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No. 23

JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF CONSTRUCTION AND TRANSPORTATION
THE REPUBLIC OF NICARAGUA

THE ROAD IMPROVEMENT AND REHABILITATION STUDY IN NICARAGUA

FINAL REPORT
ANNEXES I
MASTER PLAN

JULY 1994

CENTRAL CONSULTANT INC.
NIPPON KOEI CO., LTD.

Exchange Rate
US$ 1 = 6.15 Córdobas
July 1993

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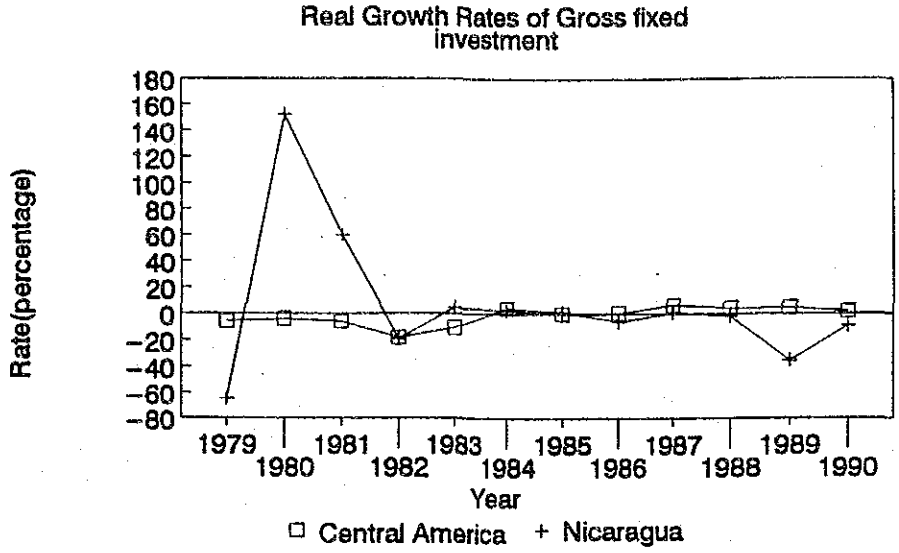
Annex 2-1 Economic Data

Real Growth Rates of Gross Fixed Investment(Percentage)

COUNTRY	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Guatemala	−5.1	−9.9	7.8	−8.7	−28.8	−9.0	−6.3	0.6	16.5	11.6	10.7	1.6
EL Salvador	−15.6	−28.0	−10.8	−7.6	5.5	2.3	10.2	7.5	9.1	2.9	3.0	−17.3
Honduras	2.6	14.5	−18.8	−16.2	−1.6	7.1	−6.6	−13.6	−6.6	6.2	4.3	−11.2
Nicaragua	−65.0	152.2	60.1	−19.3	4.7	2.2	1.1	−6.1	1.0	−1.8	−35.4	−9.1
Costa Rica	15.3	−9.4	−24.9	−38.2	−7.2	25.0	5.4	11.8	9.9	−2.7	8.3	9.2
Central America	−5.7	−3.9	−5.9	−18.2	−10.7	4.0	0.0	0.6	6.6	4.2	4.7	1.8

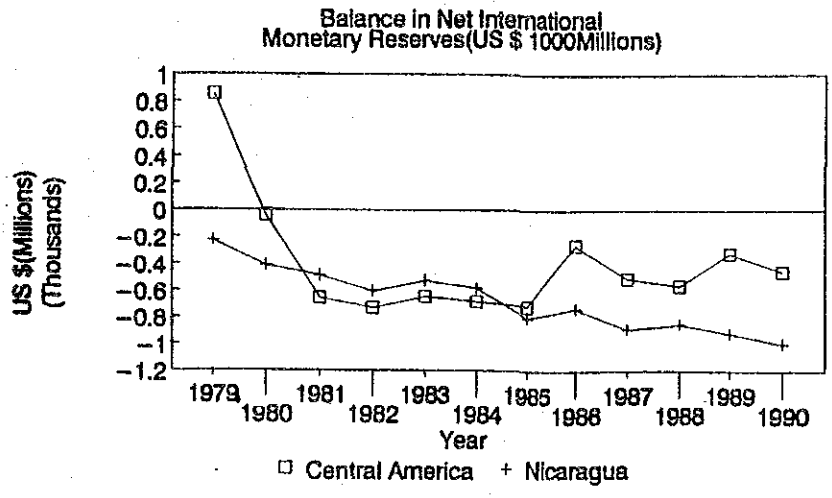
Source:Central Banks and Ministries of Planning



Balance in Net International Monetary Reserves(US$ Millions)

Year/Country	Guatemala	EL Salvador	Honduras	Nicaragua	Costa Rica	Central America
1979	722.5	171.1	128.7	−227.1	59.0	854.2
1980	464.5	−25.1	75.0	−414.3	−139.0	−38.9
1981	163.5	−149.4	2.6	−486.3	−185.0	−654.6
1982	124.5	−79.3	−121.5	−605.0	−47.0	−728.3
1983	−85.4	−0.7	−125.0	−528.6	92.6	−645.1
1984	−113.4	16.4	−165.1	−582.6	162.4	−682.5
1985	−154.0	95.5	−169.3	−800.7	312.2	−716.3
1986	51.3	211.4	−160.1	−734.4	371.5	−260.3
1987	−164.8	279.4	−111.8	−687.3	376.1	−508.4
1988	−468.8	238.1	−86.2	−851.5	604.9	−563.5
1989	−362.0	291.5	−87.9	−919.3	756.9	−320.8
1990	−331.2	437.9	−38.4	−996.0	470.8	−456.9

Source:Central Banks and Ministries of Planning

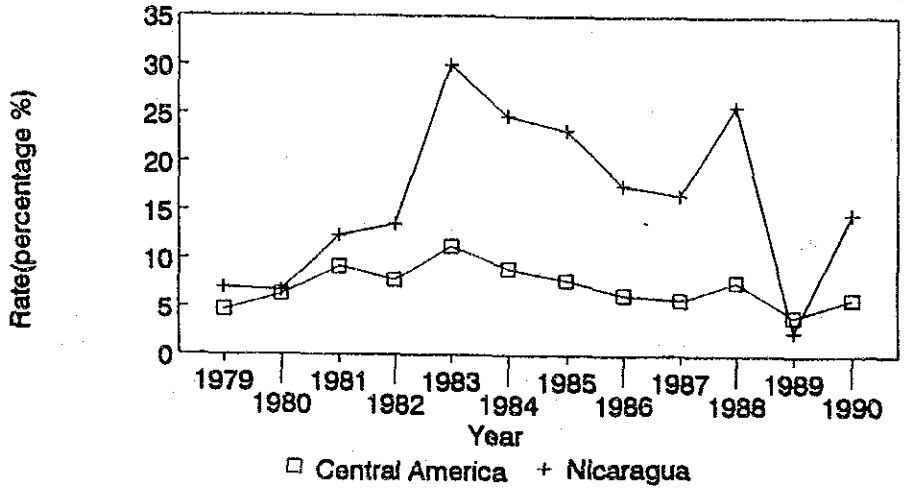


Central America: Fiscal Deficit as a Percentage of GDP

COUNTRY	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Guatemala	2.6	4.5	6.7	4.5	3.9	3.5	1.8	1.5	1.3	1.4	2.5	2.3
EL Salvador	2.3	6.8	14.4	8.0	8.8	2.6	2.7	1.4	1.3	1.1	3.5	3.6
Honduras	4.0	4.6	7.4	9.8	10.4	11.4	9.0	7.5	7.8	7.5	8.0	4.6
Nicaragua	7.0	6.7	12.4	13.6	30.0	24.8	23.3	17.6	16.6	25.8	2.5	14.7
Costa Rica	7.6	9.0	5.3	3.3	3.3	2.7	2.0	3.3	2.1	2.5	4.0	4.4
Central America*	4.7	6.3	9.2	7.8	11.3	9.0	7.8	6.3	5.8	7.7	4.1	5.9

Source:Central Banks and Ministries of Planning
*:Simple Average

Fiscal Deficit as a Percentage of GDP

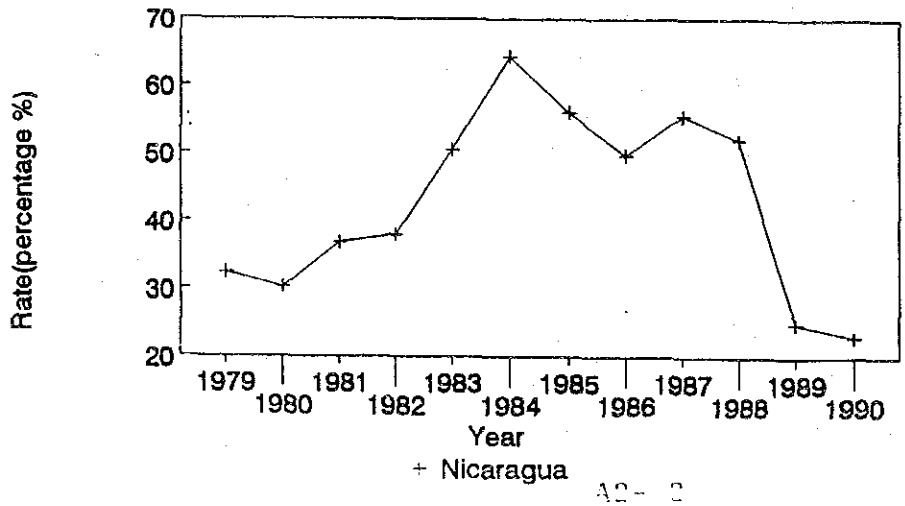


Central America Monetary Supply as a Percentage of GNP

COUNTRY	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Guatemala	23.3	22.6	22.7	25.0	25.3	27.3	29.7	25.6	26.4	25.3	25.4	21.8
EL Salvador	29.7	29.4	32.4	34.6	34.0	36.0	37.4	35.2	32.2	30.5	28.0	28.3
Honduras	28.9	27.5	24.5	27.4	30.4	31.3	30.0	30.1	33.5	34.7	35.8	36.0
Nicaragua	32.4	30.2	36.8	38.0	50.6	64.4	56.1	49.8	55.6	52.0	25.0	23.0
Costa Rica	39.4	41.2	51.4	50.6	50.0	46.6	44.3	42.8	44.4	48.2	49.9	50.6

Source:Central Banks of the Area

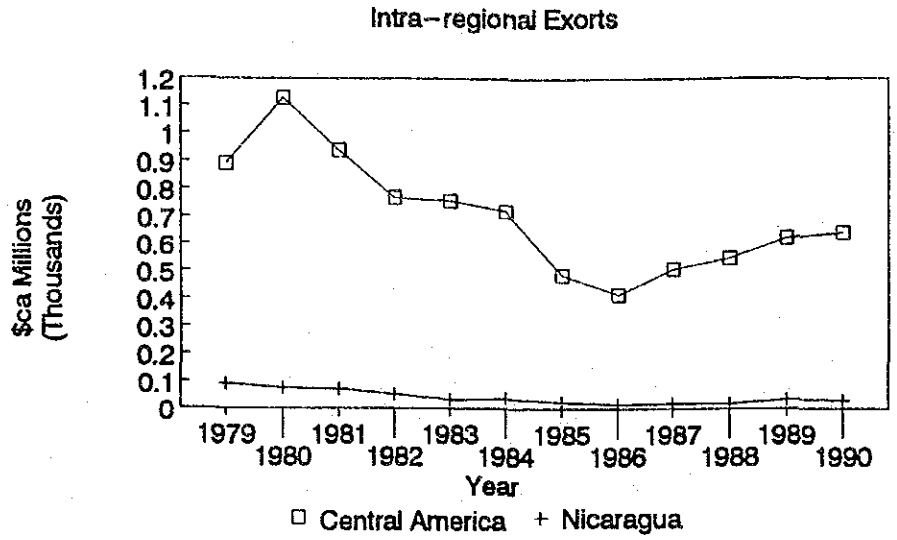
Monetary Supply as a Percentage of GNP



Central Intra-regional Exports ($CA Millones)

COUNTRY	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Guatemala	300.0	404.0	356.0	322.0	309.0	285.0	205.0	192.0	232.0	236.0	251.0	280.0
EL Salvador	267.0	296.0	207.0	174.0	165.0	156.0	94.0	87.0	120.0	140.0	161.0	173.0
Honduras	60.0	84.0	66.0	52.0	61.0	48.0	20.0	19.0	26.0	24.0	30.0	23.0
Nicaragua	90.0	75.0	71.0	52.0	33.0	37.0	24.0	15.0	19.0	19.0	34.0	30.0
Costa Rica	175.0	270.0	238.0	167.0	187.0	193.0	143.0	101.0	110.0	130.0	145.0	134.0
Central America	892.0	1129.0	938.0	767.0	755.0	719.0	486.0	414.0	507.0	549.0	621.0	640.0

