［資　料］

［資　料］

1. 調査団員氏名・所属
2. 調査行程
3. 関係者(面会者)リスト
4. 討議議事録(M/D)
5. 事業事前計画表(基本設計時)
6. 参考資料/入手資料リスト
7. その他資料/情報

［資　料］

1. 調査団員氏名・所属

(1) 現地調査時

表 A-1　調査団員名簿（現地調査時）

担　当	氏　名	所　属
総括	吉新　主門	国際協力機構　資金協力支援部準備室　次長 (経済インフラ整備担当)
副総括／計画管理	坂部　英孝	国際協力機構　資金協力支援部　準備室 事業調査第一課　副主任
業務主任／道路交通計画	小山　次郎	㈱建設企画コンサルタント/㈱長大 共同企業体
橋梁設計／施工計画Ⅰ	安部　善憲	同　上
橋梁設計／施工計画Ⅱ	川辺　了一	同　上
自然条件調査Ⅰ （気象／水文）	吉沢　方宏	同　上
自然条件調査Ⅱ （地形／地質）	仲本　　治	同　上
調達計画／積算	水越　和雄	同　上

注)総括は現地滞在なし

(2)．基本設計概要説明時

表 A-2　調査団員名簿（基本設計概要説明時）

担　当	氏　名	所　属
総括	矢部　哲雄	国際協力機構　ブータン駐在員事務所長
計画管理	坂部　英孝	国際協力機構　経済基盤開発部 運輸交通・情報通信グループ 運輸交通・情報通信第三課
業務主任／道路交通計画	小山　次郎	㈱建設企画コンサルタント/㈱長大 共同企業体
橋梁設計／施工計画Ⅰ	安部　善憲	同　上

2. 調査行程

(1)現地調査時：平成 20 年 4 月 15 日～5 月 27 日

表 A-4　調査工程（現地調査時）

日程	月	日	曜日	副総括/計画管理（JICA） 坂部　英孝	業務主任/道路交通計画 小山　次郎	橋梁設計/施工計画Ⅰ 安部　善憲	橋梁設計/施工計画Ⅱ 川辺　了一	自然条件調査Ⅰ（気象/水文） 吉沢　方宏	自然条件調査Ⅱ（地形/地質） 仲本　治	調達計画/積算 水越　和雄
1	4	14	月			東京→バンコク				東京→バンコク
2		15	火			バンコク→パロ				バンコク→パロ
3		16	水			サイト調査				市場調査
4		17	木			サイト調査				市場価格/資材調達事情/見積依頼調査
5		18	金			現地踏査		現地再委託準備		
6		19	土			現地再委託準備				
7		20	日	東京→バンコク	東京→バンコク	現地調査、団内協議、資料整理			東京→バンコク	団内協議、資料整理、資料収集
8		21	月	バンコク→パロ、JICA事務所打合せ、MOWHS表敬、インセプションレポート説明(DOR)		JICA事務所打合せ、MOWHS表敬、インセプションレポート説明(DOR)			バンコク→パロ JICA事務所打合せ MOWHS表敬 インセプションレポート説明(DOR)	市場価格/資材調達事情/見積依頼調査
9		22	火	Planning Commission表敬、MOWHSと協議現地再委託入札		サイト調査		現地再委託入札	サイト調査	
10		23	水	MOWHと協議				サイト調査		
11		24	木	サイト調査						サイト調査
12		25	金							
13		26	土							
14		27	日	現地調査、団内協議、資料整理		現地調査、団内協議、資料整理				現地調査、団内協議、資料整理
15		28	月	MOWHSと協議、ミニッツ協議（MOWHS）、現地再委託契約		サイト調査				積算関連調査
16		29	火	MOWHSと協議、ミニッツ協議（MOWHS）						
17		30	水	ミニッツ署名（MOWHS）、JICA事務所報告						
18	5	1	木	パロ→デリ 大使館、JICA事務所報告　デリー→	サイト調査					パロ→カルカッタ
19		2	金	→バンコク→東京						調達関連調査
20		3	土							カルカッタ→バンコク
21		4	日							
22		5	月							調達関連調査
23		6	火							
24		7	水							バンコク→ジャカルタ
25		8	木							調達関連調査
26		9	金							
27		10	土							ジャカルタ→
28		11	日							→東京
29		12	月							
30		13	火							
31		14	水							
32		15	木							
33		16	金			整理・分析	整理・分析	水文/測量	パロ→バンコク バンコク→	
34		17	土			パロ→バンコク バンコク→		水文/測量	→東京	
35		18	日			→東京		現地調査、団内協議、資料整理		
36		19	月					水文/気象データ		
37		20	火					沿道計画/環境資料		
38		21	水					発電所関連資料		
39		22	木					DORと協議・報告		
40		23	金					再委託調査の整理・分析		
41		24	土					現地調査、団内協議、資料整理		
42		25	日					再委託調査の整理・分析		
43		26	月		パロ→デリー 大使館・JICA事務所報告			パロ→バンコク バンコク→		
44		27	火		デリー→			→東京		
45		28	水		→東京					

(2)基本設計概要説明：平成 20 年 10 月 2 日～10 月 9 日

表 A-5　調査工程（基本設計概要説明時）

日程	月	日	曜日	総括(JICA) 矢部　哲雄	計画管理(JICA) 坂部　英孝	業務主任/ 道路交通計画 小山　次郎	橋梁設計/ 施工計画Ⅰ 安部　善憲
1	10	1	水			成田→バンコク	
2		2	木			→パロ、JICA 事務所・DOR 協議	
3		3	金			DOE 及び DOR 協議	成田→バンコク
4		4	土			サイト調査	→パロ
5		5	日		→パロ	サイト調査	サイト調査
6		6	月	MOWHS 協議			
7		7	火	MOWHS 協議、M/D 署名、GNH 表敬			
8		8	水		JICA 事務所報告	パロ→バンコク	
9		9	木		パロ→デリー、JICA デリー事務所報告、デリー→バンコク	→東京	
10		10	金		→東京		

3.関係者(面会者)リスト

表 A-7　面会者リスト

公共事業・定住省(Ministry of Works and Human Settlement:MoWHS)　道路局(Department of Roads:DoR)	
Mr. Phuntsho Wangdi	Director
Mr. Jangchuk Yeshi	Chief Engineer, Bridge Division
Mr. Karma Tenzin	Deputy Executive Engineer, Bridge Division
Mr. Sangey Tenzing	Director General
Mr. B.L. Chhetri	Deputy Executive Engineer
Mr. O.K. Pradhan	Engineer
公共事業・定住省(MoWHS)　標準・品質管理局(Standards & Quality Control Authority:SQCA)	
Mr. Rinzin Namgyel	Head, Training & Monitoring Division
Mr. Ranjan Chhetri	Chief Engineer
公共事業・定住省(MoWHS)　建設業者登録局(Construction Development Board:CDB)	
Mr. Chencho Tshering	Data Mabager
Mr. Tashi Tshering	Engineer, Manpower & Technology Section
公共事業・定住省(MoWHS)　機械課 (現在は Construction Development Co. Ltd.:CDCL)	
Mr. Sonam Dorji	Managing Director
Mr. Tshewang Phuntsho	General Manager, Western Operation CDCL Hesothangkha
公共事業・定住省(MoWHS)　Government of India(GoI) Assistant Project	
Mr. Dogo Kinley	Project Manager
公共事業・定住省(MoWHS)　Word Bank Road Project	
Mr. Tshering Peljor	Project Coordinator
公共事業・定住省(MoWHS)　Asian Development Bank(ADB) Road Network Project	
Mr. C K Pradhan	Project Manager
公共事業・定住省(MoWHS)　DoR ロベイサ事務所(DoR Lobeysa Office)	
Mr. Sonam Tobgay	Executive Engineer
Mr. Om Kumar Pradban	Engineer
公共事業・定住省(MoWHS)　DoR サルパン事務所(DoR Sarpang Office)	
Mr. K.S. Rai	Deputy Executive Engineer
Mr. Tshering Wangchuk	Assistant Engineer - I
GNH(Gross National Happiness) Commission　Development Cooperation Division	
Mr. Thinley Namgyel	Head
経済省(Ministry of Economic Affairs)　エネルギー局(Department of Energy:DoE)	
Mr. Tashi Dorji	Chief Executive Officer
Mr. Dorji	Meteorology Division
Mr. Yeshey Wangdi	Director General
経済省(Ministry of Economic Affairs)　地質調査課(Geological Survey of Bhutan)	
Mr. Yeshi Dorji	Specialist
経済省(Ministry of Economic Affairs) 工業局(Department of Industry)　工業開発課(Industrial Development Division)	
Mr. Tashi Tshering	Architect

農業省(Ministry of Agriculture) 森林局(Department of Forestry Services)　自然保護課(Nature Conservation Division)	
Dr. Sangay Wangchuk	Director
国家環境委員会(National Environment Commission:NEC)	
Mr. Nidup Tshering	Joint Director
Royal Society for Protection of Nature(RSPN)　NGO 団体	
Mr Lam Dorji	Head
Phunatshangchu Hydropower Authority (PHPA)　プナチャンチュ発電公社	
Mr Karma Tshering	Assistant Executive Engineer
JICA　ブータン駐在員事務所	
矢部　哲雄	首席駐在員
宮田　真弓	企画調査員
Ms. Emi Doyle	企画調査員
JICA　インド事務所	
山田　浩司	次長

4. 討議議事録(M/D)

(1)現地調査時

Minutes of Discussions
on the Basic Design Study
on the Project for Reconstruction of Bridges (Phase III)
in the Kingdom of Bhutan

Based on the results of the Preparatory Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Reconstruction of Bridges (Phase III) (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Kingdom of Bhutan (hereinafter referred to as "the Bhutan") the Basic Design Study Team (hereinafter referred to as "the Team"), which is managed by Mr. Shumon YOSHIARA, Deputy Director General for Economic Infrastructure Development, Grant Aid and Loan Support Department , JICA, and headed by Mr. Hidetaka SAKABE, Senior Project Administration Officer for Project Study Division I, Grant Aid and Loan Support Department, JICA, and is scheduled to stay in the country from April 15, 2008 to May 27, 2008 .

The Team held discussions with the officials concerned of the Royal Government of Bhutan and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Thimphu, April 30, 2008

Hidetaka SAKABE
Deputy Leader
Basic Design Study Team
Japan International Cooperation Agency

Phuntsho Wangdi
Director
Department of Roads (DOR)
Ministry of Works & Human Settlement
Kingdom of Bhutan

Thinley Namgyel
Head of Development Cooperation Division
GNH Commission
Kingdom of Bhutan

ATTACHMENT

1. Objective of the Project

The objective of the Project is to secure smooth and reliable traffic by the replacement of bridges on the National Highway No.5 (hereinafter referred to as "NH5").

2. Project sites

The sites of the Project are shown in Annex-1.

3. Responsible and Implementing Agency

3-1. The responsible Ministry is Ministry of Works & Human Settlement.

3-2. The implementing organization is Department of Roads, Ministry of Works & Human Settlement.

3-3. The organization chart of the responsible Ministry and the implementing organization is shown on the Minutes of Discussions signed by both sides on October 17, 2007 (hereinafter referred to as "the Signed Minutes").

4. Items requested by the Royal Government of Bhutan

4-1. After discussions with the Team, the items described below were requested by the Bhutanese side.

To replace the 6 existing bridges on NH5 (including their approach roads to the existing road).

