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E7.4-10349

CR-136957

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EARTH RESOURCES
OBSERVATION
SYSTEMS PROGRAM

Progress Report

August 1973 - February 1974

(E74-10349) CARTOGRAPHIC EXPERIMENT FOR
LATIN AMERICA Progress Report, 1 Aug.
1973 - 28 Feb. 1974 (Inter-American
Geodetic Survey, Fort Clayton) 30 p
\$4.50

N74-18958

Unclas
00349

CSCL 08B G3/13

Cartographic Experiment For Latin America

EREP #496B

Original photography may be purchased from
EROS Data Center
10th and Dakota Avenue
Sioux Falls, SD 57198

EREP REPORT

- a. Defense Mapping Agency Inter American Geodetic Survey
Drawer 934
Fort Clayton, Canal Zone
- b. Overall Evaluation of Skylab Imagery for Mapping of Latin America
- c. Progress Report, 1 August 1973 through 28 February 1974
- d. EREP Investigation Number 496B
- e. NASA Contract Number T-4651B
- f. Principal Investigator - Jack E. Staples
- g. 1 March 1974
- h. Technical Monitor:

Mr. Roger D. Hicks
Mail Code TF6
Telephone Number 713 483 6451

Original photography may be purchased from
NASA Data Center
12101 Research Avenue
Greenbelt, MD 20770

(3) Other Activities

(a) Ground truth measurements were made over Lake Titicaca, Bolivia, on 27 January and 1 February 1974 at the request of Johnson Space Center, NASA, Earth Resources Program Office.

(b) To date, I have not experimented with the S192 data to prepare thematic maps because no data has been received. This has not seriously affected the experiment because we have instead concentrated on familiarizing the Co-Investigators with the S190A and B imagery that is available.

(4) Problem Areas. To date there have been no significant problems encountered although there is a lack of essentially cloud-free imagery over the Co-Investigators' areas. This restricts executing the experiment to a few countries.

b. Recommendations. I hope that Skylab 4 has produced cloud-free imagery of more of the Latin American countries so the experiment can be extended to include more of these Co-Investigators. To date, there is no black and white 190B imagery over our areas of interest - all that has been received to date is in color, cloud covered, or over Brazil. Black and white photography is necessary for producing mapping. It is hoped that we do receive some black and white 190B with the shipment of SL4 so I may further proceed with the experiment.

c. Expected Accomplishments

(1) The Skylab Experimentation Team will be working with Bolivia and Chile during March 1974 through June 1974 to use both S190A and B imagery to produce map revision products and new mapping at 1:100,000 - 1:50,000 scales.

(2) Work will continue on the experiment to use solar inertial and earth oriented imagery in Paraguay to produce a 1:100,000 scale, 10 meter contour interval, topographic map. This will be accomplished in conjunction with Johnson Space Center Earth Resources Program Office. It is expected that a member of that office will be visiting IAGS and Paraguay in April 1974 to discuss the operational aspects of this experiment.

(3) When S192 data is received, IAGS will be working with USGS to initiate a thematic mapping experiment.

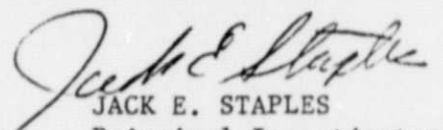
d. Significant Results. The two experiments clearly demonstrate the practical application of the Skylab photography to update existing maps

at an optimum scale of 1:100,000. The photography can even be used, by employing first order photogrammetric instruments, for updating the cultural features in 1:50,000 scale mapping. The S190A imagery has also shown itself to be most economical in preparing new photomap products over previously unmapped areas, such as Concepcion, Paraguay. These maps indicate that Skylab quality imagery is invaluable to the Latin American cartographers in their efforts to provide the mapping products required to develop their countries. In Latin America, where over 5,000 people are employed in map production and where the Latin American Governments are expending over \$20 million in this effort, the use of such systems to maintain existing mapping and publish new mapping over previously unmapped areas, is of great economic value and could release the conventional Latin American mapping resources to be utilized to produce large scale 1:25,000 and 1:1,000 scale mapping that is needed for specific development projects.

e. Summary Outlook. The experiment has proceeded as predicted and I expect to meet the established deadlines.

f. Travel Summary. The Skylab Experimentation Team will be traveling to both Bolivia and Chile from March through June this year. I also expect a visit from a member of the JSC Earth Resources Program Office in April and expect to travel with him to Paraguay.

3 Enclosures a/s


JACK E. STAPLES
Principal Investigator
Experiment 496B

PROGRESS REPORT

1 August 1973 through 28 February 1974

Reference, Milestone Plan to Technical Monitor, dated 1 August 1973.

a. Overall Status

(1) Receipt of Material. S190A imagery from Skylab 2 was received in August 1973 and 190B received during September 1973; Skylab 3 190A imagery was received in December 1973 and 190B in January 1974. Enclosures 1 and 2 are graphical depictions of the imagery received to date. Two copies of the imagery were received to date. Two copies of the imagery were received; one copy was sent to the Co-Investigators.

