社会開発調査部報告書

No. 61

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SURFACE TRANSPORT
GOVERNMENT OF INDIA

THE FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

FINAL REPORT

VOLUME III
APPENDICES

AUGUST 1998

NIPPON KOEI CO., LTD.
YACHIYO ENGINEERING CO., LTD.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SURFACE TRANSPORT
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The Feasibility Study
on
National Highway Bypasses
in
India
Final Report

Volume III
Appendices

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Appendix 1

Introduction

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Scope of Work for the Feasibility Study on National Highway Bypasses In India

A1 Introduction

A1-1 Scope of Work for the Feasibility Study on National Highway Bypasses in India

SCOPE OF WORK

FOR

THE FEASIBILITY STUDY

ON

NATIONAL HIGHWAY BYPASSES

IN

INDIA

AGREED UPON BETWEEN

MINISTRY OF SURFACE TRANSPORT

THE GOVERNMENT OF INDIA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, NOVEMBER 15, 1996

Takeo Kai

MR. TAKEO KAI,
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

MR. R. L. KOUL
CHIEF ENGINEER,
MINISTRY OF
SURFACE TRANSPORT

15/11/96

MR. D. N. NARASIMHA RAJU
DEPUTY SECRETARY,
MINISTRY OF FINANCE,
DEPARTMENT OF
ECONOMIC AFFAIRS

I. Introduction

In response to the request of the Government of India(hereinafter referred to as "GOI", the Government of Japan has decided to conduct the Feasibility Study on National Highway Bypasses in India(hereinafter referred to as "the Study"), in accordance with the relevent laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of GOI.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the study is to
1)conduct a pre-feasibility study on proposed highway bypasses projects(target year for the completion of the consruction; 2012) and
2)conduct a feasibility study on high priority projects(target year for the completion of the construction;2002) selected through the previous phase of the Study.

III. STUDY AREA

The Study shall cover the following cities and their peripheral areas where the proposed highway bypasses are located: Vijayawada in Andhra Pradesh, Patna in Bihar; Cannanore in Kerala; Bhopal in Madhya Pradesh . Khamgaon and Nandura in Maharashtra; Keonjhar and Balugaon in Orissa; Jaipur in Rajasthan and Bareilly in Uttar Pradesh.(see Appendix 1).

IV. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study shall cover the following items.

I .Phase 1: Pre-feasibility study on proposed 10 bypasses
(Target year for the completion of the construction: 2012)

1.Collection and analysis of available information
 1)National Development plans
 2)Policy and Plans on Transport sector & Road subsector
 3)Natural conditions
 4)Traffic volume by mode
 5)Natural and social environment
2.Surveys of present conditions
 1)Traffic survey including O/D, axle load,ecc
 2)Road condition including roughness of roads
 3)Natural & Social environment
 4)Natural condition including topography,geology,weather
3.Evaluation of planning and design standard of road
4.Formulation of socio-economic framework of India as a whole and concerned states

5.Formulation of a basic plan of respective bypasses
6.Standard design of the proposed bypasses
7.Preliminary cost estimate
8.Preliminary economic analysis
9.Implementation and management plan for each project
10.Formulation of project financing and cost recovery plan
11.Initial Environment Examination(IEE)
12.Social analysis of affected area
13.Formulation of criteria for the priority projects
14.Selection of high priority projects for the second phase of the Study

II.Phase 2:Feasibility study for selected high priority projects
(Target year for the completion of the construction: 2002)

1.Collection and analysis of supplementary data
2.Traffic demand forecast
3.Evaluation of alternative routes and selection of the optimal option
4.Engineering surveys
(1)Topographic survey(taking of aerial photographs and preparation of mosaics,route survey,etc.)
(2)Geological survey and soil test
(3)Hydrological survey(if necessary)
5.Preliminary design
6.Cost estimate
7.Formulation of implementation and management scheme
8.Formulation of construction plan
9.Environmental Impact Assessment(EIA)
10.Formulation of appropriate mitigation plan for affected communities
11.Economic analysis
12.Financial analysis(if necessary)
13.Formulation of implementation program
14.Overall evaluation and recommendation of 'action plan'

V. STUDY SCHEDULE

The Study will be carried out in accordance with the attached tentative schedule (Appendix 2)

VI. REPORTS

JICA shall prepare and submit the following reports to GOI.

1. Inception Report
Fifty (50) copies in English at the beginning of the Study in India.
2. Progress Report
Fifty (50) copies in English within three months after the beginning of the Study.
3. Interim Report
Fifty (50) copies in English within seven months after the beginning of the Study.
4. Draft Final Report
Fifty (50) copies in English within eleven months after the beginning of the Study.

5. Final Report

Seventy (70) copies in English within two months after the receipt of the written comments on the Draft Final Report from GOI, while these comments are expected to be delivered to JICA within one month after the receipt of the Draft Final Report.

VI. UNDERTAKING OF THE GOVERNMENT OF INDIA

1. To facilitate smooth implementation of the Study, GOI shall take necessary measures as follows:
   (1) to secure the safety of the Japanese study team (hereinafter referred to as "the Team");
   (2) to permit the members of the Team to enter, leave and stay in India for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees;
   (3) to exempt the members of the Team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into and out of India for the implementation of the Study;
   (4) to exempt the members of the Team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study;
   (5) to provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into India from Japan in connection with the implementation of the Study;
   (6) to secure permission for entry into private properties or restricted areas for the implementation of the study;
   (7) to secure permission for the Team to take out all data and documents (including maps and photographs), other than those restricted, which are necessary for the Study, from India to Japan; and
   (8) to provide medical services as needed. Its expenses will be chargeable on the members of the Team.

2. GOI shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Team.

3. Ministry of Surface Transport shall act as the counterpart agency to the Team and also as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. Ministry of Surface Transport shall, at its own expense, provide the Team with the followings, in cooperation with other organization concerned;

   (1) available data and information necessary for the Study;
   (2) counterpart personnel;
   (3) suitable office space with necessary furniture and equipment in Delhi and survey site and
   (4) credentials or identification cards.

VIII. UNDERTAKING OF JICA

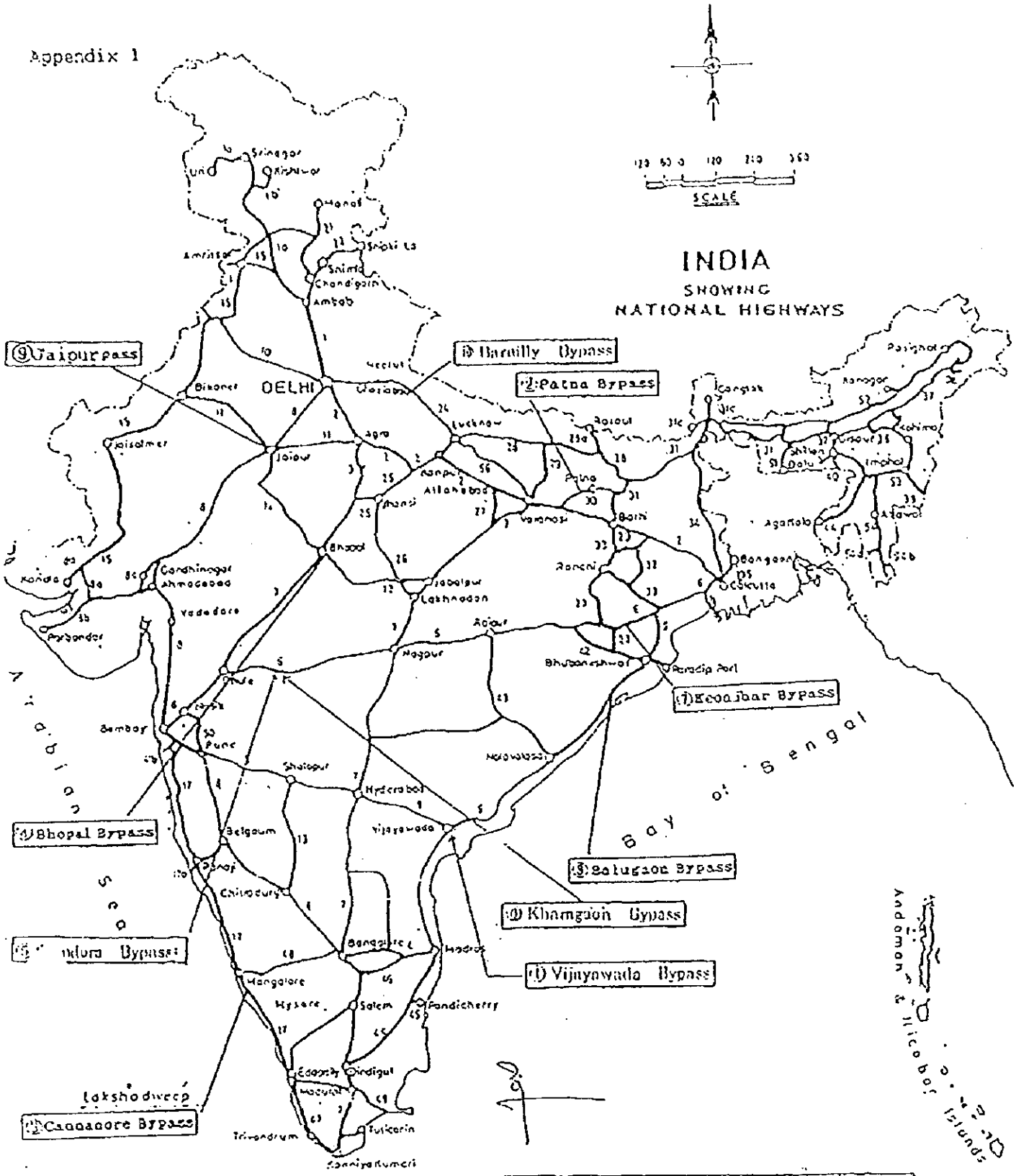
For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the Team to India and
2. to pursue technology transfer to the counterpart personnel of Indian side in the course of the Study.

IX. OTHERS

JICA and Ministry of Surface Transport shall consult with each other in respect of any matter that may arise from or in connection with the study.

Appendix 1



NO.	State	Location	Bypass
①	Andhra Pradesh (アンドラ プラデーシュ)	Vijayawada(ビジャイワダ)	Vijayawada Bypass
②	Bihar (ビハール)	Patna (パトナ)	Patna Bypass
③	Kerala (ケーララ)	Cannanore (カンナノール)	Cannanore Bypass
④	Madhya Pradesh (マディヤ プラデーシュ)	Bhopal (ボーパール)	Bhopal Bypass
⑤	Maharashtra (マーハーラシュトラ)	Nandura (ナンドラ)	Nandura Bypass
⑥	Maharashtra (マーハーラシュトラ)	Khamgaon (カンガオン)	Khamgaon Bypass
⑦	Orissa (オリッサ)	Keonjhar (ケオンジャール)	Keonjhar Bypass
⑧	Orissa (オリッサ)	Balugaon (バルガオン)	Balugaon Bypass
⑨	Rajasthan (ラージャスターン)	Jaipur(ジャイプル)	Jaipur Bypass
⑩	Uttar Pradesh (ウッタル プラデーシュ)	Bareilly (バレイリー)	Bareilly Bypass

Appendix 2

TENTATIVE STUDY SCHEDULE

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Work in India	■	■■	■■		■■	■■	■■	■■	■■	■■	■	■		
Work in Japan	■										■			■
Report Presentation	△ IC/R		△ P/R				△ IT/R				△ DF/R			△ F/R

IC/R: Inception Report
P/R : Progress Report
IT/R: Interim Report
DF/R: Draft Final Report
F/R : Final Report

A1-2

Minutes of Meeting Regarding the Scope of Work

A1-2 Minutes of Meeting Regarding the Scope of Work

MINUTES OF MEETING
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA
AGREED UPON BETWEEN
MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY
DELHI, NOVEMBER 15, 1996

Takeo Kai

MR. TAKEO KAI
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

MR. R.L.KOUL
CHIEF ENGINEER,
MINISTRY OF SURFACE TRANSPORT

15/11/96

MR. D.N.NARASIMHA RAJU
DEPUTY SECRETARY,
MINISTRY OF FINANCE
DEPARTMENT OF ECONOMIC AFFAIRS

The Japanese Preparatory Study Team (hereinafter referred to as "the Team"), organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Takeo Kai, visited India from November 4th to November 15th, 1996, to confirm the Scope of Work for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as "the Study").

The Team had a series of discussions with the representatives of Ministry of Surface Transport, Ministry of Finance, as well as authorities of concerned State Governments, and surveyed proposed sites of a few bypasses. A part of the Team remains in India till December 6th, 1996, to complete the field survey of all the bypasses proposed by the Indian side.

Main points which were discussed and agreed upon by both sides are as follows;

1. Title of the Study

Both sides agreed to entitle the Study as "Feasibility Study on National Highway Bypasses in India".

2. Scope of the Study

2-1. Both sides agreed that six of the eleven bypasses which were originally requested, should be replaced with five new bypasses, based on the strategy for development of National Highways during ninth five year plan. Consequently number of the bypasses to be covered by the Study was revised to ten number. The bypasses at Davangere and Kolar in Karnataka, Sagar in Madhya Pradesh, Eastern Diversion in Maharashtra, Kota in Rajasthan as well as Barabanki in Uttar Pradesh had been replaced by Khamgaon and Nandura in Maharashtra, Vijayawada in Andra Pradesh, Jaipur in Rajasthan as well as Bareilly in Uttar Pradesh.

2-2. Both sides agreed that upto three bypasses would be selected for the feasibility study, depending upon the results of the pre-feasibility of the proposed bypasses, subject to that their combined road length would not exeed about sixty kilometers.

2-3. Both sides agreed that durations of the Study would be fourteen months.

2-4. Both sides agreed that the Study should also address following aspects.

i)While in formulating alternative plans for each bypasse, emphasis needs to be made on provision of service roads to cater to the requirements of local traffic.

ii)While the Indian side indicated a keen interest in private resources mobilization, such as BOT scheme, for proposed bypasses, both sides agreed that the most suitable implementation plan would be worked out for the respective bypasses.

3. Undertaking of both sides

3-1. Concerning the clause XII-1-(7) of the Scope of Work, both sides agreed that some of the data and information necessary for the Study might not be available due to relevent laws and regulations of India.

3-2. Concerning the Clause XII-4-(3) of the Scope of Work, both sides agreed that equipment necessary for the Study, such as facsimile machine and photocopy machine, would be arranged by the Japanese side at its own expense, while suitable office space with basic furniture and a telephone line would be arranged by the Indian side at its own expense both in Delhi and concerned States.

3-3. Both side agreed that vehicles and their drivers would be arranged by the Japanese side at its own expense.

3-4. The Indian side requested that an offcial who is a counterpart to the Team would be provided an opportunity to undergo technical transfer program in Japan. The Study Team promised to convey the request to the Government of Japan.

ANNEX

ATTENDANTS LIST

INDIAN SIDE

Ministry of Surface Transport

Mr.A.D.Narain	Director General (Road Development)
Mr.R.L.Koul	Chief Engineer
Mr.N.K.Sinha	Chief Engineer
Mr.N.S.Jain	Superintending Engineer

Ministry of Finance

Ms.Rama Murali	Joint Secretary, Department of Economic Affairs
Mr.D.N.Narasimha Raju	Deputy Secretary, Department of Economic Affairs
Mr.G.S.Grewal	Under Secretary, Department of Economic Affairs
Mr.Mool Chand	Section Officer, Department of Economic Affairs

JAPANESE SIDE

Mr.Takeo Kai	Leader, Preparatory Study Team, Japan International Cooperation Agency(JICA)
Mr.Masahiko Yamauchi	Member of the JICA Team
Mr.Shojiro Kuwasawa	Member of the JICA Team
Mr.Masaei Matsunaga	Member of the JICA Team
Mr.Yoshitaka Higuchi	Member of the JICA Team
Mr.Takeshi Goto	Member of the JICA Team

A1-3

Minutes of Meeting on the Inception Report

A1-3 Minutes of Meeting on the Inception Report

MINUTES OF MEETING
ON
THE INCEPTION REPORT
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

AGREED UPON BETWEEN
MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 10TH APRIL 1997

Mr. Eiichi Yokota
Team Leader
The JICA Study Team

Mr. J. B. Mathur
Chief Engineer
Ministry of Surface Transport

Mr. Takeo Kai
Team Leader
The JICA Advisory Team

Witnessed by

Mr. R. K. Sharma
Superintending Engineer
ministry of Surface transport

In compliance with the Scope of Work agreed upon between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Surface Transport (hereinafter referred to as "MOST"), 30 copies of the Inception Report for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study") was submitted by the JICA Study Team to the Chief Engineer, MOST on 8th April 1997. Discussions were held between the JICA Study Team and concerned MOST officers on 8th, 9th and 10th April 1997, wherein Mr. Eiichi Yokota, Leader of the Study Team, along with the other members of the Study Team conducted a briefing of the Report and explained general approach and methodology to be followed for the Study.

After a series of discussion, the following subjects were confirmed and agreed upon by both parties.

1. Change of the Proposed Bypass Location

Prior to the mobilisation of the JICA Study Team to India, the MOST had requested to JICA to replace "Jaipur Bypass" which is one of the ten (10) proposed bypasses under the Study with "Gwalior Bypass." The Study Team and the MOST mutually confirmed this change.

2. Standard Design of the Bypass

In relation to the expression of "Standard design of the proposed bypasses" in page 3 of the Inception Report, 6th line from the bottom, the MOST clarified that the bypass design should envisage access control through service road, green belt, and fencing. This concept of the bypass as a fully access controlled highway was understood and confirmed by the JICA Study Team.

3. Selection of Priority Bypasses

In relation to Figure 2-1 General Work Flow, the MOST enquired about their involvement in the selection of the priority for the bypasses to be taken up for the Feasibility Study (Phase 2). The JICA Study Team confirmed that, as stated in the descriptive part of the Report, the MOST is expected to give their comments on every essential aspects of the Study including the selection of priority for the bypasses.

4. Traffic Survey

The MOST referred to the requirement for delay studies and the minimum duration of three days O-D survey. The JICA Study Team replied that the scheduled O-D survey is one day O-D survey. In relation to Table 2-1 Traffic Counting Sheet, the MOST requested to apply the survey sheet format presented in the guideline of "Traffic studies for Planning Bypasses Around Towns." The Study Team agreed to do the needful to the extent possible.

5. Initial Environmental Examination (IEE)

In relation to the IEE, the MOST requested to refer the Forms and Study Items in the guideline of Environmental Impact Assessment established by the Ministry of Environment. The JICA Study Team confirmed to refer the guideline.

