APPENDICES FOR CHAPTER 9

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APPENDIX 9-1 Development Strategies and Major Projects by Region

APPENDIX 9.1-1 RECIONAL STRATECIES BY SECTOR AND SELECTED MAJOR ON-COING PROJECT, RECION I, II AND VIII

Region	Agriculture	Industry	Social Services	Infracture	Selected Major On-Going Projects
llocos (I)	* improvement of the technological, financial and maketing components of the different agricultural programs together with specialization in and intensification of the production of a number of high-valle, cash, crops while exercising cash, crops that production does not conflict with ecological objectives	* expansion of manufacturing and other industrial employment generating activities in the urpan centers, and household-based or small industries in the rural area further boost to tourism sector through the continuous development of tourists attractions	* strengthening of expanded rural health nervices and nutrition program * expansion of non-formal training of unemployed adults and out-of-school gouth	* expansion of irrigation facilities * improvement of exitical trunkline roads in depressed ances and extering road linkages to neighboring regions * development of railaage an alternate mode of land transport * vigorous pursuance of electrification; program and tapping of other sources of energy (geothermal energy)	1. Philippine Rural Infrastructure Project (PRIP) 2. National Irrigation System Amprovement I 5. Philippine-Japan Highway Loan Project - Phase II 4. Manila North Road Improvement Project
Gagayan Yalley (II)	* Sttainment of the nutzf- tion, expert generation and import substitution and energy development * priority for classift- cation of public forcet land to help establish an appropriate' land use pattern	* promotion of cottage and small industries, and secondarily, on selected medium industries	* additional social infrastructure aupport in under- served areas	construction of farm-to-market roads	1. Philippine-Japan Ekshvay Loan Project, Phace II 2. Magat River Multi-Purpose Project (Zover Phase) 5. Cagan Integrated Agricultural Beve- iopment Project 4. Philippine Rural Infrastructure Project 5. Chico River Irrigation Project 6. Magat River Multi-Purpose Project (Irrigation) 7. National Irrigation Systems Improvement Project I
Eastern Visayas (VIII)	* tapping of prine arable lands for expanded production and by developing new technologies for upland and marginal farms	* complement Metro Namila and Gebu in the promotion of new industrial ventures * operation of Tongonan Geothermal Project to provide energy requirement of the Copper Smelter and Phosphatic Pertilizer Plant and Industrial Estate in Icabel Leyte.	* realignment of new technologies and propertise on manpower deve- lopment facili- ties	* construction of road. bridges, ports and telecomunication facilities	1. West Leyte Road Improvement 2. Philippine-Japan Priendahlp Highway- 3. Samar Integrated Rural Development Project 4. Copper and Melter, Laabel, Leyte 5. Phosphatic Pertilizer, Kaabele, Leyte 6. Tokgonan Geothermal Power Project 7. Leyte-Samar Project 8. National Irrigation Systems Improvement Project I

APPENDIX 9.1-2(1) PROJECT LIST ON SELECTED ON GOING MAJOR PROJECTS (AS OF DECEMBER 1982)

	γ								····				
PROJECT DESCRIPTION		Upgrading of selected portions of the Manila North Road (Road No. 3) beginning at Laoag City in Ilocos Sur North until Allacspan, Cagayan Province (Road No. 5)	Improvement of about 225 kms. from Rosario, Pangasinan to Laoag,	Improvement of existing road sections of about 296 kms. to acceptable levels of service.	This project package includes 577 kms. of national roads and 230 kms. of minor roads.	It will serve as final link for the Doang Maharlika from Allacapan in Cagayan to Davao City.		The project involve the construction of fishing port complexes for efficient handling operations and improve shelter, maintenance and repair of fishing vessels.	Rehabilation of the tracks, bridges and communication system in the southern line of the Phil. National Railwavs (PNR) between Manila and Lensen		Construction and development of hydroelectric power plant at the Majat River multi-purpose Project with an initial capacity of 360 megawatts (MA), consisting of four (4) generating units at 90 MM each.	Construction of a pumped storage hydroelactric power plant with an aggregate installed capacity of 300 MM consisting of 2 generating capacity of 500 (KM) each. Basically operating as hydraulic accumulator system, the plant will supplement electric power in the Luzon Grid, specially during periods of off peak power demand.	
PROJECT COST (MILLION PESOS) (\$1 = P7.50)		363.35	544.913	18.109	1,576.8	247.47		854.297	476.9		672.14	1,930.51	•
PROJECT LOCATION		Laoag - Allacapan	Rosario - Laoag	West Leyte	Not Specified	Sorsogon - Samar, Leyte - Surigao		Sual, Lucena,Camaligan and Zamboanga	Manila - Legaspi		Ramon, Isabela	Laguna	
REGION		I and II	—	VIII	V, VI, VII Not Speci	v, VIII		I, IV, V,	۸		11	. 10	
SECTOR / PROJECT NAME	I INFRASTRUCTURE A. Road	1. Philippine - Japan Highway Loan Project, Phase II	2. Manila - North Road Improvement Project	3. West Leyte Road Improvement	4. 3rd IBRD Highway Package	5. Philippine - Japan Friendship Highway - Ferry Service Project	8, Ports	1. Fishing Port Package I Project		D. Power and Electrification	1. Magat River Multi - Purpose Project (Power Phase)	2. Kalayaan Pumped Storage Power Project (Stage I)	

APPENDIX 9.1 - 2 (2) PROJECT LIST ON SELECTED ON GOING MAJOR PROJECTS (AS OF DECEMBER 1982)

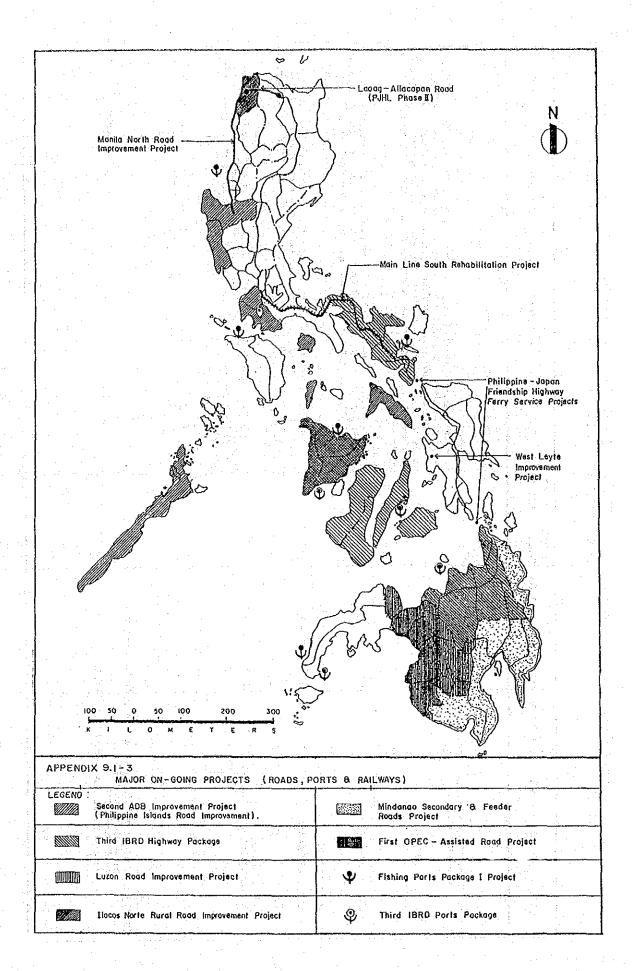
		·	··········		·			**************************************		·/·	
PROJECT DESCRIPTION	Involves the exploration and exploitation of geothermal resources in the Makiling - Banahaw areas in the Southern Tagalog region and the construction of power generation facilities for the third Mak - Ban Geothermal Power Plant including the supply and erection of the electromechanicalequipment.	Construction of power generation facilities with a total capacity of 110 (MM), consisting of 2 generating units at $55~{\rm MM}$ each.	Involves the generation of electric power, estimated to have a total generating capacity of 112.5 (MM), utilizing the geothermal resource potential of the Tongonan and Bunawen Geothermal Field.	Involves the installation of transmission lines (192 kms. of 138 KV and 45.5 Kms. of 69 KV) and construction of two substation facilities.		Upgrading and rehabilation of existing irrigation system in the project area and extend irrigation to about 19,700 has. of rainfed rice land.	The project seeks to accelerate the development of the Cagayan Valley through irrigation, flood control and provision of electric power. It is also aims to establish adequate system of domestic water supply, recreation and	Rehabilitation of existing irrigation and drainage system as well as constructing new irrigation facilities to allow year - round cultivation.	The project involves the installation of 240 deep wells and related equipment to supplement water supply for irrigating an additional 12,000 has. in areas where surface water is inadequate.		
PROJECT COST (MILLION PESOS)	993.04	790.32	490.99	254.62		548.0	681.206	1,844.010	221.351		
PROJECT LOCATION	Calauan, Laguna	Tiwi, Albay	Tongonan, Leyte	Leyte and Samar	:	Cagayan and Kalinga - Apayao	Isabela	Not Specified	Not Specified	-	
REGION	ΝI	> .	VIII	VIII	-	H	; 5-4 8-4	i, II, and VIII IV, V, VI IX, X, XI	III		
SECTOR / PROJECT NAME	3. Makiling - Banahaw Geothermal Power Project (Units 5.and 6)	4. Tiwi Geothermal Power Project (Units 5 and 6)	.S. Tongonan Geothermal Power Project	6. Leyte - Samar Circuit	E. Irrigation and Related Water Resources Project	1. Chico River Irrigation Project	2. Magat River Multi - Purpose Project	3. National Irrigation Systems Improvement Project I	4. Central Luzon Ground - water Irrigation Project		

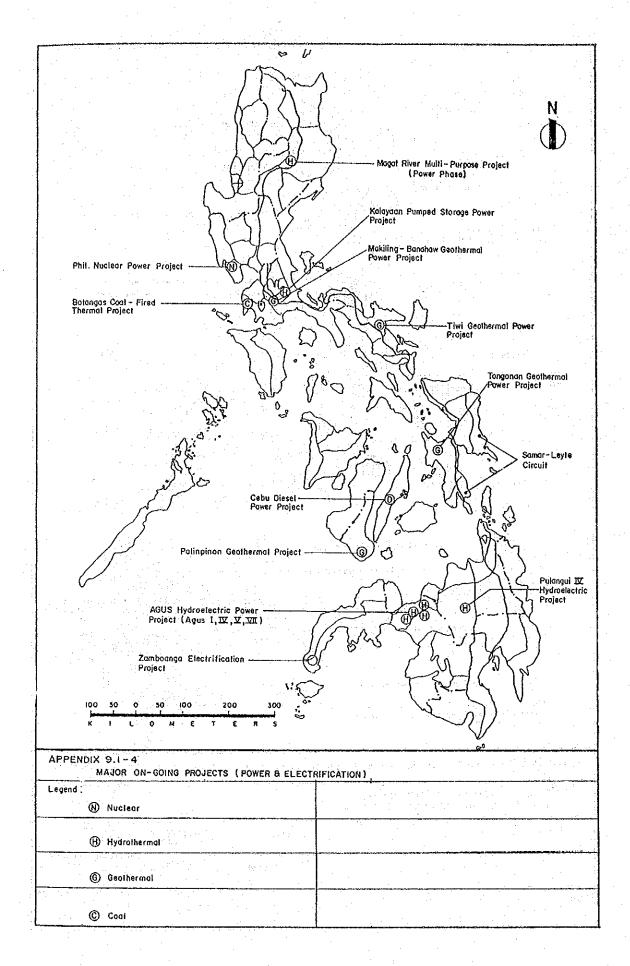
APPENDIX 9.1 ~ 2 (3) PROJECT LIST ON SELECTED ON GOING MAJOR PROJECTS (AS OF DECEMBER 1982)

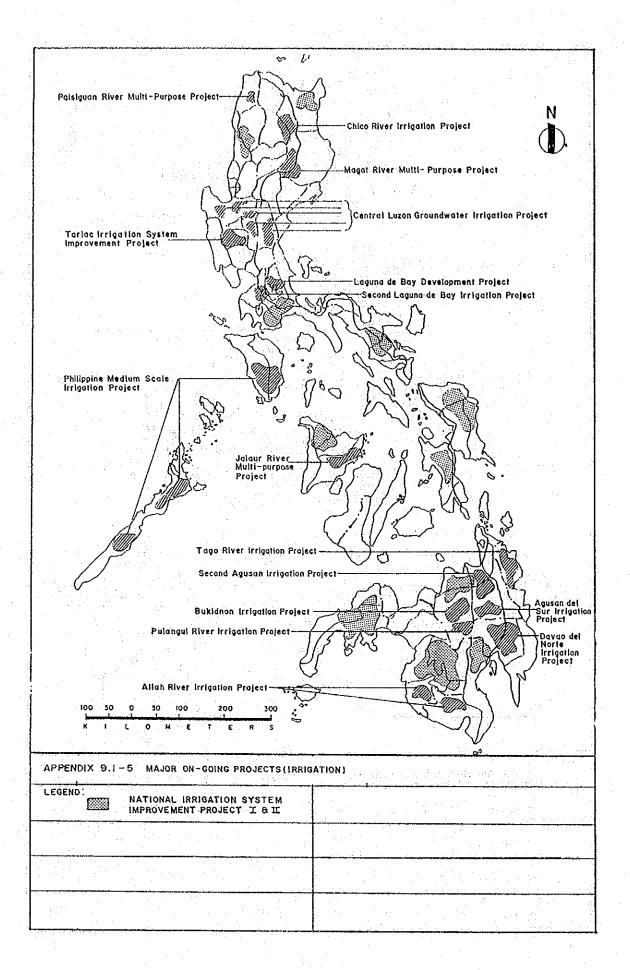
egrated Area Devel ject Libmanan Cabusao Area Development Roads Project Roads Project Roads Project Rinconada - Buhi/L Rinconada - Buhi/L And Population Project Cagayan Integrated cultural Developme cultural Developme	SECTOR, PROJECT NAME REGION PROJECT LOCATION (MILLION PESOS)	Integrated Area Development Project	Libmanan Cabusao Integrated V Libamanan and Cabusao, 78.91 Involves the construction of irrigation and drainage facilities, flood and salinity control structures, roads and social/institutional services in around	Secondary and Feeder V Camarines Sur and Albay 404.0 Involves the construction of 189.96 kms. of secondary roads. 252.34 kms. of feeder roads and 61 bridges.	Bicol River Basin Irrigation V Naga, Calabanga and 612.6 Involves the implementation of 2 integrated area development projects, namely: Naga - Calabanga and Reconada IDA's. It has 6 components irrigation and irrigation and related works, flood control; agricultural and institutional development; farm to market roads; rural waterworks development and watershed	Rinconada - Buhi/Lao V Buhi, Baao, Nabua and 75.26 Rehabilation and extension of the existing Lalo Irrigation system to about 1.500 hectares; development of Lake Buhi as water source of irrigation, construct 21 Km. of service roads, develop.watershed/agraforestation in 1,350 has. farmed by 900 small scale upland farmers.	Integrated Health, Nutrition V Camarines Sur, and 58.4 Involved the provision of health facilities to 400 barangays in Camarines and PopulationProject Albay and Albay, upgrading of the laboratory facilities of the 2 provincial tospitals; training of health aides and construction of health stations.	V Camarines Sur 69.0	Cagayan Integrated Agri- Cultural Development Project In Cagayan Province 501.98 Targeted to complete in 1983, the project includes agricultural development, projects.	Philippine Rural I, II, VI, Abra, Kalinga - Apayao, 531.0 Construction and rehabilitation of 51 communal irrigation facilities; 1,172 finfrastructure Project VII Aklan, Antique, Capiz. (Mns. of barangays roads and access roads; 3 ports in Panay; 60 barangay health (PRIP)
		lopment				/Lao	trition	>	ject	I, II VII

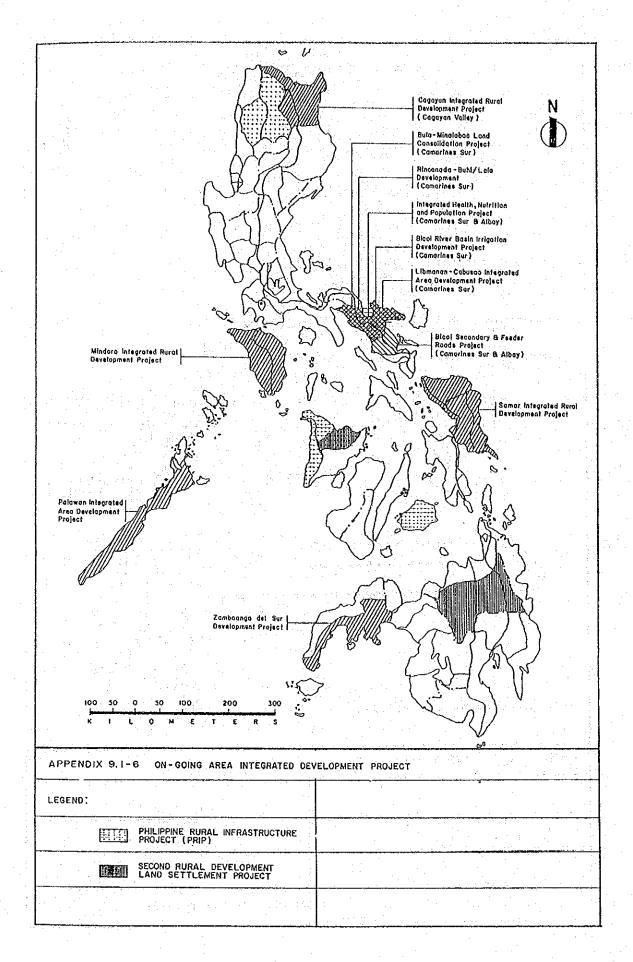
APPENDIX 9.1-2 (4) PROJECT LIST ON SELECTED ON GOING MAJOR PROJECTS (AS OF DECEMBER 1982)