(2) Progress to Date:

(a) Skylab Experimentation Team was created and Mr. Robert A. Patton and Mr. Jesse N. Valle, DMA IAGS, were selected as members of that team.

(b) Geociever positions in Paraguay were completed. Copies of imagery of the solar inertial passes over Paraguay were received in January 1974. Photo-identified positions have been selected on the photography and are being returned to Johnson Space Center for analytical aerial triangulation adjustment.

(c) Review and processing of imagery. The imagery was received, processed and reviewed. Two areas were selected for initial experimentation. These were Santa Cruz, Bolivia, and Concepcion, Paraguay. From these, the Cartographic Team prepared two cartographic products.

1. A map revision of a 1:50,000 scale sheet No. 6940-I covering Santa Cruz, Bolivia (explanation of process and sample of sheet attached as Enclosure 3).

2. A 1:100,000 scale enhanced photomosaic of Concepcion, Paraguay (Enclosure 3).

Both the above products will be forwarded to Mr. Rigdon Joosten of Johnson Space Center, NASA, who will present them at the meeting of the American Society of Photogrammetry in St. Louis, Missouri, in March 1974.

SKYLAB IMAGES RECEIVED



**IAGS - EROS INFORMATION
and
DISTRIBUTION CENTER**



DEFENSE MAPPING AGENCY
INTER AMERICAN GEODETIC SURVEY
USGS EROS PROGRAM
SKYLAB EXPERIMENT 496B

- PLANIMETRIC MAP — CONCEPCION, PARAGUAY
30 MINUTE QUADRANGLE, 1:100,000 SCALE
- MAP REVISION OVERPRINT — SANTA CRUZ, BOLIVIA 1:50,000
- SKYLAB PHOTO ENLARGEMENT WITH TOPOGRAPHIC MAP OVERLAY
SANTA CRUZ, BOLIVIA 1:100,000 SCALE



DMA IAGS-EROS SKYLAB Experiment 496B

March 1974

MAP REVISION, OVERPRINT, SANTA CRUZ, BOLIVIA, 1:50,000 SHEET 6940I

This experimental map revision overprint of the 1:50,000 scale Santa Cruz sheet is the first to be produced from SKYLAB photography in Latin America. The revision has been prepared as a part of the DMA IAGS-EROS SKYLAB Experiment 496B and illustrates the feasibility and advantages of making rapid map revisions using this photography.

The photography used was SL-2 190-A Roll 05 Frames 339-340, Camera Station 5, design band width .6 to .7, Pan-X aerial black and white, type SO-022 film. Photography from Camera 5 was selected because of the approximation in tonal response to conventional pan-chromatic aerial photography.

The 70 mm negative received from NASA was enlarged two times to an approximate scale of 1:1,500,000 and a physical size of 140 mm for use in the Wild A-9. Using a gear ratio of 1:4, scale of 1:100,000 on the plotting table was obtained. With the exception of the large floating mark, the A-9 proved to be an ideal instrument for the experiment.

The stereo pair was oriented in the Wild A-9 and rectified to a 1:100,000 scale film positive reduction of the 1:50,000 scale topographic map. Upon completion of the planimetric revision, the compilation was enlarged to the original map scale (1:50,000) on a rectifier, scribed and then overprinted onto the lithograph as it appears.

All revisions indicated by the purple overprint were extracted entirely from the SKYLAB photos without benefit of ground truth data which undoubtedly would reveal more detail for revision. The resolution of the photography restricts identification to linear features since non-linear features such as buildings are not discernible. A comparison of the overprint with the map features will reveal some major changes caused by nature, such as the river course labeled "Rio Piray" and some man-made features, such as the urbanization growth of the City of Santa Cruz.

CONCLUSION

The most significant result of this experiment is that a planimetric revision of a 10' x 15' map sheet at 1:50,000 scale was

accomplished photogrammetrically from one stereo pair of photographs within a 24-man hour period.

SKYLAB PHOTO ENLARGEMENTS WITH TOPOGRAPHIC MAP OVERLAY

The purpose of this product is to give the viewer a visible comparison between the current topographic map published in 1972 and a SKYLAB photo taken in 1973. The topographic map, although published in 1972, utilized photography taken over the years from 1956 to 1959. The SKYLAB 2 photograph was taken in June 1973 and enlarged from 1:3,000,000 to 1:100,000 scale and reproduced by Ozalid methods. The 1:100,000 scale topographic map overlay is a reduction of the 1:50,000 scale topographic map and was also reproduced by Ozalid methods.

CONCLUSION

This experiment is evidence that SKYLAB photography provides an economical and rapid means of accomplishing initial planimetric mapping and map revision. Such satellite photography and imagery can substantially assist Latin American nations in obtaining and maintaining, in an economical manner, those map products needed for development.

