosus</i>		LC
Invertebrates	<i>Gyraulusconvexiusculus</i>		LC
Invertebrates	<i>Helioporacoerulea</i>	Blue Coral	VU
Invertebrates	<i>Holothuriaarenicola</i>		DD
Invertebrates	<i>Holothuriaatra</i>	Lollyfish	LC
Invertebrates	<i>Holothuria edulis</i>	Pinkfish	LC
Invertebrates	<i>Holothuriaflavomaculata</i>		LC
Invertebrates	<i>Holothuriafuscocinerea</i>		LC

Invertebrates	<i>Holothuriafuscogilva</i>		VU
Invertebrates	<i>Holothuriahilla</i>		LC
Invertebrates	<i>Holothuria impatiens</i>	Bottleneck Sea Cucumber	DD
Invertebrates	<i>Holothuriainhabilis</i>		LC
Invertebrates	<i>Holothurialessoni</i>	Golden Sandfish	EN
Invertebrates	<i>Holothurialeucospilota</i>	White Thread Fish	LC
Invertebrates	<i>Holothuriamoebii</i>		LC
Invertebrates	<i>Holothuria pardalis</i>		LC
Invertebrates	<i>Holothuriapervicax</i>		LC
Invertebrates	<i>Holothuria rigida</i>		LC
Invertebrates	<i>Holothuriascabra</i>	Golden Sandfish	EN
Invertebrates	<i>Holothuriaspinifera</i>		DD
Invertebrates	<i>Indoplanorbissexustus</i>		LC
Invertebrates	<i>Inthaumbilicalis</i>		LC
Invertebrates	<i>Iravadiarohdei</i>		LC
Invertebrates	<i>Ischnura senegalensis</i>	Tropical Bluetail	LC
Invertebrates	<i>Labidodemasrugosum</i>		LC
Invertebrates	<i>Lamellidenscorrianus</i>		LC
Invertebrates	<i>Lestesconcinus</i>	Dusky Spreadwing	LC
Invertebrates	<i>Lestes elatus</i>	Emerald Spreadwing	LC
Invertebrates	<i>Lestesumbrinus</i>		DD
Invertebrates	<i>Littorariaundulata</i>		LC
Invertebrates	<i>Lymnaea acuminata</i>		LC
Invertebrates	<i>Lymnaeabiacuminata</i>		DD
Invertebrates	<i>Lymnaealuteola</i>		LC

Invertebrates	<i>Lymnaea persica</i>		LC
Invertebrates	<i>Lyriothemisclais</i>		LC
Invertebrates	<i>Mekongiocrassa</i>		LC
Invertebrates	<i>Melampus sincaporensis</i>		LC
Invertebrates	<i>Melanoidestuberculata</i>		LC
Invertebrates	<i>Milleporaplathyphylla</i>	Firecoral	LC

Invertebrates	<i>Milleporatenera</i>		LC
Invertebrates	<i>Neritina violacea</i>	Red-mouth Nerite Snail	LC
Invertebrates	<i>Neurobasis chinensis</i>		LC
Invertebrates	<i>Onychargiaatrocyana</i>		LC
Invertebrates	<i>Orthetrumchrysis</i>		LC
Invertebrates	<i>Orthetrumluzonicum</i>		LC
Invertebrates	<i>Paelopatides insignis</i>		DD
Invertebrates	<i>Palinustuswaguensis</i>	Japanese Blunthorn Lobster	LC
Invertebrates	<i>Paludomus inflatus</i>		DD
Invertebrates	<i>Paludomustanschuaricus</i>		LC
Invertebrates	<i>Pantalaflavescens</i>	Wandering Glider	LC
Invertebrates	<i>Panulirus homarus</i>	Scalloped Spiny Lobster	LC
Invertebrates	<i>Panulirus ornatus</i>	Ornate Spiny Lobster	LC
Invertebrates	<i>Panulirus penicillatus</i>	Pronghorn Spiny Lobster	LC
Invertebrates	<i>Panulirus polyphagus</i>	Mud Spiny Lobster	LC
Invertebrates	<i>Panulirus versicolor</i>	Painted Spiny Lobster	LC
Invertebrates	<i>Parreysiabonneaudi</i>		LC
Invertebrates	<i>Parreysiacorrugata</i>		LC
Invertebrates	<i>Parreysiafavidens</i>		LC

Invertebrates	<i>Pearsonothuriagraeffei</i>	Blackspotted Sea Cucumber	LC
Invertebrates	<i>Pila virens</i>		LC
Invertebrates	<i>Pisidium prasongi</i>		LC
Invertebrates	<i>Polychelestyphlops</i>		LC
Invertebrates	<i>Polymesoda bengalensis</i>	Bengali Geloina	LC
Invertebrates	<i>Polymesodaexpansa</i>	Marsh Clam	LC
Invertebrates	<i>Pomacealineata</i>		LC
Invertebrates	<i>Pseudagrionrubriceps</i>		LC
Invertebrates	<i>Rhinocyphabiforata</i>		LC
Invertebrates	<i>Rhythemisvariegata</i>		LC
Invertebrates	<i>Sermylariqueti</i>		LC
Invertebrates	<i>Stenothyraflanfordiana</i>		LC
Invertebrates	<i>Stereomastis nana</i>		LC
Invertebrates	<i>Stereomastis phosphorus</i>	Pink Blind Lobster	LC
Invertebrates	<i>Stichopuschloronotus</i>	Greenfish	LC
Invertebrates	<i>Stichopusherrmanni</i>	Curryfish	VU
Invertebrates	<i>Stichopushorrens</i>	Selenka's Sea Cucumber	DD
Invertebrates	<i>Stichopusmonotuberculatus</i>		DD
Invertebrates	<i>Tarebiagranifera</i>		LC
Invertebrates	<i>Thelenota ananas</i>	Prickly Redfish	EN
Invertebrates	<i>Thelenotaanax</i>	Amberfish	DD
Invertebrates	<i>Thenus indicus</i>	Mud Bug	DD
Invertebrates	<i>Thiararudis</i>		LC
Invertebrates	<i>Tholymistillarga</i>	Old World Twister	LC
Invertebrates	<i>Trameabasilaris</i>	Keyhole Glider	LC
Invertebrates	<i>Tramealimbata</i>	Ferruginous Glider	LC

Invertebrates	<i>Trithemis aurora</i>		LC
Invertebrates	<i>Trithemiskirbyi</i>	Orange-winged Dropwing	LC
Invertebrates	<i>Trithemispallidinervis</i>	Dancing Dropwing	LC
Invertebrates	<i>Tubiporamusica</i>	Organ Pipe Coral	NT
Invertebrates	<i>Urothemissignata</i>		LC
Invertebrates	<i>Willemoesialeptodactyla</i>		LC
Invertebrates	<i>Zygonyxtorridus</i>	Ringed Cascader	LC
Invertebrates	<i>Zyommapietiolatum</i>	Long-tailed Duskdarter	LC
Mammals	<i>Anathanaelliotti</i>	Madras Treeshrew	LC
Mammals	<i>Aonyx cinereus</i>	Asian Small-clawed Otter	VU
Mammals	<i>Axis axis</i>	Chital	LC
Mammals	<i>Balaenoptera acutorostrata</i>	Common Minke Whale	LC
Mammals	<i>Balaenoptera edeni</i>	Bryde's Whale	DD
Mammals	<i>Balaenoptera musculus</i>	Blue Whale	EN
Mammals	<i>Bandicota bengalensis</i>	Lesser Bandicoot Rat	LC
Mammals	<i>Bandicota indica</i>	Greater Bandicoot Rat	LC
Mammals	<i>Boselaphustragocamelus</i>	Nilgai	LC
Mammals	<i>Canis aureus</i>	Golden Jackal	LC
Mammals	<i>Cuonalpinus</i>	Dhole	EN
Mammals	<i>Cynopterus sphinx</i>	Greater Shortnosed Fruit Bat	LC
Mammals	<i>Eonycteris spelaea</i>	Dawn Bat	LC
Mammals	<i>Felis chaus</i>	Jungle Cat	LC
Mammals	<i>Feresa attenuata</i>	Pygmy Killer Whale	DD
Mammals	<i>Funambulus palmarum</i>	Common Palm Squirrel	LC
Mammals	<i>Funambulus pennantii</i>	Five-striped Palm Squirrel	LC
Mammals	<i>Globicephala macrorhynchus</i>	Short-finned Pilot Whale	DD
Mammals	<i>Grampus griseus</i>	Risso's Dolphin	LC
Mammals	<i>Herpestes edwardsii</i>	Indian Grey Mongoose	LC
Mammals	<i>Herpestes smithii</i>	Ruddy Mongoose	LC

Mammals	<i>Hipposideros speoris</i>	Schneider's Leaf-nosed Bat	LC
Mammals	<i>Hystrix indica</i>	Indian Crested Porcupine	LC
Mammals	<i>Indopacetus pacificus</i>	Indo-pacific Beaked Whale	DD
Mammals	<i>Kogiabreviceps</i>	Pygmy Sperm Whale	DD
Mammals	<i>Kogia sima</i>	Dwarf Sperm Whale	DD
Mammals	<i>Lagenodelphis hosei</i>	Fraser's Dolphin	LC
Mammals	<i>Lepus nigricollis</i>	Indian Hare	LC
Mammals	<i>Lutrogale perspicillata</i>	Smooth-coated Otter	VU
Mammals	<i>Macaca mulatta</i>	Rhesus Monkey	LC
Mammals	<i>Manis crassicaudata</i>	Indian Pangolin	EN
Mammals	<i>Megaderma lyra</i>	Greater False Vampire	LC
Mammals	<i>Megaptera novaeangliae</i>	Humpback Whale	LC
Mammals	<i>Mellivora capensis</i>	Honey Badger	LC
Mammals	<i>Mesoplodon densirostris</i>	Blainville's Beaked Whale	DD
Mammals	<i>Mesoplodon ginkgodens</i>	Ginkgo-toothed Beaked Whale	DD
Mammals	<i>Moschiola indica</i>	Indian Chevrotain	LC
Mammals	<i>Muntiacus vaginalis</i>	Northern Red Muntjac	LC
Mammals	<i>Murinacyclotis</i>	Round-eared Tube-nosed Bat	LC
Mammals	<i>Mus booduga</i>	Little Indian Field Mouse	LC
Mammals	<i>Mus musculus</i>	House Mouse	LC
Mammals	<i>Mus platythrix</i>	Brown Spiny Mouse	LC
Mammals	<i>Mus terricolor</i>	Earth-colored Mouse	LC
Mammals	<i>Myotis montivagus</i>	Burmese Whiskered Myotis	LC
Mammals	<i>Neophocaena phocaenoides</i>	Indo-Pacific Finless Porpoise	VU
Mammals	<i>Orcaella brevirostris</i>	Irrawaddy Dolphin	EN
Mammals	<i>Orcinus orca</i>	Killer Whale	DD
Mammals	<i>Panthera pardus</i>	Leopard	VU
Mammals	<i>Paradoxurus hermaphroditus</i>	Common Palm Civet	LC
Mammals	<i>Peponocephala electra</i>	Melon-headed Whale	LC
Mammals	<i>Physeter macrocephalus</i>	Sperm Whale	VU

Mammals	<i>Pipistrellus ceylonicus</i>	Kelaart's Pipistrelle	LC
Mammals	<i>Pipistrellus tenuis</i>	Least Pipistrelle	LC
Mammals	<i>Prionailurus bengalensis</i>	Leopard Cat	LC
Mammals	<i>Prionailurus rubiginosus</i>	Rusty-spotted Cat	NT
Mammals	<i>Pseudorca crassidens</i>	False Killer Whale	DD
Mammals	<i>Pteropus giganteus</i>	Indian Flying Fox	LC
Mammals	<i>Rattus rattus</i>	House Rat	LC
Mammals	<i>Rhinolophus lepidus</i>	Blyth's Horseshoe Bat	LC
Mammals	<i>Rhinolophus pusillus</i>	Least Horseshoe Bat	LC
Mammals	<i>Rhinolophus rouxii</i>	Rufous Horseshoe Bat	LC
Mammals	<i>Rousettus leschenaultii</i>	Leschenault's Rousette	LC
Mammals	<i>Rusa unicolor</i>	Sambar	VU
Mammals	<i>Scotophilus heathii</i>	Greater Asiatic Yellow House Bat	LC
Mammals	<i>Semnopithecus entellus</i>	Northern Plains Gray Langur	LC
Mammals	<i>Stenella attenuata</i>	Pantropical Spotted Dolphin	LC
Mammals	<i>Stenella coeruleoalba</i>	Striped Dolphin	LC
Mammals	<i>Stenella longirostris</i>	Spinner Dolphin	DD
Mammals	<i>Steno bredanensis</i>	Rough-toothed Dolphin	LC
Mammals	<i>Suncus murinus</i>	House Shrew	LC
Mammals	<i>Sus scrofa</i>	Wild Boar	LC
Mammals	<i>Taphozous longimanus</i>	Long-winged Tomb Bat	LC
Mammals	<i>Tatera indica</i>	Indian Gerbil	LC
Mammals	<i>Tetracerus quadricornis</i>	Four-horned Antelope	VU
Mammals	<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	DD
Mammals	<i>Tursiops truncatus</i>	Common Bottlenose Dolphin	LC
Mammals	<i>Viverricula indica</i>	Small Indian Civet	LC
Mammals	<i>Vulpes bengalensis</i>	Bengal Fox	LC
Mammals	<i>Ziphius cavirostris</i>	Cuvier's Beaked Whale	LC
Plants	<i>Acmellapaniculata</i>	Panicled Spot Flower	LC
Plants	<i>Acrostichum aureum</i>	Golden Leather Fern	LC

Plants	<i>Aegialitis rotundifolia</i>		NT
Plants	<i>Aegicerascorniculatum</i>		LC
Plants	<i>Anacyclus pyrethrum</i>	Atlas Daisy	VU
Plants	<i>Avicennia alba</i>		LC
Plants	<i>Avicennia marina</i>	Gray Mangrove	LC
Plants	<i>Avicennia officinalis</i>		LC
Plants	<i>Brownlowiaterisa</i>		NT
Plants	<i>Bruguiera cylindrica</i>		LC
Plants	<i>Bruguieragymnorhiza</i>	Oriental Mangrove	LC
Plants	<i>Bruguiera parviflora</i>	SmallflowerBruguiera	LC
Plants	<i>Carexbaccans</i>	Crimson Seeded Sedge	LC
Plants	<i>Carexhebecarpa</i>		LC
Plants	<i>Ceratopteristhalictroides</i>		LC
Plants	<i>Ceriopsdecandra</i>		NT
Plants	<i>Ceriops tagal</i>		LC
Plants	<i>Commelinacaroliniana</i>		LC
Plants	<i>Commelinasubulata</i>		LC
Plants	<i>Crotalaria quinquefolia</i>		LC
Plants	<i>Cyanotisarcotensis</i>		LC
Plants	<i>Cyclosorus interruptus</i>	Hottentot Fern	LC
Plants	<i>Cyperus amabilis</i>		LC
Plants	<i>Cyperus arenarius</i>		LC
Plants	<i>Cyperus castaneus</i>		LC
Plants	<i>Cyperus clarkei</i>		LC
Plants	<i>Cyperus compactus</i>		LC

Plants	<i>Cyperus cyperoides</i>		LC
Plants	<i>Cyperus diffusus</i>	Dwarf Umbrella Grass	LC
Plants	<i>Cyperus digitatus</i>	Finger Flatsegde	LC
Plants	<i>Cyperus distans</i>	Slender Cyperus	LC
Plants	<i>Cyperus dubius</i>		LC
Plants	<i>Cyperus esculentus</i>	Yellow Nutsedge	LC
Plants	<i>Cyperus longus</i>	Sweet Cyperus	LC
Plants	<i>Cyperus michelianus</i>	Souchet De Michel	LC
Plants	<i>Cyperus nutans</i>		LC
Plants	<i>Cyperus pilosus</i>		LC
Plants	<i>Cyperus pulchellus</i>		LC
Plants	<i>Cyperus tenuispica</i>		LC
Plants	<i>Cyperus tuberosus</i>	Nut Grass	LC
Plants	<i>Diplazium esculentum</i>		LC
Plants	<i>Dopatriumnudicaule</i>		LC
Plants	<i>Echinochloafrumentacea</i>		LC
Plants	<i>Ecliptaprostrata</i>	Eclipte Blanche	LC
Plants	<i>Eleocharis geniculata</i>	Canada Spikesedge	LC
Plants	<i>Eleocharis spiralis</i>		LC
Plants	<i>Elytrophorusspicatus</i>	Spike Grass	LC
Plants	<i>Emilia zeylanica</i>		LC
Plants	<i>Equisetum giganteum</i>	Southern Giant Horsetail	LC
Plants	<i>Eragrostis japonica</i>	Pond Lovegrass	LC
Plants	<i>Eriocaulon parviflorum</i>		LC
Plants	<i>Eriocaulon truncatum</i>	Short Pipe-Wort	LC
Plants	<i>Eriochloaprocera</i>	Spring Grass	LC

Plants	<i>Excoecariaaallocha</i>		LC
Plants	<i>Fimbristylis acuminata</i>		LC
Plants	<i>Fimbristylisalboviridis</i>		LC
Plants	<i>Fimbristylisbisumbellata</i>	Fimbristylis à Deux Ombelles	LC
Plants	<i>Fimbristyliscinnamometorum</i>		LC
Plants	<i>Fimbristyliscomplanata</i>		LC
Plants	<i>Fimbristylisdipsacea</i>	Harper's Fimbristylis	LC
Plants	<i>Fimbristylisferruginea</i>	West Indian Fimbry	LC
Plants	<i>Fimbristylislittoralis</i>	Lesser Fimbristylis	LC
Plants	<i>Fimbristylis ovata</i>		LC
Plants	<i>Fimbristylispolytrichoides</i>		LC
Plants	<i>Fimbristylischoenoides</i>	Ditch Fimbry	LC
Plants	<i>Fimbristylistetragona</i>		LC
Plants	<i>Fuirenacuspadata</i>		LC
Plants	<i>Fuirenapubescens</i>	Fuirène Pubescent	LC
Plants	<i>Fuirenaumbellata</i>	Yefen	LC
Plants	<i>Halodulepinifolia</i>	Species code: Hp	LC
Plants	<i>Haloduleuninervis</i>	Species code: Hu	LC
Plants	<i>Halodulewrightii</i>	Species code: Hw	LC
Plants	<i>Halophila beccarii</i>	Ocean Turf Grass	VU
Plants	<i>Halophila ovalis</i>	Species code: Ho	LC
Plants	<i>Halophila ovata</i>	Species code: Hq	LC
Plants	<i>Hemarthriacompressa</i>	Whip Grass	LC
Plants	<i>Heritiera littoralis</i>		LC
Plants	<i>Homonioia riparia</i>	Willow-Leaved Water Croton	LC
Plants	<i>Hoppeadichotoma</i>		LC

Plants	<i>Hydrobryopsissessilis</i>		LC
Plants	<i>Hydrocotylejavanica</i>		LC
Plants	<i>Hydrocotylesibthorpioides</i>		LC
Plants	<i>Hygrophilabalsamica</i>		LC
Plants	<i>Hygrophiladiformis</i>		LC
Plants	<i>Hygrophila quadrivalvis</i>		LC
Plants	<i>Isachnealbans</i>		LC
Plants	<i>Isachneglobosa</i>	Swamp Millet	LC
Plants	<i>Isachnepulchella</i>		LC
Plants	<i>Justicia quinqueangularis</i>		LC
Plants	<i>Kyllingamelanosperma</i>		LC
Plants	<i>Kyllinganemoralis</i>	White Water Sedge	LC
Plants	<i>Lemnagibba</i>	Fat Duckweed	LC
Plants	<i>Leptochloafusca</i>		LC
Plants	<i>Leptochloaneesii</i>	Umbrella Canegrass	LC
Plants	<i>Leptochloapanicea</i>	Mucronate Sprangletop	LC
Plants	<i>Linderniaoppositifolia</i>		LC
Plants	<i>Lipocarpa chinensis</i>		LC
Plants	<i>Ludwigiahyssoipifolia</i>	Seed Box	LC
Plants	<i>Ludwigia perennis</i>		LC
Plants	<i>Lumnitzeraracemosa</i>		LC
Plants	<i>Medicago sativa</i>	Alfalfa	LC
Plants	<i>Myriophyllum indicum</i>		LC
Plants	<i>Myriophyllumoliganthum</i>		LC
Plants	<i>Myriophyllumtuberculatum</i>		LC

Plants	<i>Nymphoideshydrophylla</i>		LC
Plants	<i>Nymphoides indica</i>	Water-snowflake	LC
Plants	<i>Nymphoidesparvifolia</i>		LC
Plants	<i>Ophioglossumlusitanicum</i>	Least Adder's-tongue	LC

Plants	<i>Phyla nodiflora</i>	Turkey Tangle Frogfruit	LC
Plants	<i>Polytrias indica</i>	Batiki Bluegrass	LC
Plants	<i>Prunus bifrons</i>		DD
Plants	<i>Pycreuspolystachyos</i>	Bunchy Flat Sedge	LC
Plants	<i>Queenslandiellahyalina</i>	Queensland Sedge	LC
Plants	<i>Rhizophora apiculata</i>		LC
Plants	<i>Rhizophora mucronata</i>	Mangrove	LC
Plants	<i>Scyphiphorahydrophyllacea</i>		LC
Plants	<i>Sonneratia apetala</i>		LC
Plants	<i>Thelypterisxylodes</i>		LC
Plants	<i>Xylocarpus granatum</i>		LC
Plants	<i>Xyris indica</i>		LC
Reptiles	<i>Acrochordusgranulatus</i>	Wart Snake	LC
Reptiles	<i>Astrotiastokesii</i>	Stokes' Sea Snake	LC
Reptiles	<i>Atretiumschistosum</i>	Olive Keelback Water Snake	LC
Reptiles	<i>Caretta caretta</i>	Loggerhead Turtle	VU
Reptiles	<i>Chamaeleozeylanicus</i>	Asian Chameleon	LC
Reptiles	<i>Chitra indica</i>	Indian Narrow-headed Softshell Tu	rleEN
Reptiles	<i>Crocodylus palustris</i>	Mugger	VU
Reptiles	<i>Crocodylusporosus</i>	Salt-water Crocodile	LR/lc
Reptiles	<i>Dermochelys coriacea</i>	Leatherback	VU
Reptiles	<i>Enhydrinaschistosa</i>	Beaked Sea Snake	LC
Reptiles	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	CR