(1) Lawakha Bridge,
(2) Basochu Bridge,
(3) Nyarachu Bridge,
(4) Burichu Bridge ,
(5) Chanchey Bridge,
(6) Loring Bridge.

4-2. Both sides reconfirmed that the specification of the bridges to be reconstructed should be the followings as described on the Signed Minutes.

(a) Width of carriage way: 6.0m
(b) Design live load: "Class A" of Indian Road Congress 2000 same as Phase-II Project

4-3. JICA will assess the appropriateness of the above-mentioned request and will recommend to the Government of Japan for approval.

4-4. Both sides confirmed that the beginning and ending points of the approach road are the places where the elevation of the approach road is placed to the existing roads. These points will be

confirmed through the further study and discussions of alignment design based on the topographic survey.

4-5. Both sides confirmed that the structure of the bridges under the Project was not selected as of this moment, and will be examined through the further study.

4-6. Both sides understood that the demolishment of the existing bridges is undertaken by the Bhutanese side in principle. However, this matter needs to be examined through the further study of the bridge construction plan and schedule. Both sides confirmed that it should be discussed and confirmed at the explanation of Draft Report of Basic Design Study for the Project.

4-7. Both sides confirmed that the Bhutanese side shall replace or improve the bridges on NH5 which are not covered by the Project at the Bhutanese expenses in a timely manner to ensure the effect of the Project.

The Bhutanese side shall prepare the implementation plan for the improvement of the existing bridges mentioned above, and submit it to JICA Study Team at the explanation of Draft Report of Basic Design Study for the Project.

5. Japan's Grant Aid Scheme

Bhutanese side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Royal Government of Bhutan as explained by the Team and described in Annex-4 and Annex-5 of the Signed Minutes.

6. Schedule of the Study

6-1. The consultants will proceed to further studies in Bhutan until May 27, 2008.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around September, 2008.

6-3. In case that the contents of the report is accepted in principle by the Royal Government of Bhutan, JICA will complete the final report and send it to the Royal Government of Bhutan by December, 2008.

7. Environmental and Social Considerations

7-1. Both sides confirmed that the Environment Clearance Certificate (ECC) for the Project had been obtained as attached in Annex-2.

The Team explained to the Bhutanese side that in case any other procedures are required to the commencement of the Project based on the Bhutanese laws and/or regulations, these procedures must be completed prior to the Project appraisal by the Government of Japan.

The Bhutanese side answered to the Team that all of the necessary procedure for the

Environmental Clearance had been completed and no more procedure is required prior to the commencement of the Project.

In case the extension of the ECC validity for the Project is required, the Bhutanese side will conduct necessary procedures for it in a timely manner.

7-2. The Bhutanese side shall complete the securing of land necessary for the Project, e.g. land for approach roads on left bank of the Chanchey Bridge, temporary yard on right bank of the Lawakaha bridge, etc., by the commencement of the Project.

8. Other relevant issues

8-1. The Team was informed that the Bhutanese side issued the approval on November 29, 2007, to construct the approach road to the site for the "Punatsangchu Hydropower Station" (hereinafter referred to as "the Punatsangchu Power Project") within easy reach of the Lawakha bridge. And both sides confirmed that its construction work had commenced already by the time the Team visited the site on April 25, 2008.

The Team pointed out that its work would limit to some extent the selection of location of the Lawakha bridge. The Bhutanese side regretted that information sharing did not take place appropriately.

And the Team also expressed its regret and strongly requested once again to provide relevant information, including the factors affecting the design of the bridges under the Project in timely manner. The Bhutanese side understood and accepted it.

And also both sides reconfirmed the followings;

(1) The NH5 will never be sunk under water as a result of the Punatsangchu Power Project.

(2) The Bhutanese side shall share the information and discuss about the Punatsangchu Power Project among the organizations concerned, e.g. Department of Energy (DOE), not to make far-reaching impacts to the Project.

8-2. The Team requested the Bhutanese side to ensure that all bridges constructed under the Japanese Grant would not be affected adversely by any Hydropower Projects in the future.

8-3. The Bhutanese side confirmed that the following undertakings should be taken by the Bhutanese side at the Bhutanese expenses.

(1) Removal of the existing buildings and/or its exterior within the Project sites.

(2) Relocation and/or removal of existing utilities (power lines, water supply lines, etc.) from the Project site.

(3) Necessary arrangement for traffic control at necessary sections.

(4) Necessary arrangement for the tax exemption of imported materials, equipment and vehicles for the Project.

(5) Necessary arrangement for the securing of borrow pit.
(6) Securing and clearance of the temporary yard.
(7) Securing of site for disposal of waste.
(8) Maintaining order at the sites and yards for the Project.

8-4. The Bhutanese side shall secure enough budget and personnel necessary for the operation and maintenance of the bridges constructed by the Project, including the periodical maintenance work, e.g. sweeping the drainage, dredging the river at each site, etc., after the completion of the Project.

8-5. The Bhutanese side shall provide necessary numbers of counterpart personnel to the Team during the period of their studies in Bhutan.

8-6. The Bhutanese side shall submit answers to the Questionnaire, which the Team handed to the Bhutanese side, by May 16, 2008.

Project Sites

【Annex-1】

DT/GM-020.3/5

【Annex-2】

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
DEPARTMENT OF ROADS
THIMPHU : BHUTAN

No. DOR/I&D(I)/2007-08/04/ 1282 *Date:* 24/12/2007

To
The Chief Engineer,
Bridge Division,
DoR : Thimphu

Sub: Environmental Clearance for reconstruction of 6 bridges under Phase-III JICA Project

Sir,

We are forwarding herewith a copy (in original) of the Environmental Clearance No. PPD/MoWHS/Env/01/2007-08/3231 dated 19th December 2007 issued by the Policy & Planning Division, Ministry of Works & Human Settlement, Thimphu for reconstruction of the following 6 bridges.

i) Lawakha Bridge
ii) Basochu Bridge
iii) Nyarachu Bridge
iv) Burichu Bridge
v) Chanchey Bridge
vi) Loring Bridge

This is for further necessary actions from your end.

Yours sincerely,

K. Tenzin
Please see if we need to forward a copy to JICA.
25/12

21/12
(Kunzang Wangdi)
Chief Engineer,
Investigation & Development Division,
DoR : Thimphu

Cc: The Director, DoR, Thimphu for kind information.

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
POLICY & PLANNING DIVISION
THIMPHU: BHUTAN
"Towards Quality Infrastructure"

PPD/MoWHS/Env/01/2007-08/3237

19th December 2007

Director
Department of Roads
Thimphu.

Sir,

Subject: Environmental Clearance for re-construction of 6 bridges under JICA project (Phase III)

The Ministry of Works and Human Settlement (MoWHS) issues the Environmental Clearance (EC) as per your letter no. DoR/I&D/Env/2006-2007/12/858 dated 24.10.07 for the re-construction of the following bridges under JICA project (Phase III): Lawakha bridge, Basochu bridge, Nyarachu bridge, Burichu bridge, Chanchey bridge and Loring bridge. The following terms and conditions apply:

1. The EC is valid for the re-constructions of the above mentioned bridges only.
2. All activities must be inline with Forest and Nature Conservation Act 1995 and Rules 2006.
3. No disturbance must be caused to public and religious sites due to the project activity.
4. Aesthetics of the valley and the river must be protected at all times.
5. A proper arrangement has to be made regarding the irrigation channel in the vicinity of the Lawakha bridge if the bridge construction activity interferes with the irrigation channel.
6. All the blasting works should be done in line with the guidelines from Ministry of Home and Cultural Affairs and Department of Geology and Mines. The blasting works should be executed strictly by trained professionals.
7. Indiscriminate dumping of excavated/waste materials into the river is an offense and is liable to penalty. It should be properly disposed in an appropriate disposal site.
8. Downstream effects must be monitored at all times to ensure that no damage is caused due to the project activity.
9. Waterways must be protected from any obstruction during and after the construction.
10. Occupational Health and Safety measures should be strictly observed at all times during the project activity.

Tele: 00975-2-327998/328173/326793/322182/325171
Fax: 00975-2-323144/322270/323122
P/o Box: 791

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
POLICY & PLANNING DIVISION
THIMPHU: BHUTAN
"Towards Quality Infrastructure"

11. A smooth flow of vehicular traffic should be maintained during the project activity.
12. Any dispute arising due to the above project activity shall be the responsibility of the project proponent (i.e Department of Roads).
13. Bio-engineering works shall be carried out wherever feasible to improve the aesthetics of the project area.
14. Copy of this EC must be maintained at all sites at all times during the construction activity for environment management and monitoring references.

Any violation of the terms and conditions specified in the EC is a violation of EA Act 2000 which will result in revocation of the EC without any liability on the part of this office. Incase of renewal of the EC, this office should be notified one month before the expiry of this Environmental Clearance.

This Environmental Clearance is valid till 31st December 2010.

Yours faithfully,

Sangay Tenzin
Offg.Chief Planning officer
PPD, MoWHS

Copy to:

1. Hon'ble Secretary, MoWHS for kind information.
2. Head, EA Section, NEC, Thimphu for kind information.
3. Dy. EE, Environment Unit, I & D Division, DoR for kind information.

Tele: 00975-2-327998/328173/326793/322182/325171
Fax: 00975-2-323144/322270/323122
Po Box: 791

(2) 基本設計概要説明時

Minutes of Discussions
on Basic Design Study
on the Project for Reconstruction of Bridges (Phase III)
in the Kingdom of Bhutan
(Explanation of Draft Report)

In April 2008, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Reconstruction of Bridges (Phase III) (hereinafter referred to as "the Project") to the Kingdom of Bhutan (hereinafter referred to as "Bhutan"), and through discussions, field survey and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult with the concerned officials of the Government of Bhutan on the contents of the draft report, JICA sent to Bhutan the Basic Design Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Tetsuo YABE, Resident Representative of JICA Bhutan Office, from October 2 to October 9, 2008.

As a result of discussions, both sides confirmed the main items described in the attached sheets.

Thimphu, October 7, 2008

Tetsuo YABE
Leader
Basic Design Explanation Team
Japan International Cooperation Agency

Sangey TENZING
Director General
Department of Roads (DOR)
Ministry of Works & Human Settlement
Kingdom of Bhutan

Pema CHEWANG
Chief Program Coordinator
GNH Commission
Kingdom of Bhutan

ATTACHMENT

1. Components of the Draft Report

The Bhutanese side agreed and accepted in principle the contents of the draft report of Basic Design Study by the Team.

However, the Bhutanese side requested the Team to look at the possibilities of shortening the construction period. The Team explained that the construction period shown in the draft report is the possible shortest at the Basic Design Stage.

2. Cost Estimation

Both sides agreed that the Project Cost Estimation as attached in Annex-1 should never be duplicated or released to any third parties before the signing of all the Contract(s) for the Project.

3. Japan's Grant Aid Scheme

3-1. The Bhutanese side understood the Japan's Grant Aid scheme explained by the Team.

3-2. The Bhutanese side understands necessary measures to be taken by the Government of Bhutan as explained by the Preliminary Study Team and described in Annex-4 of the Minutes of Discussions signed by both sides on October 17, 2007.

4. Schedule of the Study

JICA will complete the Final Report in English, in accordance with the confirmed items and send it to the Bhutanese side by the end of January, 2009.

