



# Initial Environment Examination

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Project Number: 47229-001  
December 2015

## IND: Uttarakhand Emergency Assistance Project (UEAP)

Package: UEAP/PWD/C-84

Submitted by

Project implementation Unit –UEAP (Roads and Bridges), Dehradun

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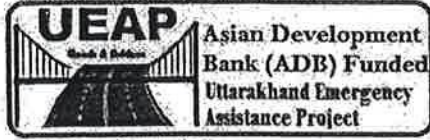
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**Asian Development Bank**



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Letter No: 1955/02/UEAP/PWD/2015-16

Date: 09/11/2015

To,

Country Director,  
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New Delhi 110021, India.



Subject: ADB Loan- 3055 IND, UEAP (R&B) Submission of IEE Report of Civil works  
"Restoration & Reconstruction of Internal Motor Roads of Nagar Palika Pauri  
(UEAP/PWD/C-84) in Pauri District of Uttarakhand"

Dear Madam,

Kindly find enclosed IEE report for Civil works Packages C-84 for accord of approval  
by ADB. IEE report has been reviewed by Mr. Sakib Qadri, Environment Specialist, ADB, TA.

Enclosed:- IEE Report (as above) (including CD).

Yours Sincerely

*09/11/15*  
Program Manager  
PIU, UEAP (R&B)  
Dehradun, Uttarakhand

Copy to: 1- Mr. A. K. Motwani, Team Leader, UEAP (R&B).  
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Program Manager  
PIU, UEAP (R&B)  
Dehradun, Uttarakhand



# Initial Environmental Examination

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**November 2015**

**India: Uttarakhand Emergency Assistance Project**

**Restoration and Reconstruction of Internal Motor Roads of Nagar Palika Pauri (Package No: Ueap/Pwd/C84) In District Pauri**

Prepared by State Disaster Management Authority, Government of Uttarakhand, for the Asian Development Bank.

## ABBREVIATIONS

ADB	-	Asian Development Bank
ASI	-	Archeological Survey of India
BOQ	-	Bill of Quantity
CTE	-	Consent to Establish
CTO	-	Consent to Operate
CCA	-	Consolidated Consent and Authorization
DFO	-	Divisional Forest Officer
DSC	-	Design and Supervision Consultant
DOT	-	Department of Tourism
CPCB	-	Central Pollution Control Board
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
EARF	-	Environment Assessment and Review Framework
EC	-	Environmental Clearance
EIA	-	Environmental Impact Assessment
EMMP	-	Environment Management and Monitoring Plan
EMP	-	Environment Management Plan
GoI	-	Government of India
GRM	-	Grievance Redressal Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IST	-	Indian Standard Time
LPG	-	Liquified Petroleum Gas
MDR	-	Major District Road
MoEF&CC	-	Ministry of Environment, Forest & Climate Change
NAAQS	-	National Ambient Air Quality Standards
NDBR	-	Nanda Devi Biospher Reserve
NDNP	-	Nanda Devi National Park
NH	-	National Highway
ODR	-	Other District Road
OM	-	Operations Manual
PIU	-	Project Implementation Unit
PMU	-	Project Management Unit
PWD	-	Public Works Department
REA	-	Rapid Environmental Assessment
RSPM	-	Respirable Suspended Particulate Matter
SDMA	-	State Disaster Management Authority
SH	-	State Highway
SPCB	-	State Pollution Control Board
SPM	-	Suspended Particulate Matter
SPS	-	Safeguards Policy Statement
SRTC	-	State Road Transport Corporation
UCADA	-	Uttarakhand Civil Aviation Development Authority
UEAP	-	Uttarakhand Emergency Assistance Project
UEPPCB	-	Uttarakhand Environment Protection and Pollution Control Board
UJS	-	Uttarakhand Jal Sansthan
VR	-	Village Road

## WEIGHTS AND MEASURES

cm	-	centimeter
Crore	-	100 lakhs = 10,000,000
Lakh	-	100 thousand = 100,000
Km	-	Kilometer
Kph	-	Kilometer per hour
Lpd	-	liters per day
M	-	Meter
mg/l	-	milligrams per liter
Mm	-	Millimeter
MSL	-	Mean sea level
$\mu$	-	$10^{-6}$ meter
$\mu\text{g}/\text{m}^3$	-	micrograms per cubic meter
$\mu\text{S}/\text{cm}$	-	micro Siemens per centimeter
NTU	-	Nephalo turbidity unit
Ppm	-	parts per million

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## Executive Summary

The State Disaster Management Authority (SDMA) has Undertaken Uttarakhand Emergency Assistance Project (UEAP), financed by the ADB. The total estimated cost of the program is about US \$205 millions, out of which \$96.75 million will be allotted for road and bridge sector.

The Uttarakhand Emergency Assistance Project (UEAP) involving internal roads of Pauri Nagar Palika with a total length of 3.527.00 Km of Urban road. The key road upgrading components includes restoration of disaster affected roads in hilly terrain to a single lane standard (3.75 m carriageway and 5.00 m formation width), conducting patch repairs and pot hole filling; strengthening of culverts, repairs/ reconstruction of R/W & B/R and providing all necessary road furniture and roadside safety hardware.

The present IEE relates to the existing project road namely internal roads of Pauri consisting of Judge Court to Civil Line road section (1.200 km), Kandolia to Chatridhaar (1.652 km), Civil Line to New Bus Stand (0.675 km) making a total length of 3.527 km of internal road.

Sl. No.	Name of Road	Chainage ( Km)	Affective length (Km)
1	Judge Court To Civil Line	0.000 to 1.200	1.200
2	Kandoliya To Chatridhaar	0.000 to 1.652	1.652
3	Civil Line To New Bus Stand	0.000 to 0.675	0.675
<b>Total</b>		<b>3.527</b>	<b>3.527</b>

Consistent with the Environmental Assessment and Review Framework (EARF), each of the internal roads were screened using ADB rapid environmental assessment (REA) checklist-roads and bridges. The environmental screening revealed that no protected or sensitive areas were traversed. All impacts are site specific; few are irreversible and can be readily mitigated supporting an environmental "Category B" classification.

Uttarakhand lies in the northern part of India amidst the magnificent Himalayas and dense forests. The State is bordering Himachal Pradesh in the north-west and Uttar Pradesh in the South and shares international borders with Nepal and China. The State is comprised of 13 districts divided into two regions and also called administrative divisions; the Kumaon and Garhwal.

**Sensitive Environmental Features.** The following section enumerates and describes the sensitive environmental feature that influenced the project design and mitigation measures.

- **Geology and soils.** The State is part of the Western Himalaya and divided into four zones according altitude namely, the Tarai-Bhabar-Shivalik (Sub-Himalayas) with altitude ranging from 750-1,200meters, Lesser-Himalayas between 1,000 – 3,500 meters, Greater-Himalayas between 3,500-4,800m with snow-line rising to 5,400m, and Trans Himalaya (Tethys) averaging 5,300m. In general, the region is geologically and pedologically unstable and prone to slides and erosion. Soils of the Uttarakhand Himalayas in general are quite shallow, gravely impregnated with un-weathered fragments of parent rocks.
- **Climate.** The overall climatic condition in the State is governed by the southwest monsoon. It has a sub-tropical to temperate climate, with three pronounced seasons; viz.

summer, winter, and monsoon. The hilly terrain of the Himalayan region has snow cover and is severely cold during winter with snowfall normally occurring during the months of December to March. The climatic conditions of Almora, Nainital, Pithoragarh, Chamoli, Uttarkashi, Pauri and Dehradun are humid and cold. The Kumaon region is under the Intermediate Zone, with moderate temperature and rainfall.

- **Air Quality.** The pristine environment and sparse population suggest that most part of the State have a very good air quality while noise pollution is not a problem except in the urban areas like Dehradun, Haridwar and Haldwani.

- **Seismicity.** The State constitutes one of the most active domains of the Himalayan region. Several damaging earthquakes are recorded from this region. As such, the region is classified under high seismic zone IV & V.

- **Forest.** Uttarakhand is ranked 9<sup>th</sup> in all-India in terms of forest covered area with 24,508 km<sup>2</sup> of forestland. The district of Pauri Garhwal, Uttarkashi, Nainital, and Chamoli have the largest forest cover accounting for 50% of all the state's total. The State Govt. of Uttarakhand has declared the oak tree (*Quercus* sp.) as a *Kalpvrksha* or wish fulfilling divine tree often treated as the signature plant of the Kumaon Himalayas as numerous logos and insignias with a stylized version of the deodar inscribed on them.

- **Biodiversity.** The State has established six national parks and six wildlife sanctuaries for the conservation of flora and fauna. Such areas include the Nanda Devi National Park, Valley of Flowers, Gangotri National Park, Govind National Park, Rajaji National Park, Kedarnath Wildlife Sanctuary, Askote Wildlife Sanctuary, Mussoorie Sanctuary, Binsar Sanctuary, Sanadi Sanctuary, and Govind Wildlife Sanctuary—all of which are being looked after by the Uttarakhand government. Variations in the topography of high mountain ranges and deep valleys and altitudes from sea-level portions give the project districts different habitats for a variety of fauna and in turn resulted in the enriched biodiversity in the region. The common wildlife reported from the forests includes Tigers, Panthers, Civet Cats, Leopard Cats, Jungle Cats, Himalayan Silver Fox, and the Jackal. Various species of deer including the Musk Deer and the Barking Deer also roam in the districts. Sambhar and Gural as well as the Bear and the Porcupine are also found in the project area. The flying mammal Bat is also common in the area. Other animals in the region include the Chipmunk, the Rhesus Monkey and the Flying Squirrel. Discussion with local people during the survey process generated reports on the presence of Leopards, Deers, Foxes, and Wild Pigs.

- **Population.** The State of Uttarakhand occupies a total land area of 53,483 sq.km. which is 1.73 percent of India's total land area. Demographically, the State has a population of 1,01,16,752 as per the 2011 census. The population is scattered between small streams and rivers and is spread over 20 to 70 degree slopes of the Himalayan and the Lesser Himalayan regions. There are 16,177,853 villages in the State and 7,227,256 gram panchayats. Of the total number of villages, 5,868 are not connected to all weather roads. As per census 2011, Pauri Garhwal had population of 687,271 of which male and female were 326,829 and 360,442 respectively. In 2001 census, Pauri Garhwal had a population of 697,078 of which males were 331,061 and remaining 366,017 were females. There was change of -1.41 percent in the population compared to population as per 2001. In the previous census of India 2001, Pauri Garhwal District recorded increase of 3.91 percent to its population compared to 1991.

- **Land Use.** Forest is the main land use in the State and nearly 64 percent of the geographical area is under the varying forest densities (cover). Agriculture is confined to areas of low reliefs, accounting for 11.5 percent of the total geographical area, is either terraced/semi-terraced or plain.

**Significant Environmental Impacts and Proposed Mitigation Measures.** No environmental impacts related to siting were identified in the environmental examination. The proposed work will be confined to the existing ROW belonging to Uttarakhand Public Works Department. The proposed subprojects are not expected to have any impact on the Forests and do not involve any tree cutting as the scope of the work is restricted to reconstruction and rehabilitation of disaster affected section of the existing roads. No road widening is proposed. Not a single road section is located inside or near a cultural heritage site, protected area (national park / sanctuary / biosphere reserve), wetland, and mangrove, estuarine, buffer zone of protected area or special area for protecting biodiversity. There are no rare, threatened, and endangered species (flora and fauna) within the subproject corridor of impact. The potential significant environmental impacts identified and assessed are related to encroachments to or near historical and ecologically sensitive areas, road sections are prone to landslides, localized flooding, increase erosion, siltation, and hazardous driving conditions. The significance of these impacts are magnified in hill roads located in Rudraprayag, Pauri, Tehri, Uttarkashi, Chamoli, and Pithoragarh. Environmental impacts and mitigation measures corresponding to different stages of project development are as follow:

- During planning design phase no significant adverse environmental impacts were identified. Several road section to be improved are located in hilly urban areas but proposed repair work is within the RoW, with high precipitation and erodible soils, the reduction of risk of increasing landslides and siltation of creeks and rivers were integrated in the road improvement design. This include rehabilitation of existing and construction of additional side- and cross drains like culverts and scuppers to control surface water flow below scouring velocity and volume. Landslide prone areas will be strengthened through the installation of retaining walls. Off-site impacts associated with the road upgrading related to material sourcing from quarries, hot mix plant, and stone crushers will be minimized by relying solely on existing and licensed quarries. All hot or stone crushers to be utilized will have will have prior consent from the UEPPCB.
- During construction phase significant impacts are expected due to risk in increase of sediment in streams affected by soil erosion; surface and groundwater quality deterioration from construction camps waste; disfiguration of landscape from cuts, fills and quarries; loss of productive soil; compaction and contamination of soil; and air quality deterioration from rock crushing, and filling works, and chemicals from asphalt processing. Majority of the significant impacts are addressed though good road construction practices such as disposal site management, oil interceptors, occupational safety, soil erosion and sedimentation control, and site and management of construction camp. This report contains these good practices that are applicable to all roads under UEAP.
- During operation phase, no significant adverse impacts are expected due to a relatively low volume of traffic, and the improvements in road safety introduced through the investment program will make these roads safer.

**Information Disclosure, Consultation, Participation, and Grievance and Redress Mechanism.** Wide stakeholder consultation and participation was observed during the environmental examination of UEAP. Project affected communities, government institutions, and non-governmental organizations. Highlight of all consultations were documented and applicable recommended measures particularly in minimizing shifting of structures, potential conflict with migrant workers, and competing demand for local resources were incorporated in the design

and the environmental management plan. This IEE report will be disclosed in the ADB website pursuant to the Bank's *Public Communication Policy* and in the SDMA website.

**Environmental Management Plan.**The Environmental Management Plan (EMP), to form part of the bidding documents, adopted the procurement package scheme and facilitates subsequent compliance monitoring by the contractor.

**Conclusion.**The initial environmental examination ascertains that the sub-project is unlikely to cause any significant environmental impacts in the affected section of roads. No additional studies or need of undertaking detailed EIA is envisaged at this stage. The Executing Agency shall ensure that EMP and EMoP is 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.

The IEE is based upon the Environmental Assessment and Review Framework (EARF) which is in consistent with the ABD's Safeguard Policy Statement (SPS) 2009. The subproject is classified as —Category “B” for Environment and does not require further Environmental Impact Assessment.

## I. INTRODUCTION

### A. Project Background/Rationale

1. About 90% of passenger and freight traffic in the State of Uttarakhand moves by road. Rail services offer freight and passenger connections to the neighboring states through four rail heads in the State's southern low-lying plain region. The hilly and mountainous terrain that covers more than 90% of the State's land area would preclude the development of railway infrastructure catering to intrastate services.
2. The roads subsector in the State comprises of road infrastructure, which is primarily administered by the Public Works Department (PWD); and transport services, which are overseen by the Transport Department. The PWD is responsible for planning, financing, constructing, and maintaining roads, bridges, and related government buildings.
3. The overall road network in the State is 31,929 km. The road network is administered by the PWD and comprises of 1151 km of national highways (NH), 13,788 km of State Highways (SH), 3,290 km of Major District Roads (MDR), 2,945 km of -Other District Roads (ODR), 15,402 km of Village Roads (VR), and 1,773 Motor Bridges. Additionally, PWD also administers 3,736 km of bridle roads/tracks and 1,073 bridle bridges. The Border Roads Organization manages about 1,623 km of NHs, SHs, MDRs, and ODRs.
4. The Transport Department is responsible for issuing licenses for vehicles and operators, operating permits for private freight and passenger service operators, and managing the State Road Transport Corporation (SRTC). Private operators provide the bulk of the freight and passenger services under permits issued by the State transport authorities. Privately operated passenger transport predominates in the rural hill areas.
5. Roads are the lifeline of the State. The quality of the road network in Uttarakhand has however been poor and constraints the economy of the State. The mountainous terrain, rivers that are prone to flash floods, fragile geology and ecology and lack of adequate funding for development and maintenance, is further aggravated by flash floods, massive landslides, erosion and caving of roads caused by cloud bursts and heavy rains during the monsoon period. The PWD faces a major challenge in opening of disrupted roads during the monsoon season every year.

### B. Uttarakhand Emergency Assistance Project (UEAP)

6. Uttarakhand being a tourist and pilgrimage State, attracts a large number of tourist and pilgrims. A major disaster during 15-17 June 2013 resulted in severe damages in several parts of Uttarakhand, which has a mountainous terrain and a fragile geology. Several towns have been washed away by the unprecedented flash floods and landslides, and a large number of houses, public buildings, roads, bridges, urban, rural, and tourism infrastructure, power generation and distribution facilities have been damaged. The impact on the affected population due to the loss of connectivity has been manifold. The State machinery is currently focused on emergency restoration and connectivity works. The affected regions are susceptible to further damages during the on-going rainy season.
7. Based on the request of India, a Rapid Joint Damage and Needs Assessment (RJDNA) was undertaken by Asian Development Bank (ADB) and the World Bank. ADB agreed to assist the Government of India (GOI) with reconstruction and rehabilitation efforts for which the Uttarakhand Emergency Assistance Project (UEAP) has

been formulated as a multi-sector emergency loan in sector loan modality. The executing agency (EA) for the UEAP will be Government of Uttarakhand (GOU) and State Disaster Management Authority (SDMA). The primary implementing agencies (IA) will be Public Works Department (PWD) for roads, bridges, urban roads, and trekking routes including eco-trails Department of Tourism (DOT) through Kumaon Mandai Vikas Nigam Limited, and Garhwal Mandai Vikas Nigam Limited for tourism infrastructure, Uttarakhand Civil Aviation Development Authority (UCADA) for helipads; and Uttarakhand Jal Sanstahan (UJS) for urban water supply, or any successor hereto. Some other state agencies such as Forest Department, are likely to be entrusted with some works under UEAP under these primary IAs.

8. The EARF was prepared in accordance with ADB's Safeguard Policy Statement (2009) (SPS 2009). The recommendations are consistent with the environmental and related legislations of the GOI at the national, state and local levels. A realistic and engineering assessment with preliminary field surveys and investigations would be undertaken only after some improvement in weather and connectivity.

### **C. Purpose of the Environmental Assessment**

9. The purpose of the study is to identify the environmental issues to be considered at project planning and design stage, assesses environmental consequences due to project intervention and suggests mitigation measures to minimise the adverse environmental impacts, if any, associated with construction and operation.
10. Initial environmental examination (IEE) has four basic objectives; (i) assess relevant potential impacts and risks associated with the proposed road upgrading, (ii) assess the compliance with ADB environmental safeguard requirements and applicable environmental laws, (iii) incorporate mitigation measures in the project design iv) preparation of Environmental Management & Monitoring Plan (EMMP)

### **D. Extent of IEE**

11. IEE was conducted based on preliminary Detailed Project Report (DPR). The IEE covers all activities proposed under the project. The core zone of impact is taken as 100 meters either side of the alignment. However, the study area is considered up to 7 km on either side of road alignment for larger analysis of landuse and other environmental features. Assessment is carried out for all components of environment covering terrestrial and aquatic ecology, soil, water, noise and socio economic aspects.

### **E. IEE Content**

12. The IEE has been largely structured as per ADB's SPS, 2009 and its Environmental Assessment Guidelines (2003) and Environmental Safeguards – A good practice sourcebook (December 2012). This includes following eight chapters including this introduction Chapter.
  - Chapter 1- Introduction
  - Chapter 2- Policy, Legal and Administrative Framework
  - Chapter 3- Description of Project
  - Chapter 4- Description of Environment
  - Chapter 5- Anticipated Impacts and Mitigation Measures
  - Chapter 6- Information Disclosure, Consultation, and Participation
  - Chapter 7- Environment Management Plan and Grievance Redress Mechanism
  - Chapter 8 Conclusion and Recommendation

13. Two stand-alone companion documents form part of this IEE Report. Volume 1 is a compilation of the individual environmental screening checklists for Restoration and reconstruction of Internal Motor Roads of Nagar Palika, Pauri and Volume 2 provides detailed good engineering practices in road construction which are referred to in Chapter 5.

**F. Methodology for Environmental Assessment**

14. The following key steps were followed in this study: review of legal requirements, reconnaissance survey for identification of key issues data requirement and preliminary consultation, primary and secondary data collection, impact assessment, consultation with stakeholders, identification of impacts and mitigation measures, and institutional review
15. The environmental and social team conducted field visit in Sep 2015 and undertook environmental screening of the project road in accordance with ADB requirements as stipulated in Environmental Assessment Guidelines 2003 and MoEF Notification 2006 with relevant subsequent amendments. The identified environmental issues were assessed for their severity to further determine the environmental categories in which they fall. The ADB’s REA checklist for this road section is attached as Appendix- A
16. During field environmental survey, public consultations have been conducted to obtain the views of local people, project affected persons and local administrative representatives. Focused Group Discussion has been adopted as tool for this public consultation. Consultations were also conducted with stakeholders to collect secondary as well as primary data. Various maps for project area, district planning maps etc. have been studied to have initial understanding of the project area.
17. Based on analysis of collected data and information, potential adverse environmental impacts have been identified and examined using standard “Checklist Method”. Thereafter possible mitigation measures have been identified. Based on the findings of impact assessment comprising the key elements embodied in this IEE, an Environmental Monitoring and Management Plan (EMMP) have been developed. Continued discussions undertaken with the executive agency and technical team of the consultant for integrating environmental management measures into the project.

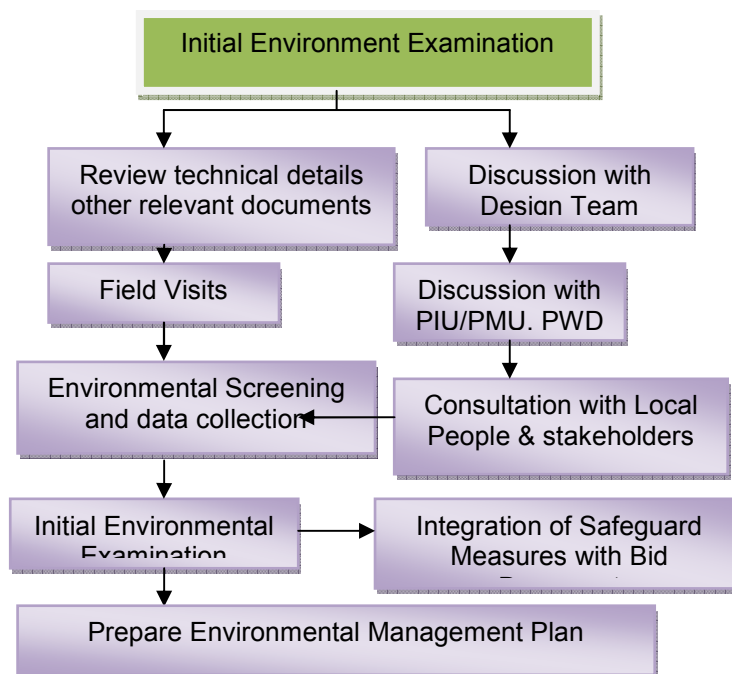


Figure I-1 Process flow for carrying out IEE



**G. Public Consultation**

18. Extensive consultations were held with all stakeholders' that includes: local residents, Govt. Departments/ agencies, other road users, and NGOs with intent to collect baseline information, for better understanding of the potential impacts and appreciate the perspectives/concerns of the stakeholders. Key information gathered were integrated in project design and used in formulating mitigation measures.

## II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

19. The legal framework of the country consists of several acts, notifications, rules and regulations to protect environment and wildlife. In 1976, the 42<sup>nd</sup> Constitutional Amendment created Article 48A and 51A, placing an obligation on every citizen of the country to attempt to conserve the environment. The various prevailing environmental acts and rules relevant to the project are listed here. This includes National Acts & Rules administered by the Ministry of Environment, Forest & Climate Change, other National legislation that are relevant and State Acts & Rules. Specifically for the UEAP, the following environmental laws and regulations are applicable:

Table II-1: Applicable Environmental National and State Requirements for UEAP

S.No.	Clearances	Acts/Rules/Notifications/Guidelines Application to Road Projects	and	Concerned Agency	Applicable to Contract package	Responsibility	Status of Compliance
<b>A. Pre-construction Stage</b>							
1	Environmental Clearance	<p>EIA Notification, 2006 amended till date, promulgated under Environment (Protection) Act 1986</p> <p>Requires prior environmental clearance from the following road projects: The Notification and its latest amendment entails requirement of prior environmental clearance to the following road projects.</p> <p>Category A -i) Expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40 m on existing alignments and 60 m on re-alignments or by-passes</p> <p><b>Category B</b>-ii) New state High ways; and ii) Expansion projects in hilly terrain (above 1000 m mean sea level (msl) and or ecologically sensitive areas)</p> <p>District and villages roads are exempted from securing an environmental clearance.</p>		State Environmental Impact Assessment Authority (SEIAA). If not constituted then MoEF&CC	No	FPIU, UEAP	Not required

S.No.	Clearances	Acts/Rules/Notifications/Guidelines and Application to Road Projects	Concerned Agency	Applicable to Contract package	Responsibility	Status of Compliance
2	Forest Clearance for felling of trees and acquisition of forest land for widening.	Forest Conservation Act (1980): i) If the forest land exceeds 20 hectare then prior permission of Central Government is required; ii) if the forest land is between 5 to 20 hectare, then permission from the Regional Office of Chief Conservator is required; iii) If the forest land is below or equal to 5 hectare the State Government can give permission. If the construction area is more than 40% forest, permission to undertake any work is needed from the Central Government, irrespective of the size of the area. ii) The Uttar Pradesh Protection of Trees in Rural and Hill Areas Act, 1976 and amended 1998 and 2001	District Level Committee constituted by the State Govt.	<u>No</u>	FPIU, UEAP	<u>Not Required</u>
<b>B. Implementation Stage</b>						
3	Permission for Sand Mining from river bed	Mines and Minerals (Regulation and Development) Act, 1957 and its amended 10th May 2012	River Board Authorities/ Department of Mining Govt. of Uttarakhand	Yes	Contractor	Contractor will obtain the consents from appropriate authority
4	Consents to establish & operate Hot mix plant, Crushers, Batching Plant	Air (Prevention and Control of Pollution) Act 1981	Uttarakhand Environmental Protection and Pollution Control Board- Dehradun	Yes	Contractor	In case Contractor establishes Hot mix plant, Crushers, Batching plant, Contractor will obtain the consents from appropriate authority or Contractor will

S.No.	Clearances	Acts/Rules/Notifications/Guidelines Application to Road Projects	and Concerned Agency	Applicable to Contract package	Responsibility	Status of Compliance
						procure the material from Compliant source.
5	Authorization for Disposal of Hazardous Waste	Hazardous Wastes (Management, Handling and Transboundary movement) Rules, 2008	Uttarakhand Environmental Protection and Pollution Control Board – Dehradun	No	Contractor	
6	Consent for Disposal of Sewage from Labour camps	Water (Prevention and Control of Pollution) Act 1974	Uttarakhand Environmental Protection and Pollution Control Board - Dehradun	No	Contractor	
7	Use of Fly ash within 100 kms around Thermal Power plants	Fly Ash Notification, 1999 as amended 03.11.2009	MoEF&CC	No	Contractor	
8	Pollution Under Control Certificate	Central Motor and Vehicle Act 1988	Department of Transport, Govt. of Uttarakhand	Yes	Contractor	Contractor will obtain the required Pollution Under Control Certificates.
9	Installation of Generators	The Air (Prev. & Con. of Pollution) Act, 1980	Uttarakhand Environment Protection and Pollution Control Board Dehradun	Yes	Contractor	Contractor will obtain the required NOC/Consents.
10	Employing Labour/workers	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996,	District Labour Commissioner	Yes	Contractor	Details to be provided
11	Permission for extraction of boulder and sand from river beds	Mines & Minerals (Regulation and Development) Act, 1957 and its amended 10 <sup>th</sup> May 2012	Department of Mines and Geology, Uttarakhand Environment Protection and	Yes	Civil Work Contractor	Details to be provided

S.No.	Clearances	Acts/Rules/Notifications/Guidelines and Application to Road Projects	Concerned Agency	Applicable to Contract package	Responsibility	Status of Compliance
			Pollution Control Board Dehradun			
12	License for Storing Diesel and other explosives	Petroleum (Amended) Rules, 2011. Hazardous Wastes (Management, Handling and Transboundary movement) Rules, 2008	Commissioner of Explosives and Uttarakhand Environmental Protection and Pollution Control Board – Dehradun	No	Contractor	

### III. DESCRIPTION OF THE PROJECT

#### a. Project Location

20. The internal roads sections to be upgraded are distributed across Pauri town in Pauri districts. Geographically, Pauri district lies between 29° 45' to 30°15' N Latitude and 78° 24' to 79° 23' E Longitude.

21. Internal Roads of Nagar Palika Pauri are important roads in district Pauri which were damaged during this natural disaster. The total length of the affected motor road is 3.527 Km. The roads are main connectivity to the city market. After restoration of this road subproject it will certainly upgrade the economic conditions of the people belonging to the entire area.

Sl. No.	Name of Road	Chainage	Affective length (Km)
1	Judge Court To Civil Line	0.000 to 1.200	1.200
2	Kandoliya To Chatridhaar	0.000 to 1.652	1.652
3	Civil Line To New Bus Stand	0.000 to 0.675	0.675
<b>Total</b>		<b>3.527</b>	<b>3.527</b>

22. The existing carriageway width of the above roads varies from 3.75 m to 5.00 m and pavement condition varies from fair to poor. Since these are urban roads, most of the region is inhabited. The work of restoration and rehabilitation includes protection work, cross drainage structures, drains, pavement, road safety devices etc.

23. The scope of this project is limited to restoration work of affected road sections only. The geometry of road has not been proposed for improvement. Therefore, there is no change in alignment. Only the affected sections of roads are proposed for reconstruction and repair work as per the damages encountered at site.

The existing features of the roads are presented in the table below:

S.No.	Description of item	Details		
		Kandoliya - Chatridhaar	Judge Court - Civil Lines	Civil line - New Bus Stand
1.	Road length	1652m	1200m	675m
2.	Carriageway width	3.75 m		5 m
3.	Surface of carriageway	Bituminous	Bituminous	Cement Concrete
4.	Shoulder width	1.0 – 1.5 m		
5.	Formation width	5.0 – 7.0 m		
6.	Condition of the road	poor		
7.	Terrain	Hilly, steep gradient		
8.	Habitant area	Inhabited		
9.	Junction	5	5	6
10.	Drain	Unlined drain found at certain location on hill side and filled with earth/ leaves/ stones. Lined drain found at habited location.		
11.	Land slide (Major)	No major land slide		
12.	Traffic Intensity	Low		
13.	RCC Slab Culvert (nos.)	Nil	2 Nos	Nil
14.	H.P. Culvert (nos.)	Nil		
15.	Arch Culvert (nos.)	Nil		
16.	Scupper (nos.)	8	5	2
17.	Causeway (nos.)	Nil		

S.No.	Description of item	Details		
		Kandoliya - Chatridhaar	Judge Court - Civil Lines	Civil line - New Bus Stand
18.	Minor Bridge (nos.)	Nil		
19.	Major Bridge (nos.)	Nil		
20.	Land Use	Residential		

24. This road subproject connect many local surroundings and after its restoration villages/areas like Kandolia, Chatridhaar, Judge Civil Court, Bus stands etc. will be well connected with the main stream

**b. Proposed Category of the Project**

25. Pursuant to the requirements of the *ADB Safeguard Policy Statement (2009)* each of the road sections proposed for upgrading were screened to identify significance of potential impacts, determine the most environmentally sensitive component, establish the needed level of assessment, and prescribe the information disclosure and consultations requirement to be complied by the Uttarakhand-PWD. Consistent with the EARF, both of the roads were screened using the ADB rapid environmental assessment (REA) checklist-roads and bridges for state highways and district roads.

26. The environmental screening revealed that no protected or sensitive areas were traversed. There are no rare, threatened, and endangered species (flora and fauna) within the subproject corridor of impact. Majority being hills roads, the most significant environmental impacts are potential increase in erosion, siltation, and landslide.

27. All the sub-package roads are existing and no expansion/realignments are proposed. The road section partial tranverse through forest but the work will be confined to the existing ROW belonging to Uttarakhand Public Works Department. All impacts are site specific, few are irreversible and related to minor alignment correction and road widening, and all impacts can be readily mitigated supporting a Category B classification.

**c. Key Rehabilitation and Reconstruction Activities**

28. Road improvement component will include upgrading of Urban Road in hilly terrain to a single lane standard (3.75 m-7.00 m carriageway and 6.00-9.00 m formation width), conducting patch repairs and pot hole filling; strengthening of culverts and bridges; constructing of cross-draining structures; and providing all necessary road furniture and roadside safety hardware. Summary of roads to be upgraded/improved is provided below:

Table III-1. Distribution of Road Sections to be upgraded under UEAP

Sl. No.	Name of Road	Chainage	Affective length (Km)
1	Judge Court To Civil Line	0.000 to 1.200	1.200
2	Kandoliya To Chatridhaar	0.000 to 1.652	1.652
3	Civil Line To New Bus Stand	0.000 to 0.675	0.675
<b>Total</b>		<b>3.527</b>	<b>3.527</b>

**d. Project Implementation Schedule**

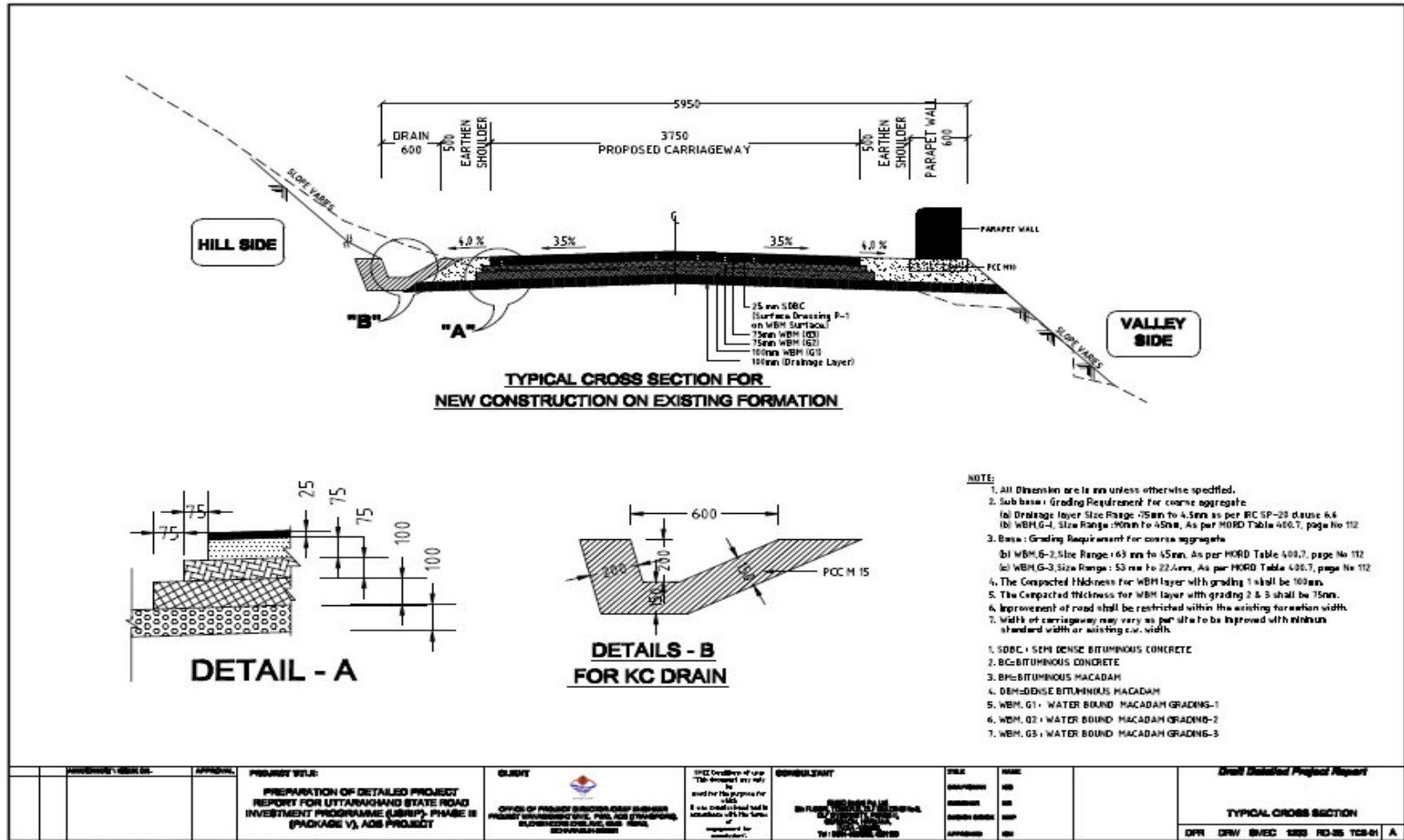
The implementation period for this civil work shall be 12 months. All UEAP components are expected to be completed by December 2017.

