

PROJECT NC-3

THAP PUT BYPASS

CHANGWAT: PHANGNGA

2) ROUTE MAP

3.3 Thap Put Bypass (NC-3)

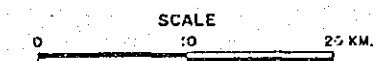
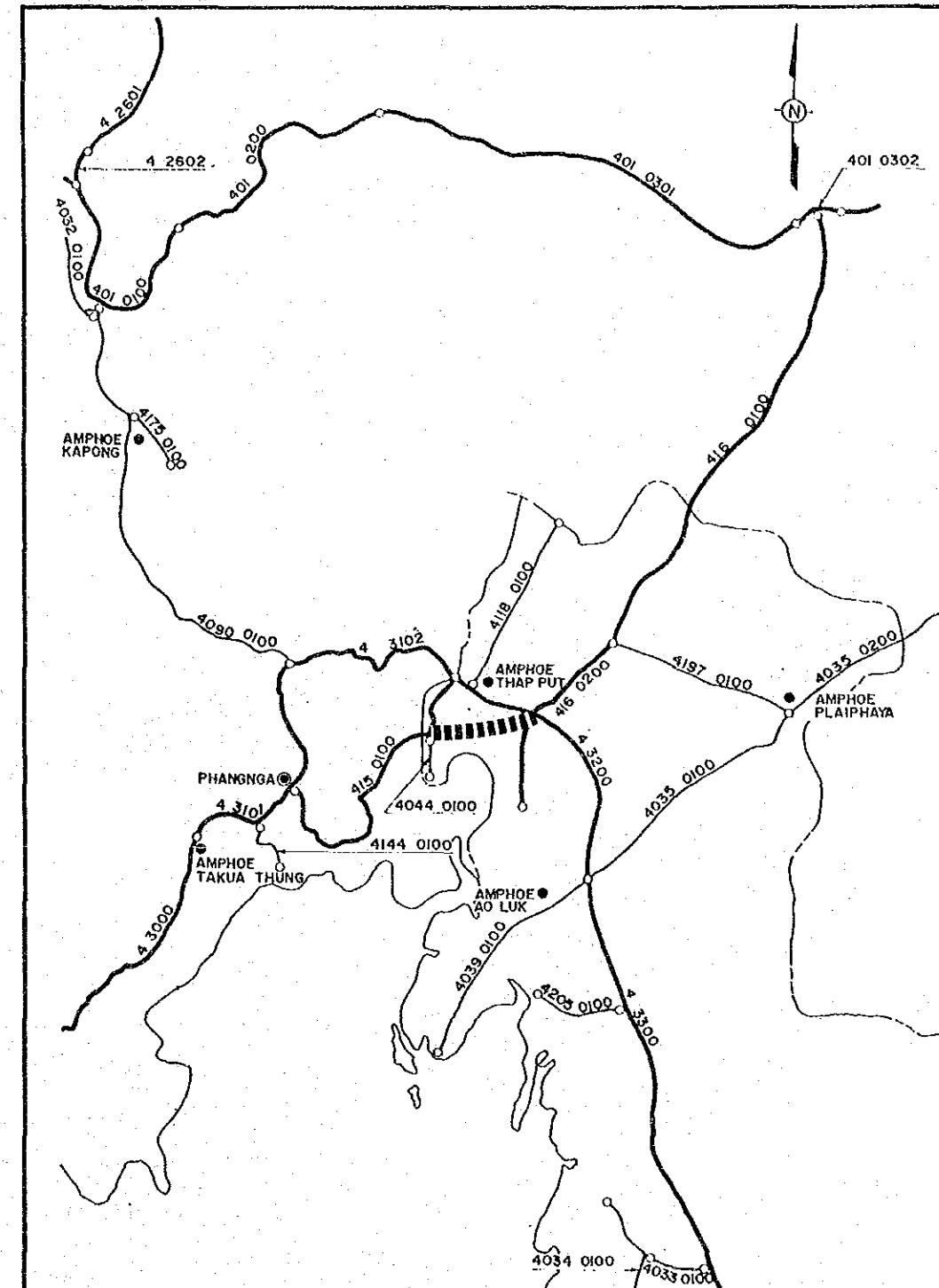
1) Summary

The aim of the project is to facilitate inter regional traffic flow between Phuket and Surat Thani/Krabi through detouring the city center of Thap Put as well as to ease traffic congestion at Thap Put intersection.

"S1" standard is applied to the bypass with asphaltic concrete carriageway of 7.0 meters and soil aggregate shoulders of 2.5 meters on both sides. A part of the existing Route 416 will be upgraded from "F4" to "S1" standard.

