14.4.1.6 Noise Level

Noise monitoring was carried out at Bareilly highway in the inner city as shown in Figure 14-5. The noise levels are comparatively high due to movement of vehicles. The present level of noise, generally ranges from 58 dB(A) to 90 dB(A), as recorded at a distance of 3 m from NH-24 which was also measured at varying distance from the highway at the time of vehicle movement, without considering the noise created due to horns which rises to 129 dB(A). The results of the monitoring are summarised in Table 14-29.

Table 14-29 Noise Level Monitoring

Location	Range dB(A)	Remarks
3 m from NH-3	58~82	Ambient noise including traffic movement
10.7m-47.2m from NH-3	87~67	Only during movement of HMVs

At 3 m distance from NH-3 Leq for day : 73 dB(A)
Leq for night : 71 dB(A)

The traffic flow on the NH-3 was monitored at Bareilly highway for 24 hours as shown in Figure 14-5. The category wise vehicle count and as well as their respective speeds were observed. The results of monitoring are summarised below:

Table 14-30 Traffic Monitoring

Period (hrs.)	2/3 wheelers	LMVs	HMVs	Total
14.00~22.00	1316	808	1464	3588
22.00~06.00	211	125	1186	1522
06.00~14.00	1389	759	1450	3598
Total	2916	1692	4100	8708
Avg. speed(km/h)	35.0	36.4	33.8	

The relation between distance and noise level based on the monitored data is shown in the form of line graph in Figure 14-7.

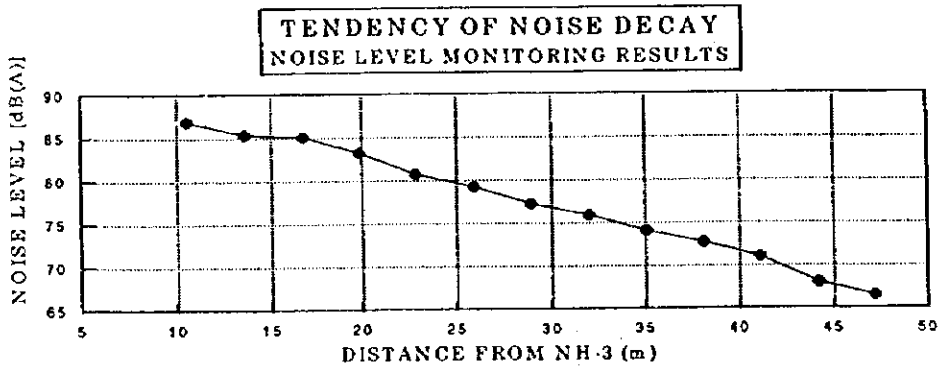


Figure 14-7 Noise decay by distance

Power Level of existing vehicles in India

There is no data available on the investigation of noise made by each type of vehicle in India. Accordingly, the noise power levels of an actual passenger car on the dual-lane at-grade road with small traffic volume were investigated briefly. The objective of the study was to investigate existing vehicle noise levels for each type considering the velocity, and on the basis of this to appraise the method of estimating noise levels caused by transportation in the future. The evaluation was based on methods used by the Acoustical Society of Japan (ASJ).

The regression of power level with running vehicle speed was estimated using the measured values. The results with regression formula fixed at 10.0 as the proportion constant, are shown in Table 14-31.

Table 14-31 Regression of Power Level with Velocity

Type of vehicle	Regression formula	Correlation coefficient	Standard error	Sampling Number
Group of small vehicle	$Lw = 10.3 \log_{10} V + 83.4$ $Lw = 10.0 \log_{10} V + 83.9$	0.20	3.21	29
Group of large vehicle	$Lw = 9.09 \log_{10} V + 94.0$ $Lw = 10.0 \log_{10} V + 92.3$	0.31	2.70	46

small vehicles : cars, taxis large vehicles: buses, trucks

Therefore, the average power level in India classified by 2 types of vehicles is estimated as the following formula synthesized from the above-mentioned formulae.

$$Lw = 83.9 + 10 \log_{10} V + 10 \log_{10}(a_1 + 6.8 a_2)$$

where, a1: Ratio of small vehicle
a2: Ratio of large vehicle $(a1 + a2 = 1.0)$

14.4.1.7 Soil

The proposed bypass passes mainly through agricultural fields and barren/waste land. Generally the whole stretch area comes under loam to sandy loam with phosphate in medium amount and low proportion of Nitrogen. The soil types along the alignment are shown Figure 14-8. The soil condition in each village is summarised as shown in Table 14-32.

14.4.1.8 Flora

The flora in this area comprises many perennial species of woody plants of trees besides various herbs and shrubs. Due to normal soil fertility the vegetation cover of this area is healthy and as the whole alignment is devoid of any forest compartment, the trees along the existing roads are attaining height of about 6m to 10m and diameter of their canopy varies from about 2 m to 6m. Types of vegetation are shown in Figure 14-9.

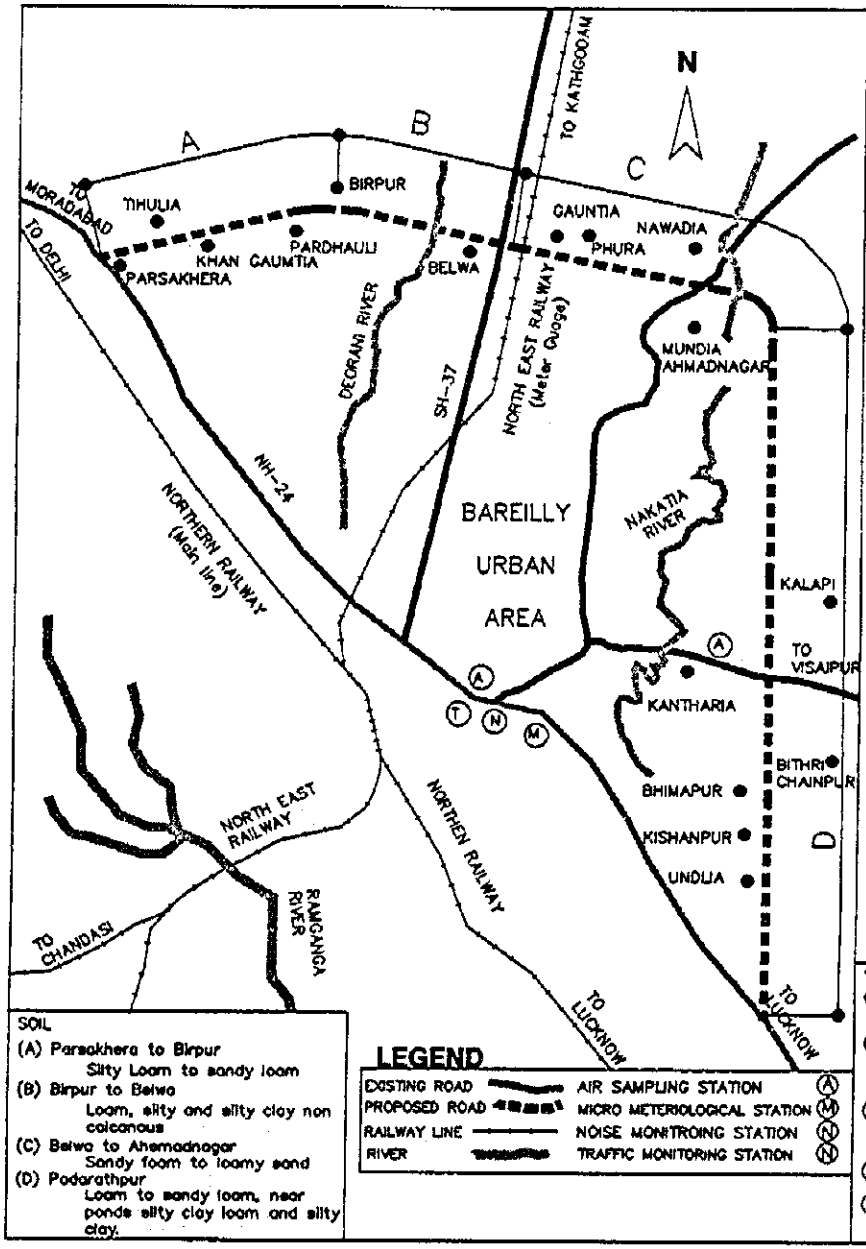


Figure 14-8 Soil Types in Bareilly Area

Figure 14-9 Vegetation Types in Bareilly Area

Table 14-32 Soil Condition

Village	Stretch (km)	Soil type
Parsakhera	5.0	Silty loam to sandy Loam
Birpur	3.0	Silty loam and silty clay without calcareous
Near Degrahiya	0.5	Almost mixed (silty clay loam and silty clay) type with calcareous mixture
Betwa	5.0	Sandy loam to loamy sand, loam in very less amount
Anand nagar	9.0	Loam and sandy loam near ponds, silty clay loam and silty clay and partly sandy clay
Kantharia	8.0	Loam and sandy loam

14.4.2 Existing Environment and Baseline Survey for Gwalior Bypass

14.4.2.1 Climate

The area falls under central highlands region with hot and sub-humid climatic conditions experiencing south-west monsoon.

The climate of Gwalior district is characterised by hot summer and is generally dry except during the south-west monsoon season. The year may be divided into four seasons as follows:

i Hot Season : From March to June (till rain break)
ii Rainy Season : From June end (when rains break) to September (till rains cease)
iii Post rains season : From September (from cessation of rains) to October.
iv Cool Season : From November to February

(1) Temperature

The annual mean daily temperature of Gwalior is 25.7°C which rises to 32.5°C as mean daily maximum temperature and drops to 18.9°C as mean daily minimum temperature. The seasonal temperature range at Gwalior is given in Table 14-33.

Table 14-33 Seasonal Range of Temperature at Gwalior

Temperature Characteristics	Hot Season	Rainy season	Post rains	Cool season
M. max. Temperature	33.1 to 42.5°C	31.4 to 34.3°C	33.3°C	22.9 to 29.4°C
M. min. Temperature	16.0 to 30.0°C	25.0 to 26.7°C	17.9°C	7.2 to 10.9°C
Mean Temperature	24.5 to 35.5°C	28.2 to 30.5°C	25.6°C	15.1 to 20.2°C

Source: IMD, Nagpur (1941-71), taken from Forest Working Plan, Gwalior Division

(2) Rainfall

The area receives rainfall from westerly wind. Monthly rainfall data has been

collected from Gwalior Observatory from 1976 to 1996. The maximum average rainfall is during August (260 mm) and minimum average during March (4 mm). The annual average rainfall is 815 mm.

(3) Winds

Winds are generally light which strengthen in force during the later part of summer and monsoon seasons. During the south-west monsoon period, the wind blows mainly from the sector between south-west and north-west. By October, north-easterlies and easterlies become predominant and continue to predominate in the next two months. In January and February, wind blows from the south-west and the north-west directions and is as common as the easterlies and north-easterlies, particularly in the afternoons. In the summer season, westerly to north-westerly winds are predominant. The average monthly wind speed is 2.7 m/s (June) and 0.8 m/s (Nov). Mean annual wind speed is 1.5 m/s.

14.4.2.2 Geology

The principal geological formations are alluvium Upper Vindhyans, Gwalior shale and volcanic, Gwalior sandstone and Archaeans. Soil is shallow and stony varying from course grained or sandy loam on the escarpments to stiff clayey loam on the plateau. At the foot of hill and along streams, soil is generally deep. The soil varies from light loam to stiff loam except along streams where it is generally clayey. The soil on slopes which are not rocky is some what deep varying from dark red to reddish in colour. Hard rocky out crops are noticed at places both on the hills and in plain areas.

14.4.2.3 Topography and Drainage

The topography along the proposed alignment of the bypass is undulating. The alignment crosses railway line (narrow gauge), irrigation canals, drainage channels and roads (including public roads and panchayat roads). Topographically, the district comprises the Malwa Plateau and the upper Vindhyan Hill Ranges.

The typical features of the district are the plateau in south as well as in west and hilly regions in the north. Morar river and Sank river passes through the Eastern and Western part of the district respectively. Tighra stream is the other drainage channel flowing through the western part of the district. The plateau is mostly covered by reserved forest. The whole district falls under Ganga basin. All the drainage channels flow from South to North.

14.4.2.4 Water Environment

There are a number of seasonal rivers in Gwalior district. All these rivers become full and active during the rainy season and in summer, they generally dry up entirely.

During this season, most of these rivers cannot be utilised for irrigation or for navigation purposes. Greater part of the tract experiences great scarcity of water specially after January each year. Many of the wells dry up in summer creating water scarcity. The water table is generally low in rocky and ravenous areas. River Sank flows near the project area. Tighra Dam has been constructed on this river. The bypass alignment intercepts Tighra canal. No other major stream/water body exist in the project area. Hence, no significant change in the present drainage system in the project area is anticipated with the completion of the project.

14.4.2.5 Air Quality

Air quality monitoring was carried out at 2 stations - Gol Pahadi and Jinawali. The location of the monitoring stations are shown in Figure 14-10. The details of the analysis of eight hourly samples collected at the above mentioned locations are summarised in Table 14-34.

Table 14-34 Ambient Air Quality

Location	Date of Sampling	Avg. 24 hrs Concentration (µg/m³)				
		SPM	SO_2	NOx	Pb	CO*
Gol Pahadi (Existing Highway inside the town)	3~4/12/97	412	6.4	8.04	Nil	Less than 167
	5~6/12/97	389	6.5	6.75	0.3	
	7~8/12/97	348	6.1	8.32	Nil	
Jinawali village (proposed bypass alignment)	7~8/12/97	61	6.3	7.16	Nil	
National Ambient Air Quality Standards (CO*: 8 hrs)	Industrial	500	120	120	1.5	5000
	Residential/Rural	200	80	80	1.0	2000
	Sensitive	100	30	30	0.75	1000

A perusal of the above table shows that the 24 hourly average concentrations of SPM, SO_2 and NOx were found to be high along the existing highway but well within the limits prescribed for industrial area. Lead content was found to be 0.3 µg/m³ in one sample at Gol Pahadi which is also well within the permissible limit of 1.5 µg/m³ for industrial area.

Meteorological data during the air quality monitoring period is shown in Table 14-35. Max. wind speed was 1.67 m/s, average temperature was 19.6° C and humidity varied from 56 % to 96 %. The predominant wind direction was South - East, as shown in Figure 14-11.

Table 14-35 Survey Results of Meteorological Data

Wind Speed (m/s)			Temperature (° C)			Humidity (%)		
Ave.	Max.	Calm (%)	Ave.	Max.	Min.	Ave.	Max.	Min.
0.4	1.7	66.7	19.6	25.5	16.5	83	96	56

Note : Calm is defined as wind condition below 1 m/sec wind speed.

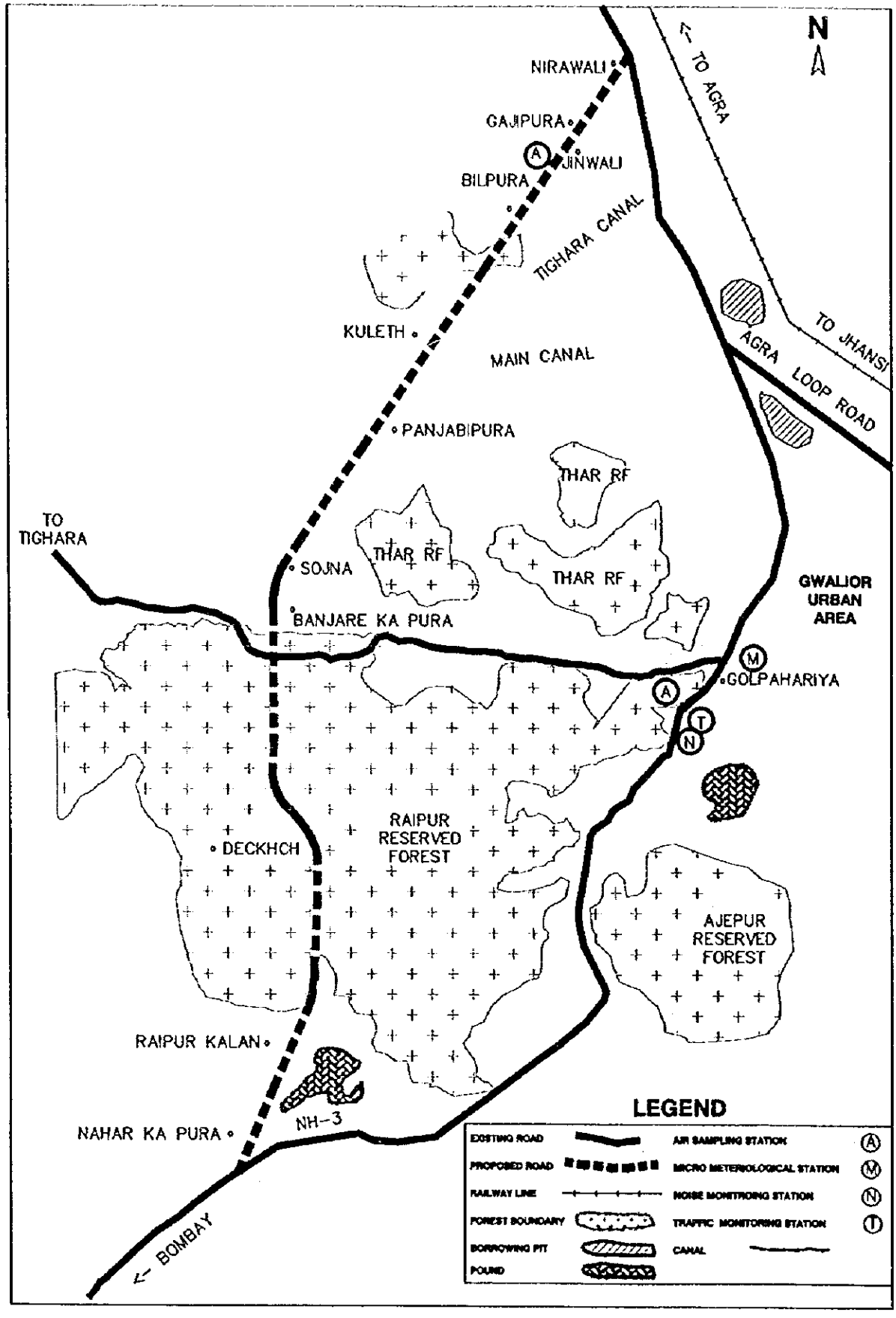
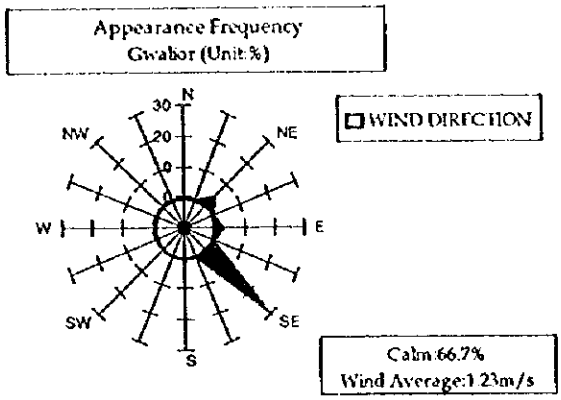


Figure 14-10 Monitoring Stations for Gwalior Bypass



Note : Wind Average except calm

Figure 14-11 Windrose Diagram during 03~08/12/1997

14.4.2.6 Noise Level

Noise monitoring was carried out at Gol Pahadi as shown in Figure 14-10. The noise levels are comparatively high due to movement of vehicles. The present noise level, generally ranges from 50 dB(A) to 92 dB(A), as recorded at a distance of 3 m from NH-3 which was also measured at varying distance from the highway at the time of vehicle movement, without considering the noise created due to horns which rises to 129 dB(A). Noise level was also monitored in and around distillery. The results of the monitoring are summarised in Table 14-36.