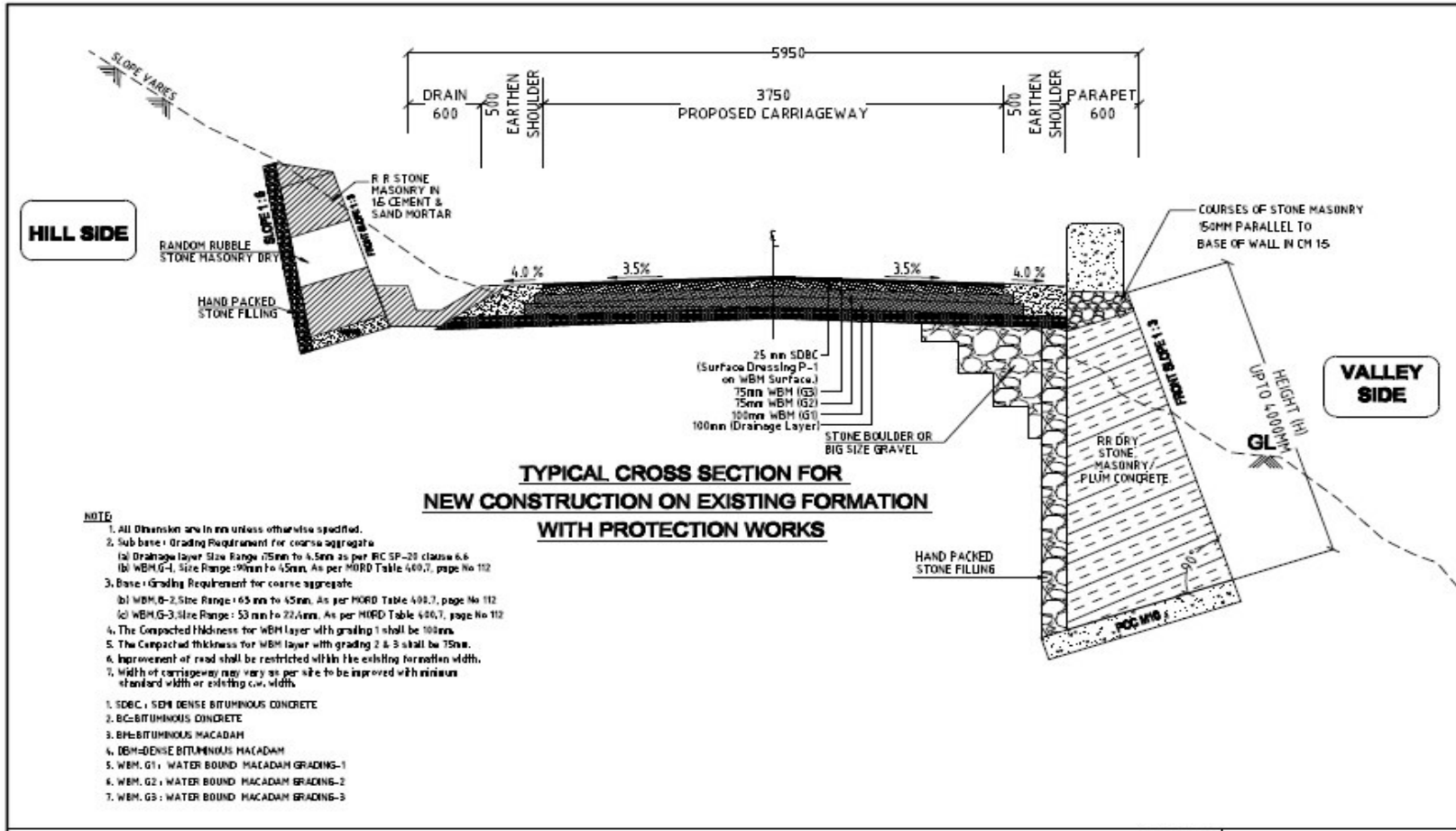


Figure III-1 Internal Motor Roads of Nagar Palika of Pauri in District Pauri



Figure III-2 Typical Cross-section





**NOTE:**

1. All dimensions are in mm unless otherwise specified.
  2. Sub base & Grading Requirement for coarse aggregate
    - (a) Drainage layer Size Range: 75mm to 4.5mm as per IRC SP-20 clause 6.6
    - (b) WBM-G-1, Size Range: 90mm to 4.5mm. As per MORD Table 469.7, page No 112
  3. Base & Grading Requirement for coarse aggregate
    - (a) WBM-B-2, Size Range: 65 mm to 4.5mm. As per MORD Table 469.7, page No 112
    - (c) WBM-G-3, Size Range: 53 mm to 2.5mm. As per MORD Table 469.7, page No 112
  4. The Compacted thickness for WBM layer with grading 1 shall be 100mm.
  5. The Compacted thickness for WBM layer with grading 2 & 3 shall be 75mm.
  6. Improvement of road shall be restricted within the existing formation width.
  7. Width of carriageway may vary as per site to be improved with minimum standard width or existing c/w. width.
1. SDBC : SEMI DENSE BITUMINOUS CONCRETE
  2. BC: BITUMINOUS CONCRETE
  3. BM: BITUMINOUS MACADAM
  4. DBM: DENSE BITUMINOUS MACADAM
  5. WBM, G1 : WATER BOUND MACADAM GRADINGS-1
  6. WBM, G2 : WATER BOUND MACADAM GRADINGS-2
  7. WBM, G3 : WATER BOUND MACADAM GRADINGS-3

<b>REVISION</b>	<b>DATE</b>	<b>APPROVED BY</b>	<b>DESIGN APPROVAL</b>	<b>PROJECT TITLE</b>	<b>CLIENT</b>	<b>CONSULTANT</b>	<b>SCALE</b>	<b>NAME</b>	<b>PROJECT NO.</b>	<b>DATE</b>	<b>PROJECT NAME</b>
				<b>PREPARATION OF DETAILED PROJECT REPORT FOR UTTARAKHAND STATE ROAD INVESTMENT PROGRAMME (USRIIP)- PHASE II (PACKAGE V), AOS PROJECT</b>	<b>OFFICE OF PROJECT SUPERVISOR/PROJECT SUPERVISOR (SPECIAL ASSISTANT), PWD, AOS (TRANSPORT), UTTARAKHAND STATE ROAD INVESTMENT PROGRAMME</b>	<b>DR. PRADEEP K. SHARMA, CHIEF ENGINEER, PWD, AOS (TRANSPORT), UTTARAKHAND STATE ROAD INVESTMENT PROGRAMME</b>					<b>Dr. Pradeep K. Sharma, Project Manager (Package V) (Phase II) KANWAR BISHN to DUNDELAH ROAD (Km 0+000 To Km 13+000) TYPICAL CROSS SECTION</b>



#### IV. DESCRIPTION OF THE ENVIRONMENT

##### A. Physical Environment

29. This section presents a brief description of the existing environment, including its physical, ecological resources, and socio-economic development of Sub project roads. Broad aspects on various environmental parameters such as geography, climate and meteorology, physiography, geology, seismology, ecology, socio-cultural and economic development parameters that are likely to be affected by the proposed roads improvement are presented. These aspects are disaggregated at the state and district levels covered in the road improvement project. Secondary information was compiled from relevant government agencies like the Forest Department, Wildlife Department, State Environment Protection, and Pollution Control Board and Metrological Department.

##### (i) Geography

30. Uttarakhand lies in the northern part of India amidst the magnificent Himalayas and dense forests. The State is bordering Himachal Pradesh in the north-west and Uttar Pradesh in the South and shares international borders with Nepal and China. The State is comprised of 13 districts, these are; Pithoragarh, Almora, Nainital, Bageshwar, Champawat, Uttarkashi, Udham Singh Nagar, Chamoli, Dehradun, Pauri, Tehri Garhwal, Rudraprayag, and Haridwar. Geographically, the state lies in the northern Himalayas between 28°53'24" to 31°27'50" North latitude and 77°34'27" to 81°02'22" East longitude. The State has an area of 53,484 sq. km. and a population of about 10 million as per census 2011.

31. Pauri Garhwal, a district of Uttarakhand state encompasses an area of 5230 sq. km and situated between 29° 45' to 30°15' Latitude and 78° 24' to 79° 23' E Longitude. This district is ringed by the districts of Chamoli, Rudraprayag & Tehri Garhwal in North, Bijnor & Udham Singh Nagar in South, Almora & Nainital in East, Dehradun & Haridwar in West. The District is administratively divided into nine tehsils, viz., Pauri, Lansdown, Kotdwar, Thalishain, Dhumakot, Srinagar, Satpuli, Chaubatakhal & Yamkeshwar and fifteen developmental blocks, viz., Kot, Kaljikkhal, Pauri, Pabo, Thalishain, Bironkhal, Dwarikkhal, Dugadda, Jaihrikkhal, Ekeshwar, Rikhnikhal, Yamkeswar, Nainidanda, Pokhra & Khirsu.

Figure IV-1 Districts of Uttarakhand



32. Uttarakhand is divided into two regions and also called administrative divisions, basically following terrain: the Kumaon and Garhwal. The Kumaon division located southeast of the state and composed of Almora, Bageshwar, Champawat, Nainital, Pithoragarh, and Udham Singh Nagar. The Kumaon region is part of the vast Himalayan track and the sub-mountains of Terai and Bhabhar. The region is drained by Gori, Dhaul, and Kali from the Tibetan mountains, and Pindari and Kaliganga which ultimately joins Alaknanda River. The Garhwal division is composed of Chamoli, Uttarkashi, Rudrapur, Tehri Garhwal, Pauri, Dehradun, and Haridwar districts and is entirely on rugged mountain ranges dissected by valley, and deep gorges. The Alaknanda River, the main source of the Ganges, traces its headwaters in this region.
33. The State is part of the Western Himalaya is further divided into four zones namely, the Tarai-Bhabar-Shivalik (Sub-Himalayas), Lesser-Himalayas, Greater-Himalayas, and Trans Himalaya (Tethys). These are briefly described below:
- (i) **Tarai-Bhabar-Shivalik (sub-Himalaya).** South of the Lesser Himalayas, Tarai-Bhabar-Shivalik is the outermost zone overlooking foot-hills and plains. With an altitude ranging from 750-1,200 metres, the Shivaliks are the foot-hills just above the Bhabar and Tarai. Once famous for the swamps and insalubrious climate and inhabited by Tribal people only, the Shivaliks are reclaimed and developed into a fertile land and are now supporting a large population. The Garhwal region is located in the Shivalik hills.
  - (ii) **The Lesser Himalayas.** The northern zone is composed of gneisses and granites, this portion has great complexity of structure having the most favorable climatic conditions for human habitation. The elevation varying from 1,000 metres to 3,500 metres from low lying river valleys to peaks close to the Great Himalayas, the Lesser Himalayas, with moderately steep slopes, consists of many fertile and flat river valleys. The Lesser Himalayas is watered by the rivers Kosi, Gomti, Saryu, Ramganga, and Ganga. The banks of these rivers locally called as 'seras' and are highly fertile. The major Lesser Himalayan settlements situated in the region as per project districts include Pithoragarh (Lohaghat, Champawat, Gangolihat, Berinag), Bageshwar (Kapkot) and Almora (Ranikhet, Dwarahat, Chaukhutia, Someshwar and Kausani). The cross profiles of the fluvial valleys show convex form with steep valley sides, interlocking spurs descending towards the main channel, hanging valleys, waterfalls and rapids, and terraced agricultural fields on the gentle slopes on the valley sides. The clustering of villages is confined mainly on the gentle slopes of the ridges on the fluvial terraces.
  - (iii) **The Greater Himalayas.** The region is the northernmost zone consisting of perpetually snow-covered ranges between 3,500 to 4,800 metres although the snow-line rises to 5,400 metres during summers at some places. The zone contains a number of glaciers (i.e. Pindari, Milam, Nandakot, Kafni, Untadhura, Gori and Poting) giving rise to a number of snow-fed rivers (i.e. Pinder, Ramganga (Eastern and Western), Dharamganga, Saryu, and Kali. Except from the Pinder and the Ram Ganga (W), all are tributaries of the Kali which separates Kumaon from Nepal in the extreme north-east.
  - (iv) **The Trans-Himalayas (Tethys).** The Trans Himalayan region itself is an ill-defined mountain region covering an area of about 1,000 km (600 miles) and having a width ranging from 225 km (140 miles) to about 32 km (20 miles). Unlike the main Himalayas, the Trans Himalayan Mountains are not divided by deep river gorges. On the Roof of the World, passes average 5,330 m (17,500 ft) in height, with the highest being the Chorgoding Pass at a height of 5,885 m (19,308 ft).

## (ii) Geology

34. The geology of the region shows that the Himalayas are the young mountains in the world. During early Mesozoic times, or the secondary geological period, the land mass now covered by them was occupied by the great geosynclinals Tethys sea. The probable date of the commencement of the elevation of the Himalayas is about the close of the Mesozoic period, but the unravelling of the story of their structure has only just begin, and in many cases no dating of the rocks is yet possible, though they include ancient and relatively recent crystalline intrusive, rocks and sediments allied to the peninsular part of India.

### **District Pauri**

35. The topography of pauri Garhwal is by and large rugged and except for the narrow strip of Bhabar, the entire region is mountainous. The highest point of the area is 3116 mtrs at Dudatoli and the lowest point of the area is 295 mtrs near chilla. The village located at the highest level is Dobri, which is 2480 mtrs high. The cross profiles of the fluvial valleys show convex form with steep valley sides, interlocking spurs descending towards the main channel, hanging valleys, water falls and rapids and terraced agricultural fields on the gentle slopes on the valley sides. The clustering of villages is confined mainly on the gentle slopes of the ridges on the fluvial terraces. The forest cover is the maximum in Thailisain block and the minimum in the Pauri block. Most of the part of the area is approachable by road from its district headquarter. Most of these roads are not yet metalled and are prone to land slips, slides, dusty, except few main roads. The district of Pauri Garhwal as part of the Western Himalaya presents a unique set of ecological characteristics over a complex variety of systems that incorporate forests, meadows, savannah grasslands, marshes and rivers, as well as wildlife, geology and several other phyto-geographically distinctive peculiarities. The occurrence of diverse topographical and climatic factors has resulted in the remarkable biodiversity of the district as a result of which flora also correspondingly differs over its different parts. Forests dominate in the phyto-geography and also constitute the most valuable natural resource of the district.

## (iii) Physiography

36. Uttarakhand lies in the Northern part of India amidst the magnificent Himalayas and dense forests. The state is bordering Himachal Pradesh in the north-west and Uttar Pradesh in the South and has international borders with Nepal and China. The State today with 13 Districts can be grouped into three distinct geographical regions, the High mountain region, the Mid-mountain region and the Terai region.

### **Pauri District**

37. The Pauri City which is situated at an altitude of 1,814 Meters above the sea-level on the northern slopes of Kandoliya hills is the headquarters of the district Pauri Garhwal and the Garhwal Division. Headquarters of all Govt. departments are located in the city Pauri. The district of Pauri-Garhwal is one of the blessed regions of Uttarakhand. It is abundantly blessed with nature's bounty like snow-capped Himalayan peaks, dense forests, winding rivers, and extremely warm people with a rich culture and tradition. Pauri also provides a panoramic view of the snow covered Himalayan peaks of Nandadevi & Trisul, Gangotri Group, Thalaiya-Sagar, Neelkanth, Bandar Poonch, Swarga- Rohini, Kedarnath, Kharcha Kund, Satopanth, Chaukhamba, Ghoriparvat, Hathiparvat and Sumeru etc.

38. Pauri Garhwal has a diverse topography varying from the foothills of the Tarai of Kotdwara to the sprawling meadows of Dhanaulti. It covers an area of 5,230 sq km and is divided into nine tehsils situated between 29° 45' to 30°15' N and 78° 24' to 79° 23' E. Pauri Garhwal is surrounded by the districts of Chamoli, Dehradun, Bijnor, Nainital, Haridwar, Rudraprayag and Tehri Garhwal. The two important rivers of this district are Alaknanda and Nayar River. Pauri experiences a sub-temperate climate which remains pleasant throughout the year except during winters when it gets extremely cold. Pauri is famous for its several tourist spots.
39. The snow-capped mountains of Khisru offer the tourists a wonderful view of the Himalayas and are reason enough to attract hundreds of tourists in Pauri. Located at a height of 3,100 m above sea level, Dhoothatoli is covered with dense forests. 114 kms from Pauri is Binsar, set amidst dense forests of Rhododendron, Oak and Deodar. About 2 kms from Pauri is Kandoliya, a beautiful area also surrounded by forests. The Kandoliya Devta temple dedicated to the local god Bhumi- Devta is also located here.
40. The nearest airport for Pauri is Jolly Grant while the nearest railway head is Kotdwara. Pauri is also well connected to Rishikesh, Dehradun and Kotdwara. The district headquarters is Pauri, total district area is 5,438 sq. km; total population: 6,97,078 having a literacy percentage of 77.99%.

## **B. Pedology**

41. Soils of the region have been formed either through pedogenetic processes or are transported soils. The pedogenetic soils are the one which have been formed by long duration of exposure to atmospheric agencies, physical and chemical weathering and rock slides. Such types of soils are derived from granite Gneissic, schistose and phyllite rocks. These soils obtained high percentage of silica from their parent body, while the soils formed from the limestone are rich in calcium carbonate. The transported soils are carried and deposited by the streams. Their parent body and source rocks lie at far away places. Some of these soils have mixed origin of glacial and fluvio-glacial origin. These soils of talus, fans and terraces are silt to clayey loam and are very fertile. The brown forest soils contain very high percentage of organic matter. The katil soils are stony, immature and extremely poor. Soils of Upraon are gravelly and sandy Loams, they are brown of Talaon. The Talaon soils are brown in colour with clayey texture. The stony texture provides higher rate of erosion.
42. The baseline data on soil quality will be generated by the Design & Supervision Consultant (DSC) before commencement of construction works.
43. The proposed no. of samples of soil quality monitoring at pre construction stage (baseline data) are as follows as per CPCB guideline monitoring as follows:

<b>S.No</b>	<b>Name of the Motor Road</b>	<b>No. of Samples</b>	<b>Sampling Location</b>
1.	Reconstruction of internal motor roads of Nagar Palika Pauri In District Pauri	1	Kandoliya

44. During construction the sampling locations proposed are, where the construction/ restoration/ repair work will be done.

### **C. Climate and Meteorology**

45. The State of Uttarakhand, with its highly varying topographical features, has shown an equally variegated climatic condition, ranging from hot and sub-humid tropical in the southern tract of Bhabhar to temperate, cold alpine, and glacial climates in the northern part of the high mountains.
46. Factors such as elevation, slope, proximity of glaciers, forests, mountain peaks and ridges and direction of mountain ranges together give rise to the great variations in climatic conditions, even at the micro and local levels. These attributes determine the temperature range as well as the distribution of rainfall.
47. However, the overall climatic condition in the State is governed by the southwest monsoon. It has a sub-tropical to temperate climate, with three pronounced seasons; summer, winter, and monsoon. The hilly terrain of the Himalayan region has snow cover and is severely cold during winter with snowfall normally occurring during the months of December to March. The climatic conditions of Almora, Nainital, Pithoragarh, Chamoli, Uttarkashi, Pauri and Dehradun are humid and cold.
48. The Garhwal region has a sub-temperate to temperate climate with maximum temperature recorded in the month of June is 45°C at Kotdwar while in the higher reaches at Dudhatoli it only rises to 25°C. Temperature descends to a minimum of 1.3°C in January, and means monthly temperature for the region ranges from 25°C to 30°C. The climate of Pauri Garhwal is very cold in winter and pleasant in summer. In rainy season the climate is very cool & full of greenness. However, in Kotdwar and the adjoining Bhabhar area it is quite hot reaching high 40s Celsius during the summer. In winter however; many parts of Pauri receive snowfall.

#### **(i) Rainfall**

49. The region has a sub-temperate to temperate climate, which remains pleasant throughout the year. The maximum temperature recorded in the month of June is 45°C at Kotdwar while in the higher reaches at Dudhatoli it only rises to 25°C. Temperature descends to a minimum of 1.3°C in January, and means monthly temperature for the region ranges from 25°C to 30°C. The hilly terrain with its densely forested slopes receives adequate rainfall generally commencing from mid-June and extending till mid-September. Occasional rainfall is also recorded in winter. Average annual rainfall in the district is 218 cm. about 90 percent of which is generally concentrated over the monsoon. Relative humidity varies between 54 and 63 percent. The higher reaches receive some snow in winter when temperature falls to freezing point.
50. The Pauri Garhwal region has a sub-temperate to temperate climate, which remains pleasant throughout the year. The maximum temperature recorded in the month of June is 45°C at Kotdwar while in the higher reaches at Dudhatoli it only rises to 25°C. Temperature descends to a minimum of 1.3°C in January, and means monthly temperature for the region ranges from 25°C to 30°C. The hilly terrain with its densely forested slopes receives adequate rainfall generally commencing from mid-June and extending till mid-September. Occasional rainfall is also recorded in winter. Average annual rainfall in the district is 218 cm. about 90 percent of which is generally concentrated over the monsoon. Relative humidity varies between 54 and 63 percent. The higher reaches receive some snow in winter when temperature falls to freezing point



**(ii) Temperature**

51. The average temperature in summer varies between 12 and 16°C. Winter nights everywhere, are extremely cold in Uttarakhand. Between April and June, temperature in plains crosses 40°C and drops to 10°C during monsoon. With increase in altitude, temperature in the hilly region falls sharply and there is permanent snow cover on the peaks.
52. The mean winter temperature at altitude 2,200m above MSL is 6.7°C and summer mean temperature is 18.3°C. In winter the daily maximum temperature in most of the hilly areas is around 7°C and minimum 1°C. The atmosphere is generally foggy during the morning and evening.

**(iii) Humidity**

53. In general in Uttarkhand relative humidity is high during the monsoon season, generally exceeding 70 percent on the average. The driest part of the year is the pre-monsoon period when humidity may drop to 35% during the afternoon. During the winter months, humidity increases toward the afternoon at certain high stations.

**D. Air and Noise Quality**

**(i) Air Quality**

54. The pristine environment and sparse population suggest that most part of the State have a very good air quality. Any point or non-point pollution sources of air pollution were not observed throughout the survey period. It was observed that the traffic on the roads is too low to cause unbearable air pollution due to vehicular exhaust. In addition, almost all the sub-project roads are passing through forests having good vegetation coverage hence vehicular emissions are easily sequestered. Finally, there are no industries recorded in or along the project roads and hence any other source of atmospheric air pollution is not expected.
55. The air pollution level is well within the permissible limits because there are no major sources of pollution in the region. The town and villages does not have any pollution monitoring mechanism, so no previous data is available. However, as per observations and feedback from the residents, the air quality is good. Before commencement of construction activities, the contractor will generate baseline ambient air quality data of PM10, PM2.5, SO<sub>x</sub>, NO<sub>x</sub> etc. The sampling locations for the baseline data will be representative of residential area, commercial area, open area and congested area.
56. The baseline data on soil quality will be generated by the Design & Supervision Consultant (DSC) before commencement of construction works.
57. The proposed no. of samples of air quality monitoring at pre construction stage (Baseline data) are as follows as per CPCB guideline monitoring as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling Location
1	Reconstruction of internal roads of Nagar Palika Pauri in District Pauri	2	Kandoliya Civil Line

**(ii) Noise Quality**

58. Generally, noise pollution is not a problem in the state except in the urban areas like Dehradun, Haridwar and Haldwani. Traffic, industrial, and festival/cultural noises, along with noise generated from construction activities, DG sets etc., are the most prominent sources of noise in the urban areas. There are no industrial enterprises along any of the road in the project area. As the traffic is moderate, the noise pollution either at point or non-point sources is not expected in the project area. Moreover, there will be not much rise in the noise levels to be brought about by the proposed activities.
59. During the construction period, a temporary increase in the noise levels are expected as there will be movement of construction machineries and construction activities to be done in the proposed road development. Suitable noise barriers in the form of vegetation and timely scheduling of construction activities will help minimize these effects better.
60. The baseline data on Noise quality will be generated by the Design & Supervision Consultant (DSC) before commencement of construction works.
61. The proposed no of samples of noise quality monitoring at pre construction stage are as follows as per CPCB guideline monitoring as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling Location
1	Reconstruction of internal Motor Roads of Nagar Palika in Pauri In District Pauri	2	Kandoliya Civil Line

62. During construction the sampling locations proposed are, where the construction/ restoration/ repair work will be done.

**E. Hydrology**

63. Uttarakhand has tremendous water resources such as glaciers, lakes, rivers and other water bodies. Most of these have tourism importance like Milam, Pindari, Sunder Dhunga and Heeramani Glaciers; Seven Lakes in Nainital; and some wetlands. However these water bodies are located far from the road corridors.
64. Generally, there has been an overall decline in water resources in the State. Hydrological studies over the last decades confirm the diminishing water resources and the worsening crises (Rawat et. al) as caused by the following factors which have resulted in the decrease in underground seepages. These have directly contributed to the reduction of water availability in and reduction of discharge in nallas as well as extensive disappearance of springs—the region’s primary source of drinking water.
- There has been a diminishing regulatory effect of glaciers of the Great Himalayan zone.
  - There is a long-term decreasing trend of stream discharges.
  - The capacities of the lakes have dwindled.
  - Surface runoff on the hillsides has shown high increase.
  - There has been an increase in floodwater and decrease in base flow water in channels and rivers.
  - Extensive soil erosion and landslips are recurring phenomena in the region.

**(i) Water Drainage**

65. The region of Uttarakhand is well drained by numerous rivers and rivulets locally known as Gad, Gadhera and Naula. The water resources of this region are of singular importance not only for the region but also for the whole Gangetic plains of north India. There are three main river systems are: (i) the Bhagirathi – Alaknanda basin – Ganges basin, (ii) The Yamuna – Tons basin, and (iii) the Kali basin.
66. The Ganges system drains the major part of the region covering the whole of the Garhwal, except the western part of Uttarkashi district, and the western part of Garhwal Himalayas from an altitude of 7,138 m meet at Devprayag and flow as the Ganges thereafter. The Bhagirathi is the main stream while the Alaknanda, Saraswati, Dauli Ganga, Berahi Ganga, Nandakini, Mandakini, Madhu Ganga, Pindar, Atagad, Bhilangana, Jad Ganga, the Kaldi Gad and the Haipur are the main tributaries to the Alaknanda and/or Bhagirathi, ultimately contributing to the waters of Ganges. The Nayar, which drains more than a half area of the Garhwal district, is an important tributary of the Ganga. The Yamuna-Tons system is also located in the Garhwal region. The Yamuna river rises at Yamunotri and is joined by important tributaries such as the Giri and more importantly, the Tons, which is its biggest tributary with 2.7 times greater volume of water than the Yamuna. The River Yamuna flows out of the hill areas through the Doon valley and the Shivaliks, into Haridwar district, being joined in the Doon valley by several streams.

**(ii) Water Quality**

67. There is very little documentation on the pollution status of rivers except that of the holy river Ganga and some other water bodies where there were at least limited monitoring studies recently. In terms of quality, the surface water of the State is unprotected from untreated wastewater, and runoffs from chemical fertilizers and pesticides. No proper sewage treatment facilities exist in the project area. Such neglect of water sources has exposed water bodies to potential pollutants and toxic wastes in the near future. The increasing pollution of water bodies constitutes the biggest threat to public health. At present, there is limited information available on the quality of fresh water resources in the State.
68. Based on limited records, the water quality of Uttarakhand's rivers, rivulets, and other natural water sources is generally good and no major source of water pollution was found. The hand pumps, natural water seeping out from mountains locally called as "Naula", and natural water springs locally called as "Gadhera" represent the ground water sources in the hills. There are no major sources of water pollution in terms of point or non – point sources aside from natural landslides leading to deposition of debris in streams. Proposed subprojects are not expected to have any impact on the surface water quality. The baseline data on water quality will be generated by the Design & Supervision Consultant (DSC) before the commencement of construction activity.
69. The proposed no. of samples of water quality monitoring in pre construction stage are as follows as per CPCB guideline monitoring as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling Location
1	Reconstruction of internal Motor Roads of Nagar Palika in Pauri In District Pauri	2	Kandoliya Civil Line

70. During construction the sampling locations proposed where the construction/ restoration/ repair work will be done.

**F. Mineral Resources**

71. It has been estimated that there are deposits of 100 million tonnes of limestone, 35 million tonnes of dolomite, 21 million tonnes of magnesite, 9.0 million tonnes of rock phosphate, 4.0 million tonnes of gypsum, and 8.8 million tonnes of soap stone in different areas of the State. Some of the major mineral deposits are indicated in the succeeding Table.

Table IV-1. Availability of Important Minerals (million tonnes)

Sl. No.	Mineral	Quantity
1.	Limestone	430.5
2.	Marble	6.4
3.	Rock Phosphate	25.0
4.	Barytes	0.085
5.	Greyphite	10.7
6.	Dolomite(superior)	30
7.	Magnesite	70.294
8.	Copper	1.6
9.	Soap stone	26.64
10.	Gypsum	0.195

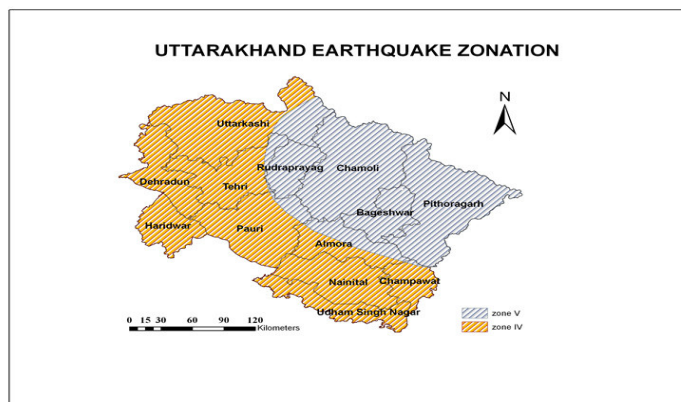
Source: <http://rrtd.nic.in/Uttarakhand.htm>

**G. Seismology**

72. Uttarakhand Himalayas are one of the seismically active regions of the world and have experienced earthquakes since times immemorial. The region has also experienced tectonic movements. This is evident from several thrusts and faults present in and around the state. Two regional tectonic features in Uttarakhand, which have earthquake potential, are the main central thrust (MCT) and the main Boundary Thrust (MBT). In fact, these tectonic features are present all along the entire Himalayan tectonic belt.

73. As per the seismic zoning map of India, as incorporated in Indian Standard Criteria for earth quake Resistant Design of Structure IS:1893-(Part I) 2002: General Provisions and Buildings; the entire state of Uttarakhand has been assigned to seismic zone IV and V, which are the two most seismo-tectonically active zones on the map.

Figure IV-2 Seismic Zone of Uttarakhand



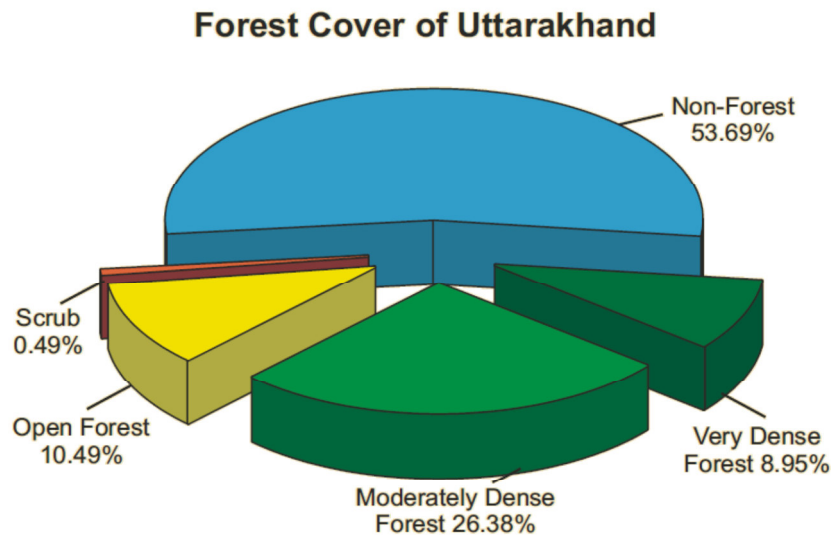
## H. Ecology

74. The hilly State of Uttarakhand has a forest cover of 65% of its total geographical areas (slightly lower than the stipulated 66.6% forest cover for hilly states).

### (i) Forestry

75. According to The India State of Forest report 2013, the recorded forest area of the Uttarakhand state is 24,508 km<sup>2</sup> which constitutes 45.82% of its geographical area. Very-dense forest constitute 8.95%, moderately dense constitutes 26.38%, Open Forest constitutes 10.49% and scrub constitutes 0.49% of total forest area.

Figure IV-3 Forest Cover by State, 2013 (FSI, 2013)



76. The distribution of forest cover by district is presented in the succeeding Figure and Table. The Garhwal region has more forest cover with 14,639 km<sup>2</sup> compared to the Kumaon region with 9,869 km<sup>2</sup>. However, they are almost equal in terms of distribution over its territory with 45% and 47% of covered with forest. The district of Pauri Garhwal, Uttarkashi, Nainital, and Chamoli have the largest forest cover accounting for 50% of all the state's total.

Figure IV-4 Uttarakhand's Forest Cover Map

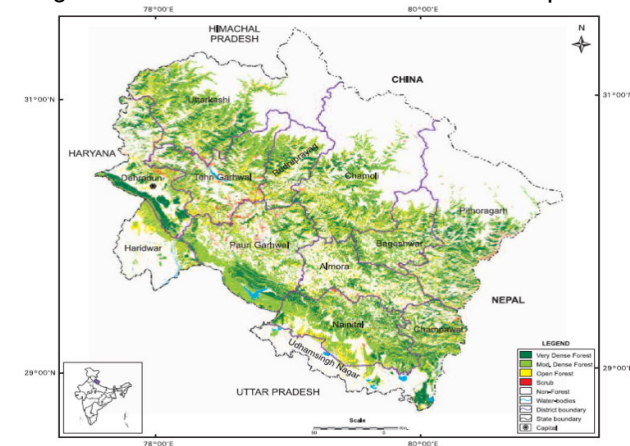


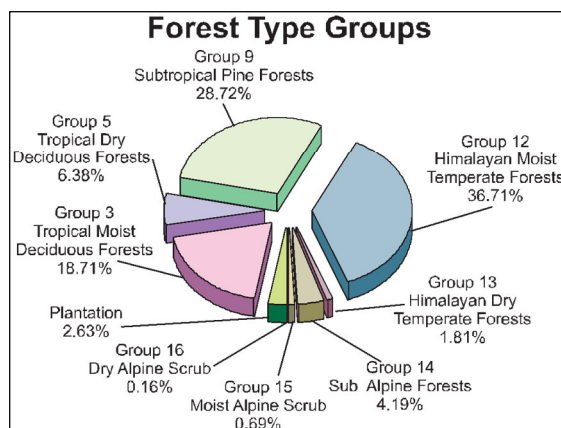
Table IV-2. District-wise Forest Cover, Uttarakhand

Region	District	Geographic Area	Forest Cover			Total Forest 2013	% of Total 2013
			Very Dense	Moderate Dense	Open Forest		
Garhwal	Uttarkashi	8,016	570	1957	618	3,145	39.23
	Rudraprayag	1,984	241	592	297	1,130	56.96
	Chamoli	8,030	441	1,573	686	2,700	33.62
	Pauri Garhwal	5,329	520	2,095	676	3,291	61.76
	Tehri Garhwal	3,642	298	1,232	618	2,148	58.98
	Dehradun	3,088	583	695	332	1,610	52.14
	Haridwar	2,360	25	333	257	615	26.06
Sub-Total		32,449	2678	8477	3,484	14,639	45.11
Kumaon	Pithoragarh	7,090	571	1,113	416	2,100	29.62
	Bageshwar	2,246	197	883	305	1,385	61.67
	Almora	3,139	222	927	428	1,577	50.24
	Nainital	4,251	605	1,899	570	3,074	72.31
	Champawat	1,766	337	576	274	1,187	67.21
	Udham Singh Nagar	2,542	175	236	135	546	21.48
Sub-Total		21,034	2,107	5,634	2,128	9,869	46.91
Total		53,483	4,785	14,111	5,612	24,508	45.82
Note	Very Dense Forest – All lands with tree cover of canopy density of 70% and above Moderately Dense Forest – Canopy density between 40%-70% Open Forest – Canopy density between 10%-40%						

Source: India State of Forest Report 2013

77. Forest type mapping using satellite data has been undertaken by Forest Survey of India with reference to Champion and Seth (1968) classification. As per this assessment, the state has 34 forest types which belong to eight forest type groups, viz. Tropical Moist Deciduous, Tropical Dry Deciduous, Subtropical Pine, Himalayan Moist Temperate Forests, Himalayan Dry Temperate Forests, Sub-Alpine Forests, Moist Alpine Scrub and Dry Alpine Scrub. Percentage wise distribution of forest in different forest type groups found in the state is given in the pie diagram.

Figure IV-5 Forest type groups of Uttarakhand



78. A wide variety of tree species is found in the mountains of Uttarakhand and enumerated in the succeeding Table according to altitude location. Some notable tree

species are Poplar (*Populus ciliata*) and Eucalyptus (*Eucalyptus citriodora*) due to their fast growing and large market demands, and Khair (*Acacia catechu*) and Seesam (*Dalbergia sissoo*) for their ecological and economic importance. Sal (*Shorea robusta*), which is highly adapted to sandy soil are being used to stabilize river banks and islands in river beds. Oak (*Quercus* sp.) is another important species considered to be amongst the best wood in the world specially for making agriculture implements due to its very heavy hard with twisted fibers. The State Govt. of Uttarakhand has declared the oak tree (*Quercus* sp.) as a *Kalpvrksha* or wish fulfilling divine tree often treated as the signature plant of the Kumaon Himalayas as numerous logos and insignias with a stylized version of the deodar inscribed on them. Deodar grows in the temperate to alpine climate that is found between 3500 and 12000 feet in this region. Finally Chir pine (*Pinus roxburghii*) a source of resin, which is used for producing resin and terpentine.

79. The proposed subproject are not expected to have any impact on the Forests and does not involve any tree cutting as the scope of the work is restricted to reconstruction and rehabilitation of disaster affected section of the existing roads. No road widening is proposed.

Table IV-3 Predominant Top-Canopy (Tree) Species According to Altitude

Sl. No.	Common Name	English Name	Botanical Name	Altitude (m.)
1.	Kachnar	Orchid tree	<i>Bauhinia variegata</i>	600-900
2.	Cheed	Chir Pine	<i>Pinus roxburghii</i>	600-900
3.	Shal tree	Shal tree	<i>Shorea robusta</i>	600-750
4.	Banj	Oak tree	<i>Quercus incana</i>	1700-2000
5.	Kail	Blue pine	<i>Pinus wallichiana</i>	1800-2400
6.	Buransh	Rose tree	<i>Rhododendron arboretum</i>	200-2100
7.	Deodar	Cedar tree	<i>Cedrus deodara</i>	1800-2400
8.	Raga	Himalayan fir-low level	<i>Abies pindrow</i>	2100-2900
10.	Raga	Himalayan fir-high level	<i>Abies spectabilis</i>	2900-3600
11.	Spruce	Spruce	<i>Picea smithiana</i>	2400-2900
12.	Thuner	Himalayan Yew	<i>Texus baccata</i>	2400-2700
13.	Surai	Cypress	<i>Cupressus torulosa</i>	2300-2400
14.	Pangar	House Chestnut	<i>Aesculus indica</i>	1800-2100
15.	-	Strawberry tree	<i>Cornus capitata</i>	2000-2300
16.	Bhojpatra	Betula	<i>Betula utilis</i>	3000-3500
17.	Buransh	Rose Wood	<i>Rhododendron arboreum</i>	1700-2000
18.	Simaru	Rose Wood	<i>R. campanulatum</i>	2200-3000
19.	Moru	Oak tree	<i>Quercus dilatata</i>	2000-2500
20.	Kharsu/Khoru	Oak tree	<i>Quercus semicarpifolia</i>	2200-2400

## (ii) Biodiversity

80. The State of Uttarakhand is endowed with rich bio-diversity as manifested by its approximately 64 percent forest cover. The State has established six national parks and six wildlife sanctuaries for the conservation of flora and fauna. Such areas include the Nanda Devi National Park, Valley of Flowers, Gangotri National Park, Govind Pashu Vihar National Park, Rajaji National Park, Jim Corbett National Park, Kedarnath Wildlife Sanctuary, Askot Musk Deer Sanctuary, Mussoorie Sanctuary, Binsar Wildlife Sanctuary, Sanadi Sanctuary, and Govind Wildlife Sanctuary—all of

which are being looked after by the Uttarakhand government. A positive remark on the State is that it maintains rich wildlife outside their protected areas.

