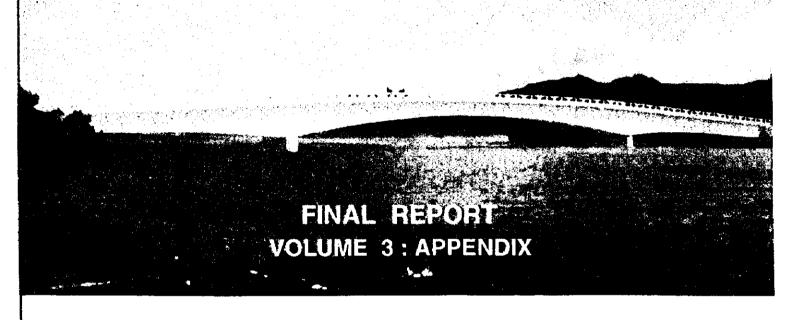
MINISTRY OF WORKS AND SUPPLIES THE REPUBLIC OF MALAWI

THE FEASIBILITY STUDY
ON
THE RECONSTRUCTION OF
MANGOCHI ROAD BRIDGE
IN
THE REPUBLIC OF MALAWI



AUGUST 1998

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD. CHODAI CO., LTD.



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MINISTRY OF WORKS AND SUPPLIES THE REPUBLIC OF MALAWI

THE FEASIBILITY STUDY ON THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE IN THE REPUBLIC OF MALAWI

FINAL REPORT VOLUME 3: APPENDIX

AUGUST 1998

JAPAN INTERNATIONAL COOPERATION AGENCY
NIPPON KOEI CO., LTD.
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APPENDIX 1 INTRODUCTION

1.1 Scope of Work

SCOPE OF WORK

FOR

THE FEASIBILITY STUDY

ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI

AGREED UPON BETWEEN

MINISTRY OF WORKS AND SUPPLIES

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Lilongwe, Dated the 7th of November 1997

Mr. M. A. Kammalere Principal Secretary

Ministry of Works and Supplies

Mr. Kazuhiko YAMAGISHI

Team Leader

Preparatory Study Team

Japan International Cooperation Agency

Mr. J. C. T. Nthani

Deputy Secretary (Bilateral)

Ministry of Finance

A. INTRODUCTION

In response to the request of the Government of the Republic of Malawi (hereinafter referred to as "the Government of Malawi"), the Government of Japan decided to implement the Feasibility Study on the Reconstruction of Mangochi Road Bodge in the Republic of Malawi (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Government of Malawi. Ministry of Works and Supplies (hereinafter referred to as "MOWS") shall act as the counterpart agency to the Japanese Study Team (hereinafter referred as" the Team") and also act as the coordinating body with other relevant organizations for the smooth implementation of the Study on behalf of the Government of Malawi.

This document sets forth the Scope of Work with regard to the Study.

B. OBJECTIVES OF THE STUDY

The objective of the Study is to conduct feasibility study for the reconstruction project of Mangochi Road Bridge including its approaches for the period up to the year of 2005.

C. SCOPE OF THE STUDY

To achieve the objectives mentioned above, the Study shall cover the following items;

1. Preliminary Economic Feasibility

- 1.1. Socio-economic assessment
 - (1) Collection of socio-economic data (population, private and public investment plans, employment, land use plan and so on by national and regional level)
 - (2) Collection of traffic and transport data including transport system, costs, price subsidies etc.
 - (3) Collection of national and regional development plans
 - (4) Assessment of existing social-economic conditions and impacts which a new bridge construction will influence
 - (5) Forecast of future socio-economic framework
- 1.2. Traffic Analysis
 - (1) Traffic survey (O-D survey, axle load survey)
 - (2) Forecast of future traffic demand
- 1.3. Economic Analysis
 - (1) Examination of available information on vehicle operating costs, maintenance costs
 - (2) Preliminary estimation of economic benefits and costs derived from new bridge alternatives

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- (3) Cost estimate of the bridge construction and maintenance
- (4) Estimation of the benefits derived from the bridge
- 1.4. Economic evaluation
 - (1) Calculation of economic internal rate of return, net present values and costs-benefits analysis
 - (2) Sensitivity analysis
- 2. Assessment of institutional capability of MOWS on road and bridge construction and maintenance

3. Preliminary Engineering

- 3.1. Data collection and analysis
 - (1) Soil and geological data
 - (2) Climatic and seismic data
 - (3) Hydrological data
 - (4) Topographic data
- 3.2. Site Survey
 - (1) Topographic survey
 - (2) Soil and geological survey
 - (3) Hydrological survey
 - (4) Land use survey
 - (5) Survey on materials mines for construction of road and bridge
- 3.3. Examination of design criteria
- 3.4. Comparative study of alternatives
 - (1) Study on the construction of new bridge and approaches (routes, location, bridge type and others)
 - (2) Evaluation of alternatives
- 3.5. Preliminary design and quantity estimate of the optimum alternative
 - (1) Badge desiga
 - (2) Approach roads
 - (3) Quantity estimate

4. Environmental Impact

- 4.1. Initial environmental evaluation
- 4.2. Environmental impact assessment
 - (1) Social impacts assessment

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(2) Natural environment

- 5. Implementation Program
- 5.1. Construction program
- 5.2. Maintenance program
- 6. Conclusions and Recommendations

D. STUDY SCHEDULE

The Study shall be conducted in accordance with the attached tentative schedule.

E. REPORTS

JICA shall prepare the following reports in English and submit them to the Government of Malawi;

1. Inception Report

Twelve (12) copies

At the commencement of the Study;

2. Interim Report

Twelve (12) copies

Within two and half (2.5) months after the commencement of the Study;

3. Eraft Final Report

Twelve (12) copies

Within four (4) months after the commencement of the Study;

The written comments on the Draft Final Report from the Government of Malawi shall be delivered to JICA within one (1) month after submission of the draft final reports.

4. Final Report

Seventeen (17) copies

Within one (1) month after the receipt of the written comments on the Draft Final Report from the Government of Malawi.

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F. UNDERTAKINGS OF THE GOVERNMENT OF MALAWI

- 1. To facilitate the smooth conduct of the Study, the Government of Malawi shall take necessary measures;
- (1) to secure the safety of the Japanese Study Team
- (2) to permit the members of the Team to enter, leave and sojourn in Malawi for the duration of their assignments therein, and exempt them from foreign registration requirements and consular fees
- (3) to exempt the members of the Team from taxes, duties and any other charges on equipment, machinery and other material brought into Malawi for the conduct of the Study
- (4) to exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study
- (5) to provide necessary facilities to the Team for the remittance as well as utilization of the funds introduced into Malawi from Japan in connection with the implementation of the Study
- (6) to secure permission for the Team for entry into private properties or special areas for the conduct of the Study
- (7) to secure permission for the Team to take all data and documents (including maps and photographs) related to the Study out of Malawi; and
- (8) to provide medical services as needed, while its expenses will be chargeable on members of the Team
- 2. The Government of Malawi shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Team.
- 3. The counterpart agency shall, at its own expenses, provide the Team with the following in cooperation with relevant organizations;

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- (1) data and information related to the Study available in MOWS, including maps and photographs
- (2) counterpart personnel
- (3) to provide office with appropriate area and necessary equipment for the Study Team
- (4) credentials or identification cards

G. UNDERTAKINGS OF JICA

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

- 1. to dispatch the Team to Malawi at its own expense; and
- 2. to pursue technology transfer to the Malawian counterpart personnel in the course of the Study.

H. OTHERS

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

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TENTATIVE STUDY SCHEDULE

Month	1	2	3	4	5	6
Work						
in						1
Malawi					<u></u>	
Work						<u> </u>
ln.		1				
Japan	}					
Report	Δ] •	Δ	4	2	
Presentation	1C/R	\	lT/R	DF	YR	F/R

IC/R: Inception Report

IT/R: Interim Report

DF/R: Draft Final Report

F/R: Final Report

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1.2 Minutes of Meeting (Dated 7th Nov., 1997)

MINUTES OF MEETING

ON

THE SCOPE OF WORK

FOR

THE FEASIBILITY STUDY

ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI

AGREED UPON BETWEEN

MINISTRY OF WORKS AND SUPPLIES

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Lilongwe, Dated the 7th of November 1997

Mr. M. A. Kammalere Principal Secretary

Ministry of Works and Supplies

Mr. Kazuhiko YAMAGISHI

Team Leader

Preparatory Study Team

Japan International Cooperation Agency

Mr. J. C. T. Nthani

Deputy Secretary (Bilateral)

Ministry of Finance

The preparatory study team for the Feasibility Study on the Reconstruction of Mangochi Road Budge in the Republic of Malawi (hereinafter referred to as "the Study") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Kazuhiko YAMAGISHI visited the Republic of Malawi from 1st November to 8th November, 1997, and had a series of discussions with the government of Malawi, represented by Ministry of Works and Supplies (hereinafter referred to as "MOWS"). List of participants is shown in Attachment 1.

As a result of the said discussions, both sides reviewed and came to an agreement on the Scope of Work (hereinafter referred to as "S/W") of the Study, and signed it on 7th November, 1997.

This document summarizes major items discussed between both sides and is meant to supplement the S/W for the smooth conduct of the Study.

1. Reconfirmation of the project justification

MOWS reaffirmed the study team that this project is still high on Government's priority.

MOWS informed the study team that the design of the road from Mangochi through Chiponde, Ntaja, Naminga to Liwonde has been completed and the tendering process started in October, 1997 with a prequalification exercise. Completed Tender Documents and a Feasibility Study Report were submitted to the study team for inspection. As a result of the upgrading of this road, the only bottleneck will be the Mangochi Bridge.

MOWS informed the team that plans are underway for the European Union (EU) to fund the rehabilitation of the M10 road from Mua to Monkey Bay to a Class 1 bitumen road.

MOWS also informed the team that the Development Bank of Southern Africa (DBSA) have expressed interest to fund the improvement of the Mangochi to Makanjila road along the eastern shore of Lake Malawi. Completion of the construction of this road will attract tourism and agricultural development.

2. Title of the Study

Both sides agreed to use "The Feasibility Study on the Reconstruction of Mangochi Road Bridge in the Republic of Malawi" as the title of the Study.

3. Study Area

Both sides agreed that the Study should cover the existing Mangochi Road Bridge, approaches, and environs.

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4. Target year

Both sides agreed that the target year of the Study shall be 2005.

Desirable schedule of this project may be as follows;

Phase I Feasibility Study 1998. 2. 1998. 8.

II Detailed Design 1999 - 2000

III Construction 2000 - 2002

5. Economic evaluation

MOWS requested that the full scale study team should use the HDM-III for economic analysis and evaluation. The Japanese side agreed.

6. Environmental survey

Both sides agreed that the full scale study team and MOWS would cooperate to carry out environmental survey.

7. Steering Committee

Both sides agreed that the Government of Malawi would establish a Steering Committee consisting of Sections of MOWS (Planning, Bridges, Highways, Construction, Planning & Evaluation), Ministry of National Heritage, Ministry of Forestry, Fisheries and Environmental Affairs, Ministry of Finance, National Economic Council co-opted as required.

8. Undertaking of the Government of Malawi

- (1) The Japanese side requested MOWS to provide the office space for the full-scale study team. MOWS agreed.
- (2) The Government of Malawi shall provide the full-scale study team with copies of all available data, reports and any information considered relevant for the execution of the Study.

9. Undertaking of JICA

- (1) The Malawian side requested that the Malawian counterpart personnel take advantage of training in Japan related to the Study to promote effective technology transfer. The Japanese side promised to convey this request to the JICA Headquarters in Tokyo.
- (2) The Japanese side agreed that JICA would bear the costs to collect new data and information if required in the course of the Study.
- (3) The Malawian side requested that JICA will bear the following costs:
 - (a) fee of necessary equipment (electricity, telephone, fax machine, furniture)

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(b) appropriate numbers of vehicles to be used while the full scale study team is in Malawi The Japanese side promised to convey these requests to JICA headquarters.

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Attachment 1

PARTICIPANTS LIST

THE MALAWIAN SIDE

1. Mr. M. A. Kammalere Secretary, Ministry of Works and Supplies (MOWS)

2. Mr. J. A. Makunje Acting Director of Roads, MOWS

3. Mr. E. L. K. Mwakhwawa Deputy Director of Roads, MOWS

4. Mr. B. Kapoteza Chief Civil Engineer, MOWS

5. Mr. B. Nayeja Civil Engineer, MOWS

6. Mr. L.S. Siwande Chief Planning & Evaluation Officer, MOWS

THE JAPANESE SIDE

1. Mr. Kazuhiko YAMAGISHI Team Leader, Preparatory Study Team

2. Mr. Koichi KITO Study Planning, Preparatory Study Team

3. Mr. Masahiro ISHIDA Budge Maintenance Planning, Preparatory Study Team

4. Mr. Keiichi SAKAEBARA Natural Conditions/Environment, Preparatory Study Team

5. Mr. Tetsuo SEKI Assistant Resident Representative, JICA Malawi Office

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Minutes of Meeting (Dated 20th Feb., 1998) 1.3

> MINUTES OF MEETING **FOR INCEPTION REPORT** OF

THE FEASIBILITY STUDY

ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI AGREED UPON BETWEEN MINISTRY OF WORKS AND SUPPLIES

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

LILONGWE, MALAWI FEBRUARY 20TH 1998

Mr.E.L.K Mwakhwawa

Director of Roads

Ministry of Works and Supplies

Mr. Kazumasa Tada

Team Leader

IICA Study Team

Minutes of Meeting

In response to the request of the Ministry of Works and Supplies (MOWS) of the Republic of Malawi, the Japan International Cooperation Agency (JICA) despatched a JICA Study Team to Malawi on February 16, 1998 to initiate "The Feasibility Study on the Reconstruction of Mangochi Road Bridge in the Republic of Malawi" (hereinafter referred to as the "Study").

