

CHAPTER – 8

PRELIMINARY ENVIRONMENTAL SCREENING AND SOCIAL ASSESSMENT

8.1 Preliminary Environmental Screening and Environmental Assessment

- Initial environmental screening has been carried out
- Finding and recommendation are as under:
- There are no negative Impact on the environment
- There is no major dislocation of permanent settlements
- Dumping of the spoils and extra cut material is provided within a reach of 4 km on i.e 8 km spacing.
- There is no requirement of borrow areas for soils
- Drainage pattern of the CD works has been retained. Additional waterway has been provided for improving the drainage system.
- Road side drain has been provided for full length of the present road for improvement drainage
- Chutes and catch pits have been provided for management of water environment
- The ambience of the air quality is not disturbed
- Controlled rock cutting measures have been provided
- There is no historical monument requiring relocation
- Mitigation measures during construction period are part of the project.
- Slope protection measures have been adopted
- Rehabilitation of landslide /sinking areas are provided in the project
- Water harvesting structures are provided to make available water for construction



operations.

8.2 PREAMBLE

This chapter presents the identification and appraisal of various environmental impacts during construction and operation of proposed widening and strengthening of existing road. Generally, the environmental impacts can be categorized as either primary or secondary. Primary impacts are those, which are attributed directly by the proposed project and secondary impacts are those, which are indirectly induced and typically include the associated investment and changed patterns of social and economic activities by the proposed actions. The details of criteria opted for impacts assessment are as per described hereunder:

Processes that may create risk to the environment are considered and analyzed in terms of key potential environmental impacts. Actual and foreseeable events, including operational and typical events are discussed in this chapter.

The environmental impacts may include all those that are beneficial or adverse, short or long term (acute or chronic), temporary or permanent, direct or indirect and local or regional. The adverse impacts may include all those leading to harm to living resources, damage to human health, hindrance to other activities, impairment of quality for use, reduction of amenities, damage to cultural and heritage resources, and damage to physical structures.

In order to minimize the adverse impacts of the proposed road project, avoidance and mitigation measures are formulated and implemented as part of the project design. Avoidance and mitigation of negative impacts involve the reduction and magnitude of the impacts through:

- Alternatives during design, site clearance, construction and operation phases of the road project to avoid adverse impacts, and
- Additional mitigation measures for unavoidable negative impacts on natural, socio-economic and cultural environment.

8.3 IMPACTS DURING CONSTRUCTION PHASE

Construction phase mainly include the following activities;



- Acquisition of additional land;
- Clearing of ROW;
- Leveling of required portion of ROW;
- Construction or strengthening/widening of new or existing culverts, bridges etc;
- Strengthening and widening of 2 lane road with paved shoulders;
- Commissioning of camp site with hot mixing/Batching plant;
- Transportation of man and materials;
- Transportation of equipments/machinery; etc

8.4 LAND USE PATTERN

Requirement of land

S.L	Particulars	Length (m)	Width (m)	Area m2
1	Widening and regrading (Open Area)	118.300	24	2839200
	Total			2839200
	Add 10% of 2839200 for new construction jetty ledges & Spoil bank			283920
	Total Land Requirement			3123120

The tentative requirement of land categories is details below:

It is proposed to commission camp sites at two locations with hot mix plants for the construction of proposed project. This will require land on temporary basis only during construction period i.e. 2-3 years. The acquisition of land and private properties will be carried out in accordance with the National Highway Act.



Land required is mostly in open areas and the congested town area at Hnahtial, zobok etc. Most of the land required is government, forest land hence impacts of land acquisition would be insignificant

8.5 PHYSIOGRAPHY AND TOPOGRAPHY

Proposed project of widening and strengthening of existing road is confined to existing ROW and design will consider the improvement of roadside drainage conditions through the improvement of cross-drainage structures. Providing Roadside Drain through out the length of road, providing chutes on the upstream and downstream side of Culvert to channelise water and avoid erosion, Catch water intercepting drains have been proposed in the land slide areas .Design of the cross drainage structures will follow IRC Guidelines (IRC, 1995).

Impact on the physiography and topography of the area would be insignificant.

8.6 BIOLOGICAL ENVIRONMENT

During construction of the project road, as first step, vegetation in the form of trees, shrubs and grasses present in ROW and additional land proposed to be acquired will be cleared.

About 2966 trees (of equal to and more than 60 cm girth) are proposed to be cut. For cutting of tress, forest clearance as applicable will be taken under the Forest Conservation Act, 1980 as amended, thereof.

There will be no significant loss of bio-diversity since no rare/endangered plant or animal species is going to be eliminated due to the proposed upgrading of project road. There will be no loss of animal habitat and the aquatic ecology will not be damaged, as structures will be provided on the water bodies crossed by project road.

The loss of trees at least during the construction phase is likely to produce some negative impacts. Following measures are suggested:

- Careful and proper planning should be done for re-plantation of trees during design and



right at the commencement of construction and the phase wise removal of growing trees will mitigate the negative impacts; and

- Compensatory plantation should be started during construction phase parallel to the construction activities.

8.7 SOIL ENVIRONMENT

a. Loss of Productive Soil

The area along the project road is mostly non agriculture land. Therefore, no loss of productive soils is anticipated due to acquisition of land.

b. Soil Erosion

During the upgrading of the project, some trees, shrubs and grasses will need to be cleared along the project road, which may pose some soil erosion problem during first few rains. Therefore, suitable mitigation measures will need to be implemented to prevent the soil erosion problem.

c. Contamination of Soil

During the construction of the project road, the contamination of the soil will be negligible. Further, the contractor shall initiate measures to minimize waste generation from all construction activities. At construction sites, the vehicles and equipment will be maintained properly and refueled only at fueling areas, without any spillage.

d. Compaction of Soil

During construction phase, at some places, soil in the adjoining productive lands beyond the ROW may be compacted by the movement of construction vehicles, machinery and equipment.

Terrain along the project road is hilly. To prevent any compaction of soil in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment will be restricted to the corridor.

As the land requirement on permanent basis is very small as compare to total area



hence impacts on soil during construction phase would be insignificant with the following mitigation measures:

- Re-plantation of trees;
- Good engineering & construction practices;
- Slope stabilization in on hills by retaining wall and breast wall;
- Turfing on slides areas
- Providing mild slopes, not flat nor steep slope; etc

These steps will efficiently mitigate the potential soil erosion problem and by the time the road starts operating, the ecosystems will restore itself Rainfall is very heavy and there is a rapid growth of vegetation which will also help in stablisation of slopes. In case soils erosion is found suitable measures should be taken to control the soil erosion.

To avoid the soil contamination, at the wash down and re-fueling areas, "oil interceptors" shall be provided. Unusable debris shall be dumped in nearest landfill sites.