Table IV-4 Wildlife in Uttarakhand

Sl. No.	Protected Areas	Year	Unit	Statistics
1.	<b>National Parks</b>			
	(i) Number	2011-12	No.	6
	(ii) Area	2011-12	Sq. Km.	4915
2.	<b>Wildlife Sanctuaries</b>			
	(i) Number	2011-12	No.	6
	(ii) Area	2011-12	Sq. Km.	2420
3.	<b>Important Wild Animals</b>			
	(i) Tiger	2008	No.	178
	(ii) Leopard	2008	No.	2335
	(iii)Elephant	2008	No.	1346
	(iv) Musk Deer	2008	No.	376
	(v) Black Bear	2008	No.	1935
	(vi) Sloth Bear	2008	No.	172
	(vii) Brown Bear	2008	No.	14

81. The Himalayas represent one of the most fascinating biota (fauna and flora) all over the world, both in terms of quality and quantity. This is evident from the fact that more than 50 percent of all biota can be found only in the Himalayan region. Such fact is brought about by the region's uniqueness in terms of favorable climatic conditions, natural habitats, and soil types.

82. The State of Uttarakhand is represented by Biogeographic Zones 2B Western Himalaya and 7B Siwaliks<sup>1</sup> in this region. About 18.7 % of the total area under the Forest Department has been clearly earmarked for biodiversity conservation by the creation and management of 12 Protected Areas (PA) and a biosphere reserve in the State.

Table IV-5. National Parks in Uttarakhand

Sl. No.	National Park	Year of Establishment	Area (sq.km)	District
1.	Corbett NP	1936	521	Nanital & Pauri
2.	Nanda Devi NP	1982	630	Chamoli
3.	Valley of Flower NP	1982	87	Chamoli
4.	Rajaji NP	1983	820	Dehradun and Haridwar
5.	Gangotri NP	1989	2390	Uttarkashi
6.	Govind NP	1990	472	Uttarkashi

Source: Wildlife and Protected Areas, ENVIS, 2002

Table IV-6. Wildlife Sanctuaries in Uttarakhand

Sl.No.	Sanctuary	Year of Establishment	Area (sq.km.)	District
1.	Govind WLS	1955	521	Uttarkashi
2.	Kedarnath WLS	1972	957	Chamoli
3.	Askot WLS	1986	600	Pithoragarh
4.	Sonanadi WLS	1987	301	Garhwal
5.	Binsar WLS	1988	46	Almora
6.	Musoorie WLS	1993	11	Dehradun

Source: Wildlife and Protected Areas, ENVIS, 2002

<sup>1</sup> Negi, A.S., Status, Distribution and Management of Mountain Ungulates in Uttaranchal, Envis Bulletin, 2002



83. Variations in the topography of high mountain ranges and deep valleys and altitudes from sea-level portions give the project districts different habitats for a variety of fauna and in turn resulted in the enriched biodiversity in the region. The common wildlife reported from the forests includes Tigers, Panthers, Civet Cats, Leopard Cats, Jungle Cats, Himalayan Silver Fox, and the Jackal. Various species of deer including the Musk Deer and the Barking Deer also roam in the districts. Sambhar and Gural as well as the Bear and the Porcupine are also found in the project area. The flying mammal Bat is also common in the area. Other animals in the region include the Chipmunk, the Rhesus Monkey and the Flying Squirrel. Discussion with local people during the survey process generated reports on the presence of Leopards, Deers, Foxes, and Wild Pigs. Proposed subprojects are not expected to have any impact on the biodiversity. Some important information about wildlife of Uttarakhand is given in the Table below.

Table IV-7. List of Major Flora

Sr No	Local Name	Scientific Name
<b>Trees</b>		
1.	Buransh	<i>Rhododendron arboretum</i>
2.	Deodar	<i>Cedrus polycarpus</i>
3.	Chir	<i>Pinus roxburghii</i>
4.	Surai	<i>Cupressus tourulose</i>
5.	Padam	<i>Prunus cornuta</i>
6.	Mehal	<i>Pyrus pashia</i>
7.	Otis	<i>Alnus nepalensis</i>
8.	Ayar	<i>Lyonia ovalifolia</i>
9.	Kafal	<i>Myrica sapida</i>
10.	Akhrot	<i>Juglana regia</i>
11.	Bhimal	<i>Grewia optiva</i>
12.	Ritha	<i>Sapindus mukorossi</i>
13.	Tun	<i>Toona ciliate</i>
14.	Nimla	<i>Ficus auriculata</i>
15.	Timur	<i>Zanthoxylum tamala</i>
16.	Kharik	<i>Celtis eriocarpa</i>
17.	Chamkhirik	<i>Carpinus viminea</i>
18.	Katmon	<i>Betula alnoides</i>
19.	Kajal	<i>Acer acuminatum</i>
20.	Katoj	<i>Castanopsis tribuloides</i>
21.	Kirmola	<i>Acer oblongum</i>
22.	Kandru	<i>Ilex dipyrene</i>
23.	Banj	<i>Quercus semicarpifolia</i>
<b>Shrubs</b>		
1.	Kala Hisalu	<i>Rubus lasiocarpus</i>
2.	Karoz	<i>Carissa spinarium</i>
3.	Kobra Plant	<i>Arisama helleborifolium</i>
4.	Kandali	<i>Urtica parviflora</i>
5.	Satavar	<i>Asparagus racemosus</i>
6.	Dudhi	<i>Hollerrhena antidysentricr</i>
7.	Bajradanti	<i>Potentilla fulgens</i>
8.	Banfasa	<i>Viola surpans</i>
9.	Bach	<i>Acorus calamus</i>
10.	Nakol	<i>Urticor dioica</i>
11.	Patyura	<i>Pteraacanthus angustifrons</i>
12.	Dudhia	<i>Taraxacum officinale</i>
13.	Vatula	<i>Flemingia fruticulose</i>
14.	Belmur	<i>Flacourtia indica</i>

Sr No	Local Name	Scientific Name
15.	Nirghesi	<i>Delphinium denudatum</i>
16.	Silfoda	<i>Bergenia gossypina</i>
17.	Jula	<i>Gerbera grassypina</i>
18.	Jatamasi	<i>Nardostachys grandiflora</i>
<b>Grasses</b>		
1.	Dub	<i>Cynodon dactylon</i>
2.	Kush	<i>Sucharum spontanour</i>
3.	Gol ringal	<i>Chimonobambusa falcate</i>
4.	Tachita	<i>Apluda muticr</i>
5.	Dev ringal	<i>Thamnocalamus facloueri</i>
6.	Jhugra ringal	<i>Arundinaria jaunsarensis</i>
7.	Thamgil	<i>Thamnocalamus spathiflorus</i>

Table IV-8 List of Major Fauna

S. No.	Wild Animals	
	Local Name	Scientific Name
1	Guldar	<i>Panthera Pardus</i>
2	Kala Bhalu	<i>Selenarctos thibetanus</i>
3	Ghural	<i>Memorhaedus goral</i>
4	Kakar	<i>Muntiacus muntjak</i>
5	Khirao	<i>Capricornis sumatraensis</i>
6	Jangli Suar	<i>Sus-scrofa cristatus</i>
7	Chitrola	<i>Martes flarigula</i>
8	Langoor	<i>Presbyits entellus</i>
9	Khargosh	<i>Lepus nigricollis</i>
10	Sehi	<i>Hystrix indica</i>
11	Gidar	<i>Canis aureus indicus</i>
12	Jangli Billi	<i>Felis chaus</i>
13	Gilehri	<i>Eurambulus pennanti</i>
14	Bandar	<i>Macaques mulatta</i>
S. No	Birds	
	Local Name	Scientific Name
1	Chir Fijent	<i>Catreus wallichii</i>
2	Kalij Fijent	<i>Lophura Leucomelana</i>
3	Koklaj Fijent	<i>Pucrassia macrolophus</i>
4	Kala Irgal	<i>Letinaetus makavensis</i>
5	Karorla	<i>Urocissa erythrorhyncha</i>
6	Ullu	<i>Strix aluco nivicola</i>
7	Baaj	<i>Flaco severaus</i>
8	Kala Titar	<i>Francolinus francolinus</i>
9	Papiha	<i>Cuculus varius</i>
10	Tota	<i>Psittacula humalayana</i>
11	Chakor	<i>Alectoris graeca chuker</i>
12	Hariyal	<i>Treron spenura</i>
13	Pashchimi Tregopan	<i>Tragopan meloccephalus</i>
14	Bulbul	<i>Pyconotus cafer</i>
15	Maina	<i>Aerioctheres tristis</i>
16	Fakhta	<i>Streptobelia orientalis meena</i>
17	Gidh	<i>Gyps himalayensis</i>
18	Kauwa	<i>Carvus macrorhynchos</i>
19	Saat Bahen	<i>Teyrdoides striatus</i>
20	Neelkanth	<i>Garrulus Lanaclatus</i>

Source: Negi, A.S., Status, Distribution and Management of Mountain Ungulates in Uttaranchal, Envis Bulletine, 2002

### (iii) Biosphere Reserves

84. The Biosphere Reserve is the top category after Wildlife Sanctuary and National Park in the Country. Out of the 14 Biosphere Reserves situated in India, the Nanda Devi Biosphere Reserve (NDBR)—established second among the 14—is situated in the State of Uttarakhand. It extends in the three districts of Chamoli (Garhwal), Pithoragarh, and Bageshwar (Kumaon). The Nanda Devi National Park (NDNP) and the Valley of Flowers are UNESCO World Heritage Site declared in 1988. The NDNP is located in the transition range between the Zaskar range and Himalayan foothills with 97 species of plants including many rare and almost extinct plants like *Saussurea sudhanshui*, *Nardostachys grandiflora*, *Picrorhiza kurroa*, *Cypripedium elegans*, *C. himalaicum*, *Dioscorea deltoidea* and *Allium stracheyi*. There are also 83 animal species including the Bharal (*Pseudois nayaur*), Himalayan Musk Deer (*Moschus chrysogaster*), Mainland Serow (*Capricornis sumatraensis*), Himalayan Tahr (*Hemitragus jemlahicus*), Goral (*Nemorhaedus goral*), Snow Leopard (*Panthera uncia*), Common Leopard (*Panthera pardus*), Himalayan Black Bear (*Selenarctos thibetanus*), Common Langur (*Presbytis entellus*), and Rhesus Macaque (*Macaca mullata*). Also, there are about 114 avian species and 27 species of butterflies in the NDNP
85. The Rajaji National Park was established in 1983 protecting sections of the tropical deciduous forest area of the Shivalik Hill range on the Himalayan foothills. The Park covers 820.42 square kms, along the Haridwar, Dehradun and Pauri Garhwal. The park has a vast Sal forest, and mixed forest mostly covered with *Acacia catechu* and *Vetiveria zizanioides*. It is refuge to approximately 49 species of mammals, 315 species of birds, 49 species of reptiles, 10 species of amphibians and 49 of Piscean species. This park has the largest population of elephants in Uttarakhand and a large population of tigers and leopards. Notable animals seen in the park are the Wild Cat, Goral, Rhesus Macaque, Himalayan Yellow Throated Marten, Monitor, Lizard, Indian Hare, Sloth, Himalayan Black Bear, King Cobra, Jackal, Barking Deer, Sambar, Wild boar, Indian Langur, Indian Porcupine and Pythons. The population of birds consists of the Great Pied Hornbill, Himalayan Pied Kingfisher, Sparrows, Fire Tailed Sunbird and the Peacock (Indian National Bird).
86. The Jim Corbett National Park covers 520 sq kms of Savannah-type grasslands and Sal forests. Declared as a Tiger Reserve in 1973, the Park has a rich diversity including the White Tiger, Throated Martem, Himalayan Palm Civet, Indian Grey Mongoose, Para, Kakka, Ghoral, Bar-headed Goose, Duck, Grebe, Snipe, Turtles, Python, Common Otter, Porcupine, Clack-taped Hare, Chital, Spotted Deer, Viper, Cobra, Krait, King Cobra, Tortoise, Graylag, Sandpiper, Gull, Cormorants and Egrets. There are 488 species of flora found protected in the Park including Sal, Savannah Grass, *Anogeissus-Acacia catechu* forests, *Mallotus philippensis*, Jamun and *Diospyros tomentosa*.
87. The Govind National Park covers an area of 957 sq. kms in Uttarakashi and a sanctuary for the endangered Snow Leopard and some other 15 species of mammals and 150 species of birds that includes the Himalayan Black bear, Brown bear, Musk deer, Bharal, Himalayan Tahr, Serow and Common leopard. The endangered birds found in this region are Monal Pheasant, Koklas Pheasant, Bearded Vulture Himalayan Snow Cock, Golden Eagle, Western Tragopan, Steppe Eagle and Black Eagle. Other varieties of birds include Owls, Pigeons, Minivets, Thrush, Warblers, Bulbul, Cuckoo and Finches.

88. The Valley of Flowers is a World Heritage Site located in Chamoli. There are hundreds of species mostly being Orchids, Poppies, Primula, Calendulas, Iris, Lily, Roses, Violets, Rhododendron, Angelica, Himalayan Fritillary, Daisies and Anemones and also supports a variety of mammals like the Himalayan Tahr, Snow Leopard, Musk Deer, Red Fox, Common Langur (a type of monkey), Bharal, Serow, Himalayan Black Bear, Himalayan Brown Bear, Pica (Mouse hare). A huge variety of butterflies and birds are also found in the valley including Himalayan Golden Eagle, Griffon Vulture, Snow Partridge, Himalayan Snow Cock, Himalayan Monal, Snow Pigeon, and Sparrow Hawk.

**(iv) Fishery**

89. Fish abound in almost all streams of the district and riparian villages find in it an important supplement to their ordinary food. The common species found here are asela or saul, mahasher, kalabans or karaunch and fucta or phar kata. Other species found in the district include gadara, gadiyal or guluwa, tarra, symplu and nama, nawoo or japa. No interference with fishery activities is envisaged by execution of the proposed subprojects.

90. Fish abound in almost all streams of the district; the common species found here are asela or saul, mahasher, kalabans or karaunch and fucta or phar kata.

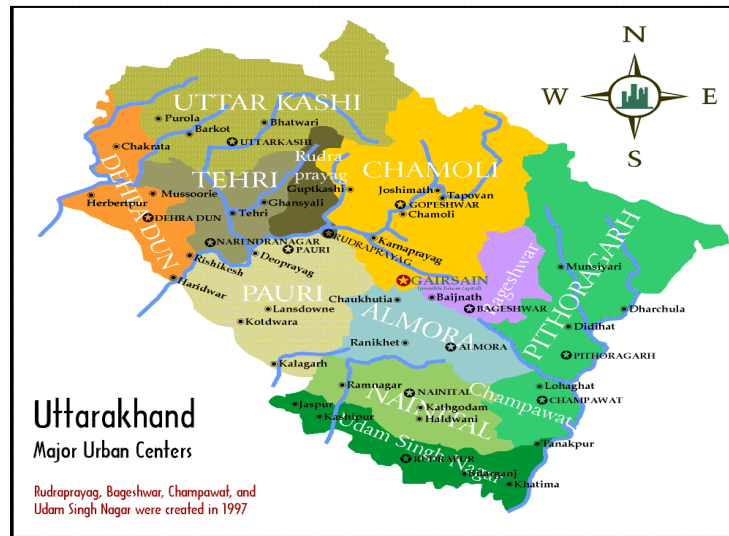
**I. Socio-Economic**

**(i) Social and Cultural Development**

91. The State of Uttarakhand occupies a total land area of 53,483 sq. km. which is 1.73 percent of India's total land area. The native people of Uttarakhand are generally called either Garhwali or Kumaoni depending on their place of origin in either the Kumaon or Garhwal region. According to the 2011 census of India, Uttarakhand has a population of 10,116,752 comprising 5,154,178 males and 4,962,574 females, with 69.45% of the population living in rural areas. The state is the 20th most populous state of the country having 0.84% of the population on 1.69% of the land. The population density of the state is 189 people per square kilometre having a 2001–2011 decadal growth rate of 19.17%. The gender ratio is 963 females per 1000 males. The crude birth rate in the state is 18.6 with the total fertility rate being 2.3. The state has an infant mortality rate of 43, a maternal mortality rate of 188 and a crude death rate of 6.6.

92. The State is divided into Garhwal and Kumaon divisions. Administratively, the State is divided into 13 districts, 79 tehsils and 97 blocks. Garhwal division has seven hill districts with one located in the foothills (Haridwar). Kumaon division, on the other hand, has six districts—one in the foothills (Udham Singh Nagar). There are 16,853 villages in the State and 7,256 gram panchayats. Of the total number of villages, 5,868 are not connected to all weather roads.

Figure IV-6 Major Urban Centre of Uttarakhand



93. As per census 2011, Pauri Garhwal had a population of 697,078 of which males were 331,061 and remaining 366,017 were females. There was change of -1.41 percent in the population compared to population as per 2001. In the previous census of India 2001, Pauri Garhwal District recorded increase of 3.91 percent to its population compared to 1991.

94. The rural sector of mountainous region of Uttarakhand is poorly developed and the inhabitants are economically poor due to tough terrain, paucity of agricultural land, limited avenues of employment and number of other constrains. In this regard, the road improvement project is seen as a solution towards economic development.

**(ii) Land Use and Land Use Pattern**

95. The land use pattern of Uttarakhand is strongly governed by the following: elevation, climate, mountainous terrain, lithological type, topography, surface hydrology, sunlight in the fields of forestry and agriculture, alpine meadows, sparse vegetation (scrub), grazing land, barren land, and human settlement. The human settlements are mainly located in the shallow water zones or around the localities nearer to springs.

96. Forest is the main land use in the State and nearly 64 % of the geographical area is under the varying forest densities (cover). Tree line is clearly demarcated above 2900 m elevation. Agriculture is confined to areas of low reliefs which are underlined by weak rock formation (i.e. schists, phyllites, weathered gneisses, and crushed quartzite). The cultivated land, approximately 11.5 % of the total geographical area, is either terraced/semi-terraced or plain. Other land use categories such as meadows, grazing lands, and scrubs do not exhibit definite relationship with lithology. It is also observed that the south-facing hill slopes are covered by lush green forests.

Table IV-9. Land Utilisation in Uttarakhand

Sl. No.	Land-use	Period / Year	Unit	Statistics
1.	Total Reported Area	2010-11	Hectare	56,72,636
2.	Forest Area	2010-11	Hectare	34,84,803
3.	Culturable Waste Land	2010-11	Hectare	310,390
4.	Fallow Land	2010-11	Hectare	1,27,793
	(i) Current Fallow	2010-11	Hectare	43,295
	(ii) Fallow Land other than Current Fallow	2010-11	Hectare	84,498
5.	Barren & Unculturable Land	2010-11	Hectare	2,24,764
6.	Land under Non-agricultural Uses	2010-11	Hectare	2,17,648
7.	Permanent Pasture & Other Grazing Land	2010-11	Hectare	1,98,526
8.	Land under Misc., Tree Crops and Groves not included in Net Area Sown	2010-11	Hectare	3,85,548
9.	Net Area Sown	2010-11	Hectare	7,23,164

Source: Uttarakhand at a Glance 2012-13, Govt. of Directorate of Economics and Statistics

## J. Health

97. The Infant Mortality Rate is 36 and Maternal Mortality Ratio is 359 (SRS 2007 - 2009) which are higher than the National average. The Sex Ratio in the State is 963 (as compared to 940 for the country). Comparative figures of major health and demographic indicators are as follows:

Table IV-10. Health Indicators of Uttarakhand

Indicator	Uttarakhand	India
Total Population (In Crore) (Census 2011)	1.01	121.01
Decadal Growth (%) (Census 2011)	19.17	17.64
Crude Birth Rate ( SRS 2011)	18.9	21.8
Crude Death Rate ( SRS 2011)	6.2	7.1
Natural Growth Rate ( SRS 2011)	12.8	14.7
Infant Mortality Rate ( SRS 2011)	36	44
Maternal Mortality Rate (SRS 2007-09)	359	212
Total Fertility Rate (SRS 2011)	NA	2.4
Sex Ratio (Census 2011)	963	940
Child Sex Ratio (Census 2011)	886	914
Schedule Caste population (In Crore) (Census 2001)	0.15	16.67
Schedule Tribe population (in crore) (Census 2001)	0.02	8.43
Total Literacy Rate (%) (Census 2011)	79.63	74.04
Male Literacy Rate (%) (Census 2011)	88.33	82.14
Female Literacy Rate (%) (Census 2011)	70.70	65.46

Source: RHS Bulletin, M/O Health & F.W., GOI

98. Some of the essential requirements of the new State include basic primary health care, pre and post-natal care, and nutritional status and preventive care. Accessibility to health services with the aid of improved road conditions is essential to put progress in the health indicators of the State. The populations around the sub-project area rely on the poorly-constructed roads in going to major towns/districts to avail of services from secondary and tertiary health facilities. With better road conditions, travel time to

such health facilities will be reduced and hence, treatment will be received more immediately.

Table IV-11. Health Infrastructure of Uttarakhand

Indicators	Required	In position	shortfall
Sub-centre	2341	1848	493
Primary Health Centre	351	257	94
Community Health Centre	87	59	28
Health worker (Female)/ANM at Sub Centres & PHCs	2105	2016	*
Health Worker (Male) at Sub Centres	1848	184	1664
Health Assistant (Female)/LHV at PHCs	257	88	169
Health Assistant (Male) at PHCs	257	29	228
Doctor at PHCs	257	205	52
Obstetricians & Gynecologists at CHCs	59	14	25
Pediatricians at CHCs	59	20	41
Total specialists at CHCs	236	51	185
Radiographers at CHCs	59	17	42
Pharmacist at PHCs & CHCs	316	292	24
Laboratory Technicians at PHCs & CHCs	316	81	235
Nursing Staff at PHCs & CHCs	670	243	427

Source: RHS Bulletin, March 2012, M/O Health & F.W., GOI

#### K. Literacy

99. Literacy rate in Uttarakhand has seen upward trend and is 78.82 percent as per 2011 population census. Of that, male literacy stands at 87.40 percent while female literacy is at 67.06 percent. In 2001, literacy rate in Uttarakhand stood at 71.62 percent of which male and female were 81.02 percent and 63.36 percent literate respectively. In actual numbers, total literates in Uttarakhand stands at 6,880,953 of which males were 3,863,708 and females were 3,017,245.

100. Pauri, Kotdwar, Lansdowne and Srinagar are major centers of education in the district. St. Thomas School situated in the city of Pauri is one of the prominent education institutes. It has got a 100 percent record in board examinations. Hemvati Nandan Bahugana Garhwal University (A central university of India) is in Srinagar. Govind Ballabh Pant Engineering College at Ghurdauri (11.5 km from Pauri) is a technical institution present in the district. Veer Chandra Garhwali Government Medical College is in Srinagar. National Institute of Technology Uttarakhand is in Srinagar.

101. The general enrollment and access to primary schools has seen a tremendous boost in the last decade. Such improvements are brought by the increased availability of functional primary schools and the initiation of the Education Guarantee Scheme in the State. Improved road conditions is deemed necessary to further develop the education services of the State.

#### L. Cultural and Archaeological Resources

102. The State of Uttarakhand has a great range of cultural practices. Festivals and cultural activities are being celebrated throughout the year in the State. The major fairs and festivals of the Garhwal region include the Hatkalika Fair, Tapkeshwar Fair, Surkhanda Devi Mela, Kunjapuri Fair, Lakhawar Village Fair, and Mata Murti Ka Mela. On the other hand, major fairs and festivals in the Kumaon region consist of Uttarayani Mela, Shraavan Mela (Jageshwar), Kartik Purnima at Dwarahat, Kasar Devi fair, and Nanda Devi melas.

103. There are no heritage sites listed by Archaeological Survey of India (ASI) within the study area hence, the proposed project activities do not have any adverse impact on these sites. There are few small temples/ shrines located along the project corridors, but none of them will be affected as the restoration work is restricted to existing ROW and no widening is envisaged. In terms of the area's common property resources (CPR) such as public wells, water tanks, play grounds, common grassing grounds or pastures, market areas and community buildings, none will be affected by the improvement/strengthening work in the sub-project roads.

## M. Economic Development

### (i) Transportation and Communication

104. Transportation system is a key factor in the socio-economic development of any State. Roads are logically the critical inputs to the growth of all the sectors. Aside from road systems, the State of Uttarakhand is connected to other states via rail and air transportation systems. Dehradun, Haridwar and Kathgodam are the major railway stations connected to various parts of the country. Jolly Grant near Dehradun is the lone airport present in the State. As per statistical data from 2006-07, Uttarakhand has a total road network of 23,274 km of which 2,228.90 km comprises the National Highway (1,328.30 km with State PWD and 900.60 km with BRTF); 1,553.00 km comprises the State Highway; 579.85 km covers the MDR; 7,154.88 km comprises the ODR (6723.90 km with State PWD and 430.98 km with BRTF), and 7,250.53 km to the Village Road. Light vehicle roads constitute of about 2,633 km.

105. Density of road length per 100 sq. Km. is 45 km which is very low compared to the national average of 97 km. Only about seven percent of the roads in the State are built in two-lane standards while 50 percent are paved. About a third of the higher class paved roads are in poor condition and over 70 percent of the light-vehicle roads need to be repaired or rehabilitated. Due to the lack of road connectivity, vast areas of the State are inaccessible. Such problem influences the population to 'chunk' in far flung areas of the State remaining to be under-developed and devoid of educational and health facilities and employment opportunities.

106. The road density per 100 sq. km. of the total area in Garhwal region is 30 km whereas road density in Kumaon region is 37 km. In terms of population, Garhwal region has 234 km of roads per lakh and the corresponding figure in Kumaon is 266 km. Motor vehicles has increased with the annual growth rate of 11 percent accounting to 44,7000 vehicles in 2003. PWD is the principal agency responsible for the management of roads in the State. As per PWD records following table gives the scenario of roads of the Uttarakhand state.

Table IV-12. Transportation of Uttarakhand State.

S.N.	Items	Year/Period	Unit	Statistics
<b>(A)</b>	<b>Motor Roads Maintained by PWD</b>			
	(i) National Highways	2011-12	Km.	1375.76
	(ii) State Highways	2011-12	Km.	3788.20
	(iii) Major District Roads	2011-12	Km.	3289.74
	(iv) Other District Roads	2011-12	Km.	2945.04
	(v) Rural Roads	2011-12	Km.	14543.89
	(vi) L.V. Roads	2011-12	Km.	858.22
<b>(B)</b>	<b>Motor Roads Maintained by BRTF</b>			
	(i) Total length of Roads	2011-12	Km.	1281.32
<b>(C)</b>	<b>Motor Roads Maintained by Local Bodies</b>			



S.N.	Items	Year/ Period	Unit	Statistics
	(i) District Panchayats	2011-12	Km.	862.45
	(ii) Urban Local Bodies & Others	2011-12	Km.	1974.30
<b>(D)</b>	<b>Roads Maintained by Other Departments</b>			
	(i) Irrigation	2011-12	Km.	741
	(ii) Cane Development	2011-12	Km.	885
	(iii) Forest	2011-12	Km.	3257
	(iv) Others	2011-12	Km.	1685
<b>(E)</b>	<b>Postal and Communication Services</b>			
	(i) Post Offices	2011-12	No.	2718
	(ii) Telephone Exchanges	2011-12	No.	477
	(iii) Telegraph Offices	2011-12	No.	2
	(iv) PCOs	2011-12	No.	8429
	(v) Telephone Connections (Including WLL) by BSNL	2011-12	No.	278751
	(vi) Mobile phone by BSNL	2011-12	No.	1360674

Source: *Uttarakhand at a Glance (2012-13)*, Directorate of Economics and Statistics, Govt. of Uttarakhand

## (ii) Industrial Development

107. The State has very few industrial units mainly because of lack resources. In the hilly terrains, industries promoted include food processing, fruit processing, medicinal/herbal plants, and horticultural/floriculture-based industries. In the plain districts of Haridwar, Udham Singh Nagar, and other places, capital intensive and high-value addition industries are being encouraged by the government. In 2003-04, there were 178 large and medium-scale industries with total investment of Rs. 500,700 lacs providing employment to about 44,000 employees. Small scale industries, on the other hand, employ about 129,782 of the population.

108. In recent years, Uttarakhand has emerged as one of the most attractive industrial destinations in India. In this regard, the government is encouraging private participation in all industrial activities in the State. The New Industrial Policy announced in 2003 by the State government puts in place the regulatory framework for Uttarakhand's industrialisation. The New Industrial Policy indicates that private resources may be tapped while promoting integrated Industrial States in Uttarakhand. The State government provides assistance in establishing small and medium sized agro parks, food parks, and the likes which in turn are expected to provide common infrastructure facilities for storage, processing, grading, and marketing.

## (iii) Agriculture, Forestry and Fishery

109. Agriculture is the main economic activity in the State as per latest land-use statistics. The total reported area for agricultural activity is 55.66 lakh hectares. In the hills, the major crops grown include wheat, paddy, mandua, ramdana and potato whereas in the plains the major crops are wheat, paddy, pulses, and sugarcane.

110. The pattern of land ownership is unlike that found in the rest of India. Most of the Uttarakhand farmers are owner-cultivators. Tenant farming and sharecropping are rare while landholdings are generally small and limited to family farms—approximately 50 percent of all landholdings are less than 0.5 hectares in size and 50 percent under one hectare. As such, the *zamindari* system of big landholders is limited to the plains. Both the geography and the Pahari cultural heritage have played roles in maintaining a traditionally more equitable, if impoverished, land distribution in Uttarakhand.

111. Agriculture in Uttarakhand is very complex and is interlinked with crop husbandry, animal husbandry and forestry to form a production system. During the year 2001-02,

contribution of agriculture to Net State Domestic Product (NSDP) of the State was about 30 percent and engaged about 58 percent of the total workers. Agriculture in the State is characterised by the following:

1. Out of 7.93 lakh hectare of agriculture land, hilly region covers 56.8 percent and plain region covers 43.2 percent.
2. The cropping intensity in Uttarakhand is 163.79, which is much higher than country's average of 129.
3. Both rain-fed and irrigated agriculture is practised in the State. Cereals are emphasised in the irrigated agriculture and two crops are taken in an agriculture year. In the rain-fed system millets, pulses and tuber crops are grown.
4. Monocropping is a common practice in the irrigated areas whereas mixed cropping is common in rainfed areas.
5. Eighty five percent of the gross cultivated area is used only for growing food grains where value addition is low.
6. More than 62 percent of the State Net Domestic Product comes from the three major towns of Dehradun, Nainital, and Haridwar.

Figure IV-7 Agricultural Map of Uttarakhand State



112. In the mountain regions and the Himalayan agriculture specifically, farmers deviate substantially from the kinds practiced in less precipitous altitudes. Hill farmers have adapted to the difficult geography, and the terrain has likewise influenced cultural modes in mountain societies. Patterns of land ownership, subsistence versus surplus production, and level of market penetration have also been decisively affected. However, traditional Himalayan agricultural systems and knowledge-base are being steadily eroded by market pressures, bringing both economic and cultural changes in Uttarakhand. Age-old self-reliance has given way to dependency on imports from the productive plains that bear pesticide/chemical fertilizer-enhanced yields. Cultural domination from the plains also threatens Uttarakhand's traditional foods as an increasing taste for mill-polished rice is outcompeting mountain crops. Activists in the hills have responded with a 'Save the Seeds' movement and are raising awareness about the need for agricultural biodiversity.

113. Agriculture is also practiced in the river valleys of Uttarakhand—a small 10-15 percent of the total land area. Over hundreds of years, many of the slopes have been cut into field terraces, a common characteristic of mountain agriculture throughout

the world. The region's farmers have also developed advanced manure, crop rotation, and intercropping systems. Most of the land on hilly slopes is non-irrigated. Three types of agriculture can be found in most river valleys with each particularly suited to the type of land. These are as follows:

- Katil (Forest edge land)
  - Hoe cultivation, with a standard rotation of 3 crops in 5 years
  - Major crops are Finger millet/Mandua (*Eleusine coracana*), Barnyard millet/Jhangora (*Echinochloa frumentesia*) and Chaulai/Ram Dana (*Amaranthus polygamous*, *Amaranthus blitum*)
- Upraon (Hillside land)
  - Permanently terraced but unirrigated
  - Major crops are Finger millet/Mandua (*Eleusine coracana*), Barnyard millet/Jhangora (*Echinochloa frumentesia*) and Chaulai (*Amaranthus polygamous*) etc.
- Talaon (Valley bottom land)
  - Paddy cultivation, low-lying, irrigated, double cropped
  - Major crops area Wheat (*Triticum aestivum*), Paddy (*Oryza sativa*), Sugarcane (*Saccharum officinarum*) etc.

Table IV-13. Land Utilization, Area under Principal Crops and Productivity in Uttarakhand

<b>Area Under Principal Crops (Provisional)</b>				
1.	Cereals	2011-12	Hectare	896774
	(i) Rice	2011-12	Hectare	280108
	(ii) Wheat ( <i>Triticum aestivum</i> )	2011-12	Hectare	369209
	(iii) Barley ( <i>Hordeum vulgare</i> )	2011-12	Hectare	22508
	(iv) Maize ( <i>Zea mays</i> )	2011-12	Hectare	28038
	(v) Finger millet ( <i>Eleusine coracana</i> )	2011-12	Hectare	125163
	(vi) Sanwan	2011-12	Hectare	63002
	(vii) Other	2011-12	Hectare	8746
2.	Pulses	2011-12	Hectare	55690
	(i) Urad ( <i>Phaseolus radiatus</i> )	2011-12	Hectare	12980
	(ii) Lentil ( <i>Lens esculenta</i> )	2011-12	Hectare	12295
	(iii) Pea ( <i>Pisum sativum</i> )	2011-12	Hectare	3451
	(iv) Gahat ( <i>Mycrotoma biflorum</i> )	2011-12	Hectare	12033
	(v) Rajma ( <i>Dolichos lablab</i> )	2011-12	Hectare	4614
	(vi) Gram			766
	(vii) Bhatt (Black Soyabean)	2011-12	Hectare	5734
	(viii) Others	2011-12	Hectare	3817
3.	Oil Seeds	2011-12	Hectare	29705
	(i) Mustard ( <i>Brassica campestris</i> )	2011-12	Hectare	14294
	(ii) Seasmum ( <i>Sesamun indicum</i> )	2011-12	Hectare	2020
	(iii) Groundnut ( <i>Arechis hypogea</i> )	2011-12	Hectare	1112
	(iv) Soyabean ( <i>Glycin max</i> )	2011-12	Hectare	12279
4.	Other Crops	2011-12		
	(i) Sugarcane ( <i>Saccharum officinarum</i> )	2011-12	Hectare	108255
	(ii) Onion ( <i>Allium cepa</i> )	2011-12	Hectare	2353
<b>Agriculture Productivity (Provisional)</b>				
1.	Cereals	2011-12	Qtl./Hectare	22.03
	(i) Rice	2011-12	Qtl./Hectare	21.20
	(ii) Wheat ( <i>Triticum aestivum</i> )	2011-12	Qtl./Hectare	23.80
	(iii) Barley ( <i>Hordeum vulgare</i> )	2011-12	Qtl./Hectare	12.64
	(iv) Maize ( <i>Zea mays</i> )	2011-12	Qtl./Hectare	14.66
	(v) Finger millet ( <i>Eleusine coracana</i> )	2011-12	Qtl./Hectare	13.92

2.	Pulses	2011-12	Qtl./Hectare	8.15
	(i) Urad ( <i>Phaseolus radiatus</i> )	2011-12	Qtl./Hectare	8.13
	(ii) Lentil ( <i>Lens esculenta</i> )	2011-12	Qtl./Hectare	8.19
	(iii) Pea ( <i>Pisum sativum</i> )	2011-12	Qtl./Hectare	9.54
	(iv) Gahat ( <i>Mycrotoma biflorum</i> )	2011-12	Qtl./Hectare	8.04
	(v) Rajma ( <i>Dolichos lablab</i> )	2011-12	Qtl./Hectare	10.27
	(vi) Gram		Qtl./Hectare	7.85
	(vii) Bhatt (Black Soyabeen)	2011-12	Qtl./Hectare	9.83
3.	Oil Seeds	2011-12	Qtl./Hectare	8.34
	(i) Mustard ( <i>Brassica campestris</i> )	2011-12	Qtl./Hectare	8.00
	(ii) Seasmum ( <i>Sesamun indicum</i> )	2011-12	Qtl./Hectare	2.26
	(iii) Groundnut ( <i>Arechis hypogea</i> )	2011-12	Qtl./Hectare	12.72
	(iv) Soyabean ( <i>Glycin max</i> )	2011-12	Qtl./Hectare	14.46
4.	Other Crops	2011-12	Qtl./Hectare	
	(i) Sugarcane ( <i>Saccharum officinarum</i> )	2011-12	Qtl./Hectare	609.33
	(ii) Onion ( <i>Allium cepa</i> )	2011-12	Qtl./Hectare	55.69

Source: Uttarakhand at a glance 2012-13 by Directorate of Economics and Statistic, Govt. Of Uttarakhand

Table IV-14. Ecological Sub-Regions and Altitude-wise Major Agriculture Crops

S. No.	Ecological Sub-Region	Altitudinal Gradient (m)	Major Agriculture Crops
1.	Lower Dun, Terai	300-600	Wheat ( <i>Triticum aestivum</i> ), Paddy ( <i>Oryza sativa</i> ) and Sugarcane ( <i>Saccharum officinarum</i> ).
2.	Upper Dun, Bhabar, lower Shivaliks	600-1,200	Wheat ( <i>Triticum aestivum</i> ), Paddy ( <i>Oryza sativa</i> ), Maize ( <i>Zea mays</i> ) Chaulai ( <i>Amaranthus</i> species) Finger millet/ Mandua ( <i>Eleusine coracana</i> ) and Barnyard millet ( <i>Echinochloa frumentesia</i> )
3.	Middle Garhwal-Kumaon	1,200-1,800	Wheat ( <i>Triticum aestivum</i> ), Paddy ( <i>Oryza sativa</i> ), Cheena ( <i>Panicum miliaceum</i> ), Potato ( <i>Solanum tuberosum</i> ), Barley ( <i>Hordeum vulgare</i> ) Finger millet ( <i>Eleusine coracana</i> ) and Barnyard millet ( <i>Echinochloa frumentesia</i> ),
4.	Upper Garhwal-Kumaon	1,800-2,400	Wheat ( <i>Triticum aestivum</i> ) Barley ( <i>Hordeum vulgare</i> ) Potato ( <i>Solanum tuberosum</i> ), Chaulai ( <i>Amaranthus</i> species), Cheena ( <i>Panicum miliaceum</i> ) and Phaphra ( <i>Fagopyrum tataricum</i> )
5.	Cold Zone	2,400-3,600	Summer Crops: Wheat ( <i>Triticum aestivum</i> ), Barley ( <i>Hordeum vulgare</i> ) Potato ( <i>Solanum tuberosum</i> ), Phaphra ( <i>Fagopyrum tataricum</i> ) Chaulai ( <i>Amaranthus</i> species), Kauni ( <i>Setaria etalica</i> ) Ogal ( <i>Fagopyrum esculentum</i> ) and Uva Jau ( <i>Hoyleum himalayense</i> )

Source: Uttarakhand at a glance 2012-13 by Directorate of Economics and Statistic, Govt. Of Uttarakhand

114. Various pulses (e.g., "Masur" - *Ervum lens*; "Kulat" – *Mycrotoma biflorus*) are grown intercropped during the two harvest seasons—early winter after the rainy season (millet), and midsummer before the hot dry season (barley-wheat). Dry and wet rice, taro, pumpkins, beans, corn, ginger, chili, cucumbers, leafy vegetables, and tobacco are also grown in the area. Likewise, potatoes have become an important cash crop being grown in areas unsuitable for other plants (Berreman, 1963).

