

**H. SCOPE OF WORK
 AND
MINUTES OF MEETING**

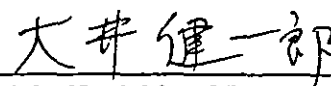
SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
CONSTRUCTION OF EASTERN ARTERIAL ROAD
IN
MONGOLIA

AGREED UPON BETWEEN
DEPARTMENT OF ROADS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

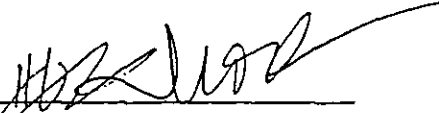
Ulaanbaatar, 14th December 2000



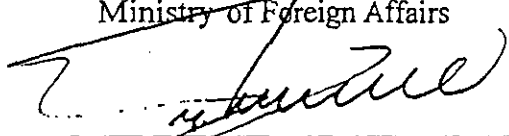
Mr. Khosbayar AMARSAIKHAN
Director General,
Department of Economic Cooperation
Management and Coordination,
Ministry of Finance and Economy



Mr. Kenichiro OI
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency (JICA)



Mr. Jantsan GULGOU
Deputy Director,
Asia and America Department,
Ministry of Foreign Affairs



Mr. Tsegmed TSENGEL
State Secretary,
Ministry of Infrastructure



Mr. Rentsen BUD
Director General,
Department of Roads

I .INTRODUCTION

In response to a request from the Government of Mongolia (hereinafter referred to as "GOM"), the Government of Japan (hereinafter referred to as "GOJ") decided to conduct the Feasibility Study on Construction of Eastern Arterial Road in Mongolia (hereinafter referred to as "the Study"), in accordance with the relevant 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 the technical cooperation programmes of the GOJ, will undertake the Study, in close cooperation with the authorities concerned of the GOM.

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

II .OBJECTIVES OF THE STUDY

The objective of the Study is to carry out the feasibility study on the construction of the Eastern Arterial Road.

III. STUDY AREA

The Study shall cover the section from Erdene sum to Undurkhaan sum (approximately 250km).

IV.SCOPE OF THE STUDY

In order to achieve the objective mentioned above, the Study shall cover the following items:

1. Collection, review and analysis of existing data, studies and plans
 - 1) Socio-economic data
 - 2) Development programmes
 - 3) Land use plan
 - 4) Transport plans and other related plans
 - 5) Road administration
 - 6) Traffic data
 - 7) Engineering data
 - 8) Other data necessary for the study
 - 9) On-going road projects and other relevant projects

2. Reconnaissance survey and problem identification
 - 1) Inventory survey
 - 2) Road-side OD survey
 - 3) Traffic counting survey
 - 4) Axle load survey
 - 5) Data processing and analysis
 - 6) Identification of existing road condition problems and issues
3. Natural condition examination
4. Formulation of socio-economic framework and forecast of future traffic demand
5. Proposition of the design criteria
6. Proposition of alternative solutions
7. Preliminary design
8. Construction plan
9. Preparation of management and maintenance plan
10. Cost estimation
11. Environmental impact assessment
12. Economic and financial analysis
13. Implementation plan
14. Overall evaluation and recommendation

V. STUDY SCHEDULE

The Study will be carried out in accordance with attached tentative schedule (APPENDIX).

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VI. REPORTS

JICA shall prepare and submit the following reports in English to GOM:

1. Inception Report:

Twenty (20) copies, at the commencement of the Study.

2. Progress Report:

Twenty (20) copies, within five (5) months after the commencement of the Study.

3. Interim Report

Twenty (20) copies, within ten (10) months after the commencement of the Study.

4. Draft Final Report:

Thirty (30) copies, within thirteen (13) months after the commencement of the Study.

5. Final Report:

Thirty (30) copies, within one (1) months after the receipt of the written comments on the Draft Final Report from the GOM, while these comments are expected to be delivered to JICA within one (1) month after the receipt of the Draft Final Report.

VII. UNDERTAKING OF THE GOVERNMENT OF MONGOLIA

1. To facilitate smooth conduct of the Study, GOM shall take following necessary measures:

- (1) To secure the safety of the Japanese Study team (hereinafter referred to as "the Team") in Mongolia;
- (2) To permit the members of the Team to enter, leave and sojourn in Mongolia for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
- (3) To exempt the members of the Team from taxes, duties and any other charges on equipment, machinery, and other materials brought into Mongolia for the implementation of the Study;
- (4) To exempt the members of the Team from income tax and 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 the remittance as well as utilisation of the funds introduced into Mongolia from Japan in connection with the implementation of the Study;
- (6) To secure permission for the Team to enter the private properties or restricted areas for the conduct of the Study;
- (7) To secure permission for the Team to take all possible data and documents (including maps and photographs) related to the Study out of Mongolia to Japan;

(8) To provide medical services as needed. Its expenses will be chargeable on the members of the Team.

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

3. On behalf of GOM, Ministry of Infrastructure assigned Department of Roads to act as a counterpart agency to the Team and to act as well as the co-ordinating body with other governmental and non-governmental organisations concerned for the smooth implementation of the Study.

4. Department of Roads shall, at its own expense, provide the Team with the following, in co-operation with relevant organisations:

- (1) Available data (including maps) and information related to the Study;
- (2) Counterpart personnel;
- (3) Suitable office space with necessary equipment in Ulaanbaatar; 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 expenses, the Team to Mongolia; and
2. To pursue technology transfer to Mongolian counterpart personnel in the course of the Study.

IX. OTHERS

JICA and Department of Roads shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Handwritten signatures and initials in the bottom right corner, including a large signature and the letters "KH".

APPENDIX

Tentative Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Year	2001												2002			
Month of the year	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Work in Mongolia																
Work in Japan	<input type="checkbox"/>											<input type="checkbox"/>				
Reports	△	△	△	△	△	△	△	△	△	△	△	△	△	△	△	△
	IC/R				P/R					IT/R			DF/R			F/R

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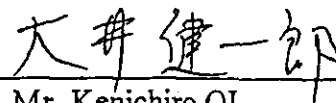
MINUTES OF MEETING
ON
SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
CONSTRUCTION OF EASTERN ARTERIAL ROAD
IN
MONGOLIA

AGREED UPON BETWEEN
DEPARTMENT OF ROADS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar, 14th December 2000



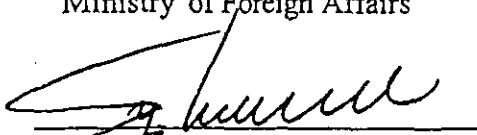
Mr. Khosbayar AMARSAIKHAN
Director General,
Department of Economic Cooperation
Management and Coordination,
Ministry of Finance and Economy



Mr. Kenichiro OI
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency (JICA)



Mr. Jantsan GULGOU
Deputy Director,
Asia and America Department,
Ministry of Foreign Affairs



Mr. Tsegmed TSENGEL
State Secretary,
Ministry of Infrastructure



Mr. Rentsen BUD
Director General,
Department of Roads

I Introduction

The Japanese Preparatory Study Team organised by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Kenichiro OI (Deputy Director, Road Department, Kinki Regional Construction Bureau, Ministry of Construction), visited Mongolia from December 5th to 22nd, 2000 to discuss the Scope of Work for the Feasibility Study on Construction of Eastern Arterial Road in Mongolia (herein after referred to as "the Study").

The Team exchanged views and had a series of discussions on the Scope of Work for the Study with relevant authorities of the government of Mongolia (hereinafter referred to as "GOM"). The list of attendants appears in the Appendix 1. The Team also carried out field surveys.

Through the discussion, both sides have completed the Scope of Work and agreed or confirmed the following points for the smooth implementation of the Study.

II Discussion and Confirmation

1. Scope of Works

The Scope of Works was agreed by both GOM and the Preparatory Study Team.

2. Reports

- (1) GOM requested that the summary version of Draft Final Report and Final Report should be presented in Mongolian as well as English to promote effective explanations for relevant authorities. The Preparatory Study Team promised to convey this request to the JICA Headquarters. And both sides agreed that if any doubt arise English version shall prevail.
- (2) GOM also requested that the main report of Final Report would be presented in Mongolian. The Preparatory Team replied that it is difficult due to the budgetary constraints.

3. Vehicles and drivers

GOM explained budgetary difficulties to prepare vehicles and drivers for the Full Scale Study Team and gave requests for the preparation by JICA.

The Preparatory Study Team agreed on this point.

4. Office spaces and equipment

GOM has agreed to provide the furnished office spaces (that of approximately 60 m²) for the Study Team in Ulaanbaatar with necessary equipment such as telephone lines.

5. Steering Committee

Steering committee for the Study shall be organised and chaired by the Department of Roads and participated with relevant authorities in the Appendix 2.

6. Counterpart Training in Japan

GOM requested that a Mongolian counterpart personnel should take advantage of the related training course in Japan to promote an effective technology transfer.

The Preparatory Study Team promised to convey this request to the JICA Headquarters.

