Appendices

1. Member List of the Survey Team
2. Survey Schedule
3. List of Party Concerned in the Recipient Country
4. Minutes of Discussion
5. References

1. Member List of the Study Team

1) Primary Study in PNG

Name	Posision	Organization
OI, Hidetomi	Team Leader	Senior Advisor, Japan International Cooperation Agency
MATSUMOTO,Kiminori	Chief Consultant / Bridge Planner	Nippon Koei Co., Ltd.
MOROISHI, Youichi	Bridge Designer	Nippon Koei Co., Ltd.
TSUTA, Hideo	River Channel Surveyor / Hydrologist	Nippon Koei Co., Ltd.
TAKAHASHI, Shinya	Surveyor / Geologist	Nippon Koei Co., Ltd.
SONOBE, Naoaki	Construction Planner / Cost Estimator	Nippon Koei Co., Ltd.
OKUNO, Kentaro	Administrator	Nippon Koei Co., Ltd.

2) Discussion on Draft Final Report in PNG

Name	Posision	Organization
IWASAKI, Kaoru	Team Leader	Resident Representative, Japan International Cooperation Agency Papua New Guinea Office
MATSUMOTO,Kiminori	Chief Consultant / Bridge Planner	Nippon Koei Co., Ltd.
FUJISAWA, Hiroshi	Bridge Designer	Nippon Koei Co., Ltd.
SONOBE, Naoaki	Construction Planner / Cost Estimator	Nippon Koei Co., Ltd.

2.1 Survey Schedule (Primary study in PNG)

	Date		Study Team Schedule	Stay	Activities
1	5 July	Wed	Study Members of Oi, Matsumoto, Moroishi, Takahashi and Sonobe move from Tokyo to Cairns	Cairns	Movement from Tokyo to Cairns
2	6 July	Thu	Study Members of Oi, Matsumoto, Moroishi, Takahashi and Sonobe arrive at Port Moresby	Port Moresby	Courtesy Call on the Embassy of Japan, JICA DOFA and DOWI
3	7 July	Fri	Move from Port Moresby to Lae	Lae	Courtesy Call on the Lae District Office
4	8 July	Sat		"	Site Survey
5	9 July	Sun	Move from Lae to Port Moresby	Port Moresby	Data Collection and Analysis
6	10 July	Mon		"	Meeting at DOWI
7	11 July	Tue		"	Meeting at DOWI
8	12 July	Wed		"	Presentation of Inception Report by Consultant , Meeting on Minutes of Discussion
9	13 July	Thu		"	Meeting on Minutes of Discussion
10	14 July	Fri		Port Moresby	Signing of Minutes of Discussion, Report to Embassy of Japan and JICA
			Oi moves from Port Moresby to Cairns	Cairns(Oi)	
11	15 July	Sat	Oi arrives at Tokyo	Port Moresby	Data Collection and Analysis
12	16 July	Sun		"	"
13	17 July	Mon	Matsumoto, Moroishi, Takahashi, Sonobe and Okuno move to Lae	Port Moresby / Lae	Site Survey, Data Collection and Analysis
14	18 July	Tue		"	"
15	19 July	Wed		"	"
16	20 July	Thu	Matsumoto, Sonobe and Okuno, move to Port Moresby	"	"
17	21 July	Fri		"	"
18	22 July	Sat		"	"
19	23 July	Sun		"	"
20	24 July	Mon		"	"
21	25 July	Tue	Tsuta moves from Tokyo to Cairns	"	"
22	26 July	Wed	Tsuta arrives at Port Moresby	"	"
23	27 July	Thu	Tsuta moves to Lae	"	"
24	28 July	Fri		"	"
25	29 July	Sat		"	"
26	30 July	Sun		"	Holiday
27	31 July	Mon		"	Site Survey, Data Collection and Analysis
28	1 Aug.	Tue		"	"
29	2 Aug.	Wed			"
30	3 Aug.	Thu	Tsuta moves to Port Moresby	"	"
31	4 Aug.	Fri		"	"
32	5 Aug.	Sat		"	Preparation of Technical Notes Data Collection and Analysis
33	6 Aug.	Sun	Takahashi and Moroishi moves to Port Moresby	Port Moresby	Holiday
34	7 Aug.	Mon		"	Preparation of Technical Notes Data Collection and Analysis
35	8 Aug.	Tue		"	"
36	9 Aug.	Wed		"	Discussion on Technical Notes
37	10 Aug.	Thu		"	Preparation of Technical Notes Data Collection and Analysis
38	11 Aug.	Fri		"	Signing of Technical Notes Report to Embassy of Japan, and JICA
39	12 Aug.	Sat	Study Team moves from Port Moresby to Cairns	Cairns	Movement
40	13 Aug.	Sun	Study Team arrives at Tokyo	Tokyo	"

2.2 Survey Schedule (Discussion on Draft Final Report in PNG)

	Date		Study Team Schedule	Stay	Activities
1	17 Oct	Tue	Study Team Members of Matsumoto, Fujisawa and Sonobe move from Tokyo to Cairns	Cairns	Movement
2	18 Oct	Wed	Study Team arrives at Port Moresby	Port Moresby	Courtesy Call on the Embassy of Japan and JICA
3	19 Oct	Thu		"	Discussion on Draft Final Report at DNPM and DOWI
4	20 Oct	Fri		"	Discussion on Draft Final Report at DNPM and DOWI
5	21 Oct	Sat	Study Team move from Port Moresby to Lae	Lae	Site Survey
6	22 Oct	Sun		"	Site Survey
7	23 Oct	Mon	Study Team move from Lae to Port Moresby	Port Moresby	Movement, Data Analysis
8	24 Oct	Tue		"	Preparation of Minutes of Discussions
9	25 Oct	Wed		"	Meeting on Minutes of Discussions
10	26 Oct	Thu			Signing of Minutes of Discussion, Report to Embassy of Japan and JICA
11	27 Oct	Fri	Study Team moves from Port Moresby to Cairns	Cairns	Movement
12	28 Oct	Sat	Study Team arrives at Tokyo	"	Movement

3. List of Party Concerned in PNG

1. Department of National Planning and Monitoring	
Camillus Midire	Secretary
Marianna Ellingson	First Assistant Secretary (Foreign Aid Managemet)
Noel Getti	Assistant Secretary (Bilateral)
2. Department of Works and Implementatoion	
Yaip K. Telue	Secretary
Tiaga Giawa	First Assistant Secretary (Operations)
Rupa Kalamo	Assistant Secretary (Roads & Bridges)
Micheal Sirabis	Assistant Secretary (Survey & Lands)
Bob Dalrymple	Principle Engineer (Bridges)
Haruku Kave	Senior Planner (Transport)
Brian Selarn Alois	Provincial Civil Engineer (Construction Management)
John Wakma	Provincial Civil Engineer (Construction Management)
3. Morobe Provincial Administration Office	
Billy Amakua	Chief of Staff
4. Department of Mining of Petroleum	
Gabriel Kuna	Assistant Acting Director
6. Embassy of Japan	
TANAKA, Tatsuo	Ambassador
TAKASHIMA, Masayuki	Consul
SHIMIZU, Ichiro	First Secretary
EDAGAWA, Mitsushi	Second Secretary
7. JICA Papua New Guinea Office	
IWASAKI, Kaoru	Resident Representative
HOSHINO, Akihiko	Assistant Resident Representative
Tony Ombo	Programme Officer

4. Minutes of Discussions

(1) Minitutes of Discussions (July 14, 2000)
(2) Technical Notes (August 11, 2000)
(3) Minitutes of Discussions (October 26, 2000)

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR RECONSTRUCTION OF BRIDGES
ON THE HIGHLANDS HIGHWAY
IN
PAPUA NEW GUINEA

In response to a request from the Government of Papua New Guinea (hereinafter referred to as "PNG"), the Government of Japan decided to conduct a Basic Design Study on the Project for Reconstruction of Bridges on the Highlands Highway (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to PNG the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Hidetomi Oi, Senior Advisor, JICA, and is scheduled to stay in the country from July 6, 2000 to August 12, 2000.