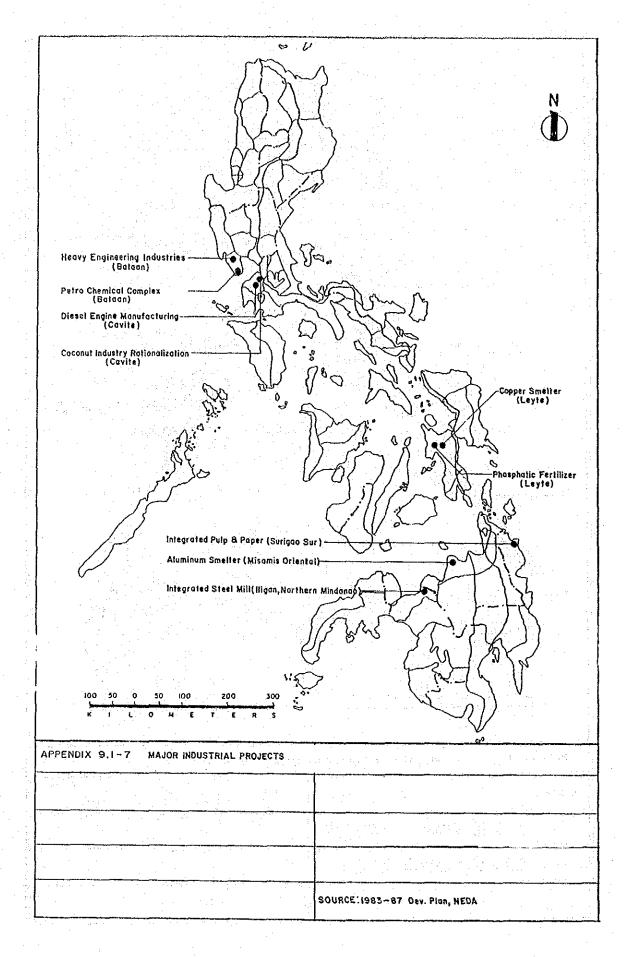
			PROJECT COST	
SECTOR / PROJECT NAME	REGION	PROJECT LOCATION	(MILLION PESOS)	PROJECT DESCRIPTION
9. Samer integrated Rural	VIII	Samar Island	599.69	CHBIC
Development Project.				Improvement of about 230 kms. of national roads in Eastern Samar; rehabilation of Port Catbalogan; construction and improvement of about 2,000 wells and 100 spring in small rural communities throughout the island; construction of 3 schistosomiasis control field laboratories and a mass chemotheraphy campaign and provision of consulting services to assist in carrying out F/S for Catubig Valley in Northern Samar.
				ADAB Construction of approx. 160 kms. of national secondary roads and around 80 bridges; 260 kms. of agricultural feeder roads, water supply systems, development of power distribution system (240 kms.) and agricultural development.
 Industry Copper Smelter 	VIII	Isabela, Leyte	\$343 M.	Establishment of a copper smelting and refining facilities designed to process locally manufactured copper concentrates into refined copper; the plant targeted to operate in mid-1983 have a production capacity of 138,000 MIPT copper cathodes; 442,000 MIPY sulfuria acid.
2. Phosphatic Fertilizer	VILL	Isabela, Leyte	\$484 M.	Targeted to operate during mid-1984 the project, with an annual production capacity of 153,000 MT ammonium sulfate; 253,000 MT of MP/NEK; 512,000 MT of DAP and 170,000 MT of MAP, will utilize the sulfuric acid output of the copper smelter project.
			:	
SQURCE: 1. Profiles of Major On-going Foreign as of 31 December 1982 NEDA, March 1983. 2. Five-year Phil. Development Plan, 1 MEDA.	ing Foreign ment Plan, 1	Assisted Projects 1983-87		











APPENDIX 9-2 Future Planning Framework

APPENDIX 9.2-1 POPULATION IN THE PROJECT AREA BY PROVINCE

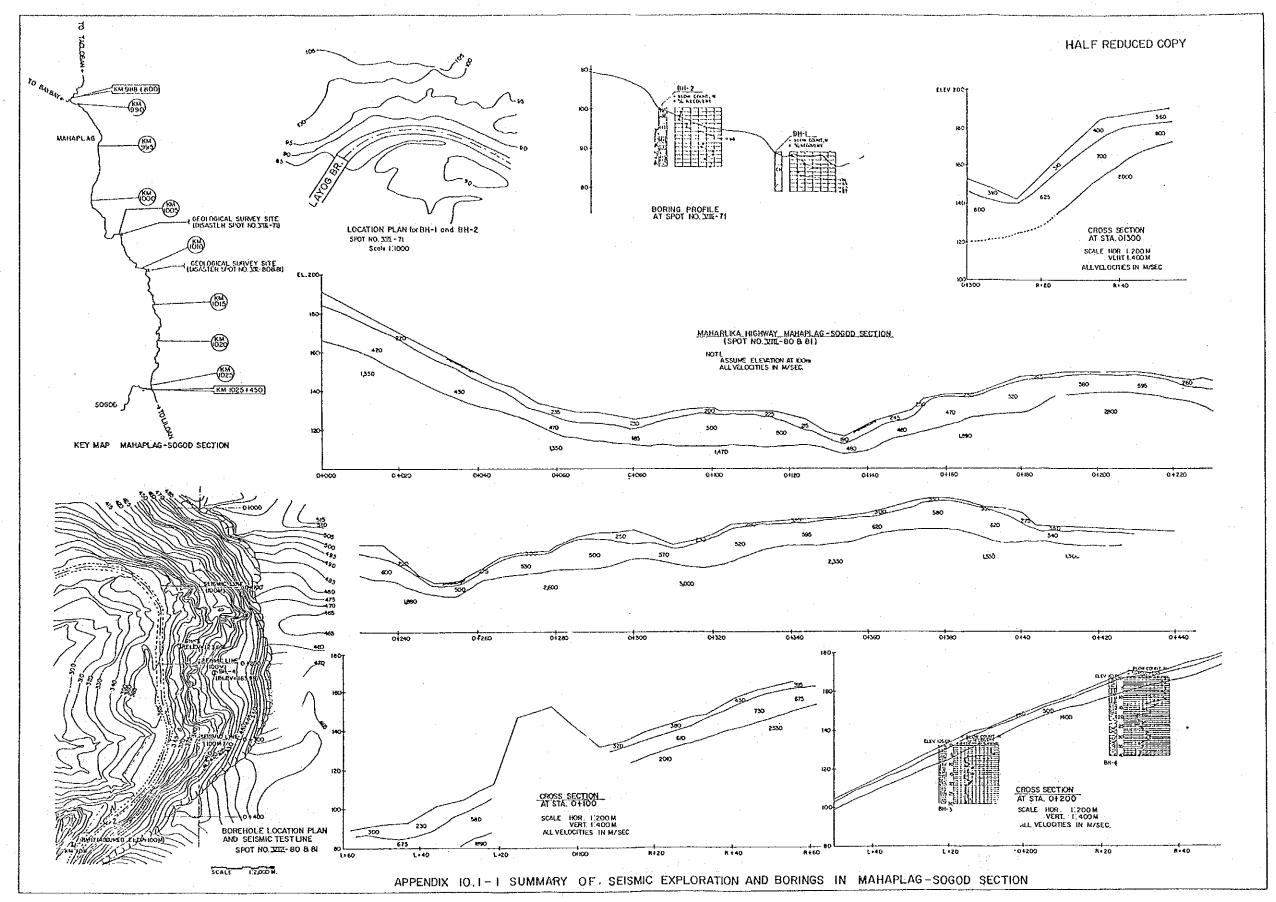
	1980	Popula 1990	tion 2000	2010		Frowth=Rates 1990-2000	2000-2010
Region I	3,540,891	4,086,000	4,422,000	4,659,000	1.4	0.8	0.5
ibra	160,198	181,000	195,000	205,000	1.2	0.8	0,5
Benquet	354,751	455,000	538,000	566,000	2.5	1,7	0.5
Ilocos Norte	390,666	434,000	451,000	475,000	1,1	0.4	0.5
Ilocos Sur	443,591	501,000	536,000	565,000	1.2	0.7	·: :
La Union	452,578	536,000	591,000	624,000	1.7	1.0	1,2
Mt. Province	103,052	120,000	132,000	139,000	1.5	1.0	0.5
Fangasinan	1,636,057	1,859,000	1,979,000	2,085,000	1.3	0.6	0.5
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Agrion II	2,215,522	2,784,000	3,273,000	3,740,000	2.5	1.6	1.3
Batanes	12,091	14,000	16,000	19,000	145	1.3	1.7
Cagayan	711,476	873,000	1,003,000	1,146,000	2.1	1.4	1.3
lfugac	111,368	136,000	156,000	178,000	2.0	1.4	1.3
Isabela	670,604	1,093,000	1,284,000	1,467,000	2.3	1.6	1.3
Kalinga-Apayao	185,063	238,000	285,000	326,000	2.6	1.8	1.3
Nueva Vizcaya	241,690	515,000	382,000	457,000	2.7	2.0	1.3
Quirino	83,250	115,000	147,000	167,000	3.5	2.5	1.5
					gun a de		
Region Ill	4,802,793	5,988,000	<u>6,464,000</u>	7,875,000	2.2	1.5	1.2
Bataan	323,254	446,000	564,000	639,000	3.3	2.4	1.3
Bulacan	1,096,046	1,394,000	1,633,000	1,846,000	2.4	. 1.6	1.2
Kueva Ecija	1,069,409	1,317,000	1,512,000	1,710,000	2.1	1.4	1.2
Pampanga	1,181,590	1,442,000	1,667,000	1,884,000	2.0	1.5	1.2
Tarlec	688,457	836,000	950,000	1,075,000	2.0	1.3	1,2
Zaupales	444,037	553,000	638,000	721,000	2.2	1.4	1.2
D _:_ NTTT	0.000.77						
Recion VIII	2,799,534	3,358,000	3,763,000	4,054,000	1.8	1.2	0.7
Eastern Samar	320,637	405,000	479,000	516,000	2.4	1.7	0.7
Leyte	1,302,648	1,541,000	1,690,000	1,821,000	1.7	0.9	0,7
Northern Samar	378,516	465,000	537,000	578,000	2.1	1.5	0.7
Southern Leyte	296,294	356,000	397,000	428,000	1.9	1.1	0,7
Vestern Samer	501,439	591,000	660,000	711,000	1.7	1,1	0.7

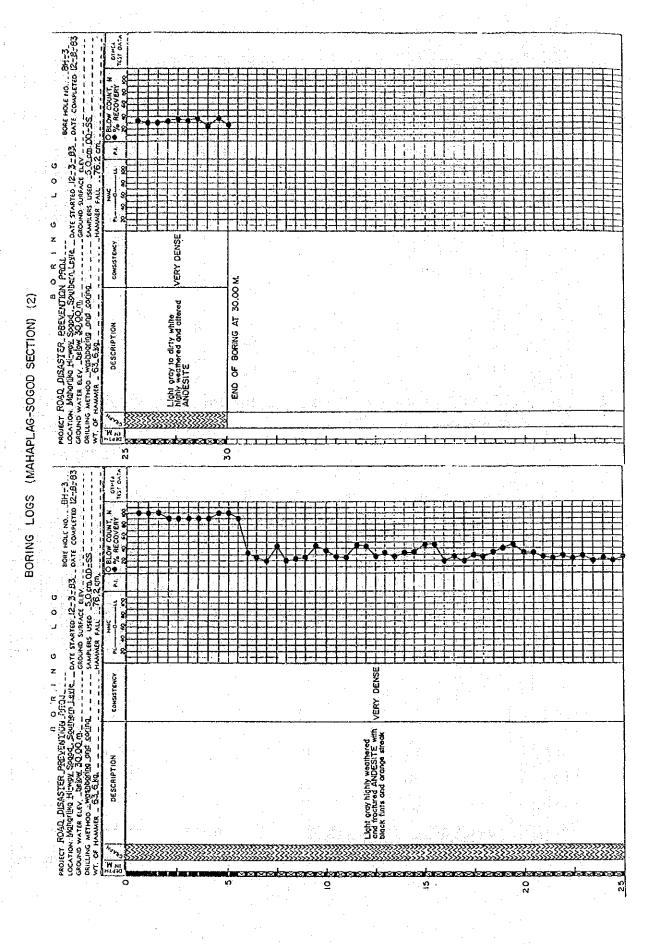
APPENDIX 9.2-2 EXPECTED GROWTH OF AGRICULTURAL OUTPUT BY REGION, 1982-87

	Philippines	R	E G I () N VIII
Food Crop	4.9		*	
Palay	3.6	4.8	6.3	1.3
Corn	11.9	4.8	6.0	1.3
Vegetables	-	4.8	16.4	<u>.</u>
Fruits	4+	4.8	5.5	· -
Commercial Crop				
Tobacco	-	4.8	5.5	
Sugar	5.6	<u></u> .	7.1	1.2
Coconut (Copra)	0.9	· •	4.1	6.9
Fish	6.2	4.7	5.4	4.5
Meat	7.3	4.8	4.6	1.3
Forestry	1.7	5.3	2,2	
Mining	10.1	11.7		
GRDP	6.3	7.2	7.4	7.6

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10 - 4	Condition of Disaster and Selected Countermeasures	227

Appendix 10-1 Summary of Geological Survey

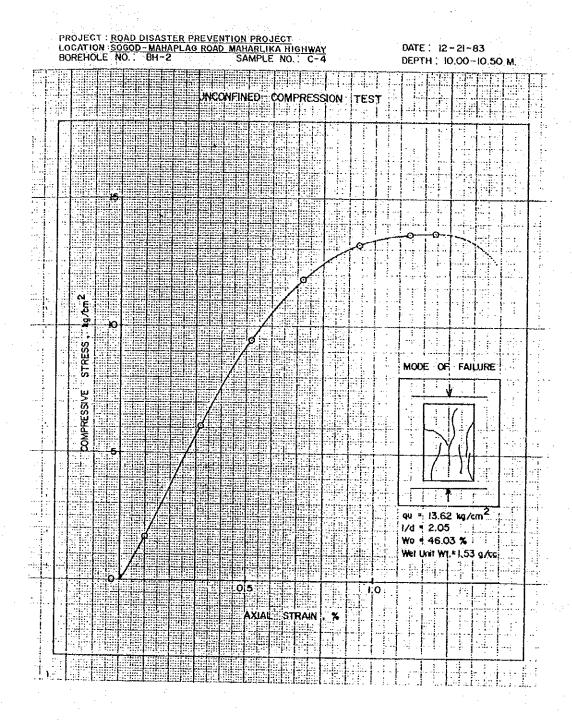




BORE TO GORE HOLE NOT THE PROPERTY PROVIDED BY THE BORE TO GORE HOLE NO. BIT A COLOSTON MATERIAL NIT WAY SORDE SUMERIAL ENTED 11-30-83, DATE COMPLETED 12-32-83, DATE COMPL VERY DENSE COMSISTENCY END OF BORING AT 40,00 M. Dark to light gray weathered and fractured DACITE BORING LOGS (MAHAPLAG-SOGOD SECTION) (3) DESCRIPTION ロベローアビ 23 PROJECT ROAD DISASTER PREVENTION PROJECT IN G LOG UORE HOLE NO. BH-4
CACATION MORPHING L'EMPLY SOUR SOUTHER LEUE DATE STARTE UL 20-83 DATE COMPLETED IZ-7Z-83
CACATION MATRICULE MOSTBACING DATE SOUTHER SECOND SURVEY (1879)
CALLING METHOD MOSTBACING DATE SOUTH SOUTHER SOUTH SOUTHER SOUTH S C1115. O BLOW COUNT, N CHES 1 VERY DENSE CONSISTENCY Grayish brown silty SAND with traces of weathered andesite gravel Graysh brown sandy SILT with traces of weathered andesite gravel Reddish gray to gray weathered and tractured ANDESITE Brownish gray sandy TUFF with traces of weathered andeste gravel Dark aray weathered and fractured DACITE DESCRIPTION ö ₽ 20

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. .		PROJECT: ROAD DISASTER PREVENTION PROJECT LOCATION Sugod-Hahaplag Road, Maharlika Hi-way	i		Ξ		0.00-045	0.55-1,00	1.00-1.45	1.55-2.00	2.00-2.45	2.55-3.00	3,00-3,45	3.55-4.00	4.00-45	4.55-5.00	5.00-5.45	5.55-6.00 26 51	6.00-6.45	6.55-7.00	7.00-7.45	7.55-8.00	8.00-8.35			
APPENDIX 10.1-3 SUMMARY OF LABORATORY TEST RESULTS (MAHAPLAG-SOGOD SECTION)		ŒΣ			+ }		ő	0.5	۱.0	3.	, o	2.5	, o	3.5	Ğ,		ě,	5.5	9 0	6.5	Щ.		80			:
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ENE		PROJECT: ROAD DISASTER PREVENTION PROJECT LOCATION: Sugod-Mahaplag Road, Mahaplika Hi	SUMMARY OF LABORATORY TEST	E E	ī		69	99	65	82	26	×	3	5,	25	22	-5	22	36	82	3	3	3	58	56	Ī
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APPENDIX 10.1-4 UNCOFINED COMPRESSION TEST

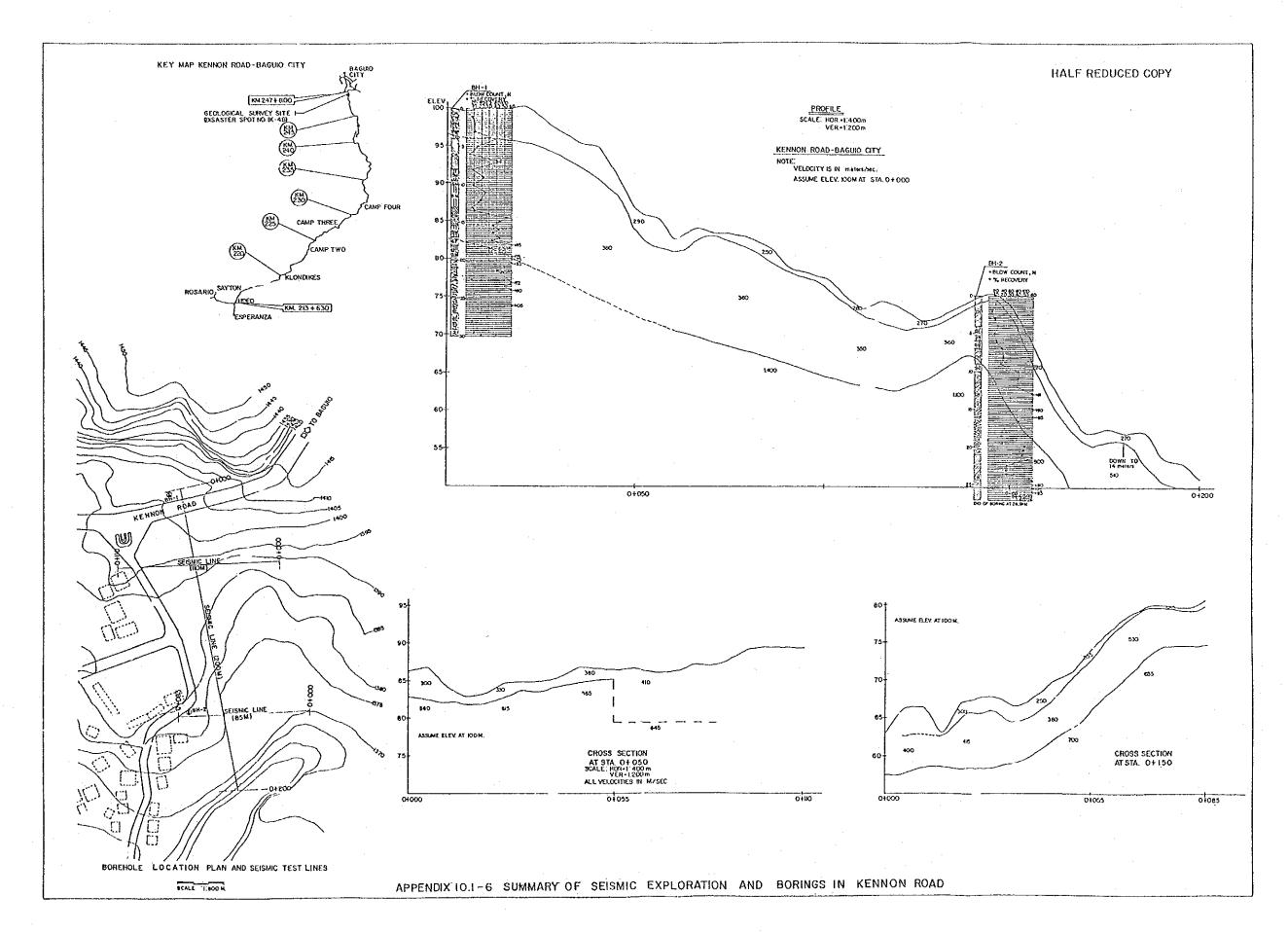


SPOT NO.	APPENDIX 10.1-5 SUMMARY OF SEISMIC REFRACTION (MAHAPLAG-SOGO Results of seismic refraction Scale Hor. 1:200 m Vert. 1:100 m All velocities in M/sec.	Description
.VIII- 75	C(X 54 - 1520 1520 1520 1520 1520 1520 1520 1520	Montle soil covering and highly to moderately weathered and fractured ANDESITE
	249	
<u>√</u> III77	ELEX. 234 - 370 211 - 500 210 - 800 211 - 800	Same as VIII-75 however, overburden thickness is smaller in VIII-75
	241 - 1620 244 - 245 -	
	11 530 10 11 550	Reddish brown soil cover underlain by moderately to highly weathered
⊻ 111-87	424 - 7 870 100 421 - 421 - 421 - 410 - 410 - 2000	AGGLOMERATES
	407 -	

