



# Initial Environmental Examination

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Project Number: 47229-001  
December 2014

## IND: Uttarakhand Emergency Assistance Project

Submitted by

Uttarakhand Emergency Assistance Project (Roads & Bridges), Government of  
Uttarakhand, Dehradun

This report has been submitted to ADB by the Program Implementation Unit, Uttarakhand Emergency Assistance Project (R&B), Government of Uttarakhand, Dehradun and is made publicly available in accordance with ADB's public communications policy (2011). It does not necessarily reflect the views of ADB.

**Asian Development Bank**

Letter No. 991/02/UEAP/PWD/2014-15

Date: 10/11/2014

To,

Country Director  
 South Asia Department  
 India Resident Mission  
 4 San Martin Marg, Chanakyapuri,  
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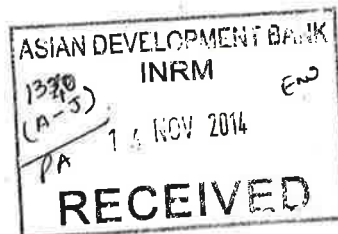
**Sub: ADB Loan-3055 IND, UEAP (R&B) Submission of Revised IEE Reports as per conditions in approval letter.**

Dear Sir/Madam,

Kindly find attached hard copies along with Compliance matrix and CD of revised IEE reports as per ADB comments for your record and disclosure on ADB website. The comments received wide letter listed as follows:

S. No.	Name of IEE report	Conditional approval wide Fax Dated
1	Nandprayag-Ghat Motor Road (Package No: UEAP/PWD/C7); Rudraprayag – Pokhari - Karanprayag Motor Road (Package No: UEAP/PWD/C7); Chamoli-Kund Motor Road (Package No: UEAP/PWD/C8); Guptkashi-Kalimath-Kotma-Jaal Chaumasi Motor Road (UEAP/PWD/C9) and Kuwa-Kafnaul Rahdi Motor Road (Package No:UEAP/PWD/ C14)	03-07-2014
2	Joshimath Auli Motor Road under Nagar Palika Joshimath (UEAP/PWD/C20); Narsingh Mandir Approach Road Under Nagar Palika Joshimath (UEAP/PWD/ C21); Internal Road of Nagar Panchayat Karanprayag (UEAP/PWD/C21); Rudraprayag-Pokhari-Karnprayag (UEAP/PWD/ C32); Tharali-Dewal-Mundoli (UEAP/PWD/ C33) and Internal Roads of Nagarpalika Gopeshwer (UEAP/PWD/C34).	04-07-2014
3	Pilkhi-Gadoliya Motor Road (Package No: UEAP/PWD/C13) and reconstruction of Inspection House approach road under Nagar Panchayat Devprayag (Package No: UEAP/ PWD/ C13)	08-07-2014
4	Udayaribend-Thal motor road (Package no- UEP/PWD/C2); Satsiling– Thal motor road (Package no- UEP/PWD/C12); Reconstruction of internal roads of Nagar Panchayat Dharchula (Package no- UEP/PWD/C12); Reconstruction of internal roads of Nagar Panchayat Didihat (Package no- UEAP/PWD/C15); Reconstruction of internal roads of Nagar Panchayat Bering (Package no- UEAP/PWD//C28) and Seraghat- Udiyaribend motor road (UEAP/PWD/C46)	08-07-2014
5	(1) Tyuni-Chakrata-Mussoorie-Chamba-Kiriti nagar Road (Package No: UEAP/PWD/C23) (2) Kalsi- Bairatkhai Road (Package No: UEAP/PWD/C24) (3) Ichari-Kwano-Meenus Road (Package No: UEAP/PWD/C38)	14-07-2014
6	Restoration works (repairs and rehabilitation) of the damaged stretches of Restoration Work of Tyuni- Mori- Purola- Naugaon Road (Package No: UEAP/PWD/C37).	14-07-2014
7	(a) Reconstruction of internal road of Nagar Palika Bageshwar Package No- UEP/PWD/C18 (b) Reconstruction of internal road of Nagar Palika Kapkot Package No- UEP/PWD/C19 (c)Bageshwar-Kapkot-Sama-Tajam Road Package No. UEAP/ PWD/C26 (d)Kalanabend-Pantkwerali (Km 0.00-6.81) Package No. UEAP/ PWD/C47 (e)Bajinath-Gwaldam (Km 84.00-87.19) Package No. UEAP/PWD / C47	14-07-2014
8	Khirsu- Kherakhai- Kandoi- Khankhra Motor Road (Package no. UEP/PWD/C29); Sonprayag-Trijugarayan motor road (Package no. UEP/PWD/C30); Makku- Paldwari Motor Road (Package No: UEAP/PWD/C31); and New Bus stand road under Nagar Palika, Rudraprayag (Package no- UEP/PWD/C22)	12-09-2014

Enclosed: 10 IEE Reports (Hard and CD) and compliance sheets.



Yours sincerely

Program Manager  
 PIU, UEAP (R&B)  
 Dehradun, Uttarakhand

Copy to:

- Mr. A. K. Motwani, Team Leader, ADB.
- Mr. Girish Mahajan, Environment Specialist, ADB.

Program Manager  
 PIU, UEAP (R&B)  
 Dehradun, Uttarakhand

# Initial Environmental Examination

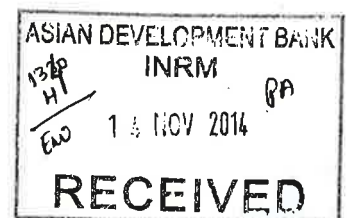
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July 2014

## India: Uttarakhand Emergency Assistance Project

### Restoration Work of Guptkashi – Kalimath – Kotma - Jaal Chaumasi Motor Road (UEAP/PWD C 9)

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



**STATUS OF COMPLIANCE WITH ADB COMMENTS AND SUGGESTIONS (ADB APPROVAL DATE 03-07-2014)**

**SUB-PROJECT: REHABILITATION OF DAMAGED ROADS UNDER CONTRACT PACKAGES C7, C8, C9 and C14**

**ROAD SUB-PROJECT**

S.N.	Comments/Suggestions	Status of Compliance	Remarks
1	<p>We refer to the submission of initial environmental examination (IEE) reports for the road sub-projects proposed for financing under UEAP. The scope includes restoration works (repairs and rehabilitation) of the damaged stretched of following roads namely:</p> <p><b>Nandprayag-Ghat Motor Road (Package No: UEAP/PWD/C7); Rudraprayag – Pokhari - Karanprayag Motor Road (Package No: UEAP/PWD/C7); Chamoli-Kund Motor Road (Package No: UEAP/PWD/C8); Guptkashi – Kalimath – Kotma - Jaal Chaumasi Motor Road (UEAP/PWD C 9) and Kuwa-Kafnaul Rahdi Motor Road (Package No: UEAP/ PWD/ C14)</b></p> <p>We note from these IEE reports that the proposed works would be strictly confined within the existing right-of-way belonging to Public Works Department, government of Uttarakhand; and no widening works would be undertaken under the proposed scope.</p>	.....	Agreed for compliance
2.	<p>The IEE reports prepared for the above works have confirmed that none of the road sections proposed for undertaking restoration works were located inside or near designated core of buffer areas of national parks/sanctuaries/ biosphere reserves, reserved forests, protected wetlands, or any other environmentally and / or ecologically sensitive areas. We note from the IEE reports that no rare, threatened, and endangered species (flora and fauna) have been reported to be present within the corridors of impact for these road sections. The IEE reports have also confirmed that no archaeological and/or protected monuments were located in the vicinity of the proposed road sections to be restored. It is also noted that the proposed works do not involve any tree cutting. Based on the information furnished in the IEE reports, the environment category of the sub-projects is assessed to be "B" in accordance with ADB's <i>Safeguard Policy Statement (SPS) (2009)</i>. We observe that the IEE reports have generally been prepared in line with <i>SPS 2009</i> requirements.</p>	.....	Agreed for compliance
3.	<p>We would like to reiterate that ADB's SPS 2009 requires all ADB-financed activities to comply with host country statutory environmental regulations applicable at national, state and local levels. We request you to ensure (a) compliance with (i) applicable statutory environmental regulation prior to commencing with works including the provisions stipulated under EIA Notification 2006 (as amended) for state highways located above 1000m above mean sea level; and (ii) the terms and conditions stipulated in the associated clearances and permits; and (b) timely renewal of permissions as required. We note that the 'Uttar Pradesh Protection of Trees in Rural and Hill Areas Act, 1976 as amended 1998 and 2001' is referred to be applicable for these sub-projects in these IEE reports. Please check the applicability, and if the reference is incorrect, revise it appropriately to reflect the applicable legislation.</p>	.....	Will be ensured and 'Uttar Pradesh Protection of Trees in Rural and Hill Areas Act, 1976 as amended 1998 and 2001' is presently applicable in the state of Uttarakhand.
4.	<p>Kindly ensure that (i) the IEE reports including associated environmental management and monitoring plan (EMMP) are disclosed to public in local language immediately (please revise environmental management plan serial no. C5.7 by replacing "local language (Kannada)" to the state's local language; (ii) the EMMPs are made a part of the bid and the contract documents; (iii) the cost towards implementation of environment and monitoring to be borne by the contractor is specifically mentioned in the bill of quantities in the contract document; (iv) the civil works contracts are awarded only after the environmental assessment documents are approved by ADB; and (v) the monitoring of baseline data for ambient air quality and noise levels; surface and ground water quality; and soil characteristics prior to commencing with the civil works so that these can be monitored during the construction phase.</p>	Local language corrected at EMP serial No. C5.7 Being ensured	Corrected as "local language (Hindi)"
5.	<p>Kindly incorporate the above observations and resubmit the corrected IEE reports for our records. The corrected IEE reports would then be disclosed on ADB website in accordance with ADB's <i>Public Communication Policy, 2011 and SPS 2009</i>. Please retain all back-up documents, and photographs associated with these IEE reports to respond to queries received if any.</p>	.....	The report has been corrected. All back up documents and photographs associated with IEE are being maintained

# **Initial Environmental Examination**

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July 2014

## **India: Uttarakhand Emergency Assistance Project**

**Restoration Work of Guptkashi – Kalimath – Kotma - Jaal Chaumasi  
Motor Road (UEAP/PWD C 9)**

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

## ABBREVIATIONS

ADB	-	Asian Development Bank
ASI	-	Archaeological Survey of India
BOQ	-	Bill of Quantity
CTE	-	Consent to Establish
CTO	-	Consent to Operate
DFO	-	Divisional Forest Officer
DSC	-	Design and Supervision Consultancy
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	-	Liquid Petroleum Gas
MDR	-	Major District Road
MoEF	-	Ministry of Environment and Forests
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 <sup>-6</sup> 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

## TABLE OF CONTENTS

Chapters	Contents	Page No.
	<b>EXECUTIVE SUMMARY</b>	1
<b>I</b>	<b>INTRODUCTION</b>	4
	A. Project background/rationale	4
	B. Uttarakhand Emergency Assistance Project (UEAP)	4
	C. Purpose of the environmental assessment	5
	D. Extent of IEE	5
	E. IEE contents	6
	F. Methodology	6
	G. Public consultation	7
<b>II</b>	<b>POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK</b>	8
<b>III</b>	<b>DESCRIPTION OF THE PROJECT</b>	12
	A. Project location	12
	B. Proposed category of the project	12
	C. Key rehabilitation and reconstruction activities	12
	D. Project implementation schedule	13
<b>IV</b>	<b>DESCRIPTION OF THE ENVIRONMENT</b>	15
	A. Physical environment	15
	1. Geography	15
	2. Geology	16
	3. Physiography	18
	B. Pedology	18
	C. Climate and meteorology	19
	D. Air and noise quality	19
	E. Hydrology	20
	1. Water drainage	21
	2. Water quality	21
	F. Mineral resources	21
	G. Seismology	23
	H. Ecology	23
	1. Forestry	23
	2. Biodiversity	23
	3. Biosphere reserves	26
	4. Fishery	30
	I. Socio-economic	31
	1. Social and cultural development	31
	2. Land use and land use pattern	32
	J. Health	32
	K. Literacy	33
	L. Cultural and archaeological resources	34
	M. Economic development	35
	1. Transportation and communication	35
	2. Industrial development	36
	3. Agriculture, forestry and fishery	37
	N. Fisheries	40
	O. Energy and electric power potential	41
	P. Aesthetic and tourism	41
<b>V</b>	<b>ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>	42
	5.1 Negative impacts related project location, preliminary planning and Design	42
	A. Impact and mitigation measure during planning and design phase	42
	B. Impacts during construction phase	42
	a. Impacts on the physical environment and mitigation measures	43



	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.	43
	ii. Impacts on water quality	43
	iii. Disfiguration of landscape by road embankments, cuts, fills and quarries.	43
	iv. Loss of productive soil	44
	v. Compaction and contamination of soil	44
	b. Impacts on environmental quality	44
	i. Increase in local air pollution due to rock crushing, and filling works and chemicals from asphalt processing.	44
	ii. Noise and vibration from civil works	45
	C. Impacts on the socio-economic	46
	i. Encroachment on historical and cultural areas	46
	ii. Impacts on occupational health and safety	46
	iii. Impacts on community health and safety	46
<b>VI</b>	<b>INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION</b>	<b>48</b>
	A. Public participation during the preparation of the IEE	48
	B. Future consultation and disclosure	49
	C. Consultation during detailed design	50
	D. Consultation during construction	50
	E. Public disclosure	50
	F. Project disclosure	51
<b>VII</b>	<b>ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM</b>	<b>52</b>
	A. Environment management plan	51
	B. Institutional arrangement	51
	I. UEAP, SDMA (PMU)	53
	II. UEAP, IA, FPIU	53
	III. The Engineer (DSC)	54
	IV. Environmental expert of engineer (DSC)	54
	V. The Contractor	54
	C. Environmental monitoring programme	83
	D. Performance indicators	83
	E. Grievance Redress Mechanism	84
	F. Environmental budget	86
<b>VIII</b>	<b>CONCLUSION AND RECOMMENDATION</b>	<b>91</b>

## LIST OF TABLES

TABLE	II-1	:	Applicable environmental national and state requirements for UEAP	8
TABLE	III-1	:	Distribution of road sections to be upgraded under UEAP, by hierarchy and length	13
TABLE	IV-1	:	Availability of important minerals (million tonnes)	22
TABLE	IV-2	:	District-wise forest cover, Uttarakhand	24
TABLE	IV-3	:	Predominant top-canopy (tree) species according to altitude	26
TABLE	IV-4	:	Wildlife in Uttarakhand	26
TABLE	IV-5	:	National parks in Uttarakhand	27
TABLE	IV-6	:	Wildlife sanctuaries in Uttarakhand	27
TABLE	IV-7	:	List of major flora	28
TABLE	IV-8	:	List of major fauna	29
TABLE	IV-9	:	Land utilisation in Uttarakhand	32
TABLE	IV-10	:	Demographic Socio-economic and health profile of Uttarakhand state as compared to India figure	32
TABLE	IV-11	:	Health infrastructure of Uttarakhand	33
TABLE	IV-12	:	Transportation of Uttarakhand state.	35
TABLE	IV-13	:	Area under principal crops and productivity in Uttarakhand	38
TABLE	IV-14	:	Ecological sub-regions and altitude-wise major agriculture crops	39
TABLE	IV-15	:	Mode of irrigation and drainage system in Uttarakhand	40
TABLE	VII-1	:	Environmental management and monitoring plan	56
TABLE	VII-2	:	The Performance Indicators and monitoring plans	83
TABLE	VII-3	:	Environmental monitoring for air, water, noise and soil	85
TABLE	VII-4	:	Environmental Budget for Guptkashi Kalimath Kotma Jaal Chaumasi Road	86

## LIST OF APPENDICES

APPENDIX	A	Rapid Environmental Assessment (REA)	92
APPENDIX	B	Public consultation records	97
APPENDIX	C	Site photographs	99
APPENDIX	D	MoEF issued specific guidelines in July 2013 for State of Uttarakhand for expediting forest clearances to carry out the emergency work in forest areas (excluding works in national parks and sanctuaries)	100
APPENDIX	1	Disposal site management	103
APPENDIX	2	Environmental standards	106
APPENDIX	3	Oil inceptors	112
APPENDIX	4	Typical bituminous disposal pit	113
APPENDIX	5	Work safety in common operation and in construction	114
APPENDIX	6	Tree plantation strategy	123
APPENDIX	7	Enhancement measures	127
APPENDIX	8	Guidelines for management of road section through forest area	129
APPENDIX	9	Arrangement of traffic during construction	131
APPENDIX	10	General guidelines for contractor construction water management plan	136
APPENDIX	11	Environmental friendly construction methodology	137
APPENDIX	12	Borrow area management	141
APPENDIX	13	Soil erosion and sedimentation control	145
APPENDIX	14	Locating quarries, rehabilitating quarries and guidelines of stone crushers	146
APPENDIX	15	Storage, handling, use and emergency responses for hazardous chemical	149
APPENDIX	16	Selection and management of construction camp	152

## 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 Guptkashi Kalimath Kotma Jaal Chaumasi existing road sections with a total length of 24.88 Km out of which 18.00 km of Major District Road (MDR) needs to be restored. The key road upgrading components includes restoration of disaster affected roads in hilly terrain to a single lane standard (3.75 m carriageway and 5.95m 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.