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

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

Port Moresby, July 14, 2000

大井英臣

Hidetomi Oi
Leader
Basic Design Study Team
Japan International Cooperation Agency

Yaip K. Telue
Secretary
Department of Works and Implementation

Noel Geti
A / Assistant Secretary
Bilateral Branch – FAMD
for
Marianna Ellingson
First Assistant Secretary
Foreign Aid Management Division
Department of National Planning and Monitoring

ATTACHMENT

1. Objective of the Project

The objective of the Project is to reconstruct bridges along the Highlands Highway to secure safe and smooth traffic on the trunk route between Lae and Highlands regions.

2. Project sites

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

3. Implementing organization

The implementing organization is Department of Works and Implementation (DOWI). The organization chart of DOWI is shown in Annex-2.

4. Project components

Components of the Project requested by PNG side are as follows:

- Reconstruction of Leron Bridge and Bitija Bridge
- River works for protection of bridges
- Construction of approach roads

As for the reconstruction of the bridges, the Team will examine two alternatives for each bridge:

- Reconstruct a new two-lane bridge
- Repair and strengthen the existing bridge, construct a new one-lane bridge and connect the two bridges so that they may act as one bridge structurally and functionally.

JICA will assess the appropriateness of the request in terms of urgency, social benefit, macroeconomy etc. for decision by the Government of Japan on the components to be covered by the grant aid.

5. Bridge design standards

The same design standard as applied to the Umi Bridge should, in principle, be applied to the Project. Details will be determined later through discussions between DOWI and the Team.

6. Japan's Grant Aid Scheme

PNG side is familiar with the Japan's Grant Aid Scheme from the experience of similar project of reconstruction of Umi Bridge that was completed in April 2000 with the grant aid of the Japanese Government. The Team explained about the Scheme to remind and for confirmation using the paper in Annex-3.

7. Necessary measures to be taken by PNG side

PNG side shall take necessary measures as follows:

7-1. Measures obligatory on the recipient government in the application of the Japan's Grant Aid, as described in Annex-4.

7-2. Land acquisition

a) Leron Bridge

The land acquisition has been completed. Hence, the land for the proposed bridge and approaches is now the Government land. Certificate of Alienability (COA) is attached in Annex-5.

b) Bitija Bridge

Payment to the landowners will commence soon in accordance with the COA issued by Department of Land on 6 July 2000, and is expected to be completed by the end of August 2000. COA is attached in Annex-6.

c) Land for temporary use

The work site areas to be temporarily used for construction yards, detour etc. will be leased with the budget of DOWI for FY2001. The Team will inform DOWI of the necessary land space as soon as determined, and DOWI will proceed with the lease contract and other related arrangement upon receipt of such information from the Team.

7-3. Relocation of utilities

DOWI will identify utilities (power lines etc.) which should be relocated from the Project sites. Relocation will be executed by concerned agencies with budget of DOWI for FY 2001.

7-4. Demolition of existing bridge

The Team is examining two alternatives for the reconstruction of Leron Bridge as mentioned in chapter 4: one is to construct a new 2-lane bridge downstream of the existing bridge, and the other is to use the existing bridge with necessary repair and reinforcement. If the former is adopted, the existing bridge should be demolished by DOWI after construction of Leron Bridge is completed.

7-5. Environmental Impact Assessment (EIA)

EIA will be carried out by DOWI in parallel with the Basic Design Study and will be completed by the end of 2000.