6. Field Survey to be Entrusted to the Local Firms

Regarding the field survey to be entrusted to the local firms, the JICA Study Team requested the co-operation of MOST in short-listing the recommended local firms for bid, or in the process of price negotiation. The MOST confirmed their co-operation in this matter.

7. Economic and Financial Analysis

Regarding the work item 20 Economic and Financial Analysis, the MOST enquired the methodology of the analysis in general and for BOT projects in particular. The JICA Study Team confirmed that the methodology will be formulated during the Study and finalised through the discussion with the MOST.

8. Counter Part of MOST

The MOST confirmed that the Superintending Engineer, Mr. R. K. Sharma will be assigned as the counterpart of the MOST to co-ordinate the Study. Furthermore the MOST confirmed that guidance and assistance from the Chief Engineer, Mr. J. B. Mathur, and the Superintending Engineer, Mr. N. S. Jain, will continue to be available for the Study as hitherto.

9. Available Data for the Study

The MOST confirmed to provide any other details/data required for the Study. The MOST requested the JICA Study Team to inform the Team's request with the ample time allowance in order to avoid the delays which may adversely affect the smooth implementation of the Study.

10. Office Space for the JICA Study Team

Although it was not yet provided by the MOST, the MOST confirmed that they will continue their efforts to provide the office space in the MOST for the JICA Study Team.

11. Identification Card of the Study Team Members

Upon the request of the JICA Study Team to issue the ID Card for the Team in order to enable the easy access to the MOST, the MOST confirmed the issuance of such ID Cards.

Participants

Ministry of Surface Transport

Director General (Road Development and Additional Secretary)	Mr. A. D. Narain
Chief Engineer (Planning)	Mr. J. B. Mathur
Superintending Engineer (Planning)	Mr. N. S. Jain
Superintending Engineer (Roads)	Mr. R. K. Sharma

Japan International Cooperation Agency

Deputy Representative	Mr. T. Tanaka
Advisory Team	Mr. T. Kai
	Mr. K. Kozai
	Mr. M. Terashima
Study Team	Mr. E. Yokota
	Mr. M. Honma
	Mr. K. Ihara
	Mr. R. Katiyar
	Mr. M. Kamiya

A1-4

Minutes of Meeting on the Progress Report

MINUTES OF MEETING
ON
THE PROGRESS REPORT
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

AGREED UPON BETWEEN
MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 31ST JULY 1997

Mr. Eiichi Yokota
Team Leader
The JICA Study Team

Mr. J. B. Mathur
Chief Engineer
Ministry of Surface Transport

Witnessed by

Mr. R. K. Sharma
Superintending Engineer
Ministry of Surface Transport

In compliance with the Scope of Work agreed upon between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Surface Transport (hereinafter referred to as "MOST"), 20 copies of the Progress Report for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study") were submitted by the JICA Study Team to the Chief Engineer, MOST on 29th July 1997. Then the discussions was followed between the JICA Study Team and concerned MOST officers, wherein Mr. Eiichi Yokota, Leader of the Study Team, along with the other members of the Study Team conducted a briefing of the Report.

After the briefing of the Report, the following subjects were confirmed and agreed upon by both parties.

1. Traffic Survey

The MOST accepted the traffic survey output inclusive its methodology which was carried out at the 10 proposed bypass locations.

2. Future Traffic Demand Forecast

The MOST agreed upon the application of the future traffic demand which was estimated by the Study Team for the proposed 10 bypasses, along with the parameters that formed the basis of the traffic demand forecast.

3. Standard Design of the Bypass

The Design Standards which was specified in the Progress Report, and the applied Typical Cross Section which was attached to this Minutes of Meeting, were accepted by the MOST. As noted in the Minutes of Meeting on the Inception Report, the MOST confirmed the concept of full control of access to be applied for the proposed bypasses.

4. Economic and Financial Analysis

The MOST agreed to the methodology applied for the economic and financial analysis of the Study, which follows the guidelines specified in Manual on Economic Evaluation of Highway Projects in India, and other data available in India, such as Updating Road User Cost Data in India.

5. Selection of Bypasses for the Feasibility Study (Phase 2)

The MOST agreed to the screening methodology applied in the Study, to give the priority for the bypasses, and accepted the screening result. The MOST requested to consider the possibility of taking up the Feasibility Study (Phase 2) for three bypasses, namely Bareilly, Gwalior and Bhopal. The Study Team confirmed the request will be forwarded to the JICA Tokyo Head Office.

6. Installation of Telephone Lines

As mentioned in Article 3-2 of Minutes of Meeting for the Feasibility Study on National Highway Bypasses in India, 15th November 1996, it was agreed that the telephone line would be arranged by the Indian side at its own expense. The JICA Study Team requested the MOST to realise the installation of telephone lines (ISD) to their project office before the next mobilisation for Phase 2. The MOST confirmed to do so.

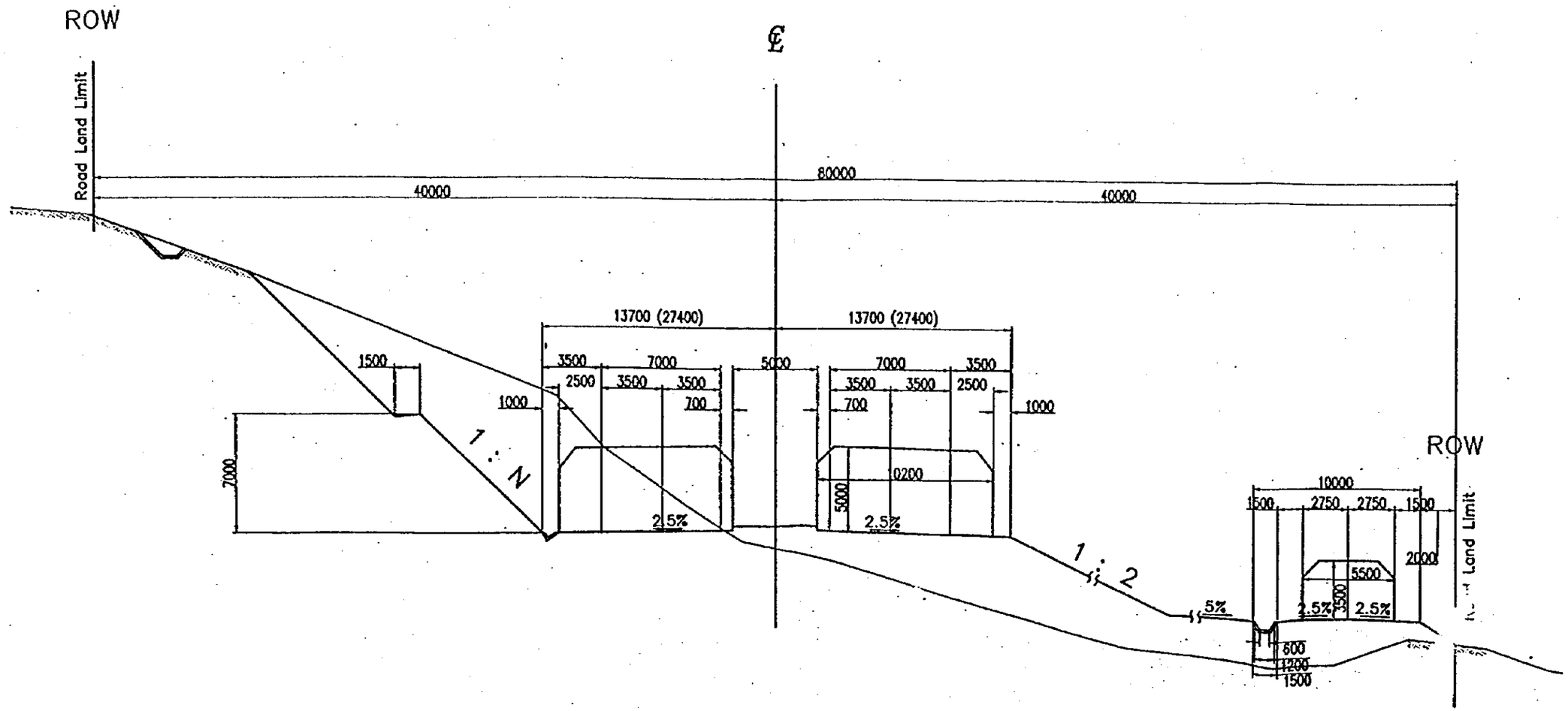
Participants

Ministry of Surface Transport

Chief Engineer (Planning)	Mr. J. B. Mathur
Superintending Engineer (Roads)	Mr. R. K. Sharma

Japan International Cooperation Agency

Deputy Representative	Mr. T. Tanaka
Study Team	Mr. E. Yokota
	Mr. M. Honma



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
THE FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

FIGURE 5-1 TYPICAL CROSS SECTION OF THROUGHWAY

A1-5

Minutes of Meeting on the Interim Report

MINUTES OF MEETING
ON
THE INTERIM REPORT
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

AGREED UPON BETWEEN
MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 22ND OCTOBER 1997

Mr. Eiichi Yokota
Team Leader
The JICA Study Team

Mr. J. B. Mathur
Chief Engineer
Ministry of Surface Transport

Takeo Kai 甲斐 T/E Witnessed by

Mr. Takeo Kai
Team Leader
The JICA Advisory Team

Mr. R. K. Sharma
Superintending Engineer
Ministry of Surface transport

In compliance with the Scope of Work agreed upon between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Surface Transport (hereinafter referred to as "MOST"), 30 copies of the Interim Report for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study") was submitted by the JICA Study Team to the Chief Engineer, MOST on 20th October 1997. Discussions were held between the JICA Study Team and concerned MOST officers, attended together with JICA Advisory Team, on 22nd October 1997, wherein Mr. Eiichi Yokota, Leader of the Study Team, along with the other members of the Study Team conducted a briefing of the Report and explained general approach and methodology to be followed for the Feasibility Study.

After the discussion, the following subjects were confirmed and agreed upon by both parties.

1. The Interim Report

Upon the briefing of Interim Report by the JICA Study Team, the MOST accepted the Report.

2. Selection of the Bypasses for the Feasibility Study

As recommended in the Interim Report, the selection of two bypasses, Bareilly Bypass and Gwalior Bypass, for the Feasibility Study was accepted by the MOST, and confirmed by both parties.

3. Issuance of the Certificate Letter for the Field Surveys

In order to allow the free access to the project sites to execute the field surveys, the MOST confirmed the issuance of the required documents to the Study Team.

Participants

Ministry of Surface Transport

Director General (Road Development and Additional Secretary)	Mr. A. D. Narain
Chief Engineer (Planning)	Mr. J. B. Mathur
Superintending Engineer (Roads)	Mr. R. K. Sharma

Japan International Cooperation Agency

Deputy Representative	Mr. T. Tanaka
Advisory Team	Mr. T. Kai Mr. K. Kubo Mr. K. Kozai
Study Team	Mr. E. Yokota Mr. K. Ihara Mr. I. Ishimoto Mr. R. Katiyar Mr. M. Kamiya

A1-6

Minutes of Meeting on the Progress Report 2

MINUTES OF MEETING
ON
THE PROGRESS REPORT 2
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

AGREED UPON BETWEEN
MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 26TH MARCH 1998

Mr. Eiichi Yokota
Team Leader
The JICA Study Team

Mr. J. B. Mathur
Chief Engineer
Ministry of Surface Transport

Witnessed by

Mr. R. K. Sharma
Superintending Engineer
Ministry of Surface Transport

In compliance with the Scope of Work agreed upon between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Surface Transport (hereinafter referred to as "MoST"), 20 copies of the Progress Report 2 for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study") were submitted by the JICA Study Team to the Chief Engineer, MoST, on 25th March 1988. Then the discussions was followed on 26th March 1998, between the JICA Study Team and concerned MoST officers, wherein Mr. Eiichi Yokota, Leader of the Study Team, along with the other members of the Study Team conducted a briefing of the Report.

After the briefing of the Report, the following subjects were confirmed and agreed upon by both parties.

1. Traffic Survey/Future Traffic Demand Forecast

The MoST accepted the traffic survey output, which shows the lower figures than the previous ones surveyed in Pre-Feasibility Study. Accordingly the MoST agreed upon the application of the future traffic demand, adjusted to downward from the previous figures for the proposed 2 bypasses, along with the parameters that formed the basis of the traffic demand forecast.

2. Design Standards/Criteria of the Bypass

The Design Standards/Criteria which was specified in the Progress Report 2 was generally accepted by the MoST, except the followings.

Superelevation : Due to the local condition of the heavy commercial vehicles with slow speed and overloaded, the MoST requested to limit the maximum superelevation by 5%, instead of 7%, to avoid the turn over of the vehicle. The maximum value of 7% is specified in IRC Standards, and once agreed by the MoST in the Pre-Feasibility Study phase.

Embankment Slope : The MoST requested that the embankment slope shall be kept to 1:2 (V:H), instead of 1:1.5, which was applied to the Typical Cross Section in the Report.

Others : The gradient for the drains should preferably ensure self cleaning velocity.

The specifications for the work may be as per Ministry's specifications for Road and Bridge Works (3rd revision)

3. Preliminary Design of the Bypasses

Based on the field investigation, which includes Geodetic Survey, Geotechnical Survey, Hydrological Survey, and Environmental Impact Assessment (Natural Environmental Aspects and Social Environmental Aspects), JICA Study Team recommended the final preliminary design of the bypasses in the Report. The MoST requested to superimpose the proposed alignment on master plan and to ensure the land use as per master plan. Alignment should run well beyond master plan fringe limits.

The MoST requested that the CBR values need to be rechecked and the pavement design should correspond to it. The provision of tollgates for each and every entry and exit needs justification especially for sections having short lengths in respect of Bareilly Bypass. The provision of service road shall be optional and for portion where local traffic justify the provision.

4. Economic and Financial Analysis

The MoST agreed to the methodology applied for the economic and financial analysis of the Study. Accordingly the MoST noted the estimated results of economic/financial analysis, and simulation results which was conducted in the course of financial analysis and implementation programme analysis to assess the possibility of project implementation by BOT basis. The MoST requested that the reasonableness of the toll rates as proposed needs to be analysed with respect to the VOC savings of road users.

5. Land Acquisition

The JICA Study Team submitted the ROW (80 m band width) schedule required for the project, which was expressed in terms of UTM co-ordinates system, along with the control point co-ordinates data. The MoST informed that the land would be acquired for the project based on the proposed alignment, and requested the JICA Study Team to identify the land required for the final alignment.

6. Installation of Telephone Lines

The JICA Study Team regretted that the telephone lines were not provided at all for the Team, in spite of the Team's continuous request. Although the used of existing PWD's line in the office was permitted by the MoST, the said lines were not available during the Study period. The provision of the telephone lines was agreed to be arranged by the Indian side at its own expense in Article 3-2 of Minutes of Meeting for the Feasibility Study on National Highway Bypasses in India, 15th November 1996.

7. Comments on Progress Report

The Report was made available to the MoST on 23/3/98 and the officers did not get sufficient time to go through it. Any additional comments would be communicated by 30th April 1998.

Participants

Ministry of Surface Transport

Chief Engineer (North)	Mr. S. C. Sharma
Chief Engineer (PL & PI)	Mr. J. B. Mathur
Chief Engineer (S & R)	Mr. Indu Prakash
Chief Engineer (T & T)	Mr. Nirmaljeet Singh
Superintending Engineer (P-8)	Mr. R. K. Sharma
Superintending Engineer (PL & PI)	Mr. R. P. Indoria
Superintending Engineer (P-7)	Mr. A. N. Dhodapkar

Japan International Cooperation Agency

Deputy Representative	Mr. T. Tanaka
Study Team	Mr. E. Yokota
	Mr. Y. Tsujimoto
	Mr. N. Hara
	Mr. K. Ihara
	Mr. I. Ishimoto
	Mr. N. Sonobe

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Minutes of Meeting on the Draft Final Report

A1-7 Minutes of Meeting on the Draft Final Report

MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
FOR
THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

AGREED UPON BETWEEN

MINISTRY OF SURFACE TRANSPORT
THE GOVERNMENT OF INDIA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 24TH JUNE 1998

Mr. Eiichi Yokota
Team Leader
The JICA Study Team

Mr. J. B. Mathur
Chief Engineer
Ministry of Surface Transport

Mr. Kanji Kubo
Team Leader
The JICA Advisory Team

Witnessed by

Mr. R. K. Sharma
Superintending Engineer
Ministry of Surface Transport

In compliance with the Scope of Works agreed upon between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Ministry of Surface Transport (hereinafter referred to as "MoST"), 30 copies of the Draft Final Report for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study"), inclusive of the volume of Drawings and the Summary, were submitted by the JICA Study Team to the Chief Engineer, MoST, on 23rd June 1988, wherein Mr. Eiichi Yokota, Leader of the Study Team, along with the other members of the Study Team conducted a briefing of the Report, in the presence of the JICA Advisory Committee (hereinafter referred to the Advisory Committee) headed by Mr. Kanji Kubo.

After a series of discussions, between the Study Team and the MoST officers concerned, the following subjects were confirmed and agreed upon by both parties.

1. Submission of the Draft Final Report

The Study Team submitted 30 copies of the Draft Final Report (Main Text and Drawings), and 30 copies of the Summary to the MoST. The MoST acknowledged the receipt of the report.

The Study Team explained the Draft Final Report, and the attendants agreed upon the contents of the report.

2. The Final Report

The Final Report is scheduled to be submitted by the end of August 1998 to the MoST after the finalisation of the report incorporating the minor comments made during discussions.

The both sides agreed that the Final Report shall be utilised in its full extent for the purpose of the realisation of the proposed bypass projects.

3. Further Action

The MoST expressed their intention to start the preparatory work in order to implement the projects by BOT basis, as recommended in the report.