SUMMARY OF SEISMIC REFRACTION (MAHAPLAG-SOGOD SECTION) (2)

SPOT NO.	Results of seismic refraction survey Scale Hor, 1:200m All velocities in M/sec	Description
. <u>√</u> III.~90	10 + 110 10 10 10 10 10 10 10 10 10 10 10 10	Brownish soils cover underlain by highly to moderately weathered AGGLOMERATES
∑III −100	ELEV 244 242 240 238 236 234 232- 230- 228- 226- 224- A+X2 220- 216- 214- 870 YEAL NOR. 1: 700 N YEAL 1: 700 N	Topsoil is underlain by ANDESITES of various weathering grades
VIII-103	6 740	Same as VIII-100, but jointing and weathering is more intense

	SUMMARY OF SEISMIC REFRACTION (MAHAPLAG-SOGOD	SECTION) (3)
SPOT NO.	Results of seismic refraction survey Hor. 1:200 m Scale Vert. 1:100 m All velocities in M/sec	Description
₩ II-104	13+100 (LEV 141 - 1	Totally weathered ANDESITE
VIII- 107	17 - 720 17 - 7	Totally weathered AGGLOMERATES with highly jointed section
	11 11 35 34 2530	



HADISCA ROAD, DISASTER, PREVENTION PROJ. LOG BORE HOLE HID. BH-1 CACATION. RETION RETION RETION RETION RETION RETION RETION SHARED TO THE STATED TO THE COMPLETED TO THE COMPLET VERY DENSE CONSISTENCY END OF BORING AT 30,00 M. Light gray highly weathered and esiric. BRECCIA DESCRIPTION (KENNON ROAD) (I) sasasal.... S ន APPENDIX 10.1-7 BORING LOGS HADIECT ROAD, DISASTER, PREVENTION, PROJ.
LOCATION, KRINDE, FILE BORDING, CHILLIAN, PROJ.
LOCATION, KRINDE, FILE BORDING, CHILLIAN, BATE STANTED, 10-26-83 DATE COMMETTED 10-31-83
CHILLIANG, METHOD, WESTBORTING, ODD SQUING, SAMPLIEN USED, 550-670, 00-55
WIT OF HAMMER, 50-58. 中が **JERY DENSE** COMBISTENCY STIFF LOOSE LOOSE DENSE DENSE STIFF STIFF STIFE HARD FIRM FIRM FIRM M FIRM Very moist brown sandy sitty CLAY Very maist arange to reddish brown sitty CLAY with sand Very moist to moist groysh brown silty SAND with a little gravel Moist dry brownish to light gray cloyey slifty SAND Moist to dry gravelly SAND Very moist reddish brown sandy sittly CLAY Very moist reddish brown sandy silly CLAY Moist grayish to reddish brown silty SAND DESCRIPTION 8

RODECT RODED DISASTER PREVENTION PROV.

LOCATION KERNOL BU BORID, CHY
GROUND WATER ELEY, IZ 90 m.
GROUND WATER ELEY, IZ 90 m.
ORILING METHOD WESTIRE ELEY
ORILING METHOD WESTIRE ELEY
WIT OF HAMMER ST 5 5 M. COMPETENCY HARD END OF BORING AT 26.91 M. Very moist dark brown sitty CLAY with sand DESCRIPTION BORING LOGS (KENNON ROAD) (2) X õ 7 单 VERY STIFF Light gray slightly weathered VERY DENSE VERY STIFF CONSISTENCY STIFF LOOSE DENSE FIRM HARD HARD STIFF FIRM HARD FIRM Maist to very maist reddish to yellowish brown silty CLAY with a little sand Moist grayish brown highly weathered tuffaceous siliy CLAY Moist brownish gray highly weathered tuffaceous SAND Moist yellowish to grayish brown clayey sifty SAND DESCRIPTION ő

APPENDIX 10.1-8 SUMMARY OF LABORATORY TEST RESULTS (KENNON ROAD)

PROJECT: ROAD DISASTER PREVENTION PROJECT LOCATION: KENNON ROAD, BAGUIO CITT

PROJECT: ROAD DISASTER PREVENTION PROJECT LOCATION: KENNGN ROAD, BAGUIO CITY

SUMMARY OF LABORATORY TEST RESULTS

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OZ.	ER) PARONNO SIEVE	0 0 07		96 89 81 72 65	34 01 05 50 50	86 68 52 41 37	93 86 74 62 54	90 80 68 62 53	42 66 66 66	99 96 91 79 77	71 50 38 34 28 89 70 65 61 40	88 71 58 54 42	77 54 41 36 27	71 55 44 36 32	99 95 90 80 71	99. 93 82 73 65	92 89 87 71 62	14 00 04 01 41	87 62 44 67 78	86 68 53 45 34	26 17 9	45 57 30 14	96 82 53 34	86 83 72 53 27	82 65 54 48 36	71 59 49 39 32	79 65 45 37 29	54 41 22 20 16	57 42 38 31	54 45 33 26 25	58 53 48 43 33	2 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	. (% FHER) PASONG SIEVE	4 10 20 40 40		96 89 81 72 65	34 01 05 50 50	68 52 41 37	93 86 74 62 54	96 90 80 68 62 53	95 90 79 74	99. 99 96 91 79 77	87 71 50 38 34 28 04 89 79 65 61 49	100 88 71 58 54 42	77 54 41 36 27	88 71 55 44 36 32	100 99 95 90 80 71	93 82 73 65	92 89 87 71 62	88 74 51 15 27 47	02 83 62 44 24 15	96 86 68 53 45 34	53 40 26 17 9	45 57 30 14	96 82 53 34	90 86 83 72 53 27	91 82 65 54 48 36	83 71 59 49 39 32	79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	71 54 45 33 26 22	94 58 53 48 43 33	91 62 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	. (% FHER) PASONG SIEVE	3/8 4 10 20 40 40		96 89 81 72 65	34 01 05 50 50	86 68 52 41 37	93 86 74 62 54	90 80 68 62 53	42 66 66 66	99. 99 96 91 79 77	100 87 71 50 38 34 28 07 04 89 70 65 61 50	100 88 71 58 54 42	77 54 41 36 27	71 55 44 36 32	100 99 95 90 80 71	99. 93 82 73 65	92 89 87 71 62	14 00 04 01 41	02 83 62 44 24 15	96 86 68 53 45 34	67 53 40 26 17 9	45 57 30 14	96 82 53 34	100 90 86 83 72 53 27	95 91 82 65 54 48 36	93 83 71 59 49 39 32	93 91 79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	82 71 54 45 33 26 22	58 53 48 43 33	2 56 43 40 33	90 79 58 43 54 27 89 76 59 48 56 28
TEST R	ANALYSIS, (% FINER) PASSING SIEVE	4 10 20 40 40		96 89 81 72 65	34 01 05 50 50	86 68 52 41 37	93 86 74 62 54	96 90 80 68 62 53	42 66 66 66	99. 99 96 91 79 77	87 71 50 38 34 28 04 89 79 65 61 49	100 88 71 58 54 42	77 54 41 36 27	88 71 55 44 36 32	100 99 95 90 80 71	99. 93 82 73 65	92 89 87 71 62	88 74 51 15 27 47	02 83 62 44 24 15	96 86 68 53 45 34	53 40 26 17 9	45 57 30 14	96 82 53 34	100 90 86 83 72 53 27	95 91 82 65 54 48 36	93 83 71 59 49 39 32	79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	71 54 45 33 26 22	94 58 53 48 43 33	91 62 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	BEVE ANALYSIS, (% FINER) PASSING SIEVE	1 3/4 3/8 4 10 20 40 40		100 96 89 81 72 65	100 34 01 05 50 50	100 86 68 52 41 37	100 93 86 74 62 54	100 96 90 80 68 62 53	100 99 95 90 79 74	100, 99, 99, 96, 91, 79, 77	100 87 71 50 38 34 28	100 88 71 58 54 42	77 54 41 36 27	88 71 55 44 36 32	100 99 95 90 80 71	100 99 93 82 73 65	100 92 89 87 71 62	100 94 124 10 20	02 83 62 44 24 15	96 86 68 53 45 34	67 53 40 26 17 9	100 60 42 37 30 14	100 99 96 82 53 34	100 90 86 83 72 53 27	100 95 91 82 65 54 48 36	93 83 71 59 49 39 32	93 91 79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	82 71 54 45 33 26 22	94 58 53 48 43 33	91 62 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	BEVE ANALYSIS, (% FINER) PASSING SIEVE	1 3/4 3/8 4 10 20 40 40		96 89 81 72 65	100 34 01 05 50 50	86 68 52 41 37	100 93 86 74 62 54	96 90 80 68 62 53	42 66 66 66	99. 99 96 91 79 77	30 100 87 71 50 38 34 28	100 88 71 58 54 15	100 27 54 41 36 27	88 71 55 44 36 32	100 99 95 90 80 71	31 100 99 93 82 73 65	42 00 92 89 87 71 62	100 94 124 10 20	02 83 62 44 24 15	96 86 68 53 45 34	67 53 40 26 17 9	100 60 42 37 30 14	96 82 53 34	100 90 86 83 72 53 27	95 91 82 65 54 48 36	93 83 71 59 49 39 32	93 91 79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	82 71 54 45 33 26 22	94 58 53 48 43 33	91 62 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	BEVE ANALYSIS, (% FINER) PASSING SIEVE	1 3/4 3/8 4 10 20 40 40		100 96 89 81 72 65	200 34 61 65 56 50	100 86 68 52 41 37	44 100 93 86 74 62 54	100 96 90 80 68 62 53	42 66 66 66 001 24	100, 99, 99, 96, 91, 79, 77	100 87 71 50 38 34 28	100 88 71 58 54 15	77 54 41 36 27	88 71 55 44 36 32	100 99 95 90 80 71	100 99 93 82 73 65	42 00 92 89 87 71 62	14 15 40 10 44 00 10 14 15 14 15 15 15 15 15 15 15 15 15 15 15 15 15	02 83 62 44 24 15	96 86 68 53 45 34	67 53 40 26 17 9	100 60 42 37 30 14	100 99 96 82 53 34	14 100 90 86 83 72 53 27	100 95 91 82 65 54 48 36	93 83 71 59 49 39 32	93 91 79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	82 71 54 45 33 26 22	94 58 53 48 43 33	91 62 56 43 40 33	79 58 43 34 27 76 59 48 36 28
TEST R	BEVE ANALYSIS, (% FINER) PASSING SIEVE	1 3/4 3/8 4 10 20 40 40		100 96 89 81 72 65	100 34 61 65 56 50	24 29 100 86 68 52 41 37	74 32 44 100 93 86 74 62 54	61 27 34 100 96 90 80 68 62 53	72 30 42 100 99 95 90 79 74	43 100, 99, 99 96 91 79 77	30 100 87 71 50 38 34 28	100 88 71 58 54 16	100 27 54 41 36 27	88 71 55 44 36 32	25 100 99 95 90 80 71	57 26 31 100 99 93 82 73 65	74 32 42 100 92 89 87 71 62	10 20 20 10 24 00 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10	02 83 62 46 24 15	96 86 68 53 45 34	67 53 40 26 17 9	100 60 42 37 30 14	12 100 99 96 82 53 34	32 14 100 90 86 83 72 53 27	12 100 95 91 82 65 54 48 36	93 83 71 59 49 39 32	93 91 79 65 45 37 29	86 54 41 22 20 16	84 68 57 42 38 31	82 71 54 45 33 26 22	94 58 53 48 43 33	100 91 62 56 43 40 33	100 90 79 58 43 54 27
OZ.	ANALYSIS, (% FINER) PASSING SIEVE	1 3/4 3/8 4 10 20 40 40		33 40 100 96 89 81 72 65	05 05 50 100 46 001	24 29 100 86 68 52 41 37	74 32 44 100 93 86 74 62 54	61 27 34 100 96 90 80 68 62 53	30 42 100 99 95 90 79 74	73 30 43 100 99 99 99 96 91 79 77	16 10 10 100 87 71 50 38 34 28 38 54 28 38 62 64 40 80 100 89 65 64 40 80 100 80 80 80 80 80 80 80 80 80 80 80 80 8	100 88 21 48	100 27 54 41 16 27	100 88 21 55 44 36 32	52 27 25 100 99 95 90 80 71	57 26 31 100 99 93 82 73 65	74 32 42 100 92 89 87 71 62	14 15 10 10 14 10 10 10 10 10 10 10 10 10 10 10 10 10	71 72 04 62 17 00 001	10 96 86 68 53 45 34	100 67 53 40 26 17 9	100 60 42 37 30 14	45 33 12 100 99 96 82 53 34	46 32 14 100 90 86 83 72 53 27	6 44 32 12 100 95 91 82 65 54 48 36	11 100 93 83 71 59 49 39 32	3 100 93 91 79 65 45 37 29	100 86 54 41 22 20 16	100 84 68 57 42 38 31	7 100 82 71 54 45 33 26 22	100 94 58 53 48 43 33	100 91 62 56 43 40 33	100 90 79 58 43 54 27
TEST R	ATTERBERG LAMT BECVE ANALYSIS, (% FINER) PASONIG SIEVE	LL PL Pl 1 3/4 3/8 4 10 20 40 40		41 73 33 40 100 96 89 81 72 65	25 05 50 10 36 001	37 53 24 29 1100 94 82 66 56 45	48 74 32 44 100 93 86 74 62 54	61 27 34 100 96 90 80 68 62 53	50 72 30 42 100 99 95 90 79 74	51 73 30 43 100 99 99 96 91 79 77	16 10 10 100 87 71 50 38 34 28 38 54 28 38 62 64 40 80 100 89 65 64 40 80 100 80 80 80 80 80 80 80 80 80 80 80 80 8	100 88 21 48	100 27 54 41 16 27	100 88 21 55 44 36 32	52 27 25 100 99 95 90 80 71	57 26 31 100 99 93 82 73 65	74 32 42 100 92 89 87 71 62	14 15 10 10 14 10 10 10 10 10 10 10 10 10 10 10 10 10	71 72 04 62 17 00 001	10 96 86 68 53 45 34	100 67 53 40 26 17 9	100 60 42 37 30 14	45 33 12 100 99 96 82 53 34	46 32 14 100 90 86 83 72 53 27	6 44 32 12 100 95 91 82 65 54 48 36	11 100 93 83 71 59 49 39 32	3 100 93 91 79 65 45 37 29	100 86 54 41 22 20 16	100 84 68 57 42 38 31	7 100 82 71 54 45 33 26 22	100 94 58 53 48 43 33	100 91 62 56 43 40 33	100 90 79 58 43 54 27
TEST R	ATTERBERG LAMT BECVE ANALYSIS, (% FINER) PASONIG SIEVE	1 3/4 3/8 4 10 20 40 40		41 73 33 40 100 96 89 81 72 65	25 05 50 10 36 001	37 53 24 29 1100 94 82 66 56 45	48 74 32 44 100 93 86 74 62 54	61 27 34 100 96 90 80 68 62 53	50 72 30 42 100 99 95 90 79 74	51 73 30 43 100 99 99 96 91 79 77	16 10 10 100 87 71 50 38 34 28 38 54 28 38 62 64 40 80 100 89 65 64 40 80 100 80 80 80 80 80 80 80 80 80 80 80 80 8	100 88 21 48	100 27 54 41 16 27	100 88 21 55 44 36 32	52 27 25 100 99 95 90 80 71	57 26 31 100 99 93 82 73 65	74 32 42 100 92 89 87 71 62	14 15 10 10 14 10 10 10 10 10 10 10 10 10 10 10 10 10	71 72 04 62 17 00 001	10 96 86 68 53 45 34	100 67 53 40 26 17 9	100 60 42 37 30 14	45 33 12 100 99 96 82 53 34	46 32 14 100 90 86 83 72 53 27	6 44 32 12 100 95 91 82 65 54 48 36	11 100 93 83 71 59 49 39 32	3 100 93 91 79 65 45 37 29	100 86 54 41 22 20 16	100 84 68 57 42 38 31	7 100 82 71 54 45 33 26 22	100 94 58 53 48 43 33	100 91 62 56 43 40 33	100 90 79 58 43 54 27
TEST R	DEPTH TERBERG LIMIT BECVE ANALYSIS, (% FHER) PASSHING SIEVE	(M) LL PL Pl 1 3/4 3/8 4 10 20 40 40		0.55-1.00 41 73 33 40 100 96 89 81 72 65	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.55-4.00 37 53 24 29 100 86 68 52 41 37	4.55-5.00 48 74 32 44 100 93 86 74 62 54	5.55-6.00 44 61 27 34 100 96 90 80 68 62 53	6.55-7.00 50 72 30 42 100 99 95 90 79 74	7.55-8.00 51 73 30 43 100 99 99 96 91 79 77	8.55-9.00 16 70 70 40 400 87 71 50 38 34 28	10 55_11.00 32	11, 55, 12, 00 24	12.55-13.00 20	13.00-13.45 46 52 27 25 000 99 95 90 80 71	14.00-14.45 32 57 26 31 100 99 93 82 73 65	14.45-14.90 34 74 32 42	15:00=15:45 50 06 50 07:	15.252-19.00 17 24 40 27 17 24 40 27 17 24 40 27 17 17 17 17 17 17 17 17 17 17 17 17 17	16.55-17.00 10 10 10 96 86 68 53 45 34	17,00-17,45 3 10 26 17 9	17,55-18,00 11 10 50 42 37 30 14	18,00-18,45 21 45 33 12 100 99 96 82 53 34	18.55-19.00 21 46 32 14 100 90 86 83 72 53 27	119.00-19.45 6 44 32 12 100 95 91 82 65 54 48 36	19.55-20.00 11 100 93 83 71 59 49 39 32	20.00-20.45 3 (100 93 91 79 65 45 37 29	21.00-21.45 6 100 86 54 41 22 20 16	R1.45-21.55 10 too 84 68 57 42 38 31	22.55-23.00 7 100 82 71 54 45 33 26 22	23.00-23.45 10 100 94 58 53 48 43 33	23.55-24.00 13 40 33	27.55-25.00 11 100 90 79 58 43 54 27 28 25.55-26.00 12 12 13 14 15 18 18 18 18 18 18 18
TEST R	ATTERBERG LAMT BECVE ANALYSIS, (% FINER) PASONIG SIEVE	(M) LL PL Pl 1 3/4 3/8 4 10 20 40 40		41 73 33 40 100 96 89 81 72 65	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	37 53 24 29 1100 94 82 66 56 45	4.55-5.00 48 74 32 44 100 93 86 74 62 54	61 27 34 100 96 90 80 68 62 53	6.55-7.00 50 72 30 42 100 99 95 90 79 74	7.55-8.00 51 73 30 43 100 99 99 96 91 79 77	16 10 10 100 87 71 50 38 34 28 38 54 28 38 62 64 40 80 100 89 65 64 40 80 100 80 80 80 80 80 80 80 80 80 80 80 80 8	10 55-11.00 32	11, 55, 12, 00 24	12.55-13.00 20	13.00-13.45 46 52 27 25 000 99 95 90 80 71	57 26 31 100 99 93 82 73 65	14.45-14.90 34 74 32 42	14 15 10 10 14 10 10 10 10 10 10 10 10 10 10 10 10 10	15. 02-15.	16.55-17.00 10 10 10 96 86 68 53 45 34	17,00-17,45 3 10 26 17 9	17,55-18,00 11 100 60 42 37 30 14	45 33 12 100 99 96 82 53 34	18.55-19.00 21 46 32 14 100 90 86 83 72 53 27	119.00-19.45 6 44 32 12 100 95 91 82 65 54 48 36	19.55-20.00 11 100 93 83 71 59 49 39 32	3 100 93 91 79 65 45 37 29	21.00-21.45 6 100 86 54 41 22 20 16	100 84 68 57 42 38 31	22.55-23.00 7 100 82 71 54 45 33 26 22	100 94 58 53 48 43 33	100 91 62 56 43 40 33	24-55-25-00 111 100 90 79 58 43 34 27 25-55-00 112 100 89 76 59 48 36 28