Source:Central Banks and Ministries of Planning



EXPORTATIONS FOB OF MAIN PRODUCTS , 1977 – 1993

PRODUCTS	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
SESAME (QQ)																	
Value	1,762.0	3,412.0	3,157.0	6,284.0	7,977.0	5,822.0	5,824.0	5,904.0	5,375.0	2,478.0	2,941.0	2249	2922.5	6532.2	7308.9	4335.3	7956
Volume	59.0	111.0	106.0	117.0	183.0	108.0	100.0	147.0	122.0	58.0	68.0	57	57	111.5	211	114	168.8
Price	29.9	30.7	29.8	53.7	43.6	53.9	58.2	40.2	44.1	42.7	43.3	39.5	51.3	58.6	34.6	38	45
COTTON (QQ)																	
Value	150,512.0	140,912.0	135,713.0	30,412.0	123,435.0	87,200.0	109,533.0	133,815.0	90,826.0	41,022.0	44,938.0	50605.9	27960.9	37251.1	44372	26218.5	2000
Volume	2,531.0	2,804.0	2,470.0	427.0	1,627.0	1,350.0	1,724.0	1,809.0	1,457.0	1,068.0	1,106.0	756.8	539.2	535.2	592.6	514.1	34.2
Price	59.5	50.2	54.9	71.2	75.9	64.6	63.5	74.0	62.3	38.4	40.6	66.9	51.9	69.6	74.9	51	
SUGAR (QQ)																	
Value	27,842.0	19,614.0	19,554.0	20,458.0	51,015.0	36,424.0	34,375.0	20,940.0	6,920.0	17,505.8	19,653.7	5420.6	17189.7	38572.2	31335.7	19102.6	20757
Volume	2,157.0	2,126.0	1,974.0	1,348.0	2,232.0	2,068.0	2,376.0	2,220.0	1,250.0	1,539.7	1,091.8	751.4	1693.1	2531	2472.9	1893.3	1887
Price	12.9	9.2	9.9	15.2	22.9	17.6	14.5	9.4	5.5	11.4	18.0	7.2	10.2	15.2	12.7	10.1	11
BANANA 1/																	
Value	4,474.0	4,799.0	6,371.0	8,385.0	20,904.0	9,788.0	14,784.0	11,888.0	16,458.0	15,494.6	14,131.3	14661.5	20128.7	27079.8	28690.4	9975.6	26144
Volume	5,677.0	6,012.0	5,637.0	5,894.0	4,907.0	2,276.0	4,288.0	4,156.0	4,465.0	4,321.4	3,985.7	3859	4032.4	5227.3	6142.9	3089.9	6536
Price	0.8	0.8	1.1	1.5	4.3	4.3	3.5	2.9	3.7	3.6	3.6	3.8	5	5.2	4.7	3.2	4
COFFEE (QQ)																	
Value	198,790.0	199,600.0	158,497.0	165,670.0	136,808.0	124,002.0	153,239.0	121,812.0	117,934.0	109,642.4	115,056.0	81361.8	104620.4	71022.4	36221.2	45294.6	52500
Volume	1,076.0	1,188.0	1,204.0	1,000.0	1,132.0	1,012.0	1,418.0	892.0	868.0	673.0	813.0	679	935.7	848.7	478.2	806.5	700
Price	184.7	168.0	131.6	165.7	120.9	122.5	108.1	136.6	135.9	162.9	141.5	119.8	111.8	83.7	75.7	56	75
MEAT (THOUSAND OF POUNDS)																	
Value	37,278.0	67,733.0	93,527.0	58,551.0	21,233.0	33,818.0	31,411.0	17,601.0	10,925.0	4,724.0	12,814.0	13446.7	33636.3	56963.8	37460.4	40815.8	44000
Volume	58,114.0	74,926.0	78,260.0	45,052.0	20,176.0	32,047.0	31,332.0	19,825.0	12,703.0	5,769.3	15,067.0	14619	38250.8	55667.7	32357.1	38889.9	40000
Price	0.6	0.9	1.2	1.3	1.1	1.1	1.0	0.9	0.9	0.8	0.9	0.9	0.9	1	1.2	1	1.1
MOLASSES (THOUSANDS OF METRIC TONS) 2/																	
Value	2,951.0	2,407.0	3,268.0	5,507.0	5,749.0	2,843.0	1,339.0	2,587.0	608.0	1,123.6			713.8	1465.6	3313	4644.8	4400
Volume	63.0	66.0	68.0	64.0	59.0	66.0	41.0	45.0	15.0	19.8			20	35.7	58.3	105.9	100
Price	46.8	36.5	48.1	86.1	97.4	43.1	32.7	57.5	40.5	56.8			35.7	41.1	56.8	43.9	44
SEAFOOD (THOUSAND OF POUNDS) 2/																	
Value	22,049.0	14,711.0	21,701.0	26,763.0	17,899.0	21,650.0	16,915.0	12,560.0	12,665.0	8,653.0	12,383.0	7192.5	11552	8704	12861.7	15485.3	25051.5
Volume	11,962.0	9,325.0	8,301.0	7,549.0	5,374.0	4,138.0	2,879.0	2,225.0	2,692.0	1,864.0	2,190.0	1830.2	2818.3	1905	3661.7	2756	3745
Price	1.8	1.6	2.6	3.6	3.3	5.2	5.9	5.6	4.8	4.6	5.7	3.9	4.1	4.6	3.5	5.6	6.7
GOLD (THOUSAND OF TROY OUNCES)																	
Value 4/	3,816.0	8,194.0	5,710.0	32,201.4	29,062.5	17,527.7	19,987.6	27,246.9	6,419.7	13,582.1	12,073.7	13270.9	20845.9	14078.1	10204.2		12920
Volume	61.0	67.0	34.0	58.8	65.1	48.4	49.1	33.4	19.7	35.1	27.2	30.5	55.3	36.7	28.3		38
Price	62.6	92.4	167.9	547.8	446.4	362.1	407.1	815.8	325.9	387.0	443.9	435.1	377	383.6	360.6		340
SILVER (THOUSAND OF TROY OUNCES)																	
Value 4/	404.0	2,332.0	1,511.0	2,098.5	1,194.6	634.6	660.7	396.4	142.6	185.0	188.5	139.3	237.2	48.1			
Volume	174.0	604.0	282.0	143.9	160.9	70.9	63.1	53.3	23.5	34.2	26.8	21.6	50.2	10			
Price	2.3	3.9	5.4	14.6	7.4	9.0	10.5	7.4	6.1	5.4	7.0	6.4	4.7	4.8	14.6		
TOTAL (VALUE)	449,978.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	211,785.5	[illegible]	195,720.5
TOTAL (VOLUME)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44,270	[illegible]	[illegible]	[illegible]	24,376	22,604	[illegible]	[illegible]	46,003	48,172	[illegible]
TOTAL (PRICE)	401.9	394.2	452.3	980.5	623.2	[illegible]	706.0	1,150.3	[illegible]	718.8	704.5	663.6	652.6	667.4	639.3	208.6	526.3

VOLUME : THOUSAND
VALUE : THOUSAND DOLLARS
PRICE : US$
1/ : Boxes of 42 pounds.Each one
2/ : 1 TM = 22.05 QQ
3/ : Includes Shrimp and Lobsters
4/ : With the Nacionalization of the mines in 1980 the values show the real prices of the market.
FUENTE:
1977–1987 , Central Bank of Nicaragua (CBN)
1988 – 1989 , Ministry of Economy, Industry and Trade
1990 – 1993 , General Direction of Foreing Programming

Loan aprovals accrued as of June 30,1991(CABEI)

NICARAGUA (in thousands of $CA)

Economic Sector	No.	Amount	%
Agriculuture,Forestry and Fishing	13	26,822.2	7.3%
Minining	1	1,947.4	0.5%
Manufacturing	72	49,191.3	13.3%
Electricity and Water	15	24,974.9	6.8%
Physical Infrastracture	45	121,504.6	33.0%
Transportation,Warehousing and Comunications	11	54,758.3	14.9%
Tourism	10	6,408.1	1.7%
Social Services	2	3,691.6	1.0%
Housing	10	45,855.0	12.4%
Multisectorial	14	33,636.4	9.1%
Total	193	368,789.8	100.0%

Loan aprovals accrued as of June 30,1991(CABEI)

HONDURAS (in thousands of $CA)

Economic Sector	No.	Amount	%
Agriculuture,Forestry and Fishing	17	16,387.8	2.7%
Minining	1	90.1	0.0%
Manufacturing	74	37,010.3	6.1%
Electricity and Water	23	106,213.8	17.4%
Physical Infrastracture	65	237,168.7	38.9%
Transportation,Warehousing and Comunications	28	89,404.0	14.7%
Tourism	24	18,358.3	3.0%
Social Services	3	8,055.0	1.3%
Housing	33	57,382.0	9.4%
Multisectorial	27	39,497.0	6.5%
Total	295	609,567.0	100.0%

Loan aprovals accrued as of June 30,1991(CABEI)

EL SALVADOR (in thousands of $CA)

Economic Sector	No.	Amount	%
Agriculuture,Forestry and Fishing	4	9,582.7	2.8%
Minining	60	36,671.3	10.7%
Manufacturing	8	64,023.7	18.6%
Electricity and Water	32	137,755.7	40.0%
Physical Infrastracture			0.0%
Transportation,Warehousing and Comunications	9	23,214.3	6.7%
Tourism	13	6,686.9	1.9%
Social Services	6	8,322.0	2.4%
Housing	7	22,449.7	6.5%
Multisectorial	18	35,867.2	10.4%
Total	157	344,573.5	100.0%

Loan aprovals accrued as of June 30,1991(CABEI)

GUATEMALA (in thousands of $CA)

Economic Sector	No.	Amount	%
Agriculuture,Forestry and Fishing	2	570.0	0.1%
Minining	3	6,210.3	1.6%
Manufacturing	58	21,756.4	5.8%
Electricity and Water	17	76,491.9	20.3%
Physical Infrastracture	24	118,934.3	31.6%
Transportation,Warehousing and Comunications	11	25,501.5	6.8%
Tourism	12	32,381.1	8.6%
Social Services	3	5,700.0	1.5%
Housing	9	53,339.9	14.2%
Multisectorial	19	35,937.8	9.5%
Total	158	376,823.2	100.0%

Loan aprovals accrued as of June 30,1991(CABEI)

CENTRAL AMERICA (in thousands of $CA)

Economic Sector	No.	Amount	%
Agriculuture,Forestry and Fishing	41	58,678.4	2.7%
Minining	7	8,261.1	0.4%
Manufacturing	320	170,891.0	7.8%
Electricity and Water	80	364,290.6	16.6%
Physical Infrastracture	219	794,558.4	36.2%
Transportation,Warehousing and Comunications	74	222,869.1	10.2%
Tourism	83	81,780.0	3.7%
Social Services	32	46,978.4	2.1%
Housing	78	264,232.5	12.1%
Multisectorial	91	179,551.8	8.2%
Total	1,025	2,192,091.3	100.0%

Source:CABEI annual report 1991

Annex 3-1 Objective Urban Center

Region	Department	Municipality	Population	
			1993	2010
1	Nueva Segovia	Ocotal	28,785	46,941
1	Nueva Segovia	El Jicaro(C.Sandino)	17,158	27,984
1	Nueva Segovia	Jalapa	33,446	54,550
1	Nueva Segovia	Quilali	16,318	26,613
1	Madriz	Somoto	30,136	49,146
1	Madriz	Telpaneca	10,604	17,294
1	Madriz	San Juan del Rio Coco	14,479	23,612
1	Madriz	Palacaguina	11,707	19,091
1	Esteli	Pueblo Nuevo	20,403	33,272
1	Esteli	Condega	22,842	37,256
1	Esteli	San Juan de Limay	14,724	24,011
1	Esteli	Esteli	89,028	145,188
1	Esteli	La Trinidad	20,518	33,461
2	Chinandega	El Viejo	67,417	109,459
2	Chinandega	Puerto Morazan	11,655	18,917
2	Chinandega	Somotillo	25,049	40,671
2	Chinandega	Villanueva	19,619	33,013
2	Chinandega	Chinandega	97,615	164,242
2	Chinandega	Corinto	22,764	38,306
2	Chinandega	Chichigalpa	46,109	77,580
2	Chinandega	Posoltega	15,256	25,671
2	Leon	Leon	165,286	278,100
2	Leon	Telica	21,496	36,170
2	Leon	Larreynaga	34,261	57,640
2	Leon	El Sauce	27,919	46,974
2	Leon	Achuapa	16,296	27,419
2	Leon	La Paz Centro	28,524	47,991
2	Leon	Nagarote	29,143	47,320
3	Managua	Tipitapa	75,024	121,400
3	Managua	Mateare	13,736	22,232
3	Managua	Villa Carlos Fonseca	25,583	41,399
3	Managua	San Rafael del Sur	38,395	62,127
3	Managua	Managua	972,072	1,572,924
3	Managua	Ticuantepe	16,162	26,158