Reptiles	<i>Eublepharishardwickii</i>	Eastern Indian Leopard Gecko	LC
Reptiles	<i>Eutropisallapallensis</i>	Schmidt's Mabuya	LC
Reptiles	<i>Eutropiscarinata</i>	Keeled Indian Mabuya	LC
Reptiles	<i>Hemidactylus frenatus</i>	Common House Gecko	LC
Reptiles	<i>Hemidactylus maculatus</i>	Spotted Leaf-toed Gecko	LC
Reptiles	<i>Hemidactylus subtriedrus</i>	Madras Blotched Gecko	DD
Reptiles	<i>Hemidactylus treutleri</i>		LC
Reptiles	<i>Hydrophiscaerulescens</i>	Dwarf Sea Snake	LC
Reptiles	<i>Hydrophis cantoris</i>	Gunther's Sea Snake	DD
Reptiles	<i>Hydrophiscyanocinctus</i>	Bluebanded Sea Snake	LC
Reptiles	<i>Hydrophis fasciatus</i>	Striped Sea Snake	LC
Reptiles	<i>Hydrophisgracilis</i>	Graceful Small Headed Seasnake	LC
Reptiles	<i>Hydrophislapemoides</i>	Persian Gulf Sea Snake	LC
Reptiles	<i>Hydrophismamillaris</i>	Bombay Sea Snake	DD
Reptiles	<i>Hydrophisornatus</i>	Ornate Reef Sea Snake	LC
Reptiles	<i>Hydrophisplaturus</i>	Yellow-bellied Sea Snake	LC
Reptiles	<i>Hydrophis spiralis</i>	Yellow Sea Snake	LC
Reptiles	<i>Hydrophisstricticollis</i>	Collared Sea Snake	DD
Reptiles	<i>Keriliajerdoni</i>	Jerdon's Sea Snake	LC
Reptiles	<i>Lapemiscurtus</i>	Spine-bellied Sea Snake	LC
Reptiles	<i>Laticauda colubrina</i>	Yellow-lipped Sea Krait	LC
Reptiles	<i>Laticaudalaticaudata</i>	Brown-lipped Sea Krait	LC
Reptiles	<i>Lepidochelys olivacea</i>	Olive Ridley	VU
Reptiles	<i>Lissemys punctata</i>	Indian Flapshell Turtle	LR/lc
Reptiles	<i>Lycodotravancoricus</i>	Travancore Wolf Snake	LC
Reptiles	<i>Oligodontaeniolatus</i>	Streaked Kukri Snake	LC
Reptiles	<i>Ophiophagus hannah</i>	King Cobra	VU
Reptiles	<i>Pangshura tentoria</i>	Indian Tent Turtle	LR/lc
Reptiles	<i>Pseudocerastespersicus</i>	Perisan Horned Viper	LC
Reptiles	<i>Sitanaponticeriana</i>	Fan Throated Lizard	LC

Reptiles	<i>Thalassophinaviperina</i>	Viperine Sea Snake	LC
Reptiles	<i>Trimeresurusgramineus</i>	Common Bamboo Viper	LC
Reptiles	<i>Varanus bengalensis</i>	Common Indian Monitor	LC
Reptiles	<i>Varanus salvator</i>	Common Water Monitor	LC

### About IBAT

The Integrated Biodiversity Assessment Tool (IBAT) provides key decision-makers with access to critical information on biodiversity priority sites to inform risk management and decision-making processes that address potential biodiversity impacts. Developed through a partnership of BirdLife International, Conservation International, International Union for Conservation of Nature (IUCN) and United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), the vision of IBAT is that decisions affecting critical natural habitats are informed by the best scientific information and in turn decision makers will support the quest to collect and enhance the underlying datasets and maintain that scientific information

**Appendix 13: Sample Site Inspection Checklist**  
**SAMPLE SITE INSPECTION CHECKLIST**

Project: \_\_\_\_\_  
 Subproject / Location: \_\_\_\_\_

Date: \_\_\_\_\_

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
1.	Supervision and Management On-Site	Yes	No	NA	
	a. Is an EHS supervisor available?				
	b. Is a copy of the SEMP available?				
	c. Are daily toolbox talks conducted on site?				
2.	The Facilities	Yes	No	NA	
	a. Are there a medical and first aid kits on site?				
	b. Are emergency contact details available on-site?				
	c. Are there PPEs available? What are they?				
	d. Are the PPEs in good condition?				
	e. Are there firefighting equipment on site?				
	f. Are there separate sanitary facilities for male and female workers?				
	g. Is drinking water supply available for workers?				
	h. Is there a rest area for workers?				
	i. Are storage areas for chemicals available and with protection? in safe locations?				
3.	Occupational Health and Safety	Yes	No	NA	
	a. Are the PPEs being used by workers?				
	b. Are excavation trenches provided with shores or protection from landslide?				
	c. Is breaktime for workers provided?				
	d. How many for each type of collection vehicle is in current use?				
4.	Community Safety	Yes	No	NA	
	a) Are excavation areas provided with barricades around them?				
	b) Are safety signages posted around the sites?				
	c) Are temporary and safe walkways for pedestrians available near work sites?				
	d) Is there a record of treated wastewater quality testing/measurement?				
5.	Solid Waste Management	Yes	No	NA	
	a. Are excavated materials placed sufficiently away from water courses?				
	b. Is solid waste segregation and management in place?				
	c. Is there a regular collection fo solid wastes from work sites?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
6.	Wastewater Management	Yes	No	NA	
	a) Are there separate sanitary facilities for various types of use (septic tanks, urination, washing, etc.)?				
	b) Is any wastewater discharged to storm drains?				
	c) Is any wastewater being treated prior to discharge?				
	d) Are measures in place to avoid siltation of nearby drainage or receiving bodies of water?				
	e) Are silt traps or sedimentation ponds installed for surface runoff regularly cleaned and freed of silts or sediments?				
7.	Dust Control	Yes	No	NA	
	a. Is the construction site watered to minimize generation of dust?				
	b. Are roads within and around the construction sites sprayed with water on regular intervals?				
	c. Is there a speed control for vehicles at construction sites?				
	d. Are stockpiles of sand, cement and other construction materials covered to avoid being airborne?				
	e. Are construction vehicles carrying soils and other spoils covered?				
	f. Are generators provided with air pollution control devices?				
	g. Are all vehicles regularly maintained to minimize emission of black smoke? Do they have valid permits?				
8.	Noise Control	Yes	No	NA	
	a) Is the work only taking place between 7 am and 7 pm, weekdays?				
	b) Do generators operate with doors closed or provided with sound barrier around them?				
	c) Is idle equipment turned off or throttled down?				
	d) Are there noise mitigation measures adopted at construction sites?				
	e) Are neighboring residents notified in advance of any noisy activities expected at construction sites?				
9.	Traffic Management	Yes	No	NA	
	a) Are traffic signages available around the construction sites and nearby roads?				
	b) Are re-routing signages sufficient to guide motorists?				
	c) Are the excavation sites along roads provided with barricades with reflectors?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
	d) Are the excavation sites provided with sufficient lighting at night?				
10.	<b>Recording System</b>	Yes	No	NA	
	a) Do the contractors have recording system for SEMP implementation?				
	b) Are the daily monitoring sheets accomplished by the contractor EHS supervisor (or equivalent) properly compiled?				
	c) Are laboratory results of environmental sampling conducted since the commencement of construction activities properly compiled?				
	d) Are these records readily available at the site and to the inspection team?				

**Other Issues:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Prepared by:** \_\_\_\_\_  
 Name, Designation and Signature



**Appendix 15: Culverts improvement proposal (Anakapalli – Atchuthapuram)**

S. No.	Culvert details		Existing Structure Details				Improvement proposals/ Proposed structural configuration	Proposed Structure Details	
	Existing Chainage as per survey (Km)	Design Chainage (km)	Super Structure Type	Sub Structure Type	Span Arrangement(m)	Total deck width (m)		Type of Structure	Span Arrangement(m)
1	1+797	1+796	RCC Slab	wall	1 x 1 x 1.5	12.2	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5
2	2+159	2+158	RCC Slab	wall	1 x 0.6 x NV	6.1	Reconstruction to 4 lane	Pipe	1 x 1
3	2+238	2+238	RCC Slab	wall	1 x 0.6 x NV	6.25	Reconstruction to 4 lane	Pipe	1 x 1
4	2+378	2+378	RCC Slab	wall	1 x 0.6 x NV	7.25	Reconstruction to 4 lane	Pipe	1 x 1
5	2+778	2+778	RCC Slab	wall	1 x 0.45 x NV	7.25	Reconstruction to 4 lane	Pipe	1 x 1
6	2+823	2+822	RCC Slab	wall	1 x 3.7 x 1.5	10.2	Reconstruction to 4 lane	Box	1 x 3.7 x 1.5
7	2+963	2+962	RCC Slab	wall	1 x 0.6 x NV	10.2	Reconstruction to 4 lane	Pipe	1 x 1
8	3+222	3+221	RCC Slab	wall	1 x 0.6 x NV	6.2	Reconstruction to 4 lane	Pipe	1 x 1
9	3+322	3+321	RCC Slab	wall	1 x 0.45 x NV	7.45	Reconstruction to 4 lane	Pipe	1 x 1
10	3+522	3+521	RCC Slab	wall	1 x 0.45 x NV	6.45	Reconstruction to 4 lane	Pipe	1 x 1
11	3+645	3+644	RCC Slab	wall	1 x 0.65 x NV	6.25	Reconstruction to 4 lane	Pipe	1 x 1
12	3+925	3+924	RCC Slab	wall	1 x 0.65 x NV	6.25	Reconstruction to 4 lane	Pipe	1 x 1
13	4+085	4+084	Cut stone Slab	wall	1 x 1.2 x NV	9.4	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5
14	4+187	4+186	RCC Slab	wall	1 x 1.2 x NV	8.2	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5

15	4+490	4+489	RCC Slab	wall	1 x 1 x 1.5	8.15	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5
16	4+761	4+760	RCC Slab	wall	5 x 1 x 1.5	8.15	Reconstruction to 4 lane	Box	1 x 5 x 2
17	5+151	5+150	RCC Slab	wall	1 x 0.3 x NV	8.15	Reconstruction to 4 lane	Pipe	2 x 1
18	6+133	6+130	RCC Slab	wall	1 x 0.65 x NV	15.95	Reconstruction to 4 lane	Pipe	1 x 1
19	6+457	6+453	Pipe	-	1 x 0.6	10.4	Reconstruction to 4 lane	Pipe	1 x 1
20	7+151	7+147	RCC Slab	wall	1 x 0.65 x NV	6.1	Reconstruction to 4 lane	Pipe	1 x 1
21	7+471	7+468	Pipe	-	1 x 0.9	8.3	Repair and widening to 4 lane	Pipe	1 x 0.9
22	7+584	7+580	Pipe	-	1 x 0.9	9.4	Repair and widening to 4 lane	Pipe	1 x 0.9
23	7+687	7+683	Pipe	-	1 x 0.6	8.7	Reconstruction to 4 lane	Pipe	1 x 1
24	7+845	7+841	Pipe	-	1 x 0.6	8.9	Reconstruction to 4 lane	Pipe	1 x 1
25	8+075	8+072	Pipe	-	1 x 0.9	8.9	Reconstruction to 4 lane	Pipe	1 x 1
26	8+275	8+271	RCC Slab	wall	1 x 2 x 1	7.3	Reconstruction to 4 lane	Box	1 x 2 x 1.5
27	8+435	8+431	RCC Slab	wall	1 x 1.8 x 0.5	8.2	Reconstruction to 4 lane	Box	1 x 2 x 1.5
28	8+464	8+460	Brick Arch	wall	1 x 3 x 1.2	9.2	Reconstruction to 4 lane	Box	1 x 3 x 1.5
29	8+719	8+715	RCC Slab	wall	1 x NV x NV	6.70	Reconstruction to 4 lane	Pipe	1 x 1
30	9+473	9+468	Pipe	-	1 x 0.6	10.50	Reconstruction to 4 lane	Pipe	1 x 1
31	10+217	10+213	Brick Arch	wall	1 x 0.9 x 1	5.95	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5

32	10+413	10+409	RCC Slab	wall	1 x 0.7 x NV	7.20	Reconstruction to 4 lane	Pipe	1 x 1
33	10+592	10+588	RCC Slab	wall	1 x 0.6 x 1.2	7.20	Reconstruction to 4 lane	Pipe	1 x 1
34	10+663	10+658	RCC Slab	wall	1 x 1.5 x 1.8	7.30	Reconstruction to 4 lane	Box	1 x 1.5 x 2.0
35	10+721	10+717	RCC Slab	wall	1 x 1.2 x 1.5	9.50	Reconstruction to 4 lane	Box	1 x 1.5 x 1.5
36	10+845	10+841	RCC Slab	wall	1 x 1.95 x NV	9.50	Reconstruction to 4 lane	Box	1 x 2 x 1.5
37	11+510	11+505	Pipe	-	3 x 0.75	9.50	Reconstruction to 4 lane	Pipe	2 x 1
38	11+542	11+538	RCC Slab	wall	1 x 0.9 x 0.6	7.30	Reconstruction to 4 lane	Pipe	1 x 1
39	11+697	11+692	RCC Slab	wall	1 x 0.9 x NV	8.50	Reconstruction to 4 lane	Box	1 x 1.5 x 2.0
40	11+867	11+863	RCC Slab	wall	1 x 1.8 x 2.5	8.80	Reconstruction to 4 lane	Box	1 x 2 x 2.5
41	12+260	12+256	Pipe	-	1 x 0.6	9.50	Reconstruction to 4 lane	Pipe	1 x 1
42	12+473	12+469	Pipe	-	1 x 0.6	8.50	Reconstruction to 4 lane	Pipe	1 x 1
43	12+984	12+979	Pipe	-	1 x 0.6	9.30	Reconstruction to 4 lane	Pipe	1 x 1
44	13+209	13+204	Pipe	-	1 x 0.6	9.50	Reconstruction to 4 lane	Pipe	1 x 1
45	13+692	13+687	Pipe	-	1 x 0.6	9.00	Reconstruction to 4 lane	Pipe	1 x 1
46	13+780	13+775	Pipe	-	1 x 0.6	10.60	Reconstruction to 4 lane	Pipe	1 x 1
47	14+667	14+662	RCC Slab	wall	1 x 2.5 x NV	16.30	Reconstruction to 4 lane	Box	1 x 2.5 x 1.5

### Bridges improvement proposal (Ankapalle – Atchuthapuram)

S. No.	Existing Chainage as per survey (Km)	Design Chainage (Km)	Details of Existing Bridge					Improvement proposal	Proposed Bridge details		
			Type of Bridge	Type of Super Structure	Type of Sub-Structure	Span	Total Deck width		Type of structure	Span arrangement(m)	Total length of new carriageway (m)
1	5+679	5+676	Minor	Brick Arch	Masonary Wall	3 x 7.4	6.5	Reconstruction to 4- lane	Box	3 x 7.0 x 3	2 x 12.00
2	8+812	8+808	Minor	Brick Arch	Masonary Wall	3 x 6.5	6.5	Reconstruction to 4- lane	Box	3 x 7.0 x 3	2 x 12.00

**Appendix 16: Widening and Strengthening of Anakapalli-Atchuthapuram road km 1+670 to km 15+700 in the Visakhapatnam District**

RHS Tree List								
S. No	Design Chainage		Tree No	Girth in Mts	Offset (From ECL)	Side	Name of the tree	Remarks
1	1+000	1+805	1	0.52	11.923	R	Tree Coconut	
2		1+812	2	0.55	10.874	R	Tree Palm	
3		1+815	3	0.46	11.119	R	Tree Palm	
4		1+818	4	0.54	11.287	R	Tree Palm	
5		1+865	5	0.58	14.176	R	Tree Coconut	
6		1+897	6	1.26	11.067	R	Tree Coconut	
7		1+950	7	0.48	11.422	R	Tree Coconut	
8		1+961	8	0.53	12.222	R	Tree Coconut	
9	2+000	2+058	9	0.44	13.829	R	Tree Other	
10		2+135	10	0.52	13.615	R	Tree Coconut	
11		2+258	11	0.56	13.076	R	Tree Coconut	
12		2+262	12	0.38	12.895	R	Tree Coconut	
13		2+267	13	0.35	13.477	R	Tree Coconut	
14		2+291	14	0.53	9.499	R	Tree Other	
15		2+298	15	0.48	12.683	R	Tree Coconut	
16		2+306	16	0.85	9.441	R	Tree Coconut	
17		2+311	17	0.54	10.132	R	Tree Coconut	
18		2+319	18	0.51	10.412	R	Tree Coconut	
19		2+391	19	0.39	10.283	R	Tree Coconut	
20		2+392	20	0.33	5.065	R	Tree Other	
21		2+402	21	0.41	10.431	R	Tree Coconut	
22		2+418	22	0.52	12.469	R	Tree Other	
23		2+447	23	1.65	4.741	R	Tree Other	
24		2+455	24	0.56	8.695	R	Tree Coconut	

25		2+480	25	0.37	8.772	R	Tree Coconut	
26		2+493	26	0.58	12.451	R	Tree Other	
27		2+494	27	0.36	11.207	R	Tree Coconut	
28		2+505	28	0.57	11.097	R	Tree Coconut	
29		2+532	29	0.50	11.958	R	Tree Coconut	
30		2+549	30	0.60	8.723	R	Tree Coconut	
31		2+554	31	0.60	9.252	R	Tree Coconut	
32		2+561	32	0.54	8.119	R	Tree Other	
33		2+563	33	0.80	7.940	R	Tree Coconut	
34		2+583	34	0.43	11.651	R	Tree Coconut	
35		2+619	35	0.44	11.760	R	Tree Other	
36		2+701	36	0.36	8.232	R	Tree Other	
37		2+704	37	0.60	8.719	R	Tree Other	
38		2+732	38	0.39	7.491	R	Tree Coconut	
39		2+746	39	0.33	11.417	R	Tree Other	
40		2+756	40	0.48	14.302	R	Tree Coconut	
41		2+760	41	0.56	13.314	R	Tree Coconut	
42		2+767	42	0.40	12.649	R	Tree Coconut	
43		2+778	43	0.55	10.793	R	Tree Coconut	
44		2+813	44	0.79	7.260	R	Tree Coconut	
45		2+896	45	0.47	9.052	R	Tree Other	
46		2+900	46	0.60	12.643	R	Tree Other	
47		2+913	47	0.59	10.895	R	Tree Other	
48		2+925	48	0.49	9.451	R	Tree Other	
49		2+938	49	0.56	8.800	R	Tree Other	
50		2+977	50	0.90	6.060	R	Tree Other	
51	3+000	3+032	51	0.51	10.702	R	Tree Coconut	
52		3+052	52	0.56	8.468	R	Tree Coconut	

53		3+063	53	0.42	7.918	R	Tree Coconut	
54		3+067	54	0.47	10.931	R	Tree Coconut	
55		3+095	55	0.44	10.970	R	Tree Coconut	
56		3+110	56	0.35	8.534	R	Tree Coconut	
57		3+117	57	0.38	6.895	R	Tree Other	
58		3+142	58	1.20	3.969	R	Tree Other	
59		3+155	59	0.69	9.379	R	Tree Coconut	
60		3+164	60	0.30	10.011	R	Tree Coconut	
61		3+201	61	0.39	11.300	R	Tree Other	
62		3+222	62	0.58	9.036	R	Tree Palm	
63		3+222	63	0.51	11.540	R	Tree Palm	
64		3+246	64	1.46	9.076	R	Tree Other	
65		3+276	65	0.90	5.905	R	Tree Other	
66		3+331	66	1.25	12.764	R	Tree Coconut	
67		3+332	67	1.20	11.452	R	Tree Other	
68		3+350	68	0.52	11.425	R	Tree Coconut	
69		3+350	69	0.45	4.698	R	Tree Other	
70		3+356	70	0.86	11.059	R	Tree Coconut	
71		3+371	71	0.56	11.695	R	Tree Coconut	
72		3+376	72	0.45	11.289	R	Tree Coconut	
73		3+389	73	1.30	3.415	R	Tree Other	
74		3+389	74	0.38	4.149	R	Tree Other	
75		3+499	75	0.98	4.985	R	Tree Other	
76		3+552	76	0.59	3.794	R	Tree Other	
77		3+653	77	0.34	11.311	R	Tree Coconut	
78		3+694	78	1.30	3.422	R	Tree Other	
79		3+704	79	0.51	11.972	R	Tree Palm	
80		3+707	80	2.18	12.856	R	Tree Other	

81		3+711	81	0.51	13.507	R	Tree Coconut	
82		3+719	82	0.48	12.691	R	Tree Palm	
83		3+720	83	0.60	12.602	R	Tree Palm	
84		3+720	84	0.57	13.739	R	Tree Coconut	
85		3+720	85	0.43	13.545	R	Tree Coconut	
86		3+728	86	0.41	11.878	R	Tree Coconut	
87		3+731	87	1.74	3.414	R	Tree Other	
88		3+745	88	0.54	11.851	R	Tree Coconut	
89		3+749	89	0.49	10.864	R	Tree Coconut	
90		3+762	90	0.57	10.737	R	Tree Coconut	
91		3+768	91	1.56	5.342	R	Tree Other	
92		3+769	92	0.57	11.145	R	Tree Coconut	
93		3+775	93	0.50	11.547	R	Tree Coconut	
94		3+779	94	0.56	11.098	R	Tree Coconut	
95		3+789	95	0.48	11.142	R	Tree Coconut	
96		3+798	96	0.44	11.021	R	Tree Coconut	
97		3+803	97	0.48	10.972	R	Tree Coconut	
98		3+807	98	0.70	10.871	R	Tree Coconut	
99		3+811	99	0.42	10.788	R	Tree Coconut	
100		3+821	100	0.36	11.658	R	Tree Coconut	
101		3+842	101	0.59	12.227	R	Tree Coconut	
102		3+889	102	1.39	8.576	R	Tree Other	
103		3+932	103	1.30	5.022	R	Tree Other	
104		3+950	104	0.44	5.021	R	Tree Other	
105		3+976	105	0.53	13.052	R	Tree Coconut	
106		3+977	106	1.75	4.313	R	Tree Other	
107		3+981	107	0.54	13.355	R	Tree Coconut	
108		3+985	108	0.49	13.608	R	Tree Coconut	