Table 14-36 Noise Level Monitoring

Location	Range dB(A)	Remarks
Gol Pahadi		
3m from NH-3	50-92	Ambient noise including traffic movement
10.7m-41.1m from NH-3	84-70	Only during movement of HMVs
Adjacent to distillery	45-65	Ambient noise level
Near gate	73-88	Movement of HMVs
Banjara ka pura	36-48	Ambient noise level
Sojna primary school	42-53	Ambient noise level (beyond 1 km distance)

At 3 m distance from NH-3 Leq for day : 76 dB(A)
Leq for night : 59 dB(A)

The traffic flow on the NH-3 was monitored at Gol Pahadi for 24 hours as shown in Figure 14-10. The category wise vehicle count and as well as their respective speeds were observed. The results of monitoring were summarised in Table 14-37.

Table 14-37 Traffic Monitoring

Period (hrs.)	2/3 wheelers	LMVs	HMVs	Total
14.00~22.00	757	350	1044	2151
22.00~06.00	73	33	332	438
06.00~14.00	604	190	980	1774
Total	1434	573	2356	4363
Avg. speed(km/h)	53.6	48.6	51.5	

The relation between distance and noise level based on the monitored data is shown in the form of line graph in Figure 14-12.

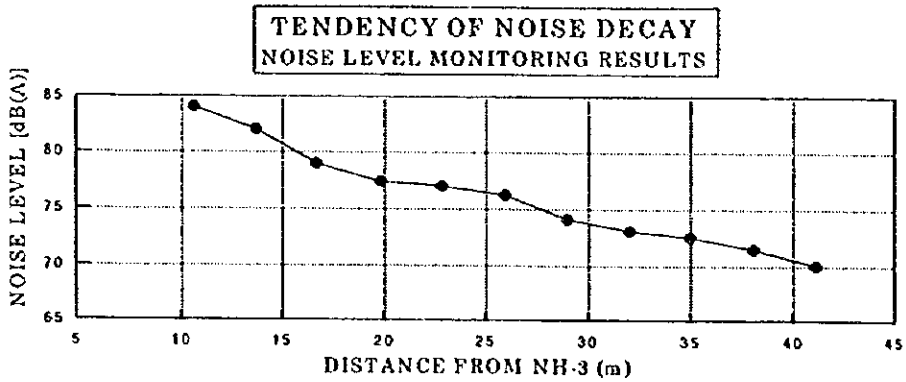


Figure 14-12 Noise decay by distance

14.4.2.7 Soil

Alluvial soil occupies the major part of the area. The soil is usually loam to sandy loam with clay admixture. The soil in agricultural fields comprises alluvium of yellowish and dark brown colour interspersed with small lumps of Kanker. It varies from black to yellow in colour and from clayey to sandy in texture. The soil in the forest tract, east and south of the Upper Vindhyans, above the escarpments is generally shallow and stony, varying from coarse grained or sandy loam texture on the escarpments to stiff clayey loam texture on plateau. It is generally reddish in colour. The depth of the soil at the top of the plateau is very less. The soil on the slopes which are not rocky is some what deep, often coarse and loose varying from dark red to reddish in colour somewhat resembling muharum. The soil is generally very shallow in these areas. The soil types are shown in Figure 14-13.

14.4.2.8 Flora

About 10 km long stretch of the bypass passes through Raipur Reserve Forest, out of the total road length of about 28 km. The rest of the length of the by-pass traverses agricultural and government waste land. Out of total alignment area (about 28 km) the stretch can be separated into four major vegetation zones, shown in Figure 14-14.

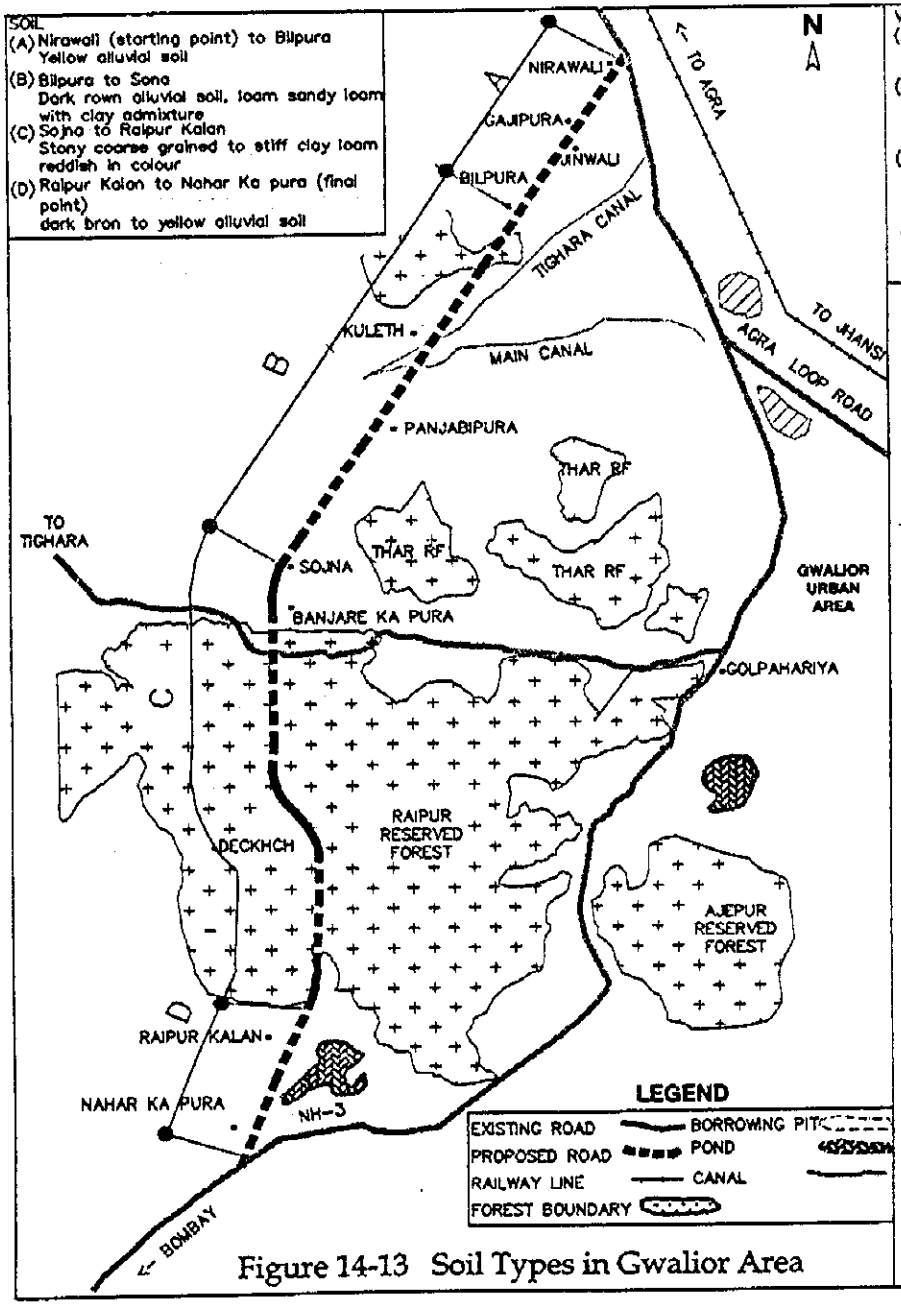


Figure 14-13 Soil Types in Gwalior Area

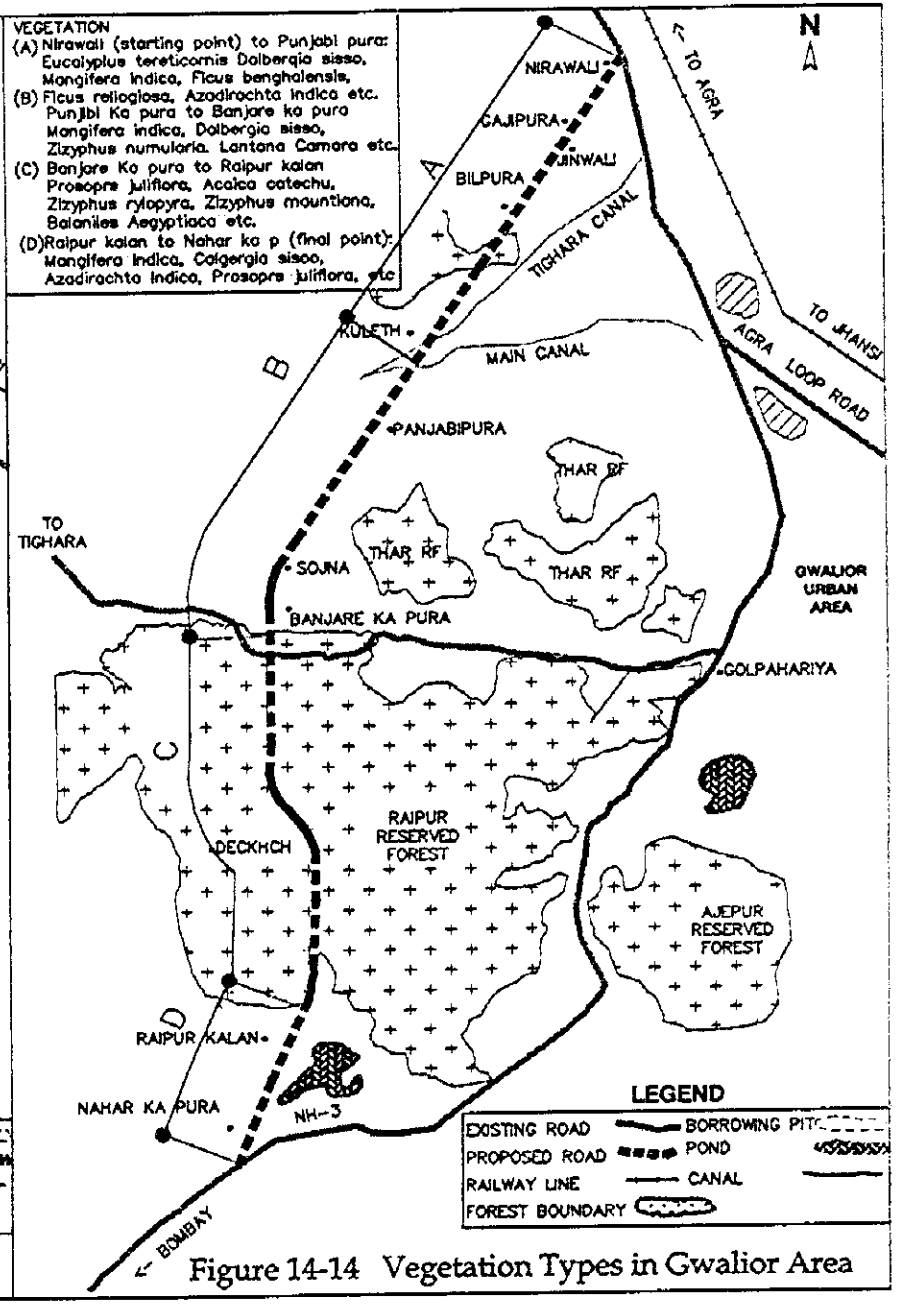


Figure 14-14 Vegetation Types in Gwalior Area

A. Agricultural zone - I (From Nirawali to Punjabi Pura) : 9 km long

After diversion from NH-3 just about 150 m away from culvert No. 103/6, there are few trees within the PWD area. This 9 km stretch passes through the agricultural fields. The main crops are Paddy, Mustard, Sugar Cane, Wheat, Bajra, Arhar, Pea, Gram, Brinjal, Bean, Tomato, Raddish, Potato, Carrot, Chili etc.

Basically whole area is coverd by Alluvial Soil. Near distillery plant, soil is polluted by the effluent of the factory and a Pungent smell is spreading around. Stagnant effluent water is black in colour. Near Kuleth village soil condition slightly changes by reddish brown colour with hard stony clay admixture.

B. Open scrub zone (from Punjabi Pura to Banjare Ka Pura) : 6 km long

In this area the stretch passes through the side of the forest block having open scrub area. The hard stony red soil is covered with small shrubs of zizyphus sps and few herbs. The herbs can be seen during monsoon season. Trees of Mango, Sisoo etc. are sparsely distributed.

C. Dense scrub forest zone (from Banjare ka pura to Raipur Khurd) : 9 km long

About 9 km reserved forest area from Banjare Ka Pura village is facing high anthropogenic and cattle grazing pressure.

D. Agricultural zone - II (from Raipur Khurd to NH-3) : 4 km long

Here the soil condition (Alluvial soil) changed with yellowish brown colour with more silt. In this stretch two semi pucca houses are located within the alignment area. The main trees are Mango (Magifera indica), Shisham (Dalbergia sisoo), Neem (Azadirachta indica), Prosopis juliflora and Acacia arabica.

14.4.3 Prediction of Impact and Evaluation for Bareilly Bypass

Prediction of impacts is the most important component of Environmental Impact Assessment Studies. Many scientific techniques and methodologies are available to predict the impacts on air, noise, biology, etc. Such predictions are superimposed over the baseline (pre-project) scenario of environmental conditions. The prediction of impacts help in specification and implementation of Environmental Management Plan during and after the execution of the operational activities to minimise the negative impacts on environmental quality.

Any project related activity has two phases, namely: construction phase and operation phase, each having quite different environmental implications. The construction phase is temporary, involving some intense building and construction related activities for a limited period. These activities are only physical ones, and sources of disturbance to the environment will cease to exist once this period is over.

At the end, only some permanent physical changes at the site will remain. In contrast, with the start of operation phase, some permanent sources of disturbance and pollution to environment will start. These will have long term impacts which need to be assessed properly.

14.4.3.1 Air Environment

(1) During Construction Period

Primary impacts on air quality will reflect on high dust loading of ambient air spreading towards the prevailing wind direction. There will be deposits of dust on all objects on surface, such as soil, water, plants and other man-made objects along the alignment route. Therefore, countermeasures during construction and transport of earth should be provided such as establishment of dust-proofing fences and sprinkling water to control dispersion of dust when necessary.

(2) During Operation Phase

The prediction of pollutant concentration of NOx and CO caused by vehicle transportation in the future was calculated using the following process. A 1-hour concentration in the case of transverse wind and parallel wind by Plume model is used as the prediction method. The prediction formula is as follows:

<u>In case of transverse wind (as line source model)</u>

$$C(x) = (2/\pi)^{1/2} \cdot (Q_L / U \sigma_z) \cdot \exp(-He^2 / 2\sigma_z^2)$$

where, U : Average wind speed (m/sec)
Q_L: Emission intensity of pollutant (mg/m·s)
He: Effective emission source height (m)
σ_z: Width of diffusion in vertical direction

<u>In case of parallel wind</u>

$$C(y) = Q/(\pi U \sigma_y \sigma_z) \cdot \exp(-y^2/2\sigma_y^2) \cdot \exp(-He^2/2\sigma_z)$$

where, Q : Emission intensity of pollutant (mg/m) $Q = \Delta x \cdot QL$
$\sigma y(x)$: Width of diffusion in horizontal direction $x = \Delta x \cdot i$
$\sigma z(x)$: Width of diffusion in vertical direction $x = \Delta x \cdot I$

$$C(y) = \Sigma Q/(\pi U \sigma_y(\Delta xi)\, \sigma_z(\Delta xi)) \cdot \exp(-y^2/2\sigma_y(\Delta xi)^2) \cdot \exp(-He^2/2\sigma_z(\Delta xi)^2)$$

where, i : I = 1, n (n=50)
Δx : Δx =10m

The concentration of vehicle exhaust gas in 2002 was thought to be higher than that of Japan, and it was assumed that the near future condition of India

will be close to the former one of Japan. Therefore, Japanese emission rates in the second half of 1970's were used as Indian rates in 2002 and those in these days are used as in 2012. Using the Pasquill-Gilfford Chart of width of diffusion, the air stability percentage B, D, E were calculated. The wind speed was taken as 0.7 m/s which is the average wind speed for Bareilly, and height of emission source was assumed as the 1 m in consideration of predicting safely as the roads are low embankment. Hourly traffic volume, classification of vehicle type and speed are specified as follows:

i) Hourly traffic volume: peak hourly traffic volume is assumed to be the daily traffic on the future network multiplied by 0.08 as a peak hourly coefficient.

ii) Classification of vehicle type: vehicle types are classified as large and small. However motorcycle may be disregarded because of its small volume.

iii) Speed: speeds are assumed to match practical speeds based on design speeds.

The above calculation conditions are shown in Table 14-38.

Table 14-38 Calculation Conditions for Bareilly Bypass

	2002			2012		
	Bus+H.Truck	Car	M.C	Bus+H.Truck	Car	M.C
Running Speed (km/h)	80	100	60	80	100	60
Emission Coefficient NOx	4.820	2.100	-	2.290	0.436	-
(g/km/unit) CO	1.380	0.970	0.280	1.210	1.150	0.013
N(W) Section (Parsakhera - Bilwa)						
Hourly Traffic Volume	322	122	79	859	337	232
Emission Intensity NOx	0.431	0.071	-	0.546	0.041	-
(mg/m/sec) CO	0.123	0.033	0.006	0.289	0.108	0.010
Total. Emission Int. NOx	0.50			0.59		
(mg/m/sec) CO	0.16			0.41		
Centre Section (Bilwa - Nawadia)						
Hourly Traffic Volume	463	222	147	969	433	296
Emission Intensity NOx	0.620	0.130	-	0.616	0.052	-
(mg/m/sec) CO	0.177	0.060	0.011	0.326	0.138	0.013
Total. Emission Int. NOx	0.75			0.67		
(mg/m/sec) CO	0.25			0.48		
S(E) Section (Nawadia - Undlia)						
Hourly Traffic Volume	316	104	60	635	267	167
Emission Intensity NOx	0.423	0.061	-	0.404	0.032	-
(mg/m/sec) CO	0.121	0.028	0.005	0.213	0.085	0.007
Total. Emission Int. NOx	0.48			0.44		
(mg/m/sec) CO	0.15			0.31		

The future concentrations are caused by the roads and background

concentrations. The calculation results were as shown in Table 14-39. Beyond the border where is 40 m far from the centre of the road, concentration of NOx was in the range 0.004~0.344 mg/m³, and that of CO was in the range 0.167~436 mg/m³. For instance, the results of high traffic volume (Centre Section) was shown in Figure 14-15.

The future hourly concentration of CO meets the Standard, however, that of NOx near the border may exceed the Standard in case of its air stability B (unstable), D (neutral), E (stable) in transversal wind. As concentration is affected by change of wind speed, wind direction and air stability, high concentrations are anticipated in a short term and in local area. However, it is difficult to diffuse the air effectually because of the low embankment road. Therefore, if settlement exists along the bypass, adequate afforestation planning of road side will be required to promote air diffusion function.

Table 14-39 Calculation Results at Border

Terms	Substances	Concentration in the future (mg/m³)		Background Concentration (mg/m³)	Standard - Rural area - (mg/m³)
		Trans. Wind	Parallel. Wind		
N(W) Section (Parsakhera - Bilwa)					
2002	NOx	0.125-0.232	0.043-0.058	0.004	NOx: 0.08(24h) CO: 2.0(8h)
	CO	0.208-0.259	0.180-0.184	0.166	
2012	NOx	0.146-0.271	0.050-0.067	0.004	
	CO	0.268-0.396	0.199-0.211	0.166	
Centre Section (Bilwa - Nawadia)					
2002	NOx	0.185-0.345	0.063-0.084	0.004	
	CO	0.229-0.307	0.187-0.194	0.166	
2012	NOx	0.166-0.308	0.056-0.076	0.004	
	CO	0.286-0.436	0.205-0.218	0.166	
S(E) Section (Nawadia - Undlia)					
2002	NOx	0.121-0.224	0.042-0.056	0.004	
	CO	0.205-0.254	0.179-0.184	0.166	
2012	NOx	0.109-0.202	0.038-0.051	0.004	
	CO	0.243-0.340	0.191-0.200	0.166	

14.4.3.2 Water Environment

(1) During Construction Period

The alignment route is in a region facing water scarcity. There will be considerable amount of water requirement during construction activities for soil compaction, cooling water for various machinery, usage in sprays and sprinklers for dust suppression, irrigation for plantation and initiation of landscaping. Requirement of water for construction activity will be met by importing water by tankers from outside sources like ponds, streams etc.