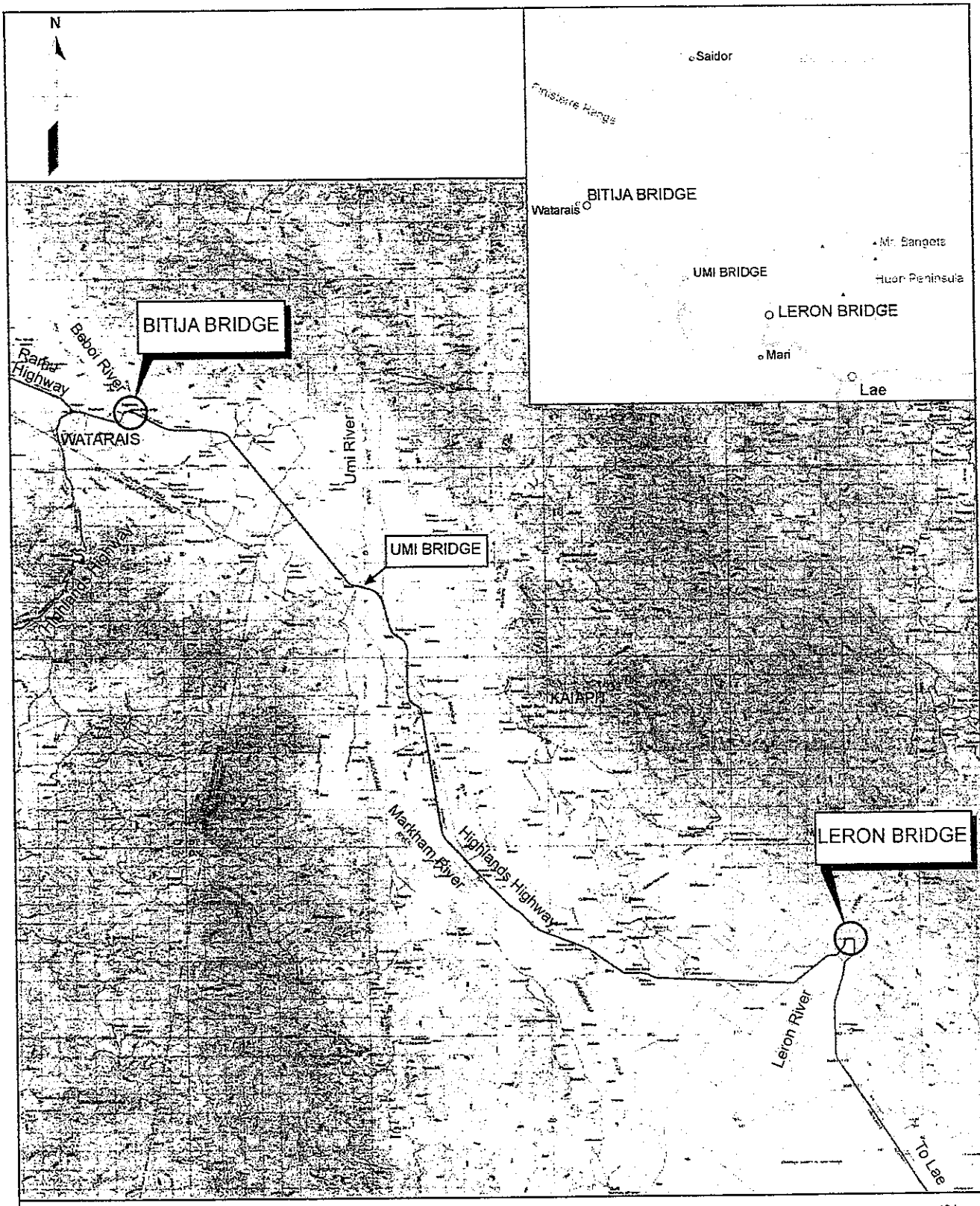
8. Schedule of the study

8-1. The Team will proceed to further studies in PNG until August 12, 2000.

8-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents in October 2000.

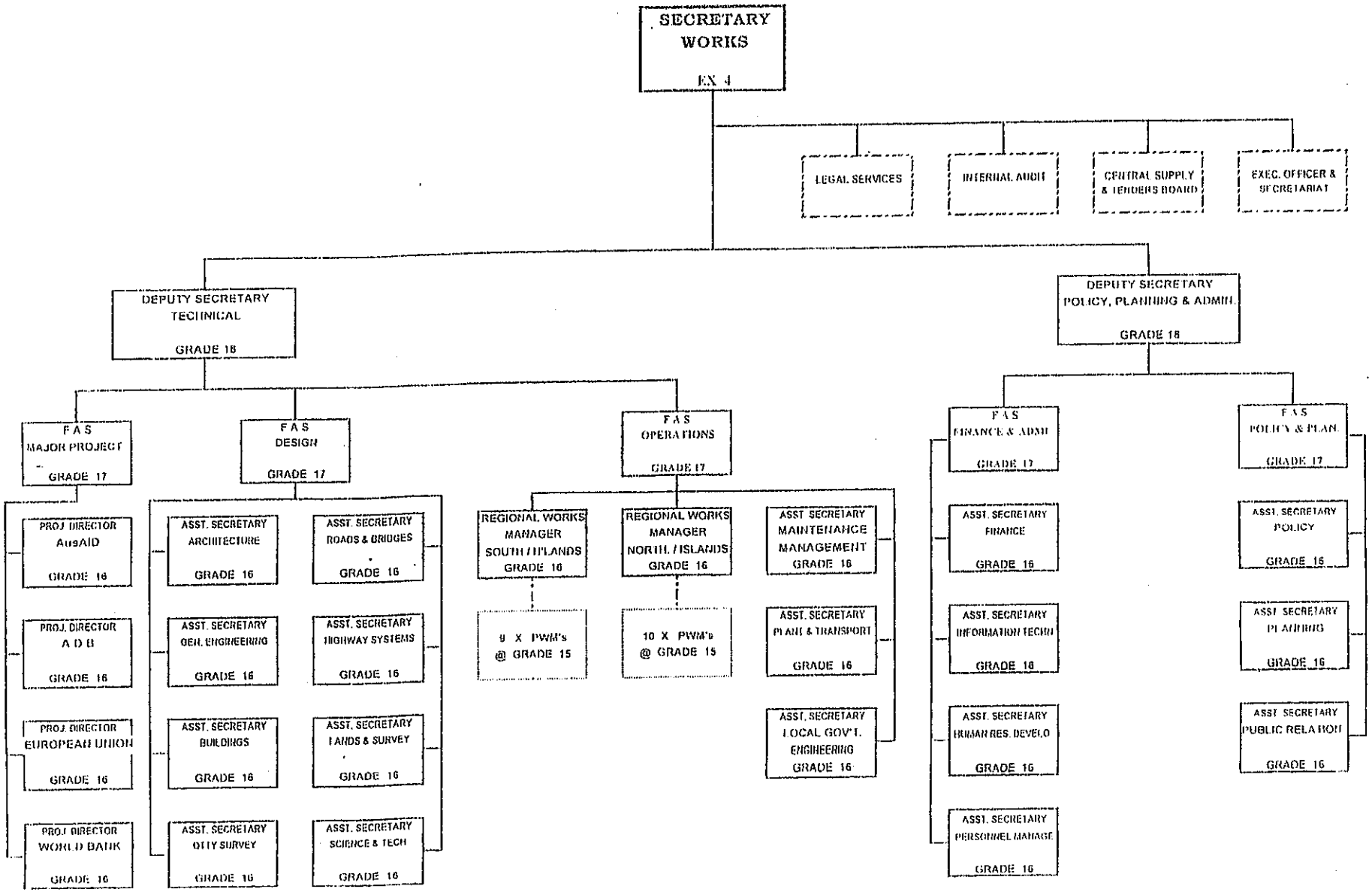
8-3. In case that the contents of the report is accepted in principle by the Government of PNG, JICA will prepare the final report and send it to the Government of PNG in December 2000.

Annex-1 Proposed Sites



BASIC DESIGN STUDY ON THE PROJECT FOR RECONSTRUCTION OF BRIDGES ON THE HIGHLANDS HIGHWAY IN PAPUA NEW GUINEA	LOCATION MAP

Annex-2 Organization chart of Department of Works and Implementation



Annex-3 Japan's Grant Aid Scheme

1. Grant Aid Procedures

1) Japan's Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Government of Japan and recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the result are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

d) Preparation of a basic design of the Project.

e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guideline of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whether measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms (s) based on proposals submitted by interested firms. The Firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical.

3. Japan's Grant Aid Scheme

1) What is Grant Aid

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Government concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid. etc., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Government.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of the third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons or Japanese nationality.)

5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan.

This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertaking required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

(1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

(3) To secure buildings prior to the procurement in case the installation of the equipment.

(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

(6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid not be re-exported from the recipient country.

9) Banking Arrangements(B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank of the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

Annex-4 Necessary Measures to be taken by the PNG Side

Following necessary measures should be taken by the PNG side on condition that the Grant Aid by the Government of Japan is extended to the Project:

1. To provide data and information necessary for the Project.
2. To secure the land for the execution of the Project, such as land for approach road, bridge construction, working areas, storage yard, etc.
3. To clear the sites prior to the commencement of the construction.
4. To bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement, namely the advising commission of the "Authorization to Pay" and payment commission.
5. To ensure prompt unloading, tax exemption, customs clearance at the port of disembarkation in the PNG and prompt international transportation therein of the materials and equipment for the Project purchased under the Grant Aid.
6. To exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the PNG with respect to the supply of the Products and services under the verified contracts.
7. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the PNG and stay therein for the performance of their work.
8. To provide necessary permissions, licenses and other authorizations for implementing the Project, if necessary.
9. To maintain and use properly and effectively the facilities constructed under the Project.
10. To bear all the expenses other than those to be borne by the Japan's Grant Aid within the scope of the Project.
11. To coordinate and solve any issues related to the Project which may be raised from third parties or inhabitants in the Project area during implementation of the Project.
12. To secure the safety of Japanese nationals engaged in the Project and to provide tight security against war, hostilities, invasion, riot, insurrection, civil commotion, rebellion, usurped power, and labour troubles or other industrial troubles, strikes, embargoes, blockages, sabotage of labour.