- (1) The JICA Study Team first made a courtesy call at 10:00 a.m. February 19 to Minister of Works and Supplies in his office.
- (2) The meeting was called to order at 9:00 a.m. February 20, 1998 in the Conference room of the MOWS Headquarters in Lilongwe.
- (3) The leader of the Study Team, Mr. K. Tada submitted to the Director of Roads of the MOWS 12 copies of the Inception Report of the Study. The Team Leader went ahead to explain the purposes, contents, work flow and methodology of the Study.
 - The Director of Roads accepted the Inception Report.
- (4) The Director of Roads proposed it was not appropriate to apply the HDM-III model developed by the World Bank to the socio-economic evaluation of this Study as the Study is a bridge project not a road project.
 - The Study Team agreed with his proposal. Instead of applying the full HDM-III model, the Study Team suggested another economic evaluation method in accordance with standard international practice.
 - The MOWS expressed their approval to the suggestion by the Study Team.
- (5) Based on their experience with concrete and steel bridges, the MOWS strongly expressed their preference for a concrete bridge.
 - The MOWS also stated their preference to the Study Team for a new bridge alignment in close proximity to the existing bridge alignment to minimize resettlement problems.

The Study Team will take into consideration MOWS' proposals and the Team will recommend the best type of bridge and new bridge alignment as a result of the studies in Malawi.

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ANNEX

THE FEASIBILITY STUDY ON THE RECONSTRUCITON OF MANGOCHI ROAD BRIDGE MEETING – 20TH FEBRUARY, 1998

List of Attendance

THE MALAWI SIDE

Mr. E.L.K. Mwakhwawa Director of Roads, MOWS: The Chairman of the Steering Committee

Mr. B. Kapoteza Chief Civil Engineer, MOWS

Mr. B. Nayeja Civil Engineer, MOWS

Mr. L.S. Siwande Chief Planning & Evaluation Officer, MOWS

Mr. G.J. Chunda Deputy Chief Civil Engineer (Materials), MOWS

Mr. S.T. Banda Civil Engineer (Bridge)

Mr. B.K. Chongwe Dipromate Survey Technician

THE JAPANESE SIDE

Assistant Residence Representative, JICA Mr. Tetsuo SEKI Planning/Bridge Leader/Transport . Mr. Kazumasa TADA Team Planning Bridge Design/Maintenance Planning Mr. Junji YASUI Traffic Survey/Traffic Demand Mr. Derek BELL Forecast/Economic Analysis Environmental Analysis/Evaluation of Social Mr. Takanori HAYASHIDA **Impact** Condition Survey (Geotechnical Natural Mr. Koichiro SEKI Investigation)

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- (6) The Study Team and MOWS agreed that the navigational clearance of the new bridge should be approximately the same as that of the existing bridge.
- (7) The Team Leader requested that during the Study the Study Team should be given full cooperation by the Malawian side, especially in executing field surveys and collecting relevant data for the Study. As for the traffic survey, the Study Team emphasized necessity of the police officers at the survey points.

MOWS assured the Team that every assistance they would require would be given to them in line with minutes of meeting of the Scope of Work signed the 7 th of November 1997.

(8) For the the smooth implementation of the Study, a Steering Committee will be in force under the chairmanship of the MOWS and will consist of following members:

Mr.E.L.K. Mwakhwawa	Director of Roads	MOWS: The Chairman of the
THE LOCAL CONTRACTOR OF THE PROPERTY OF THE PR	Director of Roads,	1410 M 2 . THE CHARMMAN OF THE

Steering Committee

Mr. B. Kapoteza Chief Civil Engineer, MOWS

Mr. B. Nayeja Civil Engineer, MOWS

Mr. L.S. Siwande Chief Planning & Evaluation Officer, MOWS

Mr. G.J. Chunda Deputy Chief Civil Engineer (Materials), MOWS

Mr. S.T. Banda Civil Engineer (Bridge)

Mr. B.K.Chongwe Diplomate Survey Technician

Mr. Nirenda Deputy Director, Planning and Design, MOWS

Members from other relevant organisations will be co-opted into meeting as and when required.

(9) Counterpart Personnel

The Study Team and MOWS also agreed the specific counterpart personnel.

Bridge Engineer Mr. S.T. Banda

Highway Engineer Mr. B. Nayeja

Transport and Environment Mr. B. Kapoteza

Economist Mr. L.S. Siwande

Geotechnical Engineer Mr. G.J. Chunda

Surveyor Mr. B.K.Chongwe

Mr.

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Minutes of Meeting (Dated 2nd Apr., 1998) 1.4

> MINUTES OF MEETING **FOR** INTERIM REPORT

OF

THE FEASIBILITY STUDY

ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI AGREED UPON BETWEEN MINISTRY OF WORKS AND SUPPLIES AND

JAPAN INTERNATIONAL COOPERATION AGENCY

LILONGWE, MALAWI 2 APRIL 1998

Mr. E.L.K. Mwakhwawa

Director of Roads

Ministry of Works and Supplies

Mr. Kazumasa Tada Team Leader

JICA Study Team

Mr. Kazuhiko Yamagishi

Leader

Advisory Committee

Minutes of Meeting

In response to the request of the Ministry of Works and Supplies (MOWS) of the Republic of Malawi, the Japan International Cooperation Agency (JICA) dispatched a JICA Study Team to Malawi on 16 February 1998 to initiate "The Feasibility Study on the Reconstruction of Mangochi Road Bridge in the Republic of Malawi" (hereinafter referred to as the "Study"). JICA also dispatched JICA Advisory Committee members to Malawi on 30 March 1998 to join the meeting concerning submission of the Interim Report of this Study.

- (1) The JICA Advisory Committee made a courtesy call at 9:00 a.m. on 1 April 1998 to the Principal Secretary of the Ministry Works and Supplies in his office.
- (2) The Steering Committee, chaired by the Director of Roads, was called to order at 9:00 a.m. on 2 April 1998 in the conference room of the MOWS Headquarters in Lilongwe.
- (3) The leader of the Study Team, Mr. K. Tada submitted to the Director of Roads 12 copies of the Interim Report of the Study. The Team Leader went ahead to explain the results of the Study conducted during the study team's stay in Malawi.
 - The Director of Roads accepted the Interim Report.
- (4) During a discussion on the Interim Report, the following items were confirmed by the Malawian and Japanese sides:
 - 1) Both sides agreed that the selected route will be planned downstream of the nearby existing bridge.
 - 2) The exact location of the centerline and the bridge length will be finally determined after further study in Japan in due consideration of topographic survey results and hydrological study conducted in Malawi.
 - 3) The Project Steering Committee indicated that according to Roads Department design standards, the minimum number of lanes on a primary road such as this one (i.e., Mangochi Bridge) is two lanes. This is a national planning policy. The Study Team will discuss these issues with JICA headquarters officials.
 - 4) The bridge type will be finalized after futher consideration in Japan, reflecting data collected in Malawi such as material cost and maintenance cost.



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5) The Malawian side assured that they would be responsible for undertaking the following items: land acquisition, relocation of residents, historical monument, water intake facility and power line, dismantling of the existing bridge, and attachment of utilities to the new bridge.

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ANNEX

THE FEASIBILITY STUDY ON THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE MEETING – 2 APRIL 1998

List of Attendance

THE MALAWIAN SIDE

Mr. E.L.K. Mwakhwawa Director of Roads, MOWS: The Chairman of the

Steering Committee

Mr. B. Nayeja Civil Engineer, MOWS

Mr. L.S.C. Siwande Chief Economist, MOWS

Mr. G.J. Chunda Deputy Chief Civil Engineer (Materials), MOWS

Mr. S.T. Banda Civil Engineer (Bridge), MOWS

Mr. W.M. Michala Director of Antiquities, Ministry of National

Heritage

Mr. S.A. Mapila Fisheries Department, Lilongwe

Mr. D.M. Chirwa Municipal Engineer, Ministry of Local

Government and Sports

Mr. O.H.M. Gondwe Survey Superintendent

Mr. P.W. Somers Department of Environmental Affairs

THE JAPANESE SIDE

Mr. Kazuhiko Yamagishi Leader, Advisory Committee

Mr. Masahiro Ishida Advisory Committee
Ms. Chisato Tanaka Coodinator, JICA

Mr. Yusuke Kitamura Resident Representative, JICA Malawi Office
Mr. Tetsuo Seki Assistant Residence Representative, JICA

Malawi Office

Mr. Kazumasa Tada Team Leader/Transport Planning/Bridge

Planning

Mr. Junji Yasui Bridge Design/Maintenance Planning

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Mr. Derek Bell Traffic Survey/Traffic Demand

Forecast/Economic Analysis

Mr. Isamu Suzuki Construction Plan/Cost Estimate

Dr. Takanori Hayashida Environmental Analysis/Evaluation of Social

Impact

Mr. Yasushi Higa Natural Condition Survey (Hydrological and

Hydraulic Invesigation/Topographic Survey)

Mr. Koichiro Seki Natural Condition Survey (Geotechnical

Investigation)

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1.5 Minutes of Meeting (Dated 30th Apr., 1998)

MINUTES OF MEETING FOR THE FEASIBILITY STUDY ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI
AGREED UPON BETWEEN
MINISTRY OF WORKS AND SUPPLIES
AND

JAPAN INTERNATIONAL COOPERATION AGENCY

LILONGWE, MALAWI 30 APRIL 1998

Mr. E.L.K. Mwakhwawa

Director of Roads

Ministry of Works and Supplies

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Mr. Kazumasa Tada Team Leader JICA Study Team

Minutes of Meeting

The leader of the Study Team, Mr. Kazumasa Tada, visited the Director of Roads of the Ministry of Works and Supplies (MOWS) of the Republic of the Malawi, Mr. E.L.K. Mwakhwawa, on 30 th April. 1998 in order to convey and explain tollowing results finally determined in the course of the study in Japan:

- 1) Bridge length is 220m long.
- 2) A caisson type foundation is recommendable to the substructures of this Study.
- 3) A three span continuous prestressed concrete bridge with box girder and two lanes should be applied to superstructure.
- 4) After due considerations in Japan obtained from data regarding earthquick records in Malawi. maximum seismic coefficient for horizontal component is adequate to be applied as 0.10 instead of 0.15 although final check has been investigated in Japan.

The Director of Roads of MOWS agreed with the above mentioned explanations by the Team Leader of the Study.

General drawing and location of the center line of this bridge with approach roads are attached to ANNEX.

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ANNEX

THE FEASIBILITY STUDY ON THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE MEETING – 30 APRIL 1998

List of Attendance

THE MALAWIAN SIDE

Mr. E.L.K. Mwakhwawa

Director of Roads. MOWS: The Chairman of the

Steering Committee

The Japanese Side

Mr. Tetsuo Seki

Assistant Residen Representative, JICA Malawi

Office

Mr. Kazumasa Tada

Team Leader/Transport

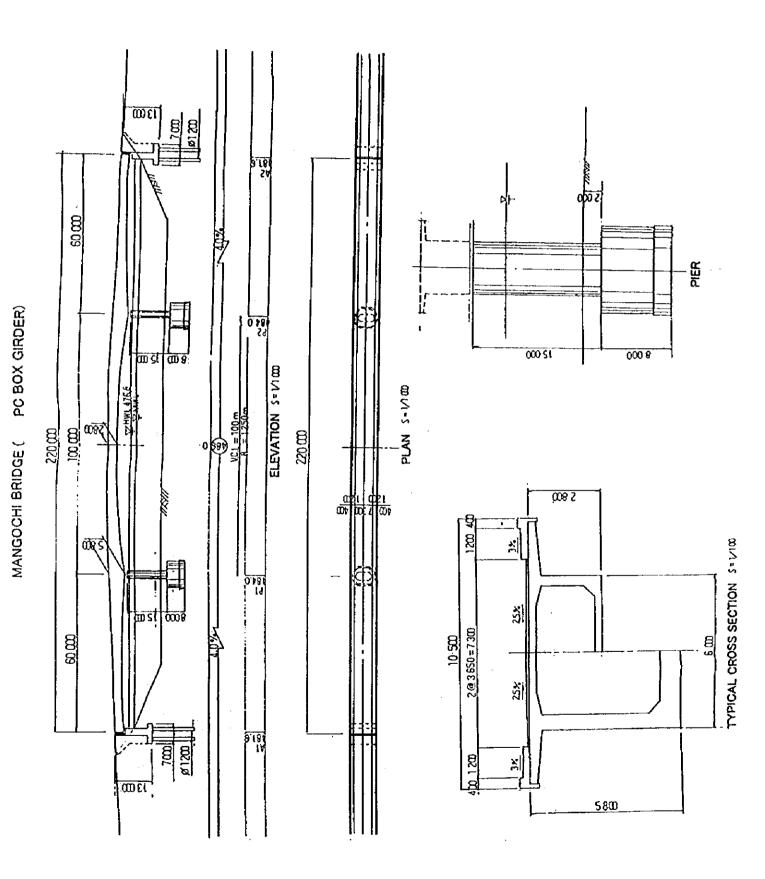
Planning/Bridge

Planning

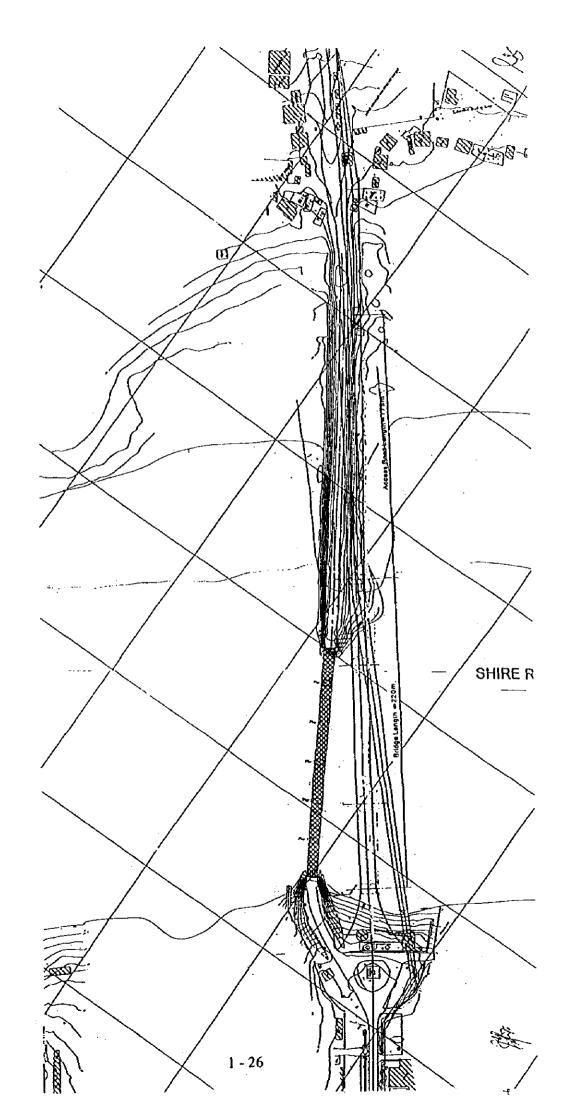


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1.6 Minutes of Meeting (Dated 2nd July, 1998)

