Appendix-2
Request Letter from MOC

THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF CONSTRUCTION
DEPARTMENTOF BRIDGE
NAY PYI TAW

Date: 18, August, 2016

Dear Mr. Masataka Fujikuma ,

First of all, thank you for your preparation of the Draft Final Report for the Phase II Survey (Pre-F/S) and our side tentatively agree upon your report.

Secondly, our side would like to inform to you is that the end destination of East West Economic Corridor (EWEC) should be the Thilawa SEZ. So please consider the connectivity and we have one route to connect Thilawa SEZ and EWEC. I herewith attached the tentative route Google plan and we would like to request to your side to do the Feasibility Study of that route.

Attached - Route of Thilawa SEZ and EWEC.

Your kind response to the above will be highly appreciated.

Sincerely yours,

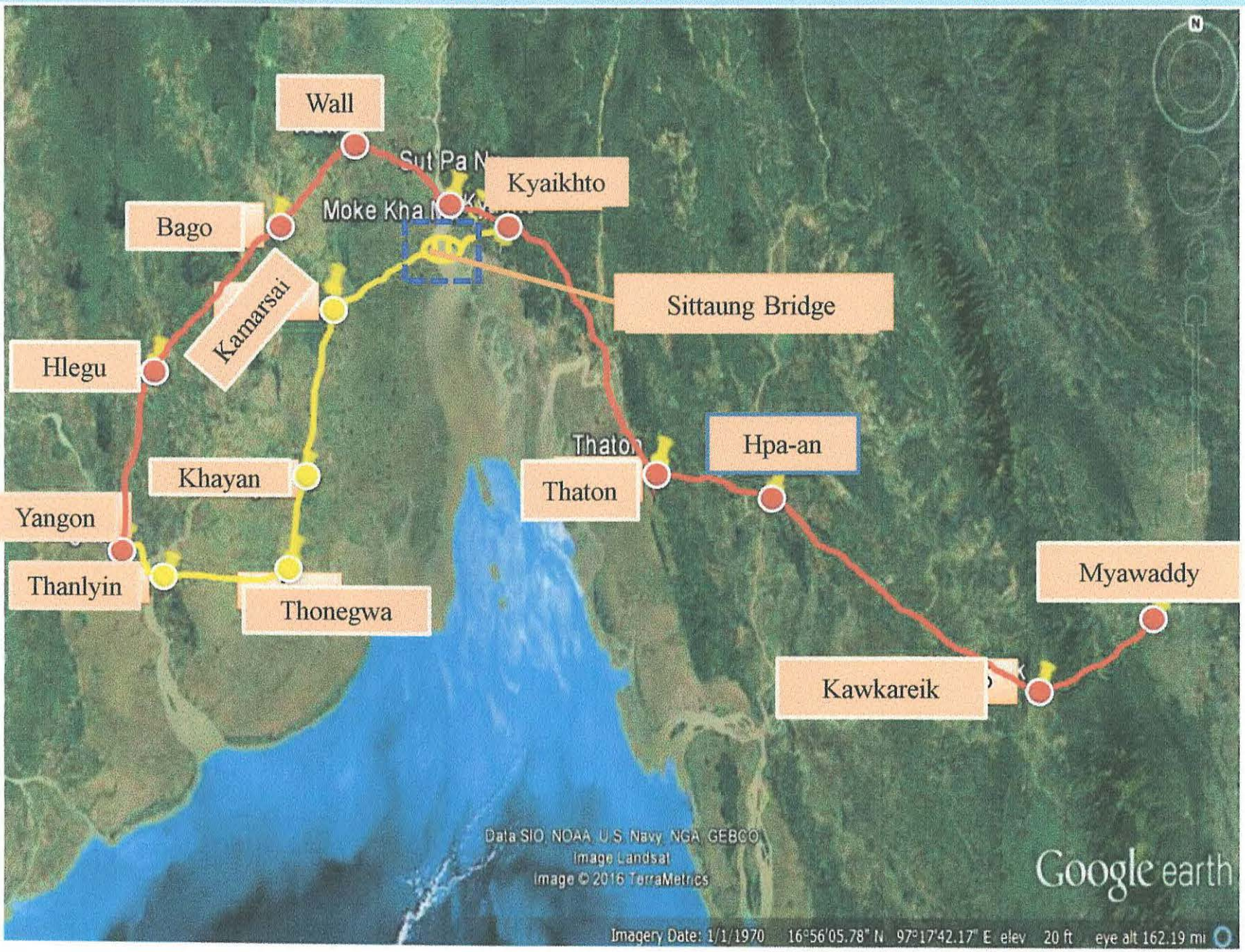
18/8/2016

(Aung Myat Oo)
Acting Director General
Department of Bridge

Cc;

(1) Permanent Secretary, Ministry of Construction.
(2) Deputy Director General (Planning, Construction, Maintenance).
(3) Copy.