APPENDIX IO.1-9 SUMMARY OF SEISMIC REFRACTION (KENNON ROAD) (!) Results of seismic refraction survey SPOT Description 1:200m NO. Hor. Scale Vert. 1:100m All velocities in M/sec Slightly weathered and fractured Conglo-[K-6 250 meratic, Metavoloanics, \$80 1434 Limestones, Diorites 1437 -2390 2390 2390 1436 -and Andesites ELEV.ICE s-(2) Moderately to 100 -highly weathered fossiliferous LIMESTONE IK-10 1100 270 2780 1229AE TESK - 100 M 1424 Moderately to 1423 highly weathered 380 1270 ANDESITE IK-12 300 Moderately weathered, 1273 -300 1272 slightly jointed 1271 -ANDESITE IK-19 1370 1560 4180 1200 3310

SUMMARY OF SEISMIC REFRACTION (KENNON ROAD) (2)

SPOT		of seismic refraction survey	
NO.	Scale Hor. 1:200 m	All velocities in M/sec	Description
	EL EX 100.~	330 330	
	330	530 530	Moderately weathered
	17 - 1500	1300 1000	highly jointed, a
IK-21	н =		livegray DIORITE
	11		
	3000	3000	
	12	3000	
;	eriant tele- son.		
			Slighly to moderate-
	EL CX 1245 -	800	ly weathered
IK-23	1244 -	2000	DIORITE
	1242 - 2150	2150 2150	
:			
			: .
	gugy ast ~		1833
	135 -	750	Highly weathered,
	134 - 330		highly jointed
	193	1200	ANDESITE
IK-29	1030		
	151 -		
	10-	2750	
	141.	XIII -	
	3000		
	ELEY. 1090 -		
	1000 -	110	Highly to moderate
11/ "J A	1041 - 25G	350 320	ly weathered highly
IK-34	1007	1100 //500/// 1250	jointed ANDESITE
	1044	2740	
	1004 2400	2200	

SUMMARY OF SEISMIC REFRACTION (KENNON ROAD) (3)

SPOT	Results of seismic refraction survey	
NO.	Scale Vert. 1:100 m All velocities in M/sec	Description
IK 38	617 - 250 416	Highly Jointed , slightly weathered Sedimentary Facies
IK- 41	110 - 100 -	Slightly weathered to moderately weathered ANDESIT

Appendix 10-2 Realignment of Critical Sections

1. Km. 1,010 + 700 in Mahaplag-Sogod Section, Mahalika Highway

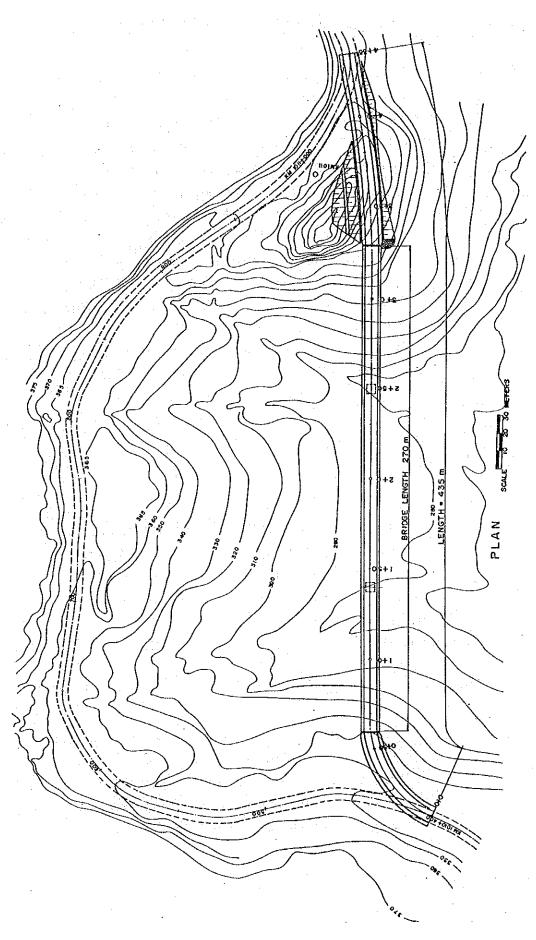
A short section at Km. 1,010 + 700 (spots VIII-80 and 81) in Mahaplag-Sogod Section is subjected to the largest scale of cut slope failure and embankment slope failure.

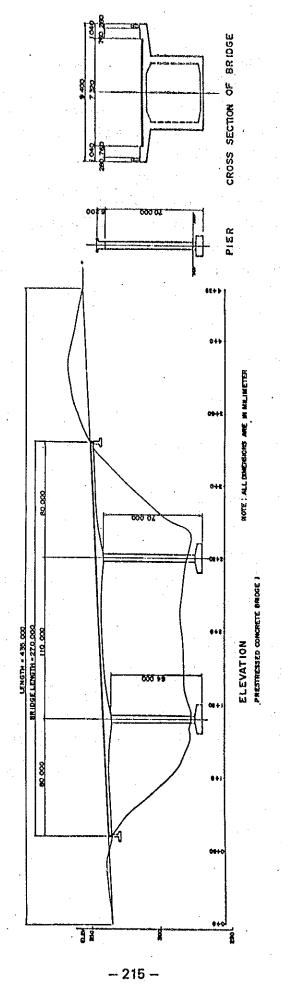
Two (2) alternative plans were studied to come up with the optimum solution on this special section: one is to provide slope protection work on the existing slopes, thus increasing stability of the existing slopes and the other is to realign a road center line to avoid disaster potential spots. In the latter plan, the road center line was shifted towards valley side and the valley was spanned by a bridge (see Figure on next page). Rough construction costs of two plans were estimated as follows;

Unit : Million Pesos

Plan-1 Slope Protection of Existing Slo	Plan-2 Realignment		
Embankment	8.8	Superstructure	38.0
Vegetation on embankment slopes	0.8	Substructure	15.0
Re-cutting (gravel)	7.1	Approach	1.2
Re-cutting (soft rock)	5.7] 	
Vegetation on cut slopes	1.1	; 	
Underground drainage	1.4	; ; ;	
Others	2.2		
Total	27.1		54.2

As Plan-2 requires a bridge of 270 meters in length with piers of 70 meters in height, construction cost of Plan-2 is more expensive by about double than Plan-1. Plan-1 which is slope protection of existing slopes was recommended for adoption to the preliminary design.





2. Section between Km. 239 + 830 and Km. 240 + 240, Kennon Road

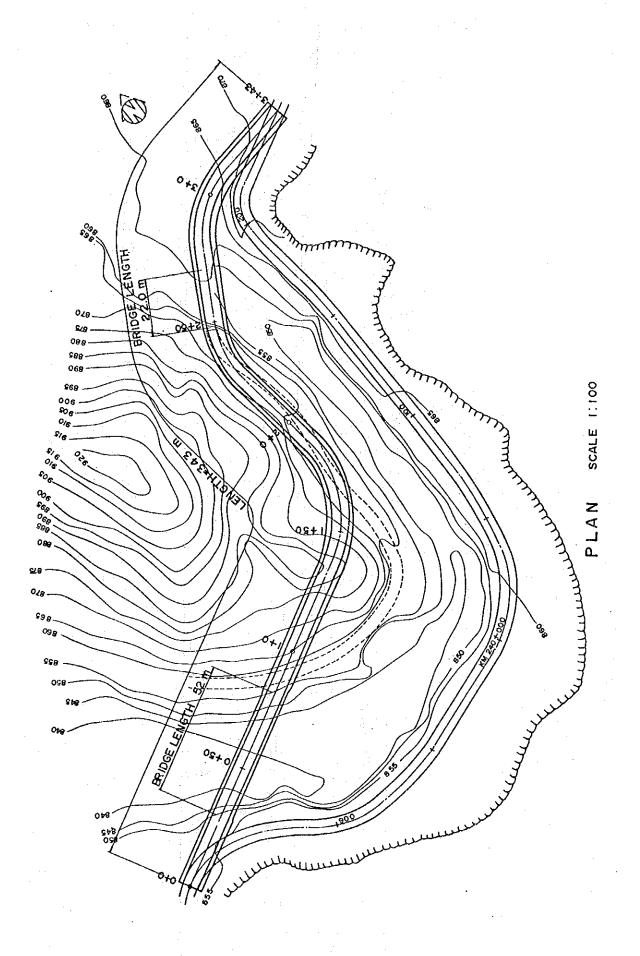
Quite steep and high cut slopes continue along this section which contains four (4) disaster spots of IK-39, 40, 41 and 42. In addition to a plan to provide slope protection works on the existing slopes, a route realignment plan was considered. New alignment was selected on the opposite side of the Bued River. New alignment has length of 343 meters which is shorter by about 70 meters than the existing route, however, new alignment has to cross the Bued River twice requiring two bridges. It also requires high cut slopes of about 25 meters in height (see Figure on next page).

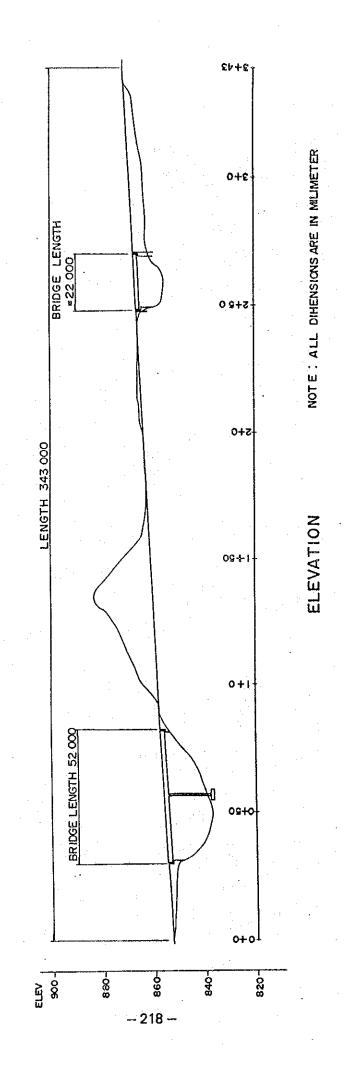
Construction costs of two plans were roughly estimated as follows;

Unit: Million Pesos

 			1011 1 0303				
 Plan-	1	Plan-2					
Slope Prot Existing S		Realignment					
 IK-39	1.0	Two bridges (L = 7	4 meters)				
IK-40	0.3	Superstructure	3.5				
IK-41	0.8	Substructure	1.8				
IK-42	0.2	New road (L = 269)	neters.)				
 ·	:		1.9				
Tota1	2.3		7.2				

Plan-2, realignment plan is more expensive by about 3 times than Plan-1. Plan-1, slope protection of existing slopes was recommended.





APPENDIX 10-3 STABILITY CALCULATIONS

A) Stability Calculation for Slope failure at Disaster

Spot No. VIII - 80/81 (Mahaplag - Sogod Section

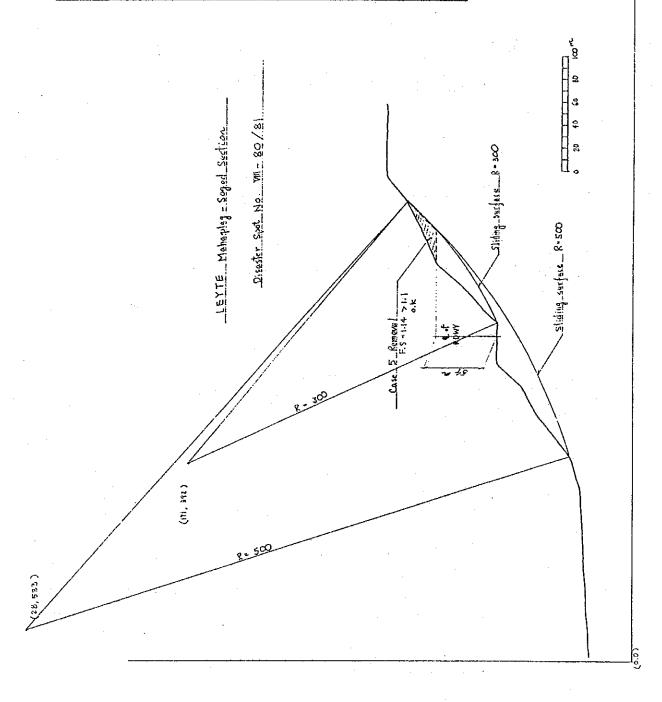
Leyte)

Computed by Micro-Computer

- B) Stability Calculation for Landslide at Disaster

 Spot No. IK- 48 (Kennon Road)
 - I. Dimension of Slope
 - 2. Computation of Stability
 - 3. Acting Force on Pile
 - 4 Design of Pile

A) STABILITY CALCULATION (Disaster Spot No. VIII - 80/81)



$$R = 500$$

F.S = 1.0
$$\rightarrow$$
 tan ϕ = 1.41 and C = 0.0 t/m² or tan ϕ = 0.00 and = 13.16 t/m²

2 Case 2

$$R = 500$$

 $tan \phi = 0.87$ F.S = 1.0
 $c = 5.00 \text{ t/m}^2$

3 Case 3

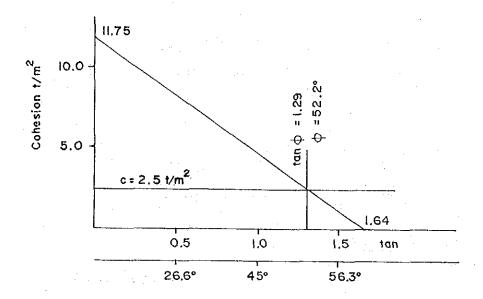
R = 300

$$\tan \phi = 0.87$$
 F.S = 0.95
 $c = 5.00 \text{ t/m}^2$

4 Case 4

$$R = 300$$

F.S=1
$$\rightarrow$$
 tan ϕ = 1.64 and c=0.00 t/m
tan ϕ = 0.00 and c=11.75 t/m²



4 Case 5
R R = 300
After Removal

$$tan \phi = 1.29$$

 $c = 2.5 t/m^2$
F. S = 1.14 > 1.

```
TITLE: LEYTE
                 CASE - 1
  WATEER LEVEL
 -----FAILURE CIRCLE---- ----FORCES-----FACTOR OF SAFETY-----
                RADIUS COHESION FRICTION DRIVING SAFETY TAN(F)
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                                                   (T≉H)
                                         (丁*申)
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500.00 X1918586.00 0.00 X1918586.00
                                                                             1,41
                                                                                      0,00
                                                                   1.00
 28,00 533,00
28,00 533,00
                                                                              0.00
                                                                                      13.16
                                                                   1.00
TITLELLEYTE
               CASE - 2
    CORDNETES OF GRAND SURFACE
    (100.0, 0.0) (151.0, 48.0) (178.0, 57.0) (214.0, 86.0) (237.0, 98.0) (253.0,122.0) (294.0,120.0) (302.0,132.0) (321.0,148.0) (344.0,174.0) (400.0,200.0)
    CORDINETES OF LAYER SOUNDARY DEN(T/M**3) (550.0%/-100.0) 1.30
                                                    COH(T/M**2)
                                                                    FRI (DEG)
                                                           5.00
                                                                           9.87
    GRAND OF WATEER LEVEL
   RADIUS COMESION FRICTION DRIVING
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                               (T*H)
                                            (T*(d)
                                                      (T*b)
   28.00 533.00
                  500.00
                            729041,30 %1182859,00 %1918586,00
                                                                         1 00
TITLE: LEYTE
               CASE - 3
    CORENETES OF GRAND SURFACE
    (100.0, 0.0) (294.0,120.0) (302.0,132.0) (321.0,148.0) (344.0,174.0) (400.0,200.0) (550.0,200.0)
    CORDINETES OF LAYER BOUNDARY DEN(T/M**3) COH(T/M**2)
                                                                   FRI (DEG)
    ( 0.0.X-100.0) (550.0.X-100.0) 1.50
                                                           5.36
                                                                         9.87
   GRAND OF WATEER LEVEL
   ----FAILURE CIRCLE---- ---
                                -----FORCES-----
                                                    ----FACTOR OF SAFETY
    Y (4)
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                     RADIUS COMESION
                                         FRICTION DRIVING
                             (T*M)
   (1:1)
            (M)
                     (14)
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                                                      (Tabl)
  171.00 392.00 298.00
                             195161.80 -242850.50 458663.20
                                                                    0.25
  TITLE: LEYTE CASE 4
  WATEER LEVEL 1
 ----FAILURE CIRCLE----
                             -----FORCES-----
               RADIUS
                                                          -- ----FACTOR OF SAFETY----
                                      FRICTION DRIVING SAFETY
  ΧØ
          Yø
                            COHESION
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                                        (T∗M)
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                                                                                  (T/M**2)
                                                   (M*T)
171.00 392.00 298.00 171.00 392.00 298.00
                           9.99 458663.29 458663.29
458663.29 9.99 458663.29
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                                                                                   0.90
                                                                1.00
                                                                          0.00
                                                                                  11.75
  TITLETLEYTE S/80/81 CASE 5
      CORDNETES OF GRAND SURFACE
      (100.0, 0.0) (294.0,120.0) (302.0,132.0) (321.0,148.0) (344.0,174.0) (374.6,174.0) (400.0,200.0) (550.0,200.0)
     CORDINETES OF LAYER BOUNDARY DEN(T/M**3) ( 0.0,%-100.0) (550.0,%-100.0) 1.80
                                    DEN (T/M**3)
                                                      COH.(T/M**2)
                                                                     FRI (DEG)
                                                             2.50
      GRAND OF WATEER LEVEL
     -----FAILURE CIRCLE---- ------FORCES-----FAILURE CIRCLES OF SAFETY
                       RADIUS COMESION FRICTION DRIVING
              Y9
      (h)
              (M)
                       (14)
                                  (丁*村)
                                             (丁米四)
                                                       (下*闭)
    171.00 392.00 298.00 89557.37 272872.20 318703.50
```