Participants

Ministry of Surface Transport

Director General	Mr. A. D. Narain
Chief Engineer (P-2)	Mr. S. C. Sharma
Chief Engineer (PL & PI)	Mr. J. B. Mathur
Chief Engineer (P-7)	Mr. P. K. Chakrabarti
Chief Engineer (S & R)	Mr. C. C. Bhattacharya
Chief Engineer (T & T)	Mr. Nirmaljeet Singh
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Superintending Engineer (PL & PI)	Mr. R. P. Indoria
Superintending Engineer (P-2)	Mr. N. S. Jain
Superintending Engineer (CP-2)	Mr. Avinash Chand
Executing Engineer (PL & PI)	Mr. O. P. Shrivastava

Japan International Cooperation Agency

Advisory Committee	Mr. K. Kubo
	Mr. K. Kozai
JICA Expert	Mr. Y. Matsui
Study Team	Mr. E. Yokota
	Mr. M. Homma
	Mr. N. Hara

Appendix 8

Preliminary Economic and Financial Analysis

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Equations and Data for VOC Calculation

Appendix: Equations and Data for VOC Calculation

1. Speed Flow Equations (1990)
   Manual on Economic Evaluation of Highway Projects in India, Indian Road Congress, Special Publication 30, 1993, Appendix 2

Terrain	Pavement Width	Eq-No.	Equation
Plain	Two-lane (with earthen shoulders)	SF-43	$V_{CO} = 67.96 - 0.012Q$
		SF-44	$V_{CN} = 85.45 - 0.017Q$
		SF-45	$V_{LCV} = 65.96 - 0.013Q$
		SF-46	$V_{HCV} = 58.96 - 0.008Q$
		SF-47	$V_{MAV} = 44.81 - 0.006Q$
		SF-48	$V_{B} = 66.79 - 0.013Q$
		SF-49	$V_{TW} = 51.58 - 0.007Q$
	Four-lane (divided carriageway with paved shoulders)	SF-85	$V_{CO} = 68.73 - 0.0049Q$
		SF-86	$V_{CN} = 92.79 - 0.0075Q$
		SF-87	$V_{LCV} = 70.94 - 0.0057Q$
		SF-88	$V_{HCV} = 63.25 - 0.0047Q$
		SF-89	$V_{MAV} = 48.07 - 0.0036Q$
		SF-90	$V_{B} = 74.48 - 0.0042Q$
		SF-91	$V_{TW} = 57.21 - 0.0062Q$

where V_X; velocity of a vehicle type x in km/hour
CO; old technology car
CN; new technology car
LCV; light commercial vehicle
HCV; heavy commercial vehicle (two-axled)
MAV; multi-axled heavy truck
Q; volume of traffic in PCU/hour (both direction for two-lane and in the direction of speed measurement for four-lane divided carrigeway)

2. VOC Equations (1993)
Manual on Economic Evaluation of Highway Projects in India, Indian Road Congress, Special Publication 30, 1993, Appendix 3

VOC Component	Equation
I. New Technology Car	
1. Fuel consumption	$FC = 21.85 + 504.15/V + 0.004957V^2 + 0.000652RG + 1.0684RS - 0.3684FL$
2. Spare parts cost	$SP(IT)/NP(IT) = 0.008(RG - 2000)/10^5$ $SP(ET)/NP(ET) = 0.008(RG - 2000)/10^5$
3. Maintenance labour	$LC = 0.5498SP(IT)$
4. Tyre life	$TL = 47{,}340 - 101.8RF - 18.39\,RG/W$
5. Engine oil	$EOL = 1.936 + 0.03769RF + 0.0005952\,RG/W$
6. Other oil	$OL = 1.631 + 0.05167RF + 0.001867\,RG/W$
7. Grease	$G = 2.816 + 0.2007RF$
8. (a) Speed on two-lane roads	$V = 73.38 - 0.6816RF - 0.001634(RG - 2000)$
(b) Speed on four-lane roads	$V = 78.52 - 0.7293RF - 0.001748(RG - 2000)$
9. Utilisation per day	$UPD = 3.083V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 75.32/UPD$
11. Depreciation cost	$DC(ET) = 0.0034NP(ET)/300UPD = 8.00/UPD$
II. Old Technology Car	
1. Fuel consumption	$FC = 10.31 + 1675.52/V + 0.0133V^2 + 0.0006RG + 1.3879RS - 1.0322FL$
2. Spare parts cost	$SP(IT)/NP(IT) = 0.008(RG - 2000)/10^5$ $SP(ET)/NP(ET) = 0.008(RG - 2000)/10^5$
3. Maintenance labour	$LC = 0.5498SP(IT)$
4. Tyre life	$TL = 47{,}340 - 101.8RF - 18.39\,RG/W$
5. Engine oil	$EOL = 1.937 + 0.03769RF + 0.0005952\,RG/W$
6. Other oil	$OL = 1.631 + 0.05167RF + 0.001867\,RG/W$
7. Grease	$G = 2.816 + 0.2007RF$
8. (a) Speed on two-lane roads	$V = 57.78 - 0.5367RF - 0.001287(RG - 2000)$
(b) Speed on four-lane roads	$V = 58.35 - 0.5421RF - 0.001299(RG - 2000)$
9. Utilisation per day	$UPD = 3.083V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 75.32/UPD$
11. Depreciation cost	$DC(ET) = 0.0034NP(ET)/300UPD = 9.59/UPD$
III. Light Commercial Vehicle	
1. Fuel consumption	$FC = 21.28 + 1615.327/V + 0.0245V^2 + 0.001525RG + 5.377RS - 0.8268FL$
2. Spare parts cost	$SP(IT)/NP(IT) = e^{[-10.755+0.0001413RG+3.4930W]}$ $SP(ET)/NP(ET) = e^{[-10.755+0.0001413RG+3.4930W]}$
3. Maintenance labour	$LC = 0.3692SP(IT)$
4. Tyre life	$TL = 21{,}933 - 3740W - 367.8RF - 1.016RG$
5. Engine oil	$EOL = 0.9926 + 0.0240RF + 0.00016\,RG/W$
6. Other oil	$OL = 2.0415 + 0.0001058RG$
7. Grease	$G = 0.3661 + 0.0283RF + 0.000251RG$
8. (a) Speed on two-lane roads	$V = 52.77 - 0.4629RF - 0.000492(RG - 2000)$
(b) Speed on four-lane roads	$V = 58.05 - 0.5092RF - 0.00054(RG - 2000)$
9. Utilisation per day	$UPD = 35.24 + 2.6716V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 277.1/UPD$
11. Depreciation cost	$DC(ET) = 0.0059NP(ET)/300UPD = 43.83/UPD$
12. Wage of crew	$CW = 99/UPD$

VOC Component	Equation
IV. Two-axled Heavy Commercial Vehicle	
1. Fuel consumption	$FC = 44.08 + 3904.64/V + 0.0207V^2 + 0.0012RG + 3.3281RS - 1.7769FL$
2. Spare parts cost	$SP(IT)/NP(IT) = e^{[-10.755+0.0001413RG+3.4930/W]}$
	$SP(ET)/NP(ET) = e^{[-10.755+0.0001413RG+3.4930/W]}$
3. Maintenance labour	$LC = 0.3692SP(IT)$
4. Tyre life	$TL = 21{,}933 + 3740W - 367.8RF - 1.016RG$
5. Engine oil	$EOL = 2.4816 + 0.0601RF + 0.0004RG/W$
6. Other oil	$OL = 5.1037 + 0.0002646RG$
7. Grease	$G = 0.9153 + 0.0707RF + 0.000627RG$
8. (a) Speed on two-lane roads	$V = 49.67 - 0.4357RF - 0.000463(RG - 2000)$
(b) Speed on four-lane roads	$V = 53.64 - 0.4706RF - 0.0005(RG - 2000)$
9. Utilisation per day	$UPD = 68.12 + 5.1637V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 353.9/UPD$
11. Depreciation cost	$DC(ET) = 0.0059NP(ET)/300UPD = 54.95/UPD$
12. Wage of crew	$CW = 196/UPD$
V. Bus	
1. Fuel consumption	$FC = 32.97 + 3904.64/V + 0.0207V^2 + 0.0012RG + 3.3281RS - 1.7769FL$
2. Spare parts cost	$SP(IT)/NP(IT) = e^{[-10.3547+0.007373RF+0.0000723RG+1.925/W]}$
	$SP(ET)/NP(ET) = e^{[-10.3547+0.007373RF+0.0000723RG+1.925/W]}$
3. Maintenance labour	$LC = 0.4027SP(IT)$
4. Tyre life	$TL = 35{,}699 + 911.3W - 361RF - 1.227RG$
5. Engine oil	$EOL = 3.663 + 0.01271RF + 0.006713RG/W$
6. Other oil	$OL = 3.3201 + 0.002889RF + 0.0008217RG - 0.3295W$
7. Grease	$G = 4.972 + 0.03376RF - 0.3634W$
8. (a) Speed on two-lane roads	$V = 50.95 - 0.3570RF - 0.000890(RG - 2000)$
(b) Speed on four-lane roads	$V = 61.14 - 0.4285RF - 0.00107(RG - 2000)$
9. Utilisation per day	$UPD = 14.84 + 8.011V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 270.83/UPD$
11. Depreciation cost	$DC(ET) = 0.0059NP(ET)/300UPD = 56.20/UPD$
12. Wage of crew	$CW = 336/UPD$
VI. Multi-axled Heavy Commercial Vehicle	
1. Fuel consumption	$FC = 141.0 + 2695.79/V + 0.0517V^2 + 0.0035RG + 17.75RS - 5.40FL$
2. Spare parts cost	$SP(IT)/NP(IT) = e^{[-10.6066+0.0001413RG+3.4930/W]}$
	$SP(ET)/NP(ET) = e^{[-10.6066+0.0001413RG+3.4930/W]}$
3. Maintenance labour	$LC = 0.3692SP(IT)$
4. Tyre life	$TL = 21{,}933 + 3{,}740W - 367.8RF - 1.016RG$
5. Engine oil	$EOL = 2.4816 + 0.0601RF + 0.0004RG/W$
6. Other oil	$OL = 5.1037 + 0.0002646RG$
7. Grease	$G = 0.9153 + 0.0707RF + 0.000627RG$
8. (a) Speed on two-lane roads	$V = 37.75 - 0.3311RF - 0.000352(RG - 2000)$
(b) Speed on four-lane roads	$V = 40.77 - 0.3577RF - 0.00038(RG - 2000)$
9. Utilisation per day	$UPD = 68.12 + 5.1637V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 473.6/UPD$
11. Depreciation cost	$DC(ET) = 0.0059NP(ET)/300UPD = 95.0/UPD$
12. Wage of crew	$CW = 336/UPD$

VOC Component	Equation
VII. Two-wheeler	
1. Fuel consumption	$FC = 3.38 + 549.57/V + 0.00436V^2 + 0.000196RG + 0.4552RS - 0.3386FL$
2. Spare parts cost	$SP(IT)/NP(IT) = (-51.80 + 0.0222RG)/10^5$
	$SP(ET)/NP(ET) = (-51.80 + 0.0222RG)/10^5$
3. Maintenance labour	$LC = 0.5498SP(IT)$
4. Tyre life	$TL = 47{,}340 - 101.8RF - 18.39\,RG/W$
5. Engine oil	$EOL = 0.387 + 0.0075RF + 0.000119\,RG/W$
6. (a) Speed on two-lane roads	$V = 46.22 - 0.4294RF - 0.001030(RG - 2000)$
(b) Speed on four-lane roads	$V = 48.43 - 0.44941RF - 0.001078(RG - 2000)$
9. Utilisation per day	$UPD = 1.814V$
10. Fixed cost	$FX(ET) = FXD(ET)/UPD = 10.67/UPD$
11. Depreciation cost	$DC(ET) = 0.0034NP(ET)/300UPD = 1.41/UPD$

where,
- *FC*: Fuel consumption in litres per 1000 km
- *V*: Speed of a vehicle in km per hour
- *RG*: Roughness in mm per km (BI)
- *RS*: Rise in m per km
- *FL*: Fall in m per km
- *SP*: Cost of spare parts in paise (R. 0.01) per km
- *(IT)*: Inclusive of taxes
- *(ET)*: Exclusive of taxes
- *NP*: Cost of a new vehicle in Rupees
- *LC*: Maintenance labour cost in paise per km
- *TL*: Tyre life in km
- *W*: Pavement width in meter (restricted to 7.0 m in the calculation)
- *EOL*: Engine oil consumption in litres per 1000 km
- *OL*: Other oil consumption in litres per 10000 km
- *G*: Grease consumption in kg per 10000 km
- *UPD*: Utilisation of vehicle in km per day
- *FX*: Fixed cost of a vehicle in Rupees per km
- *DC*: Depreciation cost of a vehicle in Rupees per km
- *CW*: Wages of a vehicle in Rupees per km

(Note) Working days of 300 are assumed.

3. Recommended Equations for Distance-related Congestion Factor

Manual on Economic Evaluation of Highway Projects in India, Indian Road Congress, Special Publication 30, 1993, Table 3 (P.16)

	Two Lane (Plain Terrain)	Four Lane (Plain Terrain)
1. NTC	CF=0.70+0.90 VCR	CF=0.90+0.90 VCR
2. OTC	CF=0.90+0.50 VCR	CF=0.90+0.80 VCR
3. LCV	CF=0.90+1.00 VCR	CF=0.90+0.70 VCR
4. HCV & Bus	CF=0.80+1.10 VCR	CF=1.00+0.75 VCR
5. MAV	CF=0.90+1.40 VCR	CF=0.90+0.70 VCR

(Note)
1. CF; congestion factor, VCR; volume capacity ratio
2. The congestion factor of buses can be taken the same as for HCV's.
3. The distance-related congestion effect on two-wheelers can be taken as 1.
4. The congestion factors obtained from the above equations are subject to the minimum value of 1.00 and the maximum value of 2.00.

4. Market Prices for VOC Calculation

The following prices as of July 1997 was applied according to the result of the interviews with dealers in Delhi. Cost update for other items were made with the assumptions mentioned in the report. The prices shown below include taxes.

Item	Cost in Rupees	
	July 1997	March 1998
A. New Vehicle		
1. Maruti (NTC)	Rs. 194,791	Rs. 209,313
2. Ambassador (OTC)	Rs. 321,675	Rs. 321,675
3. LCV (Ashok-Leyland, Tata)	Rs. 415,073	Rs. 415,073
4. HCV (Ashok-Leyland, Tata)	Rs. 613,445	Rs. 613,445
5. Bus (Ashok-Leyland, Tata)	Rs. 702,500	Rs. 702,500
6. MAV (Ashok-Leyland, Tata)	Rs. 916,700	Rs. 916,700
7. Two-wheeler (Vespa)	Rs. 25,470	Rs. 25,470
B. Petroleum Product		
1. Petrol (Gasoline) per litre	Rs. 21.52	Rs. 22.84
2. Diesel per litre	Rs. 8.02	Rs. 10.25
C. Tyre (MRF, Dunlop, etc.)		
1. NTC	Rs. 975	Rs. 975
2. OTC	Rs. 1,425	Rs. 1,470
3. LCV	Rs. 4,113	Rs. 3,488
4. HCV	Rs. 8,375	Rs. 7,500
5. Bus	Rs. 8,725	Rs. 8,725
6. MAV	Rs. 8,900	Rs. 9,300
7. Two-wheeler	Rs. 325	Rs. 288

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Economic Cost-Benefit Streams of the Projects

Economic Cost-Benefit Streams of the Projects

1. Bareilly Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			449.9		-449.9	-449.9	-358.7	-358.7
2000			749.9		-749.9	-749.9	-533.8	-533.8
2001			300.0		-300.0	-300.0	-190.6	-190.6
2002	795.0	3,950.2		31.7	763.3	3,918.5	433.1	2223.4
2003	962.9	4,475.5		31.7	931.2	4,443.8	471.8	2251.4
2004	1,130.9	5,000.8		31.7	1,099.1	4,969.1	497.2	2247.8
2005	1,298.8	5,526.2		31.7	1,267.1	5,494.4	511.8	2219.1
2006	1,466.8	6,051.5		31.7	1,435.0	6,019.7	517.5	2170.8
2007	1,634.7	6,576.8		31.7	1,603.0	6,545.1	516.1	2107.3
2008	1,802.6	7,102.1		31.7	1,770.9	7,070.4	509.1	2032.6
2009	1,970.6	7,627.4		126.3	1,844.3	7,501.2	473.4	1925.4
2010	2,138.5	8,152.7		31.7	2,106.8	8,121.0	482.8	1861.1
2011	2,306.5	8,678.1		31.7	2,274.7	8,646.3	465.5	1769.2
2012	2,474.4	9,203.4		31.7	2,442.7	9,171.7	446.3	1675.6
2013	2,474.4	9,203.4		31.7	2,442.7	9,171.7	398.5	1496.1
2014	2,474.4	9,203.4		31.7	2,442.7	9,171.7	355.8	1335.8
2015	2,474.4	9,203.4		31.7	2,442.7	9,171.7	317.6	1192.7
2016	2,474.4	9,203.4		31.7	2,442.7	9,171.7	283.6	1064.9
2017	2,474.4	9,203.4		126.3	2,348.1	9,077.1	243.4	941.0
2018	2,474.4	9,203.4		31.7	2,442.7	9,171.7	226.1	848.9
2019	2,474.4	9,203.4		31.7	2,442.7	9,171.7	201.9	758.0
2020	2,474.4	9,203.4		31.7	2,442.7	9,171.7	180.2	676.8
2021	2,474.4	9,203.4	-449.9	31.7	2,892.6	9,621.6	190.6	633.9
					46.8%	112.1%	6,639.0	30,348.6
					EIRR		NPV	

2. Patna Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			1,042.3		-1,042.3	-1,042.3	-830.9	-830.9
2000			1,667.6		-1,667.6	-1,667.6	-1,187.0	-1,187.0
2001			1,250.7		-1,250.7	-1,250.7	-794.9	-794.9
2002			208.5		-208.5	-208.5	-118.3	-118.3
2003	1,534.5	3,823.4		31.6	1,502.9	3,791.8	761.4	1,921.1
2004	1,655.0	4,253.4		31.6	1,623.4	4,221.8	734.4	1,909.7
2005	1,775.6	4,683.4		31.6	1,744.0	4,651.8	704.4	1,878.8
2006	1,896.2	5,113.4		31.6	1,864.6	5,081.8	672.4	1,832.5
2007	2,016.7	5,543.3		31.6	1,985.1	5,511.7	639.2	1,774.6
2008	2,137.3	5,973.3		31.6	2,105.7	5,941.7	605.3	1,708.1
2009	2,257.9	6,403.3		31.6	2,226.3	6,371.7	571.4	1,635.4
2010	2,378.4	6,833.2		183.1	2,195.3	6,650.1	503.1	1,524.0
2011	2,499.0	7,263.2		31.6	2,467.4	7,231.6	504.9	1,479.7
2012	2,619.5	7,693.2		31.6	2,587.9	7,661.6	472.8	1,399.7
2013	2,740.1	8,123.1		31.6	2,708.5	8,091.5	441.8	1,319.9
2014	2,740.1	8,123.1		31.6	2,708.5	8,091.5	394.5	1,178.5
2015	2,740.1	8,123.1		31.6	2,708.5	8,091.5	352.2	1,052.2
2016	2,740.1	8,123.1		31.6	2,708.5	8,091.5	314.5	939.5
2017	2,740.1	8,123.1		31.6	2,708.5	8,091.5	280.8	838.8
2018	2,740.1	8,123.1		183.1	2,557.0	7,940.0	236.7	734.9
2019	2,740.1	8,123.1		31.6	2,708.5	8,091.5	223.8	668.7
2020	2,740.1	8,123.1		31.6	2,708.5	8,091.5	199.9	597.1
2021	2,740.1	8,123.1		31.6	2,708.5	8,091.5	178.4	533.1
2022	2,740.1	8,123.1	-1,250.7	31.6	3,959.2	9,342.3	232.9	549.5
					27.9%	49.7%	6,093.7	22,545.0
					EIRR		NPV	