8.8 QUARRIES

For construction of road, aggregate will be procured from nearest quarry approved by Mizoram State Pollution Control Board in their respective jurisdiction. During operation of quarry followings measures will be adopted. 1) The over burden will not be pushed into the valley. Over burden will be utilized for repair of bad stretches of existing road during monsoon, quarry spalls will be utilized for G.S.B.

Quarry operation and closure plans will be prepared.

After extraction of stone to the full capacities, quarries will be closed after adopting mitigation measures like turfing of slopes, providing gabion toe wall to avoid slide and retain earth spoil

Providing of Breast wall as per requirement



Providing drainage channels like catch water drains.Turfing the steep slopes..

8.9 DRAINAGE PATTERN

Drainage pattern of the CD works has been retained. Additional water way has been formed improving the drainage system Roadside drain has been proposed for full length of present road for improved drainage. Chutes and catch pits have been provided for efficient management of water flow. About 587 culverts will be provided in this stretch which shall be sufficient for cross drainage and maintaining the natural flow of water.

The performance of a pavement shall be improved considerably and adequate precautions shall be taken to avoid the accumulation of water on the pavement structure. Side drains and cross drains will be properly integrated so that water from these drains shall cross the road underneath through culverts at appropriate locations.

It is evident from the details given above that there is likely no significant impact on existing drainage system along the road. However following mitigation measures shall be taken into consideration:

- The contractor shall ensure that construction debris does not find its way in to the minor drainage channels, which may get clogged;
- Extra culverts are proposed to accommodate the drainage requirement along the alignment;
- Drainage arrangements will be provided in respect of site conditions in the form of drainage layer and sub-surface drains in the full width of formation or below the shoulder so as to keep the pavement well drained at locations where these are required; and
- Good engineering and construction practiced shall be followed.

8.10 WATER ENVIRONMENT

Water requirement for the project road will be on temporary basis and meet through existing water sources available at places along the road.Water harvesting structure will be constructed at suitable locations to augment supply of water for construction purpose. Check dam will be created in the river to maintain the supply of the water for



construction. No local water supply (public water supply, community hand pumps & bore wells and public wells) will be used for construction purposes. Separate sources of water for construction purpose will be identified along the project road. Therefore, impact is anticipated as insignificant, reversible and for short duration only.

Widening activities may temporarily deteriorate surface water quality during rains in terms of turbidity along the road. However, this impact will be observed only up to first few rains. Therefore, no significant impact is anticipated on water quality due to construction of project road.

Following mitigation measures are suggested to mitigate any adverse impacts during construction phase:

- Construction camps should be located away from water bodies and basic sanitary facilities should be provided to the labour camps;
- Provision shall be made for proper drainage along the road;
- Good engineering practices to be followed to avoid the clogging of water channels along the project road; and
- Water to be used for construction shall have separate source other than public supply.

8.11 AMBIENT AIR QUALITY

During construction phase, there will be two main sources of air emissions i.e. mobile sources and fixed sources. Mobile sources are mostly vehicles to be involved in construction activities while emissions from fixed sources include diesel generator sets, construction equipments/machinery (e.g. compressors), excavation/grading activities and hot mix plant.

Certain amount of dust and gaseous emissions will be generated during the construction phase from excavation machine and road construction machines. Pollutants of primary concern include Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM). However, suspended dust particles may be coarse and will be settled within a short distance of construction area. Therefore, impact will be temporary and restricted within the closed vicinity of the



construction activities along the road only.

Generation of exhaust gases is likely due to movement of heavy machinery for clearance of the ROW for construction. High levels of HC and NO_x are likely from hot mix plant operations. Toxic gases are released through the heating process during bitumen production. Although the impact will be localized only and it can spread down wind depending on the wind speeds and directions.

Considerable amount of emissions of carbon monoxide (CO), unburned hydrocarbon, sulfur di-oxide, particulate matters, nitrogen oxides (NO_x), etc, will be generated from the hot mix plants(2 nos.).

Following distance for establishment of Hot mix plant should be maintained as per details given below

Sn.	Distance from	Distance
1.	Municipal Corporation Limits	5 Km
2.	Class A Town & Cities Limits	2 Km
3.	Other Town & Cities Limits	1 Km
4.	Village Lal Dora / Phirni	500 Mts.
5.	Wild life Sanctuary / Zoo	500 Mts.
6.	National Highway *	500 Mts.
7.	State Highway * / Scheduled Road	300 Mts.
8.	Residential Area (15 Pucca Houses)	300 Mts.
9.	Educational Institute / Historical/Religious Places/ Protected Monuments	300 Mts.

The emissions standards for hot mix plants for SPM is 150 mg/Nm³ with no smoke visible from the plant.

Following measures should be undertaken for prevention of air pollution by Hot Mix Plant:

- A suitable dust control system for the dryer and mixer to contain/recycle permissible fines in the mix should be provided. It should be capable of preventing the exhaust of fine dust into



atmosphere from both ends of the dryer drum by creating adequate negative pressure.

- The plant should have centralized control panel/cabine capable of pre-setting controlling/synchronizing all operations, starting from feeding of cold aggregates to the discharges of hot mix to ensure proper mixing. It should have adequate water scrubbing mechanism to completely remove/control the dust coming out of the drier with proper provision of re-circulation system for the scrubber water.
- Bitumen must be mixed with aggregate as soon as it is heated and dried and second time lifting of the dried aggregate for proper batching should be avoided.
- All roads/vehicular movement areas at site of Hot Mix Plant should be pucca/ stabilized with stone aggregates and regular sprinkling of water be ensured so that no dust is generated with vehicular movement.
- Hot Mix Plant must have proper stack heights for the discharge of its scrubbed flue gases and bitumen heating system with proper platform and port holes as per the CPCB/ Uttar Pradesh Pollution Control Board norms.
- Fine dust arrested by water scrubber and collected in the re-circulation water tank should be collected and filled in a pit to be covered with fresh earth. This exercise should be repeated as and when dust is removed from re-circulation tank.

Hot mix plants should be located away from the populated areas and be fitted with the air pollution control equipment meeting the standards prescribed by CPCB/Uttar Pradesh State Pollution Control Board wherever applicable.

Following mitigation measures are suggested:

- Road should be designed in such a manner that no traffic congestion in the populated are along the road;
- Vehicles delivering loose and fine materials like sand and fine aggregates will be covered to reduce spills on existing road. Water may be sprayed on earthworks, on a regular basis. During and after compaction of the sub-grade, water will be sprayed at regular intervals to prevent dust generation;
- All slopes and embankments will be turfed as per best engineering practices to minimize the



dust generation during operation of the road;

- Asphalt and hot-mix plants will be located at least 1 km away in the down wind direction from inhabited urban and rural stretches along the road with the clearance from Uttar Pradesh State Pollution Control Board wherever applicable;
- Sprinkling water will control fugitive dust emissions from construction activities
- Sprinkling of water on the dust prone areas and construction yard;
- Regular maintenance of machinery and equipment will be carried out; and
- Ambient air quality monitoring should be carried out during construction phase. If monitored parameters are above the prescribed limited, suitable control measures must be taken.