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Appendix 1

The List of Attendants

1. Mongolian Side:

<Ministry of Infrastructure>

Mr. Byamba JIGJID	Minister
Mr. Tsegmed TSENGEL	State Secretary
Mr. T. NARANMANDAH	Chief Officer, Department of Road, Transport, Info-Communications and Tourism Policy and Coordination
Ms. Dondog BAYARMAA	Officer, International Cooperation Division
Mr. B. MANDUUL	Officer, Department of Road, Transport, Info-Communications and Tourism Policy and Coordination

<Ministry of Finance and Economy>

Mr. Khosbayar AMARSAIKHAN	Director General, Department of Economic Cooperation Management and Coordination
Mr. L. CHULUUN	Officer, Department of Economic Cooperation Management and Coordination

<Ministry of Foreign Affairs>

Mr. Jantsan GULGOU	Deputy Director, Asia and America Department
Mr. Tuvdendorg JANABAGAR	Second Secretary, Asia and America Department
Mr. L. DAVAAJARGAL	3rd Secretary, Asia and America Department

< Department of Roads>

Mr. Rentsen BUD	Director General
Mr. Lhamjav GOMBO	Head of Planning and Research Division
Ms. G. NARANTUYA	Officer in charge of Traffic Engineering and Projects
Mr. T. BATJARGAL	Officer in charge of Construction Management and Supervision Division
Ms. B. OYUNCHIMEG	Officer in charge of Road and Bridge Inventory
Ms. D. OYUNBADAM	Officer in charge of Foreign Affairs

<Hentii Aimag>

Mr. ERDENEBAATAR	Governor
Mr. SUHBAATAR	Deputy Governor

< State Administration of Geodesy and Cartography>

Mr. B. DEMBEREL	Head of Control Department
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2. Japanese Side:

Mr. Kenichiro OI	Leader / Road Design
Mr. Takumi HASHIMOTO	Road Maintenance
Mr. Hidenori KUMAGAI	Study Planning 1
Ms. Rinko JOGO	Study Planning 2
Mr. Kunio OHASHI	Traffic Survey/ Road Design
Mr. Yasuhiro OKUBO	Natural Condition & Environmental Survey
Mr. Toshiyuki HANDA	Interpreter

Embassy of Japan

Mr. Hiroshi FUKASAWA	First Secretary
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JICA Mongolia Office:

Mr. Kenji MATSUMOTO	Resident Representative
Mr. Tetsuo AMAGAI	Deputy Resident Representative

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Appendix 2

Member of the Steering Committee

1. Chairman:

Ts. TSENGEL (State Secretary, Ministry of Infrastructure)

2. Secretary:

B. MANDUUL (Officer, Department of Road, Transport, Info-Communications and Tourism Policy and Coordination, Ministry of Infrastructure)

3. Members:

- | | |
|---------------------|--|
| (1) G. BAASANJAB | (Director General, Transport, Info-Communications and Tourism Policy and Coordination, Ministry of Infrastructure) |
| (2) D. NARANPUREV | (Head of Division, Cooperation Division, State Administration Department, Ministry of Infrastructure) |
| (3) H. OYUNTSETSEG | (Director General, Trade Policy and Cooperation Division, Ministry of Industry and Trade) |
| (4) D. TSOGTBAATAR | (Deputy Director, Multilateral Cooperation Division, Ministry of Foreign Affairs) |
| (5) B. ERDENEBAATAR | (Head of Division, Foreign Relation Division, Ministry of Justice and Home Affairs) |
| (6) R. BUD | (General Director, Department of Roads) |
| (7) J. BOLORMAA | (Officer, Department of Information, Monitoring and Evaluation, Ministry of Infrastructure) |
| (8) L. CHULUUN | (Officer, Department of Economic Cooperation Management and Coordination, Ministry of Finance and Economy) |
| (9) L. DOLGORMAA | (Senior Researcher, Ministry of Nature and Environment) |
| (10) L. GOMBO | (Head of Planning and Research Division, Department of Roads) |

AGREED MINUTES OF AMENDMENT TO THE SCOPE OF WORK
IN
THE FEASIBILITY STUDY ON CONSTRUCTION OF EASTERN ARTERIAL ROAD
IN
MONGOLIA

AGREED UPON BETWEEN
DEPARTMENT OF ROADS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

The Scope of Work in the Feasibility Study on Construction of Eastern Arterial Road in Mongolia (hereinafter referred to as "the Study") agreed upon between the Department of Roads (hereinafter referred to as "DOR") under the Ministry of Infrastructure and Preparatory Study Team from Japan International Cooperation Agency (hereinafter referred to as "JICA") on December 14 2000, is now considered inappropriate and subsequently must be amended in view of the fact that DOR has commenced the construction of a portion of an area covered in the Study.

1. DOR defined the construction works as follows:

- (1) The total portion, which DOR plans to construct, is approximately 39km from Erdene Sum to Baganuur.
- (2) The portion of which DOR plans to construct is 5km in FY 2001.

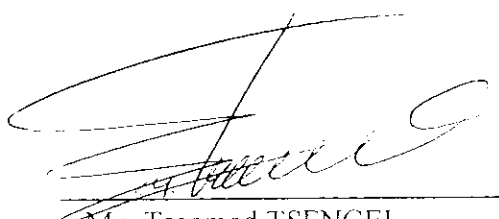
2. Amendment to the study area

- (1) The amendment excludes sufficient preparation for precise Initial Environmental Examination, Hydrological and Hydraulic Survey, Inventory Survey, Traffic Survey, Topographic Survey and Soil Investigation and Material Investigation, which it had already been implemented.
- (2) The total area for the Study shall be amended so as to exclude the area DOR either has already constructed or will construct as defined in 1. above during the execution of the Study.

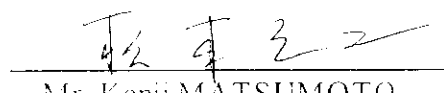
3. Respect for the Study results and responsibility for any consequences

DOR shall respect the results of the Study in every detail and carry out whatever surveys might be required if and when any other construction work in the Study area other than known to both DOR and JICA in writing at the time of signing this Agreed Minutes is carried out.

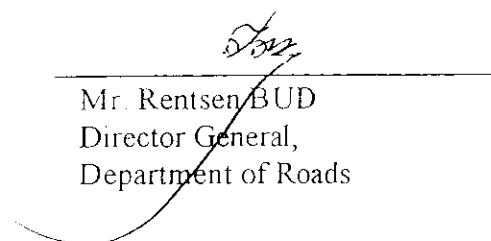
Ulaanbaatar, September 10, 2001



Mr. Tsegmed TSENGEL
State Secretary,
Ministry of Infrastructure



Mr. Kenji MATSUMOTO
Resident Representative,
JICA Mongolia Office



Mr. Rentsen BUD
Director General,
Department of Roads

I. ECONOMIC ANALYSIS

I-1. Base Case (ALT-I)

Table I-1 ALT-I-TS

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: Total Section 258.8km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.80		893.80	0.00	0.00	-893.80
2	2002	893.80		893.80	0.00	0.00	-893.80
3	2003	10,295.08		10,295.08	0.00	0.00	-10,295.08
4	2004	14,563.29		14,563.29	0.00	0.00	-14,563.29
5	2005	13,277.74		13,277.74	0.00	0.00	-13,277.74
6	2006	8,226.04	195.06	8,421.10	3,590.23	3,590.23	-4,830.86
7	2007		426.48	426.48	7,463.84	7,463.84	7,037.36
8	2008		426.48	426.48	7,883.93	7,883.93	7,457.45
9	2009		426.48	426.48	8,328.73	8,328.73	7,902.25
10	2010		426.48	426.48	8,799.77	8,799.77	8,373.30
11	2011		426.48	426.48	9,402.61	9,402.61	8,976.13
12	2012		4,757.17	4,757.17	10,047.85	10,047.85	5,290.68
13	2013		426.48	426.48	10,738.55	10,738.55	10,312.07
14	2014		426.48	426.48	11,478.01	11,478.01	11,051.53
15	2015		426.48	426.48	12,269.75	12,269.75	11,843.27
16	2016		426.48	426.48	13,108.12	13,108.12	12,681.64
17	2017		426.48	426.48	14,005.82	14,005.82	13,579.34
18	2018		426.48	426.48	14,967.20	14,967.20	14,540.72
19	2019		4,945.75	4,945.75	15,996.94	15,996.94	11,051.19
20	2020		426.48	426.48	17,100.09	17,100.09	16,673.61
21	2021		426.48	426.48	18,282.07	18,282.07	17,855.59
22	2022		426.48	426.48	19,548.72	19,548.72	19,122.24
23	2023		426.48	426.48	20,906.32	20,906.32	20,479.85
24	2024		426.48	426.48	22,361.66	22,361.66	21,935.18
25	2025		426.48	426.48	23,922.00	23,922.00	23,495.52
NPV@12%				\$33,121.98		\$44,034.67	