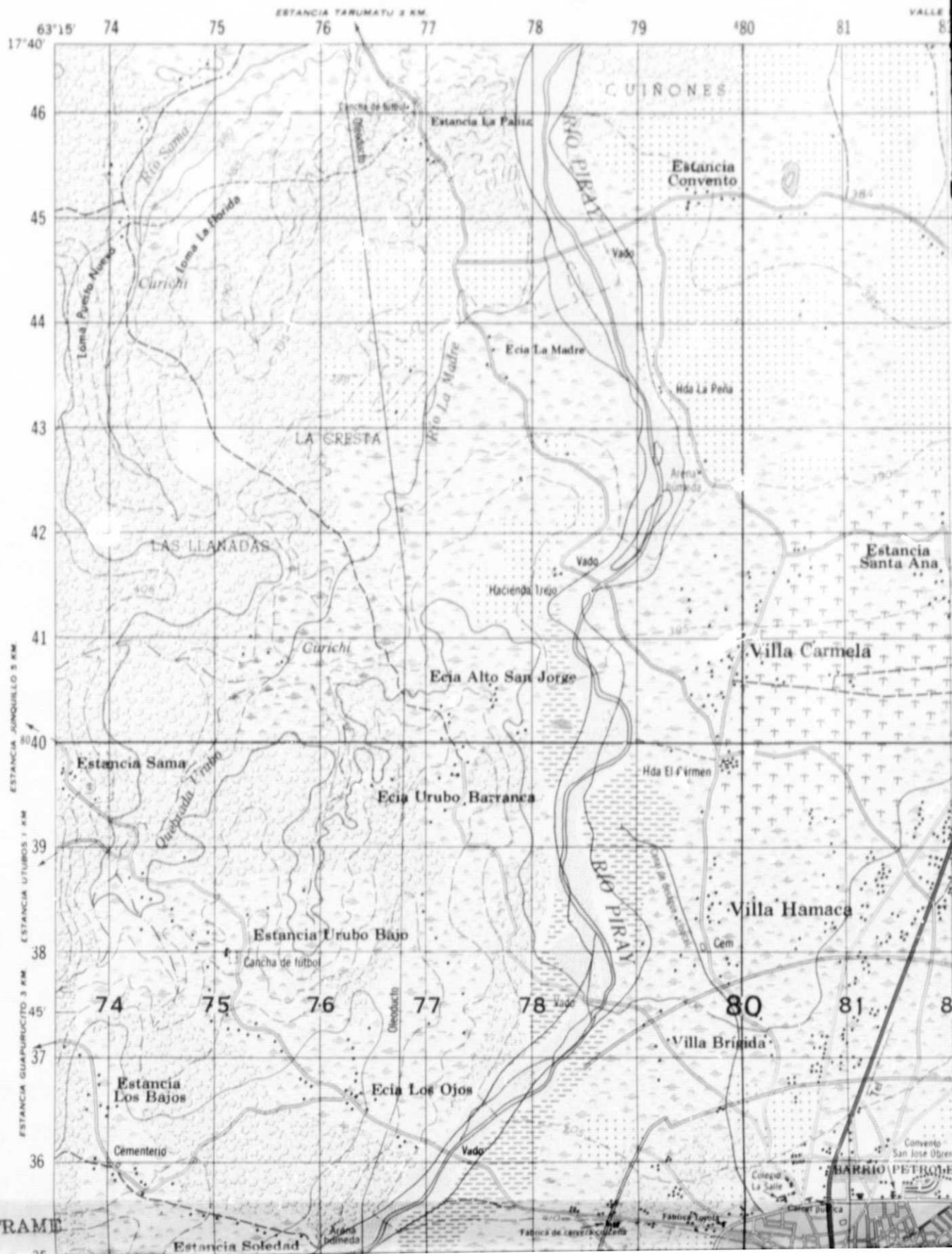
Comments about this product and its potential value will be appreciated. Please address them to:

DMA Inter American Geodetic Survey
ATTN: IAGS-EROS Coordinator
Drawer 934
Fort Clayton, Canal Zone