Consistent with the Environmental Assessment and Review Framework, Guptkashi Kalimath Kotma Jaal Chaumasi existing road were screened using ADB rapid environmental assessment (REA) checklist-roads. 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 V.
- **Forest.** Uttarakhand is ranked 9<sup>th</sup> in all-India in terms of forest covered area with 24,495 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 16,853 villages in the State and 7,256 gram panchayats. Of the total number of villages, 5,868 are not connected to all weather roads.
- **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 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. 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. 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 sections to be improved are located in forested hilly areas, 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. Re-vegetation of eroded areas will be promoted in coordination with the Forest Department. 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 through 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. of 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 facilitate subsequent compliance monitoring by the contractor.

**Conclusion.** 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 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. As per Indian laws, the proposed subproject does not require an Environmental Clearance.

# 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 neighbouring 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 31929 km. The road network is administered by the PWD and comprises of 1151 km of national highways (NH), 3,788 km of State Highways (SH), 3,290 km of Major District Roads (MDR), 2,945 km of Other District Roads (ODR), 15402 km of Village Roads (VR), and 1773 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. THE 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) 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, Kumaon Mandai Vikas Nigam Limited, and Garhwal Mandai Vikas Nigam Limited are likely to be entrusted with some works under UEAP under these primary IAs.
8. Due to bad weather, continued flooding and landslides, and the inaccessibility of the affected areas, the field visits for preliminary investigation are still not possible. Under these circumstances, the available data and information has been relied upon to prepare this environmental assessment and review framework (EARF). 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. In this sense, the overall project is considered to be 'sector like' in design.

#### **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, and (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.

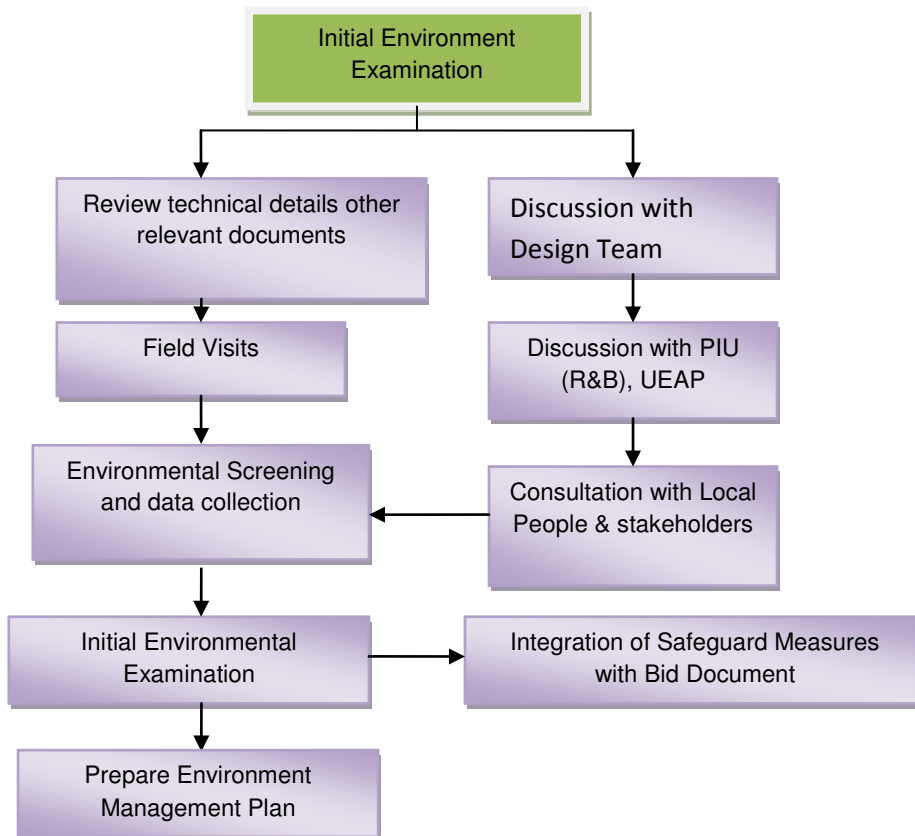


## **E. IEE CONTENT**

12. The IEE has been largely structured as per SPS, 2009 and ADB's Environmental Assessment Guidelines (2003). 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 and Management Plan and Grievance Redressal 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 Guptkashi Kalimath Kotma Jaal Chaumasi motor road and Volume 2 provides detailed good engineering practices in road construction which are referred to in Chapter 5.

## **F. METHODOLOGY**

14. A kick-off meeting for the project was arranged between the technical and engineering team of PIU (R&B), UEAP, Dehradun and Design Consultant in order to get the team members apprised of the project background, present status, approach and methodology to be followed and sources of secondary data / reports for the project roads.
15. The environmental and social team conducted field visit in May 2014 and undertook environmental screening of the project road in accordance with ADB requirements as stipulated in Environmental Assessment Guidelines 2003 and MoEF Notification 006 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 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. 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><b>Category A -i)</b> 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-ii)</b> 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>	<p>State Environmental Impact Assessment Authority (SEIAA). If not constituted then MoEF</p>	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 form 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 iii) MoEF issued specific guidelines in July 2013 for State of Uttarakhand for expediting forest clearances to carry out the emergency work in forest areas (excluding works in national parks and sanctuaries) vide no 11-298/2013-FC Dated 24.07.2013	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 as amended in 1972	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,	Air (Prevention and Control of Pollution) Act 1981	Uttarakhand Environmental Protection and Pollution Control Board, Dehradun	Yes	Contractor	In case Contractor establishes Hot

S. No.	Clearances	Acts/Rules/Notifications/Guidelines Application to Road Projects	and Concerned Agency	Applicable to Contract package	Responsibility	Status of Compliance
	Batching Plant					mix plant, Crushers, Batching plant, Contractor will obtain the consents from appropriate authority or Contractor will 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	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.

<b>S. No.</b>	<b>Clearances</b>	<b>Acts/Rules/Notifications/Guidelines Application to Road Projects</b>	<b>and Concerned Agency</b>	<b>Applicable to Contract package</b>	<b>Responsibility</b>	<b>Status of Compliance</b>
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 Pollution Control Board Dehradun	Yes	Civil Work Contractor	Details to be provided
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. **Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road (MDR)** is one of the roads that connects Kalimath one of the religiously important "Sidth Pith" in district Rudraprayag. This road was badly damaged during this natural disaster. The total length of the motor road is 24.88 Km and the road length to be improved/restored is 18.00 Km. The subproject does not involve core zones of national parks, wildlife sanctuaries and biospheres and the critical habitats. The restoration of damaged road is to be done within Rights of Way.
21. The restoration work of damaged portion of road i.e. Slip clearance in Km 2 to Km 22, reconstruction of damaged retaining wall and breast wall in Km 11 to Km 25, reconstruction of drain, reconstruction of Cross drainage works damaged in Km 4,10 to 22 Repair of damaged Causeways Km 6 to 9, 12, 17 to 19, WBM (G1,G2,G3) in Subsidence portion of Km 1,3,5,8to11,16,17, Road surface damaged (ruts & pot holes) by PC & Seal Coat in Km 1,3,5,8to11,16 to 19, restoration of Traffic sign, markings & appurtenances. These will be constructed as per MORT&H/MORD Specifications.
22. This road subproject connect many villages and after its restoration villages/areas like Guptkashi, Kalimath, Kotma , Jaal , Chaumasi etc. will be well connected with the main stream. This road was used as subway for relief of victims during disaster for traffic diversion of Kedarnath and Rudraprayag area because NH-107 washed out at Augustmuni, Tilwara, Banswara etc. The entire area is known for producing fruits & vegetables. After restoration of this road subproject it will certainly upgrade the economic conditions of the people belonging to the entire area.

#### B. Proposed Category of the Project

23. Pursuant to the requirements of the *ADB Safeguard Policy Statement (2009)* and Operation Manual Bank Policy on Environmental Safeguard of the Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road (MDR) 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 Environmental Assessment and Review Framework, Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road (MDR) was screened using the ADB rapid environmental assessment (REA) checklist-roads and highways for State Highways and district roads.
24. 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.
25. Proposed Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road (MDR) is existing road and no realignments are proposed. All impacts are site specific, few are irreversible and related to minor alignment correction and road repairing, and all impacts can be readily mitigated supporting a Category B classification.

#### C. Key Rehabilitation and Reconstruction Activities

26. Road improvement component will include upgrading of Major district Road in hilly terrain to a single lane standard (3.75 m carriageway and 5.95 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:

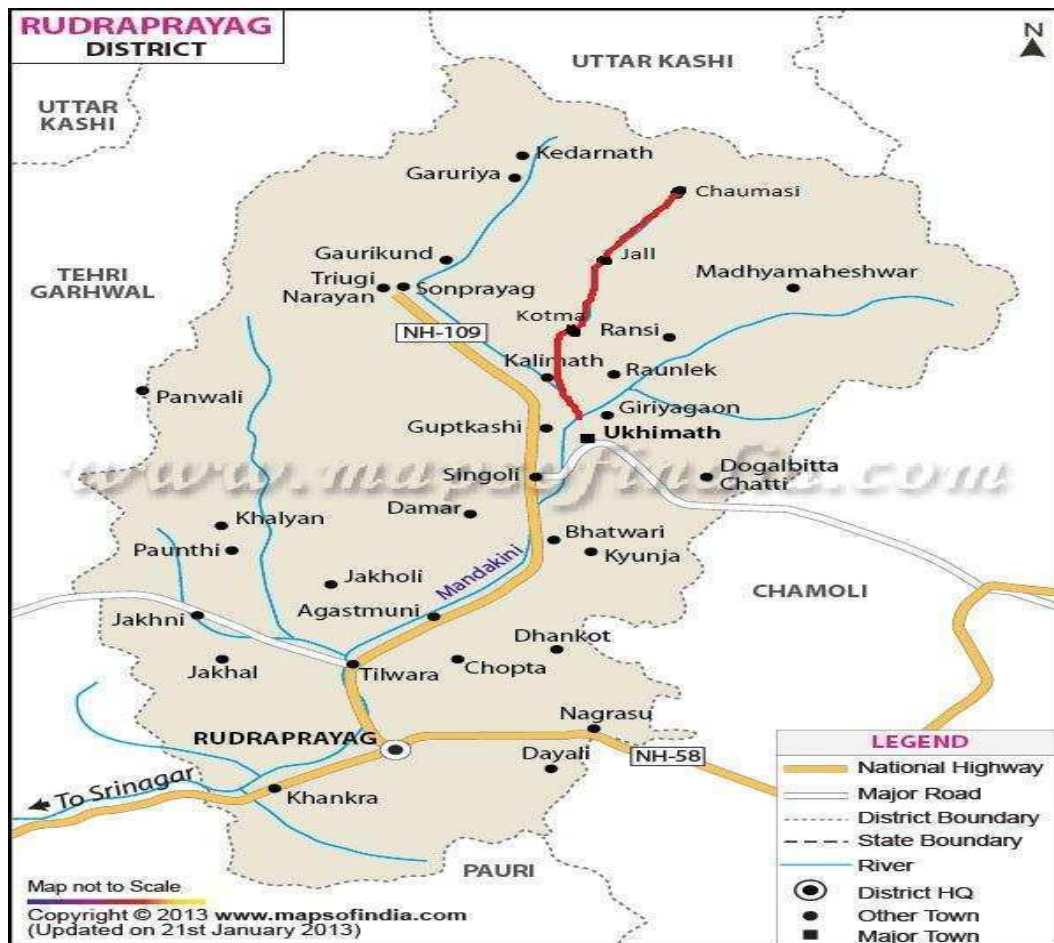
**Table III-1** Distribution of Road Sections to be upgraded under UEAP, by Hierarchy and Length

Name of Road	Category	Nos.	Length (km)
Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road	Major District Road (MDR)	1	18.00
Total		1	18.00

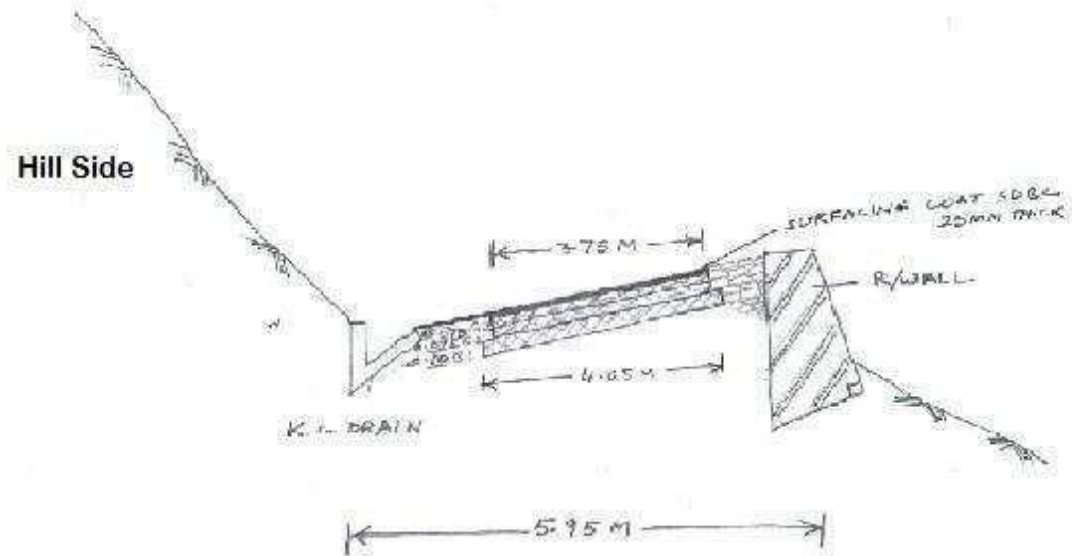
#### D. Project Implementation Schedule

27. The implementation period for the UEAP is around 3 years with a construction period of around 3 years. All UEAP components are expected to be completed by December 2017. The implementation period for affected 18.00 km road is 15 months.

### Map/Site Plan GUPTKASHI KALIMATH KOTMA JAAL CHAUMASI MOTOR ROAD (MARK IN RED COLOUR)







**Typical Road Cross Section**

## IV. DESCRIPTION OF THE ENVIRONMENT

### A. PHYSICAL ENVIRONMENT

28. 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.

#### 1. Geography

29. 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 1.01 crore as per census 2011.
30. The district well connected through road to all the major hill towns. Administratively the district is divided into 3 Tehsils and 3 development blocks namely Agustmuni, Jakholi and Ukhimath.
31. Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road (MDR) is located at 30.56°N 79.08°E. It has an average altitude of 1800 m above mean sea level.
32. **GUPTKASHI KALIMATH KOTMA JAAL CHAUMASI MOTOR ROAD. (MDR)** is one of the most important roads in district Rudraprayag and was also badly damaged during this natural disaster. The total length of the motor road is 24.850 Km out of which affected road length is 18.000 Km.
33. The restoration work of damaged portion of road includes Slip clearance in Km 2 to Km 22, reconstruction of damaged retaining wall and breast wall in Km 11 to Km 25, reconstruction of drain, reconstruction of Cross drainage works damaged in Km 4,10 to 22 Repair of damaged Causeways Km 6 to 9, 12, 17 to 19, WBM (G1,G2,G3) in Subsidence portion of Km 1,3,5,8to11,16,17, Road surface damaged (ruts & pot holes) by PC & Seal Coat in Km 1,3,5,8to11,16 to 19, restoration of Traffic sign, markings & appurtenances. These will be constructed as per MORT&H/MORD Specifications.
34. This road subproject connect many villages and after its restoration villages/areas like Guptkashi, Kalimath, Kotma , Jaal , Chaumasi etc. will be well connected. This road was used as subway for relief of victims during disaster for traffic diversion of Kedarnath and Rudraprayag area because NH-107 washed out at Augustmuni, Tilwara, Banswara etc. The entire area is known for producing fruits & vegetables. After restoration of this road subproject it will certainly upgrade the economic conditions of the people belonging to the entire area.

