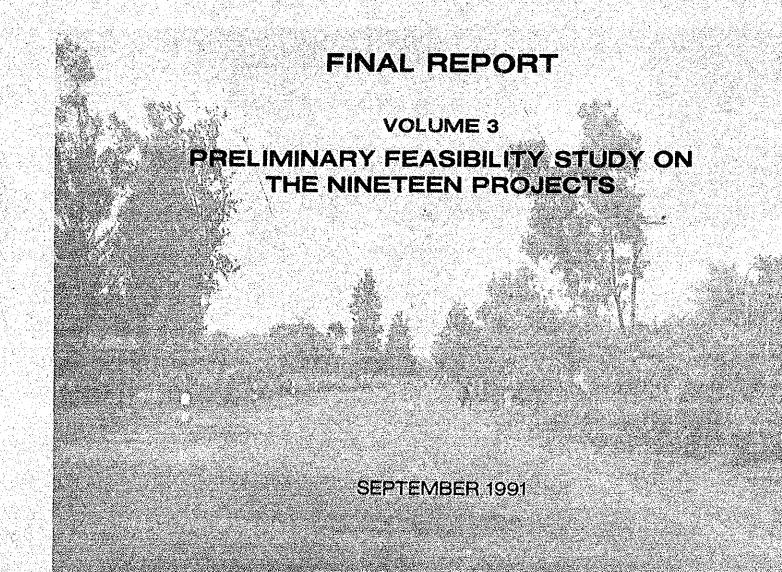
KINGDOM OF THAILAND MINISTRY OF TRANSPORT AND COMMUNICATIONS DEPARTMENT OF HIGHWAYS

ROAD DEVELOPMENT STUDY IN THE SOUTHERN REGION



JAPAN INTERNATIONAL COOPERATION AGENCY





KINGDOM OF THAILAND MINISTRY OF TRANSPORT AND COMMUNICATIONS DEPARTMENT OF HIGHWAYS

ROAD DEVELOPMENT STUDY IN THE SOUTHERN REGION

FINAL REPORT

VOLUME 3

PRELIMINARY FEASIBILITY STUDY ON THE NINETEEN PROJECTS

SEPTEMBER 1991

JAPAN INTERNATIONAL COOPERATION AGENCY



VOLUME 3:

PRELIMINARY FEASIBILITY STUDY ON THE NINETEEN PROJECTS

ABBREVIATION AND SYMBOLS FOR DRAWINGS AND PROFILE

Table of Contents

		Table of Contents		R/W	: Right of Way
				(E)	: Embankment
	-		Page	(C)	: Cut
	-	Commons of Dualiminant Bacabbility Chuder	_ 1	Rt.	: Route
	1.	Summary of Preliminary Feasibility Study1	- T -	J	: Junction
	2	Cummany of Dwaliminary Dosign		EX.	: Existing
-	2.	Summary of Preliminary Design2	- 1	PWD	: Public Work De
	3.	Preliminary Design of Priority Projects	- 1	ARD	: The Office of
	. •	2 1 Ohimmhan Oftin Tinle (NO 1)	- 1	(Material	Type of Surface)
		3.1Chumphon City Link (NC-1)	- 2	SA	: Soil Aggregate
		3.3 Thap Put Bypass (NC-3) $\dots \dots \dots$		BT	: Bitumen
		3.4 Trang Bypass (NC-4)		SGST	: Single Surface
•		3.5 Short Cut Route 4 / 406 (NC-5)		DBST	: Double Surface
		3.6 Yala Bypass (NC-6)		UPM	: Under STD Pene
÷		3.7 Route No. 401 (Rt.4 - Rt.4142) (AD-1)3		PN	: Penetration Ma
		3.8 Route No. 402 Phuket - Kok Kloi (AD-2)3		ASC	: Asphalt Concre
		3.9 Route No. 4 Kok Kloi - Phangnga (AD-3)3		(D	
		3.10 Route No. 4 and 43 Phatthalung	~	and the second	Surface Conditio
1.		- Hat Yai (AD-4)	- 69	G	: Good
		3.11 Route No.4009 Surat Thani - Wiang Sa (WD7-1)3	- 80	G/F F	: Good/Fair : Fair
		3.12 Route No. 4035 Phra Saeng - Ao Luk (WD7-2)3		r F/P	: Fair/Poor
		3.13 Route No. 4046 to Trang (WD7-3)		P	: Poor
		3.14 Route No. 408 Hua Sai - Songkhla (WD7-4)3			• FOOT
		3.15 Route No. 4 Ranong - 4006 (WD7-5)	- 118	(Twne of	Structures)
		3.16 Route No. 401 from Phun Phin to 416 (WD7-6)3		RC	: Reinforced Con
		3.17 Route No. 417 Palian - Khuan Kalong (WD6-1)3	- 134	PC	: Prestressed Co
		3.18 Yala - Narathiwat Link (RW7-1)		BX	: Box Culvert
		3.19 Ko Lanta Link (UBS-1)	- 154		
				(Type of	Tmprovement)