THE INDEPENDENT STATE OF PAPUA NEW GUINEA

Land Act No.45 of 1996

CERTIFICATE OF ALIENABILITY

I, COLIN TRAVERTZ OBE Custodian, being specifically charged under Section 134 of the Land Act No.45 of 1996 to establish, further or protect the interests of customary land owners in or in relation to land under customary tenure DO HEREBY CERTIFY that in respect of the proposed purchase/~~lease~~ by the Independent State of Papua New Guinea of about 1.9 hectares of land under customary tenure known as PAPUP (Leron) situated at Leron in the Kaiapit District of the Morobe Province:-

(a) There is no dispute as to ownership:

(b) The customary owners of the aforesaid land and the customary owners of all improvements thereon are willing to sell/~~lease for a period of.....years~~ the land and improvements to the Independent State of Papua New Guinea:

(c) The sale/~~lease for a period of.....years~~ of the aforesaid land and improvements to the States will not be detrimental to the best interests of the customary owners or of their descendants either now or in the foreseeable future: and

~~*(d)* I have fully considered the question of reserving to the customary owners and/or their descendants rights of hunting, gathering, collecting, fishing and access and recommend that such reservations be made.~~

(E) The subject land is/~~is not~~ required for public purpose.

GIVEN Under my hand at Kaigani this 10th day of June 1999

COLIN TRAVERTZ OBE
~~Secretary~~
Department of Provincial & Local Government Affairs

C. of A No 15/6-99
D.P.& L.G.A. Ref. 35-6-6
L & S Ref 1/98

THE INDEPENDENT STATE OF PAPUA NEW GUINEA

Land Act No.45 of 1996

CERTIFICATE OF ALIENABILITY

I, *LEO MENINGA* Custodian, being specifically charged under Section 134 of the Land Act No.45 of 1996 to establish, further or protect the interests of customary land owners in or in relation to land under customary tenure DO HEREBY CERTIFY that in respect of the proposed purchase/~~lease~~ by the Independent State of Papua New Guinea of about *4.178* hectares of land under customary tenure known as *AYAM-MAYAM* ....., situated *at Ragidzaria 30km from Mutzin Station* in the *Markham* District of the *Morobe* Province:-

(a) There is no dispute as to ownership:

(b) The customary owners of the aforesaid land ~~and the customary owners of all improvements~~ thereon are willing to sell/~~lease for a period of..... years~~ the land ~~and improvements~~ to the Independent State of Papua New Guinea;

(c) The sale/~~lease for a period of..... years~~ of the aforesaid land ~~and improvements~~ to the States will not be detrimental to the best interests of the customary owners or of their descendants either now or in the foreseeable future: and

~~*(d)* I have fully considered the question of reserving to the customary owners and/or their descendants rights of hunting, gathering, collecting, fishing and access and recommend that such reservations be made.~~

(E) The subject land is/~~is not~~ required for public purpose.

GIVEN Under my hand at *Waigani* this *6th* day of *July* *2000*

LEO MENINGA
Secretary
Department of Provincial & Local Government Affairs

C. of A. No: *10/7-2000*
D.P.& L.G.A. Ref: *35-6-6*
L & S Ref: *Inst.1/98*

Technical Notes

Basic Design Study

on

The Project for Reconstruction of Bridges on the Highlands Highway

in

Papua New Guinea

Based on the site study by the JICA Study Team, this technical note has been prepared by the Team to confirm the various design criteria and bridge type to be applied in this Project for the smooth execution of the further study.

After a series of discussions with the officials concerned of the DOWI and the Study Team, both sides have agreed and confirmed the main items described in the attachments.

This agreement is subject to final approval by JICA Headquarters.

Port Moresby, August 11, 2000

K. Matsumoto

Dr. Kiminori Matsumoto
Chief Consultant
Basic Design Study Team

Mr. Bob Dalrymple
A/Principle Engineer (Bridge)
Department of Works & Implementation

Mr. Rupa Kalamo
Assistant Secretary (Roads & Bridges)
Department of Works & Implementation

1. Geometrical Criteria

Referring to Part 2 of DOW Road Design Manual, the geometrical standard in PNG and criteria applied for Umi Bridge design as well as site conditions in the Project bridges, the following geometrical criteria to be applied in the Study have been formulated by the Study Team.

Geometrical Elements	Applicable Criteria	Remarks
Road classification	National Highway	
Design speed	V=60km/h	Traffic category is heavy (400vpd)
Horizontal curves	Minimum R=150m	
Transition curve length	Minimum 50m	
Gradient	General max5% Absolute max 8%	
Crossfall	3%	
Superelevation	9%	R=150m
Superelevation transition	60m	When V=60km/h, Wn=6.5m, e=0.09
Number of lanes	one each way	Asphalt surface
Carriageway width	3.25m	Asphalt surface
Shoulder width	2.0m	As same as existing

Design speed of V=80km/h was adopted for Umi-bridge design. However, taking into account the topographic condition of the existing horizontal alignment at both sites, it has been determined to apply V=60km/h in order to prevent over-design.

2. Typical Cross Section

The typical cross sections of the road and bridge as shown in Figure 1 have been determined based on the above geometrical criteria and the existing geometrical conditions of the Highlands Highway.

3. Basic Configuration of Proposed Bridge

3.1 Bridge Location

a) Leron Bridge

It is recommended and accepted that the new Leron Bridge shall be located in parallel and centered 15 m down stream to the existing bridge. For the following reasons:

- The existing bridge crossing site is located in a natural topographic stricture exposing rock. Hence, both existing banks and abutments will work as protection measures to the new abutments. However if huge protection work for new abutments and mass excavation in new approach roads are the ROW limits then a new bridge shall be located upstream side.
- It is not necessary to relocate the existing power line.
- The existing bridge can be used as a detour road during a new bridge construction.

b) Bitija Bridge

It is recommended and accepted that the new Bitija Bridge is best suited to be located at the same location as the existing for the following reasons:

- Right of way for the new bridge should be minimized.
- The detour road will be constructed easily with low embankment and drainage culverts to create for the small amount of discharge runoff.

3.2 Total bridge length to be required for Leron Bridge

The total bridge length required is determined by using several empirical formulae as stipulated below based on the estimated flood peak discharge with 1/50 year return period.