(F) **6** <u>•</u> D.L= 1360.00 M. **–** 223 –

B) STABILITY CALCULATION (Disaster Spot No. 1K-48)

Dimension of

2. Computation of Stability

Computation Table of Stability Check

						wcos O A	
Slice No.	Area of Trapezium A (m²)	Unit Weight of soil & (t/m)	Weight of Silces W (t/m)	Degree 0	W∙Sin Θ (t/m)	W·Cos ⊖ (t/m)	(m)
1 -	1/2 (0.0+14,0) X15,0	1,7	178.5	47.5	131.6	120,6	20.5
2	1/2X(14.0+14.5)X9.5	1.7	230.1	5.0°	20.1	229.2	9,54
3	1/2X(10,0+13,5)X28,5	1.7	569.3	5.0°	49.6	567.1	28.6
4	1/2X(13.5 + 7.8) X36.5	1.7	660.8	5.0	57.6	658.3	36.6
5	V2X(7.8+8.0)X31.5	1.7	423.0	5.0°	36.9	421.4	31.6
6	1/2X(8.0 +9.0)X 16.5	1.7	238.4	5.0°	20.8	239.5	16.6
7	1/2X(9.0 + 7.0)X34.0	1.7	462.4	5.0°	40.3	460.6	34.1
8	1/2X(7.0+5.2)XI6.5	1.7	171.1	5.0°	14.9	170.4	16.6
9	1/2X(5.2 + 0.0)X10.5	J.7	46.4	5.0°	4.0	46,2	10.5
Total					375.8	2911.3	204.9

If Factor of Safety = 1.0

$$F.S = \frac{C \times \Sigma l + ton \phi \times W \cdot cos \Theta}{W \cdot sin \Theta}$$

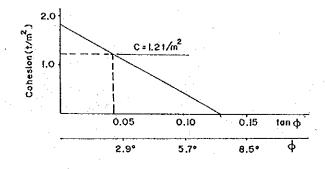
C: Cohesion of Soll (t/m²)

φ: Angle of Internal friction (degree)

F.S = 1
1 =
$$\frac{C \times 204.9 + \tan \phi \times 2911.3}{375.8}$$

$$C = 0 \longrightarrow \tan \varphi = 0.129 (\varphi = 7.4^{\circ})$$

 $\tan \varphi = 0 \longrightarrow C = 1.834 t/m^2$



$$C = 1.20 \text{ t/m}^2 \longrightarrow \tan \phi = 0.045 (\phi = 2.56^\circ)$$

3 Acting Force on Pile

P; Acting Force on Pile (1/m)

 $F.S_{(p)}$; Proposed Factor of Safety (1.1)

 $C = 1.1 1/m^2$

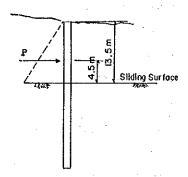
tan d = 0.045 .

P = 129.6 1/m

Interval of Piles 4.0 meters

P! Acting Force on One Pile

4 Design of Pile



Acling Force on Pile

Use Chang's Formula

Co-efficient of Horizontal Subgrade

reaction Kh

Eo =
$$28 \cdot N \left(\frac{kg}{cm^2} \right)$$

N! No. of Blows by S.P.T. (= 40)

D; Diameter of Pile (240 cm)

$$Kh = 0.2 \times 28 \times 40 \times 240^{-\frac{3}{4}} = 3.7 \text{ kg/cm}^3$$

E: Young Modulus of Pile 2.8 X 10 kg/cm²

I; Inertia of Pile

$$I = \frac{1}{64} \times IC \times D^4 = \frac{1}{64} \times IC \times 240^4 = 1.63 \times 10^8 \text{ cm}^4$$

$$B = \sqrt[4]{\frac{\text{K} \cdot \text{D}}{4 \text{ EI}}}$$

$$= \sqrt[4]{\frac{3.7 \times 240}{4 \times 2.8 \times 10 \times 1.63 \times 10}} = 0.001485^{\text{cm}^{-1}}$$

Embedment lenght under Sliding Suface

l ≥ 2.5/B

* 2.5/0.001485 * 1684cm * 16.8m

Total pile lenght 13.5 + 16.8 = 30 meter

Sectional force due to Acting force on pile

$$\operatorname{Mmax} = \frac{\sqrt{(1+2\beta ho)^2+1}}{2\beta ho} \exp \left[-\tan^2 \left(\frac{1}{1+2\beta ho}\right) \times M_0\right]$$

Mmax; Max. Moment

Mo ; Bending Moment at Silding Surface

ho .: Height from Stiding Surface to point of

Acting Force

Mo = 518.3 ton X 4.5 meters = 2332.4 1 m

M max = 2958 t·m

S = 518.3 ton

S; Shearing Force

Computation of Sectional Stresses

Diameter of Pile 240cm

Covering of Reinforcement 15 cm

Steel Reinforcement Used

$$= 3 \times 7.942 \times 44 = 1048.3 \text{ cm}^2$$

$$n\rho = n \times \frac{As}{\pi L \cdot \chi^2} = 15 \times \frac{1048.3}{\pi L \times 240^2} = 0.09$$

$$Z = 0.43$$
 homogram

$$G_{c} = \frac{M}{73} \times C$$

$$= \frac{2958 \times 10^{5}}{240^{3}} \times 2.5 = 53 \text{ kg/cm}^{2} < 70 \text{ kg/cm}^{2}$$

$$\times 1.5 = 105$$

$$\times 1.5 = 105 \, \text{kg/cm}^2$$

$$= \frac{2958 \times 10^5}{240^3} \times 6.5 \times 15 = 2086 \text{ kg/cm}^2$$

$$< 1800 \times 1.5 = 2700 \text{ kg/cm}^2$$

$$\mathcal{T} = \frac{s}{\gamma} \times z$$

$$= \frac{518.3}{240} \times 0.43 = 3.9 \text{ kg/cm}^2$$

$$< 6.0 \times 1.5 = 9.0 \text{ kg/cm}^2$$

3		Remarks	Existing state masorry was destroyed due to good surface water.			Only a half lone of the roadway is passable.
ON PASS SECTION (1)		Countermeasure	. Re-filling . Stane masonry . Side ditch	· Remaval · Concrete spraying { i = 10 }	- Removal - Concrete spraying (1 = 15)	Ra-filling of Pipe culvert Apron for culvert Stone masonry Vertical diren
DALTON	Factor for selection	of countermeasure	Re-filling should be done. Surface water flows on the slope. Slope is steep and new side ditch should be placed.	Some detached rocks exist on the slope. Cracked rocks. Progress of weathering is anticipated.	Detached rocks exist on the slope. Progress of weathering is anticipated. Many cracks and joints. More developed cracks than the cracks of spot in anticipated.	Apron, headwalf and wingwall of pipe cutvert outlet were destroyed. No restaration work was implemented.
Counermeasures		Water Condition	Concentration of road surface water	No surface water concentration.	· No surface water concentration	· Existing pipe culvert.
Selected	Slope Condition	Geological Condition	· Embankment materfal	. Diorite . Slighily wealhared. . Developed crack	Diorite Slightly weathered Highly developed cracks	· Embankment moterial
Condition of Disaster and	Existing	Dimension of slope	W=50 m.	So. So. W= 280 m.	S3. 4	
10-4 Cond	Š	Type or Disosier	167+300 E-DF	167+400 C-F	167+600 C-F	167+850 EDF
APPENDIX	Disaster No Soot		I III-4(0)	2 用-4(b)	3 Ⅲ-4(c)	4 元 元

}	·				
(2)	Remarks	The bottom of the slope is inthe toe of the ridge. It is useless to provide top stope ditch.			Grauted riprop was destroyed due to road surface - water.
ON PASS SECTION (2)	Counterméasure	Removal • Concrete spraying (t= 5 cm)	· Removal · Concrete spraying { t = 10 cm}	· Small Sabo-dam · Waterway	. Re-filling . Stone, pitching . Sid* ditch
DALTON	Factor for selection of countermeasure	Same unstable materials sholl be removed due to lord weathering in same parts of the slope. Slope gradient is not so steep. Scouring of slope surface water and progress of weathering is anticipated.	Some totally weathered rocks should be removed. Slope gradient is nearly optimum. Scouring of surface water and progress of weathering is anticipated	The amount of debris is less than 50 cu.m. Debris flows out from the hollow of the stope during rainy days.	· Embankment stope shall be protected by the structures. · Poor drainage ladiifies on the raadway
MEASURES	Water Condition	Slope surface water flows on the slope and a little concentration of surface water exists.	-Stope surface water flows on the slope.	· Water from hinterland runs at a hollow on the slope.	Concentration of road surface water Road surface water schurcies into the embrankment majerials
LECTED COUNTER	Geological Condition	Diorite Highly and totally weathered in some parts at the slope Highly developed crack	Andesite Highly tomoderately weathered rock. Highly developed cracks	Standslone Slightly weathered	- Embonkment materials
CONDITION OF DISASTER AND SELECTED COUNTERMEASURES Existing Slope Condition	Dimension of slope	50° Congrete 50° 45° 10° 10° 10° 10° 10° 10° 10° 10° 10° 10	SS° 40° FE W= 140 m.	35 South State picking and a south state of the sou	Street or television of the street or television of the street of the st
JONOD .	Type of Oisosier	167+900 C-SF	168+100 C-SF	170+400 D.F	170+700
Disaster	Spot No.	9 日	П-7	0田	= - H
	ġ.	ى	ω	. ~	- · · · · · · · · · · · · · · · · · · ·

		COND	CONDITION OF DISASTER AND SEL	SELECTED COUNTERMEASURES	WEASURES	DALTON	PASS SECTION	(3)
2	Disaster	X	Existing	Stope Condition		Foctor for selection		
ġ T	Spor	Type of Disaster	Dimension of stope	Geological Condition	Water Condition	of countermeasure.	Countermedsure	Remarks
Ø	Ⅲ—12	170+750 C-F	67° Wire Wire Wire Wire Wire Wire Wire Wire	Andesite Moderately weathered Many jointed and cracked, rocks	. A little influence of slope surface water on the spot.	Some detached rocks exist on the stope. Size of falling rocks it like a cobble stone. A little progress of weathering is due to the small intuence of surface water.	· Removal	Catch fance can not be applied due to an anticipated. Die folling rocks.
<u>o</u>	日-14	171+200 C-S.F	Sprayed owerfix crib Sprayed owerfix crib 45° W= 119 m.	Schist/Andesite -Highly and totally weathered in some parts of the slope -Highly cracked	Some seepage of water occurs when surface water flows on the stope.	Some unstable materials exist an the stape. Progress of weathering is anticipated due to stape surface water. Scouring is caused by slope surface water.	Removal Sprayed concrete crib with bouldesand with concrete wall.	
= :	日 - 1.5	172+500 D.F	Stone pitching sale pitching stone pitching stone pitching sale sale sale sale sale sale sale sale	Andesite Moderately weathered	Water from hinterland runs at the jwa houlows on the stope. Stope surface water concentrates at upper part of the twa hollows	Some debris flows out from two hotlows during rainy days.	·Small Sabo -Dam ·Water way · Pipe culvert	
20	<u>∞</u> ≀	173+450 D.F	Concrete sobo-dom Stone pitching W=10m.	· Volcaniclasties	Slope surfacewater concentrates of one hollow on the slope.	Some debris composed of gravet and sand flows out during rainy days. Amount of debris flow is about 100 cu.m.	Small Sabo-Dam • Water way	

		Remarks				
DALTON PASS SECTION (4)		Cartiermeasure	Removaí. -Concrete spraying. (t=10 cm)	- Re cutting. • Berm and Vertical ditch. • Vegetation.	Re-cutting and Re-filling, Vegetation Germ and vertical ditch Gabion Retaining wall	Removal Concrete spraying (!=!Om) Top slope ditch
DALT	Factor for selection	of countermeasure	Progress of weathering is anticipated. Stope surface failure occurs due to some unstable materials on the slope.	- Upper layer of the stope is Terrace deposit No drainage facilities on the stope.	No existing slope protection. No drainage facility on the slope Nearly soil High ground fevel	Some urstable materials exist on the slope. Progress of weathering is anticpated due to slope surface water.
MEASURES		Water Condition	. A litte influence exists due to slope surface water.	Water from hinterland flows on the stope and a concentration of slope surface water occurs.	Water from hinteriand flows on the slape. Slope surface water saturates into the slope. The ground water tevel is high.	Slope surface water flows on the slope and a concentration of slope surface water occurs.
SELECTED COUNTERMEASURES	Stope Candition	Geological Condition	· Voicaniciasiles · Moderaleiy weathered	· Highly wealhered DIORITÉ. · Terrace Deposit (Sand and gravel)	.Totally waathered DIORITE (Nearly soil)	Moderately to highly weathered DIORITE rocks with developed cracks,
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	Serving Sproying Sproying Serving Serv	Kê-cutting E He proded on W = 40 m.	Re-filling Re-filling Strains No. 11 11 11 11 11 11 11 11 11 11 11 11 11	Compacting 600° We 40 m.
CONDI	E	Type of Ciscater	173+650 C.S.F	185+450 C- S.F	185+500 C-S.F	195+900 C-S.F
		No. Soot	13、田-19	14 匠-22(0)	15 -加-22(6)	16 Ⅲ-23

રો)		Remorks				
ON PASS SECTION (5)		Countermeasure	Re - filling - Vegetation - Stone masonry - Berm ditch	.Concrete sabo dam . Water way	· Ramoval	. Concrete sabo dam . Water way
DALTON	Factor for selection	of countermecsure	Na stape protection nar drainage facilities on the slope. No side ditch on the roadway. Slope gradient is very steep.	Some debris are overlying on the bollow.	No protection for folling rocks on the slope. Some detached rocks exist on the slope.	The slope is covered by grasses and trees. Some debris are averlying on the hollow.
MEASURES		Water Candition	Concentration of slope surface water exist Road surface water alsosalurates into the embankment materials.	Water from hinterland flows at one hollow on the slope.	There is a little influence of stope surface water anthe spot.	Water from hinterland flows at one hollow on the slope.
SELECTED COUNTERMEASURES	3 Stope Condition	Geological Condition	· Embankment malerials	- Highly weathered DIORITE	- Silghtly to moderatety weathered DACITE rock with regular aracks.	'Slightly weathered DIORITE.
CONDITION OF DISASTER AND SE	Existing	Dimension, of stope	Em E E E E E E E E E E E E E E E E E E	Steer gitching Steer gitching Ell Col W=10 m.	Anchov wire not so No	State pitching way we 30 m.
COND	×	Type of Disoster	186+400 E-0.F	186+400 0-F	186+400 C-F	186+600 D.F
1	Disaster	S o	17 Ⅲ-24	18 班~25(0)	19 亚-25(6)	20 III-26

Dimension of Dimension of Dimension of Security	137	CONDITION OF DISASTER AND SELECTED COUNTERMEASURES Existing Stope Condition Secretary for selection of stope Geological Condition Water Condition of countermeasure of countermeasure Remarks	Slightly weathered Slape surface water Some unstable materials Removal No stope protection required for the rock. Sparse cracks No progress of weathering remaining stable rocks. Salis overlie on the slope . No stope protection required for the rock.	Moderately weathered Slope surfacewater Progress of weathering Removal Inwanthe slope and Invanithe slope and Is anticipated a little concentration developed cracks. The slope surface water Some unstable materials occurs (t=10 cm) (t=10	• Moderately to highly A little concentration • Weaker rocks than the • Removal weathered DiORRITE of surface water exist. rocks of spot 311-30 • Concrete spraying focks with highly developed cracks. • Berm ditch • Re-cutting	Embankment Concentration of road Poor drainage facilities - Re-filling surface water exists. Road surface water Protection. Road surface water Protection. Road surface water Protection. Road surface water Protection.
· · · · · · · · · · · · · · · · · · ·	187+ 187+ 188+ 188+ 188+	Existin Or DISASIER AND SE Existin Dimension of stope	Reavel Re	Re-cutting any ungetation any ungetation	Re-cutting on the street of th	Cost-in-place R

()		Remarks								
ON PASS SECTION (7)		Countermeasure	· Concrete Saba - Dam.	·Waterway,			• Anchared wire net.		·Concrete spraying (t=10 cm.)	·Waterway.
DALTON	Factor for selection	of countermeasure	. Some debris exist in the	nollow.			Stope is steep with stable rocks. Only falling rocks are anticipated.		A litte unstable soit is an the stope. A litte progress of weathering occurs.	Slope is stable and covered by trees and grasses.
MEASURES		Water Condition	. Waler from hinterland	flows at a hollow on the slope.			. A litte influence of slope surface water exists.		Slope surface water flows an the slope and a concentration of slope surface water occurs.	Concentration of stope surface water exists. Water from hinterland flows at a hollow on the stope.
SELECTED COUNTERMEASURES	Existing Slape Condition	Geological Condition	·Slightly weathered	DIORITE.			·Moderately weathered DIORITE with highly developed cracks.		· Highly weathered DIORITE rocks with highly developed crocks.	· Slightly weathered DIORITE .
CONDITION OF DISASTER AND SEL		Dimension of stope		Concede salu-dom Stone pitching water way	.04	W=10 m.	Ancher wire net	W=117 m.	Concrete sprenging 1355	
CONDI	E X	Type of Disaster		188+700	ſĿ,		189+900 C - F		-90+000 C-S.F	190+050 D.F
	Disaster	Spot No.		m-36			田37		亚- 38(a)	瓜-36(b)
	· .	ģ		25			26		2	88