Table IV-15. Mode of Irrigation and Drainage System in Uttarakhand

Sl. No.	Items	Year/ Period	Unit	Statistics
<b>Net and Gross Irrigated Area</b>				
1.	Canals	2011-12	Hectare	83687
2.	Tube Wells	2011-12	Hectare	216100
3.	Other Wells	2011-12	Hectare	11519
4.	Tanks/ Ponds	2011-12	Hectare	83
5.	Other Sources	2011-12	Hectare	24747
6.	Net Irrigated Area (NIA)	2011-12	Hectare	336136
7.	Gross Irrigated Area (GIA)	2011-12	Hectare	561733
<b>Irrigational Infrastructure</b>				
1.	Length of Canals	2011-12	Km.	11588
2.	Length of Lift Canals	2011-12	Km.	242
3.	Tube Wells (State)	2011-12	No.	1110
4.	Pump Sets ( Boring/ Free Boaring)	2011-12	No.	54642
5.	<i>Hauj</i>	2011-12	No.	32850
6.	<i>Gool</i>	2011-12	Km.	26365
7.	Hydrum	2011-12	No.	1547
8.	C.C.A. Under State Canal	2011-12	Lakh Hect.	3.302
9.	Revenue Collection by Irrigation	2011-12	Rs. Lakh	252.27
Source: Uttarakhand at a glance 2012-13 by Directorate of Economics and Statistic, Govt. Of Uttarakhand				

## N. Fisheries

115. The State has great potential for the development of fisheries. The State abounds in perennial and seasonal water bodies which hold high promise for the growth of fishery. Golden Mahseer (*Tor putitora*), one of the main game and food fish in the central Himalayan region, has decreased significantly. The fish migrate considerable distances upstream in search of suitable spawning grounds. Stocks of the Himalayan mahseer are depleted and it is now considered an endangered species. Catch data from the major rivers are not available while studies are characterized as sporadic and preliminary in nature. According to available statistics, the Himalayan mahseer contributes significantly only in one river—comprising 32.8% of the catch from the Nayar River, 9.7% from Song River, and 0.8–3.1% from other rivers. The important fishes commonly found in the Himalayan river basins are *Catla catla*, *Labeo rohita*, *Labeo calbase*, *Cirrihinus mirigale*, *Clarius*, *batrachus*, *Rita rita*, *Heteropneustus fonilis*, *Notopterus nontopterus*, *N. Chitala*, *Macrobrachum rosenbergii*, *M. malconsoni*, *M. Chapral*, *Channa punetatus*, *C. gaehua*, and *C. striatus*.

**O. Energy and Electric Power Potential**

116. Uttarakhand has an estimated hydro power potential of approximately 20,200 MW. However, only 1,130 MW has been tapped at present. Meanwhile, 4,170 MW projects are under implementation and 3,800 MW projects are allotted to Central, State and private sectors. Thirty-nine projects with a potential of 6,374 MW have been identified for PFR under PMs Hydro Initiatives.
117. Although Uttarakhand is a power surplus State, a lot needs to be done to harness the untapped potential and sale the surplus power to make this a GDP driver sector for the State.

**P. Aesthetic and Tourism**

118. Tourism is one of the strong pillars of the State economy. The State has high growth potential for tourism, be in nature, wildlife, adventure or pilgrimage tourism. The State received 2,05,46,323 domestic tourists in the year 2008, 2,19,34,567 in the year 2009, and 3,02,06,030 in the year 2010 registering a considerable yearly growth. Expenditure on schemes for tourism development and promotion in the State has progressively increased over the years. Some of the major destinations with tourism potential include Haridwar (called 'The Gateway of God'), Rishikesh (the birth place of Yoga), Dehradun, Mussoorie, Almora, Kedarnath, Badrinath, Yamunotri, Gangotri, Jim Corbett National Park, Nainital, Ranikhet, and Pithoragarh.

## V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

119. Urban roads were screened using the ADB's rapid environmental assessment (REA) checklist for Roads and Highways.

- i) The individual environmental screening checklist is provided in Appendix A of this report.
- ii) **No environmental impacts related to siting.** The proposed work will be confined to the existing ROW belonging to Uttarakhand Public Works Department. The work is not expected to have any impact on the Forests and does not involve any tree cutting as the scope of the work is restricted to reconstruction and rehabilitation of disaster affected section of the existing roads. No road widening is proposed. Not a single road section is located inside or near a cultural heritage site, protected area (national park / sanctuary / biosphere reserve), wetland, mangrove, estuarine, buffer zone of protected area or special area for protecting biodiversity. There are no rare, threatened, and endangered species (flora and fauna) within the subproject corridor of impact.
- iii) **Potential significant environmental impacts.** Road sections are prone to landslides, localized flooding, increase erosion, siltation, and hazardous driving conditions.

120. The beneficial impacts still outweighs the potential significant environmental impacts. Beneficial impacts include reduction in travel time and lower vehicle operating costs; better internal and external access to and from Uttarakhand; and better access to agricultural production areas, markets, religious and tourist areas. The road design is also a mitigation measure to existing road safety and accessibility issues as it addresses erosion, landslides, poor drainage, and inadequate road safety. Improved roads will also contribute to the community climate change resiliency as it can better withstand more extreme weather events allowing continued accessibility and flow of materials under such conditions.

### 4.1 Negative Impacts Related to Project Location, Preliminary Planning and Design

#### A. Impact and mitigation measure during planning and design phase

121. There are no significant adverse environmental impacts during the planning and design phase based on the environmental screening of the road sections. Since several road sections to be improved are located near forested hilly areas, with high precipitation and erodible soils, the risk of increase in landslides and siltation of creeks and rivers will be integrated in the road improvement design. This include the rehabilitation of existing and construction of additional side and cross drains like culverts and scuppers to control surface water flow below scouring velocity and volume. Landslide prone areas will strengthened through the installation of retaining walls. Revegetation of eroded areas will be promoted in coordination with the Forest Department.

122. Off-site impacts associated with the road upgrading related to material sourcing from quarries, hot mix plant, and stone crushers will be minimized by relying solely on existing and licensed quarries. All hot or stone crushers to be utilized will have will have prior consent from the UEPPCB.

## **B. Impacts during Construction Phase**

123. Majority of the significant impacts will occur during the construction phase. These impacts, to be described in the succeeding sections are classified according to major components of the environment – physical, biological, air, water, and socio-economic. These impacts were mainly drawn from screening of impacts described in the introduction of this Chapter.

### **a. Impacts on the Physical Environment and Mitigation Measures**

#### **i. Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site.**

124. During the construction phase, erosion is expected to intensify due to vegetation removal, soil disturbance and exposure of bare soil surface. Soil erosion is anticipated at bridge and culvert construction sites. Problem will be more pronounced if the construction is taken up in rainy season. Construction activities such as cuttings and fillings will initiate soil erosion within road alignment, quarries and access roads to these areas.

125. These impacts will be mitigated by: i) avoiding construction activities during monsoon, ii) maintain embankment slope ratio of 1:2, iii) compliance to IRC 59-1974 on treatment of embankment slopes for control of erosion, iv) stone pitching and retaining structures shall be provided to control to soil erosion wherever necessary, v) turbing of embankment slopes particularly near bridge locations, vi) construction of silt traps at regular points along the road, and vi) immediate cleaning of all construction debris to prevent unconsolidated soil being eroded by either wind or runoff water. (see I, Appendix 14 Soil Erosion and Sedimentation Control).

126. To prevent soil erosion along the embankment during operation phase, regular monitoring inspections should be undertaken to ensure that drainage, bridge approaches and re-vegetated areas are maintained and strengthened to prevent re-occurrence of soil erosion.

#### **ii. Impacts on water quantity**

127. Road construction decreases available water to the host community in terms of its substantial requirement for processing, dust suppression, and domestic use of camps, and to a certain extent decrease the water availability by reducing groundwater recharge due to pavement of road surface. The risk of contaminating both surface and groundwater from untreated camp sewage also impacts availability of water to its most beneficial users. Although the construction requirement is temporary, mitigation measures must ensure the additional water demand will not burden existing water supply and sanitation systems. All road construction water requirements shall be exclusively extracted from government permitted sources. All borewells will secure permission from the state groundwater authorities to ensure no disruption to customary users. Contractors may draw water from the irrigation canal provided written consent is issued by the Irrigation Department.

128. To avoid contamination of water, no wastewater will be disposed without treatment. This will include the treatment of sewage through septic tank and interception of all oil-contaminated wastewater for oil recovery prior to disposal. All petroleum-based storage and handling areas will be paved to prevent groundwater contamination and facilitate easy clean-up and recover of spills. Prohibit the cleaning of tools and



equipment on or near rivers, canals, and other waterbodies. To conserve water and promote recycling, no drinking quality water will be used for dust suppression.

**iii. Disfiguration of landscape by road embankments, cuts, fills, and quarries.**

129. During the improvement works for the road sections and because of the cutting of hill slope, filling and stone quarrying will disfigure the landscape. Although this impact is unavoidable, it becomes significant as the roads are located on hilly terrain as the land is unstable. Mitigation measures to minimize impacts are: i) ii) source rock and sand from existing license quarries; iii) balance cut and fill; iv) prohibit blasting; v) prohibit disposal of spoils on the valley side; and vi) proper construction of drainage facilities to prevent soil from being saturated and increase susceptibility to erosion and maintain the original flow of water.
130. All contractors are required to submit a Debris Transportation and Disposal Plan no later than 30 days after the issuance of Notice to Proceed. The issuance of the Completion Certificate by the Engineer will also be reckoned, among others, a certification from the Construction Supervision Consultant-Environment Specialist the Contractors successful implementation of the EMP.
131. During road operation, the compensatory forestation will be maintained in coordination with the DFO. All drainage and erosion control infrastructure will be maintained on a regular basis to ensure optimum condition as part of the post-construction maintenance component of the Project.

**iv. Loss of productive soil**

132. The proposed subproject works are restricted to reconstruction and rehabilitation of damaged sections of roads due to disaster of 2013. Restoration of some road sections is located along agricultural lands but will not require conversion as the restoration works are confined to the existing width of roads. All construction camps, labour camps, borrow areas<sup>2</sup>, access roads will be located on barren lands.

**v. Compaction and contamination of Soil**

133. Soils of productive agricultural area adjoining subproject road, haul roads, construction camp area, labour camp area and at other construction establishment may be compacted due to the movement of heavy equipment, transport vehicles, and storage of materials. Mitigation measure includes control of movement of construction vehicles; new haulage roads will limited on the barren lands; and rehabilitation of construction camps, labour camps, material storage areas near to its original condition after the completion of work;
134. During project operation, the Uttarakhand-PWD will ensure that avenue trees will not obstructs the visibility to traffic and road signs, or pose hazard of falling on motor vehicles or overhead electrical and telephone wires. Regular trimming will be undertaken exclusively using mechanical means. No herbicide or weedicide will be used for roadside vegetation maintenance.

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<sup>2</sup>Appendix 13 Borrow Area Management

**b. Impacts on Environmental Quality**

**i. Increase in local air pollution due to rock crushing, and filling works, and chemicals from asphalt processing.**

135. Most of the dust during construction arises from excavation and filling during site preparation works, loading, unloading and transportation of construction material, drilling, blasting; use of heavy equipment and machinery in the earthworks and pavement works. Gaseous emissions like, oxides of sulphur (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), and hydrocarbon (HC) are emitted from mobile sources, hot mix plant, batching plants and diesel generator sets. Elevated concentration of these parameters cause pollution, albeit short term.
136. Exposure to episodes of air pollution causes numerous health problems like pulmonary, cardiac, vascular, and neurological impairments. High-risk groups such as the elderly, infants, pregnant women, and sufferers from chronic heart and lung diseases are more susceptible to air pollution. Children are at greater risk because they are more active outdoors and their lungs are still developing. "Exposure to air pollution can cause both acute (short-term) and chronic (long-term) health effects. Acute effects are usually immediate and often reversible when exposure to the pollutant ends. Some acute health effects include eye irritation, headaches, and nausea. Chronic effects are usually not immediate and tend not to be reversible when exposure to the pollutant ends. Some chronic health effects include decreased lung capacity and lung cancer resulting from long-term exposure to toxic air pollutants (USEPA, 2010).
137. To minimize impacts on community areas, the location of all construction establishments such as hot mix plants, WMM plants, crusher plants, construction camps, and offices will be located at least 1000 m away.
138. To control gaseous emission during construction, Consent to Establish (CTE) and Consent to Operation (CTO) will be obtained for construction establishments such as hot mix plants, batching plants and stone crushers from the UEPPCB. Pollution control devices such as cyclone separators /scrubbers will be installed to control emissions from hot mix plants, crushing units and concrete batching plants. Height of the stacks will comply with statutory requirements. All vehicles and construction equipment operating for the contractor and the consultant will obtain and maintain "Pollution under Control" (PUC) Certificates.
139. To control dust emissions, vehicles deployed for borrow material, sand and aggregate haulage, shall be covered with tarpaulins to be spillage proof. Regular sprinkling of water during excavations, loading, unloading, vehicular movement and raw material transport, provisions shall be made construction period.
140. Other control measures to control emissions include the use of LPG or low sulphur diesel shall be used in the diesel generator sets and fitted with the stack of required height. The use of firewood for cooking is prohibited.
141. Periodic air quality monitoring to ensure emissions comply with standards will be conducted as per the agreed environmental monitoring plan given in table VIII - 3. The Contractor will submit annual emission monitoring results required by the SPCB as part of the annual CTO renewal. Ambient monitoring along active construction fronts and major community areas will be conducted by the contractor in consultation with the DSC.

142. Limited mitigation measures are available to the Uttarakhand PWD to control emissions from mobile sources as this is beyond their authority. Still, posters and signboards promoting the proper maintenance of vehicles will be installed along key points highlighting safer, cheaper, and more environment friendly use of the roads.

**ii. Noise and vibration from civil works**

143. Noise pollution affects both workers and nearby communities. Impacts to exposure are hearing loss, and sleep disruption. Sleep disruption in turn can cause poor concentration and performance, weight changes, and a general decrease in health and overall well being. The combination of stress and lack of sleep can also lead to frustration and aggravation. The social consequences include becoming short-tempered or potentially aggressive resulting in more accidents, poor familial and social relationships, and poor work performance.

144. Sources of noise pollution include construction activity, traffic, and heavy equipment operation. Mitigation measures to be implemented will include: use of enclosures, walls, installation of mufflers around noisy equipment and the noise sources reduce noise generated during construction and demolition activities; preference to quieter equipment or construction methods; minimizing time of operation and locating equipment farther from sensitive receptors; timing of noisier construction and demolition activities to between 6 AM and 10 PM would reduce construction noise impacts during night; detouring construction trucks away from noise-sensitive areas such as schools and hospitals would eliminate construction truck noise from those areas; mandatory use by workers of personal protective equipment (PPE) such as ear plugs and earmuffs; and temporary traffic by-passing of community areas. Appendix 5 provides typical noise barriers that maybe required during project construction and operation. Monitoring of noise levels in potential problem areas as per the monitoring plan will be carried out.

145. During project operation the PWD will explore the need to establish permanent noise control structures like avenue vegetation, and prohibition on use of horns and speed restrictions at noise sensitive areas like schools, civil courts and major hospitals reduce roadway noise levels.

**c. Impacts on the Socio-Economic**

**i. Encroachment on historical and cultural areas.**

146. No historical or cultural areas will be shifted as a result of the road restoration works in disaster affected sections. However, several religious structures are near the road which will be affected in terms noise, dust, and temporary partial/full blockade of access causing inconvenience.

147. The same mitigation measures addressing noise, and dust discussed earlier will be implemented on these sensitive areas. Traffic re-routing as provided in Appendix 10 Arrangement of Traffic during Construction will be implemented by the Contactor.

**ii. Impacts on Occupational Health and Safety**

148. Employers are required to implement precautions to protect the health and safety of workers. Road construction exposes workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries. Work close to rotating and moving equipment like hot mix plant operation, materials handling, motorpool repairs/machining and the like create trap hazards putting extremities at risk. Exposure to loud noise can cause temporary or permanent hearing impairment. Hand-arm vibration, electrical, welding/works, and working close to moving vehicles

also expose workers to injuries. , Appendix 6 “Work Safety in Common Operation and Construction” provides a range of mitigation measures to promote occupational safety.

**iii. Impacts on Community Health and Safety**

149. These impacts pertain to those that take place outside the project boundaries, in this case the ROW and camp site, but are related to road construction and operation. Impacts on water quantity, and air and water qualities were discussed in other sections. Other impact on community health and safety related to road construction pertains to road crashes, structural safety, transport of hazardous materials, communicable and vector borne diseases, and emergency preparedness in case of road failures such as slides rendering villages inaccessible.
150. Risk of road crashes will increase during construction when a construction related and transport vehicles, and workers are co-located along restricted construction fronts. During operation phase, the projected increase in the number of motorized road users traveling at higher speeds also increases the chances of injuries and fatalities from road crashes. To mitigate these risks, the contractor needs to adopt safety measures for workers, and road users particularly those that are more vulnerable to crashes. Contractors need to emphasize safety among drivers, ensuring drivers have adequate skills, avoiding dangerous routes and times of day to reduce chances of crashes, speed control devices, and regular maintenance of vehicles to avoid premature failure. To address the risk caused by increase in traffic, the Contractor will: i) minimize pedestrian interaction with construction vehicles, ii) install signages, visibility and overall road safety particularly near schools or where children are present, iii) coordinate with local emergency groups on location of active construction fronts to facilitate appropriate first aid, iv) use of local materials to the extent possible to reduce hauling distance, v) employ flag persons to warn dangerous conditions.
151. Accident risks associated with increase in vehicular traffic, leading to accidental spills of toxic materials is also magnified during construction. Contractor's or its third party suppliers of fuel, lubricants, and bitumen will be required to demonstrate proofs of capability to handle spills to include: i) proper labeling of container content, hazards, and operator's contact details; ii) ensure the integrity of the packaging/containers and transport vehicle are commensurate to the hazardous material; iv) drivers and assistants are trained on transport and emergency procedures; v) operator has the means to respond to emergencies on a 24 hour basis. (see , Appendix 16 Storage, Handling, Use and Emergency Responses for Hazardous Chemicals)
152. The construction camps pose risk of communicable and vector-borne diseases not only among its workers but to the host communities through poor camp sanitation and living conditions, migrant workers might carry sexually-transmitted diseases such as HIV/AIDS. Measures to properly maintain hygiene inside Camps are provided in , Appendix 17 Site Management of Construction. The Contractor will undertake health awareness and education through information and promoting individual protection. The Contractor will link with existing state and national health programs on STDs, HIV/AIDS, and immunization. Contractors will cause the provision of treatment of communicable diseases in community health care facilities, access to medical treatment, confidentiality particularly with respect to migrant workers. The Contractor, will implement mosquito, rodent, and arthropod-borne diseases control that will have the following components: i) prevention of propagation by eliminating all breeding habitats close to the camps, ii) elimination of all unusable impounded water; iii) increase water velocity in channels near camps; iv) judicious use of insecticides on building walls; v) promoting the use of mosquito nets; vi) monitoring and treatment of

diseases and collaboration with health officials, vii) distribute educational materials among workers and host communities, and viii) proper handling and use of insecticides to minimize human exposure and spills.

153. Roads and bridges failures due to inadequate designs may cause injuries to community and other road users. This risk is mitigated through the compliance with appropriate engineering design standards by the design engineers and review and approval of engineering plans by the PWD.

## VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

### A. Public participation during the preparation of the IEE

154. The public participation process included identifying interested and affected parties (stakeholders); informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation.

155. Stakeholder consultation and participation with various stakeholders is an integral part of the environmental and social impact assessment and also part of regulatory requirement of EIA Notification, 2006 and ADB requirements. The stake holders of the project include project affected communities (on either side of the project road) and institutional stake holders such as PCB, local bodies, Water Resource Department, Environmental Department, Mines and Geology Department, Forest Department, etc. Consultations at micro-level (along the road) and macro-level (e.g. District/State level institutional consultations) helped planners to integrate the short term and long terms requirements of the local, regional, state and national goals in to the planning process. The regional, state and national goals are generally set by the legislations and policies by controlling or limiting the activities in order to reduce and nullify the adverse impact generated by infrastructure projects like roads and highways.

156. The following methodologies were adopted for carrying out public consultation

[i] Local communities, Individuals affected, traders and local shopkeepers who are directly affected were given priority while conducting public consultation.

[ii] Walk-through informal group consultations along the proposed subprojects area

[iii] One to one meeting were generally held with a few members of local communities. These consultations sometimes focused on one or more specific issues in a given section (link) of the project corridor. Focus group consultations were conducted with a sample section of the community with a good representation from the affected communities. Such meetings usually provide substantial information about the community concerns. Details of the local consultations are given below:

<b>Internal Motor Roads of Nagar Palika Pauri In District Pauri</b>	
<b>Place:</b>	Bus stand, near judge court
<b>District:</b>	Pauri
<b>Date:</b>	10/10/2015
<b>Participants:</b>	Villagers, shopkeepers, student <i>etc.</i>
<b>1.</b>	<p><b>Issues Discussed &amp; Investigated:</b></p> <p>Although the project is undertaken for the welfare of the communities, to reconstruct/restore the existing road however in order to minimize any impact on communities and the environment safeguards following issues were discussed with the local communities:</p> <ul style="list-style-type: none"> <li>• Impact on the local environment due to construction and strengthening of the project road.</li> <li>• Scope of employment generation for the local people during construction Phase.</li> <li>• Construction activity whether causing any type of health hazard or not?</li> <li>• Any loss of land or property due to construction activity?</li> </ul>

	<ul style="list-style-type: none"> <li>• Any damage to historical or cultural monuments along project road?</li> <li>• Problems faced by the local people in their daily activities due to improper road net work?</li> <li>• Discussion among public for sharing of information related to project (environmental safe guard policy, direct and indirect impacts of improvement options on environmental).</li> </ul>
<b>2.</b>	<p><b>Stakeholder's Response:</b></p> <ul style="list-style-type: none"> <li>• Overall the locals are happy and want the work to be executed at the earliest as it will only improve the connectivity and easiness. People responded to execute the work during night (if possible) as it will reduce the effect on their daytoday life.</li> <li>• Since the existing road is to be resurfaced there is no loss to the property of the locals and no historical places are being damaged during the construction.</li> <li>• No any major impact on environment, flora and fauna due to construction activity.</li> <li>• Locals think for better livelihood and overall development, proper road network is necessary.</li> <li>• Locals of Civil Line to New Bus Stand suggested for RCC construction, Judge Court to Civil line suggested for proper water drainage facility while however almost one and all discussed on the quality of work.</li> </ul>
<b>3.</b>	<p><b>Recommendations &amp; Suggestions:</b></p> <ul style="list-style-type: none"> <li>• Special attention is required to protect landslides in the area.</li> <li>• Proper drainage is required for water disposal during rainy season.</li> <li>• Efforts should be taken for the generation of employment for local people during construction.</li> <li>• Speed breakers are required on blind curves, settlement areas etc. For control of road accidents.</li> </ul>

157. During consultation the following general opinions/suggestions were noted: i) Most of the people were not happy with the existing road infrastructure post June 2013 disaster and they need improvement of the roads, ii) people wanted the road of minimum width so that much of their land property is not affected, iii) road works should be completed at the earliest and people should not face any further inconvenience, iv) after construction, proper maintenance of the road should be carried out, v) noise pollution control measures during construction shall be devised at village settlements, particularly at schools.

#### **B. Future consultation and Disclosure**

158. The public consultation and disclosure program will remain a continuous process throughout the subproject implementation and shall include the following

#### **C. Consultation during Detailed Design**

159. Focus-group discussions with affected persons and other stakeholders to hear their views and concerns, so that these can be addressed in subproject design wherever necessary. Regular updates on the environmental component of the subproject will be kept available at the PIU/PMU of UEAP.

160. PIU/PMU will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues.

161. The PIU/PMU, with assistance of DSC will conduct information dissemination sessions in the subproject area. During EMP implementation PIU, DSC, and PMU

shall organize public meetings and will apprise the communities about the progress on the implementation of EMP in the subproject works

#### **D. Consultation during Construction**

- 162. Public meetings with affected communities (if any) to discuss and plan work programs and allow issues to be raised and addressed once construction has started.
- 163. Smaller-scale meetings to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

##### **6.1 Project Disclosure**

- 164. A communications strategy is of vital importance in terms of accommodating traffic during road closure. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, announcements, road signage, etc.
- 165. For the benefit of the community the IEE will be disclosed to the affected people and other stakeholders in a form and language(s) understandable to them at an accessible place in a timely manner and made available at: (i) PIU/PMU office; (ii) District Magistrate Office; and, (iii) DSC office. It will be ensured that the hard copies of IEE are kept at such places which are conveniently accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the SDMA UEAP and the official website of ADB after approval of the IEE by ADB. The PIU will issue Notification on the locality-wise start date of implementation of the subproject. Copies of the IEE will be kept in the PMU/PIU office and will be distributed to any person willing to consult the IEE.

##### **6.2 Public Disclosure**

- 166. The IEE report will be disclosed in the English language at PMU, IA / PIU-PWD division office and will also be available in the website of ADB. The full reports will also be available to interested parties upon request from PMU.



## VII. GRIEVANCE AND REDRESS MECHANISM

167. A joint social and environmental redress mechanism will be implemented under the project. Grievances and suggestions from local and affected people may come up related to inappropriate implementation of the project and components of EMP. The expected range of grievances to be handled through this mechanism will encompass but not limited to the following:

- i) nuisance from noise, dust, and temporary blocking of access;
- ii) contamination of receiving water from runoff;
- iii) emissions from increase vehicular traffic and stationary sources like hot mix plant;
- iv) conflict between local residents and migrant workers;
- v) ownership of vegetation for clearing; and
- vi) damage compensation.

168. These issues will be addressed through acknowledgement, evaluation and corrective action and response approach. Grievances from public or stakeholders concerning the project and EMP implementation will be received by the concerned Executive Engineer of UEAP division. The Executive Engineer shall refer the application to Construction Supervision Consultants (DSC) who then assess the grievances/suggestions and if they are found to be genuine and acceptable, will be resolved at division level itself within 15 to 30 days from the date of receipt. In case, the issue is unable to be resolved, the matter will be forwarded to PMU, UEAP (Head quarter). This mechanism is non-judicial in nature and does not preclude the affected people courting their grievances to the courts. The corrective action will be started as per the action plan indicated to the stakeholder. The action taken and the outcome shall form a part of quarterly report to ADB.

## VIII. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

### A. Environmental Management Plan

169. The EMP will guide the environmentally -sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, and PIU/PMU. The EMP identifies the three phases of development as: (i) Site Establishment and Preliminary Activities; (ii) Construction Phase; and (iii) Post Construction/Operational Phase.
170. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with.
171. A copy of the EMP must be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non -compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. It shall be noted that the Supreme Court of India mandates those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).
172. The Contractor is deemed not to have complied with the EMP if:
- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses.
  - If environmental damage ensues due to negligence.
  - The contractor fails to comply with corrective or other instructions issued by the Engineer/PMU/PIU within a specified time.
  - The Contractor fails to respond adequately to complaints from the public
173. An environmental management plan (EMP) translates recommended mitigation and monitoring measures into specific actions that will be carried out by the contractor and proponent. Environmental Management Plan deals with the management measures and implementation procedure of the guidelines along with enhancement measures recommended to avoid, minimize and mitigate foreseen environmental impacts of the project.
174. The succeeding Table presents a standardized EMP to guide the contractors in mitigating environmental impacts.

### B. Institutional Arrangement

175. The institutional arrangements specify the arrangements for the implementation of environmental provisions of the proposed subproject. The Executing Agency (EA) State Disaster Management Authority (SDMA) will work closely with the Implementing Agency (IA) Uttarakhand Public Works Department (PWD) for effective implementation of environmental safeguards related requirements of the sub projects. The institutional arrangements and responsibilities are detailed below.
176. The subproject will be implemented and monitored by Uttarakhand Public works Department as Implementing agency and implemented through its Field PIU's

supported by DSC (also working as Engineer) and overall management support shall be provided by PMU, UEAP.

177. The Safeguard Staff of UEAP SDMA (EA) in PMU & IA will monitor the implementation of environmental covenants with assistance of Engineer (DSC).
178. UEAP SDMA (EA) shall be responsible for ensuring compliance to environmental requirements of the ADB as well as central/state governments and reporting the same to ADB. A relevant portion of EMMP will be a part of contract with the civil works contractors engaged for execution of the works. The primary responsibility of implementation of EMMP is of the IA during pre-construction and operation and maintenance phases; and of the civil works contractor during the construction phase as defined in the EMMP. The responsibility of supervision of EMMP implementation is of the DSC; and it would guide the IA and the civil works contractors in this regard. , DSC with IA and EA, UEAP will act as monitoring agency as delegated in EMMP. All applicable statutory environmental clearances, consents, and/or permits (at national, state and local levels) as required for the implementation of the subproject would be obtained by the IA or by the civil works contractor in line with India's national/state/local laws and regulations, and in accordance with ADB's SPS 2009 requirements. Redressal of grievances shall be the responsibility of UEAP SDMA (EA). Apart from the mechanism for the grievances receiving and redressal at the level of EA, the provision shall be kept in the EMP of the subprojects wherein the contractor will depute one Environmental Safeguard Officer who shall be responsible for implementation of EMP, reporting and grievance redressal on day-to-day basis. The grievances/complaints received at the level of contractor shall be recorded on the Complaints Register and the same shall be forwarded to the DSC (Engineer of the Contract) within 48 hours along with the details of action taken to redress the grievance. The Team Leader of DSC shall immediately try to resolve the issues and forward the details to the Field Program Implementation Unit FPIU / IA. If the action taken by Contractor and DSC is found to be inadequate, then necessary instructions shall be issued by the FPIU. IA for implementation of rectification measures.

**(i) UEAP, SDMA (PMU)**

- Complies with all applicable legislation and is conversant with the requirements of the EMMP;
- Assesses all activities requiring special attention as specified and/or requested by the Engineer (DSC) and/or Safeguards Staff of UEAP SDMA for the duration of the Contract;
- May, on the recommendation of the EE DSC and/or Safeguards Staff of UEAP SDMA, through the DSC order the Contractor to suspend any or all works on site if the Contractor or his subcontractors/ suppliers fail to comply with the said contractual stipulations with respect to environment and EMMP.
- Act as overall monitoring agency.
- Addressing complaints and redressal of grievances.

**(ii) UEAP, IA FPIU**

- Ensures along with Engineer (DSC) that EMMP and all necessary environmental stipulations are included in bidding documents and Contract documents with Contractor.
- Complies with all applicable legislations and is conversant with the requirements of the EMMP;

- Assesses all activities requiring special attention as specified and/or requested by the Engineer (DSC) and/or Safeguards Staff of UEAP PMU as Implementing agency for the duration of the Contract;
- Ensures that the Contractor conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, as advised by the Engineer and/or Safeguards Staff of UEAP PMU & IA.
- May, on the recommendation of the EE DSC and/or Safeguards Staff of UEAP PMU & IA, through the DSC order the Contractor to suspend any or all works on site if the Contractor or his subcontractors/ suppliers fail to comply with the said contractual stipulations with respect to environment and EMMP.
- Act as supervising & monitoring agency as delegated in EMMP.
- Carries out public consultations, addresses complaints and responsible for redressal of grievances.

**(iii) The Engineer (DSC)**

- Guides EA, IA, FPIU and Contractors with respect to environmental regulations and associated requirements, and facilitates ensuring compliance with those;
- Arranges information meetings for and consults with interested and affected parties about the impending construction activities;
- Maintains a register of complaints and queries by members of the public at the site office. This register is forwarded to the Project Manager of FPIU on weekly basis
- Enforces and monitors compliance the requirements of the EMMP on site;
- Assesses the Contractor's environmental performance in consultation with Environmental Expert
- Documents in conjunction with the Contractor, the state of the site prior to commencing construction activities.
- Documents state of implementation of EMMP and clearly delineate if any item of EMMP is pending partially or fully before issue of completion certificate of the work.

**(iv) Environmental Expert of Engineer (DSC)**

- Briefs the Contractor about the requirements of the Environmental Specification and/ or EMMP, as applicable;
- Facilitates statutory compliance related activities for the IA and Contractors;
- Advises the Engineer about the interpretation, implementation and enforcement of the Environmental Specification and other related environmental matters;
- Monitors and report on the performance of the contractor/project in terms of environmental compliance with the EMMP to the Engineer and UEAP, SDMA-PMU;
- Provides technical advice relating to environmental issues to the Engineer.
- Organise and ensure public consultation and information disclosure are done as per the EMMP and ADB requirements. Monitor complaints and grievances are handled as per the Grievance Redressal Mechanism and report the same as per the environmental reporting.

**(v) The Contractor**

- Appoints one full time suitably qualified and experienced Environmental Safeguard Officer for implementation and reporting of EMMP including Environment Health & Safety (EHS) measures, community liaisoning, reporting and grievance redressal on day to day basis.
- Complies with all applicable legislations, is conversant with the requirements of the EMMP, and briefs staff about the requirements of same;
- Ensures any sub-contractors/ suppliers who are utilized within the context of the contract comply with the environmental requirements of the EMMP. The Contractor will be held responsible for non-compliance on their behalf;
- Supplies method statements for all activities requiring special attention as specified and/or requested by the Engineer or Environmental Expert (of Engineer) during the duration of the Contract;
- Provides environmental awareness training to staff;
- Bears the costs of any damages/ compensation resulting from non-adherence to the EMMP or written site instructions;
- Conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.
- Ensures that the Engineer is timely informed of any foreseeable activities that will require input from the Environmental Expert (of Engineer)
- Receives complaints/grievances from public, discuss with DSC, FPIU & IA and take steps for implementation of remedial measures in consultation with the Engineer (DSC), and reports to the Engineer (DSC) on the status in its each monthly report till satisfactory resolution.

179. The proposed sub-project will be implemented by the IA & FPIU, Uttarakhand Public Works Department. The FPIU will be responsible for supervision and monitoring of day-to-day implementation of subprojects including EMMP.

180. For monitoring of environmental parameters as outlined in the EMMP, appropriate monitoring agencies would be engaged by the contractor (cost has been included in each contract based on subproject specific monitoring plans) or by the IAs for the monitoring works not included in the civil works contracts (cost included in the budget given in table).