$L = 0.5^{\alpha_1} \sim 0.8^{\alpha_2} \cdot Q^{3/4}$ ------- (1) By Sabo Standard by MOC in Japan
$L = 3.3^{\alpha_1} \sim 4.9^{\alpha_2} \cdot Q^{1/2}$ ------- (2) Lacey's formula

Where: Q = Flood Peak Discharge
L = Desirable bridge length
α_1 : Applicable to a river with stable water flow
α_2 : Applicable to a river with unstable water flow
MOC : Ministry of Construction

Based on the above two formulas, the desirable bridge length of Leron Bridge, of which the peak discharge is about 1,800 m³/sec is estimated at 150m as a minimum bridge length required.

3.3 Minimum span length for Leron Bridge

In order to prevent the bridge waterway between piers being clogged with floating debris, a minimum span length is given by the following empirical formula.

$L = 30^{\alpha_1} + 0.005\ Q$ ------- (3)

Where: L = minimum span length
Q = peak discharge
α_1 instead of 20 specified in Sabo Standard by MOC in Japan, 30 is applied taking the long logs deposited in the river into consideration.

From the above formula, a minimum span length of 39m is given for Leron Bridge.

3.4 Total bridge length and minimum span length to be required for Bitija Bridge

For Bitija Bridge, total bridge length and minimum span length cannot be given by above formulae due to the small catchment area of Beboi River. The existing bridge length and span is applicable to the new bridge.

4. Selection of Optimum Bridge Type

4.1 Bridge Type Alternatives

Considering the requirements of bridge length and span length mentioned above, the bridge alternatives in the Project is tabulated below:

Leron Bridge

Bridge Type Alternative	Total Bridge Length (m)	Span Arrangement
A. 3 span continuous steel composite girder	150	$45^{m} + 60^{m} + 45^{m}$
B. 3 span continuous truss	150	$45^{m} + 60^{m} + 45^{m}$
C. 3 span continuous PC box girder	150	$40^{m} + 70^{m} + 05^{m}$
D. 4 span PC I girder	150	$35^{m} + 40^{m} + 40^{m} + 35^{m}$

Bitijia Bridge

Bridge Type Alternative	Total Bridge Length (m)	Span Arrangement
A. 2 span continuous steel composite girder	50	$25^{m} + 25^{m}$
B. Simple span steel composite girder	50	50^{m}
C. 2 span PC I girder	50	$25^{m} + 25^{m}$
D. Simple span PC box girder	50	50^{m}

The evaluation of each alternative is carried out as shown in Figure-2.

4.2 Selection of the Optimum Bridge Type

For selection of the Optimum Bridge Alternative, the present situation of bridge planning and bridge construction activities in PNG shall be taken into account:

- The quality of cement in PNG has been much improved. However, locally produced cements cannot be applied to PC (Prestressed Concrete) bridge construction due to widely fluctuating quality. Furthermore, local contractors with PC bridge construction experience are not available at all.

- Most of the bridge types existing in PNG are steel bridges, having been selected for easy quality control at job site and for earthquake proof aspects due to their light weight superstructure.

- The major bridge construction materials such as steel plate, and PC tendons are not available in PNG.

Based upon the above mentioned construction situation in PNG and the evaluation results of the alternatives, alternative A (3 span continuous steel composite girder) is the most suitable for Leron Bridge. And for Bitija Bridge, alternative A is selected as an optimum bridge type.

It should be noted that the span arrangement in this technical note will be slightly modified in the basic design as a consequence of final topographic survey results.

5. Bridge Design Criteria

As agreed in a series of meetings and contained in the Minutes of Discussion dated 14th July 2000, the bridge structure will be designed basically using "Specification for Road Bridge" published by JRA (Japan Road Association) although several items shall begoverned by local conditions such as thermal effects, rainfall intensity, wind load and seismic effects.

5.1 Live load to be applied in this Project

Recently, many overloaded trailer trucks (more than 60 tons) are passing through the Highlands Highway. It is therefore recommended to apply the Japanese loading system which is heavier than the Austroads.

"B Live Loading" under Japanese Road Bridge Specification is about 14% heavier at a span of 50m than the T44 Truck Loading under "92 Austroads Bridge Design Code". It is intended therefor to adopt the former with reference to the "Umi Bridge Study" the results as shown in Figure-3.

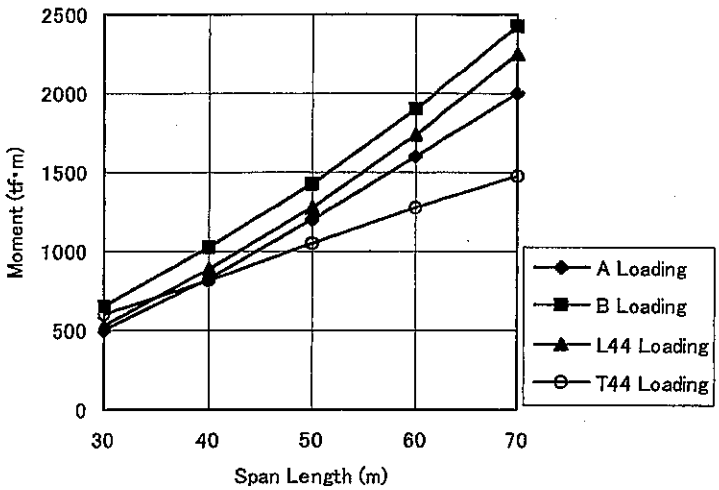


Figure-3 Comparison of Bending Moment Due To Various Live Loads

5.2 Dead Weight to be applied in this project

Unit weights of materials are as follows

Reinforced Concrete	: 2.5tf / m³
Asphalt	: 2.3 tf / m³
Plain Concrete	: 2.3 tf / m³
Steel	: 7.85 tf / m³

Dead Weight of structural components are calculated using the above unit weight.

5.3 Seismic design

A seismic design of structures shall be in accordance with the requirements of Earthquake Engineering for Bridges in Papua New Guinea, 1985 Revision.