	į	nemorks				
DALTON PASS SECTION (8)		Connermedsure	Removal Cancrete spraying (1 = 10 cm.)	Removal Concrete sproying. (1 = 15 cm.) Top slope and Verticat	Concrete Sabo-Dam Water way Box culvert	Concrete spraying. (t=15 cm.) Top stope and vertical ditch
DALTON	Factor for selection	of countermeasure	A little progress of Reweathering is anticipated. Some unstable sais exist on the stope.	Slope gradient is gentle with vary weak, soft rack Co	Some debris exist on Coathe hollow. Was hollow. Was drainage structure Boar crosses the roadway.	Progress of weathering - Co is anticipated for weak soft rock.
AEASURES		Water Condition	A little concentration of slope surface water exists.	Water from. hinterland flows at two hollows on the slopeThère is much concan- iration of slope surface water.	Water from hinterland flows at a hollow on the stope.	Water from hinterland flows on the slope.
SELECTED COUNTERMEASURES	Existing Stope Condition	Geological Condition	Highly weathered DIORITE rocks with regular cracks.	Highly weathered DIORITE rocks with highly developed cracks	· DIORITE	Highly weathered DIORITE rocks with highly developed cracks
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	Coecide springing 12 E	Courrete sproying	Storete Sala-dan Storet	Concrite spraying
CONDI	æ	Type of Disosier	1904400 C-S.F	190+750 C-S.F	190+850 D.F	190+900 C-S.F
		No. Spot	29 III-39	30 Ш-41	31 日-42	32

	٠		T	The state of the s	· · · · · · · · · · · · · · · · · · ·	-
(6)		Remarks		No slope protection is required for racks on the slope.		
ON PASS SECTION (9)		Countermeasure	Removat Sprayed concrate crib with concrete watt. Re-cutting Vegetation Top stope ditch.	· Removal · Top slope ditch. · Re-cutting · Vegelation	Removal Sprayed concrete crib with concrete wall. Barm ditch. Re-cutting	-Stone masoary. •Gabion foot protection.
DALTON	Factor for selection	of countermeasure	Much progress of weathering is due to surface water. Slope is a little bit steeper than the optimum gradient.	Slope is very gentle and stable, A fittle progress of weathering is due to surface water.	Slope is a little bit sleeper than the optimum gradient. • Much progress of weathering is anticipated.	No apron and wingwoll at the outlet of the pipe culvert. Scouring by the river current needs protection.
MEASURES		Water Condition	·Water from hinterland flows on the slope,	Water from interland flows on the slope.	- A little concentration of slope surface water exists.	Scouring is caused by water coming from the autiet of pipe culvert. River was scoured at the toe of the slope.
SELECTED COUNTERMEASURES	g Stope Condition	Geological Condition	·Highly weathered DACITE rocks with highly developed cracks and fractures.	Slighily weathered DACITE rocks with developed cracks.	-Highly weathered DACITE racks with highly developed cracks and fractures.	· Embankment malerials.
CONDITION OF DISASTER AND SELE	Existing	Dimension of slope	Fe-culting and supply of sprough convert. FE critical convert. W=120 m.	Re-culting and was been been been been been been been bee	Recentive and English and Economics and Econ	OF OF Star. masoury Sabien feet prefection W=10 m.
COND	Ж	Type of Olsosier	192+700 C-5.F	(92+650 C-S.F	193+000 C-S.F	(93+300 E-D.F
	Cisaster	S o	Ш-46	正-47(0)	正-47(5)	Ⅲ - 48
.	S. S		13	4.	35	မှ ဗ

						1
(0)		Remarks				
ON PASS SECTION (10)	•	Countermeasure	· Water way · Gravity type retaining wall	- Removol - Concrete spraying (1 = 15 cm.)	Concrete Sabo-Dam. Water way Concrete box culvert.	· Re-cutting. · Vegetation. · Berm ditch.
DALTON	Factor for selection	of countermscaure	No drainage facilities on the slope, The slope is covered by trees and grasses and can be seen stable.	Progress of weathering is anticipated. Slope's just an optimum gradient. Some detached rocks exist on the slope.	Some debris exist on the stope. No drainage structure crosses the roadway.	Stope gradient is steeper than the optimum. • No drainage on the slope.
MEASURES		Water Condition	Water from hinterland flows at several hollows on the stope,	A little influence exist due to stope surface water.	Water from hinterland flows ot a hollow on the slope.	· Slope surface water saturate into the ground.
	g Stope Condition	Geological Condition	· Colluvial soil (Debris)	· Moderately to highly weathered DACITE rocks with highly developed cracks.	· Slightly weathered DIORITE.	· Totally weathered DIORITE (nearly soil)
CONDITION OF DISASTER AND SE	Existing	Dimension of slope	Stare piteling way and	% € € 6 € 6 € 6 € 6 € 6 € 6 € 6 € 6 € 6	Concrete subsidem states dom stands which was the same stands which wi	Re-culting and vegetation and size of second and size of second we som
IGNOO	×	Type of Discerer	194+400 D.F	195+600 C-F	195+850 D.F	(95+900 7.8-0
	Disaster	spoi No.	ш-20	Ш-51	ш-53	III-54
		oj Ž	κ -	88	9 9	04

(11)	**	Remarks				The proposed Datton Pass Tunnel Project starts from this spot Same counter measures shown in left column
PASS SECTION		Countermeasure	• Re-cutting • Vegetation • Top slope ditch and berm ditch.	•Re - cutting •Vegetation • Top stope ditch and vertical ditch	Concrete Box culvert Couble barret	Sprayed concrete crib with boulders Berm ditch
DALTON	Factor for safection	of countermeasure	•Stope gradient is not optimum. •Stope failure exist due fathe absence of stope protection.	•Stope gradient is alittle bis steeper than the optimum •Stope deep failure exists due to the concentration of surface water.	•Lack of drainage facilities causes the water to cross over the raddway.	Wery weak soft rock Much progress of weathering accurs due to surface water and seepage of water.
MEASURES		Water Candition	Water from hinterland flows on the slope and a little concentration of water occurs.	Concentration of slope surface water exists.	• Water from hinterland concentrates at this place.	Surface water flows on the stape and a little seepage of water accurs.
SELECTED COUNTERMEASURES	Stope Condition	Geological Condition	•Totally weathered DIORITE (Nearly soil)	•Totally weathered DIORITE (Nearly Soil)	. Embankment materials	. Highy weathered ANDESITE Fractured and highly developed cracks
CONDITION OF DISASTER AND SEI	Existing	Dimension of slope	E 21° W = 100 m.	Re-cutting and vertication we partition and we partition	Concrete by colvert	Service and Service Service Could Country of Could Country of Assert Ass
CONDI	ž	Type of Disaster	196+050 C-S.F	196+100 C-D.F	.0.F	203+450 C-S.F
.		No.	III55	Ш-56	- 日	Ш-65
Į		2	4	4 0	٤4	4 4

* Countermeasures shown in Remarks are to be considered as countermeasures in lang term.

(2)	*	Remarks	• Re-cutting • Concrete spraying (t=10cm) • Berm ditch	. Same countermeasures shown in left column	•Re-cutting • Concrete spraying (f= 10cm) • Berm ditch	• Ra-catting • Vegetation • Berm ditch
ON PASS SECTION (12)		Countermeasure	. Re- cutting . Vegetation . Berm ditch	. Water way	• Re-cutting • Vegelation • Berm diteh	• Top stape ditch
DALTON	Factor for selection	of countermeasure	Stoped gradient is almost optimum,but no berna ditch exists on the stope. Vagetation should be applied on these soft rocks.	Some debris exist on the creeck, bed. Scouring on the bed of the creek is anticipated.	. Slope is too steep . Vegetation is needed	The slope is covered by trees and grasses and can be seen stable. Scouring is caused by the concentration of surface water.
MEASURES		Water Condition	• A little concentration of slope surface water exists.	•Smatl creek is approximately about 5.0 meters in width.	 Concentration of stope surface water exists. 	.Water from hinterland flows at a hallow on the slope.
ID SELECTED COUNTERMEASURES	Slope Condition	Geological Condition	• Highly and totally weathered ANDESITE with developed cracks in some parts of the slope. (Nearly soil)	• River deposit	•Highly to Totally weathered DIABASE rocks in some parts of the stope (Nearly soil)	.The slope is covered by soil with highly weathered DIABASE rocks.
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	Re-culting and vegetation, vegetation, and	W = 20 m	We 95 m.	66 6 ditch and very car. W = 50 m. No other protoction.
COND	ž. E	Type of Disasier	203+550 C-S.F	203+850 D.F	204+250 C-0.F	204+400 C-S.F
	Oisaster	n o	田66(0)	正-66(b)	ш-68	111—70
	- 1	Š	4 20	4 0	7 4	8

* Countermeasures shown in remarks are to be considered as countermeasures in long term.

(13)	k	Remarks	•Re-cutting •Concrete spraying (t=10cm) •Berm ditch	• Re – cutting • Concrete spraying {I=10cm} • Berm ditch	•Concrete spraying (t = 15 cm)	d Concrete spraying (t = focm) a Berm ditch cStore masorry
ON PASS SECTION (13)		Countermeasure	• Re cutting • Vegetation • Berm ditch	• Re-cutting • Vogetation • Berm ditch	• Concrete spraying († = 10 cm)	• Vegetation • Berm ditch • Stope masonty
DALTON	Factor for selection	of countermeasure	• Steep slope • Totally weathered rocks are considered as soils.	Slope gradient is gentle. Yery weak rocks covered the slope. (nearly soll)	Slope gradient is optimum Progress of weathering is anticipoted.	Berms exist on the slope but no ditches on the berm. Cut slope gradient is optimum. No slope protection.
MEASURES		Water Condition	• A little concentration of slope surface water exists.	• A little concentration of stope surface water.	• A little influence due to surface water	• Water from hinkerland flows on the slope.
	Slope Condition	Geological Condition	*Highly to totally weathered DIABASE rocks in some parts of the slapp. (Nearly soil)	- Highly and totally we othered ANDESITE rocks exist in some parts of the stope	• Highly weathered DIABASE • Highly joinled and developed cracks	eHighty to totally weathered DIABASE
CONDITION OF DISASTER AND SEL	Existing	Dimension of stope	Re-calting and Re-70m.	E & Re-culting and sor	E Caccide spragar,	W = 160 m.
CONDI	£	Type of Disoster	204+800 C-S.F	205+000 C-S.F	205+900 C-0.F	206+000 C-D.F
	Disoster	No.	11111111111111111111111111111111111111	Ⅲ-73	т-75	л-76
		o Z	9 9	S _S	2	N S

* Countermeasures shown in Remarks are to be considered as countermeasures in long term.

(14)	ş	Remarks	. Removel . Cost in place concrete crib	• Removal • Gast-in-place concrete crib	• Same countermeasures shown in left column	Concrete Spraying Berm dich and vertical ditch Stone masonry
ON PASS SECTION (14)		Countermeasure	• Removal • Concrete spraying (1= 15 cm)	• Removal • Concrete spraying (I=! 5cm)	Re-filling Cast-inplace concrete crib with grass Stone pitching Gabion foot protection Berm ditch and vertical ditch	 Vegetation Berm ditch and vertical ditch Slone masonry
DALTON	Factor for selection	of countermeasure	Stope gradient is a little bit steeper than the optimum. Progress of weathering is anticipated. Height of slope is very	Same notes as spot No. 11-77	Poor drainage facilities on the raddway. The stope is very high and a little bit steeper than the optimum stope.	"Berms exist on the slope but no diches on the berm. "No trees and grasses on the slope. "Slope gradient is optimum and stable.
COUNTERMEASURES		Water Condition	•A little concentration of slope surface water exists.	«A little concentration of stope surface water exists.	• Much concentration of road surface water couses the road surface water to saturate into the ground.	•Water from hinterland flows on the slope and a little concentra- tion of water occurs.
D SELECTED COUNTER	Stope Condition	Geological Condition	• Moderalely lo highly weathered DIABASE with highly developed cracks.	• Moderately to highly weathered DIABASE with highly developed cracks.	•Embankmeni malerids and highly weathered DIABASE	oHighly weathered DIABASE DIABASE Alighly developed cracks and fractured in some parts of the slope
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	Mea- 6- Mea- 7- Mea- 8- Mea- 8	W = BTm. Som Som Som Som Som Som Som S	stare of price of pri	E Bern dild 33.0 8 240m.
CONDI	8	Type of Disoster	206+250 C-0.F	206+350 C-S.F	206+600 E-DF	206+600 C-S.F
	Disaster	No.	77-Ш	ш-78	62-田	日 日
	:	o O	O O	ιυ 4	å.	S G

* Countermeasures shown in Remarks are to be considered as countermeasures in long term

(5)	+	Renarks	"Same courrierneasures shown in left coloma	•Re—cutting •Concrete spraying (1±10 cm) •Berm ditch and Vertical ditch	.Re - cuting .Concrete spraying (tatoom) .Berm dittu	•The proposed Dation Pass Tunnel Project. endsup to this spot. •Re-cutting •Concrete Spraying {t=10cm}
ON PASS SECTION (15)	(Countermedisure	.Re-filling .Supported type Refaining wolf .Vertical ditch .Stone pitching	. Re—cutting .Vegetation .Berm dich and Vertical dich	• Re - cutting. • Vegetation •Berm dich	"Re-cutting "Vegelation "Bern ditch and vertical ditch
DALTON	Factor for selection	of countermeasure	 Poor drainage facilities on the roadway and on the slope. Slope is very steep. 	*Slope has a very long tength but gradient is not so steep. *Some unstable materials exist on the slope.	Stope gradient is steeper: than the aptimum.	•Slope gradient is just optimum, but some unstable materials exist on the slope.
MEASURES		Water Condition	Concentrated road surface water saturates into the ground.	"Concentration of the stope surface water exists.	• A little concentration of slope surface water exists.	«Cancentration of slope surface water exists.
	Slape Condition	Geological Condition	•Embonkment materiais	•Highty and totally weathered DIABASE in some parts of the stope. (Nearly soil)	*Highty and totally weathered DIABASE in some, parts of the slope (Nearly soil)	"Highty and totally weathered DIABASE; in some parts of the slope," (Nearly soil)
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	E Septembel 1/17 - Schmusy still W = 18m + 20m + 45m.	Re-culling and waterion and waterion as so we so m.	Re-cutting and voyablian. And voyablian. N = 65 m.	Re-cutting and Keyitation A400 W = 120 m.
CONDI	E X	Type of Disoster	206+800 E-0.F	207+150 C-5.F	207+300 C-S.F	207+550 C-S.F
	Disaster	No.	18-28	ш-82	四-83	正—84
		2	57	n S	ø G	ß

* Countermeasures shown in Remarks are to be considered as countermeasures in long term

	Remarks				
ON PASS SECTION (16)	Countermedsure	· Ste-filling · Stone pitching · Vegetation · Gabion foot protection	· Re-cutting Sprayed concrete crib with grass. · Vegetation · Top slope ditch and berm ditch.	Removal Sprayed concrete crib With grass. Concrete spraying (1=15cm.) Top slope ditch.	• Removal • Concrete spraying (†= 15cm)
DALTON	Factor for selection of countermeasure	Embankment stope is not so high. No protection facilities for scouring caused by the river current.	Stope is not steep but focks are very weak. Pragress of weathering is anticipated. Eroston by stope surface water is anticipated.	Slope is very high. Re-cutting work cannot be applied. Slope gradient is a little bit steeper than the optimum.	.Unstable and detached rocks. Stope gradient is not so steep.
REASURES	Woter Condition	Scouring is caused by high velocity of river current. Concentration of road surface water exist.	Water from hinterland Ilows on the stope and a concentration of stope surface water occurs.	· Concentration of slope surface water exists.	of slope surface water.
SELECTED COUNTERMEASURES	Geological Condition	· Embankment mate- rial	· Highly to totally weathered DIABASE rocks with highly daveloped cracks and fractures.	· Highly to totally weathered DIABASE. · Highly fractured rock.	· Maderately to highly weathered. DIABASE rocks with highly developed aracks.
CONDITION OF DISASTER AND SEL	Dimension of slope	Re-filling Nagatation Start massange Start massange Start massange Start massange Start profestion food profestion	ME BOM	50° Conside spraying 65 50° Sprayed 65 Sprayed 66	Concrete spraying
TIGNOD	Km Type of Osaster	216+900 E-DF	217+350 C-D.F	219+500 C-S.F	219+600 C-S.F
	Disaster Spot No.	п-4	9-П П	т-п	89 - H
	ģ	v	62	63	64

	Remarks		ooking, 1 will be 1 fils site.		
	Rez		Generally speaking, Sabo Project will be required at this site.		
	Countermedsure	·Concrete spreying (t= 15cm.)	Gravity type retaining wall. Concrete box culvent. Calch space. (Excavation)	· Concrete Sabo -Dam. · Waterway · Gabion fool protection.	• Waterway • Concrete Sabo-Dam.
Factor for seteration		• Much progress of wea- thering is due to stope surface water. • Stope is stable.	Very big amount of debris flow. Only temporary counter measures are proposed. Road disaster will be avoided only one time. Maintenance work and small restoration work will be required.	. Debris exist on the creek Scouring is caused by the river current.	Some debris exist on the hotlow. Slope gradient is stable and the slope is covered by trees and grasses.
	Water Condition	• A little concentration of slope surface water exists.	During heavy rain, a big concentration bf water fromhinter-fand is anticipated.	Scouring of river bed is anticipated. Currant velocity of the river is very high during rainy season.	Water from hinterland flows at a hollow on the slope.
Slope Condition	Geological Condition	· Highly weathered DIABASE rock with highly developed cracks.	• River deposite (Debris)	· River deposite {Debris}	: Slightly weathered DIABASE.
Existing	Dimension of stope	W= 90 m.	Gravity type rechangual Catch space Catch space Catch space Cancel to Cancel to Cancel W = 120 m.	Conviste sobo-dem Stone pitching water any Existing Br. 10 7 1.2	Concrete subs-dam Stear pitching software range 20 the contraction of
	Type of Disaster	220+100 C-S.F	22! +250 0.F	222+050 D.F.	223450 D.F
	Spoi No.	о !	II-11(0)	π-11(6)	н - -
	ģ	တ္	99	67	89

rks		امن		
8) Remarks				
ON PASS SECTION (18) Cantermeasure	· Re-filling. · Stone pitching. · Gabion retaining watt.	Sprayed concrets orib with concrete wall. Top slope ditch. Vertical ditch.	• Ra-filling. • Stone pitching. • Gabion foot protection.	· Re-filling. · Slone pitching . · Gablon foot protection .
DALTON Factor for selection of countermeasure	Scouring caused by the river current made the stope very steep. Road surface water also saturates into the ground.	Progress of weathering is due to surface water. Rock is very weak and slope gradient is a little steeper than the optimum. Slope is very high, Re- cutting work can not be applied.	Road disaster occured due to scouring by the river. River reverment is required.	Road disaster occured due to the scauring by the river. River revetment is required.
MEASURES Woter Condition	Current valocity of the river is very high. Road surface water concentration exist.	Water from kinterland flows on the slope and concentrates at two hollows on the stope.	Current vetocity of the river is very high.	· Current velocity of the river is very high.
AND SELECTED COUNTERMEASURES Existing Stope Condition stope Geological Condition Water Cond	· Embankment material.	Highly to totally weathered DIORITE. Fractured. Very weak soft rock.	· Embankment material.	· Embankment material.
CONDITION OF DISASTER AND SEL Existing Disaster Dimension of slope	Pe-Filling Store pytching Store pytching W=100 m.	W = 150 m.	Stare pitching 60 Stare pitching 60 Stare pitching 60 Stare profession 60 Stare 60 S	Store pitching
CONDIT Km Type of Disaster	223+500 E-D.F	223+600 C-DF	224+400 E-D.F	225+000 E-D.F
Disaster No. Spot No.	69 4 - n	70 II - IS	7:1 II-18(a)	72 II-18(b)

Disaster			Existing Stope Condition		Factor for selection	Cition	
Spot	Type of Disaster	Dimension of slope	Geological Condition	Water Condition	of countermeasure	Countermeasure	Remarks
	225+700	45° E	· Embonkment material .	High velocity of river current.	Existing grouted riprap is almost destroyed. Scouring gaused by the	· Stone pitching. · Gabian foot protection.	
다 - 다	E-0.F	Stee pitching		is anticipated.	river current needs protection.		
	,	Gabion Foot predection' W=200m.					
					·		
							r .
							4.