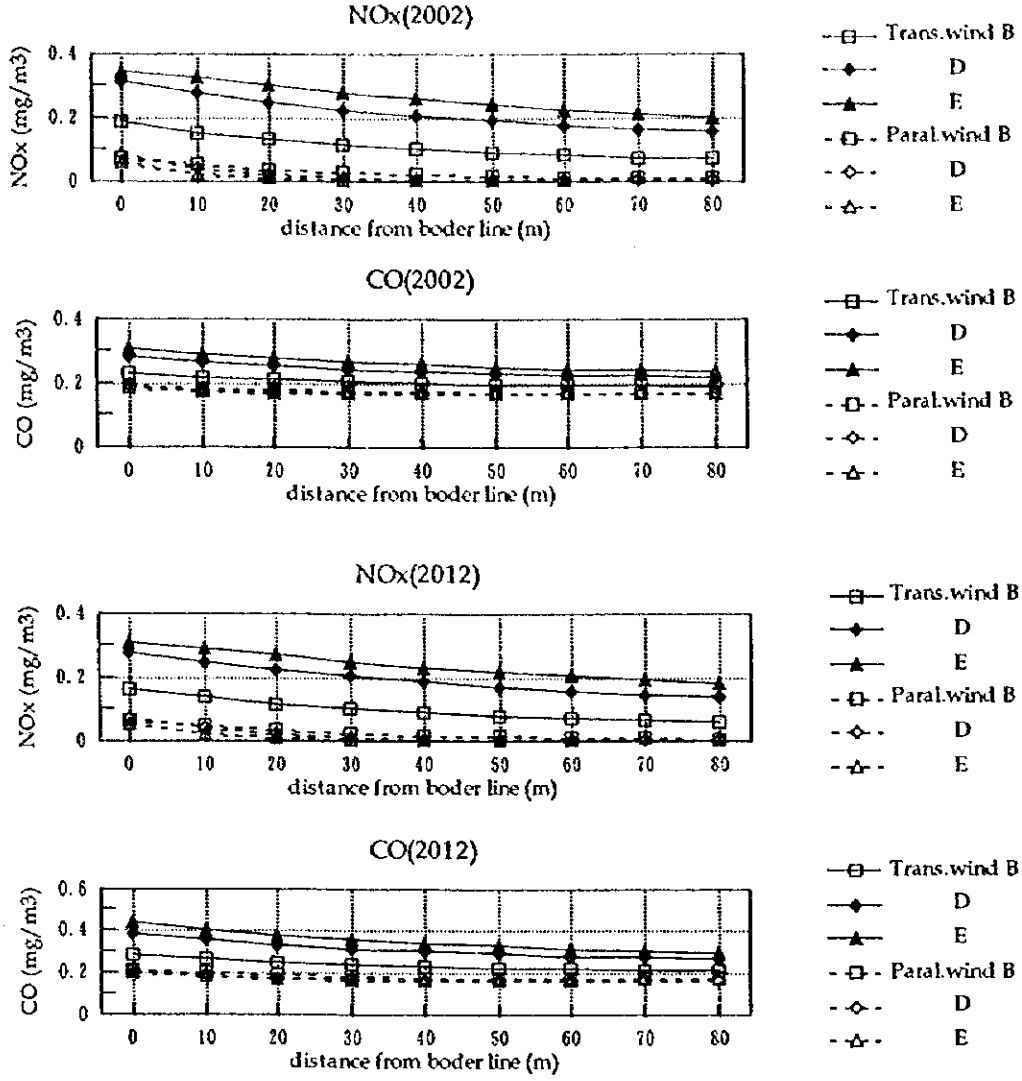


Figure 14-15 Distribution of Pollutant Level

The bypass is proposed to pass through an existing lagoon of effluents from a distillery near Nerawali village. It is anticipated that the surrounding areas water (also soil) will be polluted by this when the road will be constructed through it if appropriate control measures are not adopted.

Discharge of meagre waste water during construction will have no effect on the ground water or surface water with proper arrangement of drainage work. With regard to muddy water caused by rain during construction, it is necessary to avoid impacts on paddy fields and canals around the site by establishing temporary drains and sedimentation pools.

(2) During Operation Phase

No effect on water quality is anticipated during operational phase except for certain amount of runoff containing suspended solids from road surface into the natural drainage channels or onto open surface during rainy seasons. The

impact due to the runoff will be negligible, however, to be sure, provision will have to be made for drains of adequate volume preventing direct discharge of any oil/grease contaminated water into the paddy fields.

14.4.3.3 Noise Environment

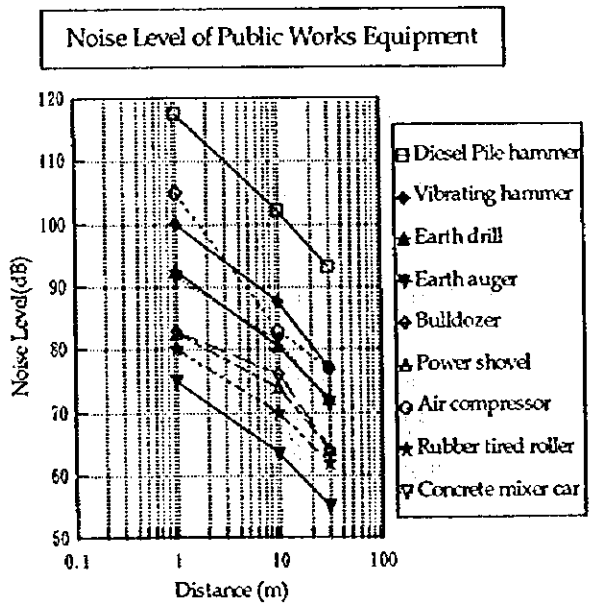
(1) During Construction Period

Noise levels in the vicinity of any construction activity increases due to running of heavy earth moving equipment like bull-dozers, excavators, transport vehicles, pile drivers, portable generators, mechanical machinery such as cranes, hammering, etc. Regarding these construction works which will affect the environs, noise produced by construction equipment is predicted. The prediction point was the edge of the site. The relationship between main construction equipment and distance are shown in Figure 14-16. As a prediction method, construction equipment is properly allocated and each noise level is synthesised as follows.

$$L = 10\log_{10}(10^{L1/10} + 10^{L2/10} + \cdots + 10^{Ln/10})$$

Calculation conditions and results were shown in Table 14-40. Although the Indian Standard for construction is still not enacted, high noise levels caused by construction equipment will be anticipated. Where housing developments or dwellings are localised close to the site, therefore, it is necessary to establish a noise barrier along the borderline of the site, to reduce the impact.

Table 14-40 Calculation Condition and Result



Name	Noise Level (dB)	Distance (m)
(Diesel pile hammer)	(93)	30
Vibrating hammer	77	30
Earth drill	72	30
Earth auger	63	10
Bulldozer	78	5
Power shovel	78	5
Air compressor	77	30
Rubber tired roller	73	5
Concreate mixure truck	82	10
Total Noise Level	86	

Regulatory Standards for Construction in Japan. 85 dB at borderline of the site.
Prohibition Items: Night time, Holiday

Figure 14-16 Noise Level of Construction Equipment

(2) During Operation Phase

The prediction of noise impact caused by vehicle transportation in the future is performed by the following process. For the noise calculations, the noise level L_{50} based on the prediction method of the Acoustical Society of Japan (AJS) is used. The prediction method of the ASJ is as follows:

$$L_{50} = Lw - 8 - 20 \log_{10} l + 10 \log_{10}(\pi l/d \tanh 2\pi l/d) + \alpha_d + \alpha_i$$

where: L_{50} : Median of traffic noise level (dBA)
Lw : Average noise power level of vehicles (dBA)
l : Distance from sound source (m)
d : Average interval between vehicle (m) $d = 1000\ V/N$
V : Average running speed (km/hour)
N : Traffic volume (Vehicle/hour)
α_d : Adjustment factor of diffraction
α_i : Adjustment factor of various causes

The formula of noise power level in 2002 used is based on the calculation results by this power level survey. Noise power levels in 2012 are expected to reduce from the present level due to the regulatory standards for vehicle noise and improvement of vehicle efficiency. Today, the vehicle noise in India is assumed to be slightly higher than that in Japan. However it was assumed that the future conditions in India will be close to the present ones in Japan. In addition to the formula of power level in 2012 based on the present ASJ, the term for motorcycles was added in the formula for this study as follows.

$$Lw_{2002} = 83.9 + 10 \log_{10} V + 10 \log_{10}(0.4\, a_0 + a_1 + 6.8\, a_2)$$
$$Lw_{2012} = 65.1 + 20 \log_{10} V + 10 \log_{10}(0.4\, a_0 + a_1 + 4.4\, a_2)$$

Using the above power level formula, the distribution of noise level Leq in 2002 and 2012 were calculated. Hourly traffic volumes, vehicle type proportions and speed were assumed to be the same as in the case of the air pollution calculations.

Using these data, the results of calculation predicted using the ASJ are shown in Figure 14-17. Leq is about L_{50} plus 2~3 dB.

In Figure 14-17, the noise standard in residential areas is 55dB in daytime, therefore noise level from proposed bypass is within the standard in the area far from 80~100 m. With continued traffic growth after 2012, the noise levels will exceed the Standard. Therefore, if conservation objects such as residence, school exist along the bypass, the countermeasure will be needed to reduce the noise. To achieve this, sound barrier with shrubs for landscaping on the edge of embankment is recommended, with a height in proportion to the traffic volumes. The effects of barrier are shown figure 14-18.

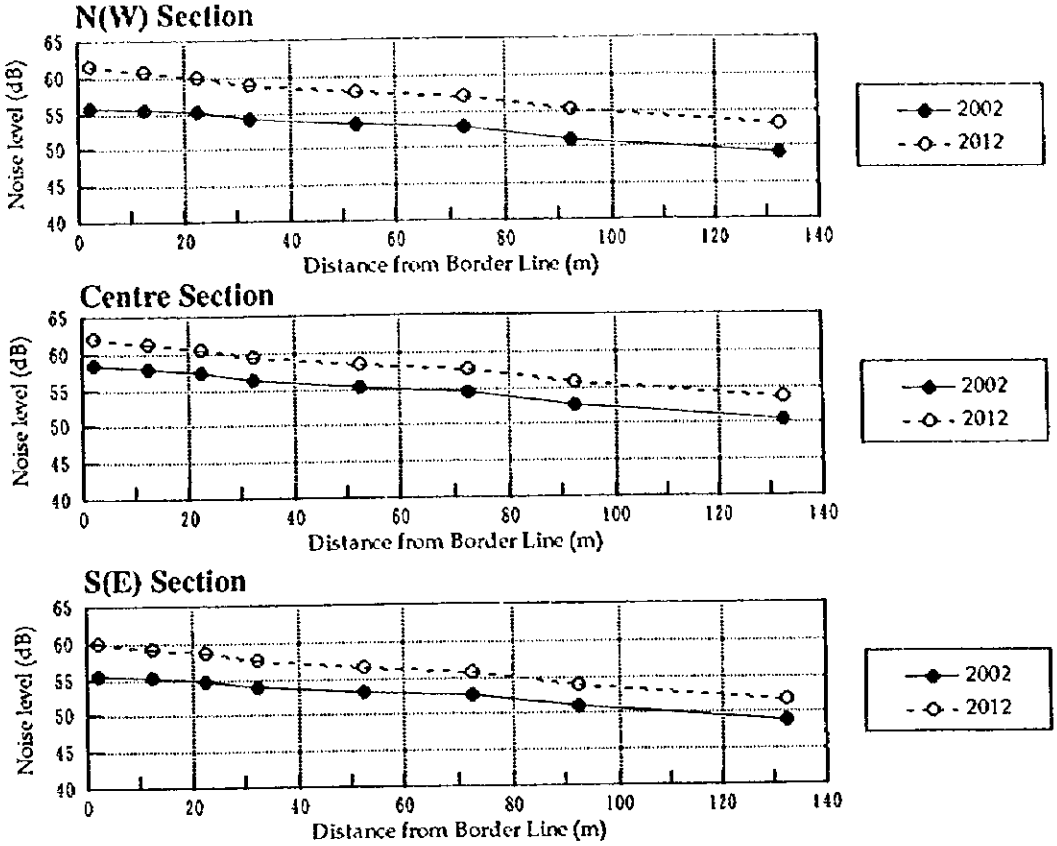


Figure 14-17 Distribution of Noise Level

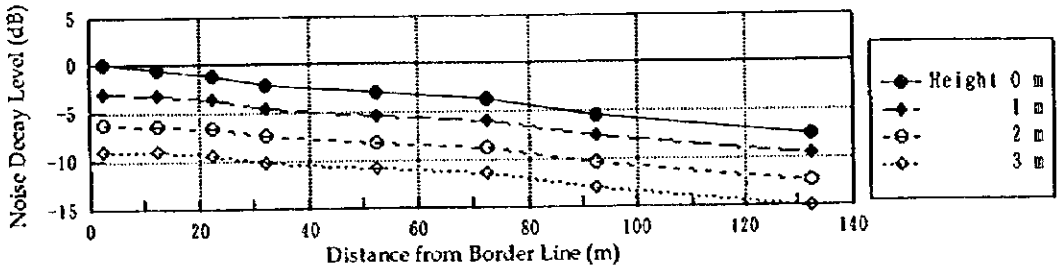


Figure 14-18 Effects of Noise Barrier

14.4.3.4 Soil Environment

During construction phase, about 4.4 million m³ of rock/soil will be brought to the site from sides of the proposed bypass to raise the ground level by 1~2 m. As the burrowing soil of the depth less than 50 cm on both sides adjoining the bypass is excavated, the water does not become stagnant and the areas will be able to support vegetation. At the end of the construction, the soil will be stabilised over the unpaved areas with the help of plantation activities wherever required. Since these plant species will be capable of checking soil erosion, the soil will be fully stabilised

without causing any erosion.

14.4.3.5 Biological Environment

(1) During Construction Period

The entire stretch of the alignment passes through the private and government waste land which will not involve deforestation barring felling of 233 PWD and privately owned trees, falling under the alignment route. This will not involve deforestation since the area is mostly devoid of vegetation cover except for open scrub land.

An exact number of trees (with girth more than 60 cm) were identified and counted which fall within the bypass alignment by actual field survey in December 1997. There are in total 233 trees summarised in Table 14-41.

Table 14-41 Summary of Trees to be filled

Tree species	From Parsakhera to Bilwa (starting point)	From Bilwa to Nawadia	From Nawadia to Kantharia	From Kantharia to Pitampura (final point)	Total
Dalbergia sisoo	15	28	27	5	75
Eucalyptus citriodora	62	13	1	24	100
Azadirachta indica	1	5	4	-	10
Magnifera indica	7	4	3	6	20
Albizia lebbeck	-	4	-	-	4
Acacia arabica	8	2	6	4	20
Ficus lucescens	3	-	-	-	3
Ficus religiosa	-	1	-	-	1
Total	97	56	41	39	233

There is no wild life sanctuary or any such fragile ecosystem in the study area. Hence during construction phase, there will be hardly any negative impact on terrestrial ecosystem. The negative impact during construction will be minimal due to following reasons:

i) Felling of trees will be avoided to the extent possible.

ii) The alignment route mainly traverses the agricultural land.

iii) Minor bridges will be constructed over drainage channels which will not require much excavation or clearing ecluding two major bridges on two rivers being crossed - Deorani and Nakatia.

(2) During Operation Phase

The plying of vehicles will create primarily air and noise pollution. The generation of dust and gaseous emission will adversely affect the ecology of

the area. The settlement of dust over the vegetation cover may result in stunted growth of plants. The gaseous emissions and dust generation will also affect the fauna in the area.

The noise generation will drive the animals and birds away from the area. This will obviously affect the animal habitat which also gets disturbed due to bright lights of the vehicles during the night.

However as already mentioned the prevalence of fauna along the proposed alignment is very low due to less vegetation.

14.4.3.6 Environmental Impact Evaluation for Bareilly Bypass

The identification of environmental impact is based on the base line condition, nature of proposed activities, and other indirect resultant activities. Parameter wise Environment Impact Units (EIU) have been arrived at as per standard BEES methodology using the relevant value function graphs for the pre-project scenario and post project scenario with the implementation of EMP and are shown in Tables 14-42, 14-43, 14-44 and 14-45 for the four categories.

Table 14-42 Evaluation of Ecological Environment

Parameters	Wt. (PIU)	Baseline EIU	With Project EIU	Change in EIU
Terrestrial				
Natural vegetation	30	3.000	1.200	-1.800
Crops	50	39.500	34.000	-5.500
Land use	50	29.500	14.400	-15.100
Non forest land	40	14.000	15.000	+1.000
Species diversity	20	20.000	20.000	0.000
Aquatic				
Streams	40	21.560	21.560	0.00
Stream flow variation	40	36.000	32.000	-4.000
Basin hydrologic loss	20	20.000	20.000	0.000
Total	300	183.560	158.160	-25.400

Table 14-43 Evaluation of Environmental Pollution

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Air				
SPM	20	12.6	9.60	-3.000
SO2	20	20.0	16.00	-4.000
CO	20	20.0	20.00	0.000
Nox +HC	20	20.0	16.00	-4.000
Diffusion factor	20	20.0	16.00	-4.000
Noise				
Community noise	50	47.5	30.50	-17.000
Occupational noise	50	40.0	20.00	-20.000
Land				
Soil erosion	50	40.0	25.00	-15.000
Soil chemistry	50	37.5	37.50	0.000
Total	300	256.6	189.60	-67.000

Table 14-44 Evaluation of Aesthetics

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Variety within vegetation type	30	10.5	18.00	+7.500
Animals - domestic	30	22.5	22.50	0.000
Native fauna	30	16.5	16.50	0.000
Appearance of water	30	15.0	15.00	0.000
Visual quality	40	32.0	26.00	-6.000
Sound	40	4.8	4.00	-0.800
Total	200	101.3	102.00	- 0.700

Table 14-45 Evaluation of Human Interest

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Economy output	20	8.0	10.0	+2.000
Employment	20	6.0	10.0	+4.000
Housing	20	10.0	10.0	0.000
Education	20	5.0	8.0	+3.000
Drinking water supply	20	12.0	12.0	0.000
Sanitation	20	10.0	10.0	0.000
Transportation and communication	20	11.0	16.0	+5.000
Community health	20	4.0	4.0	0.000
Occupational health	20	14.0	14.0	0.000
Social welfare	20	8.0	8.0	0.000
Total	200	88.0	102.0	+14.000

The summary of the environmental evaluation of the project for pre-project, (baselines) and post project (with EMP) scenarios is given in Table 14-46.

Table 14-46 Environmental Evaluation Summary of Bareilly Bypass

Environmental Category	Wt. (PIU)	Baseline (EIU) (A)	Project With EMP (EIU) (B)	Change in EIU (B-A)
Ecological environment	300	183.56	158.16	-25.40
Environmental pollution	300	256.60	189.60	-67.00
Aesthetics	200	101.30	102.00	-0.70
Human interest	200	88.000	102.000	14.000
Total	1,000	629.46	551.76	-77.70

Thus it can be observed that the post project EIU deteriorates with the completion and operation of the proposed bypass. The EIU changes are negative in case of ecological environment, environmental pollution and aesthetic, but there will be improvement in case of human interest. In overall sense, the negative impact is very mild and can be termed as negligible.