EIRR= 15.7%

NPV= \$10,912.69

B/C= 1.33

Table I-2 ALT-I-S1

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: IP Section 1: Erdene-Kherlen River East L=67.3 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.80		893.80	0.00	0.00	-893.80
2	2002	893.80		893.80	0.00	0.00	-893.80
3	2003	2,635.73		2,635.73	0.00	0.00	-2,635.73
4	2004	3,216.37		3,216.37	0.00	0.00	-3,216.37
5	2005	1,741.93		1,741.93	0.00	0.00	-1,741.93
6	2006		119.02	119.02	1,785.90	1,785.90	1,666.88
7	2007		119.02	119.02	1,873.76	1,873.76	1,754.74
8	2008		119.02	119.02	1,965.96	1,965.96	1,846.94
9	2009		119.02	119.02	2,062.73	2,062.73	1,943.71
10	2010		119.02	119.02	2,164.29	2,164.29	2,045.27
11	2011		119.02	119.02	2,293.73	2,293.73	2,174.71
12	2012		1,032.97	1,032.97	2,430.99	2,430.99	1,398.01
13	2013		119.02	119.02	2,576.54	2,576.54	2,457.52
14	2014		119.02	119.02	2,730.89	2,730.89	2,611.87
15	2015		119.02	119.02	2,894.59	2,894.59	2,775.57
16	2016		119.02	119.02	3,065.95	3,065.95	2,946.93
17	2017		119.02	119.02	3,247.45	3,247.45	3,128.43
18	2018		119.02	119.02	3,439.70	3,439.70	3,320.68
19	2019		1,065.81	1,065.81	3,643.33	3,643.33	2,577.53
20	2020		119.02	119.02	3,859.02	3,859.02	3,740.00
21	2021		119.02	119.02	4,087.47	4,087.47	3,968.45
22	2022		119.02	119.02	4,329.45	4,329.45	4,210.43
23	2023		119.02	119.02	4,585.76	4,585.76	4,466.73
24	2024		119.02	119.02	4,857.23	4,857.23	4,738.21
25	2025		119.02	119.02	5,144.78	5,144.78	5,025.76
NPV@12%				\$7,268.08		\$10,889.16	

EIRR= 17.3%

NPV= \$3,621.08

B/C= 1.50

Table I-3 ALT-I-S2

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: IP Section 2: Kherlen River East -Jargalkhaan L=94.3 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	2,865.59		2,865.59	0.00	0.00	-2,865.59
4	2004	5,772.94		5,772.94	0.00	0.00	-5,772.94
5	2005	6,742.05		6,742.05	0.00	0.00	-6,742.05
6	2006	5,772.94		5,772.94	0.00	0.00	-5,772.94
7	2007		151.98	151.98	1,915.01	1,915.01	1,763.03
8	2008		151.98	151.98	2,027.13	2,027.13	1,875.15
9	2009		151.98	151.98	2,146.11	2,146.11	1,994.13
10	2010		151.98	151.98	2,272.38	2,272.38	2,120.40
11	2011		151.98	151.98	2,431.49	2,431.49	2,279.51
12	2012		1,911.70	1,911.70	2,601.94	2,601.94	690.24
13	2013		151.98	151.98	2,784.55	2,784.55	2,632.56
14	2014		151.98	151.98	2,980.19	2,980.19	2,828.20
15	2015		151.98	151.98	3,189.81	3,189.81	3,037.83
16	2016		151.98	151.98	3,413.06	3,413.06	3,261.08
17	2017		151.98	151.98	3,652.39	3,652.39	3,500.41
18	2018		151.98	151.98	3,908.98	3,908.98	3,757.00
19	2019		2,067.45	2,067.45	4,184.12	4,184.12	2,116.67
20	2020		151.98	151.98	4,479.18	4,479.18	4,327.20
21	2021		151.98	151.98	4,795.64	4,795.64	4,643.66
22	2022		151.98	151.98	5,135.10	5,135.10	4,983.12
23	2023		151.98	151.98	5,499.27	5,499.27	5,347.29
24	2024		151.98	151.98	5,890.01	5,890.01	5,738.02
25	2025		151.98	151.98	6,309.28	6,309.28	6,157.30
NPV@12%				\$13,700.08		\$10,968.48	

EIRR= 9.4%

NPV= -\$2,731.60

B/C= 0.80

Table I-4 ALT-I-S3

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: IP Section 3: Jargaltkhaan-Murun West L=50.0 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	2,453.10		2,453.10	0.00	0.00	-2,453.10
4	2004	2,453.10		2,453.10	0.00	0.00	-2,453.10
5	2005	2,453.10		2,453.10	0.00	0.00	-2,453.10
6	2006	2,453.10		2,453.10	0.00	0.00	-2,453.10
7	2007		79.44	79.44	1,763.24	1,763.24	1,683.80
8	2008		79.44	79.44	1,864.76	1,864.76	1,785.32
9	2009		79.44	79.44	1,972.39	1,972.39	1,892.95
10	2010		79.44	79.44	2,086.52	2,086.52	2,007.09
11	2011		79.44	79.44	2,234.62	2,234.62	2,155.19
12	2012		896.83	896.83	2,393.50	2,393.50	1,496.66
13	2013		79.44	79.44	2,563.95	2,563.95	2,484.51
14	2014		79.44	79.44	2,746.85	2,746.85	2,667.41
15	2015		79.44	79.44	2,943.11	2,943.11	2,863.67
16	2016		79.44	79.44	3,150.15	3,150.15	3,070.72
17	2017		79.44	79.44	3,372.30	3,372.30	3,292.87
18	2018		79.44	79.44	3,610.69	3,610.69	3,531.26
19	2019		896.83	896.83	3,866.55	3,866.55	2,969.72
20	2020		79.44	79.44	4,141.21	4,141.21	4,061.78
21	2021		79.44	79.44	4,436.10	4,436.10	4,356.67
22	2022		79.44	79.44	4,752.76	4,752.76	4,673.32
23	2023		79.44	79.44	5,092.85	5,092.85	5,013.41
24	2024		79.44	79.44	5,458.16	5,458.16	5,378.72
25	2025		79.44	79.44	5,850.63	5,850.63	5,771.19
NPV@12%				\$6,540.98		\$10,113.62	

EIRR: 17.6%

NPV= \$3,572.64

B/C= 1.55

Table I-5 ALT-I-S4

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: IP Section 4: Murun West -Undurkhaan L=46.8 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	2,340.66		2,340.66	0.00	0.00	-2,340.66
4	2004	3,120.88		3,120.88	0.00	0.00	-3,120.88
5	2005	2,340.66		2,340.66	0.00	0.00	-2,340.66
6	2006	0.00	76.04	76.04	1,804.33	1,804.33	1,728.30
7	2007		76.04	76.04	1,911.83	1,911.83	1,835.80
8	2008		76.04	76.04	2,026.08	2,026.08	1,950.04
9	2009		76.04	76.04	2,147.50	2,147.50	2,071.46
10	2010		76.04	76.04	2,276.59	2,276.59	2,200.55
11	2011		76.04	76.04	2,442.77	2,442.77	2,366.73
12	2012		915.66	915.66	2,621.42	2,621.42	1,705.76
13	2013		76.04	76.04	2,813.52	2,813.52	2,737.48
14	2014		76.04	76.04	3,020.08	3,020.08	2,944.05
15	2015		76.04	76.04	3,242.24	3,242.24	3,166.21
16	2016		76.04	76.04	3,478.95	3,478.95	3,402.92
17	2017		76.04	76.04	3,733.67	3,733.67	3,657.63
18	2018		76.04	76.04	4,007.82	4,007.82	3,931.78
19	2019		915.66	915.66	4,302.93	4,302.93	3,387.27
20	2020		76.04	76.04	4,620.68	4,620.68	4,544.64
21	2021		76.04	76.04	4,962.85	4,962.85	4,886.82
22	2022		76.04	76.04	5,331.41	5,331.41	5,255.37
23	2023		76.04	76.04	5,728.45	5,728.45	5,652.41
24	2024		76.04	76.04	6,156.26	6,156.26	6,080.22
25	2025		76.04	76.04	6,617.31	6,617.31	6,541.27
NPV@12%				\$5,612.83		\$12,063.40	

EIRR: 23.2%

NPV= \$6,450.57

B/C= 2.15

I - 2. Sensitivity Tests (ALT-I)

Table I-6 ALT-I: Sensitivity Tests (1)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: Total Section 258.4km

Test-1 Costs Increased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	983.2		983.2			(983.2)
2	2002	983.2		983.2			(983.2)
3	2003	11,324.6		11,324.6			(11,324.6)
4	2004	16,019.6		16,019.6			(16,019.6)
5	2005	14,605.5	-	14,605.5	-		(14,605.5)
6	2006	9,048.6	214.6	9,263.2	3,590.2	3590.2	(5,673.0)
7	2007		469.1	469.1	7,463.8	7463.8	6,994.7
8	2008		469.1	469.1	7,883.9	7883.9	7,414.8
9	2009		469.1	469.1	8,328.7	8328.7	7,859.6
10	2010		469.1	469.1	8,799.8	8799.8	8,330.6
11	2011		469.1	469.1	9,402.6	9402.6	8,933.5
12	2012		5,232.9	5,232.9	10,047.8	10047.8	4,815.0
13	2013		469.1	469.1	10,738.6	10738.6	10,269.4
14	2014		469.1	469.1	11,478.0	11478.0	11,008.9
15	2015		469.1	469.1	12,269.8	12269.8	11,800.6
16	2016		469.1	469.1	13,108.1	13108.1	12,639.0
17	2017		469.1	469.1	14,005.8	14005.8	13,536.7
18	2018		469.1	469.1	14,967.2	14967.2	14,498.1
19	2019		5,440.3	5,440.3	15,996.9	15996.9	10,556.6
20	2020		469.1	469.1	17,100.1	17100.1	16,631.0
21	2021		469.1	469.1	18,282.1	18282.1	17,812.9
22	2022		469.1	469.1	19,548.7	19548.7	19,079.6
23	2023		469.1	469.1	20,906.3	20906.3	20,437.2
24	2024		469.1	469.1	22,361.7	22361.7	21,892.5
25	2025		469.1	469.1	23,922.0	23922.0	23,452.9