(I) N	agen girilgement	Remorks	A half kee of the existing concrete povement was destroyed.		Existing ground riprap was destroyed.				
MAHAPLAG - SOGOD SECTION (I)		Countermedsure	· Re-fitting · Vegetation	· Side ditch	Extension of bridge length		Fa-filing Vegetation Side ditch		· Re-filling · Vegetation · Side ditch
МАНАР	Factor for selection	of countermeasure	· Inadequate embankment · Poor drainage facilities exist on the roadway.		· ist opproach abuithent encroached to the river		Indequate embankment Poor drainage facilities exist on the roadway.		· Poor drainage facilities exist on the roadway.
MEASURES		Water Condition	· Concentration of rood surface water		· Bridge abutment was soured by the river.		Concentration of road surface water		Concentration of road surface water Embanisment material is sortucited by road surface water.
 SELECTED COUNTERMEASURES	Slope Condition	Geological Condition	• Enbankment material	:	· Sand and gravel · Filling material		Embankment inarerial		· Embankment molerial
 CONDITION OF DISASTER AND SEL	Existing	Dimension of slope	—Side difch —Vegetation 20m E	Re-fluing—W=30m	Bridge	W=10m	S S S S S S S S S S S S S S S S S S S	W-27m	E Vacetation E Magetation E
3-2		Type of Disaster	009+066	F . O . F	1000+730	Ē-D.F	1002+350 E-0.F		1003+060 E- DF
APPENDIX 10		lo. Spot No.	(0,00)		2 XIII~86		з хіп-67		4 <u>XII</u> -68

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N (2)		Renorks															
LAG - SOGOD SECTION (2)		Countermeasure	· Re-cutting	Horizontal drain hales	· Vegefatkon	· Gablon Retaining wall	. Re - cutting	· Vegetalion	. Top stope ditch	· Berm and vertical attch		· Re-filing · Vegetation	· Vertical ditch	· Side ditan	· Re-cuting	Vegetation	· Verlicas orain
MAHAPLAG	Factor for selection	of countermeasure	· High groundwater level	· Poor drainage facilities exist on the readway	. Not high nor steep	9 .00 00	Slope gradient is not	slope is not high	· Surface water concentration			. Poor drainage facilities exist on the roadway,		·	. No protection on the slope	· Slope gradient is liftle bit steeper.	· Surface water concentration
MEASURES		Water Condition	· Spring in the slope				· Concentration of	slope				· Concentration of road curface water			- Concentration of slope surface woter	. Water concentrated from hinterland	
SELECTED COUNTERMEASURES	Existing Stope Condition	Geological Condition	· Highly weathered	Sedimentary Rock	(= Nearly Soll)		· Totally weathered	. TUFF	· Almost soll			Embankment material			· Highly weathered	TUFF Totally worthward	in parts of stage
CONDITION OF DISASTER AND SEL	Existing	Dimension of slope		Re-outly regulation	8 9	W*120m	3	200		205 m	11100	Vegatation Vegatation A 400 P. Filling P. E.		W-20m	Re-cutting and	And Andrews	32° N × 35 m
CONDI	æ	Type of Ososier		1004 + 950	r.s			1006+580	G-S-F			1009+020	E-0.F			090+6001	က က
	Disoster	Spor		17-110				:	1-73			47 - EUV	· ·			87-18	
ŀ		į		<u></u>					9		-					<u> </u>	

		Remarks			a-manufa-ron								-	ya Tana Penjaha		6.0 ****		<u></u>	- Combined Comp	
SECTION (3)		<u>~</u>						·		. :		· .							ang de la décembra planse	
MAHAPLAG - SOGOD SEC		Countermeasure	. Re-fliting	· Vegetation	· Side ditch	· Vertical ditch	- Removoi	Concrete spraying (t=15 cm)				· Re-filling	· Vegetation	. Side ditch	· Vertical ditch		· Removal	· Concrete spraying (t=15cm)		
МАНДЕ	Factor for selection	of Countermeaure	Poor drainage facilities exist on the roadway.	· Steep embonkment slope			· No existing stope pratection	· Slope is sleep and high				· Poor drawage facilities exist on the roadway.	· Steep embankment stope				No existing stope protection	· Stope is steep and high.		
MEASURES		Water Condition	· Concentration of road surface water				Scoured by slope surface water					· Concentration of road surface water					Scoured by slope surface water			
ECTED COUNTER!	Stope Condition	Geological Condition	• Embankment material				• ፒሁቮ	· Slightly weathered and soft rock	· High developed cracks			· Embankment materiol	:	-			· Sightly weathered	·TUFF	· Soft rock	• High developed cracks
CONDITION OF DISASTER AND SELECTED COUNTERMEASURES	Existing	Dimension of slope	Walthien Ke-Filling	66 m		<u>W</u> = 15m	Convede oproving	Remove A	69	<u>₩</u> = 40 m	Re-Filling	Vegetation	w 51	7		W = 10 m		Loncrete spraying	Removal DE	W=65m
CONDIT		Type of Disosier	:	089+6001	Б. О.			002+6001	C-S.F			V62.10001	02116001	E-0.F				1010+200	r. s. n	
		Spot No.	:	ZIII 76				72-月					-7m-78		.i	1.		2		
		No.	:	- - - - - - - - - -				· 月					-			1.5		2		

			5	*	
7+172	Remarks	Opposite side of Spot	The biggest stope fo kure In Matroplag-Sogod Section.	Outer of pipe cuivert, headwall and apron was washed out,	
יייייייייייייייייייייייייייייייייייייי	Coumermedsure	Re-filling Vegetation Subsurface drainage Side ditch	Re-cutting Vegetation Berm and vertical ditch Horizontal drain holes	• Pips culvert • Re-filling • Verpetation • Vertical drain	· Waterway · Catch Bosin
THE STATE OF THE S	of countermeasure	No existing drainage facilities Scoured by the stope surface water and road surface water for so steep and so steep	No existing stope protection Progress of weathering is anticipated Very long stope tength	Poor drainage facilities exist on the roadway. Not so steep and high embarkment	. No existing dramage (acilities on the slope
ondition	Water Condition	· Concentration of surface water	Concentration of stope surface water Concentration of water from hinlerfand Abundant scepage of water	· Concentration of road surface water	. Concentration of slope surface water
10	Geological Condition	Embonkment material	Tuffaceous SAND - STONE Highly weathered Totally weathered in some ports of the skope (olimost sand and gravet)	. Embankment material	· Totally waathered · TUFF
Existing Stope	Dimension of slope	Subsurface Subsur	Hougantal GOOT	Recfilling and West Aller and Control of Control of Control of Control of the Column of Control of the Control of Control of the Control of Control	Store pitching water way
	Type of Discarer	1010+650 E-0.F	1010+700 C- D.F	1012+040 E-D.F	1012+520 D.F
Disaster	Spot No.	<u>VII</u> - 80	XXII 81	<u>хт-</u> ез(b)	:VIII-83(c)
	્રે	ū	4	5	<u>o</u>

(2)		Remarks						alderson (per une o nama								na magazifa pala ana an	
LAG - SOGOD SECTION (5)	Соитегтеди		. Re-flling	Cast-in-place concrete crib with grass	· Gobion retaining walt	· Verikal ditch	. Suce airci	· Concrete spraying (thickness (5 cm)	· Vertical drain	· Stone masonry	. Re-cutting	Sprayed concrete crib with grass	· Vegetation	· Vertical · drain Stone · masoury	Pipe culvert	· Stone mosonry	
MAHAPLAG	Factor for setaction	of countermeasure	Poor drainage facilities exist on the roadway.	No stope protection, high and steep slope			No existing slope	· Scoured by slope surface water		·	. No existing stope protection	. Weaker than the rock of NIII -86	Surface water	Soured by surface water	. No structure crossing the roadway		
MEASURES	Existing Stope Condition	Water Condition	Concentration of road surface water				Slope surface water	· Surface water from hinterland drops on	the slope		 Concentratration of slope surface water	. A little seepage of water			Small creek crosses the roadway and water overflows on it.		
SELECTED COUNTERMEASURES		Geological Condition	· Embankmenk material				Highly weathered	- Totally weathered in some parts of	the slope	High developed cracks	· Highly weathered ANDESITE	· High developed cracks			Enbankment materia	: .	
CONDITION OF DISASTER AND SEL		Dimension of stope	(00) (m)	29 m.	Castiniplace concrete evila	division rationing well Wz49 m	a common of the common of		253	W = 150m	Spring Courte	Re- culture and vegetalised	\$ 25 S	W=20m	Stone masonry. Overflow	Concrde pipe coloret	W*100m
CONDI	e ×	Type of Oscarer	0		E-0-F		:	1013 +980	C-S.F		0.14 ± 600	G- D.F				0.F	
	Disaster	-		XIII- 85				<u>2011</u> -86				<u>val</u> r- 87(a)		:		(q)28- <u>mzz</u>	
	Ž			~				<u>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</u>				<u> </u>				8	

			The state of the s											······································			
(e) N	Remarks									*****				There are 2 kinds of Rock hardness on the	P. Co.		
MAHAPLAG - SOGOD SECTION (6)		Countermedsure	· Re-culling	Vegetation	Vertical drain		. Re-fuling	with gross Vertical ditch	· Gobion closed conduit	Stone pitching Gabion Retaining Wall	. Re-cutting	Concrete spraying (thickness IC cm)	· Vertical drain	. Removai	· Sprayed concrete orth with concrete wall	Rock Bolt	. Anchor wire ner
MAHA	Factor for selection	of countermeasure	Progress weathering is fast.	Slope gradient is not so	•	Concentration of surface water	Poor drainage facilities exist on the roadway.	. Stope is very high and not so steep.	No stope protection nor openis of pipe cuiveris	A little seepage of water occurs.	· Mare stable than the rock of Spat NaXII-90(b)	No drainage facilities exist on the slope.		· Very weak rocks	Slope is steep and very high.	The berns exist on the stope, but there is no bern dilch.	· Re-cutting can not be applied,
MEASURES	Existing Stope Condition	Water Condition	· Surface water from hinterland drops on the state		of stope surface water		· Concentration of road surface water	· Existing culvert crosses the roodway.			· Concentration of slope surface water			. Water from hinterland drops on the stope.		·	
LECTED COUNTERMEASURES		Geological Condition	Totally weathered TUFF	· Nearly soil	· Loose soll		· Embankment malerials				· Highly weathered SANDSTONE	· Highly developed crocks		· Highly weathered SANDSTONE	· In some parts of the slope, hard SANSTONE: exists.	Highly developed crocks	
CONDITION OF DISASTER AND SEL		Dimension of slope	Re-cutting and vegoliation	205	200	W≃39m	7 (c)	Cadin place		W= 90m	Re-witing	Concrete spraying	Na 20m	Sprand convolts	54.7 () () () () () () () () () (4 80 40 650	W=40 m
CONDI	£ X	Type of Disoster	(i	061 + 6101	C-0.F	-		1015 + 560	L O I U			≅ :	י. מ ט		1015 + 560	ਨ ਜੁਲ- ੨	
	Disaster	Spor No.		88				88-1117				YIII90(a)			(q)06-mz		
		ġ Ż		77		·		22				23			24		

N (7)	Remarks			. Half lare of the cancrete pavement was destroyed.	
MAHAPLAG - SOGOD SECTION (7)	Countermeasure	· Re-filling · Vegelation · Side ditch · Gabion Retaining Wall	· Re-cutling · Vegetation · Berm and vertical ditch	Re-filling Vegetation Gablon closed condutt Vertical ditch Side ditch Side ditch Sablon Retaining Wall	· Nemovai · Vegetation · Top slope ditch
MAHAP	of countermeasure	Poor drainage facilities exist on the roadway. Slope gradient is gentle,	No slope protection No drolnoge facilities exist on the slape	Poor drainage facilities Stope gradient is genite. A little sespage of water on the stope occurs.	. No protection on the slope . Slope gradient is very gentle.
COUNTERMEASURES	Water Condition	Concentration of road surface water Embankment material is saturated by the road surface water.	Sepage of water occurs Slope surface water flows on the stape	Concentration of rood surface water Embankment morieral is sotuated by the rood surface water.	Slope surface water flows on the slope. A little seepage of water occurs.
	Geological Condition	· Embankment materials	VOLCANICLASTICS Totally weathered (Nearly Soll) Very toose	- Embonkment material	VOLCANICLASTICS Totally weathered (Nearly Soil)
Existing Slope (Existing Slope (Oimension of stope	me (k-tilling out)	νως futing and some soon soon soon soon soon soon soon soo	Carbon closed Good on refaming	We station
TONO E X	Type of Disaster	1016+600 E-D.F	1016 + 750 C-S.F	1016 + 850 E-D.F	1017 + 400 C-D.F
	No. Spot	25 区田-91	26 <u>XII</u> -92	2.7 XMC-9.3	28 VIII-94

re	Concrete povement was destroyed			
stion Countermeasure	Re-filling Vegetation Gablon closed conduit Verrical ditch Side ditch Goblon Retaining Wall.	. Re-cuiting . Concrete sproying (t = 10cm)	Renoval Re-cuting Concrete spraying (i = 15cm) Vertical ditch - Top skope ditch	Mater way Water way Goodly type retoring wall Concrete spraying (t≠10cm) Vegetation
Factor for selection of countermeasure	Poor droinage facilities exist on the roadway. A little seepage of water on the slope	No protection on the slope gradient is not optimum. Progress of weathering is anticipated.	No protection on the slope Some detoched soils existin on the slope. Slope gradient is steep.	Deep scouring due to concentration of stope surface water Debris exist on the stope.
Condition Moter Condition	Concentration of road surface water Embanyment moterful is sativated by the road surface water.	Stope surface water flows on the stope,	Stope surface water flows on the stope.	Concentration of alope surface woter, A little seepage of water occurs.
Stope C	· Embankment materiats	- Highly weathered ANDESITE (Soft rock) Highly jointed and developed cracks	. Slightly weathered . Developed cracks	· ANDESITE · Highly weathered and, developed cracks
Sxisting Slope Jissare Dimension of slope Geologic	Capun cloud could?	35° Control of program of the state of the s	Sze E	Appropriate Longues 400 Mar 60m
Km Type of Okasier	1018 + 280 E-D.F	1018+800 C-S.F	1019 + 380	1019+690 G-D.F
Disaster Spot No.	<u>∨</u> 96	-97	66 - IIIA	OOI - JUICA
No	829	O m	គ	ପ ମ

SELECTED COUNTERMEASURES MAHAPLAG - SOGOD SECTION (9)	sting Slope Candition	Geological Condition Water Condition of countermeasure Countermeasure Remarks	· Slightly weathered · Less concentration of · No stope protection was · Removal slope surface water implemented .	· Highly developed crocks			Highly weathered Concentration of slope 7 No stope protection was ANDESITE surface water implemented	Totally weathered in Soured by concentration some stope state of slope surface water fore water			AUDESITE slope surface water is minked.	Hard Rock Detached rackrexist on His stope	· Developed cracks			· Highly weathered · Less damages due to · Soft rock and soils	- Highly weathered - Less damages due to - Soft rock and soils - ANDESITE slope water surface exist in some parts of the stope.	Highly weathered - Less damoges due to - Soft rack and soils ANDESITE slope water surface exist in some parts of the stope.	Highly weathered - Less damages due to - Soft rack and soils ANDESITE slope water surface exist in some parts of the stope. Hard Rock - Progress of weathering is multinal.	- Highly weathered - Less damages due to - Soft rack and soils ANDESITE slope water surface exist in some parts of the stape. - Hard Rock - Progress of weathering is minimal.	Highly weathered - Less damages due to - Soft rack and soils ANDESITE slope water surface exist in some parts of the stope. Hard Rock - Progress of weathering is midmal.	Highly weathered - Less damages due to - Soft rack and soils ANDESITE slope water surface axist in some parts of the stope. Hard Rock Progress of weathering is minimal.	ANDESITE slope water surface axist in some parts of the stope. Hard Rock Progress of weathering is minimal. Developed cracks Slope gradient is steeper than optimum gradient.
CONDITION OF DISASTER AND SELEC		Dimension of stope G		zi.g	65° 17	W=70 m	, Re-culting and registion		mčs	11 C 2 E11	Archer was 10th	W b		W = 20 m	1	/ Anchor wire helt			 				F
TIONOS	E X	Type of Disosier		068 + 6101				1020+000	C- S- FI				<u>.</u>	· :			1020+800	1020+800	1020+800 C-F	1020+800 C-F	1020+800 C-F	1020+800 C-F	1020+800 C-F
		No. Spot		33 724-101				% 50 50				35 XIII -103						36 2011-104					

-				
Regorks	:			
SECTION (10)				
MAHAPLAG - SOGOD SECT	Horizontal drain holes	. Re cutting Vegetation Top stope, ditch	Vertical ditch Top stope ditch	Re-cutting Counter fill Goblon Retaining Wall Bern and wertical disch
Factor for selection	The slope is covered by grasses and frees. The slope gradient is not steep and the slope in the slope is unstable in dry season.	Translational stide is anticipated. Siructural weakness of stope such as beoding plane between firm bedrichtus.	The slope is covered by grasses and frees, Concentration of slope surface water	Slope gradient is not steep and height of slope is low. Wight of shoulder is more than 3.0 meters.
	High underground level A little seepage of waler occurs.	Stope surface water flows on the stope and saturate to the ground.	- Woter from thilerlond runs of the stope.	Sope surfoce water salurates to the ground, Ground water level is not so high.
Existing Stope Condition	Moderalely weathered SEDIMENTARY ROCK	Slightly weathered Tuff Bedding planes finclined fowards alope surface	. Moderately weathered TUFF	- Highly weathered SEDIMENTIARY ROCK (Nearly Soil)
Existing Cinearia di Inna	150	Watchton Wager to	W= 55 m 20 20 20 20 20 20 20 20 20 20 20 20 20 2	Re-cutting and vigotateten of Social
K K K	~]~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1022+260 C-S.F	1022 + 550 C-S.F	1023+220 L. S
Disaster Spat	· · · · · · · · · · · · · · · · · · ·	<u> </u>	<u>v≖</u> -107	801 -шх