MINUTES OF MEETING FOR DRAFT FINAL REPORT

OF

THE FEASIBILITY STUDY

ON

THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE

IN

THE REPUBLIC OF MALAWI
AGREED UPON BETWEEN
MINISTRY OF WORKS AND SUPPLIES
AND

JAPAN INTERNATIONAL COOPERATION AGENCY

LILONGWE, MALAWI 2 JULY 1998

Mr. E.L.K. Mwakhwawa

Director of Roads

Ministry of Works and Supplies

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Mr. Kazumasa Tada Team Leader

JICA Study Team

Witnessed by

Mr. Kazuhiko Yamagishi

Leader

Advisory Committee

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Minutes of Meeting

In response to the request of the Ministry of Works and Supplies (MOWS) of the Republic of Malawi, the Japan International Cooperation Agency (JICA) dispatched a JICA Study Team to Malawi on 27 June 1998 to submit the Draft Final Report on the "The Feasibility Study on the Reconstruction of Mangochi Road Bridge in the Republic of Malawi". JICA also dispatched JICA Advisory Committee members to Malawi on the same day to join the meeting concerning submission of the Draft Final Report of this Study.

After a series of discussions between the Study Team and the members of Steering Committee concerned with the projects for the Feasibility Study on the Reconstruction of Mangochi Road Bridge in the Republic of Malawi, the following subjects were confirmed and agreed upon by both sides.

- 1. Submission of the Draft Final Report and Explanation
- (1) The leader of the Study Team, Mr. K. Tada, submitted to the Director of Roads 12 copies of the Draft Final Report of the Study. The Director acknowledged receipt of the report.
- (2) The Director of Roads expressed his appreciation to the Advisory Committee and the Study Team for the efforts that they made in all stages of the study.
- (3) The Team Leader went ahead to explain the results of the Study conducted in Japan at the Steering Committee meeting, chaired by the Director of Roads, called to order on 1 July 1998 in the conference room of the MOWS Headquarters in Lilongwe.
- (4) The Malawian side is to adjust the vertical and horizontal alignment of the road of the Naminga-Mangochi project, based on the results of this bridge project.
- 2. The Final Report
- (1) The Final Report is scheduled to be submitted by August 1998 to MOWS after finalization of the report taking into consideration comments that might be raised by the Steering Committee. The comments, if any, shall be forwarded to the JICA Malawi office by 10 July 1998.
- (2) Both sides agreed that the Final Report shall be kept confidential for three years.
- Other

The Malawian side strongly requested the Japanese side to implement this Project under the Japanese grant aid program. The Japanese side promised to convey the request to the Government of Japan.



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ANNEX

THE FEASIBILITY STUDY ON THE RECONSTRUCTION OF MANGOCHI ROAD BRIDGE MEETING – 1 JULY 1998

List of Attendance

THE MALAWIAN SIDE

Mr. E.L.K. Mwakhwawa	Ministry of Works and Supplies, Director of
	Roads and Chairman of the Steering Committee
Mr. T. Nyirenda	Ministry of Works and Supplies, Deputy Director
	of Roads
Mr. B. Nayeja	Ministry of Works and Supplies
Mr. G.J. Chunda	Ministry of Works and Supplies
Mr. S. Mapila	Ministry of Forestry, Fisheries, and
	Environmental Affairs, Department of Fisheries
Mr. G.S.Z. Jere	Ministry of Finance
Mr. M.D.A. Mulebe	Ministry of Transport
Mr. W. Michala	Department of Antiquities
Mr. D.M. Chirwa	Department of Local Government
Mr. B.C. Kapoteza	Ministry of Works and Supplies

THE JAPANESE SIDE

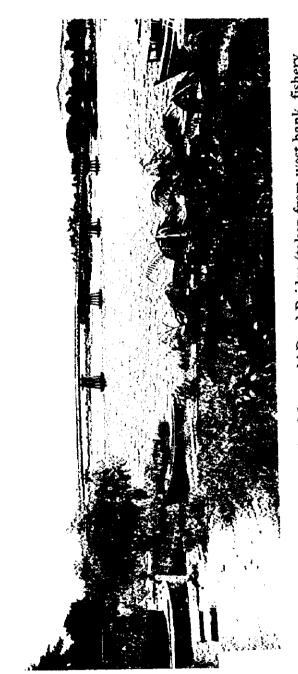
Mr. Kazuhiko Yamagishi	Leader, Advisory Committee
Mr. Masahiro Ishida	Advisory Committee
Mr. Tetsuo Seki	Assistant Resident Representative, JICA Malawi
	Office
Mr. Kazumasa Tada	Team Leader/Transport Planning/Bridge
	Planning
Mr. Junji Yasui	Bridge Design/Maintenance Planning
Mr. Derek Bell	Traffic Survey/Traffic Demand Forecast/
	Economic Analysis

4-29/4.

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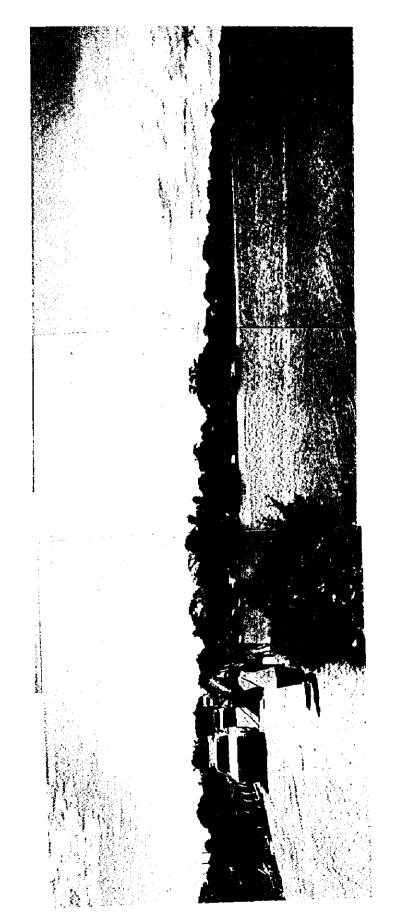
APPENDIX 2 PHOTOGRAPHIC RECORDS



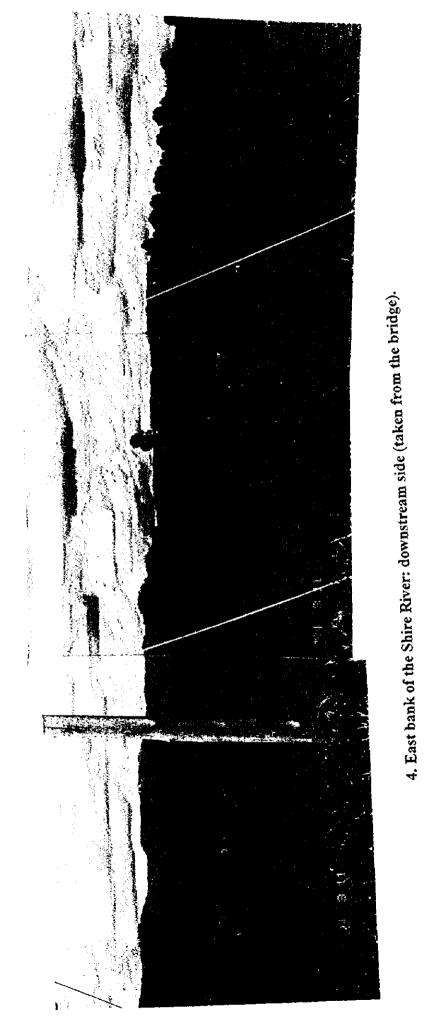
1. Overview of the existing Mangochi Road Bridge (taken from west bank, fishery department house).



2. West bank of the Shire River: downstream side (taken from the bridge).



3. West bank of the Shire River: upstream side (taken from the east bank).

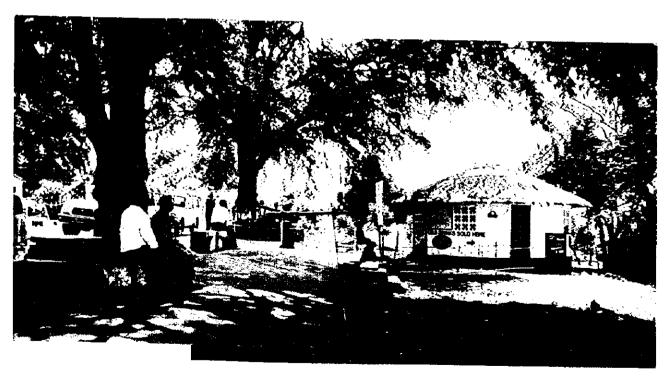




5. East bank of the Shire River: upstream side (taken from the bridge site).



6. Queen Victoria Monument



7. Gun from HMS Guendolin and kiosk (illegal squatter)

APPENDIX 3 GEOGRAPHIC SURVEY



3.1 Boring Log BH1 MATERIALS LABORATORY-JATULA PARTNERS CONSULTING ENGINEERS

DRILLING HOLE LOG LOG OF TEST BORE/PIT/AUGER HOLE

PROJECT:	Mangochi 1	Bridge Site		r				
LOCATION:	Mangochi	Bridge Site	:	COORDINA	TES:	AREA		
EXCUSSION	METHOD:	Percussion		DIM: 150	ww	GWL: 474.360m		
GROUND EL	EVATION:	475.070m		DATE: 20/		RECORDED : MACHILA/BANDA		
DORE HOLE	: 3			CHAINAGE	(KEI)	LOGGED BY: G.J.CHUNDA		
DEPTH (m)	GRAPHIC	SAMPLE TYPE & DEPTH(m)	No. OF BLOWS IN 150mm	No. OF BLOWS IN 300mm	N-VALUE	DESCRIPTION	REMARKS	
475,070						Soft darkish grey silty	Percussive	
473.070	*		1	2	_2	soft sand	_	
471.070	*-*-*-*	471.070	1	2	2	soft sandy		
469.070			3	9	9	clay		
467,070	* * * * * * * * * *	467.070	6	25	25	Medium dense		
465.070	* . * . * . * . * . *	,,,,,,,	4	31	31	sand		
463.070	* - * - * - *	463,070	13	41	41		_	
461.070	*-*-*-*-*	ļ	13	33	34	sandy clay Medium dense		
459,070	* * * * * * * * *		11	32	32	sand	-	
457.070	: : : : : : : : : : : : : : : : : : :	457.070	11 8	30 40	30 40			
453.070		456.070 453.070	13 15	92	92	Very dense		
451.070	: : : : : : : : : : : : : : : : : : :	451.070	25	55++		to extremely dense sandy		
149.070	:::::::: ::::::::		52 49	55++	55++	clay		
447.070	::::::::: ::::::::::		23	71	71			
445.070			38	110	110			
443,070	*-*-*-*-*		20	94 89	94 89	Very dense sand	End of Bil	
441.070								
439.070								
437.070								
435.070								
433.070								
UD = Undisturbed Sample N = S.P.T. N-Vlue D = disturbed sample *0*0*0* = gravel -*0.*-= weathered rock with pebbles						= Sandy sile = Sand with := clay with	ty clay pebbles pebbles	
L				3.	<u> </u>			

3.2 Boring Log BH2 MATERIALS LABORATORY-JATULA PARTNERS CONSULTING ENGINEERS

DRILLING HOLE LOG LOG OF TEST BORE/PIT/AUGER HOLE

OCATION	Mangochi	Bridge Site	9	COORDINA	TES:	AREA		
				DIM: 150		GWL: 474.450m	· -	
 	EVATION:	Percussion 474.630m		DATE: 07/		RECORDED : MACHILA/BANDA		
		171.0305		CHAINAGE		LOGGED BY: G.J.CHUNDA		
ORE HOLI	E: 2					LUGGED BI: G.C	, CHONDA	
EPTH	GRAPHIC	SAMPLE	No. OF	No. OF	S.P.T. N·VALUE	DESCRIPTION	REMARKS	
(m)		TYPE & DEPTH(m)	BLOWS IN 150mm	BLOWS IN 300mm				
474.630	:::::::					Soft darkish grey silty	Percussive	
472,630	:::::::: :::::::::::::::::::::::::::		0	0	0	clay	Drilling	
112,030	:::::::::::::::::::::::::::::::::::::::		0	0	0			
470.630					ļ		ļ	
460 630	* . * . * . * . * . * . * . * . * . * .		<u> </u>	7	7	Very dense		
408.030	* * * * * * *	T .	5	70	70	grey coarse		
466.630	*****			<u> </u>		sand		
	..*.*		5	19	19			
464.630		1	14	46	46	Dense grey		
462.630	-	L				13710		
	:::::::	:		ļ				
460.630	::::::		13	33	33	Medium dense		
450 630	_		10	39 46	39 46	grey sandy silt	j	
458.030		UD457.63	1		1 - 10	13110		
456.630	::::::		17	48	48			
	_ :::::::		9	37	37		_{	
454.630			9	60	60	Very dense		
452 630		1	29	107	107	dense sandy		
			39	108	108	clay		
450.630								
440 630			26	108	93	-{		
448.030			20	100	100	1		
446.630	· · · · · · · · · · · · · · · · · · ·	,	20	108	108			
	::0::0::		43	94	94	Very dense	n_ ,	
444.630	1::0::0::	: 444.630	20	89	89	mudstone	End of BH	
440,630								
438.630			1				<u> </u>	
436.630	7							
434,630	7							
432,630	<u></u>				1			
							_	
	listurbed T. N-Vlue					* = Silty cl : = Sandy si		
	turbed sam					· = Sand wit		
*0*0*0*	≖ gravel				::0::0	:: = clay wit	h pebbles	
1	-= weather	ed rock wit	h pebbles		1 * *	- = Weatherd	tock	