EIRR: 14.4%

Table I-7 ALT-I: Sensitivity Tests (2)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: Total Section 258.4km

Test-2 Benefits Decreased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.8		893.8			(893.8)
2	2002	893.8		893.8			(893.8)
3	2003	10,295.1		10,295.1			(10,295.1)
4	2004	14,563.3		14,563.3			(14,563.3)
5	2005	13,277.7	-	13,277.7	-		(13,277.7)
6	2006	8,226.0	195.1	8,421.1	3,231.2	3231.2	(5,189.9)
7	2007		426.5	426.5	6,717.5	6717.5	6,291.0
8	2008		426.5	426.5	7,095.5	7095.5	6,669.1
9	2009		426.5	426.5	7,495.9	7495.9	7,069.4
10	2010		426.5	426.5	7,919.8	7919.8	7,493.3
11	2011		426.5	426.5	8,462.3	8462.3	8,035.9
12	2012		4,757.2	4,757.2	9,043.1	9043.1	4,285.9
13	2013		426.5	426.5	9,664.7	9664.7	9,238.2
14	2014		426.5	426.5	10,330.2	10330.2	9,903.7
15	2015		426.5	426.5	11,042.8	11042.8	10,616.3
16	2016		426.5	426.5	11,797.3	11797.3	11,370.8
17	2017		426.5	426.5	12,605.2	12605.2	12,178.8
18	2018		426.5	426.5	13,470.5	13470.5	13,044.0
19	2019		4,945.7	4,945.7	14,397.2	14397.2	9,451.5
20	2020		426.5	426.5	15,390.1	15390.1	14,963.6
21	2021		426.5	426.5	16,453.9	16453.9	16,027.4
22	2022		426.5	426.5	17,593.8	17593.8	17,167.4
23	2023		426.5	426.5	18,815.7	18815.7	18,389.2
24	2024		426.5	426.5	20,125.5	20125.5	19,699.0
25	2025		426.5	426.5	21,529.8	21529.8	21,103.3

EIRR: 14.3%

Table I-8 ALT-I: Sensitivity Tests (3)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-I: All Asphalt Concrete Pavement

Base Case: Total Section 258.4km

Test-3 Costs Increased By 10% And Benefits Decreased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	983.2		983.2			(983.2)
2	2002	983.2		983.2			(983.2)
3	2003	11,324.6		11,324.6			(11,324.6)
4	2004	16,019.6		16,019.6			(16,019.6)
5	2005	14,605.5		14,605.5			(14,605.5)
6	2006	9,048.6	214.6	9,263.2	3,231.2	3231.2	(6,032.0)
7	2007		469.1	469.1	6,717.5	6717.5	6,248.3
8	2008		469.1	469.1	7,095.5	7095.5	6,626.4
9	2009		469.1	469.1	7,495.9	7495.9	7,026.7
10	2010		469.1	469.1	7,919.8	7919.8	7,450.7
11	2011		469.1	469.1	8,462.3	8462.3	7,993.2
12	2012		5,232.9	5,232.9	9,043.1	9043.1	3,810.2
13	2013		469.1	469.1	9,664.7	9664.7	9,195.6
14	2014		469.1	469.1	10,330.2	10330.2	9,861.1
15	2015		469.1	469.1	11,042.8	11042.8	10,573.7
16	2016		469.1	469.1	11,797.3	11797.3	11,328.2
17	2017		469.1	469.1	12,605.2	12605.2	12,136.1
18	2018		469.1	469.1	13,470.5	13470.5	13,001.3
19	2019		5,440.3	5,440.3	14,397.2	14397.2	8,956.9
20	2020		469.1	469.1	15,390.1	15390.1	14,921.0
21	2021		469.1	469.1	16,453.9	16453.9	15,984.7
22	2022		469.1	469.1	17,593.8	17593.8	17,124.7
23	2023		469.1	469.1	18,815.7	18815.7	18,346.6
24	2024		469.1	469.1	20,125.5	20125.5	19,656.4
25	2025		469.1	469.1	21,529.8	21529.8	21,060.7

EIRR: 13.0%

I - 3. Financial Capital Cost (ALT-I)

Table I-9 ALT-I: Financial Capital Cost

Base Case: Total Section 258.8km

Alternative-I: All Asphalt Concrete Pavement

Description	Total Financial Cost (\$)	AT JAN. 2002 PRICES			
		Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
1. Direct Construction Cost	42,870,627	8,531,508	18,736,866	8,691,405	6,910,848
2. Physical Contingency (10% of 1)	4,287,063	853,151	1,873,687	869,141	691,085
3. Construction Cost (total of 1&2)	47,157,690	9,384,658	20,610,553	9,560,546	7,601,933
4. Land Acquisition and Compensation	0	0	0	0	0
5. Engineering Services	1,302,913	169,722	618,317	286,816	228,058
6. Supervisory Services	1,737,217	226,295	824,422	382,422	304,077
Total	50,197,819	9,780,675	22,053,292	10,229,784	8,134,068

Capital Cost \$

	Total Financial Cost (\$)	Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
2001	931,818	931,818	0	0	0
2002	931,818	931,818	0	0	0
2003	10,732,988	2,747,839	2,987,483	2,557,446	2,440,220
2004	15,182,743	3,353,179	6,018,491	2,557,446	3,253,627
2005	13,842,514	1,816,021	7,028,827	2,557,446	2,440,220
2006	8,575,937	0	6,018,491	2,557,446	0
Total	50,197,819	9,780,675	22,053,292	10,229,784	8,134,068

O/M (\$)

	Total Financial Cost (\$)	Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
Routine (annual)	444,620	124,085	158,448	82,815	79,272
Periodic (year 2012)	4,514,896	952,827	1,834,565	852,166	875,337
Periodic (year 2019)	4,711,497	987,057	1,996,937	852,166	875,337
Road Length (km)	258.8	67.6	94.4	50.0	46.8

I - 4. Economic Capital Cost (ALT-I)

Table I-10 ALT-I: Economic Capital Cost

Base Case: Total Section 258.8km

Alternative-I: All Asphalt Concrete Pavement

Economic Capital Cost \$

	Total Economic Cost (\$)	Economic Cost of Section I (\$)	Economic Cost of Section II (\$)	Economic Cost of Section III (\$)	Economic Cost of Section IV (\$)
2001	893,800	893,800			
2002	893,800	893,800			
2003	10,295,082	2,635,727	2,865,593	2,453,102	2,340,659
2004	14,563,287	3,216,370	5,772,936	2,453,102	3,120,879
2005	13,277,740	1,741,927	6,742,051	2,453,102	2,340,659
2006	8,226,039		5,772,936	2,453,102	
Total	48,149,748	9,381,624	21,153,517	9,812,409	7,802,198

Financial Capital Cost \$

	Total Financial Cost (\$)	Financial Cost of Section I (\$)	Financial Cost of Section II (\$)	Financial Cost of Section III (\$)	Financial Cost of Section IV (\$)
2001	931,818	931,818	0	0	0
2002	931,818	931,818	0	0	0
2003	10,732,988	2,747,839	2,987,483	2,557,446	2,440,220
2004	15,182,743	3,353,179	6,018,491	2,557,446	3,253,627
2005	13,842,514	1,816,021	7,028,827	2,557,446	2,440,220
2006	8,575,937	0	6,018,491	2,557,446	0
Total	50,197,819	9,780,675	22,053,292	10,229,784	8,134,068

Economic O/M (\$)

	Total Economic Cost (\$)	Economic Cost of Section I (\$)	Economic Cost of Section II (\$)	Economic Cost of Section III (\$)	Economic Cost of Section IV (\$)
Routine (annual)	426,480	119,023	151,983	79,436	76,037
Periodic (year 2012)	4,330,689	913,952	1,759,715	817,398	839,624
Periodic (year 2019)	4,519,268	946,785	1,915,462	817,398	839,624
Road Length (km)	258.8	67.6	94.4	50.0	46.8

Financial O/M (\$)

	Total Financial Cost (\$)	Financial Cost of Section I (\$)	Financial Cost of Section II (\$)	Financial Cost of Section III (\$)	Financial Cost of Section IV (\$)
Routine (annual)	444,620	124,085	158,448	82,815	79,272
Periodic (year 2012)	4,514,896	952,827	1,834,565	852,166	875,337
Periodic (year 2019)	4,711,497	987,057	1,996,937	852,166	875,337
Road Length (km)	258.8	67.6	94.4	50.0	46.8

I - 5. Base Case (ALT-II)