(1)	Remarks	Road widening towards river side is difficult due to deep valley.	9	9	- OP -
KENNON ROAD	Countermeasure	· Ra-cutting · Anchar wire net · Vertical ditch	Re-cutting Anchor wice net Vertical disch	. Re - cutting . Anchor wire net	- Re-cutting - Anchor wire net
	Factor for selection of countermeasure	Overhang formed Water from initeriand concentrated at one place and falls to road surface. Progress of weathering is minimat.	Overhang formed Rock is stable though with slight cracks. • Water from hinterland concentrated at two places and fall to road surface.	Overhang formed More stable than rock of iK-4.	Overhang formed Some joints exist. Less wedk than rack of IK-3,4 and 6.
EASURES	Water Condition	-Less concentration of stope syrface water. • A little seepago of water.	A little scepage of water. • Water from hinterland runs at two hollows of the slope.	No water seapage nor concentration of stope surface water.	• No concentration of stope surface water.
SELECTED COUNTERMEASURES KISTING Slope Condition	Geological Condition	. Conglomerate . Hard and fresh rock wlin sparse crocks.	Conglomerate Hard and fresh rock With sparse cracks.	· Conglomerate · Fresh rock with regular cracks.	· Conglomerate · Silghtly weathered rock with regular cracks.
CONDITION OF DISASTER AND SELE	Dimension of slope	Ancher wite w.C. Cut line Courtons Almost vartical W = 140 M (W : Width of slope)	wire not will four line Cut line Overhand Aimost vertical W = 250 M	Anchov with the Cut line Cut line Atmost vertical	Anchor wire liet. Out line Overhang No Almost vertical
3-3	Type of Disaster	218+000 C-F	219 +300 C - F	223+200 C-F	C-F
APPENDIX 10	Spot No.	χ ,	× × ×	φ . 	[K-7(a)
H	Š		N	м	4

(3)	Remarks		:	Catch fence cannal be applied due to the heavier weight of the failing rocks.	. Very big stape takure occurs at the apposite side of the river.	
KENNON ROAD (2)	Countermeasure	· Supported type retaining wall.	Slone masonry relaining wail	Removal Re-cuting Sprayed concrete crib with grass and with concrete walt	Re-cutting Sprayed concrete crib with grass and with concrete wall	Re-filling of common materials Horizontal drain hate Cast-in place concrete wall
History for the sections	of countermedsure	Existing grouted riprop was destrayed due tocon- centration of road surface	water. Poor drainage facilities Stope gradient is steep but there are berms on the slope.	Two types of disosters are present on the spot. One is the slope failure and the other is rock fail. Highly jointed rocks exist in some parts of the slope, in some parts of the slope is stable.	Rock fall is in block mass. The height of the slope is not so high. Two kinds of hardness in rocks exist on the slope.	. Subsurface drain is required. The stops is high and steep.
COUNTERMEASURE	Water Condilion	-Cancentration of road surface water axists.	· Émbankment malerials were saluraled by road surface walar.	Less concentration of slope surface water Slope surface water flows on the slope.	. A little influence due lo the stape surface water.	Seepage of water an the slope occurs. Rad surface water saturates into the embankment materfals.
Slope Co	Geological Condition	• Embankment materials (sand and gravet)	· Hard CONGLOMERÀTE	· LIMESTONE · Weathered rock with developed cracks.	.Weathered rock with developed cracks.	• Embankment maleria is (sond and gravel)
OF DISASTER	Olmension or slope	Come tractions of the full of	E Existing Stone Masonry	Per-culting Spring Committee Committ	Spriged contribe city 2	Contain place converte corts Re-fill on No. fill on Solution S
CONDITION	Type of Discater	224+850	E-0.F	226+i00 C-F	226+350 C-F	227+250 E-D.F
Disaster	Spoi		(K-7(b)	⊼ ! ወ	1K-10(a)	[K-i0(b)
	ğ		ഗ	ė		m _

Remorks	There is a small creek	between stope at IK-11 and IK-12.				-				
	.There is	petween and tK-1								
KENNON ROAD (3)	.Remova!	. Anchor wire nei	.Removal	.Anchor wire net		. Removal	.Anchor wire net.		.Removal Anchor wire net	
Factor for selection	Rock fall	Progress of weathering is minimal.	.Rock fall	Progress of weathering is minimal.		.No protection facilities for rock fail.	Progress of weathering is minimal.		No protection facilities for rock fall. Progress of weathering is minimal.	
	Mater Condition No water concentration	exist on the slope.	No water concentration exists on the stope			No water concentration exist anthe slope.			.No water concentration exists on the slope.	
Stope Condition	Geological Cordinori	. Fresh rock with regular aracks.	.Fresh ANDESITE	.Regular cracks.		.Fresh ANDESITE	. Ragular cracks		·Fresh DIORITE ·Moderalely jointed	:
Existing Stope Condition	Anches entre	92 95	+5: Auchov.	25 -4.5	W*24m	40° Ancher wire mt		W-30m	20 Anchor who net	W-26.5 m
Na Ra Service And	0.	229+050 C-F		229+150 C - F		Oro Tocc) 1 1 1		230+700	C-F
Gisaster Spat		14-11		1X -12		,,,	* 13		71 1-15	
No.		თ		2			=		22	

			-	_		
{ t		Remarks				
KENNON ROAD (4)		Countermeasure	. Re-curting . Concrete spraying (t=15 m) . Sprayed concrete crib	. Romoval , Concrete spraying (t = 10 cm)	. Removal . Anchar wire net .Vertical drain and pipe aulveri.	.Anchor wire nei
	Pactor for selection	of countermedsure	.No protection facilities on the slopeStope gradient is steeper linan the optimumThere are two kinds of lardness of rocks on the slope.	.No protection on the stope . Progress of weathering	.No protection facilities for rock fall. .No progress of weathering is anticipated.	. No existing stape protection for rock falt No progress of weathering bankelpated.
COUNTERMEASURES		Water Condition	. Water from himetand flows at the hotlow on the stope.	existon the stope, Surface water flows on the stope.	. Water from hinterland Is concentrated at one hollow anthe slope.	. Water from hinterland flows at a hollow on the stope.
SELECTED COUNTER!	Stope (Gealogical Condition	Highly weathered ANDESITE rocks Slightly to moderolety weathered rocks in some prints of the stope,	Moderately weathered ANDESITE with deve- loped crucks	Signify waathered and moderately dailed GRANITE	Slightly to moderately weathered and slightly jointed DIORITE
CONDITION OF DISASTER AND SEL	Existing	Oimension at stage	48 A B B C W 1 2 B B B B B B B B B B B B B B B B B B	45 Decembrate spiriting	AST Anchor wire left 50 mm 43 m.	SOO Ancher wire net
CONDI	S.	Type or Discuser	234+300 C-F	234+400 C-F	234+700 C-F	234+900 C-F
		Spoi No.	91 – XI	IK-20	IK-21	IK-224)
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5)	Remarks				
KENNON ROAD (5)	Countermeasure	Re-Ililing Casi-in place concrete crib with concrete wali P.C. Anchor	- Re-cutting - Concrete spraying {1 = 15 cm}	Removal and Re-cutting Sprayed concrete crib with grass Sapported type Retaining wall.	·Gravity type Retaining walf.
	Factor for selection of countermeasure	Poor drainage facilities Embankment materials were saturated by rood surface water	Some unstable materials exist on the slope. Progress of weatheting is anticipated.	Slope length is too long. Slope is steeper than the optimum gradieni. Roadway is very narrow.	· Embankment scouring is anticipated; · Existing grouted riprop is hanging anthe stope. · Foundation of riprap was washed out.
COUNTERMEASURE	Water Condition	. Concentration of road surface water exists.	. No water concentra- tion on the slope.	. Water from hinterland tlows on the slope.	-tilgh valocity of clver current
	Geological Condition	·Embankment materials (Sand and gravel)	•Moderolaly tohighly weathered DiORITE rocks. • Developed cracks.	Highly weathered DIORITE rocks. Ilighly Jointed and developed cracks.	·Fresh DIORITE
CONDITION OF DISASTER AND SELECTED	Dirnension of slope	F.C. Anchor	36° C um de sprayny 36° C um de sprayny 50° C um de sprayny 63.43? C um de sprayny 63.43? C um de sprayny 63.43? C um de sprayny	55. 2 50. 4 50. 50. 50. 50. 50. 50. 50. 50. 50. 50.	02
COND	K.m. Type of Clacaster	234+900 E-0.F	235+050 c-F	235+700 C-F	235+700 E-0.F
	Spot No.	IK-22(b)	IX - 23	!K-24(a)	IK-24(b)
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			and the second s			ad lynage and an a paracina of it does not be harded to be had been been been been been been been bee						
(9)		Remarks										
KENNON ROAD		Countermedsure	Removal and Re-cutting .Concrete spraying { t = 10 cm}	Anchor wire not.	. Re-cutting.	.Anchor wire net.	.Re – cutting	. Anchor wire not		-Removal	Anchor wire net	
	Factor for selection	of countermedsure	«No slope protection «Weathering of reck is on progress due to slope surface water.	. Hord rocksexist in some parts of the slope.	Some unstable malerials exist on the slape.	Stope gradient is steep but stope is tow:	. No protection forrock	. Some detached rocks exist on the slope.		.Very than stope	. No pragress of weathering is anticipated.	
RMEASURE		Water Condition	·Water from hinlerland flows on the slope.		.No water concentration on the slope,		. No water concentration on the slope.			.No slope surface water concentration.		
LECTED COUNTER	Slope Condition	Geological Condilion	· Highly weathered DiORITE with Highly developed crocks and joints.		• Moderately to Highly weathered DIORITE		Slightly to moderately weathered DiORITE			. Slightly to moderately weathered DIORITE	with developed cracks.	
ITION OF DISASTER AND SELECTED COUNTERMEASURE	Existing	Dimension of slope	Julianis spraguit	(63.7.4 (6.7.4 (Anchor wire 14th	M 4.8	, et	OI SI 25	W=20m	45° Ancher wire net	mīs	W=119m
CONDITION	×	Type of Olsoster	236+100	L	236+500		1	C-F			236+700	
-	Disaster.	Spat No.	IK-25			IK-26		IK -27		·	28	
		g	N			88		233			24	

Om Olinension of slope Existing Slope Condition Olinension of slope Geological Condition Vary little influence ANDESITE with Water Condition On Safety Water Interval Condition On Concentration of road (Sand and growt) Safety Water Condition Safety Water Condition Concentration of road (Sand and growt) Safety Water Condition Safety Water Condition Water Condition Water Condition Water Condition On Safety Water Condition Safety Water Condition Safety Water Condition Concentration of road (Sand and growt) Safety Water Condition Safety Water Condition Concentration Fresh Andesite Current.
100 100 100 100 100 100 100 100 100 100

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(8)	·	Remarks				
KENNON ROAD		Countermeasure	.Removal Sprayed concrete crib.	•Removat • Concrete spraying (t = 15 cm.) • Anchor wire net.	.Re-cutting .Vegetation .Concrele spraying (†=10 cm)	•Removal •Concrete spraying (1=10 cm)
	Factor for selection	of countermeasure	Some unstable materials and detached rocks exist on the slope. Slope is not steep but very Mgh. No slope protection on the slope,	There is alittle progress of weathering. Two different kinds of hordness in rocks are present on the stope.	Slope is not so high nor steep. There are two kinds of loyes, one is part sock and the other is soil.	. Slope gradient is optimen. . No slope protection. . A little unstable materials,
COUNTERMEASURE	Transfer de la companya de la compan	Water Condition	Surface water from thinteriand flows on the slope but with less. concentration of the surface water.	. A iliste Influence axists due to sue slope surface, water.	, Less concentration of the slope surface Water.	Slope surface water flows on the stope but with less consolration of the surface water.
LECTED COUNTER	Slope Condition	Geological Condition	Moderately to highly weathered ANDESITE focks with highly developed cracks and joints.	- Highiy weathered DIORITE rocks with highly jointed and developed cracks.	Moderately to highly weathered ANDESITE rocks with developed aracks. Sand and gravel exist on the upper portion of the slope.	Moderately tohighty weathered DORITE and ANDESITE racks with highly developed cracks.
CONDITION OF DISASTER AND SELECTED	Exfeting	Dirnension of slope	45° 40° Kemul C. 40° 40° 40° 40° 40° 40° 40° 40° 40° 40°	883° (1974) 00 00 00 00 00 00 00 00 00 00 00 00 00	Sceede spruging - 600	W=80 m
CONDI	Y E	Type of Cisoster	237+200 C-S.F	237+300 C-F	237+400 C-S.F	237+900 C-S.F
	Disaster.	S pol	IK-33	.K -34	IK-35	IK-36
		g Z	29	30	n	9 5

		Remarks							- Stability and a second se			ungujujug die in international			
KENNON ROAD (S)		Countermeasure	·Re-filling	- State masonry - Supported type Retaining wall.	· Gabion foot protection · Side disch	- Removal	Sprayed concrete crib with grass.			Ramova) Concrete spraying	(and t= fiscm).		- Removal	Concrete spraying	
	Factor for selection	of countermeasure	· Poor droinage facilities in the roadway	Scouring is caused by the river current.		· Stope gradient is natso steep.	· Very weak soft rock.	Some unstable materials are on the stope.		20	wedkness in rocks exist on the slope.	wade shoulder exists in some parts of the road-way.	Stope is high but not so steep.	Ony some detached rocks exist on the slope. • A little progress of weathering exists.	770
COUNTERMEASURE		Mater Condition	· Concentration of road surface water exists.	· High velocity of the river current.		· Slope surface water flowson the sicpe,but	less concentration of the surface water,			• A little Influence due to slope sur face water			. A state influence due to stope sur face wa-	je.	
LECTED COUNTER	Slope Condition	Geological Condition	• Embankmens snaterials	:		- Highy weathered DIORITE FOCK WITH	highly jointed and developed cracks			Moderately to highly weathered Diorit TE rocks with highly	oeveloped cracks,		. Moderately to highly weathered ANDESITE	rocks with highly de- veloped crocks.	:
CONDITION OF DISASTER AND SELECTED	Existing	Oimension of slope	Store mesons	Han tomanders	Gobius ful prolation W=177 m	Spinsted courted	Removal SS6 33	8.8	W ≤ 62 m		75.	₩ 535 m/s	9	E Marcelet spenglet	₩ ≈ 90m
COND	χ	Type of Ciscater		236+120 E-0.F			238+300	C-S.F			C-F			239+900 C-F	
-		od o		1K-37(a)			K-37(h)				1K-38			구 - - 	
		2		8			r.	5	· · ·		35			ဖွ	

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	Remarks				. :
<u>(0)</u>	u.				
KENNON ROAD (10)	Countermeasure	Gravity type Retaining val).	Removoi Anchor wire net (in some parts of the slope) Catch Fence	Removal	Removai Anchor wire net
	of countermeasure	The exising grouted riprops are hanging. Foundation of riprop was washed out.	Stope gradient is not so steep but almost optimum with very high stope. Falling of rocks are axpected in some parts of the slope. Wide shoulder width.	.Not steep nor high stopeSome dotached rocks are on the slope.	A little bit steeper slope, but slope is almost stoble. Some detached rocks are on the slope
COUNTERMEASURE	Water Condition	. Fligh velocity of the river, current.	Slope surface .water flows on the slope.	Very (Inte influence existedue tosurface water,	. Very Ittile influence due to surface water. No water concentration on the stope.
Stope Co	Geological Candition	·Fresh ANDESITE	Highly jointed with developed cracks ANDESITE are slighly weathered.	-Silghtly to moderately weathered ANDESITE rocks are highly jointed.	-Silghily iomoderately weathered ANDESITE rocks are highly joinled.
CONDITION OF DISASTER AND SEL	Oimension of slope	Specify Type Ve 80m	Ancha wire mt Ancha	Auchar wire not 1555 55 55 55 55 55 55 55 55 55 55 55 5	Anchor wire
O C C C C X	Type of Oscater	240+100 E-D.F	240+150 C-F	240+230 C-F	240+350 C-F
Disaster.	Spot	IK-40	IK-41	ix - 42	IK-43
<u> </u>	2		88	ф 8	9

· 		v.				
	Remarks					
KENNON ROAD (II)						
			. Re-cutting . Concrete spraying (t = (0 cm)	· Removat · Concrete spraying (1=10) · Anchor wire net.	. Stone masonry . Side ditch	. Re – culting. . Concrete spraying. (t=10 cm.)
	Factor for selection	of countermeasure	Slope is very steep but not so high. Weak soft rocks. There is a little progress of weathering.	Slope is very stuap. Almost stable stope,but some detached rocks exist on the stope. Altitle progress of weathering is anticipated. There are two kinds of hardness in rocks on the stope.	Poor drainage facilities Existing grouted ripropwadestroyed due to the concentration of road surface water.	. Slope is not high butslacp. . There is a little progress of weathering.
CONDITION OF DISASTER AND SELECTED COUNTERMEASURE	Existing Stope Condition	Water Condilion	A little concentration of stope surface water exists.	· Very little influence of surface water on the spol.	. Concentration of road surface water exists Embankment materials was saturated by the road surface water.	. Very little influence existedue to stope surface water.
		Geotogical Condition	Moderately to highly weathered DIORITE rocks with highly developed cracks.	· Moderalaly lo highly wealthered DIORITE rocks with highly developed cracks.	• Embankment mater lals.	Moderately to highly weathered DiORITE rocks with highly developed oracks.
		Dimension of slope	Concede spraying	Councile spring 1 mg	Shee pageony Shee pageony Welfs	Re-cutting Re-cutting E Almost vertical W=28
	Km Type of Oscater		240+400 C-S.F	240+500 C-F	240+500 E-0.F	240+600 C-F
	Disaster	No.	⊼	IK-45(0)	IK-45(b)	IK-46(a)
	2		-	42	6	4

0 (12)		Remarks		The existing roadway runs on the lop portion of the landsilde. Private residence area. Re-cuting and counter weight fill can not be applied.			
KENNON ROAD (12)		Countermedsura	• Re-cutting • Cancrete spraying (1=10 cm.)	. Piling method			
CONDITION OF DISASTER AND SELECTED COUNTERMEASURES	Fortor for extension	of countermeasure	No protection facilities on the slope. There is a little progress of weathering. Slope is not so high but so steep.	- Bedding plane existen the top of TUFF layer and is notined towards slope surface. - There is a translational landslide type.			
	Existing Stope Condition	Water Candition	.Very linie influence. axisisdue 10 slope surface water,	. In dryseasons, underground			
		Geological Condition	Moderately to highly weathered DIORITE rocks with highly developed cracks.	From the ground surface to a depth of 13 meters is clay and sand. (Alternate)			
		Dirnension of stope	Re-culting	N=150m			
CONDI	Km Type of Discoier		240+700 C-F	247+400 L-S			
	Disasier	No.	IK-46(b)	IK-48			
		g S	a. N	â â			