109		3+989	109	0.42	13.278	R	Tree Coconut	
110		3+993	110	0.38	12.746	R	Tree Coconut	
111	4+000	4+032	111	1.22	9.472	R	Tree Coconut	
112		4+032	112	0.57	4.202	R	Tree Other	
113		4+059	113	0.38	4.113	R	Tree Other	
114		4+176	114	0.40	15.663	R	Tree Coconut	
115		4+180	115	1.62	4.974	R	Tree Other	
116		4+191	116	0.52	11.836	R	Tree Coconut	
117		4+199	117	0.57	11.933	R	Tree Coconut	
118		4+205	118	0.34	11.419	R	Tree Coconut	
119		4+215	119	1.05	11.165	R	Tree Other	
120		4+226	120	0.53	12.713	R	Tree Coconut	
121		4+234	121	0.57	13.139	R	Tree Coconut	
122		4+239	122	0.54	11.937	R	Tree Coconut	
123		4+244	123	0.48	12.022	R	Tree Coconut	
124		4+250	124	0.55	3.180	R	Tree Other	
125		4+251	125	0.34	4.734	R	Tree Coconut	
126		4+256	126	0.52	14.467	R	Tree Coconut	
127		4+262	127	0.54	11.625	R	Tree Coconut	
128		4+267	128	0.41	13.335	R	Tree Coconut	
129		4+272	129	0.60	11.181	R	Tree Coconut	
130		4+277	130	0.52	10.316	R	Tree Coconut	
131		4+279	131	0.57	12.953	R	Tree Coconut	
132		4+293	132	1.30	3.778	R	Tree Other	
133		4+297	133	0.37	13.163	R	Tree Coconut	
134		4+297	134	1.40	3.873	R	Tree Other	
135		4+301	135	0.35	13.595	R	Tree Coconut	
136		4+311	136	0.56	11.642	R	Tree Coconut	

137		4+322	137	0.54	12.619	R	Tree Coconut	
138		4+323	138	0.78	3.358	R	Tree Other	
139		4+334	139	0.39	12.668	R	Tree Coconut	
140		4+346	140	0.52	11.251	R	Tree Coconut	
141		4+350	141	0.54	11.821	R	Tree Coconut	
142		4+355	142	0.46	10.303	R	Tree Coconut	
143		4+356	143	0.32	10.286	R	Tree Coconut	
144		4+360	144	0.58	10.072	R	Tree Coconut	
145		4+364	145	0.57	11.141	R	Tree Coconut	
146		4+370	146	0.55	13.105	R	Tree Coconut	
147		4+377	147	0.58	12.281	R	Tree Coconut	
148		4+382	148	0.45	11.827	R	Tree Coconut	
149		4+388	149	0.51	11.384	R	Tree Coconut	
150		4+392	150	0.54	11.746	R	Tree Coconut	
151		4+396	151	0.60	11.221	R	Tree Coconut	
152		4+396	152	1.48	3.252	R	Tree Other	
153		4+399	153	0.38	11.247	R	Tree Coconut	
154		4+403	154	0.47	11.196	R	Tree Coconut	
155		4+405	155	0.41	10.281	R	Tree Coconut	
156		4+410	156	0.38	10.213	R	Tree Coconut	
157		4+415	157	0.45	10.870	R	Tree Coconut	
158		4+418	158	0.56	10.540	R	Tree Coconut	
159		4+421	159	0.58	10.795	R	Tree Coconut	
160		4+422	160	0.46	11.090	R	Tree Coconut	
161		4+423	161	0.58	7.198	R	Tree Coconut	
162		4+423	162	1.54	3.868	R	Tree Other	
163		4+424	163	0.56	11.266	R	Tree Coconut	
164		4+424	164	0.31	12.070	R	Tree Coconut	

165		4+427	165	0.38	10.541	R	Tree Coconut	
166		4+432	166	0.45	11.647	R	Tree Coconut	
167		4+438	167	0.48	12.476	R	Tree Coconut	
168		4+478	168	0.44	10.057	R	Tree Coconut	
169		4+483	169	0.60	10.699	R	Tree Coconut	
170		4+494	170	0.56	8.323	R	Tree Other	
171		4+494	171	0.57	10.845	R	Tree Coconut	
172		4+501	172	1.29	11.228	R	Tree Coconut	
173		4+506	173	0.56	11.549	R	Tree Coconut	
174		4+512	174	0.48	11.853	R	Tree Coconut	
175		4+535	175	0.58	13.044	R	Tree Coconut	
176		4+544	176	1.60	3.283	R	Tree Other	
177		4+547	177	0.60	13.473	R	Tree Coconut	
178		4+548	178	0.43	3.178	R	Tree Coconut	
179		4+552	179	0.47	13.810	R	Tree Coconut	
180		4+556	180	0.45	13.843	R	Tree Coconut	
181		4+560	181	0.41	14.865	R	Tree Coconut	
182		4+564	182	0.36	14.075	R	Tree Coconut	
183		4+579	183	0.33	13.358	R	Tree Coconut	
184		4+584	184	0.35	13.195	R	Tree Coconut	
185		4+588	185	0.56	11.574	R	Tree Coconut	
186		4+598	186	0.44	13.034	R	Tree Coconut	
187		4+605	187	0.40	12.619	R	Tree Coconut	
188		4+608	188	1.52	4.296	R	Tree Other	
189		4+611	189	0.34	12.431	R	Tree Coconut	
190		4+639	190	0.52	14.044	R	Tree Coconut	
191		4+673	191	0.95	12.910	R	Tree Coconut	
192		4+677	192	0.37	8.161	R	Tree Coconut	

193		4+679	193	0.58	13.942	R	Tree Coconut	
194		4+692	194	0.56	4.432	R	Tree Other	
195		4+699	195	0.33	13.849	R	Tree Coconut	
196		4+704	196	0.56	13.639	R	Tree Coconut	
197		4+710	197	0.52	13.670	R	Tree Coconut	
198		4+716	198	0.58	13.679	R	Tree Coconut	
199		4+726	199	0.54	13.229	R	Tree Coconut	
200		4+728	200	0.35	12.888	R	Tree Coconut	
201		4+752	201	0.56	15.088	R	Tree Coconut	
202		4+756	202	0.51	12.886	R	Tree Coconut	
203		4+758	203	0.53	10.918	R	Tree Coconut	
204		4+760	204	0.57	14.894	R	Tree Coconut	
205		4+761	205	0.35	10.227	R	Tree Coconut	
206		4+765	206	0.30	8.823	R	Tree Coconut	
207		4+772	207	0.54	10.349	R	Tree Coconut	
208		4+777	208	0.41	11.566	R	Tree Coconut	
209		4+782	209	0.35	11.883	R	Tree Coconut	
210		4+787	210	0.58	12.636	R	Tree Coconut	
211		4+791	211	0.60	12.609	R	Tree Coconut	
212		4+854	212	2.30	3.299	R	Tree Other	
213		4+899	213	0.48	11.278	R	Tree Coconut	
214		4+928	214	0.52	10.957	R	Tree Coconut	
215		4+933	215	0.34	11.891	R	Tree Coconut	
216		4+941	216	0.45	13.141	R	Tree Coconut	
217		4+946	217	0.60	12.929	R	Tree Coconut	
218		4+949	218	0.36	13.188	R	Tree Coconut	
219		4+978	219	0.52	14.881	R	Tree Other	
220	5+000	5+049	220	0.54	11.263	R	Tree Coconut	

221		5+056	221	0.60	11.184	R	Tree Coconut	
222		5+060	222	0.32	11.920	R	Tree Coconut	
223		5+068	223	0.48	12.146	R	Tree Coconut	
224		5+128	224	0.60	5.659	R	Tree Coconut	
225		5+132	225	0.60	8.067	R	Tree Coconut	
226		5+136	226	0.37	7.849	R	Tree Coconut	
227		5+148	227	0.54	9.642	R	Tree Coconut	
228		5+154	228	0.37	10.454	R	Tree Coconut	
229		5+159	229	0.56	10.874	R	Tree Coconut	
230		5+177	230	0.54	6.516	R	Tree Palm	
231		5+181	231	0.39	11.126	R	Tree Coconut	
232		5+185	232	0.38	10.865	R	Tree Coconut	
233		5+190	233	0.45	10.757	R	Tree Coconut	
234		5+192	234	0.57	6.768	R	Tree Palm	
235		5+195	235	0.60	11.776	R	Tree Coconut	
236		5+200	236	0.38	10.337	R	Tree Palm	
237		5+205	237	0.48	11.654	R	Tree Coconut	
238		5+207	238	0.58	6.018	R	Tree Palm	
239		5+215	239	0.49	11.415	R	Tree Coconut	
240		5+221	240	0.57	11.055	R	Tree Coconut	
241		5+237	241	0.50	12.785	R	Tree Coconut	
242		5+242	242	0.40	11.049	R	Tree Coconut	
243		5+266	243	0.46	12.643	R	Tree Coconut	
244		5+269	244	0.37	12.558	R	Tree Coconut	
245		5+271	245	0.45	11.601	R	Tree Coconut	
246		5+274	246	0.58	12.709	R	Tree Coconut	
247		5+277	247	0.60	12.781	R	Tree Coconut	
248		5+282	248	0.45	11.513	R	Tree Coconut	

249		5+285	249	0.41	15.822	R	Tree Coconut	
250		5+288	250	0.34	11.208	R	Tree Coconut	
251		5+315	251	1.20	8.734	R	Tree Other	
252		5+337	252	0.59	5.956	R	Tree Other	
253		5+344	253	1.33	10.804	R	Tree Palm	
254		5+346	254	0.54	10.537	R	Tree Other	
255		5+353	255	0.44	9.637	R	Tree Palm	
256		5+360	256	0.48	9.820	R	Tree Palm	
257		5+365	257	0.35	9.506	R	Tree Other	
258		5+368	258	0.38	11.407	R	Tree Palm	
259		5+370	259	0.69	11.789	R	Tree Palm	
260		5+372	260	0.36	10.391	R	Tree Palm	
261		5+375	261	0.77	9.759	R	Tree Palm	
262		5+378	262	0.49	10.547	R	Tree Palm	
263		5+379	263	1.78	11.352	R	Tree Palm	
264		5+380	264	0.56	10.032	R	Tree Palm	
265		5+381	265	0.56	12.342	R	Tree Other	
266		5+383	266	0.50	10.719	R	Tree Palm	
267		5+383	267	0.52	12.821	R	Tree Other	
268		5+390	268	0.41	13.511	R	Tree Palm	
269		5+395	269	0.49	10.269	R	Tree Palm	
270		5+395	270	0.35	12.149	R	Tree Coconut	
271		5+399	271	0.60	12.647	R	Tree Coconut	
272		5+403	272	0.36	10.833	R	Tree Palm	
273		5+403	273	0.56	11.316	R	Tree Palm	
274		5+405	274	0.37	10.958	R	Tree Palm	
275		5+405	275	1.57	10.570	R	Tree Palm	
276		5+405	276	0.36	11.960	R	Tree Coconut	

277		5+408	277	0.30	10.284	R	Tree Palm	
278		5+411	278	0.54	11.696	R	Tree Coconut	
279		5+412	279	0.60	11.047	R	Tree Palm	
280		5+414	280	0.45	11.708	R	Tree Palm	
281		5+416	281	0.43	10.856	R	Tree Palm	
282		5+416	282	0.60	12.668	R	Tree Coconut	
283		5+417	283	0.58	11.250	R	Tree Palm	
284		5+427	284	0.54	14.351	R	Tree Coconut	
285		5+431	285	0.54	13.890	R	Tree Coconut	
286		5+436	286	0.42	11.490	R	Tree Palm	
287		5+437	287	1.63	14.076	R	Tree Coconut	
288		5+441	288	0.35	15.767	R	Tree Coconut	
289		5+441	289	0.45	10.802	R	Tree Palm	
290		5+443	290	0.60	10.670	R	Tree Palm	
291		5+445	291	0.35	14.538	R	Tree Coconut	
292		5+446	292	0.42	8.932	R	Tree Palm	
293		5+447	293	0.56	11.318	R	Tree Palm	
294		5+448	294	0.45	12.337	R	Tree Palm	
295		5+449	295	0.56	10.158	R	Tree Palm	
296		5+451	296	0.53	9.894	R	Tree Palm	
297		5+453	297	0.55	14.463	R	Tree Coconut	
298		5+456	298	0.60	7.233	R	Tree Other	
299		5+457	299	0.38	11.534	R	Tree Palm	
300		5+458	300	0.59	15.179	R	Tree Coconut	
301		5+468	301	0.37	10.394	R	Tree Palm	
302		5+471	302	0.56	11.403	R	Tree Palm	
303		5+478	303	0.58	13.642	R	Tree Coconut	
304		5+489	304	0.53	7.621	R	Tree Palm	

305		5+500	305	0.51	8.776	R	Tree Palm	
306		5+502	306	0.35	13.247	R	Tree Coconut	
307		5+502	307	0.56	7.738	R	Tree Palm	
308		5+503	308	0.52	7.263	R	Tree Other	
309		5+504	309	0.58	10.229	R	Tree Palm	
310		5+506	310	0.38	13.902	R	Tree Coconut	
311		5+507	311	0.31	5.315	R	Tree Other	
312		5+541	312	0.59	3.099	R	Tree Other	
313		5+543	313	0.58	8.324	R	Tree Palm	
314		5+553	314	0.47	9.885	R	Tree Coconut	
315		5+556	315	0.42	9.024	R	Tree Palm	
316		5+558	316	1.38	9.484	R	Tree Palm	
317		5+559	317	0.45	9.492	R	Tree Palm	
318		5+579	318	0.45	8.317	R	Tree Other	
319		5+583	319	0.36	13.536	R	Tree Coconut	
320		5+585	320	0.58	17.477	R	Tree Coconut	
321		5+601	321	0.46	7.126	R	Tree Palm	
322		5+602	322	0.58	10.967	R	Tree Coconut	
323		5+612	323	0.59	9.960	R	Tree Coconut	
324		5+612	324	0.54	7.990	R	Tree Palm	
325		5+616	325	0.45	14.264	R	Tree Coconut	
326		5+645	326	0.42	3.200	R	Tree Other	
327		5+742	327	0.53	6.669	R	Tree Other	
328		5+890	328	0.54	7.433	R	Tree Neem	
329		5+899	329	0.44	5.516	R	Tree Other	
330		5+947	330	1.25	13.432	R	Tree Other	
331		5+954	331	0.60	9.186	R	Tree Other	
332	6+000	6+023	332	0.52	9.468	R	Tree Other	

333		6+104	333	0.42	13.274	R	Tree Coconut	
334		6+115	334	0.48	12.235	R	Tree Coconut	
335		6+133	335	0.60	10.780	R	Tree Other	
336		6+135	336	0.34	11.128	R	Tree Other	
337		6+234	337	0.82	16.091	R	Tree Other	
338		6+236	338	0.76	16.207	R	Tree Coconut	
339		6+268	339	0.55	12.089	R	Tree Mango	
340		6+326	340	0.54	9.684	R	Tree Coconut	
341		6+333	341	1.55	10.299	R	Tree Coconut	
342		6+347	342	0.60	10.336	R	Tree Coconut	
343		6+352	343	0.34	10.394	R	Tree Coconut	
344		6+374	344	0.74	7.924	R	Tree Other	
345		6+455	345	0.69	11.109	R	Tree Coconut	
346		6+461	346	0.45	8.248	R	Tree Coconut	
347		6+477	347	0.36	8.255	R	Tree Palm	
348		6+499	348	0.52	11.181	R	Tree Coconut	
349		6+585	349	0.55	10.448	R	Tree Coconut	
350		6+595	350	0.45	9.221	R	Tree Coconut	
351		6+595	351	0.84	14.000	R	Tree Coconut	
352		6+598	352	0.76	8.142	R	Tree Coconut	
353		6+608	353	0.53	10.561	R	Tree Mango	
354		6+611	354	0.68	10.937	R	Tree Palm	
355		6+613	355	0.45	11.825	R	Tree Mango	
356		6+616	356	0.56	12.342	R	Tree Coconut	
357		6+798	357	0.51	10.801	R	Tree Palm	
358		6+801	358	0.37	10.920	R	Tree Palm	
359		6+803	359	0.39	11.796	R	Tree Palm	
360		6+809	360	0.39	11.789	R	Tree Coconut	

361		6+915	361	2.80	3.211	R	Tree Other	
362	7+000	7+068	362	0.43	11.553	R	Tree Coconut	
363		7+068	363	0.56	11.553	R	Tree Coconut	
364		7+077	364	0.35	7.750	R	Tree Other	
365		7+085	365	0.37	12.506	R	Tree Coconut	
366		7+141	366	0.60	13.124	R	Tree Coconut	
367		7+142	367	0.86	9.272	R	Tree Coconut	
368		7+145	368	0.58	13.326	R	Tree Coconut	
369		7+149	369	0.57	9.231	R	Tree Other	
370		7+203	370	0.39	8.534	R	Tree Coconut	
371		7+330	371	0.53	9.098	R	Tree Coconut	
372		7+355	372	1.61	10.946	R	Tree Coconut	
373		7+356	373	0.52	6.907	R	Tree Coconut	
374		7+362	374	0.50	10.644	R	Tree Coconut	
375		7+374	375	0.80	8.359	R	Tree Coconut	
376		7+377	376	0.74	12.754	R	Tree Coconut	
377		7+380	377	0.56	9.191	R	Tree Coconut	
378		7+385	378	0.45	7.024	R	Tree Coconut	
379		7+386	379	0.60	7.300	R	Tree Coconut	
380		7+388	380	0.36	7.979	R	Tree Coconut	
381		7+392	381	0.54	7.744	R	Tree Coconut	
382		7+395	382	0.58	8.811	R	Tree Coconut	
383		7+462	383	0.73	13.619	R	Tree Coconut	
384		7+463	384	0.35	8.284	R	Tree Coconut	
385		7+468	385	0.33	11.968	R	Tree Coconut	
386		7+469	386	0.37	11.075	R	Tree Coconut	
387		7+471	387	0.85	8.853	R	Tree Mango	
388		7+475	388	0.56	10.443	R	Tree Coconut	

389		7+477	389	0.60	10.567	R	Tree Mango	
390		7+478	390	0.69	14.305	R	Tree Coconut	
391		7+479	391	0.59	11.003	R	Tree Coconut	
392		7+481	392	0.37	9.384	R	Tree Other	
393		7+484	393	1.34	8.866	R	Tree Mango	
394		7+489	394	0.37	8.002	R	Tree Coconut	
395		7+498	395	0.60	9.389	R	Tree Coconut	
396		7+506	396	0.49	11.241	R	Tree Coconut	
397		7+506	397	0.57	10.422	R	Tree Coconut	
398		7+527	398	0.86	5.846	R	Tree Other	
399		7+530	399	0.60	10.519	R	Tree Coconut	
400		7+532	400	0.38	9.220	R	Tree Coconut	
401		7+558	401	0.90	13.291	R	Tree Other	
402		7+632	402	0.77	12.049	R	Tree Coconut	
403		7+643	403	0.55	11.692	R	Tree Coconut	
404		7+653	404	0.50	8.504	R	Tree Coconut	
405		7+659	405	0.54	6.763	R	Tree Coconut	
406		7+664	406	0.60	11.980	R	Tree Coconut	
407		7+665	407	0.58	4.120	R	Tree Coconut	
408		7+676	408	0.46	2.702	R	Tree Mango	
409		7+688	409	0.60	12.267	R	Tree Coconut	
410		7+691	410	0.37	12.358	R	Tree Coconut	
411		7+695	411	0.39	13.509	R	Tree Coconut	
412		7+696	412	0.32	2.561	R	Tree Coconut	
413		7+696	413	0.45	10.223	R	Tree Coconut	
414		7+702	414	0.57	11.080	R	Tree Coconut	
415		7+705	415	0.58	3.093	R	Tree Coconut	
416		7+706	416	0.55	14.651	R	Tree Coconut	

417		7+711	417	0.45	11.798	R	Tree Coconut	
418		7+712	418	0.41	4.400	R	Tree Coconut	
419		7+760	419	0.46	8.768	R	Tree Coconut	
420		7+763	420	1.19	6.698	R	Tree Palm	
421		7+765	421	0.60	9.502	R	Tree Coconut	
422		7+772	422	0.38	12.069	R	Tree Coconut	
423		7+775	423	0.60	7.203	R	Tree Palm	
424		7+778	424	0.58	11.002	R	Tree Coconut	
425		7+801	425	0.52	8.480	R	Tree Coconut	
426		7+802	426	0.35	8.524	R	Tree Coconut	
427		7+807	427	0.57	12.428	R	Tree Coconut	
428		7+813	428	0.56	8.302	R	Tree Other	
429		7+818	429	0.52	12.185	R	Tree Coconut	
430		7+820	430	0.60	10.648	R	Tree Coconut	
431		7+831	431	0.45	12.129	R	Tree Mango	
432	8+000	8+075	432	0.45	14.268	R	Tree Other	
433		8+077	433	1.44	12.522	R	Tree Coconut	
434		8+081	434	0.36	11.505	R	Tree Coconut	
435		8+083	435	0.52	9.973	R	Tree Coconut	
436		8+088	436	0.55	10.610	R	Tree Coconut	
437		8+089	437	0.60	12.389	R	Tree Coconut	
438		8+103	438	1.58	11.032	R	Tree Other	
439		8+115	439	0.59	8.677	R	Tree Mango	
440		8+122	440	0.54	11.434	R	Tree Neem	
441		8+124	441	0.56	13.182	R	Tree Coconut	
442		8+133	442	0.56	11.894	R	Tree Neem	
443		8+139	443	0.52	11.469	R	Tree Neem	
444		8+143	444	0.56	11.943	R	Tree Coconut	

445		8+146	445	0.41	12.748	R	Tree Coconut	
446		8+151	446	0.44	12.959	R	Tree Coconut	
447		8+155	447	0.38	12.372	R	Tree Coconut	
448		8+165	448	0.40	12.280	R	Tree Coconut	
449		8+169	449	0.59	12.986	R	Tree Coconut	
450		8+173	450	0.38	12.604	R	Tree Coconut	
451		8+177	451	0.30	12.171	R	Tree Coconut	
452		8+182	452	0.35	11.382	R	Tree Coconut	
453		8+182	453	0.42	11.382	R	Tree Coconut	
454		8+188	454	0.56	12.065	R	Tree Coconut	
455		8+193	455	0.80	12.709	R	Tree Coconut	
456		8+202	456	1.20	12.724	R	Tree Peepal	
457		8+222	457	0.60	11.946	R	Tree Coconut	
458		8+228	458	0.35	13.637	R	Tree Coconut	
459		8+232	459	0.59	14.312	R	Tree Coconut	
460		8+232	460	0.84	6.436	R	Tree Coconut	
461		8+233	461	0.69	11.231	R	Tree Coconut	
462		8+233	462	0.85	12.224	R	Tree Coconut	
463		8+237	463	0.45	12.117	R	Tree Coconut	
464		8+241	464	0.60	4.848	R	Tree Other	
465		8+243	465	0.66	9.560	R	Tree Coconut	
466		8+248	466	0.35	7.455	R	Tree Coconut	
467		8+248	467	0.34	7.130	R	Tree Coconut	
468		8+249	468	0.54	11.073	R	Tree Coconut	
469		8+252	469	0.81	11.868	R	Tree Coconut	
470		8+271	470	0.58	9.307	R	Tree Coconut	
471		8+275	471	0.45	9.095	R	Tree Coconut	
472		8+281	472	0.35	13.869	R	Tree Mango	