## 2. Geology

35. 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 geosynclinal Tethys sea. The probable date of the commencement of the elevation of the Himalayas is about the close of the Mesozoic period, but the unraveling of the story of their structure has only just begun, 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. The section of the range in the district is deeply cut into by the headwaters of the Alaknanda river, this trunk stream seeming to have reached a latter stage of development than its tributaries. This much, however, is known that there has been intense metamorphism. In some parts uplift has been considerable since the mid-pleistocene period, in others there are great stretches of high but subdued topography and elsewhere there are the deepest gorges.
36. Geologically, Rudraprayag district comprises of diverse rock types ranging in age from Palaeoproterozoic to Mesoproterozoic in age. The rock succession exposed in the district mainly falls in two groups namely,
1. The rock sequences exposed between Main Boundary Fault (MBF) and Main Central Thrust (MCT) – Constituting the Lesser Himalaya
  2. The rock sequences exposed to the north of Main Central Thrust (MCT) – Constituting the Higher Himalaya
37. The rock sequences exposed between Main Boundary Fault (MBF) and Main Central Thrust (MCT) in Rudraprayag district are of Mesoproterozoic Period and are exposed at different structural levels and individually occupy very small areas.
38. Regionally metamorphosed rocks, along with granitoids occur as Klippen, over the sedimentary sequence, towards south of Main Central Thrust (MCT) in the district. The Central or Higher Himalayas in Rudraprayag district consists of metamorphosed rock sequences of Palaeoproterozoic age and are of green schist to amphibolite facies.
39. The rock sequences of Higher Himalaya and most of the Lesser Himalaya are mainly of :
- Proterozoic age.** Lithologically these sequences are regionally metamorphosed rocks emplaced by granitoids of various ages and weakly metamorphosed to unmetamorphosed sedimentaries comprising of quartzites with interbedded volcanics, carbonate rocks associated with slate, quartzite and shale. The ages of regionally metamorphosed sequence is not well known and has been inferred by the ages of intrusive granitoids. The generalized Stratigraphic succession of rocks exposed in Rudraprayag district is given in following:

**Rocks of Palaeoproterozoic (2500 – 1600 Ma) Period:** The metamorphic rocks associated with granites, gneisses and migmatites have been referred as Central Crystallines in the Himalayan Region. Generally, these Crystallines occurs as thrust sheets over metasedimentaries of Lesser Himalaya in varied tectonic setting. South of Main Central Thrust (MCT), the crystalline rocks occur in two settings –

- 1) Bounded by the Main Central Thrust (MCT) on the north and thrust over the sedimentaries of Garhwal Group and
- 2) As a Klippe occurring over the rocks of Garhwal Group.

**Rocks of Mesoproterozoic (1600 – 1000 Ma) Period:** The Period is characterized by extensive development of quartzite with penecontemporaneous volcanic flows and carbonates. The section is well exposed in the inner part of the Lesser

Himalayas –the belt bounded by North Almora Thrust in the south and Main Central Thrust in the north. The basal quartzite metavolcanic group is known as Rudraprayag Formation locally in Rudraprayag area and consists of Garhwal Group of Volcanics.

**Granitoids of Mesoproterozoic Period:** The granitoids of Rudraprayag district occur at different tectonic levels. Granitoids emplaced in the regionally metamorphosed rocks commonly known as Crystallines of Proterozoic age occur as Klippe in the Lesser Himalayan Zone locally known as Volcanics of Garhwal Group. Granitoids also occur associated with volcanic sedimentary sequences, emplaced in the rocks of Garhwal Group such as Chandrapuri Granite of age 1595 Ma (Pandey, 1981).

**Central Crystallines:** The Central Crystallines from the basement of Martoli Group and Tethyan Sediments. Central Crystallines probably represent the oldest rocks exposed in Higher Himalaya and thrust over the rocks of Lesser Himalaya along the Main Central Thrust (MCT). These are the metamorphic rocks associated with granites, gneisses and migmatites.

The generalized Stratigraphic succession of rocks exposed in Rudraprayag district is given below.

Age		Formation	Lithology
Mesoproterozoic	GARHWAL GROUP	Basic Volcanics of Garhwal Group	Biotite granite
		Rautgara Formation	Quartzite interbedded with purple green mottled slate and calcareous phyllites
		Intrusive Granitoids of Chandrapuri (Plutonic Igneous Rocks)	Tourmaline biotite granite, microcline, plagioclase and quartz
	Agastmuni Formation		Schist, schistose quartzite and dolomite
Palaeoproterozoic		Bhilingana Formation	Quartzites, schists, granite gneisses, carbonaceous phyllites & metapeltic rocks.
-----MAIN CENTRAL THRUST-----			
Palaeoproterozoic		Central Crystallines	Metamorphosed rocks associated with granites, gneisses and migmatites

**Bhilingana Formation:** The Bhilingana Formation is bounded by Main Central Thrust on the north and consists of quartzite schists and granite gneisses. It is thrust over the rocks of Garhwal Group. This formation also includes quartzite, schist, carbonaceous phyllites, limestones and some metapeltic rocks.

**Agastmuni Formation:** It is the name given to schist, schistose quartzites and thin bands of dolomite exposed in the Mandakini valley. The metamorphosed sequence of orthoquartzite, slates with penecontemporaneous flows has been emplaced by the Chandrapuri gneisses. Many workers consider the Agastmuni Formation as the base of Garhwal Group.

**Rautgara Formation:** The Rautgara Formation is well exposed along the Srinagar – Rudraprayag section in the Alaknanda valley. Its the name given to a sequence of massive cream coloured, purplish and brownish fine grained quartzite interbedded with purple green mottled slate and calcareous phyllites exposed in Saryu valley of

Pithoragarh district by Valdiya (1962). The Rautgara Formation is best developed and mapped by Gopendra Kumar and Agarwal (1975) in the Alaknanda valley.

**Granitoids of Chandrapuri:** These intrusive granitoids of plutonic origin are best exposed in Chandrapuri area of Rudraprayag district. The granitoid is mainly of tourmaline biotite granite and is made up of hypidiomorphic granular aggregate of feldspars (microcline and plagioclase) and quartz with subordinate greenish biotite.

**Volcanics of Garhwal Group:** The granitic intrusive in the Grahwal Group is of Biotite granite type and intrudes the Rautgara Formation towards west of Tilwara. The volcanics are composed of very coarse grained, non-foliated, rich in biotite and generally porphyritic. They are also exposed in Pokhri area of Rudraprayag district.

### 3. Physiography

40. 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. Uttarakhand consists of 13 districts viz., Pithoragarh, Almora, Nainital, Bageshwar, Champawat, Uttarkashi, Udham Singh Nagar, Chamoli, Dehradun, Pauri, Tehri Garhwal, Rudraprayag and Haridwar. The project roads fall in Western Himalayas Physiographic Zones.
41. Physiographically the district, which lies in a region of tectonic or folded and overthrust mountain chains, has strata are structurally marked by complex folds, reverse faults, overthrusts and nappes of great dimensions, all these as well as frequent earthquake of varying intensity give region to believe that the region is still unstable. Although any movement or tremor of the earths crust in the district is not produced by volcanic activity, the Chaukhamba peak a pair to be the crater of an extinct volcano.

### B. PEDOLOGY

42. The soils are natural, dynamic, heterogeneous, non-renewable resource, which support plant and animal life. The tract of Rudraprayag district consists of outward succession of ridges viz; Greater Himalaya and Lesser Himalaya of decreasing height. These hills posses very little level land. The soils have developed from rocks like granite, schist, gneiss, phyllites, shales, slate etc. under cool and moist climate.
43. Very steep to steep hills and Glacio-fluvial valleys are dominantly occupied with very shallow to moderately shallow excessively drained, sandy-skeletal to loamy-skeletal, neutral to slightly acidic with low available water capacity soils. They have been classified as Lithic/Typic Cryorthents. These soils are in general under sparse vegetation. Soil types of Rudraprayag district as follows:

S. No.	Soil type	Characteristics
1.	Brown forest soil and residual sandy loam	Acidic, rocky, stone and gravel and poor moisture regime

44. The baseline data on soil quality will be generated by the contractor before commencement of construction works.
45. The proposed locations of soil quality monitoring at pre construction stage (baseline data) are as follows as per CPCB guideline monitoring location as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling locations
1	Guptkashi Kalimath Kotma Jaal Chaumasi	2	Kotama and Chaumasi

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

### C. CLIMATE AND METEOROLOGY

47. The State of Uttarakhand, with its highly varying topographical features, has shown an equally variegating 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.
48. 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.
49. 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.
50. The climate of Rudraprayag district according to Central Ground water board varies from Sub-tropical monsoon type (mild inter, hot summer) to tropical upland type (mild winter, dry winter, short warm summer). The northern, northwestern, northeastern and western part of the district is perennially under snow cover; here the climate is sub-arctic type as the area is represented by lofty Himalayan Range. Severe winter and comparatively higher rainfall are the characteristic features of the northern part. The year may be divided into four seasons viz. the cold winter season, (December to February), the hot weather season (March to May), southwest monsoon season (June to September) followed by post monsoon season (October to November).
51. Larger part of the district is situated on the southern slopes of the outer Himalayas, monsoon currents can penetrate through trenched valleys, the rainfall reaches its maximal in the monsoon season that spans between June to September. Rainfall, spatially, is highly variable depending upon the altitude. In the Lesser Himalayan Zone (1000-3000m amsl) maximum rainfall occurs about 70 to 80% in southern half. August is the rainiest month. Rainfall rapidly decreases after September and it is the least in November. About 55 to 65% rainfall occurs in the northern half in Central Himalayan Zone. About 17% of the annual precipitation occurs in winter season. The winter precipitation is in association with the passage of the western disturbances and is mostly in the form of snowfall, particularly at higher elevations. The precipitation during the pre-monsoon month, which is about 7% of the annual total and the post-monsoon months, is frequently associated with thunderstorms. In the southern part of the district at Rudraprayag the average annual rainfall is around 1220.18mm while in the central part at Chandrapuri the average annual rainfall is 1750.9mm and the rainfall in the northern part at Okhimath is 1995mm. The overall average rainfall in the district is 1485mm.

### D. AIR AND NOISE QUALITY

52. Main source of air pollution in Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road is traffic except natural sources of pollution like pollen grains of forest. The

construction activities will also impart dust and will be mitigated by implementing environmental management plan. The town and villages does not have any pollution monitoring mechanism. So no previous data is available. However, as per observation and feedback from the residents, the air quality is good. Before commencement of construction, the contractor will generate baseline ambient air quality data of PM10, PM2.5, SO2, NOX etc. The sampling locations for the baseline data will be representative of residential area, commercial area, open area, congested area.

53. The baseline data on ambient air quality will be generated by the contractor before commencement of construction works.
54. The proposed locations of air quality monitoring at pre construction stage (Baseline data) are as follows as per CPCB guideline monitoring location as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling locations
1	Guptkashi Kalimath Kotma Jaal Chaumasi	4	Kabiltha village, Kotma, Jaal and Near Kalimath Temple

55. As reported and observed the overall ambient noise level is calm, however, before commencement of construction, the contractor will generate baseline ambient Noise level data of equivalent noise level of day time, night time and day-night.
56. Noise level monitoring is not conducted in the Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road; however the overall ambient noise level is calm. Before commencement of construction, the contractor will generate baseline ambient Noise level data of equivalent noise level of day time, night time and day-night. The sampling locations for the baseline data will be representative of residential area, commercial area, open area and congested area.
57. The baseline data on Noise quality will be generated by the contractor before commencement of construction works.
58. The proposed locations of noise quality monitoring at pre construction stage are as follows as per CPCB guideline monitoring location as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling locations
1	Guptkashi Kalimath Kotma Jaal Chaumasi	2	Near Govt. Inter College Kotma and Near Kalimath temple

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

## E. HYDROLOGY

60. The river Mandakini, which is the most important river coming down from the slopes of Kedarnath peak, joins the Alaknanda (the Alaknanda originates at a height of 3641 metres below Balakun peak 16 kms. upstream from Adrinath.) at Rudraprayag. The river actually originates from the springs fed by melting snow of Charabari glacier about one km above Kedarnath temple. Mandakini is itself fed by Vasukiganga, which meets it at Sonprayag 16 km down-stream from Kedarnath.

61. The fact is that the main river of the Himalaya are older than the mountains they traverse. This is why they flow right across the axis of the ranges through deep gorges carved out by the river themselves. All the rivers of the district are snow fed. As the water levels of the rivers are much below the arable land levels, the rivers cannot be generally used for irrigation purposes.

### 1. Water drainage

62. The main drainage patterns are dendritic, sub-dendritic, trellis, sub-rectangular and rectangular. The major rivers are Alaknanda, Mandakini are of antecedent type, where the drainage in the structurally disturbed area of subsequent type.

### 2. Water quality

63. The entire Rudraprayag district is having predominantly rural population. The villages are scattered over the hill slopes and valleys. The rural population depends upon the springs, perennial streams and rivers for their domestic and irrigational requirements. The water supplies in the villages are inadequate and at several places the sources are far from the inhabitation, which causes great hardship to villagers. However, some efforts are being made by state agencies, local bodies such as Jal Nigam, Swajal Yojna, Gram Sabha to facilitate the water supply by constructing bore wells (shallow tube wells) and installing hand pumps in the district and tapping the source of spring at higher reaches and supply the water in the different villages through gravitational method. In the area where low discharge springs/seepage occur, the water collection tanks are constructed at the higher altitudes and after collecting the water in storage tank it is supplied to the villages at lower altitudes. Many such type of schemes have been made by the state agencies in the district.

64. The drinking water supply is made in rural as well as in urban area of Rudraprayag district through tapping 275 springs /gadheras and 67 Nos. of hand pumps made by Uttaranchal Jal Sansthan and Uttaranchal Pey Jal Nigam

65. The baseline data on Water quality will be generated by the contractor before commencement of construction works.

66. The proposed locations of water quality monitoring in pre construction stage are as follows as per CPCB guideline monitoring location as follows:

S. No.	Name of the Motor Road	No. of Samples	Sampling locations
1	Guptkashi Kalimath Kotma Jaal Chaumasi	4	Kabiltha village, Kotma, Jaal and Near Kalimath Temple

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

## F. MINERAL RESOURCES

68. Uttarakhand state is not rich in mineral resources. Moreover, it is also part ecologically sensitive area, extensive quarrying is not practiced in the state. However, there are some mineral sparsely distributed in the state. It includes limestone, Gypsum, Iron Ore, Graphite and Copper.

69. 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-2. 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>)

70. The minerals that are found in the district are the following-

**Asbestos**-This is of the amosite variety and can be used for the production of asbestos, cement bricks, laboratory asbestos sheet and paper, but is not considered to be of economic importance.

**Magnestic** - This is of an average quality is crystalline in nature, and is found associated with crystalline dolomites and sometimes with soapstone. The Magnesium carbonate found here is also of average quality and its mineralisation has also been reported to occur in the district.

**Soapstone or Steatite** - This white saponaceous stone resembling pipe clay is obtained in as lenticular body and is associated with mineral pyrites, which adds a color to it, and in places with magnesite. it can be mined for use as filler in soap and in the cosmetic industries. In the past various utensils were made of it which, when polished, had the appearance of marble.

**Copper** - The copper mines in the district are extensive and of reputed during the period of Hindus and The Gorkhas rules. All the rich mines have since being exhausted and at present they do not offer a fair field for the employment of capital.

