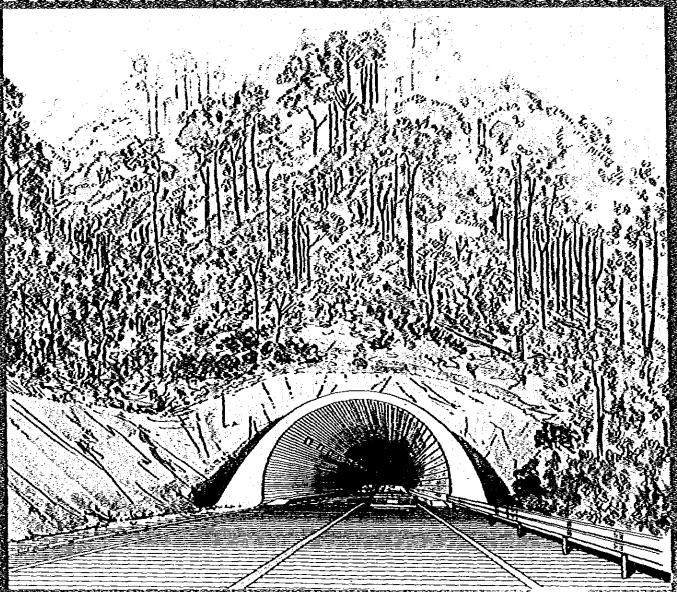
THE FEASIBILITY STUDY ON DALTON PASS TUNNEL PROJECT



Final Report (Appendices) March, 1982

Japan International Cooperation Agency





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Republic of the Philippines

The Feasibility Study on Dalton Pass Tunnel Project

Final Report (Appendices)

March, 1982

Japan International Cooperation Agency



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APPENDIX A

REPORT ON TRAFFIC SURVEY

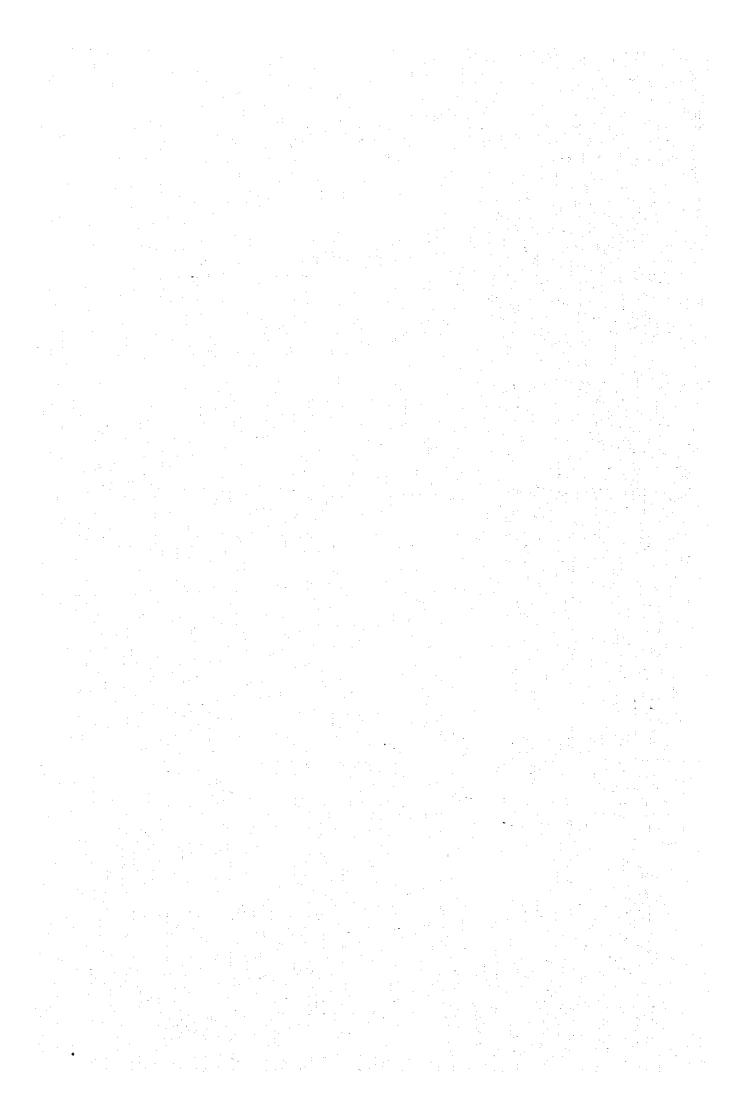


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1 Traffic Counting

1.1 Outline of Survey

The traffic counting was carried out as hereunder specified. At the same time and place, Origin-Destination survey was also undertaken.

- (1) Date and Site:
 - 1) Lacag City on 10 July 1981
 - 2) Sta. Fe on 17 July 1981
- (2) Hours from 6:00 AM to 6:00 AM
- (3) Direction:

 Both directions

The counting station at Sta. Fe is about 7 kgs. away from Dalton Pass. But it is possible to consider the traffic at Sta. Fe as just the traffic at Dalton Pass, as there is no intervening short trip in Sta. Fe.

Bicycles and motorcycles were excluded.

1.2 Result of Survey

The results of the survey are shown in Table 1.1 and 1.7. Since no adequate seasonal factor is available, the traffic in Table 1.1 as it is, should unavoidably be considered as the AADT at Dalton Pass.

As evidence of the accuracy of traffic in Table 1.1, we present the 1980 traffic count at Sta. Fe in Table 1.3 and the 1979 traffic count at Bone South (8 kms. north of Sta. Fe) in Table 1.4.

Table (1.1) and (1.2) are classified by direction as shown in Table (1.5) and (1.6)

DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY TRAFFIC COUNT SUMMARY 1

	STA. NO. 20	, 20	LOCATION	C. V. R. Sta.	Fe Miesza Vozcasza	ry.	17 July 1981		BOTH DIRECTIONS
			-		אבאוכרפ	3477 3		•	:
	2 2 2 2 2	CARS	SUS BUS	MINI BUS INCLUDING JEEPHEYS	BIG TRUCK O OR WORE TYRES	TRUCK TRAILER	ALL OTHERS		TOTAL
J.,	24 - 01	6	4		50	3			57
L	01-02	- 2	. 9		39				- 65
	02-03	8	. 3)		27	3			41
L	03-04	5		1	31.				39
L	04-05	3		•	24	7			32
.	90 - 50	4			.38.,	3			42
	06 - 07	15	2		32		80		. 65
٨	07 - 08	24	* *		37	3	7		75
نبا	60 - 80	. 27	5	2	23	\$	8		. 67
لـــا	01-50	. 97	10	4	28				69
	10 - 11	1.5	21.	3.	27	7.	3		- 99
	21-11	30	21		24	4	4.	19	24
J <u></u> .	2-13	- 29	. 25	3	14		-		71
<u> </u>	3-14	25	24		25	10	. 3		86
	14-15	62.	8		11	4.5			67
	31-5	33	20	2	33	80			. 95.
	21 - 91	25	4		37	7			- 26
	17 - 18	29	6	5.	45	6			. 98
	18-19	77	3	·	٠ ٤٥	Ó			
	19 - 20	24	4.		44	3			2,5
<u>~</u>	20-21	12	7		47				. 89
8	21-22	11	9.		54				72
4	22-23	11	8		47	2	6		. 54
8	3-24	12	7	٦.	42	9			88
ب	€ 24 Hrs.	459	204	7,5	811	90	39		1678
j									

Table 1.2.

DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
TRAFFIC COUNT SUMMARY 1
LOCATION Lades - Burges Section (M. N. R. - Ilocos Norte)

BOTH DIRECTIONS STA. NO 10

CARS BIG BUS MINI BUS BIG TRUCK IT 1	STA, NO		LOCATION	A PROPERTY OF THE PROPERTY OF					מיסויסשיים ביוסט
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0.05 1 2 1 3 0.64 2 3 4 1 3 0.65 2 3 4 4 12 5 0.6 2 22 4 4 5 6 6 0.9 6 7 12 2 53 6 8 6 0.9 10 5 13 6 41 5 5 6 6 1.1 1 2 4 5 5 28 6 7 6 1.5 3 6 7 7 8 4 8 6 7 4 9 6 1.5 4 7 8 3 4 8 6 6 1.5 4 7 18 4 8 6 6 1.5 4 7 8 3 4 8 6 1.5	-02	1							
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20 7 3 5 25 21 5 25 22 6 9 22 6 2 23 1 2 24 1 2 34 1 2 4415 172 91	7 - 18	13		9			43		65
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5. 175 ST 512 S	2-23	2	3		2				6
24 Mrs. 172 61 112 61 512	3-24	1			2		7	-	10
	€ 24Hrs.	701	65	113	9-1		512		918