Appendix 3-1 Objective Urban Centres

Region	Department	Municipality	Population	
			1993	2010
4	Masaya	La Concepcion	24,416	39,640
4	Masaya	Nindiri	26,085	42,348
4	Masaya	Masaya	101,433	164,678
4	Masaya	Tisma	12,466	20,243
4	Masaya	Masatepe	22,291	37,208
4	Masaya	Niquinohomo	12,246	19,881
4	Carazo	San Marcos	24,080	39,089
4	Carazo	Diriamba	57,745	93,746
4	Carazo	Jinotepe	37,922	61,568
4	Carazo	Santa Teresa	16,535	26,845
4	Granada	Granada	91,527	148,600
4	Granada	Diriomo	22,263	36,148
4	Granada	Nandaime	36,411	59,115
4	Rivas	Tola	20,773	33,728
4	Rivas	Belen	17,037	27,661
4	Rivas	Rivas	35,543	57,708
4	Rivas	San Juan del Sur	16,466	26,736
4	Rivas	Moyogalpa	10,189	16,543
4	Rivas	Altagracia	16,037	26,039
5	Boaco	Teustepe	20,927	34,082
5	Boaco	Boaco	38,747	63,111
5	Boaco	Camoapa	28,587	46,557
5	Boaco	San Lorenzo	20,054	32,662
5	Chontales	Juigalpa	49,044	79,875
5	Chontales	Santo Domingo	18,870	30,725
5	Chontales	San Pedro de Lovago	14,365	23,391
5	Chontales	Santo Tomas	14,486	23,595
5	Chontales	Acoyapa	15,730	25,620
5	Chontales	Villa Sandino	18,170	29,596
6	Jinotega	Wiwili	27,190	44,119
6	Jinotega	Cua-Bocay	32,664	52,994
6	Jinotega	San Sebastian de Yali	15,088	24,480
6	Jinotega	San Rafael del Norte	16,372	26,562
6	Jinotega	Santa Maria de Pantasma	17,452	28,316
6	Jinotega	Jinotega	68,468	111,092
6	Matagalpa	San Isidro	14,356	23,295
6	Matagalpa	Sebaco	23,042	37,388

Appendix 3–1 Objective Urban Centres

Region	Department	Municipality	Population	
			1993	2010
6	Matagalpa	Ciudad Dario	37,175	60,321
6	Matagalpa	Terrabona	11,299	18,331
6	Matagalpa	San Dionisio	11,904	19,313
6	Matagalpa	Esquipulas	14,127	22,919
6	Matagalpa	Matagalpa	94,898	153,972
6	Matagalpa	San a Ramon	22,195	36,012
6	Matagalpa	El Tuma–La Dalia	35,608	57,775
6	Matagalpa	Rancho Grande	17,343	28,137
6	Matagalpa	Matiguas	32,140	52,145
6	Matagalpa	Rio Blanco	37,329	60,569
7	Atlantico Norte	Waspan	26,025	42,243
7	Atlantico Norte	Rosita	13,047	21,181
7	Atlantico Norte	Puerto Cabezas	31,860	51,714
7	Atlantico Norte	Waslala	23,837	38,678
7	Atlantico Norte	Siuna	28,606	46,431
8	Atlantico Sur	La Cruz de Rio Grande	13,635	22,202
8	Atlantico Sur	El Rama	36,860	60,030
8	Atlantico Sur	Muelle de los Bueyes	26,227	42,710
8	Atlantico Sur	Nueva Guinea	48,980	79,776
8	Atlantico Sur	Bluefields	38,235	62,274
9	Rio San Juan	San Carlos	16,374	26,619

Annex 3-2 Identification of Distress Type

Asphalt Surfaced Pavements

1. Alligator or Fatigue Cracking
2. Bleeding
3. Block Cracking
4. Corrugation
5. Depression
6. Joint Reflection Cracking from PCC Slab
7. Lane/Shoulder Dropoff or Heave
8. Lane/Shoulder Joint Separation
9. Longitudinal and Transverse Cracking (Non-PCC Slab Joint Reflective)
10. Patch Deterioration
11. Polished Aggregate
12. Potholes
13. Pumping and Water Bleeding
14. Raveling and Weathering
15. Streaking

Concrete Pavements

1. Spalling (Transverse and Longitudinal Joint/Crack)
2. Spalling (Corner)

E.1 DISTRESS TYPE (ASPHALT SURFACED PAVEMENTS)

Name of Distress: Alligator or Fatigue Cracking

Description:

Alligator or fatigue cracking is a series of interconnecting cracks caused by failure of the asphalt concrete surface (or stabilized base) under repeated traffic loading. The cracking initiates at the bottom of the asphalt concrete surface (or stabilized base) where tensile stress and strain is highest under a wheel load. The cracks propagate to the surface initially as one or more longitudinal parallel cracks. After repeated traffic loading, the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are usually less than 1 foot on the longest side. Alligator cracking occurs only in areas that are subjected to repeating traffic loadings. Therefore, it would not occur an entire area that is not subjected to loading is rated as block cracking which is not a load-associated distress. Alligator cracking is considered a major structural distress.

Name of Distress: Bleeding

Description:

Bleeding is a film of bituminous material on the pavement surface which creates a shiny, glass-like, reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amount of asphalt cement in the mix and/or low air void contents. It occurs when asphalt fills the voids of the mix during hot weather and then expands out onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt will accumulate on the surface.

Name of Distress: Block Cracking

Description:

Block cracks divide the asphalt surface into approximately rectangular pieces. The blocks range in size from approximately 1 ft2 to 100 ft2. Cracking into larger blocks are generally rated as longitudinal and transverse cracking. Block cracking is caused mainly by shrinkage of the asphalt concrete and daily temperature cycling (which results in daily stress/stain cycling). It is no load-associated, although load can increase the severity of individual cracks from low to medium to high. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large proportion of pavement area, but sometimes will occur only in non traffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles. Also unlike block cracks, alligator cracks are caused by repeated traffic loadings and are, therefore, located only in trafficked areas (i.e., wheel paths).

Name of Distress: *Corrugation*

Description:

Corrugation is a form of plastic movement typified by ripples across the asphalt pavement surface . It occurs usually at points where traffic starts and stops. Corrugation usually occurs in asphalt layers that lack stability in warm weather, but may also be attributed to excessive moisture in a subgrade, contamination of the mix, or lack of aeration of liquid asphalt mixes.

Name of Distress: Depression

Description:

Depressions are localized on pavement surface areas having elevations slightly lower than those of the surrounding pavement. In many instances, light depressions are not noticeable intil after a rain, when ponding water creates "birdbath" areas; but the depressions can also be located without rain because of strains created by oil dropping from vehicles. Depressions can be caused by settlement of the foundation soil or can be "built in" during construction. Depressions cause by roughness and when filled with water of sufficient depth could cause hydroplaning of vehicles.

Name of Distress: Joint Reflection Cracking from PCC Slab

Description:

This distress occurs only on pavements having an asphalt concrete surface over a jointed portland cement concrete (PCC) slab and they occur at transverse and longitudinal joint (i.e., cement stabilized, lime stabilized). This distress does not include reflection cracking away from a joint or from any other type of base (i.e, cement stabilized, lime stabilized) as these cracks identified as "Longitudinal and Transverse Cracking". Joint Reflection cracking is caused mainly by movement of the PCC slab beneath the asphalt concrete (AC) surface because of thermal and moisture changes; it is generally not load iniciated. However, traffic loading may cause a breakdown of the AC near the initial crack, resulting in spalling. Acknowledge of slab dimensions beneath the AC surface will help to identify these cracks.

Name of Distress: Lane/Shoulder Drop-off or Heave

Description:

Lane/Shoulder drop-off or heave occurs wherever there is a difference in elevation betweeen the traffic lane and the shoulder. Typically, the outside shoulder settles due to consolidation or a settlement of the underlying granular or subgrade material or pumping of the underlying material. Heave of the shoulder may occur due to frost action or swelling soils. Drop-off of granular or soil shoulder is generally caused from blowing away of shoulder material passing trucks.

Name of Distress: Lane/Shoulder Joint Separation

Description:

Lane/Shoulder joint separation is the widening of the joint between the traffic lane and the shoulder, generally due to movement in the shoulder. If the joint is tightly closed or well sealed so water cannot enter (or if there is no joint due to full-width paving), then lane/shoulder joint separation is not considered a distress. If the shoulder is not paved (i.e., gravel or grass), then the severity should be rated as high. If a curbing exists, then it should be rated according to the width of the joint between the asphalt surface and curb.

Name of Distress: Longitudinal and Transverse Cracking
(Non-PCC Slab Joint Reflective)

Description:

Longitudinal cracks are parallel to the pavement's centerline or laydown direction. They may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or (3) a reflective crack caused by cracks beneath the surface course, including cracks in PCC slabs (but not at PCC slab joints). Transverse cracks extend across the pavement centerline or direction of laydown. They may be caused by items (2) or (3) above. These types of cracks are not usually load-associated.

Name of Distress: Patch Deterioration

Description:

A patch is an area where the original pavement has been removed and replaced with either similar or different material.

Name of Distress: Polished Aggregate

Description:

Aggregate polishing is caused by repeated traffic applications. Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small or there are no rough or angular aggregate particles to provide good skid resistance.

Name of Distress: Potholes

Description:

A bowl shaped hole of various sizes in the pavement surface. The surface has broken into small pieces by alligator cracking or by localized disintegration of the mixture and the material is removed by traffic. Traffic loads force the underlying materials out of the hole, increasing the depth.

Name of Distress: Pumping and Water Bleeding

Description:

Pumping is the ejection of water and fine materials under pressure through cracks under moving loads. As the water is ejected, it carries fine material resulting in progressive material deterioration and loss of support. Several cases of pumping of stabilized base material have been observed for example. Surface staining or accumulation of material on the surface close to cracks is evidence of pumping. Water bleeding occurs where water seeps slowly out of cracks in the pavement surface.

Name of Distress: Rutting (Streaking)

Description:

A rut is a surface depression in the wheel paths. Pavement uplift may occur along the sides of the rut; however, in many instances, ruts are not noticeable only after a rainfall, when the wheel paths are are filled with water. Rutting stem from a permanent deformation in any of the pavement layers or subgrade, usually caused by consolidation or lateral movement of the materials due to traffic loads. Rutting may be caused by plastic movement in the mix in hot water or inadequate compaction during construction. Significant rutting can lead to major structural failure of the pavement and hydroplaning potential. Wear of the surface in the wheel paths from studded tires can also cause a type of rutting.

Name of Distress: Raveling and Weathering

Description:

Raveling and weathering are the wearing way of the pavement surface caused by the dislodging of aggregate particles (raveling) and loss of asphalt binder (weathering). They generally indicate that the asphalt binder has hardened significantly.

E.2 DISTRESS TYPES (JOINTED REINFORCED CONCRETE PAVEMENTS)

Name of Distress: Spall (Transverse and Longitudinal Joint/Crack)

Description:

Spalling of cracks and joints is the cracking, breaking, or chipping (or fraying) of the slab edges within 2 feet (0.6m) of the joint/crack. A spall usually does not extend vertically through the whole slab thickness but extends to intersect the joint at an angle. Spalling usually results from (1) excessive stresses at the joint or crack caused by infiltration of incompressible materials and subsequent expansion, (2) disintegration of the concrete from freeze-thaw action of "D" cracking, (3) weak concrete at the joint (caused by honey-combing), (4) poorly designed or constructed load transfer device (misalignment, corrosion), and/or (5) heavy repeated traffic loads.

Name of Distress: Spalling (Corner)

Description:

Corner spalling is the raveling or breakdown of the slab within approximately 1 foot (0.3m) of the corner. However, corner spalls with both edges less than 3 inches (8cm) long will not be recorded. A corner spall differs from a corner break in that the spall usually angles downward at about 45 degrees to intersect the joint, while a break extends vertically through the slab. Corner spalling can be caused by freeze-thaw deterioration, "D" cracking, and other factors.