**Iron** - Small and sporadic occurrence of iron are known to occur in several parts of district but are of hardly any economic important. Iron ore, rich in haematite, and magnetic ore, with haematite and siderite, also occur in the district.

**Graphite** - In the past this mineral, also known as plumbago, found mostly in patti Lohba, was used as a dye but no large deposits have been noticed for a long time.

**Gypsum** - This mineral is found on the bank of some river and was used in the past for the manufacture of saucers and bowls .when ground to a fine powder it is known as Plaster of Paris and can be used for a number of purposes.

**Lead** - Deposits of this metal were fairly numerous in the past but it is found in somewhat inaccessible places and has long since ceased to be worked.

**Slate** - This dense, fine grained metamorphic rock, which is produced from a fine clay, can be split into thin, smooth plates and is quarried throughout the district. It is suitable for roofing purposes, the thin dark blue slates being somewhat inferior in quality.

**Building Stone** - Stone which can be used for building purposes is available in most parts of the district. Sand stone is found in abundance in the lower hills. Gneiss and chlorite schists which are available throughout the district are frequently used for building purposes.

**Sulphur** - This yellow mineral, also known as brimstone is found in the district as green sulphate of iron and is obtainable from iron pyrites and copper mines, its

presence being characterised by a small as of rotten eggs. Sulphur springs also occur in many parts in the district.

**Bitumen** - The brownish white natural sulphate of alumina known as Shilajit is found in rocks at a fairly high altitude and occur in small lumps which generally have an admixture of red sand and micaceous stone embedded in them. It is used in Ayurvedic medicine and during the season when there is an influx of pilgrims, it fetches good income to those who deal in it.

71. Some other minerals found in the district are Antimony, Arsenic, Lignite or Brown Marble, Mica and silver.

## G. SEISMOLOGY

72. The main tectonic elements of the region include the (i) central thrust and (ii) boundary fault. Several NE-SW lineaments are also known from the area and these traverses across different tectonic zones.
73. Seismically, 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 V. The modified mercalli intensity broadly associated with the zone V is IX. The succeeding Figure shows the seismic zones of India.

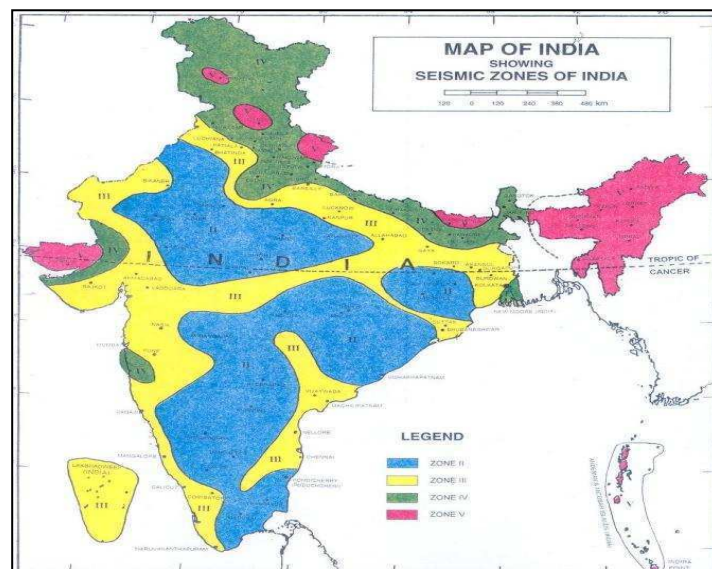


Figure IV-1  
Seismic Zone of India

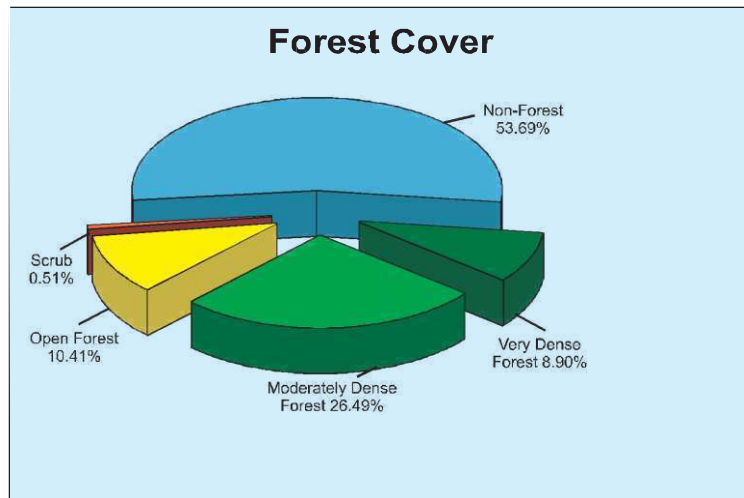
## H. ECOLOGY

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).

### 1. Forestry

75. According to The India State of Forest report 2011, the recorded forest area of the Uttarakhand state is 34,651 km<sup>2</sup> which constitutes 64.79% of its geographical area. Reserve forests constitute 71.11%. Protected Forests 28.52% and Unclassed Forests constitutes 0.35% of the total forest area.

Figure H-1. Forest Cover by State, 2011.



76. The distribution of forest cover by district is presented in the succeeding Figure and Table. The Garhwal region has more forest cover with 14,626 km 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.

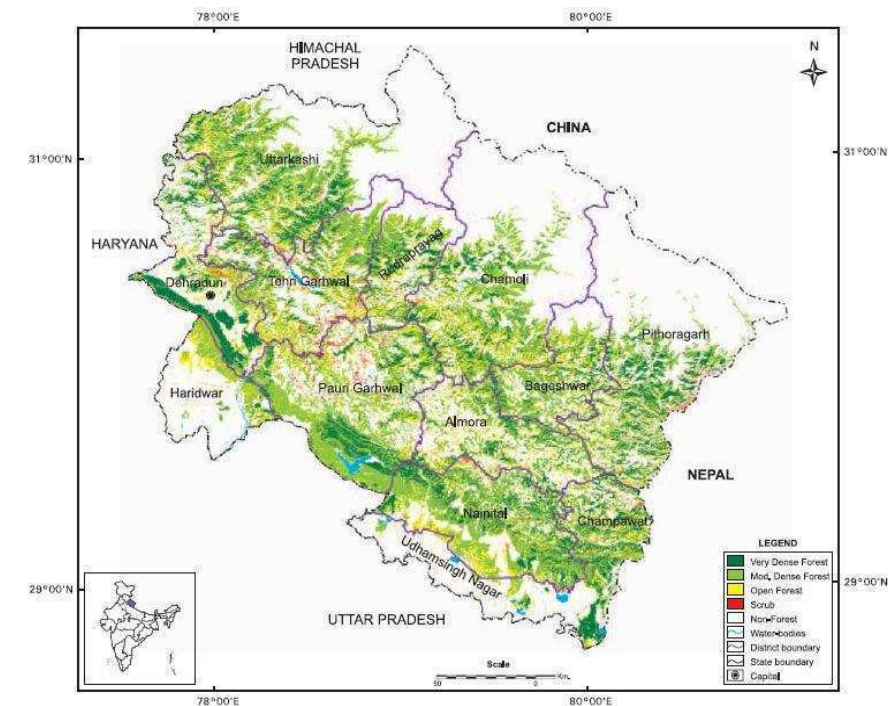


Figure IV-3. Uttarakhand's Forest Cover Map

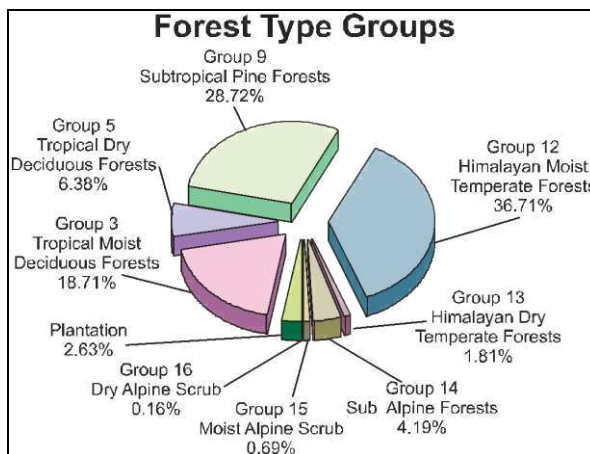
Table IV-2. District-wise Forest Cover, Uttarakhand

Region	District	Geographic Area	Forest Cover			Total Forest 2007	% of Total 2007
			Very Dense	Moderate Dense	Open Forest		
Garhwal	Uttarkashi	8,016	567	1959	619	3145	39.23
	Rudraprayag	1,984	246	581	298	1125	56.70

Region	District	Geographic Area	Forest Cover			Total Forest 2007	% of Total 2007
			Very Dense	Moderate Dense	Open Forest		
	Chamoli	8,030	427	1,586	682	2695	33.56
	Pauri Garhwal	5,329	523	2,094	672	3289	61.72
	Tehri Garhwal	3,642	298	1,232	617	2147	58.95
	Dehradun	3,088	584	695	328	1,607	52.04
	Haridwar	2,360	26	354	238	618	26.19
Sub-Total		32,449	2,671	8,501	3,454	14,626	<b>46.91</b>
Kumaon	Pithoragarh	7,090	567	1,115	412	2,094	29.53
	Bageshwar	2,246	194	883	304	1,381	61.49
	Almora	3,139	222	928	427	1,577	52.04
	Nainital	4,251	601	1,919	573	3,093	72.76
	Champawat	1,766	336	571	274	1,181	66.87
	Udham Singh Nagar	2,542	171	248	124	543	21.36
Sub-Total		21,034	2,091	5,664	2,114	9,869	<b>50.38</b>
<b>Grand Total</b>		<b>5,3483</b>	<b>4,762</b>	<b>14,165</b>	<b>5,567</b>	<b>24,496</b>	<b>48.65</b>
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%						

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 eighth 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-4. 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.

**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

## 2. Biodiversity

79. 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

Sl. No.	Protected Areas	Year	Unit	Statistics
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

80. 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.

81. 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	Garhwal
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

82. 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

1. \_\_\_\_\_

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

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. Some important information about wildlife of Uttarakhand is given in the Table below.

**Table IV-7. List of Major Flora**

<b>Sr No</b>	<b>Local Name</b>	<b>Scientific Name</b>
<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 diphyre</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 antidysentric</i>
7.	Bajradanti	<i>Potentilla fulgens</i>
8.	Banfasa	<i>Viola surpans</i>
9.	Bach	<i>Acorus calamus</i>
10.	Nakol	<i>Urtica dioica</i>
11.	Patyura	<i>Pteracanthus angustifrons</i>
12.	Dudhia	<i>Taraxacum officinale</i>
13.	Vatula	<i>Flemingia fruticulose</i>
14.	Belmur	<i>Flacourtia indica</i>
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>

Sr No	Local Name	Scientific Name
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**

Sl. 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>
<b>Birds</b>		
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 macromynchos</i>
19	Saat Bahen	<i>Teyrdoides striatus</i>
20	Neelkanth	<i>Garrulus Lanaclatus</i>

### 3. Biosphere reserve

83. 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 Zanskar 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

84. 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).
85. 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, Grepe, 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*.
86. 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.
87. 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.

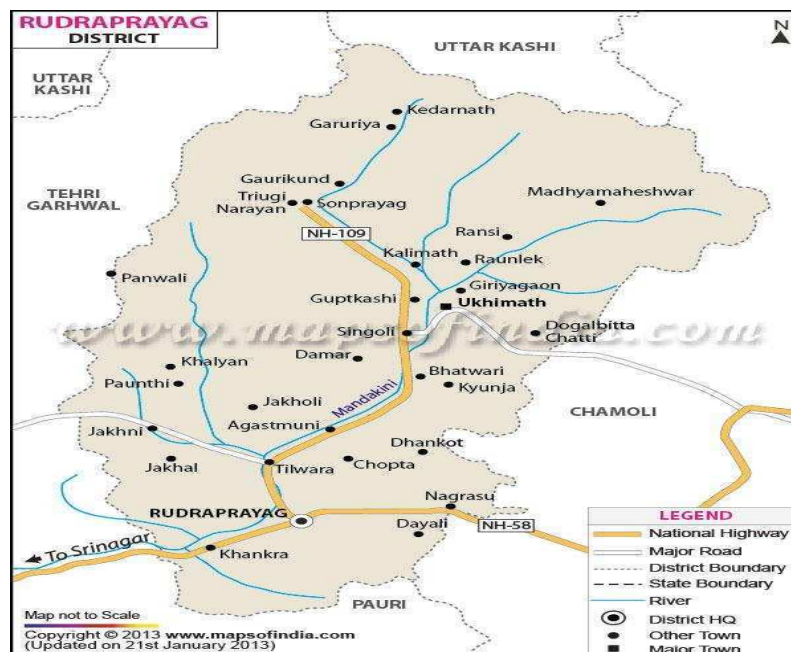
#### 4. Fishery

88. 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.

### I. Socio-economic

#### 1. Social and cultural development

89. 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.



90. 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.

91. In 2011, Rudraprayag had population of 2,42,285 of which male and female were 114,589 and 127,696 respectively. In 2001 census, Rudraprayag had a population of 227,439 of which males were 107,535 and remaining 119,904 were females. Rudraprayag District population constituted 2.40 percent of total Uttarakhand population. In 2001 census, this figure for Rudraprayag District was at 2.68 percent of Uttarakhand population.

## 2. Landuse and landuse pattern

92. 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.
93. 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 & Un-culturable 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

94. The Infant Mortality Rate is 38 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. Demographic, Socio-economic and Health profile of Uttarakhand State as compared to India figures**

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

Indicator	Uttarakhand	India
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

#### a. Health Infrastructure of Uttarakhand

**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	45
Pediatricians at CHCs	59	20	39
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

95. Average literacy rate of Rudraprayag in 2011 were 81.30 compared to 73.65 of 2001. If things are looked out at gender wise, male and female literacy were 93.90 and 70.35 respectively. For 2001 census, same figures stood at 89.81 and 59.57 in Rudraprayag District. Total literate in Rudraprayag District were 170,933 of which male and female were 91,803 and 79,130 respectively. In 2001, Rudraprayag District had 141,078 in its district.

#### L. Cultural and Archeological resources

96. 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, Shravan Mela (Jageshwar), Kartik Poornima at Dwarahat, Kasar Devi fair, and Nanda Devi melas.

97. Living in the mountains mostly in places that are not easily accessible the people of the district have been able to preserve their culture, folklore, folksongs and folkdances, the last, a distinctive feature of the district, being seasonal, traditional and religious, some of the better known being described below -
98. The Thadiya dance, which is accompanied by song, is performed on Basant Panchami, the festival celebrating the advent of spring, the Mela, another dance, is performed on Deepawali and the Pandava during the winter after the harvesting of the crop and depicts the principal events of the Mahabharata. Other folk dances are Jeetu Bhagdawal and Jagar or Ghariyali. These dances enact mythological stories, the participants, both men and women, put on their traditional colorful dress and dance to the tune of drums and Ransinghas. Another dance performed during the fairs and accompanied by song is the Chanchari in which both men and women participate.
99. Folk songs are usually traditional and are sung particularly by the woman, who works very hard in the fields from morning till night in all kind of weather. During the month of Chaitra the women of the village gather at a central place and sing traditional song which generally relates deeds of heroism, love and the hard life which they have to lead in the hills. In the district, fairs, festivals, religious and social gatherings are the main occasions for recreation and amusement. On special occasions people arrange Swangs (open air dramatic performances) particularly depicting scenes or legends connected with Shiva and Parvati.
100. The houses in the district have not been built according to any town planning scheme but have been built haphazardly in clusters on level ground at places where water springs are accessible or on the bank of the river in the valley. The houses are built of stones and are generally double storeyed, a few having three to five storeys, the very low rooms on the ground floor, which are usually 1.8 mtrs. high being used for housing the cattle. Each house has in front of it a courtyard called a Chauk. A mud or stone staircase or a wooden ladder leads to the upper storey, the roof being of wood. The height of the upper storey is generally 2.1 mtrs. and the roof is usually a sloping structure of timber covered with Patals (quartzite slabs), the well off use corrugated galvanized iron sheets. Generally the upper storey has a Verandah in front of the upper rooms.
101. The houses in the higher regions are two to three storeyes with balconies all round and paved courtyard in front where people do their threshing, weaving, spinning and other household works. A few houses have five or six storeyes, the topmost being used as the kitchen. At times the cattle sheds are made at some distance from the villages. The houses are built in rows of half a dozen or so and strikingly picturesque in their fort like appearance.
102. The staple grains consumed by the people of the district are wheat, rice, maize, mandua and jhanjora, the last three being coarse grains generally eaten by the poorer sections. The pulses consumed are urad, gahat, bhatt, soontha, tur, lopia and masor. The Hindus of the district mostly vegetarian by habit and preference and although the Muslims, Christians and Sikhs are generally non vegetarian, those not able to afford eating meat daily due to want of fund or local unavailability often resulting to a vegetarian diet.
103. There is no Archaeological Survey of India (ASI) listed heritage sites within the study area. There are few small temples/ shrines located along the sub projects corridor, but none of them will be affected.