3. Keonjhar Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999								
2000			180.8		-180.8	-180.8	-128.7	-128.7
2001			180.8		-180.8	-180.8	-114.9	-114.9
2002	-0.9	1.1		10.7	-11.6	-9.6	-6.6	-5.4
2003	4.2	12.6		10.7	-6.5	1.9	-3.3	1.0
2004	9.3	24.2		10.7	-1.4	13.5	-0.6	6.1
2005	14.4	35.7		10.7	3.7	25.0	1.5	10.1
2006	19.5	47.2		10.7	8.8	36.5	3.2	13.2
2007	24.6	58.7		10.7	13.9	48.0	4.5	15.5
2008	29.7	70.2		10.7	19.0	59.5	5.5	17.1
2009	34.8	81.7		36.5	-1.8	45.2	-0.5	11.6
2010	39.9	93.2		10.7	29.2	82.5	6.7	18.9
2011	45.0	104.8		10.7	34.3	94.1	7.0	19.2
2012	50.1	116.3		10.7	39.4	105.6	7.2	19.3
2013	50.1	116.3		10.7	39.4	105.6	6.4	17.2
2014	50.1	116.3		10.7	39.4	105.6	5.7	15.4
2015	50.1	116.3		10.7	39.4	105.6	5.1	13.7
2016	50.1	116.3		10.7	39.4	105.6	4.6	12.3
2017	50.1	116.3		36.5	13.5	79.7	1.4	8.3
2018	50.1	116.3		10.7	39.4	105.6	3.6	9.8
2019	50.1	116.3		10.7	39.4	105.6	3.3	8.7
2020	50.1	116.3		10.7	39.4	105.6	2.9	7.8
2021	50.1	116.3	-108.5	10.7	147.8	214.0	9.7	14.1
					2.9%	11.6%	-176.3	-9.8
					EIRR		NPV	

4. Balugaon. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			132.3		-132.3	-132.3	-105.5	-105.5
2000			220.5		-220.5	-220.5	-156.9	-156.9
2001			88.2		-88.2	-88.2	-56.0	-56.0
2002	6.3	13.7		14.3	-8.0	-0.5	-4.5	-0.3
2003	20.8	49.9		14.3	6.6	35.6	3.3	18.0
2004	35.4	86.0		14.3	21.1	71.8	9.6	32.5
2005	50.0	122.2		14.3	35.7	107.9	14.4	43.6
2006	64.5	158.3		14.3	50.3	144.0	18.1	51.9
2007	79.1	194.5		14.3	64.8	180.2	20.9	58.0
2008	93.7	230.6		14.3	79.4	216.3	22.8	62.2
2009	108.2	266.7		61.1	47.1	205.7	12.1	52.8
2010	122.8	302.9		14.3	108.5	288.6	24.9	66.1
2011	137.4	339.0		14.3	123.1	324.8	25.2	66.5
2012	151.9	375.2		14.3	137.7	360.9	25.1	65.9
2013	151.9	375.2		14.3	137.7	360.9	22.5	58.9
2014	151.9	375.2		14.3	137.7	360.9	20.0	52.6
2015	151.9	375.2		14.3	137.7	360.9	17.9	46.9
2016	151.9	375.2		14.3	137.7	360.9	16.0	41.9
2017	151.9	375.2		61.1	90.8	314.1	9.4	32.6
2018	151.9	375.2		14.3	137.7	360.9	12.7	33.4
2019	151.9	375.2		14.3	137.7	360.9	11.4	29.8
2020	151.9	375.2		14.3	137.7	360.9	10.2	26.6
2021	151.9	375.2	-132.3	14.3	270.0	493.2	17.8	32.5
					11.7%	23.0%	-8.7	554.0
					EIRR		NPV	

5. Vijayawada. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			491.8		-491.8	-491.8	-392.1	-392.1
2000			819.7		-819.7	-819.7	-583.4	-583.4
2001			327.9		-327.9	-327.9	-208.4	-208.4
2002	73.8	130.4		20.6	53.2	109.8	30.2	62.3
2003	198.5	566.6		20.6	177.8	546.0	90.1	276.6
2004	323.1	1,002.8		20.6	302.4	982.1	136.8	444.3
2005	447.7	1,438.9		20.6	427.1	1,418.3	172.5	572.8
2006	572.3	1,875.1		20.6	551.7	1,854.5	198.9	668.7
2007	696.9	2,311.3		20.6	676.3	2,290.7	217.8	737.5
2008	821.6	2,747.5		20.6	800.9	2,726.8	230.2	783.9
2009	946.2	3,183.6		106.1	840.0	3,077.5	215.6	789.9
2010	1,070.8	3,619.8		20.6	1,050.2	3,599.2	240.7	824.8
2011	1,195.4	4,056.0		20.6	1,174.8	4,035.4	240.4	825.7
2012	1,320.0	4,492.2		20.6	1,299.4	4,471.5	237.4	816.9
2013	1,320.0	4,492.2		20.6	1,299.4	4,471.5	212.0	729.4
2014	1,320.0	4,492.2		20.6	1,299.4	4,471.5	189.2	651.3
2015	1,320.0	4,492.2		20.6	1,299.4	4,471.5	169.0	581.5
2016	1,320.0	4,492.2		20.6	1,299.4	4,471.5	150.9	519.2
2017	1,320.0	4,492.2		106.1	1,213.9	4,386.0	125.8	454.7
2018	1,320.0	4,492.2		20.6	1,299.4	4,471.5	120.3	413.9
2019	1,320.0	4,492.2		20.6	1,299.4	4,471.5	107.4	369.5
2020	1,320.0	4,492.2		20.6	1,299.4	4,471.5	95.9	329.9
2021	1,320.0	4,492.2	-491.8	20.6	1,791.2	4,963.3	118.0	327.0
					23.7%	43.2%	2,115.1	9,996.1
					EIRR		NPV	

6. Kannur. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			335.4		-335.4	-335.4	-267.4	-267.4
2000			559.0		-559.0	-559.0	-397.9	-397.9
2001			223.6		-223.6	-223.6	-142.1	-142.1
2002	147.1	702.6		12.0	135.1	690.6	76.7	391.8
2003	178.1	946.8		12.0	166.0	934.8	84.1	473.6
2004	209.0	1,191.0		12.0	196.9	1,179.0	89.1	533.3
2005	239.9	1,435.2		12.0	227.9	1,423.2	92.0	574.8
2006	270.8	1,679.4		12.0	258.8	1,667.4	93.3	601.3
2007	301.7	1,923.6		12.0	289.7	1,911.6	93.3	615.5
2008	332.7	2,167.8		12.0	320.6	2,155.8	92.2	619.7
2009	363.6	2,412.1		45.9	317.7	2,366.2	81.5	607.3
2010	394.5	2,656.3		12.0	382.5	2,644.2	87.7	606.0
2011	425.4	2,900.5		12.0	413.4	2,888.4	84.6	591.0
2012	456.3	3,144.7		12.0	444.3	3,132.6	81.2	572.3
2013	456.3	3,144.7		12.0	444.3	3,132.6	72.5	511.0
2014	456.3	3,144.7		12.0	444.3	3,132.6	64.7	456.3
2015	456.3	3,144.7		12.0	444.3	3,132.6	57.8	407.4
2016	456.3	3,144.7		12.0	444.3	3,132.6	51.6	363.7
2017	456.3	3,144.7		45.9	410.4	3,098.8	42.5	321.2
2018	456.3	3,144.7		12.0	444.3	3,132.6	41.1	290.0
2019	456.3	3,144.7		12.0	444.3	3,132.6	36.7	258.9
2020	456.3	3,144.7		12.0	444.3	3,132.6	32.8	231.2
2021	456.3	3,144.7	-335.4	12.0	779.7	3,468.1	51.4	228.5
					18.8%	57.4%	599.3	8,447.3
					EIRR		NPV	

7. Nandura. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999								
2000			143.1		-143.1	-143.1	-101.9	-101.9
2001			143.1		-143.1	-143.1	-90.9	-90.9
2002	31.5	75.5		9.6	21.8	65.9	12.4	37.4
2003	54.4	134.1		9.6	44.8	124.4	22.7	63.0
2004	77.4	192.6		9.6	67.8	183.0	30.7	82.8
2005	100.4	251.2		9.6	90.8	241.6	36.7	97.6
2006	123.4	309.8		9.6	113.7	300.1	41.0	108.2
2007	146.4	368.3		9.6	136.7	358.7	44.0	115.5
2008	169.3	426.9		9.6	159.7	417.3	45.9	120.0
2009	192.3	485.5		29.0	163.3	456.5	41.9	117.2
2010	215.3	544.0		9.6	205.7	534.4	47.1	122.5
2011	238.3	602.6		9.6	228.6	593.0	46.8	121.3
2012	261.3	661.2		9.6	251.6	651.5	46.0	119.0
2013	261.3	661.2		9.6	251.6	651.5	41.0	106.3
2014	261.3	661.2		9.6	251.6	651.5	36.6	94.9
2015	261.3	661.2		9.6	251.6	651.5	32.7	84.7
2016	261.3	661.2		9.6	251.6	651.5	29.2	75.6
2017	261.3	661.2		29.0	232.2	632.2	24.1	65.5
2018	261.3	661.2		9.6	251.6	651.5	23.3	60.3
2019	261.3	661.2		9.6	251.6	651.5	20.8	53.8
2020	261.3	661.2		9.6	251.6	651.5	18.6	48.1
2021	261.3	661.2	-85.9	9.6	337.5	737.4	22.2	48.6
					28.6%	50.2%	470.9	1,549.6
					EIRR		NPV	

8. Khamgaon. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			170.1		-170.1	-170.1	-135.6	-135.6
2000			283.5		-283.5	-283.5	-201.8	-201.8
2001			113.4		-113.4	-113.4	-72.1	-72.1
2002	69.4	158.6		11.9	57.4	146.7	32.6	83.2
2003	90.9	219.4		11.9	79.0	207.5	40.0	105.1
2004	112.5	280.2		11.9	100.6	268.3	45.5	121.3
2005	134.0	341.0		11.9	122.1	329.1	49.3	132.9
2006	155.6	401.8		11.9	143.7	389.9	51.8	140.6
2007	177.1	462.6		11.9	165.2	450.7	53.2	145.1
2008	198.7	523.4		11.9	186.8	511.5	53.7	147.0
2009	220.2	584.2		45.0	175.2	539.2	45.0	138.4
2010	241.8	645.0		11.9	229.9	633.1	52.7	145.1
2011	263.4	705.8		11.9	251.4	693.9	51.5	142.0
2012	284.9	766.6		11.9	273.0	754.7	49.9	137.9
2013	284.9	766.6		11.9	273.0	754.7	44.5	123.1
2014	284.9	766.6		11.9	273.0	754.7	39.8	109.9
2015	284.9	766.6		11.9	273.0	754.7	35.5	98.1
2016	284.9	766.6		11.9	273.0	754.7	31.7	87.6
2017	284.9	766.6		45.0	239.9	721.6	24.9	74.8
2018	284.9	766.6		11.9	273.0	754.7	25.3	69.9
2019	284.9	766.6		11.9	273.0	754.7	22.6	62.4
2020	284.9	766.6		11.9	273.0	754.7	20.1	55.7
2021	284.9	766.6	-170.1	11.9	443.1	924.8	29.2	60.9
					20.0%	36.8%	389.2	1,771.6
					EIRR		NPV	

9. Bhopal. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			511.8		-511.8	-511.8	-408.0	-408.0
2000			853.0		-853.0	-853.0	-607.2	-607.2
2001			341.2		-341.2	-341.2	-216.9	-216.9
2002	332.6	1,289.2		36.4	296.2	1,252.9	168.1	710.9
2003	378.4	1,530.8		36.4	342.0	1,494.4	173.3	757.1
2004	424.2	1,772.4		36.4	387.8	1,736.0	175.4	785.3
2005	469.9	2,013.9		36.4	433.6	1,977.5	175.1	798.7
2006	515.7	2,255.5		36.4	479.3	2,219.1	172.9	800.2
2007	561.5	2,497.0		36.4	525.1	2,460.6	169.1	792.3
2008	607.3	2,738.6		36.4	570.9	2,702.2	164.1	776.8
2009	653.1	2,980.1		122.6	530.5	2,857.5	136.2	733.5
2010	698.8	3,221.7		36.4	662.4	3,185.3	151.8	730.0
2011	744.6	3,463.2		36.4	708.2	3,426.8	144.9	701.2
2012	790.4	3,704.8		36.4	754.0	3,668.4	137.8	670.2
2013	790.4	3,704.8		36.4	754.0	3,668.4	123.0	598.4
2014	790.4	3,704.8		36.4	754.0	3,668.4	109.8	534.3
2015	790.4	3,704.8		36.4	754.0	3,668.4	98.0	477.0
2016	790.4	3,704.8		36.4	754.0	3,668.4	87.5	425.9
2017	790.4	3,704.8		122.6	667.8	3,582.2	69.2	371.4
2018	790.4	3,704.8		36.4	754.0	3,668.4	69.8	339.5
2019	790.4	3,704.8		36.4	754.0	3,668.4	62.3	303.2
2020	790.4	3,704.8		36.4	754.0	3,668.4	55.6	270.7
2021	790.4	3,704.8	-511.8	36.4	1,265.8	4,180.2	83.4	275.4
					21.6%	56.9%	1,295.3	10,619.8
					EIRR		NPV	

10. Gwalior. Bypass

(Rs. million)

year	Benefit		Cost		Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construc-tion	O & M	(A)	(B)	(A)	(B)
1997								
1998								
1999			508.2		-508.2	-508.2	-405.2	-405.2
2000			847.1		-847.1	-847.1	-602.9	-602.9
2001			338.8		-338.8	-338.8	-215.3	-215.3
2002	335.6	743.1		19.6	316.1	723.6	179.3	410.6
2003	361.7	782.8		19.6	342.1	763.3	173.3	386.7
2004	387.8	822.6		19.6	368.2	803.0	166.6	363.2
2005	413.9	862.3		19.6	394.3	842.7	159.3	340.4
2006	439.9	902.0		19.6	420.4	882.4	151.6	318.2
2007	466.0	941.7		19.6	446.5	922.1	143.8	296.9
2008	492.1	981.4		19.6	472.6	961.8	135.8	276.5
2009	518.2	1,021.1		79.0	439.1	942.0	112.7	241.8
2010	544.3	1,060.8		19.6	524.7	1,041.2	120.3	238.6
2011	570.4	1,100.5		19.6	550.8	1,080.9	112.7	221.2
2012	596.4	1,140.2		19.6	576.9	1,120.7	105.4	204.7
2013	596.4	1,140.2		19.6	576.9	1,120.7	94.1	182.8
2014	596.4	1,140.2		19.6	576.9	1,120.7	84.0	163.2
2015	596.4	1,140.2		19.6	576.9	1,120.7	75.0	145.7
2016	596.4	1,140.2		19.6	576.9	1,120.7	67.0	130.1
2017	596.4	1,140.2		79.0	517.4	1,061.2	53.6	110.0
2018	596.4	1,140.2		19.6	576.9	1,120.7	53.4	103.7
2019	596.4	1,140.2		19.6	576.9	1,120.7	47.7	92.6
2020	596.4	1,140.2		19.6	576.9	1,120.7	42.6	82.7
2021	596.4	1,140.2	-508.2	19.6	1,085.1	1,628.9	71.5	107.3
					19.7%	34.5%	926.2	3,193.6
					EIRR		NPV	

A8-3

Financial Cost-Benefit Streams of the Projects

Financial Cost-Benefit Streams of the Projects

1. Bareilly Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		680.5		-680.5
2000		1,247.6		-1,247.6
2001		549.0		-549.0
2002	306.2		63.9	242.3
2003	477.9		70.3	407.6
2004	649.6		77.3	572.3
2005	821.3		85.0	736.3
2006	993.0		93.5	899.4
2007	1,164.7		102.9	1,061.8
2008	1,336.3		113.2	1,223.2
2009	1,508.0		495.4	1,012.7
2010	1,679.7		136.9	1,542.8
2011	1,851.4		150.6	1,700.8
2012	2,023.1		165.7	1,857.4
2013	2,023.1		182.2	1,840.9
2014	2,692.8		200.5	2,492.3
2015	2,692.8		220.5	2,472.2
2016	2,692.8		242.6	2,450.2
2017	3,584.1		1,061.9	2,522.2
2018	3,584.1		293.5	3,290.6
2019	3,584.1		322.8	3,261.2
2020	4,770.4		355.1	4,415.2
2021	4,770.4		390.6	4,379.7
			FIRR	25.9%

2. Patna Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		1,576.4		-1,576.4
2000		2,774.5		-2,774.5
2001		2,289.0		-2,289.0
2002		419.6		-419.6
2003	707.0		70.0	637.0
2004	844.4		77.0	767.5
2005	981.8		84.7	897.2
2006	1,119.3		93.1	1,026.1
2007	1,256.7		102.5	1,154.2
2008	1,394.1		112.7	1,281.4
2009	1,531.5		124.0	1,407.5
2010	1,668.9		790.2	878.7
2011	1,806.3		150.0	1,656.3
2012	1,943.7		165.0	1,778.7
2013	1,943.7		181.5	1,762.2
2014	2,587.1		199.7	2,387.5
2015	2,587.1		219.6	2,367.5
2016	2,587.1		241.6	2,345.5
2017	3,443.4		265.7	3,177.7
2018	3,443.4		1,693.8	1,749.6
2019	3,443.4		321.5	3,121.9
2020	4,583.2		353.7	4,229.5
2021	4,583.2		389.1	4,194.2
2022	4,583.2		428.0	4,155.2
			FIRR	14.2%