Table 1.3 DAILY SUMMARY

TRAFFIC CLASSIFICATION

NTPP/NEDA/MPH TRAFFIC SURVEY

STA. NO. 03			SAN JOSE	CIEY, Ye.	•	60,000 NORTH OF SAN JOSE	OF SAN	30SE	•			•	BOTH	DIRECTIONS
					>	VEHICLE	TYPE							-
7 A 4	Car Jeep	Pick - Up Von	Joepney	Smott Bus	Bio Bus	Truck 2- Axles	Truck 3- Axles	Truck Comb.	Special Vahicles	Tri - Cycle	Motor Cycle	Animot Orown	SUB - TOTAL	TOTAL
Mondoy	307	116	138	61	178	382	256	69	15	758	95	'n	1507	2339
Tuesdoy	290	102	157	44	194	387	203	68	17	772	83	5	1466	2347
Wednesday	318	111	173	61	188	407	223	108	t)	785	8	Ŋ	1589	2476
Thursday	304	170	159	61	193	431	256	78	10	750	116	•	1652	2532
Friday.	275	130	179	44	185	434	232	74	13	686	. 79	ý	1553	2322
Soturdoy	249	168	149	88	178	413	265	81.	14	629	74		1561	1 2278
Sunday	256	15.	148	20	174	314	234	55	6	859	92	4	1385	2346
Totol	1999	951	1103	379	1290	2768	1669	554	88	5239	573	27	10713	16640
ADT June 81	286	136	158	54	184	395	238	79	13	748	. 23	4	1530	2377
Seasonol Foctor	1.08	1.08	0.99	7.02	1.16	1-02	0.60	0.93	1.00	1.00	1.00	8:		
AADT 1981	309	147	75	55	213	403	143	73	13	748	. 28	4	1499	2346

Sub-Jotol exclude motorcycle, tricycle and special vehicle, animal drawn

Seasonal Factors derived from seasonal Sta. No. 3620, Mm. 103, Sta. Rosa - Gapan Section,

1979 Traffic Data

Table 1.4
Traffic Survey at Bone south
(North of Sta. Fe)

Sta. 110	1978	1979
KH, 227		-
Car	323	352
Jeepney	166	160
Bus	171	234
Truck	339	586
Total	. 999	1332

Source: Internal Paper of Feasibility Study Division of Region IV.

DALTON PASS TUNNEL PROJECT FEASIBILITY SIJUY TRAFFIC COUNT SUMMARY I TABLE (1.5)

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47.	TOTAL	3	28	28	6/	1.5/	25	33	3/	43	6/7	52	8/2	39	25	/3	. 55	30	7/7	39	42	25	38	33	ر ا	832		
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47.	BIG TRUCK	25	31	21	1/6	. /3	6/	///	16	. 6/	. 22	61	1/4	0/	1.5		18	13	20	1/.	24	/2	24	30	/5	40%		
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DALTON PASS THINNEL PROJECT FEASIBILITY STUDY
TRAFFIC COUNT SUMMAR' I
TAGGO BURGOS SECTION (HIM.R. TLOGGS NORTE)

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- 2 Origin-Destination Survey
- 2.1 Purpose of O.D Survey

The O.D Survey was carried out with the following purposes:

- (1) To grasp the social and economic relationship between Dalton Pass and the Cagayan Valley.
- (2) To confirm the distribution of zonal pair traffic between National Road No. 5 and No. 3.
- 2.2 Kethod of Survey (see Table 2.1 and 2.2)
 - (1) Date and Site:

Laoag City on 10 July 1981 and Sta. Fe on 17 July 1981

Survey stations were located in places where there were no intervening short trips available.

(2) Hour:

24 hours from 6:00 AN to 6:00 AN

(3) Directions:

Both directions

(4) Vehicle Classification

Vehicles were classified as follows:

- 1) Car (including van and vagon)
- 2) Big Bus (with seat capacity more than 30)
- 3) Kini Bus (including jeepneys)
- 4) Big Truck (with more than 6 tyres)
- 5) Semi-Trailer and Full Trailer
- 6) All Others (excluding motor-cycles)
- (5) Commodity Classification:

Cosmodities were class fied as follows:

- 1) Cereals and Unprocessed Agricultural grains
- 2) Forestry Products

- 3) Mineral Oil Products
- 4) Cement
- 5) Building and Construction Katerials
- 6) Soft Drinks, Beer, Wines
- 7) All Others
- (6) Sampling Rate:

Target was 100% and actual was 100% also.

2.3 Zoning

The zoning is shown in Table 2.3 and Figure 2.1 gives the location of each zone center.

2.4 Result of O.D Survey

The result of the O.D Survey is shown in Table 2.4 to Table 2.28 and in Table 2.29:

2.5 Share of Diesel Vehicles

In the Philippines, the share of diesel vehicles is very large. In the O.D Survey undertaken for this study, the diesel vehicle sharing was not included. However, we are presenting Table 2.30 showing the diesel vehicle share obtained from a survey at San Jose in 1980.

TRAFFIC SURVEY PROGRAM

Lood - Burgos CVR Sta. Fe . (CVR Sta.	Labag - Burgas Labag - Burgas CVR Sta. Fa. (CVR Sta. Fa. (At - Travel Time. B - Recrultment Organization C - Seminar and X - OD Survey X - O	LOCATION Section (floces North (Nueva Viscaya) (Nueva Viscaya) (me Manila to Lacaquem OD.S Interviewers	eminor and Dry Run D Survey Operation D Survey Operation Dupliation of Rate Sheet (Raw Data) athering, and Arrosement of Traffic and Signs. ovel Time - Locog to Sto. Fe ast Day - Origin-Destination Survey - Field Date Processing
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY OD INTERVIEW FIELD SHEET 1981

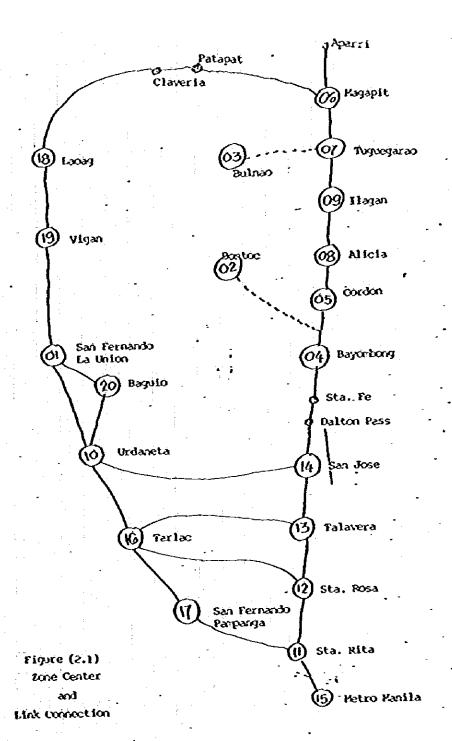
TABLE (2.2)

I. VEHICLE TYPE 1. CARS 2. BIG BUS 3. MINI BUS (INCLUONS) SEEPHEYS) 5. ALL OTHERS 7. 11	STA.NO DIRECTION: FROM	DATE:		Hour: To:_	f	PROVINCE:	
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OTY/PUNCEALITY FROWINCE 5.NUMBER OF PERSONS (INCLUDING DRIVER AND CONDUCTOR (5)) 6.SEAT CAPACITY (OMY FOR BUS, JEEPHEY) PASSENGER SEATS TYPE 1. TYPE 2. TYPE 3. TYPE 4. TYPE 5. TYPE 5. TYPE 2. 'VEIGHT KGS B.COMMODITY WEIGHT KGS TYPE 4. WEIGHT KGS TYPE 3. WEIGHT KGS TYPE 4. WEIGHT KGS TYPE 4. WEIGHT KGS TYPE 5. WEIGHT KGS TYPE 5. WEIGHT KGS TYPE 5. WEIGHT KGS TYPE 5. WEIGHT KGS		2. ORIGIN		3. DESTINATIO)N i	4.INTERME	AOTS STAK
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TYPE 4. TYPE 5. TYPE 8. WEIGHT KGS TYPE 2. "YEIGHT KGS B.COMMODITY WEIGHT TYPE 3. WEIGHT KGS TYPE 4. WEIGHT KGS TYPE 5. WEIGHT KGS TYPE 5. WEIGHT KGS			TYPE 2		*		
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Table (2.3) ZONAL DIVISIONS

Zonal Description

10.	(2008 Center)	(Provinces, Cities & Numberpalities In- cluded)
01	San Fernando	La Union (all municipalities
02	Bontoc	Hountain Province (all runicipalities
03	Bulnao	Kalinga-Apayao (all nunicipalities
04	Bayonbong	Nueva Vizcayà, Ifugao (all municipalities
05	Cordon	Cordon, Saintiago
06	Magapit	Cagayan: Aparri, Buguey, Calayan, Canalaniugan,
	Masser	Consaga, Lal-lo, Sta. Ana, Sta. Teresita
		Abulug, Allacapan, Ballesteros, Claveria,
	•	Lasan, Parplora, Sanchez Hira, Langungan
	· · · · · · · · · · · · · · · · · · ·	Alcala, Kulung, Baggao, Gattaran Iguig, Pagapit
07	Tuguegarao	Cagayan: Tuguegarao, Enrile, Penablanca, Solana
C3	Alicia	Isabela: Alicia, Angadanan, Cauayan, Echague, Jores,
		Duna, Peina Fercedes, San Agustin, San
		Quillerro, SanIsidro, Cabatuan, Airora,
		Benito, Dinapigui, Kallig, Quezon, Roxas,
	•	San Banuel, San Mateo, Raton
09	Ilagan	Isabela: Ilagan, Soliven, Burgos, Cabagan, Divilican,
		Garu, Kacanacon, Kagsaysay, Nagyilian, Palanan,
	-	Quirino, San Hariano, San Pablo, Santa Karia,
·		Santo Toras, Teravini
10	Urdaneta	Pargasinan (all minicipalities and cities)
11	Sta. Rita	Bulacan (all municipalities except Valenzuela)
. 12	Sta. Posa	Nueva Ecija: Sta. Posa, Cabanatuan, Capan, General
. •		Tinio, Penararda, San Leonardo, Jeen, San
		Antonio, San Isidro, Vabiao, Aliaga, Licab,
		Qiezon, Zaragona, Palayan City, Bongaton,
		Gabaldon, Natividad, Laur, Llaneza, Panta-
	:	bengan, Rizal
13	Talavera	Noeva Ecija: Guisba, Cuyapo, Naspicuan, Talugtug,
,,	10.01010	Talavera, Sto. Doningo
14	San Jose	Nieva Ecija: Carranglan, Lupen, Mire , San Jose City
15	Fetro Kanila	Petro Manila, Rizal, Cavite, Laguna, Batargas,
13	· cuo tama	Quezon, Albay, Cararines Norte, Cararines
		Sur, Sorsogon, (all nunicipalities and
		cities)
	•	
16	Tarlac	Tarlac (all nunicipalties and cities)
17	San Fernando	Bataan, Parpanga, Cacholes, (all runicipalities)
18	Lacus	Hocos Forte (all cities and municipalities)
19	Vig≥n	Alxa, Ilocos for (all mnicipalities)
20	Beguio	Benguet (all cities and manicipalities)



DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
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WEL PROJECT FEASIBILITY STUDY mais (2.10)
OD MATRIX (In. Tons) DALTON PASS TUNNEL

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DALTON PASS TUNNEL PROJECT FEASTHLITY STUDY

OD MATRIX (In Ions)

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DALTON PASS .UNINEL PROJECT FEAS. LITY STUDY

TABLE (2-12)

OD MATRIX (In Ions)

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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
TABLE (21.13). "
OD MATRIX (In Tons)

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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
THREE (2.75)
OD MATRIX (in tons)

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DALTON PASS TUNNEL PROJECT FEAS LITY STUDY
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY TRBE (2:17):
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY mate (2.18)

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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY TABLE (2.19)

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DALTON PASS TUNNEL PROJECT FEASIBLITY STUDY
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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
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OD MATRIX (m. 100%)

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DALTON PASS TUNNEL PROJECT FEASIBILITY STUDY
THEIR (2.22)
OD MATRIX (in ions)

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DALTON PASS TUNNEL PROJECT ("EASIBILITY STUDY THREE (2.24)
OD MATRIX (IN TONS)

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TABLE (2.25)
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DALTON PASS TUNNEL PROJECT FEAS. DILITY STUDY

OD .MATRIX (II) Tons)

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DALTON PASS TUNNEL PROJECT FEASIPILITY STUDY

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3.4 4.2 8.0 17.4 0.2 0.1	7													_				<u> </u>				
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DALTON PASS TUNNEL PROJECT FEAS' LITY STUDY

TABLE (2.23)
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1) Passengers on Cars and other private Passenger vehicles only

Table (2.29)
Summary of Cargo Traffic on Dalton Russ
(ton/day)

	Cutgoing from Cagayan Valley	Incoming to Cagayan Valley
Grain	1312	63
Lumber	2956	3
Cecent	0	795
Fuel	47	338
Construction Material	75	189
Soft Drinks, Ecer and		
Hines	0	216
All Others (grocery in main)	70	560
Total	4170	2165

This is daily traffic ascertained by the O.D survey in July 1981 in Sta. Fe.

TABLE (2.33) Share of Diesel at San Jose (In 1980)

AADT 1980	GA	S	DIE	SEL	TOTAL		
and the second s	No. of Vehicle	8	No. of Vehicle	8	No. of Vehicle	8	
Cars	424	72.6	162	27.6	586	100.0	
Big Bus	4	1.9	204	98.1	208	100.0	
Mini Bus	41	32.3	85	67.7	126	. 100.0	
Big Trucks	7	1.0	720	99.0	727	100.0	
TRK/TLR SFM/TLR	1	1.4	101	. 98.6	102	100.0	

3. Vehicle Operating Speed Survey

3.1 Purpose of the Survey

The time saving which may be brought about by the proposed tunnel is one of our greatest matters of concern. For estimating this time saving, first it is necessary to confirm the actual vehicle operating speed at the relevant Dalton section.

3.2 Date and Site

The survey was carried out for the 14 km. section between Capitalan (7 km. south of Dalton Pass) and Sta. Fe on 15 July 1981. The survey time was from 8:00 AM to 10:00 AM. Both directions, i.e., to and from Eanila, were the objects of the survey.

3.3 Rethod of Survey

At both ends of the survey section, the plate number and the passing time of each sample vehicle was manually recorded.

3.4 Result of Survey

The records of all 91 sample vehicles are shown in Tables 3.1 to 3.10 while Table 3.11 gives the summary of the survey.

DALTON PASS TUNNEL PROJECT TABLE 3.1

Result of Troyol Time S lefy 15, 1901 (8:00	urvey -10:00	(EAC			Type	Cors	ila ila		
Somple No.	Rocor	ded Tim	o Af	Treve	Time	(Hrs.)	Ave.	Speed l	KPH
(Registered Plate No.)	C	В	A	C~B	в-А	CA 1	C-B	B-A	CV
1. FR - 378	8:03	8:17	8:27	0.23	0.17	0.4	29.35	41.24	34.4
2. 327 • HL	8:10	8129	8:42	0.32	0.21	0.53	21.09	33.38	25.96
3. 560 - 8T	8:15	8:29	8146	0.23	0.28	0.51	29.35	25,04	26.98
4. CL - 379	8:51	9:05	9:17	0:23	0.2	0.43	29.35	35.05	32.0
5. E3 - 584	9:05	9:20	9131	0,25	0.18	0.43	27.0	38.94	32.0
6. 441 - 7D	9:09	9:35	9:43	0.43	0.22	0.65	15.70	31.86	21.17
7. V5 - 283	9:15	9:29	9:40	0.23	0.18	0.41	29.35	38.94	33,56
8. EX - 359	9:32	9:45	9:58	0.22	0.22	0.44	39.68	31.86	31.27
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HOTE:

Capitation — Pt. "A"

Dalton — Pt. "B"

Sto. Fe — Pt. "C"

Distance From: A - 3 = 7.01 kms. B - C = 6.75 kms.A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT

Result of Trayel Time S July 15, 1931 (8:00	10:0		•	Vehicle. Directio	Type	Cars, Pron	leeps Ianila		
Sample No			ne At	1	el Tinio		·	Speed in	KPH
(Registered Plata No.)	A	R	С	A-8	B-C	AC	А-В	B-C	ĄC
1. 2A - 321	8:11	8125	8:38	0.23	0.22	0.44	30.68	32.14	39.58
2. 2T - 308	8:15	8:30	8:43	0.25	0.22	0.47	28.04	30.68	29.28
- 3. 911 - 319	8:20	8:31	. !	0.13	-		38.94	ı	
4. R - 284	8:23	8:35	8:46	0.2	0.18	0.38	35.05	37.50	36.21
5, 402 - 30	8124	8:37	8:50	0.21	0.21	0.42	33.38	32.14	32.76
6. 181 - 3X	8127	8139	8:50	0.2	0.18	0.33	35.05	37.50	
7. 09 - 391	8:27	8:39		0.2		4.	35.05		_
8. EP - 400	8:32	8:43	8:56	0.18	0.22	0.4	33.94	30.63	36 60
9. 786 - 8ห	8:33	8145	8:56	0.2	0.18	0.38	35.05	37.50	36.21
10, 937 - 59	8:33	8:45	8:56	9.2	0.18	0.33	35.05	37.50	36.21
11. H3 - 465	8:39	8:50	9:05	0.18	0.25	0.43	38.94	27.0	32.0
12. JH - 976	8: 49	8 : 59	9:09	0.17	0.17	0.34	41.24	39.71	
13. 306 - 5V	8:50	9:00	9:46	0.17	0.76	0.93	41.24	8.88	14.80
14. 409 - 4J	8:59	9:27		0.47		-:	14.91	-	-
15. ER - 394	9:00	9:10	9:21	0.17	0.18	0.35	41.24	37.50	39.31
16. 865 - 5X	9:04	9:23	19:33	0.31	0.17	0.48	22.16	39.71	28.67
17. 621 - 84	9:09	9:19	9:30	0.17	0.18	0.35	41.24	37.50	39.31
13. 523 - 6F	9:15	9:31	9:40	0.27	0.15	0.42	25.96	45.0	32.76
12, PS - 393	9:18	9:32	9154	0.23	0.37	0.6	30.43		22.93
20. 846 - 4H	9:39	9150		0.18			38.94		22170
21. DR - 128	9:41	9:52		0.18	-		38.94	-	-
- 22. CI - 251	9149	10:01		0.2			35.05	•	-
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HOYE:

Capintalan — Pt. "A"

Dalton — Pt. "B"

Sto. Fe — Pt. "C"

Oistence From: A - 8 = 7.01 kms. B - C = 6.75 kms.A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT

TABLE (3.3)

Recult of Trevel Time S	-		•	Vehicle	Type	Big Bu	15		,
Cely 15, 1931 (8:00) Semple No.		ded Tim		Direction Trove	l Time				
(Régisteres Plate No.)		В	С	A~B	B-C	AC	A-B	в-с	AC
1. 828 - FG	8:17	8:30	8:47	0.22	0.28	0.5	31.86	24.11	27.52
2. 417 - EH	8156	9:06	9:19	0.2	0.22	0.42	35.05	30.68	32.76
3. 225 ~ FE	9:05	9:18	9:30	0,22	0.2	0.42	31.86	33,75	32.76
4. 489 - ET	9:20	9:31	9:44	0,18	0.22	0.4	38.94	30.68	34.40
5. 589 - FE	9:27	9137	9:48	0.17	0.18	0.35	41.24	37.50	39.31
6. 944 - FE	9146	9:59		0.21	· ·		33.38		•
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HOTE:

Cepintalan — Pt, "A"

Celton — Pt."B"

Sto. Fo — Pt."C"

Distance From: A - B = 7.01 kms. B - C = 6.75 kms.A - C = 13.76 kms.