5. Other Relevant Issues

5-1. Regarding to the "Punatsangchu Hydropower Station" (hereinafter referred to as "the Punatsangchu Power Project"), both sides reconfirmed that the Bhutanese side shall continue the followings after the completion of the Basic Design Study;

(1) To provide relevant information, including the factors affecting the design and/or construction of the bridges under the Project in timely manner.

(2) To share the information and discuss about the Punatsangchu Power Project among the organizations concerned, e.g. Department of Energy (DOE), not to make far-reaching impacts to the Project.

And the Team requested the Bhutanese side again to ensure that all bridges constructed under the Japanese Grant would not be affected adversely by any Hydropower Projects in the future.

5-2. Both sides confirmed that present condition at Lawakha Bridge would not be changed any more by the Punatsangchu Power Project.

5-3. The Bhutanese side submitted the tentative plan for reconstruction of 5 bridges on National Highway No. 5 not covered by Japan's Grant Aid, and explained to the Team that the construction work borne by the Bhutanese side should be completed by 2013, the end of 10th 5 year plan of the Government of Bhutan. And both sides reconfirmed that the reconstruction is important to ensure the effect of the Project, and the Bhutanese side shall implement it at the Bhutanese expenses.

5-4. The Bhutanese side confirmed that the following undertakings should be taken by the Bhutanese side at the Bhutanese expenses.

(1) Before commencement of construction work

(a)Securing of the land for the Project,
(b) Relocation of existing utilities (electricity power, telecommunication, water, etc.),

(2) During construction work
(a) To Secure and clearance of the temporary yard,
(b) To Secure the site for borrow pit, quarry and disposal of waste,
(c) To make necessary arrangement of detours for public traffic at necessary sections, e.g. securing of land, public announcement etc,
(d) Maintaining order at the sites and yards for the Project.

(2) After the Completion of the Project
(a) To remove the existing bridges.

5-5. The Bhutanese side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities improved by the Project, including the periodical maintenance work after the completion of the Project.

<Confidential>

Annex-1

Project Cost to be Borne by Japan's Grant Aid

Items			Cost (Million Japanese Yen)
Construction Facilities	Bridge	Substructure: 12 Abutments Superstructure: Carriageway Width: 6.0m Bridge Length: Lawakha Br.(Composite Girder): 45.0m Basochu Br.(PC Box Girder): 40.0m Nyarachu Br.(PC Box Girder): 40.0m Burichu Br.(PC Box Girder): 50.0m Chanchey Br.(PC Box Girder): 45.0m Loring Br.(Steel Langer Girder): 70.0m Bridge Surface: 1,740 m² Accessories: Handrails, Expansion Joint Approach Road Bank Protection Drainage System Others	2,319
Detailed Design and Construction Supervision			275
Total			2,594

Notes:

(1) The cost estimates in the above table are provisional and will be further examined by the government of Japan for the approval of the Grant.

(2) The Total Cost of the Project JPY2,594 million is equivalent to USD 24.30 million at the current exchange rate USD 1.0=JPY 106.74.

5. 事業事前計画表(基本設計時)

1. 案件名

ブータン王国　第三次橋梁架け替え計画

2. 要請の背景（協力の必要性・位置付け）

ブータン王国(以下「ブ」国)は、国土(46,500km^2)の大部分が山岳地帯で道路交通が唯一の交通手段となっており、道路は基礎インフラとして最も重要である。「ブ」国の主要交通である道路および橋梁の整備は、1961 年に始まった第 1 次 5 ヵ年計画以来、常に重要課題として取り上げられ、全国の県庁所在地の主要都市を結ぶ幹線道路網整備を重点に実施されてきた。しかし、国道上の多くの橋梁は 1970 年～80 年代に架橋された仮設ベイリー橋で既に耐用年数を過ぎており、損傷や老朽化が著しく、農業を中心とする地域経済の拡充による交通量や積載量の増加により、橋桁の変形、部材の摩耗、腐蝕および結合部の緩み、桁変形による橋のたわみ等の現象が見られ、崩落の危険性が指摘される橋梁も存在する。

このような状況の下、「ブ」国政府は橋梁架け替えの重要性に鑑み、公共事業・定住省が管轄する 22 橋に係る開発調査の実施を我が国に要請し、これを受け我が国は 1997～1998 年にかけて「橋梁整備計画調査」を実施した。同調査では 22 橋の中から緊急に架け替えの必要な 12 橋が選定された。その中で最も架け替えの優先度が高い 5 橋に関し、我が国は無償資金協力として「橋梁架け替え計画」を実施し、2003 年に完成した。引き続いて 3 橋を対象とした「第二次橋梁架け替え計画」が実施され、2007 年 11 月に完成した。

上記のプロジェクトに続く無償資金協力として、「ブ」国は我が国に対し、国道 5 号線上にある、架け替えが行われていない 11 橋のうち 6 橋梁について架け替え計画を要請した。この要請に対し、下記に示す協力実施の必要性・妥当性を確認した。

① 国道 5 号線は、インドと接続している道路の中で唯一、自国で管理でき、また、南部平野部の開発地域を通過する道路でもあることから、非常に重要な道路である。そのため安全で円滑な道路交通を確保する必要がある。

② ①に関連し、国道 5 号線の橋梁のほとんどは仮設橋(ベイリー橋)であり、永久橋として設計・施工されていない。現時点では落橋の危険性がないものの、将来の地域開発にともない交通量、特に大型車輌の増加に耐えうるだけの設計・施工はなされていないため、将来の安全な交通を確保する必要がある。

この結果より、国道 5 号線の円滑で安全な交通を確保するため、同路線にある 11 橋について架け替えを実施することとしている。これにより、国道 5 号線において安定した輸送が確保されると期待されている。この中において、無償資金協力事業は、要請された 6 橋について仮設橋から永久橋へ架け替えを行うとともに、要請対象でない 5 橋について「ブ」国側で架け替えることとしている。

3. プロジェクト全体計画概要

(1) プロジェクト全体計画の目標（裨益対象の範囲及び規模）

国道 5 号線において安定した人・物資の輸送が確保される。

裨益対象：国道 5 号線沿線住民(約 12 万人)

(2)プロジェクト全体計画の成果

要請された 6 橋(ラワカー橋、バソチュ橋、ニャラチュ橋、ブリチュ橋、チャンチー橋、ローリン橋)について、仮設橋を永久橋に架け替えが行われる。

国道 5 号線上にある要請外の 5 橋(ヘソタンカ橋、ルリチュ橋、バイチュ橋、カミチュ橋、メチコラ橋)について、「ブ」国側で架け替えが行われる。

(3)プロジェクト全体計画の主要活動

国道 5 号線上の対象橋梁の 6 橋の架け替え工事を行う。

国道 5 号線上の対象外橋梁の 5 橋の架け替え工事を「ブ」国側が行う。

(4)投入（インプット）

ア　日本側：無償資金協力 26.02 億円

イ　相手国側

(ア)既設橋梁(6 橋)の撤去

(イ)国道 5 号線沿線にある対象外 5 橋梁の架け替え

(ウ)用地確保・既存占有物の撤去・移設

(エ)仮設ヤードの確保

(オ)建設に必要な手続き

(5)実施体制

主管官庁及び実施機関：公共事業・定住省

4.無償資金協力案件の内容

(1)サイト

国道 5 号線沿線の 4 県(ワンディ県、ダガナ県、チラン県、サルパン県)

(2)概要

要請された 6 橋(ラワカー橋、バソチュ橋、ニャラチュ橋、ブリチュ橋、チャンチー橋、ローリン橋)の架け替え

(3)相手国側負担事項

①既設橋梁(6 橋)の撤去

②チェックポスト移設

③国道 5 号線沿線にある対象外 5 橋梁の架け替え

(4)概算事業費

概算事業費 27.16 億円（無償資金協力 26.02 億円、相手国側負担 1.14 億円）

(5)工期

詳細設計・入札期間を含め約 45 ヶ月（予定）

(6)貧困、ジェンダー、環境及び社会面の配慮

なし

5.外部要因リスク（プロジェクト全体計画の目標の達成に関するもの）

・当初想定を超える大洪水、大地震等の自然災害が発生しない。

6.過去の類似案件からの教訓の活用

第一次計画(5 橋)、第二次計画(3 橋)において、伸縮装置のカバーの脱落、排水枡の蓋の紛失などが見られた。これらについては脱落防止等の対策を設計に反映した。

7. プロジェクト全体計画の事後評価に係る提案

(1)プロジェクト全体計画の目標達成を示す成果指標

成果指標	現状(2008 年)	将来(2012 年以降)
橋梁の耐荷力増加	18t(6 橋の中の最小値)	6 橋全て 40t
移動距離の短縮(大型車両) (ティンプー～ゲレフ間)	国道 2 号線-インド経由 約 380km	国道 1 号線-国道 5 号線経由 約 260km

(2)その他の成果指標

なし

(3)評価のタイミング

2012 年以降（施設供用開始後）

6.参考資料/入手資料リスト

No.	名　　称	形　　態 (図書・ビデオ・ 地図・写真等)	オリジナル ・ コピー	発行機関	発行年
1	Bhutan At a Glance 2007	図書	ｺﾋﾟｰ	ブータン政府統計局	2007 年
2	Statistical Year book of Bhutan 2004	図書	ｵﾘｼﾞﾅﾙ	ブータン政府統計局	2004 年
3	Statistical Yearbook of Bhutan 2006	図書	ｵﾘｼﾞﾅﾙ	ブータン政府統計局	2006 年
4	Statistical Yearbook of Bhutan 2007	図書	ｺﾋﾟｰ	ブータン政府統計局	2007 年
5	National Accounts Statistics 2000-2006	図書	ｺﾋﾟｰ	ブータン政府統計局	2007 年
6	Labour and Employment Act of Bhutan 2007	図書	ｵﾘｼﾞﾅﾙ	ブータン政府労働・人材省	2007 年
7	Employment Agencies Rules	図書	ｺﾋﾟｰ	ブータン政府労働・人材省	―
8	Handbook on Recruitment and Employment of Foreign Workers in Bhutan	図書	ｺﾋﾟｰ	ブータン政府労働・人材省	―
9	The Companies Act of the Kingdom of Bhutan 2000	図書	ｵﾘｼﾞﾅﾙ	ブータン政府財務省	2000 年
10	Income Tax Act of the Kingdom of Bhutan 2001	図書	ｵﾘｼﾞﾅﾙ	ブータン政府財務省	2001 年
11	Rules on the Income Tax Act of the Kingdom of Bhutan 2001	図書	ｵﾘｼﾞﾅﾙ	ブータン政府財務省	2005 年
12	Bhutan Trade Classification Customs Tariff and Sales Tax Schedule 2007	図書	ｵﾘｼﾞﾅﾙ	ブータン政府財務省	2007 年
13	Standard Specifications and Code of Practice for Road Bridges section Ⅱ Loads and Stresses(Forth Revision) The Indian Roads Congress 2000	図書	ｺﾋﾟｰ	The Indian Roads Congress	2000 年
14	Design Criteria for Prestressed Concrete Road Bridges (Post-Tensioned Concrete) (Third Revision) The Indian Roads Congress 2000	図書	ｺﾋﾟｰ	The Indian Roads Congress	2000 年
15	Design Criteria for Prestresses Concrete Road Bridges section-V Steel Road Bridges (Second Revision) The Indian Roads Congress 2001	図書	ｺﾋﾟｰ	The Indian Roads Congress	2001 年
16	Road Design Manual Royal Government of Bhutan, MWHS, DoR, Thimphu	図書	ｺﾋﾟｰ	Misistry of Works & Human Settlement, Department of Roads	2005 年
17	Pavement Design Manual Royal Government of Bhutan, MWHS, DoR, Thimphu	図書	ｺﾋﾟｰ	Misistry of Works & Human Settlement, Department of Roads	2005 年
18	GUIDLINES FOR LAND ACQUISITION & SATSHAB ALLOTMENT 2005	図書	ｵﾘｼﾞﾅﾙ	ブータン政府農業省	2005 年
19	LAND COMPENSATION RATE 1996	図書	ｵﾘｼﾞﾅﾙ	ブータン政府農業省	1996 年
20	LAND ACT OF BHUTAN 2007	図書	ｵﾘｼﾞﾅﾙ	ブータン政府農業省	2007 年
21	BHUTAN'S NATIONAL NATIONAL NEWSPAPER KUENSEL	図書	ｵﾘｼﾞﾅﾙ	KUENSEL Corporation Ltd.	2008 年
22	Land Rules and Regulations of the Kingdom of Bhutan 2007	図書	ｵﾘｼﾞﾅﾙ	Royal Government of Bhutan National Land Commission	2007 年
23	FIELD MANUAL OF ROAD MAINTENANCE	図書	ｺﾋﾟｰ	PUBLIC WORKS DEPARTMENT MINISTRY OF SOCIAL SERVICES ROYAL GOVERNMENT OF BHUTAN	―