3. Keonjhar Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		300.7		-300.7
2000		330.8	0.0	-330.8
2001	9.4		21.5	-12.1
2002	15.8		23.7	-7.9
2003	22.2		26.1	-3.9
2004	28.6		28.7	-0.1
2005	35.0		31.5	3.5
2006	41.4		34.7	6.7
2007	47.8		38.2	9.7
2008	54.3		143.4	-89.1
2009	60.7		46.2	14.5
2010	67.1		50.8	16.3
2011	73.5		55.9	17.6
2012	73.5		61.5	12.0
2013	97.8		67.6	30.2
2014	97.8		74.4	23.4
2015	97.8		81.8	16.0
2016	130.2		307.3	-177.1
2017	130.2		99.0	31.2
2018	130.2		108.9	21.3
2019	173.3		119.8	53.4
2020	173.3		131.8	41.5
2021			FIRR	negative

4. Balugaon. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		200.1		-200.1
2000		366.8		-366.8
2001		161.4		-161.4
2002	25.3		28.7	-3.5
2003	52.7		31.6	21.2
2004	80.2		34.7	45.5
2005	107.7		38.2	69.5
2006	135.2		42.0	93.2
2007	162.7		46.2	116.5
2008	190.2		50.9	139.3
2009	217.7		239.6	-21.9
2010	245.2		61.6	183.6
2011	272.7		67.7	205.0
2012	300.2		74.5	225.7
2013	300.2		81.9	218.2
2014	399.5		90.1	309.4
2015	399.5		99.1	300.4
2016	399.5		109.0	290.5
2017	531.8		513.6	18.1
2018	531.8		131.9	399.8
2019	531.8		145.1	386.6
2020	707.8		159.7	548.1
2021	707.8		175.6	532.2
			FIRR	13.0%

5. Vijayawada. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		743.9		-743.9
2000		1,363.7		-1,363.7
2001		600.0		-600.0
2002	77.5		41.5	35.9
2003	211.1		45.7	165.4
2004	344.7		50.3	294.5
2005	478.4		55.3	423.1
2006	612.0		60.8	551.2
2007	745.6		66.9	678.7
2008	879.2		73.6	805.6
2009	1,012.8		416.4	596.4
2010	1,146.5		89.0	1,057.4
2011	1,280.1		97.9	1,182.2
2012	1,413.7		107.7	1,306.0
2013	1,413.7		118.5	1,295.2
2014	1,881.7		130.4	1,751.3
2015	1,881.7		143.4	1,738.3
2016	1,881.7		157.7	1,723.9
2017	2,504.5		892.6	1,611.9
2018	2,504.5		190.9	2,313.6
2019	2,504.5		209.9	2,294.6
2020	3,333.5		230.9	3,102.5
2021	3,333.5		254.0	3,079.5
			FIRR	18.6%

6. Kannur. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		507.3		-507.3
2000		930.1		-930.1
2001		409.3		-409.3
2002	57.2		24.2	33.0
2003	83.4		26.7	56.8
2004	109.6		29.3	80.3
2005	135.8		32.3	103.5
2006	162.0		35.5	126.5
2007	188.2		39.0	149.1
2008	214.4		42.9	171.4
2009	240.6		180.1	60.5
2010	266.8		52.0	214.8
2011	292.9		57.2	235.8
2012	319.1		62.9	256.3
2013	319.1		69.2	250.0
2014	424.8		76.1	348.7
2015	424.8		83.7	341.1
2016	424.8		92.0	332.7
2017	565.4		386.0	179.3
2018	565.4		111.4	454.0
2019	565.4		122.5	442.9
2020	752.5		134.8	617.7
2021	752.5		148.2	604.3
			FIRR	7.4%

7. Nandura. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999				
2000		238.1		-238.1
2001		261.9		-261.9
2002	55.7		19.4	36.3
2003	74.1		21.3	52.7
2004	92.4		23.5	69.0
2005	110.8		25.8	85.0
2006	129.1		28.4	100.7
2007	147.5		31.2	116.3
2008	165.8		34.4	131.5
2009	184.2		113.9	70.3
2010	202.5		41.6	161.0
2011	220.9		45.7	175.2
2012	239.2		50.3	188.9
2013	239.2		55.3	183.9
2014	318.4		60.9	257.6
2015	318.4		66.9	251.5
2016	318.4		73.6	244.8
2017	423.8		244.1	179.8
2018	423.8		89.1	334.7
2019	423.8		98.0	325.8
2020	564.1		107.8	456.3
2021	564.1		118.6	445.5
			FIRR	19.0%

8. Khamgaon. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		257.3		-257.3
2000		471.6		-471.6
2001		207.5		-207.5
2002	110.2		24.0	86.2
2003	147.6		26.4	121.2
2004	185.0		29.0	155.9
2005	222.3		31.9	190.4
2006	259.7		35.1	224.6
2007	297.1		38.6	258.5
2008	334.5		42.5	292.0
2009	371.9		176.6	195.3
2010	409.2		51.4	357.8
2011	446.6		56.5	390.1
2012	484.0		62.2	421.8
2013	484.0		68.4	415.6
2014	644.2		75.3	568.9
2015	644.2		82.8	561.4
2016	644.2		91.1	553.1
2017	857.4		378.6	478.9
2018	857.4		110.2	747.3
2019	857.4		121.2	736.2
2020	1,141.3		133.3	1,007.9
2021	1,141.3		146.7	994.6
			FIRR	20.1%

9. Bhopal. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		774.1		-774.1
2000		1,419.3		-1,419.3
2001		624.5		-624.5
2002	200.6		73.3	127.3
2003	353.8		80.6	273.2
2004	507.0		88.6	418.4
2005	660.2		97.5	562.7
2006	813.4		107.3	706.2
2007	966.6		118.0	848.6
2008	1,119.8		129.8	990.0
2009	1,273.0		480.9	792.2
2010	1,426.3		157.0	1,269.2
2011	1,579.5		172.7	1,406.7
2012	1,732.7		190.0	1,542.6
2013	1,732.7		209.0	1,523.6
2014	2,306.2		229.9	2,076.2
2015	2,306.2		252.9	2,053.3
2016	2,306.2		278.2	2,028.0
2017	3,069.5		1,030.8	2,038.7
2018	3,069.5		336.6	2,732.9
2019	3,069.5		370.3	2,699.2
2020	4,085.5		407.3	3,678.2
2021	4,085.5		448.1	3,637.5
			FIRR	20.9%

10. Gwalior. Bypass

(Rs. million)

year	Revenue	Cost		Balance
		Construction	O & M	
1997				
1998				
1999		768.7		-768.7
2000		1,409.3		-1,409.3
2001		620.1		-620.1
2002	225.2		39.4	185.8
2003	309.7		43.3	266.4
2004	394.3		47.6	346.7
2005	478.9		52.4	426.5
2006	563.5		57.6	505.9
2007	648.1		63.4	584.7
2008	732.6		69.7	662.9
2009	817.2		310.1	507.1
2010	901.8		84.4	817.4
2011	986.4		92.8	893.6
2012	1,071.0		102.1	968.9
2013	1,071.0		112.3	958.7
2014	1,425.5		123.5	1,301.9
2015	1,425.5		135.9	1,289.6
2016	1,425.5		149.5	1,276.0
2017	1,897.3		664.7	1,232.6
2018	1,897.3		180.9	1,716.4
2019	1,897.3		198.9	1,698.3
2020	2,525.3		218.8	2,306.4
2021	2,525.3		240.7	2,284.6
			FIRR	16.9%

Appendix 12

Supplemental Traffic Survey and Analysis

A12-1

Sample Size and Expansion Factor by O-D Survey Location (Bareilly)

A12-1 Sample Size and Expansion Factor by Survey Location (Bareilly) (1/5)

Location1			1	2	3	4		5	6	7		
Highway (Chainage) Date	Location Date Direction		Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	Fast vehicles	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	Slow vehicles	Total
NH24	1 1 1	Sample size	220	138	419	77	854	101	86	32	219	1073
(km 235)		12 hrs Traffic	1112	499	1338	847	3796	1346	133	167	1646	5442
11/11/97		Sample Rate %	19.8	27.7	31.3	9.1	22.5	7.5	64.7	19.2	13.3	19.7
	Average traffic(Nov.'97)		1189	520	1815	909	4433	1872	157	132	2161	6594
	Average traffic(May.'97)		1349	1146	1919	872	5286	1111	149	139	1399	6685
		AADT	1269	833	1867	891	4860	1492	153	136	1780	6640
	Expansion Factor		5.77	6.04	4.46	11.56	5.69	14.77	1.78	4.23	8.13	6.19
	1 1 2	Sample size	355	156	239	151	901	5	16	21	42	943
		12 hrs Traffic	1541	675	1762	912	4890	1840	145	168	2153	7043
		Sample Rate %	23.0	23.1	13.6	16.6	18.4	0.3	11.0	12.5	2.0	13.4
	Average traffic(Nov.'97)		1355	682	2057	823	4917	1581	115	118	1814	6731
	Average traffic(May.'97)		1204	907	1769	684	4564	1308	150	125	1583	6147
		AADT	1280	795	1913	754	4741	1445	133	122	1699	6439
	Expansion Factor		3.60	5.09	8.00	4.99	5.26	288.90	8.28	5.79	40.44	6.83
Both Directions		Sample size	575	294	658	228	1755	106	102	53	261	2016
		12 hrs Traffic	2653	1174	3100	1759	8686	3186	278	335	3799	12485
		Sample Rate %	21.7	25.0	21.2	13.0	20.2	3.3	36.7	15.8	6.9	16.1
NH24	1 2 1	Sample size	457	267	678	218	1620	181	61	89	331	1951
(km 235)		12 hrs Traffic	1114	328	1030	1158	3630	3017	153	129	3299	6929
12/11/97		Sample Rate %	41.0	81.4	65.8	18.8	44.6	6.0	39.9	69.0	10.0	28.2
	Average traffic(Nov.'97)		1189	520	1815	909	4433	1872	157	132	2161	6594
	Average traffic(May.'97)		1349	1146	1919	872	5286	1111	149	139	1399	6685
		AADT	1269	833	1867	891	4860	1492	153	136	1780	6640
	Expansion Factor		2.78	3.12	2.75	4.08	3.00	8.24	2.51	1.52	5.38	3.40
	1 2 2	Sample size	355	143	599	268	1365	84	30	35	149	1514
		12 hrs Traffic	1260	586	1106	1001	3953	1989	84	101	2174	6127
		Sample Rate %	28.2	24.4	54.2	26.8	34.5	4.2	35.7	34.7	6.9	24.7
	Average traffic(Nov.'97)		1355	682	2057	823	4917	1581	115	118	1814	6731
	Average traffic(May.'97)		1204	907	1769	684	4564	1308	150	125	1583	6147
		AADT	1280	795	1913	754	4741	1445	133	122	1699	6439
	Expansion Factor		3.60	5.56	3.19	2.81	3.47	17.20	4.42	3.47	11.40	4.25
Both Directions		Sample size	812	410	1277	486	2985	265	91	124	480	3465
		12 hrs Traffic	2374	914	2136	2159	7583	5006	237	230	5473	13056
		Sample Rate %	34.2	44.9	59.8	22.5	39.4	5.3	38.4	53.9	8.8	26.5

A12-1 Sample Size and Expansion Factor by Survey Location (Bareilly) (2/5)

Location2			1	2	3	4		5	6	7		
Highway (Chainage) Date	Location Date Direction		Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	Fast vehicles	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	Slow vehicles	Total
SH37 (km 14) 17/11/97	2 1 1	Sample size	464	197	463	83	1207	92	38	51	181	1388
		12 hrs Traffic	694	197	575	752	2218	2371	132	109	2612	4830
		Sample Rate %	66.9	100.0	80.5	11.0	54.4	3.9	28.8	46.8	6.9	28.7
	Average traffic(Nov.'97)		963	201	1052	774	2990	3006	141	118	3265	6255
	Average traffic(May.'97)		1219	301	1534	868	3922	1807	191	187	2185	6107
		AADT	1091	251	1293	821	3456	2407	166	153	2725	6181
	Expansion Factor		2.35	1.27	2.79	9.89	2.86	26.16	4.37	2.99	15.06	4.45
	2 1 2	Sample size	161	97	176	152	586	97	45	23	165	751
		12 hrs Traffic	713	188	525	653	2079	2113	144	121	2378	4457
		Sample Rate %	22.6	51.6	33.5	23.3	28.2	4.6	31.3	19.0	6.9	16.8
	Average traffic(Nov.'97)		825	209	990	644	2668	2898	149	149	3196	5864
	Average traffic(May.'97)		1313	376	1784	873	4346	1623	187	215	2025	6371
		AADT	1069	293	1387	759	3507	2261	168	182	2611	6118
	Expansion Factor		6.64	3.02	7.88	4.99	5.98	23.30	3.73	7.91	15.82	8.15
Both Directions		Sample size	625	294	639	235	1793	189	83	74	346	2139
		12 hrs Traffic	1407	385	1100	1405	4297	4484	276	230	4990	9287
		Sample Rate %	44.4	76.4	58.1	16.7	41.7	4.2	30.1	32.2	6.9	23.0
SH37 (km 14) 18/11/97	2 2 1	Sample size	334	142	224	66	766	62	54	46	162	928
		12 hrs Traffic	723	172	655	634	2184	2712	131	103	2946	5130
		Sample Rate %	46.2	82.6	34.2	10.4	35.1	2.3	41.2	44.7	5.5	18.1
	Average traffic(Nov.'97)		963	201	1052	774	2990	3006	141	118	3265	6255
	Average traffic(May.'97)		1219	301	1534	868	3922	1807	191	187	2185	6107
		AADT	1091	251	1293	821	3456	2407	166	153	2725	6181
	Expansion Factor		3.27	1.77	5.77	12.44	4.51	38.81	3.07	3.32	16.82	6.66
	2 2 2	Sample size	136	84	322	96	638	101	61	45	207	845
		12 hrs Traffic	651	191	529	536	1907	2092	132	112	2336	4243
		Sample Rate %	20.9	44.0	60.9	17.9	33.5	4.8	46.2	40.2	8.9	19.9
	Average traffic(Nov.'97)		825	209	990	644	2668	2898	149	149	3196	5864
	Average traffic(May.'97)		1313	376	1784	873	4346	1623	187	215	2025	6371
		AADT	1069	293	1387	759	3507	2261	168	182	2611	6118
	Expansion Factor		7.86	3.48	4.31	7.90	5.50	22.38	2.75	4.04	12.61	7.24
Both Directions		Sample size	470	226	546	162	1404	163	115	91	369	1773
		12 hrs Traffic	1374	363	1184	1170	4091	4804	263	215	5282	9373
		Sample Rate %	34.2	62.3	46.1	13.8	34.3	3.4	43.7	42.3	7.0	18.9

A12-1 Sample Size and Expansion Factor by Survey Location (Bareilly) (3/5)

Location3				1	2	3	4		5	6	7		
Highway (Chainage) Date	Location	Date	Direction	Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	**Fast vehicles**	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	**Slow vehicles**	**Total**
SH33	3	1	1	Sample size	214	38	138	94	**484**	57	35	44	**136**	620
(km 42)				12 hrs Traffic	796	115	361	650	**1922**	877	98	172	**1147**	3069
18/11/97				Sample Rate %	26.9	33.0	38.2	14.5	**25.2**	6.5	35.7	25.6	**11.9**	20.2
				Average traffic (Nov.'97)	1014	187	776	673	**2650**	1304	112	155	**1571**	4221
				Average traffic(May.'97)	1445	891	1453	1096	**4885**	1368	342	283	**1993**	6878
				AADT	1230	539	1115	885	**3768**	1336	227	219	**1782**	5550
				Expansion Factor	5.75	14.18	8.08	9.41	**7.78**	23.44	6.49	4.98	**13.10**	8.95
	3	1	2	Sample size	300	78	239	107	**724**	50	30	38	**118**	842
				12 hrs Traffic	705	134	469	541	**1849**	981	91	154	**1226**	3075
				Sample Rate %	42.6	58.2	51.0	19.8	**39.2**	5.1	33.0	24.7	**9.6**	27.4
				Average traffic(Nov.'97)	1243	206	857	797	**3103**	1323	147	204	**1674**	4777
				Average traffic(May.'97)	1495	889	1441	887	**4712**	1525	373	398	**2296**	7008
				AADT	1369	548	1149	842	**3908**	1424	260	301	**1985**	5893
				Expansion Factor	4.56	7.02	4.81	7.87	**5.40**	28.48	8.67	7.92	**16.82**	7.00
Both Directions				Sample size	514	116	377	201	**1208**	107	65	82	**254**	1462
				12 hrs Traffic	1501	249	830	1191	**3771**	1858	189	326	**2373**	6144
				Sample Rate %	34.2	46.6	45.4	16.9	**32.0**	5.8	34.4	25.2	**10.7**	23.8
SH33	3	2	1	Sample size	328	81	186	233	**828**	77	19	45	**141**	969
(km 42)				12 hrs Traffic	888	163	589	625	**2265**	1330	80	95	**1505**	3770
19/11/97				Sample Rate %	36.9	49.7	31.6	37.3	**36.6**	5.8	23.8	47.4	**9.4**	25.7
				Average traffic(Nov.'97)	1014	187	776	673	**2650**	1304	112	155	**1571**	4221
				Average traffic(May.'97)	1445	891	1453	1096	**4885**	1368	342	283	**1993**	6878
				AADT	1230	539	1115	885	**3768**	1336	227	219	**1782**	5550
				Expansion Factor	3.75	6.65	5.99	3.80	**4.55**	17.35	11.95	4.87	**12.64**	5.73
	3	2	2	Sample size	384	83	278	224	**969**	73	43	89	**205**	1174
				12 hrs Traffic	1023	174	578	774	**2549**	1748	125	156	**2029**	4578
				Sample Rate %	37.5	47.7	48.1	28.9	**38.0**	4.2	34.4	57.1	**10.1**	25.6
				Average traffic(Nov.'97)	1243	206	857	797	**3103**	1323	147	204	**1674**	4777
				Average traffic(May.'97)	1495	889	1441	887	**4712**	1525	373	398	**2296**	7008
				AADT	1369	548	1149	842	**3908**	1424	260	301	**1985**	5893
				Expansion Factor	3.57	6.60	4.13	3.76	**4.03**	19.51	6.05	3.38	**9.68**	5.02
Both Directions				Sample size	712	164	464	457	**1797**	150	62	134	**346**	2143
				12 hrs Traffic	1911	337	1167	1399	**4814**	3078	205	251	**3534**	8348
				Sample Rate %	37.3	48.7	39.8	32.7	**37.3**	4.9	30.2	53.4	**9.8**	25.7

A12-1 Sample Size and Expansion Factor by Survey Location (Bareilly) (4/5)