Table I-11 ALT-II-TS

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: Total Section 258.8km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.80		893.80	0.00	0.00	-893.80
2	2002	893.80		893.80	0.00	0.00	-893.80
3	2003	9,347.29		9,347.29	0.00	0.00	-9,347.29
4	2004	13,175.96		13,175.96	0.00	0.00	-13,175.96
5	2005	11,895.68		11,895.68	0.00	0.00	-11,895.68
6	2006	7,294.04	194.24	7,488.28	3,590.23	3,590.23	-3,898.05
7	2007		424.01	424.01	7,463.84	7,463.84	7,039.83
8	2008		1,169.65	1,169.65	7,883.93	7,883.93	6,714.27
9	2009		424.01	424.01	8,328.73	8,328.73	7,904.72
10	2010		424.01	424.01	8,799.77	8,799.77	8,375.76
11	2011		1,169.65	1,169.65	9,402.61	9,402.61	8,232.95
12	2012		3,097.68	3,097.68	10,047.85	10,047.85	6,950.17
13	2013		424.01	424.01	10,738.55	10,738.55	10,314.54
14	2014		1,169.65	1,169.65	11,478.01	11,478.01	10,308.36
15	2015		424.01	424.01	12,269.75	12,269.75	11,845.74
16	2016		424.01	424.01	13,108.12	13,108.12	12,684.11
17	2017		1,169.65	1,169.65	14,005.82	14,005.82	12,836.16
18	2018		424.01	424.01	14,967.20	14,967.20	14,543.18
19	2019		3,286.26	3,286.26	15,996.94	15,996.94	12,710.68
20	2020		1,169.65	1,169.65	17,100.09	17,100.09	15,930.44
21	2021		424.01	424.01	18,282.07	18,282.07	17,858.06
22	2022		424.01	424.01	19,548.72	19,548.72	19,124.71
23	2023		1,169.65	1,169.65	20,906.32	20,906.32	19,736.67
24	2024		424.01	424.01	22,361.66	22,361.66	21,937.64
25	2025		424.01	424.01	23,922.00	23,922.00	23,497.99
NPV@12%				\$30,590.95		\$44,034.67	

EIRR= 16.8%

NPV= \$13,443.72

B/C= 1.44

Table I-12 ALT-II-S1

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: IP Section 1: Erdene-Kherlen River East L=67.3 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.80		893.80	0.00	0.00	-893.80
2	2002	893.80		893.80	0.00	0.00	-893.80
3	2003	2,635.73		2,635.73	0.00	0.00	-2,635.73
4	2004	3,216.37		3,216.37	0.00	0.00	-3,216.37
5	2005	1,741.93		1,741.93	0.00	0.00	-1,741.93
6	2006		119.02	119.02	1,785.90	1,785.90	1,666.88
7	2007		119.02	119.02	1,873.76	1,873.76	1,754.74
8	2008		119.02	119.02	1,965.96	1,965.96	1,846.94
9	2009		119.02	119.02	2,062.73	2,062.73	1,943.71
10	2010		119.02	119.02	2,164.29	2,164.29	2,045.27
11	2011		119.02	119.02	2,293.73	2,293.73	2,174.71
12	2012		1,032.97	1,032.97	2,430.99	2,430.99	1,398.01
13	2013		119.02	119.02	2,576.54	2,576.54	2,457.52
14	2014		119.02	119.02	2,730.89	2,730.89	2,611.87
15	2015		119.02	119.02	2,894.59	2,894.59	2,775.57
16	2016		119.02	119.02	3,065.95	3,065.95	2,946.93
17	2017		119.02	119.02	3,247.45	3,247.45	3,128.43
18	2018		119.02	119.02	3,439.70	3,439.70	3,320.68
19	2019		1,065.81	1,065.81	3,643.33	3,643.33	2,577.53
20	2020		119.02	119.02	3,859.02	3,859.02	3,740.00
21	2021		119.02	119.02	4,087.47	4,087.47	3,968.45
22	2022		119.02	119.02	4,329.45	4,329.45	4,210.43
23	2023		119.02	119.02	4,585.76	4,585.76	4,466.73
24	2024		119.02	119.02	4,857.23	4,857.23	4,738.21
25	2025		119.02	119.02	5,144.78	5,144.78	5,025.76
NPV@12%				\$7,268.08		\$10,889.16	

EIRR= 17.3%

NPV= \$3,621.08

B/C= 1.50

Table I-13 ALT-II-S2

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: IP Section 2: Kherlen River East -Jargaltkhaan L=94.3 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	2,563.36		2,563.36	0.00	0.00	-2,563.36
4	2004	5,145.00		5,145.00	0.00	0.00	-5,145.00
5	2005	6,005.54		6,005.54	0.00	0.00	-6,005.54
6	2006	5,145.00		5,145.00	0.00	0.00	-5,145.00
7	2007		151.20	151.20	1,915.01	1,915.01	1,763.81
8	2008		151.20	151.20	2,027.13	2,027.13	1,875.93
9	2009		151.20	151.20	2,146.11	2,146.11	1,994.91
10	2010		151.20	151.20	2,272.38	2,272.38	2,121.17
11	2011		151.20	151.20	2,431.49	2,431.49	2,280.29
12	2012		1,910.92	1,910.92	2,601.94	2,601.94	691.02
13	2013		151.20	151.20	2,784.55	2,784.55	2,633.34
14	2014		151.20	151.20	2,980.19	2,980.19	2,828.98
15	2015		151.20	151.20	3,189.81	3,189.81	3,038.61
16	2016		151.20	151.20	3,413.06	3,413.06	3,261.86
17	2017		151.20	151.20	3,652.39	3,652.39	3,501.18
18	2018		151.20	151.20	3,908.98	3,908.98	3,757.78
19	2019		2,066.67	2,066.67	4,184.12	4,184.12	2,117.45
20	2020		151.20	151.20	4,479.18	4,479.18	4,327.97
21	2021		151.20	151.20	4,795.64	4,795.64	4,644.44
22	2022		151.20	151.20	5,135.10	5,135.10	4,983.90
23	2023		151.20	151.20	5,499.27	5,499.27	5,348.07
24	2024		151.20	151.20	5,890.01	5,890.01	5,738.80
25	2025		151.20	151.20	6,309.28	6,309.28	6,158.08
NPV@12%				\$12,346.94		\$10,968.48	

EIRR= 10.6%

NPV= -\$1,378.45

B/C= 0.89

Table I-14 ALT-II-S3

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: IP Section 3: Jargalkhaan-Murun West L=50.0 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	2,149.04		2,149.04	0.00	0.00	-2,149.04
4	2004	2,149.04		2,149.04	0.00	0.00	-2,149.04
5	2005	2,149.04		2,149.04	0.00	0.00	-2,149.04
6	2006	2,149.04		2,149.04	0.00	0.00	-2,149.04
7	2007		78.56	78.56	1,763.24	1,763.24	1,684.67
8	2008		473.71	473.71	1,864.76	1,864.76	1,391.05
9	2009		78.56	78.56	1,972.39	1,972.39	1,893.83
10	2010		78.56	78.56	2,086.52	2,086.52	2,007.96
11	2011		473.71	473.71	2,234.62	2,234.62	1,760.91
12	2012		78.56	78.56	2,393.50	2,393.50	2,314.93
13	2013		78.56	78.56	2,563.95	2,563.95	2,485.39
14	2014		473.71	473.71	2,746.85	2,746.85	2,273.14
15	2015		78.56	78.56	2,943.11	2,943.11	2,864.55
16	2016		78.56	78.56	3,150.15	3,150.15	3,071.59
17	2017		473.71	473.71	3,372.30	3,372.30	2,898.59
18	2018		78.56	78.56	3,610.69	3,610.69	3,532.13
19	2019		78.56	78.56	3,866.55	3,866.55	3,787.99
20	2020		473.71	473.71	4,141.21	4,141.21	3,667.50
21	2021		78.56	78.56	4,436.10	4,436.10	4,357.54
22	2022		78.56	78.56	4,752.76	4,752.76	4,674.19
23	2023		473.71	473.71	5,092.85	5,092.85	4,619.14
24	2024		78.56	78.56	5,458.16	5,458.16	5,379.59
25	2025		78.56	78.56	5,850.63	5,850.63	5,772.07
NPV@12%				\$5,978.48		\$10,113.62	

EIRR= 19.0%

NPV= \$4,135.13

B/C= 1.69

Table I-15 ALT-II-S4

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: IP Section 4: Murun West -Undurkhaan L=46.8 km

US\$ in thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	0.00		0.00	0.00	0.00	0.00
2	2002	0.00		0.00	0.00	0.00	0.00
3	2003	1,999.17		1,999.17	0.00	0.00	-1,999.17
4	2004	2,665.55		2,665.55	0.00	0.00	-2,665.55
5	2005	1,999.17		1,999.17	0.00	0.00	-1,999.17
6	2006	0.00	75.22	75.22	1,804.33	1,804.33	1,729.11
7	2007		75.22	75.22	1,911.83	1,911.83	1,836.61
8	2008		425.72	425.72	2,026.08	2,026.08	1,600.36
9	2009		75.22	75.22	2,147.50	2,147.50	2,072.28
10	2010		75.22	75.22	2,276.59	2,276.59	2,201.37
11	2011		425.72	425.72	2,442.77	2,442.77	2,017.05
12	2012		75.22	75.22	2,621.42	2,621.42	2,546.20
13	2013		75.22	75.22	2,813.52	2,813.52	2,738.30
14	2014		425.72	425.72	3,020.08	3,020.08	2,594.37
15	2015		75.22	75.22	3,242.24	3,242.24	3,167.02
16	2016		75.22	75.22	3,478.95	3,478.95	3,403.73
17	2017		425.72	425.72	3,733.67	3,733.67	3,307.95
18	2018		75.22	75.22	4,007.82	4,007.82	3,932.60
19	2019		75.22	75.22	4,302.93	4,302.93	4,227.71
20	2020		425.72	425.72	4,620.68	4,620.68	4,194.96
21	2021		75.22	75.22	4,962.85	4,962.85	4,887.63
22	2022		75.22	75.22	5,331.41	5,331.41	5,256.19
23	2023		425.72	425.72	5,728.45	5,728.45	5,302.73
24	2024		75.22	75.22	6,156.26	6,156.26	6,081.04
25	2025		75.22	75.22	6,617.31	6,617.31	6,542.09
NPV@12%				\$4,997.45		\$12,063.40	