	PWD	: Public Work Department
	ARD	: The Office of Accelerated Ru
	(Material	Type of Surface)
	SA	: Soil Aggregate
	BT	: Bitumen
	SGST	: Single Surface Treatment
	DBST	: Double Surface Treatment
	UPM	: Under STD Penetration Macada
	PN	: Penetration Macadam
	ASC	: Asphalt Concrete
	(Pavement	Surface Conditions)
	G	: Good
	G/F	: Good/Fair
		: Fair
	F/P	: Fair/Poor
• .	Ρ	: Poor
	(Type of S	
		: Reinforced Concrete Bridge
	PC	: Prestressed Concrete Bridge
	BX	: Box Culvert
		mprovement)
		: New Road Construction
	AD	: Additional Lane Construction
		: Widening of Carriageway
		: Reconstruction and Widening
		: Upgrading to Bitumen Standar
		: Re-Alignment
	RB	: Re-Embankment
	RC	: Re-Construction

(Socio-economy)

IRR	. :	Economic Internal Rate	of	R
B/C	:	Benefit Cost ratio		
ADT	 :	Average Daily Traffic	۰.	÷

Rural Development

lam

n

g of Carriageway urd

Return

1. Summary of Preliminary Feasibility Study



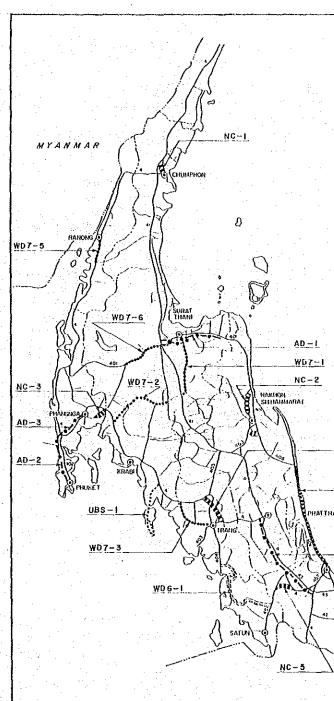
VOLUME 2 PRELIMINARY FEASIBILITY STUDY ON NINETEEN PROJECTS

SUMMARY OF PRELIMINARY FEASIBILITY STUDY 1.

Projects for the preliminary feasibility study were selected out of the projects proposed by the highway development master plan for the year 1996. Table 1.1 shows a list of projects for the preliminary feasibility study and Fig. 1.1 shows their locations. Total length of the projects amounts to 914 kilometers:

Table 1.1 Projects for Preliminary Feasibility Study

Name of Project	Length(KM)	Planning Standard
NEW ROAD CONSTRUCTION (NC)	102.3 km	
NC-1 Chumphon City Link	9.4	F1
NC-2 Nakhon Si Thammarat Bypass	20.5	F1
NC-3 Thap Put Bypass	7.7	S1
NC-4 Trang Bypass	30.7	F1
NC-5 Short Cut Route (4 - 406)	17.3	S3
NC-6 Yala Bypass	16.7	S1
ADDITIONAL LANE CONSTRUCTION (AD)	237.1	
AD-1 Route No. 401 (41 - 4142)	60.4	SD
AD-2 Route No. 402 Phuket - Kok Kloi	45.6	SD
AD-3 Route No. 4 Kok Kloi - Phangnga	35.6	PD
AD-4 Route No. 4 and 43 Phatthalung		
- Hat Yai	95.5	PD
WIDENING OF CARRIAGEWAY TO 7.00 M (WD7)	365.2	i i i
WD7-1 Route No. 4009 Surat Thani - Wiang S	a 62.8	F1
(including Additional Lane to city)		
ND7-2 Route No. 4035 Phra Saeng - Ao Luk	68.1	F1
WD7-3 Route No. 4046 to Trang	49.0	F1
WD7-4 Route No. 408 Hua Sai - Songkhla	95.4	S 1
ND7-5 Route No. 4 Ranong - 4006	25.9	P1
WD7-6 Route No. 401 from Phun Phin to 416	64.0	S1
WIDENING OF CARRIAGEWAY TO 6.00 M (WD6)	79.2	
WD6-1 Route 417(4078) Palian - Khuan Kalon	ig 79.2	S3
RECONSTRUCTION & WIDENING TO 7.00M (RW7)	51.2	
RW7-1 Yala - Narathiwat Link	51.2	Fl
UPGRADING TO BITUMEN STANDARD	78.7	
UBS-1 Ko Lanta Link	78.7	F3
Total Length	913.6 km	



1 - 1

MALAYSIA

LEGEND

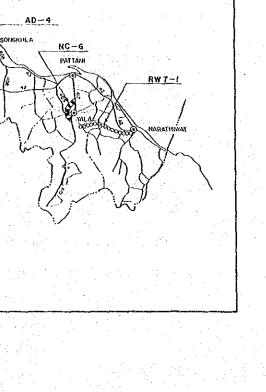
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CENTER IGHAT BOUNDARY

KETTEL NEW ROAD CONSTRUCTION ADDITIONAL LANE CONSTRUCTION WIDENING OF CARRAGEWAY 7.00 M WIDENING OF CARRAGEWAY 5.00 M. DOCODOO RECONSTRUCTION & WIDENING 7.00 M UPGRADING TO BLIUMENT STANDAP

NC-4

WD7-4



Preliminary designing of the projects was carried out based on the following design policy:

- the DOH standard is to be applied in designing; a):
- improvement is to be based on the best use of the b) existing highways;
- earth work materials are to be procured from borrow C) pit; and
- d) appropriate measures are to be incorporated into designing for preventing the damages caused by natural disasters.

A series of standard pattern of design was prepared for preliminary designing of the projects. Each project was designed by applying appropriate standard patterns by taking account of the project site information mainly based on the DOH road data base and site reconnaissance.

Table 1.2 summarizes the results of the preliminary feasibility study. Total costs of the nineteen projects amount to about 6.1 billion baht. In terms of the economic internal rate of return (EIRR), AD-2 showed the highest EIRR of 77.6 % , followed by NC-1 of 73.5 %. These projects are characterized by the increase of highway capacity to the existing small capacity highway of cul-desac shape on which every directional traffic is forced to concentrate. NC-6 showed the lowest EIRR of 4.1 % because of the high cost of long bridge construction.

		1			· · · · ·
VD7-1	Rt. 4009 Surat	166.2	316	5.1	43.3
· · · · · · · · · · · · · · · · · · ·	Rt. 4035 Ao Luk	200.2	120	2.3	21.8
VD7-3	Rt. 4046 Trang	168.7	28	1.4	16.0
VD7-4	Rt. 408 Songkhla	140.4	532	8.9	46.3
√D7-5	Rt. 4 Ranong	88.0	29	1.7	18.1
ND7-6	Rt. Rt: 401	165.6	-7	0.9	10.8
√iden	ing 6.0 Meters (WI	D6):			· · ·
	Rt. 417 Palian	251.2	117	1.9	22.4
Recon	struction (RW7):				ana series a
₹₩7-1	Yala-Narathiwat	309.1	283	2.9	26.7
Jpgra	ding (UBS):			• •	
JBS-1	Ko Lanta	804.0			11.8
			587	2.5	22.0
	Grand Total	6,079.2			