Location4				1	2	3	4		5	6	7		
Highway (Chainage) Date	Location	Date	Direction	Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	**Fast vehicles**	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	**Slow vehicles**	**Total**
NH24 (km 252) 19/11/97	4	1	1	Sample size 282	132	526	76	**1016**	129	35	94	**258**	**1274**
				12 hrs Traffic 784	226	845	1193	**3048**	3037	74	162	**3273**	**6321**
				Sample Rate % 36.0	58.4	62.2	6.4	**33.3**	4.2	47.3	58.0	**7.9**	**20.2**
	Average traffic(Nov.'97)			1220	419	2434	1506	**5579**	3628	121	231	**3980**	**9559**
	Average traffic(May.'97)												
				AADT 1220	419	2434	1506	**5579**	3628	121	231	**3980**	**9559**
	Expansion Factor			4.33	3.17	4.63	19.82	**5.49**	28.12	3.46	2.46	**15.43**	**7.50**
	4	1	2	Sample size 168	97	604	21	**890**	71	6	62	**139**	**1029**
				12 hrs Traffic 821	222	924	1068	**3035**	2588	48	144	**2780**	**5815**
				Sample Rate % 20.5	43.7	65.4	2.0	**29.3**	2.7	12.5	43.1	**5.0**	**17.7**
	Average traffic(Nov.'97)			1077	338	2226	1119	**4760**	3263	86	180	**3529**	**8289**
	Average traffic(May.'97)												
				AADT 1077	338	2226	1119	**4760**	3263	86	180	**3529**	**8289**
	Expansion Factor			6.41	3.48	3.69	53.29	**5.35**	45.96	14.33	2.90	**25.39**	**8.06**
Both Directions				Sample size 450	229	1130	97	**1906**	200	41	156	**397**	**2303**
				12 hrs Traffic 1605	448	1769	2261	**6083**	5625	122	306	**6053**	**12136**
				Sample Rate % 28.0	51.1	63.9	4.3	**31.3**	3.6	33.6	51.0	**6.6**	**19.0**
NH24 (km 252) 20/11/97	4	2	1	Sample size 347	171	496	267	**1281**	280	66	147	**493**	**1774**
				12 hrs Traffic 1326	321	1485	1729	**4861**	4097	119	256	**4472**	**9333**
				Sample Rate % 26.2	53.3	33.4	15.4	**26.4**	6.8	55.5	57.4	**11.0**	**19.0**
	Average traffic(Nov.'97)			1220	419	2434	1506	**5579**	3628	121	231	**3980**	**9559**
	Average traffic(May.'97)												
				AADT 1220	419	2434	1506	**5579**	3628	121	231	**3980**	**9559**
	Expansion Factor			3.52	2.45	4.91	5.64	**4.36**	12.96	1.83	1.57	**8.07**	**5.39**
	4	2	2	Sample size 531	135	623	370	**1659**	299	21	138	**458**	**2117**
				12 hrs Traffic 778	152	1076	825	**2831**	2001	84	138	**2223**	**5054**
				Sample Rate % 68.3	88.8	57.9	44.8	**58.6**	14.9	25.0	100.0	**20.6**	**41.9**
	Average traffic(Nov.'97)			1077	338	2226	1119	**4760**	3263	86	180	**3529**	**8289**
	Average traffic(May.'97)												
				AADT 1077	338	2226	1119	**4760**	3263	86	180	**3529**	**8289**
	Expansion Factor			2.03	2.50	3.57	3.02	**2.87**	10.91	4.10	1.30	**7.71**	**3.92**
Both Directions				Sample size 878	306	1119	637	**2940**	579	87	285	**951**	**3891**
				12 hrs Traffic 2104	473	2561	2554	**7692**	6098	203	394	**6695**	**14387**
				Sample Rate % 41.7	64.7	43.7	24.9	**38.2**	9.5	42.9	72.3	**14.2**	**27.0**

A12-1 Sample Size and Expansion Factor by Survey Location (Bareilly) (5/5)

Location5			1	2	3	4		5	6	7		
Highway (Chainage) Date	Location Date Direction		Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	**Fast vehicles**	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	**Slow vehicles**	**Total**
NH24	5 1 1	Sample size	193	134	640	74	**1041**	28	19	20	67	1108
(km 260)		12 hrs Traffic	556	188	940	321	**2005**	309	45	32	386	2391
21/11/97		Sample Rate %	34.7	71.3	68.1	23.1	**51.9**	9.1	42.2	62.5	17.4	46.3
	Average traffic(Nov.'97)		779	308	1934	373	**3394**	420	71	79	570	3964
	Average traffic(May.'97)		1222	675	2339	940	**5176**	960	170	178	1308	6484
		AADT	1001	492	2137	657	**4285**	690	121	129	939	5224
	Expansion Factor		5.18	3.67	3.34	8.87	**4.12**	24.64	6.34	6.43	14.01	4.71
	5 1 2	Sample size	269	164	427	65	**925**	45	36	20	101	1026
		12 hrs Traffic	571	209	994	285	**2059**	226	93	20	339	2398
		Sample Rate %	47.1	78.5	43.0	22.8	**44.9**	19.9	38.7	100.0	29.8	42.8
	Average traffic(Nov.'97)		706	318	1866	316	**3206**	391	106	56	553	3759
	Average traffic(May.'97)		1218	654	2079	1036	**4987**	944	172	153	1269	6256
		AADT	962	486	1973	676	**4097**	668	139	105	911	5008
	Expansion Factor		3.58	2.96	4.62	10.40	**4.43**	14.83	3.86	5.23	9.02	4.88
Both Directions		Sample size	462	298	1067	139	**1966**	73	55	40	168	2134
		12 hrs Traffic	1127	397	1934	606	**4064**	535	138	52	725	4789
		Sample Rate %	41.0	75.1	55.2	22.9	**48.4**	13.6	39.9	76.9	23.2	44.6
NH24	5 2 1	Sample size	205	131	351	49	**736**	13	11	38	62	798
(km 260)		12 hrs Traffic	731	227	1081	320	**2359**	354	58	91	503	2862
22/11/97		Sample Rate %	28.0	57.7	32.5	15.3	**31.2**	3.7	19.0	41.8	12.3	27.9
	Average traffic(Nov.'97)		779	308	1934	373	**3394**	420	71	79	570	3964
	Average traffic(May.'97)		1222	675	2339	940	**5176**	960	170	178	1308	6484
		AADT	1001	492	2137	657	**4285**	690	121	129	939	5224
	Expansion Factor		4.88	3.75	6.09	13.40	**5.82**	53.08	10.95	3.38	15.15	6.55
	5 2 2	Sample size	251	244	463	117	**1075**	83	51	55	189	1264
		12 hrs Traffic	570	244	906	268	**1988**	189	73	59	321	2309
		Sample Rate %	44.0	100.0	51.1	43.7	**54.1**	43.9	69.9	93.2	58.9	54.7
	Average traffic(Nov.'97)		706	318	1866	316	**3206**	391	106	56	553	3759
	Average traffic(May.'97)		1218	654	2079	1036	**4987**	944	172	153	1269	6256
		AADT	962	486	1973	676	**4097**	668	139	105	911	5008
	Expansion Factor		3.83	1.99	4.26	5.78	**3.81**	8.04	2.73	1.90	4.82	3.96
Both Directions		Sample size	456	375	814	166	**1811**	96	62	93	251	2062
		12 hrs Traffic	1301	471	1987	588	**4347**	543	131	150	824	5171
		Sample Rate %	35.0	79.6	41.0	28.2	**41.7**	17.7	47.3	62.0	30.5	39.9

A12-2

Sample Size and Expansion Factor by O-D Survey Location (Gwalior)

(Gwalior) (1/3)

Location6				1	2	3	4		5	6	7		
Highway (Chainage) Date	Location	Date	Direction	Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	**Fast vehicles**	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	**Slow vehicles**	**Total**
NH3	6	1	1	Sample size 169	99	262	94	**624**	48	46	4	**98**	722
(km 103)				12 hrs Traffic 699	146	806	689	**2340**	436	87	9	**532**	2872
10/11/97				Sample Rate % 24.2	67.8	32.5	13.6	**26.7**	11.0	52.9	44.4	**18.4**	25.1
	Average traffic(Nov.'97)			1005	204	1693	708	**3610**	447	96	15	**558**	4168
	Average traffic(May.'97)			783	323	1850	603	**3559**	266	107	33	**406**	3965
				AADT 894	264	1772	656	**3585**	357	102	24	**482**	4067
	Expansion Factor			5.29	2.66	6.76	6.97	**5.74**	7.43	2.21	6.00	**4.92**	5.63
	6	1	2	Sample size 123	92	361	55	**631**	18	21	3	**42**	673
				12 hrs Traffic 538	176	869	582	**2165**	376	99	11	**486**	2651
				Sample Rate % 22.9	52.3	41.5	9.5	**29.1**	4.8	21.2	27.3	**8.6**	25.4
	Average traffic(Nov.'97)			961	318	1628	696	**3603**	505	159	29	**693**	4296
	Average traffic(May.'97)			800	277	1747	683	**3507**	236	137	33	**406**	3913
				AADT 881	298	1688	690	**3555**	371	148	31	**550**	4105
	Expansion Factor			7.16	3.23	4.67	12.54	**5.63**	20.58	7.05	10.33	**13.08**	6.10
Both Directions				Sample size 292	191	623	149	**1255**	66	67	7	**140**	1395
				12 hrs Traffic 1237	322	1675	1271	**4505**	812	186	20	**1018**	5523
				Sample Rate % 23.6	59.3	37.2	11.7	**27.9**	8.1	36.0	35.0	**13.8**	25.3
NH3	6	2	1	Sample size 212	144	328	88	**772**	39	17	8	**64**	836
(km 103)				12 hrs Traffic 790	144	1036	584	**2554**	323	52	12	**387**	2941
11/11/97				Sample Rate % 26.8	100.0	31.7	15.1	**30.2**	12.1	32.7	66.7	**16.5**	28.4
	Average traffic(Nov.'97)			1005	204	1693	708	**3610**	447	96	15	**558**	4168
	Average traffic(May.'97)			783	323	1850	603	**3559**	266	107	33	**406**	3965
				AADT 894	264	1772	656	**3585**	357	102	24	**482**	4067
	Expansion Factor			4.22	1.83	5.40	7.45	**4.64**	9.14	5.97	3.00	**7.53**	4.86
	6	2	2	Sample size 113	130	405	34	**682**	5	12	10	**27**	709
				12 hrs Traffic 635	202	1196	529	**2562**	386	75	22	**483**	3045
				Sample Rate % 17.8	64.4	33.9	6.4	**26.6**	1.3	16.0	45.5	**5.6**	23.3
	Average traffic(Nov.'97)			961	318	1628	696	**3603**	505	159	29	**693**	4296
	Average traffic(May.'97)			800	277	1747	683	**3507**	236	137	33	**406**	3913
				AADT 881	298	1688	690	**3555**	371	148	31	**550**	4105
	Expansion Factor			7.79	2.29	4.17	20.28	**5.21**	74.10	12.33	3.10	**20.35**	5.79
Both Directions				Sample size 325	274	733	122	**1454**	44	29	18	**91**	1545
				12 hrs Traffic 1425	346	2232	1113	**5116**	709	127	34	**870**	5986
				Sample Rate % 22.8	79.2	32.8	11.0	**28.4**	6.2	22.8	52.9	**10.5**	25.8

A12-2 Sample Size and Expansion Factor by Survey Location (Gwalior) (2/3)

Location7				1	2	3	4		5	6	7		
Highway (Chainage) Date	Location	Date	Direction	Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	Fast vehicles	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	Slow vehicles	Total
NH3	7	1	1	Sample size	252	80	329	64	725	12	45	11	68	793
(km 115)				12 hrs Traffic	609	147	1017	1067	2840	1366	179	21	1566	4406
12/11/97				Sample Rate %	41.4	54.4	32.4	6.0	25.5	0.9	25.1	52.4	4.3	18.0
				Average traffic (Nov.'97)	765	208	1563	1149	3685	1417	170	30	1617	5302
				Average traffic(May.'97)										
				AADT	765	208	1563	1149	3685	1417	170	30	1617	5302
				Expansion Factor	3.04	2.60	4.75	17.95	5.08	118.08	3.78	2.73	23.78	6.69
	7	1	2	Sample size	194	107	328	34	663	30	21	9	60	723
				12 hrs Traffic	578	164	934	849	2525	1148	133	23	1304	3829
				Sample Rate %	33.6	65.2	35.1	4.0	26.3	2.6	15.8	39.1	4.6	18.9
				Average traffic (Nov.'97)	701	173	1532	993	3399	1275	138	35	1448	4847
				Average traffic (May.'97)										
				AADT	701	173	1532	993	3399	1275	138	35	1448	4847
				Expansion Factor	3.61	1.62	4.67	29.21	5.13	42.50	6.57	3.89	24.13	6.70
Both Directions				Sample size	446	187	657	98	1388	42	66	20	128	1516
				12 hrs Traffic	1187	311	1951	1916	5365	2514	312	44	2870	8235
				Sample Rate %	37.6	60.1	33.7	5.1	25.9	1.7	21.2	45.5	4.5	18.4
NH3	7	2	1	Sample size	197	91	322	34	644	27	30	11	68	712
(km 115)				12 hrs Traffic	547	137	884	980	2548	1180	151	31	1362	3910
13/11/97				Sample Rate %	36.0	66.4	36.4	3.5	25.3	2.3	19.9	35.5	5.0	18.2
				Average traffic(Nov.'97)	765	208	1563	1149	3685	1417	170	30	1617	5302
				Average traffic(May.'97)										
				AADT	765	208	1563	1149	3685	1417	170	30	1617	5302
				Expansion Factor	3.88	2.29	4.85	33.79	5.72	52.48	5.67	2.73	23.78	7.45
	7	2	2	Sample size	97	62	445	17	621	3	17	16	36	657
				12 hrs Traffic	505	122	889	880	2396	1021	156	44	1221	3617
				Sample Rate %	19.2	50.8	50.1	1.9	25.9	0.3	10.9	36.4	2.9	18.2
				Average traffic(Nov.'97)	701	173	1532	993	3399	1275	138	35	1448	4847
				Average traffic(May.'97)										
				AADT	701	173	1532	993	3399	1275	138	35	1448	4847
				Expansion Factor	7.23	2.79	3.44	58.41	5.47	425.00	8.12	2.19	40.22	7.38
Both Directions				Sample size	294	153	767	51	1265	30	47	27	104	1369
				12 hrs Traffic	1052	259	1773	1860	4944	2201	307	75	2583	7527
				Sample Rate %	27.9	59.1	43.3	2.7	25.6	1.4	15.3	36.0	4.0	18.2

Sample Size and Expansion Factor by Survey Location (Gwalior) (3/3)

Location8			1	2	3	4		5	6	7		
Highway (Chainage) Date	Location Date Direction		Cars, Jeeps, Vans, 3 Wheelers	Buses, Mini-Buses	Trucks	Two-Wheelers	**Fast vehicles**	Cycles, Rickshaw	Agricultural Tractors	Animal/ Hand Drawn	**Slow vehicles**	**Total**
NH3 (km133.3) 17/11/97	8 1 1	Sample size	79	57	306	23	**465**	3	17	0	**20**	**485**
		12 hrs Traffic	293	62	569	234	**1158**	80	71	16	**167**	**1325**
		Sample Rate %	27.0	91.9	53.8	9.8	**40.2**	3.8	23.9	0.0	**12.0**	**36.6**
	Average traffic(Nov.'97)		367	105	1168	309	**1949**	123	87	9	**219**	**2168**
	Average traffic(May.'97)		1007	417	2647	486	**4557**	237	140	45	**422**	**4979**
		AADT	687	261	1908	398	**3253**	180	114	27	**321**	**3574**
	Expansion Factor		8.70	4.58	6.23	17.28	**7.00**	60.00	6.68		**16.03**	**7.37**
	8 1 2	Sample size	115	68	321	60	**564**	14	28	0	**42**	**606**
		12 hrs Traffic	271	79	571	251	**1172**	119	57	1	**177**	**1349**
		Sample Rate %	42.4	86.1	56.2	23.9	**48.1**	11.8	49.1		**23.7**	**44.9**
	Average traffic(Nov.'97)		382	111	1288	261	**2042**	104	96	0	**200**	**2242**
	Average traffic(May.'97)		1077	471	3134	529	**5211**	207	192	56	**455**	**5666**
		AADT	730	291	2211	395	**3627**	156	144	28	**328**	**3954**
	Expansion Factor		6.34	4.28	6.89	6.58	**6.43**	11.11	5.14		**7.80**	**6.52**
Both Directions		Sample size	194	125	627	83	**1029**	17	45	0	**62**	**1091**
		12 hrs Traffic	564	141	1140	485	**2330**	199	128	17	**344**	**2674**
		Sample Rate %	34.4	88.7	55.0	17.1	**44.2**	8.5	35.2	0.0	**18.0**	**40.8**
NH3 (km133.3) 18/11/97	8 2 1	Sample size	109	63	337	44	**553**	6	32	2	**40**	**593**
		12 hrs Traffic	262	85	644	237	**1228**	115	53	9	**177**	**1405**
		Sample Rate %	41.6	74.1	52.3	18.6	**45.0**	5.2	60.4	22.2	**22.6**	**42.2**
	Average traffic(Nov.'97)		367	105	1168	309	**1949**	123	87	9	**219**	**2168**
	Average traffic(May.'97)		1007	417	2647	486	**4557**	237	140	45	**422**	**4979**
		AADT	687	261	1908	398	**3253**	180	114	27	**321**	**3574**
	Expansion Factor		6.30	4.14	5.66	9.03	**5.88**	30.00	3.55	13.50	**8.01**	**6.03**
	8 2 2	Sample size	81	104	355	34	**574**	7	16	0	**23**	**597**
		12 hrs Traffic	264	104	553	223	**1144**	68	81	1	**150**	**1294**
		Sample Rate %	30.7	100.0	64.2	15.2	**50.2**	10.3	19.8	0.0	**15.3**	**46.1**
	Average traffic(Nov.'97)		382	111	1288	261	**2042**	104	96	0	**200**	**2242**
	Average traffic(May.'97)		1077	471	3134	529	**5211**	207	192	56	**455**	**5666**
		AADT	730	291	2211	395	**3627**	156	144	28	**328**	**3954**
	Expansion Factor		9.01	2.80	6.23	11.62	**6.32**	22.21	9.00		**14.24**	**6.62**
Both Directions		Sample size	190	167	692	78	**1127**	13	48	2	**63**	**1190**
		12 hrs Traffic	526	189	1197	460	**2372**	183	134	10	**327**	**2699**
		Sample Rate %	36.1	88.4	57.8	17.0	**47.5**	7.1	35.8	20.0	**19.3**	**44.1**