EIRR= 25.6%

NPV= \$7,065.95

B/C= 2.41

I - 6. Sensitivity Test (ALT-II)

Table I-16 ALT-II: Sensitivity Tests (1)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: Total Section 258.4km

Test-1 Costs Increased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	983.2		983.2			(983.2)
2	2002	983.2		983.2			(983.2)
3	2003	10,282.0		10,282.0			(10,282.0)
4	2004	14,493.6		14,493.6			(14,493.6)
5	2005	13,085.2	-	13,085.2	-		(13,085.2)
6	2006	8,023.4	213.7	8,237.1	3,590.2	3590.2	(4,646.9)
7	2007		466.4	466.4	7,463.8	7463.8	6,997.4
8	2008		1,286.6	1,286.6	7,883.9	7883.9	6,597.3
9	2009		466.4	466.4	8,328.7	8328.7	7,862.3
10	2010		466.4	466.4	8,799.8	8799.8	8,333.4
11	2011		1,286.6	1,286.6	9,402.6	9402.6	8,116.0
12	2012		3,407.4	3,407.4	10,047.8	10047.8	6,640.4
13	2013		466.4	466.4	10,738.6	10738.6	10,272.1
14	2014		1,286.6	1,286.6	11,478.0	11478.0	10,191.4
15	2015		466.4	466.4	12,269.8	12269.8	11,803.3
16	2016		466.4	466.4	13,108.1	13108.1	12,641.7
17	2017		1,286.6	1,286.6	14,005.8	14005.8	12,719.2
18	2018		466.4	466.4	14,967.2	14967.2	14,500.8
19	2019		3,614.9	3,614.9	15,996.9	15996.9	12,382.1
20	2020		1,286.6	1,286.6	17,100.1	17100.1	15,813.5
21	2021		466.4	466.4	18,282.1	18282.1	17,815.7
22	2022		466.4	466.4	19,548.7	19548.7	19,082.3
23	2023		1,286.6	1,286.6	20,906.3	20906.3	19,619.7
24	2024		466.4	466.4	22,361.7	22361.7	21,895.2
25	2025		466.4	466.4	23,922.0	23922.0	23,455.6

EIRR: 15.5%

Table I-17 ALT-II: Sensitivity Tests (2)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: Total Section 258.4km

Test-2 Benefits Decreased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	893.8		893.8			(893.8)
2	2002	893.8		893.8			(893.8)
3	2003	9,347.3		9,347.3			(9,347.3)
4	2004	13,176.0		13,176.0			(13,176.0)
5	2005	11,895.7	-	11,895.7	-		(11,895.7)
6	2006	7,294.0	194.2	7,488.3	3,231.2	3231.2	(4,257.1)
7	2007		424.0	424.0	6,717.5	6717.5	6,293.4
8	2008		1,169.7	1,169.7	7,095.5	7095.5	5,925.9
9	2009		424.0	424.0	7,495.9	7495.9	7,071.8
10	2010		424.0	424.0	7,919.8	7919.8	7,495.8
11	2011		1,169.7	1,169.7	8,462.3	8462.3	7,292.7
12	2012		3,097.7	3,097.7	9,043.1	9043.1	5,945.4
13	2013		424.0	424.0	9,664.7	9664.7	9,240.7
14	2014		1,169.7	1,169.7	10,330.2	10330.2	9,160.6
15	2015		424.0	424.0	11,042.8	11042.8	10,618.8
16	2016		424.0	424.0	11,797.3	11797.3	11,373.3
17	2017		1,169.7	1,169.7	12,605.2	12605.2	11,435.6
18	2018		424.0	424.0	13,470.5	13470.5	13,046.5
19	2019		3,286.3	3,286.3	14,397.2	14397.2	11,111.0
20	2020		1,169.7	1,169.7	15,390.1	15390.1	14,220.4
21	2021		424.0	424.0	16,453.9	16453.9	16,029.9
22	2022		424.0	424.0	17,593.8	17593.8	17,169.8
23	2023		1,169.7	1,169.7	18,815.7	18815.7	17,646.0
24	2024		424.0	424.0	20,125.5	20125.5	19,701.5
25	2025		424.0	424.0	21,529.8	21529.8	21,105.8

EIRR: 15.4%

Table I-18 ALT-II: Sensitivity Tests (3)

Feasibility Study On Construction Of Eastern Arterial Road In Mongolia

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Base Case: Total Section 258.4km

Test-3 Costs Increased By 10% And Benefits Decreased By 10% Total Section

US\$ Thousand

Serial	Year	Capital Cost	Maint. Cost	Total Cost	VOC Benefit	Total Benefit	Net Benefit
1	2001	983.2		983.2			(983.2)
2	2002	983.2		983.2			(983.2)
3	2003	10,282.0		10,282.0			(10,282.0)
4	2004	14,493.6		14,493.6			(14,493.6)
5	2005	13,085.2		13,085.2			(13,085.2)
6	2006	8,023.4	213.7	8,237.1	3,231.2	3231.2	(5,005.9)
7	2007		466.4	466.4	6,717.5	6717.5	6,251.0
8	2008		1,286.6	1,286.6	7,095.5	7095.5	5,808.9
9	2009		466.4	466.4	7,495.9	7495.9	7,029.4
10	2010		466.4	466.4	7,919.8	7919.8	7,453.4
11	2011		1,286.6	1,286.6	8,462.3	8462.3	7,175.7
12	2012		3,407.4	3,407.4	9,043.1	9043.1	5,635.6
13	2013		466.4	466.4	9,664.7	9664.7	9,198.3
14	2014		1,286.6	1,286.6	10,330.2	10330.2	9,043.6
15	2015		466.4	466.4	11,042.8	11042.8	10,576.4
16	2016		466.4	466.4	11,797.3	11797.3	11,330.9
17	2017		1,286.6	1,286.6	12,605.2	12605.2	11,318.6
18	2018		466.4	466.4	13,470.5	13470.5	13,004.1
19	2019		3,614.9	3,614.9	14,397.2	14397.2	10,782.4
20	2020		1,286.6	1,286.6	15,390.1	15390.1	14,103.5
21	2021		466.4	466.4	16,453.9	16453.9	15,987.5
22	2022		466.4	466.4	17,593.8	17593.8	17,127.4
23	2023		1,286.6	1,286.6	18,815.7	18815.7	17,529.1
24	2024		466.4	466.4	20,125.5	20125.5	19,659.1
25	2025		466.4	466.4	21,529.8	21529.8	21,063.4

EIRR: 14.1%

I - 7. Financial Capital Cost (ALT-II)

Table I-19 ALT-II: Financial Capital Cost

Section: Eredene - Undurkhaan L=258.8 km
Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Description	Total Financial Cost (\$)	AT JAN. 2002 PRICES			
		Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
1. Direct Construction Cost	38,752,582	8,531,508	16,704,389	7,614,105	5,902,581
2. Physical Contingency (10% of 1)	3,875,258	853,151	1,670,439	761,411	590,258
3. Construction Cost (total of 1&2)	42,627,841	9,384,658	18,374,827	8,375,516	6,492,839
4. Land Acquisition and Compensation	0	0	0	0	0
5. Engineering Services	1,167,017	169,722	551,245	251,265	194,785
6. Supervisory Services	1,556,023	226,295	734,993	335,021	259,714
Total	45,350,880	9,780,675	19,661,065	8,961,802	6,947,338

Capital Cost \$

	Total Financial Cost (\$)	Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
2001	931,818	931,818	0	0	0
2002	931,818	931,818	0	0	0
2003	9,744,880	2,747,839	2,672,389	2,240,450	2,084,201
2004	13,736,407	3,353,179	5,363,842	2,240,450	2,778,935
2005	12,401,665	1,816,021	6,260,993	2,240,450	2,084,201
2006	7,604,292	0	5,363,842	2,240,450	0
Total	45,350,880	9,780,675	19,661,065	8,961,802	6,947,338

O/M (\$)

	Total Financial Cost (\$)	Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
Routine (annual)	442,858	124,085	157,636	81,905	78,420
Periodic (year 2008)	777,360	0	0	411,954	365,406
Periodic (year 2011)	777,360	0	0	411,954	365,406
Periodic (year 2012)	2,787,393	952,827	1,834,565	0	0
Periodic (year 2014)	777,360	0	0	411,954	365,406
Periodic (year 2017)	777,360	0	0	411,954	365,406
Periodic (year 2019)	2,983,993	987,057	1,996,937	0	0
Periodic (year 2020)	777,360	0	0	411,954	365,406
Periodic (year 2023)	777,360	0	0	411,954	365,406
Road Length (km)	258.8	67.6	94.4	50.0	46.8

I - 8. Economic Capital Cost (ALT-II)