7. その他資料/情報

7-1　テクニカルノート

7-2　環境申請許可書

7-3　各サイトの地形・地質

7-1　テクニカルノート

「ブ」国　公共事業・定住省(MoWHS)道路局(DoR)と取り交わした技術覚書(テクニカルノート)を以下に示す。

CONSTRUCTION PROJECT CONSULTANTS, INC.
YSK Bldg., 3-23-1 Takadanobaba, Shinjuku-ku,
Tokyo 169-0075, JAPAN
Phone:+81-3-5337-4062　　Facsimile:+81-3-5337-4092

22 May, 2008

To
The Director
Department of Roads
Ministry of Works and Human Settlement (MoWHS)
The Royal Government of Bhutan
Attn: Mr. Phuntsho Wangdi

Subject: Submission of Technical Note for the Basic Design Study of Reconstruction of Bridges (Phase III)

Dear Sir,

We are pleased to submit the Technical Note which indicates the key design value to be used for the Basic Design Study for the captioned project by the Japan International Cooperation Agency (JICA) as Japanese Grant Aid Project.

The values on the Technical Note are following the result of discussion by the Study Team and MoWHS technical representative. Thus the concepts of basic design on Technical Note which was carried out and agreed by both parties at DOR head quarter on 14th May, 2008.

Please kindly confirm the attached Technical Note and references.

Very truly yours,

Jiro KOYAMA
Project Manager
Construction Project Consultants, Inc. Japan (CPC)
In association with
Chodai

Ref. 1. The stated Technical Note
2. Location of bridges and assumed bridge types (6 bridges)

Japan International Cooperation Agency (JICA)

THE BASIC DESIGN STUDY ON THE PROJECT FOR RECONSTRUCTION OF BRIDGES (PHASE III)

22-May-2008

Memorandum

Subject: <u>Technical note of Design Value to be used for the Basic Design Study on the Project</u>

The JICA Study Team will propose the following principal standard for the design of .captioned project.

1. DESIGN SPECIFICATION

1) ROAD DESIGN

Principle Items			Notes
Design Speed	Approach Road	20km/hr	
	Main Road	60km/hr	
Minimum Curve Radius	Approach Road	15 m	
	Main Road	120 m	
Pavement Width (The distance between each wheel guard)		6 m	Class-A two Lanes, same to Wakleytar bridge and all new bridges on NH No,5
Pavement Crossfall		2 %	
Maximum Longitudinal Grade	20 km/hr	8 %	
	60 km/hr	7 %	

2) BRIDGE DESIGN Specification

Principle Items			Notes
Design Standard		Standard Specification and Code of Practice for Road Bridges, The Indian Road Congress (IRC), Japanese Standard	
Road Class		National Highway	
Design Load		CLASS A	40t
Seismic Coefficient		K_h=0.12 K_v=0.0	Zone V (Same to Assam)
Concrete Strength	Substructure	21 N/mm²	
	Superstructure	30 N/mm²	Post tensioning Pre-stress Concrete
	Slab	24 N/mm²	
Pavement	Asphalt	t=60mm	

Mr.Phuntsho Wangdi
Director
Department of Roads

Mr. Jiro Koyama
Chief Consultant of JICA Study Team

2. BRIDGE DESIGN CONCEPT

(1) LAWAKHA BRIDGE

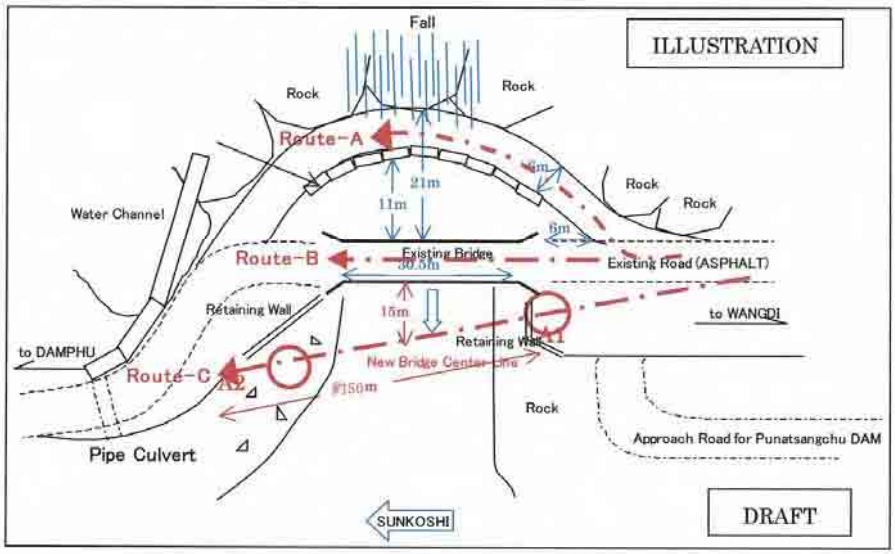

Table-1 Basic Design Concept for LAWAKHA Bridge

Selection of Bridge Alignment	➢ Route-A : Cars cannot pass through due to the water fall in rainy season.	NG
	➢ Route-B : Cars cannot pass through during construction period.	NG
	➢ Route-C : It has no problems. But we have to consider the approach road for PUNATSANGCHU DAM SITE to decide our plan.	○
Location of Abutment	➢ WANGDI PHODRANG SIDE : Almost same position of existing Abutment. ➢ DAMPHU SIDE : The End of retaining wall.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 40 to 45m	
Assumed Bridge Types	➢ Composit Simple Steel I Girder Bridge (Using Weathering Steel) ➢ Simple Steel Pony Truss Bridge (Using Weathering Steel)	

(2) BASOCHU BRIDGE

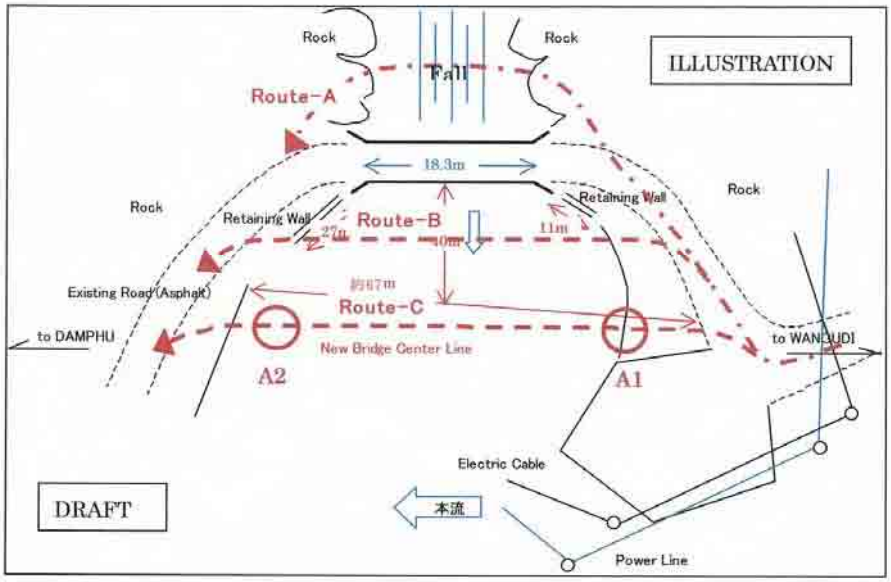

Table-2 Basic Design Concept for BASOCHU Bridge

Selection of Bridge Alignment	➢ Route-A : There is no space because of Rocks.	NG
	➢ Route-B : The alignment will not be suitable to drive, because the S curve on Wangdi side will be very tight .	NG
	➢ Route-C : The alignment will be the most suitable, and the bridge length will be almost same to that of Route-B.	○
Location of Abutment	➢ WANGDI PHODRANG SIDE : The location of A1 abutment will not be influenced by the river stream because the existing abutment will protect from flood water. ➢ DAMPHU SIDE : ditto.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 40 to 50m	
Assumed Bridge Types	➢ Composit Simple Steel I Girder Bridge (Using Weathering Steel) ➢ Simple Steel Pony Truss Bridge (Using Weathering Steel). ➢ In-situ Post tensioning pre-stress Concrete box girder Bridge.	

(3) NYARACHU BRIDGE

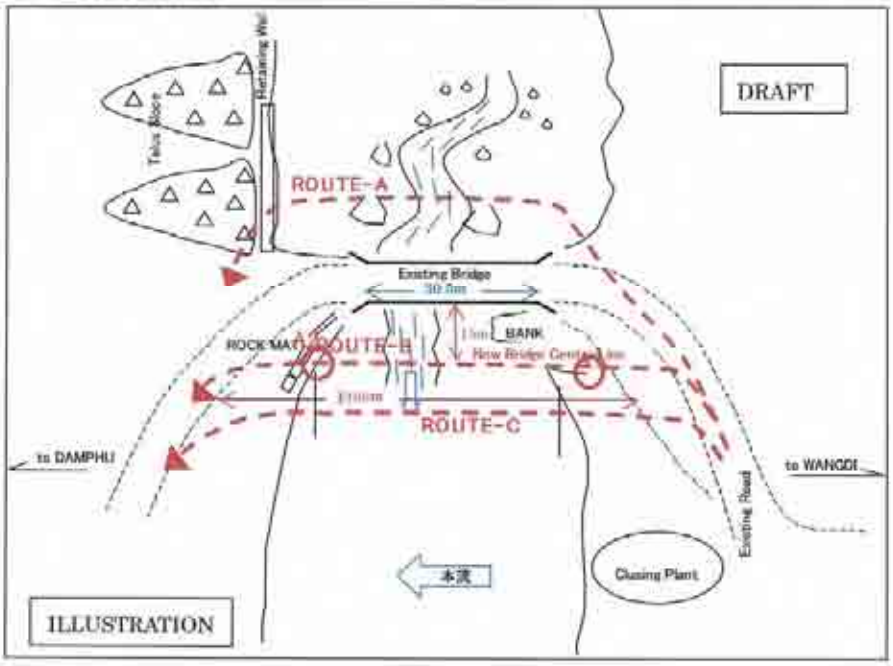

Table-3 Basic Design Concept for NYRACHU Bridge

Selection of Bridge Alignment	➢ Route-A:The alignment is not suitable because there is an existing unstable slope at right bank of river.	NG
	➢ Route-B : The alignment has no problem, and the bridge length will be shorter than Route-C.	○
	➢ Route-C:The alignment has no problem, but the bridge length and area of construction will be longer than Route-B.	NG
The Location of Abutment	➢ WANGDI PHODRANG SIDE : The location of A1 abutment will not be influenced by the river because the existing abutment will protect it from flood water. ➢ DAMPHU SIDE : ditto.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 35 to 45m	
Assumed Bridge Types	➢ Composit Simple Steel I Girder Bridge (Using Weathering Steel) ➢ Simple Steel Pony Truss Bridge (Using Weathering Steel). ➢ In-situ Post tensioning pre-stress Concrete box girder Bridge.	