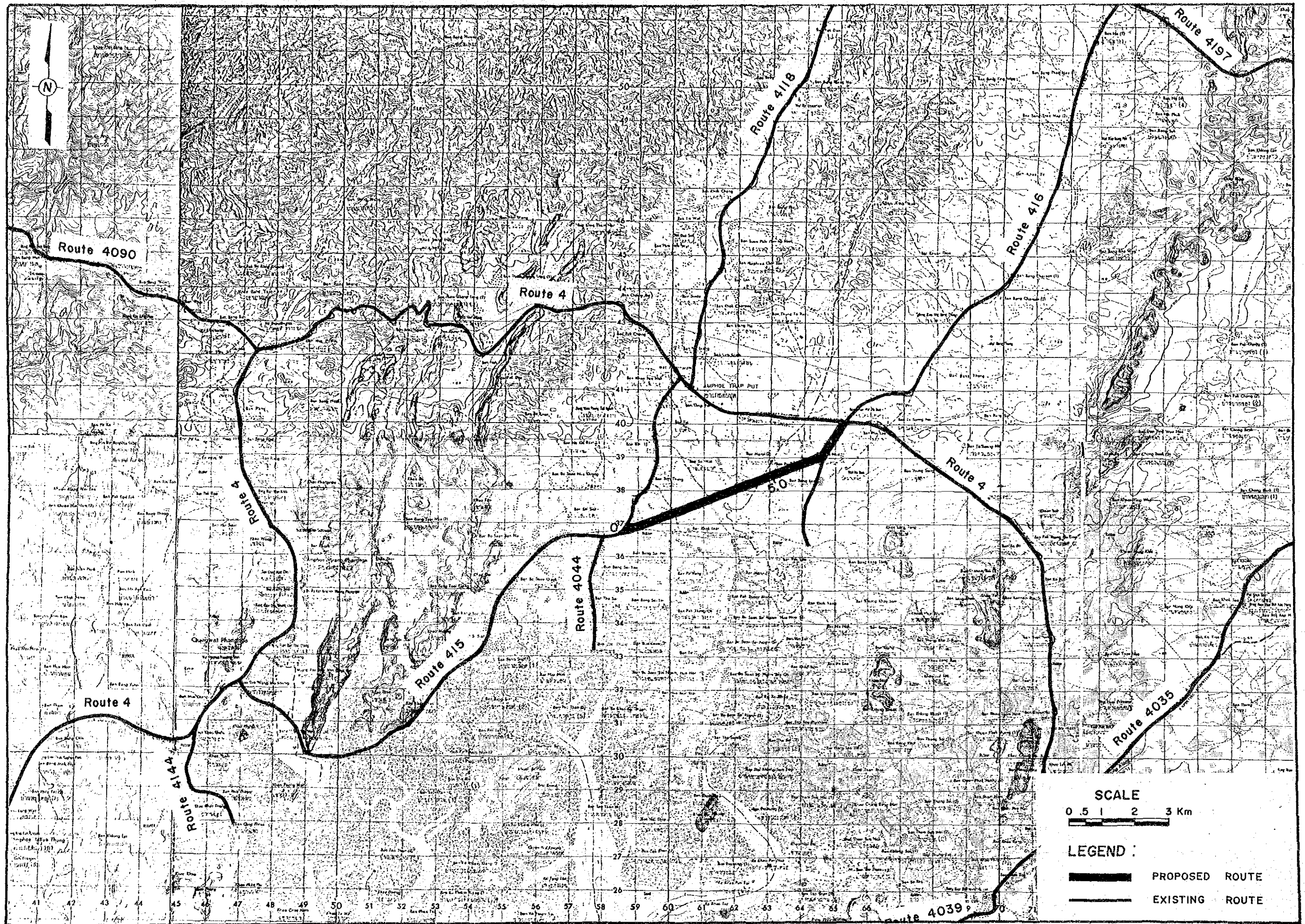
The proposed bypass connects Route 415 with Route 4 over a distance of 7.7 kilometers. The project comprises new construction of 6.4 kilometers and widening of carriageway to 7.0 of 1.3 kilometers. The terrain is generally flat starting from Route 415 and gradually change to hilly toward Thap Put.

NC-3	Description
Changwat	: Phangnga
Name or Location	: Thap Put Bypass
Road Class	: S1
Cross Section (m)	: 2.50+7.00+2.50
Surface Type	: SA /ASC / SA
Length: Total	: 7.7 km
DOH Road	: 7.7 km
AADT<'96/'01/'06>	: 4,800 / 6,600 / 8,880
Financial Cost	: 82.9 million baht
NPV	: 63 million baht (12% discount rate)
B/C	: 2.7 (12% discount rate)
EIRR	: 30.4 %



LEGEND :