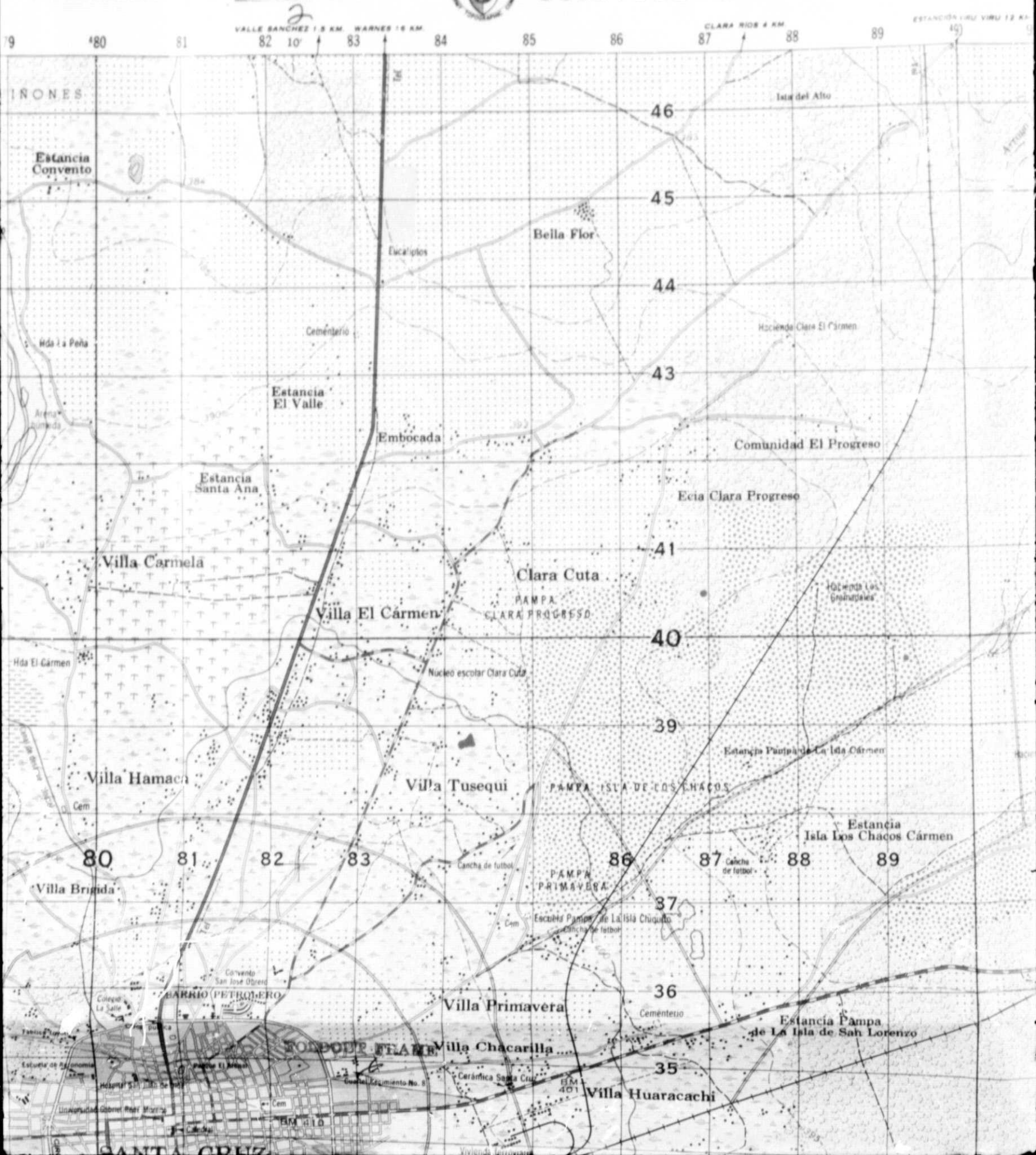
FOLDOUT FRAME

BOLIVIA 1:50,000

DMA-IAGS-EROS SKYLAB EXPERIMENTAL REVISION



FOLDOUT FRAME



2
VALLE SANCHEZ 1.5 KM. WARRER 10 KM.

CLARA RIOS 4 KM

ESTACION ORU VIRU 12 KM

80

81

82

83

86

87

88

89

46

45

44

43

41

40

39

37

36

35

IRONES

Estancia Convento

Isla del Alto

Hda. La Peña

Arroyo Lumbada

Cementerio

Eucaliptos

Bella Flor

Hazienda Clara El Carmen

Estancia El Valle

Embocada

Comunidad El Progreso

Estancia Santa Ana

Ecija Clara Progreso

Villa Carmela

Clara Cuta

PAMPA CLARA PROGRESO

Hazienda Los Granadas

Hda El Carmen

Nucleo escolar Clara Cuta

Estancia Pampa de La Isla Carmen

Villa Hamaca

Villa Tusequi