## **M. Economic development**

### **1. 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 2012-13 Uttarakhand has a total road network of 37,486.92 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. PWD is the principal agency responsible for the management of roads in the State. As per PWD records following table given the scenario of roads of the Uttarakhand state.

**TableIV-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>			
	(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

## 2. 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.

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.
109. Main and traditional business of the state is, Handicrafts, Handlooms, Wool Based Industry, Khadi and Village Industries. Hydro Power, tourism are the backbone of economic development in the state. No recognizable industry is located along the project corridor.

### **3. Agriculture, Forestry and Fishery**

110. 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.
111. 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.
112. 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.
  7. 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.

Figure IV-5. Agricultural Map of Uttarakhand State



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 are Wheat (*Triticum aestivum*), Paddy (*Oryza sativa*), Sugarcane (*Saccharum officinarum*) etc.



**Table IV-13. Area under Principal Crops and Productivity in Uttarakhand**

Sl. No.	Items	Year/ Period	Unit	Statistics
<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 Soyabean)	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	

Sl. No.	Items	Year/ Period	Unit	Statistics
	(i) Sugarcane ( <i>Saccharum officinarum</i> )	2011-12	Qtl./Hectare	609.33
	(ii) Onion ( <i>Allium cepa</i> )	2011-12	Qtl./Hectare	55.69

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

Sl. 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 species</i> ) 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 species</i> ), Cheena ( <i>Panicum miliaceum</i> ) and Phaphra ( <i>Fagopyum 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>Fagopyum tataricum</i> ) Chaulai ( <i>Amaranthus species</i> ), Kauni ( <i>Setaria etalica</i> ) Ogal ( <i>Fagopyrum esculentum</i> ) and Uva Jau ( <i>Hoyleum himalayense</i> )

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).
115. The irrigation facility is only available adjoining to rivers in valleys. The cross drainages are required in project roads for durability of strengthening work. The irrigation and drainage system in Uttarakhand is described below.

**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

## **N. Fisheries**

116. 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*, *Labeio calbase*, *Cirrihinus mirigale*, *Clarius*, *batrachus*, *Rita rita*, *Heteropneustus fonilis*, *Notopterus notopterus*, *N. Chitala*, *Macrobrachum rosenbergii*, *M. malconsoni*, *M. Chapral*, *Channa punetatus*, *C. gaehua*, and *C. striatus*.

## **O. Energy and Electric Power Potential**

117. 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.
118. 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**

119. Travellers can also visit another shrine namely Jagdamba Temple located in the close vicinity of the Rudraprayag Temple. Agastmuni Town is also visited by numerous tourists for the Agasteshwar Mahadev Temple. According to legend, Saint Agastmuni mediated in this place for many years.
120. Deoria Tal is an enchanting lake to visit in Rudraprayag. Nestled at an elevation of 2438 m above sea level, this lake offers breathtaking reflections of the Chaukhamba Ranges along with Gangotri, Badrinath, Kedarnath, Yamunotri and Neelkanth peaks. Birdwatching, boating and angling are the popular activities to enjoy here. Visitors can also go to Triyuginarayan, a small village of Rudraprayag, where they can see the ever burning flame of the Havan Kund. According to beliefs, this village was the capital of Himvat, where Goddess Parvati was married to the Lord Shiva in the light of this Havan Kund.
121. The other important tourist sites of Rudraprayag are Guptkashi, Ukhimath, Vasuki Tal, Jakholi, and Tunganath. Tourists can also go to Kalimath, Kartik Swami Temple, Indrasani Mansa Devi Temple, Chandrashila, Maa Hariyali Devi Temple, Koteswar Temple, and Madmaheshwar .
122. So many temples are also situated at Rudraprayag district namely, Kedarnath, Omkareshwar Shiva, Tungnath, Madmaheshwar, Trijuginarayan, Maa Hariyali Devi, Koteswar, Kalimath, Kartik Swami, Chandrashila, Indrasani Mansa Devi tec.

## V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

123. Major district road was 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.** Not a single road section is located inside or near a cultural heritage site, protected area, 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.** 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.
124. 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.

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

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

125. There are no significant adverse environmental impacts during the planning and design phase based on the environmental screening of proposed road sections. Since several road sections to be improved are located in 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 be strengthened through the installation of retaining walls. Revegetation of eroded areas will be promoted in coordination with the Forest Department.
126. 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 prior consent from the SPCB.

#### B. Impacts during Construction Phase

127. 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.
128. 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.
129. 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) turning 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).
130. 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
131. 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 bore wells 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.
132. 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 water bodies. 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.
133. During the improvement works for the sub-project sections and because of the cutting of hill slope, filling, the cutting of trees 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) minimize removal of vegetation and all trees removed will be

compensated at a rate of 1:3 using native species; 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.

134. 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.
135. 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

136. Up-gradation some roads located along agricultural lands may require conversion to minimize the lost of productive soil, all top soil will be collected, stored and re-used turfing works of embankment slopes. All construction camps, labour camps, borrow areas; access roads will be located on barren lands.

v. Compaction and contamination of Soil

137. 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;
138. 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.

**b. Impacts on Environmental Quality**

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

139. 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 or these parameters cause pollution, albeit short term.
140. 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).

141. 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.
142. 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.
143. 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.
144. 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.
145. Periodic air quality monitoring to ensure emissions comply with standards will be conducted. 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 the conducted by the contractor in consultation with the DSC.
146. 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
147. 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.
148. Sources of noise pollution include construction activity, traffic, and heavy equipment operation. Mitigations 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.

149. 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.**

150. No historical or cultural areas will be shifted as a result of the road upgrading. 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.
151. 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**

152. 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, motor pool 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**

153. 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 or road failures such as slides rendering villages inaccessible.
154. 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 travelling 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 signage, 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.

155. 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 labelling 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)
156. 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 16 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.
157. 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**

158. 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.
159. 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.
160. The following methodologies were adopted 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 meetings 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 local consultations are given below:

### Gupkashi Kalimath Kotma Jaal Chaumai Motor Road

**Place:** Near Kalimath temple  
**District:** Rudraprayag  
**Date:** 22/05/2014  
**Participants:** PWD Officials, Villagers, shopkeepers *etc.*



<b>1.</b>	<p><b>Issues Discussed:</b></p> <ul style="list-style-type: none"> <li>• Impact on the local environment, flora and fauna due to construction and strengthening of the road.</li> <li>• Expectation of people for employment generation during construction activity.</li> <li>• Any nuisance or health hazard due to construction activity.</li> <li>• Any impact on any historical, cultural or religious monument.</li> <li>• Any loss of housing/shops, agricultural land and other property or displacement of people fully or partially.</li> </ul>
<b>2.</b>	<p><b>Stakeholder's Response:</b></p> <ul style="list-style-type: none"> <li>• No any major impact on environment, flora and fauna due to construction activity but due care should be taken in cutting the trees and save the ecology.</li> <li>• On this road stretch there are two places where accidental zones cross the road are ear Barakham and Sure Gwel.</li> <li>• Villagers think for better livelihood and overall development, proper road network is necessary.</li> <li>• Villagers want deployment of local village people for local road construction.</li> <li>• Construction activity is not causing any major health hazard.</li> </ul>
<b>3.</b>	<p><b>Recommendations &amp; Suggestions:</b></p> <ul style="list-style-type: none"> <li>• Due care should be taken in selection of trees for cutting and minimum number of trees should be cut to preserve the ecology.</li> <li>• Construction of cross ways for water at places where water come on road in rainy</li> <li>• Season and construction of retaining walls to check land slide.</li> <li>• Efforts should be taken for the generation of employment for local people in construction work</li> </ul>

161. 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**

162. 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**

- 163. 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.
- 164. 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.
- 165. 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**

- 166. 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.
- 167. 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.

**E. Project Disclosure**

- 168. 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.
- 169. 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.



Figure VI-1  
Photographs of shop and roadside Consultations

**F. Project Disclosure**

170. The IEE report will be disclosed in the English language at PMU, 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. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN AND GRIEVANCE REDRESS MECHANISM**

### **A. Environmental Management Plan**

171. 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.

172. 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.

173. 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).

174. 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

175. 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.

176. The succeeding Table presents a standardized EMP to guide the contractors in mitigating environmental impacts.

### **B. Institutional Arrangement**

177. 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.

178. 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.

179. The Safeguard Staff of UEAP SDMA (EA) in PMU & IA will monitor the implementation of environmental covenants with assistance of Engineer (DSC).

180. 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. Redress 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.

181. 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.

182. 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 VII-1

### Environmental Management and Monitoring Plan

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ 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	At green tunnels and trees present at the toe line of	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/ Monitoring
		important trees (religiously important etc.). Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the Forest Dept./MoEF are completed and subsequently a written order is issued to the Contractor. 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. In the event of design changes, additional assessments including the possibility to save trees shall be made. Systematic corridor level documentation for the trees cut and those saved shall be maintained by the UEAP	the carriage way and trees 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	All religious property resources such as shrines, temples and mosques within the project road shall be relocated. No such utilities will be relocated.. 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. 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.	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>						

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
<b>P 7</b>		<b>Field Verification and Modification of the Contract Documents</b>				
P.7.1	Joint Field Verification	The Environmental Specialist of DSC and the Contractor 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.	Throughout the stretch of subproject	MoRTH 201.2	Contractor/ Environmental Specialist of DSC	PMU
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.</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/ Monitoring
		To balance this deficient information boards shall be erected at appropriate locations with a message to "Dust prone area take precautions.				
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	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

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		DSC should include the Request for Inspection form for borrow area approval from the environmental point of view.				
P.8.2	Quarry	<p>Contractor shall finalize the quarry for procurement of construction materials after assessment of the availability of 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>	Quarry sites	MoRTH 111.3	Contractor	Environmental Specialist 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</p>	Throughout the subproject	As per the contract document and Clause No. 1010 EPA, 1986	Contractor	Environmental Specialist of DSC

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		the permission to DSC and UEAP.				
P 9	Sand	The Sand shall be procured from identified statutorily approved sand mines as far as possible. The Contractor shall obtain copy of the Lease Agreement of the supplier and submit to DSC before procuring the sand.	Sand quarries being used for the construction	As per the contract document4	All riverbeds recommended for sand extraction 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	The UEAP shall organize Orientation Sessions and regular	Throughout the	EMP and other	Contractor/	PMU



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
	Implementing Agency and Contractors	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.	implementation period.	training plan developed by UEAP	DSC and UEAP	
<b>CONSTRUCTION STAGE</b>						
<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 (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, PMU
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</p>	All debris disposal sites	MoRTH 202	Contractor	Environmental Specialist and Resident Engineer of DSC, EC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>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> <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</p>				

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>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 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.</p>				
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</p>	All waste disposal sites	MoRTH: 202.5 MoRTH: 301.11	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>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 on account of lack of action on his part.</p>				
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>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>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>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>	At all construction material storage areas	<p>MoRTH: 301.3.2</p> <p>MoRTH: 301.7</p> <p>MoRTH: 305.3.3 and</p> <p>MoRTH: 305.3.9</p>	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		Covering all disturbed areas including borrow areas, only in case where they are to be rehabilitated. Dressing of slopes of road embankment/agricultural fields of farmers acquired temporarily land.				
C.1.5	Accessibility	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. The Contractor shall also ensure that the existing accesses 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.	Throughout the project corridor		Contractor	Environmental Specialist of DSC, PMU
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	Throughout the project corridor especially at intersections and settlements and schools	MoRTH: 112 and its Amendments	Contractor	Environmental Specialist and Resident Engineer of DSC, EO, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		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).				
<b>C.2</b>		<b>Procurement of Construction Material</b>				
C.2.1	Earth from Borrow Areas for Construction	<p>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 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>	All borrow areas	MoRTH: 305.2	Contractor	Environmental Specialist of DSC, PMU
C.2.2	Quarry Operations Crushers	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	At quarries and Crushing units.	MoRTH: 111.3	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		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.				
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 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</p>	Quarry sites	Sub-Clauses of MoRTH 302,4 301.9 (i) 304.5	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		should be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions.				
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 vehicles.</p> <p>Contractor shall arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces.</p>	All roads used for haulage of construction materials	As per IRC guidelines and contract documents	Contractor	Environmental Specialist of DSC, PMU
C.2.5	Construction Water	<p>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.</p> <p>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.</p> <p>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.</p> <p>The Contractor shall take all precaution to minimize the</p>	Throughout the project corridor	Environmental. Protection Act 1986 and MoRTH Spec. for Roads and Bridges	Contractor	Environmental Specialist of DSC, PMU



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		wastage of water in the construction process/operation.				
<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, PMU
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 drainage channels. 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.	Construction sites of cross drainage structures	MoRTH:305.3.7 MoRTH:306	Contractor	Environmental Specialist of DSC, PMU
C.3.3	Siltation of water bodies and degradation of water quality	The Contractor shall not excavate beds of any stream/canals/any other water body for borrowing earth for embankment construction. 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	Construction sites of cross drainage structures	MoRTH:06	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		road. 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.				
C.3.4	Slope protection and control of soil erosion	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. Contractor shall ensure the following aspects: After construction of road embankment, the side slopes shall be covered with grass and shrubs (refer Appendix-7 and 14) as per design specifications. Turfing works shall be taken up as soon as possible 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. 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. Along sections abutting water bodies, pitching as per design specification shall protect slopes.	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, PMU
<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	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.	At all surface water bodies intercepting with the project corridor	MoRTH: 111.4 MoRTH: 111.1	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		Contractor shall not wash his vehicles in river water and shall not enter riverbed for that purpose.				
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 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>	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/CPCB Notifications	Contractor	Environmental Specialist of DSC, PMU
<b>C.4.2</b>	<b>Air Pollution</b>					
C.4.2.1	Dust Pollution	The Contractor shall take every precaution to reduce the level of dust from construction plants, construction sites	Construction sites and	MoRTH:111.1 MoRTH:111.5	Contractor	Environmental Specialist

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>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/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 through the Engineer shall submit required certificates and consents.</p>	construction establishment such as batching plants, hot mix plants	MoRTH:111.9 MoRTH:111.10 Contract Agreement		of DSC, EO, PMU through Engineer
C.4.2.2	Emission from Construction Vehicles, Equipment and Machineries	<p>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.</p> <p>The Contractor shall submit PUC certificates for all vehicles/equipment/machinery used for the Project.</p>	The Air (prevention and control of pollution) Act, 1981 and EPA, 1986	Annexure 'A' to MoRTH 501	Contractor	Environmental Specialist of DSC, PMU
<b>C.4.3</b>		<b>Noise Pollution</b>				
C.4.3.1	Noise Pollution: Noise from Vehicles, Plants and	<p>The Contractor shall confirm the following:</p> <p>All Construction plants and equipment used in construction shall strictly conform to the MoEF/CPCB noise standards.</p> <p>All Vehicles and equipment used in construction shall be fitted with exhaust silencers.</p>	Through out the project corridor and other construction establishments	The noise pollution (regulation and control) rules, 2000	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
	Equipments	<p>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.</p> <p>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.</p> <p>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.</p> <p>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 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> <p>Protective footwear, protective goggles and nose masks to the workers employed in asphalt works, concrete works, crusher etc.</p> <p>Welder's protective eye-shields to workers who are</p>	Throughout the project corridor and construction phase of the	Building and other Construction Workers (regulation of	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>engaged in welding works  Earplugs to workers exposed to loud noise, and workers working in crushing or compaction  The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.  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.  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.  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  The Contractor shall also ensure that paint containing lead or lead products is used except in the form of paste or readymade paint.</p>	project	Employment and Conditions of Services) Act, 1996;		
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.  The Contractor shall ensure that all signs, barricades,</p>	Throughout the project corridor especially at intersections and settlements	MoRTH: 112.4 MoRTH: 112.1 IRC: SP:55	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		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.				
C.5.3	Risk from electrical equipments	The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that – No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights shall be provided to protect the public in construction zones. 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 Expert of DSC.	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 of SC, PIU
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, PMU
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.	Construction sites; labour camps and construction establishments	The Building and Other Construction workers (Regulation of Employment	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/Monitoring
		Equipment and trained nursing staff at construction camp.		and Conditions of Service) Act, 1996		
C.5.7	Informatory Signs and Hoardings	The Contractor shall provide, erect and maintain informatory/safety signs, hoardings written in English and local language (Hindi), 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, PMU
<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 accordance with the plantation strategy suggested.	Throughout the length of project corridor	As per the contract document and MoRTH 301.3.3	Contractor	Environmental Specialist of DSC, PMU
C.6.2	Flora and chance found Fauna	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. 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.	Throughout project corridor especially near forest stretches including surface water bodies		Contractor	Environmental Specialist of DSC, PMU



Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
C.6.3	Chance Found Archaeological Property	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. 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.	Throughout project corridor	The Ancient Monuments and Archaeological Sites and Remains Act, 1958	Contractor	Environmental Specialist of DSC, PMU
C.7.1	Accommodation	Contractor shall follow all relevant provisions of the Building and the other Construction Workers (Regulations of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The location, layout and basic facility provision of each labour camp shall be submitted to DSC and UEAP prior to their construction. The Construction shall commence only upon the written approval of the Environmental Specialist of DSC. The Contractor shall maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the DSC.	Labour camps	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Environmental Specialist of DSC, PMU
C.7.2	Potable Water	The Contractor shall construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing.	Construction site, Labour camp	The Building and Other Construction	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<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> <p>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.</p> <p>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.</p> <p>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.</p> <p>All such wells shall be entirely covered and provided with a trap door, which shall be dust proof and water proof.</p> <p>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>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>		workers (Regulation of Employment and Conditions of Service) Act, 1996		
C.7.3	Sanitation and Sewage System	<p>The Contractor shall ensure that –</p> <p>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</p>	Labour camps	The Building and Other Construction workers	Contractor	Environmental Specialist of DSC, PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
		<p>courses take place</p> <p>Separate toilets/bathrooms, wherever required, Screened from those form men (marked in vernacular) are to be provided for women</p> <p>Adequate water supply is to be provided in all toilets and urinals</p> <p>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.</p>		(Regulation of Employment and Conditions of Service) Act, 1996 MoRTH:114.14		
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, PMU
<b>C.8</b>		<b>Contractor's Demobilization</b>				
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 and 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 and PMU
C.8.3	Clean-up	Contractor shall prepare site restoration plans, which shall	Throughout the	MoRTH 111.9,	Contractor	Environment

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
	Operations, Restoration and Rehabilitation	<p>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.</p> <p>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.</p>	project corridor	111.10 and 111.11		al Specialist of DSC, PMU
<b>C.9</b>	<b>Construction Activities by UEAP</b>					
C.9.1	Tree Plantation	<p>The plantation at the following locations shall be implemented by the UEAP through the State Forest Department; as per Appendix-7 and 8</p> <p>Road side Enhancement sites Forest land Community Forestation</p>	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	The UEAP shall monitor the operational performance of the various mitigation/enhancement measures carried out as a	Throughout the project corridor	As per the contract	PMU	PMU

Sl. No.	Environmental Issue	Mitigation Measures	Approximate location	Reference law/guidelines	Responsibility	
					Planning and Execution	Supervision/ Monitoring
	Performance	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.		document		
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 Areas	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 out once in every three months as suggested in monitoring plan.	Borrow areas and embankment slopes	MoRTH 305.2.2.2 and 306.3	PMU	PMU
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

183. 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

184. 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 VII-2. The Performance Indicators and monitoring plans**

<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 consultation	Target to attend the issues raised in the Public Consultation	Status of compliance to the issues of 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

## E. GRIEVANCE AND REDRESS MECHANISM

185. 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.

186. 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 the Social and Environmental cell, UEAP (Head quarter). This mechanism is non-judicial in nature and does not preclude the affected people coursing 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.

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

Attribute	Parameter	Special guidance	Standards	Frequency	Duration	Location	Implementation
Air	CO, NO <sub>x</sub> , PM10, PM2.5, 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 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.



## F. Environmental Budget

187. 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 VII-4. Environmental Budget for Guptkashi Kalimath Kotma Jaal Chaumasi Motor Road**

S.No	Description	Quantity	Unit	Rate	Amount	Reponsibility
				(in Rs)	(in Rs)	
<b>A</b>	Legislation, permits and Agreements ( Consents to Establish and Operate for plants and machinery of the contractor)					These consents are to be obtained by contractor on own cost
<b>B</b>	Public consultations and information disclosure (Construction phases)		Lump sum	50,000	50,000	FPIU/IA
<b>C Environmental Monitoring (Pre-construction Stage)</b>						
1	Air Quality	4	No	10,000	40,000	Contractor
2	Noise Levels	2	No	2500	5,000	
3	Water Quality	4	No	5500	22,000	
4	Soil	2	No	8000	16,000	
<b>Total Cost</b>					<b>83,000</b>	
<b>D Environmental Monitoring (Construction Stage)</b>						
1	Air Quality	14	No	10,000	1,40,000	Contractor
2	Noise Levels	8	No	2500	20,000	
3	Water Quality	10	No	5500	55,000	
4	Soil	8	No	8000	64,000	
<b>Total Cost</b>					<b>2,79,000</b>	
<b>E Environmental Monitoring (Operation Stage)</b>						
1	Air Quality	6	No	10,000	60,000	FPIU
2	Noise Levels	6	No	2500	15,000	
3	Water Quality	3	No	5500	16,500	
	Soil	6	No	8000	48,000	
<b>Total Cost</b>					<b>1,39,500</b>	
<b>F</b>	Water Sprinkling by Water Tanker at haul road to minimise the dust pollution during construction activities of project road. It has been considered for at least 2 hours/ day for 250 days	500	Hrs	500	<b>2,50,000</b>	Contractor
<b>Total Cost</b>					<b>2,50,000</b>	
<b>G Training/Workshops</b>						
1	EMP Training at site	2		15,000	<b>30,000</b>	Contractor
2	Training on Implementation of EMP for Field PIUs and Engineer	1		50,000	<b>50,000</b>	DSC/FPIU
<b>Total Cost</b>					<b>80,000</b>	
<b>Grand Total (A+B+C+D+E+F+G)</b>					<b>8,81,500</b>	
<b>Grand Total (in Lac)</b>					<b>8.81</b>	

## VIII. CONCLUSION AND RECOMMENDATION

188. The proposed Project has been categorized as Category 'B' based on environmental screening and assessment of likely impacts of proposed road section. 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.
189. The 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.
190. 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.
191. 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
192. 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.
193. 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.

## RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

COUNTRY/PROJECT TITLE: INDIA / UTTARAKHAND EMERGENCY ASSISTANCE PROJECT (UEAP)

SECTOR DIVISION: ROAD AND HIGHWAYS

PACKAGE NO: UEAP/PWD/C9

ROAD SECTION: RESTORATION OF KALSI GUPTKASHI KALIMATH  
KOTMA JAAL CHAUMASI MOTOR ROAD

ROAD CATEGORY: MAJOR DISTRICT ROAD (MDR)

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?		√	The project road is categorized as Major District Road (MDR). The proposed project road forms a portion of the hilly road that starts from an intersection from Guptkashi and traverses a length of 24.850 km. The entire project falls under Ruraprayag district in Uttarakhand State.
■ Cultural heritage site		√	
■ Protected Area		√	
■ Wetland		√	
■ Mangrove		√	
■ Estuarine		√	
■ Buffer zone of protected area		√	
■ Special area for protecting biodiversity		√	
<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 historical/cultural area is within the proposed ROW. All the construction activities will be performed within available formation width. Some temples are located outside the ROW along the project road . None will be shifted and appropriate roads signs will be installed. Existing/ Licensed quarries will be used with necessary redevelopment to avoid any disfiguration of landscape.
■ Encroachment on precious ecology (e.g. sensitive or protected areas)?		√	The project road is passing through agricultural, built up and forest land. No trees are affected or no encroachment on precious ecology is anticipated since all construction activities shall be limited to the available formation width only.
■ Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		√	There are some seasonal streams, scuppers and minor bridges crossing the project road. There are adequate no. of causeways at various kms. to provide adequate cross drainage to roadside nallahs and to avoid soil erosion and accelerated deterioration of paved shoulders.

<p>■ Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?</p>		√	<p>No direct impact on surface water quality is envisaged. However, measures like locating camps away from water bodies and providing septic tanks and soak pits as sewage disposal facilities will be provided in the construction camps. The chemicals will be used for the project are kept at least 300 m away from the drainage channel, nallahs and other water resources.</p>
<p>■ Increased local air pollution due to rock crushing, cutting, and filling works, and chemicals from asphalt processing?</p>		√	<p>Conformance to Emission standards and norms, use of locally available materials (licensed quarry), 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 &lt; 30 km / hr when traversing these locations. Contractor with concerned PIU will conduct consultation during construction phase to identify other measures to control dust.</p>
<p>■ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?</p>		√	<p>Providing Personal Protection Equipments (PPE) to workers etc. Dismantling of existing structures and disposal by manual and mechanical means.</p>
<p>■ Noise and vibration due to blasting and other civil works?</p>		√	<p>No blasting will be done. During construction, nuisance would be created due to the movement of heavy machineries like excavators, dumpers etc. No work will be permitted near the Schools and Colleges during the study hours. Proper mitigation measures will be in place like PPEs, noise enclosures, etc.</p>
<p>■ Dislocation or involuntary resettlement of people?</p>		√	<p>Not involved</p>
<p>■ Dislocation and compulsory resettlement of people living in right-of-way?</p>		√	<p>Not involved</p>
<p>■ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?</p>		√	<p>No. This hilly road will improve access of marginal upland dwellers to market centres and social services.</p>

<p>■ Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?</p>	<p>√</p>	<p>Hauling of fill materials and spoils over unpaved road at uncontrolled speeds will increase fugitive dust emissions resulting to episodes of elevated SPM concentration above standards during the construction phase. Water sprinkling to suppress the dust along built-up areas of the Project Road for twice a day (1000 hrs and 1500 hrs). Air quality monitoring will also be conducted in some of these locations during construction phase to evaluate the effectivity of dust control measures. Haul trucks will be covered and will strictly observe speed &lt;30 km/hr when traversing these locations. Contractor with concerned PIU will conduct consultation during construction phase to identify other measures to control dust.</p>
<p>■ Hazardous driving conditions where construction interferes with pre-existing roads?</p>	<p>√</p>	<p>Interference with pre-existing roads will mostly occur in settlement areas (Banswada) and when existing alignment intersects with access paths leading to individual houses. Suitable road safety measures to be incorporated in design and creating awareness amongst road users on safe driving. Prior information will be provided by the PIU and Contractor to affected residents and communities before start of construction that will cause interference.</p>
<p>■ Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?</p>	<p>√</p>	<p>Limited areas suitable for construction camp site are available along the alignment since most of the level areas are either forest, inhabited or farmed. Employing local labour will decrease the needed scale of the construction camps. Construction camps will be established away from any local human settlement area and preferably located on lands, which are barren/ waste lands. The Contractor will link with existing national and state programs on HIV awareness. Construction camps will be provided with necessary water supply, sanitation, storm water drainage, solid waste management and first aid facilities during the construction period and necessary provision for rehabilitation or restoration after the completion of construction.</p>
<p>■ Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?</p>	<p>√</p>	<p>Proper disposal of liquid effluent at camps to avoid water stagnation and creation of breeding grounds.</p>
<p>■ Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?</p>	<p>√</p>	<p>The transport of toxic materials during construction is not expected. During construction, bitumen will be transported and this material is considered hazardous (flammability) but not toxic. All workers handling bitumen will be trained on its management as provided in the material safety data sheet.</p>
<p>■ Increased noise and air pollution</p>	<p>√</p>	<p>During construction phase, the use of paver,</p>

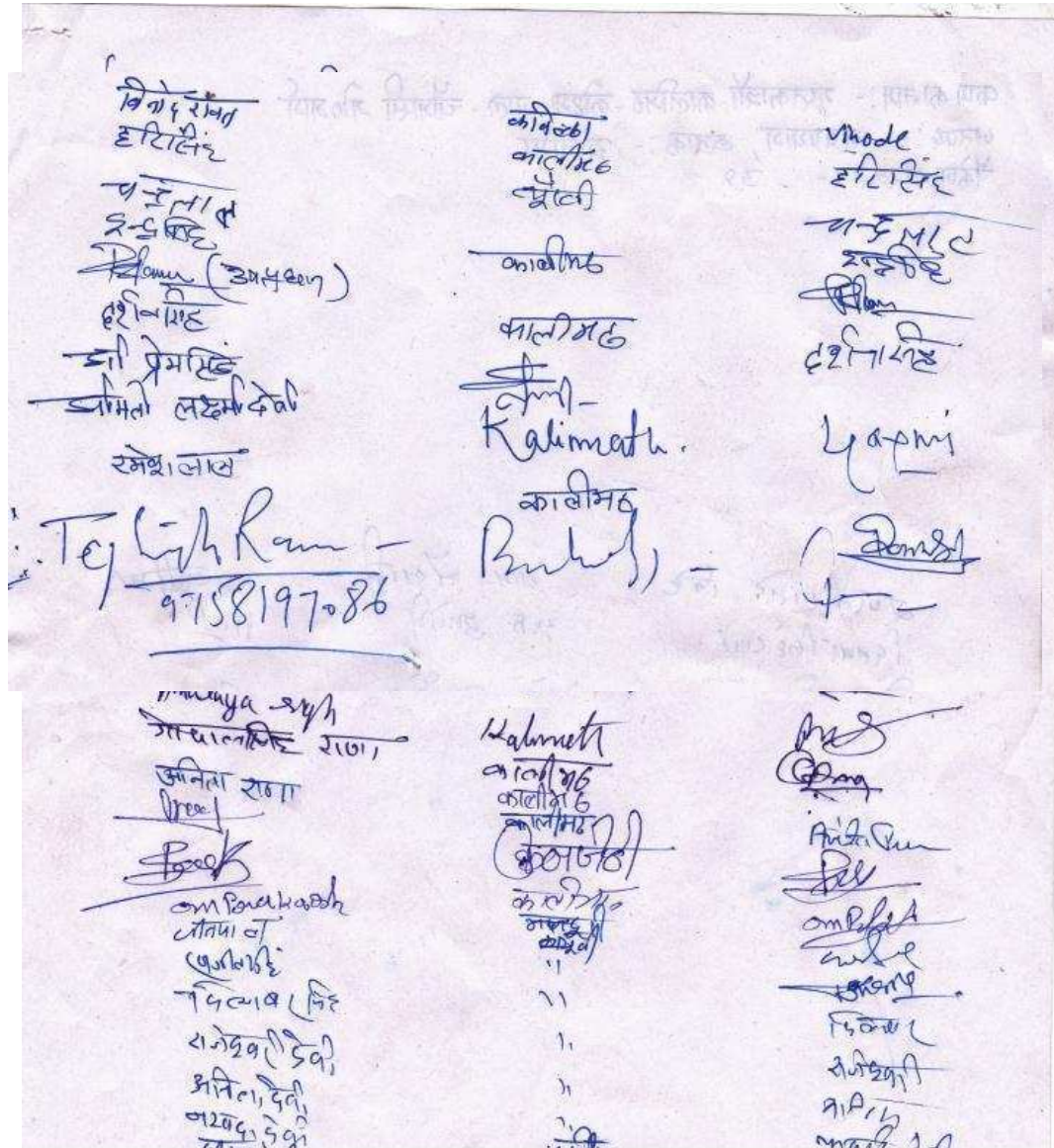
resulting from traffic volume?			rollers and other heavy equipment will be operated during daytime only. Near places of worship, schools, and hospitals, major sources of noise shall be confined by temporary barrier
■ Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?		√	It will be ensured that the fuel storage and refuelling sites are kept at least 300m away from drainage channels and important water bodies.
■ 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 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. Improve access may increase migration to settlements within corridor of impact. The PIU will raise awareness of local leaders on this indirect impact of the road and emphasize the need for better land use management.
■ 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 blasting will be required during construction. 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. The PIU will inform the Panchayats on the risk of fuel and chemical spillages during operation phase and suggest ways on their immediate containment and relevant other government agencies for management and control.
■ 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 this is hill road, landslides due to natural causes extreme weather event or earthquake may result to injury. All 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. These advisories will be communicated through the Panchayats.