5.4 Temperature condition

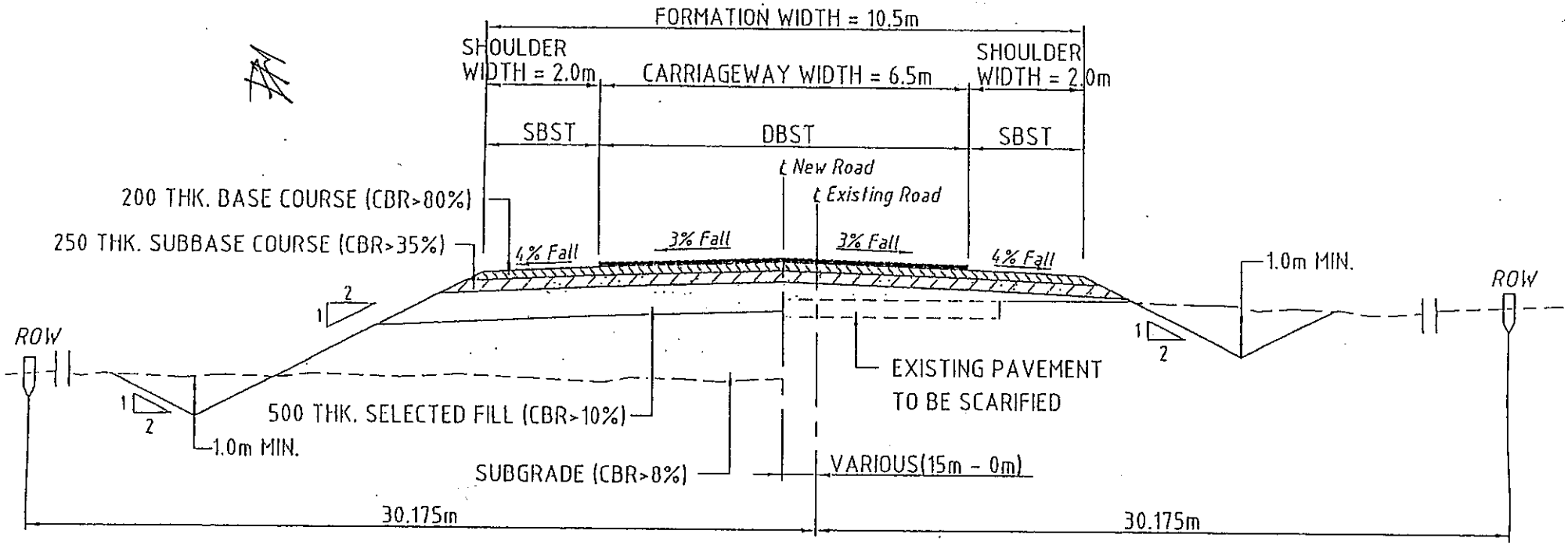
The effective temperature gradient shall be 20°C for all areas of PNG.

5.5 The Log collision

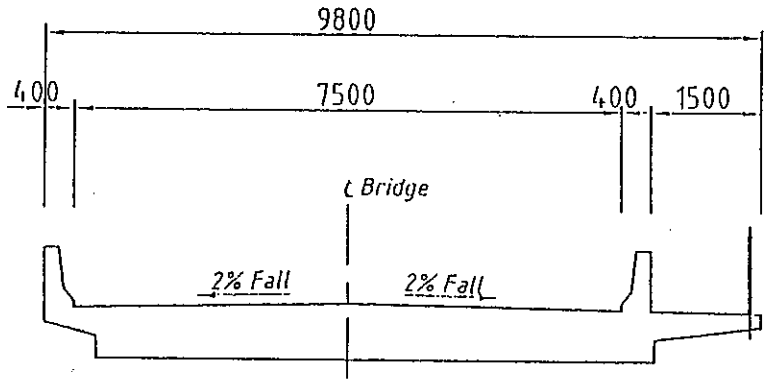
Forces due to log collision to substructures shall be calculated in accordance with Article 2.10.6 of the Austroads Bridge Code.

5.6 Other design items

Other design items and design methods shall be in accordance with the requirements of Japanese Road Bridge Specification.



ROAD



BRIDGE

NOTE: THE SIDEWALK SHALL BE PROVIDED AT THE DOWNSTREAM SIDE

Figure 1 TYPICAL CROSS SECTIONS

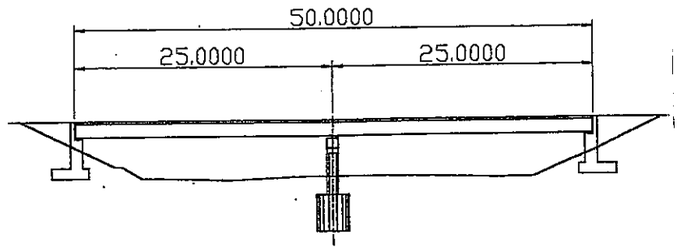
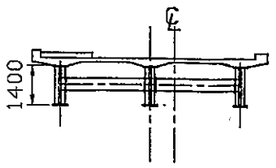
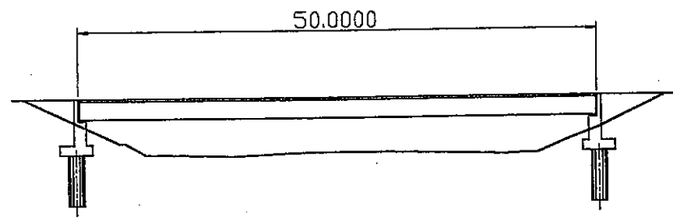
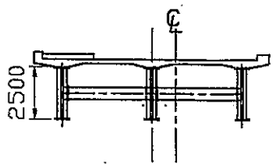
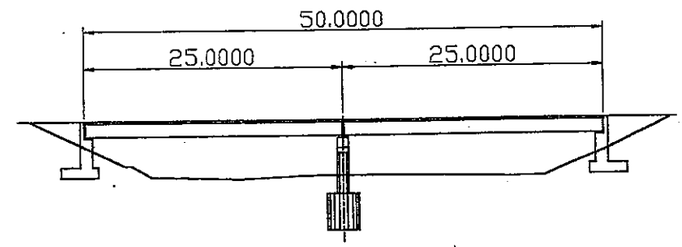
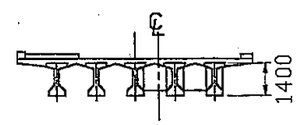
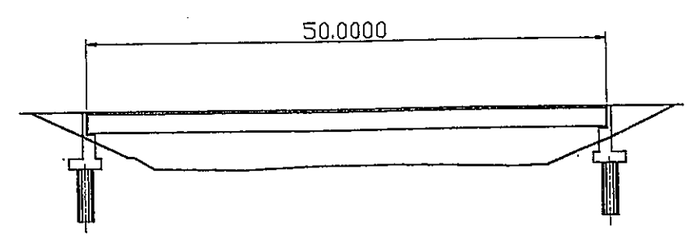
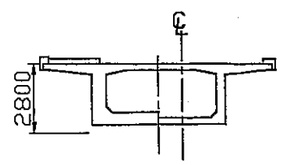
Side View (Scale 1:600)	Cross Section	Evaluation Item	Ranking	Remark	Overall Ranking
(A) 2 span continuous composite steel girder bridge 		Structural Profile	1	Light weight superstructure (advantageous for seismic force)	1
		Constructability	1	Easy construction for superstructure	
		Construction Period	2	Longer than B due to construction of pier	
		Cost	1	The most economical	
		Maintenance	4	Steel girders are disadvantageous compared to PC ones due to repainting	
		Procurement of Material	2	All materials for superstructure must be imported	
		Aseisemicity	1	Advantageous due to a light weight superstructure	
		Hydrological Advantage	2	1 pier	
(B) Single span continuous composite steel girder bridge 		Structural Profile	3	Light weight superstructure with single span	2
		Constructability	2	Construction method can be simplified	
		Construction Period	1	The shortest	
		Cost	3	Less costly due to simplified substructure	
		Maintenance	3	Steel girders are disadvantageous compared to PC ones due to repainting	
		Procurement of Material	2	All materials for superstructure must be imported	
		Aseisemicity	3	Less seismic stability due to the single span system	
		Hydrological Advantage	1	Advantageous owing to no piers	
(C) 2 span PC I-girder bridge 		Structural Profile	2	Heavier structure	3
		Constructability	4	Complicated construction	
		Construction Period	4	Longer construction period due to complicated construction for superstructure	
		Cost	2	The most economical next to A	
		Maintenance	2	Advantageous for concrete structure	
		Procurement of Material	1	Local materials are applicable	
		Aseisemicity	2	Disadvantageous due to heavier superstructure	
		Hydrological Advantage	2	1 pier	
(D) Single span PC box-girder bridge 		Structural Profile	4	Heavier superstructure and fewer degree of redundancy	4
		Constructability	3	Advantageous due to no pier	
		Construction Period	3	Though it has no piers, longer girder prefabrication is needed	
		Cost	4	PC superstructure is much costlier	
		Maintenance	1	Easiest maintenance due to PC girder with fewer expansion joints	
		Procurement of Material	1	Local materials are applicable	
		Aseisemicity	4	Less seismic stability due to the single span system with fewer degree of redundancy	
		Hydrological Advantage	1	Advantageous owing to no piers	