3.3 Boring Log BH3

MATERIALS LABORATORY-JATULA PARTNERS CONSULTING ENGINEERS

DRILLING HOLE LOG LOG OF TEST BORE/PIT/AUGER HOLE

		Dridge Site		COORDINA	TES:	AREA			
		Bridge Site				GWL: 474,340m			
EXCUSSION	METHOD: I	Percussion		DIM: 150	irin .	· · _ · _ · · _ · · · · · · · · ·			
GROUND EL	EVATION:	474.920m		DATE: 28/ CHAINAGE	(km)	RECORDED : MACHILA/BANDA			
BORE HOLE	: 1					LOGGED BY: G.J.CHUNDA			
DEPTH	GRAPHIC	SAMPLE	No. OF	No. OF	S.P.T.	DESCRIPTION	REMARKS		
(m)		TYPE &	BLOWS IN		N-VALUE	<u>{</u>			
(10.)		DEPTH(m)	150mm	IN 300mm			<u> </u>		
474.920	* - * - * - *			1		Loose dark			
1,4.520	* . * . * . * . *		3	7	7	brown sand	Percussive		
472,920	* . * . * - * - *		7	14	14	}	Drilling		
112.720	1 . * . * - * - *		2	8	8	j			
470 920	x - x - x - * - *		3	18	18	}	1		
110.740	* * * * * * *		3	17	17]			
468 020	* * * * * *		3	16	16]	1		
100.720	£. *. *. *. *		8	53	53		}		
466 020			14	66	66	Dense bluish	1		
400.920	1		1	1	· - · · -	grey sandy	1		
464 000		1	9	39	39	clay	1		
404.920	:::::::::		3	29	29	Banded bluish	7		
160 000	::::::::		i 	+- -	 	grey sandy	İ		
462.920		1	1			clayey silt			
	<u> </u>	1	1	1	-	0.0,0,0			
460.920		151	1 2	44	44	Stiff dark			
	_ ::::::::		13	44	56	grey sandy	1		
458.920		1-1-1	15	56	40	silty clay			
L		<u> </u>	14	34	34				
456.920		UD456.920	10		39	-{	l		
]::::::::		10	39	43	-{	1		
454.920	2:::::::		12	43	1 9.3	-			
		:UD453.920		- 3,7	1 27				
452.920	:::::::		3	37	75	Very dense			
	_[:::::::		35	1 75	1 /3	•	:		
450.920	:::::::	1			i	sandy clay	İ		
	_:::::::		1	_	1		105 Deservation		
448.920	::::::	: 448.920	21	98	98		106mm Penetration		
	_::0::0::	and the second s	1		1		Ì		
446.920	::0::0::		10	45	45	Dense			
	1::0::0::		9	44	44	jmudstone			
444.920	::0::0::	: 444.920	18	87	87				
<u> </u>	_;::0::0::	1 .	1	1	i	!			
	::0::0::		11	42	42				
•	_;::0::0::	: 439.920	17	37	37_	!			
438.920	::0::0::								
	.:0::0::		10	51	51	Very dense			
436.920	::0::0::		16	55++		limestone	ļ		
L	::0::0::		22	66	66	- i	!		
434.920	::0::0::	: 434.920	24	78	78	<u> </u>			
432,920				İ		1			
432,920	<u>'. L </u>		<u> </u>		 	<u></u>	L -		
III) - 11-3	lintush.a	Campla			x - x - x -	* = Silty cla	vev sand		
	listurbed T. N·Vlue				Į.	: = Sandy sil			
	urbed sam					= Sand with			
	urped sam = gravel	his):: = clay with			
		ed rock with				- Weatherd	=		
1 [] - 7 -	- weather	ed LOCK Will	' hebbies			HORCHOLU			

RESULTS LABORATORY TEST

LOCATION:- WEST BANK (BH1)

Laboratory To	est Resu	olt B	H	i	_	Γ	 	Γ.		ì -) -·	Γ	Γ	I		<u> </u>
			ANGLE	Degrees										12	122	128
		L/BOX SHEAR SHEARING												5.5		
(1		TRIAXIAL/BOX SHEAR									_			15.415.5	17.2 100	18.19
IANK (BH		TRIAXI	DENS.	kg/m/3			:							2058	2088	2118
LOCATION:- WEST BANK (BH1)		CLASSIFI			A-1-b(0)	A-1-5(0)	A-1-b(0)	A-2-7(3)	(A-1-b(0)	A-7-5(6)	A-7-6(9)	A-2-6(0)	A-7-6(15)	(9) 9·2·V	A-7-6(11)	A-2-6(2)
ATION:-		BERG	I.d.	3 2	ď	ď	ይ	33	<u>.</u>	1.5	26	12	24	24	28	121
LOCA		ATTERBERG	1.7.	51%	N	N	N	54	N	35	47	28	20	47	52	39
				501.07	13	0	2	3 27	9 (55	49	18	69	45	51	128
Ŋ				2.36 .600.425.300 .150.075	119 19	13 3	14 5	40 33	22 10	82 176	66 57	34 27	182 80	10 59	19 69	66 47
RESULTS		777	ONS	425	36	23	21	46	32	85 8	174	145	83 (8		75 6	74 6
TEST		"	12	5 . 600	55	43	28	52	4.5	68	82	55	82	_	83	83
		RIBUT BS SI		5 2.30	86	86	8.5	9.5	96	.66	66	56	91.	100	66	66
Laboratory		E DIST		9.5 4.75	100	100	100	66 001	100	100	100	100 99	66	_	1100	100
		GE PA	RES					100	1	-		100	195			
E SITE		PARTICLE SIZE DISTRIBUTION PERCENTAGE PASSING BS SIEVE	MILLIMETRES	19.0 13.2									97			
skibG		V a	E	19				_		0	-	0	86 0	0	0	5
PROJECT: - MANGOCHI BRIDGE SITE		SAMP DEPTH	(metres)		0.00-1.45	1.45-4.80	4.80-6.50	6.50-7.00	7.00-11.35	11.35-16.20	16.20-2135	21,35-28,30	28.30.30.00 98	15.65-16.10	17.85-18.30	20,90-21.35
SCT: -		SAMP			1	2	13	4	5	9	7	8	6	1	2	3
PROJI		BH	! !		вни											

sio Mango	chi B	ridge s	Sita	Oper	rator	
Location 8H1		<u> </u>		Date	12/03/98	
					ription	
					ing	
Total Weight of dry S	ımple:	1850)	g Dry.		
B.S. Sieve Size	Weight Retained B	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Loed
75.50 mm						
63.0 mm						
53.0 mm	·····					4500
37.5 mm						3500
26:5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm						750
4.75 mm	10-1	10.1	0.5	99.5	(00	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	34-1	44.8	2.4	97.6	98	200
No. 14 (1.18 mm)			i			100
No. 25 (.600 mm)	794.5	838.7	45.3	54.7	55	ぉ
No. 36 (.425 mm)	344.2	1182.9	63.9	36-1	36	75
No. 52 (.300 mm)	316-8	1499.7	}	18-9	19	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	6.091	1689.9	91.3	8.7	9	40
No. 200 (.075 mm)	96.5	1786-4		3-4	3	25
Passing No. 200 (.075 mm)	i	3-4				
Total	1850					

Sin Mange	chi	Bridge	Site	Open	HOC	
Location BHJ		٧		Date	13/08/98	
Sample No.					ription	
Sample No.		Deput				
	,	ን ሎ ፫~		216411	18	
Total Weight of dry Sa	umple:	705		g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm	ĺ					
63.0 mm	·					
53.0 mm				<u> </u>		4500
37.5 mm						3500
26.5mm			•			2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm						750
4.75 mm	0.3	0.3	0.0	99.96	100	500
Passing 4,75 mm				_		
Riffled Sample 4.75 mm Passing						·
3.35 mm						300
No. 7 (2.36 mm)	17.9	18-9	9.0	98.0	98	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	498-1	576.3	57-0	43-0	43	75
No. 36 (.425 mm)	182.0	698.3	77.2	22.8	93	75
No. 52 (.300 mm)	89.4	787.7	87.0	13-0	13	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	88-0	875.7	96.8	3-2	3	40
No. 200 (.075 mm)	29-1	904.8	99.9	0.0	0	25
Passing No. 200 (.075 mm)	0-5	0.0				
Total	905	100				<u> </u>
W. & K.				_		

sio Margo	hi Br	idge		Open	12/3/98	
Langing BHI		<u> </u>		Date	12/8/98	
Sample No. 8		Depth 4.8	0-6-50	Descr	ription	
Sample 1 to 1		• .		Sievia	16	·
	ゥ	^CT				
Total Weight of dry Sa	mple: D	000		g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained S	Per cent Retained	Total Passing %	Remarks	Max* Sieve Load
75.50 mm						
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm	i					1500
9.5 mm						1000
6.7 mm				100		750
4.75 mm	0.5	0.5	0-05	99.9	100	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm	!					300
No. 7 (2.36 mm)	269.3	8.596	8.76	91.8	92	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	1910.5	9173.0	72.43	97·6	98	75
No. 36 (.425 mm)	196.8	2369.8	79.00	21.0	2/	75
No. 52 (.300 mm)	209.3	2579.1			14	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	266.2	284-5-2	94.84	5:7	5	40
No. 200 (.075 mm)	91-0	8936-3		ଚ-1	ð	25
Passing No. 200 (.075 mm)		ଚ-1				
Total	3000			_		

Site Mange Location BH1	ochi f	midge	Site	Oper	ator	
inning BH12		q		Dete	13/03/98	
Sample No. 4	· · · · · · · · · · · · · · · · · · ·	- 6·S	0 - 7.0)() (() p	ription	
Sample No.	· · · · · · · · · · · · · · · · · · ·	. Depth			_	
				Sievi	ng	
Total Weight of dry S	ample:l	49 <u>5</u>	المتأمستين وماستونات فارتبرون	g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max ^e Sieve Load 8
75.50 mm				_		
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm	1,9	1.9	0.1	99.9	100	1000
6.7 mm						750
4.75 mm	11.9	13.1	0.8	99.2	99	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	129.7	132.8	7.9	93.1	92	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	640.0	775.8	45.0	55.0	55	75
No. 36 (.425 mm)	149.4	935.9	53.6	46.4	46	75
No. 52 (.300 mm)	4.611	1037.6	60.5	40-0	40	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	116.7	1154.3	66.9	33-1	33	40
No. 200 (.075 mm)	97.7	1952-0		27-4	97	25
Passing No. 200 (.075 mm)		27.4				
Total	1725					

sie Mang	ochi f	bridge	Site	Oper	12/03/98	41-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-
Location BH1				Date	12/03/98	***************************************
Sample No. 5		Depth 7.00	<u> </u>	S Desc	riptica	······
water provide the same and		•	•) <u> </u>	
Total Weight of dry Sa		3 የ ტ			•	
Total Weight of dry Si	mple:					Max*
B.S. Sieve Sizo	Weight Retained	Weight Retained S	Per cent Retained	Total Passing	Remarks	Sieve Load
75.50 mm						
63.0 mm						
53,0 mm						4500
37.5 mm						3500
26.5mm						2500
19,0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm						750
4.75 mm	0.8	0.8	စ.ဝပ္	99.96	100	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	67-2	68.0	37	963	96	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	931.7	999.7	54.6	45.4	4-5	75
No. 36 (.425 mm)	358.2	1251.9	68·4	31.6	39	75
No. 52 (.300 mm)	181-1	1433-0	-	21.7	23	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	9.616	1643.9	89-8	4.01	10	40
No. 200 (.075 mm)	79.9	1723.8		5.8	6	25
Passing No. 200 (.075 mm)		5-8				
Total	1830					