PAMPA ISLA DE LOS CHACOS

Estancia Isla Los Chacos Carmen

Cem

Cancha de futbol

PAMPA PRIMAVERA

Cancha de futbol

Villa Brinda

Escuela Pampa de La Isla Chiquito

Cancha de futbol

BARRIO (PETRO)ERO

Villa Primavera

Cementerio

Estancia Pampa de La Isla de San Lorenzo

Colegio La Salle

TORQUE FLAMER

Villa Chacarilla

Ceramica Santa Cruz

Villa Huaracachi

Estacion de Economia

Palacio El Arce

Cuartel Regimiento No. 8

B.M. 401

SANTA CRUZ

Vivienda ferroviaria

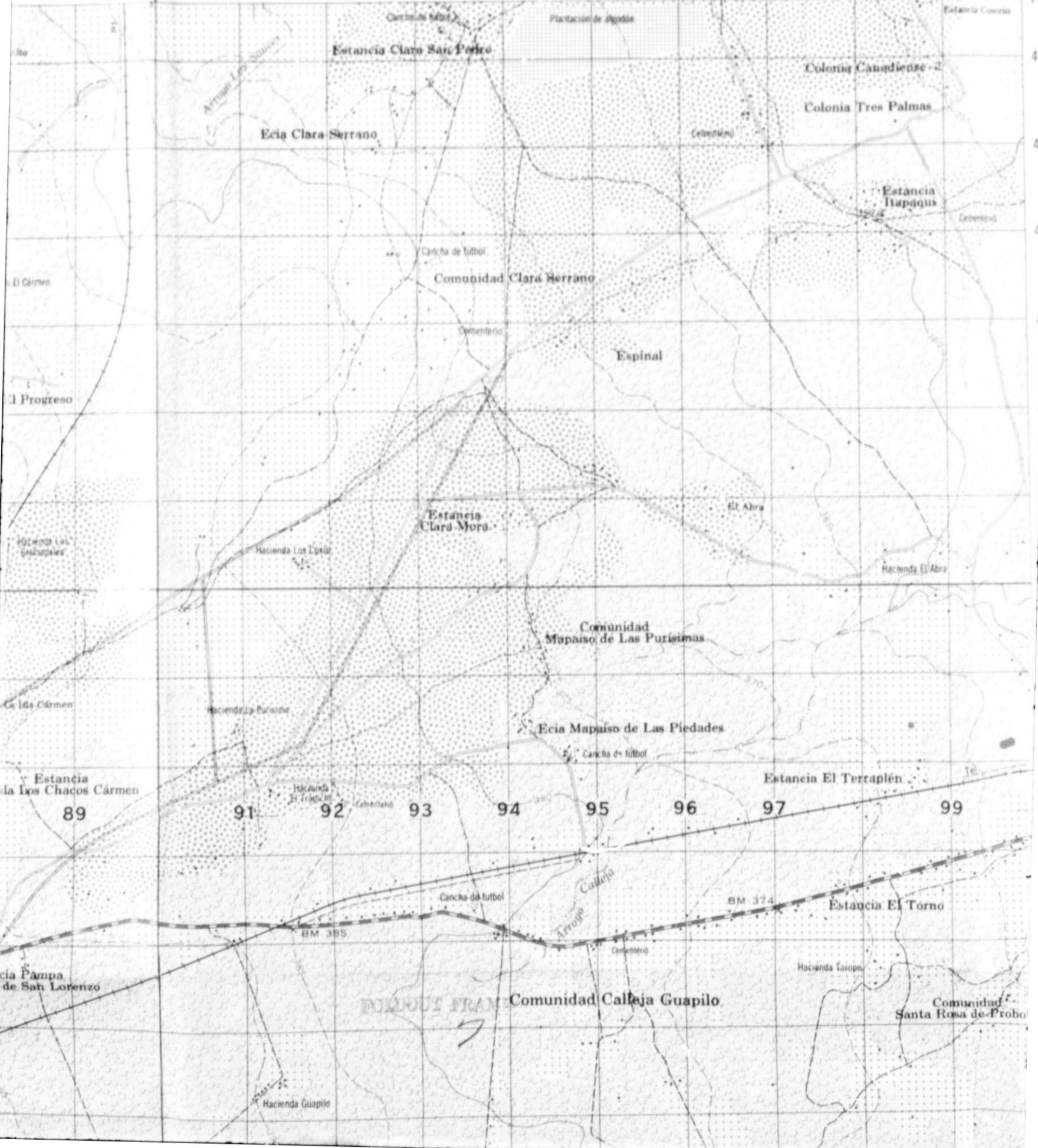
FOLDOUT FRAME

ESTACION VIRU VIRU 12 KM

ESTANCIA CLARA SAUCE 4 KM

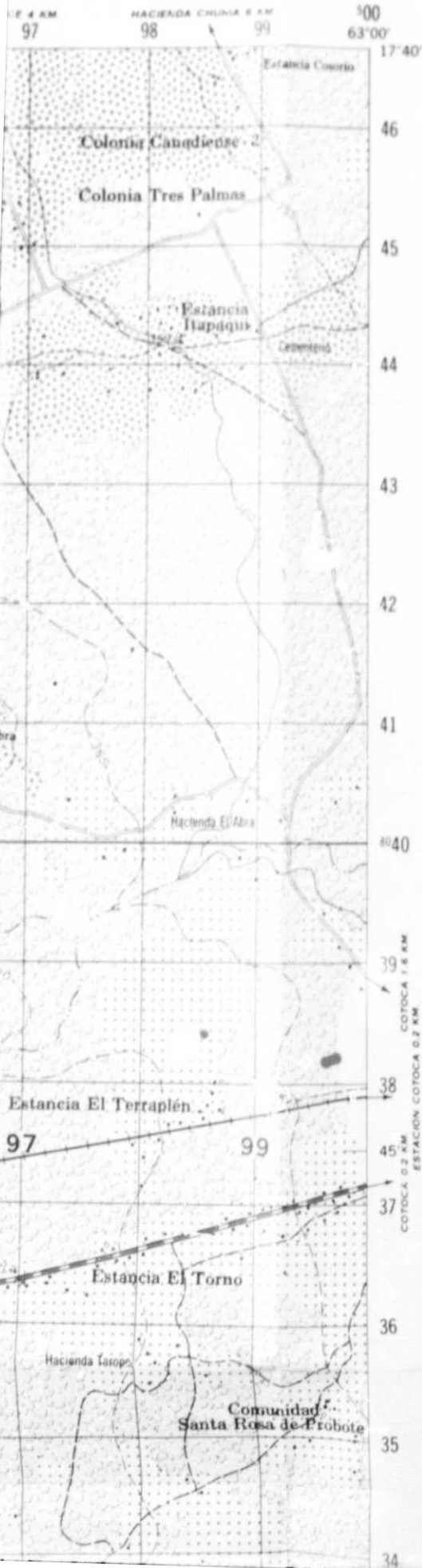
HACIENDA CHURIA 8 KM

89 90 91 05 92 3 93 94 95 96 97 98 99 100
63'00"