Proposal of Thanlyin-Thonegwa-Khayan-Kamarsai-Kyaikhto Road



Proposal of Thanlyin-Thonegwa-Khayan-Kamarsai-Kyaikhto Road

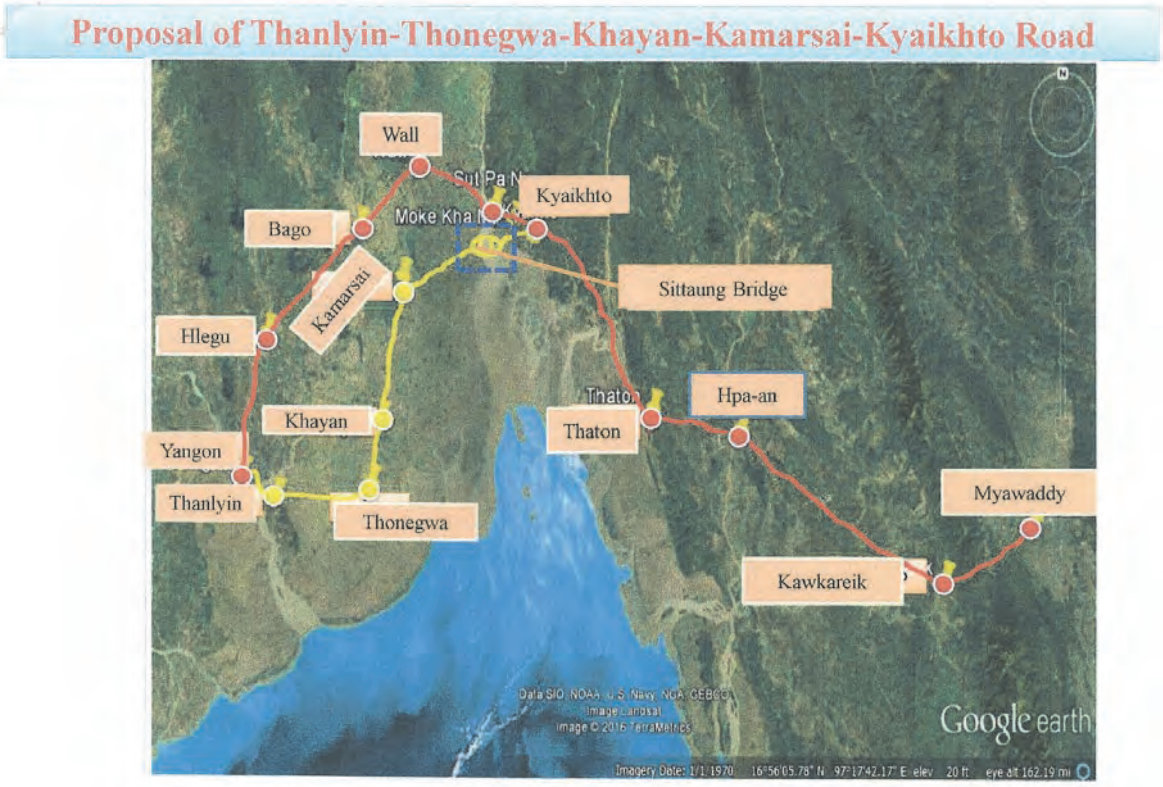
Appendix-3

Initial Study on the Alternative Route Proposed by MOC

Initial Study on the Alternative Route Proposed by MOC

1. General

Upon receipt of new alternative route from MOC after the explanation of Draft Final Report for Phase-II Survey in August 2016 as shown in Figure 1.1, JICA Survey Team (JST) studied on the validity of the road alignment which is directly connected from Kyaito (Kyakhto) to Thanlyin (Thilawa SEZ) as the final destination of EWEC (See yellow alignment in Figure 1.1). The study includes the clarification for the consistency with Arterial Road Network Development (KOICA) and the comparative study for the crossing points of New Sittaung Bridge.

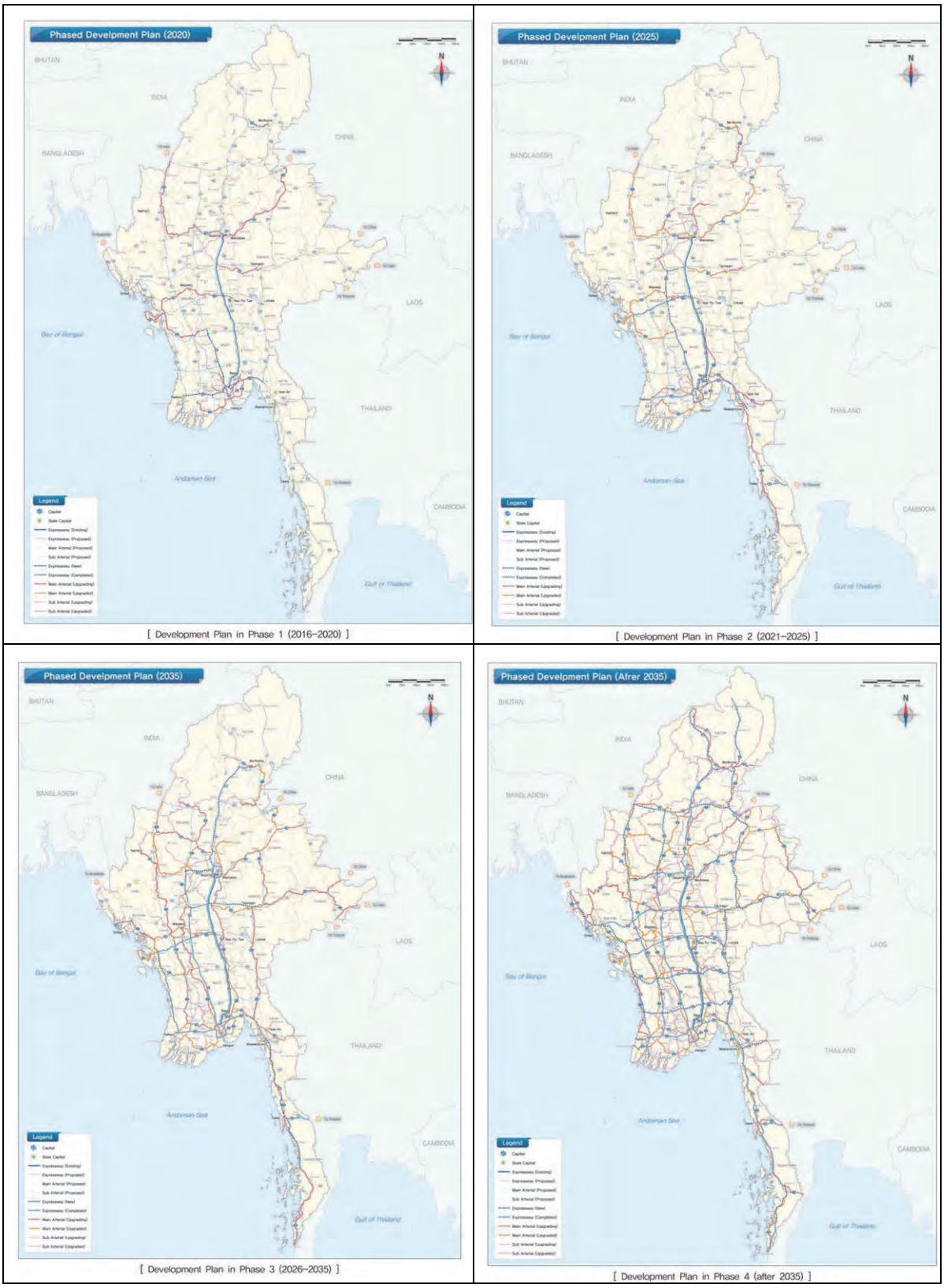


Source: The request letter to JICA Survey Team issued by MOC (18th August 2016)

Figure 1.1 Thanlyin-Thonegwa-Khayan-Kamarsai-Kyaikhto Road (MOC, Aug 2016)

2. Consistency with Master Plan for Arterial Road Network Development in Myanmar (ARND-MP)

The ARND-MP was developed by the assistance of KOICA August 2015 that demonstrates the master plan for the establishment of arterial road network in Myanmar. The ARND-MP consists of i) the new 7x5 expressway network to support economic growth, ii) the 12x6 main arterial road network to promote region's economic development and regional integration, and iii) the sub arterial road network to enhance efficiency of road networks by connecting main arterial roads. It is planned that the arterial road length of 15,309km (44.5%) among the entire length, 34,378km will be constructed or improved by 2035 and the rest of it, 19,069 (54.5%), will be after 2035. The ARND-MP recommends the phasing development of arterial road network based on the prioritization of the road sections are given in Figure 2.1.