14.4.4 Prediction of Impact and Evaluation for Gwalior Bypass

14.4.4.1 Air Environment

(1) During Construction Period

Primary impacts on air quality will reflect on high dust loading of ambient air spreading towards the prevailing wind direction. There will be deposits of dust on all objects on surface, such as soil, water, plants and other man-made objects along the alignment route. Therefore, countermeasures during construction and transport of earth should be provided such as establishment of dust proofing fences and sprinkling water to control dispersion of dust when necessary.

(2) During Operation Phase

The prediction of pollutant concentration of NOx and CO caused by vehicle transportation in the future was carried out in the same manner as described in Chapter 14.4.3.1 (2). For the prediction, the wind speed was taken as 1.5 m/s which is the average wind speed for Gwalior, and height of emission source was assumed as the 1 m in consideration of predicting safely.

The calculation conditions for the prediction of pollutant concentration were shown in Table 14-47.

Table 14-47 Calculation Conditions for Gwalior Bypass

		2002		2012	
		Bus+H.Truck	Car	Bus+H.Truck	Car
Hourly Traffic Volume		329	25	658	50
Running Speed (km/h)		80	100	80	100
Emission Coefficient	NOx	4.820	2.100	2.290	0.436
(g/km/unit)	CO	1.380	0.970	1.210	1.150
Emission Intensity	NOx	0.440	0.015	0.419	0.006
(mg/m/sec)	CO	0.126	0.007	0.221	0.016
Total. Emission Int.	NOx	0.46		0.42	
(mg/m/sec)	CO	0.13		0.24	

The calculation results were as shown in Table 14-48 and Figure 14-19. Beyond the border where is 40 m far from the centre of the road, concentration of NOx was in the range 0.08~1.05 mg/m^3, and that of CO is in the range 0.167~0.229 mg/m^3.

Table 14-48 Calculation Results at Border

Terms	Substances	Concentration in the future (mg/m^3)		Background Concentration (mg/m^3)	Standard - Rural area - (mg/m^3)
		Trans. Wind	Parallel. Wind		
2002	NOx	0.058-0.104	0.024-0.030	0.007	NOx: 0.08(24h) CO: 2.0(8h)
	CO	0.182-0.202	0.172-0.173	0.166	
2012	NOx	0.055-0.097	0.022-0.028	0.007	
	CO	0.195-0.224	0.176-0.179	0.166	

The future hourly concentration of CO meets the Standard, however, that of NOx near the border may exceed the Standard in case of its air stability D (neutral), E (stable) in transversal wind. As concentration is affected by change of wind speed, wind direction and air stability, high concentrations are anticipated in a short term and in local area. However, it is difficult to diffuse the air effectually because of the low embankment road. Therefore, if settlement exists along the bypass, adequate afforestation planning of road side will be required to promote air diffusion function.

14.4.4.2 Water Environment

(1) During Construction Period

The alignment route is in a region facing water scarcity. There will be considerable amount of water requirement during construction activities for soil compaction, cooling water for various machinery, usage in sprays and sprinklers for dust suppression, irrigation for plantation and initiation of landscaping. Requirement of water for construction activity will be met by importing water by tankers from outside sources like ponds, streams etc.

The bypass is proposed to pass through an existing lagoon of effluents from a distillery near Nerawali village. It is anticipated that the surrounding areas water (also soil) will be polluted by this when the road will be constructed through it if appropriate control measures are not adopted.

Discharge of meagre waste water during construction will have no effect on the ground water or surface water with proper arrangement of drainage work. With regard to muddy water caused by rain during construction, it is necessary to avoid impacts on paddy fields and canals around the site by establishing temporary drains and sedimentation pools.

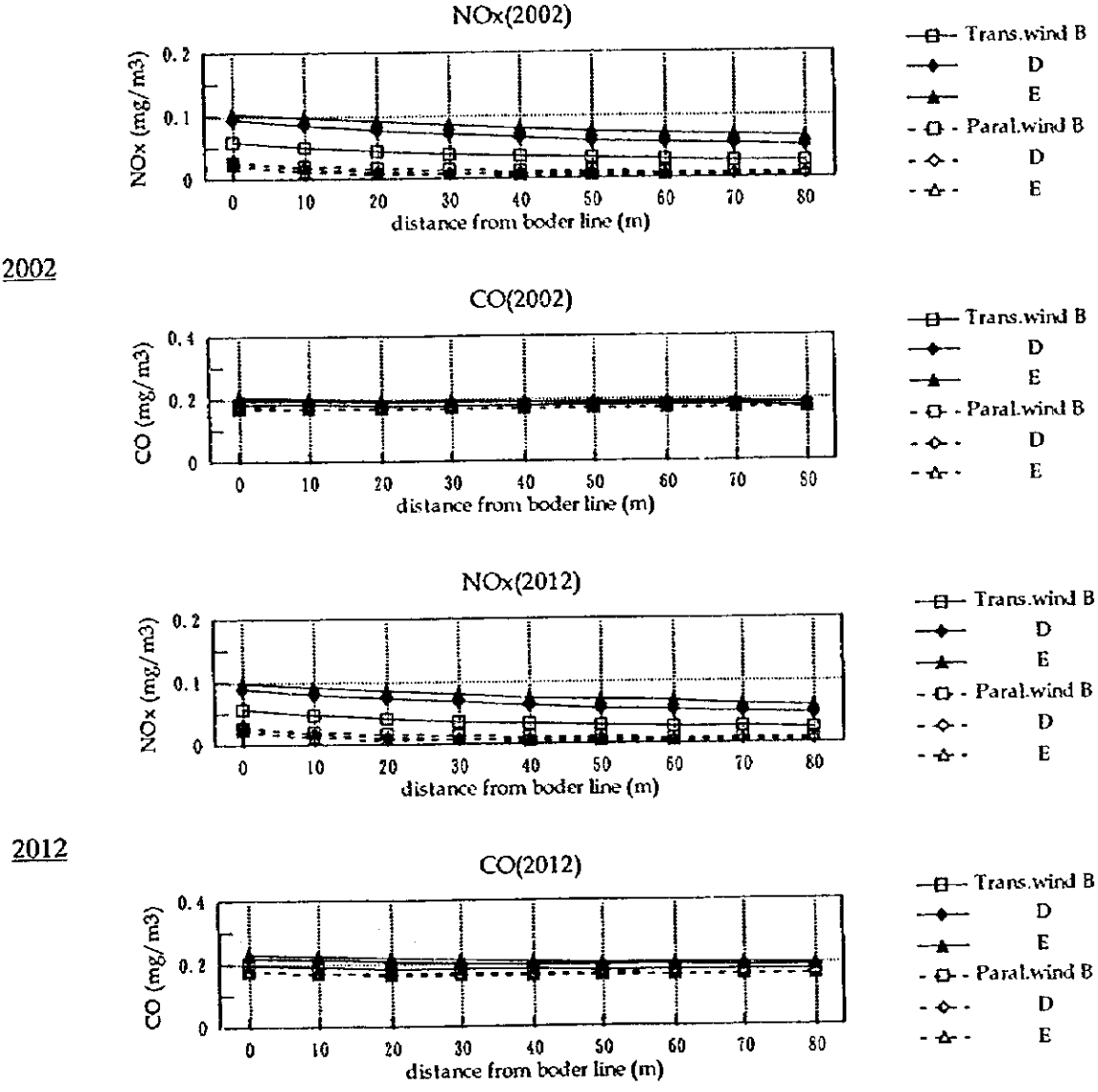


Figure 14-19 Distribution of Pollutant Level

(2) During Operation Phase

No effect on water quality is anticipated during operational phase except for

certain amount of runoff containing suspended solids from road surface into the natural drainage channels or onto open surface during rainy seasons. The impact due to the runoff will be negligible, however, to be sure, provision will have to be made for drains of adequate volume preventing direct discharge of any oil/grease contaminated water into the paddy fields.

14.4.4.3 Noise Environment

(1) During Construction Period

The prediction of noise environment during the construction period was carried out in the same way as described in Chapter 14.4.3.3. Since the prediction point was assumed at similar location of the case of Bareilly Bypass, the calculation conditions and results gave the same values as shown in Table 14-35. As high noise levels caused by construction equipment will be anticipated, it is necessary to establish a noise barrier along the borderline of the site to reduce the impact, where housing developments or dwellings are localised close to the site.

(2) During Operation Phase

The process to predict the noise impact caused by vehicle transportation in the future was already discussed in Chapter 14.4.3.3. The formula of power level applied for the study was based on the present ASJ as presented below.

$$Lw_{2002} = 83.9 + 10\log_{10}V + 10\log_{10}(a_1 + 6.8\,a_2)$$
$$Lw_{2012} = 65.1 + 20\log_{10}V + 10\log_{10}(a_1 + 4.4\,a_2)$$

Using the above power level formula, the distribution of noise level Leq in 2002 and 2012 were calculated. Hourly traffic volumes, vehicle type proportions and speed were assumed to be the same as in the case of the air pollution calculations. Using these data, the results of calculation predicted using the ASJ are shown in Figure 14-20. Leq is about L_{50} plus 2~3 dB.

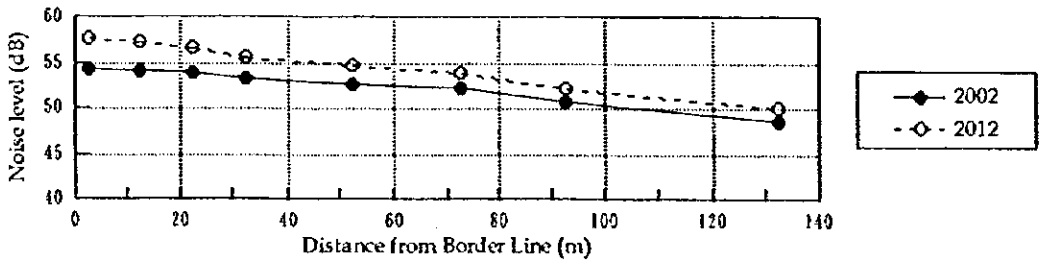


Figure 14-20 Distribution of Noise Level

In the above figures, the noise standard in residential areas is 55 dB in daytime, therefore noise level from proposed bypass meets the standard narrowly in the area

far from 30~40 m. With continued traffic growth after 2012, the noise levels will exceed the Standard. Therefore, if conservation objects such as residence, school exist along the bypass, the countermeasure will be needed to reduce the noise. To achieve this, sound barrier with shrubs for landscaping on the edge of embankment is recommended, with a height in proportion to the traffic volumes. The effects of barrier were shown in Figure 14-18.

14.4.4.4 Soil Environment

During construction phase, about 5.3 million m^3 of rock/soil will be brought to the site from existing borrowing pits in rocky terrain for the purpose of land filling. The quarry area (barren) is located at a distance of over 6 km from the inter section of proposed bypass with NH-3 near Nerawali village. The total fill requirement will be about 5.8 million m^3 out of which about 0.5 million m^3 will be generated out of cut. At the end of the construction, the soil will be stabilised over the unpaved areas with the help of plantation activities wherever required. Since these plant species will be capable of checking soil erosion, the soil will be fully stabilised without causing any erosion.

14.4.4.5 Biological Environment

(1) During Construction Period

Though the 12 km stretch of the alignment passes through the forest land, this will not involve deforestation since the area is mostly devoid of vegetation cover except for open scrub land.

An exact number of trees (with girth more than 60 cm) was identified and counted which fall within the bypass alignment by actual field survey in December 1997. There are in total 86 trees out of which 30 are of Acacia arabica, 24 of Azadirachta indica, 12 of Eucalyptus tereticornis and seven more species but none of them is endangered species.

There is no wild life sanctuary or any such fragile ecosystem in the study area. Hence during construction phase, there will be hardly any negative impact on terrestrial ecosystem except that while aligning the road way over the 12 km stretch in Raipur R.F, fauna may stay away from the alignment site temporarily. The negative impact during construction within Raipur R.F. will be minimal due to following reasons:

i) Felling of trees will be avoided.

ii) The alignment route mainly traverses the open scrub land with low vegetation cover.

iii) Minor bridges will be constructed in the forest land mainly over drainage

channels which will not require much excavation or clearing.

(2) During Operation Phase

The plying of vehicles will create primarily air and noise pollution. The generation of dust and gaseous emission will adversely affect the ecology of the area. The settlement of dust over the vegetation cover may result in stunted growth of plants. The gaseous emissions and dust generation will also affect the fauna in the area.

The noise generation will drive the animals and birds away from the area. This will obviously affect the animal habitat which also gets disturbed due to bright lights of the vehicles during the night.

However as already mentioned the prevalence of fauna along the proposed alignment is very low due to less vegetation.

14.4.4.6 Environmental Impact Evaluation for Gwalior Bypass

The identification of environmental impact is based on the base line condition, nature of proposed activities and other indirect resultant activities as already described. Parameter wise Environment Impact Units (EIU) have been arrived at as per standard BEES methodology using the relevant value function graphs for the pre-project scenario and post project scenario with the implementation of EMP and are shown in Tables 14-49, 14-50, 14-51 and 14-52 for the four categories.

Table 14-49 Evaluation of Ecological Environment

Parameters	Wt. (PIU)	Baseline EIU	With Project EIU	Change in EIU
Terrestrial				
Natural vegetation	30	3.000	1.200	-1.800
Crops	30	4.638	4.372	-0.266
Land use	40	26.160	14.400	-10.400
Forest	40	6.750	21.600	-4.560
Non forest land	40	20.000	14.000	+7.250
Species diversity	20		20.000	0.000
Aquatic				
Streams	40	19.752	19.752	0.00
Stream flow variation	40	38.000	33.600	-4.400
Basin hydrologic loss	20	20.000	20.000	0.000
Total	300	163.100	148.924	-14.176

Table 14-50 Evaluation of Environmental Pollution

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Air				
SPM	20	16.0	7.00	-9.000
SO2	20	20.0	16.00	-4.000
CO	20	20.0	20.00	0.000
NOx +HC	20	20.0	16.00	-4.000
Diffusion factor	20	20.0	16.00	-2.000
Noise				
Community noise	50	47.5	30.00	-17.530
Occupational noise	50	40.0	20.00	-20.000
Land				
Soil erosion	50	26.0	35.00	+9.000
Soil chemistry	50	37.5	37.50	0.000
Total	300	245.0	197.50	-47.500

Table 14-51 Evaluation of Aesthetics

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Variety within vegetation type	30	7.5	15.00	+7.500
Animals - domestic	30	22.5	22.50	0.000
Native fauna	30	16.5	16.50	0.000
Appearance of water	30	15.0	15.00	0.000
Visual quality	40	30.0	20.00	-10.000
Sound	40	12.0	6.00	-6.000
Total	200	103.5	95.00	- 8.500

Table 14-52 Evaluation of Human Interest

Parameters	Wt. PIU	Baseline EIU	With Project EIU	Change in EIU
Economy output	20	8.0	10.0	+2.000
Employment	20	6.0	10.0	+4.000
Housing	20	10.0	10.0	0.000
Education	20	5.0	8.0	+3.000
Drinking water supply	20	12.0	12.0	0.000
Sanitation	20	10.0	10.0	0.000
Transportation and communication	20	11.0	16.0	+5.000
Community health	20	4.0	4.0	0.000
Occupational health	20	14.0	14.0	0.000
Social welfare	20	8.0	8.0	0.000
Total	200	88.0	102.0	+14.000

The summary of the environmental evaluation of the project for pre-project, (baselines) and post project (with EMP) scenarios is given in Table 14-53.

Table 14-53 Environmental Evaluation Summary for Gwalior Bypass

Environmental Category	Wt. (PIU)	Baseline (EIU) (A)	Project With EMP (EIU) (B)	Change in EIU (B-A)
Ecological environment	300	163.100	148.924	-14.176
Environmental pollution	300	245.000	197.500	-47.500
Aesthetics	200	103.500	95.000	-8.500
Human interest	200	88.000	102.000	14.000
Total	1,000	599.600	543.424	-56.176

Thus it can be observed that the post project EIU deteriorates with the completion and operation of the proposed bypass. The EIU changes are negative in case of ecological environment, environmental pollution and aesthetic, but there will be improvement in case of human interest. In overall sense, the negative impact is very mild and can be termed as negligible.

14.4.5 Environmental Management Plan for the Project Bypasses

14.4.5.1 Mitigation Measures

The proposed bypass to NH-24 at Bareilly and NH3 at Gwalior will facilitate faster movement of traffic, reduce the traffic density on the National Highway passing through Bareilly town. However, there will be adverse impact on the environment surrounding the alignment area. Careful planning and strategy is required during construction and operation of the project in order to cause the least environmental degradation. The present environmental management plan for each and every component of environment likely to be affected has been envisaged to achieve the above mentioned objective. The mitigation measures with reference to each environmental parameter are suggested separately for construction and operation phases.

(1) During Construction Period

a) Air Environment

The dust and gaseous emissions during the construction period will be caused due to clearing of vegetation, levelling, erection of structures, operation of portable diesel generator sets, operation of earth moving equipment and asphalt plants. This will increase the SPM load as well as the concentration of gaseous emissions viz CO, NOx, SO_2 and HC.

In order to prevent the fugitive dust emission and its dispersal it is proposed to provide a water sprinkling system at the construction site. Dust covers may be required over the beds of trucks which will be used for transportation of

materials. Low emission construction equipment must be used wherever feasible.

b) Noise Environment

The plant and machinery to be used during the construction period will be properly maintained. The vehicles to be used during construction period will be provided with silencers. With regard to use of equipment emitting high noise such as diesel pile hammer, it is necessary to reduce the effect on inhabitants in consideration of controlling daily operation hours.

c) Water Environment

The following measures will be taken to improve the drainage system in the area.

- Drainage channels to be made along the entire stretch of the bypass.
- Check dams to be constructed to prevent run-offs
- Retaining walls to be constructed along the slopes to prevent land slides occurring during heavy rains.
- The alignment of Gwalior Bypass is passing through the lagoon of distillery effluent and to prevent this effluent from spreading over to surrounding areas, a temporary draining arrangements will be made.

d) Solid Waste Management

To construct Bareilly Bypass, over 4.4 million m^3 of soil will be excavated from both sides of the proposed bypass to form the embankment structure. For Gwalior Bypass, over 5.3 million m^3 of soil will be brought to the site, which will be brought from the nearby stone quarries. The solid waste generated due to levelling of elevated surface will be used elsewhere at the site for the purpose of levelling. However it is anticipated that there will be no solid waste which will remain unutilised.

(2) During Operation Phase

a) Air Environment

Due to the basic reason that the present traffic will be divided in two parts and the speed of the vehicles will be higher and smoother on bypass, the air pollution levels will be reduced considerably in comparison with the present level in the inner city. Though specific environmental control measures can not be implemented, efforts will be made to mitigate the impact by the following means.

- Avenue plantation
- Periodic maintenance of the road to prevent damages to the road.

It is proposed to plant green belt on both sides of the bypass, at least 5 m wide. For instance, a green belt of 7 m width on either side is known to absorb 5% of NOx emitted by 30,000 vehicles/day. The green belt also creates turbulence in the airflow accross it hence enhancing the diffusion. Hence pollutants values are anticipated to go further down.

b) Noise Environment

The following measures will be adopted for the prevention of noise propagation.

- Plantation of trees along both sides of the bypass,
- Construction of noise barriers along the roadways particularly where the bypass passes through the settlement or habitat areas.
- Regulating the smooth flow of traffic, thereby preventing the traffic jams and the subsequent use of horns.

c) Plantation Programme

To reduce the impact of air pollution and noise pollution and also to improve the aesthetics of the area, it has been proposed to undertake avenue plantation having a width of at least 5 m along the either side of the entire stretch of the bypass. The total stretch of the proposed bypass will be covered under the plantation scheme.