DALION PASS TUNNEL PROJECT TABLE (3.4)

Result of Trovel Time S July 15, 1901 (8:00		(MA				Big Bus O_Mani			······································
Sampla No.		ded Tin				(Hrs.)		Speed in	ነ KPH
(Registered Piote No.)	C	8	٨	C∙8	B-A	C-A	C-B	B-A	C+A
_1, 594 • EU	8125	8:45	8:58	_0.33_	0.22	_0.55_	20.45	31.86	25.02
2, 650 - EU	8129	8:51	9:05	_0.37	100	_0.6	•	ì	
3, 335 • EU	-8452-	-9109-	9:21	0.28	l i	• •		35.05	
_4318 EU	-8:52	9:07	9:18	_0.25_	0.13	0.43	27.0	33.94	_32.0_
5, 409 - ET	8:57	9:09	9:13	0.18	0.17	0.35	37.5	41.24	39.31
6. 646 - EU	_9:17_					0.68			l
5785K	9:21			0.2		0.42			ł
8. 325 - EU	9134	9146	9458	.0.2	_0.2_	-0.6	33.25	35.05	_34.4_
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: STON

Capinlalan — Pt. "A"

Dalton — Pt. "B"

Sto. Fe — Pt. "C"

Distance From: A-B=7.01 kms. B-C=6.75 kms. A-C=13.76 kms.

DALTON PASS TUNNEL PROJECT

55 15, 1851 (8:00) Sample No.	Ricer	ecd Tin		Treve		Jeepney a Hanff (Hrs.)			n KPH
(Registered Plate No.)	A	8	С	A-B	9+C	i	A-B	B•C	<u> </u>
1. 421 - AT	9:05	9124	9:39	0.32	0.25	0.57.	21.91	27.0	24.1
2. 716 - 4H	9:15	9128	9159	0.21	1.0	0.73		•	
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NOTE:

Copintolen — Pt. "£"

Colton — Pt. "6"

Sto. Fo — Pt. "6"

Distance From: A - B = 7.01 kms. B - C = 6.75 kms. A - C = 13.76 kms.

DALION PASS TUNNEL PROJECT TABLE (3.6)

Sempla No.		ded Tin	e At	Trave	l Time	(Hrs.)	Ave. Speed in KPH			
Registered Plate No.)	c ·	В	٨	C-8	B-A	C-A	С-В	B-A	C-A	
1. 793 - 8A	8:16	0129	8:52	0.22	0.38	0.6	30.63	18.45	22.9	
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HOTE:

Cosintolon — Pt. "A"

Dollon — Pt. "8"

Sto. Fe — Pt. "C"

Distance From: A - B = 7.01 kms. B - C = 6.75 kms. A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT TABLE (3.7)

. :	1	(EA 00		Directio	n:	From 1	iani ta		
Somple No. (Registered Plate No.)		iT toba	me Al	Trove	el Timo	(Hrs.)	Ave.	Speed i	n KPH
the stored Plate 80.	A	В	С	A-B	B-C	A-C	A-B	B-C	A-C
1. 165 - GQ	8:05	8:24	•	0.32	•	_	21.91	-	-
2. 2X - 914	8:07	8:26	8141	0.32	0.25	0.57	21.91	27.0	24.14
3. 2S - 843	8:07	8:38	8:53	0.52	0.25	0.77	13.48	27.0	17.8
4. 2R - 627	8:08	8:27	8:47	0.32	0,23	0.55	21.91	29.35	25.0
5. 2M - 114	8:11	8146	9:02	0.58	0.27	0.85	12.09	25.0	16.19
6. 647 - GG	8:16	8:28	8:41	0.2	0.22	0.42	35.05	30,68	32.70
7. QA - 297	8:20	8:36	8:52	0.27	0.27	0.54	25.96	25.0	25,4
8. NAD - 654	8122	8:38	8155	0.27	0.28	0.55	25.96	24.11	25.0
9. 314 - GG	8:40	8:51	9:01	0.18	0.17	0.35	38.94	39.71	39.31
10. 2U - 286	8:46	8:58	9:11	0.2	0.22	0.42	35.05	39.68	32.70
11. DX - 190	8:56	9:09	9:23	0.22	0.23	0.45	31.36	29.35	25.96
12. VT - 231	8:53	9:16	9:30	0.3	0,23	0.53	23.37		25,96
13. 215 - GL	8:59	9:23	9:41	0.4	0.3	0.7	17.53	22.50	19.66
14. VT - 624	9:17	9:44	9:58	0.45	0.23	0.68	15,58	29.35	20.24
15. 690 - 8V	9:17	9:32	9:44	0.25	0.2	0.45	28.04	33.75	30.58
16. 111 - 6Ј	9:20	9:31	9:43	0.18	0.2	0.33	33.94	33.75	36.21
17. 18 - 776	9:24	9:41		0.28	- 1		25.04	-	30.21
13. 448 - 60	9:24	.9;36	9147	0.2	0.18			37.50	36.21
19. 302 - GL	9:29	9:54		0.42	. •	•	16.69		
20. NBN - 159	9:31	10:01		0.5			14.02	- 	
21. 2K - 697	9:35	9:50		0,25	•		28.04	-	<u> </u>
22. TJ - 199	9:35	9148	9159	0.22	0.18	0.4	31.86		34.40
23. QS - 854	9142	9:55		0.22	-		31.86	37.30	
24. QP - 129	9:44	9158		0.23	•	•	30.48		• •
•							30,40	•	

ROTE:

Copinitation — Pt. "A"

Dollon — Pt. "8"

Sto. Fo — Pt. "C"

Distance From: A - B = 7.01 kms. B - C = 6.75 kms. A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT TABLE (3.8)

Result of Travel Time S July 15, 1981 (8:00	Burvey 10:00			Vehicle Directie	Type	frucks (fo Manil	6 or me	ore whee	ls)
	Facor			•	l Timé			Spead in	n KPH
(Registered Plate No.)	C	В	· A	C-B	B-A	C-A	C-B	B-A	C-Y
. 1. 955 - GG	8:00	8:20	8:43	0.33	0.38	0.72	20.45	18,45	19.11
2. 255 - FY	8:12	8:41	8158	0.48	0.28	0.77	14.06	25.04	17.87
3. 244 - GL	8112	8:38	8:58	0.43	0.33	0.77	15.70	<u> </u>	17.87
4. 28 - 930	8:15	8:43	9:01	0.45	0.32	0.77	15.0	21.91	17:87
5. QE - 618	8:19	8:51	9:12	0.53	0.35	0.88	12.74	20.03	15.64
6. 759 - GN	8:19	8:59	9:27	0,51	0.62	1.13	13.24	11.31	12.18
7. 760 4 GN	8:20	8:51	9:27	0.52	0.6	1.12	12.98	11.63	12.29
8. QU - 326	8121	8:50	9:05	0.48	0.27	_		25.96	
9. QU - 112	8:23	9:12	9:40	0.81	0.47	1.28		1	10.75
10. 211 - 496	8:39	9:10	9:48	0.52	0,63	1.15	12.98	11.13	11.97
11. 2T - 401	8:44	9:11	9:31	0.45	0.33	0.78	12.93	21.24	17.64
12. 20 - 751	8151	9:17	9:47	0,43	0.5	0.93	15.0	14.02	14.80
13. 5X - 857	8:51	9:12	9128	0.35	0.27	0.62	19.29	25.96	22.19
14. I2 - 212	9:04	9129	9:46	0.42	0.28	0.7	16.07	25.04	19.65
15, 12 - 196	9:04	9:29	9:47	0.42	0.3	0.72	16.07	23.37	19.11
16. 2K - 510	9:18	9:39	9155	0.35	0.27	0.62	19.29	25.96	22.19
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NOTE:

Copintolon — P1. "A"

Dolton — P1. "B"

Sto. Fo — Pt. "C"

Distance From: A - 8 = 7.01 kms. B - C = 6.75 kms. A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT TABLE (3.9)

leself of July 15, 19			Survēy —10:00	O AM)		Vehicle Directio	Type	Truck - Hanil	Traile a	YS	· · · · · · · · · · · · · · · · · · ·
Şo	mpie N			ded Tim	se At	Treve	l Time	(Hrs.)	Ave.	Speed i	KPH
(Segister	red Pla	te_Ro.)	С	в	А	C-B	B-A	C+A	C-8	B•A	C-A
1.	140 -	GG	8:29	9:09	9:37	0.67	0.47	1.13	10,07	14,91	12.18
	.000	_cq	-2103_	_9:29_	9145	0.43	0.27	0.7	_15.20	25.96	19.66
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ROTE:

Oction — Pt. "A"

Oction — Pt. "B"

Sto. Fe — Pt. "C"

Distance From: A - B = 7.01 kms. B - C = 6.75 kms. A - C = 13.76 kms.