SHEET 6940 I
SERIES H731

FOLDOUT FRAM
4



LEGEND
SIGNOS CONVENCIONALES

On this map a lane is considered as being a minimum of 2.5 meters wide
En este mapa se considera que una vía tenga un ancho mínimo de 2.5 metros

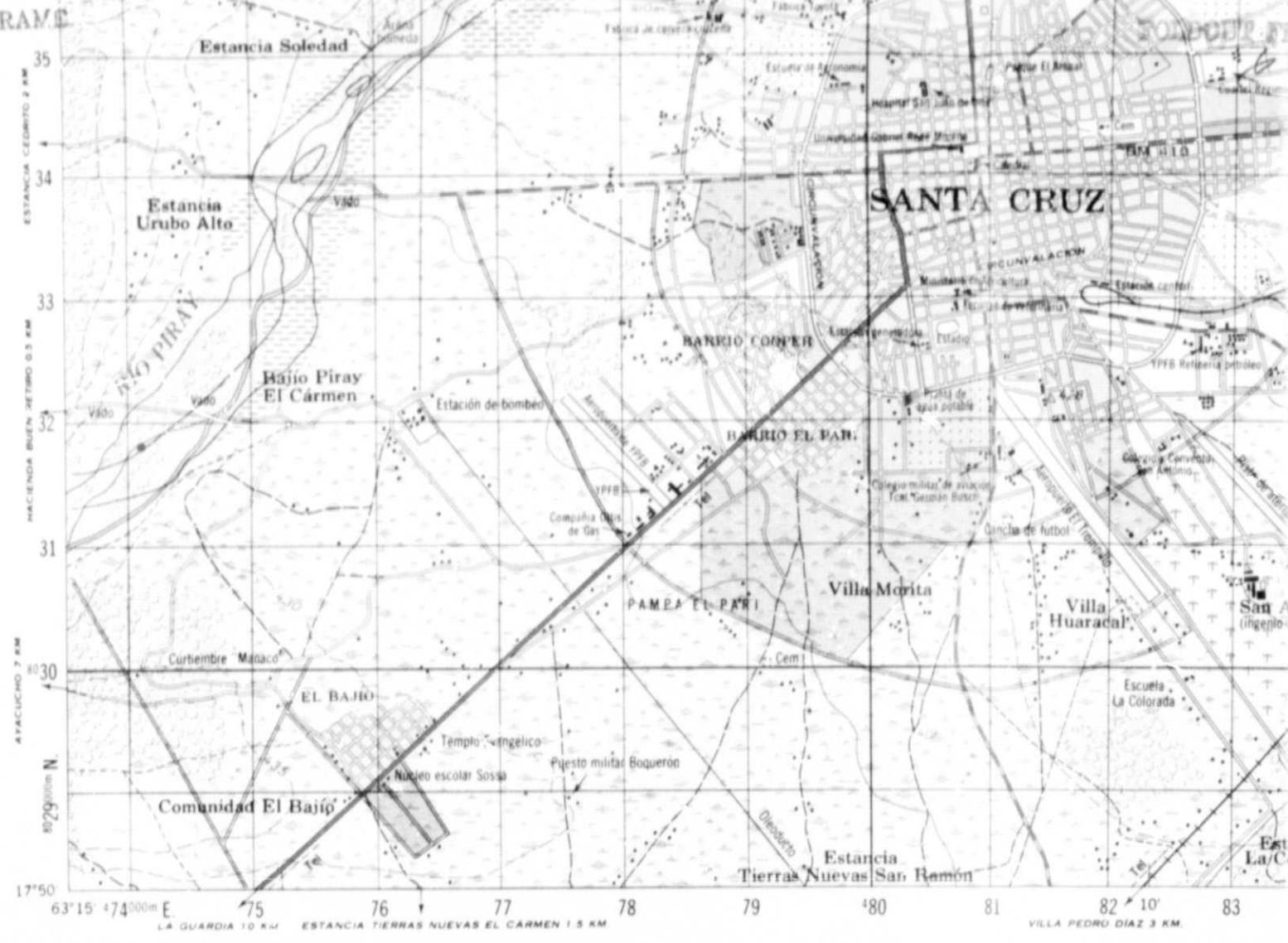
Red tint represents built-up areas in which only important buildings are shown
El tinte rojo representa zonas urbanizadas en las cuales solo se muestran edificios importantes