8.12 NOISE AND VIBRATION

Noise will be generated from the various activities, such as, site clearing activities, excavation, erection and finishing. The anticipated typical noise levels from these activities are given hereunder:

Site clearing activities	85 dB(A)
Excavation	90 dB(A)
Erection	80 dB(A)
Finishing	85 dB(A)

During the construction phase, the noise level is bound to increase as a result of usages of construction machines, etc. The increase in noise levels is expected to be between 10 - 20 %. However, these noise levels will be temporary in nature mostly during daytime only.

For an approximate estimation of dispersion of noise in the ambient air, a standard mathematical model for sound wave propagation is used. The sound pressure level generated by noise sources decreases with increasing distance from the source due to wave divergence. An additional decrease in sound pressure level from the source is



expected due to atmospheric effect or its interaction with objects in the transmission path.

The resultant maximum noise level for the above sources as calculated is 90 dB(A). Assuming no environmental attenuation factors, based on the equations, calculations are made, which shows that noise level at different distance will be as under:

Area	Permissible Limits (Day Time)	Distance (m) from source
Residential	55 dB (A)	22.4
Commercial	65 dB (A)	7.1
Industrial	75 dB (A)	2.7

Therefore, the impact of noise on surrounding area during the construction phase will be limited within 25 m, hence inferred as moderate.

However, following mitigation measures are recommended:

- *Site Controls:* Stationary equipment will be placed along inhabited stretches as per distance requirements computed above as far as practicable to minimize objectionable noise impacts;
- *Scheduling of Project Activities:* Operations will be scheduled to coincide with period when people would least likely to be affected. Construction activities will be strictly prohibited between 8 P.M. and 8 A.M. near residential areas;
- Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines;
- Construction equipment and machinery should be fitted with silencers and maintained properly; and
- Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures.

8.13 CONSTRUCTION WORKERS' CAMP

Upgrading of the project road will be completed within the 2-3 years by deployment of mostly local labour. Quantum of construction labour will vary time to time depending upon construction activities. In case construction camps are required, solid waste and sewage generated from construction camp may pollute the surroundings of camp and may cause health problems. Two construction labour camps are proposed for the proposed project during construction period of 2-3 years. Following mitigation measures are suggested for construction workers camps:

- Basic amenities, especially, drinking water supply and toilet facilities at construction camps shall be provided;
- Lavatories shall be located away from the water bodies;
- Proper disposal of domestic refuse will be undertaken;
- Temporary medical facilities will be provided for the construction workers; and
- Use of small temporary shanties / camps beside the project road should be strictly discouraged.

8.14 HISTORICAL MONUMENTS

There is no archaeological monument along the project road. Therefore, no impact is anticipated in cultural, religious and historical monuments.

8.15 SOCIO- ECONOMIC

Construction phases of the project road will have some beneficial impacts on socio-economic status of the area. Marginal increase in direct and indirect employment opportunities on short term basis for local people is expected during construction phase. Since the immigration of work force during construction phase i.e. for 2-3 years is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspect are expected to be insignificant.



The relatively short-lived economic impacts of the construction phase are likely to be experienced in local communities during construction phase as workers and contractor will make everyday purchases from local traders. This is likely to give a short-lived stimulus to these traders that will disappear as soon as the construction is complete.

In addition to direct employment, several opportunities for locals will be available in terms of supply of construction materials & machinery, vehicles and other essential commodities.

Hence, overall impact is rated as:

- Preference will be given to locals for temporary direct and indirect employment;
- Local suppliers for machineries and construction materials will be given preference; and
- Local transporters will be preferred for transportation of machinery/ materials.

8.16 PROPERTY MANAGEMENT

Most of strengthening and widening of the existing road will be confined to exiting ROW except for following:

Requirement of land

S.L	Particulars	Length (m)	Width (m)	Area m2
1	Widening and regrading (Open Area)	91080	11.5	1047420
3	New Construction for improvement work	8615	24	206760
4	By-passes	15430	24	370320
	Total			1624500
	Add 5% of 1361112 for new construction jetty ledges			10338
	Total Land Requirement			1634838



	1634838	-	114875
Total Area of Government/ Forest	1519963		

The tentative requirement of land categories is details below:

Area of Houses LSC =75600

Area of land in built up towns/villages=110975 m² private land

Area of Government land = 2182615.1 - 110975 m²=2071640 m²

It is proposed to commission camp sites at two locations with hot mix plants for the construction of proposed project. This will require land on temporary basis only during construction period. The acquisition of land and private properties will be carried out in accordance with the National Highway Act.

It is evident that the land requirement is insignificant as compare to total area hence impacts would be insignificant.

8.17 DISTURBANCE TO COMMUNITY RESOURCES AND SAFETY

The disturbance to the community resources and safety will be mainly due to transportation of machinery and materials, storage and construction activities which shall be confined to ROW of existing road. There is a requirement for warning signs to minimize damage to the third-party vehicles. In addition, risk to public need to be managed by making mandatory for placing warning sign on vehicles and keeping vigilance during transportation by proper training and adequate manpower on board.

- Proper planning and communication with traffic police;
- Advance notice to local administration about the activities;
- Proper cordon off the site with sign Board;
- Diversion of traffic, if required;



- Placing the warning sign boards on the vehicles during transportation of machinery and materials; and
- Proper training to the drivers about public safety.

8.17.1 IMPACTS DURING OPERATION PHASE

It will mainly include the movement of traffic with the increased volume. The impacts during operation phase are described hereunder:

8.17.2 DRAINAGE PATTERN

No impact is envisaged as drainage pattern along the project road will be designed using the IRC criteria and code.587 nos. of culverts will be constructed along the low lying section of project road which are prone to water logging due to flooding in the monsoon season. Care shall be taken for removal of obstructions if any, in the cross drainage structures intercepting the flood waters.

8.17.3 SOIL ENVIRONMENT

No impact is envisaged except accidental spillage.

8.17.4 WATER RESOURCES

During the operation phase, drainage pattern or hydrology of the area will not be affected. Therefore, no impact is anticipated during operation phase.

8.17.5 WATER ENVIRONMENT

No impact is anticipated on water quality along the project road except accidental leakages, if any.



8.17.6 BIOLOGICAL ENVIRONMENT

Compensatory afforestation / plantation along the project road on available space will enhance aesthetics in the area. Compensatory afforestation should be carried out along the road during Construction phase/operation phase, wherever, it is possible. Monitoring of survival of trees shall be done at regular interval.

8.17.7 AMBIENT AIR QUALITY

During the operation phase, air quality along the road will be affected by vehicular emissions on the project road. Pollutants of primary concern will include NO_x, CO, SPM, RSPM and SO₂. In the populated area, traffic congestion due to bottlenecks of constructed road may increase the air pollution problem in the along the road. Following mitigation measures are suggested to control the air pollution:

- Bottlenecks should be avoided for smooth flow of traffic;
- Proper traffic management system shall be adopted;
- Plantation of pollutants adsorbing trees along the road; and
- Ambient air quality monitoring should be carried out during operation phase. If monitored parameters are above the prescribed limited, suitable control measures must be taken.