(4) BURICHU BRIDGE

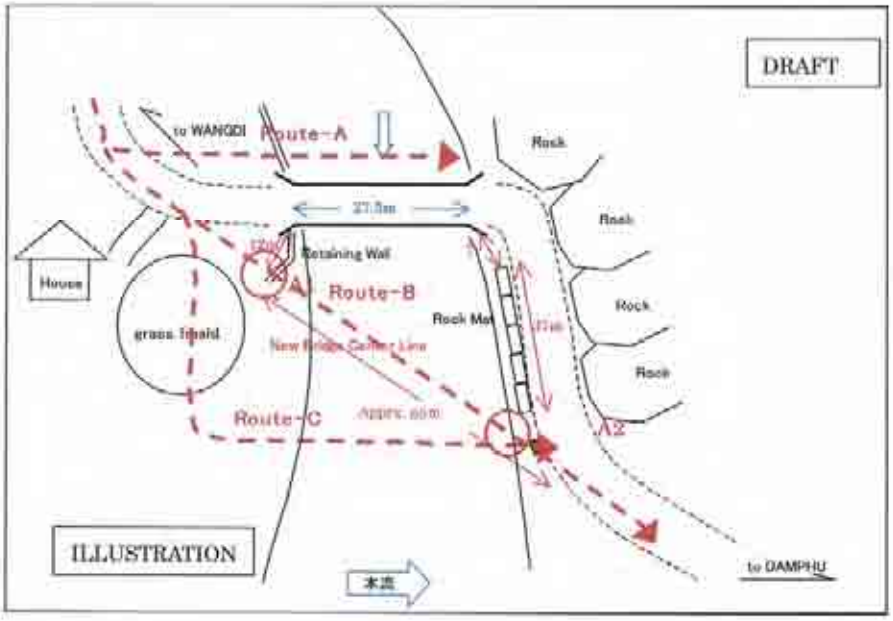

Table-4 Basic Design Concept for BURICHU Bridge

Selection of Bridge Alignment	➢ Route-A : There is no space because of a vertical rock.	NG
	➢ Route-B : The alignment is the best, and the area of construction will be much smaller than Route-C..	○
	➢ Route-C : The alignment is inferior to Rout-C and the area of construction will be much larger than Route-B.	NG
The Location of Abutment	➢ WANGDI PHODRANG SIDE : Around the end of retailing wall. ➢ DAMPHU SIDE : On the land shown on the above illustration.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 45 to 55m	
Assumed Bridge Types	➢ Simple Steel Pony Truss Bridge (Using Weathering Steel). ➢ In-situ Post tensioning pre-stress Concrete box Girder Bridge.	

(5) CHANCHEY BRIDGE

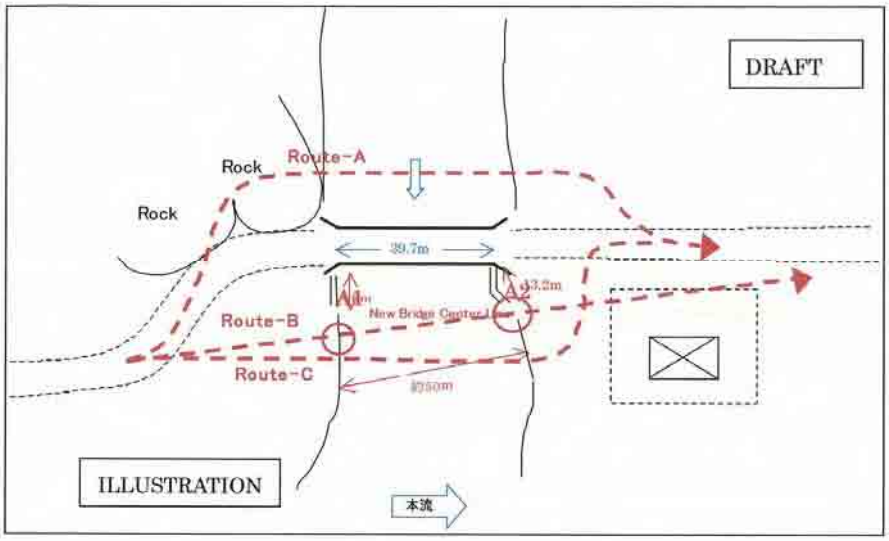

Table-5 Basic Design Concept for CHANCHEY Bridge

Selection of Bridge Alignment	➢ Route-A : There is no space because of a steep rock.	NG
	➢ Route-B : The alignment is the best, and the construction area will be smaller than Route-C.	○
	➢ Route-C : The alignment is much worse than Route-B, and the construction area will be larger than Route-B.	NG
The Location of Abutment	➢ WANGDI PHODRANG SIDE : On the land around the retaining wall. ➢ DAMPHU SIDE : On the land around the retaining wall.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 40 to 50m	
Assumed Bridge Types	➢ Simple Steel Pony Truss Bridge (Using Weathering Steel). ➢ In-situ Post tensioning pre-stress Concrete box Girder Bridge.	

(6) LORING BRIDGE

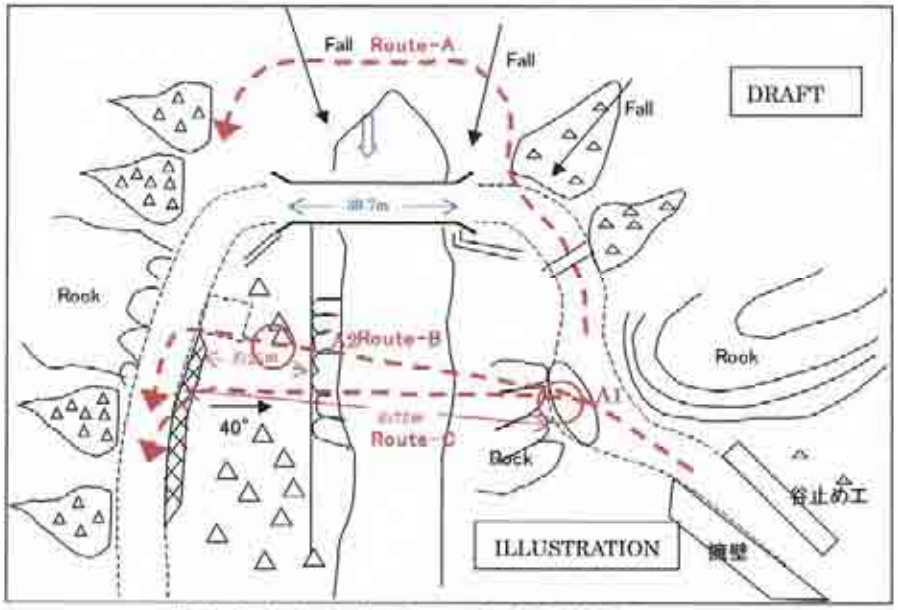

Table-6 Basic Design Concept for LORING Bridge

Selection of Bridge Alignment	➢ Route-A : The alignment is not suitable because there are existing Unstable slopes at the both sides, and the boalder falls will disturb the traffic.	NG
	➢ Route-B : This route is the best. First of all, the bridge length will be the shortest when the A1 abutment is set on the rock on Damphu side which locates forward. Secondly, in order to execute cable erection method of bridge the behind rocks are equally useful.	○
	➢ Route-C : The alignment is good. But behind A2 abutment, there is a unstable slope which is not suitable for not only the construction but also the bridge safety.	NG
The Location of Abutment	➢ DAMPHU SIDE : On the rock described above. ➢ SALPANG SIDE : On the slope described above.	
Assumed Bridge Length	➢ The distance between A1 and A2 abutment is approximately 65 to 75m	
Assumed Bridge Types	➢ Simple Steel Truss Bridge (Using Weathering Steel). ➢ Simple Steel Langer Bridge (Using Weathering Steel).	

7-2　環境申請許可書

環境申請許可書について以下に示す(予備調査報告書にも同じ許可書が資料として添付されており、現地では以下の申請内容を元に内容の確認を行っている)。

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
DEPARTMENT OF ROADS
INVESTIGATION AND DEVELOPMENT DIVISION

Ref. no. **DoR/I&D/Env/2006-07/12/** ๕๕๘　*Date:* 24.10.2007

To
The Chief Planning Officer
Planning and Policy Division
Ministry of Works & Human Settlement
Thimphu

Sub: Forwarding of Checklist for Environmental Clearance.

Madam,

Enclosed please find herewith the checklist for processing environmental clearance for the replacement of 6 existing bridges proposed under the Japan International Cooperation Agency (JICA), Project for Reconstruction of Bridges (Phase III) on the Wangdue - Sarpang Highway (National Highway No. 5).

In this regard it would be appreciated if you could kindly issue environmental clearance.

Yours faithfully,

(Phuntsho Wangdi)
Director,
DoR: Thimphu

lc

Cc:
1. The Hon'ble Secretary, Ministry of Works & Human Settlement, Thimphu for kind information.
2. The Head, Technical Division, NECS, Thimphu for kind information.
3. The Chief Engineer, Bridge Division, DoR.
4. The Chief Engineer, Roads Division, DoR.
5. The Executive Engineers, Field Division, Lobesa and Sarbang.

P.O. Box No. 145, Thimphu, Bhutan　Tel.No.: +975-2-321371

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACMENT OF BAILEY BRIDGE OVER LAWAKHA CHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a)	Village	: **Lawakha**
b)	Geog	: **Gasa Tshowom**
c)	District	: **Wangdue**

2. Purpose and Need of the Bridge	: **Replacement of old existing Bridge.**
3. Bridge over Perennial or seasonal stream/ river	: **Perennial**
4. Name of the Bridge	: **Lawakha Bridge**
5. Type of Bridge	: **Steel Bridge**
6. Single or Multiple Bridge span	: **Single**
7. Total Bridge Span (feet)	: **124 Feet (38 m)**
8. Bridge Width (m)	: **6.0 m**
9. Loading Capacity (Tonne)	: **40 tonnes**
10. Sidewalk Width (m)	: -
11. Bridge Designer/Address	: **JICA**
12. Name of the Construction Company	: **NA**
Address	: **NA**
13. Time frame of the project :	
Project start date :	
Project completion date :	

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division, and Department of Forestry Services is required as per EA Act 2000.