Annex 3-3 Evaluation of Existing Conditions

Section A-1:

Int. Guanacaste/Belen/Nandaime - Guanacaste

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Local Potholes Patch deterioration Shoulders severely deteriorated Overlaid Slope erosion L=3.7km (40%) Roadway width=6.3m Shoulders width=1.3m		
5.0km-9.1km	Transverse and longitudinal cracking in the whole surface Located small potholes Fair condition Roadway width=6.0m Shoulders width=1.7m Roadway width=6.8m Shoulders width=1.2m		

Section A-2:

Int.Granada/Nandaime/Catarina - Int.Masaya/Guanacaste/Masatepe

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 3.0km	Tinny overlay Raveling Potholes (deep) Critical alligator cracking Probably weak structure pavement (base coarse) Critical condition Roadway width=6.8m Shoulder width=1.2m		
3.0km- 7.1km	Overlaid Asphalt content is improper Block cracking Deficient construction Fair to bad condition Roadway width=6.6m Shoulder width=1.63;1.1m		
7.1km-8.9km	Overlaid Fair to good condition Improper shoulder definition		

Section A-3:

Int.Masaya/Guanacaste/Masatepe-Int.Nindiri/Catarina/Masaya

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 9.1km	Tinny overlay Raveling Potholes, block cracking Critical alligator cracking Probably weak structure pavement (base coarse) Critical condition Roadway width= 7.1m Shoulders width=1.3m		

Section A-4:

Int. San Benito/Masaya/Tipitapa - Int. Tipitapa/Masaya/Managua

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 3.9km	Deficient construction, Rough surfacing, Longitudinal Streaking Non symmetric cross section, Left lane=4.6m Right lane=3.9m Roadway total width=8.5m		
3.9km-5.0km	-ditto-Raveling		
5.0km-10.0km	-ditto- Roadway width=8.6m		
10.0km-15.0km	Bleeding and raveling overlay Roadway width=8.1m		
15.0km-20.0km	-ditto- Roadway width=8.9m Without shoulders		
20.0km-22.1km	-ditto-		

Section A-5:

Int.LasMaderas/Tipitapa/Sn.Benito-Int.Sn.Benito/Masaya/Tipitapa

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Bleeding, Local longitudinal cracking Local block cracking Progressive streaking Asphalt content is improper Deficient construction Roadway width =7.2m Shoulders width=1.9m		
5.0km-9.5km	-ditto-		
9.5km-11.8km	Overlaid pavement Potholes Fair condition Roadway width =9.3m Shoulders width=1.0m		
11.8km-13.3km	Progressive transversal cracks at the middle area, Alligator cracks at the borders Longitudinal Streaking Overlaid, fair to poor condition Roadway width =6.6m Shoulders width=2.5m		

Section A-6:

San Benito - Las Maderas

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	partially pothole portion 0.0km:coarse graded t=5cm		1.6/2.8/3.9
5.0km-10.0km	many patched portion slightly deeper potholes 5.0km:coarse graded t=5cm		10.0
10.0km-15.0km	maintained	11.1	

Section A-7:
Las Maderas - Sebaco

Section A-8:
Sebaco - Int.San Isidro/Sebaco/Telica

Section A-9:
Int.San Isidro/Sebaco/Telica - Esteli

Section A-10:
Esteli - Int.Somoto/Esteli/Ocotal

Section A-11:
Int.Somoto/Esteli/Ocotal - El Espino

Section A-101:

Int.Catarina/Nandaime/Granada - Centro de Granada <Guanacaste>

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	maintained		
5.0km-10.0km	maintained		

Section A-102:

Catarina - Int.Jinotepe/Managua

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Alligator crack		1.8/4.3/5.0
5.0km-10.0km	-ditto-		5.7/6.7
10.0km-15.0km	-ditto-	13.5/13.9/ 14.5	
15.0km-19.5km	maintained without shoulder		16.6

Section A-103:

San Marcos - Jinotepe

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Alligator crack	3.9	
5.0km- 7.1km	-ditto-		

Section A-104:

Int.Tipitapa/Masaya/Tisma - Tisma - Granada

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km-4.4km	(until "El Capulin") Progressive to critical alligator cracking Potholes		
4.4km-7.3km	Fair gravel coarse		
7.3km-12.0km	Earth road (narrow)		

Section A-108:
Yalaguina - Ocotal

Section A-109:
Ocotal - Las Manos

Section A-104-1
Tipitapa - Managua

Section A-104-2
Ciudad Dario - San Dionisio - Muy Muy - Siuna

Section A-107-2:

El Sauce - Achuapa

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 24.0km	Gravel coarse road Road width=4.5m (Total width=8.6m)		

Section A-107-3
Condega - San Sebastian de Yali

Section A-107-4
Condega - Pueblo Nuevo - Somoto

Section A-107-5
Palacaguina - San Juan de Rio Coco - La Reforma - Wiwili

Section A-107-6
San Juan de Rio Coco - Yali

Section A-107-7
La Reforma - Jalapa

Evaluation of Existing Conditions

ROUTE B (PENAS BLANCAS - GUASAULE)

Section B-0:
Penas Blancas - Sapoa

Section A-104-3
San Dionisio - San Ramon

Section A-105:
Sebaco - Matagalpa

Section A-105-1
Matagalpa - Siuna - Puerto Cabezas

Section A-106:
Matagalpa - Jinotega - San Rafael del Norte - Yali

Section A-107:
Esteli - La Concordia - Yali

Section A-107-1:

El Sauce - La Aceituna - Esteli

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 11.0km	Earth road Bad conditions Total width=4.5		

Section B-1:

Sapoa - Int.Rivas/Sapoa/San Juan Del Sur

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 1.1km	Deeper potholes on patched portion Possibly soft ground		
1.1km- 6.1km	-ditto-		
6.1km-11.1km	-ditto-		
11.1km-16.1km	-ditto-		
16.1km-21.1km	-ditto-		

Section B-2:

Int.Rivas/Sapoa/San Juan Del Sur - Int.Nandaime/Rivas/Tola

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 3.6km	slightly raveling many patched portion		0.0/1.4
3.6km- 8.6km	-ditto-		5.0
8.6km-13.6km	maintained		

Section B-3:

Int.Nandaime/Rivas/Tola - Int.Jinotepe/Nandaime/Granada

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 4.5km	slightly raveling		
4.5km- 9.5km	-ditto-		
9.5km-14.5km	-dito-		
14.5km-18.0km	progressive raveling on overlayed surface		
18.0km-24.5km	-ditto-		
24.5km-29.5km	slightly raveling longitudinal crack		
29.5km-34.5km	longitudinal crack		
34.5km-39.5km	longitudinal crack slightly raveling		37.6
39.5km-44.5km	slightly raveling		

Section B-4:

Int.Jinotepe/Nandaime/Granada - Int.Diriamba/Nandaime/San Marcos

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 3.4km	maintained		2.7
3.4km- 8.4km	alligator cracks		3.4/4.5/5.6
8.4km-13.4km	alligator cracks potholes on overlayed surface		
13.4km-18.4km	potholes on overlayed surface		13.4

Section B-5:

Int.Diriamba/Nandaime/San Marcos-Int.Managua/Jinotepe/La Boquita

Section B-6:

Int.Managua/Jinotepe/La Boquita-Int.Managua/Diriamba/Masachapa

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 0.7km	Maintained Dense graded		
0.7km- 5.7km	longitudinally deteriorated many patched portion		
5.7km-10.7km	longitudinally deterirated raveling on shoulder		
10.7km-15.7km	raveling on shoulder		11.4/12.7/ 13.7

Section B-7:

Int.Managua/Diriamba/Masachapa-Int.Managua/Diriamba/Leon

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 2.4km	maintained		0.8
2.4km- 7.4km	slightly raveling	4.4/5.5/6.2/ 7.4	6.2/7.4
7.4km-12.4km	alligator crack progressive raveling		10.5
12.4km-17.4km	-ditto-	16.6/16.9	16.6/16.9

Section B-8:
Int.Managua/Diriamba/Leon - Izapa

Section B-9:
Izapa - Int.Chinandega/Izapa/Malpaisillo

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km-10.0km	maintained		5.0
10.0km-20.0km	-ditto-		13.8
20.0km-30.0km	slightly raveling		25.9
30.0km-36.3km	-ditto-		35.4

Section B-10:

Int.Chinandega/Izapa/Malpaisillo - Int.Guasaule/Leon/Corinto

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km-10.0km	maintained		
10.0km-20.0km	slightly raveling alligator crack		
20.0km-29.9km	-ditto-		

Section B-11:

Int. Rancheria/Chinandega/El Viejo - Somotillo

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Alligator cracking Raveling Patch deterioration		
5.0km-10.0km	Bleeding, asphalt mix badly designed Longitudinal streaking		
10.0km-15.0km	-ditto- Drainage system is lacked		12.0
15.0km-20.0km	-ditto- Longitudinal cracking		
20.0km-25.0km	Patch deterioration Potholes		
25.0km-30.0km	Longitudinal cracking		
30.0km-35.0km	-ditto- Drainage problems (flodding)		37.0
35.0km-40.0km	Potholes, Raveling Patch deterioration Improper (poor) asphalt mix Weak pavement Without shoulders, narrow		
40.0km-45.0km	-ditto-		
45.0km-48.0km	-ditto- (Bleeding)		
48.0km-55.0km	(Superficial treatment) Longitudinal continuous asphalt patching		
55.0km-68.5km (Somotillo)	-ditto-		61.3

Section B-12:

Somotillo - Guasaule

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 6.1km	(Superficial treatment)		

<Section B-101:>

Section B-102:

Int.Rivas/Sapoa/San Juan Del Sur - San Juan Del Sur

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	maintained		
5.0km-10.0km	-ditto-		
10.0km-15.0km	-ditto-		10.0
15.0km-19.9km	-ditto-		

Section B-103:

Int. Nandaime/Rivas/Tola - Tola

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Gravel slightly undulated		
5.0km-10.0km	-ditto-		5.8
10.0km-15.0km	-ditto- 13.5km: existing 1-lane Con.Br.		

<Section B-104:>

Section B-105:

Int.Nejapa/Las Esquinas/San Rafael del Sur-San Rafael del Sur

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
	(PCC pavement 20cm, with a thin asphalt seal coat 2cm. Transverse joints each 6m, Longitudinal joint at the middle, i.e. 3.0m)		
0.0km-3.3km	Tinny asphalt seal coat Desegregation of the asphalt Spalling Potholes (of the PCC) Joint reflection cracking from PCC slab Non existence of a proper base coarse was verified Narrow carriage way (6.0m) Without shoulders Drainage is lacked Rock and earth slumps		0.0-5.0
3.3km- 6.7km	-ditto- Longitudinal deep cracking Block cracking of the PCC		
6.7km-10.0km	-ditto-		
10.0km-21.3km (San Rafael del Sur)	-ditto-		

Section B-106:

Int.Managua/Diriamba/Mateare - Mateare - Izapa

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	slightly raveling		1.5
5.0km-10.0km	-ditto-		
10.0km-15.0km	slightly raveling bleeding depression		
15.0km-20.0km	many patched portion on shoulder alligator crack		
20.0km-25.0km	-ditto-		
25.0km-30.0km	alligator crack		
30.0km-35.0km	alligator crack longitudinal crack		
35.0km-40.0km	longitudinal crack		35.0
40.0km-45.0km	-ditto-		
45.0km-50.0km	maintained		49.9
50.0km-55.0km	-ditto-		
55.0km-60.0km	-ditto-		
60.0km-61.3km	-ditto-		60.0

<Section B-107>

<Section B-108>

<Section B-109>

Section B-110:

Int. Chinandega/Leon/Malpaisillo - La Cruz de la India

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Raveling, Patch deterioration Roadway width=8.0m		
5.0km-10.0km	Streaking, critical alligator cracking Shoulder dropoff Raveling, potholes, patch deterioration Roadway width=6.9m		
10.0km-20.0km	-ditto- Longitudinal and transverse cracking Overlaid Roadway width=7.2m	10.3	
20.0km-25.0km	-ditto- Roadway width=8.2m		
25.0km-30.7km	-ditto- Roadway width=7.3m		
30.7km-32.0km	(Superficial treatment)		
32.0km-34.6km	Asphalt pavement in critical condition		
34.6km-35.0km	Overlaid (good condition) Roadway width=8.0m		
35.0km-40.0km	Overlaid (fair to good condition) Roadway width=6.2m Without shoulders		
40.0km-46.3km	-ditto-		
46.3km-52.4km	-ditto- (Center line with longitudinal and continuous depression) Roadway width=6.5m Without shoulders		
52.4km-55.1km	-ditto-	52.5/54.1	54.1
55.1km-60.1km	-ditto- Roadway width=6.3m	56.9/60.7	
60.1km-65.0km	-ditto- Rock slump	62.6/64/64.9	
65.0km-70.0km	-ditto-	69.2/70.0	
70.0km-73.7km (La Cruz de la India)	-ditto- Roadway width=7.0m	70.0/73.7	

Section B-111:
La Cruz de la India - Int.Esteli/Sebaco

Section B-112:

Int.Chinandega/Leon/Posoltega - Posoltega

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 2.5km	Longitudinal, Transversal crack		

Section B-113:

Int.Chinandega/Leon/Ingerio San Antonio - Ingerio San Antonio

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km-5.0km	slightly raveling on center line		
5.0km- 7.7km	-ditto-		

Evaluation of Existing Conditions

ROUTE C (MANAGUA - GRANADA)

Section C-1:
Centro de Granada - Int.Managua/Granada/Tipitapa
<El Coyotepe>

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Longitudinal crack		
5.0km-10.0km	Longitudinal and alligator crack		
10.0km-15.0km	alligator crack		10.0/14.1/ 15.0
15.0km-20.2km	-ditto-		

Section C-2:

Int.Nindiri/Catarina/Masaya - Managua

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	Tinny overlay Raveling Potholes Patch deterioration Block and alligator cracking Mix with a poor asphalt content Probably weak structure pavement Poor condition		
5.0km-10.0km	Tinny overlay Transverse and longitudinal cracking Big and deep located potholes Critical block and alligator cracking Rough surface Poor condition Roadway width= 7.2m Shoulders width=1.0m		
10.0km-20.0km	-ditto-		
20.0km-26.0km	(4 traffic lanes road starts) Transverse and longitudinal cracking Located potholes and block cracking		