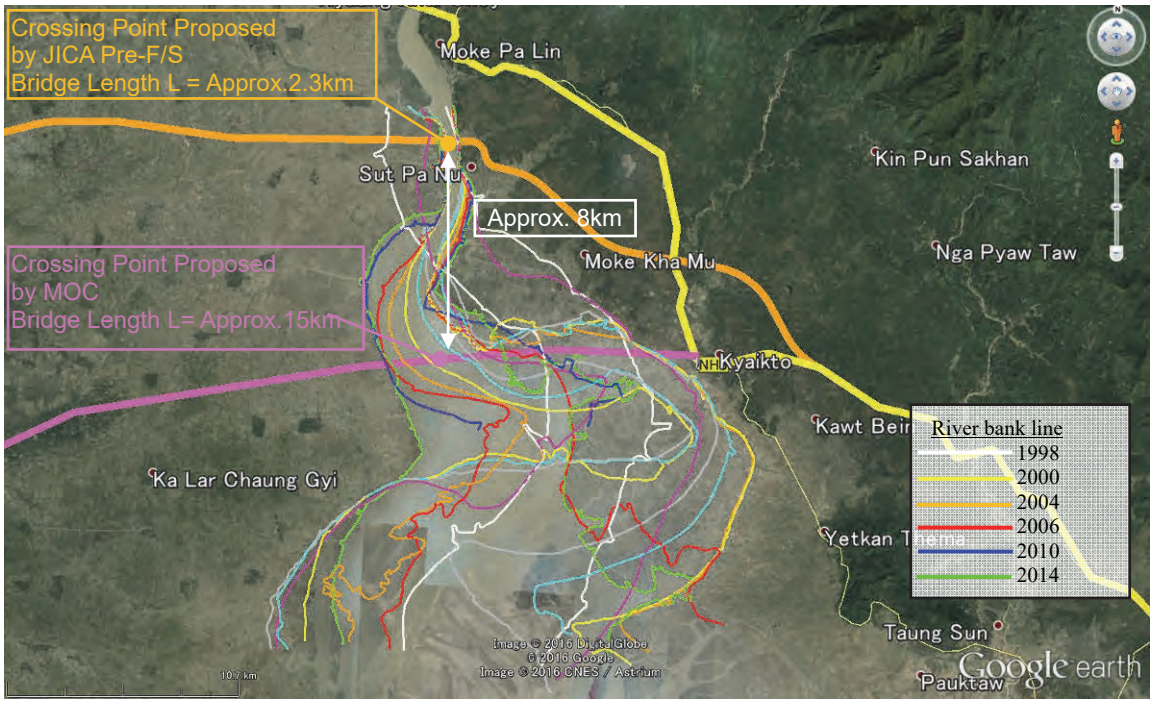
Source: Master Plan for Arterial Road Network Development in Myanmar (KOICA)

Figure 2.1 Phasing Development Plan for Arterial Highways (Four Phases from 2016 to 2035)

In the ARND-MP, the construction of new expressway (R10) from Pathein to Kyaito via Bago is scheduled in Phase-1 during the period between 2016 and 2020. The alignment of JICA Pre-F/S Road connected from northern Yangon to Kyaito via Bago, almost traces the proposed route of R10 expressway. JICA Pre-F/S is expected to work for a bypass (or alternative national road) of the existing EWEC from Kyaito to Bago via Payagyi, however, the level of services, access control and toll operation, etc. has not been discussed and that will be subject to the further study in the future. More justification will be required however the road alignment is consistent to the ARND-MP as such JICA Pre-F/S Road regards as the proposed alignment of R10 expressway. On the other hand, Thalyin – Thonegwa – Khayan – Kamarsai – Kyaito Road, which is proposed by MOC is scheduled to improve the existing road in Phase 1 of ARND-MP. This road will be upgraded to an arterial road (R8) from Thalyin (Thilawa SEZ) to Bago after the completion of improvement. However, it is not described in ARND-MP as MOC proposes that the improved existing road (R8) is directly connected to Kyaito across Sittaung River.

3. Crossing Point of Sittaung River

JST recommends the crossing point of Sittaung River upon the study of three possible comparative points as described in 6.2.2. It was justified that the route crossing upstream side is more preferable due to lower cost and lower risk from future scouring by tidal water. The area near the river mouth is intensively scoured by tidal water from Andaman sea. JST identified from the available satellite images that the riverside area near the river mouth was severely scoured and became further widened in the past as given in Figure 3.1. The massive scouring and changing of the river trail has been progressed year by year until now. JST thereby recommends that new Sittaung Bridge should be located further upstream to avoid the risk from scouring by tidal water although the distance of road becomes longer.



Source : Prepared by JICA Survey Team based on Google Earth

Figure 3.1 Past River Course Shifting of Sittaung River

In addition, the cost comparison for both bridges was roughly conducted based on the respective bridge lengths as shown in Table 3.1. The crossing point proposed by MOC is located at about 8km downstream side from the proposed crossing point by JST and the bridge length is thereby required approximately 15km (See Fig. 4). If new Sittaung Bridge is constructed along with the route proposed by MOC, the cost would be about 7 times different from the cost of JST proposed bridge.

Table 3.1 Preliminary Estimated Construction Cost

Item	Bridge Length (km)	Construction Cost (million USD)	Remark
Bridge A (JICA)	2.3	180.7	Refer to 8.2.1
Bridge B (MOC)	15.0	1,400	

Source : JICA Survey Team

4. Conclusion

According to the clarifications above, the JICA Pre-F/S Road is possible to meet the development plan of ARND-MP and the crossing point of new Sittaung Bridge was justified reasonable. It is therefore recommended that the road alinement should follow the JICA Pre-F/S Road extended from northern Yangon to Kyaito via Bago maintained preferable. However, the improvement of logistics route in Yangon area is urgently required before commencing the full scaled operation of Thilawa SEZ. It is expected to avoid unfavorable traffic congestion in Yangon urban area which is caused by the logistic traffic derived from Thilawa SEZ. The logistics road, which is exclusively functioned as a bypass for the freight vehicles not to pass through Yangon urban area and directly access to other arterial roads, should be provided to secure smooth logistic link with Thilawa SEZ. In this context, the improvement of the existing roads of Thalyin – Thonegwa – Khayan – Kamarsai – Bago road (R8) which is proposed in the ARND-MP would be effective. The objective and function for each proposed road would be justified as given below;

- Construction of New Bago- Kyaito Road (JICA Pre-F/S Road) is to avoid the future severe bottleneck around Bago area and secure redundancy of EWEC with providing shortest route to the southeast region of Myanamar (Yangon – Bago – Myawaddy)
- Improvement of the existing Thalyin – Thonegwa – Khayan – Kamarsai –Bago road is to provide logistic access from Thilawa SEZ connecting to other arterial highways including the EWEC, Yangon-Mandalay Highway (NH1) and Yangon-Mandalay expressway.
- Intersection of these roads around the south Bago area is to develop a logistic hub, which could contribute to the regional development and provide synergy of multi-modal shift with railway transport in the future.