- Benerre.
 - EIRR (Economic Internal Rate of Return) 3)

in percentage

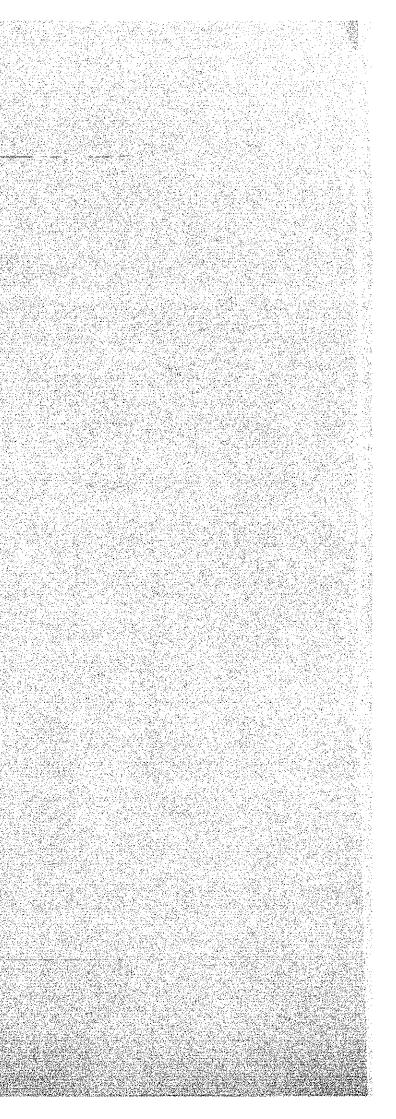
Table 1.2 Summary of Preliminary Economic Evaluation

	Financial	Econo	mic Eval	uation
	Project Cost illion baht)	NPV	B/C	EIRR (%)
New Construction (NC)	: 1,322.4			
NC-1 Chumphon	93.5	514	12.4	73.5
NC-2 Nakhon Si T.	280.4	9	1.1	12.6
NC-3 Thap Put	82.0	63	2.7	30.4
NC-4 Trang	383.1	6	1.0	12.3
NC-5 Rt. 4-406	140.2	726	11.3	53.8
NC-6 Yala	342.3	-99	0.4	4.1
Additional Lane (AD):	2,463.4			
AD-1 Rt. 401 (41-4142) 666.9	1,341	5.0	34.2
AD-2 Rt. 402 Phuket	528.6	4,388	17.5	77.6
AD-3 Rt. 4 Phangnga	273.0	1,496	12.4	51.0
AD-4 Rt. 4/43 Hat Yai	994.0	1,785	4.8	42.9

1 -

Widening 7.0 Meters (WD7):929.1

2. Summary of Preliminary Design



2. SUMMARY OF PRELIMINARY DESIGN

1) New-Construction Projects (NC)

Control 1 Section	Length			litions -Section	Pavement Condition		Proposed Road Class	Conditi Cross-S	
<nc-1: chump<br="">New-Link New-Link (Subtotal</nc-1:>	ohon City 1,800 7,600 9,400)	y Link> PWD		6.00				12.00RC 12.00NC ((PV) Subtotal:
4103-0100	8,000 22,100 12,500	nmarat F3 ARD	-	6.00+2.00 6.00	G/F	40.00+40.00		12.00NC (Out of 12.00RC (Project Subtotal:
<nc-3: thap<br="">New-Link 416-0200 (Subtotal:</nc-3:>	6,400 1,300	r4	1.50+	5.00+1.50	G/F	20.00+35.00	a second s	12.00NC 12.00WD (Subtotal:
<nc-4: trang<br="">New-Link (Subtotal:</nc-4:>	30,700)	· · · · · · · · · ·				P1	12.00NC (Subtotal:
	3,000 14,300		Route>	6.00		9.00		10.00RC 10.00NC (
<nc-6: yala<br="">New-Link New-Link New-Link (Subtotal:</nc-6:>	3,000 6,500 7,200	PWD		6.00		9.00	S1	12.00NC 12.00RC 12.00NC ((PV) Subtotal:
Total 1	24,400								Total 1