	PROJECT ROUTE		PROVINCIAL HIGHWAYS
	DIVIDED HIGHWAYS		CHANGWAT, AMPHOE
	NATIONAL HIGHWAYS		

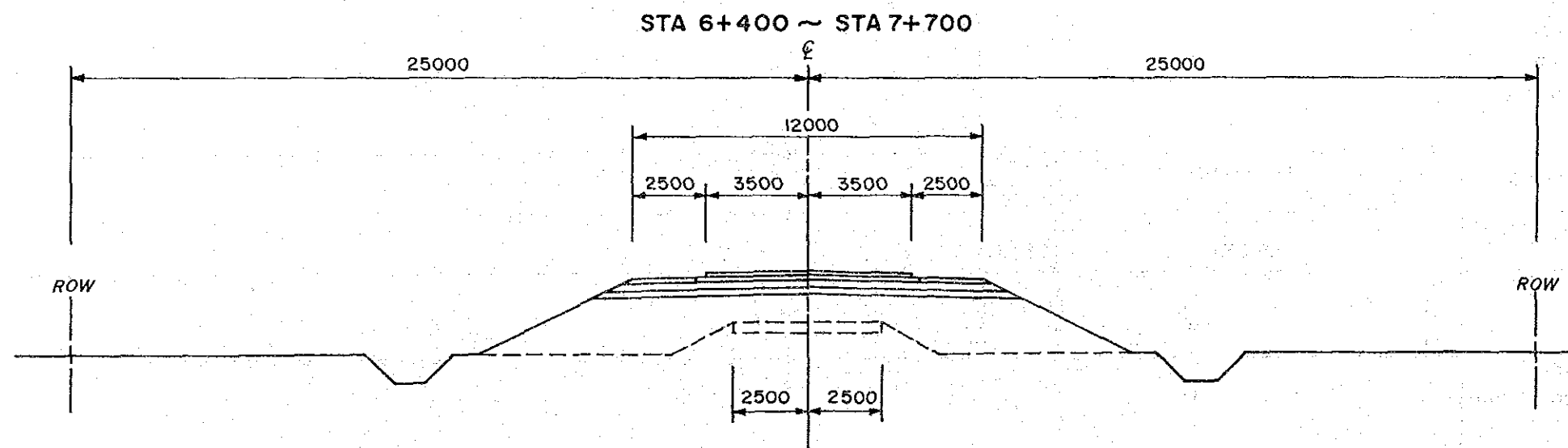
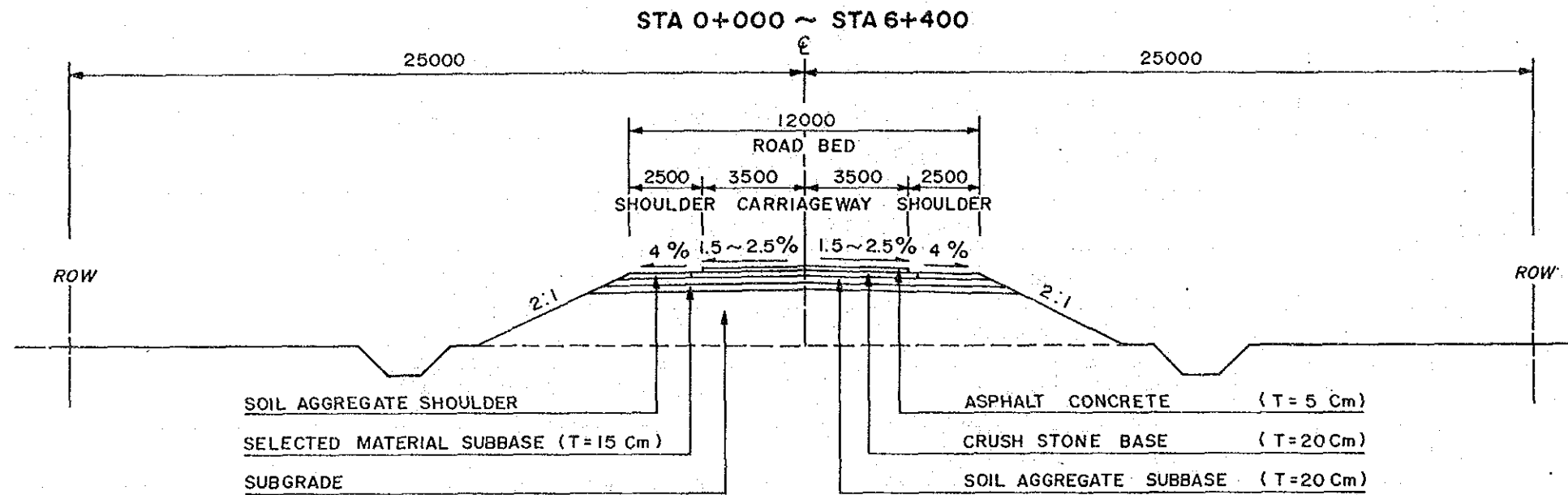


4) PROFILE OF PROJECT

PROJECT NO. NC-3: THAP PUT BYPASS

STATION (KM)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30				
VILLAGE ROAD INTERSECTION				J. Rt. 415		PA TAO		J. Rt. 416		J. Rt. 4											
LAND USE		PLANTATION				FOREST															
TERRAIN		FLAT				ROLLING															
FLOODING LENGTH																					
EXISTING CONDITIONS	RIGH OF WAY															55.00M					
	ALIGNMENT	HOR.																STRAIGHT			
		VER.																FLAT			
	CROSS SECTION															5.00 M					
	SURFACE															DBST					
BRIDGES AND (Type - Width - Length (m))																					
BOX CULVERTS (Width - Height - Length (m))																					
PROPOSED CONDITIONS	CROSS SECTION	NC, SI, 2.5(SA)+7.0(ASC)+2.5(SA) = 12.00 M., R/W = 50.00 M.				RC, SI R/W = 50.00M															
	EMBANKMENT / CUT (Height (m))	2.5 (E)				2.5 (E)															
	BRIDGES (Type - Width - Length (m))	0+000				4+100											6+400	7+700			
		PC 12.0 x 40.0																			

5) TYPICAL CROSS SECTION



6) CONSTRUCTION QUANTITIES AND COSTS

CONSTRUCTION QUANTITIES AND COSTS
(Project NC -3 Length = 7.700 Km)
(Improved Length 7.700 Km)