Section C-101:

Int. Managua/Nindiri/Esquipulas - La Concepcion - Masatepe

Investigation Results

Subsection	Surface and Slope Condition	Alignment	
		Horizontal	Vertical
0.0km- 3.8km	Concrete blocks pavement (Until Tikuantepe) Poorly drained New construction, but seriously damaged by drainage effects Roadway width=7.3m		
3.8km- 8.4km	Asphalt pavement New construction Rough surfacing Asphalt mix and gradation fairly designed Roadway width= 6.5m Shoulders width=1.0m		
8.4km-18.0km	(La Concepcion) -ditto-		
18.0km-31.5km	Earth road Roadway width=3.8m (Until Masatepe)		

ROUTE D (SAN BENITO - EL RAMA)

Section D-1:
San Benito - Las Banderas

Investigation Results

Subsection	Surface condition	Alignment	
		Horizontal	Vertical
0.0km- 5.0km	maintained	0.0	0.0
5.0km-10.0km	maintained		8.6/10.0
10.0km-11.3km	maintained		

Section D-2:
Las Banderas - Int.Juigalpa/San Benito/Boaco

Section D-3:
Int.Juigalpa/San Benito/Boaco - Lovago

Section D-4:
Lovago - La Gateada

Section D-5:
La Gateada - El Rama

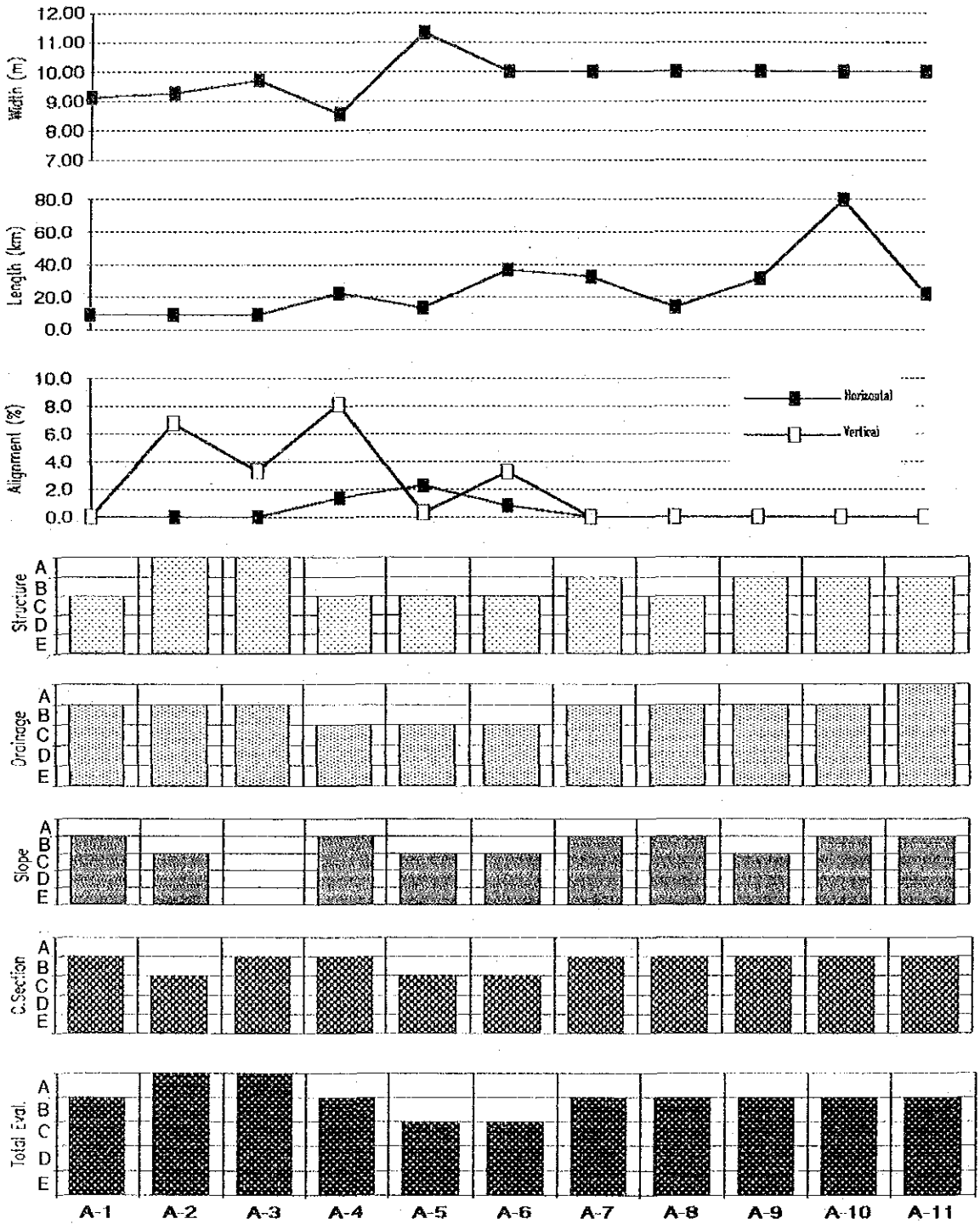
Section D-101:
Int.Juigalpa/San Benito/Boaco - Boaco

Section D-102:
Lovago - Acoyapa - San Carlos

Section D-103:
La Gateada - Nueva Guinea

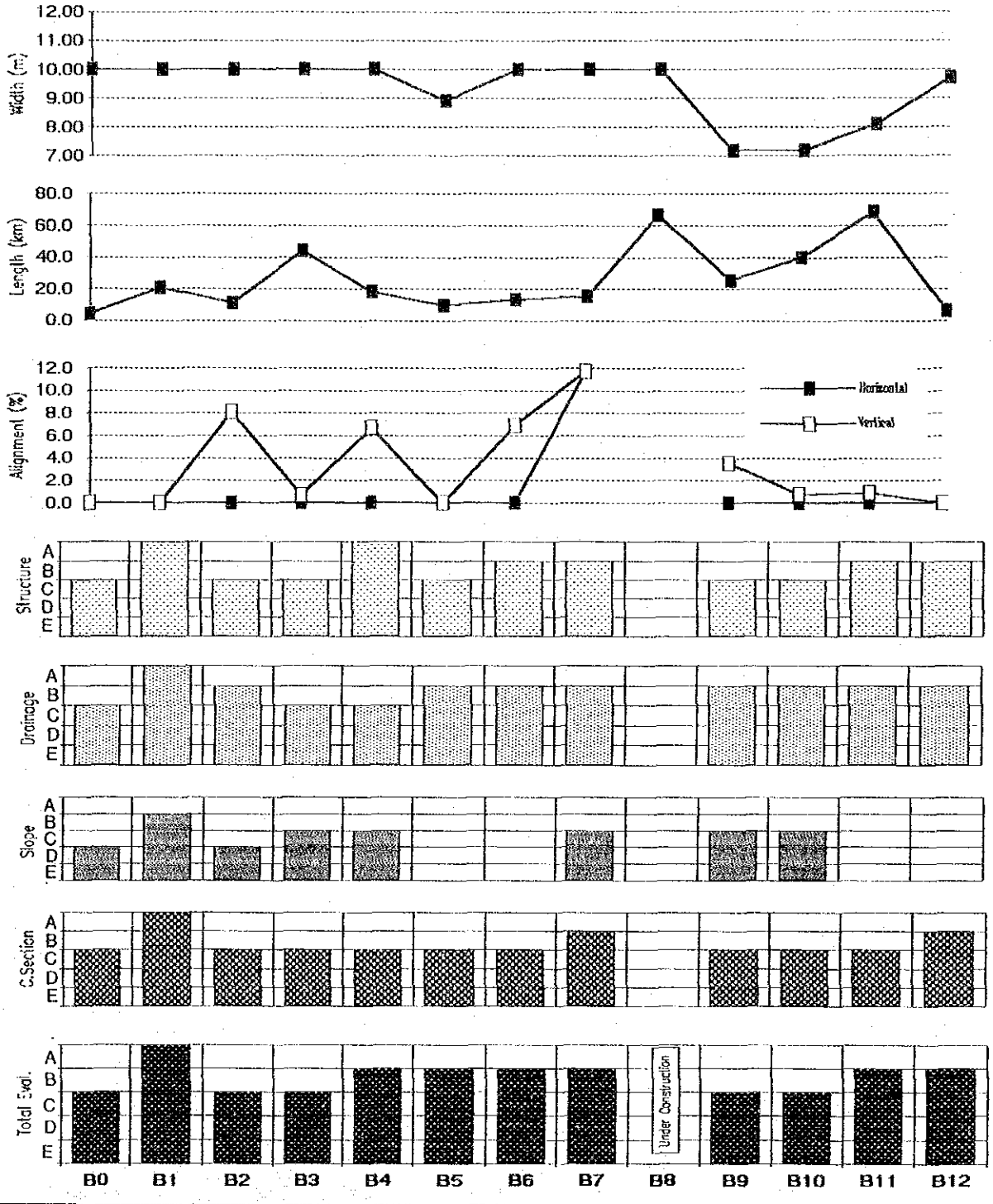
Section D-101-1
San Francisco - Camoapa

Section D-101-2
Las Lajitas - San Pedro



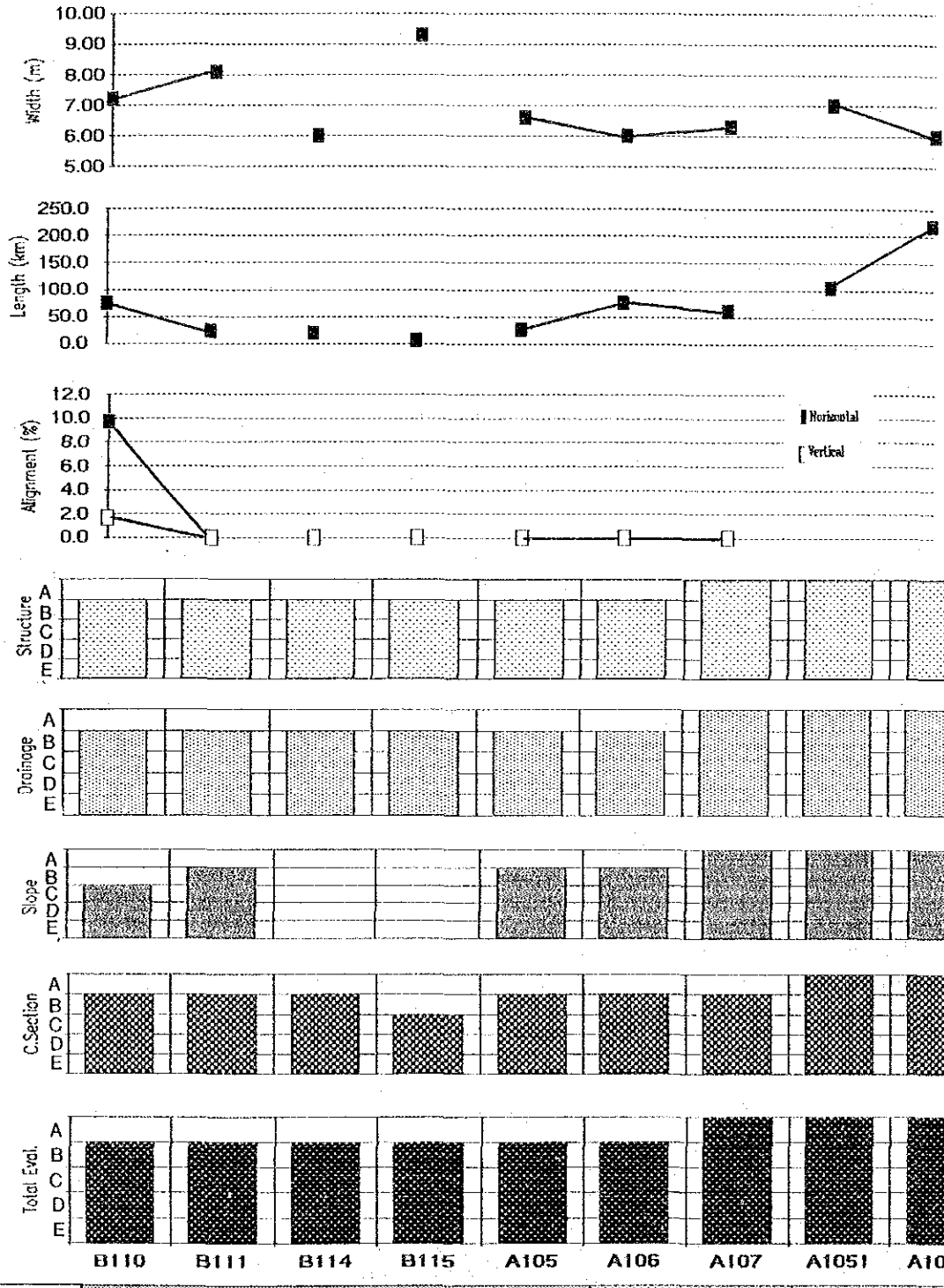
Surface Type	Asphalt Pavement
Remarks:	