=> No, the proposed bridge does not pass through protected areas/national parks/wildlife corridor.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> No

a) Type of blasting technique :
b) Type of explosives :
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> Irrigation Channel lies in the vicinity of the bridge site for paddy field below the road.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The spoil soil and rocks from the excavation is very minimal and this will be utilized as back filling in abutment walls and embankment works.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The excavated materials will be prevented from getting into the water by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> No

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils), human waste etc. (Use additional Sheet)

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No

12) Environmental Management plan:

1) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fuel wood, air pollution due to Garbage pollution**

b) Social impacts : **- No -**

c) Cultural impacts : **- No -**

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> Restoration of labour camp site after completion of works. Construction of labour camp as per conditions laid down in the ECoP (Roads & Highways).

3) Who will manage the mitigation measures?

=> The mitigation measures shall be managed by the Field Division, DoR, Lobesa and the contractor as per the conditions laid down in the ECOP.

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> The Field Division, DoR, Lobesa and the Department of Roads.

2) What is the monitoring schedule?

=> The monitoring schedule will be carried out as per the ECOP and as per the terms & conditions of the contract agreement.

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: 335344

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACMENT OF BAILEY BRIDGE OVER BASOCHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a)	Village	: **Basochu**
b)	Geog	: **Daga/Gasa Tshowom**
c)	District	: **Wangdue**

2. Purpose and Need of the Bridge	: **Replacement of old existing Bridge.**
3. Bridge over Perennial or seasonal stream/ river	: **Perennial**
4. Name of the Bridge	: **Basochu Bridge**
5. Type of Bridge	: **Steel Bridge**
6. Single or Multiple Bridge span	: **Single**
7. Total Bridge Span (feet)	: **Option I - 147 Feet (45 m)** **Option II – 130 Feet (40m)** **Option III – 98 Feet (30m)**
8. Bridge Width (m)	: **6.0 m**
9. Loading Capacity (Tonne)	: **40 tonnes**
10. Sidewalk Width (m)	: -
11. Bridge Designer/Address	: **JICA**
12. Name of the Construction Company	: **NA**
Address	: **NA**
13. Time frame of the project :	
Project start date :	
Project completion date :	

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division, and Department of Forestry Services is required as per EA Act 2000.

=> No, the proposed bridge does not pass through protected areas/national parks/wildlife corridor.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> No

a) Type of blasting technique :
b) Type of explosives :
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> No.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The spoil soil and rocks from the excavation is very minimal and there will be the construction materials from the demolition of the foundation of the old bridge which will be utilized as back filling in abutment walls and embankment works.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The excavated materials will be prevented from getting into the water by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> There will be no significant impacts on air and noise in and around the project area, the surface water quality will not be affected as long as the debris , grease and fuel are protected from flowing into the river during construction.

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils) , human waste etc.

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No, there aren't any historical and cultural sites in the vicinity of the project Area.

12) Environmental Management plan:

1) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fuel wood, garbage oil and grease Pollution.**
b) Social impacts : **There are no settlements near the project area**
c) Cultural impacts : **- No -**

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> The labour camp site will be restored to its original position at the end of the project. To minimize the pressure on fuel wood the laborers are to be provided with fuel for consumption.

3) Who will manage the mitigation measures?

=> The mitigation measures shall be managed by the Field Division, DoR, Lobesa and the contractor as per the conditions laid down in the ECOP.

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> The Field Division, DoR, Lobesa and the Department of Roads.

2) What is the monitoring schedule?

=> The monitoring schedule will be carried out as per table 2.41 of the ECoP for Highways and Roads and as per the terms & conditions of the contract agreement.

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: **335344**

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACEMENT OF BAILEY BRIDGE OVER NYARACHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a) Village : **Nyarachu**
b) Geog : **Patila**
c) District : **Tsirang**

2. Purpose and Need of the Bridge : **Replacement of old existing bridge, the edge of the road has been washed away by the recent flood and due to the debris the water level has increased. A new bridge at a higher level with a longer span is proposed.**

3. Bridge over Perennial or seasonal stream/ river : **Perennial**

4. Name of the Bridge : **Nyarachu Bridge**

5. Type of Bridge : **Steel Bridge**
6. Single or Multiple Bridge span : **Single**

7. Total Bridge Span (feet) : **163 Feet (50 m)**

8. Bridge Width (m) : **6.0 m**

9. Loading Capacity (Tonne) : **40 tonnes**

10. Sidewalk Width (m) : -

11. Bridge Designer/Address : **JICA**

12. Name of the Construction Company : **NA**

Address : **NA**

13. Time frame of the project :

Project start date :
Project completion date :

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division and Department of Forestry Services is required as per EA Act 2000.

=> Yes, the proposed bridge falls on the Black Mountain National Park.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No, A private Quarry is under operation next to the bridge site.

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> No

a) Type of blasting technique :
b) Type of explosives :
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> No.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The spoil soil and rocks from the excavation is very minimal and this will be utilized as back filling in abutment walls and embankment works.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The excavated materials will be prevented from getting into the water by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No, there are no major land changes anticipated due to the construction of the bridge. The new bridge construction with longer span has positive impact on the flow of the river by allowing the natural flow of the river which has been controlled due to the shorter span of the old bridge.

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> No

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils) , human waste etc.

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No

12) Environmental Management plan:

1) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fuel wood, garbage oil and grease pollution.**

b) Social impacts : **- No -**

c) Cultural impacts : **- No -**

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> **The labour camp site will be restored to its original position at the end of the project. To minimize the pressure on fuel wood the laborers are to be provided with fuel for consumption.**

3) Who will manage the mitigation measures?

=> **The mitigation measures shall be managed by the Field Division, DoR, Tsirang and the contractor as per the conditions laid down in the ECOP.**

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> **The Field Division, DoR, Tsirang and the Department of Roads.**

2) What is the monitoring schedule?

=> **The monitoring schedule will be carried out as per table 2.4.1 of the ECoP for Highways and Roads and as per the terms & conditions of the contract agreement.**

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: **335344**

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACEMENT OF BAILEY BRIDGE OVER BURICHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a) Village : **Burichu**
b) Geog : **Patila**
c) District : **Tsirang**

2. Purpose and Need of the Bridge : **Replacement of old existing bridge, and also to avoid the sharp turn which makes the big vehicles and machineries difficult to enter the bridge and the rocky cliff.**

3. Bridge over Perennial or seasonal stream/ river : **Perennial**

4. Name of the Bridge : **Burichu Bridge**

5. Type of Bridge : **Steel Bridge**
6. Single or Multiple Bridge span : **Single**

7. Total Bridge Span (feet) : **183 Feet (56 m)**

8. Bridge Width (m) : **6.0 m**

9. Loading Capacity (Tonne) : **40 tons**

10. Sidewalk Width (m) : -

11. Bridge Designer/Address : **JICA**

12. Name of the Construction Company : **NA**

Address : **NA**

13. Time frame of the project :

Project start date :

Project completion date :

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division and Department of Forestry Services is required as per EA Act 2000.

=> Yes, the proposed bridge falls on the Black Mountain National Park.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No.

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> No

a) Type of blasting technique :
b) Type of explosives :
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> No.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The spoil soil and rocks from the excavation is very minimal and this will be utilized as back filling in abutment walls and embankment works.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The excavated materials will be prevented from getting into the water by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No, there are no major land changes anticipated due to the construction of the bridge.

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> No

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils) , human waste etc.

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No

12) Environmental Management plan:

1) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fuel wood, garbage oil and grease pollution.**

b) Social impacts : **- No -**

c) Cultural impacts : **- No -**

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> **The labour camp site will be restored to its original position at the end of the project. To minimize the pressure on fuel wood the laborers are to be provided with fuel for consumption.**

3) Who will manage the mitigation measures?

=> **The mitigation measures shall be managed by the Field Division, DoR, Tsirang and the contractor as per the conditions laid down in the ECOP.**

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> **The Field Division, DoR, Tsirang and the Department of Roads.**

2) What is the monitoring schedule?

=> **The monitoring schedule will be carried out as per table 2.4.1 of the ECoP for Highways and Roads and as per the terms & conditions of the contract agreement.**

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: **335344**

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACMENT OF BAILEY BRIDGE OVER CHANGCHEY CHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a) Village : **Changchey**
b) Geog : **Patila**
c) District : **Tsirang**

2. Purpose and Need of the Bridge : **Replacement of old existing bridge, and also to avoid the sharp turn which makes the big vehicles and machineries difficult to enter the bridge and the rocky cliff.**

3. Bridge over Perennial or seasonal stream/ river : **Perennial**

4. Name of the Bridge : **Changchey Bridge**

5. Type of Bridge : **Steel Bridge**
6. Single or Multiple Bridge span : **Single**

7. Total Bridge Span (feet) : **173 Feet (53 m)**

8. Bridge Width (m) : **6.0 m**

9. Loading Capacity (Tonne) : **40 tonnes**

10. Sidewalk Width (m) : -

11. Bridge Designer/Address : **JICA**

12. Name of the Construction Company : **NA**

Address : **NA**

13. Time frame of the project :

Project start date :

Project completion date :

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division and Department of Forestry Services is required as per EA Act 2000.

=> No, the proposed bridge does not pass through protected areas/national parks/wildlife corridor.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No.

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> No

a) Type of blasting technique :
b) Type of explosives :
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> No, the bridge doesn't pass through any private property. However there is a Forest check office located near the bridge site which will not be affected but will have to inform them about the construction.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The stones from the foundation slab of the old bridge need to removed this will be reused this will be utilized as back filling in abutment walls, embankment works and soling of the road.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The stone slabs will be prevented from getting into the water by proper removal and also by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No, there are no major land changes anticipated due to the construction of the bridge.

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> No

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils), human waste etc.

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No

12) Environmental Management plan:

1) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fuel wood, garbage oil and grease pollution.**

b) Social impacts : **- No -**

c) Cultural impacts : **- No -**

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> The labour camp site will be restored to its original position at the end of the project. To minimize the pressure on fuel wood the laborers are to be provided with fuel for consumption.

3) Who will manage the mitigation measures?

=> The mitigation measures shall be managed by the Field Division, DoR, Tsirang and the contractor as per the conditions laid down in the ECOP.

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> The Field Division, DoR, Tsirang and the Department of Roads.

2) What is the monitoring schedule?

=> The monitoring schedule will be carried out as per table 2.4.1 of the ECoP for Highways and Roads and as per the terms & conditions of the contract agreement.

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: **335344**

CHECKLIST TO PROCESS FOR ENVIRONMENTAL CLEARANCE FOR REPLACMENT OF BAILEY BRIDGE OVER LORING CHU

1. GENERAL INFORMATION

1) Location of the Bridge:

a) Village : **Loring**
b) Geog : **Loring**
c) District : **Tsirang**

2. Purpose and Need of the Bridge : **Replacement of old existing bridge, and also to avoid the sharp turn which makes the big vehicles and machineries difficult to enter the bridge and also to avoid the shooting boulders on the existing bridge.**

3. Bridge over Perennial or seasonal stream/ river : **Perennial**

4. Name of the Bridge : **Loring Bridge**

5. Type of Bridge : **Steel Bridge**
6. Single or Multiple Bridge span : **Single**

7. Total Bridge Span (feet) : **Option I - 320 Feet (98 m)**
Option II – 277 Feet (85m)

8. Bridge Width (m) : **6.0 m**

9. Loading Capacity (Tonne) : **40 tonnes**

10. Sidewalk Width (m) : -

11. Bridge Designer/Address : **JICA**

12. Name of the Construction Company : **NA**

Address : **NA**

13. Time frame of the project :

Project start date :

Project completion date :

2. ENVIRONMENTAL & SOCIAL ASPECTS

1) Does the proposed Bridge Construction pass though protected areas/national parks/wildlife corridor. If "Yes" approval from Nature Conservation Division and Department of Forestry Services is required as per EA Act 2000.