The total area under the plantation will be around 30 ha for Bareilly Bypass and 28 ha for Gwalior Bypass. The number of trees to be planted as a part of the plantation programme will be 1,000 trees per hectare. Thus over 30,000 trees for Bareilly and 28,000 trees for Gwalior will be planted by the project authorities.

The plantation techniques for the respective plant species as presented in Tables 14-54 and 14-55 will be favourable for the proposed bypass areas.

For Bareilly Bypass area, other general plant species for plantation were considered as Shorea robusta (Sal), Adina cordifolia (Yellow teak), Syzygium cumini (Black plum), Populus spp. (Polar), Kydia calycina, Dilonthus excelsa, Broussonetia papyrifera (Paper malberry) etc.

For Gwalior Bypass area, other general plant species for afforestation were considered as follows: Cassia fistula (Amaltas), Grevillea robusta (Silky oak), Duabanga grandiflora (Laqmpatic), Delonix regia (Royal poinciana), Eucalyptus tereticornis, Syzygium cumini (Jambolana), Terminalia myriocarpa (Hollock).

Table 14-54 Plantation Techniques for Bareilly Bypass

Sl. No.	Method	Botanical name	English name	Local name
1	Direct sowing	Acacia nilotica	Babul	Babul
		Dalbergia sissoo	Sisso	Sisam
		Albizia lebbeck	Indian walnut	Siris
		Bom bax ceiba (Salmalia malabarica)	Bamboo	Semur
		Azadirachta indica	Margosa	Neem
		Cassia auriculata	Tanners cassia	Tarwar
		Eucalytus tereticornis	Eucalyptus	Safeda
		Tectona grandis	Teak	Sagwan
2	Transplanting	Albizia lebbeck	Indian walnut	Siris
		Pongamia pinnata	Indian beech	Karanja
		Ailanthus Excelsa	Tree of heaven	Maharukh
		Gmelina arborea	Malay bush beech	Gambhar

Table 14-55 Plantation Techniques for Gwalior Bypass

Sl. No.	Method	Botanical name	English name	Local name
1	Direct sowing	Prosopis juliflora		Khejra
		Acacia nilotica	Babul	Babul
		Dalbergia sissoo	Sisso	Sisam
		Albizia lebbeck	Indian walnut	Siris
		Acacia catechu		Khair
		Bom bax ceiba (Salmalia malabarica)	Bamboo	Semur
		Azadirachta indica	Margosa tree	Neem
		Cassia auriculata	Tanneas cussia	Tarwar
2	Transplanting	Albizia lebbeck	Indian walnut	Siris
		Pongamia pinnata	Indian beech	Karanja
		Ailanthus Excelsa	Tree of heaven	Maharukh
		Gmelina arborea	Malay bush beech	Gambhar

Areas along the Gwalior Bypass alignment areas (Gojipura, Bilpura, Kuleth and Raipur Kalan area) are characterised by thin soil cover not exceeding 1 m depth. Biological activity in such soils is very low and structure is poor. Nutritional status, moisture reaction and base exchange capacity are generally poor.

Practice for the plantation of mixture for following species will give a better result along the proposed Gwalior Bypass area (particularly in Gajipura, Bilpura Kuleth and Raipur Kalan).

Dalbergia sissoo, Dendrocalamus strictus (Bamboo), Albizia lebbeck, Azadirachta indica, Pongamia pinnata, Tectona grandis (Teak), Eucalyptus tereticornis, Acacia auriculiformis (Australian wettle), Casuarina equisetifolia (She-oak), Anacardium occidentle (Cashew).

In Soil Conservation Division (Raipur), Azadirachta indica (neem), Anacardium occidentale (cashew), Albizia lebbeck (Siris), raised in polythene bags and Acacia auriculiformis, Eucalyptus Seedlings raised in nursery beds are used for planting.

The selection of trees to be planted has to be done judiciously keeping in mind the adaptability of trees to the climate of the region. As already mentioned, the trees which are found in relative abundance as compared to the other species as well as species with proven survival rate should be preferred. Consultation with the forest officers and experts in the field will further help to identify the exact species to be planted and these can be obtained from the nurseries in the nearby areas. The details of the recommended plants are given in Table 14-56.

Table 14-56 Recommended Flora Species in Gwalior Bypass Area

Sl. No	Name	Avg. height (m.)	Leaf density (%)	Remark	Survival Rate %
1	Azadirachta indica	6	80	Slow growing	98
2	Butea monosperma	8	70	Slow growing	95
3	Mangifera indica	7	75	Quick growing	95
4	Ficus religiosa	10	80	Slow growing	93
5	Eucalyptus globulus	15	50	Quick growing	98

Cassia fistula (Golgen-shower), Delonix elata (White gulmohar), Delonix regia (Peacock-flower), Hardwickia binata, Bauhinia acuminata, Terminalia arjuna (Axel-wood), Anogeissus latifolia and Diospyros melanoxylon (Coromandel along persimmon) are also recommended since they have a good survival rate. The above mentioned plants are capable of arresting dust upto 56%~60%.

Compensatory afforestation

Since the proposed alignment of the Gwalior Bypass involves about 120 ha. of forest land, it is imperative for the project authority to make provision for the Compensatory afforestation in the ratio of 1:3 i.e. for every 1 ha. of land deforested, 3 ha. of land is to be utilised for roadside plantation or as wood lots along road if sufficient land is not available for road side plantation, or certain lump sum amount per ha. (approx. Rs. 25,000 per ha.) allocated for the purpose to be given to the Forest Department. However, deforestation will be kept to a minimum and strict control will be exercised in consultation with forest authorities .

14.4.5.2 Implementation and Monitoring

Success of any environmental management programme depends upon the efficiency of the organisational set-up responsible for the implementation of the programme. Regular monitoring of the various environmental parameters is also necessary to evaluate the effectiveness of the management programme so that necessary corrective measures could be taken in case there are some drawbacks in the proposed programme. A specially made Environmental Management team will be responsible for :

i. Collecting and analysing air samples.
ii. Monitoring noise level.
iii. Implementing control and protective measures.
iv. Co-ordinating the environment related activities within the project as well as with outside agencies.
v. Collecting statistics of health of workers and population of the surrounding villages.
vi. Carrying out avenue plantation and its monitoring.
vii. Monitoring the progress of implementation of environmental management programme.

(1) Monitoring Schedule and Parameters

To evaluate the effectiveness of environmental management programme regular monitoring of the important environmental parameters will be taken up by an outside agency. The schedule of duration and parameters to be monitored by environment cell are summarised in Table 14-57.

Table 14-57 Monitoring Schedule and Parameters

Sl. No.	Description of parameters	Schedule and duration of monitoring
1	Ambient air quality (SPM, SO_2, and Nox)	24 hourly sample twice a week for one month during each season for 3 seasons.
2	Ambient noise levels	Once a year
3	Traffic density	Once a year
4	Green belt maintenance	Once a year (Summer season)

Note : Monitoring schedule are mentioned as per practice adopted for preparing EIA for submission to DOEn. Based on the results of improvement in the environmental parameters further monitoring will be structured after consulting Pollution Control Board and Ministry of Environmental and Forest.

a) Air Quality

Ambient air quality shall be monitored for SO_2, NOx, SPM, CO, HC and Pb. The instruments like high volume air samplers would be used for this

purpose. These parameters will be measured once in a month.

b) Noise Monitoring

Noise levels shall be monitored along the proposed bypass particularly in the settlement area.

c) Green Belt and Afforested Areas

Continuous vigil and monitoring of green belts and afforested areas shall be done for its performance and webbing, including replacement of dead trees and maintenance of fencing.

2) Cost for Environmental Monitoring/Management

The details of investment for implementation of the environmental management plan is given in Tables 14-58 and 14-59. The total investment for Bareilly Bypass includes stabilisation and treatment costs at various sites wherever earthwork is involved, construction of check dams, avenue plantation and compensation for felling of private trees.

The total investment for Gwalior Bypass includes stabilisation and treatment costs at various sites wherever earthwork is involved, construction of check dams, compensatory afforestation, avenue plantation and compensation for felling of private trees. The cost for the compensatory afforestation of twice the forest area acquired for the project, at the rate of Rs. 25,000 per hectare to be paid by the project authority to the Government.

Table 14-58 Cost for Environmental Mitigation/Management for Bareilly Baypass

Particulars	Cost in Rs. $\times 10^3$
Construction of check dams/retaining walls/baffels etc.	500
Compensation for trees to be cut[1]	233
Avenue Plantation[2]	900
Total	1,633

Note 1. 233 trees to be cut be compensated at the rate of Rs 1,000 per tree.
2. Avenue plantation will be carried out at the rate of Rs 30 per tree

Table 14-59 Cost for Environmental Mitigation/Management for Gwalior Bypass

Particulars	Cost in Rs. $\times 10^3$
Construction of check dams/retaining walls/baffels etc.	500
Compensation for trees to be cut[1]	86
Avenue Plantation[2]	840
Compensatory afforestation*	3,000
Total	4,426

Note 1. 86 trees to be cut be compensated at the rate of Rs 1,000 per tree.
2. Avenue plantation will be carried out at the rate of Rs 30 per tree

The recurring cost for environmental monitoring viz. ambient air quality, water quality and noise level will depend upon the number of locations and samples to be analysed by an outside agency assigned for the purpose, as already mentioned earlier. The estimated cost to be incurred by the project authorities on account of environmental monitoring programme is as given in Table 14-60.

Table 14-60 Environmental Monitoring Cost

Particulars	No. of samples	Rate (Rs./sample)	Cost in Rs. $\times 10^3$
Air quality analysis	144	1,000	144
Noise level monitoring	10	1,000	10
Traffic density	LS	44.26	10
Green belt maintenance	LS		50
Other maintenance (check dams etc)	LS		20
Total			234

The total investment on environmental improvement works with the setting up of the project was envisaged as Rs. 16.33 lakhs for Bareilly Bypass and Rs. 44.26 lakhs for Gwalior Bypass. The annual cost for environmental monitoring will be around Rs. 2.34 lakhs for each bypass.

14.4.5.3 Forum for Environmental Protection

The project shall form a joint forum with the participation of local government officers and representatives of the local villagers to monitor the environmental impact of the project in the area and to take corrective measures, if considered necessary. These representatives shall be allowed access to all the data related to environment collected by the project authorities.

14.5 Environmental Impact Assessment (Social Aspect)

14.5.1 Background and Objectives

Road improvement and construction involve expropriation of land and structures from the current owner/users. Besides the economic disturbance due to land acquisition the construction work may displace present economic activities within the corridor of impact of the project. This will include eviction of many squatters and removal of petty commercial structures/encroachments from the ROW forming part of the corridor of impact. Expropriation of land, eviction of squatters and removal of commercial encroachments may cause social disruption and economic loss of project affected persons (PAPs) and their families. The economic losses for the project include loss of a commercial structure, reduced access to economic opportunities, and/or the loss of income. Therefore, while implementing the project one needs to take into account these disturbances and loss due to project, their impact on the socio-economic living of the people and the plan for the mitigation measures to minimise any negative adverse impacts.

The study emphasises that the population displaced and/or adversely affected people receive benefits from the project. Where displacement is unavoidable, project should assist with all the means to improve the affected population's living standards, income generating capacities and production levels, or at least maintain their previous standards of living. This requires a Social Environmental Assessment (SEA) study of the affected area and its people so as to understand their social, economic and cultural condition, and identify factors which influence the lives of those affected. The results of such a survey will indicate the social impact of the project. They will also provide baseline information to plan measures to mitigate any adverse impacts of the project on people.

Social Environment studies of the bypass locations are based on the adoption of a transparent environmental and social policy and have the overall objectives of:

- Enhancement of quality of life and environment in and around the project locations
- Prevent and minimise adverse environmental and social situations
- Mitigate possible negative environmental and social situations

The scope of SEA studies done in Phase 1 as part of the Pre-Feasibility Study was limited to typical Initial Environmental Examination (IEE) level. The SEA studies done in Phase 1 for 10 bypass locations resulted in "sizing up" of each location to delineate likely adverse social impacts. They also were used to prioritise the bypass locations in terms of degree of adverse social impacts and easiness/difficulty in land acquisition. Various social environments related legislation and policies in India were also reviewed during Phase 1.

The scope of SEA studies done in Phase 2 for the Bareilly Bypass and Gwalior Bypass sites was limited to typical Environmental Impact Assessment (EIA) level. The aim of studies conducted in Phase 2 were to supplement the information already collected in Phase 1 so that impacts and mitigation measures identified in Phase 1 can be confirmed and be elaborated in greater detail. The main objectives of the study are:

- to determine the impact on the public facilities;
- to identify the PAPs, and conduct socio-economic -surveys concerning the PAPs to assess the social impacts due to acquisition of land and property, and
- to outline measures to mitigate negative impacts of the project.

The land acquisition process in India as per the Land Acquisition Act of 1894 and its subsequent amendments involves four stages, namely, 1) preparation of land acquisition schedules and estimates, 2) preliminary investigations, 3) hearing of objections, and 4) taking possession. At this early stage of feasibility level planning, delineation of each piece of land to be acquired (with the survey numbers recorded in Revenue maps along with the extent of acquisition) was yet to be done. Therefore, the identification of PAPs and their socio-economic characteristics has been determined through extensive field consultations.

14.5.2 Study Methodology

For the studies in Phase 2, the geographical boundaries of the study zone were fixed by a 200 m wide zone, 100 m on either side of the centre of bypass road alignment.

(1) Collection and Analysis of Available Information

Collection and analysis of data was done concerning various aspects from the various district level offices concerning public works and urban planning and development. The data collected concerned aspects like community life and socio-economic activities, existing land use, affected public facilities, existing transportation network (vehicular as well as pedestrian to examine the problem of severance), affected cultural resources, land and resources therein affected or to be acquired, as well as identification of PAPs and the nature of the impact.

(2) Field Surveys and Participatory Consultations

Field surveys and participatory consultations were conducted for:

a) Identification of specific land acquisition and related issues.

b) Identification of public facilities affected.

c) Identification of PAPs and their social and economic characteristics.

d) Prediction of likely impacts and determination of mitigation measures

e) Identification of impacts on vulnerable social groups like scheduled tribes and scheduled castes.

f) Collection of socio-economic data, and determining public opinion and conduct of consultations to promote public awareness and acceptability for the project.

As a prelude to the SEA survey, a reconnaissance survey of the proposed tentative alignment was done to identify any structures coming within the proposed bypass alignment and identify any stake holders of the project. For this purpose, initially Revenue Officials were contacted to get the land records. However, the same could not be made available by the authorities. The information collected during the reconnaissance survey formed the base for carrying out the SEA survey.

During the SEA survey, a well designed and pretested '*Household Interview Schedule*' was used for collection of data. Important aspects covered in the questionnaire were the identification particulars of the PAP, his/her family details work participation and employment assess/possession, likely losses of household income, opinion on the project preferences for their resettlement etc. Most part of the questionnaire was precoded excepting those reflecting the opinion and choices of the PAP which were left open ended.

14.5.3 Assessment of Mitigation Measures

14.5.3.1 Community Life and Economic Activities

(1) Consideration of Alternatives

In this Phase 2, a more detailed study of locations identified herein where sensitive public facilities are affected by the proposed alignment is being considered for minor changes in alignment to minimise unwanted negative social impacts. Sensitive receptors like temples shall be avoided completely.

(2) Measures Incorporated into Road Design - Corrective Measures

Several corrective measures have been incorporated into basic road design. These include:

a) Provision of service roads. The project bypass road will carry on the through traffic, banning the entry of slow traffic such as three-wheelers, bicycles, animal-drawn cart etc. Service roads with dual lane running along the bypass road shall be provided to facilitate the access of such slow traffic.

b) Provision of interchanges between project bypass road and major highways.

c) Provision of suitable crossing structures like culvert box, culvert pipe, viaduct, and bridge for highways/roads, railways, and water channels. The structures shall be planned to have appropriate lateral/vertical clearance, and/or flow capacity. The maximum interval of pedestrian/ cattle path to cross the bypass road was proposed as two km.

d) Median openings were proposed at intervals of about 2 km. Raised median type is proposed was against flat median type to prevent people from crossing the bypass road easily and thus preventing accidents.

(3) Public Awareness and Acceptability Promotion - Preventive Methods

It is strongly recommended that MOST in co-operation with the concerned PWD office initiates a public awareness campaign in the affected villages concerning the exact alignment and the unavoidable residual impacts concerning possible relocation of some public facilities. This kind of awareness promotion commenced early in the project cycle would go a long way in avoiding public protests and also in improved understanding by the people about the road alignment.

14.5.3.2 Land Acquisition and Related Issues

Mitigation measures necessary to counteract negative impacts of land acquisition in terms of the impacts on the PAPs need to be formulated keeping in mind two important aspects, namely:

- the process of land acquisition and entitlements as per the Land Act, and
- the key trends in law and policies concerning entitlements, relocation and rehabilitation.

These aspects were already discussed in Chapter 6.2.3.

(1) Proposed Mitigation Measures

In line with the above two important aspects, mitigation measures proposed to minimise negative impacts related to land acquisition are:

a) Transparent land acquisition, compensation and rehabilitation plan formulation to facilitate land acquisition without delays. This needs to be formulated as soon as delineation of land to be acquired is carried out (on Revenue maps) along with identification of PAPs is completed. The trend in changes occurring rapidly in social related laws and policies in India towards a better definition of "PAPs" and "Entitlements" as discussed above needs to be kept in mind in formulation of this plan. Giving priority in employment opportunities to PAPs and formulating necessary skill/training programmes for the PAPs are also important considerations.

b) Public consultations and involvement of PAPs and/or their representatives at all stages.

c) Formulation of a Monitoring Committee with members from all concerned groups like implementing agency officials, Revenue Department officials, PAPs and/or their representatives, village heads etc. This committee will meet regularly to facilitate timely implementation of the land acquisition, compensation and rehabilitation plan.

14.5.3.3 Other Aspects

Impacts identified in this section are positive in nature. One important measure which needs to be considered by project implementation authorities is giving priority to the PAPs in employment opportunities in road construction activities. As the PAPs are largely practising agriculture for their livelihood and are adversely affected by loss of even a part of their small holding, this aspect gains all the more significance. Project development authorities need to formulate necessary skill/training development programmes directed at PAPs for their efficient involvement in project construction activities. These programmes need to be implemented before commencement of construction activities. These programmes would also constitute a part of the land acquisition, compensation and rehabilitation plan that needs to be formulated.

14.5.4 Environmental Impact Assessment (Social Aspect) of Bareilly Bypass

14.5.4.1 Summary of Social Environmental Impact by Phase 1 Study

The main adverse impact on community life and economic activities at this site is related to acquisition of agricultural land. There is high dependency on agriculture with a relatively large fraction of small and marginal farmers. Severance or division of individual parcels of agricultural land is another significant issue, which will be clearly determined only when land to be acquired is surveyed and clearly delineated.

Effect on public facilities and resources as well as severance of communities and their resources were determined to be very important issues.

Bareilly was graded "6 - acceptable" in terms of the degree of adverse social impact (on a scale "10 - negligible" to "0 - not recommended to be implementation"). It was given a score of 5 in evaluating the land acquisition condition (10 - no difficulty expected in process or cost; 5 - possible to overcome the problem in time; 0 - difficulty expected in process or cost).

14.5.4.2 Baseline Data

(1) Public Facilities and Land Use

The detailed description of the bypass route with public facilities of social significance was shown on a line diagram in Figure 14-21.