DALTON PASS TUNNEL PROJECT

TABLE (3.10)

Result of Trovel Time S July 15, 1931 (8:00	-10:00			Direction	n:	Truck - From 1	anila		
Somple No.		ded Tin	10 /.1	Trovo	dail l	(Krs.)	Ave.	Speed in	KPH
(Registered Plate No.)	A	В	C	A-B	B-C	A-C	A-B	B-C	Y-C
1. 2C - 601	8:12	8136	8:55	0.4	0,32	0.72	17.53	21.09	19.11
2. 995 - GG	9104	9:49	:	0.75		-	9.35	•	-
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HOTE:

Copintolon — Pt. "A"

Dolton — Pt. "B"

Sta. Fo — Pt. "C"

Distance From: A - 8 = 7.01 kms. B - C = 6.75 kms.

A - C = 6.75 kms.

TABLE (7.11) Summary of Vehicle Speed Survey at Dalton Pass

=		From	From Monila		^	H OF	To Manila	•	Average
	' No. of Samples	Total Hour (mins.	Aver- age Hour (min.)	Average Speed Speed (Km/h)	No. of Samples	rotal Hour (min.)	Average Sour (ún.)	Aver - Sp age Spood (Km/h)	Speed (4/th / th / th / th / th / th / th / th
Corrs	15	373	25	33	တ	228	53	28	18 31
डाट द्वाड	Ŋ	125	25	ဗ္ဗ	œ	235	82	28	ä
Mini Bus	N	78	39			36	38	83	22
Heavy Truck	80	583	32	56	<u>φ</u>	932	52	19	17

APPENDIX B

COUNTERMEASURE METHODS

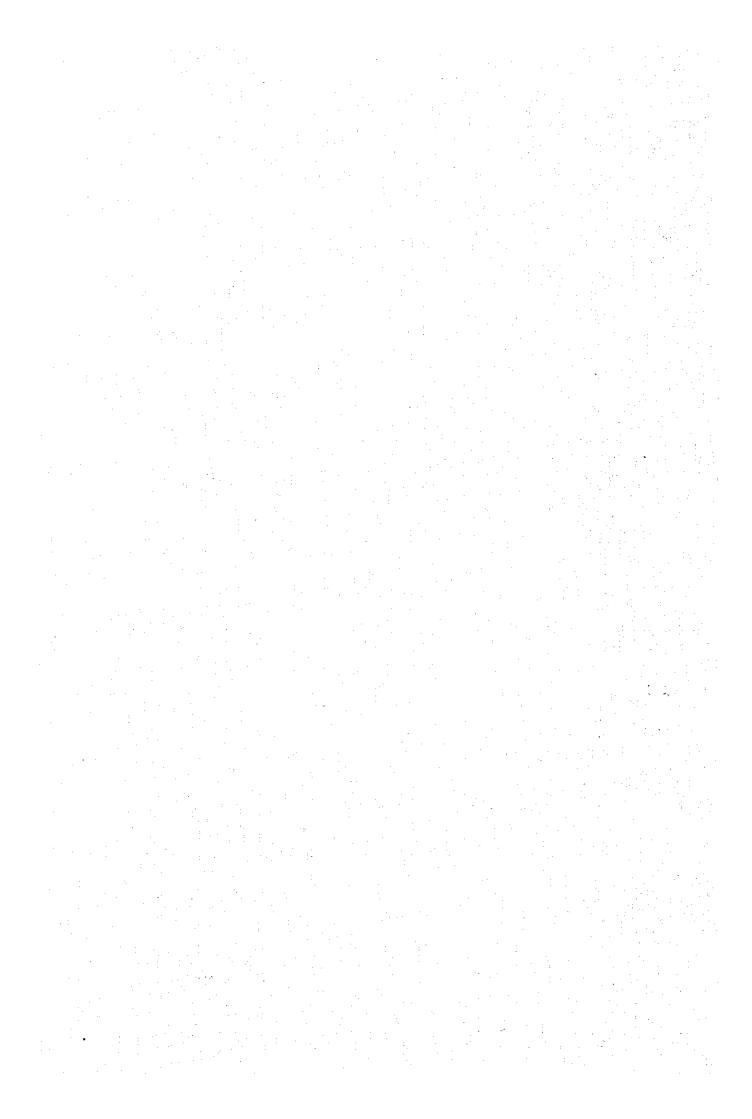


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Embankment Slope Stability Check Table	B-12
Cutting Slope Stability Check Table	B-30

I. INTRODUCTION

Topography between Balaho and Baliling with an approximate length of 60 km. is mountainous in nature consisting of some terrace and alluvial planes in the lower part. The existing national road (Route 5) passes at the foot of this area with steep slopes. This continous slope is found all throughout the road.

The cutting slope condition has a steep gradient and no slope protection. The geological condition of the existing road is quite poor with andesites and diabase indicative of shear zone. The existing road passes through a weak zone where weathering and hydrothermal alteration is advancing along the boundary. Thus, typhoons and heavy rainfalls induce failures in side slopes. On embankments failures also exist caused by ground and running water.

It is therefore important to clarify the slope condition and to carefully study the slope treatment based on the results of the survey. The Study Team provided a slope stability check table based on field reconnaissance as shown in II and III.

located in the mountainous area, the side slopes form a long and continous steep slope along the existing national road with features as follows:

- Generally, the slope gradient consists of the same material and is very steep.
- 2) Failure observation indicates that slope protection is not advisable for all side slopes.
- 3) There is no drainage preparation on side slopes. Running water and seepage water flows on the slopes resulting in the formation of gullies.

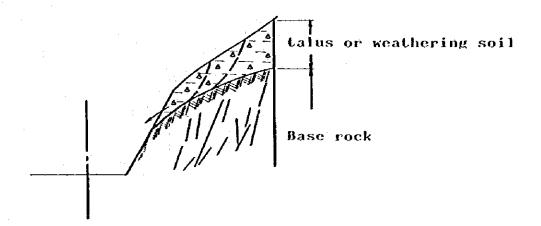
There are five types of failures classified as follows:

1) Type A - This is a surface failure induced by heavy rainfall. Side slope materials consist of talus and weathered soil existing in a plane of discontinuity between the strong base rock and soil. When heavy rainfall passes through gentle slopes, it normally penetrates to the soil and flows along the boundary of the base rock and soil strata. This is called seepage water and causes erosion and surface failures in this area. The formation of natural slopes is steep where surface water flows along its course and penetrates deeper, thus, causing surface erosion and gullies beyond its boundaries. In such cases failures normally occur along the gullies.

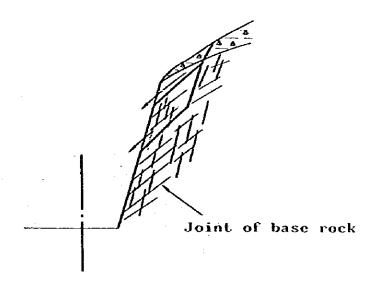
- Type B Failures of this type are exfoliated from fissures of base rock. As mentioned above the existing road of the project site has andesite and diabase formation. Shearing zone is evident near the boundary causing cracks and fissures on the base rock and weathering advances. Failure occurs from cracks on base rocks in cases where slope gradient exceeds the angle of crack gradient. This is caused by the decreasing resistance due to weathering and water penetration. When the trend of slopes coincides with the cracks and its gradient is at a low angle lesser than the slope gradient, failures develop into a landslide.
- 3) Type C These are rock fragments coming from the cracks on the base rock and is made up of diorite, andesite, diabase and granite rock. These types of rock fragments usually originate from joints fissures and shear zones and normally appear during typhoons and heavy rains. When geology consists of terrace deposits, the gravel deposits are eroded by typhoons and heavy rains.
- 4) Type D Failure of this type is similar to Type A. However, when the side slope materials are homogeneous void water pressure is developed and the shear strength of the material decreases which causes the landslide. Surface failure on granitic rock of less than 5 meters is distributed throughout the northern part of Dalton Pass.
- 5) Type E This is a type of landslide caused by shearing zone. The formation of andesite and diabase on this section consists of shear zone bearing gouges and fault breccia. Ground water fills the fissures and cracks on the base rock and the reaction of the fault clay is to trap the water. In effect, it weakens the strength of soil bonding thereby causing landslide. Whenever the slope gradient and shear zone are in the same direction, a larger scale landslide is normally expected to occur.

The different types of failures based on field reconnaissance are shown as follows:

TYPE	NO.	PERCENTAGE RATIO	NO. OF FAILURES/km
A B C D E	34 36 22 1	34 36 22 1 7	0.61 0.65 0.40 0.02 0.12
Total	100	100	



TYPE B



TYPE C

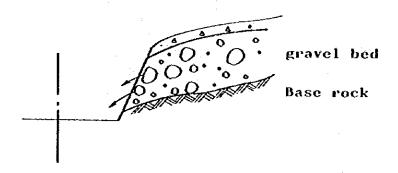
in case of Base rock

Diorite, Andesite

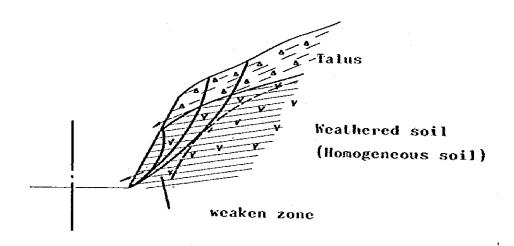
Stone fall

TYPE C

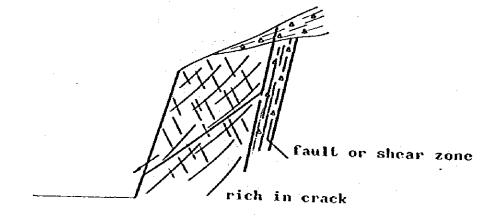
In case of Terrace deposits



TYPE D



TYPE E



Based on the above table, failures that occur on the existing national road with an approximate length of 55 km. from Balaho to Baliling are classified under Types A, B and C.