A12-3

Axle Load Data (Bareilly)

A12-3 Axle Load Data (Bareilly) (1/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1980	UTI	Light Truck	2	2.33	5.4	0	.	L
1	1994	DL		2	0.68	0.57	.	.	UL
1	1993	HR		2	1	2.14	.	.	L
1	1988	UGL		2	1.24	2.03	.	.	L
1	1994	UP		2	1.04	1.16	.	.	UL
1	1997	UP		2	0.81	0.63	.	.	UL
1	1997	U9		2	0.66	1.95	0	.	UL
1	1997	UP		2	1.01	1.76	0	.	UL
1	1990	UP		2	0.68	0.68	0	.	UL
1	1991	UP		2	0.97	0.86	0	.	UL
1	1978	EL		2	0.58	0.91	0	.	UL
1	1994	UP		2	0.74	0.86	0	.	L
1	1996	UP		2	0.93	1.03	0	.	L
1	1988	DDL		2	0.33	0.79	0	.	UL
1	1988	DDL		2	1.03	1.89	0	.	L
1	1988	UP		2	1.41	0.89	0	.	UL
1	1988	UP		2	1.22	1.93	0	.	UL
1	1992	UP		2	0.85	1.48	0	.	L
1	1989	UP		2	1.19	1.54	0	.	L
1	1991	DL		2	0.7	1.23	0	.	L
1	1987	UP		2	2.52	3.7	0	.	L
1	1988	UP		2	1.09	3.31	0	.	L
1	1997	UP		2	1.33	1.89	0	.	L
1	1997	UP		2	1.27	4.21	0	.	L
1	1997	UP		2	1.58	1.33	0	.	L
1	1985	UP		2	2.92	7.08	0	.	UL
1	1991	DL		2	1.68	3.54	0	.	L
1	1992	UP		2	1.76	3.34	0	.	L
1	1982	UP	Medium	3	2.26	7.07	.	.	L
1	1972	USE	Truck	3	2.86	6.6	.	.	L
1	1988	HNG		3	3.14	6.14	.	.	L
1	1990	UP		3	3.11	5.2	.	.	L
1	1996	MP		3	3.18	4.8	.	.	L
1	1997	PB		3	3.5	7.87	.	.	L
1	1987	DIL		3	3.65	6.99	.	.	L
1	1985	UHQ		3	3.48	5.74	.	.	L
1	1989	UHB		3	2.39	6.96	.	.	L
1	1981	UP		3	2.73	5.37	.	.	L
1	1984	UP		3	2.03	3.37	.	.	UL
1	1990	UP		3	1.51	3.89	.	.	L
1	1984	UP		3	1.56	5.44	0	.	L
1	1988	HP		3	1.65	4.23	0	.	L
1	1993	UP		3	1.84	5.57	0	.	UL
1	1982	UP		3	2.81	3.68	0	.	L
1	1984	BL		3	2.49	4.53	0	.	L
1	1986	BR		3	2.63	4.89	0	.	L
1	1991	HR		3	2.23	6	0	.	L
1	1982	UP		3	1.44	1.48	0	.	UL
1	1986	UP		3	1.33	1.72	0	.	UL
1	1991	UP		3	2.12	4.23	0	.	L
1	1981	UR		3	1.47	1.89	0	.	UL
1	1996	AP		3	2.49	6.89	0	.	L
1	1984	UP		3	2.24	4.45	0	.	L
1	1992	UP		3	2.02	2.24	0	.	UL
1	1990	UP		3	1.95	4.22	0	.	L
1	1987	DIG		3	3.47	8.27	0	.	L
1	1996	MP		3	2.28	6.69	0	.	L

A12-3 Axle Load Data (Bareilly) (2/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1990	UP	Medium	3	2.03	4.49	0		L
1	1989	GMM	Truck	3	1.2	1.76	0		UL
1	1986	PI		3	2.71	3.47	0		L
1	1980	HYH		3	1.3	2.4	0		UL
1	1987	MP		3	2.52	3.82	0		UL
1	1997	MP		3	1.68	4.77	0		L
1	1989	UMM		3	2.32	6.01	0		L
1	1984	DEL		3	1.07	3.6	0		UL
1	1987	WB		3	2.45	3.81	0		L
1	1995	WB		3	1.36	3.71	0		L
1	1996	UP		3	2.67	5.03	0		L
1	1982	BRC		3	2.09	4.61	0		L
1	1984	UHG		3	1.68	3.36	0		L
1	1996	UP		3	2.31	5.04	0		L
1	1984	GHI		3	1.35	4.01	0		L
1	1978	URD		3	1.21	3.62	0		L
1	1990	UP		3	1.16	1.19	0		UL
1	1976	UP		3	1.63	3.68	0		L
1	1987	UP		3	1.66	1.76	0		UL
1	1983	UP		3	1.58	1.51	0		UL
1	1985	UP		3	3.86	4.96	0		L
1	1992	UP		3	2.43	3.9	0		UL
1	1982	WGA		3	1.19	2.21	0		UL
1	1985	UP		3	2.28	3.09	0		L
1	1983	DL		3	3.86	5.67	0		L
1	1980	UP		3	2.32	3.46	0		L
1	1988	UGL		3	1.28	1.58	0		UL
1	1991	BR		3	2.89	4.87	0		L
1	1990	WB		3	1.89	2.64	0		UL
1	1992	UP		3	1.56	1.91	0		L
1	1989	UMM		3	1.96	3.32	0		L
1	1996	HR		3	3.34	4.31	0		L
1	1985	HR		3	3.17	4.95	0		L
1	1985	URR		3	2.82	5.25	0		L
1	1990	CIF		3	3.29	6.36	0		L
1	1986	UGR		3	3.15	6.28	0		L
1	1990	UGL		3	2.68	5.95	0		L
1	1988	DL		3	3.66	7.54	0		L
1	1990	HR		3	3.18	6.49	0		L
1	1989	UMS		3	2.23	4.84	0		L
1	1992	HP		3	0.83	5.1	0		L
1	1990	MP		3	1.58	2.55	0		L
1	1991	UP		3	2.75	6.47	0		L
1	1992	UP		3	2.01	4.69	0		L
1	1996	HR		3	2.92	3.99	0		L
1	1981	UTX		3	1.67	3.04	0		L
1	1989	HR		3	1.98	3.01	0		L
1	1994	UP		3	1.31	1.94	0		UL
1	1985	UHZ		3	1.31	5.49	0		L
1	1985	UP		3	2.91	4.26	0		L
1	1991	UP		3	2.62	4.86	0		L
1	1976	UTF		3	1.76	4.31	0		L
1	1997	UAR		3	2.31	4.86	0		L
1	1992	BR		3	2.19	3.92	0		L
1	1984	UH		3	2.62	5.12	0		L
1	1987	UTJ		3	2.74	4.12	0		L
1	1991	UP		3	1.6	1.2	0		UL

A12-3 Axle Load Data (Bareilly) (3/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1987	HR	Medium	3	2.14	2.7	0		UL
1	1991	UP	Truck	3	1.83	3.14	0		L
1	1981	HR		3	1.87	6.89	0		L
1	1992	UP		3	1.71	3.3	0		L
1	1992	UP		3	1.93	4.08	0		L
1	1997	USP		3	2.08	4.11	0		L
1	1980	UP		3	2.64	4.83	0		L
1	1986	BI		3	3.22	7.03	0		L
1	1992	UP		3	1.23	2.04	0		UL
1	1997	WB		3	2.42	5.03	0		L
1	1989	UP		3	1.31	2.04	0		UL
1	1994	UP		3	2.18	4.22	0		L
1	1985	UP		3	2.17	4.62	0		L
1	1992	UP		3	2.87	4.73	0		L
1	1997	UP		3	2.82	5.41	0		L
1	1985	UTI		3	1.47	1.17	0		UL
1	1994	UP		3	2.76	6.73	0		L
1	1992	UP		3	2.23	3.94	0		L
1	1992	UP		3	1.47	2.08	0		UL
1	1995	UR		3	1.47	1.91	0		UL
1	1985	UHN		3	2.39	4.23	0		L
1	1985	UP		3	2.76	5.59	0		L
1	1993	HR		3	2.52	5.98	0		L
1	1997	UP		3	3.1	6.23	0		L
1	1994	UP		3	2.19	5.88	0		L
1	1992	UP		3	1.57	1.22	0		UL
1	1993	HR		3	1.99	4.03	0		L
1	1991	UP		3	2.66	5.66	0		L
1	1995	UP		3	2.31	7.12	0		L
1	1990	UHT		3	2.12	4.03	0		L
1	1992	URW		3	2.25	3.89	0		L
1	1981	URQ		3	2.46	6.23	0		L
1	1997	UP		3	1.97	4.33	0		L
1	1996	HR		3	1.53	1.14	0		UL
1	1985	MP		3	1.79	2.83	0		L
1	1989	DEL		3	2.48	5.23	0		L
1	1996	UP		3	2.71	3.78	0		L
1	1987	UP		3	1.51	1.59	0		UL
1	1989	UP		3	1.99	4.63	0		L
1	1981	UHN		3	2.27	4.03	0		L
1	1992	HR		3	1.78	3.17	0		L
1	1995	UP		3	1.71	1.29	0		UL
1	1982	URN		3	1.91	3.82	0		L
1	1990	WB		3	1.88	3.22	0		L
1	1981	USW		3	2.14	4.39	0		L
1	1986	HNU		3	1.59	1.62	0		UL
1	1986	HNE		3	1.91	1.84	0		UL
1	1990	HR		3	1.94	1.49	0		UL
1	1985	URN		3	1.67	4.03	0		L
1	1985	UHH		3	2.17	3.06	0		L
1	1982	UR		3	2.36	4.59	0		L
1	1992	UP		3	3.21	7.92	0		L
1	1985	AP		3	3.42	7.01	0		L
1	1990	WB		3	1.81	2.22	0		UL
1	1990	WB		3	1.77	2.13	0		UL
1	1981	URN		3	3.6	6.86	0		L
1	1985	UPO		3	3.23	7.29	0		L

A12-3 Axle Load Data (Bareilly) (4/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1985	UR	Medium	3	2.95	6.94	0		L
1	1982	HP	Truck	3	1.39	3.03	0		UL
1	1980	HP		3	2.65	3.09	0		L
1	1986	WB		3	1.64	2.19	0		UL
1	1993	HR		3	3.95	8.87	0		L
1	1992	DL		3	2.18	6.62	0		L
1	1987	UTI		3	3.02	7.75	0		L
1	1992	UP		3	3.08	6.23	0		L
1	1985	PIL		3	3.16	5.39	0		L
1	1993	RJ		3	2.74	8.06	0		L
1	1985	URL		3	3.5	6.03	0		L
1	1988	UP		3	2.53	6.05	0		L
1	1987	UP		3	2.54	5.14	0		L
1	1984	UAB		3	3.13	7.52	0		L
1	1985	UGD		3	3.25	7.52	0		L
1	1985	DIG		3	2.51	5.41	0		L
1	1997	UP		3	3.53	4.57	0		L
1	1989	UMM		3	2.96	4.21	0		L
1	1995	U9	Heavy	4	2.93	5.17	4.63		L
1	1996	HR	Truck	4	2.71	5.67	5.95		L
1	1994	UPF		4	3.37	4.14	4.06		L
1	1995	HR		4	3.36	5.78	5.53		L
2	1994	UP	Pickup	1	0.1	1.39	0		UL
2	1995	UP	Light Truck	2	1.13	2.16	0		L
2	1994	UP		2	0.83	1.79	0		L
2	1996	UP		2	1.57	3.62	0		L
2	1997	UP		2	1.1	1.51	0		UL
2	1997	UP		2	0.92	1.14	0		L
2	1987	UP		2	1.57	3.19	0		L
2	1980	UP	Medium	3	1.46	1.86	0		UL
2	1986	USE	Truck	3	1.5	1.94	0		UL
2	1991	URI		3	2.23	5.23	0		L
2	1992	UP		3	1.53	1.74	0		L
2	1992	UP		3	1.38	2.25	0		L
2	1985	UTI		3	1.84	1.95	0		L
2	1985	UIA		3	2.29	4.01	0		L
2	1987	UH		3	3.13	6.51	0		L
2	1983	UTI		3	1.64	1.83	0		UL
2	1995	UP		3	2.01	2.9	0		L
2	1990	UP		3	3.57	5.87	0		L
2	1996	UP		3	3.14	6.88	0		L
2	1993	UP		3	2.05	2.06	0		L
2	1996	UP		3	2.52	1.93	0		L
2	1988	UH		3	1.57	4.9	0		L
2	1991	DL		3	1.92	5.33	0		L
2	1989	UP		3	1.76	1.91	0		UL
2	1972	UP		3	1.58	1.44	0		UL
2	1993	HR		3	2.95	6.04	0		L
2	1992	UMH		3	0.83	0.97	0		UL
2	1990	UP		3	1.08	1.85	0		UL
2	1996	HR		3	1.26	2.96	0		UL
2	1997	UP		3	2.65	5.17	0		L
2	1990	UR		3	2.85	6.15	0		L
2	1992	HR		3	3.22	5.85	0		L
2	1997	UP		3	1.76	3.12	0		L
2	1993	HR		3	2.42	3.59	0		L

A12-3 Axle Load Data (Bareilly) (5/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
2	1983	UR	Medium	3	2.61	6.22	0	.	L
2	1989	UP	Truck	3	1.88	1.69	0	.	UL
2	1992	UP		3	2.46	4.9	0	.	UL
2	1969	USW		3	1.98	5.23	0	.	L
2	1992	UP		3	2.1	5.88	0	.	L
2	1995	DL		3	2.53	4.57	0	.	L
2	1990	DL		3	2.91	6.36	0	.	L
2	1982	URU		3	2.83	3.39	0	.	L
2	1980	UB		3	2.66	5.82	0	.	L
2	1979	USC		3	1.94	2.95	0	.	UL
2	1995	UP		3	1.69	1.97	0	.	UL
2	1991	UP		3	1.97	1.78	0	.	L
2	1995	UP		3	3.03	4.5	0	.	UL
2	1994	MP		3	2.97	5.14	0	.	L
2	1990	UH		3	2.75	5.12	0	.	L
2	1995	UP		3	1.64	2.78	0	.	UL
2	1996	DL		3	3.67	6.92	0	.	L
2	1980	URK		3	1.78	5.49	0	.	L
2	1985	WGQ		3	3.39	5.04	0	.	L
2	1988	WGQ		3	3.5	4.68	0	.	L
2	1985	UAN		3	2.71	3.77	0	.	L
2	1996	HR		3	1.54	3.73	0	.	L
2	1997	UP		3	2.44	5.75	0	.	L
2	1979	URK		3	0.98	1.94	0	.	UL
2	1972	US7		3	1.73	1.44	0	.	L
2	1994	URM		3	2.26	3.19	0	.	L
2	1997	UP		3	3.67	3.79	0	.	L
2	1987	DIG		3	1.76	1.83	0	.	UL
2	1987	DIG		3	3.02	9.01	0	.	L
2	1990	DIG		3	7.55	5.13	0	.	L
2	1985	UP		3	2.62	5.79	0	.	L
2	1980	UGL		3	1.4	1.48	0	.	UL
2	1991	MP		3	2.18	3.01	0	.	L
2	1986	USR		3	2.44	5.31	0	.	L
2	1992	PB		3	2.63	4.27	0	.	L
2	1996	HR		3	1.89	4.88	0	.	L
2	1990	DL		3	3.1	5.89	0	.	L
2	1990	MP		3	3	6.98	0	.	L
2	1992	UP		3	2.44	5.95	0	.	L
2	1989	DL		3	2.14	4.79	0	.	L
2	1985	UP		3	2.05	4.58	0	.	L
2	1992	UP		3	1.94	2.91	0	.	UL

A12-3 Axle Load Data (Bareilly) (6/6)

Date : 19 Nov. 1997
Road : NH 24 (km 252)

Direction	Model	Registration	Vehicle Type		Axle Loading (ton)				Load / Unload
				Code No.	Axle 1	Axle 2	Axle 3	Axle 4	
2	1990	UP	Medium	3	3.33	7.21	0	.	L
2	1985	URU	Truck	3	2.39	5.89	0	.	L
2	1990	UP		3	3.12	7.29	0	.	L
2	1992	UP		3	3.63	6.5	0	.	L
2	1988	UP		3	3.19	9.04	0	.	L
2	1985	HR		3	3.98	8.34	0	.	L
2	1996	NL		3	3.98	7.06	0	.	L
2	1995	UP		3	2.63	4.92	0	.	L
2	1990	UP		3	2.07	2.52	0	.	UL
2	1985	UP		3	3.01	10.78	0	.	L
2	1995	DL		3	2.24	1.74	0	.	UL
2	1992	UP		3	3.42	6.65	0	.	UL
2	1988	UP		3	3.64	9.84	0	.	L
2	1981	UR		3	3.24	3.23	0	.	UL
2	1981	UP		3	2.1	9.23	0	.	L
2	1996	UP		3	4.12	9.23	0	.	L
2	1981	UP		3	3.6	7.89	0	.	L
2	1992	UP		3	4.01	8.66	0	.	L
2	1996	UP		3	4.14	9.12	0	.	L
2	1993	UP	Heavy	4	3.01	3.78	3.74	.	L
2	1996	UP	Truck	4	2.48	1.67	1.72	.	L
2	1996	UP		4	1.56	1.52	1.26	.	L

A12-4

Axle Load Data (Gwalior)

A12-4 Axle Load Data (Gwalior) (1/4)