473		8+285	473	0.57	10.150	R	Tree Coconut	
474		8+340	474	0.71	10.556	R	Tree Coconut	
475		8+363	475	1.40	3.208	R	Tree Other	
476		8+364	476	1.30	3.960	R	Tree Other	
477		8+393	477	0.75	3.340	R	Tree Other	
478		8+394	478	1.42	5.148	R	Tree Other	
479		8+412	479	0.79	6.747	R	Tree Mango	
480		8+420	480	0.67	5.802	R	Tree Coconut	
481		8+424	481	0.89	13.407	R	Tree Coconut	
482		8+537	482	0.59	11.144	R	Tree Coconut	
483		8+538	483	2.10	3.364	R	Tree Banyan	
484		8+541	484	0.57	10.471	R	Tree Coconut	
485		8+547	485	0.54	9.775	R	Tree Coconut	
486		8+551	486	0.55	7.101	R	Tree Coconut	
487		8+557	487	0.39	4.874	R	Tree Other	
488		8+573	488	0.57	3.724	R	Tree Other	
489		8+574	489	0.59	3.558	R	Tree Other	
490		8+598	490	0.85	12.819	R	Tree Coconut	
491		8+601	491	0.60	11.625	R	Tree Coconut	
492		8+601	492	0.58	11.635	R	Tree Coconut	
493		8+601	493	0.52	11.647	R	Tree Coconut	
494		8+606	494	0.54	12.789	R	Tree Coconut	
495		8+644	495	0.47	14.555	R	Tree Coconut	
496		8+680	496	0.56	12.528	R	Tree Coconut	
497		8+687	497	0.51	13.919	R	Tree Coconut	
498		8+766	498	0.53	10.200	R	Tree Palm	
499		8+819	499	1.50	9.223	R	Tree Other	
500		8+959	500	0.46	11.479	R	Tree Palm	

501	9+000	9+038	501	0.43	8.518	R	Tree Other	
502		9+039	502	0.45	14.857	R	Tree Coconut	
503		9+123	503	0.41	8.969	R	Tree Other	
504		9+132	504	0.84	8.073	R	Tree Other	
505		9+139	505	0.49	7.846	R	Tree Other	
506		9+175	506	0.37	11.525	R	Tree Other	
507		9+293	507	0.45	13.747	R	Tree Other	
508		9+295	508	0.37	10.930	R	Tree Other	
509		9+295	509	0.58	10.830	R	Tree Other	
510		9+451	510	0.59	5.446	R	Tree Neem	
511		9+488	511	0.60	9.814	R	Tree Other	
512		9+564	512	0.51	9.244	R	Tree Coconut	
513		9+624	513	0.50	15.114	R	Tree Neem	
514		9+624	514	0.45	15.112	R	Tree Neem	
515		9+741	515	0.56	9.109	R	Tree Other	
516		9+889	516	0.38	12.806	R	Tree Palm	
517		9+923	517	0.39	13.836	R	Tree Palm	
518		9+924	518	0.57	11.633	R	Tree Palm	
519		9+925	519	0.48	12.902	R	Tree Palm	
520		9+941	520	0.57	13.543	R	Tree Palm	
521		9+942	521	0.43	13.194	R	Tree Palm	
522		9+944	522	0.46	10.834	R	Tree Palm	
523		9+944	523	0.47	12.818	R	Tree Palm	
524		9+947	524	0.43	11.505	R	Tree Palm	
525		9+949	525	0.45	13.543	R	Tree Palm	
526		9+949	526	0.57	9.349	R	Tree Palm	
527		9+950	527	0.58	13.067	R	Tree Palm	
528		9+951	528	0.58	12.699	R	Tree Palm	

529		9+955	529	0.38	13.880	R	Tree Palm	
530		9+960	530	0.45	13.760	R	Tree Palm	
531		9+961	531	0.58	13.681	R	Tree Palm	
532		9+994	532	0.56	9.716	R	Tree Other	
533	10+000	10+039	533	0.58	14.184	R	Tree Coconut	
534		10+053	534	0.57	14.158	R	Tree Palm	
535		10+053	535	0.59	14.203	R	Tree Coconut	
536		10+056	536	0.35	12.871	R	Tree Palm	
537		10+059	537	0.38	13.692	R	Tree Palm	
538		10+068	538	0.45	12.148	R	Tree Palm	
539		10+095	539	0.43	12.086	R	Tree Palm	
540		10+098	540	0.38	12.775	R	Tree Palm	
541		10+099	541	0.52	10.530	R	Tree Palm	
542		10+101	542	0.42	10.067	R	Tree Palm	
543		10+101	543	0.48	12.542	R	Tree Palm	
544		10+107	544	0.37	11.516	R	Tree Palm	
545		10+109	545	0.39	11.132	R	Tree Palm	
546		10+111	546	0.35	9.185	R	Tree Palm	
547		10+116	547	0.37	14.146	R	Tree Coconut	
548		10+120	548	0.54	12.134	R	Tree Palm	
549		10+129	549	0.38	12.097	R	Tree Coconut	
550		10+136	550	0.58	13.491	R	Tree Coconut	
551		10+146	551	0.54	11.791	R	Tree Palm	
552		10+147	552	0.36	13.955	R	Tree Palm	
553		10+151	553	0.60	8.764	R	Tree Palm	
554		10+152	554	0.58	14.329	R	Tree Coconut	
555		10+153	555	0.39	10.687	R	Tree Palm	
556		10+158	556	0.57	11.046	R	Tree Coconut	

557		10+164	557	0.56	6.795	R	Tree Palm	
558		10+165	558	0.45	11.029	R	Tree Coconut	
559		10+166	559	0.34	10.530	R	Tree Palm	
560		10+172	560	0.60	12.334	R	Tree Coconut	
561		10+172	561	0.34	12.238	R	Tree Coconut	
562		10+179	562	0.36	6.384	R	Tree Palm	
563		10+180	563	0.60	10.607	R	Tree Coconut	
564		10+188	564	0.87	11.823	R	Tree Coconut	
565		10+202	565	0.36	11.661	R	Tree Coconut	
566		10+213	566	0.68	15.054	R	Tree Coconut	
567		10+219	567	0.65	11.349	R	Tree Coconut	
568		10+228	568	0.60	10.741	R	Tree Other	
569		10+228	569	0.52	7.180	R	Tree Palm	
570		10+237	570	0.37	11.414	R	Tree Coconut	
571		10+242	571	0.48	11.642	R	Tree Coconut	
572		10+309	572	0.47	6.713	R	Tree Palm	
573		10+312	573	0.52	6.635	R	Tree Palm	
574		10+319	574	0.54	7.826	R	Tree Palm	
575		10+346	575	0.45	8.760	R	Tree Other	
576		10+353	576	0.34	9.002	R	Tree Palm	
577		10+359	577	0.45	7.807	R	Tree Palm	
578		10+379	578	0.46	8.052	R	Tree Palm	
579		10+403	579	0.48	8.418	R	Tree Palm	
580		10+413	580	0.88	7.759	R	Tree Palm	
581		10+416	581	0.87	8.055	R	Tree Palm	
582		10+431	582	0.58	6.587	R	Tree Palm	
583		10+432	583	0.86	9.706	R	Tree Palm	
584		10+434	584	0.59	9.056	R	Tree Palm	

585		10+657	585	0.60	9.073	R	Tree Palm	
586		10+668	586	0.37	8.663	R	Tree Palm	
587		10+669	587	0.60	11.655	R	Tree Palm	
588		10+706	588	0.34	14.781	R	Tree Mango	
589		10+737	589	0.30	12.451	R	Tree Palm	
590		10+767	590	0.38	10.302	R	Tree Palm	
591		10+767	591	0.58	7.299	R	Tree Palm	
592		10+771	592	0.54	9.945	R	Tree Palm	
593		10+787	593	0.98	9.392	R	Tree Palm	
594		10+793	594	1.56	14.705	R	Tree Palm	
595		10+866	595	0.57	14.357	R	Tree Palm	
596		10+874	596	0.58	13.350	R	Tree Tamarind	
597		10+887	597	0.52	14.645	R	Tree Palm	
598		10+897	598	0.45	14.611	R	Tree Palm	
599		10+900	599	0.46	14.186	R	Tree Palm	
600		10+904	600	0.43	13.304	R	Tree Palm	
601		10+909	601	0.38	12.798	R	Tree Palm	
602		10+914	602	0.35	14.308	R	Tree Palm	
603		10+920	603	0.68	13.289	R	Tree Palm	
604		10+920	604	0.78	10.230	R	Tree Palm	
605		10+923	605	0.36	11.973	R	Tree Palm	
606		10+928	606	1.45	12.338	R	Tree Palm	
607		10+928	607	0.60	14.031	R	Tree Palm	
608		10+931	608	0.57	12.409	R	Tree Palm	
609		10+934	609	0.58	12.525	R	Tree Palm	
610		10+940	610	0.52	12.887	R	Tree Palm	
611		10+943	611	0.60	14.664	R	Tree Palm	
612		10+945	612	0.42	12.918	R	Tree Palm	

613		10+946	613	0.44	14.299	R	Tree Palm	
614	11+000	11+001	614	0.46	14.753	R	Tree Palm	
615		11+003	615	0.35	13.454	R	Tree Palm	
616		11+080	616	0.36	10.222	R	Tree Palm	
617		11+202	617	0.56	11.631	R	Tree Palm	
618		11+235	618	0.45	12.813	R	Tree Palm	
619		11+236	619	0.38	13.401	R	Tree Palm	
620		11+240	620	0.59	14.813	R	Tree Palm	
621		11+242	621	0.57	6.265	R	Tree Palm	
622		11+247	622	0.52	14.772	R	Tree Palm	
623		11+267	623	0.50	8.097	R	Tree Other	
624		11+310	624	0.35	10.692	R	Tree Palm	
625		11+347	625	0.72	14.434	R	Tree Palm	
626		11+375	626	0.37	10.172	R	Tree Palm	
627		11+381	627	0.45	9.571	R	Tree Palm	
628		11+406	628	0.45	5.019	R	Tree Palm	
629		11+406	629	0.48	4.388	R	Tree Palm	
630		11+409	630	0.76	8.950	R	Tree Other	
631		11+413	631	0.60	8.910	R	Tree Other	
632		11+418	632	0.36	8.008	R	Tree Other	
633		11+418	633	0.56	7.995	R	Tree Other	
634		11+420	634	0.53	7.573	R	Tree Other	
635		11+434	635	0.58	4.750	R	Tree Other	
636		11+435	636	0.59	14.004	R	Tree Palm	
637		11+439	637	0.52	14.851	R	Tree Palm	
638		11+444	638	0.45	13.622	R	Tree Palm	
639		11+445	639	0.36	4.712	R	Tree Other	
640		11+455	640	0.78	14.368	R	Tree Palm	

641		11+461	641	0.58	14.152	R	Tree Palm	
642		11+462	642	0.45	15.203	R	Tree Palm	
643		11+474	643	0.41	9.087	R	Tree Other	
644		11+476	644	0.60	10.152	R	Tree Neem	
645		11+499	645	0.34	11.295	R	Tree Palm	
646		11+499	646	0.38	14.818	R	Tree Palm	
647		11+499	647	0.58	9.353	R	Tree Other	
648		11+500	648	0.45	15.701	R	Tree Palm	
649		11+513	649	0.86	12.014	R	Tree Palm	
650		11+514	650	0.56	13.396	R	Tree Palm	
651		11+518	651	0.42	14.307	R	Tree Palm	
652		11+522	652	0.38	13.867	R	Tree Palm	
653		11+607	653	0.33	14.366	R	Tree Palm	
654		11+611	654	1.80	6.313	R	Tree Other	
655		11+614	655	0.53	14.712	R	Tree Neem	
656		11+634	656	0.59	11.436	R	Tree Palm	
657		11+638	657	0.54	9.738	R	Tree Palm	
658		11+658	658	0.45	15.380	R	Tree Other	
659		11+659	659	0.32	14.780	R	Tree Palm	
660		11+661	660	0.30	15.239	R	Tree Palm	
661		11+661	661	1.54	15.378	R	Tree Palm	
662		11+663	662	0.90	14.919	R	Tree Palm	
663		11+664	663	0.37	14.798	R	Tree Palm	
664		11+664	664	1.22	15.667	R	Tree Palm	
665		11+672	665	0.65	15.543	R	Tree Palm	
666		11+675	666	0.45	14.015	R	Tree Palm	
667		11+706	667	0.82	14.548	R	Tree Palm	
668		11+707	668	0.73	8.962	R	Tree Other	

669		11+711	669	1.56	16.585	R	Tree Palm	
670		11+717	670	0.57	16.800	R	Tree Palm	
671		11+767	671	0.71	14.732	R	Tree Palm	
672		11+768	672	0.39	9.551	R	Tree Palm	
673		11+843	673	0.54	7.230	R	Tree Palm	
674		11+956	674	2.30	11.908	R	Tree Banyan	
675		11+960	675	2.60	10.025	R	Tree Banyan	
676	12+000	12+004	676	2.10	2.667	R	Tree Banyan	
677		12+018	677	0.77	3.638	R	Tree Other	
678		12+021	678	0.79	3.655	R	Tree Other	
679		12+048	679	0.80	4.864	R	Tree Mango	
680		12+143	680	0.68	14.051	R	Tree Coconut	
681		12+188	681	1.69	6.967	R	Tree Palm	
682		12+210	682	0.43	4.841	R	Tree Other	
683		12+216	683	0.36	7.229	R	Tree Other	
684		12+258	684	0.42	6.355	R	Tree Other	
685		12+274	685	3.10	10.871	R	Tree Banyan	
686		12+324	686	2.80	7.166	R	Tree Banyan	
687		12+361	687	3.20	6.572	R	Tree Banyan	
688		12+380	688	2.70	5.958	R	Tree Banyan	
689		12+383	689	2.90	8.251	R	Tree Banyan	
690		12+416	690	3.30	5.600	R	Tree Banyan	
691		12+451	691	0.66	12.392	R	Tree Palm	
692		12+461	692	0.81	10.673	R	Tree Palm	
693		12+477	693	0.37	7.614	R	Tree Other	
694		12+478	694	0.39	7.646	R	Tree Palm	
695		12+492	695	4.20	6.493	R	Tree Banyan	
696		12+493	696	0.36	7.286	R	Tree Palm	

697		12+493	697	0.60	12.417	R	Tree Palm	
698		12+507	698	0.50	6.610	R	Tree Palm	
699		12+520	699	0.70	11.823	R	Tree Palm	
700		12+547	700	0.50	14.705	R	Tree Mango	
701		12+587	701	5.10	6.476	R	Tree Banyan	
702		12+640	702	0.30	3.562	R	Tree Other	
703		12+648	703	0.90	12.187	R	Tree Palm	
704		12+673	704	6.20	13.331	R	Tree Banyan	
705		12+806	705	7.20	5.045	R	Tree Banyan	
706		12+838	706	2.60	5.955	R	Tree Banyan	
707		12+853	707	2.90	3.731	R	Tree Banyan	
708		12+854	708	0.34	6.421	R	Tree Palm	
709		12+854	709	0.48	5.063	R	Tree Palm	
710		12+867	710	0.46	14.506	R	Tree Palm	
711		12+869	711	0.58	14.563	R	Tree Palm	
712		12+871	712	0.39	14.598	R	Tree Palm	
713		12+872	713	0.73	14.520	R	Tree Palm	
714		12+877	714	0.64	14.213	R	Tree Palm	
715		12+878	715	0.60	14.313	R	Tree Palm	
716		12+879	716	0.57	14.226	R	Tree Palm	
717		12+882	717	0.50	14.135	R	Tree Palm	
718		12+885	718	0.49	13.957	R	Tree Other	
719		12+886	719	1.56	14.082	R	Tree Palm	
720		12+893	720	0.90	13.957	R	Tree Palm	
721		12+894	721	0.79	13.843	R	Tree Palm	
722		12+899	722	0.71	13.846	R	Tree Palm	
723		12+900	723	0.68	13.816	R	Tree Palm	
724		12+911	724	0.69	13.911	R	Tree Palm	

725		12+913	725	0.64	13.842	R	Tree Palm	
726		12+918	726	0.40	13.367	R	Tree Palm	
727		12+996	727	0.37	12.355	R	Tree Mango	
728	13+000	13+008	728	0.46	9.158	R	Tree Palm	
729		13+029	729	0.44	10.995	R	Tree Coconut	
730		13+053	730	0.39	5.359	R	Tree Palm	
731		13+061	731	0.40	8.519	R	Tree Palm	
732		13+064	732	0.48	6.808	R	Tree Palm	
733		13+074	733	0.49	6.835	R	Tree Palm	
734		13+124	734	0.44	8.692	R	Tree Palm	
735		13+135	735	0.78	10.816	R	Tree Palm	
736		13+137	736	0.38	13.376	R	Tree Other	
737		13+139	737	0.34	7.774	R	Tree Palm	
738		13+152	738	0.41	10.834	R	Tree Palm	
739		13+156	739	0.49	11.460	R	Tree Palm	
740		13+156	740	0.79	10.089	R	Tree Palm	
741		13+160	741	0.46	9.293	R	Tree Coconut	
742		13+162	742	0.50	10.729	R	Tree Palm	
743		13+163	743	0.46	9.025	R	Tree Palm	
744		13+163	744	0.52	9.508	R	Tree Coconut	
745		13+168	745	0.58	11.378	R	Tree Coconut	
746		13+171	746	0.38	10.620	R	Tree Palm	
747		13+178	747	0.55	11.255	R	Tree Palm	
748		13+186	748	0.39	10.760	R	Tree Coconut	
749		13+208	749	0.34	9.531	R	Tree Palm	
750		13+209	750	0.45	7.786	R	Tree Palm	
751		13+209	751	1.77	6.739	R	Tree Palm	
752		13+210	752	0.45	9.107	R	Tree Palm	

753		13+263	753	0.60	12.581	R	Tree Coconut	
754		13+271	754	0.48	11.578	R	Tree Coconut	
755		13+301	755	0.60	12.284	R	Tree Coconut	
756		13+317	756	0.75	13.601	R	Tree Coconut	
757		13+324	757	0.45	13.481	R	Tree Coconut	
758		13+330	758	0.53	13.008	R	Tree Coconut	
759		13+429	759	0.35	8.929	R	Tree Palm	
760		13+429	760	0.50	8.690	R	Tree Palm	
761		13+431	761	0.58	7.072	R	Tree Palm	
762		13+432	762	0.70	7.139	R	Tree Palm	
763		13+434	763	0.76	8.728	R	Tree Palm	
764		13+435	764	0.35	11.601	R	Tree Palm	
765		13+501	765	0.67	12.618	R	Tree Coconut	
766		13+510	766	0.30	13.760	R	Tree Coconut	
767		13+682	767	0.39	12.585	R	Tree Coconut	
768		13+691	768	0.69	14.752	R	Tree Coconut	
769		13+823	769	0.46	11.558	R	Tree Palm	
770		13+824	770	0.86	11.138	R	Tree Palm	
771		13+826	771	0.58	11.242	R	Tree Palm	
772		13+826	772	0.78	11.535	R	Tree Palm	
773		13+830	773	0.35	13.735	R	Tree Palm	
774		13+842	774	0.84	11.308	R	Tree Palm	
775		13+978	775	2.30	3.445	R	Tree Banyan	
776	14+000	14+007	776	0.85	14.543	R	Tree Palm	
777		14+009	777	0.53	11.423	R	Tree Other	
778		14+150	778	0.60	6.501	R	Tree Other	
779		14+155	779	0.57	7.030	R	Tree Other	
780		14+238	780	0.60	14.208	R	Tree Palm	

781		14+286	781	0.57	11.095	R	Tree Other	
782		14+302	782	0.42	18.157	R	Tree Coconut	
783		14+418	783	0.60	13.851	R	Tree Other	
784		14+422	784	0.82	13.248	R	Tree Other	
785		14+422	785	0.90	13.950	R	Tree Other	
786		14+921	786	0.37	19.607	R	Tree Coconut	
787		15+130	787	1.49	20.848	R	Tree Other	
788		15+495	788	1.65	17.525	R	Tree Palm	
789		15+500	789	0.46	16.250	R	Tree Other	

**Widening and Strengthening of Anakapalli-Atchuthapuram road Km 1+670 to Km 15+700 in the Visakhapatnam District**

LHS Tree List								
S. No	Design Chainage		Tree No	Girth in Mts	Offset (From ECL)	Side	Name of the tree	Remarks
1	1+000	1+744	1	0.60	16.875	L	Tree Other	
2		1+766	2	0.56	12.772	L	Tree Other	
3		1+788	3	0.54	10.916	L	Tree Other	
4		1+793	4	0.52	12.793	L	Tree Coconut	
5		1+797	5	0.36	9.057	L	Tree Coconut	
6		1+799	6	0.34	11.301	L	Tree Coconut	
7		1+801	7	0.56	8.688	L	Tree Coconut	
8		1+821	8	0.45	6.430	L	Tree Palm	
9		1+825	9	0.44	9.907	L	Tree Coconut	
10		1+825	10	0.41	12.297	L	Tree Coconut	
11		1+826	11	0.34	6.814	L	Tree Palm	
12		1+829	12	0.45	13.912	L	Tree Coconut	
13		1+834	13	0.48	13.673	L	Tree Coconut	
14		1+835	14	0.39	11.053	L	Tree Coconut	
15		1+839	15	0.54	11.223	L	Tree Coconut	
16		1+848	16	0.56	9.746	L	Tree Coconut	
17		1+852	17	0.37	10.492	L	Tree Coconut	
18		1+857	18	0.45	8.905	L	Tree Coconut	
19		1+861	19	0.58	7.360	L	Tree Other	
20		1+863	20	0.49	12.281	L	Tree Coconut	
21		1+867	21	0.48	11.483	L	Tree Coconut	
22		1+872	22	0.41	11.589	L	Tree Coconut	
23		1+877	23	0.38	10.896	L	Tree Coconut	
24		1+881	24	0.33	10.412	L	Tree Coconut	