Table VIII-1. Environmental Management and Monitoring Plan

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
<b>PRE-CONSTRUCTION STAGE</b>						
P 1	Land Acquisition (If required)	The acquisition of land and private properties shall be carried out in accordance with the RAP and entitlement framework of the Project. UEAP has to ascertain that acquisition of land in the post design phase are addressed and integrated into the EMP and relevant contract documents.	Wherever existing RoW is less than proposed RoW	Right to fair Compensation & Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013[,	PMU/PIU, Revenue Dept, Collaborating Agencies	PMU
P 2	Clearance of Encroachment/ Squatters (change in land use)	Advance notice, as per RAP shall be given to the encroachers and squatters present in the Corridor of Impact, who need to be relocated. All R&R activities shall be undertaken. Entitlements as per UEAP entitlement framework shall be completed before construction starts.	Where compulsory resettlement of people is involved	RAP documents	PIU, PMU and Revenue Authority	PMU
P 3	Tree Cutting (If required)	Trees shall be removed from the Corridor of Impact before the actual commencement of the work with the permission from the state Forest Department. Cutting shall not start until the implementation of the project in that particular location of cutting is confirmed. Stacking, transport and storage of the wood shall be done as per the relevant norms.	Trees along the subproject road falling within proposed RoW	MoRTH 201.1 and 201.6	Forest Department	DSC and PMU
P 4	Preservation of Trees	All efforts shall be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. Specific attention shall be given for protecting giant trees, green tunnels and locally important trees (religiously important etc.). Tree cutting is to proceed only after all the legal	At green tunnels and trees present at the toe line of the carriage way and trees	MoRTH 201.2 and 301.5	Contractor/ Agency engaged by PMU	DSC and PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>requirements including attaining of In-principle and Formal Clearances from the Forest Dept./MoEF&amp;CC are completed and subsequently a written order is issued to the Contractor.</p> <p>Particular species declared as “protected” by the State Forest Dept. in the private land shall be felled only after due clearance from the Forest Dept. is obtained.</p> <p>In the event of design changes, additional assessments including the possibility to save trees shall be made.</p> <p>Systematic corridor level documentation for the trees cut and those saved shall be maintained by the UEAP</p>	of valuable species having ecological value.			
P 5	Relocation of Community Utilities and Common Property Resources	All community utilities and properties i.e., hand pumps, open wells, water supply lines, sewer lines, telephone cables, buildings and health centers shall not be relocated before construction of subproject road starts.	Throughout the corridor	RAP document	PIU/PMU, other Agencies / Contractor	PMU
P 6	Relocation of affected Cultural and Religious Properties	<p>All religious property resources such as shrines, temples and mosques within the project road shall be relocated. No such utilities will be relocated..</p> <p>If there is any relocation of the religious structures may happen then it shall be identified in accordance with the choice of the community. UEAP in consultation with local people shall finalize those.</p> <p>The entire process (i.e. selection of relocation sites and design) shall be under supervision of Environmental Specialist of DSC, during the construction stage by the Contractor. The relocation shall be completed before the construction starts in these sites.</p>	Throughout the stretch especially nearby settlements	MoRTH 110.7	PIU/ Contractor	DSC/ PMU
<b>Pre-construction activities by the Contractor/Environmental Specialist of DSC</b>						
<b>P 7</b>		<b>Field Verification and Modification of the Contract Documents</b>				
P.7.1	Joint Field	The Environmental Specialist of DSC and the Contractor	Throughout the	MoRTH 201.2	Contractor/	PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Verification	shall carry out joint field verification to ascertain any possibilities of saving trees, environmental and community resources, and these activities are to be taken up by the construction contractor.	stretch of subproject		Environmental Specialist of DSC	
P.7.2	Assessment of Impacts due to Changes/Revisions/additions in the Project Work	The Environmental Specialist of DSC shall assess impacts and revise/modify the EMP and other required sections of the project document/s in the event of changes/revisions (including addition or deletion) in the project's scope of work.	Where ever changes are applicable		Contractor/ Environmental Specialist of DSC	PMU
P.7.3	Crushers, Hot-mix plants and Batching Plants Location	<p>All construction plants shall be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants shall be located at least 1000 m away from the nearest dwelling preferably in the downwind direction.</p> <p>The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Specialist of DSC shall be necessary prior to the establishment.</p> <p>Arrangements to control dust pollution through provision of windscreens, water sprinklers, and dust extraction systems shall have to be provided at all such sites.</p> <p>Specifications for crushers, hot mix plants and batching plants shall comply with the requirements of the relevant emission control legislations. Consent for the Establishment and Operation from UEPPCB shall be obtained before establishment and operation respectively and a copy should be submitted to the DSC and UEAP.</p> <p>Wherever there is extremely water scarcity areas exist the Water sprinkling shall be limited to one time in the morning. To balance this deficient information boards shall be erected at appropriate locations with a message to "Dust prone area take precautions.</p>	At all Crushers, Hot-mix plants and Batching Plants opened up for the construction of subproject road	MoRTH 111.1, Air (prevention of control of pollution) Act, 1981 and Noise Rules	Contractor/ Environmental Specialist of DSC	PMU



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
P.7.4	Other Construction Vehicles, Equipment and Machinery	All vehicles, equipment and machinery to be procured for construction shall conform to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 and Motor Vehicles Act, 1988 shall be strictly adhered to. The silent/quiet equipment available in the market shall be used in the Project. The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period which shall be produced to EO, UEAP verification whenever required.	Applicable to all vehicles used in the construction	Air pollution Control Act, and Noise Rules and Motor Vehicle Act, 1988	Contractor/ Environmental Specialist of DSC	PMU
<b>P 8</b>		<b>Identification and Selection of Material Sources</b>				
P.8.1	Borrow Areas	Finalising soil borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, shall be the sole responsibility of the Contractor. The Contractor shall not start borrowing earth from selected borrow area until the formal agreement is signed between landowner and Contractor and a copy is submitted to the DSC. Locations finalized by the Contractor shall be reported to the Environmental Specialist of DSC and he shall submit the report to UEAP. Planning of haul roads for accessing borrows areas shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible and shall use the existing village roads wherever available. The environmental personnel of the DSC shall be required to inspect every borrow area location prior to approval. The DSC should include the Request for Inspection form for borrow area approval from the environmental point of view.	Borrow sites	IRC Guidelines on borrow areas and quarries; EPA 1986 and MoRTH 111.2 and 305.2.2	Contractor/ Environmental Specialist of DSC	PMU
P.8.2	Quarry	Contractor shall finalize the quarry for procurement of construction materials after assessment of the availability of	Quarry sites	MoRTH 111.3	Contractor	Environmental Specialist

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>sufficient quantity of materials, quality and other logistic arrangements.</p> <p>In case the Contractor decides to use quarries other than recommended by DPR consultant, then the Contractor should give substantiation.</p> <p>Contractor shall also work out haul road network and report to Environmental Specialist of DSC and DSC shall inspect and in turn report to UEAP before approval.</p>				of DSC
P.8.3	Arrangement for Construction Water	<p>In view of the special situation in Uttarakhand, Contractor shall prepare and implement the approved Water Management Plan in accordance with the Appendix-11, and BOQ Environment mitigation works</p> <p>The contractor shall use ground/surface water as a source of water for the construction and may set up own bore well facility for construction work.</p> <p>Contractor may take surface water from the Irrigation Canal with the written consent from the Irrigation Department.</p> <p>To avoid disruption/disturbance to other water users, the Contractor shall extract water from fixed locations and consult Environmental Specialist of DSC before finalizing the locations.</p> <p>The Contractor shall provide a list of locations and type of sources from where water for construction shall be extracted.</p> <p>The Contractor shall need to comply with the requirements of the State Ground Water Department for the extraction and seek their approval for doing so and submit copies of the permission to DSC and UEAP.</p>	Throughout the subproject	As per the contract document and Clause No. 1010 EPA, 1986	Contractor	Environmental Specialist of DSC
P 9	Sand	<p>The Sand shall be procured from identified statutorily approved sand mines as far as possible.</p> <p>The Contractor shall obtain copy of the Lease Agreement of the supplier and submit to DSC before procuring the sand.</p>	Sand quarries being used for the construction	As per the contract document <sup>4</sup>	All riverbeds recommended for sand extraction	

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
					for the project.	
P 10	Labour Requirements	The Contractor shall preferably use unskilled labour drawn from local communities to give maximum benefits to the local community.	Throughout the subproject road	As per the Contract Document	Contractor	Environmental Specialist of DSC
P 11	Construction Camp Locations – Selection, Design and Layout	Siting of the construction camps shall be as per the guidelines below and details of layout to be approved by DSC Resident Engineer and environment specialist. Construction camps shall not be proposed within 1000 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Location for stockyards for construction materials shall be identified at least 300m away from watercourses. The Sewage Treatment Plant and solid waste treatment for the camp shall be designed, built and operated. Contractor's camps shall be identified at least 2km away from the Forest Reserves.	Construction camps	As per IRC guidelines and contract documents.	Contractor	Environmental Specialist of DSC
P 12	Arrangements for Temporary Land Requirement	The Contractor as per prevalent rules shall carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction camp/construction/borrow areas etc. Temporary land arrangements shall not be from the forest reserves except under special permission circumstances where it is unavoidable due to the vast forest reserves in the PIA.	Construction camps and borrow areas	MoRTH 108.3	Contractor	Environmental Specialist of DSC
P 13	Orientation of Implementing Agency and Contractors	The UEAP shall organize Orientation Sessions and regular training sessions at all stages of the project. This shall include on-site training (general as well as in the specific context of a sub-project). These sessions shall involve all staff of UEAP involved in the implementation of EMP, Environmental Specialists of DSC and Contractors.	Throughout the implementation period.	EMP and other training plan developed by UEAP	Contractor/ DSC and UEAP	PMU
<b>CONSTRUCTION STAGE</b>						

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
<b>Activities to be Carried Out by the Contractor</b>						
<b>C 1</b>		<b>Site Clearance</b>				
C.1.1	Clearing and Grubbing	<p>If required vegetation shall be removed from the construction zone before commencement of construction. All works shall be carried out such that the damage or disruption of flora other than those identified for cutting is minimum.</p> <p>Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from the Environmental Expert of DSC.</p> <p>The Contractor, under any circumstances shall not cut or damage trees and forest reserves. Trees identified under the project shall be cut only after receiving clearance from the Forest Dept./DoEF/MoEF&amp;CC (as applicable) and after the receipt of UEAP's written permission in this regard.</p> <p>Vegetation only with girth size of over 30 cm shall be considered as trees and shall be compensated, in the event of UEAP's instruction to undertake tree cutting.</p>	Throughout the corridor	MoRTH 201	Contractor	Environmental Specialist of DSC,
C.1.2	Disposal of Debris from dismantling structures and road surface	<p>Appendix-1 &amp; 4 provides guidelines for the preparation of the contractors Debris disposal plan. This is mainly to deal with surplus debris materials that would be available after adjusting for all insitu applications.</p> <p>Other debris generated due to dismantling of the existing road shall be suitably reused in the proposed construction zone, subjected to the structure suitability of the materials and approval of the Resident Engineer and Environmental Expert of DSC as follows:</p> <p>For filling and leveling of School grounds and proposed parking areas.</p> <p>The sub grade of the existing pavement shall be used as embankment fill material.</p>	All debris disposal sites	MoRTH 202	Contractor	Environmental Specialist and Resident Engineer of DSC, EPMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>Existing base and sub-base material shall be recycled as sub-base of the haul road or access roads.</p> <p>The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.</p> <p>The Contractor shall suitably dispose off unutilized debris materials either through filling up of borrows areas located in wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of DSC.</p> <p>At locations identified for disposal of bituminous wastes, the disposal shall be carried out over a 30 mm thick layer of rammed clay so as to eliminate the possibility of scarified percolation of leachate into the ground water. The Contractor shall ensure that the surface area of such disposal pits is covered with a layer of soil and subsequent turfing.</p> <p>All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, shall be considered incidental to the work and shall be planned and implemented by the Contractor as approved and directed by the Environmental Expert of DSC.</p> <p>The pre-designed disposal locations shall be a part of Waste Disposal Plan in consultation and with approval of Environmental Expert of DSC.</p> <p>Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or for mud puddles in the area.</p> <p>The Contractor shall identify dumping sites as per the Debris Disposal Plan prepared using the Guidelines provided in the Appendix 1; The identified locations shall be</p>				

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		reported to the Environmental Expert of DSC. These locations shall be checked on site and accordingly approved by Environmental Expert of DSC prior to any disposal of waste materials.				
C.1.3	Other Construction Wastes Disposal	<p>The pre-identified disposal location shall be part of Comprehensive Waste Disposal Plan Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Specialist of DSC.</p> <p>Location of disposal sites shall be finalized prior to initiation of the works on any particular section of the road.</p> <p>The Environmental Specialist of DSC shall approve these disposal sites after conducting a joint inspection on the site with the Contractor.</p> <p>Contractor shall ensure that any spoils or material unsuitable for embankment fill shall not be disposed off near any water course or agricultural land, Orchards and Natural Habitats like Grasslands. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project road (if it so desired by the owner/community and approved by the Environmental Specialist, DSC).</p> <p>Non-bituminous wastes shall be dumped in borrow pits covered with a layer of 30cm soil to ensure that borrow pit is restored to original use. No new disposal site shall be created as part of the project, except with prior approval of the Environmental Specialist of DSC.</p> <p>All waste materials shall be completely disposed and the site shall be completely cleaned and certified by Environmental Specialist of DSC before handing over.</p> <p>The Contractor at his cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise</p>	All waste disposal sites	MoRTH: 202.5 MoRTH: 301.11	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		on account of lack of action on his part.				
C.1.4	Stripping, stocking and preservation of top soil	<p>The topsoil from all areas of cutting and all areas to be permanently covered shall be stripped off to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way shall be earmarked for storing topsoil. The locations for stock piling shall be pre-identified in consultation and with approval of Environmental Specialist of DSC. The following precautionary measures shall be taken to preserve them till they are used:</p> <p>(a) Stockpile shall be designed such that the slope does not exceed 1:2 (Vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing shall protect the edges of the pile.</p> <p>(b) Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum to ensure that no compaction shall occur. The stockpiles shall be covered with gunny bags or vegetation.</p> <p>(c) It shall be ensured by the Contractor that the topsoil shall not be unnecessarily trafficked either before stripping or when in stockpiles.</p> <p>Such stockpiled topsoil shall be utilized for –</p> <ul style="list-style-type: none"> <li>➤ Covering all disturbed areas including borrow areas, only in case where they are to be rehabilitated.</li> <li>➤ Dressing of slopes of road embankment/agricultural fields of farmers acquired temporarily land.</li> </ul>	At all construction material storage areas	MoRTH: 301.3.2 MoRTH: 301.7 MoRTH: 305.3.3 and MoRTH: 305.3.9	Contractor	Environmental Specialist of DSC,
C.1.5	Accessibility	<p>The Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property access connecting the project road, providing temporary connecting road.</p> <p>The Contractor shall also ensure that the existing accesses</p>	Throughout the project corridor		Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		shall not be undertaken without providing adequate provisions. The Contractor shall take care that the cross roads are constructed in such a sequence that construction work on the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.				
C.1.6	Planning for traffic diversions and detours	Temporary diversions shall be constructed with the approval of the Resident Engineer and Environmental Specialist of DSC. Detailed Traffic Control Plans shall be prepared by the Contractor and approved by Environmental Specialist and Resident Engineer of DSC seven days prior to commencement of works on any section of road. The Traffic Control Plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures for night time traffic and precaution for transportation of hazardous materials and arrangement of flagmen. The contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. The Contractor shall also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from DSC and UEAP. The temporary traffic detours shall be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).	Throughout the project corridor especially at intersections and settlements and schools	MoRTH: 112 and its Amendments	Contractor	Environmental Specialist and Resident Engineer of DSC, E&S PMU
<b>C.2</b>		<b>Procurement of Construction Material</b>				
C.2.1	Earth from Borrow Areas for	No borrow area shall be opened without permission of the Environmental Specialist of DSC. The location, shape and size of the designated borrow areas shall be as approved	All borrow areas	MoRTH: 305.2	Contractor	Environmental Specialist of DSC,



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Construction	<p>by the Environmental Specialist of DSC and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC: 10: 1961). The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas.</p> <p>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; shall be maintained dust free by the Contractor. Sprinkling of water shall be carried out twice a day to control dust along such roads during their period of use. During dry seasons (winter and summer) frequency of water sprinkling shall be increased in the settlement areas and Environmental Specialist of DSC shall decide the sprinkling time depending on the local requirements.</p> <p>Contractor shall rehabilitate the borrow areas as soon as borrowing of soil is over from a particular borrow area in accordance with the approved Borrow Area Redevelopment Plan.</p>				
C.2.2	Quarry Operations Crushers	<p>The Contractor shall obtain materials from quarries only after consent of the Department of Mines and Geology and District Administration. In view of special situation of excavation of the hill ward side, Contractor shall get an opportunity to use the same material for road construction. This shall require establishment of a number of crushers along the roadsides. The crushers and all related activities shall be under taken as per the Policy guidelines for installation of stone Crushers.</p>	At quarries and Crushing units.	MoRTH: 111.3	Contractor	Environmental Specialist of DSC,
C.2.3	Blasting	<p>Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor shall not use explosives.</p> <p>Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the</p>	Quarry sites	Sub-Clauses of MoRTH 302,4 301.9 (i) 304.5	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land as applicable.</p> <p>The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives. The contractor shall at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer.</p> <p>The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations.</p> <p>Blasting shall be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.</p> <p>Blasting shall be carried out during fixed hours (preferably during mid-day) or as permitted by the Engineer. The timing should be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions.</p>				
C.2.4	Transporting Construction Materials and Haul Road Management	<p>Contractor shall maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site shall be covered to avoid spillage of materials.</p> <p>All existing roads used by vehicles of the Contractor or any of his subcontractor or suppliers of materials and similarly roads, which are part of the works, shall be kept clear of all dust/mud or other extraneous materials dropped by such</p>	All roads used for haulage of construction materials	As per IRC guidelines and contract documents	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		vehicles. Contractor shall arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces.				
C.2.5	Construction Water	Contractor need to implement the finally approved contractors Construction Water Management Plan as per the guidelines provided in Appendix 11. This is linked to the contractor's work plan. Contractor shall arrange adequate supply and storage of water for the whole construction period at his own cost. The contractor shall submit a list of source/s from where water shall be used for the project to DSC and UEAP. The Contractor shall source the requirement of water preferentially by conjunctive use of Surface water and groundwater but with prior permission from the Groundwater Authority. A copy of the permission shall be submitted to DSC and UEAP prior to initiation of construction. The Contractor shall take all precaution to minimize the wastage of water in the construction process/operation.	Throughout the project corridor	Environmental Protection Act 1986 and MoRTH Spec. for Roads and Bridges	Contractor	Environmental Specialist of DSC,
<b>C.3</b>		<b>Construction Work</b>				
C.3.1	River training and disruption to other users of water	While working across or close to any perennial water bodies, Contractor shall not obstruct/prevent the flow of water. Construction over and close to the non-perennial streams shall be undertaken in the dry season. If construction work is expected to disrupt users of community water bodies, notice shall be served well in advance to the affected community.	Near major cross drainage structures (River crossings)	MoRTH:304.3.2	Contractor	Environmental Specialist of DSC,
C.3.2	Drainage and flood control	Contractor shall ensure that no construction materials like earth, stone, or appendage disposed off in a manner that block the flow of water of any water course and cross	Construction sites of cross drainage	MoRTH:305.3.7 MoRTH:306	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>drainage channels.</p> <p>Contractor shall take all necessary measures to prevent any blockage to the water flow. In addition to the design requirements, the Contractor shall take all required measures as directed by the Environmental Specialist of DSC to prevent temporary or permanent flooding of the site or any adjacent area.</p>	structures			
C.3.3	Siltation of water bodies and degradation of water quality	<p>The Contractor shall not excavate beds of any stream/canals/any other water body for borrowing earth for embankment construction.</p> <p>Contractor shall construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including springs and wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. The fencing shall be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road.</p> <p>Contractor shall ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.</p>	Construction sites of cross drainage structures	MoRTH:06	Contractor	Environmental Specialist of DSC,
C.3.4	Slope protection and control of soil erosion	<p>All temporary sedimentation control works and maintenance thereof shall be deemed as incidental to the earth work or other items of work and as such no separate payment shall be made for them.</p> <p>Contractor shall ensure the following aspects:</p> <ul style="list-style-type: none"> <li>➤ After construction of road embankment, the side slopes shall be covered with grass and shrubs (refer Appendix-7 and 14) as per design specifications.</li> <li>➤ Turfing works shall be taken up as soon as possible</li> </ul>	At bridge approaches; high embankment sections (Low lying areas) and borrow pits	MoRTH: 305.2.2.2 MoRTH: 306.2	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>provided the season is favorable for the establishment of grass sods. Other measures of slope stabilization shall include mulching netting and seeding of batters and drains immediately on completion of earthworks.</p> <ul style="list-style-type: none"> <li>➤ In borrow pits, the depth shall be so regulated that the sides of the excavation shall have a slope no steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank.</li> <li>➤ Along sections abutting water bodies, pitching as per design specification shall protect slopes.</li> </ul>				
<b>C.4</b>		<b>Pollution</b>				
<b>C.4.1</b>		<b>Water Pollution</b>				
C.4.1.1	Water Pollution from Construction Wastes	<p>The Contractor shall take all precautionary measures to prevent entering of wastewater into streams, water bodies or the irrigation system during construction. Contractor shall avoid construction works close to the streams or water bodies during monsoon.</p> <p>Contractor shall not wash his vehicles in river water and shall not enter riverbed for that purpose.</p>	At all surface water bodies intercepting with the project corridor	MoRTH: 111.4 MoRTH: 111.1	Contractor	Environmental Specialist of DSC,
C.4.1.2	Water Pollution from Fuel and Lubricants	<p>The Contractor shall ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites shall be located at least 500 m away from rivers and irrigation canal/ponds.</p> <p>The Contractor shall submit all locations and layout plans of such sites prior to their establishment and shall be approved by the Environmental Specialist of DSC.</p> <p>Contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refueling shall be carried out in such a manner that spillage of fuels and lubricants does not contaminate the ground. Wastewater from vehicle parking, fuel storage areas, workshops, wash</p>	At all surface water bodies intercepting with the project corridor; refueling stations and construction camps	MoRTH: 111.4 MoRTH: 111.1 (Oil Interceptors) Petroleum Act and Rules MoEF&CC/CP CB Notifications	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>down and refueling areas shall be treated in an oil interceptor before discharging it on land or into surface water bodies or into other treatment system.</p> <p>In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after cessation of such storage.</p> <p>Contractor shall arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to DSC and UEAP) and approved by the Environmental Specialist of DSC. All spills and collected petroleum wastes shall be disposed off in accordance with Petroleum Rules and PCB guidelines.</p>				
<b>C.4.2</b>	<b>Air Pollution</b>					
C.4.2.1	Dust Pollution	<p>The Contractor shall take every precaution to reduce the level of dust from construction plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source.</p> <p>Due to the acute water scarcity in certain areas, Contractor should limit water sprinkling once in the early morning hours. Contractor should erect warning boards on dust nuisance to the road users.</p> <p>The Contractor shall procure the construction plants and machinery, which shall conform to the pollution control norms specified by MoEF&amp;CC/CPCB/UEPPCB.</p> <p>The concentration of suspended particulate matter at a distance of 40m from a construction plant located in a cluster of industries should be less than 500 µg. The environmental monitoring is to be conducted as per the monitoring plan.</p> <p>Alternatively, only crushers licensed by the UEPPCB shall be used. The Environmental Specialist, EO and UEAP</p>	Construction sites and construction establishment such as batching plants, hot mix plants	MoRTH:111.1 MoRTH:111.5 MoRTH:111.9 MoRTH:111.10 Contract Agreement	Contractor	Environmental Specialist of DSC, PMU and Engineer

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		through the Engineer shall submit required certificates and consents.				
C.4.2.2	Emission from Construction Vehicles, Equipment and Machineries	Contractor shall ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant statutory requirements of CPCB and/Motor Vehicles Rules. The Contractor shall submit PUC certificates for all vehicles/equipment/machinery used for the Project.	The Air (prevention and control of pollution) Act, 1981 and EPA, 1986	Annexure 'A' to MoRTH 501	Contractor	Environmental Specialist of DSC,
<b>C.4.3</b>		<b>Noise Pollution</b>				
C.4.3.1	Noise Pollution: Noise from Vehicles, Plants and Equipments	The Contractor shall confirm the following: <ul style="list-style-type: none"> <li>➤ All Construction plants and equipment used in construction shall strictly conform to the MoEF&amp;CC/CPCB noise standards.</li> <li>➤ All Vehicles and equipment used in construction shall be fitted with exhaust silencers.</li> <li>➤ Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.</li> <li>➤ The equipment available in the market should be procured, if the Contractor plans to purchase new equipment. For the old equipment, necessary or possible alterations must be carried out to reduce the noise levels to the possible extent.</li> <li>➤ Maintenance of vehicles, equipment and machinery shall be regular and up to the satisfaction of the Environmental Specialist of DSC to keep noise levels at the minimum.</li> </ul> At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, operation of DG sets, use of high noise generation	Through out the project corridor and other construction establishments	The noise pollution (regulation and control) rules, 2000	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>equipment shall be stopped during the night time between 10.00 pm to 6.00 am. Working hours of the construction activities shall be restricted around educational institutions/Health Centers (silent zones) up to a distance of 100 m from the sensitive receptors i.e., School, Health Centers and Hospitals etc.</p> <p>Contractor shall provide noise barriers to the suggested locations of select Schools.</p> <p>Noise monitoring shall be carried out at the locations specified in monitoring plan by the UEAP and the Engineer through the approved monitoring agency.</p>				
<b>C.5</b>		<b>Safety</b>				
C.5.1	Personnel Safety Measures for Labour	<p>Contractor shall provide:</p> <ul style="list-style-type: none"> <li>➤ Protective footwear, protective goggles and nose masks to the workers employed in asphalt works, concrete works, crusher etc.</li> <li>➤ Welder's protective eye-shields to workers who are engaged in welding works</li> <li>➤ Earplugs to workers exposed to loud noise, and workers working in crushing or compaction</li> <li>➤ The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</li> </ul> <p>The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract.</p> <p>The Contractor shall make sure that during the construction work all relevant provisions of Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p>	Throughout the project corridor and construction phase of the project	Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996;	Contractor	Environmental Specialist of DSC,



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>The Contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed on the work of painting with products containing lead in any form</p> <p>The Contractor shall also ensure that paint containing lead or lead products is used except in the form of paste or readymade paint.</p>				
C.5.2	Traffic and Safety	<p>The Contractor shall take all necessary measures for the safety of traffic during construction and provide erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of DSC for the information and protection on traffic approaching or passing through the section of any existing cross roads.</p> <p>The Contractor shall ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan shall be devised and implemented to the satisfaction of the Environmental Expert of DSC.</p>	Throughout the project corridor especially at intersections and settlements	MoRTH: 112.4 MoRTH: 112.1 IRC: SP:55	Contractor	Environmental Specialist of DSC,
C.5.3	Risk from electrical equipments	<p>The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that –</p> <ul style="list-style-type: none"> <li>➤ No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public.</li> <li>➤ All necessary fencing and lights shall be provided to protect the public in construction zones.</li> </ul> <p>All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order, shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental</p>	Construction sites and storage areas	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act, 1996 and Factories Act, 1948	Contractor	Environmental Expert SC, PIU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Expert of DSC.				
C.5.4	Risk force measure	Contractor shall take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities. Contractor shall make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor shall identify necessary actions in the event of an emergency.	Throughout the construction phase	Contract Agreement and Annexure 'A' to MoRTH Clause 501	Contractor	Environmental Specialist of DSC,
C.5.6	First Aid	The Contractor shall arrange for – A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone. Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital. Equipment and trained nursing staff at construction camp.	Construction sites; labour camps and construction establishments	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Environmental Specialist of DSC,
C.5.7	Informatory Signs and Hoardings	The Contractor shall provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Specialist of DSC.	Construction sites and construction establishments	MoRTH:801 MoRTH:802	Contractor	Environmental Specialist of DSC,
<b>C.6</b>		<b>Flora and Fauna: Plantation/Preservation/Conservation Measures</b>				
C.6.1	Road side Plantation Strategy	The Contractor shall do turfing on embankment slopes, plantation of shrubs as specified in the Contract. The compensatory plantation shall be carried out by the State Forest Department. Minimum 80 percent survival rate of the saplings shall be acceptable otherwise the Contractor/Forest Department shall replace dead plants at his own cost. The Environmental Specialist of DSC shall inspect regularly the survival rate of the trees planted by the Contractor in	Throughout the length of project corridor	As per the contract document and MoRTH 301.3.3	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		accordance with the plantation strategy suggested.				
C.6.2	Flora and Fauna	<p>The Contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any animal is found near the construction site at any point of time, the contractor shall immediately upon discovery thereof acquaint in the Environmental Specialist of DSC and carry out his instructions for dealing with the same.</p> <p>Environmental Specialist of DSC shall report to the nearby forest office (range office or divisional office) and shall take appropriate steps/measures, if required in consultation with the forest officials.</p>	Throughout project corridor especially near forest stretches including surface water bodies		Contractor	Environmental Specialist of DSC,
C.6.3	Chance Found Archaeological Property	<p>All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.</p> <p>The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall, immediately upon discovery thereof and before removal acquaint the Environmental Specialist of DSC of such discovery and carry out the DSC's instructions for dealing with the same, waiting which all work shall be stopped. The DSC shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site. The Archaeological structures identified along the road sides should be protected/ preserved or enhanced as per the law.</p>	Throughout project corridor	The Ancient Monuments and Archaeological Sites and Remains Act, 1958	Contractor	Environmental Specialist of DSC,
C.7.1	Accommodation	Contractor shall follow all relevant provisions of the Building and the other Construction Workers (Regulations of	Labour camps	The Building and Other	Contractor	Environmental Specialist

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to DSC and UEAP prior to their construction.</p> <p>The Construction shall commence only upon the written approval of the Environmental Specialist of DSC.</p> <p>The Contractor shall maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the DSC.</p>		Construction workers (Regulation of Employment and Conditions of Service) Act, 1996		of DSC,
C.7.2	Potable Water	<p>The Contractor shall construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing.</p> <p>The Contractor shall also provide potable water facilities within the premises of every camp at an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</p> <p>The Contractor shall also guarantee the following:</p> <ol style="list-style-type: none"> <li>Supply of sufficient quantity of Potable Water (as per IS) in every workplace/labour camp (Site at suitable and easily accessible places and regular maintenance of such facilities.</li> <li>If any water storage tank is provided that shall be kept such that the bottom of the tank at least 1 m above the surrounding ground level.</li> <li>If water is drawn from any existing well, which is within 30 m proximity of any toilet, drain or other source of pollution, the well shall be disinfected before water is used for drinking.</li> <li>All such wells shall be entirely covered and provided with a trap door, which shall be dust proof and water</li> </ol>	Construction site, Labour camp	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>proof.</p> <p>e) A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once in a month.</p> <p>f) Analysis of water shall be done every month as per parameters prescribed in IS 10500-1991.</p> <p>Environmental Specialist of DSC shall be required to inspect the labour camp once in a week to ensure the compliance of the EMP</p>				
C.7.3	Sanitation and Sewage System	<p>The Contractor shall ensure that –</p> <ul style="list-style-type: none"> <li>➤ The Sewage system for the camp are designed, built and operated in such a manner that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place</li> <li>➤ Separate toilets/bathrooms, wherever required, Screened from those form men (marked in vernacular) are to be provided for women</li> <li>➤ Adequate water supply is to be provided in all toilets and urinals</li> <li>➤ Night soil can be disposed of with the help of local municipal extractor or disposed of by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm layer of waste or refuse and then covered with a layer of earth for fortnight.</li> </ul>	Labour camps	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act, 1996 MoRTH:114.14	Contractor	Environmental Specialist of DSC,
C.7.4	Waste Disposal	The Contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Specialist of DSC.	Labour camps	Annexure 'A' to MoRTH Clause 501	Contractor	Environmental Specialist of DSC,
<b>C.8</b>		<b>Contractor's Demobilization</b>				

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
C.8.1	Environmental Conditions	The UEAP shall undertake seasonal monitoring of air, water and noise and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored shall be as per the Monitoring Plan prepared. National Standard of Air, Noise and Water given in Appendix-2.	Representative locations as directed by Environmental Engineer, DSC.	Environmental Protection Act, 1986	Contractor	Environmental Specialist of DSC PMU
C.8.2	Continuous Community Participation	The Environmental Specialist of DSC shall have continuous interactions with local people around the project area to ensure that the construction activities are not causing undue inconvenience to the locals residing in the vicinity of project site under construction due to noise, dust or disposal of debris etc.	Along the project corridor		Environmental Specialist of DSC	Environmental Specialist of DSC PMU
C.8.3	Clean-up Operations, Restoration and Rehabilitation	Contractor shall prepare site restoration plans, which shall be approved by the Environmental Specialist of DSC. The clean-up and restoration operations are to be implemented by the Contractor prior to demobilization. The Contractor shall clear all temporary structures; dispose all garbage, night soils and POL (Petroleum, Oil and Lubricants) wastes as per Comprehensive Waste Management Plan and as approved by DSC. All disposal pits or trenches shall be filled in and effectively sealed off. Residual topsoil, if any shall be distributed on adjoining/proximate barren land or areas identified by the Contractor and approved by the Environmental Specialist of DSC in a layer of thickness of 75 mm – 150 mm. All construction zones and facilities including culverts, road side areas, camps, Hot Mix plant sites, Crushers, batching plant sites and any other area used/affected due to the project operations shall be left clean and tidy, at the Contractor's expense, to the entire satisfaction to the Environmental Specialist of DSC.	Throughout the project corridor	MoRTH 111.9, 111.10 and 111.11	Contractor	Environmental Specialist of DSC,

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
<b>C.9</b>	<b>Construction Activities by UEAP</b>					
C.9.1	Tree Plantation	The plantation at the following locations shall be implemented by the UEAP through the State Forest Department; as per Appendix-7 and 8 1. Road side 2. Enhancement sites 3. Forest land 4. Community Forestation	Throughout the project corridor	The Uttar Pradesh Protection of Trees in Rural and Hill Areas Act, 1976 and amended 1998 and 2001	State Forest Department	PMU
<b>OPERATION STAGE</b>						
<b>Activities to be Carried Out by the UEAP</b>						
O.1	Monitoring Operation Performance	The UEAP shall monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision made under the project; status of rehabilitation of borrow areas; and effectiveness of noise barriers.	Throughout the project corridor	As per the contract document	PMU	PMU
O.2	Maintenance of Drainage	PWD shall ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.	Throughout the project corridor		PMU	PMU
O.3	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil quality in the selected locations as suggested in pollution monitoring plan through the UEPPCB or its approved monitoring agency.	At representative locations as per the instructions of Env. Engineer	Environmental Protection Act, 1986 and The noise pollution (regulation and control) rules, 2000	Pollution Monitoring Agency	PMU
O.4	Soil Erosion and Monitoring of Borrow	Visual Monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried	Borrow areas and embankment	MoRTH 305.2.2.2 and 306.3	PMU	PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Areas	out once in every three months as suggested in monitoring plan.	slopes			
O.5	Public awareness on Noise levels and Health Affects	However the public shall be advised to construct the noise barriers such as walls, double glazed windows and tree plantation between the roads and their property. The public awareness is necessary regarding the human health through the news papers and consultations and distribution of pamphlets during the operation stage.	Throughout the project corridor	Corporate Social Responsibility	PMU	PMU



### C. Environmental Monitoring programme

195. The succeeding Table presents the monitoring plan for UEAP. The objectives of environmental monitoring are: ensure effective implementation of EMP; comply with all applicable environmental, safety, labour and local legislation; ensure that public opinions and obligations are taken in to account and respected to the required satisfaction level; and modify the mitigation measures or Implementing additional measures if required.

The environmental monitoring plan contains:

- All performance indicators
- Environmental monitoring programme
- Necessary budgetary provisions

### D. Performance Indicators

196. The physical, biological and social components identified to be particularly significant in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- a) Environmental condition indicators to determine efficiency of environmental management measures in control of air, noise and water pollution.
- b) Environmental management indicators to determine compliance with the suggested environmental management measures.
- c) Performance indicators that have been devised to determine efficiency and utility of the proposed mitigation measures.

The Performance Indicators and monitoring plans prepared are presented in Table below

Table VIII-2. Performance Indicators of EMMP

<b>Performance Indicators</b>	<b>Target</b>	<b>Achievement in Semi-annually and annually</b>
Budget	Environmental Budget (EMMP Budget)	Expenditure till date
<b>Performance Indicators of Monitoring Plan</b>		
Ambient Air Quality	Total Number of samples as per Environmental Monitoring Plan	Total Number of samples collected
Noise Level	Total Number of samples as per Environmental Monitoring Plan	Total Number of samples collected
Water Quality	Total Number of samples as per Environmental Monitoring Plan	Total Number of samples collected
Soil	Total Number of samples as per Environmental Monitoring Plan	Total Number of samples collected
Safety of Workers	List of PPE as per the number labours	List of PPEs actually provided in the project
<b>Performance Indicators of Environmental Management Plan</b>		
Permissions,/ NoCs/Consents requirement	Target timeline to obtain the permit/NoC/ consents and its validity	List of Permission and NoCs / consents obtained till date and status of its validity.
Public Consultation	Total Number of planned Public Consultation with timeline and coverage of people.	Number of public consultation conducted till date and actual coverage of the people.
Grievance redressal	Total number of complaints received, its timeline to response and resolution	Actual number of complaints resolved in percentage, response time.
Issues raised in public	Target to attend the issues raised in the	Status of compliance to the issues of

consultation	Public Consultation	Public consultation
Information disclosure	List of information and locations where information to be disclosed	Actual locations where information has been disclosed.
Education of site staff on Environmental training	Total Number of staffs to be trained	No of staff actually
Capacity Building	Total number of sessions to be covered Total Number of contractors, PIUs and DSCs to be covered	Number of Sessions completed and Number of contractors, PIUs and DSCs.
Implementation of EMP mitigation Measures	All items of Environmental Management Plan with timeline	Implementation status of EMP items till date
Reporting	List and number of Report to be submitted	List and number of reports submitted

Table VIII-3. Environmental monitoring for Air, Water, Noise and Soil

Attribute	Parameter	Special guidance	Standards	Frequency	Duration	Location	Implementation
Air	CO, NO <sub>x</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , Pb and SO <sub>2</sub>	High volume sampler to be located 50m from the plant in the down wind direction. Use method specified by CPCB for 24 hr sampling	Air (prevention and control of pollution) Rules. CPCB, 1994	Once in every three months during construction and operation stage.	Two years	Construction Sites and major establishments along the subproject including base line monitored stations	Contractor (Responsible) through approved monitoring agency
Water	Please refer Appendix 2 for water quality parameters to be monitored or parameters as decided by the Environmental Specialist of the DSC	Grab sample collected from source and analyze as per standard methods for examination	IS for Inland surface waters (IS:2296,1982) and for drinking water (IS: 10500-1991)	Once in every three months during construction and operation stage.	Two years	Drinking water samples from the labour camps and from hand pumps, Surface water from the water courses along the road project.	
Noise	Noise quality as per National Ambient Noise Standards on db (A) scale	Equivalent noise levels using and integrated noise level meter kept at a distance of 15m from edge of pavement Leq in db (A) of day time and night time	MOEF&CC Noise Rules 2000	Once in every three months during construction and operation stage.	Two years	Near the construction camps, working zones, sensitive receptors at major human settlements along the road.	
Soil	Monitoring of pH, Nitrogen, Phosphorus, Potassium, Sodium, Chloride, Organic Carbon and Lead	Sample of soil collected and analyzed using absorption spectrometer	Indian Standards (IS-2720)	One sample each during the pre and post monsoon for construction and operation stage.	Two years	Construction camp /plant sites, Labour camps, Batching plants and productive agricultural lands abutting traffic detours and traffic diversions and major intersections.	

\*Accidental spillage of hazardous and non-hazardous substances need to be dealt with as special cases largely depends on the circumstances including state of the substance (liquid or solid)

Monitoring shall be carried out at all locations used for collection of primary data in the study.