ROADS		CAMINOS	
All weather, hard surface, two or more lanes wide		Transitable todo el año, afirmado sólido, dos o más vías	
All weather, loose or light surface, two or more lanes wide		Transitable todo el año, revestimiento suelto o ligero, dos o más vías	
All weather, hard surface, one lane wide		Transitable todo el año, afirmado sólido, una vía	
All weather, loose or light surface, one lane wide		Transitable todo el año, revestimiento suelto o ligero, una vía	
Fair or dry weather, loose surface		Transitable en tiempo bueno o seco, revestimiento suelto	
Cart track, Trail		Rodera; Vereda	
Bridge		Puente	
RAILROADS		FERROCARRILES	
Single track, normal or broad gauge		Vía sencilla, trocha normal o ancha	
Single track narrow gauge		Vía sencilla, trocha estrecha	
BOUNDARIES		LÍMITES	
International		Nacional	
Primary administrative		Departamental	
Power transmission line; Fence		Línea transmisora de energía; Cerca	
Church; School; Mine		Iglesia; Escuela; Mina	
Area name		Nombre de área	
Shrine; Quarry		Calvario; Cantera	
Windmill, windpump; Water mill		Molino de viento, bomba de viento; Molino de agua	
Horizontal control point; Bench mark		Punto de control horizontal; Monumento de cota fija	
Spot elevations: Checked; Photogrammetric		Elevaciones: Comprobadas; Fotogramétricas	
Tola growth, yareta growth; Pasture		Tholar, yareta; Pastizal	
Woods or brushwood; Sugar cane		Sosque o monte; Cañaveral	
Tropical grass; Tall grass		Hierba tropical; Pajonal	
Orchard; Cultivated area		Huerto; Área cultivada	
Sand; Wet sand		Arena; Arena húmeda	
Intermittent stream		Río intermitente	
Intermittent lake or pond		Lago o charco intermitente	
Land subject to inundation		Terrono sujeto a inundación	
Marsh or swamp		Ciénaga o bofedal	
Well; Spring		Pozo; Manantial	
Large rapids; Large falls		Rápidos grandes; Saltos grandes	
Rapids; Falls		Rápidos; Saltos	
Pier		Muelle	
Dam		Represa	
Dry stream or wash		Río seco o aluvión	

GLOSSARY
GLOSARIO

Aeropuerto	airport
Arroyo	stream
Canal de desagüe	drainage ditch
Cancha de fútbol	soccer field
Carcel publica	jaíl
Catedral	cathedral
Cementerio	cemetery
Cerámica	ceramic factory
Circunvalación	circumferential highway
Colegio	school
Colegio militar de aviación	military aviation school
Compañía de Gas	gas company
Convento	convent
	barracks