2 - 1

(m) Improved Length 1,800 7,600 9,400) 8,000 22,100) 12,500 20,500) 6,400 1,300 7,700) 30,700 30,700) 3,000 14,300 17,300) 3,000 6,500 7,200 16,700) 102,300

Control Section	Length	Existin Road Class	ng Conditions Cross-Section	Pavement Condition	Right of Way	Proposed Road Class	l Conditions Cross-Section
<ad-1: rt.4<="" td=""><td>1153/4008/</td><td>401 4</td><td>1-4142></td><td></td><td></td><td></td><td></td></ad-1:>	1153/4008/	401 4	1-4142>				
4153-0100	8,536	F3	2.00+ 6.00+2.00	F	20.00+20.00	SD	11.00NC+ 11.00WD
4008-0100	2,002	SD	2.50+13.00+2.50	F	15.00 + 20.00	SD	(Out of Project
401-0601	6,983	SD	2.50+13.00+2.50	F	25.00+25.00	SD	(Out of Project
401-0602	10,535	S1	2.50 + 7.00 + 2.50	G	15.00+35.00	SD	11.00NC+ 12.00EX
401-0700	11,415	S1	2.50+7.00+2.50	G/F	20.00+20.00	SD	11.00NC+ 12.00EX
401-0801	29,850	S3	2.00 + 6.00 + 2.00	G/F	20.00+20.00	SD	11.00NC+ 10.00EX
(Subtotal	69,321)		an an Anglan an a				(Subtotal:
<ad-2: rt.4<="" td=""><td>102 Kok k</td><td>10i - 1</td><td>Phuket></td><td></td><td></td><td>t the second second</td><td></td></ad-2:>	102 Kok k	10i - 1	Phuket>			t the second second	
402-0101	8,413	S3	2.50+7.00+2.50	G	20.00+20.00	SD SD	11.00NC+ 12.00EX
							(Out of Project
402-0201	41,718	S 3	2.50+ 6.00+2.50	G	20.00+20.00	· ·	(Out of Project
						SD	10.00WD+ 10.00WD
(Subtotal	50,131)	4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -					(Subtotal:
(A) 0. D1	an a	·					
<ad-3: rt.4<="" td=""><td></td><td></td><td></td><td>a</td><td>00.00.00.00</td><td>DD.</td><td>11 00101 10 0077</td></ad-3:>				a	00.00.00.00	DD.	11 00101 10 0077
4-3000	24,828	P3	2,00+ 6.00+2.00	G	20.00+20.00	PD	11.00NC+ 10.00EX
4-3101	10,772	P3	2.00+ 6.00+2.00	G/F	20.00+20.00	PD	11.00NC+ 10.00EX
(Subtotal	35,600)						(Subtotal:
<ad-4: rt.4<="" td=""><td>/43 Phat</td><td>thalung</td><td>g - Hat Yai></td><td>ne de la clérica. De la clerica de la clérica de la</td><td></td><td>ti statistica</td><td></td></ad-4:>	/43 Phat	thalung	g - Hat Yai>	ne de la clérica. De la clerica de la clérica de la		ti statistica	
4-4000	40,038	P3	2.00+ 6.00+2.00	F/P	20.00+20.00	PD	11.00NC+ 11.00WD
4-4100	25,190	P3	1.50 + 6.00 + 1.50	F/P	20.00+20.00	PD	11.00NC+ 11.00WD
43-0101	11,160	P2	2.25+ 6.50+2.25	G	50.00+30.00	PD	11.00NC+ 11.00EX
43-0102	11,840	P2	2.25+ 7.00+2.25	G/F	50.00+30.00	D PD	11.00NC+ 11.50EX
43-0200	7,219	P3	2.00+ 6.00+2.00	G/F	20.00+20.00	PD	11.00NC+ 10.00EX
(Subtotal:	95,507)						(Subtotal:
Total	250,559						Total