8.17.8 NOISE AND VIBRATION

During the operation phase, noise will be generated through the vehicles movement. Noise levels will depend up on traffic density, number of traffic events. Plantation along the road and improved road conditions will be helpful in reduction on noise levels during operation phase. To mitigate the impact of noise levels during operation phase, following mitigation measure are recommended:

- Bottle-necks should be avoided for smooth flow of traffic;



- Proper traffic management system shall be adopted;
- Road should be designed in such a manner that no traffic congestion in the populated area along the road;
- Developing trees barriers between the road and sensitive area, wherever it is possible; and
- Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures.

Socio-economic

Once the strengthening and widening will be completed, there is likely to be regional beneficial long-term socio-economic changes in the areas served by the project road. This shall be due to generation of more direct and indirect opportunities for employment and business resulting from more industrial development, easy & speedy access to nearby areas and development of infrastructural facilities.

Disturbance to Community Resources and Safety

Improved road conditions would significantly reduce the accidents. The project will be implemented with due considerations for safety of pedestrians and school children near populated areas.

The measures will include speed humps, speed delimiting signs, cross walks, etc, at desired locations especially near habitations. Moreover, the upgraded road with improved geometrics will itself reduce the chances of accidents significantly. So all these factors cumulatively will have positive impacts on the safety aspects of the road users and the local populace.

Summary of Impacts

The environmental impacts are summarized as per given below:



Sn.	Impact On	Impact				
		Significant		Insignificant		None
		+ve	-ve	+ve	-ve	
1.0	Construction Phase					
1.1	Physical Environment					
1.1.1	Meteorological Conditions					√
1.1.2	Land		√			
1.1.3	Water				√	
1.1.4	Air				√	
1.1.5	Noise		√			
1.2	Biological Environment					
1.2.1	Terrestrial Ecology				√	
1.2.1.1	Flora				√	
1.2.1.2	Fauna					√
1.2.2	Aquatic Ecology					√
1.3	Social Environment					
1.3.1	Cultural and archaeological properties					√
1.3.2	Safety				√	
1.3.3	Land acquisition and PAH				√	
1.3.4	Socio-economic Conditions			√		
1.3.5	Employment Opportunity	√				
2	Operation Phase					
2.1	Physical Environment					
2.1.1	Meteorological Conditions					√
2.1.2	Land					√
2.1.3	Watercourses and Water Bodies					√



Sn.	Impact On	Impact				
		Significant		Insignificant		None
		+ve	-ve	+ve	-ve	
2.1.4	Air Quality				√	
2.1.5	Noise Quality				√	
2.2	<i>Biological Environment</i>					
2.2.1	Terrestrial Ecology			√		
2.2.1.1	Flora			√		
2.2.1.2	Fauna					√
2.2.2	Aquatic Ecology					√
2.3	<i>Social Environment</i>					
2.3.1	Cultural and archaeological properties					√
2.3.2	Safety				√	

ENVIRONMENTAL MANAGEMENT PLAN

Table 1 Environmental Management Plan for Pre-Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
P1	Relocation of Project Affected Persons (PAP) and	All requirements of the RAP shall be complete before start of construction stage. The activities broadly include acquisition of land and structures, relocation of utilities, payment of compensation and provision assistance ¹	All areas	Before construction begins	NGOs, , NHIDCL, PWD, Village Council (Nokma), District Revenue authorities,	PIU, SC
P2	Removal of vegetation	<ul style="list-style-type: none"> Minimize the scale of vegetation clearing by factoring vegetation/forest cover in the final design of the road alignment process Removal of trees to be carried out after forest clearance is obtained Reforestation/replantation of trees at a term as instructed by the Forest Dept. Activity shall be supervised to avoid poaching of animals 	All areas	Before construction begins	PIU, Contractor	PIU, SC



P3	Setting up construction camps	<ul style="list-style-type: none"> • Camps shall be located at least 500m away from the nearest built-up area. • Sewage system for a construction laborer's camp shall be designed, built and operated so that no pollution to ground or adjacent water bodies/ watercourses takes place. Garbage bins shall be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner, to the satisfaction of the relevant norms and the Engineer. • In relation to underground water resources, the contractor shall take all necessary precaution to prevent interference with such water resources. • All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 shall be adhered to. 	All construction campsite identified by the contractor and approved by SC	During Establishment, Operation and Dismantling of Such Camps.	Contractor	PIU, SC
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P4	Setting up hot mix plants	<ul style="list-style-type: none"> Hot mix plants and batching plants shall be located sufficiently away from habitation and agricultural operations. Where possible such plants will be located at least 1000m away from the nearest habitation. 	All hot-mix and batching plants	During Erection, Testing, Operation and Dismantling of Such Plants.	Contractor	PIU, SC
P5	Finalizing sites for surplus soil dumping	<ul style="list-style-type: none"> Location of dumping sites shall be finalized. The sites shall meet following conditions: i) dumping does not impact natural drainage courses; ii) no endangered/rare flora is impacted by such dumping 	All areas identified as potential dumping sites	During mobilization	Contractor	PIU, SC
P6	Identification of hazard-prone locations	<ul style="list-style-type: none"> The contractor shall identify locations sensitive to landslides (in addition to the ones that area already identified) and shall duly report these to the Supervision Consultant (SC) and to PIU/PWD. 	All area	During mobilization	Contractor	PIU, SC
P7	Identify and prepare relocation sites	<ul style="list-style-type: none"> Location of relocation sites shall be identified in consultation with district/village authorities and PAPs. Sites to be developed including provision of necessary utilities such as water and electricity. 	Near villages with large-scale resettlement		PIU	PIU



Table 2 Environmental Management Plan for Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
Soil						
C1	Soil Erosion in Borrow Pits	<ul style="list-style-type: none">The depth of borrow pits shall be restricted so that sides of the excavation shall have a slope not steeper than 1:4, from the edge of the final section of the bank.	On approved locations of borrow pits.	Construction Stage	Contractor and Supervision Consultant	PIU
C2	Loss of top soil in Borrow pits	<ul style="list-style-type: none">Agricultural fields or productive land shall be avoided for borrowing earth. If unavoidable topsoil shall be preserved and used for tree plantation.	On approved locations of borrow pits.	Construction Stage	Contractor and Supervision Consultant	PIU
C3	Compaction of Soil	<ul style="list-style-type: none">Construction equipment and vehicles shall be restricted to move only within designated area to avoid compaction of productive soil.	Throughout corridor.	Construction Stage	Contractor and Supervision Consultant	PIU
C4	Soil erosion in embankments	<ul style="list-style-type: none">Pitching shall be done for slope stabilization as per the IRC guidelines	At the places of embankments	Construction Stage	Contractor and Supervision Consultant	PIU