The takeoff point of the bypass is at NH-24 on Bareilly -Rampur road in village Parsa Khera which falls in Bareilly district. From the take off point, the proposed alignment mainly passes through private agricultural land. For the first 100m stretch, one godown of M/s India Potash Ltd., one house and a few shops were observed within the study zone (100m on either side of the alignment). The standing crop observed in the stretch was mainly Mustard and Sugarcane. At approximately km. 1.250 the proposed alignment crosses a 2.5m wide metalled road to village Tulia. Facing northwards, one Ayuevedic Dispensary was observed approx. 80m LHS of the alignment.

At approximately km 2.000, one samadhi was observed on the centreline of the proposed alignment and another was observed approximately 30 metre RHS of the proposed alignment. At approximately km 2.050 the proposed alignment crosses Mundia distributory which is approximately 100 metre wide. Rest of the area comprises private agricultural land.

At approx. Km2.500, the proposed alignment crosses a village road from Khanna Gauntia toTullia.

At approx. Km3.450, the proposed alignment passes very closeby a Mazar(20m RHS)in village Hamirpur .

The proposed alignment crosses another village road from Khanna Gauntia toTullia at chainage Km 3.500.

A private Primary School and a Bullock Driven jaggery unit fall at approx. 50m RHS at chainage Km 4.200 of the proposed alignment in Pardhauli village.

Moving further ahead along the proposed alignment, a village road (Pardhauli - Bahit) is crossed at approximately km 4.550.

A village road from Bibiyapur to Bahit crosses the proposed alignment at chainage Km 5.250. At Km6.000, another village road from Bibiyapur to Kasimnagar crosses the proposed alignment. Bhojipura Distributary is also crossed by the proposed alignment at approximately km. 6.475.

Deoranian River is crossed by proposed alignment at approximately km. 7.870.

A Brick Kiln falls around 15m RHS, at Km 8.120 of the proposed alignment in Belwa village.

From Km 8.800 to Km 9.000, the proposed alignment cuts through the builtup area of Belwa village. Apart from houses, the builtup area includes one Shiva Temple and one Hanuman temple located at 80m and 60m LHS respectively, from the centreline of the proposed alignment.

At appx. Km 9.025 the alignment crosses Bareilly-Nainital Road (SH-37) and MG Railway line from Bareilly to Kathgodam.

Two brick kilns were also observed on centreline of the alignment beyond the MG Railway track at approximately Km 9.025 to Km 9.200.

At Km 9.215, adjoining the centre line of the alignment is builtup area comprising a Government recognised P. S. Memorial High School with a strength of 600 students.

From Km 9.500 to Km 11.750 the proposed alignment crosses through private agricultural land. Two village roads(metalled) from Bhura to Rithoda cross the alignment in close vicinity at Km. 10.000 and Km 10.150.

At approx Km 11.750, the proposed alignment crosses a cart track connecting Saidpur Village Road.

A 5m wide distributory crosses the alignment at Km 13.220. Another cart track crossing was observed at Km 13.225 connecting Pilibhit road.

A brick kiln falls at the centre line of the alignment at Km 13.800 running around 100m along the proposed alignment.

At approx. Km 13.980 the proposed alignment crosses State Highway (SH-33) to Pilibhit.

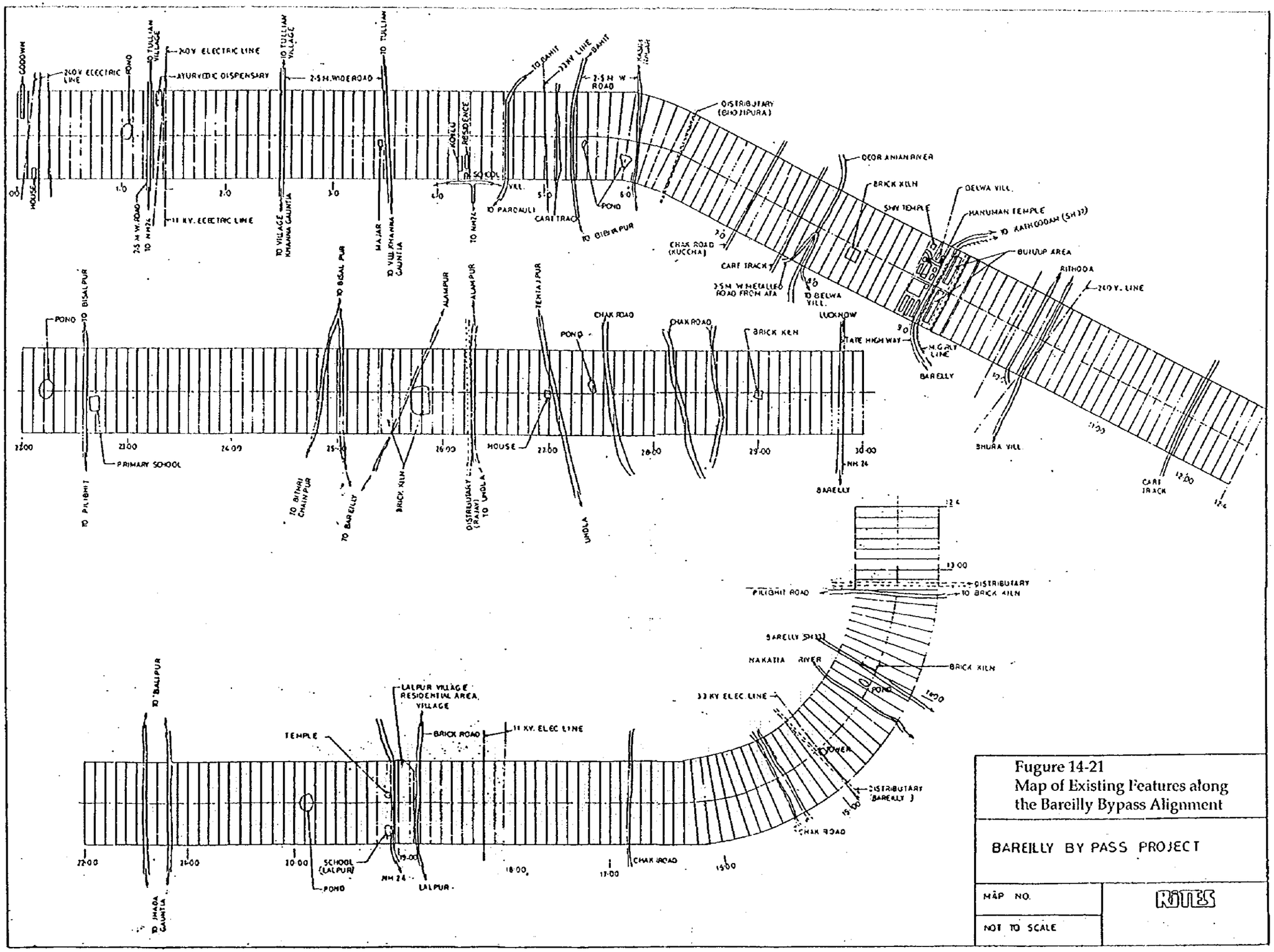
Nakatia river is crossed by the alignment at Km 14.300. One tower of 33kV Transmission line falls 10m LHS at Km 14.900.

Bareilly distributory crosses the alignment at Km 14.950. Two chak roads also cross the proposed alignment between Km 15.300 and Km 15.400.

At approx. Km. 16.800 the proposed alignment crosses another chak road.

In between the chainages and features such as roads, buildings and electric lines being mentioned above and in subsequent paragraphs, lies a vast expanse of agricultural fields.

Two 11kV electric lines cross the alignment at Km 18.000 and Km 18.200.



Fugure 14-21
Map of Existing Features along the Bareilly Bypass Alignment

BAREILLY BY PASS PROJECT

MAP NO.

NOTES

NOT TO SCALE

At Km 18.850, a village road connecting Lalpur village crosses the alignment.

The alignment runs through the residential area of Lalpur village from Km 18.860 to Km 19.000.

A metalled road from Lalpur village to NH24 crosses the alignment at Km 19.025. At Km 19.100, lies a temple 20m RHS and also Lalpur village primary school at 60m LHS. A pond used by the village community for fishing and irrigation lies in the centre of the proposed alignment at Km 19.825.

Two village metalled roads connecting Balipur and Jhada Gauntia fall at Km 21.200 and Km 21.400.

Another village pond happens to be on the centre line of the alignment at Km 22.200. At approx Km 22.600, the proposed alignment crosses Bisalpur-Pilibhit metalled road. A primary school is located at Km 22.650 and 30m RHS of the proposed alignment.

Further moving ahead the proposed alignment traverses through private agricultural land.

At km. 24.850, the proposed alignment cuts across a village metalled road connecting Bitthri Chainpur to Bisalpur. Bareilly - Bisalpur Road which is also a metalled road cuts the proposed alignment at Km 25.050. These roads join each other towards Bisalpur.

The proposed alignment surges forward to cut across a brick kiln at its centre at Km 25.450. At Km 25.675, a road from Bareilly to Alampur cuts the alignment. Another Brick kiln falls at the centre of the proposed alignment at Km 25.725. Rajau Distributory was observed to cut the alignment at km. 26.250, adjacent to the proposed alignment.

Undla - Tehtajpur Road is intersected by the proposed alignment at Km 27.050. A village pond lies at the centre of the alignment at Km 27.400. Three chak roads cross the alignment in close vicinity at Km 27.500, Km 28.200 and Km 28.600. A brick kiln was observed on the centre line of the alignment at Km 29.000. Finally towards the end of the alignment, Lucknow-Bareilly road which is also NH-24, is intersected by the alignment at Km 29.786.

The end point of proposed bypass on NH-24 is at the kilometer post placed at Km 260.

(2) Villages along the Bypass Route

The 33 villages falling along the bypass alignment are in the Blocks Bhojipura, Fatehganj Paschim and Bithri Chainpur (Table 14-62).

Table 14-61 Synopsis of the Proposed Bypass Alignment

1. Name	:	Bareilly Bypass
2. State	:	Uttar Pradesh
3. District	:	Bareilly
4. Length	:	29.786 km.
5. Width	:	80 metres
6. Area	:	238.29 Hectare
7. Starting Point	:	Km 236 of NH 24 on Delhi side
8. Ending Point	:	Km 260 of NH 24 on Lucknow side
9. No of Crossings	:	2 River Bridges, 3 Road Bridges, 1 Rail Over Bridge.
10. Major Controls	:	1) NH-24 - To secure smooth takeoff 2) Deorania River - Bridge 3) SH-37 - Bridge 4) Railway - Bridge 5) SH -33 - Bridge 6) Nakatia River - Bridge 7) District Road - Bridge 8) NH-24-To secure smooth connection
11. No. of Villages	:	33

Table 14-62 Villages along the Bareilly Bypass Alignment

S.No	Name of Village
1	Parsa Khera
2	Dhantia
3	Tullia
4	Gautia - Kanha
5	Hamirpur
6	Padgauli
7	Babiyapur
8	Ata
9	Bilwa
10	Bhura
11	Saidpur
12	Mudian Ahmednagar
13	Mudia
14	Khera
15	Kumra
16	Ahladpur
17	Rupapur

S.No	Name of Village
18	Sitora
19	Kalari
20	Lalpur
21	Itawa
22	Kacholi
23	Balipur
24	Gautiya Jadha
25	Purnapur
26	Nawada Jhada
27	Bithri Chainpur
28	Undla
29	Alampur
30	Padrathpur
31	Gauntiya Shamnagar
32	Bhadanliya
33	Pritampur

(3) Land Requirements and Cost of Land Acquisition

As mentioned earlier, at this early stage of feasibility level planning, delineation of each piece of land to be acquired (with the survey numbers recorded in Revenue maps along with the extent of acquisition) is yet to be

done. Therefore, considering the ROW of 80 metres and total length of the bypass being 29.786 km, the total land required for construction of bypass is 238.29 hectares.

From public consultations the market value of land was determined to be on the average Rupees 20,000 per Bigha (In Uttar Pradesh one Bigha is approximately 1/15th of a hactare).

The cost of land per ha. works out to be Rs 300,000. This will be provided as compensation to all owners losing land. An additional 30% should be added to the above amount as solatium, making the land compensation Rs. 390,000 per ha. At this rate the total cost of land acquisition works out to around Rs. 9.28 crores.

(4) Project Affected Persons and their Socio-Economic Profile

a) General

As already mentioned elsewhere in the report, the alignment of the Bareilly bypass has so far not been transferred on the ground. As such pegs/pillars were not stacked, either on the centre line or the ROW/corridor for the proposed alignment. Therefore in the absence of a well defined alignment on the ground, it became difficult to be very precise on the area of the land to be acquired, specially at the boundary zones.

Based on the tentative alignment details available, all efforts were made to determine, as accurately as possible the Project Affected People (PAPs) and their land and other details, through detailed field reconnaissance surveys and field consultations.

b) Definition of PAP

A Project Affected People (Persons) are every adult person affected by the project implementation through acquisition of land and other properties from the corridor of impact. A PAP displaced as a result of acquisition and removal of structures from the corridor of impact is considered as a displaced person or a displaced business depending upon the purpose for which the structure is being used.

c) Profile of PAPs

To obtain the socio-economic profile, it was decided to carryout a survey among the land owners along the ROW of the bypass. A well defined and pre-tested " Household Interview Schedule" was used for collection of data as given in the methodology. The classification of the people according to their religion, caste structure, land holding, family etc., adequately reflects the

social profile of the PAPs.

The classification of PAPs according to religion is given in Table 14-63. The data reveals that the majority of the people are Hindus (70.74%) though there are sufficient number of Muslims (28.68%). Sikhs are very few. There are no Christians.

Table 14-63 Religion wise Classification OF PAPs

S. No	Name of Village	N	Hindu	Muslim	Sikh
1	Parsa Khera	1	-	-	100.00
2	Dhantia	1	-	-	100.00
3	Tullia	37	97.30	2.70	-
4	Gautia - Kanha	18	33.33	66.67	-
5	Hamirpur	8	62.50	37.50	-
6	Padgauli	39	100.00	-	-
7	Babiyapur	15	33.33	66.67	-
8	Ata	36	63.69	33.33	2.98
9	Bilwa	16	100	-	-
10	Bhura	19	15.79	84.21	-
11	Saidpur	10	-	100.00	-
12	Mudian Ahmednagar	18	72.22	27.78	-
13	Mudia	16	100.00	-	-
14	Khera	3	100.00	-	-
15	Kumra	21	100.00	-	-
16	Ahladpur	37	86.49	13.51	-
17	Rupapur	2	100.00	-	-
18	Sitora	1	100.00	-	-
19	Kalari	10	40.00	60.00	-
20	Lalpur	12	100.00	-	-
21	Itawa	14	100.00	-	-
22	Kacholi	11	100.00	-	-
23	Balipur	15	100.00	-	-
24	Gautiya Jadha	-	-	-	-
25	Purnapur	3	66.67	33.33	-
26	Nawada Jhada	11	100.00	-	-
27	Bithri Chainpur	54	83.33	16.67	-
28	Undla	32	15.62	84.38	-
29	Alampur	19	13.79	86.21	-
30	Padrathpur	30	88.89	11.11	-
31	Gauntiya Shamnagar	9	-	100.00	-
32	Bhadanliya	5	100.00	-	-
33	Pritampur	6	-	100.00	-
	TOTAL	529	70.74	28.68	0.58

N : Number of PAPs.

Caste-wise distribution of PAPs is given in Table 14-64. This indicates that the majority of people belong to Other Backward Castes (OBCs) category, followed by General, SC and ST categories.

Table 14-64 Caste-wise Classification of PAPs

S. No	Name of Village	N	SC	ST	OBC	General
1	Parsa Khera	1.	-	-	-	100.00
2	Dhantia	1	-	-	-	100.00
3	Tullia	37	8.10	5.41	81.08	5.41
4	Gautia - Kanha	18	-	-	100.00	-
5	Hamirpur	8	-	-	12.50	87.50
6	Padgauli	39	7.69	-	92.31	-
7	Babiyapur	15	-	-	-	100.00
8	Ata	36	25.00	-	25.00	50.00
9	Bilwa	16	12.50	-	81.25	6.25
10	Bhura	19	-	-	5.26	94.74
11	Saidpur	10	-	-	-	100.00
12	Mudian Ahmednagar	18	22.22	-	22.22	55.56
13	Mudia	16	-	-	18.75	81.25
14	Khera	3	-	-	-	100.00
15	Kumra	21	-	-	100.00	-
16	Ahladpur	37	-	-	97.30	2.70
17	Rupapur	2	-	-	100.00	-
18	Sitora	1	-	-	100.00	-
19	Kalari	10	-	-	40.00	60.00
20	Lalpur	12	-	-	41.67	58.33
21	Itawa	14	-	-	100.00	-
22	Kacholi	11	9.10	-	90.90	-
23	Balipur	15	13.33	-	86.67	-
24	Gautiya Jadha	-	-	-	-	-
25	Purnapur	3	33.33	-	66.67	-
26	Nawada Jhada	11	-	-	100.00	-
27	Bithri Chainpur	54	3.70	-	94.02	2.28
28	Undla	32	3.125	-	93.75	3.125
29	Alampur	19	-	-	100.00	-
30	Padrathpur	30	-	-	-	100.00
31	Gauntiya Shamnagar	9	80.00	-	20.00	-
32	Bhadanliya	5	-	-	-	100.00
33	Pritampur	6	33.33		66.67	-
	TOTAL	529	7.03	0.38	64.19	28.40

Table 14-65 reflects the land ownership pattern among the PAPs. 86.35% are marginal farmers having less than 2.5 acre land. 8.92% are small farmers having land 2.5 acre to 5.0 acre and 3.59% are medium sized farmers having land between 5 to 10 acres. Thus 95% od PAPs fall in the category of marginal and small farmers.

Table 14-65 Land Ownership Pattern among PAPs

S.No	Name of Village	N	No Land	<2.5 (Acre)	2.5-5.0 (Acre)	5.0-10.0 (Acre)	>10.0 (Acre)
1	Parsa Khera	1	-	-	-	100.00	-
2	Dhantia	1	-	-	-	100.00	-
3	Tullia	37	-	83.78	5.41	10.81	-
4	Gautia - Kanha	18	-	100	-	-	-
5	Hamirpur	8	-	25.00	50.00	25.00	-
6	Padgauli	39	-	87.18	10.26	-	2.56
7	Babiyapur	15	-	100.00	-	-	-
8	Ata	36	-	97.22	-	2.78	-
9	Bilwa	16	-	87.50	6.25	6.25	-
10	Bhura	19	-	84.21	15.79	-	-
11	Saidpur	10	-	70.00	30.00	-	-
12	Mudian Ahmednagar	18	-	83.33	16.67	-	-
13	Mudia	16	-	93.75	-	-	6.25
14	Khera	3	-	100.00	-	-	-
15	Kumra	21	-	57.14	28.57	14.29	-
16	Ahladpur	37	-	94.59	5.41	-	-
17	Rupapur	2	-	100.00	-	-	-
18	Sitora	1	-	100.00	-	-	-
19	Kalari	10	-	100.00	-	-	-
20	Lalpur	12	-	83.33	8.33	8.34	-
21	Itawa	14	-	100.00	-	-	-
22	Kacholi	11	-	100.00	-	-	-
23	Balipur	15	-	80.00	20.00	-	--
24	Gautiya Jadha	-	-	-	-	-	-
25	Purnapur	3	-	100.00	-	-	-
26	Nawada Jhada	11	-	72.73	18.18	9.09	-
27	Bithri Chainpur	54	-	75.92	11.11	7.41	5.56
28	Undla	32	-	93.75	6.25	-	-
29	Alampur	19	-	100.00	-	-	-
30	Padrathpur	29	-	90.00	10.00	-	-
31	Gauntiya Shamnagar	9	-	88.80	-	-	11.20
32	Bhadanliya	5	-	80.00	20.00	-	-
33	Pritampur	5	-	80.00	20.00		--
	TOTAL	529		86.35	8.92	3.59	1.14

Table 14-66 indicates predominance of nuclear families. Only 32.44% are joint and remaining 67.56% are nuclear.