As observed during the field reconnaissance, side slopes along the existing road are of steep gradient bearing no slope protection for alteration. In effect, gullies are formed whenever typhoons and heavy rainfall occur causing failures on the side slopes. In such cases, countermeasures are necessary to avoid erosion and further landslides.

Based on the above findings and geological analyses, it is necessary to provide slope protection. Depending on what slope protection will be applied, the side slope materials are classified into three groups:

- 1) Topsoil mixtures of talus deposits, weathered soil and terrace deposits
- 2) Soft rock induced by weathering
- 3) Hard rock induced by weathering

Normally topsoil is a conglomerate of talus, terrace deposits and mixture of sand and gravel. When topsoil is imposed on the base rock failures are more likely to appear since the effect of ground water is to weaken the strength of bonding between the soil and the base rock. Countermeasures taken in this particular case are as follows:

- Recutting Since side slopes gradient ratio for 1) this is normally considered to be 1:1.0 or 1:1.2, slope is usually protected by planting ipil-ipil all throughout the slopes.
- Drainage Boring Method This method is applied when 2) the ground water level is high and has to be lessened to prevent landslides. Varied information is necessary to support this equation below which states that the ground water is inversely proportional to the resistant stress.

FS =
$$\frac{C \times 1 + (W \cos \beta - u)}{W \sin \theta}$$
 Eq. 1

Where:

FS = Factor of safety

C = Cohesion (m^2/t)

1 = length of sliding mass (m)
Weight of sliding mass (m)

= Weight of sliding mass (t/m) = Angle of sliding mass (°) 0

= Angle of internal friction (0)

= Void water pressure (t/m)

Counterweight Method - Whenever the topsoil and base rock boundary occurs either on the topmost or lower part of the side slope, it is advisable to cut the nearest portion in the boundary of the topsoil and base rock, adopt a flat plane of about 2.5 meters and construct the gaboin along the flat plane in order to increase the force resistance and acquire a factor of safety. This method is normally combined with the drainage boring factor to give a better result of slope stability.

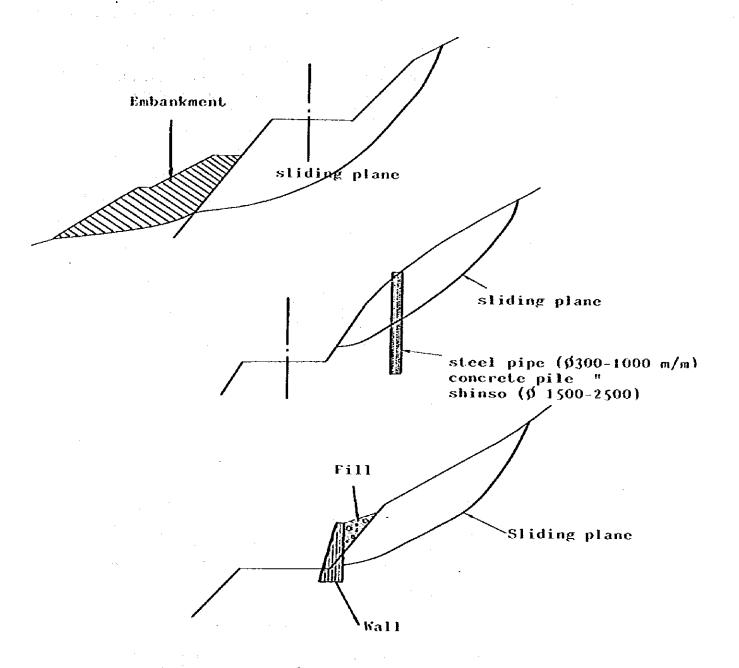
In cases where geological condition of cutting slope consists of soft rock, failure from cracks sometimes occurs. Generally, there are abundant open cracks in soft rock. Some cracks are filled with soft clay material, and failure is based on these cracks which cause the unsafe condition in high gradient cutting slopes.

Based on the slope stability check table, slope gradient of soft rock is 1:0.3 - 1:0.5. This slope gradient is steep for soft rock and should undergo recutting to have a gradient of 1:0.8 - 1:1.0, considering high temperature and heavy rain in this area. However, because of the geological conditions recutting all slopes in existing road will be very difficult and therefore not advisable.

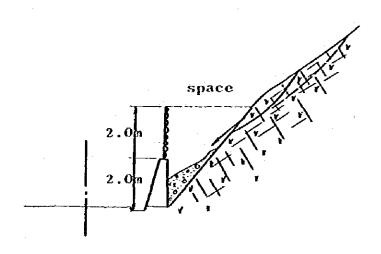
In this area, slope protection was not conducted for all slopes. Generally, slope protection for soft rock should be conducted to avoid advanced weathering in soft rock. Thus, there should be slope protection by means of concrete spreading with a thickness of 10 to 20 cm.

Failures in soft rock consist of stone falls and small failures from cracks except in the rock sliding by fault or shearing zone. Countermeasure works on failure types consisting of stone falls and small failures from cracks should be undertaken as follows:

- Rock Net This is used as protection by covering the slope consisting of soft rock. However, this method is not complete and should be used along with other protection methods, because sometimes small stones fall and will pass through the net mesh.
- 2) Spraying method It is necessary to cover the surface of the slope in order to protect from advance weathering. Spraying method has been conducted in Japan widely. It consists of two methods: one is concrete spraying with a thickness of 5 to 15 cm. including wire net and the other is gunite shooting with thickness of 3 to 5 cm. In places where ground water flows, this should be treated completely for ground water.



3) Spacing between shoulder of road and cutting slope One method of protecting small failures from cutting slope consisting of soft rock is to keep a space between road and slope. Therefore there should be wall and rock fence at the shoulder of the road. In the space behind the wall and rock fence small rock mass can be kept and rock mass falling down from the cutting slope acts as counterweight.

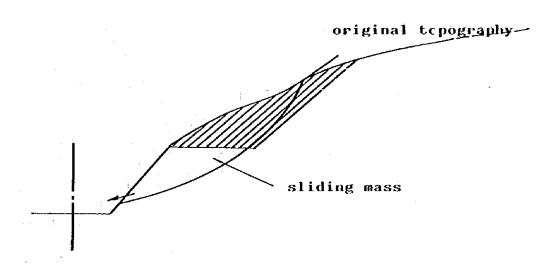


In cases of hard rocks consisting of cutting slope failure seldom occurs but ocassional stone falls from cracks occur. Therefore for stone falls from the cracks, rock net and spraying method should be adopted. Slope gradient of hard rock will be considered as 1:0.3 to 1:0.5.

Landslide areas may be avoided in new road designs. after conducting field reconnaissance. However, in existing roads it is very difficut to avoid landslides. Therefore it is necessary to protect these areas by conducting countermeasures. The most common methods for countermeasures against landslides are:

- 1) Excavation for sliding mass
- 2) Counterweight Method
- 3) Drainage Method

In the excavation for sliding mass the upper part of the sliding area is excavated upon which the sliding force decreases more than the resistant force thus increasing the safety of the sliding area. However, it is very difficult to decide the excavated area and detailed investigation for landslide is required. In case of wrong excavations, landslide will be activated.



Counterweight method protects the landslide by using embankment weight, steel or concrete pile shinso and structures. It is necessary to confirm the position of the sliding plane and sliding form by geological investigation in the design of this method. If according to geological investigations, organization of landslide is confirmed, calculation of shear strength and bending resistance is necessary and countermeasure bearing will be attained using the following equation:

FS =
$$\frac{C \cdot 1 + W \cos \theta - u}{W \sin \theta}$$
 tan $\theta + PR$... Eq. 2

Where:

= Design safety factor FS

= Cohesion (t/m)

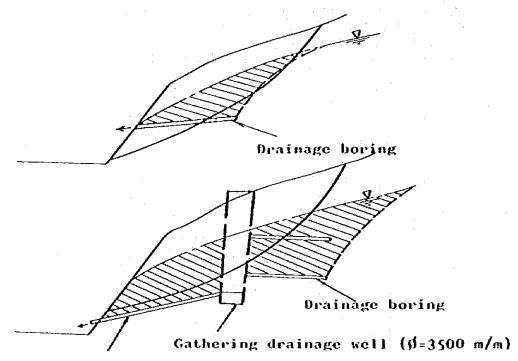
= Length of sliding mass (m) = Weight of sliding mass (t/m) . 1 W

0

= Angle of sliding mass (°)
= Angle of internal friction (°) Ø

= Void water pressure 11

PR = Shear strength and bending resistance which each countermeasure will be bearing brainage method is used with other countermeasure methods to protect the landslide by drainage boring or gathering drainage well. If ground water level is brought down to ordinary level by drainage method, resistance force will increase more than before doing countermeasure.



Drainage boring

The embankment in existing roads between Balaho and Baliling is half cut and fill type. Approximately fill type exists only at the glen or small stream. The characteristics of the embankment in this area are as follows:

- 1) The place of embankment is mainly located at the glen or small stream. Earth retaining structures are constructed at the end of the embankment. Thus, the size of embankment is lesser.
- 2) The gradient of embankment is 1: 0.3 to 1: 0.5.
- 3) There is no protection of embankment slope except for masonry.
- 4) Embankment height on the flat plane is less than 5 meters but at half-cut and fill embankment, the height is more than 5 to 10 meters because in the mountainous area, original topography is steep.