C5	Contamination of soil from fuel and lubricants	<ul style="list-style-type: none"> Construction vehicles and equipment shall be operated and maintained in such a manner so that soil contamination due to its spillage shall be minimum. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. 	Near Labor camp and sites of installation of Construction machineries.	Construction Stage	Contractor and Supervision Consultant	PIU
C6	Contamination of land from construction waste and quarry materials	<ul style="list-style-type: none"> Debris generated due to the dismantling of the existing pavement structure and the cutting of the hillside for the widening shall be suitably reused in the proposed construction, such as for fill materials for embankments. Debris and other material obtained from existing embankment shall be dumped in approved landfill site already identified by concerned agency. All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over. Construction waste including non- bituminous and bituminous waste shall be dumped in approved landfill site identified by State Pollution Control Board (SPCB). All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over. 	<p>Solid waste dump Site identified and approved by SPCB.</p> <p>Throughout the area</p>	Construction Stage	Contractor and Supervision Consultant	PIU
C7	Loss of top soil in land acquisition	<ul style="list-style-type: none"> Topsoil shall be stripped, stored and shall be laid on ground for landscaping purpose. 	Throughout the area	Construction Stage	Contractor and Supervision Consultant	PIU

Water

C8	Contamination of water by fuel/ oil spillage of vehicle	<ul style="list-style-type: none"> Construction vehicles / equipment shall be operated and maintained in such a manner to avoid contamination of water bodies due to oil spillage. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. 	Near labor camp and sites of installation of Construction machineries.	Construction Stage	Contractor and Supervision Consultant	PIU
C9	Contamination of stagnant water body by fecal matters from labor camp.	<ul style="list-style-type: none"> Labor camp shall not be allowed near any of the water bodies. The proper sanitation facilities shall be provided. 	Preapproved locations away from the water bodies.	Construction Stage	Contractor and Supervision Consultant	PIU
C10	Deposition of dust in open wells near construction site	<ul style="list-style-type: none"> The mouth/opening of the well shall be covered with suitable material during any of the construction activity so as to prevent dust entering in the well. 	All the wells along the project corridor.	Construction Stage	Contractor and Supervision Consultant	PIU
C11	Using drinking water for construction purpose	<ul style="list-style-type: none"> The contractor shall make arrangements for water required for construction in such a way that water availability and supply to nearby community is unaffected. Wastage of water shall be kept minimum during construction. 	At respective planned construction sites	Construction Stage	Contractor and Supervision Consultant	PIU
C12	Hand pump close to road may get affected in widening	<ul style="list-style-type: none"> All the Hand pumps shall be relocated to suitable alternate place. 	At the respective locations	Construction Stage	Contractor and Supervision Consultant	PIU
C13	Well may get affected in widening	<ul style="list-style-type: none"> All the Wells shall be relocated at alternate site. 	At the respective locations	Construction Stage	Contractor and Supervision Consultant	PIU



C14	Altering flow of Natural drains	<ul style="list-style-type: none"> Drain shall be channelized with Slope protection - Gabion Structure. 	At the respective locations	Construction Stage	Contractor and Supervision Consultant	PIU
C15	Sanitation of waste disposal in construction camps	<ul style="list-style-type: none"> The construction of camps will be done with sufficient buffer from habitation. At construction sites and labor camps sufficient no of latrines will be provided. The sewage generated from the camps will be properly disposed off so that it does not affect water bodies 	Wherever labor camp is located	Construction Stage	Contractor and Supervision Consultant	PIU
Air						
C16	Emission from construction vehicles and machinery.	<ul style="list-style-type: none"> All vehicles, equipment and machinery shall be selected to meet recognized international and national standards for emissions and shall be maintained and operated in a manner that ensures relevant air, noise and discharge rules. Only unleaded petrol and low sulphur diesel or sulphur free diesel shall be used as fuel for vehicles, equipment and machinery. 	Wherever the hot mix plant and batching plant is setup.	Construction Stage	Contractor and Supervision Consultant	PIU
C17	Air pollution from various plants affecting settlements	<ul style="list-style-type: none"> The asphalt plants, crushers and batching plants shall not be sited at least 500 m in leeward direction from nearest human settlement 	Locations near Settlement	Construction Stage	Contractor and Supervision Consultant	PIU
C18	Air pollution may exceed the limits prescribed by Central Pollution Control Board.	<ul style="list-style-type: none"> Regular monitoring or air quality parameters during the construction period as envisaged in the Environmental Monitoring Plan. 	Locations given in Environmental Monitoring Plan.	Construction Stage	Contractor and Supervision Consultant	PIU



C19	Vehicles will generate dust and suspended particles.	<ul style="list-style-type: none"> The dust generated by vehicles on site shall be arrested using a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. 	Wherever the plants are setup and sensitive locations as suggested in monitoring plan.	Construction Stage	Contractor and Supervision Consultant	PIU
Noise						
C20	Noise levels from vehicles. Asphalt plants and equipment	<ul style="list-style-type: none"> The plants and equipments used for construction shall confirm to CPCB norms. Vehicles and equipments used shall be fitted with silencer. Any vehicle and machinery shall be kept in good working order and engines turned off when not in use. All equipments and plants shall strictly be placed away from educational institutes and hospitals. Regular monitoring of noise parameters (Leq) during the construction period as envisaged in the Environmental Monitoring Plan. 	Wherever the plants are setup.	Construction Stage	Contractor and Supervision Consultant	PIU
C21	Noise from blasting operations	<ul style="list-style-type: none"> Blasting as per Indian Explosives act will be carried out. People living near such blasting operation sites shall be informed before the operational hours. Workers at blasting sites shall be provided with earplugs. 	At the sites where the blasting is required and in quarry sites	Construction Stage	Contractor and Supervision Consultant	PIU



C22	Noise barriers	<ul style="list-style-type: none"> Construction of noise barriers in the form of walls and vegetation at Sensitive locations. 	All along the corridor wherever the sensitive locations like schools, hospitals and other community places are located.	Construction Stage	Contractor and Supervision Consultant	PIU
Flora and Fauna						
C23	Tree cutting for widening	<ul style="list-style-type: none"> Three trees shall replace each tree cut for the purpose. The Engineer shall approve such felling only when the NHIDCL receives a “clearance” for such felling from the DOF, as applicable. Trees felled shall be replaced as per the compensatory afforestation criteria in accordance with the Forests (Conservation) Act, 1980. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU



C24	Damage or Loss of Important Flora	<ul style="list-style-type: none"> During construction, at any point of time, if a rare/threatened/endangered flora species is found, it shall be conserved in a suitable manner in consultation with authorities. The Engineer shall approve detailed conservation processes, plans and designs as well as associated modification in the project design. 	Throughout the project area.	Construction Stage	Contractor and Supervision Consultant	PIU
Health and Hygiene						
C25	Health hazard to workers due to bad water and sanitation	<ul style="list-style-type: none"> At every workplace, good and sufficient potable water (as per IS 10500) supply shall be ensured to avoid water-borne diseases and to secure the health of workers. Adequate drainage, sanitation and waste disposal shall be provided at workplaces. Preventive Medical care shall be provided to workers. 	Wherever labor camp is setup	Construction Stage	Contractor and Supervision Consultant	PIU
C26	Health hazard to workers by various construction activity	<ul style="list-style-type: none"> Personal protective equipment shall be provided to worker as per the Factories Act. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU



C27	Health/ social hazard, sexual harassment to female workers	<ul style="list-style-type: none"> Segregation of male and female areas in labor camp shall be executed. 	Wherever labor camp is setup	Construction Stage	Contractor and Supervision Consultant	PIU
C28	Hygiene at Construction Camps	<ul style="list-style-type: none"> The Contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labor to standards and scales approved by the resident engineer. These shall be provided within the precincts of every workplace, latrines and urinals in an accessible place, and the accommodation, separately for each for these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. There shall be adequate supply of water, close to latrines and urinals. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place. Compliance with the relevant legislation must be strictly adhered to. Garbage bins must be provided in the camp and regularly emptied and the garbage disposed off in a lined landfill sites. Construction camps are to be sited away from vulnerable people and adequate health care is to be provided for the work force. 	Wherever labor camp is setup	Construction Stage	Contractor and Supervision Consultant	PIU



C28	Hygiene at Construction Camps	<ul style="list-style-type: none"> On completion of the works, the whole of such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the whole of the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer. 				
C29	Abandoned Quarry will accumulate water and act as a breeding ground for disease vectors.	<ul style="list-style-type: none"> Reclamation measure shall be adopted with garland of trees around the periphery. The quarry dust and waste shall be used for refilling. The remaining portion should be covered with trees. 	All quarry locations.	Construction Stage	Contractor and Supervision Consultant	PIU
Safety						
C30	Safety of vehicles plying on road while the construction activity is going on.	<ul style="list-style-type: none"> Prior arrangement/traffic diversion for safe passage of vehicles shall be made with proper direction and signage at the construction site. Detailed Traffic Control Plans shall be prepared and submitted to the Site Engineer/ Project Director for approval 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day. 	Throughout the project area	Construction stage	Contractor and Supervision Consultant	PIU



C31	Risk from Operations	<ul style="list-style-type: none"> • The Contractor is required to comply with all the precautions as required for the safety of the workmen as far as those are applicable to this contract. • The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. The contractor has to comply with all regulation regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU
C32	Risk from Electrical Equipment	<ul style="list-style-type: none"> • Adequate precautions will be taken to prevent danger from electrical equipment. No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the Engineer. 	All construction Site	Construction stage	Contractor and Supervision Consultant	PIU



C33	Risk at Hazardous Activity	<ul style="list-style-type: none"> • All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stone-breakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. • The use of any herbicide or other toxic chemical shall be strictly in accordance with the manufacturer's instructions. The Engineer shall be given at least 6 working day's notice of the proposed use of any herbicide or toxic chemical. A register of all herbicides and other toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product. This should comply with Hazardous Material Act. 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU
C34	Risk of Lead Pollution	<ul style="list-style-type: none"> • Nobody below the age of 18 years and no woman shall be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form of paste or readymade paint. • Facemasks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU



C35	Risk caused by Force' Majure	<ul style="list-style-type: none"> • All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work. 	All construction Site	Construction stage	Contractor and Supervision Consultant	PIU
C36	Risk from Explosives	<ul style="list-style-type: none"> • Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor shall not use explosives. 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 this Clause besides the law of the land as applicable. • 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 and shall, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. • 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 whatsoever concerned or affected or likely to be concerned or affected by blasting operations. 	Place of use of Explosives	Construction stage	Contractor and Supervision Consultant	PIU



C37	Malarial risk	<ul style="list-style-type: none"> The Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer, including filling up any borrow pits which may have been dug by him 	All construction sites, particularly beyond Lunglei district	Construction stage	Contractor and Supervision Consultant	PIU
C38	First Aid	<ul style="list-style-type: none"> At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided. 	At the construction site /labor camp	Construction stage	Contractor	PIU
Disruption to Users						
C39	Loss of Access	<ul style="list-style-type: none"> At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses connecting the project road. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer. The works shall not interfere unnecessarily or improperly with the convenience of public or the access to, use and occupation of public or private roads, railways and any other access footpaths to or of properties whether public or private. 	Throughout the project area, particularly in built-up areas	During Construction.	Contractor	Engineer



C40	Traffic Jams and Congestion	<ul style="list-style-type: none"> • Detailed Traffic Control Plans shall be prepared and submitted to the Site Engineer/ Project Director for approval 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day. • Temporary diversion (including scheme of temporary and acquisition) will be constructed with the approval of the designated Engineer. While approving temporary diversion construction, the Engineer will seek endorsement from the PIU. • Special consideration shall be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night. • The Contractor shall ensure that the running surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs. As far as possible idling of engines shall be avoided to curb pollution. • The temporary traffic detours shall be kept free of dust by frequent application of water, if necessary. 	Throughout Corridor	During Construction.	Contractor	Engineer
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C41	Traffic Control and Safety	<ul style="list-style-type: none"> 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 may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. All signs, barricades, pavement markings shall be as per the MORTH specification. Before taking up construction on any section of the highway, a traffic control plan shall be devised to the satisfaction of the Engineer as per EMP. Excavated pits shall be filled to avoid falling of animals/ human beings. 	Throughout the project area	During Construction.	Contractor	Engineer
Environment Enhancement						
C42	Hand pumps enhancement/relocation for ground water recharging	<ul style="list-style-type: none"> Hand pumps within Right of Way shall be enhanced/relocated. 	At the respective locations along the corridor.	Construction Stage	Contractor and Supervision Consultant	PIU
C43	Roadside landscape development	<ul style="list-style-type: none"> Avenue plantation of foliage trees mixed with flowering trees, shrubs and aromatic plants shall be carried out where ever land is available between ditches and Right of Way. 	Throughout the corridor	Construction Stage	Contractor and Supervision Consultant	PIU
C44	Providing better bus bays	<ul style="list-style-type: none"> Bus shelters shall be provided at given locations 	As per traffic plan	Construction Stage	Contractor and Supervision Consultant	PIU
C45	Better sitting arrangements where small space is available	<ul style="list-style-type: none"> Designed sitting arrangements shall be provided. 	As per the design	Construction Stage	Contractor and Supervision Consultant	PIU