25		1+887	25	0.56	8.909	L	Tree Other	
26		1+898	26	0.52	8.182	L	Tree Palm	
27		1+906	27	0.42	16.738	L	Tree Coconut	
28		1+920	28	1.68	8.608	L	Tree Other	
29		1+977	29	0.40	8.032	L	Tree Other	
30	2+000	2+013	30	0.31	10.557	L	Tree Coconut	
31		2+021	31	0.30	10.409	L	Tree Coconut	
32		2+029	32	0.60	10.447	L	Tree Coconut	
33		2+035	33	0.35	10.687	L	Tree Coconut	
34		2+041	34	0.42	10.189	L	Tree Coconut	
35		2+045	35	0.56	12.263	L	Tree Coconut	
36		2+049	36	0.45	10.797	L	Tree Coconut	
37		2+143	37	0.60	7.701	L	Tree Other	
38		2+165	38	0.38	6.748	L	Tree Other	
39		2+204	39	0.36	10.887	L	Tree Coconut	
40		2+206	40	0.49	14.690	L	Tree Coconut	
41		2+212	41	0.52	14.367	L	Tree Coconut	
42		2+212	42	0.38	9.808	L	Tree Coconut	
43		2+223	43	0.44	10.492	L	Tree Coconut	
44		2+266	44	1.32	7.626	L	Tree Other	
45		2+270	45	0.50	8.589	L	Tree Other	
46		2+279	46	0.32	13.414	L	Tree Other	
47		2+280	47	0.40	14.037	L	Tree Other	
48		2+286	48	0.56	13.118	L	Tree Other	
49		2+292	49	1.65	10.782	L	Tree Other	
50		2+300	50	0.36	14.766	L	Tree Coconut	
51		2+310	51	0.52	15.940	L	Tree Coconut	
52		2+315	52	0.31	10.812	L	Tree Other	

53		2+315	53	0.35	11.930	L	Tree Coconut	
54		2+328	54	0.37	9.311	L	Tree Tamarind	
55		2+331	55	0.78	12.544	L	Tree Coconut	
56		2+336	56	0.39	12.096	L	Tree Coconut	
57		2+337	57	0.42	16.311	L	Tree Coconut	
58		2+343	58	0.38	11.226	L	Tree Coconut	
59		2+349	59	0.65	12.035	L	Tree Coconut	
60		2+362	60	0.33	11.460	L	Tree Coconut	
61		2+390	61	1.56	11.366	L	Tree Other	
62		2+430	62	5.60	7.215	L	Tree Peepal	
63		2+465	63	0.60	11.572	L	Tree Coconut	
64		2+471	64	0.38	11.671	L	Tree Coconut	
65		2+484	65	0.45	10.070	L	Tree Palm	
66		2+500	66	0.48	11.236	L	Tree Coconut	
67		2+505	67	0.39	11.373	L	Tree Coconut	
68		2+540	68	0.35	12.322	L	Tree Other	
69		2+542	69	0.45	12.403	L	Tree Other	
70		2+542	70	0.90	11.902	L	Tree Other	
71		2+544	71	0.58	12.839	L	Tree Other	
72		2+546	72	0.35	12.427	L	Tree Other	
73		2+549	73	0.32	13.408	L	Tree Other	
74		2+604	74	0.42	15.585	L	Tree Coconut	
75		2+605	75	0.50	16.662	L	Tree Coconut	
76		2+607	76	0.60	16.274	L	Tree Coconut	
77		2+609	77	0.37	14.649	L	Tree Coconut	
78		2+609	78	0.57	15.149	L	Tree Other	
79		2+611	79	0.49	16.927	L	Tree Coconut	
80		2+616	80	0.37	16.051	L	Tree Coconut	

81		2+621	81	0.35	16.054	L	Tree Coconut	
82		2+640	82	0.43	16.792	L	Tree Coconut	
83		2+644	83	1.37	11.452	L	Tree Other	
84		2+657	84	0.39	8.474	L	Tree Other	
85		2+659	85	0.53	16.829	L	Tree Coconut	
86		2+664	86	0.51	10.149	L	Tree Coconut	
87		2+665	87	0.77	15.580	L	Tree Coconut	
88		2+670	88	0.50	16.366	L	Tree Coconut	
89		2+673	89	0.38	16.641	L	Tree Coconut	
90		2+677	90	0.39	16.434	L	Tree Coconut	
91		2+682	91	0.80	12.710	L	Tree Other	
92		2+687	92	0.53	14.431	L	Tree Coconut	
93		2+691	93	0.60	15.489	L	Tree Coconut	
94		2+750	94	0.45	16.182	L	Tree Coconut	
95		2+758	95	0.40	12.452	L	Tree Other	
96		2+765	96	0.48	13.391	L	Tree Coconut	
97		2+768	97	0.38	13.686	L	Tree Coconut	
98		2+770	98	0.46	13.854	L	Tree Coconut	
99		2+778	99	0.41	11.678	L	Tree Coconut	
100		2+778	100	0.39	13.730	L	Tree Coconut	
101		2+795	101	0.48	13.374	L	Tree Coconut	
102		2+799	102	0.37	12.857	L	Tree Coconut	
103		2+801	103	0.41	12.808	L	Tree Coconut	
104		2+809	104	0.36	8.425	L	Tree Palm	
105		2+819	105	0.90	11.129	L	Tree Coconut	
106		2+822	106	0.54	12.800	L	Tree Coconut	
107		2+831	107	0.37	12.273	L	Tree Coconut	
108		2+877	108	0.60	7.599	L	Tree Other	

109		2+890	109	1.80	13.603	L	Tree Palm	
110		2+893	110	0.90	13.057	L	Tree Palm	
111		2+895	111	0.39	14.708	L	Tree Coconut	
112		2+909	112	0.87	9.648	L	Tree Other	
113		2+913	113	0.43	14.707	L	Tree Coconut	
114		2+922	114	0.45	11.797	L	Tree Other	
115		2+922	115	0.41	15.843	L	Tree Coconut	
116		2+928	116	0.32	12.705	L	Tree Other	
117		2+930	117	0.38	12.403	L	Tree Coconut	
118		2+946	118	0.58	13.102	L	Tree Coconut	
119	3+000	3+035	119	0.59	14.055	L	Tree Coconut	
120		3+040	120	0.53	13.874	L	Tree Coconut	
121		3+046	121	0.45	13.542	L	Tree Coconut	
122		3+051	122	0.45	13.629	L	Tree Coconut	
123		3+059	123	0.46	12.032	L	Tree Coconut	
124		3+066	124	0.41	11.347	L	Tree Coconut	
125		3+066	125	0.37	12.948	L	Tree Other	
126		3+067	126	0.99	14.193	L	Tree Other	
127		3+073	127	0.53	12.578	L	Tree Coconut	
128		3+084	128	0.54	11.455	L	Tree Coconut	
129		3+099	129	0.55	10.651	L	Tree Coconut	
130		3+104	130	0.38	10.265	L	Tree Coconut	
131		3+126	131	0.33	13.165	L	Tree Coconut	
132		3+142	132	0.60	13.410	L	Tree Coconut	
133		3+152	133	0.56	11.165	L	Tree Other	
134		3+163	134	0.51	12.792	L	Tree Coconut	
135		3+168	135	0.51	12.222	L	Tree Coconut	
136		3+173	136	0.56	12.272	L	Tree Coconut	

137		3+178	137	0.35	12.367	L	Tree Coconut	
138		3+195	138	0.33	12.617	L	Tree Coconut	
139		3+200	139	0.48	12.938	L	Tree Coconut	
140		3+206	140	0.67	13.739	L	Tree Coconut	
141		3+212	141	0.37	13.601	L	Tree Coconut	
142		3+217	142	0.31	13.634	L	Tree Coconut	
143		3+223	143	0.62	13.465	L	Tree Coconut	
144		3+267	144	0.32	13.856	L	Tree Coconut	
145		3+274	145	1.52	14.442	L	Tree Other	
146		3+330	146	0.31	12.721	L	Tree Coconut	
147		3+358	147	1.20	5.361	L	Tree Other	
148		3+402	148	0.44	13.004	L	Tree Coconut	
149		3+416	149	0.41	12.010	L	Tree Other	
150		3+453	150	0.42	14.525	L	Tree Coconut	
151		3+455	151	0.60	12.759	L	Tree Coconut	
152		3+465	152	1.19	13.527	L	Tree Coconut	
153		3+466	153	1.10	5.381	L	Tree Other	
154		3+473	154	0.43	12.097	L	Tree Coconut	
155		3+478	155	0.60	12.269	L	Tree Coconut	
156		3+484	156	0.60	12.676	L	Tree Coconut	
157		3+496	157	1.58	6.873	L	Tree Other	
158		3+496	158	0.39	13.893	L	Tree Coconut	
159		3+503	159	0.54	14.353	L	Tree Coconut	
160		3+511	160	0.52	9.158	L	Tree Other	
161		3+521	161	0.60	6.521	L	Tree Other	
162		3+549	162	1.15	5.028	L	Tree Other	
163		3+621	163	0.38	11.306	L	Tree Coconut	
164		3+630	164	0.60	5.644	L	Tree Other	

165		3+631	165	0.56	12.090	L	Tree Coconut	
166		3+635	166	0.46	11.315	L	Tree Coconut	
167		3+645	167	0.33	8.083	L	Tree Coconut	
168		3+648	168	0.45	10.546	L	Tree Coconut	
169		3+656	169	0.45	13.592	L	Tree Coconut	
170		3+664	170	0.60	13.267	L	Tree Coconut	
171		3+670	171	0.52	13.832	L	Tree Coconut	
172		3+673	172	0.51	12.114	L	Tree Palm	
173		3+674	173	0.55	14.363	L	Tree Coconut	
174		3+676	174	0.48	11.278	L	Tree Palm	
175		3+680	175	0.48	13.857	L	Tree Coconut	
176		3+694	176	2.20	6.326	L	Tree Other	
177		3+708	177	0.42	13.934	L	Tree Palm	
178		3+721	178	1.36	6.142	L	Tree Other	
179		3+761	179	0.45	13.027	L	Tree Coconut	
180		3+774	180	1.40	6.473	L	Tree Other	
181		3+800	181	2.50	7.261	L	Tree Other	
182		3+835	182	1.85	8.929	L	Tree Coconut	
183		3+895	183	2.54	7.089	L	Tree Other	
184		3+922	184	1.30	6.733	L	Tree Other	
185		3+977	185	1.09	6.991	L	Tree Other	
186	4+000	4+152	186	1.64	6.287	L	Tree Other	
187		4+179	187	0.35	14.921	L	Tree Coconut	
188		4+188	188	0.54	11.732	L	Tree Coconut	
189		4+195	189	1.25	9.011	L	Tree Other	
190		4+205	190	1.12	7.451	L	Tree Other	
191		4+263	191	0.51	7.359	L	Tree Other	
192		4+296	192	0.56	13.902	L	Tree Coconut	

193		4+305	193	0.60	13.730	L	Tree Coconut	
194		4+309	194	0.58	13.994	L	Tree Coconut	
195		4+320	195	0.60	13.292	L	Tree Coconut	
196		4+341	196	0.38	8.598	L	Tree Other	
197		4+356	197	0.59	14.623	L	Tree Coconut	
198		4+365	198	0.55	14.780	L	Tree Coconut	
199		4+371	199	0.37	13.250	L	Tree Other	
200		4+377	200	1.56	9.443	L	Tree Other	
201		4+380	201	0.58	13.655	L	Tree Coconut	
202		4+389	202	0.48	13.825	L	Tree Coconut	
203		4+395	203	0.44	12.937	L	Tree Coconut	
204		4+406	204	0.50	12.272	L	Tree Coconut	
205		4+411	205	0.38	12.183	L	Tree Coconut	
206		4+423	206	1.55	7.415	L	Tree Other	
207		4+430	207	0.57	11.577	L	Tree Coconut	
208		4+438	208	0.54	12.011	L	Tree Coconut	
209		4+443	209	0.56	12.694	L	Tree Coconut	
210		4+448	210	0.53	14.110	L	Tree Coconut	
211		4+452	211	0.51	14.018	L	Tree Coconut	
212		4+467	212	0.52	15.212	L	Tree Coconut	
213		4+471	213	0.55	13.784	L	Tree Coconut	
214		4+476	214	0.45	14.185	L	Tree Coconut	
215		4+480	215	0.45	7.284	L	Tree Other	
216		4+500	216	0.48	7.014	L	Tree Other	
217		4+528	217	0.38	12.924	L	Tree Coconut	
218		4+534	218	0.56	13.469	L	Tree Coconut	
219		4+546	219	1.54	6.317	L	Tree Palm	
220		4+556	220	0.37	6.818	L	Tree Other	

221		4+604	221	0.33	6.630	L	Tree Other	
222		4+633	222	1.63	7.846	L	Tree Other	
223		4+756	223	1.35	8.783	L	Tree Other	
224		4+766	224	0.45	15.283	L	Tree Coconut	
225		4+771	225	0.45	14.392	L	Tree Coconut	
226		4+775	226	0.49	15.710	L	Tree Coconut	
227		4+798	227	0.58	14.423	L	Tree Coconut	
228		4+803	228	0.54	14.240	L	Tree Coconut	
229		4+807	229	0.56	13.918	L	Tree Coconut	
230		4+812	230	0.58	13.297	L	Tree Coconut	
231		4+820	231	0.59	13.664	L	Tree Coconut	
232		4+827	232	0.45	13.259	L	Tree Coconut	
233		4+833	233	0.50	12.843	L	Tree Coconut	
234		4+833	234	0.53	18.449	L	Tree Coconut	
235		4+839	235	1.33	13.662	L	Tree Coconut	
236		4+844	236	0.45	15.600	L	Tree Coconut	
237		4+867	237	0.35	12.417	L	Tree Coconut	
238		4+877	238	0.59	11.820	L	Tree Coconut	
239		4+882	239	0.54	11.329	L	Tree Coconut	
240		4+896	240	0.56	7.784	L	Tree Palm	
241		4+898	241	0.35	12.058	L	Tree Coconut	
242		4+898	242	0.45	9.605	L	Tree Other	
243		4+904	243	0.35	12.352	L	Tree Coconut	
244		4+910	244	0.45	13.082	L	Tree Coconut	
245		4+917	245	0.57	12.376	L	Tree Coconut	
246		4+968	246	1.58	12.478	L	Tree Coconut	
247		4+974	247	0.58	12.622	L	Tree Coconut	
248		4+980	248	0.53	12.806	L	Tree Coconut	

249		4+986	249	0.52	12.202	L	Tree Coconut	
250		4+992	250	0.32	11.073	L	Tree Coconut	
251		4+998	251	0.30	12.778	L	Tree Coconut	
252	5+000	5+005	252	0.39	12.497	L	Tree Coconut	
253		5+012	253	0.60	12.622	L	Tree Coconut	
254		5+017	254	0.56	11.416	L	Tree Coconut	
255		5+022	255	0.42	11.490	L	Tree Coconut	
256		5+027	256	0.42	11.669	L	Tree Coconut	
257		5+034	257	0.33	11.740	L	Tree Coconut	
258		5+037	258	0.58	11.361	L	Tree Coconut	
259		5+042	259	0.56	11.258	L	Tree Coconut	
260		5+049	260	0.48	8.675	L	Tree Other	
261		5+119	261	0.44	16.589	L	Tree Coconut	
262		5+123	262	0.60	17.155	L	Tree Coconut	
263		5+128	263	0.33	15.614	L	Tree Coconut	
264		5+134	264	0.56	17.030	L	Tree Coconut	
265		5+139	265	0.58	15.544	L	Tree Coconut	
266		5+143	266	0.53	16.063	L	Tree Coconut	
267		5+186	267	0.34	11.467	L	Tree Other	
268		5+198	268	0.30	13.133	L	Tree Coconut	
269		5+206	269	0.39	8.036	L	Tree Palm	
270		5+208	270	0.48	11.800	L	Tree Coconut	
271		5+211	271	0.39	12.069	L	Tree Coconut	
272		5+219	272	0.56	12.682	L	Tree Coconut	
273		5+237	273	0.58	13.629	L	Tree Coconut	
274		5+244	274	0.80	13.509	L	Tree Coconut	
275		5+251	275	0.31	13.333	L	Tree Coconut	
276		5+251	276	0.36	13.024	L	Tree Coconut	

277		5+254	277	0.54	12.636	L	Tree Palm	
278		5+259	278	0.56	13.876	L	Tree Coconut	
279		5+259	279	0.45	13.824	L	Tree Coconut	
280		5+273	280	0.36	15.660	L	Tree Coconut	
281		5+324	281	0.37	11.786	L	Tree Coconut	
282		5+348	282	0.45	10.450	L	Tree Palm	
283		5+355	283	0.45	13.440	L	Tree Coconut	
284		5+377	284	0.89	15.043	L	Tree Coconut	
285		5+381	285	1.69	10.633	L	Tree Palm	
286		5+400	286	0.59	13.956	L	Tree Coconut	
287		5+402	287	0.34	12.873	L	Tree Palm	
288		5+404	288	0.30	12.679	L	Tree Palm	
289		5+406	289	0.32	13.837	L	Tree Coconut	
290		5+423	290	0.58	13.570	L	Tree Coconut	
291		5+427	291	0.47	14.631	L	Tree Coconut	
292		5+434	292	0.54	16.397	L	Tree Coconut	
293		5+442	293	0.56	10.805	L	Tree Other	
294		5+446	294	0.41	9.824	L	Tree Palm	
295		5+451	295	0.34	14.936	L	Tree Coconut	
296		5+454	296	0.33	13.506	L	Tree Other	
297		5+454	297	0.53	11.857	L	Tree Coconut	
298		5+456	298	0.51	14.419	L	Tree Coconut	
299		5+461	299	0.50	14.386	L	Tree Coconut	
300		5+465	300	0.45	12.249	L	Tree Coconut	
301		5+470	301	0.59	12.077	L	Tree Coconut	
302		5+470	302	0.31	12.151	L	Tree Coconut	
303		5+475	303	0.38	12.865	L	Tree Coconut	
304		5+479	304	0.56	14.543	L	Tree Coconut	

305		5+496	305	0.99	8.602	L	Tree Other	
306		5+498	306	0.52	16.801	L	Tree Coconut	
307		5+509	307	0.45	13.367	L	Tree Coconut	
308		5+530	308	0.41	16.505	L	Tree Other	
309		5+531	309	0.31	16.325	L	Tree Coconut	
310		5+540	310	0.38	12.225	L	Tree Palm	
311		5+552	311	0.56	12.398	L	Tree Coconut	
312		5+566	312	0.68	12.398	L	Tree Coconut	
313		5+566	313	0.52	12.398	L	Tree Coconut	
314		5+631	314	0.55	17.208	L	Tree Other	
315		5+649	315	0.43	19.563	L	Tree Coconut	
316		5+663	316	0.37	16.219	L	Tree Palm	
317		5+665	317	0.30	19.148	L	Tree Coconut	
318		5+665	318	0.38	20.441	L	Tree Palm	
319		5+665	319	0.58	20.434	L	Tree Palm	
320		5+668	320	0.49	15.834	L	Tree Coconut	
321		5+705	321	0.45	13.752	L	Tree Other	
322		5+734	322	0.43	14.761	L	Tree Coconut	
323		5+920	323	0.36	15.812	L	Tree Coconut	
324	6+000	6+059	324	0.34	18.749	L	Tree Other	
325		6+210	325	0.58	13.211	L	Tree Other	
326		6+274	326	0.60	12.691	L	Tree Coconut	
327		6+309	327	0.86	12.522	L	Tree Coconut	
328		6+315	328	0.76	12.242	L	Tree Coconut	
329		6+322	329	0.35	8.502	L	Tree Other	
330		6+336	330	0.48	13.075	L	Tree Coconut	
331		6+337	331	0.77	15.647	L	Tree Coconut	
332		6+343	332	0.60	13.878	L	Tree Coconut	

333		6+351	333	0.34	8.781	L	Tree Other	
334		6+360	334	0.32	8.957	L	Tree Other	
335		6+398	335	0.34	16.101	L	Tree Coconut	
336		6+402	336	0.39	16.108	L	Tree Coconut	
337		6+407	337	0.57	16.240	L	Tree Coconut	
338		6+417	338	0.55	16.342	L	Tree Coconut	
339		6+418	339	0.59	12.867	L	Tree Coconut	
340		6+426	340	0.60	12.035	L	Tree Coconut	
341		6+434	341	0.37	12.722	L	Tree Coconut	
342		6+439	342	0.38	13.494	L	Tree Other	
343		6+443	343	0.72	16.808	L	Tree Coconut	
344		6+445	344	0.82	13.125	L	Tree Coconut	
345		6+572	345	0.81	11.546	L	Tree Coconut	
346		6+576	346	0.90	12.704	L	Tree Coconut	
347		6+580	347	0.34	11.960	L	Tree Coconut	
348		6+598	348	0.60	11.945	L	Tree Coconut	
349		6+605	349	0.54	12.301	L	Tree Coconut	
350		6+611	350	0.36	11.064	L	Tree Coconut	
351		6+618	351	0.54	10.321	L	Tree Coconut	
352		6+633	352	0.58	11.616	L	Tree Coconut	
353		6+639	353	0.60	11.268	L	Tree Coconut	
354		6+644	354	0.60	10.803	L	Tree Coconut	
355		6+671	355	0.34	9.820	L	Tree Coconut	
356		6+677	356	0.52	9.325	L	Tree Coconut	
357		6+819	357	0.30	11.196	L	Tree Coconut	
358		6+825	358	0.32	8.133	L	Tree Coconut	
359		6+831	359	0.38	8.334	L	Tree Coconut	
360		6+845	360	0.58	9.815	L	Tree Coconut	

361		6+856	361	0.56	9.875	L	Tree Coconut	
362		6+860	362	0.37	8.981	L	Tree Coconut	
363		6+872	363	0.73	7.776	L	Tree Coconut	
364		6+884	364	0.49	7.740	L	Tree Coconut	
365		6+889	365	0.42	9.509	L	Tree Coconut	
366		6+900	366	0.50	9.637	L	Tree Coconut	
367		6+906	367	0.56	9.151	L	Tree Coconut	
368		6+913	368	0.40	9.699	L	Tree Coconut	
369		6+923	369	0.49	9.442	L	Tree Coconut	
370		6+928	370	0.41	9.590	L	Tree Coconut	
371		6+934	371	0.31	9.524	L	Tree Coconut	
372		6+939	372	0.39	9.206	L	Tree Coconut	
373		6+939	373	0.52	9.166	L	Tree Coconut	
374		6+945	374	0.54	9.163	L	Tree Coconut	
375		6+949	375	0.38	9.684	L	Tree Coconut	
376		6+954	376	0.60	10.155	L	Tree Coconut	
377	7+000	7+024	377	0.61	11.452	L	Tree Other	
378		7+026	378	0.58	12.262	L	Tree Other	
379		7+033	379	0.56	12.581	L	Tree Coconut	
380		7+039	380	0.78	12.854	L	Tree Coconut	
381		7+042	381	0.58	11.871	L	Tree Mango	
382		7+049	382	0.65	11.583	L	Tree Mango	
383		7+072	383	1.77	5.343	L	Tree Other	
384		7+074	384	0.32	6.518	L	Tree Other	
385		7+177	385	0.42	11.631	L	Tree Coconut	
386		7+180	386	0.36	11.837	L	Tree Coconut	
387		7+232	387	0.76	10.325	L	Tree Coconut	
388		7+240	388	0.54	10.618	L	Tree Coconut	