=> No, the proposed bridge does not pass through protected areas/national parks/wildlife corridor.

2) Does the proposed Bridge construction involve quarrying activities? If "Yes" prior approval from the Department of Geology and Mines should be obtained.

=> No.

3) Does the proposed project involve use of explosives? If "Yes" specify:
=> Yes, silent blasting is required to remove the rock on the edge of the road to lay foundation base of the new bridge.

a) Type of blasting technique : **Silent Blasting**
b) Type of explosives : **Aconex**
c) Amount of explosives required :

Also provide evidence that the personnel involved in blasting works are properly trained and that proper handling /storage of blasting explosive materials are in place.

4) Are there any listed species of flora & fauna in the vicinity of the project area (Forest & Nature Conservation Act of 1995, Schedule 1)?

=> No

5) Does the bridge pass through any private property? If "Yes" NOC should be obtained from the affected parties.

=> No, the bridge doesn't pass through any private property.

6) How would the debris (spoil soil and rocks) from the excavation works would be disposed off? Specify if there is any identified site for disposal of these debris or other ways of proper disposal.

=> The spoil soil and rocks from the excavation is very minimal and this will be utilized as back filling in abutment walls, embankment works and rocks for soling of the road.

7) Are there enough mitigation measures to avoid the excavated spoil materials from getting into the water body?

=> The excavated materials will be prevented from getting into the water by providing boulder barriers and walls if necessary.

8) Are there any major Land use changes anticipated due to the construction of the bridge with the secondary development that will occur due to the bridge construction?

=> No, there are no major land changes anticipated since it is the replacement of the existing bridge.

9) Would there be significant impacts on the Air, Noise and surface water quality in and around the project area due to the proposed project?

=> No

10) Impact from laborers/worker:

a) Number of laborers (both expatriate and local) :
=> NA

b) Waste Management Plan for all kinds of waste generated such as spent fuel from machineries (grease & oils) , human waste etc.

=> Proper sanitary facility such as pit latrines are to be provided to the laborers involved at the site along will borrow pits for dustbin. The glass, pet bottles and the tin cans are to be collected and sold to the local dealers.

11) Are there any historical and cultural sites (Lhakangs, monasteries) in the vicinity of the project area? If "Yes" obtain NOC form NCCA.

=> No

12) Environmental Management plan:

I) From the above information, what potential environmental, social and cultural impacts are foreseen as a result of the Bridge Construction?

a) Environmental impacts : **Pressure on fire wood, pollution due to Garbage, fuel and grease**

b) Social impacts : **- No -**

c) Cultural impacts : - No -

2) What are the proposed mitigation measures to avoid or minimize the potential impacts?

=> **The labour camp site will be restored to its original position at the end of the project. To minimize the pressure on fuel wood the laborers are to be provided with fuel for consumption.**

3) Who will manage the mitigation measures?

=> **The mitigation measures shall be managed by the Field Division, DoR, Sarbang and the contractor as per the conditions laid down in the ECOP.**

3. ENVIRONMENT MONITORING PLAN

1) Who will monitor the above activities?

=> **The Field Division, DoR, Sarbang and the Department of Roads.**

2) What is the monitoring schedule?

=> **The monitoring schedule will be carried out as per table 2.4.1 of the ECoP for Highways and Roads and as per the terms & conditions of the contract agreement.**

3) Contact address of the Environmental focal person:

Name	: **Sonam Choki**
Designation	: **Deputy Executive Engineer**
Organization/Agency	: **Environmental Unit, Investigation & Development Division, DoR**
Telephone No.	: **321571/105**
Fax No.	: **335344**

BT/GM-020, 3/5

Royal Government of Bhutan
Ministry of Works & Human Settlement
Department of Roads
Bridge Division
"Enhancing Productivity & Professionalism"

DoR/BD/ 28 /2007-2008/ 185 8/01/2008

To
The Resident Representative
JICA, Bhutan Office
Thimphu

Sub: Environmental Clearance for reconstruction of 6 bridges under Phase-II, JICA Project

Sir,

We are forwarding herewith a copy (in original) of the Environmental Clearance No.PPD/MoWHS/Envl/01/2007-08/3231 dated 19th December 2007 issued by the Policy & Planning Division, Ministry of Works & Human Settlement, Thimphu for reconstruction of the following 6 bridges.

i. Lawakha Bridge
ii. Basochu Bridge
iii. Nyarachu Bridge
iv. Burichu Bridge
v. Chanchey Bridge
vi. Loring Bridge

This is for you kind information and necessary action please.

Yours faithfully,

Phuntsho Wangdi
Director

P.O. Box No. 143, Thimphu : Bhutan
PABX Nos: (+9752) 326753, 327451, 325171.
Telefax #: (+975 2) 324437
E-mail: sebridge@druknet.bt

TT/QM-020.3/5

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
DEPARTMENT OF ROADS
THIMPHU : BHUTAN

No. DOR/I&D(I)/2007-08/04/ 1282 *Date:* 24/12/2007

To
The Chief Engineer,
Bridge Division,
DoR : Thimphu

Sub: Environmental Clearance for reconstruction of 6 bridges under Phase-III JICA Project

Sir,

We are forwarding herewith a copy (in original) of the Environmental Clearance No. PPD/MoWHS/Env/01/2007-08/3231 dated 19th December 2007 issued by the Policy & Planning Division, Ministry of Works & Human Settlement, Thimphu for reconstruction of the following 6 bridges.

i) Lawakha Bridge
ii) Basochu Bridge
iii) Nyarachu Bridge
iv) Burichu Bridge
v) Chanchey Bridge
vi) Loring Bridge

This is for further necessary actions from your end.

Yours sincerely,

24/12

(Kunzang Wangdi)
Chief Engineer,
Investigation & Development Division,
DoR : Thimphu

K. Tenzin
Please see if we need to forward a copy to JICA.
25/12

Cc: The Director, DoR, Thimphu for kind information.

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
POLICY & PLANNING DIVISION
THIMPHU: BHUTAN
"Towards Quality Infrastructure"

PPD/MoWHS/Env/01/2007-08/3231 19th December 2007

Director
Department of Roads
Thimphu.

Sir,

Subject: Environmental Clearance for re-construction of 6 bridges under JICA project (Phase III)

The Ministry of Works and Human Settlement (MoWHS) issues the Environmental Clearance (EC) as per your letter no. DoR/I&D/Env/2006-2007/12/858 dated 24.10.07 for the re-construction of the following bridges under JICA project (Phase III): Lawakha bridge, Basochu bridge, Nyamechu bridge, Burichu bridge, Chunchey bridge and Loring bridge. The following terms and conditions apply:

1. The EC is valid for the re-constructions of the above mentioned bridges only.
2. All activities must be inline with Forest and Nature Conservation Act 1995 and Rules 2006.
3. No disturbance must be caused to public and religious sites due to the project activity.
4. Aesthetics of the valley and the river must be protected at all times.
5. A proper arrangement has to be made regarding the irrigation channel in the vicinity of the Lawakha bridge if the bridge construction activity interferes with the irrigation channel.
6. All the blasting works should be done in line with the guidelines from Ministry of Home and Cultural Affairs and Department of Geology and Mines. The blasting works should be executed strictly by trained professionals.
7. Indiscriminate dumping of excavated/waste materials into the river is an offense and is liable to penalty. It should be properly disposed in an appropriate disposal site.
8. Downstream effects must be monitored at all times to ensure that no damage is caused due to the project activity.
9. Waterways must be protected from any obstruction during and after the construction.
10. Occupational Health and Safety measures should be strictly observed at all times during the project activity.

Tele: 00975-2-327998/328173/326793/322182/325171
Fax: 00975-2-323144/322270/323122
P.o Box: 791

BT/GH-020.5/5

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF WORKS & HUMAN SETTLEMENT
POLICY & PLANNING DIVISION
THIMPHU: BHUTAN
"Towards Quality Infrastructure"

11. A smooth flow of vehicular traffic should be maintained during the project activity.
12. Any dispute arising due to the above project activity shall be the responsibility of the project proponent (i.e Department of Roads).
13. Bio-engineering works shall be carried out wherever feasible to improve the aesthetics of the project area.
14. Copy of this EC must be maintained at all sites at all times during the construction activity for environment management and monitoring references.

Any violation of the terms and conditions specified in the EC is a violation of EA Act 2000 which will result in revocation of the EC without any liability on the part of this office. Incase of renewal of the EC, this office should be notified one month before the expiry of this Environmental Clearance.

This Environmental Clearance is valid till 31st December 2010.

Yours faithfully,

Sangay Tenzin
Offg.Chief Planning officer
PPD, MoWHS

Copy to:

1. Hon'ble Secretary, MoWHS for kind information.
2. Head, EA Section, NEC, Thimphu for kind information.
3. Dy. EE, Environment Unit, I & D Division, DoR for kind information.

Tele: 00975-2-327998/328173/326793/322182/325171
Fax: 00975-2-323144/322270/323122
Po Box: 791

7-3　各サイトの地形・地質

(1)　地形

以下に、各サイトの地形と周辺の状況を記述する。

1)ラワカー橋

既設のラワカー橋は標高 1,180m付近で支流に掛かり、本流との標高差は 50m 以上である。既設橋の 20m ほど山側には支流の滝が流れており、滝のすぐ下には発電所施工時の代替道路がある。現在の橋台はこの代替道路と約 5m の離れである。支流と橋梁の標高差は 12m程度ある。

起点側には、新しいダム建設のための進入路が施工中である。起点側の既存の橋台は 3m 程度下に露出している岩盤に乗っている。

橋中央の山側の滝においては乾季の水量は少なく、代替道路を通行できるが、雨季には山側道路が覆われるほどである。橋の下には、2m 大の巨礫が累々としている。

終点側の道路は S 字状である。山側には滝からの水路が引かれている。水路は道路を潜り、下の麦畑や水田の灌漑に利用されている。S 字カーブの終点側付近まで切土には岩盤が分布しているが、それよりバソチュ側には旧崖錐層が分布している。終点側の橋台は岩着しているが、岩盤は橋面から約 10m 下にある。崖錐層は締りが良いが、道路下の崖錐の表面には建設当時に投棄されたガレが 1m～2m 程度の厚さで分布している。

2)バソチュ橋

既設のバソチュ橋は標高 1030m 付近で支流に掛かり、本流との標高差は 30m 程度である。既設橋の 10m 程度山側には、支流の滝が流れているが、乾季はほとんど流れが無い。しかし、雨季には流れが強くなり、上流のダムが放流した際には、激流とかす。支流と橋梁の標高差は 8m 程度ある。

既設橋の位置から下流に 50m 程度の範囲は河床がほぼ水平であるため、砂が堆積しているがその下流は数m大の巨礫が累重している。この巨礫の累積が雨季には幾段もの滝を形成すると想定される。

現橋を挟んで左右岸の取付道路は扇型に広がっており、他の 5 橋に比べ平坦な地形である。また、左岸側（起点側）には架設用ヤードとして利用できる平場がある。

3)ニャラチュ橋

既設のナラチュ橋は標高 525m付近で支流に掛かり、本流との標高差は 60m である。当該渓流は 1m 大以下の円礫が累々と堆積しており、雨季には大量の礫が上流から流れてきて当該橋梁を中心に上流 1km、下流 300m 付近に堆積している。堆積速度は毎年浚渫を行なっているが、既設の橋梁建設から 8 年間に 4m 堆積しており、年に 50cm 以上である。既存橋の橋台は共に約 10m 河川にせり出しており、通水断面を狭くしている。2007 年の洪水では水位が現橋道路面まで及んだ。