C46	Landscaping of junctions	<ul style="list-style-type: none"> All rotary junctions shall be landscaped suitably 	As per landscape design at the respective locations	Construction Stage	Contractor and Supervision Consultant	PIU
C47	Abandoned Quarry will accumulate water and act as a breeding ground for disease vectors.	<ul style="list-style-type: none"> The abandoned quarry locations shall be planted suitably as the plan 	Wherever quarries are located and abandoned	Construction Stage	Contractor and Supervision Consultant	PIU
C48	Erosion of embankments, shoulders, side slopes, and pavement leading to deterioration and affecting stability and integrity of road	<ul style="list-style-type: none"> Earth works specifications will include provision for stable slope construction, compacting and laying out turf including watering until ground cover is fully established Proper construction of Breast wall and retaining wall at the locations identified by the design team to avoid soil erosion The measures proposed for slope stabilization are: Discharge zones of drainage structures (culverts and minor bridges) provided with riprap Construction in erosion and flood prone areas will not be in monsoon /season. Side slopes will be kept flatter wherever possible, and in case of steeper slopes it will be supported by the retaining wall. 	At the respective locations throughout the project area.	Construction Stage	Contractor and Supervision Consultant	PIU



Table 3 Environmental Management Plan for Operation Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
O1	Water quality degradation due to road-run-off	<ul style="list-style-type: none"> Silt fencing, oil & grease traps, etc. shall be provided at sensitive water bodies to ensure that the water quality is not impaired due to contaminants from road run-off Monitoring shall be carried out as specified in the Monitoring plan 	As specified in the monitoring plan	As per monitoring plan	PIU, SPCB	PIU
O2	Soil and water contamination from accidental spills	<ul style="list-style-type: none"> Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals 	All area	Plan to be developed at state/district level by early operation stage	PIU, Local Government Bodies	PIU
O3	Traffic safety	<ul style="list-style-type: none"> Traffic control measures including speed limits to be enforced strictly. Local government bodies and development authorities will be encouraged to control building development along the highway. 	All area	Throughout operation stage	PIU, Local Government Bodies	PIU



O4	Accidents involving hazardous materials	<ul style="list-style-type: none"> • Compliance with the Hazardous Wastes (Management and Handling) Rules, 1989 including: <ul style="list-style-type: none"> ✓ For delivery of hazardous substances, permit license, driving license and guidance license will be required. ✓ These vehicles will only be harbored at designated parking lots. ✓ In case of spill of hazardous materials, the relevant departments will be notified at once to deal with it with the spill contingency plan. 	All area	Manual/guideline to be prepared during early operation stage	PIU	PIU
O5	Roadside tree plantation	<ul style="list-style-type: none"> • Trees planted along the corridor shall be maintained for a period of three years. Maintenance works include, watering of the saplings, replacement of the bamboo fence every year for 3 years and all necessary measures for survival of the sapling. 	All area	Immediately from the planting of sapling	NGO	PIU



Table 4 Environmental Monitoring Plan

Sl. No	Item	Project Stage	Parameters	Guidance	Standards	Location	Frequency	Duration	Responsibility	
									Implementati on	Superv ision
M1	Air	Construction	SPM, RSMP, SO ₂ , NOx, CO, HC	<ul style="list-style-type: none"> Dust sampler to be located 50m from the plan in the downwind direction. Use method specified by CPCB for analysis 	Air (P&CP) Rules, CPCB, 1994	Hot mix plant/ batching plant	Twice a year for three years	Continuous 24 hours	Contractor through approved monitoring agency	PIU
M2		Construction	SPM, RSPM	<ul style="list-style-type: none"> Dust sampler to be located 50m from the earthworks site downwind direction. Follow CPCD method for analysis 	Air (P&CP) Rules, CPCB, 1994	Stretch of road where construction is underway	Twice a year for three years	Continuous 24 hours	Contractor through approved monitoring agency	PIU
M3		Operation	SPM, RSMP, SO ₂ , NOx, CO, HC	<ul style="list-style-type: none"> Use method specified by CPCB for analysis 	Air (P&CP) Rules, CPCB, 1994	Sampling location specified in EIA report	Twice a year for one year	Continuous 24 hours	PIU	PIU
M4	Water	Construction	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	<ul style="list-style-type: none"> Sample collected from source and analyze as per Standard Methods for Examination of Water and Wastewater 	Water quality standards by CPCB	Sampling locations specified in EIA report	Twice a year for three years		Contractor through approved monitoring agency	PIU



M5		Operation	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	<ul style="list-style-type: none"> Grab sample collected from source and analyze as per Standard Methods for Examination of Water and Wastewater 	Water quality standards by CPCB	Sampling locations specified in EIA report	Twice a year for one year		PIU	PIU
M6		Operation	Cleaning of drains and water bodies	<ul style="list-style-type: none"> Choked drains, water bodies undergoing siltation and subject to debris disposal should be monitored under cleaning operations 	To the satisfaction of the engineer (PWD)	All area	Post-monsoon		PIU	PIU
M7	Noise	Construction	Noise levels on dB (A) scale	<ul style="list-style-type: none"> Free field at 1m from the equipment whose noise levels are being determined 	Noise standards by CPCB	At equipment yard	Once every 3 Month (max) for three years, as required by the engineer	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged	Contractor through approved monitoring agency	PIU
M8		Operation	Noise levels on dB (A) scale	<ul style="list-style-type: none"> Equivalent Noise levels using an integrated noise level meter kept at a distance of 15 m from edge of Pavement 	Noise standards by CPCB	At maximum 15 locations listed in EIA report for noise monitoring locations	Twice a year for 1 years	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.	PIU	PIU



M9	Soil erosion	Construction	Turbidity in Storm water; Silt load in ponds, water courses	<ul style="list-style-type: none"> Visual observations during site visits 	As specified by the engineer / Water quality standards	At locations of stream crossings and at locations of retaining wall and breast wall	Pre-monsoon and post-monsoon for three years		Contractor	PIU
M10		Operation	Turbidity in Storm water; Silt load in ponds, water courses	<ul style="list-style-type: none"> Visual observations during site visits 	As specified by the engineer / Water quality standards	As directed by the engineer	Pre-monsoon and post-monsoon for one year		PIU	PIU
M11	Construction camp	Construction	Monitoring of: 1.Storage Area; 2. Drainage Arrangement 3. Sanitation in Camps	<ul style="list-style-type: none"> Visual Observations and as directed by the engineer 	To the satisfaction of the engineer and Water quality standards	At storage area and construction workers' camp	Quarterly during construction stage		PIU	PIU
M12	Afforestation	Construction and operation	Plant survival	<ul style="list-style-type: none"> The success of tree planting. Monitor the rate of survival after six months, one year and 18 months in relation to total numbers of trees planted 		All area	Minimum three years after planting		NGO, PIU	PIU
M13	Flora and Fauna	Construction	Condition of ecosystem	<ul style="list-style-type: none"> Comparison to pre-project flora and fauna 	As specified in TOR	As specified in TOR	Twice a year for three years		NGO, PIU	PIU



Resettlement Action Plan

There are three components of the RAP monitoring framework for the project:

- Internal monitoring by PIU's Environmental and Social expert in conjunction with relevant state/district authority, to be supported by inputs from NGO and other stakeholders;
- External monitoring by a panel of expert; and
- RAP Completion Audit by the Expert Monitoring Panel.