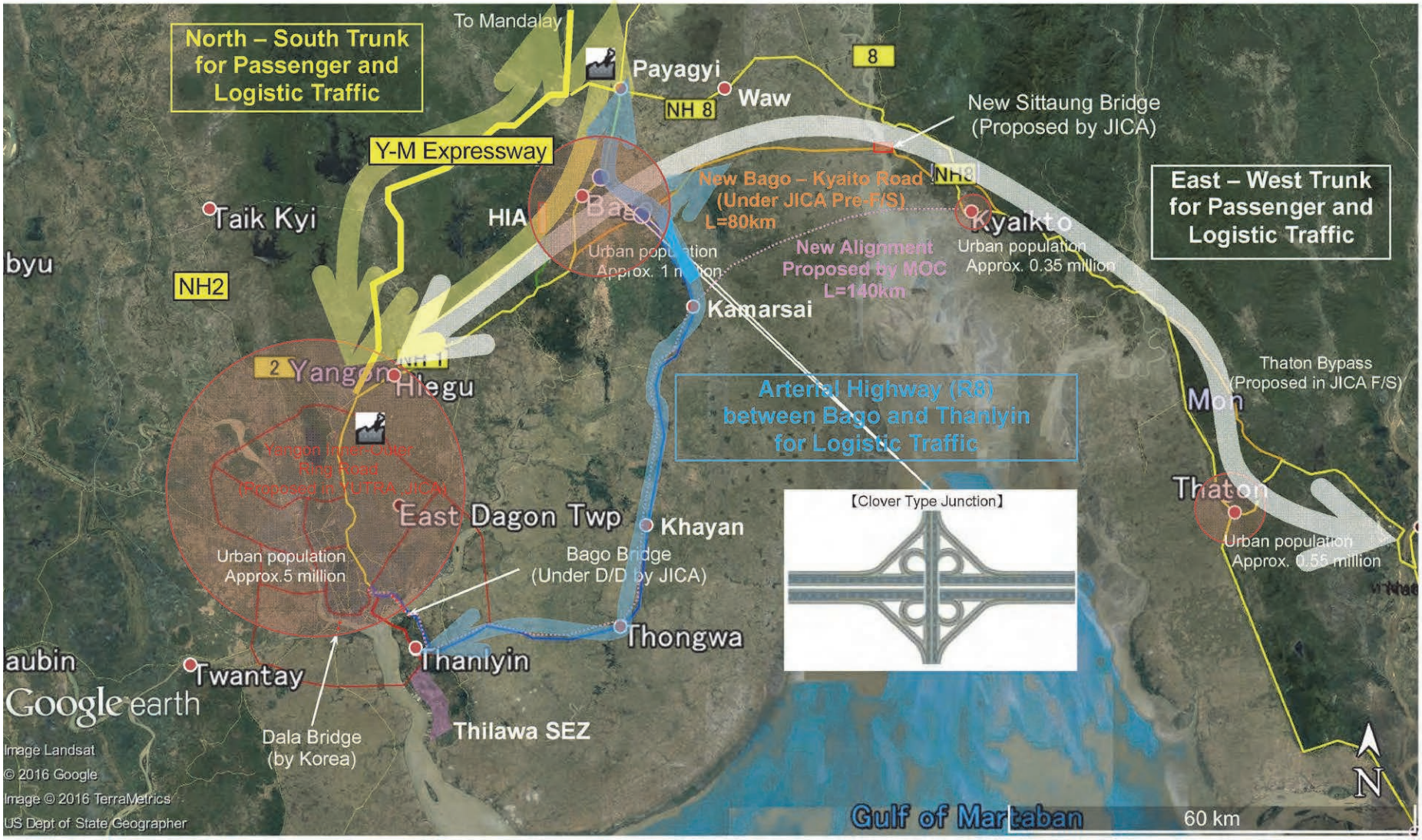


Figure 4.1 Proposed Future Road Network in Yangon Region and Southeastern Myanmar

Source : Prepared by JICA Survey Team based on Google Earth

5. Way Forward to Following Surveys

In order to set out robust road network related to the EWEC around Bago and Yangon area, further study should be conducted to clarify the subjects below.

① Justification for the Final Destination of EWEC at Thilawa SEZ

As shown in Annex-1, MOC has proposed to be the final destination of EWEC at Thilawa SEZ. However there is no technical study result to justify the MOC's proposal which is also not consistency with ARND-MP by KOICA. Thus justification for the final destination of EWEC at Thilawa SEZ is necessary by the placement of functions on each related road for demarcating logistics and passenger traffic taking into account the accessibility between major transportation hubs and New Bago-Kyaito Road of the core towns located in Bago region (Thanatpin and Kamarse, etc.)

② Consistency with Other Related Master Plan and Development Plan

There are related transportation master plans and development plans, such as 1) Arterial Road Network Master Plan (KOICA)、2) Comprehensive Urban Transport Plan of the Urban Transport Plan of the Greater Yangon (YUTRA) (JICA). It is also planned to rehabilitate the existing Thalyin – Thonegwa – Khayan – Kamarsai – Bago road by an aid of ADB and proposed to extend the EWEC to be the final destination of EWEC at Thilawa SEZ by MOC. Moreover there are other sector's development plan, such as Project for New Hanthawaddy International Airport and Yangon-Mandalay Railway Improvement Project. However there is no comprehensive road development plan covering the related master plans and development plans so that the objected and function for each road is only given by each plan. It is therefore necessary to justify comprehensively the objective and function for each road to secure consistency with related master plans and development plans.

③ Route Justification of New Bago-Kyaito Road

In the Pre-F/S, the road alignment of New Bago-Kyaito road is planned to be shortest route between Bago and Kyaito taking into account the control points such as the optimum crossing point at Sittaung River and avoiding towns. It is however based on the limited information obtained from the satellite map. Therefore, in following surveys, route justification should be examined by mutual discussion with expected implementation agency and local government taking into account the further technical study based on natural condition surveys (distribution of soft soil layer and flooding area in the projected area) and existing and future plan for irrigation facilities etc.

④ Type of intersection of Thalyin – Thonegwa – Khayan – Kamarsai – Bago Road (R8) and New Bago-Kyaito Road

The clover type junction is proposed in the Pre-F/S. But the selection of optimum intersection type should be conducted taking into account directional traffic volume based on further traffic demand forecast and available land for intersection in following surveys.