2) Additional Lane Projects

•

с, +*

(m) سريد مرجد د مراجز ع Improved Length 8,536 2,002) 6,983) 10,535 11,415 29,850 60,336) 8,000 413) 4,087) 37,631 45,631) 24,828 10,772 35,600) 40,038 25,190 11,160 11,840 7,279 95,507) ------237,074 ------

Control Section		·	Cross-	litions -Section	Pavement Condition	Right	Road	l Conditions Cross-Section	Improved Length
WD7-1: Rt.	4000 9	not mha		land Gal				ی شرح سال کار اور در بال کار کار کار کار کار میں بنی وی کار میں اور میں میں میں میں میں میں میں کار کار کار کا اور اور اور اور اور اور اور اور اور اور	
4009-0100	4009 Sur 40,869			5.50+1.75		15.00+15.00	•	10.00WD+ 10.00WD	
4009-0200	21,930	F4	1.50+	5.00+1.50	F	15.00+15.00	F1 F1	12.00WD 12.00WD	38,167 21,930
(Subtotal:	62,799)		an An Anna An Anna Anna Anna Anna Anna A			ana ang kanalang sa		(Subtotal:	62,799)
(WD7-2: Rt.	4035 Ao	Lók -	Phra Sa	ieng>			e Alexandre de la Constante de La constante de la Constante de		
4035-0100					F	20.00+20.00	F1	12.00WD	20,812
4035-0200	44,688	F4	1.50+	5.00+1.50	F	20.00+20.00			44,688
4035-0300		F4	1.50 +	5.00+1.50	F	20.00+20.00	F1	12.00WD	2,600
(Subtotal:					·			(Subtotal:	68,100)
<wd7-3: rt.<="" td=""><td>4046 Tra</td><td>ng - K</td><td>huan Ki</td><td>ın></td><td></td><td>andra ann an Aonaichte Ann an Aonaichte an Aonaichte</td><td></td><td></td><td></td></wd7-3:>	4046 Tra	ng - K	huan Ki	ın>		andra ann an Aonaichte Ann an Aonaichte an Aonaichte			
4046-0100				5.50+1.75	F	15.00+15.00	F1	12.00WD	22,629
	· -· ·	s in the	· ·				F1	12.00NC (RA)	3,700
		a stational second			and a state of the second s			(Out of Project	3,700)
			· ·				F1	12.00RC (RB)	3,000
Incpl Rd.	1,834		1997) 1997				F1	12.00NC (RA)	1,200
			• •	_ · _ · _ ·				(Out of Project	
1046-0200		F4	1.75+	5.50+1.75	G/F	20.00+20.00	F1	12.00WD	18,522
(Subtotal:	49,685)		· .					(Subtotal:	49,051)
WD7-4: Rt.	408 Hua	Sai -	Song Kl	nla>			an a	an an an an an trainn a tha an	
408-0301				6.00+1.00	G/F	15.00+35.00	S 1	12.00WD	11,904
408-0302						15.00+35.00	S1	12 00WD	17,113
408-0400				6.00+2.00	G/F	15.00+15.00	S1	12.00WD	34,517
408-0500		F3	2.00+	6.00 + 2.00	G/F	15.00+15.00	S 1	12.00WD	31,874
(Subtotal:	95,408)		n a star The start of the start					(Subtotal:	95,408)
WD7-5: Rt.	4 Ranong	- J.R	t.4006>						
4-2202	25,852			6.00+2.00	G/F	20.00+20.00	P1	12.00WD	25,852
(Subtotal:								(Subtotal:	
WD7-6: Rt.	401 J.Rt	.416 -	Phun I	hin>			an an san san san san san san san san sa		
401-0302	2,076	S 3	2.00+	6.00+2.00		30,00+30,00			2,076
401-0400	29,923	S 3		6.00+2.00	G/F	30.00+30.00		12.00WD	29,923
401-0500	32,001	S 3	2.00+	6.00+2.00	G/F	30.00+30.00	S1	12.00WD	32,001
(Subtotal:	64,000)							(Subtotal:	64,000)
WD6-1: Rt.	4137/417	Khuan	Kalone	g - Palian	>				
137-0100	26,780	F4		5.00+1.00		15,00+15.00	S3	10.00WD	21,680
							S3	10.00NC (RA)	5,100
					an an an tha an an tha an an tha a			(Out of Project	
417-0101	12,820	F 4	1.50+	5.00 + 1.50	G/F	15.00+15.00		(Out of Project	3,900)
· · · · ·							S3	10.00WD	8,920
417-0102	1,459			5.00+1.50	G/F	15.00+15.00	S3	10.00WD	1,459
417-0200	25,800	F4	1.50+	5.00+1.50	G/F	15.00+15.00		10.00WD	4,400
	· · · · · · · · · · · · · · · · · · ·	an a	e e constante a se constante				S 3	10.00NC (RA)	14,300
						00 00.00 00		(Out of Project	21,400)
417-0301	14,700	F4	1.50+	5.00+1.50	F	20.00+20.00	S3	10.00WD (Out of Project	6,650 8,050)
117 0900	16 675	177	1 601	5 00+1 50	G/F	20.00+20.00	S3	10.00WD	16,675
417-0302 (Subtotal:		F4	1.00+	5.00+1.50	ਯ/ ዞ	40.00740.00	ου	(Subtotal:	
Total	464 078	الد کر کہ کاریا ہے۔ ایک کاری					= = = = = = = = = = = = = = =	Total	444,394
			ن کار . مراجع می موجع می م						