Annex 3-4(a) Existing Conditions Evaluation Charts



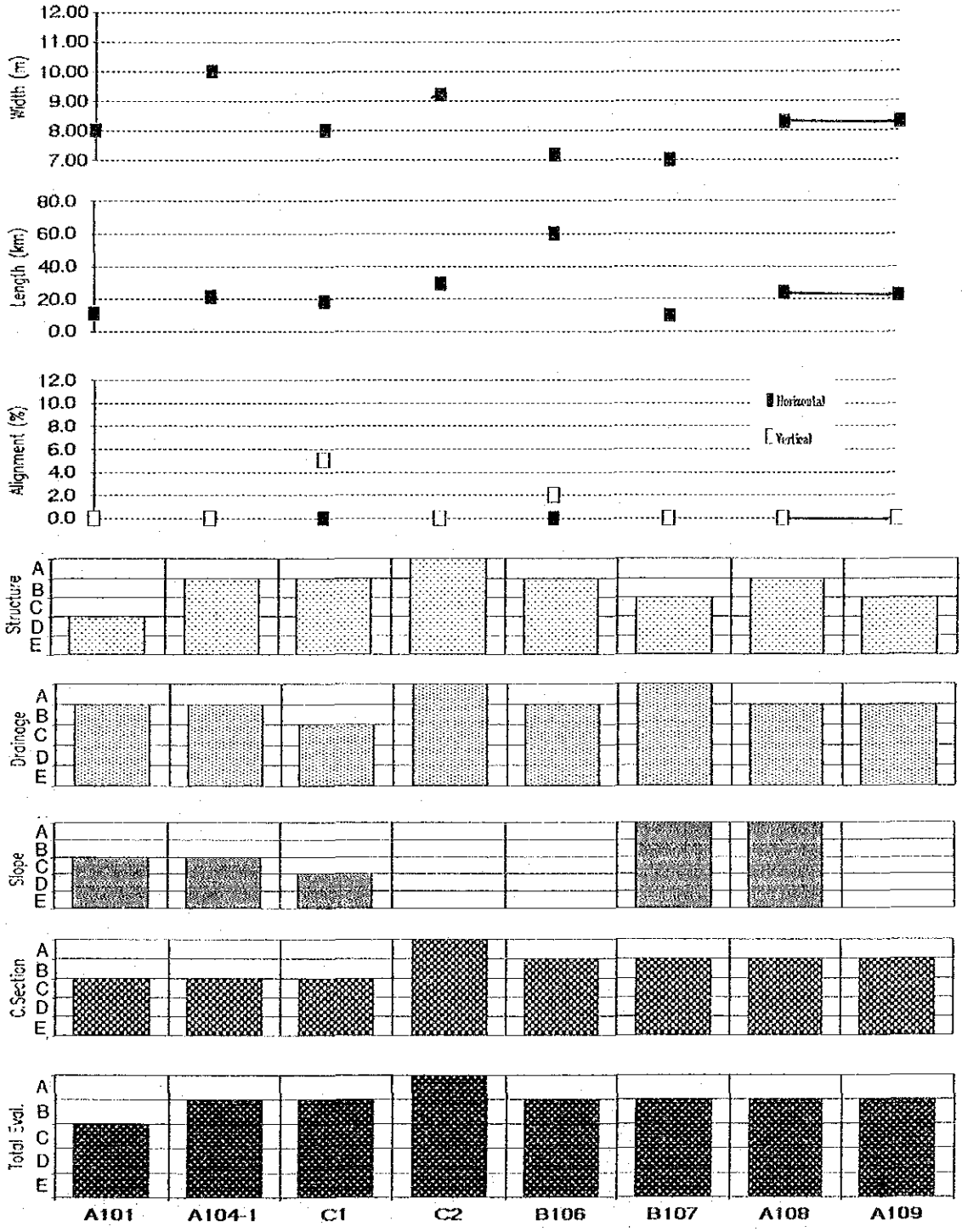
Surface Type	Asphalt Pavement
Remarks:	

Annex 3-4(b) Existing Conditions Evaluation Charts



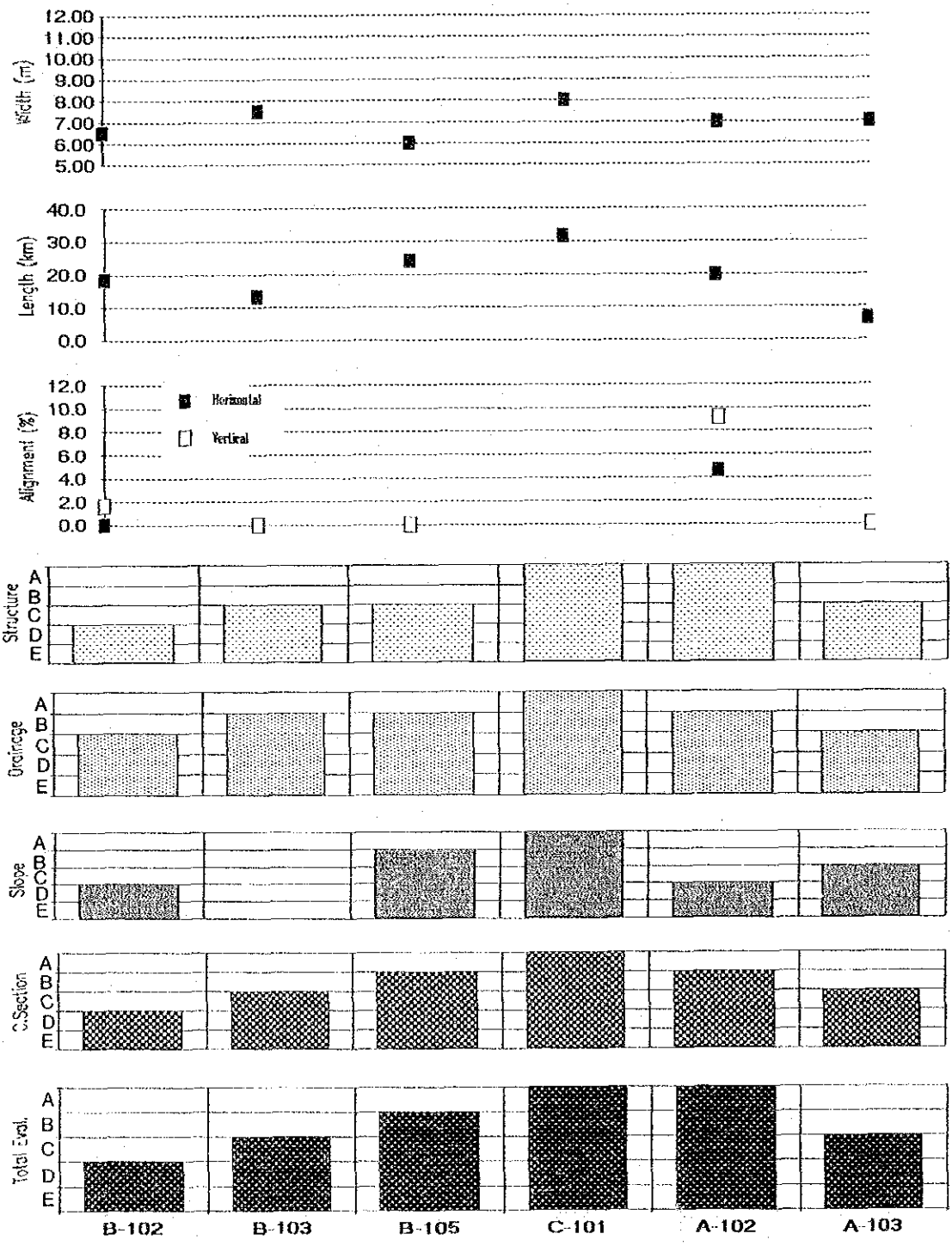
Surface Type	Asphalt Pavement	Gravel	Earth
Remarks:			

Annex 3-4(c) Existing Conditions Evaluation Charts



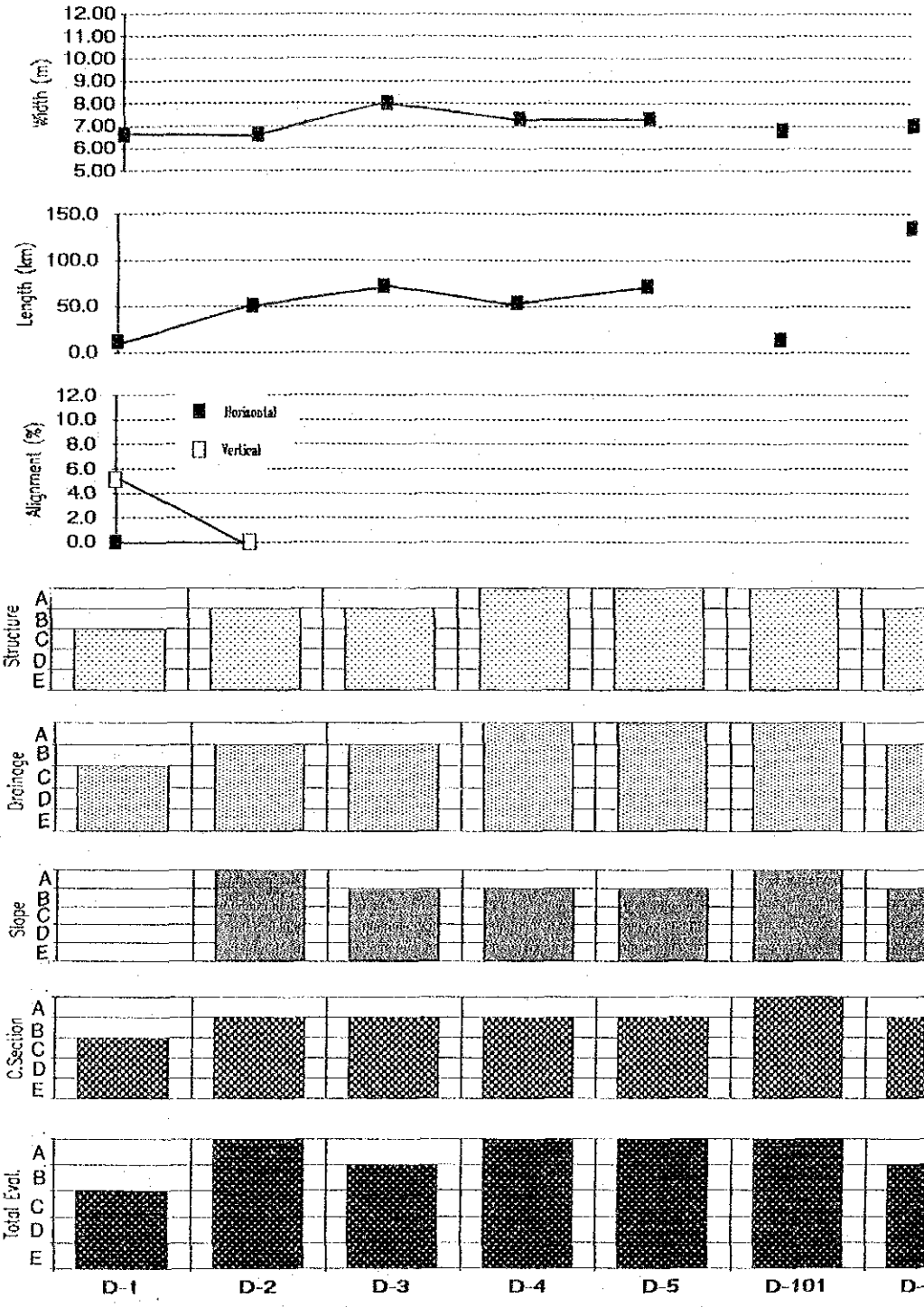
Surface Type	Asphalt Pavement
Remarks:	

Annex 3-4(d) Existing Conditions Evaluation Charts



Surface Type	Asphalt	Gravel	Concrete	Block/Asphalt/Earth	Asphalt
Remarks:					

Annex 3-4(e) Existing Conditions Evaluation Charts



Annex 3-4(f) Existing Conditions Evaluation Charts

Annex 3-5 Bridge Inventory

TABLE No. 1

ROUTE No. 1 MANAGUA– SEBACO– ESTELI– SOMOTO– EL ESPINO

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	7	10	Concrete Slab		
2	5	10	ditto		
3	9	10	ditto		
4	7	10	ditto		
5	4	10	ditto		
6	5	10	ditto		
7	7	10	ditto		
8	5	10	ditto		
9	7	10	ditto		
10	72	10	ditto		
11	21	10	ditto		
12	6	12	ditto		
13	30	6	ditto		
14	7	6	ditto		
15	5	6	ditto		
16	6	7	ditto		
17	21	10	ditto		
18	25	5	ditto		
19	6	10	ditto		
20	14	10	ditto		
21	5	10	ditto		
22	21	8	ditto		
23	100	8	ditto		
24	19	8	ditto		
25	64	8	ditto		