<b>Climate Change and Disaster Risk Questions</b> <b>The followings questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.</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 sub-project road passes through the hilly terrain. Therefore, no chances of floods, tsunami or volcanic eruptions. There is a possibility of landslides during rainy season and earthquakes prone zone.
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)		√	
Are there any demographic or socio-economic aspects of the Projects area that are already vulnerable (eg., high incidence of marginalized, populations, rural-urban migrants, illegal settlements, ethnic minorities, women of children) ?		√	
Could the Project potentially increase the climate of disaster vulnerability of 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)?		√	

<b>X</b>	should be categorized as an A project.
√	should be categorized as a B project.
<b>X</b>	should be categorized as a B project in an environmentally sensitive area.
<b>X</b>	should be categorized as a C project.
<b>X</b>	should be categorized as an A/B project because (give reason) .
<b>X</b>	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

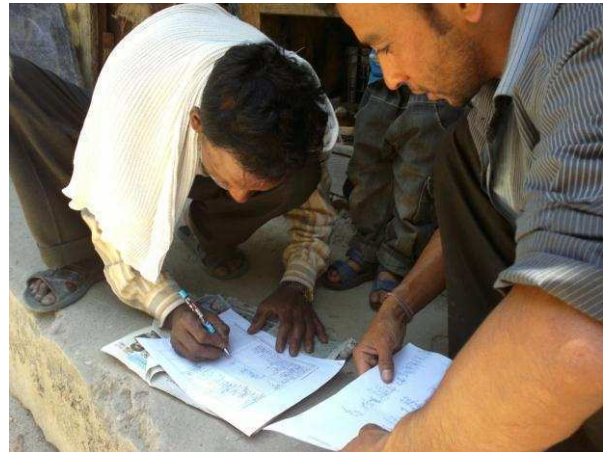
PUBLIC CONSULTATION RECORDS

Name of the Project : Uttarakhand Emergency Assistance Project  
 Name of the project Road : Guptkashi Kalimath Kotma Jaal Chaumasi  
 Place of public consultation : Near Kalimath Temple  
 Date : 22/05/2014





Public Consultation Photographs



Site Photographs



MoEF issued specific guidelines in July 2013 for State of Uttarakhand for expediting forest clearances to carry out the emergency work in forest areas (excluding works in national parks and sanctuaries)

F. No. 11-298/2013-FC  
Government of India  
Ministry of Environment and Forests  
(FC Division)

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Paryavaran Bhawan,  
CGO Complex, Lodhi Road,  
New Delhi - 110 510.  
Dated: 24<sup>th</sup> July, 2013

To  
The Principal Secretary (Forests),  
Government of Uttarakhand,  
Dehradun

Sub: General approval under section 2 of the Forest (Conservation) Act, 1980 for diversion of forest land, not more than one hectare in each case for restoration/reconstruction including realignment of roads damaged in the recent floods and construction of helipads and ropeways in flood affected areas in Uttarakhand.

Sir,

It has been brought to notice of this Ministry that recent floods in Uttarakhand have caused extensive damage to the road network in the State. Restoration of roads damaged/washed out during these floods may require minor realignment also. It has also been brought to notice of this Ministry that expeditious delivery of relief and rehabilitation services to flood affected areas requires creation of a network of helipads and ropeways. Formulation and processing of proposals to obtain approval under the Forest (Conservation) Act, 1980 for restoration/reconstruction including realignment of roads/ bridges and construction of helipads and ropeways in forest areas may take some time, which may hamper the delivery of relief and rehabilitation services to the flood affected areas.

The Central Government, keeping in view the extraordinary situation and also keeping in view the urgent necessity to restore and strengthen the communication network to ensure expeditious rehabilitation of the flood affected areas, hereby accords general approval under section 2 of the Forest (Conservation) Act, 1980 for diversion of forest land, not more than one hectare in each case, for restoration/reconstruction including realignment, by the Government Departments, of roads/ bridges damaged in the recent floods and construction of helipads and ropeways in flood affected areas in Uttarakhand, subject to fulfillment of the following conditions:

- (i) General approval shall be applicable for restoration/reconstruction including realignment of the existing roads/bridges damaged by the recent floods and construction of helipads and ropeways only. Use of forest land for construction of new roads will be governed by the existing provisions;
- (ii) User agencies shall explore all feasible alternatives to minimize use of forest land for restoration/ reconstruction including realignment of roads/ ropeways. Additional forest land to be used for restoration/ reconstruction including realignment of existing roads/bridges and construction of helipads and ropeways shall be restricted to the bare minimum and shall be used only when it is unavoidable;
- (iii) Additional forest land utilized for restoration/reconstruction including realignment of a stretch of road/ bridge and construction of helipads and ropeways shall not be more than 1.00 hectare in each case;

*[Handwritten signature]*

*[Handwritten signature]*

- (iv) Revised alignment of each stretch of the road/ bridge and location of each helipad and ropeway shall be jointly finalized by the representative of the user agency and the State Forest Department;
- (v) Trees standing on the forest land proposed to be utilized for restoration/ reconstruction including realignment of the existing roads/ bridges and construction of helipads and ropeways shall be jointly enumerated by representatives of the user agency and the State Forest Department, before felling;
- (vi) For every tree cut for restoration/ reconstruction including realignment of the existing roads/ bridges and construction of helipads and ropeways in accordance with this approval, at least ten trees shall be planted by the user agency;
- (vii) State Forest Department shall within six months realize NPV of the forest land utilized for restoration/reconstruction including realignment of the roads/ bridges and construction of helipads and ropeways from the user agency and transfer the same to the ad-hoc CAMPA under intimation to this Ministry;
- (viii) Nodal Officer, Forest (Conservation) Act, 1980, Uttarakhand shall within one year submit to the Regional Office (Central Zone), Lucknow and to this Ministry, survey of India toposheet, indicating original as well as revised layout of each stretch of road/ bridge, for whose restoration/ reconstruction including realignment forest land in accordance with this approval has been utilized. Survey of India toposheet, indicating location of each helipad and ropeway for whose construction forest land in accordance with this approval has been utilized, shall also be submitted to the Regional Office (Central Zone), Lucknow and to this Ministry within one year. Such survey of India toposheets shall be authenticated by the concerned Divisional Forest Officer and the representative of the user agency;
- (ix) Nodal Officer, Forest (Conservation) Act, 1980, Uttarakhand shall submit half yearly report on the forest land utilized for restoration/ reconstruction including realignment of the roads/bridges and construction of helipads and ropeways to the Regional Office (Central Zone), Lucknow and to this Ministry;
- (x) This dispensation of general approval shall not be valid for use of forest land located within the National Parks and Wildlife Sanctuaries; and
- (xi) This approval shall be valid for a period of one year from the date of its issue.

Yours faithfully,

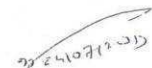
SIL

(H.C. Chaudhary)  
Assistant Inspector General of Forests

Copy to:-

1. Shri Sanjay Lohia, Director, Prime Minister's Office, New Delhi for kind information.
2. The Cabinet Secretariat, New Delhi for kind information.
3. The Secretary, Ministry of Home Affairs, New Delhi for kind information.
4. The Principal Secretary, Public Works Department, Government of Uttarakhand Dehradun.
5. The Principal Chief Conservator of Forests, Government of Uttarakhand, Dehradun.

6. The Nodal Officer, Forest (Conservation) Act, 1980, Government of Uttarakhand, Dehradun.
7. Regional Office (Central Zone), Ministry of Environmental and Forests, Government of India, Lucknow.
8. All AIGs/ Directors in the Forest Conservation Division MoEF.
9. The Director, RoHQ Division, MoEF.
10. Sr. PPS to DGF&SS, MoEF.
11. PPS to Addl. DGF (FC), MoEF.
12. PS to IGF (FC), MoEF.
13. Guard File.

  
(H.C. Chaudhary)  
Assistant Inspector General of Forests

**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.

199. 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.



## ENVIRONMENTAL STANDARDS

## National Ambient Air Quality Standards

Pollutants	Time Weighted	Industrial Area	Residential Rural & Other	Sensitive Area <sup>2</sup>	Method of Measurement
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 Establish	Not Established	Not Establish	
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.

1. \_\_\_\_\_

**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	-
8.	Chlorides (as Cl)	250	Beyond this limit, taste, corrosion	1000	3025 (Part 32)	-

S. No.	Substance Characteristic or	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
	mg/L		and palatability are affected		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	-
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	-

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.	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 opalescence in water	15	39 of 3025: 1964	To be tested when pollution is suspected
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 <sup>+</sup> ) 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	-	May be carcinogenic above this limit	-	-	-

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
	PAH) g/L, Max					
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)*

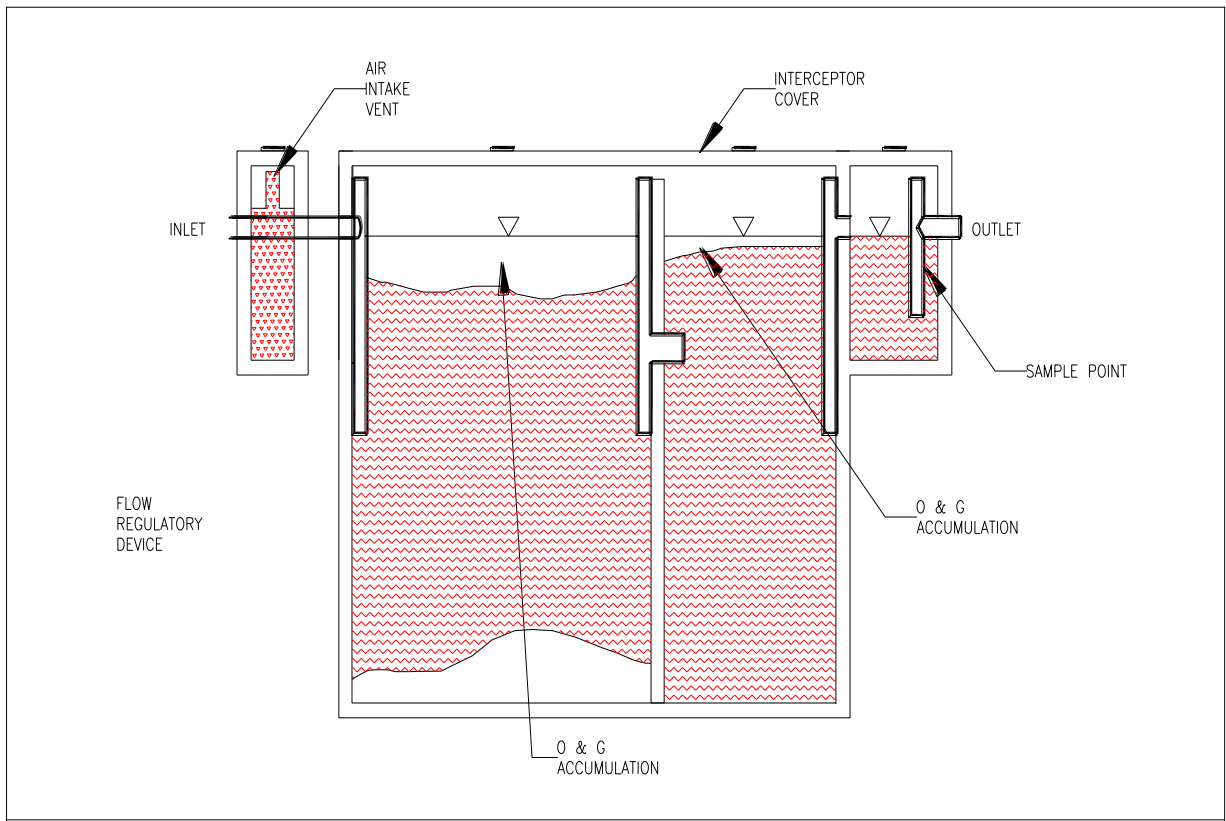
**Source: CPCB, 1989, GOI.**

**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  $\mu\text{g}/\text{m}^3$

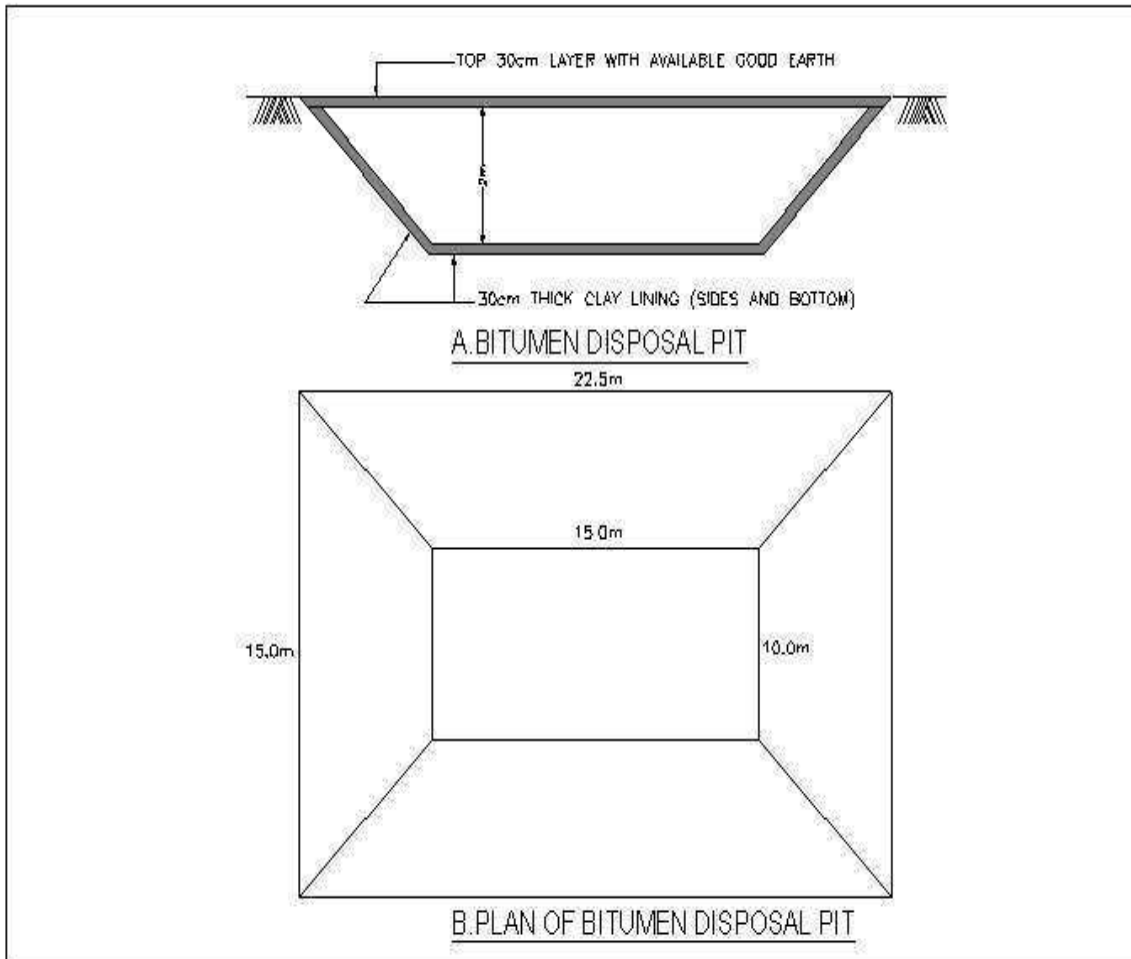
(Source: EPA Notification [G.S.R. 742(E) dt. 30th Aug; 1990] & [S.O. 8(E) dt. Dec. 31, 1990])

OIL INTERCEPTORS



Location of Oil Interceptors has been considered such that each construction camp having refuelling 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**





**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 an hazard to people
11. Make sure that hazardous/dangerous chemicals are kept in the stores with the appropriate labelling, 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 carryout 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 form 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 form 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 thea 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**

<b>S. n</b>	<b>Stage and Nature of construction Hazard</b>	<b>Safety measures expected to be taken by the contractors and site Engineers</b>
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	Many a times ballies joined together give way due to

S. n	Stage and Nature of construction Hazard	Safety measures expected to be taken by the contractors and site Engineers
	while concreting or just before concreting or just before concreting especially when wooden ballies are used.	weak joint. Hence the use of joined ballies should be restricted. Only 2 joined ballies out of 8 ballies should be allowed. In case 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-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 far 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	Before taking up the work all available drawings



S. n	Stage and Nature of construction Hazard	Safety measures expected to be taken by the contractors and site Engineers
	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.	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 circuits/leakages etc., and may electrocute the person touching the wire accidentally.	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. 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 properly 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.