ITEM	Unit	Financial		Financial		Economic cost		Residual Value	
		Unit Cost	Quantity	Total cost	Total cost	%	%	%	%
		Baht		1000 Baht	1000 Baht				
EARTH WORK									
Clearing & Grubbing	SQ.M	1	169,400	169		83		90	
Roadway Excavation(Unclassified)	CU.M	30	0	0					
Embankment(Borrowed Material)	CU.M	100	260,684	26,068					
Slope Protection(Stripe Sodding)	SQ.M	6	86,086	517					
Sand Mat (t=0.5m)	SQ.M	50	0	0					
Excavate Existing Surface	SQ.M	2	0	0					
Thickness Over 10Cm (2 Lay)	SQ.M	14	0	0					
SUB TOTAL				26,754			22,206		19,985
SUBBASE AND BASE									
Subbase(Selected Material)	CU.M	190	16,863	3,204		83		50	
Subbase(Soil Aggregate)	CU.M	190	22,484	4,272					
Base Coarses(Crush Stone)	CU.M	280	11,704	3,277					
Shoulder(Soil Aggregate)	CU.M	190	6,776	1,287			9,994		4,997
SUB TOTAL				12,040					
SURFACE									
Asphaltic Prime coat	SQ.M	13	53,900	701		83		50	
Asphaltic Tack coat	SQ.M	7	53,900	377					
Asphalt concrete Surfacing	CU.M	1,900	5,390	10,241			9,395		4,697
SUB TOTAL				11,319					
STRUCTURES(Equivalent)									
RC Pipe Culvert(D= 600 m)	M	1,380	550	759		83		50	
(D= 800 m)	M	1,950	0	0					
(D=1000 m)	M	2,650	0	0					
(D=1200 m)	M	3,850	0	0					
RC Box Culvert(1-2.40*2.40 m)	M	5,700	176	1,003					
RC Bridge Widening	SQ.M	9,600	0	0					
RC Bridge (W=15.0 m)	M	96,000	0	0					
PC Bridge (W=15.0 m)	M	150,000	40	6,000			6,443		3,221
SUB TOTAL				7,762					
TOTAL (a)				57,876			48,037		32,901
Miscellaneous Works [(a)*7%]	Ls	1		4,051			3,363		2,303
CONTRACT AMOUNT (b)				61,927			51,400		35,204
PHYSICAL CONTINGENCIES [(b)*10%] (c)	Ls	1		6,193			5,140		3,520
ENGINEERING & SUPERVISION	Ls	1		6,812	85		5,790	0	0
[(b)+(c))*10%] (d)									
LAND ACQUISITION(Average) (e)	SQ.M	25	320,000	8,000	100		8,000	100	8,000
PROJECT COST [(b)+(c)+(d)+(e)]				82,932			70,330		46,724
AVERAGE COST PER KM				10,770					

MAINTENANCE BUDGET CALCULATION

Project Road No, NC -3 Na= 8,200 Baht/Km/year
(Proposed Road) Km= 1.001
Length = 7.700 Km

Asphalt Pavement

ITEMS	Proposed Road	
	Condition	Factor
1. Surface /Base Type	X1 AC	0.00
2. Subgrade CBR	X2 4 %	0.50
3. A.D.T	X3 4,800	1.76
4. Service Life (year)	X4 NEW	0.00
5. Pavement Width (m)	X5 7 m	0.19
6. R-O-W Width (m)	Y1 50 m	0.05
7. Shoulder, Access, Median Width (m)	Y2 2.50 m	0.05
8. Traffic Service Operation Topography	Y3 0 - 3 %	0.00
9. Drainage Topography	Y4 0 - 3 %	0.00
10. Bridge Quantity (m/Km)	Y5 5	0.00
11. NO. Of Lanes	2	

Ka(Existing) = 1+0.5(X1+X2+X3+X4+X5+Y1+Y2+Y3+Y4+Y5) = 2.275
 Maintenance cost + Overhead = Ka * Km * Na * 1.28 = 23,902 Baht/Km/year
 Total Cost(Existing) = Length *(Baht/Km/year) = 184,048 Baht/year
 Financial Cost = 184,000 Baht/year
 Economic Cost = 153,000 Baht/year
 (152,720)Baht/year

7) Construction Schedule

Project NC-3 Thap Put Bypass

year and Month	First Year												Second Year											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Land Acquisition	=====																							
Preparatory Works	=====																							
Earth Works	=====												=====											
Pavement Works													=====											
Bridge Works	=====												=====											
Miscellaneous Works	=====												=====											
Clearing-Up													=====											
Percentage Of Disbursement (%)	47 %												53 %											

8) Economic Evaluation

Project NC-3 Thap Put Bypass

(unit ; 1000 Baht)

Year	Const- ruction Cost	Mainte- nance Cost	Total Cost	VOC Saving	Time Saving	Balance	Sensi. Analysis Benefit= Cost=
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	38,407	0	38,407	0	0	(38,407)	(46,088)
1995	31,924	0	31,924	0	0	(31,924)	(38,309)
1996	0	85	85	11,468	10,255	21,638	17,276
1997	0	85	85	11,440	10,873	22,227	17,748
1998	0	85	85	11,411	11,491	22,817	18,219
1999	0	85	85	11,383	12,108	23,406	18,691
2000	0	85	85	11,354	12,726	23,996	19,162
2001	0	85	85	11,326	13,344	24,585	19,634
2002	0	85	85	11,298	13,962	25,174	20,106
2003	0	85	85	11,269	14,580	25,763	20,578
2004	0	85	85	11,241	15,198	26,352	21,050
2005	0	85	85	11,212	15,816	26,941	21,522
2006	0	85	85	11,184	16,434	27,530	21,994
2007	0	85	85	11,155	17,052	28,119	22,466
2008	0	85	85	11,127	17,670	28,708	22,938
2009	0	85	85	11,098	18,288	29,297	23,410
2010	0	85	85	11,070	18,906	29,886	23,882
Total	70,331	1,275	71,606	169,322	337,606	435,322	319,615
				IRR =		30.36%	21.55%
				NPV (i;12%) =		63,291	
				B/C (i;12%) =		2.65	

PROJECT NC-4

TRANG BYPASS

CHANGWAT: TRANG

2) ROUTE MAP

3.4 Trang Bypass (NC-4)

1) Summary

The aim of the project is to alleviate traffic congestion in the city centers of Trang and Huai Yot as well as to facilitate inter regional traffic on Route 4 along the west coast.