3) Widening Projects (WD)

.

[mproved Length -----2,702 38,167 21,930 52,799) 20,812 14,688 2,600 58,100) 2,629 3,700 3,700) 3,000 1,200 1,834) 18,522 19,051) 11,904 17,113 34,517 31,874 95,408) 25,852 25,852) 2,076 39,923 12,001 34,000) 21,680 5,100 5,100) 3,900) 8,920 1,459 4,400 4,300 21,400) 6,650 8,050) - -6,675 9,184) _____ 4,394 . سا جا ہو ہے جا ہو .

Control Section	Length	Existi Road Class	ng Condi Cross-S		Pavement Condition	Right of Way	Proposed Road Class	l Conditi Cross-S	
<rw7-1: rt<="" td=""><td>.4063/406</td><td>6/4107/</td><td>New-Link</td><td>Yala -</td><td>Narathiwa</td><td>t></td><td></td><td></td><td></td></rw7-1:>	.4063/406	6/4107/	New-Link	Yala -	Narathiwa	t>			
4063-0100	9,100		1.25+ 6			15.00+15.00	$\mathbf{F1}$	12.00WD	
							F1	12.00NC	(RA)
- -								(Out of	Project
4066-0100	10,147	F4	1.50+5	.00+1.50	G/F	15.00+15.00		(Out of	Project
				and the second second			$\mathbf{F1}$	12.00WD	
4107-0100	7,000	F4	1.50+5	.00+1.50	G	15.00+15.00	F1	12.00WD	
	an an an Araba. An Araba an Araba		· · ·		. *		F1	12.00RC	(RB)
New-Link	25,450	ARD	5	.00		5.00	F1	12.00RC	9
		· · ·				· · · ·	F1	12.00NC	
(Subtotal	: 51,697)		· · · · · ·			·		· . ((Subtotal:

4) Reconstruction and Widening Projects (RW)

Control Section	Length	Exist Road Class	ing Cond Cross	litions -Section	Pavement Condition		Proposed Road Class	d Conditions Cross-Section
<pre><ubs-1: pre="" rt<=""></ubs-1:></pre>	.4206/New	 -Link	Khlong	Thom - Ko	Lanta>			
4206-0100	10,061	F6		6.00		15.00+15.00	F 3	10.00RC (PV)
New-Link	68,639	PWD		4.00		· · · · ·	F 3	10.00RC (PV)
							F 3	10.00NC
			1				F 3	10.00NC (BR)
(Subtotal	: 78,700)				antan 1910 - Angelander 1910 - Angelander			(Subtotal:

2 - 4

5) Upgrading to Bitumen Standard Project (UBS)

10,061 27,039 39,700 1,900 : 78,700)