## E. Environmental Budget

197. Based upon the environmental issues identified, preliminary assessment of the project impact on the environment, EMP cost is estimated to implement the key environmental measures and environmental management and monitoring plan

Table VIII-4 Environmental Budget for Reconstruction and Restoration of Internal Motor Roads of Nagar Palika Pauri in District Pauri

Item No.	Description	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Responsibility
<b>A</b>	Legislation, permits and Agreements (CTE & CTO for plants and machinery of the contractor)					These consents are to be obtained by contractor on own cost
	Public consultations and information disclosure (Construction phases)		Lump sum	40,000.00	40,000.00	FPIU/IA
	<b>Sub-total (A)</b>				<b>40,000.00</b>	
<b>B</b>	<b>Environmental Monitoring (Pre-construction Stage)</b>					
B.01	Ambient air quality monitoring	2	No.	6685.00	13370.00	DSC
B.02	Ambient noise level monitoring	2	No.	2022.00	4044.00	
B.03	Water quality monitoring of surface/ Ground water	2	No.	5157.00	10314.00	
B.04	Soil quality monitoring	1	No.	4551.00	4551.00	
	<b>Sub-total (B)</b>				<b>32,279.00</b>	
<b>C</b>	<b>Environmental Monitoring (Construction Stage)</b>					
C.01	Ambient air quality monitoring	8	No.	6685.00	53480.00	Contractor
C.02	Ambient noise level monitoring	6	No.	2022.00	12132.00	
C.03	Water quality monitoring of surface/ Ground water	4	No.	5157.00	20628.00	
C.04	Soil quality monitoring	1	No.	4551.00	4551.00	
	<b>Sub-total (C)</b>				<b>90,791.00</b>	
<b>D</b>	<b>Environmental Monitoring (Operation Stage)</b>					
D.01	Ambient air quality monitoring	4	No.	6685.00	26740.00	FPIU
D.02	Ambient noise level monitoring	4	No.	2022.00	8088.00	
D.03	Water quality monitoring of surface/ Ground water	2	No.	5157.00	10314.00	
D.04	Soil quality monitoring	1	No.	4551.00	4551.00	
	<b>Sub-total (D)</b>				<b>49,693.00</b>	
<b>E</b>	<b>Mitigation and Enhancement Measure Cost</b>					
E.01	Protection Work Like RW/BW and line drain in the project road	As per DPR	RM	-	Included under Engineering cost	
E.02	Water Sprinkling to suppress dust.	As per DPR				Contractor
<b>F</b>	<b>Environmental Training</b>					
F.01	EMP Training at site	1	LS	20,000.00	20,000.00	Contractor
F.02	Training on Implementation of EMP for Field PIUs and Engineer	1		50,000	50,000.00	
	<b>Sub-total (F)</b>				<b>70,000.00</b>	
<b>G</b>	<b>Total Environmental Cost (A+B+C+D+E+F)</b>					<b>2,82,763.00</b>
	<b>Grand Total (in Lac)</b>					<b>2,83</b>

## **IX. CONCLUSION AND RECOMMENDATION**

198. The proposed Project has been categorized as Category 'B' based on environmental screening and assessment of likely impacts of road sections. The initial environmental examination (IEE) ascertains that it is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed sub-project, all of which are localized and temporary in nature and easy to mitigate.
199. All road sections proposed to be upgraded do not pass through or located nearby any national park, wildlife sanctuary, reserved forests, or any other ecologically sensitive or protected areas. No archaeological/protected monument is located in the project vicinity.
200. Potential significant environmental impacts are related to encroachments or near to historical and ecologically sensitive areas, road sections are prone to landslides, localized flooding, increase erosion, siltation, and hazardous driving conditions.
201. The beneficial impacts still outweighs the potential significant environmental impacts. Beneficial impacts include reduction in travel time and lower vehicle operating costs; better internal and external access to and from Uttarakhand; and better access to agricultural production areas, markets, religious and tourist areas. The road design is also a mitigation measure to existing road safety and accessibility issues as it addresses erosion, landslides, poor drainage, and inadequate road safety. Improved roads will also contribute to the community climate change resiliency as it can better withstand more extreme weather events allowing continued accessibility and flow of materials under such conditions
202. In general, the sub-project received immense support from local people. Majority welcomes several benefits related to better roads like facilitate transport, employment, and boost economic development. Concerns were expressed related to construction camps may put stress on local resources and the infrastructure in nearby communities.
203. The initial environmental examination ascertains that the sub-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 shall ensure that EMMP is 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.

**Appendix A**  
**Rapid Environmental Assessment (REA)**

**Country/Project Title:** India / Uttarakhand Emergency Assistance Project (UEAP)  
**Sector Division:** Road and Highways  
**Road Section:** Restoration of Internal Motor Road of Nagar Palika Pauri (UEAP/PWD/C-84)  
**Road Category:** Urban Road

Screening Questions	Yes	No	Remarks																				
<b>A. Project siting</b> Is the project area adjacent to or within any of the following environmentally sensitive areas?			These roads are designated as urban roads and the total affected length of these urban roads is 3.527 km. The proposed road work is distributed in 3 road section falling in close proximity: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Sl. No.</th> <th>Name of Road</th> <th>Chainage</th> <th>Affective length (Km)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Judge Court To Civil Line</td> <td>0.000 to 1.200</td> <td>1.200</td> </tr> <tr> <td>2</td> <td>Kandoliya To Chatridhaar</td> <td>0.000 to 1.652</td> <td>1.652</td> </tr> <tr> <td>3</td> <td>Civil Line To New Bus Stand</td> <td>0.000 to 0.675</td> <td>0.675</td> </tr> <tr> <td colspan="2"><b>Total</b></td> <td><b>3.527</b></td> <td><b>3.527</b></td> </tr> </tbody> </table>	Sl. No.	Name of Road	Chainage	Affective length (Km)	1	Judge Court To Civil Line	0.000 to 1.200	1.200	2	Kandoliya To Chatridhaar	0.000 to 1.652	1.652	3	Civil Line To New Bus Stand	0.000 to 0.675	0.675	<b>Total</b>		<b>3.527</b>	<b>3.527</b>
Sl. No.	Name of Road	Chainage	Affective length (Km)																				
1	Judge Court To Civil Line	0.000 to 1.200	1.200																				
2	Kandoliya To Chatridhaar	0.000 to 1.652	1.652																				
3	Civil Line To New Bus Stand	0.000 to 0.675	0.675																				
<b>Total</b>		<b>3.527</b>	<b>3.527</b>																				
Cultural heritage site		√	Nil at proposed work, However entire Pauri District contain many old temples grace the place revealing the cultural beliefs and magnificent architecture of region.																				
Protected area		√	Nil																				
Wetland		√	Nil																				
Mangrove		√	Nil																				
Estuarine		√	Nil																				
Buffer zone of protected area		√	Nil																				
Special area for protecting biodiversity		√	Nil																				
<b>B. Potential environmental impacts</b> Will the project cause...																							
Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		√	No encroachment on historical/cultural areas. Reconstruction work will be limited to available formation width without acquiring additional land and the proposed technical design provisions include overlaying/ strengthening of badly affected sections of the existing roads and up gradation of existing CD structures. Stone aggregates required for widening shall be brought from approved quarry sites.																				
Encroachment on precious ecology (e.g. Sensitive or protected areas)?	√		Project road passes majorly through human settlements with a varying formation width of 5.0-7.0m. Proper engineering work and mitigation measures will be adopted and no Forest diversion and Land acquisition will be done in any condition.																				
Alteration of surface water		√	The Road passes through hilly terrain. Project																				

hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?			involves rehabilitation of badly affected sections of the existing roads and improvements of CD structures which will improve the drainage system. The drainage system shall be upgraded wherever required.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		√	No direct impact on surface water quality. Measure like locating camps away from water bodies and providing septic tanks & soak pits as sewage disposal facilities will be provided in the construction camp. Chemical shall be stored as per specifications. Accidental spills can be avoided through good practices.
Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?		√	To minimize the impact of air pollution measures such as conformance to Emission standards and norms, use of locally available materials from approved quarry sites, scheduling the activity preferably in wet months, avoiding the use of wood as fuel for heating bitumen, hot mix plant location to be preferably on waste lands, reuse of land filling of bituminous wastes, use of dust suppressants. Haul trucks will be covered and will strictly observe speed < 30 km / hr when traversing these locations. Contractor with concerned PIU will conduct consultation during construction phase to identify other measures to control dust.
Risk and vulnerabilities related to occupational health and safety due to physical, chemical, biological and radiological, hazard during project construction and operation during project construction and operation?		√	The road passes through hilly terrain where landslide and slip occurs especially during monsoon season. However physical risk can be reduced by providing Personal Protection Equipments (PPE) to workers etc. Dismantling of existing structures and disposal by manual and mechanical means.
Noise and vibration due to blasting and other civil works?		√	No blasting will be done. During construction, nuisance would be created due to the movement of heavy machineries like excavators, dumpers etc. Proper mitigation measures will be in place like PPEs, noise enclosures, engine maintenance schedules and standards (or use alternative fuels) shall be taken to reduce noise pollution.
Dislocation or involuntary resettlement of people?		√	Not involved
Dislocation and compulsory resettlement of people living in right-of way?		√	Not involved
Disproportionate impact on the poor, women and children, Indigenous people or other vulnerable group.		√	No. This hilly road will improve access of marginal upland dwellers to market centres and social services.
Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper		√	As a result of improvement of this road section, the communication and accessibility to the area will increase which will lead to improvement of the socio-economic condition of the area.

respiratory problems and stress?			
Hazardous driving conditions where construction interferes with pre-existing roads?		√	Existing IRC 55 and MoRTH Specification for Roads & Bridges shall be followed with design of proper markers on roads for reducing such impacts. Works along with planned construction to minimise impact on road users.
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?		√	Limited areas suitable for construction camp site are available along the alignment. Employing local labour shall be adopted. Construction camps will be established away from any local human settlement area and preferably located on lands, which are barren/ waste lands. Construction camps will be provided with necessary health systems with provision of regular health check-ups and awareness camps for communicable diseases.
Creation of temporary breeding habitats for mosquito vectors of disease?	√		Proper disposal of liquid effluent at camps to avoid water stagnation and removal of all created pools till spring-time. Reinstitution of relief and landscape shall be done for reducing temporary breeding habitats.
Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	√		Suitable road safety measures to be incorporated in design and creating awareness amongst road users on safe driving.
Increased noise and air pollution resulting from traffic volume?	√		During construction phase, the use of paver, rollers and other heavy equipment will be operated during daytime only. Near places of worship, schools, and hospitals, major sources of noise shall be confined by temporary barrier. Post construction, improved road connectivity can enhance the noise and air pollution however suitable road safety measures incorporation in design and creating awareness amongst road users on safe driving can reduce the risk.
Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?		√	Existing road are to be used for hauling of materials to extent possible. It will be ensured that the fuel storage and refuelling sites are kept at least 300m away from drainage channels and important water bodies. Accidental spills oil/lubricant/fuel shall be avoided through good practice.
Social conflict if workers from other regions or countries are hired?		√	Local labour will be employed
Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	Large influx of population during construction is not expected as per the size of project work and local labour will be employed. Construction camps will be provided with necessary water supply, sanitation, storm water drainage, solid waste management etc. during the construction period and necessary provision for rehabilitation or restoration after completion of



			construction.
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?		√	No chemicals will be used for site clearing and the contractor is limited to manual or mechanical means to clear thorny areas. All refuelling, lubrication, and equipment cleaning and maintenance will be conducted exclusively inside the construction site's designated motor pool. The area shall be paved and drained into one canal equipped with oil-water separator/grease trap. All collected grease will either be disposed to an approved site, or re-used for emergency roadside illumination during construction.
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.		√	Since the project road is hill road, landslides due to natural cause, extreme weather event or earthquake may result to injury. Affected road sections that are undergoing slides and erosions will be mitigated through stone/concrete masonries, hill side drains, weep holes, and toe protection. During operation, the PWD will advise communities and motorist of warnings during expected extreme weather events issue travel limitations or bans, when necessary.

<b>Climate Change &amp; Disaster Risk Questions</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	√		The road section passes through hilly terrain wherein chances of floods, tsunami or volcanic eruptions may not occur however there is high possibility of landslides during rainy season, cloud burst and as per the 2012 seismic zoning map of India, Uttarakhand state also fall in Zones IV thus, the project area is subject to earthquake hazard.
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability, (eg. Increased erosion or landslides could increase maintenance costs, permafrost melting of increased soil moisture content could affect sub-grade)?	√		Heavy precipitation can cause increased erosion/ landslides. Increase maintenance cost can occur at times. However slope stabilization measures such as construction of breast wall and retaining to mitigate such events will be done.
Are there any demographic or socio-economic aspects of the Projects area that are already vulnerable (e.g. high incidence of marginalized, populations, rural-urban migrants, illegal settlements, ethnic minorities, women of children)?		√	Not likely to be. However, the details will be studied during detailed social impact assessment.
Could the Project potentially increase the climate of disaster vulnerability of	√		The Project road passes through mountainous region and thereby

the surrounding area (e.g. by encouraging settlement in areas that will be more affected by floods in the future, or encouraging settlement in earthquake zones)?		disturbing natural stability of slopes by construction activities, water courses along the slopes may also cause erosion. However for improving slope stability proper mitigation measure shall be incorporated while designing the road.
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X	should be categorized as an A project.
√	<b>should be categorized as a B project.</b>
X	should be categorized as a B project in an environmentally sensitive area.
X	should be categorized as a C project.
X	should be categorized as an A/B project because (give reason) .
X	requires additional information for classification. Therefore, an Environment Specialist should be involved in the PPTA Fact-finding Mission. the Mission Leader should gather additional information during the PPTA Fact- finding Mission

Site Photographs Public Consultation



Name of the Project : Uttarakhand Emergency Assistance Project  
Name of the Project Road : INTERNAL MOTOR ROADS OF NAGAR PALIKA PAURI  
(Judge Court To Civil Line)

Project Package No. : UEAP/PWD/G-84  
Length to be improved : 3.52 KM  
Date & Place of Public Consultation: 10-10-2015

Tehsil: Pauri

District: Pauri

List of stakeholders/participants at public consultation meeting

S.No.	Name and Address of Respondent	Occupation	Signature	Remarks/Opinion
1	दिनेश सिंह पिपल	प्रीस्वामी जि.वि.से.पा.पोस्ट	दिनेश	उक्त सड़क को खुलवाते हैं जहाँ जल्द में नाली पर सीमा का पाइप डाला जाये वर फिनारे को पूरी नाली के गत को जाये।
2	श्री. वि. से. पा. पोस्ट श्री. वि. से. पा. पोस्ट	इकांतपति	Shrinivas	कारण कि दुखल का ध्यान रखें जायें
3	श्री. वि. से. पा. पोस्ट	सखिया पुत्रीनाथ	[Signature]	
4	अनिल शर्मा	इकांतपति	[Signature]	

Name of the Project : Uttarakhand Emergency Assistance Project  
 Name of the Project Road : INTERNAL MOTOR ROADS OF NAGAR PALIKA PAURI  
 (Civil Line to New Bus Stand)

Project Package No. : UEAP/PWD/C-84  
 Length to be improved : 3.52 KM  
 Date & Place of Public Consultation: 10-10-2015  
 Tehsil: Rauni

District: Rauni

List of stakeholders/participants at public consultation meeting

S.No.	Name and Address of Respondent	Occupation	Signature	Remarks/Opinion
1	A.S. Rana	कर्मचारी		
2	देवेन्द्र सिंह	कर्मचारी		
3	विद्यावती शर्मा	दुकानदार		
4	रतन सिंह रावत	विद्यार्थी		सी.टी. भाग को हटाने का सुझाव
5	सुदीप सिंह	दुकानदार		अच्छा गा. पंचायत का काम करके देना चाहिए
6	रवि वर्धन शर्मा	कर्मचारी		कारोबार को बढ़ावा देना चाहिए
7	मकुल उप्पेरी	दुकानदार		अच्छा गा. पंचायत का काम करके देना चाहिए
8	नितिन उप्पेरी	दुकानदार		अच्छा गा. पंचायत का काम करके देना चाहिए
9	मुकेश शर्मा	व्यवसाय		अच्छा गा. पंचायत का काम करके देना चाहिए

APPENDIX - 1  
DISPOSAL SITE MANAGEMENT

**SELECTION OF DISPOSAL SITES:**

The locations of Disposal sites have to be selected such that:

- Disposal sites are located at least 1000 m away from sensitive locations like Settlements, Water body notified forest areas, Sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the Village/local community is to be obtained for the Disposal site selected.
- Environment Engineer of DSC and Executive Engineer of Contract Management Unit must approve the Plan before commencement of work.

**PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS / WASTE MATERIAL**

The Contractor shall take the following precautions while disposing off the waste material

- During the site clearance and disposal of debris, the Contractor will take full care to ensure that public or private properties are not affected, there is no dwellings around the dumpsite and that the traffic is not interrupted.
- The Contractor will dispose off debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works.
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works.
- The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it.

While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.

**GUIDELINES FOR REHABILITATION OF DISPOSAL SITES**

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the supervision consultant

- The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees has also to be planted so that the landscape is coherent and is in harmony with its various components.
- In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such playground could be made coherent with the landscape by planting trees all along the periphery of the playground.
- Some of the dumpsites could be used either for plantation or for growing agricultural produce such as ginger, turmeric or oranges etc.
- Care should always be taken to maintain the hydrological flow in the area.

#### **Identification of Disposal Areas:**

The Contractor should also try to make use of all disposal areas identified during the project preparation stage. If the road execution is approaching hilly area, rolling terrain, mountainous area or rocky area then importance should be given to screening i.e., to screen the debris into useful materials. Useful stones can be utilized as construction material and non-useful can be used as development of the public, social and cultural properties as already written above such as parking places, school playground, bus bays, ground near any temple and Mosque so that people participation can be assured in the implementation of the project. So it would be good if NGOs are introduced to perform this task more efficiently.

#### 204. Disposal methods and its limitations:

There are several constraints in the disposal of materials in the identified locations. They are

- Disposal areas are uneven and irregular in shape in the hilly terrain
- Most of the disposal areas would require construction of retaining walls
- Disposal areas would require compaction
- Disposal areas would require plantation
- No overloading and should be in small trucks or dumpers
- Need to transport safely with covered trucks using tarpaulin
- Consultation with all concerned
- Written permission from all concerned
- To transport through difficult haul roads- may require maintenance

#### **Local community Groups**

At each identified debris disposal locations, it is necessary to form local community groups. Entrust the duty of the supervision and all other assistance to dumping process. Ultimately the disposed area should be compacted using road rollers.

#### **Information display boards**

The capacity of the disposal locations, name of the location etc shall be written in an information board at each identified disposal locations.

#### **Proposed design:**

Contractor needs to plan the disposal in the following way

- Identify the disposal area
- Need to photograph the present land use and condition of the area
- Consult with all stakeholders
- Get written agreement from all concerned
- Prepare a suitable design for the safe disposal

- Construct all required structures (e.g. retaining wall)
- Planting of fast growing popular trees on the outer portion of the retaining wall in the form of a linear wall parallel to the retaining wall
- Compact of the materials after disposal
- Prepare a Contractors debris disposal plan with design drawings for each identified area
- With regards to plan, there would be only one disposal plan with small changes for each location. Contractors need to get approvals for specific design for each identified disposal area.

**Penalties:**

Stringent action & penalties for dumping of materials in locations other than the pre-identified locations is to be worked out to avoid clandestine disposal in the midnight hours. There are several cases of dumping of material randomly in many locations.



**APPENDIX – 2**  
**ENVIRONMENTAL STANDARDS**

**National Ambient Air Quality Standards**

<b>Pollutants</b>	<b>Time Weighted</b>	<b>Industrial Area</b>	<b>Residential Rural &amp; Other</b>	<b>Sensitive Area<sup>3</sup></b>	<b>Method of Measurement</b>
Sulphur Dioxide (SO <sub>2</sub> )	Annual*	80µg/ m <sup>3</sup>	60µg/ m <sup>3</sup>	15µg/ m <sup>3</sup>	Improved West and Gaeke method
	24 hours**	120µg/ m <sup>3</sup>	80µg/ m <sup>3</sup>	30µg/ m <sup>3</sup>	Ultraviolet fluoresce
Oxides of Nitrogen (NO <sub>x</sub> )	Annual*	80µg/ m <sup>3</sup>	60µg/ m <sup>3</sup>	15µg/ m <sup>3</sup>	Jacobe and Hochheiser
	24 hours**	120µg/ m <sup>3</sup>	80µg/ m <sup>3</sup>	30µg/ m <sup>3</sup>	Gas phase Chemiluminescence
Carbon Monoxide (CO)	8 hours	5000µg/ m <sup>3</sup>	2000µg/ m <sup>3</sup>	1000µg/ m <sup>3</sup>	Non dispersive infrared spectroscopy
	1 hour	1000µg/ m <sup>3</sup>	4000µg/ m <sup>3</sup>	2000µg/ m <sup>3</sup>	
Hydrocarbon (HC)		Not Established	Not Established	Not Established	
Lead (Pb)	Annual*	1.0µg/ m <sup>3</sup>	0.75µg/ m <sup>3</sup>	0.50µg/ m <sup>3</sup>	AAS Method 24 hours after sampling using EPM 20000 or equivalent filter paper
	24 hours**	1.5µg/ m <sup>3</sup>	1.00µg/ m <sup>3</sup>	0.75µg/ m <sup>3</sup>	
Respirable Particulate (RPM)- size less than 10 µ	Annual*	120µg/ m <sup>3</sup>	60µg/ m <sup>3</sup>	50µg/ m <sup>3</sup>	
	24 hours**	150µg/ m <sup>3</sup>	100µg/ m <sup>3</sup>	75µg/ m <sup>3</sup>	
Suspended Particulate Matter (SPM)	Annual*	360µg/ m <sup>3</sup>	140µg/ m <sup>3</sup>	70µg/ m <sup>3</sup>	Average flow rate not less than 1.1cu.m/minute
	24 hours**	500µg/ m <sup>3</sup>	200µg/ m <sup>3</sup>	100µg/ m <sup>3</sup>	

\* Average Arithmetic mean of minimum 104 measurements in a year taken for a week 24 hourly at uniform interval.

\*\* 24 hourly/8 hourly values should meet 98 percent of the time in a year.

**Sensitive area may include:**

One km around the periphery of health resorts so notified by SPCB in consultation with Department of public Health.

One km around the periphery of Biosphere Reserves, Sanctuaries and National parks so notified by MOEF.

One km around the periphery of an Archaeological Monuments declared to be national importance or otherwise so notified by ASI in consultation with SPCB.

Areas where crops sensitive to air pollution are grown, so notified by SPCB in consultation with Department of Agriculture.

One km around the periphery of tourism or pilgrimage sites due to their religious, historic, scenic or other attraction so notified by Department of Tourism of the concerned state in construction with SPCB.

**Indian Standards of Drinking Water Specifications-IS 10500: 1991**

S. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
<b>Essential Characteristics</b>						
1.	Colour, Hazen units, Max.	5	Above 5, consumer acceptance decreases	25	3025(Part 4) 1983	Extended to 25 only if toxic substances, in absence of alternate sources
2.	Odour	Unobjectionable	-	-	3025 (Parts 5) 1984	a) Test cold and when heated b) Tests at several dilutions
3.	Taste	Agreeable	-	-	3025(Part 7 and 8) 1984	Test to be conducted only after safety has been established
4.	Turbidity NTU, Max.	5	Above 5, consumer acceptance decreases	10	3025 (Part 10) 1984	-
5.	pH Value	6.5 to 8.5	Beyond this range, the water will affect the mucous membrane and /or water supply system	No relaxation	3025 (Part 11) 1984	-
6.	Total hardness (as CaCO <sub>3</sub> ) mg/L. Max.	300	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21) 1983	-
7.	Iron (as Fe) mg/L. Max.	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1	32 of 3025:1964	-

S. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
8.	Chlorides (as Cl) mg/L	250	Beyond this limit, taste, corrosion and palatability are affected	1000	3025 (Part 32) 1988	-
9.	Residual, free chlorine, mg/L, Min	-	-	-	3025 (Part 26) 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be Min 0.5 mg/l.
<b>Desirable Characteristics</b>						
1.	Dissolved solids mg/L, Max	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	3025 (Part 16) 1984	-
2.	Calcium (as Ca) mg/L, Max	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40) 1991	-
3.	Magnesium (as Mg) mg/L, Max	30	Encrustation to water supply structure and adverse effects on domestic use	100	16,33,34 of IS 3025: 1964	-
4.	Copper (as Cu) mg/L, Max	0.05	Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this	1.5	36 of 3025: 1964	-
5.	Manganese (as Mn) mg/L, Max	0.1	Beyond this limit taste / appearance are affected, has adverse effects on domestic uses and water supply structures	0.3	35 of 3025:1964	-

S. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
6.	Sulphate (as SO <sub>4</sub> ) mg/L, Max	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	3025 (Part 24) 1986	May be extended up to 400 provided (as Mg) does not exceed 30
7.	Nitrate (as NO <sub>2</sub> ), mg/L, Max	45	Beyond this methaemoglobinemia takes place	100	3025 (Part 34) 1988	-
8.	Fluoride (as F) mg/L, Max	1	Fluoride may be kept as low as possible, high fluoride may cause fluorosis	1.5	23 of 3025: 1964	-
9.	Phenolic compounds (As C <sub>5</sub> H <sub>5</sub> OH) mg/L, Max	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025: 1964	-
10.	Mercury (as Hg) mg/L, Max	0.001	Beyond this, the water becomes toxic	No relaxation	Mercury ion analyser	To be tested when pollution is suspected
11.	Cadmium (as Cd), mg/L, Max	0.01	Beyond this, the water becomes toxic	No relaxation	-	To be tested when pollution is suspected
12.	Selenium (as Se), mg/L, Max	0.01	Beyond this, the water becomes toxic	No relaxation	28 Of 3025: 1964	To be tested when pollution is suspected
13.	Arsenic (as As) mg/L, Max	0.05	Beyond this, the water becomes toxic	No relaxation	3025 (Part 37) 1988	To be tested when pollution is suspected
14.	Cyanide (as CN) mg/L, Max	0.05	Beyond this, the water becomes toxic	No relaxation	3025 (Part 27) 1986	To be tested when pollution is suspected
15.	Lead (as Pb) mg/L, Max	0.05	Beyond this, the water becomes toxic	No relaxation	-	To be tested when pollution is suspected
16.	Zinc (as Zn) mg/L, Max	5	Beyond this limit it can cause astringent taste and an	15	39 Of 3025: 1964	To be tested when pollution is suspected

S. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
			opalescence in water			
17.	Amonic detergent (as MBAS) mg/L, Max	0.2	Beyond this limit it can cause a light froth in water	1	Methylene-blue extraction method	To be tested when pollution is suspected
18.	Chromium (as Cr+) mg/L, Max	0.05	May be carcinogenic above this limit	-	38 of 3025: 1964	To be tested when pollution is suspected
19.	Poly nuclear aromatic hydrocarbon (as PAH) g/L, Max	-	May be carcinogenic above this limit	-	-	-
20.	Mineral oil mg/L, Max	0.01	Beyond this limit undesirable taste and odour after chlorination take place	0.03	Gas Chromatograph	-
21.	Pesticides mg/L, Max	Absent	Toxic	0.001	-	-
22.	Radioactive Alpha emitters Bq/L, Max	-	-	0.1	58 of 3025: 01964	-
23.	Radioactive Beta emitters pci/L, Max	-	-	1	58 of 3025: 01964	-
24.	Aluminium (as Al), mg/L Max	200	Beyond this limit taste becomes unpleasant	600	13 of 3025: 1964	-
25.	Aluminium (as Al), mg/L Max	0.03	Cumulative effect is reported to cause dementia	0.2	31 of 3025: 1964	-
26.	Boron, mg/L, Max	1	-	5	29 of 3025: 1964	-

Source: Indian Standard Drinking water Specification- IS 10500: 1991

### Noise Level Standards

<b>Category</b>	<b>Noise level for Day Time Leq dB (A)</b>	<b>Noise level for Night Time dB (A)</b>
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence Zone	50	40

**Note:**

**Day Time- 6.00 am –10.00 pm (16 hours)**

**Night Time- 10.00 pm –6.00 am (8 hours)**

**Silence Zone:** *The silence zone includes a radius of 100 m around premises where loud noise is prohibited (including hospitals and educational institutions)*

**Source: CPCB, 1989, GOI.**

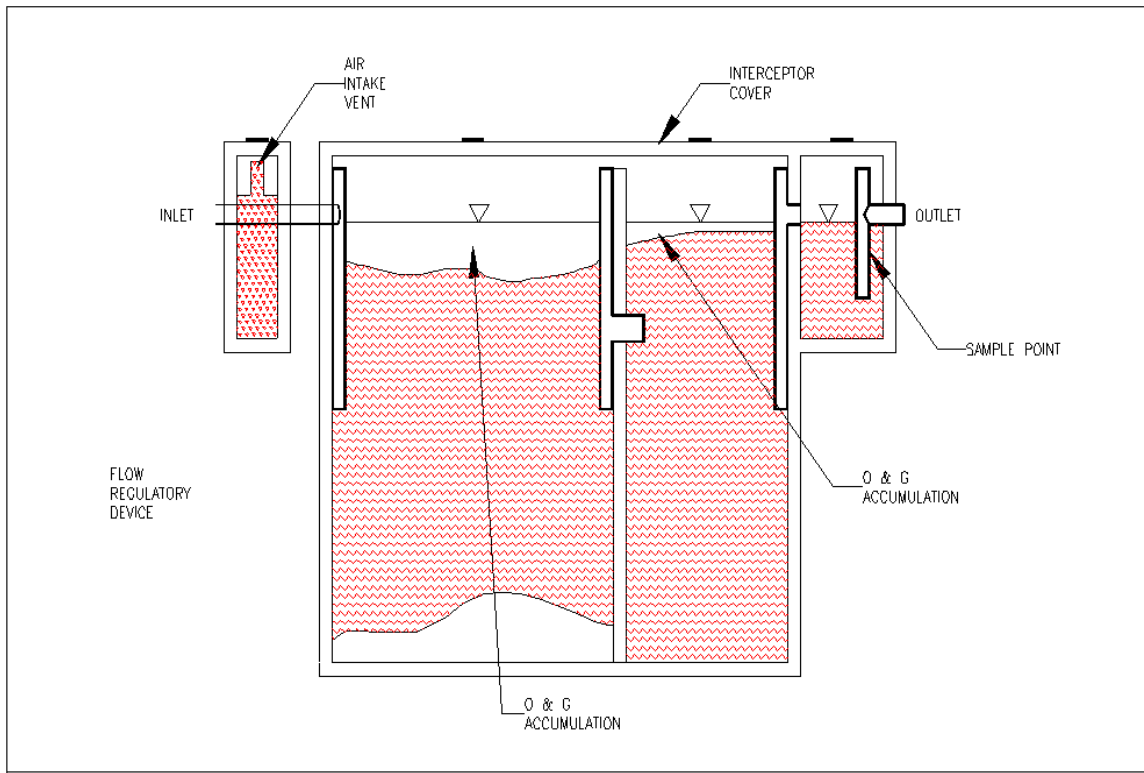
**a. Standards for Suspended Particulate Matter for Stone Crushing Unit**

The suspended particulate matter measured between 3 to 10 meters from any process equipment of a stone crushing unit shall not exceed 600 µg/m<sup>3</sup>

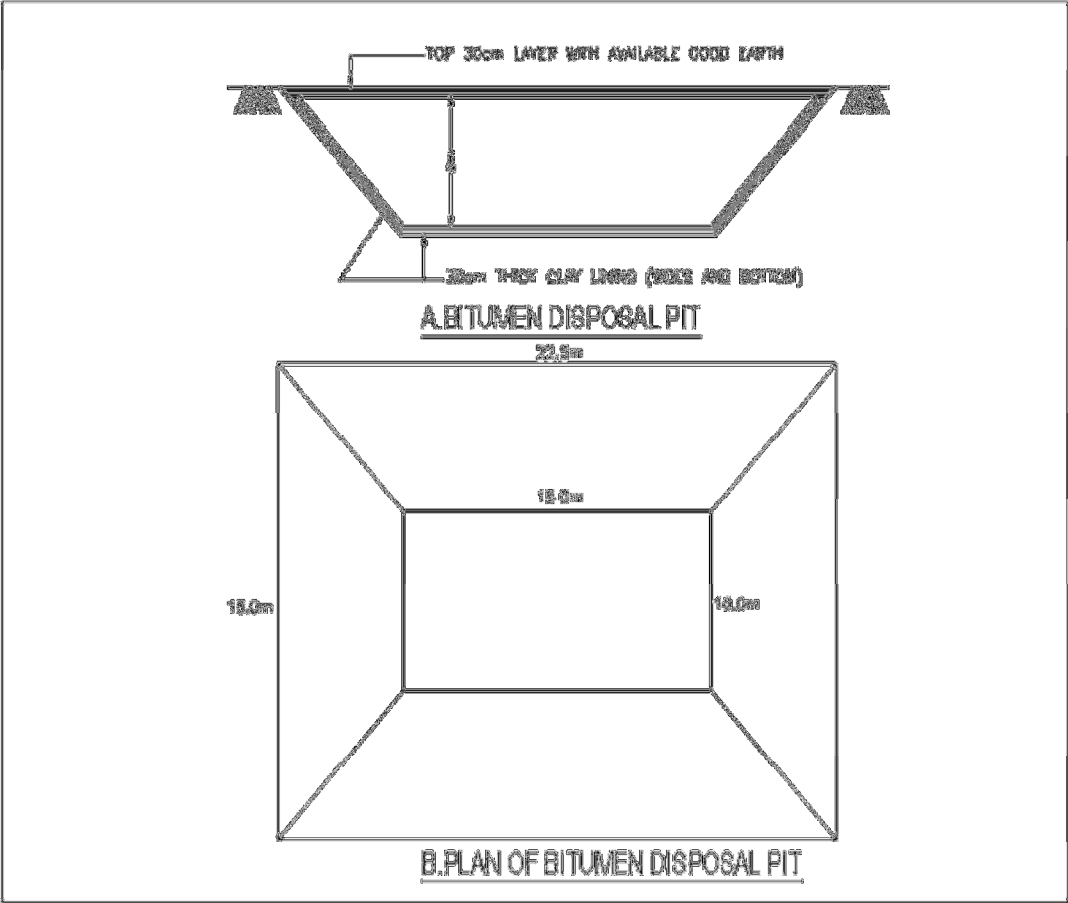
(Source: EPA Notification [G.S.R. 742(E) dt. 30th Aug; 1990] & [S.O. 8(E) dt. Dec. 31, 1990])

OIL INTERCEPTORS

Location of Oil Interceptors has been considered such that each construction camp having refueling stations, oil and lubricants storage places will have one oil interceptor to stop & separate the floating oils. However the number of interceptors shall be increased as the situation demands or during the accidental spillages with the consent of Environmental Engineer of Construction Supervision Consultants. Provision has been made to provide one oil interceptor for each construction campsite in the EMP BoQ.



TYPICAL BITUMEN DISPOSAL PIT





## **APPENDIX – 5**

### **WORKERS SAFETY IN COMMON OPERATION AND DURING CONSTRUCTIONS**

#### **HOUSE KEEPING PRACTICES**

1. Maintain washrooms and canteens clean
2. Keep all walkways clear and unobstructed at all times
3. Ensure that no spillages of oil and grease occurs in the construction camp
4. Stack raw materials and finished products clear of walkways or out of roads
5. Do not leave tools on the floor or in any location where they can be easily dislodged
6. Keep windows and light fittings clean
7. Maintain the workplace floors dry and in a non-slippery condition
8. Provide and maintain proper drainage system to prevent stagnant water.
9. Use metal bins for oily and greasy rags and store all flammable materials in appropriate bins, racks or cabinets. Ensure that the metal bins for storing oily and grease rags should be covered with lids.
10. Ensure that protruding nails in boards or walls are removed or bent over so that they do not constitute a hazard to people
11. Make sure that hazardous/dangerous chemicals are kept in the stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures
12. Display 'no smoking' signs in areas with high fire risks such as paint stores, wood working areas, etc.

#### **SAFE LAYOUT IN THE CONSTRUCTION PLANT, CAMP AND QUARRY AREAS**

- 1) Arrange perimeter fencing for construction plant
- 2) Ensure good visibility and safe access at site entrances
- 3) Provide adequate warning signs at the entrance and exit and where ever necessary
- 4) Provide adequate space/area for loading, unloading and storage of materials, plant and machinery
- 5) Display emergency procedure and statutory notices at conspicuous locations
- 6) Consider provision of welfare facilities required
- 7) Provide areas for dumping garbage and other waste materials, and also arrange their regular clearance and safe disposal
- 8) Arrange storage, transport and use of fuel, other flammable materials and explosives in lines with the license requirements to be obtained from appropriate authorities
- 9) Plan emergency assembly points, fire escape routes and location of fire-fighting equipment
- 10) Provide access roads and plant movement areas within the site.
- 11) Ensure the availability of first aid facilities and display notices to show the location of these facilities
- 12) Provide proper drainage and sewage facilities

#### **TREE FELLING**

- Use hard hats during tree felling works
- Ensure that tools such as axes are in good condition
- Determine proper foot and body position while using the axe
- Wear appropriate foot protection while felling trees
- Carry a first aid kit to the site
- Determine possible hazards in the area, with reference to electrical or telephone or other utility lines
- Determine the safest direction for the tree fall prior to felling
- Determine the proper hinge size before directing the tree fall.

#### **NOISE HAZARDS AND ITS CONTROL**

- 1) Observe the indications of noise levels

- 2) Use sound level meters to measure. If the sound level exceeds 85 dB(A), then preventive and protective measures should be taken
- 3) Make personnel aware of noisy areas by using suitable warning signs and insisting that ear protective devices should necessarily be worn.
- 4) Reduce noise at source by improved maintenance, replacing noisy machines, screening with noise absorbing material, making changes to the process/equipment, controlling machine speeds, ensuring that two noise-generating machines are not running at the same time, using cutting oils and hydraulic breakers.
- 5) Appoint a competent person to carry out a detailed noise assessment in the site, designate ear protection zone, and give instructions on the necessary precautionary measures to be observed by site personnel, including the use of suitable type of ear protections.
- 6) Wear and maintain ear muffs and ear plugs as required
- 7) In construction or repair works, noise should be kept to a low-level bearing in mind the disturbance to local residents.

### **ROAD WORKS**

- 1) The use of signage is most important to caution the road users of possible unsafe conditions due to the road works.
- 2) Use appropriate signage devices as required by the site conditions/situation. The devices include regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights.
- 3) While using signs, make sure that they are (i) simple, easy-to-understand and convey only one message, (ii) luminescent and with reflective properties and (iii) prominent and of appropriate size.
- 4) While using barricades, make sure that you keep traffic away from work areas and you guide the drivers to keep along a safe and alternative path.
- 5) Ensure that proper personal protective equipment (PPE) is provided to all the workers.
- 6) Cover existing road signs and install new ones at appropriate locations taking into account the distances that would be required and reaction times.
- 7) Plan layout and traffic management so that hazards do not occur.
- 8) Deploy flagmen to control traffic at the work areas. The flag should be 600mm x 600mm fastened to a 1m length staff.
- 9) Flagmen should wear reflective safety vests along with hard hats.
- 10) If required, use wireless devices for flagmen to co-ordinate from either ends of the road, where works are being carried out.