Table 14-66 Type of Family of PAPs

S. No	Name of Village	N	Joint	Nuclear
1	Parsa Khera	1	-	100.00
2	Dhantia	1	-	100.00
3	Tullia	37	70.27	29.73
4	Gautia - Kanha	18	-	100.00
5	Hamirpur	8	-	100.00
6	Padgauli	39	2.60	97.40
7	Babiyapur	15	-	100.00
8	Ata	36	61.11	38.89
9	Bilwa	16	25.00	75.00
10	Bhura	19	-	100.00
11	Saidpur	10	-	100.00
12	Mudian Ahmednagar	18	-	100.00
13	Mudia	16	87.50	12.50
14	Khera	3	100.00	-
15	Kumra	21	95.24	4.76
16	Ahladpur	37	83.78	16.22
17	Rupapur	2	50.00	50.00
18	Sitora	1	-	100.00
19	Kalari	10	60.00	40.00
20	Lalpur	12	80.00	20.00
21	Itawa	14	-	100.00
22	Kacholi	11	-	100.00
23	Balipur	15	-	100.00
24	Gautiya Jadha	-	-	-
25	Purnapur	3	-	100.00
26	Nawada Jhada	11	-	100.00
27	Bithri Chainpur	54	3.70	96.30
28	Undla	32	-	100.00
29	Alampur	19	5.26	94.74
30	Padrathpur	30	79.31	20.69
31	Gauntiya Shamnagar	9	33.33	66.67
32	Bhadanliya	5	60.00	40.00
33	Pritampur	6	20.00	80.00
	TOTAL	529	32.44	67.56

The size wise classification of families is given in Table 14-67. It indicates that a majority of families are large i.e. 5 or more members (75.47%) and four members 9.84%. 7.32 % have three members and only 7.38% family have two members.

Table 14-67 Size-wise Classification of Families of PAPs

S. No	Name of Village	N	<=2	3	4	>=5
1	Parsa Khera	1	-	-	100.00	-
2	Dhantia	1	-	-	100.00	-
3	Tullia	37	5.40	10.80	8.80	75. 00
4	Gautia - Kanha	18	-	-	-	100.00
5	Hamirpur	8	20.00	40.00	15.00	25.00
6	Padgauli	39	5.13	12.82	12.82	69.23
7	Babiyapur	15	-	6.67	20.00	73.33
8	Ata	36	2.78	5.56	5.56	86.11
9	Bilwa	16	6.25	-	-	93.75
10	Bhura	19	10.53	15.79	-	73.68
11	Saidpur	10	20.00	20.00	-	60.00
12	Mudian Ahmednagar	18	11.11	-	5.56	83.33
13	Mudia	16	31.25	6.25	-	62.50
14	Khera	3	-	40.00	60.00	-
15	Kumra	21	4.76	4.76	4.76	85.72
16	Ahladpur	37	-	-	10.00	90.00
17	Rupapur	2	-	-	-	100.00
18	Sitora	1	-	-	-	100.00
19	Kalari	10	-	-	-	100.00
20	Lalpur	12	-	-	25.00	75.00
21	Itawa	14	14.29	50.00	7.14	28.57
22	Kacholi	11	27.27	9.10	45.45	18.18
23	Balipur	15	6.67	-	40.00	53.33
24	Gautiya Jadha	-	-	-	-	-
25	Purnapur	3	-	-	-	100.00
26	Nawada Jhada	11	9.10	-	18.20	72.70
27	Bithri Chainpur	54	5.56	1.85	9.26	83.33
28	Undla	32	1.35	10.35	15.90	72.40
29	Alampur	19	15.79	15.79	5.26	63.16
30	Padrathpur	30	20.00	-	-	80.00
31	Gauntiya Shamnagar	9	-	-	-	100.00
32	Bhadanliya	5	-	-	-	100.00
33	Pritampur	6	-	-	-	100.00
	TOTAL	529	7.38	7.32	9.84	75.47

Details on Livestock of affected people have been documented in Table 14-68. Livestock are oxen, cows, buffaloes and calves. Being predominantly agricultural and rural area, there is a good parity between farm animals and milch animals. Among the milch animals there are more buffaloes (43.2%) than cows (16.62%).

Table 14-68 Livestock Details of PAPs

S. No	Name of Village	N	Oxen	Cow	Buffaloe	Calf
1	Parsa Khera	1	-	2	3	-
2	Dhantia	1	-	2	3	-
3	Tullia	37	14	11	33	-
4	Gautia - Kanha	18	4	-	7	-
5	Hamirpur	8	7	6	6	87.50
6	Padgauli	39	50	20	54	-
7	Babiyapur	15	20	4	20	-
8	Ata	36	12	7	25.00	44.44
9	Bilwa	16	14	13	-	-
10	Bhura	19	20	10	5.26	94.74
11	Saidpur	10	8	-	-	-
12	Mudian Ahmednagar	18	8	7	22.22	55.56
13	Mudia	16	4	4	18.75	81.25
14	Khera	3	2	2	-	10
15	Kumra	21	15	17	100.00	-
16	Ahladpur	37	20	15	97.30	2.70
17	Rupapur	2	2	1	100.00	-
18	Sitora	1	-	-	100.00	-
19	Kalari	10	8	4	40.00	60.00
20	Lalpur	12	6	-	-	-
21	Itawa	14	18	18	100.00	-
22	Kacholi	11	18	20	90.90	-
23	Balipur	15	24	-	86.67	-
24	Gautiya Jadha	-	-	-	-	-
25	Purnapur	3	8	-	66.67	-
26	Nawada Jhada	11	18	5	100.00	-
27	Bithri Chainpur	54	50	3	94.02	2.28
28	Undla	32	18	-	93.75	3.125
29	Alampur	19	18	-	100.00	-
30	Padrathpur	30	8	2	-	100.0
31	Gauntiya Shamnagar	9	2	-	20.00	-
32	Bhadanliya	5	-	1	-	-
33	Pritampur	6	4	1	66.67	-
	TOTAL	529	400	175	455	23

The data on sexwise classification among PAPs is given in Table 14-69 which indicates 61% females and 39% male population.

Table 14-69 Sex-wise Classification of PAPs

S.No	Name of Village	N	Male	Female
1	Parsa Khera	1	50.00	50.00
2	Dhantia	1	50.00	50.00
3	Tullia	37	34.80	65.20
4	Gautia - Kanha	18	50.00	50.00
5	Hamirpur	8	37.80	62.20
6	Padgauli	39	24.60	75.40
7	Babiyapur	15	11.50	88.50
8	Ata	36	32.70	67.30
9	Bilwa		44.10	55.90
10	Bhura	19	18.30	81.70
11	Saidpur	10	30.20	69.80
12	Mudian Ahmednagar	18	39.00	61.00
13	Mudia	16	43.70	56.30
14	Khera	3	19.00	81.00
15	Kunra	21	7.40	92.60
16	Ahladpur	37	26.00	74.00
17	Rupapur	2	66.70	33.30
18	Sitora	1	25.00	75.00
19	Kalari	10	35.20	64.80
20	Lalpur		12.50	87.50
21	Itawa	14	42.60	57.40
22	Kacholi	11	35.10	64.90
23	Balipur	15	17.40	82.60
24	Gautiya Jadha	-	-	-
25	Purnapur	3	35.70	64.30
26	Nawada Jhada	11	52.40	47.60
27	Bithri Chainpur	54	42.50	57.50
28	Undla	32	63.60	36.40
29	Alampur	19	45.80	54.20
30	Padrathpur	30	42.30	54.70
31	Gauntiya Shamnagar	9	48.90	51.10
32	Bhadanliya	5	60.90	39.10
33	Pritampur	6	100.00	0.00

14.5.4.3 Assessment of Impacts

(1) Community Life and Economic Activities

Based on the data presented in Chapter 14.5.4.2 (1), the public facilities affected as a result of the bypass are summarised in Table 14-70. The alignment passes through two villages - Belwa (Km 8/800~Km 9/000) and Lalpur (Km 18/800~Km 19/000) such that many houses among the proposed

corridor shall have to be acquired. There are also three schools (at Km 4.250, Km 9.200, Km 19.100) and one Ayurvedic dispensary (Km1.350) within the ROW of the alignment. Temples and mazars are also very close to the centre-line of the proposed alignment (Km3.500, Km9.000, Km19.100). Two Samadhis (graveyard), three village ponds and a municipal garbage dump site are other sensitive public facilities which come within the ROW. Dislocation of such sensitive premises is always an emotive issue, which may lead to disagreements.

Table 14-70 Affected Public Facilities

S. No.	Utilities	No. of Location	Approx. Chainage
1.	Godown	1	0/050.
2.	Residential Area	5	0/150, 4/250, 8/800 to 9/000, 18/800 to 19/000, 27/000.
3.	Brick Kiln	4	1/100, 8/200, 13/975, 29/000.
4.	Temple (2) / Mazaar (1)	3	3/500, 9/000, 19/100.
5.	Bullock driven oil mill	1	4/200.
6.	School	3	4/250, 9/200, 19/100.
7.	Built-up Area	1	9/100.
8.	Electric Tower	1	14/900.
9.	240 V Electric line crossing	8	0/100, 0/200, 0/300, 1/350, 4/650, 10/200, 18/200, 14/900
10.	11kV Electric line crossing	2	1/400, 18/000.
11.	33kV Electric line crossing	1	5/000.
12.	Ayurvedic Dispensary	1	1/350.
13.	SH 37 crossing	1	9/000.
14.	SH 33 crossing	1	14/000.
15.	M G Rly. line crossing	1	9/050
16.	Metalled Road crossing	6	1/250, 4/600, 5/250, 5/900, 10/050, 27/050.
17.	Unmetalled road crossing	3	2/500, 3/500, 13/200.
18.	Brick Road crossing	1	18/850.
19.	Cart Track crossing	2	5/100, 28/600.
20.	Chak Road (kuchha) crossing	6	7/150, 15/300, 15/375.
21.	River crossing	2	7/800, 14/275.
22.	Two Samadhi (graveyard)	1	2/000
23.	Village Pond	3	19/800, 22/200, 27/500
24.	Garbage Dump-Site	1	29/900.

The other important impact is a study of existing and future planned crossing facilities (road, railway and water channels) running across the planned bypass road in order to determine the problem of severance. This problem is important as the bypass roads are being planned with full control of access to provide high level of service. Full control of access means that preference is given to through-traffic by providing access connections only with selected

public roads and by prohibiting crossing at grade direct private driveway connections. Entry of slow traffic such as three wheelers, bicycles, animal drawn cart etc. shall be banned on the bypass road. Section 14.5.4.2 (1) describes in detail the locations of existing crossing facilities. Existing and future crossing facilities are also well studied in planning of various structures along the bypass and are elaborated elsewhere in this report.

It was determined that adequate planning of various crossing structures, service roads, interchanges, and road cross sectional elements would alleviate this problem of severance. Details in the form of mitigation measures are presented in the next section.

(2) Land Acquisition and Related Issues

The following can be determined from the data presented in Chapter 14.5.4.2 (2), (3), and (4).

a) About 256 ha of agricultural land needs to be acquired from possible around 529 PAPs distributed in 33 villages along the bypass route.

b) The PAPs are predominantly small and marginal farmers (95%) having very small holdings and agriculture is their main source of livelihood. Livestock including both farm animals and milch animals are an important resource of the PAPs and very few of them own tractors.

c) There is a predominance of nuclear families with large family size (more than 5 people) among the PAPs. It is also seen that the male population is 61% as compared to 39% female population among the PAPs.

d) Hindus constitute about 71% of the PAPs and Muslims around 29%. Only about 3% of the PAPs come under SC/ST classification. About 64% of them come under Other Backward Classes (OBC) category.

The above characteristics are indicative of the fact that land acquisition from the PAPs would have a very significant impact in terms of their losing their only source of livelihood. Further, the very large number of PAPs makes the process of land acquisition a formidable task.

Public consultations were carried out among the PAPs and general public in order to find out their reactions and concerns towards the construction of Bareilly bypass. Anxiety was observed among the PAPs concerning loss of land. PAPs expressed their concern that by losing their entire land holding or even a part of their land holding could lead to the loss of their main source of livelihood as agriculture is their traditional way of life. Most of the needs of their family are obtained and fulfilled by land resources. PAPs requested for adequate and timely compensation for their land. The compensation expectation by PAPs is the market value for their lost land, tube wells,

structures and standing crops. As a result of public consultations it was found that there is no resistance amongst people provided that adequate compensation for land, tube wells, structures and standing crops is given to them and facilities/utilities are provided wherever required.

(3) Other Aspects

a) The project is likely to be completed in a period of at least three years. During this period, manpower will be required for construction activities. The project will thus provide social benefits in terms of direct employment.

b) Bareilly is an upcoming commercial town of importance. NH-24 passes through Bareilly city connecting Delhi and Lucknow. Two state highways also pass through Bareilly. Thus, vehicular traffic bound for cities other than Bareilly has to necessarily pass through Bareilly. Further, the growing vehicular population of Bareilly also adds to the traffic congestion. The construction of bypass will remove traffic congestion and bottlenecks, as well reduce the occurrence of accidents, which will be significant social gains.

c) Savings in travel time will be the major social benefit to road users. Implementation of project will raise the average vehicle speed for all categories of transport.

d) Tribals/indegenous people are one of the most vulnerable sections of the society to the impacts of any development activity. However, no tribal population was reported in the project area.

14.5.5 Environmental Impact Assessment (Social Aspect) of Gwalior Bypass

14.5.5.1 Summary of Social Environmental Impact by Phase 1 Study

The main adverse impact on community life and economic activities at this site is related to acquisition of agricultural land. There is high dependency on agriculture with a relatively large fraction of small and marginal farmers. Severance or division of individual parcels of agricultural land is another significant issue, which will be clearly determined only when land to be acquired is surveyed and clearly delineated. The impact on 45 families encroaching on Government land at the beginning of the alignment could be significant and needs to be considered in formulating mitigation measures and determining compensation.

Effect on public facilities and resources as well as severance of communities and their resources were determined to be very important issues.

Gwalior was graded "6-acceptable" in terms of the degree of adverse social impact (on a scale "10-negligible" to "0-not recommended to be implementation"). It was

given a score of 5 in evaluating the land acquisition condition (10-no difficulty expected in process or cost; 5-possible to overcome the problem in time; 0-difficulty expected in process or cost).

14.5.5.2 Baseline Data

(1) Public Facilities and Land Use

The detailed description of bypass route is shown on a line diagram in Figure 14-22.

The take-off point on Agra side of the proposed Gwalior bypass is at Km 103.400 on NH-3 (National Highway which inter-alia connects Gwalior to Agra) in village Baragwa which falls in Morena district. From the take off point, the proposed alignment passes mainly through hutments of Baragwa village for a length of 100m.The state PWD officials have indicated that these dwelling units have been constructed on government land and hence are encroachments. At approximately Km 0.150, the proposed alignment crosses the N.G. Railway line from Gwalior to Sheopur.

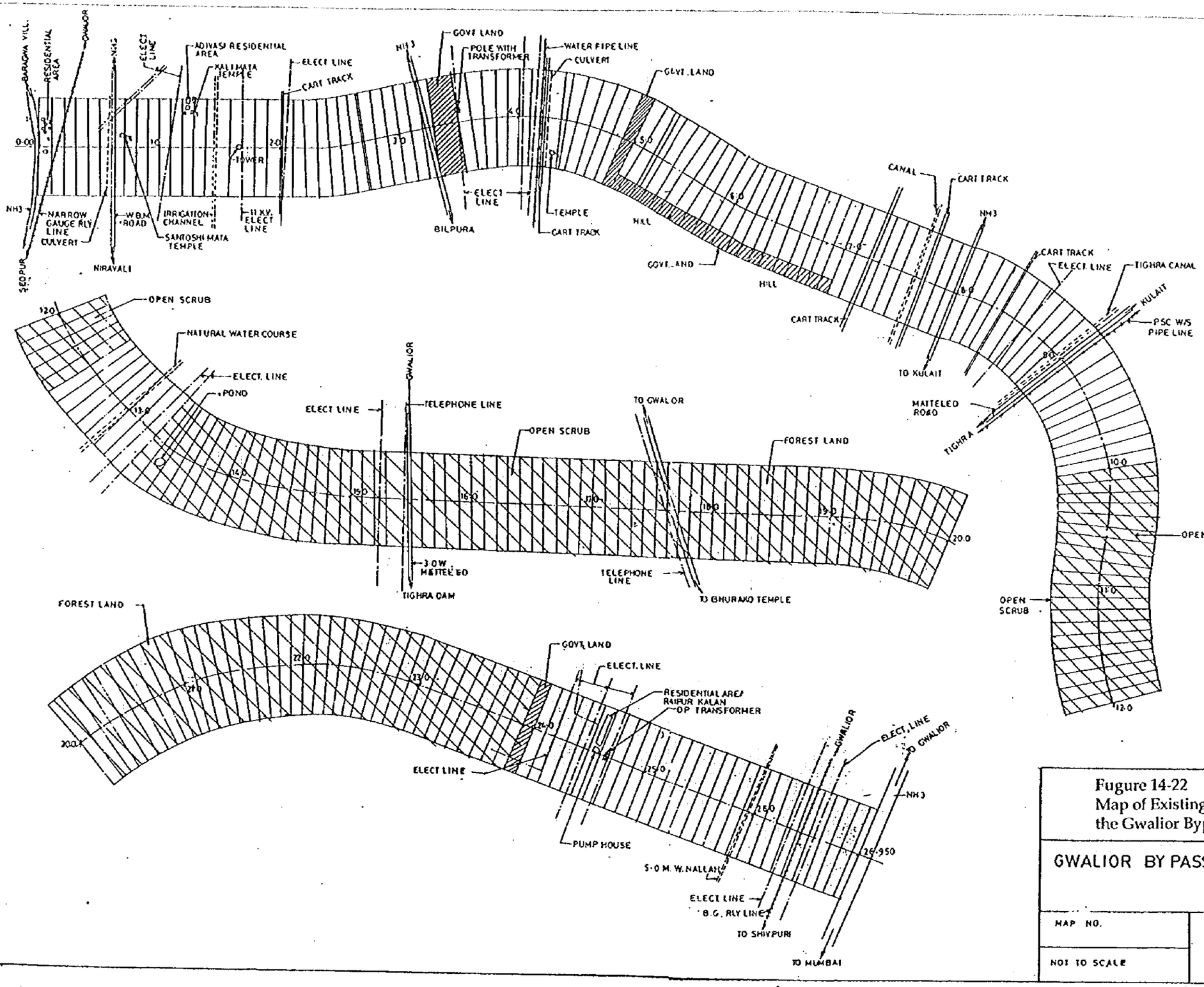
At approx Km 0.650, the proposed alignment crosses the road to village Nirawali. Facing westwards, one temple is located 30m LHS at approx Km 0.700. An authorised settlement of Tribals on government land is located around 70m LHS of the proposed alignment at Km 1.250 for a stretch of about 50m.This settlement also includes a temple dedicated to tribal deity.

There is a canal crossing at Km 1.500 of the alignment. One High Tension electric tower falls at the centreline of the proposed alignment at Km 1.700. At approx Km.2.000 a cart track was observed to cross the proposed alignment.

In between the chainages and features such as roads, buildings and electric lines being mentioned above and in subsequent paragraphs, lies a vast expanse of agricultural fields.

A village metalled road connecting NH-3 to Bilpura village crosses the alignment at Km 3.250. The alignment then cuts through government land, mainly used for grazing, from Km 3.300 to Km 3.500. A transformer mounted on electric pole falls 20m LHS of the proposed alignment at Km 3.500.