Figure-2(2) Bridge Type Alternatives for Bitija Bridge

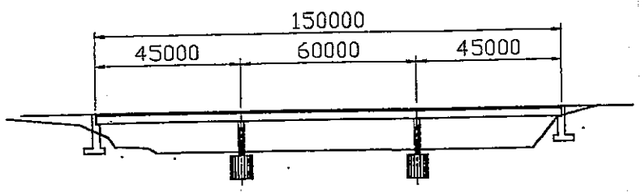
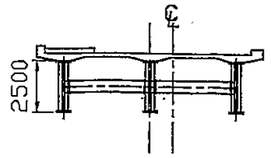
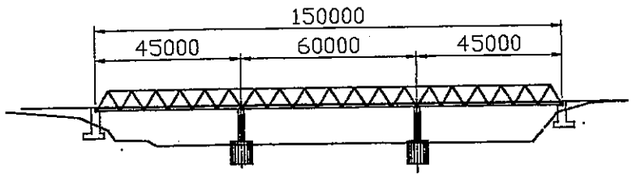
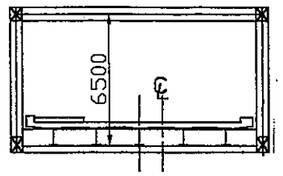
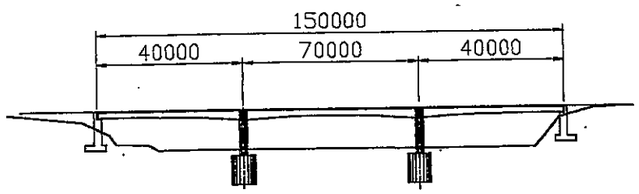
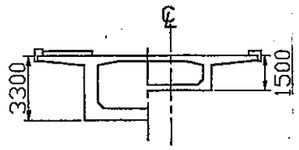
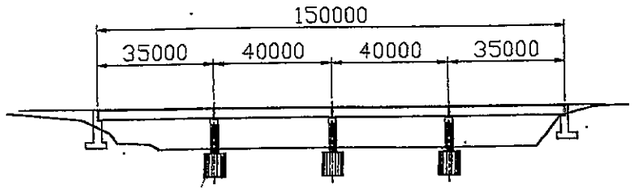
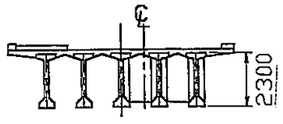
Side View (Scale 1:2,000)	Cross Section	Evaluation Item	Ranking	Remarks	Overall Ranking
(A) 3 span continuous triple steel girder bridge 		Structural Profile	1	Light weight superstructure (advantageous for seismic force)	1
		Constructability	1	Easy Construction for simplified method	
		Construction Period	1	The shortest	
		Cost	1	The most economical	
		Maintenance	3	Steel girders are disadvantageous compared to PC ones for repainting	
		Procurement of Material	2	All materials for superstructure must be imported	
		Aseisemicity	1	Advantageous due to a light weight superstructure	
		Hydrological Advantage	1	Less obstacles to water flow	
(B) 3 span continuous steel truss girder bridge 		Structural Profile	3	Ductile structural system	4
		Constructability	4	Construction method is disadvantageous due to fabrication and cantilevering	
		Construction Period	2	Steel members are all prefabricated	
		Cost	4	The most expensive	
		Maintenance	4	Steel girders are disadvantageous compared to PC ones for anticorrosion treatment	
		Procurement of Material	2	All materials for superstructure must be imported	
		Aseisemicity	2	Advantageous due to light weight superstructure	
		Hydrological Advantage	2	Less obstacles to water flow	
(C) 3 span continuous PC rigid frame bridge 		Structural Profile	2	Large horizontal force will be loaded to substructures due to a heavier superstructure	2
		Constructability	2	Traveler is used and easy construction for cantilever erection	
		Construction Period	4	All the structural members are constructed cast in site	
		Cost	3	More expensive than D	
		Maintenance	1	Advantageous due to fewer bearing and expansion joint	
		Procurement of Material	1	Local materials are applicable	
		Aseisemicity	3	With big magnitude of horizontal force due to heavy superstructure, it will be disadvantageous in case of lower pier.	
		Hydrological Advantage	2	Less obstacles to water flow	
(D) 4 span connected PC I girder bridge 		Structural Profile	4	4 span with heavier superstructure	3
		Constructability	3	Longer construction period due to increased numbers of substructure	
		Construction Period	3	Superstructure components are prefabricated	
		Cost	2	Superstructure components are prefabricated	
		Maintenance	2	PC girder with couples of expansion joints	
		Procurement of Material	1	Local materials are applicable	
		Aseisemicity	4	Distribution of horizontal force with 3 fixed supports is required	
		Hydrological Advantage	3	3 piers inside the river	

Figure-2(1) Bridge Type Alternatives for Leron Bridge

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR RECONSTRUCTION OF LERON BRIDGE
AND BITIJA BRIDGE ON THE HIGHLANDS HIGHWAY
IN
PAPUA NEW GUINEA

In July 2000, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Reconstruction of Leron Bridge and Bitija Bridge on the Highlands Highway (hereinafter referred to as "the Project") to Papua New Guinea (hereinafter referred to as "PNG"), through discussion, 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 PNG on the components of the draft report, JICA sent to PNG the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. IWASAKI, Kaoru, Resident Representative, JICA PNG Office, from October 18 to October 27, 2000.

As a result of discussions, both parties confirmed the main items described in the ATTACHMENT. The Team held discussions with the officials concerned of the Government of PNG and conducted a field survey at the study area.

Port Moresby, October 26, 2000

IWASAKI, Kaoru
Leader
Draft Report Explanation Team
Japan International Cooperation Agency

Camillus Midire
Secretary
Department of National Planning and Monitoring

Yaip K. Telue
Secretary
Department of Works and Implementation

ATTACHMENT

1. Components of the Draft Report

The PNG government agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The PNG government understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the PNG government as explained by the Team and described in Annex-3 and Annex-4 of the Minutes of Discussions signed by both parties on July 14, 2000.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed item and send it to the PNG government by the end of December 2000.