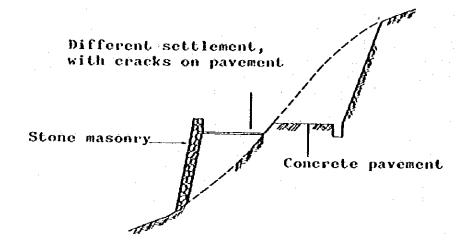
It was observed that there are many kinds of failures at the embankment area caused by bad drainage. The following types of embankment failures were observed:

1) Type A - Pavement crack or settlement - Cracks which are caused by grading settlement at the boundary of fill and original parts on the pavement exist.

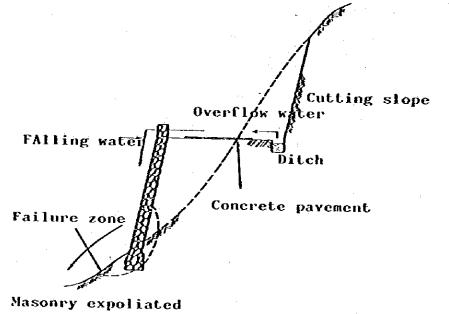
- 2) Type B Embankment failure by water action from ditch The present road shoulder does not establish pavement at the ditch (gutter). When it rains, ditch water flows at the shoulder of the road. After road shoulder erodes and flood water from ditch falls at sag point of embankment slope, the water of embankment shoulder fails due to falling water action such as exfoliate.
- 3) Type C Embankment failure by underground cross pipe failure Underground pipe was established at the sag of the road but failed due to an unequal settlement of original ground and filling at the boundary. This embankment croded at the underground due to leaking water from failure parts.
- 4) Type D Embankment slope failures by river crosion Embankment slope failures occured due to river crosion which has a large catchment area. Embankment slope failure is only at the riverside of Digdig and Sta. Fe rivers.
- 5) Type E Exit part of underground pipe failure by water action The front portion of the exit in underground pipe failure is caused by stream erosion. After embankment failure occured lateral erosion developed and expanded.
- O) Type F Pavement failure by water action from ditchDitches in the area are not sealed. During rainy
 periods, water stream at ditches penetrates into the
 subgrade which consists of coarse material such as
 gravel. Thus, soil particles in subgrade flows out
 and the pavement submerges due to these ground water
 currents.

According to reconnaissance, the main causes of embankment failure is that surface and shoulder drainage and the construction of pipe or culvert box in the embankment is not complete. Thus, it is necessary to protect the embankment failure by the following:

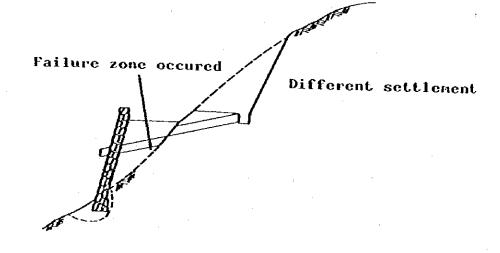
- Rehabilitation of surface drainage and shoulder drainage
- 2) Reinforcement of structural foundation in granitic area
- Revetment at the scoring area
- 4) Installation of gullies at the sountain side of the road
- 5) Sweeping of pipe and culvert box



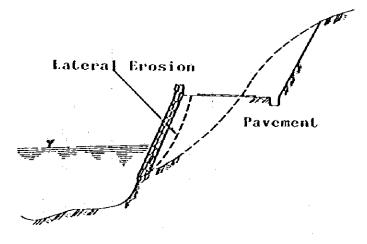
Type B



Type C

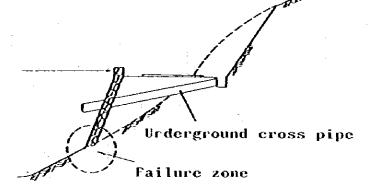




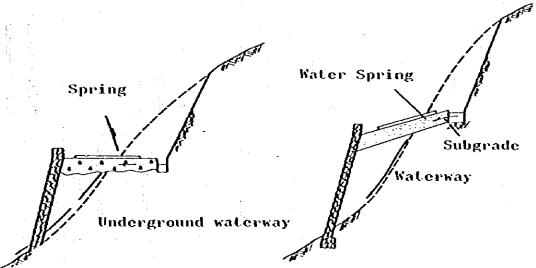


TYPE E

Masonry



TYPE F



	N C F				
4 - 1 - Georgia	ESSANCTONS THEST WIT	failure zone repair by masonry and gut- ter repair	failure zone repair by masonry and gut- ter repair	failure zone repair by masonry and gut- ter repair	failure zone repair by masonry and gut- ter repair
W CHOCK TABLE	Whose where we will also with a second supposed the second supposed to the second supposed supposed to the second supposed to the second supposed supp	COMMISCY WATER OOK MACHINET FILL COT RICK WHEREAGUND BINE	CATTING ALONG	and assume design	2011 SAMINES
EMBANIOMENT, STOPE STABILLY CITICS TABLE	CONDITION OF PANELIENT PENTURE	embankmont settlement	normal.	many cracks	"סייצסים
THE THE THE THE THE THE THE THE THE THE	CONDITION OF ENGANKMENT FEATURE	failure coours at the under pipe	failure of om- beniment slope cocurs due to _ under ground, vater, and over-	Tailure coours due by overflow water	due to ruming water from stress
	LAND FORM	outting and . embenionent	cutting and embankment	outting and embendment	outting Lod
portugate to the language of	ia x	167-500	167.580	185.900	186.100
	ó	4-	N	W	4

	N				
	ENDANKMENT TREATMENT	failure zone repair by masonry and gutter repair	gutter repair	failure zone remair sone by masomry and gutter repair	appron foundation repair relatorce- ment of apron
OXEOK TABLE	PRESENT LAND	ann awrited	MANDERS ONLY	CUTTING ING	COACA WINCE SHO
STABILITY, CH	CONDITION OF PANEWELLT	. crack	normal.	normal	sottlement and gracks
EMBANKMENT SLOPE	CONDITION OF GILDANKI SAT	* masonry founda- tion is eroded by Migdig river	* nosonry cracks	* ombendement fail- ure occurate by ereston of digits	foundation of mesonry is eroded by running water from pipe
	LAND	cutting and .	•		embenkment om gentle slope
	% %	186.300	186.400	187.100	187.200
;	Ç,	V.	9	~	ω

	2) ()				
	ನಿಗಿದ್ದ ನಿರ್ವಹಿತಿ ಕೆಗಡಿಸಲಾವುತ	failure zone repair by masonry	failure zone repair by masonry	guttor repair	
SLOPE STABILITY CHECK TABLE	PRESENT LAND	Market LIND	PICOLO AIVER	" " " " COMOS	CACOL DIPS
	CONDITION OF	crack and grading settle	cracks on the pavement	cracks and grading sottle ments	
EMBANKKKENT	CONDITION OF EMBANKHENT	" magonny looson	* shoulder parts is eroded by digdig river	masoury loosen	normal
	Land Form Feature	cutting and embankment	cutting and embankment	cutting and embankaent	ombenkmen t
The second secon	 	187_850	188_100	188.300	183_350
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	orton arton				
en	ELDANKNENT TREATMENT	gutter pavement	foundation repair	foundation repair	protection of cm- bankment slope is masonry
EMBANKMENT SLOPE STABILITY CHECK TABLE	PRECENT LAND FORM	Section of the sectio	Source Supervision of the Superv	Due and	2000
ANTWENT STOPE	CONDITION OF PAVELIENT	Many cracks on the pave- ment	settlements - and cracks	cracking	
	CONDITION OF EMBANKMENT	shoulder'ss ero- ded by overflow water from gutter	. Foot of masonry is eroded by over flow water	Foot of masonry is eroded by over- flow water	Foot of masonry is eroded by pver-few cracks flow water
	FORM	embankmen t	cutting and embankment	cutting and embankment	cutting and embankment
***************************************	¥ ¥	182.900	190-500	192.600	192.700
l,	Ç,	K	24.	£.	9,

	2010 1010		•		
ŭ	THENRY THENT	reinforcement of masonry	drainage boring	gutter repair	apron repair
EMBANKWENT STAYE STABILITY CHECK TABLE	PRESENT LIND PORM	Namy Carck	PARTICINAL CANCE, AMO SATILEMENT PACE ZONS	MANY GULLINS	
ANYOVENT STARTS	CONDITION OF	cracks and sottlements	cracka and settloments	normal	normal
EWE	CONDITION OF	Lomon.	normal	natural slope, tich in meny gullies	shoulder is ero- ded by runding water from pipe
	LANO PORM PEATURE	cutting and anbankment	cutting and embankment	cutting and embankment	custing and embankment
A CHECKERATO OF THEM SUBSTITUTES IN	*	195.800	201-500	203,400	203.800
	ġ Ž	17	₩ -	6.	8