Site Mange Location BH1	xhù f	<u>Snidge</u>	<u>Site</u>	Ope	rator	
Lordin BH1				Date	13/03/98	
Sample No. 6		. Depth 11-3	5-16-2	OM. Dek	ription	
				Sievi	ing	
Total Weight of dry S	emple:	050		g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm						
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm	 					1000
6.7 mm						750
4.75 mm						500
Passing 4.75 mm	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
Riffied Sample 4.75 mm Passing						
3.35 mm				100		300
No. 7 (2.36 mm)	5.1	5.1	0-8	99.2	99	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	71.6	76-7	11.4	88-6	89	ಶ
No. 36 (.425 mm)	21-4	98.1	14-6	85·4	85	75
No. 52 (.300 mm)	22-1	190.9	17.9	1.68	82	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	39-9	160-1	83-9	76.1	76	40
No. 200 (.075 mm)	140.0	300-1	44.8		55	25
Passing No. 200 (.075 mm)		55.9			_	
Total	670					

sin Mango	dhi B	mdge S	<u>Sita</u>	Ope	rator	
Location BH1		· ·		Dete	18/03/98	
Sample No. 7		Depth 16-	20-21.	BSM Dex	ziptica	
•			•		ing	
Total Weight of dry S	ample:	1600				
			1			Max*
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing %	Remarks	Sieve Load E
75.50 mm						
63.0 mm						
53,0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm		·				750
4.75 mm	0.5	0.5	0.03	99.9	100	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	11.6	19.1	0.8	99.2	99	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	0.086	J92-1	18.3	81-7	82	**
No. 36 (.425 mm)	131.4	423.5		73.5	74	75
No. 52 (.300 mm)	115.3	538.8	33.7	66.3	66	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	143-8	683.6	42.7	57.3	57	40
No. 200 (.075 mm)	135. q	818.5	કા છે	48-8	49	25
Passing No. 200 (.075 mm)		48.8				
Total	1600					

sin Mang	ochi t	<u>Indge</u>	Sit	<u>್ದ</u> Oper	ator	~~					
Location 841		·		Date	12/03/98						
		Depth 81.	35_28	3 - 3.ODesc	ription						
		•			ng						
Total Weight of dry Sample: 1485 g Dry.											
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max ^e Sievo Load					
75.50 mm											
63.0 mm											
53.0 mm						4500					
37.5 mm						3500					
26.5mm						2500					
19.0 mm						2000					
13.2 mm		· · · · · · · · · · · · · · · · · · ·				1500					
9.5 mm						1000					
6.7 mm						750					
4.75 mm	13-8	13.8	0.9	99.1	99	500					
Passing 4.75 mm											
Riffied Sample 4.75 mm Passing											
3.35 mm						300					
No. 7 (2.36 mm)	59.0	72.8	4.9	95-1	95	200					
No. 14 (1.18 mm)						100					
No. 25 (.600 mm)	4.692	665-2	44.8	5S, B	5\$	75					
No. 36 (.425 mm)	156.8	8 22-0	55.4	446	45	75					
No. 52 (.300 mm)	154.3	976.3	65.7	34-3	34	50					
No. 72 (.212 mm)						50					
No. 100 (.150 mm)	115.9	6.6901	73.5	26.5	97	40					
No. 200 (.075 mm)	122.0	1914.3		18-2	18	25					
Passing No. 200 (.075 mm)			1								
Total	1485										

· Manago	chi (Bridge	2 Sil	D Open	12/08/98	nia da (. la parado e d'Alle Plad
Location BH 1		U		Date	12/08/98	
Location 9	·	Janih 28.	80 -37.°	i Sop Desc i	ilptioa	
Sample No.	<u></u> 4	reput			18	
		1000		Pican	The second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the second section of the section of the second section of the second section of the second section of the section of t	
Total Weight of dry Sa	mple:	820		g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm					<u> </u>	
63.0 mm						
53.0 mm				<u></u>		4500
37.5 mm						3500
26.5mm				100		2500
19.0 mm	30·4	30.4	1.7	98.3	98	2000
13.2 mm	24.4	54.8	3-0	970	97	1500
9.5 mm	29.0	83-8	4.6	95.4	95	1000
6,7 mm						750
4.75 mm	41.8	125.6	6-9	93-1	93	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm				<u> </u>		300
No. 7 (2.36 mm)	33.9	159.5	৪১৪	91.2	91	200
No. 14 (1.18 mm)			ļ			100
No. 25 (.600 mm)	6.811	277.7	15.3	84-7	85	75
No. 36 (.425 mm)	31.0	308.7	17-0	83.0	83	75
No. 52 (.300 mm)	33-3	330.9	18-9	81.8	85	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	36.4	367.3	20:5	79.8	80	40
No. 200 (.075 mm)	193-2	560.5		69.9	69	25
Passing No. 200 (.075 mm						
Total	1820			<u> </u>		

Sile Mange	schi R	ridge?	ita	Оре	erator	
Location BH 1		Y 		Det	. 14/03/98	
Sample No. U	/100	Denth 15	65-16	-10 a Des	cription	
Junipro 8 10;					ring	
		250 0			408	
Total Weight of dry S	Sample:	379-9		g Dry.	 	
B.S. Sieve Size	Weight Retained \$	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm						
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm		•				750
4.75 mm					· · · · · · · · · · · · · · · · · · ·	500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	1.6	1.6	0.43	99.6	100	200
No. 14 (1.18 mm)				<u> </u>		100
No. 25 (.600 mm)	55.7	57.3	15.4	84-6	85	75
No. 36 (.425 mm)	23.9	85.7	93.9	77.1	77	75
No. 52 (.300 mm)	24.9	110-1	29.6	70.4	70	50
No. 72 (.212 mm)	<u> </u>			·····		50
No. 100 (.150 mm)	41.2	151.3	40.7	59.3	59	40
No. 200 (.075 mm)	54-8	206.	55.4			25
Passing No. 200 (.075 mm)		44.6				
Total						
W. & F.						

siw <u>Mang</u> o	schi k	<u>Sndge</u>	Site	Open	utor	
Location BH1				Date		
Sample No. Ulo	<u>0</u>	Depth 17 - 9	85-18	<u>30 M</u> Desc	iption	·
-					\ 8	
Total Weight of dry Sa	mple: U	20.4	<u></u>	g Dry.		
B.S. Sieve Size	Weight Retained	Weight Retained	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm						
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26,5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm						750
4.75 mm						500
Passing 4.75 mm						
Riffled Sample 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	3-8	3-8	0.9	99.1	99	200
No. 14 (1.18 mm)						100
No. 25 (.600 mm)	66-0	69-8	83-4	83.4	83	75
No. 36 (.425 mm)	34-8	104.6	24.9	75-1	75	75
No. 52 (.300 mm)	27.3	131-9	31.4	68.6	69	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	33.5	165.4	39.3	60.7	61	40
No. 200 (.075 mm)	41-6	207-0	49.2	20.8	81	25
Passing No. 200 (.075 mm)		50.8				
Total	420.4			1	· · · · · · · · · · · · · · · · · · ·	

siw Mangoc	hi Bro	<u>lge</u>	Site_	Oper	stor	
Location B#1				Date	15/03/98	
	(u/100)	Depth 30	·9-21.	SM Dec	riptica	
•					ng	
Total Weight of dry Si	ımple:5	47-0		g Dry.	•	
B.S. Sieve Size	Weight Retained	Weight Retained S	Per cent Retained	Total Passing	Remarks	Max* Sieve Load
75.50 mm						
63.0 mm						
53.0 mm						4500
37.5 mm						3500
26.5mm						2500
19.0 mm						2000
13.2 mm						1500
9.5 mm						1000
6.7 mm				100		750
4.75 mm	0.5	0.5	0.1	99.9	100	500
Passing 4.75 mm						
Riffled Samplo 4.75 mm Passing						
3.35 mm						300
No. 7 (2.36 mm)	5.8	6-3	1.9	98.8	99	200
No. 14 (1.18 mm)			l			100
No. 25 (.600 mm)	89-1	95-4	17.4	82.6	83	75
No. 36 (.425 mm)	49.7	145.1	26-5	93.5	74	75
No. 52 (.300 mm)	43-5	188.6	34.5	65.5	66	50
No. 72 (.212 mm)						50
No. 100 (.150 mm)	104.9	292.8	53.5	46.5	4-7	40
No. 200 (.075 mm)	103-4	396.9	79.4	27.6	98	25
Passing No. 200 (.075 mm)	150.8	87-6				
Total	547.0					

Elquid limit (cone penetrometer) and plastic limit

quid limit (cone penetrometer) and plastic limit	Form 2	i.c						
Location Margoon p		100	χ		Jobs	of.		
12.0	5	(7,		Bore	hola/	0	11 1
.					Pit	no.	\overline{Q}	计门
Soll description Dork Grown		669	u	· 6	403 n	pleno.	_	3 1
				~	Dept) ~	B .ml
	00.1	AT1 - D A	. 1000		Date	 	<i>)</i> (0 -1
Test method	851.	377 : Part 2	: 1990 :	5.314.4	Uate	<u>'</u>		
PLASTIC LIMIT Te	st no.	1	2	3		4		Average
Containerno.					1		4	
Mass of wet solt + container	Ç		<u> </u>		1	Ā	\pm	
Mess of dry soil + container	9		1			<u> </u>	_	
Mass of container	g	1/	\		V			
Mass of moisture	g	11/	¥	<u> </u>	Λ	1		
Mass of dry soil	9		_\			/		
Moisture content	%			7				
			1		1			
LIQUID LIMIT Te	st no.	1	2	: -	- \3/		4	1
Initial dial gauge reading	mm				_ _'			<u> </u>
Final dial gauge reading	mm							
Average panetration	กก	<u> </u>						
Containerno.		ļ						
Mass of wet soil + container	8	ļ						
Mass of dry soil + container	9			_				
Mass of container	g	<u> </u>					<u> </u>	
Mass of moisture	9				<u> </u>			
Mass of dry soil	g	<u> </u>				<i></i>	_	
Molsture content	%							
					Sample	preparatio	on •	······································
					as receiv		,	
26-						on 425 μπ at		eva
£ 24						ed at		
					not know		_	
					Proportio	on retains	ಕ	
20-						m siava .		
Ö 18				圖上	Liquid lic			%
					Plastic fi			%
8 16 18 18 18 18 18 18 18 18 18 18 18 18 18					Plasticity	robni		
					* ()	es abbiol	prist	G
					perator	Chacke	d	Approve
Moisture content,%				[· ·			·

Liquid limit (cone penetrometer) and plastic limit Form 2.C Margachi Bridge Jobref. Location Borehole/ Pitno. Medium to Cogosamplano. Brown Soli description Depth BS 1377 : Part 2 : 1990 : 4.3/4.4* Date Test method 4 egstevA 2 3 PLASTIC LIMIT Test no. Containerno. Mass of wet soil + container 0 Mass of dry soil + container Mass of container 8 Mass of moisture ð Mass of dry soll g ч, Moisture content i 2 3 LIQUID LIMIT no. Initial dial gauge reading mm mm Final distigauge reading Average penetration mm Container no. Mass of wet soil + container 8 Mass of dry soil + container g Mass of conteiner Q Mass of moisture Q Mass of dry soll 8 4, Molsture content Sample preparation * as received 28 washed on 425 µm slave 26 air dried at °C oven dried at °C 24 cone, not known 22 Proportion retained Penetration of on 425 μm sleve % 20 squid limit 25 18 Plastic limit 5.c Plasticity Index 16 * Delete as appropriate Operator Checked Approved 12 Moisture content, %