Monitoring will follow the system of input, output, process, outcome and impact performance indicators that has been adopted by the World Bank. These are outlined in the RAP. Specific indicators for the projects will be identified/verified when the expert panel is first convened. These indicators will be field-tested in consultation with affected people and other stakeholders to ensure that they are effective and relevant to the RAP. Tasks for each types of monitoring are discussed below.

I. Internal Monitoring Team

Objective

The objectives of internal monitoring are:

- To measure and report progress against the RAP schedule,
- To verify that agreed entitlements are delivered in full to affected people,
- To identify any problems, issues or cases of hardship resulting from the resettlement process, and to develop appropriate corrective actions, or where problems are systemic refer them to the management team,
- To monitor the effectiveness of the grievance system, and
- To periodically measure the satisfaction of project affected people.

Activities

The RAP identifies the following activities for the internal monitoring teams:



- Coordinate with the PIU, relevant state and district authorities, NGO and project affected communities to review and report progress against the RAP;
- Verify that land acquisition and compensation entitlements are being delivered in accordance with the RAP;
- Verify that agreed measures to restore or enhance livelihood are being implemented;
- Verify that agreed measures to restore or enhance livelihood are being implemented;
- Identify any problems, issues, or cases of hardship resulting from the resettlement process;
- Assess project affected peoples' satisfaction with resettlement outcomes through informal village head and household interviews;
- Collect records of grievances, follow-up that appropriate corrective actions have been undertaken and that outcomes are satisfactory;
- When required, assist with verification activities to support the expert panel; and
- Prepare brief quarterly progress and compliance reports for BTC Management and the Expert RAP Monitoring Panel.

Implementation

Internal monitoring teams activities might involve 30 percent of time in the office and 70 percent of time in the field. Typical office review activities might entail:

- Liaison with District Collector to collate up-to-date information on land acquisition progress such as agreement signing, compensation disbursement, RAP Funds milestones and disbursement, land areas under construction, land areas reinstated and the like;
- Review of grievance register and basic analysis of grievance types, numbers, and closures; and
- Report preparation.



Fieldwork activities might entail:

- Liaison with the village/block level representatives to gather information about progress, incidents, grievances and issues;
- Spot checking on complainants who had lodged grievances to verify outcomes of corrective actions;
- Conduct semi-structured interviews with a cross-section of affected households including vulnerable groups to verify receipt of entitlements, review effectiveness of measures, assess satisfaction with outcomes; and
- Conduct interviews with other key informants

II. External Monitoring Panel

Objective

- To assess overall compliance with the RAP;
- To verify that measures to restore or enhance project affected peoples' quality of life and livelihood are being implemented and to gauge their effectiveness; and
- To assess the extent to which the quality of life and livelihoods of affected communities have been restored.

Activities

- Review of internal monitoring procedures and reporting to ascertain whether these are being undertaken in compliance with the RAP;
- Review internal monitoring records as a basis for identifying any areas of non-compliance, any recurrent problems, or potentially disadvantaged groups or households;
- Review grievance records for evidence of significant non-compliance or recurrent poor performance in resettlement implementation;



- Discussions with NGO, DC, PIU and others involved in land acquisition, compensation disbursement or livelihood restoration to review progress and identify critical issues;
- Survey affected households and enterprises to gauge the extent to which project affected people's standards of living and livelihood have been restored or enhanced as a result of the project;
- Assess overall compliance with the RAP requirements and JICA Guidelines; and
- Prepare a summary compliance report for NHIDCL on resettlement progress, any issues arising and any necessary corrective actions.

Implementation

- The Expert Monitoring Panel would initially convene by teleconference or in person and discuss the review agenda, overall and district-by-district.
- Each Expert Monitoring Panel member would then travel to project site.
- In-site, a panel member would:
 - ✓ spend 3-4 days in the project office reviewing internal monitoring reports, grievance registers, interviewing internal monitoring team members, project / government officers, NGOs as necessary to assess functioning of monitoring and grievance systems, assess progress against the RAP and identify issues arising;
 - ✓ Brief/ prepare terms of reference for livelihood restoration verification surveys, when required; and
 - ✓ Spend 7-10 days in field interviews with affected people, key informants, project field staff and the like.
- All panel members would then convene for 4-5 days to run through overall and district-level findings and develop key conclusions and recommendations.
- Panel members would return to home offices to draft and finalize the six monthly external monitoring report.



Based on the above, the assignment period for each expert monitoring panel member would be 30 days.

III. RAP Completion Audit

Objective

A key objective of the RAP is that resettlement actions and mitigation measures should lead to sustainable restoration or enhancement of affected peoples' pre-project living standards and income levels. At such time as affected peoples' quality of life and livelihood can be demonstrated to have been sustainably restored, the resettlement process can be deemed "complete".

Resettlement planning for the projects assumes that livelihood restoration of affected landowners will be complete when the productivity of agricultural land affected by construction has been fully restored, compensatory forestation for loss of forest is carried out, and community and social investment programs are well established. It is proposed that the resettlement completion audit be conducted by the Expert RAP Monitoring Panel 36 months following relocation or at such time as the Expert RAP Monitoring Panel determines affected peoples' living standards and income levels have been fully restored, whichever occurs earlier.

Provisional RAP Implementation Cost

Provisional Budget for RAP for NH54 (from km 125 to km 250)

Item	Unit	Unit Cost	Quantity	Total (Rs)
I. Compensation				
Land (construction)	ha.	700,000	145	101,500,000
Land (surplus soil)	ha.	500,000	53	26,716,667
Rural area multiplier	*the land price will be double for compensation of rural area land			128,216,667
Structure	Sq. m	7,500	6,667	50,000,000
Public toilet, water point	No.	50,000	7	333,333
Crops	No.			30,000,000
Solatium	*100% of compensation as per LARR 2013			313,433,333



Sub-Total (I)				626,866,667
II. Allowance				
Moving allowance	Household	50,000	500	25,000,000
Subsistence allowance	Household	18,000	667	12,000,000
Assistance to vulnerable	Household	20,000	333	6,666,667
Training	Household	20,000	667	13,333,333
Sub-Total (II)				57,000,000
III. Resettlement Site				
Sub-total (III)	Village	30,000,000	16	480,000,000
IV. Implementation				
Expert fees	Lump sum			6,666,667
Staff training	Lump sum			1,000,000
External monitoring	Lump sum			1,666,667
Information disclosure	Lump sum			500,000
Livelihood restoration	Lump sum			5,000,000
Sub-Total (IV)				14,833,333
Sub-Total (I+II+III+IV)				1,178,700,000
Contingency (10%)				117,870,000
Total				1,296,570,000