Table I-20 ALT-II: Economic Capital Cost

Section: Eredene - Undurkhaan L=250 km

Alternative-II: Asphalt Concrete Pavement + Bituminous Surface Treatment

Economic Capital Cost \$

	Total Economic Cost (\$)	Economic Cost of Section I (\$)	Economic Cost of Section II (\$)	Economic Cost of Section III (\$)	Economic Cost of Section IV (\$)
2001	893,800	893,800			
2002	893,800	893,800			
2003	9,347,289	2,635,727	2,563,356	2,149,040	1,999,166
2004	13,175,961	3,216,370	5,144,997	2,149,040	2,665,555
2005	11,895,677	1,741,927	6,005,544	2,149,040	1,999,166
2006	7,294,037		5,144,997	2,149,040	
Total	43,500,564	9,381,624	18,858,894	8,596,160	6,663,886

Financial Capital Cost \$

	Total Financial Cost (\$)	Financial Cost of Section I (\$)	Financial Cost of Section II (\$)	Financial Cost of Section III (\$)	Financial Cost of Section IV (\$)
2001	931,818	931,818	0	0	0
2002	931,818	931,818	0	0	0
2003	9,744,880	2,747,839	2,672,389	2,240,450	2,084,201
2004	13,736,407	3,353,179	5,363,842	2,240,450	2,778,935
2005	12,401,665	1,816,021	6,260,993	2,240,450	2,084,201
2006	7,604,292	0	5,363,842	2,240,450	0
Total	45,350,880	9,780,675	19,661,065	8,961,802	6,947,338

Economic O/M (\$)

	Total Economic Cost (\$)	Economic Cost of Section I (\$)	Economic Cost of Section II (\$)	Economic Cost of Section III (\$)	Economic Cost of Section IV (\$)
Routine (annual)	424,011	119,023	151,205	78,563	75,221
Periodic (year 2008)	745,644	0	0	395,146	350,498
Periodic (year 2011)	745,644	0	0	395,146	350,498
Periodic (year 2012)	2,673,667	913,952	1,759,715	0	0
Periodic (year 2014)	745,644	0	0	395,146	350,498
Periodic (year 2017)	745,644	0	0	395,146	350,498
Periodic (year 2019)	2,862,246	946,785	1,915,462	0	0
Periodic (year 2020)	745,644	0	0	395,146	350,498
Periodic (year 2023)	745,644	0	0	395,146	350,498
Road Length (km)	258.8	67.6	94.4	50.0	46.8

Financial O/M (\$)

	Total Financial Cost (\$)	Financial Cost of IP Section 1 (\$)	Financial Cost of IP Section 2 (\$)	Financial Cost of IP Section 3 (\$)	Financial Cost of IP Section 4 (\$)
Routine (annual)	442,858	124,085	157,636	81,905	78,420
Periodic (year 2008)	777,360	-	-	411,954	365,406
Periodic (year 2011)	777,360	-	-	411,954	365,406
Periodic (year 2012)	2,787,393	952,827	1,834,565	-	-
Periodic (year 2014)	777,360	-	-	411,954	365,406
Periodic (year 2017)	777,360	-	-	411,954	365,406
Periodic (year 2019)	2,983,993	987,057	1,996,937	-	-
Periodic (year 2020)	777,360	-	-	411,954	365,406
Periodic (year 2023)	777,360	-	-	411,954	365,406
Road Length (km)	258.8	67.6	94.4	50.0	46.8

I-9. Unit Cost for Economic Analysis

Table I-21 Fuel (Tg/L)

	A-76 gasoline	AI-93 gasoline	Diesel
Ulaanbaatar	350	400	410
Undurhaan	365	520	530

Source: NIC (Feb.27, 2002)

Table I-22 Lubricants

	Lubricant type	Price Tg/L
Petrol	Mobil Super 10W-40	2180
	Mobil Super 10W-30	2230
Diesel	10W-30	2120
	15W-40	2180
Transmission	Mobil GX80W90	2010

Source: NIC (Feb. 27, 2002)

Table I-23 Vehicles

Vehicle type	Marque	Price (mln. Tg)
Light vehicle – Car	Korean Hyundai Sonata	12.0
Light vehicle – Jeep	Russian UAZ	6.0
Small truck	Russian UAZ	5.2
Medium truck		NA
Heavy truck	Russian URAL	9.7 (used)
Microbus	Russian UAZ	5.9
	Korean Hyundai Grace	12.0
Medium bus	Russian PAZ	4.5 (used)
	Korean (KIA)	6.0 (used)

Source: Vehicle Market in UB (Feb. 27, 2002)

Table I-24 Tires (Bridgestone)

Vehicle type	Tire size	Price (thousand Tg)
Small jeep	205x75x15	124.0
MTS Pajero	235x75x15	110.0
Nissan Patrol	255x70x15	150.0
Toyota Land Cruiser	7.50x16	185.0
Truck (2t – 5t)	7.00x15	140.0

Source: Vehicle Market in UB (Feb. 27, 2002)

Table I-25 Tires (made in Russian)

Vehicle type	Tire size	Price (thousand Tg)
Ordinary Truck ZIL-130	260x508x9.0020	80.0
Heavy Truck	MAZ	126.0
Microbus	205x70x14	31.0
Jeep UAZ	215x90x15S	33.0
Tractor UMZ	155x38	175.0

I-10. Relationship between IP Section and Cost Estimate Section

Table I-26 Relationship of Financial Capital Cost between IP Section and Cost Estimate Section

Section	Length (km)	Cost (US\$)						Engineering Service	Supervisory Service	Total
		Base Cost	General	Direct Construction Cost	Physical Contingency	Construction Cost	Engineering Service			
		①	② ①x5%	③ ①+②	④ ③x10%	⑤ ③+④	⑥ ⑤x3%	⑦ ⑤x4%	⑧ ⑤+⑥+⑦	
IP Section 1										
Section I	37.0	37.00		3,388,427	338,842	3,727,270	0	0	3,727,270	
Section II	9.35	505,349	25,268	530,617	53,062	583,680	17,510	23,347	624,537	
Section 2	9.35	377,911	18,896	396,807	39,681	436,490	13,095	17,460	467,045	
Section 3	30.6	4,014,911	200,746	4,215,657	421,566	4,637,220	139,117	185,489	4,961,826	
Sub-Total	67.6	4,898,171	244,909	5,143,080	514,308	5,657,388	169,722	226,295	5,943,405	
IP Section 2										
Section 4	10.00	1,692,229	84,612	1,776,841	177,684	1,954,525	58,636	78,181	2,091,342	
Section 5	10.00	1,891,565	94,578	1,986,143	198,614	2,184,757	65,543	87,390	2,337,690	
Section 6	10.00	2,322,737	116,137	2,438,874	243,887	2,682,761	80,483	107,310	2,870,554	
Section 7	10.00	2,009,020	100,451	2,109,471	210,947	2,320,418	69,613	92,817	2,482,848	
Section 8	49.7	1,753,851	87,693	1,841,544	184,154	2,025,698	60,771	81,028	2,167,497	
Section 9	11.00	2,097,743	104,887	2,202,630	220,263	2,422,893	72,687	96,916	2,592,496	
Section 10	11.00	2,050,850	102,543	2,153,393	215,339	2,368,732	71,062	94,749	2,534,543	
Section 11	11.00	2,187,598	109,380	2,296,978	229,698	2,526,676	75,800	101,067	2,703,543	
Section 12	44.7	1,839,041	91,952	1,930,993	193,099	2,124,092	63,723	84,964	2,272,779	
Sub-Total	94.4	17,844,634	892,232	18,736,866	1,873,687	20,610,553	618,317	824,422	22,053,292	
IP Section 3										
Section 13	10.00	1,656,999	82,850	1,739,849	173,985	1,913,834	57,415	76,553	2,047,802	
Section 14	10.00	1,533,136	76,657	1,609,793	160,979	1,770,772	53,123	70,831	1,894,726	
Section 15	10.00	2,310,750	115,538	2,426,288	242,629	2,668,917	80,068	106,757	2,855,742	
Section 16	10.00	1,571,588	78,579	1,650,167	165,017	1,815,184	54,456	72,607	1,942,247	
Section 17	50.0	1,205,055	60,253	1,265,308	126,531	1,391,839	41,755	55,674	1,489,268	
Sub-Total	50.0	8,277,528	413,877	8,691,405	869,141	9,560,546	286,816	382,422	10,229,784	
IP Section 4										
Section 18	10.00	1,231,370	61,569	1,292,939	129,294	1,422,233	42,667	56,889	1,521,789	
Section 19	10.30	1,517,510	75,876	1,593,386	159,339	1,752,725	52,582	70,109	1,875,416	
Section 20	13.20	2,162,492	108,125	2,270,617	227,062	2,497,679	74,930	99,907	2,672,516	
Section 21	46.9	1,670,387	83,519	1,753,906	175,391	1,929,297	57,879	77,172	2,064,348	
Sub-Total	46.9	6,581,759	329,088	6,910,848	691,085	7,601,933	228,058	304,077	8,134,068	
Total	258.8	37,602,092	1,880,105	42,870,627	4,287,063	47,157,690	1,302,913	1,737,217	50,197,819	

J. LIST OF COLLECTED DATA

J. List of Collected Data

List of Collected Data

Area	East Asia	Name of the Project	The Feasibility Study on Construction of Eastern Arterial Road in Mongolia	Feasibility Study			Collected By	
				Period of the Survey	2001/03/30 - 2001/08/11		Chief Consultant	Mr. Kenji Maruoka
Country	Mongolia							