Liquid limit (cone penetrometer) and plestic limit

Form 2.C

PLASTICUMIT Test no. 1 2 3 4 Average Conteiner no. Mass of wet soil + container 9 Mass of dry soil + container Mass of container Mass of container Mass of are soil Mosture content LIQUID LIMIT Test no. 1 2 3 4 Initial dial gauge reading mm Final dial gauge reading mm Container no. Mass of wot soil + container 9 Mass of wot soil + container 9 Mass of wot soil + container 9 Mass of fory soil Mass of moisture 9 Mass of fory soil Mass of moisture 9 Mass of container 9 Mass of moisture 9 Mass of dry soil Sample preparation as as received vashed on 425 µm sievo alt dried at 'C oven dried	Location Margeel	· Brick	J-l.		Jobn	ef.	
Test method BS 1377 : Part 2 : 1990 : 4.3/4.4* Date 71 ~ S ~ C PLASTIC LIMIT Test no. 1 2 3 4 Average Contelliner no. Mass of wat solf + container Mass of wat solf + container Mass of lay solf was olf was	•		O				B#1-
Test method BS 1377 : Pert 2 : 1990 : 4.3/4.4* Date Test no. PLASTIC LIMIT Test no. Test n	Soil description . What St	- deed	to 0	shood	Sam	ple no.	3
Test method BS 1377: Part 2: 1990: 4,3/4,4* Date PLASTIC LIMIT Test no. 1 2 3 4 Average Conteiner no. Mass of wat soll + container Q Mass of good learner Mass of good learner Mass of groot language reading Moleture content LIQUID LIMIT Test no. 1 2 3 4 4 Initial dial gauge reading mm Average ponetration Container no. Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of moleture Q Mass of wat soll + container Q Mass of for soll Mass of for soll Q Mass of wat soll + container Q Mass of for soll Mass of moleture Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of moleture Q Mass of wat soll + container Q Mass of moleture Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of wat soll + container Q Mass of moleture Q Mass of wat soll + container Q Mass of wat soll +	Sol.	, ,	· -		Dept	ո Սջ	20-605
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Container no. Mass of very soil + container Mass of ory soil Mass of very soil + container Mass of ory soil Mass of ory soil Mass of ory soil Molsture content LIQUID LIMIT Test no. I 2 3 4 Initite dial gauge reading mm Average ponetration Container no. Mass of wort soil + container 9 Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of wort soil + container 9 Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Mass of ory soil Sample preparation at received washed on 425 µm sievo alt died at 'C oven died at .	OL LOTIO LIST	Test no	1	,	3	4	Average
Mess of dry soil + container Mess of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Most of dry soil Mass of wet soil + container Mass of content Mass of dry soil Mass of dry soil + container Mass of dry soil + container Mass of dry soil + container Mass of dry soil + container Mass of dry soil + container Description Mass of dry soil Mass		103(110)	<u> </u>				
Moss of dry soil + container Mass of container Mass of moisture Mass of dry soil Moisture content LIQUID LIMIT Test no. 11 2 3 4 4 Initial dial gauge reading mm Average penetration Mass of word soil + container 9 Mass of dry soil Mass of dry soil + container 9 Mass of dry s	· <u> </u>	9	<u></u>				1
Mass of molisture Mass of molisture Mass of dry soil Molisture content LIQUID LIMIT Test no. 1 2 3 4 Initial dial geoge reading mm Molisture content Container no. Mass of wort soil + container 9 Mass of dry soil + container 9 Mass of dry soil + container 9 Mass of molisture 0 Mass of molisture 0 Mass of molisture 0 Mass of molisture 0 Mass of dry soil 9 Molisture content 9 Sample preparation 1 Sample preparation 2 Sample preparation 1 Sample preparation 1 Sample preparation 1 Sample preparation 1 Sample preparation 1 Sample preparation 2 Sample preparation 1 Sa			h	 			1
Mass of moisture Mass of dry soil Moisture content LIQUID LIMIT Test no. 1 2 3 4 Initial dial gauge reading mm Average ponetration mm Average ponetration mm Average ponetration mm Mass of word soil + container g Mass of dry soil + container g Mass of dry soil + container g Mass of container g Mass of fory soil of moisture g Mass of dry		-					1
Moisture content LIQUID LIMIT Test no. 1 2 3 4 Initial dial gauge reading mm Average penetration mm Average penetration mm Container no. Mass of wort soil + container 9 Mass of dry soil + container 9 Mass of dry soil + container 9 Mass of dry soil + container 9 Mass of dry soil + container 9 Mass of dry soil + container 9 Mass of dry soil 9 Moisture content 18 Sample preparation 18 Sample preparation 18 Sample preparation 18 Sample preparation 18 Estreceived washed on 425 µm sieve air dried at 18 Coven dried at 18 Liquid limit 18 Plastic limit 18		1					
Moisture content LIQUID LIMIT Test no. 1 2 3 4 Initial dial gauge reading mm Final dial gauge reading mm Average penetration mm Container no. Mass of wet soll + container 9 Mass of dry soll + container 9 Mass of dry soll + container 9 Mass of dry soll + container 9 Mass of dry soll 9 Moisture content 9 Sample preparation * as received washed and 425 µm sieve air dried at *C oven dried at *C oven dried at *C oven dried at *C it known Preparation testined on 425 µm sieve *S tiquid limit 19 Test no. 1 2 3 4 Test no. 1 2 3 4 Test no. 1 2 3 3 3 4 Test no. 1 2 3 3 3 4 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test no. 1 2 3 3 3 3 3 Test n			<u> </u>]
LIQUID LIMIT Test no. 1 2 3 4 Initial dial gauge reading mm Average penetration mm Average penetration mm Container no. Mass of wat soll + container 9 Mass of dry soll + container 9 Mass of container 9 Mass of moisture 9 Mass of dry soll 9 Moisture content 5 Sample preparation * as received washed on 425 µm sievo air dried at *C oven dried at *C oven dried at *C is Iknown Proportion retained on 425 µm sievo air dried at *C is Iknown Proportion retained on 425 µm sievo *S tiguid limit 5: 14 µm sievo *S tiguid limit 5:		T A	i\				
Initial dial gauge reading mm Average ponetration mm Container no. Mass of wot soll + container 9 Mass of dry soll + container 9 Mass of container 9 Mass of dry soll 9 Moisture content 9 Sample preparation 1 ex received washed on 425 µm sievo air dried at 1°C oven dried at 1°C			7		······································		
Final dial gauge reading mm Average ponetration mm Container no. Mass of wot soil + container 9 Mass of dry soil + container 9 Mass of container 9 Mass of dry soil 9 Mass of dry s	LIQUID LIMIT	Test no.	1	2	3		4
Average ponetration mm Container no. Mass of wot soll + container 9 Mass of dry soll + container 9 Mass of container 9 Mass of dry soll 9 Moisture content 55 Sample preparation * 28 26 27 20 20 20 20 20 21 22 23 24 25 26 27 28 28 29 20 20 20 20 20 20 20 20 20	Initial dial gauge reading	mm	X V	_			
Container no. Mass of wot soil + container Mass of dry soil + container Mass of container Mass of moisture Mass of dry soil Mass of dry soil Mass of dry soil Moisture content Sample preparation * as received washed on 425 µm sieve air dried at *C oven dried at *C oven dried at *C oven dried at *C it known Proportion retained on 425 µm sieve *% Liquid limit *% Plasticity Index * Delete as appropriate Operator Chacked Approver	Final dial gauge reading	mm			1 1		
Mass of dry soil + container Mass of dry soil + container Mass of container Mass of moisture Mass of dry soil Moisture content Sample preparation * as received washed on 425 µm sieve air dried at *C oven dried at *C oven dried at *C it known Proportion retained on 425 µm sieve *S tiguld limit Plastic timit Plasticity Indox * Delete as appropriate Operator Chacked Approvention Operator Chacked A	Average ponetration	mm					
Mass of dry soil + container Mass of moisture Mass of moisture Mass of dry soil Moisture content Sample preparation * as received washed on 425 µm sievo air dried at *C oven dried at *C oven dried at *C it known Proportion retained on 425 µm sievo air dried at *C it known Proportion retained on 425 µm sievo air dried at *C it known Proportion retained on 425 µm sievo ** Liquid ilmit ** Plastic limit ** Plasticity Index ** Delete as appropriate Operator Chacked Approver	Containerno.		V				
Mass of molsture Mass of molsture Mass of dry soil Molsture content Sample preparation ' as received washed on 425 µm sieve alr dried at 'C oven dried at 'C i tknown Proportion retained on 425 µm sieve '% Liquid limit Plasticity indox Defeator Chocked Approver	Mass of wet soil + container	9					
Mass of molsture Mass of dry soll Molsture content Sample preparation * as received washed on 425 µm sieve air dried at *C oven dried at *C 1 1 known Proportion retained on 425 µm sieve *% Liquid limit Plastic limit *C Operator Chacked Approve	Mass of dry soll + container	S	<u> </u>				
Mass of dry soil Molsture content Sample preparation * as received washed on 425 µm sieve air dried at *C oven dried at *C oven dried at *C it known Proportion retained on 425 µm sieve *S tiguld limit \$10 plastic limit \$2 plastic l	Mass of container	9	<u> </u>				
Sample preparation * 28 26-22-24-25-25-25-25-25-25-25-25-25-25-25-25-25-	Mass of moisture	g	<u> </u>				
Sample preparation * as received washed on 425 µm sieve air dried at 'C oven dried at 'C oven dried at 'C it known Proportion retained on 425 µm sieve % Liquid ilmit Plasticity indox * Plasticity indox * Delete as appropriete Operator Chacked Approves	Mass of dry soil	g	<u> </u>				
28 26 26 27 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	Moisture content	**					
vashed on 425 μm sievo air dried at °C oven dried at °C oven dried at °C oven dried at °C oven dried at °C oven dried at °C oven dried at °C oven dried at °C it known Proportion retained on 425 μm sievo % Liquid limit % Plastic limit % Plastic limit % Plasticity Index • Delete as appropriate Operator Chocked Approver					Sample	preparation	*
26 - 32 - 24 - 24 - 25 - 25 - 25 - 25 - 25 - 2	28				· }		_
oven dried at 'C I tknown Proportion retained on 425 µm sieve % Liquid ilmit Plasticity index • Delete as appropriate Operator Chacked Approve	26-				Ł.		
on 425 µm sieve % Liquid limit % Plastic limit % Plasticity Index • Delete as appropriate Operator Chacked Approve	£ 2/				I		
on 425 µm sieve % Liquid limit % Plastic limit % Plasticity Index • Delete as appropriate Operator Chacked Approve					1		
Liquid limit % Plastic timit % Plasticity index Delete as appropriate Operator Chacked Approves							
14 Delete as appropriate Operator Chacked Approves	° 20				<u> </u>	 	
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14 Delete as appropriate Operator Chacked Approves					}		
Operator Chocked Approve							
7) January - Jan	14						 -
INDICATION CONTROL TO	12				Operator	Chacked	Approved

Form 2.C Liquid limit (cone penetrometer) and plastic limit Location Morgochi Jobref. Borshole/ Pitno. Blueish Sample no. Solidescription Depth BS 1377 : Part 2 : 1990 : 4.3/4.4* Date Test method 2 Average PLASTIC LIMIT Test no. 118 Container no. Mass of wet soil + container 9 Mass of dry soil + container 8 Mass of container 9 Mass of moisture g Mass of dry soil 9 % Moisture content 2 3 LIQUID LIMIT Test no. 1 Initial dial gauge reading ពារា Final dial gauge reading mm Average penetration $2 \, \text{mm}$ Container no. Mass of wet soil + container Ω g Mass of dry soil + container g Mass of container g Mass of moisture 9 Mass of dry soil ø % Moisture content Sample preparation as received 28 washed on 425 µm sieve 26 air dried at °C E 24 oven dried at °C ဗီ 22 not known Proportion retained Penetration of on 425 µm sieve % 20 Liquid limit C 511 18 Plastic limit Plasticity Index 16 • Delete as appropriate 14-Operator Checked Approved Moisture content, %52

Liquid limit (cone penstrometer) and plastic limit	Form 2	ı.c					
Location Management	7 7 (DE	Ο.		Job	rof.	
100. 200 00 12		(Bore	ahole/	
	æ/\	- ~		ļ		tno.	1841
Solidescription Borded Div		- 4	rer		San	rple no.	(S^)
Solidescription Borded blums	nd,			1	Dep	th	100_ IP 3
Tast method	BS 13	377 : Part 2 :	1990 : 4.3/4	41	Date		11-3-4
PLASTIC LIMIT 7.	est no.	1	2	3		4	Avarage
Containerno.							
Mass of wet soil + container	3						
Mass of dry soll + container	g		/			/	
Mass of container	g		/ -			 	$\overline{}$
Mass of molsture	0		1/	_			† :
Mass of dry soil	\\g		<u> </u>				
Moisture content	Vs		1/1-				
						7	·
	est do.	1 1 17	2		3	<u>'</u>	4
Initial dial gauge readir, 1	w,h						
Finel dial gauge reading	mm			<u>L_i</u>			
Average penetration	mm					· · · · · · · · · · · · · · · · · · ·	
Contsinerno.			·				
Mess of wet soil + container	g						
Mess of dry soil + container	g		\ 				
Mass of container	Ç ·		<u> </u>				
Mass of molsture	<u> </u>	<u> </u>					
Mass of dry soil	8				!		ļ
Moisture content		<u> </u>			L		<u> </u>
20				}		preparati	ัดก •
28				•	recelv shada	ยน on 425 ₍ น:	m cirun
26· 28 - 28 - 28 - 28 - 28 - 28 - 28 - 28				!		et	
€ 24-						od et	
E 24-				no	t know	/n	
				1		on tetsin	
						m sleve	
ig 18-					uld IIr stic Iir		
Penetration 91 92 92 92 92 92 92 92 92 92 92 92 92 92						Index	7/c
[12 (1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							1
						as appro	
12 Moisture content,%				Ope	rotor	Checke	rii Approved
rivisione content, re					i		j

Liquid limit (cone penetrometer) end plastic limit

Form 2.C

Location Margaeli (Borded Jellow	र्रेट वर्ष	grey		Sa	\mathcal{M}	Jobref. Boreho	191		
dow sitt		9	'			Pit no	.	BH1	
Soll description						Sample	no.	6	
						Depth		1.25-16	20
Test method	BS 1:	377 : Part 2 :	1990	: 4.3/4.		Date		11.3-0	8
PLASTIC LIMIT	Test no.	1	2	•	3	4		Average	
Container no.		181			12	$ \mathbf{x} $			
Mass of wet soil + container	9	11.48			124	52			
Mass of dry soil + container	Q	10.66			11.5	(T)			
Mass of container	9	6.60			6.4	18			<u> </u>
Mass of moisture	ŷ	0.33			1.0	22			ļ
Mass of dry soil	9	21.05	}		(<u>-</u>	02			Ì
Molsture content	%	20.8	1			,2		20:3	
LIQUID LIMIT ;	Test no.	1		2		3		4	Ì
Initial dial gauge reading	រាហ	01		0	(0]
Final dial gauge reading .	ខាភា	152		18.0	2	1.0		246]
Avarago panetration	róm								ĺ
Containerno.		73		A	B	115	3	215	
Mass of wet soil + container	9	23.0	12	33	.18	32	-84	27.86	Ì
Mass of dry soil + container	8	32.5	2	26	.06	25	.62	21.36	Ì
Mass of container	6	5-41	4	ζ,	22	5.6	12	2.92	
Mass of moisture	g	576	,	7.	12	ي ر	72	6.5	1
Mass of dry soil	δ	17.3	28	20)·94	20		17.44	
Moisture content	યુ	32.)	. 3	11.9	34	;	27.2	
•					Sem	ple prej	paration	n *	
			ii-		ļ	colved			
26-					2	ied on 4			
					1	ried at dried s			
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					į	nown	и	t	
					i	ortion r	etained	1	
20 20						25 լւՠ s			
i to					Liqui	d llmit	3	5-1 %	3.5
ē 18					<i>i</i> ::st	ic limit	5	D·3 . %]
Penetration 18 18 18 18 18 18 18 18 18 18 18 18 18					Plast	icity Inc	dox	14.8	15
					• Del	lote as a	gorqq	riate	
					Opera	tor C	hecked	Approved	1
34 Meisture 3 Sonient, 770	, 45								1
									}

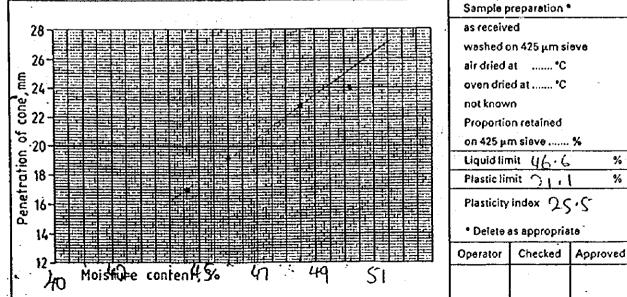
Liquid limit (cone penetrometer) and plastic limit