TABLE No. 2

ROUTE No. 1 MANAGUA– SEBACO– ESTELI– SOMOTO– EL ESPINO

BRIDGE No	LENGTH m	WIDTH m	TIPO		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	13	7	Concrete Slab		
27	16	7	ditto		
28	7	10	ditto		
29	53	7	ditto		
30	56	7	ditto		
31	64	7	ditto		
32	8	7	ditto		
33	18	5	ditto		
34	15	7	ditto		
35	64	7	ditto		
36	109	7	ditto		

TABLE No. 3

ROUTE No. 2 MANAGUA– JINOTEPE– NANDAIME– RIVAS– PENAS BLANCAS

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	19	9	Concrete Slab	Masonry	
2	6	6	ditto	Concrete Slab	
3	12	8	Beam T	ditto	
4	13	7	ditto	ditto	
5	7	7	ditto	ditto	
6	11	8	ditto	ditto	
7	7	9	ditto	Concrete	
8	65	8	Reinforced	Masonry	
9	9	7	Beam T	ditto	
10	28	7	Compose Beam	ditto	
11	6	7	Beam T	ditto	
12	11	7	ditto	ditto	Scourring in the river botton
13	8	7	ditto	ditto	
14	4	7	Concrete Slab	ditto	
15	8	7	Beam T	ditto	
16	4	7	Concrete Slab	ditto	Hand rail deteriorate
17	7	7	Beam T	ditto	
18	4	7	Concrete Slab	ditto	
19	7	7	Beam T	ditto	Hand rail deteriorate
20	4	7	Concrete Slab	ditto	
21	8	7	Beam T	ditto	
22	4	7	Concrete Slab	ditto	
23	4	7	ditto	ditto	
24	8	7	Beam T	ditto	
25	37	7	ditto	Concrete	

TABLE No. 4

ROUTE No. 2 MANAGUA– JINOTEPE– NANDAIME– RIVAS– PENAS BLANCAS

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	4	7	Concrete Slab	Masonry	
27	3	7	ditto	Concrete	
28	11	7	Beam T	Masonry	
29	11	7	ditto	ditto	
30	46	7	Reinforced	Concrete	
31	32	7	Beam T	Concrete	
32	49	7	Compose Beam	ditto	Superficial Cracks
33	19	7	ditto	Concrete	Superficial Cracks
34	25	7	ditto	Masonry	Superficial Cracks
35	31	7	ditto	ditto	Superficial Cracks
36	31	7	Beam T	Concrete	
37	40	8	Beam I	ditto	
38	46	8	Beam T	ditto	
39	11	8	ditto	Masonry	
40	48	8	Beam I	Concrete	Scourring in the river botton
41	13	7	Beam T	ditto	
42	8	7	ditto	Masonry	
43	20	7	Beam I	ditto	
44	11	7	Beam T	ditto	

TABLE No. 5

ROUTE No. 3 SEBACO– MATAGALPA– JINOTEGA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	7	6	Concrete Slab		
2	16	6	Concrete Slab		

ROUTE No. 4 MANAGUA– MASAYA– GRANADA– NANDAIME

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDICIONES
			SUPER STRUCTURE	SUB STRUCTURE	
1	9	7	Concrete Slab	Masonry	
2	13	7	ditto	ditto	
3	7	7	ditto	ditto	
4	24	7	Beam T	ditto	
5	20	7	ditto	ditto	
6	20	7	ditto	Concrete	*Expansion joints deteriorate*
7	10	7	Concrete Slab	Masonry	
8	24	7	Beam T	ditto	*Scourring in the river botton*

TABLE No. 6

ROUTE No. 5 MATAGALPA– SAN FRANCISCO– EL TUMA– LINDA VISTA– SIUNA

BRIDGE No	LENGTH m	WIDTH m	TIPO		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	13	7	Concrete Slab		
2	17	7	ditto		
3	34	5	ditto		
4	11	4	Wood		
5	5	4	ditto		
6	48	4	Concrete Slab		
7	20	4	ditto		
8	20	4	ditto		
9	7	4	ditto		
10	16	4	ditto		
11	12	4	ditto		
12	12	4	ditto		
13	33	4	ditto		
14	12	4	ditto		
15	36	4	ditto		
16	22	4	ditto		
17	10	5	ditto		
18	24	5	ditto		
19	12	4	ditto		
20	23	4	ditto		
21	20	4	ditto		
22	20	4	ditto		
23	44	4	ditto		
24	12	4	ditto		
25	22	4	ditto		

TABLE No. 7

ROUTE No. 5 MATAGALPA– SAN FRANCISCO– EL TUMA– LINDA VISTA– SIUNA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	11	5	Concrete Slab		
27	24	4	ditto		
28	12	4	ditto		
29	36	4	ditto		
30	49	4	ditto		
31	19	4	ditto		

TABLE No. 8

ROUTE No. 7 SAN BENITO– JUIGALPA– LOVAGO– EL CACAO– CIUDAD RAMA

BRIDGE No	LENGTH m	WIDTH m	TIPO		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	5	6	Concrete Slab		
2	8	6	ditto		
3	28	6	ditto		
4	4	6	ditto		
5	39	6	ditto		
6	7	7	ditto		
7	28	8	ditto		
8	101	6	Girder		
9	18	6	Concrete Slab		
10	8	6	ditto		
11	10	6	ditto		
12	18	6	ditto		
13	9	6	ditto		
14	10	6	ditto		
15	4	7	ditto		
16	10	6	ditto		
17	10	6	ditto		
18	4	7	ditto		
19	106	6	Girder		
20	19	6	Concrete Slab		
21	14	7	ditto		
22	19	6	ditto		
23	6	7	Wood		
24	25	6	Girder		
25	7	6	Concrete Slab		

TABLE No. 9

ROUTE No. 7 SAN BENITO– JUIGALPA– LOVAGO– EL CACAO– CIUDAD RAMA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	13	6	Concrete Slab		
27	12	6	ditto		
28	4	6	ditto		
29	8	6	ditto		
30	31	6	ditto		
31	50	6	ditto		
32	13	6	Wood		
33	5	6	Concrete Slab		
34	8	6	ditto		
35	85	7	ditto		
36	39	7	ditto		
37	63	7	ditto		
38	48	7	ditto		
39	59	7	ditto		
40	56	7	ditto		
41	48	7	ditto		
42	69	7	ditto		
43	71	7	ditto		
44	62	7	ditto		
45	71	7	ditto		
46	56	7	ditto		
47	56	7	ditto		
48	18	7	ditto		

TABLE No. 10

ROUTE No. 12 MANAGUA – LEON – CHINANDEGA – POTOSI

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	11	7	Compose Beam	Concrete	
2	10	7	Concrete Slab	Masonry	
3	38	7	Beam T	Concrete	
4	37	7	ditto	ditto	
5	10	7	Concrete Slab	Masonry	
6	6	7	ditto	ditto	Hand rail deteriorate
7	4	9	ditto	ditto	
8	9	7	Beam T	ditto	
9	16	7	ditto	Concrete	
10	24	7	ditto	ditto	
11	7	7	Concrete Slab	ditto	
12	6	7	ditto	Masonry	Hand rail deteriorate
13	10	7	Concrete Slab	ditto	
14	5	7	ditto	ditto	
15	50	7	Beam T	Concrete	
16	7	7	Concrete Slab	Masonry	Scourring in the river botton
17	7	7	ditto	ditto	
18	7	8	ditto	ditto	Scourring in the river botton
19	7	7	ditto	ditto	Hand rail deteriorate
20	10	7	Beam T	ditto	
21	17	7	ditto	ditto	
22	24	7	Concrete Slab	Concrete	
23	26	7	Beam T	Masonry	
24	30	7	ditto	Concrete	
25	38	7	ditto	ditto	

TABLE No. 11

ROUTE No. 12 MANAGUA – LEON – CHINANDEGA – POTOSI

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONTITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	8	8	Concrete Slab	Masonry	
27	25	7	Beam T	ditto	
28	6	8	Concrete Slab	ditto	
29	6	8	ditto	ditto	
30	6	8	ditto	ditto	
31	43	8	Concrete Slab	Concrete	

TABLE No. 12

ROUTE No. 15 YALAGUINA – OCOTAL – LAS MANOS

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	132	6	Concrete Slab		
2	24	7	ditto		
3	24	7	ditto		
4	20	7	ditto		
5	10	7	ditto		

ROUTE No. 17 SAN FRANCISCO – CAMOAPA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	12	3	Concrete Slab		
2	12	3	ditto		
3	10	3	ditto		

TABLE No. 13

ROUTE No. 21 PUERTAS VIEJAS-- MUY MUY-- SIUNA-- EL EMPALME-- PUERTO CABEZAS

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	38	7	Concrete Slab		
2	17	7	ditto		
3	24	3	ditto		
4	12	4	ditto		
5	18	4	ditto		
6	12	3	ditto		
7	23	7	ditto		
8	50	7	ditto		
9	45	8	ditto		
10	41	8	ditto		
11	28	6	ditto		
12	30	7	ditto		
13	18	4	Wood		
14	8	4	ditto		
15	5	4	ditto		
16	14	4	ditto		
17	18	4	ditto		
18	15	5	ditto		
19	35	5	ditto		
20	15	5	ditto		
21	26	5	ditto		
22	5	4	ditto		
23	10	5	ditto		
24	6	5	ditto		
25	19	5	ditto		

TABLE No. 14

ROUTE No. 21 Puertas Viejas– Muy Muy– Siuna– El Empalme– Puerto Cabezas

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
26	18	5	Wood		
27	12	5	ditto		
28	40	5	ditto		
29	18	5	ditto		
30	15	5	ditto		
31	30	5	ditto		
32	8	4	ditto		
33	9	4	ditto		
34	28	6	ditto		
35	4	5	ditto		
36	7	5	ditto		
37	20	5	ditto		
38	8	5	ditto		
39	22	5	ditto		
40	28	5	ditto		
41	60	9	Concrete Slab		
42	8	5	Wood		
43	10	4	ditto		
44	8	4	ditto		
45	14	4	ditto		
46	14	4	ditto		
47	15	4	ditto		
48	16	4	ditto		
49	11	5	Girder		

TABLE No. 15

ROUTE No. 23 SANTO TOMAS-- SANTO DOMINGO

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	48	6	Girder		
2	11	4	Wood		

ROUTE No. 24 CORINTO-- CHINANDEGA-- VILLA SALVADORITA-- RIO GUASAULE

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	150	8	Beam T	Concrete	
2	16	7	ditto	Masonry	
3	33	7	Concrete Slab	Concrete	Hand rail deteriorate
4	10	7	Beam T	Masonry	Hand rail deteriorate
5	172	7	ditto	Concrete	
6	14	7	ditto	Masonry	Superficial Cracks
7	65	7	ditto	Concrete	
8	9	7	Concrete Slab	Masonry	
9	13	7	ditto	ditto	Hand rail deteriorate
10	15	7	ditto	ditto	
11	58	7	ditto	Steel Pile	
12	12	7	Beam T	Masonry	
13	60	7	ditto	Concrete	
14	14	7	ditto	Masonry	
15	229	7	Concrete Slab	Concrete	

TABLE No. 16

ROUTE No. 25 LOVAGO– ACOYAPA– SAN CARLOS

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	21	9	Concrete Slab		
2	22	9	ditto		
3	17	10	ditto		
4	16	10	ditto		
5	9	10	ditto		
6	16	10	ditto		
7	4	9	ditto		
8	12	9	ditto		
9	11	9	ditto		
10	6	9	ditto		
11	36	9	ditto		
12	40	3	Wood		
13	8	3	ditto		
14	5	4	ditto		
15	11	4	ditto		
16	10	4	ditto		
17	11	4	ditto		
18	12	4	ditto		

TABLE No. 17

ROUTE No. 26 TELICA– SAN ISIDRO

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	9	7	Concrete Slab	Masonry	
2	9	7	ditto	ditto	
3	8	7	ditto	ditto	
4	6	7	ditto	ditto	
5	17	7	ditto	Concrete	
6	5	6	ditto	Masonry	
7	7	6	ditto	ditto	
8	9	7	ditto	ditto	
9	8	7	ditto	ditto	
10	9	7	ditto	ditto	Scourring in the river botton
11	4	8	Beam T	Concrete	
12	32	8	ditto	ditto	
13	18	7	Concrete Slab	ditto	
14	18	8	ditto	Masonry	
15	75	8	Beam T	Concrete	Superficial Cracks
16	9	8	Concrete Slab	Masonry	
17	31	8	Beam T	Concrete	Superficial Cracks
18	10	8	Concrete Slab		
19	25	8	ditto		
20	18	8	ditto		