Appendix-4
Boring Logs

BORE HOLE No. **BH-01**

BORING LOG

Job No. SMF-2016-002

Sheet No. 1 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Western Bank of Sittaung River, Near Sut Pa Nu Village, Waw Township

GROUND LEVEL : 8.00m

COORDINATE : E 275530.000 ; N 1924805.000 DEPTH : 46.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 2.00m

DATE : 20.03.2016 ~ 22.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION	DATE & DEPTH (m)	CASING (DEPTH (m) & DIAMETER (mm))	WATER DEPTH (m)	STANDARD PENETRATION TEST TEST METHOD (ASTM) DEPTH GL - (m)	N-Value (Blows / 30cm)	CURVE OF BLOW / N-Value (Blows / 30cm) 0 10 20 30 40 50	SAMPLING SAMPLE (Type & No.)	SAMPLING DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)	SCALE (m)
1					brown to gray	Soft to stiff	Sandy CLAY	Soft to stiff, brown to gray, moist to wet, fine grained, low plastic Sandy CLAY, with trace of mica mineral				1.00	3/30		P-1	1.00				1
2												2.00	7/30		P-2	1.45				2
3												3.00	13/30		W-1 P-3	2.00				3
4												4.00	15/30		P-4	3.00				4
5	3.00	5.00	5.00							5.00 Ø115		5.00	9/30		P-5	3.45				5
6					brownish gray	Loose to medium dense	Silty SAND	Loose to medium dense, brownish gray, moist, fine grained, Silty SAND, with trace of mica mineral				6.00	10/30		P-6	4.00				6
7												7.00	8/30		P-7	4.45				7
8								GL-(9.00 ~ 9.45)m; Silt percent is increased at that depth				8.00	7/30		P-8	5.00				8
9												9.00	4/30		P-9	5.45				9
10												10.00	7/30		P-10	6.00				10
11												11.00	15/30		P-11	6.45				11
12												12.00	15/30		P-12	7.00				12
13	-5.00	13.00	8.00									13.00	37/30		P-13	7.45				13
14					brownish gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, brownish gray, moist, fine grained, Silty SAND, with trace of mica mineral				14.00	38/30		P-14	8.00				14
15												15.00	40/30		P-15	8.45				15
16												16.00	48/30		P-16	9.00				16
17												17.00	48/30		P-17	9.45				17
18									20.03.16 18.00			18.00	50/30		P-18	10.00				18
19												19.00	50/29		P-19	10.45				19
20												20.00	34/30		P-20	11.00				20
21												21.00	28/30		P-21	11.45				21
22												22.00	38/30		P-22	12.00				22
23	-15.00	23.00	10.00									23.00	40/30		P-23	12.45				23
24					brownish gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, brownish gray, moist, fine to medium grained, Silty SAND, with trace of mica mineral				24.00	34/30		P-24	13.00				24
25												25.00	29/30		P-25	13.45				25
26								GL-(31.00 ~ 32.45)m; silt percent is increased at that depth				26.00	31/30		P-26	14.00				26
27												27.00	27/30		P-27	14.45				27
28												28.00	39/30		P-28	15.00				28
29												29.00	50/28		P-29	15.45				29
30												30.00	29/30		P-30	16.00				30
31												31.00				16.45				31

Continue to next sheet

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-1 Disturbed sample (SPT sample)
- T-1 Undisturbed Sample (Piston sampler)
- D-1 Undisturbed Sample (Denison sampler)
- Rock core sample (Single core tube)
- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-1 Water sample

PBT Permeability Test
VS Vane Shear Test
PMT Pressuremeter Test

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Remarks

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

BORE HOLE No. **BH-01**

BORING LOG

Job No. SMF-2016-002

Sheet No. 2 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Western Bank of Sittaung River, Near Sut Pa Nu Village, Waw Township

GROUND LEVEL : 8.00m

COORDINATE : E 275530.000 ; N 1924805.000 DEPTH : 46.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 2.00m

DATE : 20.03.2016 ~ 22.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION	DATE & DEPTH (m)	CASING (DEPTH (m) & DIAMETER (mm))	WATER DEPTH (m)
31 ~ 33	-25.00	33.00	12.00		brownish gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, brownish gray, moist, fine to medium grained, Silty SAND, with trace of mica mineral GL-(31.00 ~ 32.45)m; silt percent is increased at that depth	21.03.16 31.00		
34 ~ 40	-32.00	40.00	7.00		mottled gray and red	Very stiff to hard	CLAY	Very stiff to hard, mottled gray and red, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel			
41 ~ 44	-36.00	44.00	4.00		mottled gray and red	Hard	CLAY	Hard, mottled gay and red, moist, low plasticity, CLAY with fine grained sand and trace of fine lateritic gravel			
45 ~ 46	-38.45	46.45	2.45		mottled yellow and light gray	Medium dense	Clayey SAND	Medium dense, mottled yellow and light gray, moist, low plasticity, fine to coarse grained, Clayey SAND with fine gravel	22.03.16 46.00		
47 ~ 61								This borehole is terminated at 46.00m, according to the termination criteria.			

STANDARD PENETRATION TEST
TEST METHOD (ASTM)

DEPTH GL - (m)	N-Value (Blows / 30cm)
31.00	38/30
32.00	27/30
33.00	24/30
34.00	34/30
35.00	42/30
36.00	29/30
37.00	23/30
38.00	23/30
39.00	34/30
40.00	47/30
41.00	45/30
42.00	36/30
43.00	38/30
44.00	29/30
45.00	30/30
46.00	30/30

CURVE OF BLOW ●

N-Value (Blows / 30cm)

0 10 20 30 40 50

SAMPLING

SAMPLE (Type & No.)	DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)
P-31	31.00 ~ 31.45			
P-32	32.00 ~ 32.45			
P-33	33.00 ~ 33.45			
P-34	34.00 ~ 34.45			
P-35	35.00 ~ 35.45			
P-36	36.00 ~ 36.45			
P-37	37.00 ~ 37.45			
P-38	38.00 ~ 38.45			
P-39	39.00 ~ 39.45			
P-40	40.00 ~ 40.45			
P-41	41.00 ~ 41.45			
P-42	42.00 ~ 42.45			
P-43	43.00 ~ 43.45			
P-44	44.00 ~ 44.45			
P-45	45.00 ~ 45.45			
P-46	46.00 ~ 46.45			

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-1 Disturbed sample (SPT sample)
- T-1 Undisturbed Sample (Piston sampler)
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- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-1 Water sample

PBT Permeability Test
VS Vane Shear Test
PMT Pressuremeter Test

RQD (%)	Term
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Planner structure

Term	Spacing (mm)
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Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks

BORE HOLE No. **BH-02**

BORING LOG

Job No. SMF-2016-002

Sheet No. 1 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Eastern Bank of Sittaung River, Near Sut Pa Nu Village, Kyaikto Township

GROUND LEVEL : 9.00m

COORDINATE : E 276632.000 ; N 1924814.000 DEPTH : 60.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 3.50m

DATE : 11.03.2016 ~ 17.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION
1 ~ 5	4.00	5.00	5.00		brown to gray	Soft	CLAY	Soft, brown to gray, moist to wet, low to medium plasticity, CLAY with silt, with trace of mica mineral
6 ~ 8	1.00	8.00	3.00		mottled gray and reddish brown	Soft	CLAY	Soft, mottled gray and reddish brown, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel
9 ~ 16	-7.00	16.00	8.00		mottled gray and reddish brown	Loose to medium dense	Clayey SAND	Loose to medium dense, mottled gray and reddish brown, moist, fine to medium grained, low plastic Clayey SAND with fine gravel GL-(13.00 ~ 13.45)m, thin sandy clay layer is observed as intercalated layer.
17 ~ 23	-14.00	23.00	7.00		mottled gray and red	Firm to very stiff	CLAY	Firm to very stiff, mottled gray and red, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel
24 ~ 26	-17.00	26.00	3.00		brownish yellow	Loose to medium dense	Clayey SAND	Loose to medium dense, brownish yellow, moist, fine to medium grained, low plastic Clayey SAND with fine gravel
27 ~ 31					mottled gray and red	Very stiff	CLAY	Very stiff, mottled gray and red, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel

Continue to next sheet

DATE & DEPTH (m): 11.03.16 / 14.00; 12.03.16 / 25.00; 14.03.16 / 30.00

CASING (DEPTH (m) & DIAMETER (mm)): 3.00 / Ø115

WATER DEPTH (m): ▽

STANDARD PENETRATION TEST
TEST METHOD (ASTM)

CURVE OF BLOW ●

N-Value (Blows / 30cm)

0 10 20 30 40 50

DEPTH GL - (m)	N-Value (Blows / 30cm)
1.00	4/30
2.00	3/30
3.00	
4.00	3/30
5.00	3/30
6.00	
7.00	3/30
8.00	11/30
9.00	
10.00	11/30
11.00	9/30
12.00	12/30
13.00	11/30
14.00	9/30
15.00	22/30
16.00	12/30
17.00	13/30
18.00	5/30
19.00	13/30
20.00	21/30
21.00	20/30
22.00	14/30
23.00	30/30
24.00	8/30
25.00	16/30
26.00	24/30
27.00	28/30
28.00	24/30
29.00	25/30
30.00	17/30
31.00	

SAMPLING

SAMPLE (Type & No.)	DEPTH GL - (m)
P-1	1.00
	1.45
P-2	2.00
	2.45
U T-1 (45/30) cm	3.00
W W-1	3.65
P-3	4.00
	4.45
P-4	5.00
	5.45
U T-2 (45/30) cm	6.00
	6.45
P-5	7.00
	7.45
P-6	8.00
	8.45
U D-1 (50/30) cm	9.00
	9.50
P-7	10.00
	10.45
P-8	11.00
	11.45
P-9	12.00
	12.45
P-10	13.00
	13.45
P-11	14.00
	14.45
P-12	15.00
	15.45
P-13	16.00
	16.45
P-14	17.00
	17.45
P-15	18.00
	18.45
P-16	19.00
	19.45
P-17	20.00
	20.45
P-18	21.00
	21.45
P-19	22.00
	22.45
P-20	23.00
	23.45
P-21	24.00
	24.45
P-22	25.00
	25.45
P-23	26.00
	26.45
P-24	27.00
	27.45
P-25	28.00
	28.45
P-26	29.00
	29.45
P-27	30.00
	30.45

TCR (%) | SCR (%) | RQD (%)

SCALE (m)

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-1 Disturbed sample (SPT sample)
- T-1 Undisturbed Sample (Piston sampler)
- D-1 Undisturbed Sample (Denison sampler)
- Rock core sample (Single core tube)
- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-1 Water sample

PBT Permeability Test
VS Vane Shear Test
PMT Pressuremeter Test

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks

BORE HOLE No. **BH-02**

BORING LOG

Job No. SMF-2016-002

Sheet No. 2 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Eastern Bank of Sittaung River, Near Sut Pa Nu Village, Kyaikto Township

GROUND LEVEL : 9.00m

COORDINATE : E 276632.000 ; N 1924814.000 DEPTH : 60.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 3.50m

DATE : 11.03.2016 ~ 17.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION	DATE & DEPTH (m)	CASING (DEPTH (m) & DIAMETER (mm))	WATER DEPTH (m)	STANDARD PENETRATION TEST TEST METHOD (ASTM) DEPTH GL - (m)	N-Value (Blows / 30cm)	CURVE OF BLOW N-Value (Blows / 30cm) 0 10 20 30 40 50	SAMPLING SAMPLE (Type & No.)	DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)	SCALE (m)
31					mottled gray and red	Very stiff	CLAY	Very stiff, mottled gray and red, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel				31.00	24/30		P-28	31.00				31
32												32.00	25/30		P-29	31.45 32.00				32
33												33.00	17/30		P-30	32.45 33.00				33
34	-25.00	34.00	8.00									34.00	18/30		P-31	33.45 34.00				34
35					mottled gray and red	Loose to medium dense	Clayey SAND	Loose to medium dense, mottled gray and red, moist, fine to medium grained, low plastic Clayey SAND with fine gravel				35.00	12/30		P-32	34.45 35.00				35
36												36.00	9/30		P-33	35.45 36.00				36
37												37.00	16/30		P-34	36.45 37.00				37
38												38.00	20/30		P-35	37.45 38.00				38
39												39.00	29/30		P-36	38.45 39.00				39
40									15.03.16 40.00			40.00	30/30		P-37	39.45 40.00				40
41												41.00	28/30		P-38	40.45 41.00				41
42	-33.00	42.00	8.00									42.00	31/30		P-39	41.45 42.00				42
43					mottled gray and red	Very stiff to hard	CLAY	Very stiff to hard, mottled gray and red, moist, low to medium plasticity, CLAY, with trace of fine fine grained sand and fine lateritic gravel				43.00	25/30		P-40	42.45 43.00				43
44												44.00	25/30		P-41	43.45 44.00				44
45												45.00	21/30		P-42	44.45 45.00				45
46												46.00	21/30		P-43	45.45 46.00				46
47												47.00	20/30		P-44	46.45 47.00				47
48												48.00	28/30		P-45	47.45 48.00				48
49												49.00	39/30		P-46	48.45 49.00				49
50									16.03.16 50.00			50.00	31/30		P-47	49.45 50.00				50
51												51.00	29/30		P-48	50.45 51.00				51
52												52.00	20/30		P-49	51.45 52.00				52
53	-44.00	53.00	11.00									53.00	13/30		P-50	52.45 53.00				53
54					mottled gray and red to brownish yellow	Medium dense to dense	Clayey SAND	Medium dense to dense, mottled gray and red to brownish yellow, moist, fine to medium grained, low plastic Clayey SAND				54.00	41/30		P-51	53.45 54.00				54
55	-46.00	55.00	2.00									55.00	29/30		P-52	54.45 55.00				55
56					yellowish brown	Very stiff	CLAY	Very stiff, yellowish brown, moist, low to medium plasticity, CLAY, with trace of fine lateritic gravel and fine grained sand layer Sand percent is increased downwards				56.00	27/30		P-53	55.45 56.00				56
57												57.00	50/30		P-54	56.45 57.00				57
58												58.00	39/30		P-55	57.45 58.00				58
59								GL-(57.00 ~ 59.00)m, fine grained sand layer is observed as intercalated layer				59.00	28/30		P-56	58.45 59.00				59
60	-51.45	60.45	5.45					This borehole is terminated at 60.00m, according to the termination criteria.	17.03.16 60.00			60.00	28/30		P-57	59.45 60.00				60
61												61.00				60.45				61