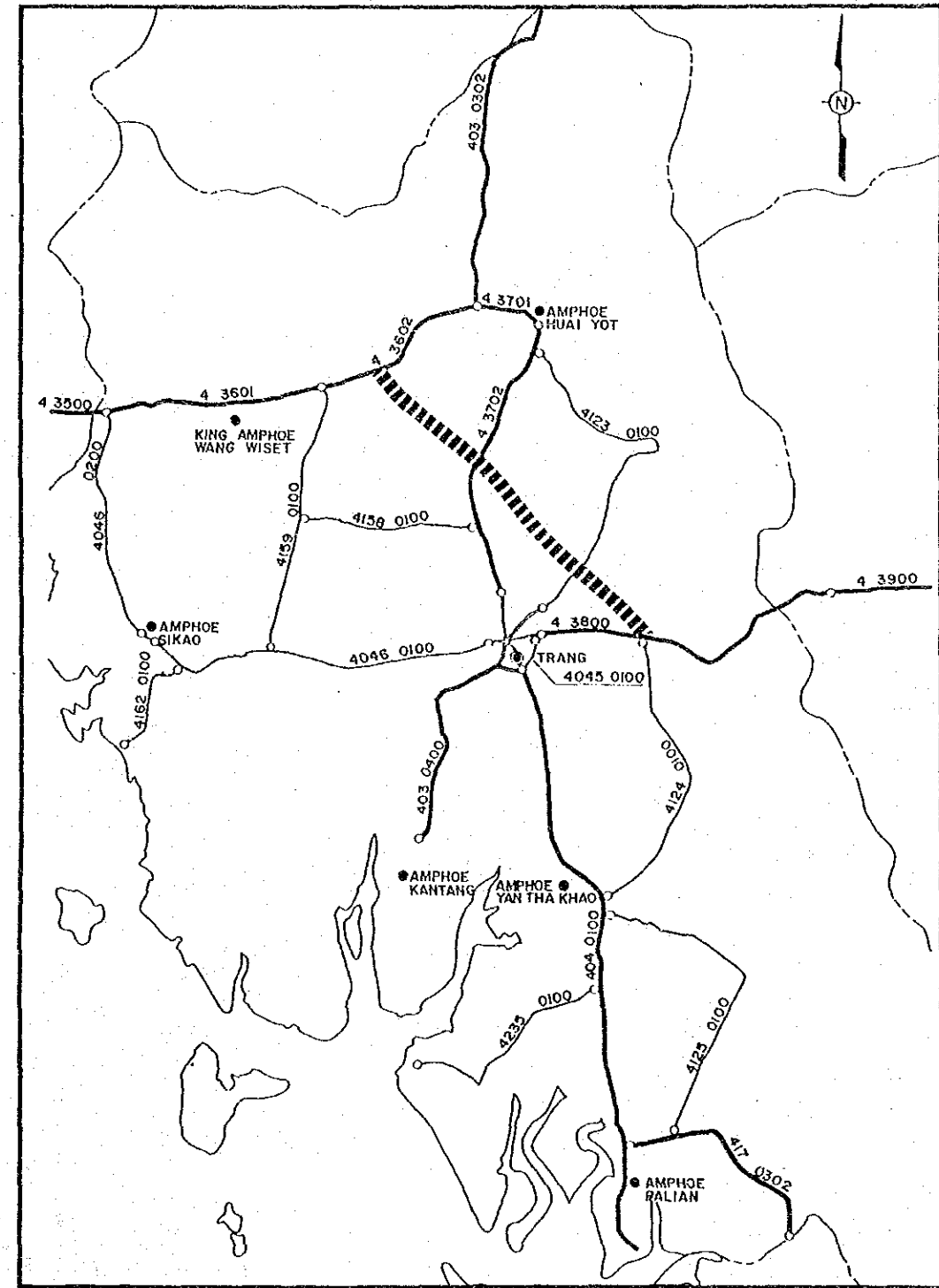
"P1" standard is applied to the bypass with asphaltic concrete carriageway of 7.0 meters and soil aggregate shoulders of 2.5 meters on both sides.

The length of the bypass is 30.7 kilometers from the junction with Route 4 to the junction with Route 4 and 4124. The whole length is for new construction. The bypass needs a long bridge to cross the Trang River. Height of the embankment is planned to be 3.0 meters in flat area where flooding damages are severe in rainy season.

NC-4	Description
Changwat	: Trang
Name or Location	: Trang Bypass
Road Class	: P1
Cross Section (m)	: 2.50+7.00+2.50
Surface Type	: SA /ASC / SA
Length: Total	: 30.7 km
DOH Road	: 30.7 km:New