Date : 17 Nov. 1997
Road : NH 3 (km 133.3)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1996	MP	Light Truck	2	1.35	3.11	0	0	L
1	1991	MP		2	0.76	0.66	0	0	UL
1	1997	MP		2	1.02	0.9	0	0	UL
1	1995	MP		2	0.57	6.3	0	0	L
1	1996	PB		2	1.08	2.39	0	0	L
1	1995	MPK		2	1.1	1.4	0	0	UL
1	1995	MP		2	0.92	1.37	0	0	UL
1	1992	MP	Medium Truck	3	1.78	4.03	0	0	L
1	1979	MP		3	2.78	5.61	0	0	L
1	1996	MP		3	3.02	5.49	0	0	L
1	1995	UP		3	3.21	4.85	0	0	L
1	1985	MR		3	2.29	4.11	0	0	L
1	1991	UP		3	2.71	5.4	0	0	L
1	1995	MP		3	2.81	6.56	0	0	L
1	1985	MR		3	2.14	5.46	0	0	L
1	1991	MP		3	2.58	3.99	0	0	L
1	1995	MP		3	3.05	4.62	0	0	L
1	1996	UP		3	2.04	2.24	0	0	UL
1	1991	HR		3	3.24	5.56	0	0	L
1	1987	RJ		3	3.16	6.54	0	0	L
1	1993	MBH		3	1.99	7.44	0	0	L
1	1996	MP		3	1.78	2.14	0	0	UL
1	1991	MP		3	0.86	1.94	0	0	UL
1	1991	MP		3	2.39	6.29	0	0	L
1	1988	MKW		3	3.08	5.53	0	0	L
1	1994	DL		3	3.02	5.45	0	0	L
1	1994	MP		3	3.09	5.38	0	0	L
1	1994	DL		3	3.37	5.26	0	0	L
1	1979	CPH		3	2.45	5.87	0	0	L
1	1994	UP		3	2.04	1.97	0	0	UL
1	1996	UP		3	2.22	5.4	0	0	L
1	1991	AP		3	2.02	6.61	0	0	L
1	1982	MP		3	1.92	5.21	0	0	L
1	1991	MP		3	2.89	7.14	0	0	L
1	1992	DL		3	2.96	7.23	0	0	L
1	1991	UP		3	3.37	6.89	0	0	L
1	1987	UGU		3	2.43	6.59	0	0	L
1	1990	MP		3	1.72	2.24	0	0	UL
1	1992	HR		3	1.69	1.77	0	0	UL
1	1995	DL		3	0.43	5.56	0	0	L
1	1987	CTW		3	3.22	5.52	0	0	L
1	1991	DL		3	2.67	5.44	0	0	L
1	1997	UP		3	3.63	5.76	0	0	L
1	1992	UP		3	3	5.49	0	0	L
1	1991	MP		3	2.67	4.41	0	0	L
1	1996	KL		3	2.16	6.14	0	0	L
1	1991	UP		3	2.89	5.04	0	0	L
1	1986	DL		3	3.53	7.8	0	0	L
1	1995	MP		3	3.21	6.11	0	0	L
1	1990	UP		3	2.78	4.46	0	0	L
1	1990	UP		3	3.58	7.44	0	0	L
1	1995	UP		3	2.96	6.23	0	0	L
1	1996	BRI		3	3.59	6.83	0	0	L
1	1980	CIG		3	2.74	6.11	0	0	L
1	1990	HR		3	2.2	1.94	0	0	UL
1	1996	MP		3	4.46	8.76	0	0	L
1	1996	MP		3	1.66	2.04	0	0	UL
1	1995	MP		3	2.06	2.06	0	0	UL
1	1993	MP		3	1.97	2.51	0	0	UL

A12-4 Axle Load Data (Gwalior) (2/4)

Date : 17 Nov. 1997
Road : NH 3 (km 133.3)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
1	1991	CPG	Medium	3	2.65	6.73	0	0	L
1	1992	MP	Truck	3	3.24	6.83	0	0	L
1	1993	DL		3	1.62	2.11	0	0	UL
1	1989	MKW		3	3.16	5.67	0	0	L
1	1988	MKH		3	2.67	7.02	0	0	L
1	1995	HR		3	3.26	7.27	0	0	L
1	1989	MIH		3	3.13	6.34	0	0	L
1	1997	UP		3	2.27	6.55	0	0	L
1	1996	HR		3	3.42	4.53	0	0	L
1	1996	MP		3	2.86	6.65	0	0	L
1	1997	MP		3	2.01	6.24	0	0	L
1	1996	MP		3	2.83	5.65	0	0	L
1	1996	TN		3	2.21	2.63	0	0	L
1	1990	MBH		3	1.13	3.41	0	0	L
1	1994	MP		3	3.62	6.4	0	0	L
1	1996	MP		3	2.08	3.63	0	0	L
1	1995	MP		3	3.52	6.68	0	0	L
1	1994	MP		3	3.18	7.7	0	0	L
1	1991	UP		3	2.95	7.51	0	0	L
1	1986	CPW		3	1.95	2.23	0	0	UL
1	1996	MP		3	3.03	4.57	0	0	L
1	1990	MP		3	2.85	7.39	0	0	L
1	1995	MP		3	2.85	6.33	0	0	L
1	1992	DL		3	2.8	7	0	0	L
1	1991	DL		3	3.37	6.47	0	0	L
1	1989	MP		3	1.33	2.23	0	0	L
1	1994	MKW		3	2.44	5.37	0	0	L
1	1990	PY		3	2.01	2.11	0	0	L
1	1992	MP		3	2.98	5.74	0	0	L
1	1994	UP		3	2.58	5	0	0	L
1	1995	MP		3	3.38	8.75	0	0	L
1	1989	WAK		3	3.21	5.47	0	0	L
1	1995	NL		3	2.97	6.57	0	0	L
1	1995	MP		3	1.23	3.31	0	0	U
1	1992	HR		3	2.44	3.94	0	0	L
1	1994	DIG		3	2.17	2.01	0	0	UL
1	1995	MRG		3	2.65	7.32	0	0	UL
1	1996	MP		3	3.04	6.28	0	0	L
1	1994	HR		3	2.09	6.03	0	0	L
1	1996	MP		3	2.82	6.07	0	0	L
1	1996	MP		3	2.54	5.6	0	0	L
1	1994	MKW		3	3.14	5.21	0	0	L
1	1992	UP		3	2.06	2.27	0	0	UL
1	1994	HYU		3	1.95	5.79	0	0	L
1	1991	M9		3	2.54	5.72	0	0	L
1	1992	MP		3	2.92	7.01	0	0	L
1	1991	RJ		3	2.84	6.83	0	0	L
1	1989	MP		3	3.33	5.46	0	0	L
1	1986	MKW		3	2.46	5.26	0	0	L
1	1990	MP		3	2.14	5.91	0	0	L
1	1990	MP		3	3.25	6.52	0	0	L
1	1992	MP		3	3.57	5.47	0	0	L
1	1992	GJ		3	1.52	1.84	0	0	UL
1	1997	HP	Heavy	4	2.86	1.01	2.79	0	L
1	1995	HR	Truck	4	2.09	6.01	5.71	0	L
1	1991	MP		4	3.16	6.25	5.49	0	L
1	1989	MP		4	3.5	5.47	5.37	0	L

A12-4 Axle Load Data (Gwalior) (3/4)

Date : 17 Nov. 1997
Road : NH 3 (km 133.3)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
2	1995	MP	Light	2	3.61	7.61	0	0	L
2	1996	MP	Truck	2	1.24	3.04	0	0	L
2	1995	MP		2	1.53	2.57	0	0	L
2	1989	MP		2	2.67	5.88	0	0	L
2	1996	PCQ		2	1.56	2.76	0	0	L
2	1989	CPH	Medium	3	2.24	6.62	0	0	U
2	1992	MP	Truck	3	2.83	5.16	0	0	U
2	1996	MP		3	3.13	5.4	0	0	U
2	1989	MP		3	2.12	5.79	0	0	L
2	1986	MP		3	2.99	4.2	0	0	L
2	1983	MP		3	2.92	6.98	0	0	L
2	1997	MP		3	4.35	7.24	0	0	L
2	1992	MP		3	1.73	2.1	0	0	L
2	1989	MP		3	3	5.47	0	0	L
2	1997	MP		3	2.52	6.69	0	0	L
2	1997	MP		3	2.55	5.26	0	0	L
2	1991	HR		3	3.15	6.69	0	0	L
2	1995	UP		3	3.89	8.32	0	0	L
2	1990	MP		3	3.14	7.79	0	0	L
2	1993	MP		3	1.89	7.5	0	0	L
2	1990	MP		3	1.07	5.66	0	0	L
2	1986	UP		3	2.74	5.25	0	0	L
2	1990	MP		3	2.86	7.23	0	0	L
2	1986	MP		3	2.05	3.33	0	0	UL
2	1991	MP		3	2.62	6.56	0	0	L
2	1990	CIW		3	2.67	7.84	0	0	L
2	1990	CIW		3	2.85	6.18	0	0	L
2	1990	MP		3	2.79	6.25	0	0	L
2	1988	HIX		3	2.5	6.98	0	0	L
2	1993	MP		3	2.51	6.92	0	0	L
2	1991	MP		3	3.59	7.61	0	0	L
2	1996	MP		3	2.23	5.4	0	0	L
2	1995	HP		3	2.23	6.59	0	0	L
2	1991	MP		3	2.02	8.86	0	0	L
2	1995	MP		3	2.01	5.88	0	0	L
2	1988	MKW		3	2.26	6.98	0	0	L
2	1995	MP		3	2.3	8.58	0	0	L
2	1995	MP		3	2.79	7.52	0	0	L
2	1995	MP		3	2.26	4.98	0	0	L
2	1994	MP		3	2.86	5.51	0	0	L
2	1995	MP		3	3.05	7.02	0	0	L
2	1991	UP		3	1.91	2.03	0	0	UL

A12-4 Axle Load Data (Gwalior) (4/4)

Date : 17 Nov. 1997
Road : NH 3 (km 133.3)

Direction	Model	Registration	Vehicle Type	Code No.	Axle Loading (ton) Axle 1	Axle 2	Axle 3	Axle 4	Load / Unload
2	1997	UP	Medium	3	2.04	3.34	0	0	L
2	'1990	MPW	Truck	3	2.4	3.34	0	0	L
2	1990	CPH		3	1.91	2.67	0	0	L
2	1996	MP		3	2.95	7.17	0	0	L
2	1997	MP		3	2.94	7.07	0	0	L
2	1994	HR		3	2.91	7.52	0	0	L
2	1990	UAW		3	2.18	3.26	0	0	UL
2	1996	HR		3	2.32	5.66	0	0	L
2	1997	MP		3	2.99	8.77	0	0	L
2	1997	MP		3	2.83	8.26	0	0	L
2	1990	MP		3	3.03	7.89	0	0	L
2	1996	HR		3	2.96	7.1	0	0	L
2	1996	MP		3	3.03	6.68	0	0	L
2	1989	CPO		3	2.18	6.89	0	0	L
2	1997	MP		3	3.13	6.79	0	0	L
2	1989	UP		3	2.98	7.02	0	0	L
2	1997	MP		3	2.67	6.76	0	0	L
2	1991	MP		3	2.83	8.3	0	0	L
2	1988	UP	Heavy Truck	4	3	1.1	2.26	0	L

A12-5

Questionnaire for Opinion Survey on Toll Bypass (Bareilly)

Sample No.	1-(1)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Farmers about Toll Bypass (Bareilly)

1 Name and Address :

Name :

Address : (Mark the sample No. on a map)

2 How much cultivable land do you own ? ha

3 Annual production of major crops ?

Crops	Tonnes per annum
1)	
2)	
3)	
4)	
5)	

4 What is the main market for your major products ?

Crops	Market Place (Mark the location on a map)	Distance to market (km)
1)		
2)		
3)		
4)		
5)		

5 How do you usually transport your major produce ? (Mark with ✓)

LCV (pickup)		MAV		Bullock/Horse Cart	
HCV (truck)		Tractor			

6 How many trips do you make in a week/month by vehicles ?

	per week		per month

7 Do you feel the need/usefulness of the proposed Bareilly Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

8 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

9 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

10 Please give your suggestions and comments regarding the proposed Bareilly Bypass, if any.

Sample No.	1-(2)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Traders/Truck Operators about Toll Bypass (Bareilly)

1 Name and Address of Operator :

Name :

Address : (Mark the sample No. on a map)

2 Fleet Composition (Nos.) :

LCV (pickup)		MAV	
HCV (truck)		Others	

3 Please name five major places (origins & destinations both outside the city/town)

Origin	Destination	Distance (km)
1)		
2)		
3)		
4)		
5)		

4 How many trips do you make in a month with vehicles operated ? ____

5 How much time does it normally take to travel along the existing corridors ?

Corridor	Peak Hour	Off Peak Hour
1) Bareilly to Rampur		
2) Bareilly to Shahjahanpur		
3) Bareilly to Haldwani		
4) Bareilly to Pilibhit		
5) Bareilly to Bisalpur		

6 Do you feel the need/usefulness of the proposed Bareilly Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

7 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

8 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

9 Please give your suggestions and comments regarding the proposed Bareilly Bypass, if any.

Sample No.	1-(3)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Industries/Factories about Toll Bypass (Bareilly)

1 Name of the Organisation/Industry/Factory and Address

Name :

Address : (Mark the sample No. on a map)

2 Names of major commodities manufactured/processed at your unit, and the quantity produced monthly :

Commodity	Quantity
1)	
2)	
3)	
4)	

3 a) Do you arrange to transport the raw materials and finished goods yourself ? Yes/No

b) If yes, please specify the major Origins and Destinations.

Commodity	Origin	Destination
1)		
2)		
3)		
4)		

4 Which mode of transport do you usually use to transport your raw materials and finished goods ? (Mark the vehicle type(s))

LCV (Light Truck)	
HCV (Heavy Truck)	
MAV(Multi Axle)	

5 How many trips do you make in a month to transport your commodities ?

6 Do you feel the need/usefulness of the proposed Bareilly Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

7 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

8 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

9 Please give your suggestions and comments regarding the proposed Bareilly Bypass, if any.

Sample No.	1-(4)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Local Leaders about Toll Bypass (Bareilly)

1 Name and Designation :

Name : _____

Designation : _____

2 Is the present road corridor able to cater to the traffic needs ? Yes/No

3 Do you feel the needs/usefulness of the proposed Bareilly Bypass ? Yes/No

(Reasons of above)
(What do you think about levying toll on users of the proposed bypass ?)

4 Has there been any demand from the Traders/Truck Operators/Industries/Others for alternative Road/Bypass which could save their travel distance and time ? Yes/No

(If Yes, please describe the alternatives.)

5 Do you agree with the proposed alignment of the Bypass ? Any suggestions/comments ?

6 What do you think would be the alternative choice of the people ?

1) Not to have a Bypass	
2) Have a toll Bypass	

7 If a toll bypass, what should be the appropriate toll charges (in Rs.) per :

1) LCV	
2) HCV	
3) MAV	
4) Car	
5) Scooter	
6) Bus	

8 Please give your suggestions and comments regarding the proposed Bareilly Bypass, if any.

A12-6

Questionnaire for Opinion Survey on Toll Bypass (Gwalior)

Sample No.	2-(1)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Farmers about Toll Bypass (Gwalior)

1 Name and Address :

Name :

Address : (Mark the sample No. on a map)

2 How much cultivable land do you own ? ha

3 Annual production of major crops ?

Crops	Tonnes per annum
1)	
2)	
3)	
4)	
5)	

4 What is the main market for your major products ?

Crops	Market Place (Mark the location on a map)	Distance to market (km)
1)		
2)		
3)		
4)		
5)		

5 How do you usually transport your major produce ? (Mark with √)

LCV (pickup)		MAV		Bullock/Horse Cart	
HCV (truck)		Tractor			

6 How many trips do you make in a week/month by vehicles ?

	per week		per month

7 Do you feel the need/usefulness of the proposed Gwalior Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

8 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

9 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

10 Please give your suggestions and comments regarding the proposed Gwalior Bypass, if any.

Sample No.	2-(2)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Traders/Truck Operators about Toll Bypass (Gwalior)

1 Name and Address of Operator :

Name :

Address : (Mark the sample No. on a map)

2 Fleet Composition (Nos.) :

LCV (pickup)		MAV	
HCV (truck)		Others	

3 Please name five major places (origins & destinations both outside the city/town)

Origin	Destination	Distance (km)
1)		
2)		
3)		
4)		
5)		

4 How many trips do you make in a month with vehicles operated ?

5 How much time does it normally take to travel along the existing corridors ?

Corridor	Peak Hour	Off Peak Hour
1) Gwalior to Agra/Delhi		
2) Gwalior to Shivpuri		
3) Gwalior to Datia		
4) Gwalior to Bhind		

6 Do you feel the need/usefulness of the proposed Gwalior Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

7 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

8 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

9 Please give your suggestions and comments regarding the proposed Gwalior Bypass, if any.

Sample No. 2-(3)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Industries/Factories about Toll Bypass (Gwalior)

1 Name of the Organisation/Industry/Factory and Address

Name :

Address : (Mark the sample No. on a map)

2 Names of major commodities manufactured/processed at your unit, and the quantity produced monthly :

Commodity	Quantity
1)	
2)	
3)	
4)	

3 a) Do you arrange to transport the raw materials and finished goods yourself ? Yes/No

b) If yes, please specify the major Origins and Destinations.

Commodity	Origin	Destination
1)		
2)		
3)		
4)		

4 Which mode of transport do you usually use to transport your raw materials and finished goods ? (Mark the vehicle type(s))

LCV (Light Truck)	
HCV (Heavy Truck)	
MAV(Multi Axle)	

5 How many trips do you make in a month to transport your commodities ?

6 Do you feel the need/usefulness of the proposed Gwalior Bypass ? Yes/No

(Reasons of above)	
(How about levying toll ?)	

7 If the proposed bypass reduces the trip distance by following kilometers, how much toll would you pay ?

Distance Savings (km)	up to 2	2-5	5-10	10-15	15-20	more than 20
Amount of toll (Rs.)						

8 If the proposed bypass reduces the trip time by following minutes, how much toll would you pay ?

Time Savings (Min.)	up to 10	10-20	20-30	30-45	45-60	more than 60
Amount of toll (Rs.)						

9 Please give your suggestions and comments regarding the proposed Gwalior Bypass, if any.

Sample No.	2-(4)-

FEASIBILITY STUDY ON NATIONAL HIGHWAY BYPASSES IN INDIA

Questionnaire for Local Leaders about Toll Bypass (Gwalior)

1 Name and Designation :

Name : _____

Designation : _____

2 Is the present road corridor able to cater to the traffic needs ? Yes/No

3 Do you feel the needs/usefulness of the proposed Gwalior Bypass ? Yes/No

(Reasons of above)
(What do you think about levying toll on users of the proposed bypass ?)

4 Has there been any demand from the Traders/Truck Operators/Industries/Others for alternative Road/Bypass which could save their travel distance and time ? Yes/No

(If Yes, please describe the alternatives.)

5 Do you agree with the proposed alignment of the Bypass ? Any suggestions/comments ?

6 What do you think would be the alternative choice of the people ?

1) Not to have a Bypass	
2) Have a toll Bypass	

7 If a toll bypass, what should be the appropriate toll charges (in Rs.) per :

1) LCV	
2) HCV	
3) MAV	
4) Car	
5) Scooter	
6) Bus	

8 Please give your suggestions and comments regarding the proposed Gwalior Bypass, if any.