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-I Disturbed sample (SPT sample)
- T-I Undisturbed Sample (Piston sampler)
- D-I Undisturbed Sample (Denison sampler)
- Rock core sample (Single core tube)
- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-I Water sample

PBT Permeability Test

VS Vane Shear Test

PMT Pressuremeter Test

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks

BORE HOLE No. **BH-03**

BORING LOG

Job No. SMF-2016-002

Sheet No. 1 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Western Bank of Sittaung River, Near Sut Pa Nu Village, Waw Township

GROUND LEVEL : 9.00m

COORDINATE : E 275873.000 ; N 1922257.000 DEPTH : 31.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 2.00m

DATE : 26.03.2016 ~ 28.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION
1 ~ 7	2.00	7.00	7.00		brownish gray to gray	Soft	CLAY	Soft, brownish gray to gray, wet to moist, low plasticity, CLAY with silt, with trace of mica mineral
8 ~ 12	-3.00	12.00	5.00		gray	Very loose to medium dense	Silty SAND	Very loose to medium dense, gray, moist, fine grained, Silty SAND
13 ~ 22	-13.00	22.00	10.00		brownish gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, brownish gray, moist, fine to medium grained, Silty SAND, with trace mica mineral
23 ~ 31					brownish gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, brownish gray, moist, fine to medium grained, Silty SAND, with trace mica mineral GL- (30.00 ~ 31.45)m; Thin Clay layer is observed as intercalated layer at that depth.

Continue to next sheet

DATE & DEPTH (m): 26.03.16 / 20.00

CASING (DEPTH (m) & DIAMETER (mm)): 4.00 / Ø115

WATER DEPTH (m)

STANDARD PENETRATION TEST
TEST METHOD (ASTM)

DEPTH GL - (m)	N-Value (Blows / 30cm)
1.00	3/30
2.00	2/30
3.00	3/30
4.00	3/30
5.00	3/30
6.00	3/30
7.00	13/30
8.00	7/30
9.00	11/30
10.00	12/30
11.00	13/30
12.00	34/30
13.00	27/30
14.00	27/30
15.00	37/30
16.00	26/30
17.00	29/30
18.00	50/30
19.00	38/30
20.00	28/30
21.00	50/20
22.00	38/30
23.00	48/30
24.00	30/30
25.00	25/30
26.00	31/30
27.00	31/30
28.00	35/30
29.00	50/28
30.00	32/30
31.00	

CURVE OF BLOW ●

N-Value (Blows / 30cm)

0 10 20 30 40 50

SAMPLING

SAMPLE (Type & No.)	DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)
P-1	1.00 ~ 1.45			
P-2 / W-1	2.00 ~ 2.45			
P-3	3.00 ~ 3.45			
P-4	4.00 ~ 4.45			
P-5	5.00 ~ 5.45			
P-6	6.00 ~ 6.45			
P-7	7.00 ~ 7.45			
P-8	8.00 ~ 8.45			
P-9	9.00 ~ 9.45			
P-10	10.00 ~ 10.45			
P-11	11.00 ~ 11.45			
P-12	12.00 ~ 12.45			
P-13	13.00 ~ 13.45			
P-14	14.00 ~ 14.45			
P-15	15.00 ~ 15.45			
P-16	16.00 ~ 16.45			
P-17	17.00 ~ 17.45			
P-18	18.00 ~ 18.45			
P-19	19.00 ~ 19.45			
P-20	20.00 ~ 20.45			
P-21	21.00 ~ 21.35			
P-22	22.00 ~ 22.45			
P-23	23.00 ~ 23.45			
P-24	24.00 ~ 24.45			
P-25	25.00 ~ 25.45			
P-26	26.00 ~ 26.45			
P-27	27.00 ~ 27.45			
P-28	28.00 ~ 28.45			
P-29	29.00 ~ 29.43			
P-30	30.00 ~ 30.45			

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-1 Disturbed sample (SPT sample)
- T-1 Undisturbed Sample (Piston sampler)
- D-1 Undisturbed Sample (Denison sampler)
- Rock core sample (Single core tube)
- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-1 Water sample

PBT Permeability Test
VS Vane Shear Test
PMT Pressuremeter Test

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks

BORE HOLE No. **BH-03**

BORING LOG

Job No. SMF-2016-002

Sheet No. 2 OF 2

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Western Bank of Sittaung River, Near Sut Pa Nu Village, Waw Township

GROUND LEVEL : 9.00m

COORDINATE : E 275873.000 ; N 1922257.000 DEPTH : 31.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 2.00m

DATE : 26.03.2016 ~ 28.03.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION	DATE & DEPTH (m)	CASING (DEPTH (m) & DIAMETER (mm))	WATER DEPTH (m)	STANDARD PENETRATION TEST TEST METHOD (ASTM) DEPTH GL - (m)	N-Value (Blows / 30cm)	CURVE OF BLOW / N-Value (Blows / 30cm) 0 10 20 30 40 50	SAMPLING SAMPLE (Type & No.)	DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)	SCALE (m)
31	-22.45	31.45	19.45					This borehole is terminated at 31.00m, according to the termination criteria.	28.03.16 / 31.00			31.00	50/30		P-31	31.00 / 31.45				31
32												32.00								32
33												33.00								33
34												34.00								34
35												35.00								35
36												36.00								36
37												37.00								37
38												38.00								38
39												39.00								39
40												40.00								40
41												41.00								41
42												42.00								42
43												43.00								43
44												44.00								44
45												45.00								45
46												46.00								46
47												47.00								47
48												48.00								48
49												49.00								49
50												50.00								50
51												51.00								51
52												52.00								52
53												53.00								53
54												54.00								54
55												55.00								55
56												56.00								56
57												57.00								57
58												58.00								58
59												59.00								59
60												60.00								60
61												61.00								61