Form 8.0

Location Mongach Bridge	Jobref.	
	Borehole/ Pitno.	84%
Solldescription Staf ballish god SUH	Sample no.	7
sody day.	Depth	16.25-
Test method BS 1377 : Part 2 : 1990 : 4.3/4.4	Date	16-28-

PLASTIC LIMIT	Test no.	1	2	3	4	Average
Container no.		G9K		WHU		
Mass of wet soil + container	9	2.86		3 .32		• .
Mass of dry soil + container	g	᠊ᢖ᠂᠈ᡱ		9.24		
Mass of container	Q	5.50		546		
Mass of moisture	9	0153		058		
Mass of dry soil	9	2.74		2.78		
Moisture content	%	203		209		21.1

	<u> </u>							,	
LIQUID LIMIT	Test no.	1		2		3		4	
Initial dial gauge reading	mm	0		0		0	<u> </u>	b	
Final dial gauge reading	mm	Ωα		HO		22.8		240	<u> </u>
Average penetration	mm					<u> </u>		<u> </u>	
Container no.		B		0	5	5			(1)
Mass of wet soil + container	9	23.	30	37	-14	25	40	22	·30
Mass of dry soil + container	9	17.	30	164	30	13-8	<u> </u>	16.	93_
Mass of container	g	Sil	6	S	32	5.4	<u>, </u>	50	Ŭ
Mass of moisture	g	55		5.	3	65	-	5.	2)_
Mass of dry soil	9	12:	34	11.	52	B.(4_	· 11	4
Moisture content	%	Y	6	4	60	439	~ >	S	20



%

26

'quid limit (cono penetrometer) and plastic limit

Form 2.C

drig ituit (coup benettometer) sua bissiic ituit	1 50tm 5						
Location Margodin &	kbind	Q ^		Jobs	61.		
, ,	O .	م			hole/	BH7.	
Solidescription Whith 8h G	red	Sug	ghti	Sem.	ple no.	2	
day, Buty	"modi	'un t	o co	LED DOP	ıh T	21.35-2	2.20
Test method		377 : Part 2 : 19	990 • 4.3/4.4	é Deta		11 3.03	
103(1101100			•		1	11,7 19	
PLASTIC LIMIT	Test no.	1	2	3	4	Averaga	
Container no.		25.2		69			
Mess of wet soil + container	8	10.82		11.20			
Mass of dry soll + container	0	10.24		10.28		_	
Mass of container	g	6.53		6.68	·	_{	
Mass of melsture	9	0.58		0.62		_	
Mass of dry soil		3.66		3.9		1000	
Moisture content		18.8		15-9		15-9	
LIQUID LIMIT	Test no.	1	2	3	<u> </u>	4	
gaibser aguag leib laitint	mm	0	0	0		0	
Final dial gauge reading	mm	กร	19.1	22.9		265	
Average penetration	mm				7-7		
Container no.		6xx	G3	> 6	,	WHY	
Mass of wet soil + container	ę	26.64			400	32.90	
Mass of dry soil + container	8	22.72			.46	26.44	
Mass of container	9	5-88	5.5		.43	5-46	!
Mass of moisture	6	3.92	3.6		.34	16.46_	
Mass of dry soil	9	16.84		18 1	1.18	20.98	
Moisture contant	· · · · · · · · · · · · · · · · · · ·	1 23.3	<u>. 27</u>	<u>6 3</u>	30.6	<u> 30.8</u>	<u> </u>
26 7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	gan nigang sa ha h ki sa sao mahasan gana	the time of management and	}	Sampla p		0,	<u>.</u>
					. ο on 425 μπ	ı cievs	<u> </u>
26-				air dried	at	c	
8 22 - S					od at	"C	•
§ 22-				not know	rn on retalne	ರ	1
				-	m sieva		1
				Liquid IIr	nit 🧲	18.2 %	28
20 - 18 - 16 - 17 - 18 - 18 - 18 - 18 - 18 - 18 - 18				- stie II		15.9 %	
S 16-				Plasticity	in tex	2.3	12
			麗園	* Delate	es obbtob	erizta	
				Operator	Checka	d Approved	
20 Mossture Conten 85		30	-				{
					L		j

Form 2.C Uquid limit (cons penetrometer) and plastic limit Location Margodi Job ref. Borehole/ BHI Pitno. Esmpla no. brown tollonish Depth BS 1377 : Part 2 : 1990 : 4.3/4.4 Date Test method Average Test nos PLASTIC LIMIT Containerno. Mass of wet soil + container 8 Mass of dry soil + container g Mass of container 9 Mass of moisture ġ Mass of dry soil 4, Moisture content Tast no. LIQUID LIMIT mm Initial dial gauge reading ന്ന Final dial gauge reading លាហ Average penatration Containerno. g Mass of wat soil + container g Mass of dry soil + container g Mass of container G Mass of moisture 8 Mass of dry soll Moisture content Sample preparation as received 28 washed on 425 jum sleve 26 air dried at 'C oven dried at °C 24 ni kaowa crocortion retained 25 on 425 µm sieve % 50 20 50.2 Penetration 53 Liquid !imit Plastic limit 26.3 18 Plasticity Index 23.9 2 v 16 * Delete as appropriate Checked | Approved Operator 12

iquid limit (cone penetrometer) end plastic limit	Form		·· •						
Location Margacin Brid	12 9 BJ	He			Jobref.				}
	Borehole/ BH / Pitno.								
Solldescription Sty Ff which	of which Get Sut Sampleno. U/100 Depth 10,65m								
Sordy clant.					Dep	th		, 65m_	6
Test method :	B\$ 1:	377 : Part 2 :	1990 : 4.3/4	1.4 ^è	Date	,		1-03-	1
PLASTIC LIMIT	Test no.	1	3	3		4	-	Average]
Container no.		69		C,]
Mass of wet soil + container	9	14.30		140	60			•	
Mass of dry soil + container	9	12.69		12.5					
Mass of container	9	Sub		<u>с.</u> е		•			
Mass of moisture	9	1.66			D.				
Mass of dry soil	9	3.18		71	Ct	-			
Moisture content	%	231		23				232	
LIQUID LIMIT	Test no.	1	2		3		4]
Initial dial gauge reading	mm	0	0		0		0		1
Final dial gauge reading	mm	MS	५८		23.			h	1
Average penetration	mm			-					
Container no.		HIM	+ 119	3	ľ	~	C	Jak	1
Mass of wet soil + container	9	שייפי	*		76	of the	2	P.D.	1
Mass of dry soil + container	9	1900	6	_	19	ص	2	216	1
Mass of container	9	5:46	5-4			(S)	~	-146	ĺ
Mass of maisture	9	डवा	50			26	7	1 CA.	
Mass of dry soil	9	1354			- <u>1</u> u	733	ī	(v)	
Moisture content	%	42A	46.	Ų	(b-g	Ç.	1,3	1
		7		7	nple p	preparatio	n *		
			重重 重	1	receiv		_		
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£ 24.				1		at ed at			
8					know		-		
\$ 22					•	n retaine		•	
S 20						n sieve			
§ 18 -					uid lin stic lir	nit U			Įų.
				<u> </u>			<u> </u>		
16 - 61 W				1		index [-	12.
14-						s approp	oriate	0	
12/11/12/11/12				Oper	ator	Checke	d .	Approved]
. '93 Moishare contrent, %49	21	53							
<u> </u>				1	[J .

, 	3 H II IC 60 3 2	Samplano. Dopth Date 4 9 07 12 3-6,	1.7.25 mlf / 14 -3 -97
an 2: 1990: 2 C S -(T) -(3 H II IC 60 3 2	Pitno. Samplano. Dopth Date 4 9 07 12 12 12 14 3	73.9
2 0 64 .(T) .(T)	3 H II IC 60 3 2	Dopth Date 4 9 07 38 4 17 31 3	73.99
2 0 64 .(T) .(T)	3 H II IC 60 3 2	Date 4 9 07 38 9 17 3-6,	73.99
2 0 84 .CD .CD .C3 .Y3 .Y3	3 H II IC 6 0 2	Date 4 9 07 38 9 17 31 13	23.9
2 0 84 .CD .CD .C3 .Y3 .Y3	3 H II IC 6 0 2	3 3 3 3 3 3 3	23.9 4
2 .(7). .(2) .(3) .(4) .(4)	H 11 10 6 0 3 2	2 .07 .12 .38 .9 .12 .3.6,	23.q
13. (C2 (C2 V3. V3. V3. V4.	11 10 6 0 3 2	.07 .18 .38 .9 .17 .3.6,	4
.(TC) -(C)	10 6 0 3 2	38 9 17 3.6	4
.(TC) -(C)	6.0 3 2	38 19 17 3.4,	4
1·1	2	3.6.	4
1.1	3 2	3,6,	4
1.1	2	3,6,	4
	2	3	4
, 		- 	_{
9	\sim 1	la i	
	<u>C'</u>	10	0
K	4.3	222 .	25.2
0	<u>C3</u>	<u> </u>	130
4.02	11:32	35.4	33.5.8
7.98	9:30_	13.00	16:22
5:40	<u>८37</u>	4.20	4.90
Sich	3,03	7:04	b.32
12:58	3,48		11.3
48·01			15615
	}		stion *
	SPECIAL CONTRACT		um sievo
	2.3,2.3		50
		ven dried at	*C
		-	
	المساح المسابقاة		C1.9 %
			23.9 %
			27.0
			21.9
			
४ इ.स. १ <u>.स.च्यास्त्रा</u>		PO10.01 ; O10	
	2 4.02 7.98 2.40 3.64 2.63	株式 11・32 11・32 11・32 11・32 11・32 11・32 11・32 12・10 5・32 3・18 18・0 5・12 18・0 5・12 18・0 5・12 18・0 5・12 18・0 5・12 18・0 5・12 18・0 5・12 18・0 5・12 18・0	CZ X 11.32 36.01 1.98 9.30 13.00 3.40 5.32 4.80 3.48 13.16 18.0 509 53.0 Sample proportion retained at another at another another at another ano

BS 1377: Part 2: 1990

guid timit (cone penetrometer) end plastic limit	Form 2.				<u>.</u>		
Location Mugochi Bri	dure	/		Jobref			
INO doon to	~ U .		·= ·	Boreho	ole/ () to		
		-		Pitno	o. B		
Soil description Olu ewith	cher	·/ C.;	1.tml	Sampl	eno.	GEO.	
clated sord		· · · · · · · ·	-	Depth		٠٩٣١٠	フィ フィ
		77 . Part 2 1	1990 : 4.3/4.4		1.0	- 2 (7	Ω
Test method	DS 13	77. FBILZ.	1550 : 5:574.4	1 0010	112		ð
PLASTICLIMIT	Test no.	1	2	3	4	Average	
Container no.		84		99		. [
Mass of wat soil + container	9	14.38		14.14	··		
Mass of dry soil + container	8	13.24		2.96		1	
Mass of container	9	6.64		6.42			
Mass of moisture	9	1.14		1.18		-	
Mass of dry soil	9	6.6		6.54			
Moisture content	%	13.3		18.01	<u>. ;; 1</u>	7.7	
ALOUNOLINAT	Test no.	1	2	+ 3	4		
LIQUID LIMIT	mm	2					
Initial dial gauge reading	mm	12.1		210			
Final dial gauge reading	mm	134	17-0	1 231	1 16	412.1.	
Average penetration		544		c	10	<u></u>	
Container no.	9	26.4	i	08/30	4/1	8.30	
Mass of wet soil + container		20.4				4.40	
Mass of dry soil + container	9	5.1		105		. 38	
Mass of container		5.S		6 7.	7	₹.9	
Mass of moisture	8	15.0			.980		
Mass of dry soil	<u>-</u> %	35.6				3.2	
. Moisture content		197.60	<u> </u>	Sample p	reparation *		
28 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		zí i i		as receive	ed		
				i	in 425 μm si	eve	
26-				1	at°C		
E 24-				not know	d at *C	!	
0 22				i	n n retained		
					m sieve	%	<u>ر</u> ا
					nit 354		3
₹ 18 · · · · · · · · · · · · · · · · · ·				Plastic lir	nit 176) %	
Penetration 91 19 19 19 19 19 19 19 19 19 19 19 19				Plasticity	index 2	3	
				* Delete	as appropria	ate .	
				Operator	Checked	Approved	
12 Moishure content, %(1)	ሀ <u>ኛ</u> -	45	·				-
Moishure content, %41		•					



Triaxial Test Mohr Circles



MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST ON SAMPLE 762mmLONG AND 381mm DIA.