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	NOTE:				,
31	Trement	beam and gutter repair	gutter repair	gutter repair	
EMBANKMENT SLOPE STABILITY CHECK TABLE	Present Land	The same of the sa	No. of the second secon	COLOR PLANT	
MANGMENT STOPE	CONDITION OF PANGMENT PEATURE	normal	cracks and settlements	cracks and grading settlements	normal
	CONDITION OF GMBANYCIENT FEATURE	failure of beam occurs by overflow water	Temzou	ಗಂಸ್ತಾತ್ತಿ.	normal
	LAND FORM FEATURE	cutting and embankment	cutting and embankment	cutting and embankment	cutting and embankment
AND A SAME WAS AND A SAME MANAGES.	×	\$24.500	204-550	204.900	205.050
	ż	x	×	83	7 2

	() () 2		-		
	THEMBRICANT	apron failure zone ropair	apron repair	gutter repair	gatter repair
ENBANKMENT STOPE STABILITY CRECK TABLE	T LAND ROAM	ANUTA 867	PINER BY NAKONON	Sorial Sorial Strawd	Sorrmo Jawa
KWENT STOPE ST	CONDITION OF PAVENTAL FEATURE	meny cracks	many cracks	normal	eracks and settlements
NYBYO	CONDITION OF GLADANKHENT PRATUNE	masonry loose apron is eroded by water from pipa	mousonry cracks apron is eroded by water from pipe	embankment slope eroded by overflow water	embanisment slope croded by overflow water
	LAND FORM FEATURE	embankmens on the, swamp fill	embankment on the swemp fill	. cutting and embankment	cutting and embankment
را المستعدد وحميها الم	K.W.	205.800	205-900	206.100	206.400
	0 2	8	92	8	88

	STON				-
**************************************	TREADURE TO THE CONTRACTOR	counterweight method for embankment draing age boring slope protection for cutting slope	cxisting pipe repoir vortical water way and gutter repair	gutter repair. embankment failure zone repair by mason-	shoulder failure repair by masonry
BUBANKWENT SLOPE STABILITY CHECK TABLE	FRESENT LAND FORM	DAIWING COL BEARMANGOT TOWNS OWEN ON THE COLUMN OF THE CO	UNISPLEADED TIP OF DRAWGO	AGOTO SHOULD BE	ADOTAL TO THE WOOD
NKAENT SLOPE ST	do Noteranos	cracks occured, damping soil. is settle- ments	many cracks	cracks and grading sotthements	a Learnon
AGME	CONDITION OF	demping soil is	failure of masonry occurs by running water from pipe	gutter and embank- ment failure	orosion and should- or failure failure of embank- ment slope occurs
	LAED FORM TRATURE	cutting and embankment	cutting and embankment	cutting and embankment	cutting and embankment
أورون منهمين والمساور	KX.	206-700	206-900	207.000	207-100
	8	& ì	8	×	×

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	M 1: 0:				
	Cheannaint	* shoulder failure re-	reinforcement of masonry	failure zone repair by masonry	
PRANTOURING STABILLING, CHROX RABLE	PRESENT LAND FORM	TOTAL STATE OF THE PARTY OF THE	The court in a court	mume use	- STEEL
NOVEMBER STORE ST	CONDITION OF PAVEMENT PERTURE	.crack	cracks and settlements	meny cracks and settlements	normal
YEME	CONDITION OF EMBANKHENT FEATUME	failure of road shoulder occurs by overflow water	masonry loosed	fallure of road shoulder occurs by running water from natural slope	_ norme1.
	Land Form Frature	cutting and embankment	cutting and embankment	cutting and embenkment	cutting and embankment
<u> </u>	д Ж	207#400	207.500	207.600	208.100
-	ő	18	*	*	*

	3; 0)				
	THEATHERT	failure of apron re- pair vertical water way.	failure of apron re- pair_vertical water_ way	failure of apron re- peir vertical water way	fállure of apron re pair vertical water way
THE WINDOWS STORE STREET CHECK THERE	מבספאו רענים פסטאו	COON PIE	MILLER FORCE	EILE RIVER BOD	PAILURG BONG C-COX
ANKWENT STOPE	CONDITION OF PAVENCINT FEATURE	few cracks	many cracks	cracks and grading set- tlements	cracks and grading sot- tlements
76	CONDITION OF EMGINKMENT PERTURE	t failure of masonry occurs by running water from pipe	failure of masonry occurs by running water from pipe	failure of masonry occurs by running water from pipe	failure of masonry occurs by rupning water from pipe
***************************************	LAND FORM FEATURE	embankment at ravine fill	embankment at ravine fill	embankment at ravino fill	embankment at ravino fill
	ž,	208-200	208.400	208.600	209.200
	ģ	2	*	80	3

	NOTE				
37	FNBENNAGO CA	apron repair gutter repair	guttor repair		apron repair and establish vertical
SLOPE STABILITY CHECK TABLE	PRESENT LAND FORW	Contracto Suravos Confesso	And the second of the second o	ANCE WORKS	Will River for
BYBANKWENT STOPE	FNEUEVEG BRUTAGE	oracking	cracks and grading sottlements	cracks and grading settlements	normal
MG	EMBANKSIENT FEATS SE	failure of apron occurs by over- flow water	failure of apron occurs by over- flow water	normal	Toe of masonry foundation is eroded by running water from pipe
	LAND PORM PER CNS	cutting and embankment	cutting and embankment	cutting and embankment	ombankment
	i V	209,400	210.000	270-100	210.700
	Š	4	2,4	43	\$

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	NOTE		: •		
	THEMNACAT	reinforcement of foundation	reinforcement of masonry	reinforcement of foundation appon and gutter repair	reinforcement of masonry
EMPRINGMENT SLOPE, STABILLITY CHECK TABLE	PRESENT LAND FORM	Call of the state	Santa Santa	WANDOWAY WINGS SOO CAES 5 P. P. RAILUNG PAUMON RAILUNG PA	A CTONE MALONAY
BRINGARINE SIOPE	TWENTER	normal .	cracks and grading set- tlements	. normal	cracks and grading
B	CMCANKERNT	toe of masoury is eroded by overflow water	masonry looson	toe of masonry Lis croded by water	normal
	LAND FORM FEATURE	enbankment	cutting and embankment	embankmen t	cutting / and embankment
	XX	210.800	210.850	211_000	211.780
	ģ	3	\$	\$	- 84

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	arcon ar		•		
	THE SANKELENT THE SANKE SANKE	guttor repair	gutter repair over- lay	overlay	guttor repair overlay
BUBANKWENT SLOPE STABILITY CHECK TABLE	PRESCHT LAND FORM	THE COUNTY OF TH	promient cond.	mount coon of control	KADONA CENCE ADJE
NK-ENT STOPE ST	CONDITION OF PAVEMENT PEATURE	norma)	cracks and sottlements	many cracles	many eracks
PENE	CONDITION OF ENGANCHIT FEATURE	toe of foundation is eroded by over flow water	Lourou	normal	. toe of masonry foundation is croded by over- flow water from stream
	FORM FEATURE	. cutting and embankment	cutting and embankment	cutting and embankment	cutting and embankment
-	xx.	211.800	211.900	272,500	212.600
	Š	64	8.	- K	83
			B - 26	THE CONTRACTOR AND ADMINISTRATION OF PERSONS AND ADMINISTRATION OF THE CONTRACTOR OF	

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	310%				
	THENTHENT	vertical drain re- inforcement of found- ation	vertical drain	reinforcement of masonry	reinforcement of masonry
SIOPE STABILITY CHECK TABLE	PRESENT LAND FORM	MASON BY CARCAS. WASANANUW DIPE	MASONAY SECONG	Photos Parise was	MAKONES
EMBANKMENT SLOPE S	CONDITION OF PRINCIPAL PRI	many cracks n on .	mony cracks and settlo- ments	normal,	cracks and grading sottlements
ABMO	CONDITION OF	toe of masonry foundation is eroded by runguates from	motionay looko	mazonry looso	normal
	FORM	cutting and embankment	cutting and embankment	cutting and embankment	cutting and embankment
	Ž	212.78	272.750	213.000	213.200
I L	છું	12	ħ	55	56

NO-15 ENDANKWENT TREATHERT reinforcement of reinforcement of reinforcement of Sutter repair gutter repair gutter repair gutter repair foundation masonry masonry 2000 2010 2011 BEANKENT SLOPE STABILITY CHECK TABLE PECONYOND DIORITE 50.20 E Dacan Hos Co PRESENT LAND PAILURG BONE ķ NEO. '**ş** MAXONRY ---WASOLET AND CONDITION OF PAVEMENT many cracks few cracks settlements Louron . normal. Prod . masonry foundation embanisment failurp occurs by over-CONDEPPION OF Sround water . masonmy loose is eroded by normal flow water cutting and aglen fill LAND FORM FEATURE embankment embandmen t enbankmen t and cutting embankment cutting Cutting And and 272-250 213.400 213.500 ž 27.58 o, 23 农 ŝ 8

				. Anna anna anna	
	3.70x				
	EMDANKLIENT TREATHENT	vertical drain reinforcement of foundation	gutter ropalr	reinforcement of	reinforcement of masonry
BYBANKWENT SLOPE STABILITY CHECK TABLE	פווארו דונספאק אהסא	ONNOSTRONOST	winge our	with the state of	Falles or Oxology
WAS STOPE ST	CONDITION OF PAYEMENT FEATURE	cracking	normal	many cracks	cracks and sottlements
BWBA	CONDITION OF ENCIRCHE	mocomry foundation is oroded by running water from	masonry loose	failure occurs due to overflow water	failure, occurs by overflow water
	LAND FORM FEATURE	embonkmen t	cutting and embankment	cutting and embankment	· cutting and ombankment
	ži X	213.700	214-700	214.900	215.000
	8	2	8	63	\$