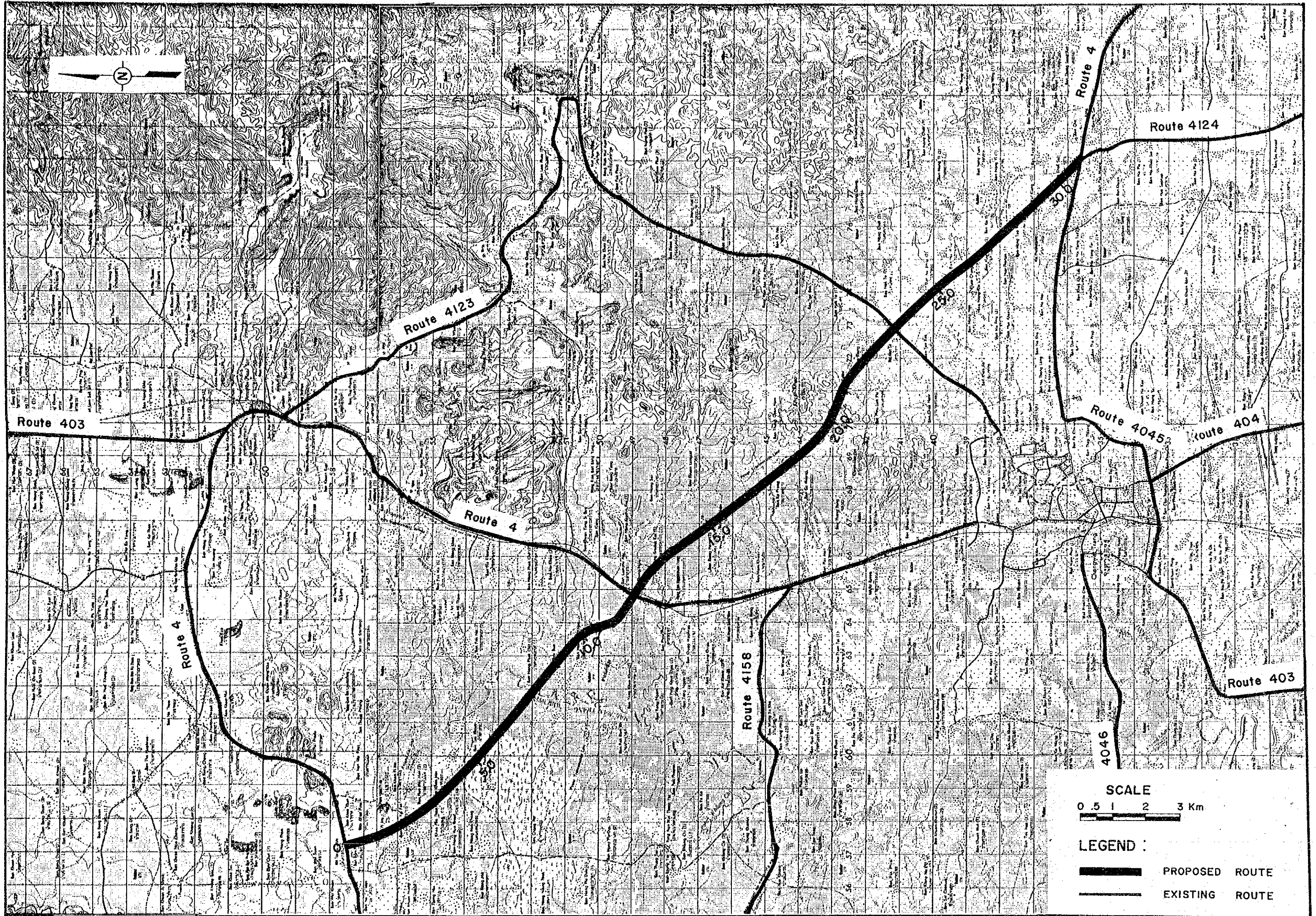
AADT<'96/'01/'06>	: 2,700 / 3,700 / 5,700

Financial Cost	: 383.1 million baht
NPV	: 6 million baht (12% discount rate)
B/C	: 1.0 (12% discount rate)
EIRR	: 12.3 %



LEGEND :