389		7+244	389	0.31	10.562	L	Tree Coconut	
390		7+248	390	0.52	11.033	L	Tree Coconut	
391		7+252	391	0.36	10.888	L	Tree Coconut	
392		7+254	392	0.58	11.127	L	Tree Other	
393		7+256	393	0.57	10.706	L	Tree Other	
394		7+262	394	0.45	9.653	L	Tree Other	
395		7+270	395	0.36	12.629	L	Tree Palm	
396		7+286	396	0.71	10.734	L	Tree Coconut	
397		7+291	397	0.45	10.766	L	Tree Coconut	
398		7+299	398	0.35	10.936	L	Tree Neem	
399		7+304	399	0.48	11.798	L	Tree Mango	
400		7+304	400	0.56	13.688	L	Tree Coconut	
401		7+314	401	0.54	11.544	L	Tree Other	
402		7+317	402	0.53	10.959	L	Tree Mango	
403		7+358	403	0.35	9.919	L	Tree Coconut	
404		7+358	404	0.56	17.395	L	Tree Coconut	
405		7+360	405	0.54	5.545	L	Tree Other	
406		7+365	406	0.35	17.151	L	Tree Coconut	
407		7+368	407	0.51	16.326	L	Tree Coconut	
408		7+370	408	0.50	15.501	L	Tree Coconut	
409		7+371	409	0.36	9.561	L	Tree Coconut	
410		7+374	410	0.58	16.055	L	Tree Coconut	
411		7+375	411	0.54	15.245	L	Tree Mango	
412		7+375	412	0.56	9.456	L	Tree Coconut	
413		7+378	413	0.80	11.827	L	Tree Coconut	
414		7+436	414	0.54	11.479	L	Tree Mango	
415		7+446	415	0.48	11.310	L	Tree Coconut	
416		7+447	416	0.35	11.023	L	Tree Coconut	

417		7+450	417	0.60	10.255	L	Tree Coconut	
418		7+451	418	0.60	10.627	L	Tree Coconut	
419		7+452	419	0.45	15.628	L	Tree Coconut	
420		7+459	420	0.54	10.691	L	Tree Coconut	
421		7+460	421	0.60	10.434	L	Tree Coconut	
422		7+465	422	0.58	14.875	L	Tree Coconut	
423		7+468	423	0.57	9.704	L	Tree Coconut	
424		7+479	424	0.36	16.296	L	Tree Coconut	
425		7+481	425	0.53	14.054	L	Tree Coconut	
426		7+486	426	0.57	12.214	L	Tree Coconut	
427		7+487	427	0.60	15.701	L	Tree Coconut	
428		7+511	428	0.54	10.195	L	Tree Coconut	
429		7+540	429	0.56	9.669	L	Tree Coconut	
430		7+545	430	0.35	10.173	L	Tree Coconut	
431		7+553	431	0.31	10.754	L	Tree Coconut	
432		7+615	432	0.39	10.915	L	Tree Coconut	
433		7+619	433	0.30	13.871	L	Tree Coconut	
434		7+624	434	0.70	15.326	L	Tree Coconut	
435		7+631	435	0.34	12.926	L	Tree Coconut	
436		7+637	436	0.76	17.082	L	Tree Coconut	
437		7+639	437	0.77	17.011	L	Tree Coconut	
438		7+644	438	0.35	13.173	L	Tree Mango	
439		7+647	439	0.45	13.895	L	Tree Coconut	
440		7+672	440	0.60	15.498	L	Tree Coconut	
441		7+675	441	0.53	14.291	L	Tree Coconut	
442		7+683	442	0.56	13.835	L	Tree Coconut	
443		7+688	443	0.54	14.480	L	Tree Coconut	
444		7+691	444	0.58	14.222	L	Tree Coconut	

445		7+697	445	0.59	17.032	L	Tree Coconut	
446		7+710	446	0.56	13.358	L	Tree Other	
447		7+718	447	0.54	12.610	L	Tree Other	
448		7+722	448	2.54	17.164	L	Tree Other	
449		7+788	449	0.59	12.935	L	Tree Coconut	
450		7+788	450	0.55	4.654	L	Tree Other	
451		7+791	451	0.50	13.323	L	Tree Coconut	
452		7+803	452	0.36	15.209	L	Tree Coconut	
453		7+809	453	0.59	13.702	L	Tree Coconut	
454		7+820	454	0.51	15.198	L	Tree Coconut	
455		7+826	455	0.58	13.250	L	Tree Coconut	
456		7+829	456	0.69	15.097	L	Tree Coconut	
457		7+832	457	0.57	13.600	L	Tree Coconut	
458		7+848	458	0.50	9.959	L	Tree Other	
459		7+931	459	0.56	16.673	L	Tree Coconut	
460		7+945	460	0.60	14.210	L	Tree Coconut	
461		7+959	461	0.54	15.047	L	Tree Coconut	
462		7+971	462	0.50	16.959	L	Tree Coconut	
463		7+976	463	0.32	17.671	L	Tree Coconut	
464		7+980	464	1.85	16.495	L	Tree Mango	
465		7+991	465	0.60	13.815	L	Tree Coconut	
466	8+000	8+003	466	0.75	10.228	L	Tree Coconut	
467		8+025	467	0.35	11.028	L	Tree Coconut	
468		8+026	468	0.38	14.561	L	Tree Coconut	
469		8+046	469	0.59	10.292	L	Tree Coconut	
470		8+053	470	0.55	9.159	L	Tree Other	
471		8+053	471	0.35	10.890	L	Tree Other	
472		8+068	472	0.58	10.401	L	Tree Other	

473		8+072	473	0.55	14.258	L	Tree Coconut	
474		8+075	474	0.54	12.010	L	Tree Coconut	
475		8+077	475	0.58	10.080	L	Tree Palm	
476		8+160	476	0.59	14.632	L	Tree Coconut	
477		8+168	477	0.59	14.535	L	Tree Coconut	
478		8+178	478	1.38	14.150	L	Tree Coconut	
479		8+193	479	0.55	13.986	L	Tree Coconut	
480		8+200	480	0.68	10.670	L	Tree Coconut	
481		8+207	481	0.69	12.565	L	Tree Neem	
482		8+209	482	0.38	13.462	L	Tree Coconut	
483		8+209	483	0.45	13.398	L	Tree Coconut	
484		8+216	484	0.88	13.194	L	Tree Coconut	
485		8+232	485	0.54	12.652	L	Tree Coconut	
486		8+232	486	0.60	12.280	L	Tree Coconut	
487		8+234	487	0.35	11.060	L	Tree Coconut	
488		8+240	488	0.53	11.857	L	Tree Coconut	
489		8+242	489	0.67	13.760	L	Tree Coconut	
490		8+247	490	0.53	11.346	L	Tree Coconut	
491		8+256	491	0.36	11.430	L	Tree Coconut	
492		8+256	492	0.75	11.401	L	Tree Coconut	
493		8+259	493	0.54	12.903	L	Tree Coconut	
494		8+270	494	0.56	13.428	L	Tree Coconut	
495		8+272	495	0.77	12.868	L	Tree Coconut	
496		8+275	496	0.52	13.998	L	Tree Coconut	
497		8+290	497	0.57	12.527	L	Tree Coconut	
498		8+310	498	0.35	12.077	L	Tree Mango	
499		8+313	499	0.74	13.731	L	Tree Coconut	
500		8+317	500	0.90	14.726	L	Tree Coconut	

501		8+317	501	0.84	15.112	L	Tree Coconut	
502		8+338	502	0.80	12.942	L	Tree Other	
503		8+403	503	0.72	8.711	L	Tree Neem	
504		8+446	504	0.61	9.846	L	Tree Mango	
505		8+475	505	0.60	15.117	L	Tree Coconut	
506		8+475	506	0.83	15.380	L	Tree Coconut	
507		8+509	507	0.53	9.595	L	Tree Coconut	
508		8+542	508	0.54	15.669	L	Tree Coconut	
509		8+545	509	0.80	6.437	L	Tree Other	
510		8+548	510	0.60	15.493	L	Tree Coconut	
511		8+613	511	0.45	15.604	L	Tree Coconut	
512		8+615	512	0.58	14.216	L	Tree Coconut	
513		8+618	513	0.54	15.162	L	Tree Coconut	
514		8+621	514	0.35	16.016	L	Tree Coconut	
515		8+622	515	0.45	14.362	L	Tree Coconut	
516		8+626	516	0.60	15.717	L	Tree Coconut	
517		8+627	517	0.52	16.495	L	Tree Coconut	
518		8+662	518	0.55	16.846	L	Tree Mango	
519		8+762	519	0.45	3.972	L	Tree Other	
520		8+876	520	2.80	7.069	L	Tree Banyan	
521		8+882	521	0.56	7.262	L	Tree Other	
522		9+087	522	0.57	7.200	L	Tree Other	
523		9+118	523	0.56	10.705	L	Tree Other	
524		9+273	524	0.52	13.007	L	Tree Coconut	
525		9+279	525	0.53	12.697	L	Tree Coconut	
526		9+281	526	0.51	10.828	L	Tree Coconut	
527		9+282	527	0.50	10.639	L	Tree Coconut	
528		9+312	528	0.38	12.903	L	Tree Other	

529		9+319	529	0.49	14.898	L	Tree Other	
530		9+347	530	0.49	11.452	L	Tree Palm	
531		9+368	531	0.44	14.576	L	Tree Coconut	
532		9+370	532	0.42	10.358	L	Tree Coconut	
533		9+375	533	0.35	9.412	L	Tree Other	
534		9+381	534	0.88	10.024	L	Tree Other	
535		9+386	535	0.30	8.151	L	Tree Other	
536		9+387	536	0.56	11.087	L	Tree Other	
537		9+400	537	0.58	13.050	L	Tree Other	
538		9+409	538	0.58	12.957	L	Tree Other	
539		9+468	539	0.50	10.512	L	Tree Coconut	
540		9+494	540	0.52	13.626	L	Tree Coconut	
541		9+497	541	0.56	13.555	L	Tree Coconut	
542		9+497	542	0.54	13.602	L	Tree Coconut	
543		9+498	543	0.52	10.282	L	Tree Neem	
544		9+502	544	0.56	14.027	L	Tree Coconut	
545		9+502	545	0.57	14.048	L	Tree Coconut	
546		9+507	546	0.56	13.507	L	Tree Coconut	
547		9+507	547	0.55	13.563	L	Tree Coconut	
548		9+608	548	0.51	16.466	L	Tree Other	
549		9+608	549	0.58	15.785	L	Tree Other	
550		9+608	550	0.59	15.791	L	Tree Other	
551		9+610	551	0.51	14.320	L	Tree Other	
552		9+622	552	2.26	12.495	L	Tree Banyan	
553		9+629	553	0.52	13.436	L	Tree Other	
554		9+640	554	0.60	13.081	L	Tree Other	
555		9+649	555	0.51	14.631	L	Tree Neem	
556		9+663	556	0.55	9.747	L	Tree Other	

557		9+668	557	0.54	10.115	L	Tree Other	
558		9+722	558	1.46	15.606	L	Tree Neem	
559		9+768	559	0.36	13.046	L	Tree Other	
560		9+784	560	0.57	17.271	L	Tree Other	
561		9+801	561	0.82	15.072	L	Tree Palm	
562		9+825	562	0.75	13.865	L	Tree Neem	
563		9+826	563	0.58	12.696	L	Tree Palm	
564		9+828	564	0.59	13.575	L	Tree Palm	
565		9+882	565	0.54	16.978	L	Tree Other	
566		9+937	566	0.58	11.406	L	Tree Other	
567	10+000	10+002	567	0.51	13.157	L	Tree Palm	
568		10+004	568	0.56	13.230	L	Tree Palm	
569		10+007	569	0.55	11.852	L	Tree Coconut	
570		10+009	570	0.53	12.434	L	Tree Palm	
571		10+024	571	0.30	9.902	L	Tree Mango	
572		10+032	572	0.52	16.538	L	Tree Palm	
573		10+038	573	0.56	15.867	L	Tree Palm	
574		10+045	574	0.54	14.793	L	Tree Palm	
575		10+047	575	0.55	14.858	L	Tree Palm	
576		10+049	576	0.52	15.423	L	Tree Palm	
577		10+050	577	0.32	15.851	L	Tree Palm	
578		10+056	578	0.56	13.426	L	Tree Palm	
579		10+060	579	0.51	13.271	L	Tree Palm	
580		10+062	580	0.58	15.907	L	Tree Palm	
581		10+067	581	0.59	15.761	L	Tree Palm	
582		10+068	582	0.52	12.654	L	Tree Palm	
583		10+072	583	0.77	11.946	L	Tree Palm	
584		10+098	584	0.54	13.663	L	Tree Other	

585		10+102	585	0.56	12.857	L	Tree Palm	
586		10+110	586	0.53	10.562	L	Tree Palm	
587		10+112	587	0.51	15.130	L	Tree Palm	
588		10+129	588	0.58	11.848	L	Tree Palm	
589		10+134	589	0.35	13.314	L	Tree Other	
590		10+169	590	0.36	12.179	L	Tree Palm	
591		10+226	591	0.56	13.476	L	Tree Palm	
592		10+236	592	0.48	13.260	L	Tree Palm	
593		10+242	593	0.44	12.183	L	Tree Palm	
594		10+245	594	0.60	16.460	L	Tree Palm	
595		10+251	595	0.59	12.596	L	Tree Palm	
596		10+283	596	0.54	9.165	L	Tree Other	
597		10+349	597	0.40	9.767	L	Tree Other	
598		10+497	598	0.44	10.761	L	Tree Palm	
599		10+530	599	0.30	10.355	L	Tree Palm	
600		10+541	600	0.56	11.978	L	Tree Palm	
601		10+641	601	0.72	16.805	L	Tree Palm	
602		10+647	602	0.52	16.198	L	Tree Palm	
603		10+651	603	0.71	14.601	L	Tree Palm	
604		10+653	604	0.31	11.479	L	Tree Palm	
605		10+654	605	0.60	14.133	L	Tree Palm	
606		10+668	606	0.45	10.379	L	Tree Palm	
607		10+671	607	3.22	14.519	L	Tree Banyan	
608		10+673	608	0.52	14.697	L	Tree Palm	
609		10+725	609	0.35	7.115	L	Tree Other	
610		10+738	610	0.55	17.023	L	Tree Palm	
611		10+748	611	0.58	14.481	L	Tree Palm	
612		10+748	612	0.45	14.480	L	Tree Palm	

613		10+764	613	0.60	15.424	L	Tree Palm	
614		10+764	614	0.35	15.826	L	Tree Palm	
615		10+766	615	0.50	15.317	L	Tree Palm	
616		10+773	616	0.53	15.306	L	Tree Palm	
617		10+773	617	1.63	13.765	L	Tree Palm	
618		10+774	618	0.54	13.559	L	Tree Palm	
619		10+775	619	1.20	13.561	L	Tree Palm	
620		10+785	620	1.84	15.164	L	Tree Palm	
621		10+788	621	1.36	15.738	L	Tree Palm	
622		10+789	622	0.60	14.101	L	Tree Palm	
623		10+789	623	0.34	15.898	L	Tree Palm	
624		10+864	624	0.31	17.311	L	Tree Palm	
625		10+879	625	0.54	13.862	L	Tree Palm	
626		10+882	626	0.57	16.987	L	Tree Palm	
627		10+884	627	0.60	16.831	L	Tree Palm	
628		10+892	628	0.90	16.591	L	Tree Palm	
629		10+901	629	0.34	16.029	L	Tree Palm	
630		10+905	630	0.32	16.868	L	Tree Palm	
631		10+909	631	0.51	13.770	L	Tree Palm	
632		10+914	632	0.60	16.064	L	Tree Palm	
633		10+916	633	0.59	12.614	L	Tree Palm	
634		10+916	634	1.35	16.333	L	Tree Palm	
635		10+926	635	0.35	15.959	L	Tree Palm	
636		10+928	636	0.73	16.133	L	Tree Palm	
637		10+972	637	0.40	12.941	L	Tree Palm	
638		10+981	638	0.34	11.532	L	Tree Palm	
639		10+986	639	0.46	16.432	L	Tree Other	
640		10+988	640	0.46	15.223	L	Tree Palm	

641		10+993	641	0.52	15.660	L	Tree Other	
642		10+997	642	0.70	15.570	L	Tree Other	
643	11+000	11+008	643	0.50	17.379	L	Tree Palm	
644		11+009	644	0.36	17.066	L	Tree Palm	
645		11+012	645	0.45	17.258	L	Tree Palm	
646		11+025	646	0.42	10.276	L	Tree Palm	
647		11+027	647	0.60	12.537	L	Tree Palm	
648		11+028	648	0.39	14.909	L	Tree Palm	
649		11+031	649	0.37	11.206	L	Tree Palm	
650		11+036	650	0.35	13.829	L	Tree Palm	
651		11+036	651	0.45	15.614	L	Tree Palm	
652		11+061	652	0.52	12.728	L	Tree Palm	
653		11+104	653	0.34	16.467	L	Tree Palm	
654		11+125	654	0.37	9.819	L	Tree Palm	
655		11+166	655	1.45	17.031	L	Tree Palm	
656		11+181	656	0.32	15.870	L	Tree Palm	
657		11+230	657	0.45	9.290	L	Tree Palm	
658		11+255	658	0.56	6.529	L	Tree Other	
659		11+287	659	0.37	5.866	L	Tree Other	
660		11+314	660	0.56	11.572	L	Tree Palm	
661		11+314	661	0.52	13.954	L	Tree Palm	
662		11+342	662	0.42	10.063	L	Tree Palm	
663		11+375	663	0.42	9.036	L	Tree Palm	
664		11+376	664	0.36	8.077	L	Tree Palm	
665		11+390	665	1.36	8.960	L	Tree Palm	
666		11+411	666	0.39	14.501	L	Tree Palm	
667		11+425	667	0.54	9.602	L	Tree Palm	
668		11+427	668	0.53	12.005	L	Tree Palm	

669		11+438	669	0.59	10.870	L	Tree Palm	
670		11+439	670	0.53	10.449	L	Tree Palm	
671		11+441	671	0.38	11.995	L	Tree Palm	
672		11+444	672	0.35	11.235	L	Tree Palm	
673		11+445	673	0.34	11.164	L	Tree Palm	
674		11+450	674	0.52	10.288	L	Tree Palm	
675		11+452	675	0.60	12.185	L	Tree Palm	
676		11+453	676	0.37	12.359	L	Tree Palm	
677		11+456	677	0.34	9.457	L	Tree Palm	
678		11+464	678	0.56	11.329	L	Tree Palm	
679		11+464	679	0.35	9.014	L	Tree Palm	
680		11+466	680	0.80	11.431	L	Tree Palm	
681		11+472	681	0.42	8.838	L	Tree Other	
682		11+482	682	0.36	11.212	L	Tree Palm	
683		11+483	683	0.51	10.420	L	Tree Palm	
684		11+490	684	0.34	7.466	L	Tree Other	
685		11+491	685	0.32	9.354	L	Tree Other	
686		11+492	686	1.03	9.435	L	Tree Palm	
687		11+493	687	0.42	10.695	L	Tree Palm	
688		11+493	688	0.41	10.757	L	Tree Palm	
689		11+494	689	0.36	12.279	L	Tree Palm	
690		11+495	690	0.42	10.821	L	Tree Palm	
691		11+495	691	0.60	12.555	L	Tree Palm	
692		11+496	692	0.52	11.131	L	Tree Palm	
693		11+496	693	0.34	14.943	L	Tree Palm	
694		11+496	694	0.60	12.062	L	Tree Palm	
695		11+498	695	0.56	12.148	L	Tree Palm	
696		11+503	696	0.85	14.297	L	Tree Palm	

697		11+510	697	2.85	13.772	L	Tree Banyan	
698		11+514	698	0.59	13.421	L	Tree Palm	
699		11+517	699	0.88	13.550	L	Tree Palm	
700		11+517	700	0.55	14.182	L	Tree Palm	
701		11+519	701	0.38	13.903	L	Tree Palm	
702		11+526	702	0.57	14.465	L	Tree Palm	
703		11+527	703	0.48	17.235	L	Tree Palm	
704		11+565	704	0.35	16.262	L	Tree Palm	
705		11+566	705	0.48	6.633	L	Tree Other	
706		11+571	706	0.59	12.751	L	Tree Palm	
707		11+575	707	0.53	13.044	L	Tree Palm	
708		11+581	708	0.36	13.759	L	Tree Palm	
709		11+586	709	0.34	14.175	L	Tree Palm	
710		11+587	710	0.62	12.262	L	Tree Palm	
711		11+589	711	0.35	13.324	L	Tree Palm	
712		11+590	712	0.42	12.908	L	Tree Palm	
713		11+591	713	0.35	7.087	L	Tree Palm	
714		11+600	714	0.60	9.960	L	Tree Palm	
715		11+603	715	0.52	13.771	L	Tree Palm	
716		11+608	716	0.34	13.100	L	Tree Palm	
717		11+612	717	0.54	14.082	L	Tree Palm	
718		11+617	718	0.51	9.837	L	Tree Palm	
719		11+624	719	0.60	13.538	L	Tree Palm	
720		11+624	720	0.35	12.315	L	Tree Palm	
721		11+625	721	0.45	13.622	L	Tree Palm	
722		11+625	722	0.35	13.534	L	Tree Palm	
723		11+627	723	0.58	13.911	L	Tree Palm	
724		11+627	724	0.60	12.192	L	Tree Palm	

725		11+629	725	0.37	11.257	L	Tree Palm	
726		11+631	726	0.52	6.773	L	Tree Palm	
727		11+632	727	0.60	14.198	L	Tree Palm	
728		11+634	728	0.56	13.626	L	Tree Palm	
729		11+649	729	0.54	10.074	L	Tree Palm	
730		11+649	730	0.53	9.025	L	Tree Palm	
731		11+652	731	0.60	8.642	L	Tree Palm	
732		11+655	732	0.56	8.263	L	Tree Palm	
733		11+656	733	0.52	9.950	L	Tree Palm	
734		11+657	734	0.54	9.324	L	Tree Palm	
735		11+662	735	0.81	13.807	L	Tree Palm	
736		11+663	736	0.90	13.360	L	Tree Other	
737		11+668	737	0.83	13.382	L	Tree Palm	
738		11+673	738	0.75	13.354	L	Tree Palm	
739		11+681	739	0.52	6.496	L	Tree Other	
740		11+681	740	0.70	13.558	L	Tree Palm	
741		11+684	741	0.71	13.215	L	Tree Palm	
742		11+685	742	0.78	13.470	L	Tree Palm	
743		11+685	743	0.75	13.637	L	Tree Palm	
744		11+688	744	0.84	14.004	L	Tree Palm	
745		11+689	745	7.00	10.900	L	Tree Palm	
746		11+690	746	0.32	10.293	L	Tree Palm	
747		11+692	747	0.85	9.598	L	Tree Palm	
748		11+704	748	0.36	7.781	L	Tree Palm	
749		11+704	749	0.34	12.520	L	Tree Palm	
750		11+710	750	1.75	11.749	L	Tree Palm	
751		11+710	751	0.69	12.546	L	Tree Palm	
752		11+712	752	0.66	13.716	L	Tree Palm	