TABLE No. 18

ROUTE No. 28 MANAGUA – LA PAZ CENTRO – IZAPA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	36	7	Beam T	Concrete	
2	16	7	Concrete Slab	Masonry	
3	23	7	ditto	Concrete	
4	6	7	ditto	Masonry	
5	6	7	ditto	ditto	
6	6	7	ditto	ditto	

ROUTE No. 38 (NIC – 1) – PUEBLO NUEVO – ACHUAPA

BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	13	3	Girder		
2	25	4	Concrete Slab		
3	25	4	ditto		
4	10	4	ditto		
5	17	4	ditto		
6	57	6	ditto		
7	24	3	ditto		
8	6	3	ditto		
9	6	3	ditto		

TABLE No. 19

ROUTE No. 49 EL SAUCE – ESTELI

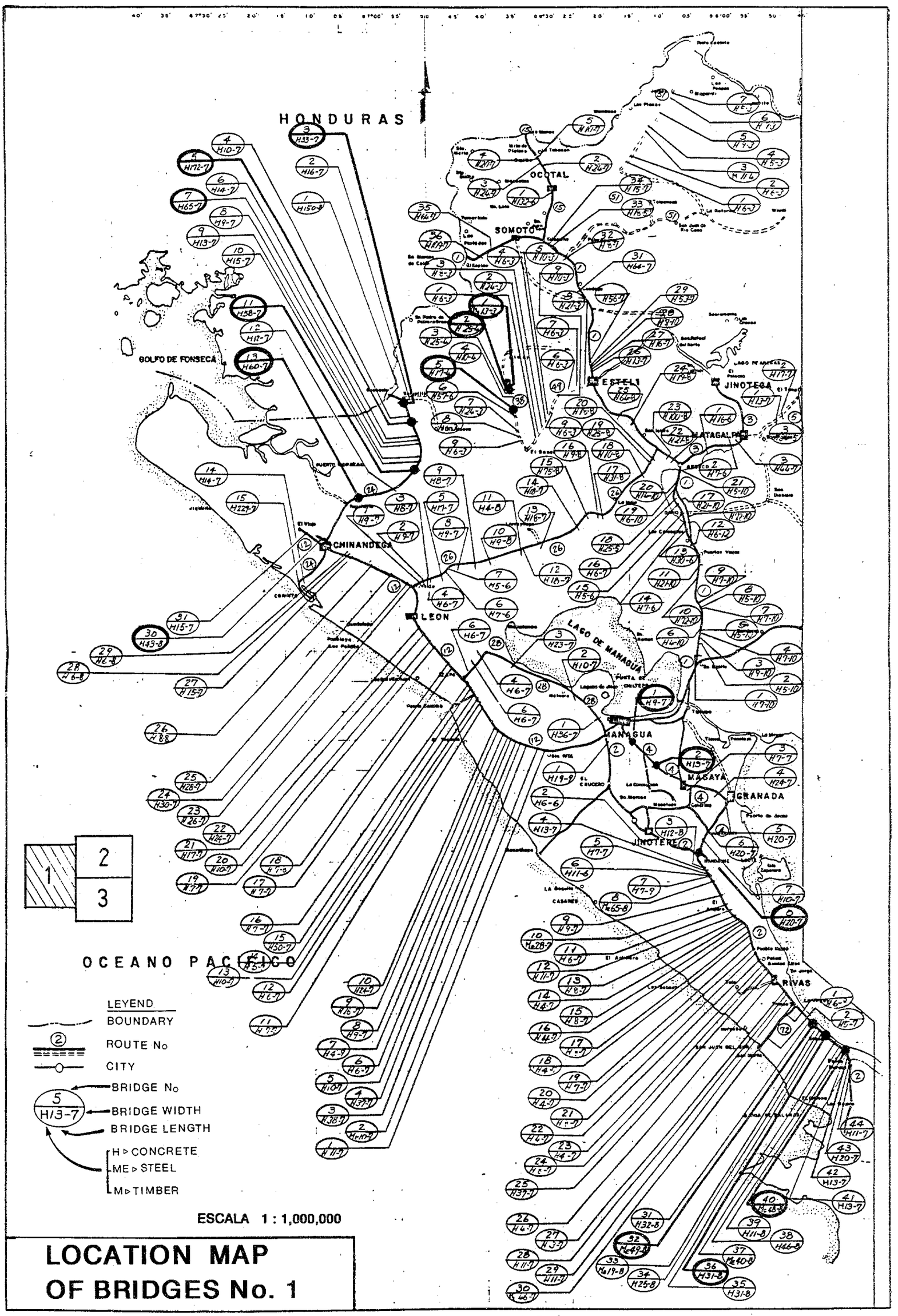
BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	6	3	Concrete Slab		
2	24	3	ditto		
3	8	3	ditto		
4	6	3	ditto		
5	10	3	ditto		
6	6	3	ditto		
7	6	3	ditto		
8	21	3	ditto		
9	10	3	ditto		

ROUTE No. 51 (NIC – 1)– PALACAGUINA–SAN JUAN DEL RIO

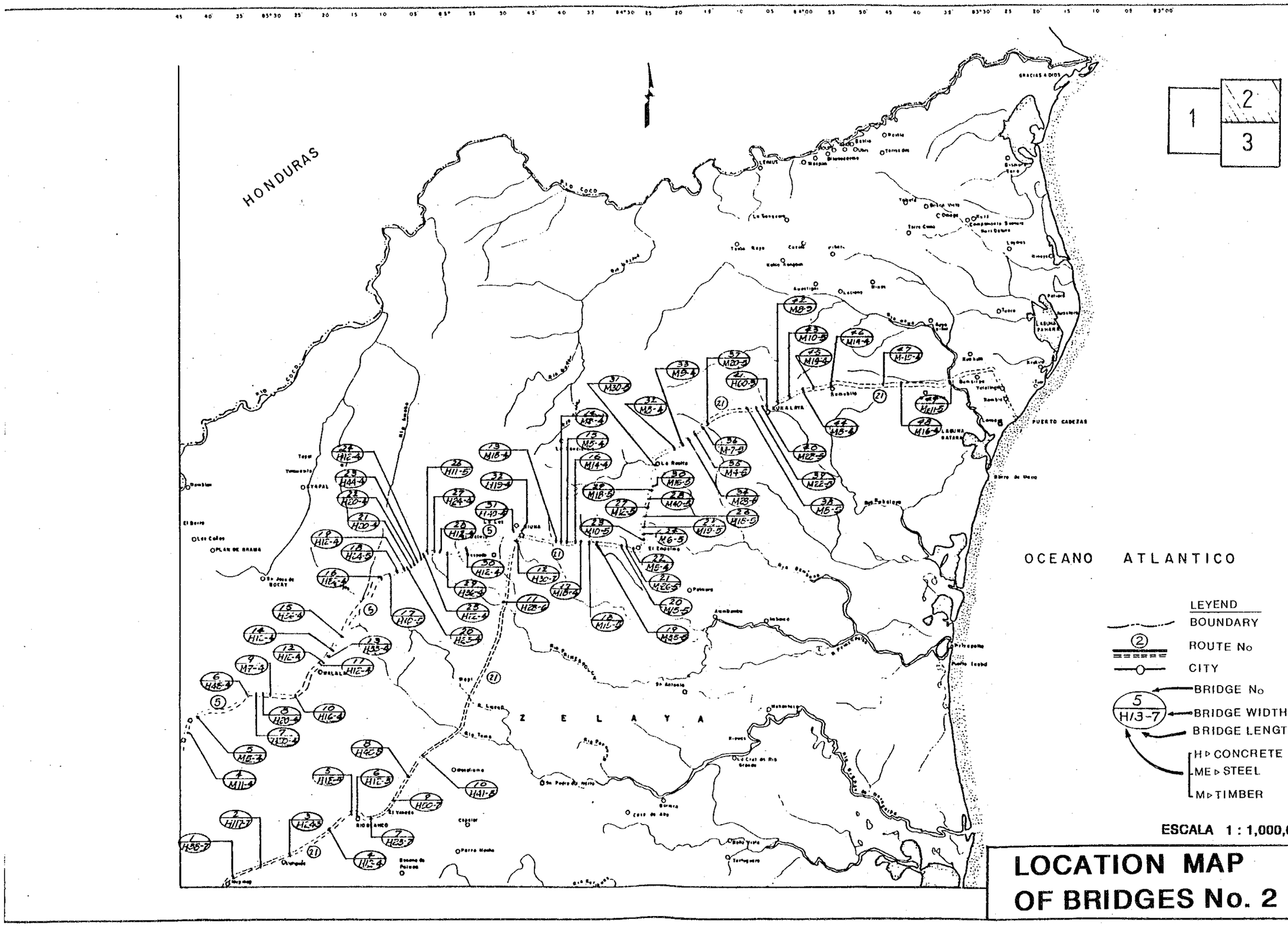
BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	6	3	Concrete Slab		
2	6	3	ditto		
3	11	4	Wood		
4	5	3	Concrete Slab		
5	9	3	ditto		
6	9	3	ditto		
7	3	3	ditto		

ROUTE No. 71 LA GATEADA– NUEVA GUINEA

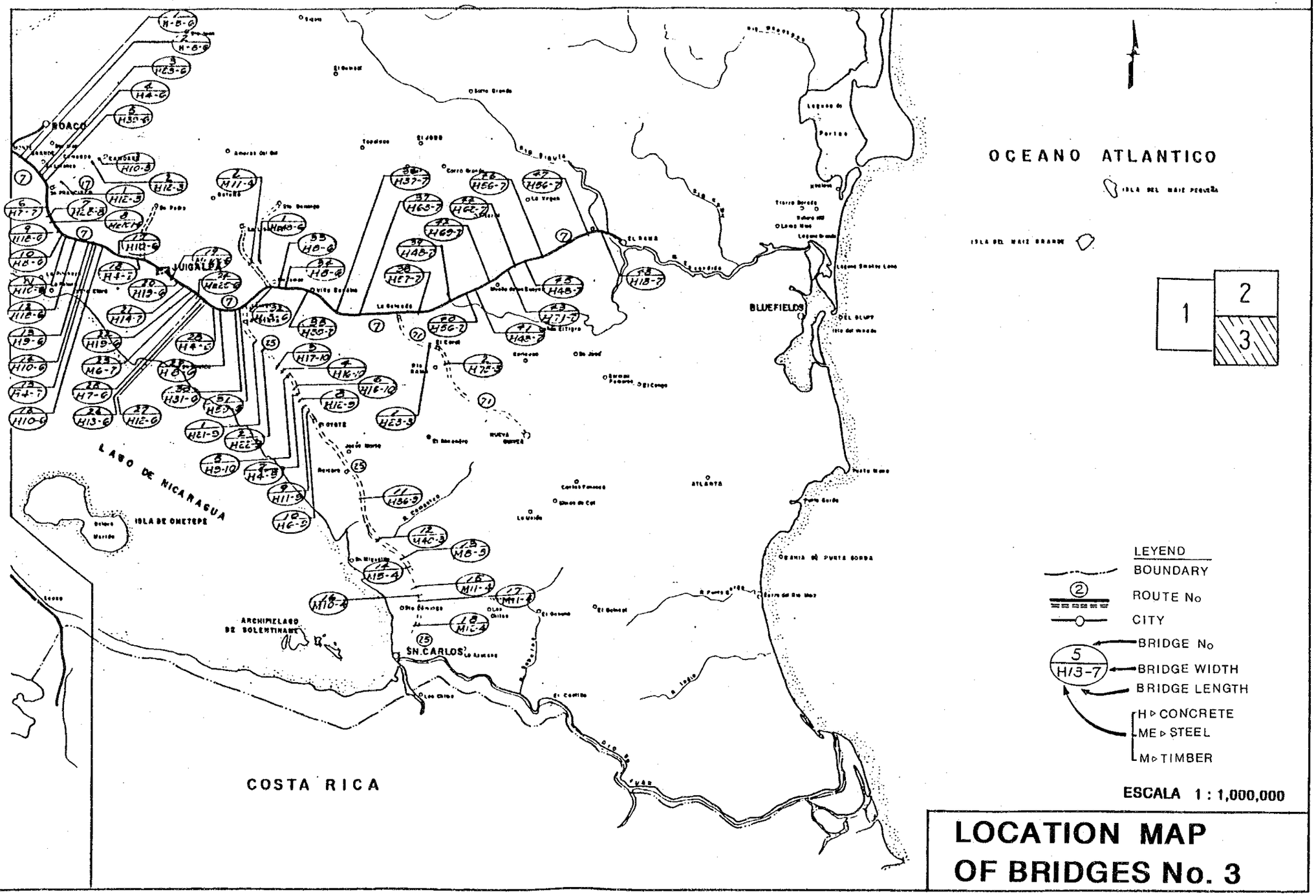
BRIDGE No	LENGTH m	WIDTH m	TYPE		CONDITIONS
			SUPER STRUCTURE	SUB STRUCTURE	
1	73	3	Concrete Slab		
2	23	3	ditto		



Annex 3 - 6: Location Map of Bridges



LOCATION MAP OF BRIDGES No. 2



LOCATION MAP OF BRIDGES No. 3