4. Other Relevant Issues

(1) The title of the Project will be changed to "THE PROJECT FOR RECONSTRUCTION OF LERON BRIDGE AND BITIJA BRIDGE ON THE HIGHLANDS HIGHWAY IN PAPUA NEW GUINEA".

(2) The PNG government shall provide tight security in and around the construction camp and plant yards and during transportations of material and equipment.

(3) The PNG government shall complete the demolition of existing Bitija Bridge after provision of detour and prior to the commencement of the construction of bridge, according to the attached implementation schedule.

(4) The PNG government shall ensure the relocation of power line of Leron Bridge site and other public utilities prior to the commencement of construction works, according to the attached implementation schedule.

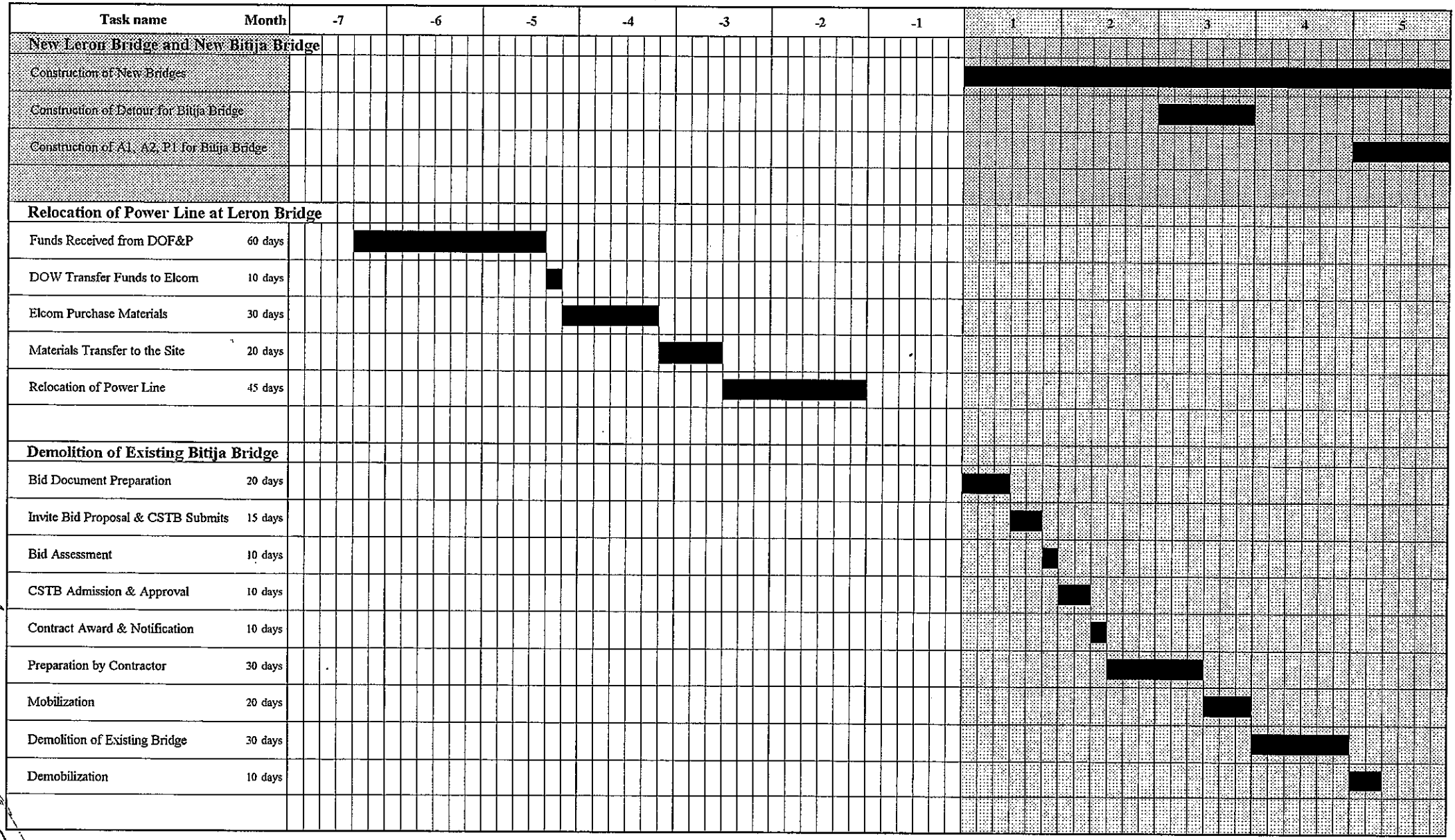
(5) The PNG government shall fund the demolition of the existing Leron Bridge. The demolition shall commence after the substantial completion of the New Leron Bridge.

(6) The PNG government shall provide appropriate land for the construction camp and plant yards prior to the commencement of construction works.

(7) The PNG government shall exempt consultant and contractor from customs duties, internal taxes and other fiscal levies that may be imposed in PNG with respect to services and construction.

Attachment

IMPLEMENTATION SCHEDULE FOR POWER LINE RELOCATION AT LERON BRIDGE AND DEMOLITION OF BITIJA BRIDGE



5. References

No.	Title of Reference Data	Publication by
1	Section ONE-Commentary Design Code '92 Austroads BRIDGE Design Code	Austroads
2	Standard P.N.G Vehicle Loadings Maximum Single Span Shear Reaction	Department of Works
3	Section TWO-CODE Design Load '92 Austroads BRIDGE Design Code	Austroads
4	Section THREE-CODE Foundations '92 Austroads BRIDGE Design Code	Austroads
5	Section FOUR-CODE Bearings and Deck Joints '92 Austroads BRIDGE Design Code	Austroads
6	Section FIVE-CODE Concrete '92 Austroads BRIDGE Design Code	Austroads
7	Section SIX-CODE Steel and Composite Construction Austroads BRIDGE Design Code	Austroads
8	Section SEVEN-CODE Rating '93 Austroads BRIDGE Design Code	Austroads
9	Section TWO-Commentary Design Loads '92 Austroads BRIDGE Design Code	Austroads
10	Section THREE-Commentary Foundations '92 Austroads BRIDGE Design Code	Austroads
11	Section THREE-Commentary Foundations '92 Austroads BRIDGE Design Code	Austroads
12	Section FOUR-Commentary Bearing and Deck Joints '92 Austroads BRIDGE Design Code	Austroads
13	Section Five-Commentary Concrete '92 Austroads BRIDGE Design Code	Austroads
14	Section SIX-Commentary Steel and Composite Construction '93 Austroads BRIDGE Design Code	Austroads
15	Section Seven-Commentary Rating '92 Austroads BRIDGE Design Code	Austroads
16	River Training Manual 1987	Department of Works
17	Papua New Guinea Flood Estimation Manual	Department of Environment and Conservation (SMEC)
18	Papua New Guinea Flood Estimation Manual REPORT ON INVESTIGATION	Department of Environment and Conservation (SMEC)
19	Bridge Inventory - Bitija Creek Bridge	Department of Works
20	Bridge Inventory - Leron Creek Bridge	Department of Works
21	Certificate of Alienability	Department of Works