## 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

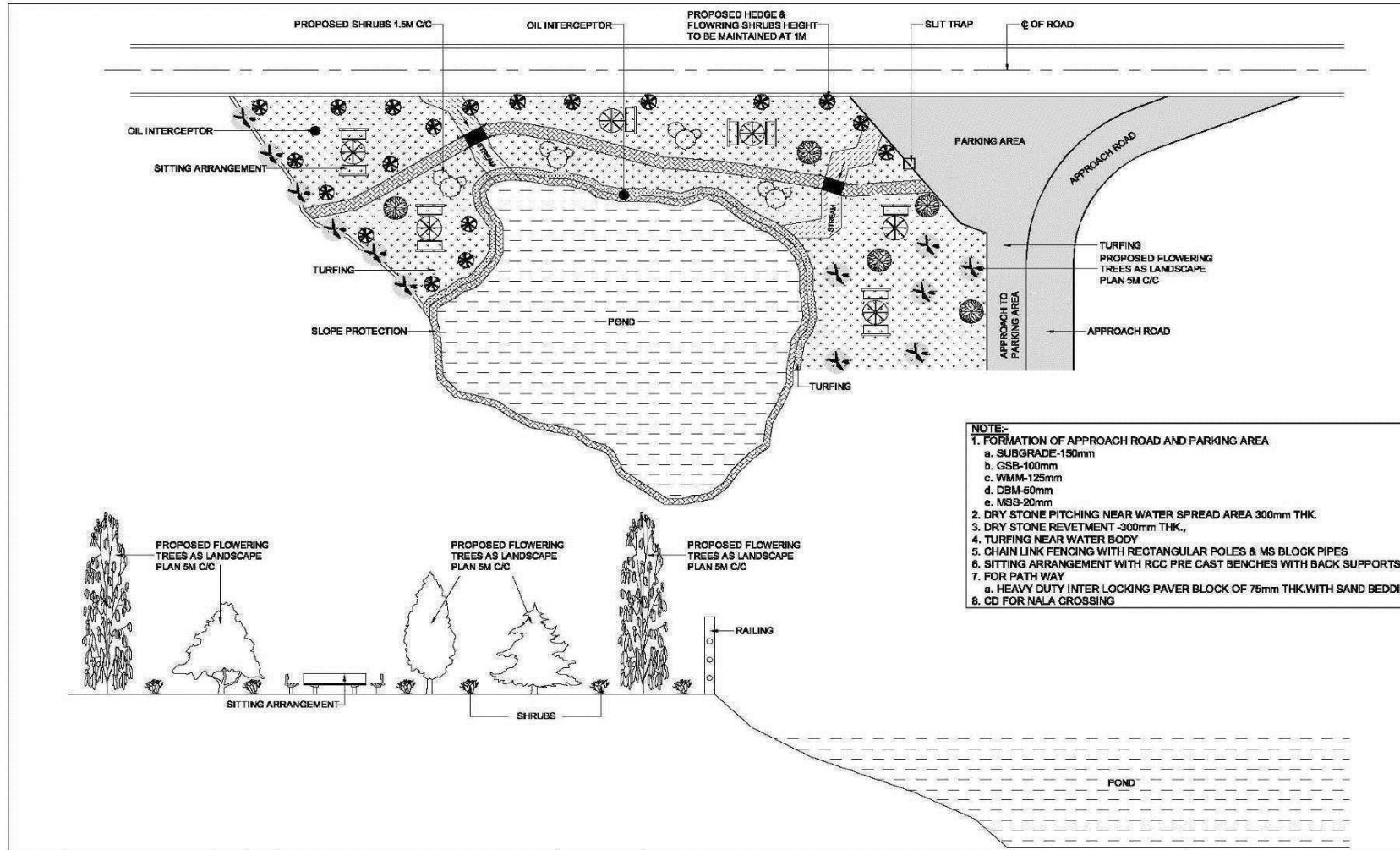
#### d) Pond enhancement

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**

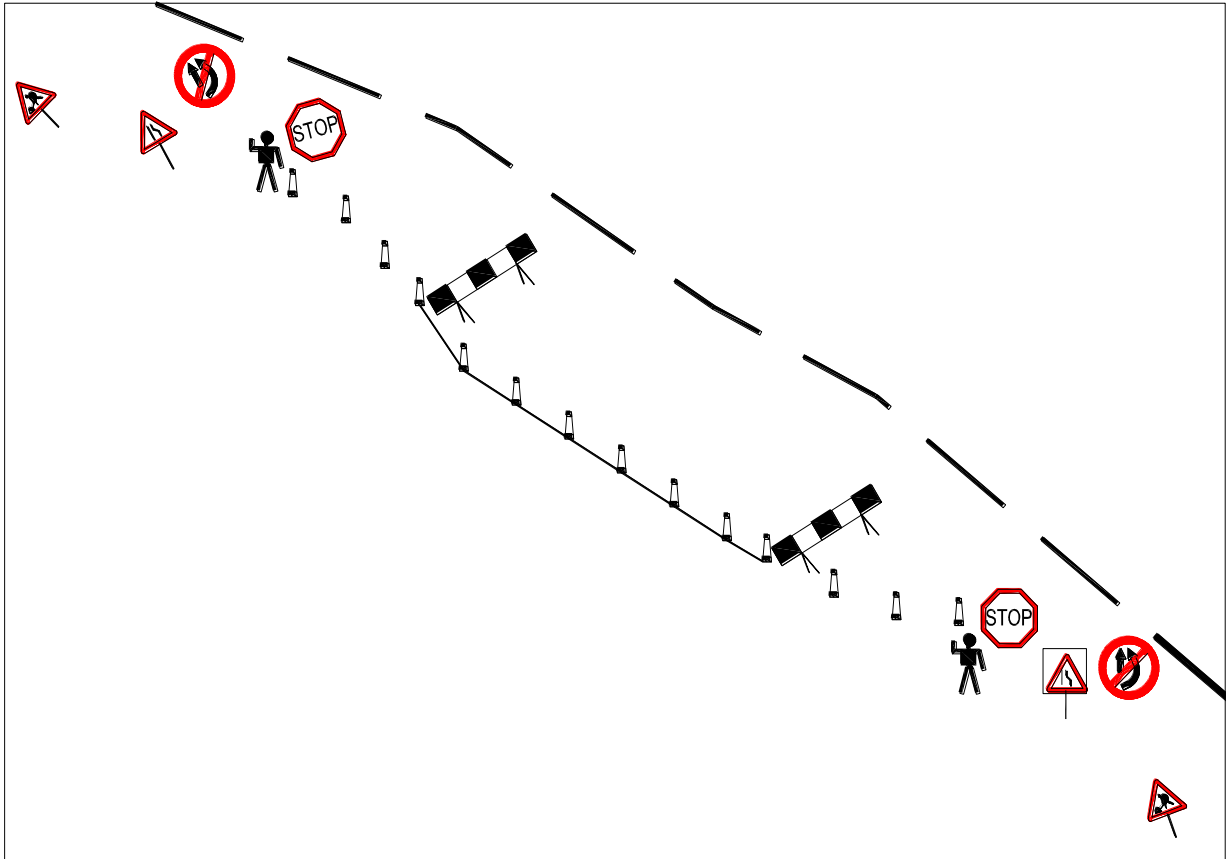


Figure-1 : Diversion of Traffic on Half of the Road Width (Say Left)

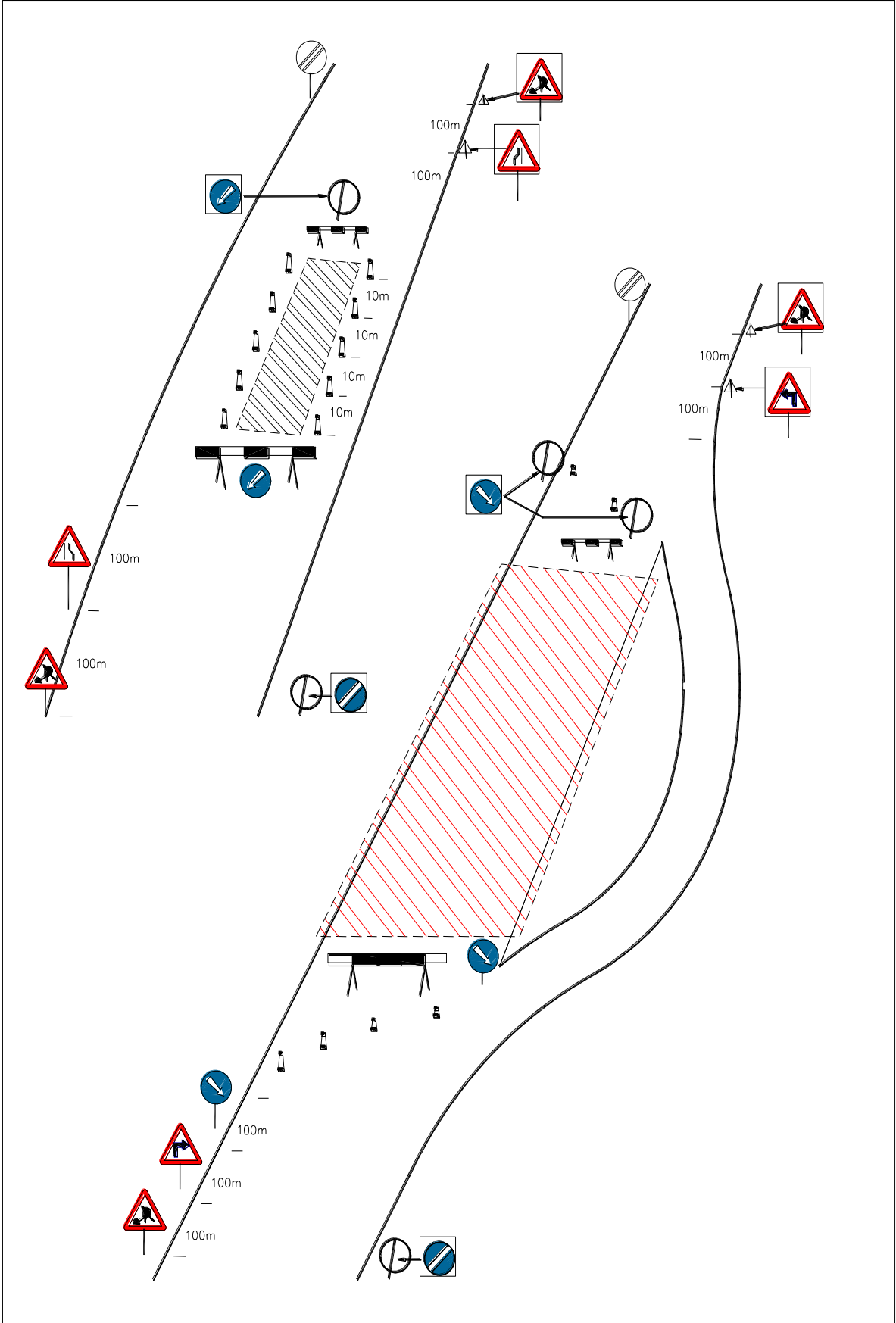
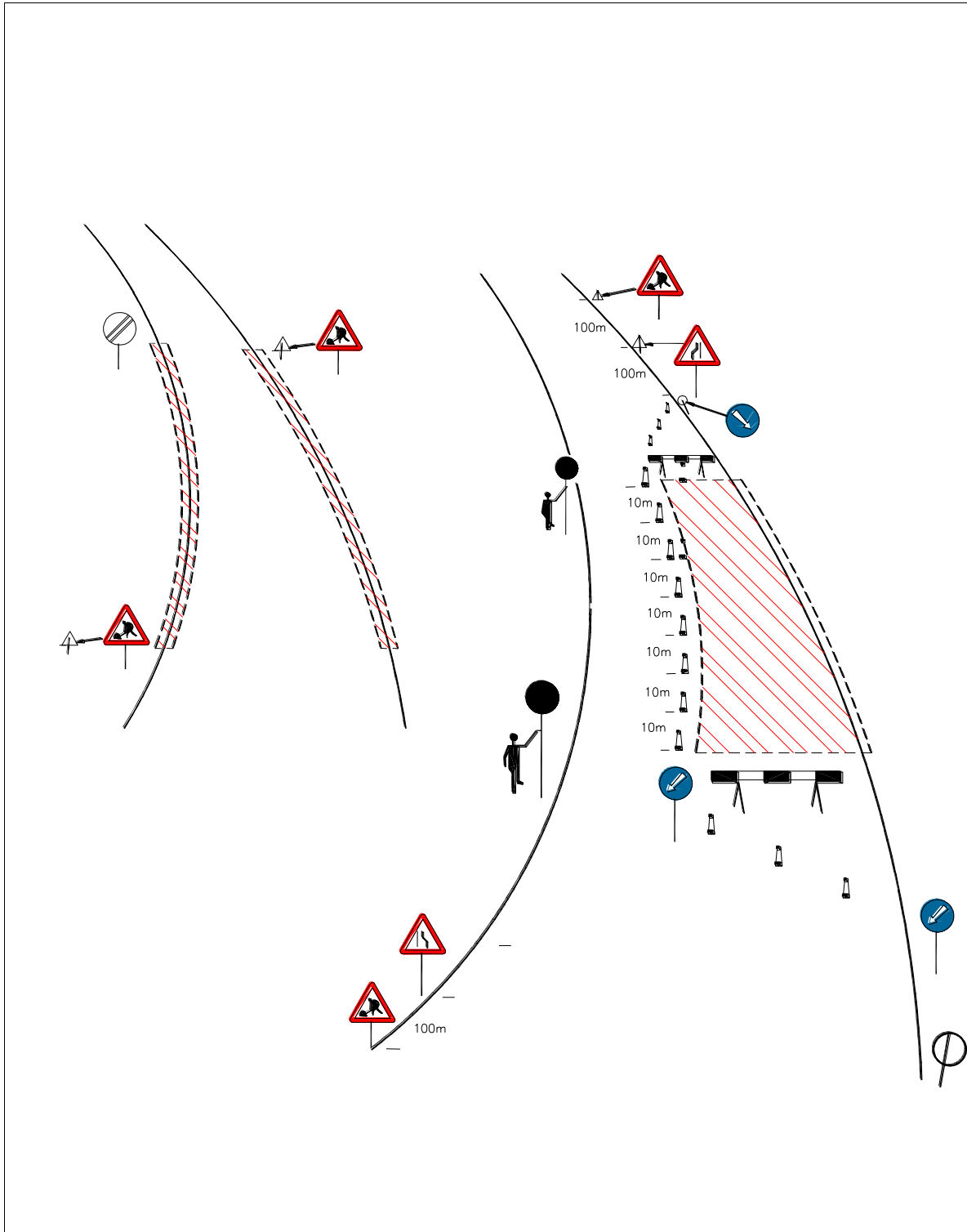


Figure : 2



**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.

**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 form 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, carryout 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 layer of stockpiled topsoil in accordance with compliance requirements with respect MOEF/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) If 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 to facilitate drainage.
- (vii) The depth of the pits shall be so regulated that their 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 a 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 in line with the owner's will and to the satisfaction of the 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.

**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 or 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 committ	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.