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

P-I	Disturbed sample (SPT sample)	PBT	Permeability Test
T-I	Undisturbed Sample (Piston sampler)	VS	Vane Shear Test
D-I	Undisturbed Sample (Denison sampler)	PMT	Pressuremeter Test
	Rock core sample (Single core tube)		
	Rock core sample (Double core tube)		
	Rock core sample (Core Loss)		
W-I	Water sample		

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks

BORE HOLE No. **BH-04**

BORING LOG

Job No. SMF-2016-002

Sheet No. 1 OF 1

PROJECT NAME : Soil Investigation for Phase-II of Kyaikto ~ Bago Bypass Road

LOCATION : Eastern Bank of Bago - Sittaung Channel, between Waw Township & Thanatpin Township

GROUND LEVEL : 8.00m

COORDINATE : E 249007.000 ; N 1922257.000 DEPTH : 30.00m

BORING EQUIPMENT : TOHO "D1"

BORING METHOD : Rotary Direct Circulation

ORIENTATION : Vertical

GROUND WATER LEVEL : 3.50m

DATE : 01.04.2016 ~ 02.04.2016

CLIENT

JICA STUDY TEAM

SCALE (m)	ELEVATION (m)	DEPTH GL - (m)	THICKNESS (m)	DIAGRAM	COLOUR	RELATIVE DENSITY (or) CONSISTENCY	SOIL NAME	SOIL DESCRIPTION	DATE & DEPTH (m)	CASING (DEPTH (m) & DIAMETER (mm))	WATER DEPTH (m)	STANDARD PENETRATION TEST TEST METHOD (ASTM) DEPTH GL - (m)	N-Value (Blows / 30cm)	CURVE OF BLOW / N-Value (Blows / 30cm) 0 10 20 30 40 50	SAMPLING SAMPLE (Type & No.)	SAMPLING DEPTH GL - (m)	TCR (%)	SCR (%)	RQD (%)	SCALE (m)
1					brownish gray	Soft	CLAY	Soft, brownish gray, moist, low to medium plasticity, CLAY				1.00	3/30		P-1	1.00				1
2	6.00	2.00	2.00									2.00	1/30		P-2	1.45 / 2.00				2
3					gray	Very soft to soft	CLAY	Very soft to soft, gray, moist to wet, medium to high plasticity, CLAY		3.00 Ø115		3.00				2.45 / 3.00				3
4												4.00	3/30		U D T-1 (50) cm W W-1 P-3	3.80 / 4.00				4
5	3.00	5.00	3.00									5.00	11/30		P-4	4.45 / 5.00				5
6					gray	Loose to dense	Silty SAND	Loose to dense, gray, moist, fine to medium grained, Silty SAND with clay patches				6.00	7/30		P-5	5.45 / 6.00				6
7												7.00	19/30		P-6	6.45 / 7.00				7
8								GL- (9.00 ~ 9.45)m; hard, gray, low to medium plasticity, CLAY with silt layer is observed as intercalated layer	01.04.16 8.00			8.00	22/30		P-7	7.45 / 8.00				8
9												9.00	31/30		P-8	8.45 / 9.00				9
10												10.00	17/30		P-9	9.45 / 10.00				10
11	-3.00	11.00	6.00									11.00	39/30		P-10	10.45 / 11.00				11
12					gray	Medium dense to very dense	Silty SAND	Medium dense to very dense, gray, moist, fine to medium grained, Silty SAND, with trace of mica mineral				12.00	24/30		P-11	11.45 / 12.00				12
13												13.00	32/30		P-12	12.45 / 13.00				13
14								GL- (16.00 ~ 16.45)m; hard, gray, low to medium plasticity, CLAY with silt layer is observed as intercalated layer				14.00	25/30		P-13	13.45 / 14.00				14
15												15.00	24/30		P-14	14.45 / 15.00				15
16												16.00	31/30		P-15	15.45 / 16.00				16
17												17.00	50/15		P-16	16.45 / 17.00 / 17.30				17
18												18.00	31/30		P-17	18.00				18
19												19.00	40/30		P-18	18.45 / 19.00				19
20												20.00	31/30		P-19	19.45 / 20.00				20
21												21.00	42/30		P-20	20.45 / 21.00				21
22	-14.00	22.00	11.00									22.00	27/30		P-21	21.45 / 22.00				22
23					gray	Hard to firm	CLAY	Hard to firm, gray, moist, low to medium plasticity, CLAY with silt and trace of mica mineral				23.00	32/30		P-22	22.45 / 23.00				23
24												24.00	16/30		P-23	23.45 / 24.00				24
25												25.00	34/30		P-24	24.45 / 25.00				25
26												26.00	20/30		P-25	25.45 / 26.00				26
27												27.00	17/30		P-26	26.45 / 27.00				27
28												28.00	13/30		P-27	27.45 / 28.00				28
29												29.00	15/30		P-28	28.45 / 29.00				29
30	-22.45	30.45	8.45					This borehole is terminated at 30.00m, according to the termination criteria.	02.04.16 30.00			30.00	8/30		P-29	29.45 / 30.00				30
31												31.00				30.45				31

NOTES

Relative density description		Consistency description	
Relative density	SPT N-Value (meas)	Consistency	SPT N-Value (meas)
Very loose	0 - 4	Very soft	under 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Firm	5 - 8
Dense	30 - 50	Stiff	9 - 15
Very dense	over 50	Very stiff	16 - 30
		Hard	over 30

Sample key

- P-I Disturbed sample (SPT sample)
- T-I Undisturbed Sample (Piston sampler)
- D-I Undisturbed Sample (Denison sampler)
- Rock core sample (Single core tube)
- Rock core sample (Double core tube)
- Rock core sample (Core Loss)
- W-I Water sample

PBT Permeability Test

VS Vane Shear Test

PMT Pressuremeter Test

RQD (%)	Term
0 - 25	Very poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Planner structure

Term	Spacing (mm)
Very thick	> 2000
Thick	600 - 2000
Medium	200 - 600
Thin	60 - 200
Very thin	20 - 60
Thickly laminated	6 - 20
Thinly laminated	< 6

Discontinuities

Term	Spacing (mm)
Very widely spaced	> 2000
Widely spaced	600 - 2000
Medium spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	< 20

Saramayri - Fuji Construction Co., Ltd.

Revision No.	Rev: 01
Revision Date	25.04.2016

Remarks