Loc. No. BH	1		8.4.5	2mmLONG ANI HNGOCHI	7 0 KC (-	SILE Due 116 - 3 - 30
Sample No.			Tube No.		<u></u>	Length Dia.
Wet Weight _	17/1	Y		gm. Bulk De	nsity	- suladi
Proving Ring 1	70			Proving Ri	ng Constant	0.3 CLB/BAV at Faiture
Cell Pressure		200	K	in/ m' Rate o	f Strain	Length Dia. kg/m² 0.3 C LB/DIV at Failure per cent per min
Strain Dial	Stress Dial	Load kg	Area cm³	Compressive Stress	Strain	15.65 - 16.10 M
0	0		11-40		0.0	Laboratory Assistant's
5	60		11-419		0.167	Description of Sample
10	90		11-439		0.333	
15	110		11 458		0.500	1 1 1 1
20	128		11-477		0.667	<u> </u>
25	146		11-497		-0.833	
30	150		11.516		1.0	
45	192		11.574		1.5	
60	217		11,639		2.0	Sketch of Sample after failure
- 75	238		11.697		2.5	_
80	245		11.761		3.0	
105	269		11.819		3.5	*Conditions at failure
120	284		11 884		4.6	1. Plastic Bulging
135	294		11-948		4.5	2. Shear Plane (Angle)
150	305		12 013		5.0	3. Vertical Gracks
165	315		12 077		5.5	5. Velucia Cacas
180	327		12-142		6.0	Compressive Strength kg
210	346		12-271		7.0	kg kg
240	365		12.400		8.0	Failure Strain %
270	382		12-529		9,0	*Indicate type of failure.
300	398		12 658		10.0	
330	410		12.787		11.0	
360	425		12-961		12.0	
390.	436		13:110.		13.0	
420	446		13:277	478.3	72 14.0	
- 450	455		13-419	482.81		1 (3)
480	461		13:581	483:54	2 16.0	483.342
510	465		13-742	481.87		100 WALMS
540	467		13 923	477.60	5 18.0	(1) 404.198 1510111
570	468		14-097	442.77	19.0	101 (22 102 1/M/M?
600	469		14:258	4683	₹ 1 20.0	(2) 435.123 Files
630	468		14-445	461.37	21.0	(1) 404.192 KN/M2 (2) 433.123 KN/M2 (3) 483.348 KN/M2
660			14-632		22.0	
690			14-819		23.0	
720			15:019		24.0	
750			15:219		25.0	

MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST

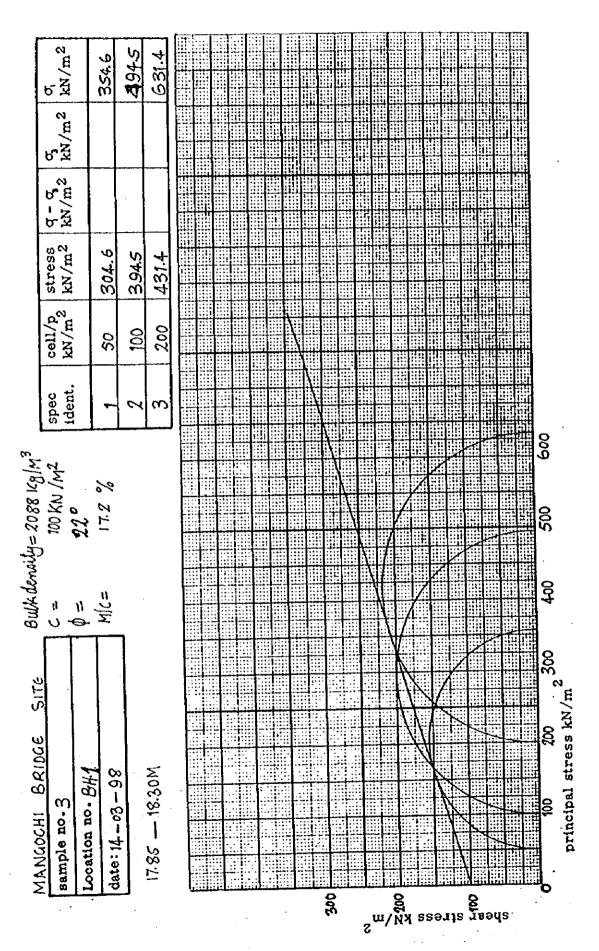
ON SAMPLE 7620mLONG AND 381mm DIA. Loc, No. BH 1 Name MANGOCHI BRIDGE Date 14-3-96 Tube No. Length Dia. Moisture Content Proving Ring Constant at Fallure Proving Ring No. per cent per min KN/ ms Rate of Strain 100 Cell Pressure Stress Strain 15.65-16.10M Strain Compressive Area Load Dial Dial **%**. Stress kg cm_t Laboratory Assistant's 0.0 11-40 0 0 Description of Sample 0.167 11-419 5 30 0.333 11-439 10 51 0.500 11-458 65 15 0.667 11-477 77 20 0.833 11-497 87 - 25 1.0 11.516 30 98 11.574 1.5 45 126 2.0 Sketch of Sample after failure 11.639 60 150 2.5 11.697 75 171 3.0 11.761 80 179 *Conditions at failure 3.5 11.819 105 204 1. Plastic Bulging 4.0 11.884 120 219 4.5 11.948 2. Shear Plane (Angle) 135 234 5.0 12:013 150 248 3. Vertical Oracks _____ 5.5 12:077 165 262 Compressive Strength ____ kg 6.0 12-142 180 276 _____ kg 7.0 12-271 210 300 Failure Strain ______ % 8.0 12-400 325 240 *Indicate type of failure. 9,0 12-529 270 344 0.01 12-658 300 360 11.0 12.787 330 376 12.0 12.961 360 387 13.0 · 13·110: 390. 393 14.0 13-277 420 401 15.0 13-419 432938 450 408 16.0 13:581 433.01c 480 413 433.123 17.0 13-742 418 5[0 18.0 13-923 540 422 19.0 14-097 57:0 426 20.0 14-258 600 428 21.0 14-445 630 430 22.0 14-632 420.40 660 432 23.0 14-819 415.09 690 432 24.0 15:019 720 25.0 15-219 750

MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST ON SAMPLE 762mmLONG AND 384mm DIA.

				mmLONG ANI	K300 ≥	Data 14 - 2 - 20
Loc. No. 15 11	1		Namo <u>/////</u> Tube No	NUVCIII 1		Length Dia
Wet Weight	177.7			gm. Bulk De	nsity	Length Dia
Moisture Cont	ent				ng Constant .	at Failur
Proving Ring P	۷٥ ک	50	K	N/ m ^a Rate o	f Strain	per cent per mi
Strain Dial	Stress Dial	Load kg	Area cm³	Compressive Stress	Strain	per cent per min 15.65—16.10 M
0	0		11 40		0.0	Laboratory Assistant's
- 5	45	-	11:419		0.167	Description of Sample
10	62		11-439		0.333	+
15	78		11-458		0.500	
20	94		11-477		0.667	
25	1		11-497		-0.833	
30	110		11.516	 	1,0	
45	172		11.574		1.5	1 '
60	210		11,639		2.0	Sketch of Sample after failure
75	239		11.697		2.5	
80		 	11.761		3.0	-
105	750		11.819		3,5	*Conditions at failure
120	293		11.884		4.0	1. Plastic Bulging
135	316	ļ	11-948	395.6	\$ 4.5	2. Shear Plane (Angle)
150	332	<u> </u>	12:013	404.19	5.0	1404192
165	341		12 077	398.513	i '	3. Vertical Gracks
180	338		12:142	9,00.313	6.0	Compressive Strength kg
210	 	 	12:271		7.0	kg kg
240			12:400		8.0	Failure Strain %
270		 	12.529		9.0	*Indicate type of failure.
	_	<u></u>	12.658		10.0	1
300		 	12:787		11.0	
330	<u> </u>	<u></u>	12-961		12.0	7
360	 		13-110.		13.0	
390		 	13:277		14.0	-
420			13:419		15.0	_
450		<u> </u>	13:581		16.0	
480	<u> </u>		13:742		17.0	-
5 0			13:923	 	18.0	 [.
-540			14.097		19.0	
570					20.0	-
600			14:258		21.0	-
- 630			14 445		22.0	\dashv
660			14.832		23.0	
690			15:019		24.0	-
720			15:019		25.0	-
750			13'417			



Triaxial Test Mohr Circles



MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST ON SAMPLE REPORTIONS AND 381mm DIA.

	4 17.9	ON SAI (MOE: 81 – 2)	MPLB 762	MILONG AND	381mm DI/ PUBGE	Date 14 -03-18 Length Dia kg/m ¹
Sample No.			Tube No	1		Length Dia
Wet Weight	<u> 174</u>			gm. Bulk Der	isity	26/111
Moisture Conte	ni			Proving Rin	g Constant	et Feilure per cent per min
Cell Pressure		0	Ka	i ms Rate of	Strain	per whe per min
Strain Dial	Stress Dial	Load kg	Area cm³	Compressive Stress	Strain	
0	0 .		11-40	<u> </u>	0.0	Laboratory Assistant's
5	40		11-419		0.167	Description of Sample
10	55		11-439		0.333	+
15	66		11-458		0.500	
20	76		11-477		0.667	\ \ \ \ \\ \\ \\ \\
25	85		11-497		-0.833	
30	93		11.516		1.0	
45	116	-	11.574		1.5	
60	139		11,639		2.0	Sketch of Sample after failure
75	162		11.697		2.5	
80			11.761		3.0	
105	209	· · · · · · · · · · · · · · · · · · ·	11.819		3.5	*Conditions at failure
120	 ' -	-	11:884		4.6	1. Plastic Bulging
	249	296.769	11-948	•	4.5	2. Shear Plane (Angle)
135		304.626		309.626	5.0	
150	2.57		12 077	704.	5.5	3. Vertical Gracks
	257	303.Di2 281.453	12-142	1	6.0	Compressive Strengthkg
180	240	401.433	12:271		7.0	kg
210	 		12:400		8.0	Failure Strain %
240	<u> </u>		12.529		9.0	*Indicate type of failure.
270	-		12:658		10.0	_
300			12.787		11.0	50KN=304.626KN/M2
330	 		12.961		12.0	1 mich = 300 losa 100/102
360	<u>-</u>				13.0	1 100 KW - 134 474 KWM
390	<u> </u>		13·110.	-	14.0	50KN=304.626KN/M² 10VKN=394.479KN/M² 200KN=431.418KN/M²
420					15.0	- {
450	 		13-419	_	16.0	-
480			13.581	_ 	27.0	-
5 0			13:742			·
540			13-923		18.0	
570			14:097		19.0	
600			14-258		20.0	We '
630			14-445		21.0	SAKM FINZ
660			14-632		22.0	- S !
690			14-819		23.0	_ *
720			15:019		24.0	⊣
750			15.219		25.0	

MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST ON SAMPLE 16-2mmLONG AND 38-1mm DIA.

Date 14-03-59 ength Dia kg/m ³	381mm DIA. BR(なら	nmLONG ANI	AMPLE 767	0N S	ro. er l	94
engthDia,	L		Tube No		3	Loc. No. Eff. 1.
kg/m³	nsity	gm. Bulk De	and the same of the same of the same same same same same same same sam		185	Wet Weight
at Failu	g Constant	/o Proving Ri			at	Moisture Contr
at Failus per cent per mis	Strain	/ mª Rateo	K	00		Cell Pressure
	Strain %	Compressive Stress	Area cm³	Load kg	Stress Dial	Strain Dial
Laboratory Assistant's	0.0		11:40		0	0
Description of Samplo	.0.167		11-419		42	5
t	0.333		11-439		67	10
	0.500		11-458		83	15
11-11-1	0.667		11-477		98	20
	-0.833		11-497		112	25
	1.0		11.516		125	30
.	1.5		11.574		163	45
Sketch of Sample after failure	2.0		11,639		200	
	2.5		11.697		233	75
	3.0		11,761		265	80
*Conditions at failure	3.5		11.819		213	105
1. Plastic Bulging	4.8		11-884.		317	120
2. Shear Plane (Angle)	4.5		11-948			135
3. Vertical Gracks	5.0		12-013	<u> </u>		150
	5.5		12 077	 		165
Compressive Strength kg	6.0		12-142		 	18.0
kg	7.0		12-271		317	210
Failure Strain %	8.0		12-400		327	240
*Indicate type of failure.	9,0		12.529	 	335	270
	10.0		12-658		342	300
	11.0		12-767		347	330
	12.0		12 961	 	353	360
	13.0		- 13-110.		328	390
	14.0		13-277		364	420
	15.0		13 419		369	
	16.0		13:581	 	373	480
	17.0		13.742		371	510
	18.0		13-923		364	540
	19.0	393,93	14-097		390	570
3523 394 479 KN	20.0	394.4	14-258		395	600
	21.0	39430	14-445		400	630
]	22.0	394.12	14-632	_	405	660
	23.0	393.95	14-819		410	690
	24.0	393.4	15-019		425	720
	25.0		15-219			750

MATERIALS LABORATORY TRIAXIAL COMPRESSION TEST

ON SAMPLE 762mmLONG AND 381mm DIA.

Loc, No. BH' 1 12 95-18-30m Name MANGOCHI BEIAGE Date 14-03-98

Sample No. 3 Tube No. Length Dia.

Wet Weight 183-2 gm. Bulk Density kg/m Moisture Content Proving Ring Constant _____at Failure Proving Ring No. 200 KN/ me Rate of Strain. per cent per min Cell Pressure _ Strain Stress Strain Area Compressive Load Dial Dial <u>"%</u> . . Stress kg cm¹ Laboratory Assistant's 0.0 11.40 0 0 Description of Sample 0.167 11-419 5 50 0.333 11-439 10 80 0.500 15 105 11:458 0.667 11-477 20 130 .0.833 25 11:497 150 1.0 30 11.516 172 1.5 45 11.574 221 2.0 11.639 60 265 Sketch of Sample after failure 2.5 11.697 75 302 3.0 11.761 80 327 *Conditions at failure 11.819 3.5 105 347 1. Plastic Bulging 4.0 11-884 426.557 120 356 A31.418 KN M² 2. Shear Plane (Angle) 4.5 11.94.8 135 362 5.0 12:013 150 362 3. Vertical Gracks _____ 5.5 12 077 165 36 W 6.0 Compressive Strength kg 358 12-142 180 ____ kg 7.0 210 12-271 341 Failure Strain _______ % 8.0 12:400 240 *Indicate type of failure. 9.0 12-529 270 10.0 12-658 300 11.0 12-787 330 12.0 12-961 360 13-110, 13.0 390. 13:277 14.0 420 13:419 15.0 450 13:581 16.0 480 13:742 17.0 50 13-923 18.0 540 14:097 19.0 570 20.0 14:258 600 14-445 21.0 630 14-632 22.0 660 14-819 23.0 690 15:019 24.0 720 15.219 25.0 750



Triaxial Test Mohr Circles

Mangachi Bridge Depth 20.9—21.35m