### **ELECTRICAL HAZARDS IN CONSTRUCTION AREAS**

- 1) Treat all wires as live wires
- 2) Never touch dangling wires but report them to the manager
- 3) Unless you are a qualified electrician do not attempt electrical repairs
- 4) Never use electrical equipments if your hands are wet or you are standing in water
- 5) If electrical equipment is sparking or smoking, turn the power off and report the condition to the supervisor
- 6) Never use electrical wires having physical damage
- 7) Never allow equipment or traffic to run over the electrical wires.

### **USE AND STORAGE OF GAS/LPG**

- 1) Store filled gas/LPG cylinder in an open area or outside the building
- 2) Transport, store, use and secure cylinders in upright position
- 3) Ensure proper ventilation at the ground level where the gas/LPG is in use
- 4) Avoid physical damage to the cylinder
- 5) Never weld or cut on or near the cylinder
- 6) Store empty cylinders secured and in upright position.
- 7) Make sure that the cylinder is closed immediately after use.
- 8) Investigate immediately if there is the smell of LPG or gas.

- 9) Never use destenched gas/LPG on site.
- 10) Make sure that there is no fire in the vicinity of the cylinder.

#### **OPERATION OF EXCAVATORS**

- 1) Ensure that excavators are operated by authorized persons who have adequately trained.
- 2) Prevent unauthorized movement or use of excavators
- 3) Check regularly and maintain the machine thoroughly
- 4) Ensure that all relevant information, including those related to instruction, training, supervision and safe system of work are provided to the operators.
- 5) Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of machines to service engineers or other safety personnel during periodic maintenance, inspection and examination.
- 6) During tipping or running along the trenches, excavators must be provided with stop blocks.
- 7) Excavators must be rested on firm ground during operation.
- 8) Avoid operating the machine too close to an overhand, deep ditch or slope.
- 9) Locate and identify underground utility services by checking with all utility companies before the excavations.
- 10) Ensure that all excavations are supervised by experienced and competent persons.
- 11) When reversing or in case the operator's view is restricted, adequate supervision and signaling should be provided.
- 12) Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.
- 13) Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator.
- 14) Check that all linkages/hinges are properly lubricated and ensure that the linkage pins are secured. Never use the improper linkage pins.
- 15) Never get down or climb a moving machine
- 16) Ensure adequate ventilation and lighting in the working place.
- 17) Ensure that the protective front screen of the driving cabin is fixed in position during excavations to avoid eye injury to the operator.
- 18) Ensure to switch-off the unattended vehicle.

#### **OPERATION OF TRUCKS AND DUMPERS**

- 1) Ensure that only trained, authorized and licensed drivers operate the vehicles.
- 2) Provide the help of another worker before reversing the vehicle.
- 3) Switch-off the engine of an unattended vehicle.
- 4) Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall.
- 5) Wear safety boots or shoes to avoid injuries during loading and unloading.
- 6) Carryout periodic servicing to the manufacturer's requirements. All records of maintenance and repairs should be in writing and kept in the site.
- 7) Keep the vehicle tidy and its cabin free from tools and materials which might obstruct the controls.
- 8) Do not exceed speed limits.
- 9) No passenger should be carried on a dumper except the driver
- 10) Never drive the vehicle across a slope
- 11) Provide stop blocks when the vehicle is tipping into or running towards excavations
- 12) Do not overload the vehicle.
- 13) Carry only well secured loads.
- 14) Park only on level ground, in neutral with the parking brake applied.
- 15) Never climb or get down from a moving vehicle.

## **GAS WELDING**

- 1) Use the following personal protective equipment during welding
  - Face or hand shield fitted with filters,
  - Goggles, particularly while chipping slag,
  - Gloves long enough to protect wrists and forearms against heats, molten metal and radiation,
  - High-top boots to prevent sparks from burning foot.
- 2) Screen the work area with sturdy opaque or translucent materials as glare can cause eye injury.
- 3) Key for opening the acetylene cylinder valve must be kept ready while the cylinder is in use so that the cylinder valve may be immediately shut-off in an emergency.
- 4) Ventilate the workplace using air blowers and exhaust fans to remove poisonous fumes and gases that are being used during welding
- 5) Take precautions against flying spark and hot slag where welding is being done near flammable materials and check the area before leaving.
- 6) Do not weld the material degreased with solvents until it is completely dry.
- 7) Do not use gas cylinders for supporting work or as rollers.
- 8) Do not use oil/grease on oxygen cylinder fittings.
- 9) Do not use cylinders with damaged valves.
- 10) Do not use too much force if valves are stuck.
- 11) Replace valve caps after use
- 12) Search for leaks in equipment by using a solution of soap water.
- 13) Shut the cylinder valve if acetylene from a cylinder catches fire at the valve or regulator due to leakage at a connection.
- 14) Treat all gas cylinders as "full" unless you are sure otherwise.
- 15) Never attempt to transfer acetylene from one cylinder to another or attempt to refill an acetylene cylinder.
- 16) Keep portable fire extinguishers near the welding area
- 17) Secure all cylinders against accidental displacement.
- 18) Always lift gas cylinders. Do not slide them along the ground or drop them from trucks.
- 19) Keep gas cylinders in vertical position both in store and when it is in use.
- 20) Keep the work place dry, secure, free from combustible materials and obstruction.
- 21) Store the acetylene and oxygen cylinders separately and in a proper store.
- 22) Keep the gas cylinders away from source of heat, flammable materials, corrosive chemicals and fumes.

## **MANUAL HANDLING AND LIFTING**

- 1) Use mechanical equipment in place of manual handling as far as possible.
- 2) Assess the manpower required to handle or lift the load safely and arrange the manpower accordingly.
- 3) While handling hazardous materials, the workers shall be informed of the hazards and safety precautions.
- 4) All relevant persons shall be trained on proper methods of lifting and carrying.
- 5) Where team work is required, select the persons whose ages and physical builds are compatible for teaming up. Coordinate the actions of the team members by giving necessary instructions.
- 6) Always lighten or suitably shape the load for manual handling. As far as possible keep a look for splinters, sharp edges, loose banding and nails.
- 7) Clear path or obstruction and tripping hazards.
- 8) Stack and secure goods safely on trucks, otherwise they fall off and injure passers-by.
- 9) Use personal protective equipment such as gloves, safety shoes, etc.
- 10) Adopt the following procedure when you lift a load.
  - Stand close to the object, have a firm footing with feet spread on either side of the road.

Bend the knees and keep your back as straight as you can.  
 Grasp object firmly & be sure grip will not slip  
 Breathe in and throw the shoulder back wards.  
 Straighten the legs, continuing to keep the back as straight as you can.  
 Hold the object firmly & close to the body  
 Always lift smoothly, avoid jerky motions and turn with feet instead of twisting the back.

**FIRST AID**

- 1) Provide first aid boxes at every site.
- 2) Ensure that training on the use of first aid box is provided to a handful of staff working in the site.
- 3) Display the list of persons who are trained on providing first aid.
- 4) Ensure that every first aid box is marked plainly "First Aid" in English and local language.
- 5) The responsible person or first aider should replenish the contents of the first aid box as necessary.

**PERSONAL PROTECTIVE EQUIPMENT**

**List of personal protective equipment (PPE)**

Sl. No.	Part of the body	Personal protective Equipment
1	Eye	Safety glasses, Goggles
2	Face	Face shields
3	Nose	Nose masks
4	Head	Helmets
5	Feet	Safety shoes
6	Hands and Arms	Gloves
7	Body	Vests
8	Hearing	Earplugs, Earmuffs

**Cost of Personal Protective Equipment (PPE):**

Cost of Personal Protective Equipment per person per project has been considered based on the assumption that one person/labour requires two set of PPE till the completion of the project. Cost per set of PPE is taken as Rs. 750 on an average for EMP BoQ estimate. So cost / person / project will be Rs. 1500.00

**General:**

- 1) Ensure that sufficient personal protective equipment are provided and that they are readily available for every person who may need to use them.
- 2) The management should ensure that all persons make full and proper use of the personal protective equipment provided.
- 3) Provide instruction and training on the proper use and care of protective equipment.
- 4) Do not willfully misuse, interfere with or ill-treat any protective clothing and equipment provided.
- 5) Ensure that the personal protective equipments are in good condition. Report immediately any damage to the management for replacement. Always keep the personal protective equipment as clean as possible.

**Eye Protection**

- 1) Issue eye protection equipment where there is a foreseeable risk of eye injury.
- 2) Ensure an adequate supply of goggles/shields is available.
- 3) Keep the goggles clean and make sure they fit well.
- 4) Do not watch welding operations unless your eyes are protected.

**Head Protection**

- 1) No person shall enter a construction site unless he is wearing a suitable safety helmet
- 2) Wear a safety helmet:
  - When there is the risk of being hit by falling objects

- While on or near a construction site
  - During adverse weather conditions
  - When in any area designated as a “hard hat” area.
- 3) Provide identification labels to all helmets in some way to prevent random exchange among wearers, with one helmet exclusive to each person.
  - 4) Inspect helmets for cracks, sign of impact or rough treatment before each usage and replace defective or damaged helmets.

### **Hearing Protection**

- 1) Provide ear plugs or ear muffs as required. Use re-usable ear plugs when the reduction required (15-25 dB (A) is not excessive. Use ear muffs where a large attenuation of up to 40 dB (A) is demanded.
- 2) Do not use dry cotton wool for hearing protection because it cannot provide protection.
- 3) Provide disposable ear plugs for infrequent visitors and ensure that they are never re-used.
- 4) Provide re-usable ear plugs for those who need to work continuously for a long period in a high noise area.
- 5) Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- 6) Avoid wearing spectacles with ear muffs.
- 7) Use soap and water or the recommended solvent for cleaning ear muffs.
- 8) Provide ear muffs for those who may need to get in and out of a high noise area frequently.

### **RESPIRATORY PROTECTIVE EQUIPMENT**

- 1) Wear suitable respirable mask for protection against small particles entering the lungs, e.g. while emptying of cement bags.
- 2) Provide training to all persons using the respirators for their correct fitting, use, limitations and symptoms of exposure.
- 3) Clean and inspect all respirators before and after use.
- 4) Store respirators properly when it is not in use.

### **Safety Footwear**

- 1) Wear suitable footwear while working.
- 2) Use safety footwear on site or in dangerous areas.
- 3) Wear suitable safety shoes or ankle boots when working where there is a high risk of foot injuries from slippery or uneven ground, etc.
- 4) All Safety footwear including safety shoes, ankle boots and rubber boots should be fitted with steel toecaps.
- 5) Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
- 6) Keep shoe lace knots tight.

### **Hand Protection**

- 1) Wear suitable gloves for activities such as welding & cutting and manual handling of materials & equipment.
- 2) Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- 3) Wash hands properly with disinfectant soap before eating & drinking. Wash hands immediately after each operation on site & when the situation warrants.

### **FIRE PREVENTION, FIGHTING AND EQUIPMENT**

#### **Before fire breaks out**

- 1) Store flammable material in proper areas having adequate fire protection systems.
- 2) Display sufficient warning signs.

- 3) Train selected personnel to use these fire extinguishers.
- 4) Inspect fire extinguishers regularly and replace as necessary.
- 5) Fire escape route should be kept clear at all times and clearly indicated.
- 6) Know the escape route and assembly point.
- 7) Display escape route maps prominently at prominent places.
- 8) Carryout fire drill regularly. Designate fire Officers.
- 9) Install fire alarm wherever required and test regularly.
- 10) Provide sufficient exit signs at prominent locations for directing people to the escape route.

**When fire breaks out**

- 1) Alert all persons.
- 2) Put off the fire with appropriate fire extinguishers when you are sure that you are safe to do so.
- 3) Escape if you are in danger through the fire escape route to assembly point.
- 4) Fire officers should carryout head count at the assembly point.

**GUIDELINES FOR WORKERS SAFETY DURING CONSTRUCTION**

Sl. no.	Stage and Nature of construction Hazard	Safety measures expected to be taken by the contractors and site Engineers
1	Excavation in soft, loose & slushy soil above 2m depths sliding of earth or collapsing of sides.	The Excavation beyond 1.5m to 2m to be done in steps of minimum 500mm offsets and also planking and strutting should be done.
2	Excavation in slippery area (water logged) - the labour may fall or machinery on site may slip.	Try to dewater the area and spread minimum 150mm thick sand layer to avoid slipping
3	Excavation in rock where chiseling involved – The fall of hammer may injure the hand, small rock pieces may injure the eyes and legs.	For hammer work, only experienced and skilled labour should be employed. Chisel should not be allowed to be held by hand, while hammering but chisel holding clamp should be provided. The labour should be provided with goggles and leg cover to protect eyes and legs, from injuries due to small rock pieces.
4	Excavation in Rock where blasting is involved – careless handling may lead to injury to worker or a passerby.	The work of blasting should be entrusted to only experienced persons. Provide sufficient length of fuse to give ample margin of time from the time of lighting to the time of explosion. A danger zone at least 180m diameter is to be flagged off 10 minutes before actual firing. All workmen should be sent way from danger zone except the firing man, who should be provided with a whistle.
5	Excavation for drain across road or manhole adjacent to a road – chances of a passer by falling into the excavated portion.	The area should be well barricaded & a red lamp provided at night. A watchman should be deputed to prevent any movement of persons or vehicles.
6	Centring and scaffolding – formwork collapse while concreting or just before concreting or just before concreting especially when wooden ballies are used.	Many a times ballies joined together give way due to weak joint. Hence the use of joined ballies should be restricted. Only 2 joined ballies out of 8 ballies should be allowed. Incase of double staging for a slab at a height, utmost care should be taken to see that the top balli rests on the bottom balli. Particular care that should be taken during each concreting, operating of slabs and beams is that one carpenter and two helpers with spare ballies, nails etc. should be deputed below the slab/beam that is being concreted to watch any disturbance in the supports of the form-

Sl. no.	Stage and Nature of construction Hazard	Safety measures expected to be taken by the contractors and site Engineers
		work below, during concreting and in case of any doubt concreting should be stopped immediately and the form work to be strengthened. Never allow bricks below a balli to make up the required height. This is most dangerous.
7	Form- work for beams and slabs – opening the form – work accident due to fall of materials during removing the forms.	In fact, this is a most dangerous work. One should be very careful while formwork is removed. Only trained carpenters should be deputed for the work. A safe resting place outside the area of slab as a temporary measure should be constructed from where the slab can be removed safely. Removal of form-work during night should not be permitted under any circumstances.
8	Scaffolding – Fall of work–man, supervision staff, standing on challis not tied properly or toed only at one end. (Challis mainly made of Bamboos)	This is a very common negligence on the part of labour who do scaffolding work. The Challis on which they work either span over its complete length or is tied loosely and many a times at one end only. Hence, care must be taken that the challis do not span over the full length but some middle support should be provided and also the same is tied properly on both ends.
9	Ladders - Balli or bamboo ladders – The horizontal member breaks and the person falls. Some times the top face just rests on wall and the whole ladder tilts causing an accident.	The ladders should be strong enough to bear the weight of a labour with materials on head. As for as possible a hand rail should be provided at one end. The horizontal member should be preferably fixed with bolt & nuts or strong nails. When the ladder is placed across a wall the top portion should be tied firmly to a strong support so that the ladder does not move laterally.
10	Dismantling – Dismantled materials may fall on passer by or the person engaged in dismantling work may fall due to slipping. The dismantled materials may fall on persons working below.	When work of demolition is to be taken up the area should be closed for all outsiders. No one should be allowed up to 50m from the place of demolition. The workers engaged in demolition should be asked to wear safety belts. Helmets must be worn by all the workers engaged in dismantling work. The place should be strictly guarded at night with red lights at prominent places, and watchman should be posted.
11	Electrical connections/ cables etc., - HT / LT electric wire passing near the slab structure – while bending, lifting or tying reinforcements the bar benders may sustain the electric shock, causing fatal injury.	The work in such places should not be allowed to the workers themselves, but in such position the work must be executed under the strict supervision of a responsible Foreman or a Supervisor.
12	Electric- connections/cables, etc., - cables below ground may get punctured during excavation & thus electrocute the labour working. Similarly when connecting is in progress the punctured cable may prone to be fatal to the labour.	Before taking up the work all available drawings should be studied, local enquiry to be made to know the position of cables and work in such area should be got executed under strict supervision of an experienced Foreman or a supervisor.
13	Electric connections/cables etc.,- Temporary Electric lines near damp walls, near joinery stretched on a considerable length – There is every chance that the wire may get cut due to usage and may develop short	The Electric wires should be maintained by an electrician who should regularly check up the insulation of wires especially placed near steel items & damp areas. The temporary wiring should be supported properly.



Sl. no.	Stage and Nature of construction Hazard	Safety measures expected to be taken by the contractors and site Engineers
	circuits/leakages etc., and may electrocute the person touching the wire accidentally.	As far as possible a good quality wire should be used which may not get damaged easily.
14	Electric and gas welding work – Drilling, polishing work – Done by temporary cables used on a number of works – Due to the fact that the wires are old & when they come in contact with water even in the process of curing the surrounding area may get affected due to leakage in the electric current thus causing damage to the workers & supervision staff.	All wiring works to be inspected by experienced electrician. All wires to be properly insulated and fixed at height on temporary poles. No welding work should be permitted near damp area. The welders to be provided with welder's goggles & gloves. As far as possible machine in good condition should be used.
15	Construction machinery – Concrete mixers – Safety precautions. A mixer with hopper tried to be operated by an helper could not release brake in time thus causing injury to the person near hopper – some times fatal one.	The Mixers with hopper should be operated by an experienced mixer operator and such mixers should not be allowed to be handled by a helper or a labour.
16	Water storage Tank for general use & curing - chances of children of workers falling in the tank with fatal accident.	The water tanks constructed on site should be protected by at least 1.0m high walls on four sides, so that the children do not fall.
17	Site cleaning – Cleaning top floors of buildings – Upper portion of any structure – throwing waste materials broken concrete pieces, brick bats, sand etc., straightway fro top to ground injuring person below or even a passerby.	This dangerous practice should not be allowed at all. The materials should be brought to the ground with the help of lift or the use of rope over pulley with a bucket, thus bringing down materials safely.
18	Bar bending work – Helpers of bar benders to follow short cut method, throw surplus steel pieces from top floors to ground and may cause fatal injuries.	This is a very bad practice. The helpers should bring the rods to ground with help of lift or rope & pulley.

## TREE PLANTATION STRATEGY

### 1. Introduction

This is the most common impact of any road-widening project. If the location of the project road is in dry areas, the degree of impact is more than in a wet area where the trees can be planted and grown easily. In the case of Uttarakhand thick vegetation exists in the Project Implementation Area.

The scopes for tree planting along roads sides is good and also there are many isolated patches of unutilized land along the project road. A typical plantation scheme proposed for two lane road in plains with shoulders at the rate of 200 plants per km length.

#### **Avenue Plantation:**

It is proposed to plant 100 trees per kilometer on each side of the trees. The number of trees proposed to be planted (Avenue plantation) along the road length on both sides of the road is given as follows.

#### **Median Plantation:**

No median plantation is suggested as there is no proposed cross section having median.

### 2. Purpose of tree plantation

The objectives of planting trees and shrubs at selected enhancement sites against the felled trees are as follows.

- To reduce the impacts of air and dust pollution and act as a natural filter to traffic emissions
- To provide shade for the traffic as well as the pedestrians
- To reduce the impact of vehicular noise caused by vehicles
- To arrest soil erosion on slopes
- Beautification of sites by planting selective ornamental shrubs, landscaping and turfing with grasses.
- Planting trees on the roadsides is to produce a softer greener landscape.
- To act as a natural filter to the traffic emissions

### 3. Impacted Trees

#### 3.1 Public owned trees

These are trees within the legal ROW of project road within the control of PWD.

All these trees within the forest reserves are also termed as public trees. However the procedure for cutting of these trees is different from the normal trees within the PWD ROW.

#### 3.2 Private owned trees

The number of private owned trees to be acquired outside the right of way will be high compared to the public trees within the right of way. The private trees that will be affected during widening and improvement will be subjected to compensation at the appropriate market rates. In addition to this the project will plant two trees for every tree removed as a compensatory tree planting measure irrespective of the size, species etc.

### 4. Selection of trees species

The selection of the plants for greenery development is to be made as per the following criteria;

- Plants should be fast growing & have dense canopy cover
- Preferably tropical to temperate species with large leaf area index
- Indigenous species
- Species resistant to air pollutants and
- Should help to maintain the ecological and hydrological balance of the region

The plant species that are selected based on the climatic condition, soil characteristics and conditions of the area. The row closest to the main carriage way will be of shade plants. Similarly, subsequent rows will comprise of ornamental and flowering species. Mainly native deciduous species, which retain their foliage longest, with high crown forms, resistant to fungus and insects with rapid growth rate are selected for avenues. Lists of the species recommended as shade plants and most recommended trees for planting along the roadsides are provided in the following table.

**Table: Trees recommended for planting**

Sl. No.	Main Species
1	Banyan
2	Pipal
3	Arjun
4	Mango
5	Jamun
6	Tamarind
7	Jakranda
8	Neem
9	Kheia
10	Peacock tree
11	Gulmour
12	Jack Fruit

## **5. Compensatory Tree plantation programme**

All trees are cut and removed will be accountable as per the Forest laws and efforts will be maintained to plant minimum of two times the number of trees cut according to this tree plantation strategy.

Indigenous species of trees recommended above are most suited for the tree plantations. In order to make it tourist friendly and beautiful same types of trees would be planted in the same location so that for every Kilometer the trees would change to new species.

## **6. Tree planting during construction**

### **6.1 Tree planting along the roadsides**

Tree plantation will be the responsibility of the Forest department. Necessary budget has been allocated in the EMP.

### **6.2 Tree planting along Oxbow lands**

In some areas, the improvement of roads will result in the formation of 'oxbow lands' all along the roads due to suitable curve improvements and realignments. The oxbow lands are the existing roads where the road realignments are proposed. This is similar to the Oxbow Lakes formed during the evolution of rivers hence the name for easier identification for environmental management. The importance of the proper management of these oxbow lands is there for an unavoidable outcome of the project. Tree planting all along these oxbow

lands could be very useful for the environmental enhancement of the region. This will help positively for tourism industry. The oxbow lands along the corridors are available as described in the Environmental management plan for individual corridors.

**7 Protection Measures**

The protection measures are as follows.

**7.1 Barbed wire Fencing**

Barbed wire fencing around the plantation area will be provided to protect the plants. Iron Angles will be fixed at a spacing of 5m with 3-stand stretched barbed wire.

**7.2 Precautionary Measures**

- Plantation will be made in the monsoon months (July-August)
- The height of the plants should not be less than 30 cm and should be supplied in polythene bags which are not to be removed until the moment of planting
- All plants supplied must be planted within three days of removal from the nursery
- Arrangements must be made to water in case of insufficient rains after planting
- Provide compost/manure suggested quantity for each pit before plantation

**7.2.1 Shrubs**

Prior to planting it is suggested to remove all loose debris, fill up with good soil and level the area. To ensure better growth and survival of grasses and shrubs, the surface should have sufficient layer of good quality soil (up to 45 cm). Shrubs which are suggested for the roadside and open area spaces where available should be selected from the following and agreed with the Environmental Specialist of the construction supervision consultants.

**Shrubs:**

1	Bougainville
2	<i>Nerium odorum ait</i>
3	<i>Carissa spinarum</i>
4	<i>Capparis decidua</i>
5	<i>Capparis zeylanica</i>
6	<i>Zizyphus nummularia</i>
7	<i>Artemisia species</i>
8	<i>Xanthium strumarium</i>
9	<i>Cassia tora</i>
10	<i>Capsicum frutescens</i>
11	<i>Tabernaemontana coronaria</i>
12	<i>Achyranthes aspera</i>

The contractor will be responsible for planting of shrubs at enhancement sites and along bridge approaches during construction phase.

**7.2.2 Turfing with grasses**

The contractor will be responsible for turfing at enhancement sites and along bridge approaches during construction phase.

The cost for the turfing along the bridge approaches and high embankments are part of the civil construction contract.

Grass lines are used to provide a strong surface cover at the slope but it also needs a well – prepared surface. If grass is to be effective, then it must be allowed to establish property on a slope, which is not subject to undue stress from erosion and mass movement in its stages. To ensure this the following measures are suggested for the grass turfing.

- A cover of 25 grams of grass seeds per Sq. m of surface will be prepared.
- Bed will be prepared in June. The seed sowing must be carried out before the onset of monsoon so that they yield desired results. Till the onset of the monsoon, watering of the surface to be done by tankers with controlled flow sprinklers.
- After sowing, mulch of prepared and dried out herbs will be laid over the whole seeded area in a thin layer so that the direct sunlight and transpiration loss may not affect the grasses
- The grass species recommended for median are khabbal, Dhaula, Palwan, Sariala and Kahi.

Contractor will ensure that the condition of the site is good enough for the successful establishment of grasses and quality of grass seeds used.

#### **8 Tree plantation costs**

The plantation cost has been included in the bill of quantity (BOQ) under the non-civil contracts and provided in section EMP BoQ

A tree- planting strategy is being developed which will meet all compensatory tree planting that will be cut during the improvement of the roads including private trees. The cost provisions have been included in the EMP BOQ.

#### **9 Maintenance of trees planted**

The trees planted once will be maintained at least for a period of six years.

A programme of compensatory afforestation has been proposed, not only to replace the trees, which are cut to accommodate road widening and improvements in geometric design, but also to upgrade the condition of adjacent areas. Trees will be replanted at a rate of two for each one removed depending upon the location.

Tree felling in other sites such as borrow areas – shall be accommodated by the contractor in the borrow area management plan.

## **APPENDIX – 7**

### **ENHANCEMENT MEASURES**

Enhance measures include

- Plantation of trees along the length of the proposed roads wherever enough space available within RoW.
- Enhancement by tree planting along the oxbow land and the other left over portions of the original PWD land.
- Cultural property enhancement as a part of the cultural property rehabilitation plan.
- Public amenities such as bus lay byes (new), rain shelters (in addition to the compensatory rain shelters for the impacted ones), comfort stations (toilets) and parking areas.
- To improve the water table in this region recharge pits are constructed wherever feasible along the project road.
- Median plantation in urban location.
- Pond and catchment area improvements to protect ground water and harvest rain water
- Information boards for the tourists, pilgrimage and other important structures of importance.

#### **List of Enhancement sites:**

##### **a) Archaeological sites**

None identified along this road.

##### **b) Valley view location**

None identified along this project road.

##### **c) Proposed Bus bays & Parking areas**

As the work is to

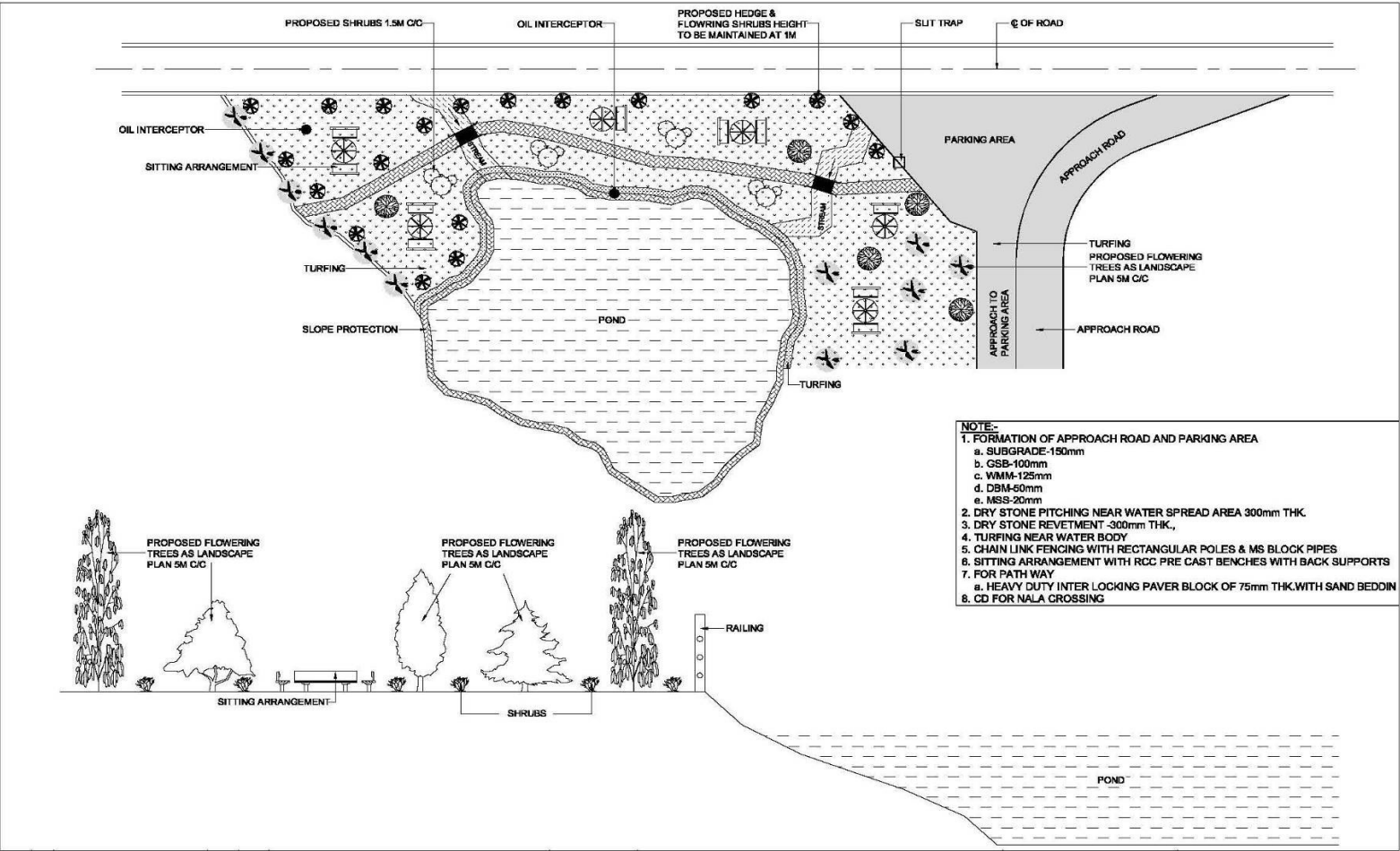
##### **d) Pond enhancement**

There are many streams and rivers along the project road. The typical pond/water body enhancement drawing is given below

##### **e) Oxbow land and other left over land**

There are oxbow land spaces at realignment locations along the proposed road and where ever width of Col is less than width of the RoW, the space available along the sides of the project road can be utilized for tree plantation..

# TYPICAL DRAWING FOR POND ENHANCEMENT



**GUIDELINES FOR THE MANAGEMENT OF ROAD SECTION THROUGH FOREST AREAS**

**1. Introduction**

A Management plan for the impacted or adjacent forest area is required for mitigation and enhancement measures during construction and operational phases of the project road. This will not allow any room for neglecting /avoiding of the implementable measures. This will also define responsibilities of various institutions in this regard. This requirement is the basis of the preparation of this document. The document addresses the issues relating to the forest areas in the PIAs as well as immediately adjacent to the project road. The mitigation measures are to be addressed during the design, construction and operational phases of the project.

Incorporation of effective mitigation measures is therefore necessary and important. This will be based on the recommendations of the biodiversity studies.

**2. Status of the work relating to the up-gradation**

The actual construction work cannot be started until all environmental clearances are obtained. The environmental clearance also includes forest clearance basically for the required land from forest reserves. Application for both clearances has to be routed through two different agencies viz., PCB and State Forest Department.

**3. Impact mitigation and Enhancement measures**

This includes the legal requirement according to the (1) Gol Forest laws and (2) the requirement according to the other laws.

**4. Compensatory Afforestation Programme**

Compensatory afforestation will be carried out against the loss of trees for road project. According to the afforestation programme PWD shall plant thrice the number cut for the project. Preferably this amount will be deposited with forest Department.

In addition, a number of impact mitigation and enhancement measures are required for the Forest area that will be impacted. The Forest reserves adjacent to the project road do have high faunal value.

1) Considering this aspect, the project will not provide demarcation of the forest boundary with the Project road, as it will be a barrier for the wildlife movement.

2) PWD is committed to compensate plant trees according to the compensatory afforestation programme required according to the Forest conservation Act 1980

3) Further, contractors have to set-up construction camps and plants (Hot mix, WMM plant etc) at least 5 Km away from the forest boundary. In this regard;

- Adequate training will be provided to contractors
- The labour force will not allowed to enter forest reserves for the purpose of hunting, fuel wood collection, nuts and fruits collection etc.,]
- The debris and waste materials shall not be dumped inside / immediately outside forest areas and other water sources.



- Debris shall be disposed off according to the contractors debris disposal plan
- The source of construction water shall not be from the forest areas or immediately adjacent (within 2 km) to the forest areas.
- The construction work within the forest stretches should adhere to all international environmental standards as laid out by the environmental management plan under the GoI/GoU/ADB rules, regulation and policies.

During construction, the following measures will be taken in to consideration for effective implementation

- No construction camps or other polluting plants within 5 Km of the forest reserves.
- No blasting shall be allowed during nighttime.
- Blasting should be silent blasting along the forest reserves.
- Blasting shall be confined to a particular time only. Best time would be 2-3 pm in daytime.
- Hunting is strictly prohibited.
- No cutting of trees from the forest reserves for any purpose relating to the construction work nor shall the people associated with the project construction should enter the forest reserves other than any legal requirements.
- Contractor should erect appropriate signboards during construction.
- After construction, the DSC/PWD should advice the locations for erecting the signboards including advance signboards notifying the forest reserves.
- Immediately after construction fencing should be carried out parallel to the Forest reserves.
- Any sign/indication of forest fire will be immediately notified to all considered agencies

Immediately after construction, the contractors shall erect signboards and information boards close to the forest boundaries according to the Environmental Management plan (EMP) prepared.

During operational period erection of sign/ information boards will be required. With regards to institutional responsibilities the PWD and Forest Department need to coordinate the various requirements.

- PWD– Maintenance of the road furniture, signboards, information boards
- State Forest Department – to coordinate with the PWD for various roadside arrangements change in the status of the forest
- To facilitate Contractor do his job of construction

### **NGO Participation**

Participation of NGO may be useful for the smooth implementation of the project.

**ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION**

The Contractor shall at all times carry out work on the road in manner creating least interference to the flow of traffic with the satisfactory execution. For all works involving improvements to the existing state highway, the Contractor shall, in accordance with the directives of the DSC, provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the state highway. The Contractor shall take prior approval of the DSC regarding traffic arrangements during construction.

**1. TRAFFIC SAFETY AND CONTROL**

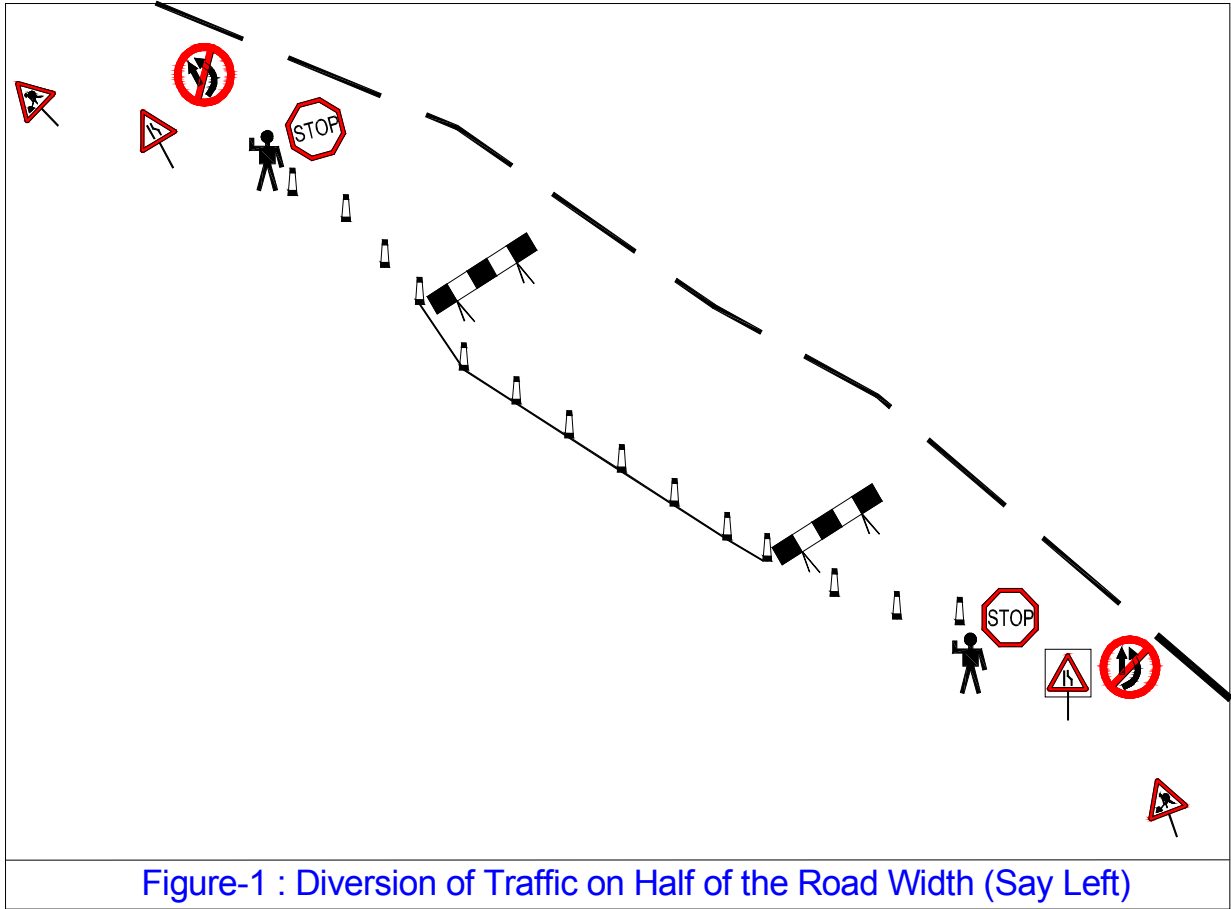
- (i) Where subject to the approval of the Engineer the execution of the works requires temporary closure of road traffic use, the Contractor shall provide and maintain temporary traffic diversions. The diversions shall generally consist of 200 mm thickness of gravel 4.5 meters wide laid directly upon natural ground and where any additional earthworks are required for this purpose that will be provided under the appropriate payment items.
- (ii) Where the execution of the works requires single-lane operation on public road, the Contractor shall provide and maintain all necessary barriers, warning signs and traffic control signals to the approval of the Engineer.
- (iii) With the exception of temporary traffic arrangements or diversions required within the first 4 weeks of the Contract, the Contractor shall submit details of his proposals to the Engineer for approval no less than 4 weeks prior to the temporary arrangement or diversion being required. Details of temporary arrangements or diversions for approval as soon possible after the date of the Letter of Acceptance.
- (iv) The colour, configuration, size and location of all traffic signs shall be in accordance with the code of practice for road sign. In the absence of any detail or for any missing details, the signs shall be provided as directed by the Engineer (DSC).
- (v) The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required by the Engineer for the formation and protection of traffic approaching or passing through the section of the road under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the road shall be drawn up in consultation with the SE.
- (vi) At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the Carriageway) the lane width path for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the SE. At night, the passage shall be delineated with lanterns or other suitable light source.
- (vii) One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights.
- (viii) On both sides, suitable regulatory / warnings signs as approved by the SE shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of design and of reflectory type, if so directed by SE.
- (ix) Upon completion of the works for which the temporary traffic arrangements or diversions have been made, the Contractor shall remove all temporary installations and signs and

reinstate all affected roads and other structures or installations to the conditions that existed before the work started, as directed by the Engineer.