For the next 500m, the alignment passes through agricultural fields without any features in between. At Km 4.000 and at Km 4.150, two electric lines cross the alignment, almost parallel to each other, in North-South direction. Water Supply Pipe line of 0.75m diameter connecting Tigra Dam to Motihill water treatment plant (6.5MLD) crosses the alignment at Km 4.150. The alignment then crosses a cart track and a culvert at Km 4.200. A temple is located on 50m RHS at Km 4.250 of the proposed alignment.



Fugure 14-22
Map of Existing Features along the Gwalior Bypass Alignment

GWALIOR BY PASS PROJECT

MAP NO.

NOT TO SCALE

RITES

For the next 750m, the alignment traverses through private agricultural land and for another 100m, through encroached government land; these stretches being devoid of any physical features.

Further ahead, for a long stretch of 2Kms, the alignment runs mainly through private agricultural land. However, for this stretch at 75m RHS of the alignment, agricultural activities by encroachers belonging to Scheduled categories, on land adjoining the hill slopes reportedly owned by the government, were being carried out. A cart track crosses the alignment at Km 7.250. The alignment then cuts through a canal used by village community at Km 7.600. Another cart track crosses the alignment at Km 7.650.

A village metalled road connecting NH-3 to village Kulaith cuts the alignment at Km 8.000. A cart track cuts the alignment at Km 8.400. The alignment crosses an electric transmission line at Km 8.600. At Km 9.000, the alignment cuts the Tigra canal and also one village metalled road connecting Tigra Dam with village Kulaith. Another water supply pipeline from Tigra Dam to Motihill water treatment plant cuts the alignment at Km 9.010.

Thereafter, the alignment passes through agricultural land, devoid of any physical features, for a length of about 1 Km . From Km 10.000 to Km 12.500, the alignment passes through open scrub land with no physical features. Agricultural land is encountered from Km 12.500 to Km 13.000 with no features. The alignment crosses a natural water course at Km 13.000. Two electric lines cut the alignment at Km 13.200 and 13.300.

Scrub land was observed from Km 13.3000 to Km 17.600. However, in between a pond was located 50m RHS at Km 13.450. Electric line and telephone line crossings were noticed at Km 15.250 and Km 15.500 respectively. A village metalled road connecting Gwalior to Tigra Dam crosses the alignment at Km 15.500. Further ahead, the alignment crosses one telephone line at Km 17.700 and a metalled road connecting Gwalior to Bhurako temple at Km 17.700.

From Km 17.700, for a length of about 6 Km, the alignment enters Raipur Reserved Forest up to Km 23.800.

The alignment emerges into government land used for grazing upto Km 24.000. One electric line falls 75m RHS from Km 23.800 to Km 24.200. This line turns at right angle to cut through the alignment at Km 24.200. This line returns pass 50m LHS of the alignment from Km 24.275 to Km 24.500. A little before at Km 24.450, another electric line cuts the alignment. Two houses fall 25m LHS of the alignment at Km 24.550. At this chainage, the alignment also cuts a two-storeyed pump house at the centre. One transformer mounted on electric pole falls at the centre of the alignment at Km 24.675 with the electric

line running across the alignment. Agricultural land, without any features, was noticed upto Km 25.950.

The alignment crosses a 5m wide nalah at Km 25.950. Two electric lines cross the alignment at Km 26.350 and Km 26.550. In between the alignment cuts through a BG railway line connecting Gwalior to Shivpuri at Km 26.450.

The end point of proposed bypass on NH-3 is at the kilometer post placed at Km 133.400.

(2) Villages along the Bypass Route

The 9 villages falling along the bypass alignment are as follows:

Table 14-71 Villages along the Gwalior Bypass Alignment

S.No	Name of Village
1	Baragwa
2	Nirawali
3	Gajupura
4	Janavali
5	Jigsolly

S.No	Name of Village
6	Kulaith
7	Punjabi Pura
8	Sojana
9	Raipur kalan

(3) Land Requirements and Costs for Land Acquisition

As mentioned earlier, at this early stage of feasibility level planning, delineation of each piece of land to be acquired (with the survey numbers recorded in Revenue maps along with the extent of acquisition) is yet to be done. Therefore, considering the ROW of 80 metres and total length of the bypass being 26.95 km, the total land required for construction of bypass is 215.6 hectares. Out of this, forest land and scrub land is around 104 ha, and Government revenue land about 6.4 ha.

From public consultations the market value of land was determined to be on the average to be Rs. 188,000 per hectare. The cost of land acquisition considering only private agricultural land works out to be Rs 1.98 crores. This will be provided as compensation to all owners losing land. An additional 30% should be added to the above amount as solatium, making the land compensation Rs. 244,400 per ha. At this rate the total estimated cost of land acquisition works out to around Rs. 2.57 crores.

(4) Project Affected Persons and their Socio-Economic Profile

a) General

As already mentioned elsewhere in the report, the alignment of the Gwalior bypass has so far not been transferred on the ground. As such pegs/pillars

were not stacked, either on the centre line or the ROW/corridor for the proposed alignment. Therefore in the absence of a well defined alignment on the ground, it became difficult to be very precise on the area of the land to be acquired, specially at the boundary zones.

Based on the tentative alignment details available, all efforts were made to assess, as accurately as possible the Project Affected People (PAPs) and their land and other details.

b) Profile of PAPs

The classification of PAPs according to religion is given in Table 14-72. The data reveals that the majority of the people are Hindus (93.60%). There are only 0.80 % Muslims. Sikhs are 4.00% whereas Jains are 1.60%. There are no Christians.

Table 14-72 Religion-wise Classification of PAPs

S.No	Name of Village	N	Hindus	Muslim	Sikh	Jain
1	Baragwa	6	100.00	-	-	-
2	Nirawali	36	97.22	2.78	-	-
3	Gajupura	3	100.00	-	-	-
4	Janavali	4	100.00	-	-	-
5	Jigsolly	24	100.00	-	-	-
6	Kulaith	13	84.62	-	-	15.38
7	Punjabi Pura	7	28.57	-	71.43	-
8	Sojana	10	100.00	-	-	-
9	Raipur Kalan	22	100.00	-	-	-
	TOTAL	125	93.60	0.80	4.00	1.60

N : Number of PAPs.

Castewise distribution of PAPs is given in Table 14-73. This indicates that the majority of people belong to OBC category (66.40%), followed by General (27.20%), ST (5.60%) and SC (0.80%) categories.

Table 14-73 Caste-wise Classification of PAPs

S. No	Name of Village	N	SC	ST	OBC	General
1	Baragwa	6	-	-	16.67	83.33
2	Nirawali	36	-	8.33	91.67	-
3	Gajupura	3	-	-	100.00	-
4	Janavali	4	-	-	25.00	75.00
5	Jigsolly	24	-	8.33	66.67	25.00
6	Kulaith	13	7.69	-	38.46	53.85
7	Punjabi Pura	7	-	-	-	100.00
8	Sojana	10	-	-	100.00	-
9	Raipur Kalan	22	-	9.09	63.64	27.27
	TOTAL	125	0.80	5.60	66.40	27.20

Table 14-74 reflects the land ownership pattern among the PAPs. 56.80% are marginal farmers having less than 2.5 acre land. 21.60% are small farmers having land 2.5 acre to 5.0 acre and 6.40% are medium famers having land between 5 to 10 acres. Thus 78% of PAPs fall in the category of marginal and small farmers.

Table 14-74 Land Ownership Pattern among PAPs

S. No	Name of Village	N	No Land	<2.5 (Acre)	2.5-5.0 (Acre)	5.0-10.0 (Acre)	>10.0 (Acre)
1	Baragwa	6	-	100.00	-	-	-
2	Nirawali	36	-	91.67	8.33	-	-
3	Gajupura	3	-	100.00	-	-	-
4	Janavali	4	75.00	-	25.00	-	-
5	Jigsolly	24	12.50	37.50	20.83	25.00	4.17
6	Kulaith	13	-	61.54	30.77	7.69	-
7	Punjabi Pura	7	14.28	42.86	-	-	42.86
8	Sojana	10	-	40.00	50.00	10.00	-
9	Raipur Kalan	22	36.36	22.73	40.91	-	-
	TOTAL	125	12.00	56.80	21.60	6.40	3.20

Table 14-75 indicates predominance of nuclear families. Only 28.80% are joint and remaining 71.20% are nuclear.

Table 14-75 Type of Family of PAPs

S. No	Name of Village	N	Joint	Nuclear
1	Baragwa	6	33.33	66.67
2	Nirawali	36	27.78	72.22
3	Gajupura	3	33.33	66.67
4	Janavali	4	50.00	50.00
5	Jigsolly	24	62.50	37.50
6	Kulaith	13	7.70	92.30
7	Punjabi Pura	7	28.57	71.43
8	Sojana	10	20.00	80.00
9	Raipur Kalan	22	4.55	95.45
	TOTAL	125	28.80	71.20

The size wise classification of families is given in Table 14-76. It indicates that a majority of families are large i.e. 5 or more members (88.80%) and four members 8.80%. 1.60 % have three members and only 0.80% family have two members.

Table 14-76 Size-wise Classification of Families of PAPs

S. No	Name of Village	N	<=2	3	4	>=5
1	Baragwa	6	-	-	-	100.00
2	Nirawali	36	-	2.78	8.33	88.89
3	Gajupura	3	-	-	-	100.00
4	Janavali	4	-	-	-	100.00
5	Jigsolly	24	-	-	-	100.00
6	Kulaith	13	-	7.69	30.80	61.52
7	Punjabi Pura	7	-	-	14.29	85.71
8	Sojana	10	10.00	-	20.00	70.00
9	Raipur Kalan	22	-	-	4.55	95.45
	TOTAL	125	0.80	1.60	8.80	88.80

Details of Livestock of affected people have been documented in Table 14-77. Livestock are oxen, cows, buffaloes and calves. Being predominantly an agricultural and rural area, there is a good parity between farm animals and milch animals. Among the milch animals there are more buffaloes (53.21%) than cows (11.92%).

Table 14-77 Livestock Details of PAPs

S. No	Name of Village	N	Oxen	Cow	Buffalo	Calf
1	Baragwa	6	-	-	1	-
2	Nirawali	36	28	4	16	5
3	Gajupura	3	2	-	1	-
4	Janavali	4	-	8	38	3
5	Jigsolly	24	16	-	10	-
6	Kulaith	13	6	-	2	-
7	Punjabi Pura	7	15	-	45	-
8	Sojana	10	16	8	27	-
9	Raipur Kalan	22	14	16	21	-
	TOTAL	125	32.12	11.92	53.31	2.65

The data on sexwise classification among PAPs is given in Table 14-78 which indicates 41.63% females and 58.37% male population.

Table 14-78 Sex-wise Classification of PAPs

S.No	Name of Village	N	Male	Female
1.	Baragwa	6	53.66	46.33
2.	Nirawali	36	60.05	39.95
3.	Gajupura	3	63.83	36.17
4.	Janavali	4	53.70	46.30
5.	Jigsolly	24	61.93	38.07
6.	Kulaith	13	49.00	51.00
7.	Punjabi Pura	7	53.85	46.15
8.	Sojana	10	57.89	42.11
9.	Raipur Kalan	22	60.44	39.66
	TOTAL	125	58.37	41.63

14.5.5.3 Assessment of Impacts

(1) Community Life and Economic Activities

The utilities affected as a result of the bypass are summarised in Table 14-79. From the table it is clear that the alignment has been selected to avoid built-up area of villages. There are three temples at Kms 0.700, 1.250 and 4.250 very near the centre line of the alignment. Other utilities affected include electric lines, telephone lines and water pipe line, the details of which have been mentioned earlier in the baseline data. At this stage it is possible to avoid disturbance to temples since dislocation of such sensitive premises is always an emotive issue, which may lead to disagreements.

The other important impact is a study of existing and future planned crossing facilities (road, railway and water channels) running across the planned bypass road in order to determine the problem of severance. This problem is important as the bypass roads are being planned with full control of access to provide high level of service. Full control of access means that preference is given to through-traffic by providing access connections only with selected public roads and by prohibiting crossing at grade direct private driveway connections. Entry of slow traffic such as three wheelers, bicycles, animal drawn cart etc. shall be banned on the bypass road. Section 14.5.5.2 (1) describes in detail the locations of existing crossing facilities. Existing and future crossing facilities are also well studied in planning of various structures along the bypass and are elaborated elsewhere in this report.

It was determined that adequate planning of various crossing structures, service roads, interchanges, and road cross sectional elements would alleviate this problem of severance. Details in the form of mitigation measures are

presented in the next section.

Table 14-79 Affected Public Facilities

S. No.	Utilities	No. of Location	Approx. Chainage
1.	Residential Area	3	0/050 to 0/150, 1/200 to 1/300, 24/550
2.	Temple	3	0/700, 1/250, 4/250.
3.	Electric Tower	1	1/700.
4.	Electric line crossing	19	0/700, 0/700, 1/075, 1/700, 2/025, 3/500, 4/000, 4/150, 8/600, 13/200, 13/300, 15/250, 23/800 to 24/200, 24/200, 24/275 to 24/500, 24/450, 24/675, 26/350, 26/550.
5.	D. P. Transformer	2	3/500, 24/675.
6.	Telephone line crossing	3	1/075, 15/500, 17/700
7.	N. G. Rly. line crossing	1	0/150.
8.	M G Rly. line crossing	1	26/450
9.	Metalled Road crossing	5	3/250, 8/000, 9/000, 15/500, 17/700.
10.	Unmetalled road crossing	1	0/600.
11.	Cart Track crossing	5	2/000, 4/200, 7/250, 7/650,8/400.
12.	Culvert / Nallah crossing	7	0/600, 1/500, 4/200, 7/600, 9/000, 13/000, 25/950.
13.	Water pipe line crossing	2	4/150, 9/000.

(2) Land Acquisition and Related Issues

The following can be determined from the data presented in Section 14.5.5.2 (3) and 14.5.5.2 (4).

a) About 212 ha of agricultural land needs to be acquired from around 125 PAPs distributed in 9 villages along the bypass route. These include 6 families at Bargwa at the beginning of the alignment who are encroaching on Government revenue land.

b) The PAPs are mostly small and marginal farmers (78%) having very small holdings and agriculture is their main source of livelihood. Livestock including both farm animals and milch animals are an important resource of the PAPs and very few of them own tractors.

c) There is a predominance of nuclear families with large family size (more than 5 people) among the PAPs. It is also seen that the male population is 58% as compared to 42% female population among the PAPs.

d) Hindus constitute about 94% of the PAPs and Sikhs around 4%. Only about 3% of the PAPs come under SC/ST classification. Majority (66.4%) come under Other Backward Classes (OBCs).

The above characteristics are indicative of the fact that land acquisition from the PAPs would have some impact in terms of their losing their only source of livelihood. For the 6 families with no land but having their houses on Government revenue land, appropriate compensation needs to be considered.

Public consultations were carried out among the PAPs and general public in order to find out their reactions and concerns towards the construction of Bareilly bypass. Anxiety was observed among the PAPs concerning loss of land. PAPs expressed their concern that by losing their entire land holding or even a part of their land holding could lead to the loss of their main source of livelihood as agriculture is their traditional way of life. Most of the needs of their family are obtained and fulfilled by land resources. PAPs requested for adequate and timely compensation for their land. The compensation expectation by PAPs is the market value for their lost land, tube wells, structures and standing crops. As a result of public consultations it was found that there is no resistance amongst people provided that adequate compensation for land, tube wells, structures and standing crops is given to them and facilities/utilities are provided wherever required.

(3) Other Aspects

a) The project is likely to be completed in a period of at least three years. During this period, manpower will be required for construction activities. The project will thus provide social benefits in terms of direct employment.

b) Gwalior attracts a number of national and international tourists due to its heritage and splendid historical past. It is also a commercial town of importance. NH-3 passes through Gwalior city connecting Delhi and Bombay. Thus, vehicular traffic bound for cities other than Gwalior has to necessarily pass through Gwalior . It being an old city, most of the roads of Gwalior are narrow and congested. Further, the growing vehicular population of Gwalior also adds to the traffic congestion. The construction of bypass will remove traffic congestion and bottlenecks at Gwalior which will be a significant social gain.

c) Savings in travel time will be the major social benefit to road users. Implementation of project will raise the average vehicle speed for all categories of transport.

d) Tribals/indegenous people are one of the most vulnerable sections of the society to the impacts of any development activity. Since tribal population was found to cultivate land on the fringes of the corridor of proposed alignment special care needs to be exercised to compensate them for the hardships as a result of project activities.

14.5.6 Conclusions and Recommendations

The previous sections presented the anticipated impacts and recommended mitigation measures for each bypass site. Impacts and mitigation measures were identified in three broad areas namely - community life and economic activities, land acquisition and related issues, and other aspects.

For Bareilly concerning impact on community life and economic activities, the alignment passes through two villages - Belwa and Lalpur such that many houses among the proposed corridor shall have to be acquired. There are also three schools, one ayurvedic dispensary, two Samadhis, three village ponds, and a municipal garbage site within the ROW of the alignment. Three temples and Mazars (places of worship) are very close to the centre-line of the proposed alignment. Dislocation of such sensitive premises is always a sensitive issue, which may lead to disagreements. The other important aspect is the problem of severance caused to existing and future planned crossing facilities (road, railway and water channels) running across the planned bypass road.

For Gwalior, concerning impact on community life and economic activities, the alignment has been selected to avoid built-up areas. There are three temples very near to the centre-line of the alignment. The other important aspect is the problem of severance caused to existing and future planned crossing facilities (road, railway and water channels) running across the planned bypass road.

Mitigation measures were formulated for each bypass site concerning negative impacts on community life and economic activities. These included consideration of alternative alignments to avoid sensitive receptors, measures incorporated into road design (like provision of service roads, provision of interchanges, provision of suitable crossing structures like culvert box, culvert pipe, bridge, and median openings at intervals of about 2 Km), and a public awareness and acceptability promotion.

Impacts of land acquisition and related issues arise out of the need to acquire about 238 ha of agricultural land from about 529 PAPs distributed in 33 villages along the bypass route in case of Bareilly. In the case of Gwalior, about 216 ha of agricultural land needs to be acquired from about 125 PAPs distributed in 9 villages along the bypass route. These include 6 families at Bargwa at the beginning of the alignment who are encroaching upon Government revenue land. In case of both Bareilly and Gwalior, the PAPs are predominantly small and marginal farmers with very small farm holdings and agriculture is their main source of livelihood. There is a predominance of nuclear families among the PAPs and they largely come under the Other Backward Classes (OBCs) caste category.

Mitigation measures to counteract the identified negative impacts of land acquisition were formulated keeping in mind the process of land acquisition and entitlements as

per the Land Act, and the key trend in law and policies concerning entitlements, relocation and rehabilitation. These mitigation measures include the recommendation for formulation of a transparent land acquisition, compensation and rehabilitation plan formulation, public consultations and involvement of PAPs and/or their representatives at all stages, and formulation of a Monitoring Committee with representation from all stakeholders.

Other impacts identified for both sites are positive in nature including employment generation during road construction, reduced traffic congestion in Bareilly and Gwalior towns, and savings in travel time for road users. It is important for project development authorities to give priority to PAPs in employment opportunities in road construction activities. Project development authorities need to formulate necessary skill and training development programmes directed at PAPs for their efficient involvement in project construction activities.

It can be concluded that by effectively implementing the proposed mitigation measures, negative environmental impacts related to community life and economic activities and land acquisition can be controlled and managed adequately. The importance of a participatory approach including active involvement and consultations with the PAPs is an integral part of the recommended mitigation measures. This would go a long way in paving the way for smooth implementation of land acquisition and road construction. It is strongly recommended that project development authorities take early steps in formulating and implementing the identified mitigation measures in a transparent and public friendly manner to facilitate the overall project implementation without any delay