753		11+747	753	0.36	7.771	L	Tree Palm	
754		11+748	754	0.62	9.267	L	Tree Palm	
755		11+766	755	1.56	13.048	L	Tree Palm	
756		11+767	756	0.33	13.354	L	Tree Palm	
757		11+797	757	0.67	14.236	L	Tree Palm	
758		11+806	758	0.86	12.605	L	Tree Palm	
759		11+807	759	1.44	12.635	L	Tree Palm	
760		11+809	760	0.84	11.817	L	Tree Palm	
761		11+811	761	0.85	8.917	L	Tree Other	
762		11+813	762	0.69	13.064	L	Tree Palm	
763		11+813	763	0.83	13.246	L	Tree Palm	
764		11+815	764	0.88	9.000	L	Tree Palm	
765		11+818	765	0.86	8.178	L	Tree Palm	
766		11+818	766	0.85	13.020	L	Tree Palm	
767		11+822	767	0.45	12.479	L	Tree Palm	
768		11+823	768	0.55	12.745	L	Tree Palm	
769		11+830	769	0.60	10.765	L	Tree Palm	
770		11+832	770	0.59	11.205	L	Tree Palm	
771		11+833	771	0.55	11.319	L	Tree Palm	
772		11+833	772	0.57	8.935	L	Tree Palm	
773		11+835	773	1.08	10.840	L	Tree Palm	
774		11+839	774	0.53	12.928	L	Tree Palm	
775		11+840	775	0.35	13.886	L	Tree Palm	
776		11+849	776	1.90	14.250	L	Tree Banyan	
777		11+850	777	0.46	13.712	L	Tree Palm	
778		11+851	778	0.41	11.212	L	Tree Palm	
779		11+852	779	0.75	12.566	L	Tree Palm	
780		11+901	780	0.40	6.837	L	Tree Other	

781		11+988	781	0.84	12.969	L	Tree Other	
782		11+989	782	0.86	16.149	L	Tree Palm	
783	12+000	12+001	783	3.35	11.183	L	Tree Banyan	
784		12+037	784	0.41	13.713	L	Tree Palm	
785		12+039	785	0.51	13.300	L	Tree Palm	
786		12+050	786	0.81	9.772	L	Tree Other	
787		12+058	787	0.83	8.520	L	Tree Other	
788		12+062	788	1.55	9.600	L	Tree Other	
789		12+070	789	0.84	5.713	L	Tree Other	
790		12+109	790	0.88	13.768	L	Tree Mango	
791		12+148	791	1.35	5.968	L	Tree Peepal	
792		12+199	792	0.36	7.943	L	Tree Other	
793		12+200	793	0.42	16.620	L	Tree Mango	
794		12+209	794	0.52	4.064	L	Tree Tamarind	
795		12+232	795	0.52	14.606	L	Tree Coconut	
796		12+236	796	0.51	14.507	L	Tree Coconut	
797		12+275	797	0.42	2.479	L	Tree Other	
798		12+320	798	0.46	5.316	L	Tree Palm	
799		12+320	799	0.63	14.747	L	Tree Palm	
800		12+354	800	1.36	5.197	L	Tree Banyan	
801		12+369	801	1.75	3.261	L	Tree Banyan	
802		12+388	802	1.65	2.861	L	Tree Banyan	
803		12+406	803	0.62	4.005	L	Tree Banyan	
804		12+425	804	1.25	4.961	L	Tree Banyan	
805		12+445	805	0.80	11.638	L	Tree Banyan	
806		12+446	806	1.52	10.900	L	Tree Banyan	
807		12+449	807	0.69	9.708	L	Tree Banyan	
808		12+471	808	0.53	15.451	L	Tree Banyan	

809		12+479	809	0.67	5.019	L	Tree Banyan	
810		12+482	810	0.34	16.333	L	Tree Banyan	
811		12+495	811	0.58	4.100	L	Tree Banyan	
812		12+523	812	0.56	8.481	L	Tree Banyan	
813		12+541	813	1.92	16.552	L	Tree Banyan	
814		12+577	814	0.61	3.486	L	Tree Banyan	
815		12+611	815	0.42	4.982	L	Tree Banyan	
816		12+697	816	4.25	4.396	L	Tree Banyan	
817		12+712	817	1.26	8.063	L	Tree Banyan	
818		12+720	818	1.16	15.400	L	Tree Banyan	
819		12+814	819	3.45	6.529	L	Tree Banyan	
820		12+887	820	1.98	5.339	L	Tree Banyan	
821		12+908	821	2.26	4.894	L	Tree Banyan	
822		12+948	822	3.21	4.972	L	Tree Banyan	
823		12+958	823	0.52	13.450	L	Tree Other	
824		12+972	824	0.60	12.837	L	Tree Mango	
825		12+999	825	0.51	13.283	L	Tree Palm	
826	13+000	13+038	826	0.39	13.326	L	Tree Neem	
827		13+073	827	0.82	16.033	L	Tree Palm	
828		13+128	828	0.50	15.437	L	Tree Other	
829		13+132	829	0.58	14.764	L	Tree Palm	
830		13+133	830	0.42	15.319	L	Tree Palm	
831		13+140	831	1.36	14.515	L	Tree Palm	
832		13+148	832	0.40	14.915	L	Tree Palm	
833		13+151	833	0.44	14.987	L	Tree Other	
834		13+158	834	0.36	15.107	L	Tree Other	
835		13+190	835	0.53	13.495	L	Tree Other	
836		13+202	836	0.35	13.305	L	Tree Other	

837		13+212	837	1.54	13.862	L	Tree Other	
838		13+218	838	0.52	14.602	L	Tree Palm	
839		13+236	839	0.35	16.216	L	Tree Other	
840		13+244	840	0.84	14.405	L	Tree Other	
841		13+246	841	0.82	13.812	L	Tree Other	
842		13+248	842	0.30	13.126	L	Tree Other	
843		13+251	843	0.36	12.856	L	Tree Other	
844		13+297	844	1.55	10.673	L	Tree Neem	
845		13+311	845	0.58	16.221	L	Tree Palm	
846		13+324	846	0.86	10.489	L	Tree Palm	
847		13+424	847	1.20	13.654	L	Tree Palm	
848		13+426	848	1.62	12.670	L	Tree Palm	
849		13+428	849	0.44	12.733	L	Tree Other	
850		13+434	850	0.31	13.624	L	Tree Mango	
851		13+441	851	0.87	10.918	L	Tree Palm	
852		13+443	852	0.30	10.270	L	Tree Other	
853		13+445	853	0.85	11.245	L	Tree Palm	
854		13+476	854	0.60	13.710	L	Tree Other	
855		13+519	855	0.85	15.555	L	Tree Palm	
856		13+519	856	0.58	11.928	L	Tree Other	
857		13+588	857	0.80	15.893	L	Tree Palm	
858		13+589	858	0.54	13.847	L	Tree Palm	
859		13+590	859	0.84	15.628	L	Tree Palm	
860		13+596	860	0.60	14.426	L	Tree Palm	
861		13+599	861	0.82	14.351	L	Tree Palm	
862	14+000	14+117	862	0.81	12.035	L	Tree Palm	
863		14+240	863	1.36	11.004	L	Tree Other	
864		14+299	864	1.54	4.806	L	Tree Other	

865		14+692	865	0.52	14.111	L	Tree Coconut	
866	15+000	15+061	866	0.34	15.889	L	Tree Mango	
867		15+094	867	0.34	15.026	L	Tree Other	
868		15+466	868	0.51	15.241	L	Tree Other	

**Widening and Strengthening of Anakapalli-Atchuthapuram road km 1+670 to km 15+700 in the Visakhapatnam District**

S. No	Design Chainage		Tree List		Remarks
	From	To	RHS	LHS	
1	1+000	2+000	8	29	
2	2+000	3+000	42	89	
3	3+000	4+000	60	67	
4	4+000	5+000	109	66	
5	5+000	6+000	112	72	
6	6+000	7+000	30	53	
7	7+000	8+000	70	89	
8	8+000	9+000	69	56	
9	9+000	10+000	32	45	
10	10+000	11+000	81	76	
11	11+000	12+000	62	140	
12	12+000	13+000	52	43	
13	13+000	14+000	48	36	
14	14+000	15+000	11	4	
15	15+000	16+000	3	3	
<b>Total nos</b>			<b>789</b>	<b>868</b>	
<b>Grand Total</b>			<b>1657</b>		

## **Appendix 17: COVID-19 Health and Safety Plan and Precautions**

### **1 INTRODUCTION**

- This document is intended to supplement formal H&S policies, procedures and plans that the contractor has in place for its employees and staff working on VCICDP projects under loan 3430-IND and Grant 0495 and Visakhapatnam-Chennai Industrial Corridor Development Program Tranche 2. Hence, this document is not intended to replace any formalized procedures currently in place for the Contractor. Where this guideline does not meet or exceed the standards put forth by the Contractor, the Contractor shall abide by the most stringent procedure available.
- This approved project specific Health and Safety Plan (H&SP) shall be modified to require that the COVID-19 Officer (supervised by the contractor's environmental and health and safety officer) at the Contractor's worksite (appointed by Contractor and agreed by PIU) submit a written daily report to the Client's Representative (PIU Head). The COVID-19 Officer shall certify that the Contractor and all subcontractors are in full compliance with these guidelines.
- The COVID-19 officer should be present on site at all times.
- Any issue of non-compliance with these guidelines shall be a basis for the suspension of work. The Contractor will be required to submit a corrective action plan (on the next day or immediately as per the nature of issue) detailing each issue of non-conformance and a plan to rectify the issue(s). The Contractor will not be allowed to resume work until the plan is approved by the Client (PIU). Any additional issues of non-conformance may be subject to action against the Contractor's as health & safety/safeguard clauses of the contract.
- Construction sites operating during the Covid-19 pandemic need to ensure they are protecting their WORKFORCE and minimising the risk of spread of infection.
- This guidance is intended to introduce consistent measures on sites of all sizes in line with the Government's recommendations on social distancing.
- These are exceptional circumstances and the industry must remain abreast of and comply with the latest Government advice on COVID-19 at all times.
- The health and safety requirements of any construction activity must also not be compromised at this time. If an activity cannot be undertaken safely due to a lack of suitably qualified personnel being available or social distancing being implemented, it should not take place.
- It is to be noted that emergency services are also under great pressure and may not be in a position to respond as quickly as usual.
- Sites should remind the workforce at every opportunity of the Worksite Procedures which are aimed at protecting them, their colleagues, their families and the Andhra Pradesh population.
- If a worksite is not consistently implementing the measures in this document, it may be required to shut down.

### **2 PRINCIPLES OF WORKER PROTECTION**

- Consistently practice social distancing
- Cover coughs and sneezes
- Maintain hand hygiene
- Clean surfaces frequently

### **3 MAXIMUM PRECAUTION FOR PERSONS/LABOURERS REPORTING TO WORK**

- IF SICK, STAY HOME!
- IF SICK, GO HOME!
- IF SOMEONE SICK, SEND THEM HOME!

Contractor to provide face masks (of the type approved by Government for use to protect persons from COVID-19) to all persons working in or visiting the worksite. This along with procedures set out in this document is for maximum precaution to protect all persons/labourers at all times.

### **4 COVID-19 TYPICAL SYMPTOMS**

- Fever
- Cough
- Shortness of Breath
- Sore Throat

All persons at the worksite should have their temperature screened by COVID-19 officer with Infrared Thermometer (handheld non-contact).

### **5 SELF-ATTESTATION BY PERSONS/LABOUR PRIOR TO WORK**

Prior to starting a work (on daily basis), each labour /worker will self-attest to the supervisor:

- no signs of COVID-19 symptoms within the past 24 hours.
- No contact with an individual diagnosed with COVID-19. (contact means living with a positive person, being within 6 ft of positive person OR sharing things of positive person)
- Not undergone quarantine or isolation (in case of any labourer /worker who has been quarantined or isolated previously, the engagement shall be only after obtaining the requisite clearance)

The engagement of workers falling in the high-risk category such as workers over the age of 55 years, with underlying medical conditions or health issues, etc. should be done only after obtaining the requisite clearance from trained and registered medical practitioners.

The self-attestation would be verified in collaboration with trained and registered medical practitioners deployed at site through discussions with laborers /workers and/or preliminary checks such as temperature checks, etc. prior to their engagement at site.

In addition, the Contractor shall mandatorily follow all medical test requirements for the workers prior to their engagement and/or mobilization at site as per the guidelines issued by the Central and State government agencies and WHO from time to time.

Persons/Labourers showing COVID-19 symptoms or not providing self-attestation shall be directed to leave the work site and report to the fever clinic/quarantine centre immediately. Labour not to return to the work site until cleared by fever clinic/quarantine centre.

### **6 GENERAL DIRECTION**

- No handshake, Only Namaste

- Non-essential physical work that requires close contact between workers should not be carried out
- Work requiring physical contact should not be carried out
- Plan all other work to minimise contact between workers
- Wash hands often (every 1-2 hrs or frequently as possible) with soap for at least 20 seconds
- Use hand sanitizer
- No person should enter the work site other than the authorized persons mentioned by supervisor during start of work
- All must implement social distancing by maintaining a minimum distance of 6-feet from others at all times to eliminate the potential of cross contamination.
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing i.e., 6 ft from others.
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- All individual work group meetings/ talks should follow social distancing
- At each job briefing/toolbox talk, employees are asked if they are experiencing any symptoms, and are sent home if they are
- Each worksite should have laminated COVID-19 safety guidelines and handwashing instructions
- All restroom/toilet facilities should be cleaned (min twice a day), and handwashing facility must be provided with soap, hand sanitizer and paper towels
- All surfaces should be regularly cleaned, including mobiles, tabletops /surfaces, door handles, laptops, records, etc.
- All common areas and meeting areas are to be regularly cleaned (min twice a day) and disinfected at least twice a day
- All persons to maintain their own water bottle, and should not be shared.
- To avoid external contamination, it is recommended everyone bring food from home
- Please maintain Social Distancing separation during breaks and lunch.
- Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough /sneeze into your upper sleeves or elbow. Do not cough or sneeze into your hands.
- Clean your hands after coughing or sneezing thoroughly by using soap and water (minimum for 20 seconds). If soap and water are not available, please use a hand sanitizer. The Contractor shall ensure adequate quantities of sanitizer and soap are made available at all locations including site offices, meeting rooms, corridors, washrooms /toilets, etc. as appropriate.
- Avoid touching eyes, nose, and mouth with your hands
- To avoid sharing germs, please clean up after Yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings
- If you or a family member is feeling ill, stay home!
- Work schedules are adjusted to provide time for proper cleaning and disinfecting as required.

## **7 WORK-SITE PREVENTION PRACTICES**

- At the start of each shift, confirm with all employees that they are healthy and inform all workers of reusable and disposable PPE.
- Outside person(s) should be strictly prohibited at worksite

- All construction workers will be required to wear cut-resistant gloves or the equivalent.
- Use of eye protection (reusable safety goggles/face shields) is recommended. The supply of eye protection equipment to the workers is considered as a standard part of PPE during construction works.
- In work conditions where required social distancing is impossible to achieve, such employees shall be supplied with standard face mask, gloves, and eye protection.
- All employees shall drive to work site as per the prevailing guidelines of the Government in a single occupant vehicle. Staff shall not ride together in the same vehicle
- When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant (with 1% sodium hypochlorite solution daily) prior to entry. Adequate quantity of the disinfectant shall be provided by the Contractor at all such site-specific locations.
- Workers should maintain separation of 6' from each other.
- Multi person activities will be limited where feasible (two persons lifting activities)
- Gathering places on the site such as sheds and/or break areas will be eliminated, and instead small break areas will be used with seating limited to ensure social distancing.
- Contact the cleaning person of the worksite and ensure proper COVID-19 sanitation processes. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning. The Contractor shall make available adequate supply of PPE and chemicals while the threat of COVID-19 continues.
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles
- All employees to maintaining good health by getting adequate sleep; eating a balanced, healthy diet, avoid alcohol; and consume plenty of fluids.
- Continuation of works in construction project with workers available on site and no workers to be brought in from outside
- The site offices shall have adequate ventilation. The air conditioning or ventilation systems installed at the site offices would have high-efficiency air filters to reduce the risk of infection. The frequency of air changes may be increased for areas where close personal proximity cannot be fully prevented such as control rooms, elevators, waiting rooms, etc.
- The Contractor shall carry out contactless temperature checks for the workers prior to site entrance, during working hours and after site works to identify persons showing signs of being unwell with the COVID-19 symptoms

## **8 WASHING FACILITY**

- All worksites should have access to toilet and hand washing facility.
- Providing hand cleaning facilities at entrances and exits. This should be soap and water wherever possible or hand sanitiser if water is not available
- Washing facility with hot water, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees
- All onsite workers must help to maintain and keep stations clean

- If a worker notices soap or towels are running low or out, immediately notify supervisors. Proactively supervisor should make sure shortage situation never occurs.
- Garbage bins will be placed next to the hand wash facility for discarding of used tissues/towels with regular removal and disposal facility (end of each day)

## **9 CLEANING PROCEDURES**

Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning.

Each worksite should have enhanced cleaning and disinfection procedures that are posted and shared including sheds, gates, equipment, vehicles, etc. and shall be posted at all entry points to the sites, and throughout the project site. These include common areas and high touch points like

- Taps and washing facilities
- Toilet flush and seats
- Door handles and push plates
- Handrails on staircases and corridors
- Lift and hoist controls
- Machinery and equipment controls
- Food preparation and eating surfaces
- Telephone equipment / mobiles
- Keyboards, photocopiers and other office equipment

Re-usable PPE should be thoroughly cleaned after use and not shared between workers

## **10 LABOUR CAMP**

Contractor shall follow a zero-tolerance policy on wearing of masks.

Masks (homemade can be thought of) to be provided to all the persons/labourers for use at the camp site as well as at the worksite. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with disposable gloves, gown and face mask for each cycle of cleaning.

### **10.1 Toilet Facility**

- Restrict the number of people using toilet facility at any one time e.g. appoint one welfare attendant among the labours.
- Wash hands before and after using the facilities
- Enhance the cleaning regimes for toilet facilities particularly door handles, locks and the toilet flush
- Portable toilets should be avoided wherever possible, but where in use these should be cleaned and emptied more frequently
- Provide suitable and sufficient rubbish bins for hand towels with regular removal and disposal.

### **10.2 Eating/snacks Arrangements**

- With eateries having been closed (restricted) across Andhra Pradesh, providing permanent (till society is safe from COVID-19) on-camp/off-camp cook/helpers can be implemented. Make sure that the “Guidelines for food handling, preparation and distribution during COVID-19” and its regular updates are being followed.
- Whilst there is a requirement for construction camps to provide a means of heating food and making hot water, these are exceptional circumstances and where it is not possible to introduce a means of keeping equipment clean between use, etc. must be removed from use.
- Contractor to arrange all daily need items and grocery at site itself and no worker is allowed to go to shops for daily need items.
- Dedicated eating areas should be identified on camp to reduce food waste and contamination
- Break times should be staggered to reduce congestion and contact at all times
- Hand cleaning facilities or hand sanitiser should be available at the entrance of any room where people eat and should be used by workers when entering and leaving the area
- Workers should sit 2 metres “6 feet” apart from each other whilst eating and avoid all contact
- Where catering is provided on camp, it should provide pre-prepared and wrapped food only
  - Payments should be taken by contactless options wherever possible
  - Crockery, eating utensils, cups etc. should be avoided wherever possible
- Drinking water should be provided with enhanced cleaning measures of the tap mechanism introduced
- Tables should be cleaned between each use
- All rubbish should be put straight in the bin and not left for someone else to clear up; only covered pedal operated bins should be used and the bins should be cleared and cleaned regularly, with strict adherence to safety protocols for disposal and hygiene maintenance (including proper PPE’s such as gloves, mask and apron worn by the waste handler/cleaner and disposal at a designated place);
- All areas used for eating must be thoroughly cleaned at the end of each break and shift, including chairs, door handles, etc.

### **10.3 Changing Facilities, Showers and Drying Areas**

- Introduce staggered start and finish times to reduce congestion and contact at all times
- Introduce enhanced cleaning of all facilities throughout the day and at the end of each day
- Consider increasing the number or size of facilities available on camp if possible
- Based on the size of each facility, determine how many people can use it at any one time to maintain a distance of two metres
- Provide suitable and sufficient garbage bins in these areas with regular removal and disposal.
- Visitor log should be strictly maintained that the labour camp.

COVID-19 officer will ensure compliance with prevention issues at the labour camp(s).

## **11 UPDATES ON COVID-19**

The Contractor shall be in touch with the Department of Health & Family Welfare and Labour Department to identify any potential worksite exposures relating to COVID-19, including:

- Strictly follow the guidelines issues by Ministry of health and OSHA
- Other workers, vendors, inspectors, or visitors to the worksite with close contact to the individual
- Labour Camps / Work areas such as designated workstations or rooms/sheds
- Work tools and equipment
- Common areas such as break rooms, tables and sanitary facilities

Also refer the following websites from time to time for regular updates.

<https://www.mohfw.gov.in/>

<http://hmfw.ap.gov.in/>

This document can be updated from time to time based on the advisories or directions of the Government.

## **12 TRAINING**

- RPMU/PIU to ensure all workers get training on above requirements before start of any construction activity
- During construction period frequent visual and verbal reminders to workers can improve compliance with hand hygiene practices and thus reduce rates of infection. Handwashing posters should also be displayed at work site and labour camps

## **13 EMERGENCY CONTACT**

- Provide emergency contact number(s) at work site and labour camp for reporting COVID-19 symptoms

Ensure all staff and personal use the AarogyaSetu App, recommended by GOI for tracking COVID-19 patients.

**Appendix 18: Site Pictures of Kondakarla Ava**











## **Appendix 19: Sample Outline Traffic Management Plan**

### **A. Principles for TMP around the Road Construction Sites**

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
  - (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
  - (ii) protection of work crews from hazards associated with moving traffic;
  - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
  - (iv) maintenance of access to adjoining properties; and
  - (v) Addressing issues that may delay the project.