	PROJECT ROUTE		PROVINCIAL HIGHWAYS
	DIVIDED HIGHWAYS		CHANGWAT, AMPHOE
	NATIONAL HIGHWAYS		

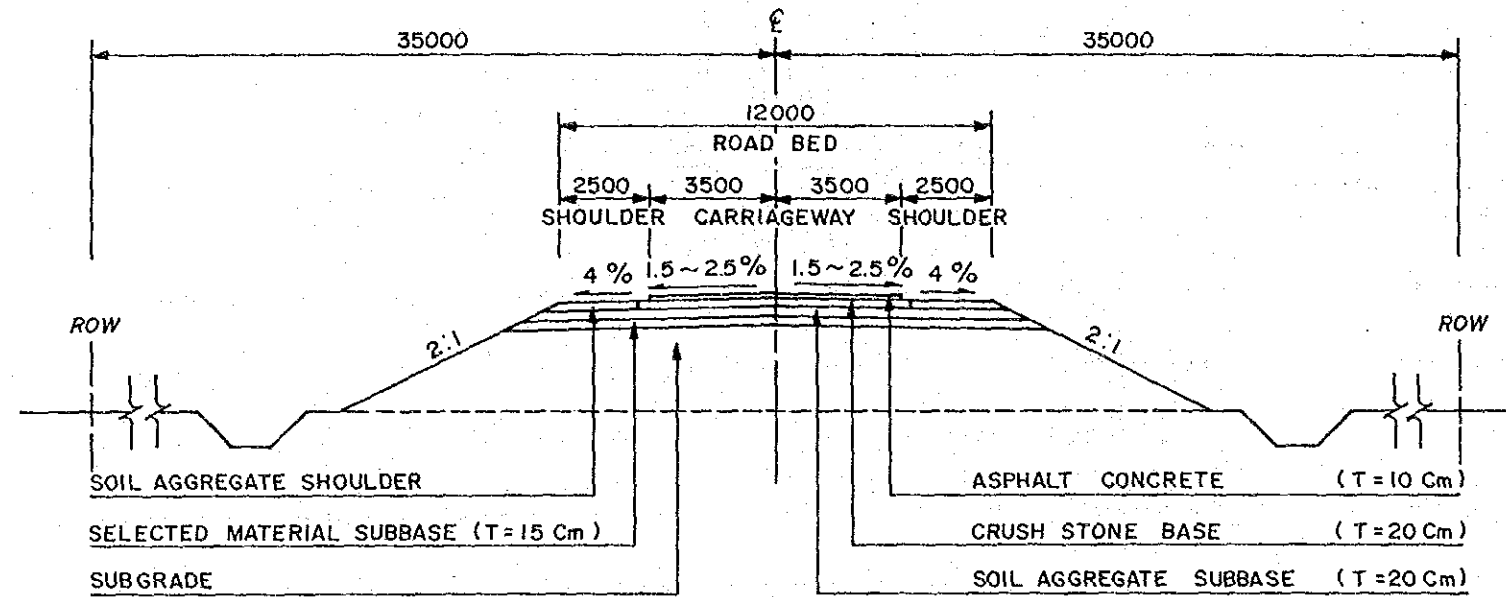


4) PROFILE OF PROJECT
PROJECT NO. NC-4: TRANG BYPASS

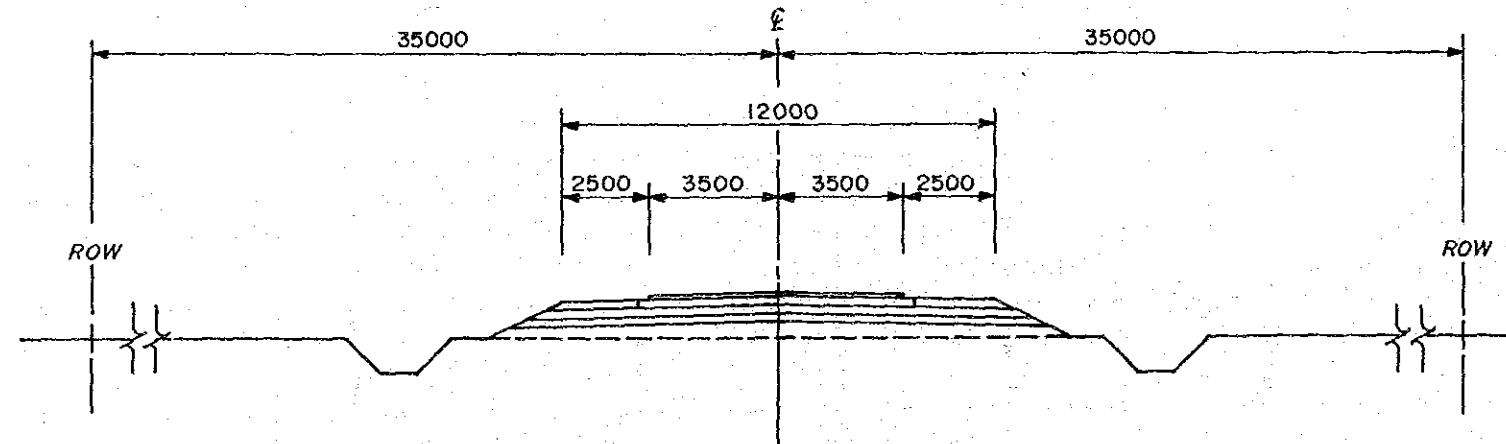
STATION (KM)		0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30											
VILLAGE ROAD INTERSECTION		J. Rt. 4 NONG PHAK CHIT HAN CHIN KHAD J. Rt. 4 NA NGE TON RIANG J. Rt. 4123 WAT KIANG J. Rt. 4											
LAND USE		ORCHARD ORCHARD, PLANTATION RICE											
TERRAIN		FLAT ROLLING FLAT ROLLING FLAT											
FLOODING LENGTH													
EXISTING CONDITIONS	RIGHT OF WAY												
	ALIGNMENT	HOR.											
		VER.											
	CROSS SECTION												
	SURFACE												
BRIDGES AND (Type - Width - Length (m))													
BOX CULVERTS (Width - Height - Length (m))													
PROPOSED CONDITIONS	CROSS SECTION	NC, PI, 2.5 (SA) + 7.0 (ASC) + 2.5 (SA) = 12.00 M, R/W = 70.00 M											
	EMBANKMENT / CUT (Height (m))	3.0 (E) 1.0 (E) 3.0 (E) 1.0 (E) 3.0 (E)											
	BRIDGES (Type - Width - Length (m))	0+000	2+000	4+000	7+600	10+000	12+700	16+600	22+000	23+100	25+500	26+100	27+400
				PC 12.0 x 80.0 (TRANG RIVER)		RC 12.0 x 30.0	RC 12.0 x 20.0		RC 12.0 x 20.0	RC 12.0 x 20.0	RC 12.0 x 20.0	RC 12.0 x 20.0	RC 12.0 x 20.0

5) TYPICAL CROSS SECTION

STA 0+000 ~ STA 2+000
 STA 4+000 ~ STA 10+000
 STA 22+000 ~ STA 30+700



STA 2+000 ~ STA 4+000
 STA 10+000 ~ STA 22+000



6) CONSTRUCTION QUANTITIES AND COSTS

CONSTRUCTION QUANTITIES AND COSTS
(Project NC -4 Length = 30.700 Km)
(Improved Length 30.700 Km)