**2. MAINTENANCE OF DIVERSIONS AND TRAFFIC CONTROL DEVICES**

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the SE. The temporary traveled way shall be kept free of dust by frequent applications of water, if necessary.

**Examples of some good practice in traffic control safety during construction**



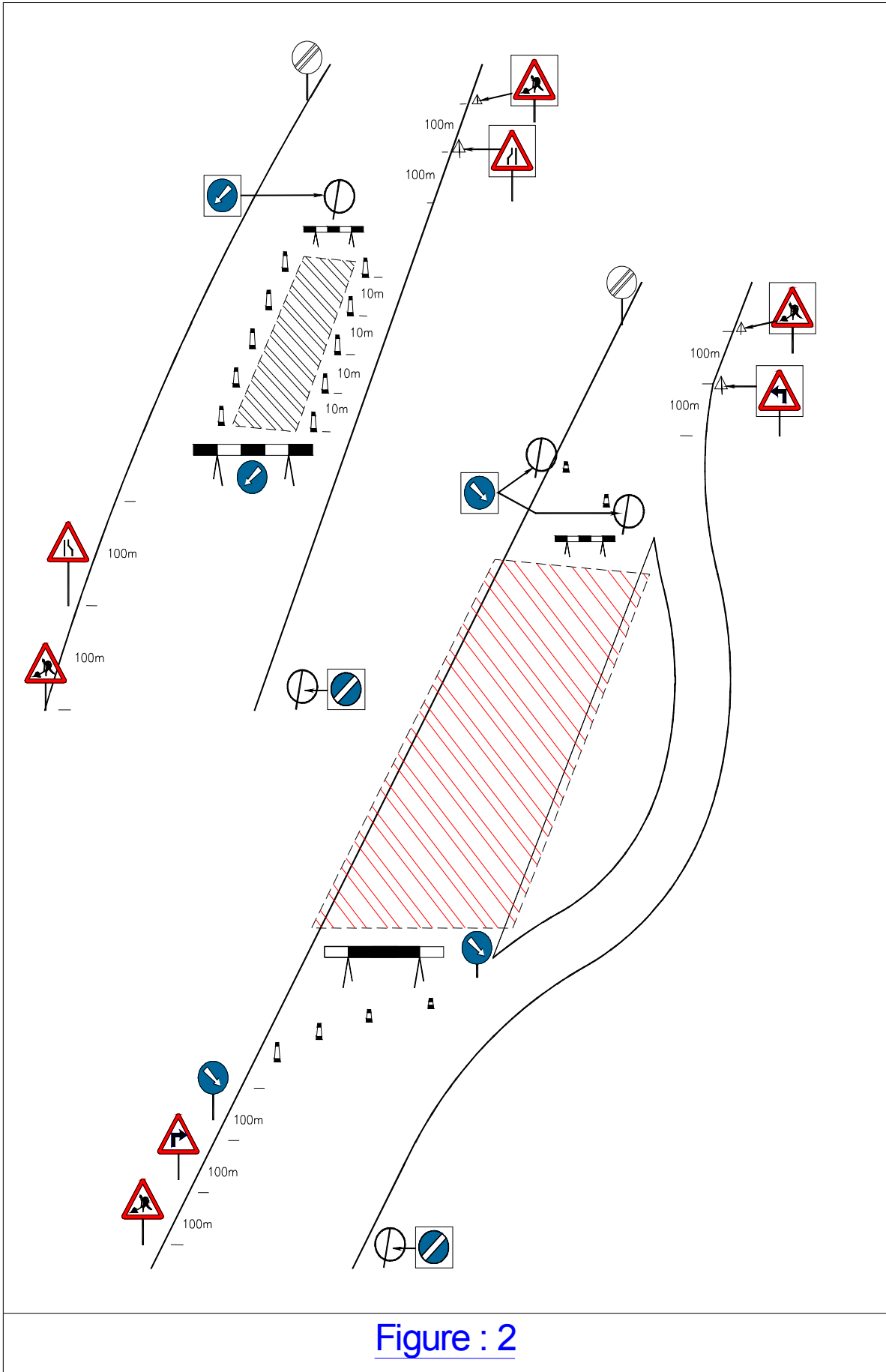


Figure : 2

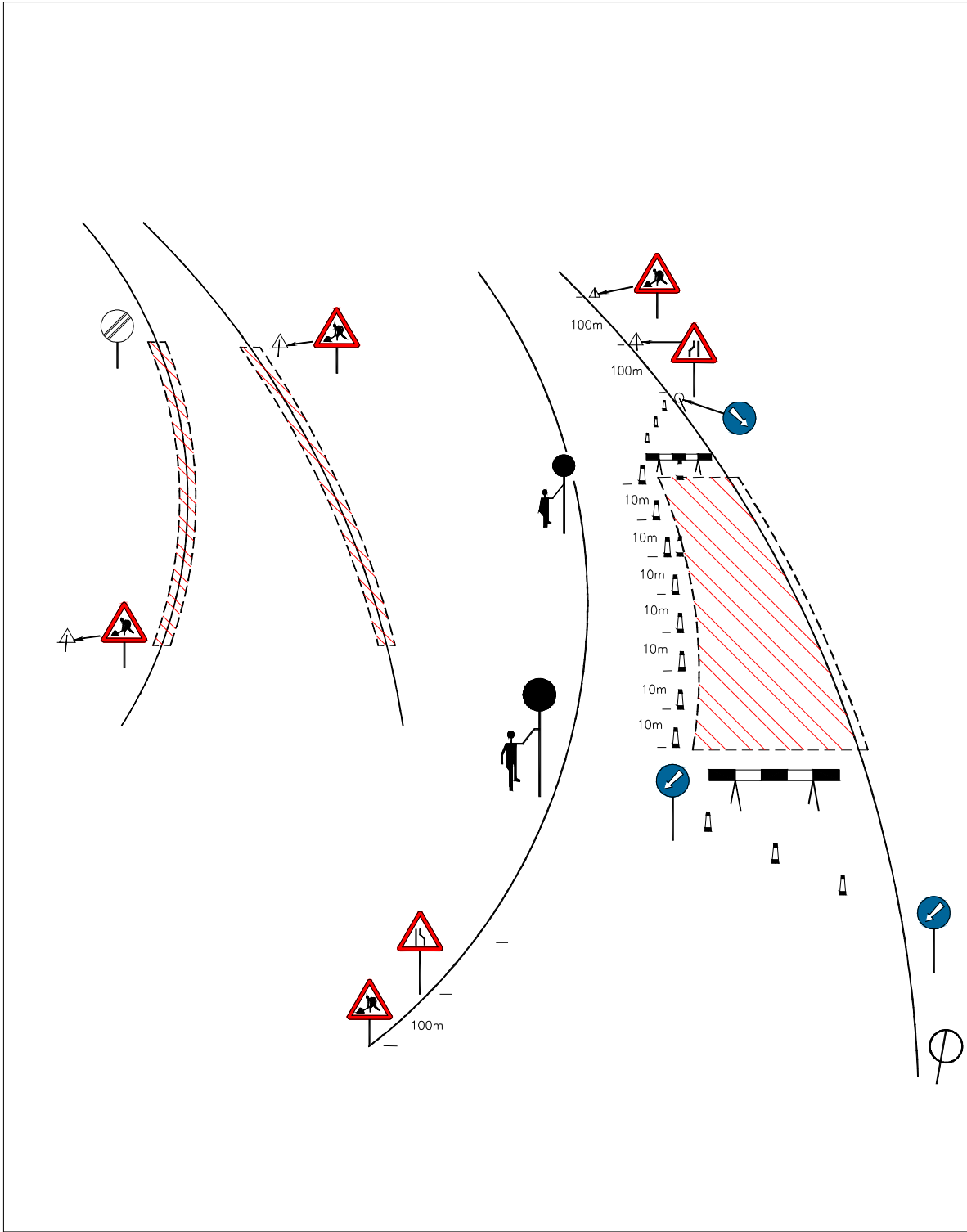


Figure : 3  
SIGN LAYOUT FOR LANE CLOSURE  
 (Drawn for Driving on Left)

### List of Traffic safety Signs/Equipment (Guideline)

Sl. No.	Signs
1	Barricading
2	Men at work
3	Keep Left
4	Go slow
5	Flag men
6	Narrow signs
7	Lantern(Amber Blinker)
8	Traffic control Lights
9	Cones

**Note:**

- Safety jackets and helmets should be provided to all the workers/ Engineers working on the road.
- Fixed mobile solid barricades must be placed between the workmen and traffic or pedestrian and traffic.
- All the safety signs should be according to IRC: 67 and IRC: SP: 55: 2001

**GENERAL GUIDELINES FOR CONTRACTOR'S CONSTRUCTION WATER MANAGEMENT PLAN**

**Dos and Don'ts for the contractor**

There are a number of dos and don'ts for the contractor as provided below

- Contractor's vehicles shall not be allowed to wash in the river or stream. This is to avoid potential pollution from oil residues.
- Contractors shall not use water from the community drinking water sources such as;
  - Public water supply schemes
  - Community spring water sources
  - Community hand pumps
  - Community bore wells / shallow tube wells
  - Location of the streams from which the Community takes drinking water
- Contractor shall obtain all legal approvals and clearances from the concerned departments.
- Contractor shall consult the local communities where the water source has been identified.
- If the source is a spring – check discharge, dependency in consultation with local communities.
- If the source is river/stream- discharge data for the past several years need to be analyzed, whether source is perennial, or non-perennial, any irrigation scheme is running over it or not, if IPH\* department is using it, or local people are using it or not. NOC\* from all concerned authorities will be required.
- If the source is Major River - In addition to the local permission, Contractor may require obtaining written permission from State level authorities at Dehradun.
- If the sources is groundwater (a hand pump/bore well or open deep well)- then its chemical composition and water related tests are required to be obtained from the competent authority and an NOC\* is obtained from the competent authority.

**Post Construction Stage**

Once the Contractor finishes his job, this can be handed over to the local panchayath or for local communities. The possible alternate uses of this structure would be

- Local communities of this area can use the same source to meet their water needs
- If road passes through a plain water scarcity prone area and if no nearby water source has been identified, transportation is uneconomic, then contractor should go for Underground water option. If it is feasible and will not lead to a serious depletion of the ground water.

\*IPH = Irrigation and Public Health Department.

\*NOC = No Objection Certificate.

**APPENDIX – 11**  
**ENVIRONMENT FRIENDLY CONSTRUCTION METHODOLOGY**

The contractor shall be deemed to have acquainted himself with the requirements of all the current statutes, ordinances, by laws, rules and regulations or their instruments having the force of law including without limitation those relating to protection of the environment, health and safety, important of labour, demolition of houses, protection of environment and procurement, transportation, storage and use of explosives etc.

**PROTECTION OF ENVIRONMENT:**

- i) The contractor will take all necessary measures and precautions and ensure that the execution of the works and all associated operations on site or offsite are carried out in conformity with statutory and regulatory environmental requirements including those prescribed in EMP.
- ii) The Contractor will take all measures and precautions to avoid any nuisance or disturbance to inhabitants arising from the execution of works.
- iii) All liquid waste products arising on the sites will be collected and disposed of at a location on or off the sites and in a manner that will not cause either nuisance or pollution.
- iv) The contractor will at all time ensure that all existing water courses and drains within and adjacent to the site are kept safe and free from any contamination.
- v) The contractor will submit details of his temporary drainage work system (including all surface channels, sediment traps, washbasins and discharge pits) to the DSC and CMU for approval prior to commencing work on its construction.
- vi) The contractor will arrange all the equipment in good condition to minimize dust, gaseous or other air-borne emissions and carry out the works in such a manner as to minimize adverse impact on air.
- vii) Any vehicle with an open load-carrying area used for transporting potentially dust-producing material will have properly fitted side and tailboards. Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a clean tarpaulin in good condition.
- viii) The contractor will take all necessary measures to ensure that the operation of all mechanical equipment and condition processes on and off the site will not cause any unnecessary or excessive noise, taking into account applicable environmental requirements.
- ix) The contractor will take necessary measures to maintain all plant and equipment in good condition.
- x) Where the execution of the works requires single –lane operation on public road the contractor will provide and maintain temporary traffic diversions subject to the approval of the DSC.



- xi) Where the execution of the works requires single-line operation on public road the contractor will provide and maintain all necessary barriers, warning signs and traffic control signals to the satisfaction of the DSC.
- xii) Wherever traffic diversions, warning signs, traffic control signals and barriers are required, the contractor will install them to the satisfaction of DSC prior to commencing the work, in that area.
- xiii) Contractor shall install asphalt plants and other machineries away from the populated areas as per laid down regulations.
- xiv) Permit for felling of trees will be obtained from the forest department before the execution of any work.
- xv) Trees and plants going to be uprooted will be duly compensated and maintained up to 3 years.
- xvi) Mist sprays should be provided at appropriate places for preventing dust pollution during handling and stockpiling of stones and loose earth.
- xvii) Overburden waste dumps shall be sprayed with water, as they are the major source of air borne particulate matter.
- xviii) Overburden waste dumps shall be reclaimed / afforested to bind the loose soil and to prevent soil erosion. The frequency of sprinkling should be fixed as per the seasonal requirement and in consultation with engineer.
- xix) Regular water spraying on haulage roads during transportation of construction materials by water sprinklers. The frequency of sprinkling should be fixed as per the seasonal requirements in consultation with engineer.
- xx) Transfer point for transporting construction material shall be provided with appropriate hoods/ chutes to prevent dust emissions.
- xxi) Dumping of construction material should be from an optimum height (preferably not too high), So as to reduce the dust blow.
- xxii) Innovative approaches of using improved machinery designs, with in-built mechanism to operator's cabin.
- xxiii) Procurement of drillers, loaders, dumpers and other equipment with noise proof system in operator's cabin.
- xxiv) Confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas.
- xxv) Regular and proper maintenance of noise generating machinery including the transport vehicles to maintain noise levels.
- xxvi) Provisions should be made for noise absorbing pads at foundations of vibrating equipments to reduce noise emissions.

## **QUARRY OPERATIONS**

The Contractor shall obtain materials from quarries only after the consent of the Forest Department or other concerned authorities and in consultation with the Engineer. The quarry operations shall be undertaken within the purview of the rules and regulations in force.

## **PREVENTION OF WATER COURSES FROM SOIL EROSION AND SEDIMENTATION SILTATION**

The Contractor shall apply following mitigation measures to prevent sedimentation and pollution of watercourses.

- To prevent increased siltation, if need be existing bridges maybe widened downstream side of the water body;
- Cement and coal ash should be stacked together, fenced by bricks or earth wall, and kept away from water, to prevent leachate formation and contamination of surface and ground water;
- If need be, slope of the embankments leading to water bodies should be modified and re channelized to prevent entry of contaminations into the water body;
- During construction silt fencing (consists of geo-textile with extremely small size supported by wire-mesh mounted on a panel made up angle frame) could be used along the road at all canals and rivers to prevent sediments from the construction site to enter into the watercourses.

## **POLLUTION FROM HOT-MIX PLANTS AND BATCHING PLANTS**

Plants and concrete batching plants shall be located sufficiently away from habitation, agricultural operations. The Contractor shall take every precaution to reduce the levels of noise, vibration, dust and emissions from his bituminous hot-mix plants and shall be fully responsible for any claims for damages caused to the property, fields and residents in the vicinity.

## **HEALTH AND SAFETY**

The Contractor shall take all measures and precautions necessary to ensure the health, safety and welfare of all persons entitled to be on the site. Such precautions shall include those that, in the opinion of the Engineer, are reasonable to prevent unauthorized entry upon the site and to protect members of the public from any activities under the control of the Contractor. The Contractor's responsibilities shall include but not be limited to:

- The provision and maintenance of the Contractor's Equipment in a safe working condition and the adoption of methods of work that are safe and without risks to the health of any person entitled to be on the site.
- The execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances,
- The provision of lighting, including standby facilities in the event of failure that, in the opinion of the Engineer, is adequate to ensure the safe execution of any works that are to be carried out at night.
- The provision of protective clothing and safety equipment, with such personnel and equipment and such information, instruction, training and supervision as the necessary to ensure the health and safety at work of all persons employed on or entering on the site in connection with the works, including the Engineer's supervisory staff, all in accordance with the laws.
- Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced provided with proper caution signs and marked with lights at

night to avoid accidents. Contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.

- The Contractor shall not use or generate any materials in the works, which are hazardous to the health of persons, animals or vegetation. Where it is necessary to use some substances, which can cause injury to the health or workers, the Contractor shall provide protective clothing or appliances to his workers.
- The Contractor will take all measures necessary to safeguard the health; safety and welfare of all persons entitled to be on site and will ensure that works are carried out in a safe and efficient manner.
- The Contractor will provide, and ensure the utilization of appropriate safety equipment for all workmen and staff employed directly or indirectly by the Contractor. Such safety equipment will include but not be limited to the safety harnesses, safety equipment for working over water, rescue equipment, fire extinguishers and first-aid equipment. The personnel working at vulnerable locations at site will wear safety helmets and strong footwear.
- The Contractor will provide an adequate number of latrines and other arrangements at areas of the site where work is in progress and ensure that they are regularly cleaned and maintained in a hygienic condition.

#### **FIRST AID**

- The provision and maintenance of suitably equipped and staffed first aid stations throughout the extent of the works to the satisfaction of the Engineer. The Contractor shall allow in his prices and be responsible for the costs of all such site welfare arrangements and requirements.
- Injuries might occur during the construction period. It is therefore pertinent to provide first aid facilities for all the construction workers. At construction camps and at all workplaces first aid equipment and nursing staff must be provided. Since many of the workplaces may be far away from regular hospitals, an indoor health unit having one bed facility every 250 workers needs to be provided.
- Adequate transport facilities for moving the injured persons to the nearest hospital must also be provided in ready to move condition.
- The first-aid units apart from an adequate supply of sterilized dressing material should contain other necessary appliances as per the factory rules.

#### **MAINTENANCE**

- All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.
- Each structure made available for occupancy shall be of sound construction, shall assure adequate protection against weather, and shall include essential facilities to permit maintenance in a clean and operable condition. Adequate heating, lighting, ventilation or insulation when necessary to reduce excessive heat shall provide for comfort and safety of occupants.
- Each structure made available for occupancy shall comply with the requirements of the Uniform Building Code. This shall not apply to tent campus.

**BORROW AREAS MANAGEMENT**

Borrow areas will be finalized as identified by Contractor as agreed by the DSC and UEAP as per the requirements of the contract. Agreement is not reached between the Contractor and landowners for the identified borrow areas sites. In such cases arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environment requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment and Forests, Government of India, and local bodies, as applicable shall be the sole responsibility of the Contractor.

The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations.

- 1) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
- 2) The borrow pits should not be located along the roads.
- 3) The loss of productive and agricultural land should be minimum.
- 4) The loss of vegetation is almost nil or minimum.
- 5) Sufficient quality of soil is available.
- 6) The Contractor will ensure the availability of suitable earth.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme as approved by the concerned Engineer. It shall be ensured that the fill material compacted to the required density

The Contractor shall submit the following information to the Engineer for approval at least 7 working days before commencement of compaction

- The values of maximum dry density and optimum moisture content obtained in accordance with IS: 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
- A graph of density plotted against content from which, each of the values in (i) above of maximum dry density and optimum moisture content are determined.

After identification of borrow areas based on guidelines. Contractor will fill reporting format Annexure-III and submit the same for approval of the “Engineer”.

After receiving the approval Contractor will begin operations keeping in mind following;

- 1) Haulage of material to the areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.
- 2) No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material

form the site to suit his operational procedure, then he shall make good any consequent deficit of material arising there from.

- 3) Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
- 4) The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

#### **Borrow Areas located in Agricultural Lands**

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (iii) Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
- (iv) Borrowing of earth will not be done continuously through out the stretch.
- (v) Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- (vi) Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- (vii) The slope of the edges will be maintained not steeper than 1:4 (Vertical: Horizontal).

#### **Borrow Areas located in Agriculture Land in un-avoidable Circumstances:**

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (iii) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

#### **Borrow Areas located on Elevated Lands**

- (i) The preservation of topsoil will be carried out in stockpile
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).

- (iii) At location where private owners desire their fields to be leveled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields.

#### **Borrow Areas near Riverside**

- (i) The preservation of topsoil will be carried out in stockpile
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (iii) Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is maximum.

#### **Borrow Areas near Settlements**

- (i) The preservation of topsoil will be carried out in stockpile
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (iii) Borrow pit location will be located at least 0.75 km from villages and settlements. If unavoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
- (iv) Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with a layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF&CC/PPCB guidelines.

#### **Borrow Pits along the Road**

- (i) The preservation of topsoil will be carried out in stockpile
- (ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (iii) Borrow pits along the road shall be discouraged.
- (iv) It permitted by the Engineer; these shall not be dug continuously.
- (v) Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- (vi) Small drains shall be cut through the ridges of facilitate drainage.
- (vii) The depth of the pits shall be so regulated that there bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.

- (viii) Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

### **Re-development of Borrow Areas**

The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit approximately to the road level.

Re-development plan will be prepared by the Contractor before the start of work inline with the owner's will and to the satisfaction of owner.

### **The Borrow Areas will be rehabilitated as follows;**

- Borrow pits will be backfilled with rejected construction wastes (unserviceable materials) compacted and will be given a turfing or vegetative cover on the surface. If this is not possible, then excavation slope should be smoothed and depression is filled in such a way that it looks more or less like the original ground surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post-use restoration and Environment Expert of Supervision Consultant will certify the post-use redevelopment.

The Contractor will keep record of photographs of various stages i.e. before using materials from the location (pre-project), for the period borrowing activities (Construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

**APPENDIX - 13**  
**SOIL EROSION AND SEDIMENTATION CONTROL**

Prior to the start of the relevant construction, the Contractor shall submit to the Engineer for approval, his schedules for carrying out temporary and permanent erosion/sedimentation control works as are applicable for the items of clearing and grubbing, road way and drainage excavation, embankment/sub-grade construction, bridges and other structures across water courses, pavement courses and shoulders. He shall also submit for approval his proposed method of erosion/sedimentation control on service road and borrow pits and his plan for disposal of waste materials. Work shall not be started until the erosion/sedimentation control schedules are prepared and the Engineer has approved methods of operations for the applicable construction.

The surface area of erodible earth material exposed by clearing and grubbing, borrow and fill operations shall be limited to the extent practicable. The Contractor may be directed to provide immediate control measures to prevent soil erosion and sedimentation that will adversely affect construction operations, damage adjacent properties, or cause contamination of nearby streams or other watercourses. Such work may involve the construction of temporary berms, dikes sediment basins, slope drains and use of temporary mulches, fabrics, mats, seedling, or other control devices or methods as necessary to control erosion and sedimentation.

The Contractor shall be required to incorporate all permanent erosion and sedimentation control features into the project at the earliest practicable time as outlined in his accepted schedule to minimize the need for temporary erosion and sedimentation control measures.

Temporary erosion/sedimentation and pollution control measures will be used to control the phenomenon of erosion, sedimentation and pollution that may develop during normal construction practices, but may neither be foreseen during design stage for associated with permanent control features on the Project.

Where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion or sedimentation control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion or sedimentation control measures may be required between successive construction stages. Under no conditions shall a large surface area of erodible earth material be exposed at one time by clearing and grubbing or excavation without prior approval of the Engineer.

The Engineer may limit the area of excavation, borrow and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seedling and other such permanent erosion, sedimentation and pollution control measures, in accordance with the accepted schedule.

Temporary erosion is sometimes caused due to the Contractor's negligence, carelessness or failure to install permanent controls. Sedimentation and pollution control measures then become necessary as a part of the work as scheduled or ordered by the Engineer, and these shall be carried out at the Contractor's own expense. Temporary erosion, sedimentation and pollution



control work required, which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, will be performed as ordered by the Engineer.

Temporary erosion, sedimentation and pollution control may include construction work outside the right of way where such work is necessary as a result of road construction such as borrow pit operations, service roads and equipment storage sites.

The temporary erosion, sedimentation and pollution control features installed by the Contractor shall be maintained by him till these are needed, unless otherwise agreed by the Engineer.

## LOCATING QUARRIES, REHABILITATING QUARRIES AND GUIDELINES FOR STONE CRUSHERS

### Locating Quarries

The Contractor will finalize the locations in consultation with DSC and UEAP. The Contractor shall establish a new quarry with the prior consent of the DSC only in cases when

- i) Lead from existing quarries is uneconomical and
- ii) Alternative material sources are not available.

The Contractor shall prepare a redevelopment plan for the quarry site and get approved by the DSC.

The construction schedule and operation plans to be submitted to the DSC prior to commencement of work shall contain a detailed work plan for procuring materials that includes procurement, transportation and storage of quarry materials.

### Operation & redevelopment plan (if a new quarry is opened)

- Photograph of the quarry site prior to commencement
- The quarry boundaries as well as location of the material deposits, working equipments, stockpiling, access roads and final shape of the pit.
- Drainage and erosion control measures at site.
- Safety measures during quarry operation.
- Design for redevelopment of exhaust site.

**Option-A: Revegetating the quarry to merge with surrounding landscape:** This is done by conserving and reapplying the topsoil for the vegetative growth.

**Option-B: Developing exhausted quarries as water bodies:** The pit shall be reshaped and developed into pond, for harvesting rainwater. This option shall only be considered where the location of quarry is at the lowest point, i.e. surrounding areas/ natural drainage slopes towards it.

### Construction stage:

Development of site:

To minimize the adverse impact during excavation of material following measures are need to be undertaken

- i) Adequate drainage system shall be provided to prevent the flooding of the excavated area
- ii) At the stockpiling locations, the Contractor shall construct sediment barriers to prevent the erosion of excavated material due to runoff

- iii) Construction of offices, laboratory, workshop and rest places shall be done in the up-wind of the plant to minimize the adverse impact due to dust and noise.
- iv) The access road to the plant shall be constructed taking into consideration location of units and also slope of the ground to regulate the vehicle movement within the plant.
- v) In case of storage of blasting materials, all precautions shall be taken as per The Explosive Rules, 1983.

**Quarry operations including safety:**

- i) Overburden shall be removed and disposed inline with Guidelines of Disposal Management.
- ii) During excavation, slopes shall be flatter than 20 degrees to prevent their sliding. In cases where quarry strata are good and where chances of sliding are less this restriction can be ignored.
- iii) In case of blasting, procedure and safety measures shall be taken as per The Explosive Rules, 1983.
- iv) The Contractor shall ensure that all workers related safety measures shall be done as per guidelines for workers and Safety attached as Annexure-8
- v) The contractor shall ensure maintenance of crushers regularly as per manufacture's recommendation.

Topsoil will be excavated and preserved during transportation of the materials measures shall be taken to minimize the generation of dust and prevent accidents.

The PIU and the DSC shall review the quarry site for the management measures during quarry operation, including the compliance to pollution norms.

**Post construction stage:**

The Contractor shall restore all haul roads constructed for transporting the material from the quarries to construction site to their original state.

The PIU and the DSC shall be entrusted the responsibility of reviewing the quarry site for the progress of implementation of Redevelopment plan. These shall include the following two cases;

- Redevelopment of quarries opened by the contractor for the project
- Redevelopment of existing quarries operated by other agencies

In the first case, the Contractor shall be responsible for the Redevelopment plan prior to completion after five years, during the defect liability period. The DSC and PIU shall be responsible for reviewing this case of redevelopment prior to the issuing the defect liability certificate.

In the second case, the redevelopment of exhaust quarry shall be the responsibility of the agency providing the permit to ensure the implementation of Redevelopment Plan.

**Geological and Geomorphologic considerations:**

- i) No mining shall be allowed where the slope angles are more than 45 degree from horizontal and in case of mid slope mining, the foot wall should be of hard strata.
- ii) No mining lease shall be granted where the ore to overburden ratio is not economical i.e. 1:0.2 that is the waste generation should not be more than 20%
- iii) Proper appraisal of the deposit for its qualitative and quantitative assessment shall be made in the form of Geological and topographical plans.

**Technical consideration:**

- i) The area should not be highly jointed, fractured on consisting of weak planes.
- ii) Relation of slope angle to angle of repose should be within mining parameters where 6x6 m benches by keeping overall angle of repose as 45degree can be made.
- iii) No mining shall be allowed where subsidence of rocks is likely due to steep angle of slope.
- iv) No overhangs shall be allowed to be formed during the course of mining.
- v) The gradient of approach roads shall be gentle with hill-ward slope, side drains and parapet walls. Adequate number of waiting and crossing points shall be provided for safe plying of vehicles.
- vi) No blasting shall be resorted to without taking proper license under Explosive Act.

**General conditions:**

- i) Mining site shall only be handed over to the leaseholder, after it is duly demarcated by permanent boundary pillars and certified by concerned mining officer.
- ii) Junction at take off point of approach road with main road shall be developed with proper width and geometric required for safe movement of traffic by crusher owner at his own cost in consultation with Executive Engineer, UKPWD.
- iii) No leaseholder shall store/ stack any material in the acquired width of PWD road without the specific permission of the competent authority.
- iv) In addition to above the mining operation shall be subjected to provisions of various Acts and Rules in force.
- v) Dumping of waste shall be done in earmarked places as per the working plans.

**Table: Parameters for new stone crushers to be set up in future**

Sl. No.	Parameters	Distance
i	Minimum distance from NH/SH	150m
ii	Minimum distance from link roads / other District roads	75m
iii	Minimum distance from District Head - Quarters	1.5 km
iv	Minimum distance from town / Notified area by the committee	1 km
v	Minimum distance from village	500 m

vi	Minimum distance from Hospital/Education Institution	1 km
vii	Minimum distance from Natural water springs	500 m
viii	Minimum distance from Notified parks	2 km
ix	Minimum distance from Sanctuaries	1 km
x	Minimum distance from Bridge sites	200 m Upstream
xi	Minimum distance from Notified Lakes and Wetlands	300 m

**STORAGE, HANDLING, USE AND EMERGENCY RESPONSE FOR HAZARDOUS  
CHEMICALS**

**A1. Refueling / Maintenance procedure**

- Truck or suitable containers will bring in all fuel and fluids. There will be no storage of fuel, oil or fluids within 100M (or 50M) of the permanent water line.
- Prior to re-fueling or maintenance, drip pans and containment pans will be placed under the equipment. Absorbent blankets may also be required to be placed under the equipment and hoses where there is a possibility of spillage to occur.
- All used oils or fluids will be properly contained and transported to appropriately licensed (authorized) disposal facilities;
- Following re-fueling and maintenance, the absorbent blankets (if any) and spill pans will be picked up and the fuel truck or container moved outside of the 100m (or 50m) wide area.

**Emergency spill procedure**

Should a spill occur, through spillage or equipment failure, the applicable emergency spill procedure outlined in sections A-2 to A-4 must follow.

**A2. Spill Procedure (inside the stream)**

In the case of a spill, overflow or release of fluid into the stream waterway (whether water is flowing during the spill or not), do what is practical and safely possible to control the situation, then get help.

- **Stop the flow**
  - Stop the release into the stream waterway
  - Shutdown equipment
  - Close valves and pumps
  - Plug hoses
- **Remove Ignition sources**
  - Shut off vehicles and other engines
  - Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts, the extinguisher must be easily accessible)
- **Contact the environmental officer and initiate emergency response**

- Notify the site supervisor and the Contractor's Environmental Officer as soon as possible
- The Environmental Officer will review the situation and decide if Emergency services like Fire Brigade are required
- Appropriate parties to be notified of the spill are
  - The contractor's Project Manager
  - The Engineer through his designated Environmental Officer
  - The Client
  - Regulatory Agencies like Pollution Control Board, Municipal Authorities, as applicable.
  - Site safety Officer

➤ **Cleanup and Disposal**

Emergency Services will be engaged for the containment, cleanup and disposal of contamination release into the environment.

➤ **Reporting**

The Contractor's Environmental Officer will document the event and submit reports to the Engineer, the client and appropriate regulatory agencies like the Pollution Control Board(s).

➤ **Procedure Review**

The Engineer will review the report, determine if changes are required to procedures and recommended implementation of all required changes ...

**A3. Spill procedure (on land)**

In the case of a spill, overflow or release fluid onto land, do what is practical and safety possible to control the situation and then get help.

➤ **Stop the flow**

- Stop the release into the water body
- Shut down equipment
- Close valves and pumps
- Plug hoses

➤ **Remove Ignition sources**

Shut off vehicles and other engines

Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition sources (if a fire starts the extinguisher must be easily accessible).

➤ **Contain the Spill**

- Dike around the spill to contain the material
- Spread absorbent or place a spill blanket on the spill
- Enlist the help of personnel on site
- Notify your supervisor as soon as possible

➤ **Notification**

Appropriate parties to be notified of the spill are

- The Contractor's Project Manager
- The Engineer through his designated Environmental officer
- The Client
- Regulatory Agencies like Pollution control Board, Municipal Authorities, as applicable
- Site Safety coordinator

➤ **Cleanup and Disposal**

The Engineer's Environmental officer will ensure that a proper cleanup and disposal method is determined. Absorbent pads will soak up the spilled material. The pads will be contained and removed from site for disposal at a licensed (authorized) facility.

➤ **Reporting**

The Contractor's Environmental Officer will document the event and submit reports to the Engineer, the Client and appropriate regulatory agencies like the Pollution control Board(s)

➤ **Procedure Review**

The Engineer will review the report, determine if changes are required to procedures and recommend implementation of all required changes.



## SELECTION AND MANAGEMENT OF CONSTRUCTION CAMP

### 1. Selection and layout of construction camp

The construction camps for labour, accommodation, offices and construction plant sites shall be identified based on the following guidelines. The construction site shall be located

- At a minimum distance of 1km away from any major settlement or village.
- At a minimum distance of 1000m of any major surface water course or body

If this is not possible the base camps should be located away from the settlements with the following precautions

- Base camp should be enclosed with boundary wall.
- Movement of the workers should be registered during the nighttime.
- There should not be any disturbance to the local community.
- Operation of the plant and machinery should be restricted to 6 am to 10 am
- Care should be taken while starting and moving the heavy vehicles, there is a possibility that children of near settlement may be playing with machinery parked outside the camps.

### 2. Facilities at workers camps

During the construction stage of the project, the construction contractor will construct and maintain necessary (temporary) living accommodation and ancillary facilities for labour. It will be ensured that all the temporary accommodation will be provided with uncontaminated water for drinking, cooking and washing. Adequate washing and bathing places shall be provided, and kept in clean and drained condition. Construction camps will be sited away from vulnerable people and adequate health care will be provided for the work force.

- General requirements include availability of:
- Potable water supply in quantity and quality,
- Requirement of power supply for heating as well as for cooking. Firewood shall not be used for cooking and heating purposes. Contractor must provide LPG gas / Kerosene for the construction camps.
- Safe access road is required at camps
- Waste (all kind of solid and liquid wastes) generated need to be disposed off smoothly.

#### 2.1 Sanitation Facilities:

Construction camps shall be provided with sanitary latrines and urinals. Closed drainage systems and the proper treatment systems according to the local conditions should be constructed for the proper flow and effective treatment. The sewage system built for the camp will be operated properly to avoid health hazard, ground water and soil pollution. Compost pits will be constructed for the disposal of the garbage and other biodegradable wastes generated from the camps. Proper collection, transportation and disposal of the wastes will be ensured.

### **3. Shelter at work place:**

At such work places where the duration of the works will prevail for more than one month some form of shelters will be provided for meals, resting, change of clothes and for keeping the tools of the work and personal protective equipment. The height of shelter shall not less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1.0 Sq.m per head.

### **4. Canteen Facilities:**

A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered necessary. All the wastes generated from the canteen will be treated / disposed of as detailed in the other sections of the waste disposal.

### **5. Health care Facilities:**

Health problems of the workers should be taken care of by providing basic health care facilities through a health centre set up at the construction camps. The health centre will have at least a doctor (part time), nurses, duty staff, medicines and minimum medical facilities to tackle first-aid requirements for minor accidental cases. Some arrangements will be made with the nearest hospital to refer patients of major illnesses or critical cases.

The health centre will carry out quarterly awareness programme of HIV – AIDS with the help of AIDS control society. Posters will be exhibited in the health care clinic.

### **6. Day crèche facilities**

At construction sites where women with very young children are employed, provision of a day crèche shall be provided. At construction sites where 20 or more women are ordinarily employed, a hut for children under the age of 6 years shall be provided.

For ensuring the implementation of effective pollution control measures at the construction base camps and construction plant sites, redevelopment/ closure plans for the closure of these sites will be made part of the EMP of the construction contract.

### **7. Construction workers Camp**

In all over India, road construction works are in peak stage. With several local / regional/ national and international contractors in place, the road construction work recently started showing seriousness towards this issue. The contractor recently started providing required legal and contractual facilities for the unskilled labour, hired from the local villages or are brought to the place of work from outside the State.

Even now the Contractor camps and other facilities are set up in worst conditions even when the contract documents are clearly specifying the required standards. The associated issues are as follows.

Forest resources could be encroached up on in all possible ways by the labour force.

Unauthorized tree felling to get fuel-wood both for cooking as well as heating even when alternative fuel is made available,

Poaching of edible animals and birds of the locality in spite of prohibition,

Poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent,

Indigenous people getting invaded by imported construction labour-force, due to lack of discipline,

Transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities, and

Creating hazardous traffic flow at construction site due to lack of concern about the local needs and provision for pedestrian

### **No Contractor's Establishments zones**

Contractor shall not establish any construction camp, crushers, hot mix plant and WWM plant in the identified locations (No Contractor's Establishment Zone). These locations will be treated as eco-sensitive. No construction campsite areas also include settlement areas provided below. These are the major settlements along the corridor. Campsites should be a minimum of 500m away from settlements.