### **B. Operating Policies for TMP**

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
  - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
  - (ii) Inhibit traffic movement as little as possible.
  - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
  - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
  - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
  - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
  - (vii) Keep the public well informed.
  - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.
3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

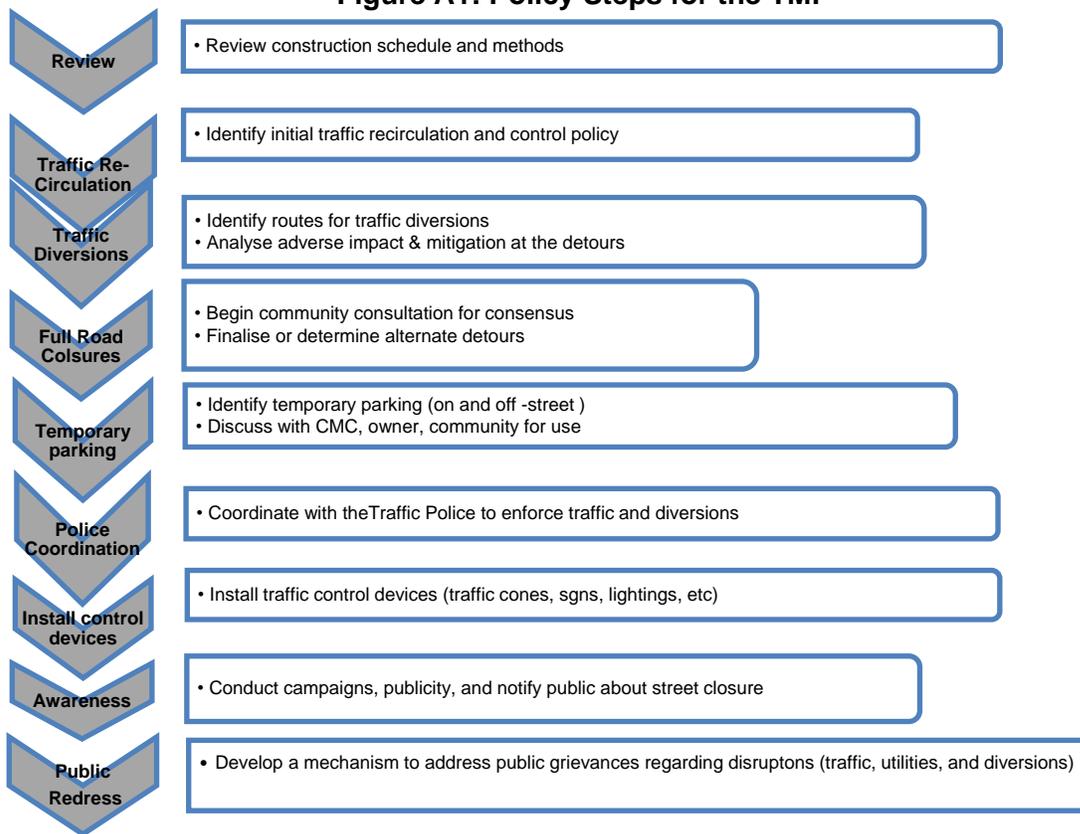
### **C. Analyze the impact due to street closure**

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
  - (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
  - (ii) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
  - (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;

- (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
- (v) considering how access will be provided to the worksite;
- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

**Figure A1: Policy Steps for the TMP**



**D. Public awareness and notifications**

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:

- (i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) Defensive driving behaviour along the work zones; and
- (iii) Reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;
- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behaviour to emulate at the work zones;
- (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) indicate the office hours of relevant offices.

#### **E. Install traffic control devices at the work zones and traffic diversion routes**

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the roadway, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel Lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two-lane road (two flagger operation)
- Lane closure on a four-lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

**Figure A2 & A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road**

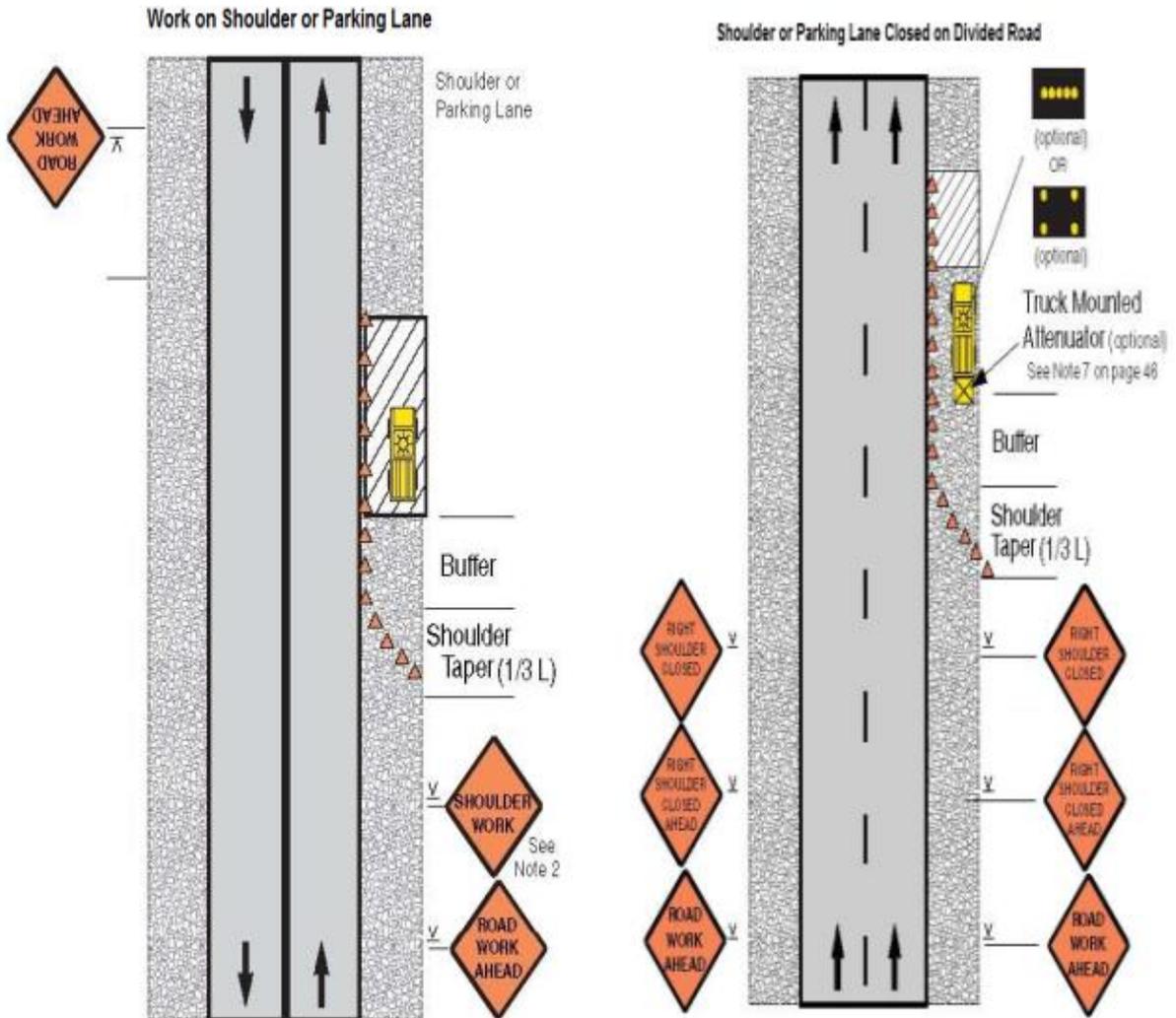
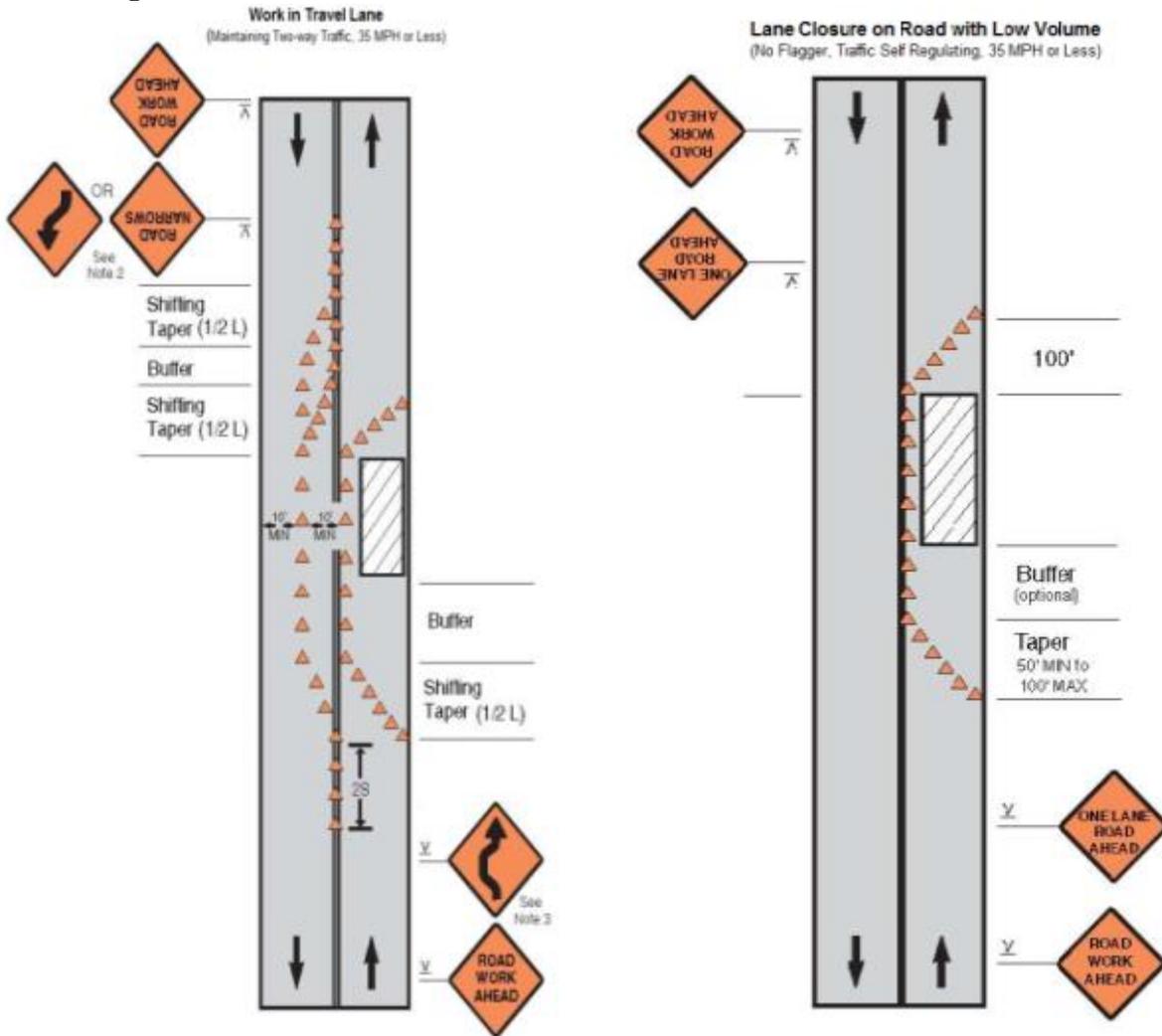
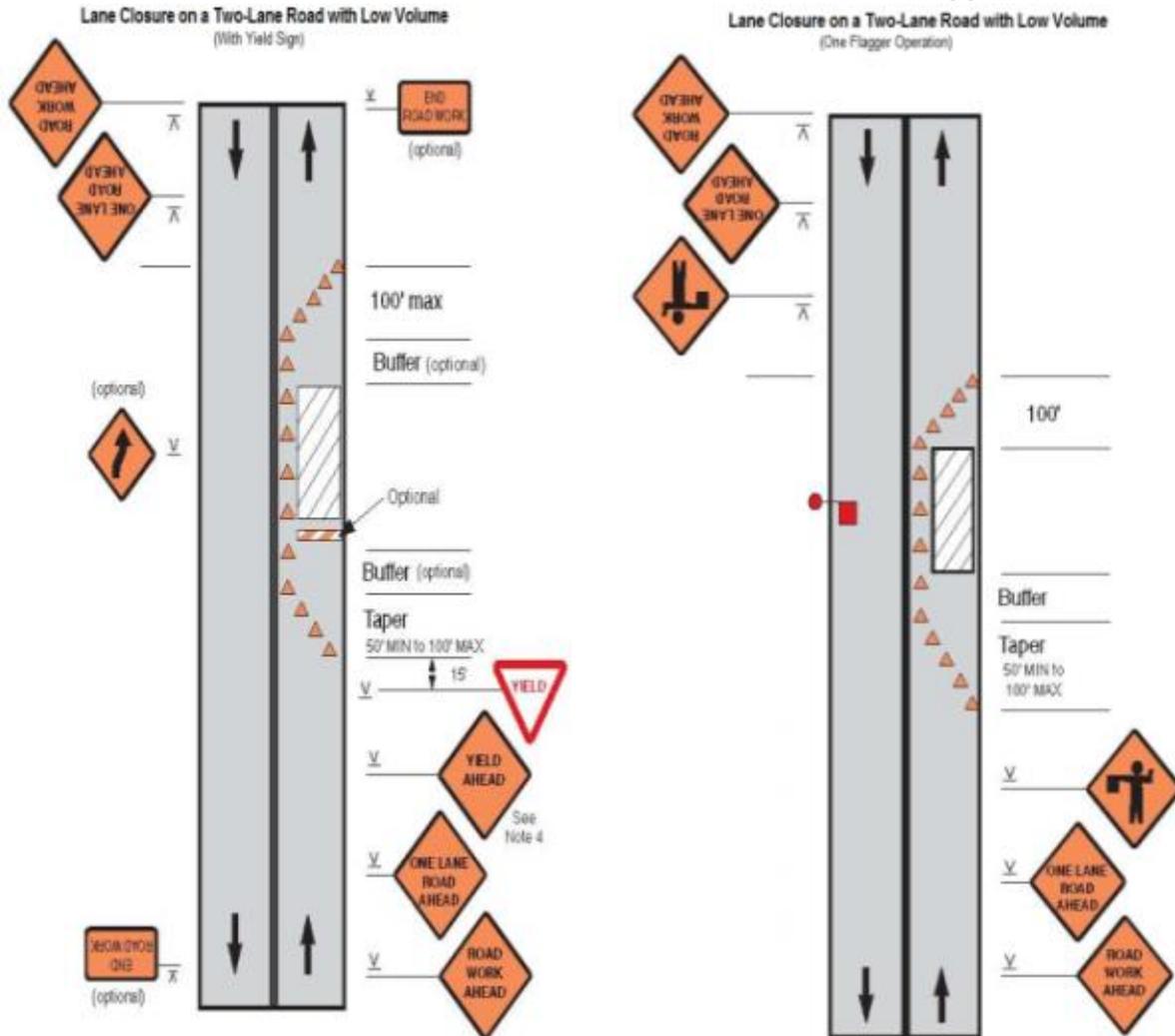


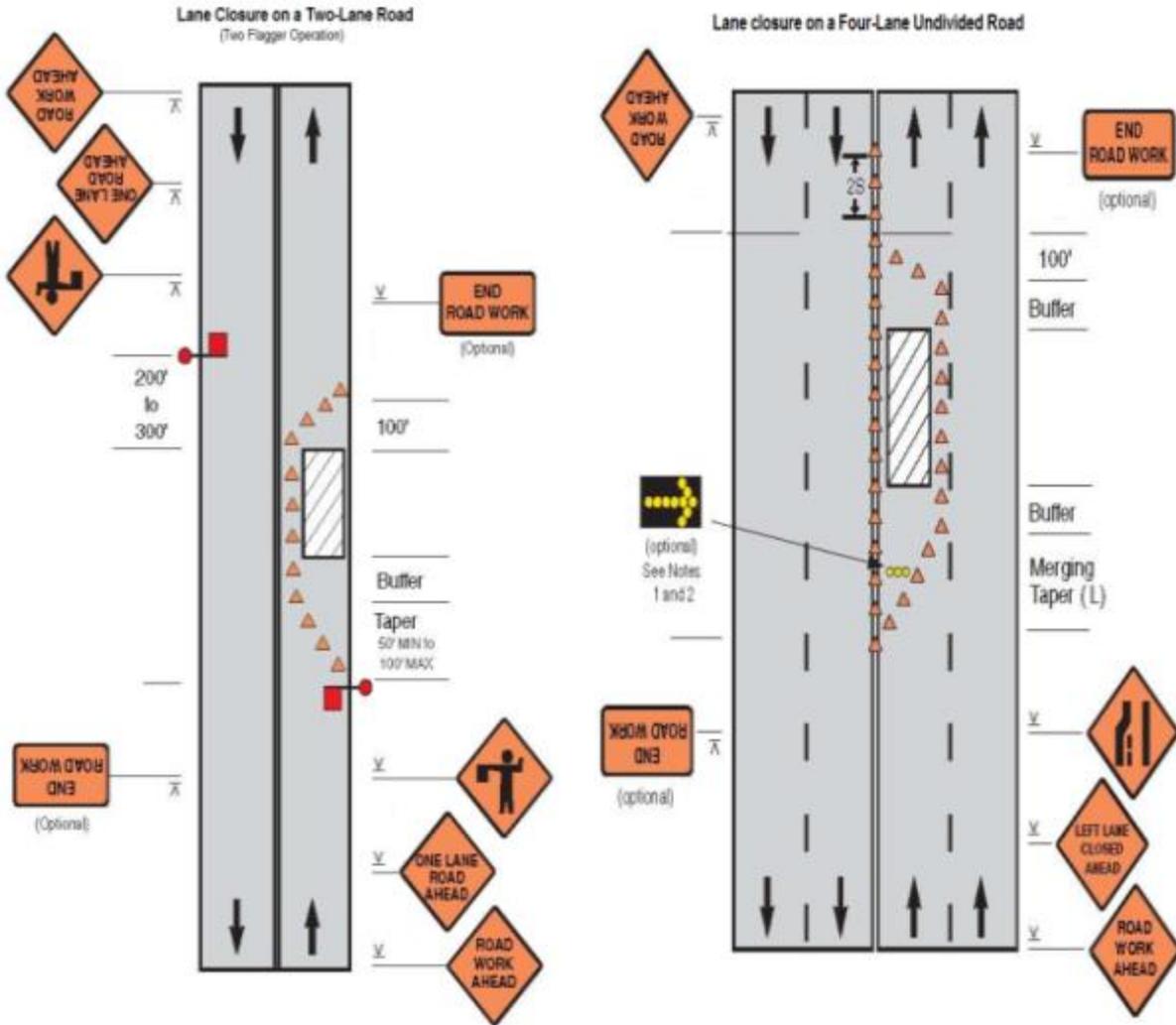
Figure A4 & A5: Work in Travel Lane & Lane closure on road with low volume



**Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)**



**Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road**



**Figure A10 & A11: Lane Closure on Divided Roadway & Half Road Closure on Multi-Lane Roadway**

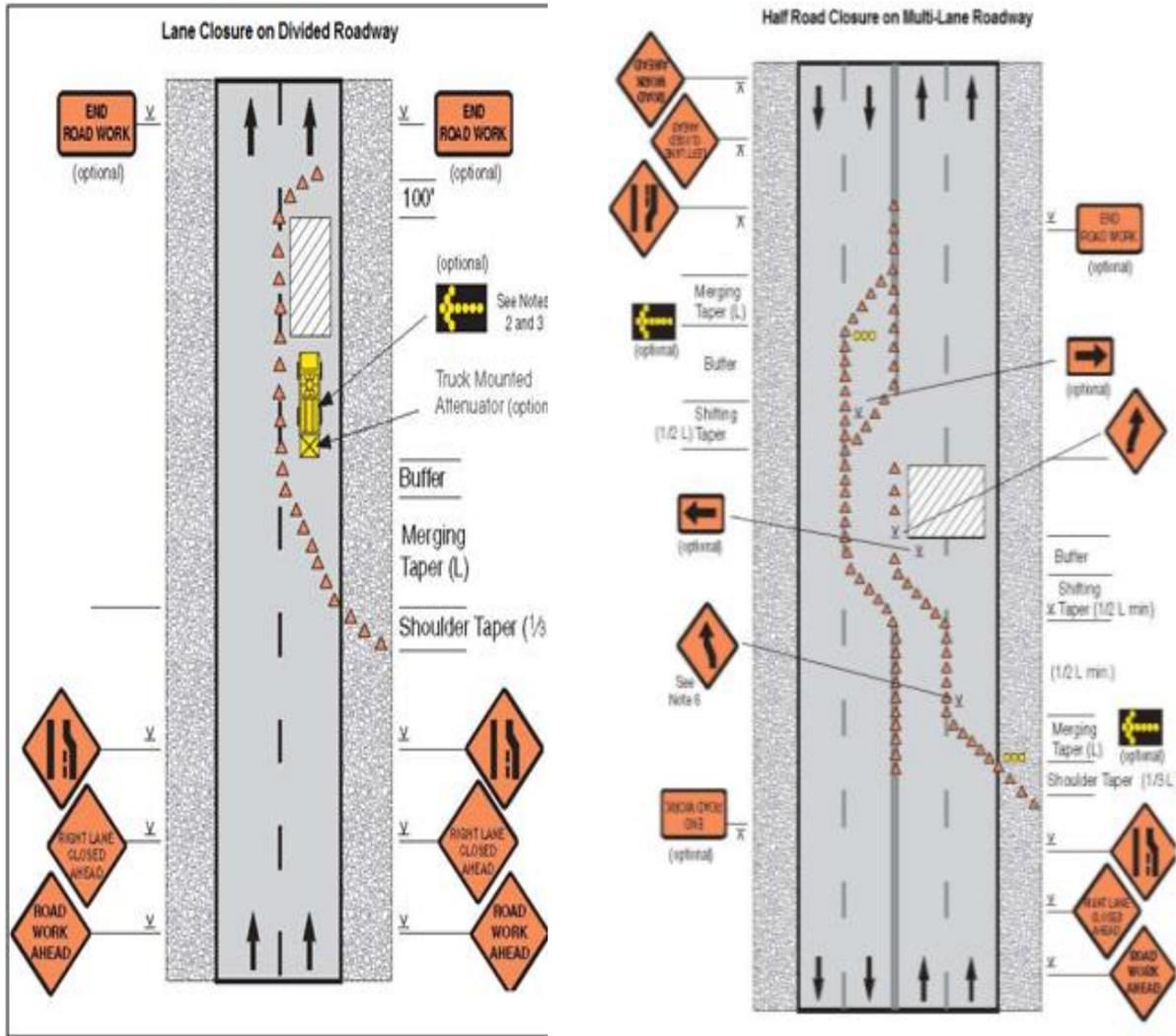


Figure A12: Street closure with detour