No.	Title	Size	Pages	original/Copy	Date	Nos.	Published By
1	Yearbook of Statistics	A4	222	original	1999	1	Statistics Department, Mongolia
2	Kuwait Fund, Darkhan Erdenet Road Project, Draft Final Report, Volume 1 Main Report	A4		copy	May, 1997	1	Intercontinental Consultants & Technocrats PVT.Ltd
3	Kuwait Fund, Darkhan Erdenet Road Project, Pavement Condition Report	A4		copy	May, 1997	1	Intercontinental Consultants & Technocrats PVT.Ltd
4	Kuwait Fund, Darkhan Erdenet Road Project, Pavement Design Report	A4		copy	Feb, 1997	1	Intercontinental Consultants & Technocrats PVT.Ltd
5	Kuwait Fund, Construction of Darkhan-Erdenet Road from km 0.00 to 184.00 (excluding reconstruction of Orkhon and Burgaltai bridges), Bidding Documents, Volume 4-Part I, Drawings Road Works	A3		copy		1	Intercontinental Consultants & Technocrats PVT.Ltd
6	Kuwait Fund, Construction of Darkhan-Erdenet Road from km 0.00 to 184.00 (excluding reconstruction of Orkhon and Burgaltai bridges), Bidding Documents, Volume 4-Part II, Drawings Bridge Works	A3		copy		1	Intercontinental Consultants & Technocrats PVT.Ltd
7	Kuwait Fund, Feasibility Study for Erdenet-Bulgan-Murun Road Project, Final Report, Volume 1 Main Report	A4		copy	February, 2001	1	Intercontinental Consultants & Technocrats PVT.Ltd
8	Kuwait Fund, Feasibility Study for Erdenet-Bulgan-Murun Road Project, Final Report, Volume 2 Annexures	A4		copy	February, 2001	1	Intercontinental Consultants & Technocrats PVT.Ltd

No.	Title	Size	Pages	original/Copy	Date	Nos.	Published By
9	WB,Transport Rehabilitation Project, Roads Subproject.Mid Term progress report	A4		copy	1996	1	Scott Wilson Kirkpatrick
10	WB, Transport Rehabilitation Project, Roads Subproject, The Road Network & Road Maintenance resources	A4		copy	February, 1997	1	Scott Wilson Kirkpatrick
11	WB, Road Maintenance manual	A4		copy	June, 2000	1	Scott Wilson Kirkpatrick
12	ADB, Technical Assistance. Road Master Plan & Feasibility Study. Volume 3, Road and Road Transport Sector Profile	A4		copy	January, 1995	1	Intercontinental Consultants & Technocrats PVT.Ltd. In association with Scott Wilson Kirkpatrick (consulting engineers)
13	ADB, Technical Assistance. Road Master Plan & Feasibility Study. Volume 2, Feasibility Study, Preliminary Engineering Design & Initial Environmental Examination	A4		copy	January, 1995	1	Intercontinental Consultants & Technocrats PVT Ltd. In association with Scott Wilson Kirkpatrick (consulting engineers)
14	ADB, Institutional Strengthening of the Roads Sector, Draft Final Report, Volume 1, Executive Summary	A4		copy	March, 1997	1	N.D Lea International Ltd
15	ADB,Second Road Development Project, Progress Report No1	A4		copy	April, 1998	1	Intercontinental Consultants & Technocrats PVT.Ltd
16	ADB,Second Road Development Project, Progress Report No4	A4		copy	July, 1998	1	Intercontinental Consultants & Technocrats PVT.Ltd
17	ADB, Roads Development Project,Project Completion Report Volume 2: Annexures	A4		copy	April, 2001	1	Intercontinental Consultants & Technocrats PVT.Ltd
18	ADB,Roads Development Project,Project Completion Report Volume 1: Main Reports	A4		copy	April 2001	1	Intercontinental Consultants & Technocrats PVT.Ltd
19	Tacis, CIS & Georgia -TRACEKA, Technical Assistance to the Southern Republics, Roads Maintenance. Completion Report, Module B-Winter Maintenance	A4		copy	December 1998	1	Finnroad OY & Parkman Ltd.
20	Tacis,Technical Deliverable Winter Maintenance System (WMS) Proposal for Mongolia, Modal-B	A4		copy	October, 1998	1	Finnroad OY & Parkman Ltd.
21	Population of Mongolia	A4		copy	1994	1	State Statistical Office of Mongolia

No.	Title	Size	Pages	original/Copy	Date	Nos.	Published By
22	Dornod Area Development Project	A4		copy	1996	1	Ministry of Infrastructure, National Design and Research Center
23	SNIP-32-02-00, Mongolian Road Construction Standard Book	A4	153	copy	2000	1	Ministry of Infrastructure
24	Work drawings of RC bridge over Murun river in Murun sum of Khentii aimag	A3 long	15 drawings	original	1996	1	Road & Bridge Design, Production & Research Institute under the General Department of Roads
25	Cost Estimation of RC bridge over Murun river in Murun sum of Khentii aimag	A4	14	original	1996	1	Road & Bridge Design, Production & Research Institute under the General Department of Roads
26	Mongolia, The World Bank, Transport Rehabilitation Project, Roads Subproject, 1996 Mid Term Progress Report	A4	18	original	July, 1996	1	Intercontinental Consultants & Technocrats PVT Ltd
27	ASD, TA No. 2380-MON, Contract No. COCS 96/137, Institutional Strengthening of the Roads Sector, Draft Final Report, Volume 1-Executive Summary, Project No.7402.T820.250	A4	33	original	March, 1997	1	Padego Co. Ltd. & Technology Training Associates Ltd.
28	Transport Rehabilitation Project, Roads Sub-Project, The Road Network and Road Maintenance Resources	A4	44	copy	Feb-97	1	Scott Wilson Kirkpatrick, Transport Research Laboratory
29	Drawings & Cost Estimation of 20 km Chandgana Road Section in Murun river of Khentii aimag	A4 and A3 long	axplanatory note-38, drawings-21	copy	1998	3	Road & Bridge Design, Production & Research Institute under the General Department of Roads
30	Transport Rehabilitation Project, Mongolia (C-2615-MOG), Transport Sector Policy Advisor, Closing Report, Volume 2, Appendices	A4	122	copy	Aug-98	1	Scott Wilson Kirkpatrick
31	Transport Rehabilitation Project, Mongolia (C-2615-Mog), Transport Sector Policy Advisor, Closing Report, Volume 1, Text	A4	80	copy	Aug-98	1	Scott Wilson Kirkpatrick
32	Government of Mongolia, Ministry of Infrastructure Development, Department of Roads, Detailed Engineering for Nalaib-Maant Road, Final Report, Volume 1, Main Report	A4	A4-62 A3-4	copy	Feb-99	1	Scott Wilson Kirkpatrick

No.	Title	Size	Pages	original/Copy	Date	Nos.	Published By
33	Government of Mongolia, Ministry of Infrastructure , Department of Roads, Second Roads Development Project under ADB Loan Assistance, Loan No.1700-MON (SF), Final Report on Detailed Engineering Design, Nalaikh-Maanti- Choir (200.0 km)	A4	89	copy	Dec-00	1	Auto zam Co.Ltd.
34	Government of Mongolia, Ministry of Infrastructure , Transport Development Project Under IDA/NDP CREDIT, Bidding Document, Rehabilitation of Erdenesant - Arvaiheer Road, Volume III Drawings	A3	47	Copy	Mar-00	1	Department of Roads, GBET Co., Ltd.
35	Geological Map of The Catchment Area of The Kherlen River	A1	1	Copy	1965	1	P.V.Osorin, A.A.Khapov, V.V.Soloviyov, E.D.Stepanyan, A.S.Zelenko, S.M.Markov, A.N.Passkazchikov, T.A.Khrapova, Eruun, Nergui, Densmaa
36	Geological Map of The Catchment Area of The Kherlen River Middle Stream	A1	3	Copy	1968	1	S.M.Kalimulin, M.B.Durante, L.P.Zonenshain, R.N.Kalimulina, I.B.Filippova, Z.P.Kozlovskoi, E.E.Fyodorova, M.E.Fyodorovoi
37	Yearbook of Statistics	A4		original	2000	1	Statistics Department, Mongolia
38	Master Plan of Baganuur City (Target Year 1995)	A4		Copy		1	Baganuur District
39	Master Plan of Baganuur City (Target Year 2040)	A4		Copy		1	Baganuur District
40	Master Plan of Baganuur City (Energy Infrastructure)	A4		Copy	1987	1	Baganuur District
41	Lanuse Plan Surrounding Baganuur City	A4		Copy	1987	1	Baganuur District
42	Existig Map of Baganuur District (1999)	A4		Copy	1987	1	Baganuur District
43	Landuse Plan of Baganuur District (1999)	A4		Copy	1987	1	Baganuur District
44	Topographic Map in Baganuur District	Digital Files		Original	2001	1	Baganuur District

No.	Title	Size	Pages	original/Copy	Date	Nos.	Published By
45	Undrukhaan City Map	A0		Copy	1997	1	Khentii Province
46	On the seismicity of territory of Mongolia	A4		Copy	1974	1	T.Bayaraa, B.Tsengel, T.Dugarmaa