ITEM	Unit	Financial		Financial		Economic cost		Residual Value	
		Unit Cost Baht	Quantity	Total cost 1000 Baht	%	1000 Baht	%	1000 Baht	
EARTH WORK									
Clearing & Grubbing	SQ.M	1	624,800	625		83		90	
Roadway Excavation(Unclassified)	CU.M	30	0	0					
Embankment(Borrowed Material)	CU.M	100	832,399	83,240					
Slope Protection(Stripe Sodding)	SQ.M	6	286,655	1,720					
Sand Mat (t=0.5m)	SQ.M	50	0	0					
Excavate Existing									
Surface	SQ.M	2	0	0					
Thickness Over 10cm (2 Lay)	SQ.M	14	0	0					
SUB TOTAL				85,585		71,035		63,932	
SUBBASE AND BASE COURSES									
Subbase(Selected Material)	CU.M	190	67,233	12,774		83		50	
Subbase(Soil Aggregate)	CU.M	190	89,644	17,032					
Base Courses(Crush Stone)	CU.M	280	46,664	13,066					
Shoulder(Soil Aggregate)	CU.M	190	27,016	5,133					
SUB TOTAL				48,006		39,845		19,922	
SURFACE COURSES									
Asphaltic Prime coat	SQ.M	13	214,900	2,794		83		50	
Asphaltic Tack coat	SQ.M	7	214,900	1,504					
Asphalt concrete Surfacing	CU.M	1,900	21,490	40,831					
SUB TOTAL				45,129		37,457		18,729	
STRUCTURES(Equivalent)									
RC Pipe Culvert(D= 600 m)	M	1,380	2,344	3,235		83		50	
(D= 800 m)	M	1,950	0	0					
(D=1000 m)	M	2,650	0	0					
(D=1200 m)	M	3,850	0	0					
RC Box Culvert(1-2.40*2.40 m)	M	5,700	792	4,514					
RC Bridge Widening	SQ.M	9,600	0	0					
RC Bridge (W=15.0 m)	M	96,000	150	14,400					
PC Bridge (W=15.0 m)	M	150,000	80	12,000					
SUB TOTAL				34,149		28,344		14,172	
TOTAL (a)				212,868		176,681		116,754	
Miscellaneous Works [(a)*7%]	Ls	1		14,901		12,368		8,173	
CONTRACT AMOUNT (b)				227,769		189,048		124,927	
PHYSICAL CONTINGENCIES [(b)*10%] (c)				22,777		18,905		12,493	
ENGINEERING & SUPERVISION [(b)+(c)*10%] (d)				25,055	85	21,296	0	0	0
LAND ACQUISITION(Average) (e)				50 2,149,000	107,450	100 107,450	100	107,450	
PROJECT COST [(b)+(c)+(d)+(e)]				383,051		336,700		244,870	
AVERAGE COST PER KM				12,477					

MAINTENANCE BUDGET CALCULATION

Project Road No, NC -4 Na= 8,200 Baht/Km/year
(Proposed Road) Km= 1.001
Length = 30.700 Km

Asphalt Pavement

ITEMS	Proposed Road		
	Condition	Factor	
1. Surface /Base Type	X1 AC		0.00
2. Subgrade CBR	X2 4 %		0.50
3. A.D.T	X3 1,500		0.41
4. Service Life (year)	X4 NEW		0.00
5. Pavement Width (m)	X5 7 m		0.19
6. R-O-W Width (m)	Y1 70 m		0.15
7. Shoulder, Access, Median Width (m)	Y2 2.50 m		0.05
8. Traffic Service Operation Topography	Y3 0 - 3 %		0.00
9. Drainage Topography	Y4 0 - 3 %		0.00
10. Bridge Quantity (m/Km)	Y5 7		0.00
11. NO. Of Lanes	2		

$Ka(Existing) = 1 + 0.5(X1 + X2 + X3 + X4 + X5 + Y1 + Y2 + Y3 + Y4 + Y5) = 1.650$
 Maintenance cost + Overhead = $Ka * Km * Na * 1.28 = 17,336$ Baht/Km/year
 Total Cost(Existing) = $Length * (Baht/Km/year) = 532,207$ Baht/year
 Financial Cost = 532,000 Baht/year
 Economic Cost = 442,000 Baht/year
 (441,560) Baht/year

7) Construction Schedule

Project NC-4 Trang Bypass

year and Month	First Year												Second Year												Third Year											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Work Items																																				
Land Acquisition	=====																																			
Preparatory Works	=====																																			
Earth Works													=====												=====											
Pavement Works																									=====											
Bridge Works													=====												=====											
Miscellaneous Works													=====												=====											
Clearing -Up																									=====											
Percentage Of Disbursement (%)	30 %												44 %												26 %											

8) Economic Evaluation

Project NC-4 Trang Bypass

(unit ; 1000 Baht)

Year	Const- ruction Cost	Mainte- nance Cost	Total Cost	VOC Saving	Time Saving	Balance	Sensi. Analysis
						Benefit= Cost=	0.8 1.2
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	155,938	0	155,938	0	0	(155,938)	(187,126)
1994	115,190	0	115,190	0	0	(115,190)	(138,228)
1995	65,572	0	65,572	0	0	(65,572)	(78,687)
1996	0	336	336	4,607	10,664	14,935	11,814
1997	0	336	336	5,730	13,265	18,659	14,793
1998	0	336	336	6,853	15,866	22,383	17,772
1999	0	336	336	7,977	18,466	26,107	20,751
2000	0	336	336	9,100	21,067	29,831	23,730
2001	0	336	336	10,223	23,668	33,555	26,710
2002	0	336	336	11,346	26,268	37,280	29,689
2003	0	336	336	12,469	28,868	40,999	32,668
2004	0	336	336	13,592	31,468	44,712	35,647
2005	0	336	336	14,715	34,068	48,426	38,626
2006	0	336	336	15,838	36,668	52,140	41,605
2007	0	336	336	16,961	39,268	55,854	44,584
2008	0	336	336	18,084	41,868	59,568	47,563
2009	0	336	336	19,207	44,468	63,282	50,542
2010	0	336	336	20,330	47,068	66,996	53,521
Total	336,700	5,040	341,740	380,027	879,781	918,068	597,759
				EIRR =		12.34%	8.18%
				NPV (i;12%) =		6,398	
				B/C (i;12%) =		1.03	