当該地の両岸は切り立った崖とその下に広がる崖錐層からなる。崖錐は毎年、河川浸食を受けている。終点側上流には浸食防止のための擁壁が築かれている。

起点側下流には砕石プラントがあり、ナラチュ橋の上流の新しい崖錐から基盤岩の石を採取している。

橋梁付近の上下流の平均勾配は 3/100 であるが、下流 300m から本流との合流点までは、巨石が累々と重なり、1m～3m 程度の滝を形成しながら急激に流下している。この付近の平均勾配は 12/100 である。

4)ブリチュ橋

既設のブリチュ橋は標高 380m付近で支流に掛かり、支流との高低差は 7m である。本流とは既設橋の下流約 180m 付近で合流し、本流との標高差は 2m 程度である。

起点側は 2 つの段丘面があり、高い段丘面には民家が道路から 20m ほどのところにある。HWL は乾季の河床から約 3m 上がったところである。低い段丘面は雨季の HWL と同じ高さであり、雨季にはしばしば水没すると思われる。河床勾配は１％と緩やかである。

終点側の左岸に岩山が迫り、道路建設時の掘削で終点側道路はオーバーハングを呈している。このため、道路および橋梁取り付け部にまで、落石による被害が出ている。

終点側の道路の川側は攻撃斜面であるため、道路を防護するための蛇篭による護岸工が設けられている。

既設の橋梁終点部は岩山に直面し、直角に曲がるためトラックは何度かハンドルを切り返さなければ通過できない。

5)チャンチー橋

既設のチャンチー橋は標高 345m付近で支流に掛かり、支流との高低差は 15m である。本流とは既設橋の下流約 280m 付近で合流し、本流との標高差は 7m 程度である。起点側及び終点側とも本流河床から約 20m高い段丘面が広がる。

起点側の道路は直線の緩やかな上り道で、両側に平地が広がるが、山側には民地（レストラン）があり、本流側には森林局管理事務所と送電線建設用資材置き場があるが、道路用地としては余裕がある。

終点側の道路は尾根を巻き込むようにあり、斜面を７m程度切土して橋台を岩盤の上に載せるためにＳ字カーブとなっている。

6)ローリン橋

既設のローリン橋は標高 1120m付近で支流の上流部に掛かっている。既設橋の 100m 程度山側には、乾季の流れは少ないが滝が流れている。雨季になると起点側の道路の山側 40m 間から、3 条の滝が現れ、既設橋からバソチュー側の 40m 付近は道路上も含めて全て滝と変化し、交通規制が引かれる。また、既設橋付近では毎年の雨期に落石が多くなり、既設橋や通行車両に損傷を与えている。

既設橋から、70m 起点側のカーブには岩盤の両切土があり、そのダンプ側には道路盛土のための擁壁と谷止めのための擁壁がある。この谷止め工の上方には安定勾配で土砂が堆積している。現在、谷止め工の上から、土砂がこぼれ出ている形跡はないが、ほとんど埋まっている。盛土の擁壁の高さは約 6m である。

既設橋の基点側の取り付け部分は直角な道路線形であるため、トラックは数度に渡りきり返しを行わないと通過できない。

沢と橋梁の標高差は 40m 程度ある。河床勾配は急である。河床には２ｍ台の巨礫が堆積しており、雨季にはこの礫の上を川が流下する。

(2)地質

以下に各サイトの地質状況を示す。また、表に、各橋梁位置における地形的特徴、河川勾配、地質およびボーリング結果等の概略を示す。

1)ラワカー橋

ラワカー橋周辺の基盤岩は細粒な片麻岩である。

起点側の片理の構造は N55E30N であり、橋台に対して相対的に受盤構造である。層理に沿ったクラックの間隔は 50cm～1m と極めて荒い間隔でクラックが入っている。岩盤表面は 20 度程度本流側に傾斜している。既設橋の起点側の左側には、1m 台の巨礫が投棄されている。

終点側の基盤岩は塊状である。ほとんどクラックがない。層理は N20W28E で、起点側とは逆向きである。そのため、終点側の橋台基礎も受盤構造である。ボーリングポイントおよびその背面には崖錐堆積物が分布している。この崖錐堆積物は古い時代にものと推定され、比較的良く締まっている。この旧崖錐堆積物には人頭大までの礫が多く含まれ、まれに 2～3m 大の巨礫を含む。崖錐部分の斜面勾配は 40 度である。

終点側の橋台計画位置で行ったボーリングの結果、旧崖錐層の深さは、9m であり、N 値は 50 以上を示した。岩盤は RQD も 40～80％程度で新鮮である。

2)バソチュ橋

当該地の地質は基盤岩の眼球片麻岩（Augen gneiss）と基盤岩の大きな角礫と円礫を含む旧崖錐層、その上位を不整合に覆う段丘堆積物、河床に分布する現河床堆積物からなる。
起点側の切土面で確認される地質は基盤岩と旧崖錐層である。終点側ではこれらに加えて段丘堆積物が確認される。

基盤岩の片理面は大まかには山側から谷川に向けての流れ盤となる。片理面に沿ったクラックは、10cm から 25cm 間隔で入っている。

崖錐層に含まれる基盤岩の巨礫は１ｍ～３ｍ程度あるが最大は 10m 以上である。巨礫の占める面積比は 60%程度である。巨礫以外の部分には人頭大程度以下の円礫が主体をなす砂質土からなる。

起点側橋台計画位置の河床で行ったボーリングの結果、河床から３ｍ程度が現河床堆積物、そのした約５ｍが旧崖錐層であった。基盤岩は約８ｍの深さに確認された。
終点側橋台計画位置の河床で行ったボーリングの結果、河床から４ｍ程度が現河床堆積物であった。ボーリングを１０ｍ行ったが基盤岩は確認されなかった。

現河床堆積物も旧崖錐層も N 値は、礫打ちによるリバウンドのため 50 以上を示した。

3)ニャラチュ橋

基盤岩は変成度の低い硬質砂岩である。再結晶化しており、黒雲母が確認できる。層理の走行傾斜はやや起点側に傾斜している。

起点側の道路脇の切土には崖錐層しか確認されない。基盤岩は橋の上流側には分布するが、橋を境に下流側はこの崖錐層が分布する。起点側の崖錐層は古い崖錐層であり、基質部分は比較的締まっている。10m 近い巨礫を含んでいる。川に向かう斜面の勾配は 50 度程度と急勾配である。

終点側の山頂付近には基盤岩の崖が連続して分布している。その下に崖錐層が分布するが、この崖錐層は基点側のものより締りがないことから時代的にも若い崖錐層であることが伺える。そのため、道路切土や、河川侵食により崩壊して、二次的な地すべり起こしている。

起点側、終点側の橋台計画位置の河床で行ったボーリングは 10m まで掘進したが、共に基盤岩は確認できなかった。両ボーリング共に 7m～8m まで河床堆積物があり、表層は N 値 25 程度のシルト分を含む砂礫層で、下は礫分を多く含む砂礫層で N 値は 50 以上である。河床堆積物の下には旧崖錐層が分布している。

4)ブリチュ橋

当該地の地質は基盤岩の眼球片麻岩（Augen gneiss）と旧崖錐層、その上位を不整合に覆う段丘堆積物、河床に分布する現河床堆積物からなる。

この眼球片麻岩はマクロ的な眼球片麻岩であり、眼球となる石英は 3m～5m と大きい。また黒色鉱物である黒雲母も幅が 50cm～１ｍの幅を持って生成されている。基部の片麻岩は細粒である。この部分の構造はＮＳ走行 10～20 度Ｅである。

左岸側の切土部は風化が進んでおり、全体に褐色化している。片麻岩部分の片理は２～5cm 間隔である。縦クラックは 70cm 程度の間隔で入っている。この基盤岩は左岸にある布団篭付近まで、道路上の露頭として確認されるが、それより終点側では古い崖錐層に覆われてしまう。この旧崖錐層は終点側の道路上及び道路と川の間に広く分布している。

この旧崖錐層は角礫と亜角礫およびシルト質な基質部分（砂質シルト）からなり、表面はルーズであるが、36 度の斜面勾配があり、全体的にはしっかりしている。

起点側は 2 つの平坦面を有している。共に若い段丘である。支流と本流の合流点であるため、本流の円礫と支流の亜円礫や角礫が混在して段丘礫層を形成している。

起点側、終点側共に河床から 3m～5m ほど上がった橋台計画位置でのボーリングでは 10m 掘進しても基盤岩は確認されなかった。終点側の道路面からのボーリングでは約 13m の深さに基盤岩が分布していた。

橋台位置では表層から 2～3m まで旧崖錐層が分布し、N 値は 25 程度である。その下の段丘堆積物は N 値 50 以上であった。

5)チャンチー橋

当該地の地質は基盤岩の眼球片麻岩（Augen gneiss）と段丘堆積物、現河床堆積物からなる。

終点側は主に段丘円礫層が分布しているが、既存の橋台部分から、上流側に基盤岩の眼球片麻岩が分布している。片理に沿ったクラックは 50cm～1m 間隔である。片理に直行するクラッ

クは 50cm～2m 間隔で入っている。橋台部の片麻岩の厚さは 2m～3m で幅が薄く、段丘面と同じ高さに分布するが、下流側に 10m 程度離れると河床の下に潜る。これらのことから、この基盤岩の分布は下流側にも終点側にも限られたものであることが表面上うかがえる。

段丘層は円礫を含む砂質層だけでなく、部分的に角礫や亜角礫も混入しており、1m 大の巨礫も混入している。段丘面から河床に向かう斜面勾配は 60 度と急であるが、斜面全体は安定しているように見受けられる。

終点側の橋台計画位置の段丘面からのボーリングでは､約 8m の深さに基盤岩が確認された。起点側の橋台計画位置の段丘面からのボーリングでは約 16m の深さに基盤岩が確認された。段丘層は極表層を除き N 値 35～50 程度である。

6)ローリン橋

当該地の地質は基盤岩の片麻岩（gneiss）と旧崖錐層、および道路工事中に投棄されたれルーズな礫からなる。

起点側の両切土には基盤岩が分布し、片理面は大まかには上流側に向けての流れ盤となる。片理面に沿ったクラックは、10cm から 25cm 間隔で入っている。縦クラックの間隔は 10cm から 1m である。岩盤としては CL～CM 級である。

終点側の計画位置の背後の切どの岩盤も起点側の岩盤と同様である。この切土の上下流とも浅い谷地形である。右岸の上流側の沢は道路と沢の間に旧道を挟むため、土砂の流出があった場合でも若干の余裕がある。下流側には 10m 以内に 2 本の沢があり、現在、道路にまで、沖積錐を堆積している。

右岸の道路下にある旧崖錐層は､他の地域にある旧崖錐層に比べ締りが悪い。それに加えて、工事中または、最近、解体された小屋の瓦礫が計画ルート上の斜面に堆積している。

起点側のボーリングでは 2m 程度の崖錐層があるが、基本的には露頭と同じ基盤岩が確認された。

終点側の基盤線は、斜面同様に傾斜しており、旧崖錐層の層厚は 10m 程度である。N 値は 29～50 程度である。