FOY DOUT FRAME



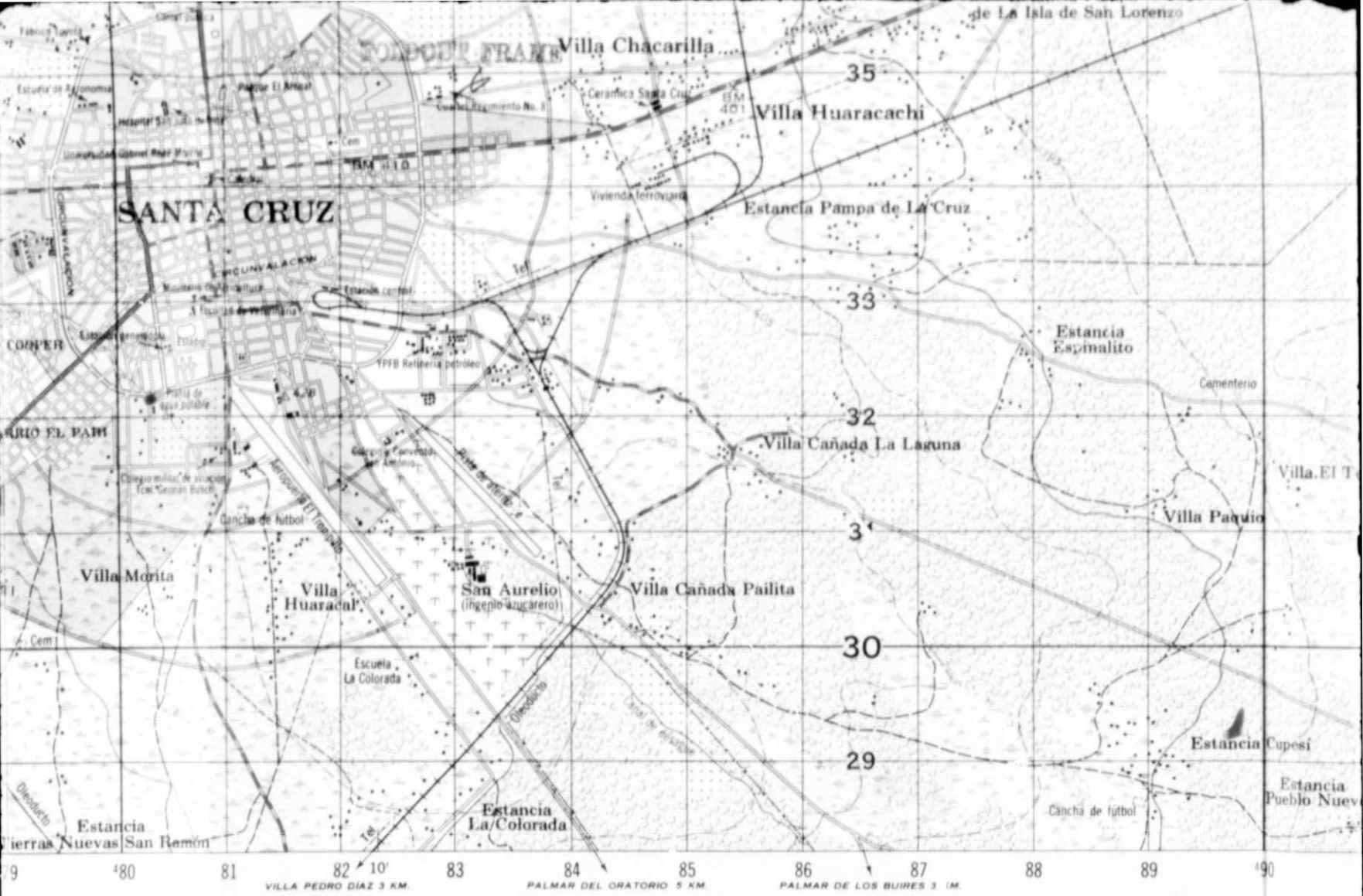
H731, EDITION 1-TPC

Prepared by the U. S. Army Topographic Command, Washington, D. C. Copied in 1971 from Bolivia, 1:50,000, Instituto Geografico Militar (IGM), Sheet 6940 I, 1970. Original mapping by photogrammetric methods by IGM 1969. Aerial photography Sept. 1956, Oct. 1963, May, July 1964, and Aug. 1967. Horizontal and vertical control by IGM and Int. American Geodetic Survey (IGS). Field checked 1966 and 1968. Marginal data revised, 1971.

The revision overprint in purple was prepared by the IAGS-EROS team in the Canal Zone in the Republic of Panama, February 1974, as an initial photogrammetric experiment with SKYLAB photography (camera S 190A, Station 5) taken June 1973. Revisions were made to planimetric map features by photogrammetric methods (Wild A9). Revisions not field checked or field classified. Authorization for the use and distribution of this map was approved by both the Bolivian and the American (U.S.A.) governments, February 1974.

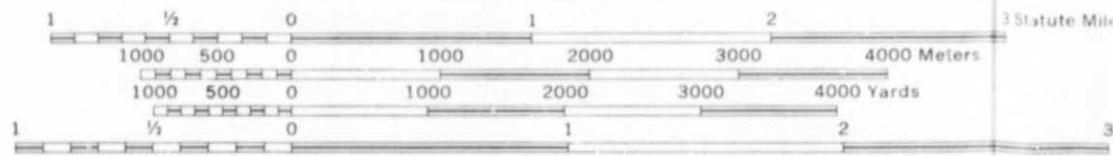
GRID ZONE DESIGNATION DESIGNACION DE ZONA DE CUADRICULA	TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 100 METERS	PARA DAR UNA REFERENCIA EN ESTA HOJA A LOS 100M MAS CERCANOS
<p>20K</p> <p>100,000 M SQUARE IDENTIFICATION IDENTIFICACION DEL CUADRADO DE 100,000 METROS</p> <p>MF</p> <p>100</p> <p>IGNORE THE SMALLER figures of any grid number, these are for finding the full coordinates. Use ONLY the LARGER figures of the grid number. NO DEBEN TOMARSE EN CUENTA las cifras en TIPO PEQUEÑO de cualquier numero cuadrado, estos numeros son para determinar los valores completos de las coordenadas. Utilicenses SOLAMENTE los numeros de TIPO GRANDE. Ejemplo Ejemplo 8029000</p>	<p>SAMPLE POINT, PUNTO UTILIZADO COMO EJEMPLO</p> <p>1. Read letters identifying 100,000 meter square in which the point lies.</p> <p>2. Locate first VERTICAL grid line to LEFT of point and read LARGE figures labeling the line either in the top or bottom margin, or on the line itself.</p> <p>Estimate tenths from grid line to point.</p> <p>3. Locate first HORIZONTAL grid line BELOW point and read LARGE figures labeling the line either in the left or right margin, or on the line itself.</p> <p>Estimate tenths from grid line to point.</p> <p>SAMPLE REFERENCE</p> <p>If reporting beyond 9° N S or 18° E W prefix grid zone designation as</p>	<p>ESCUELA LA COLORADA</p> <p>1. Leuse las letras que identifican el cuadrado de 100,000m dentro del cual se encuentra el punto.</p> <p>2. Localicese la linea VERTICAL de la cuadrícula situada inmediatamente a la IZQUIERDA del punto y léase las cifras de TIPO GRANDE correspondientes a ella, ya sea en el margen superior, en el inferior, o sobre la línea misma.</p> <p>Estimense los décimos (del intervalo de cuadrícula) entre la línea mencionada y el punto.</p> <p>3. Localicese la línea HORIZONTAL de la cuadrícula situada inmediatamente DEBAJO del punto y léase las cifras de TIPO GRANDE correspondientes a ella, las cuales se pueden ver en el margen izquierdo, en el derecho, o sobre la línea misma.</p> <p>Estimense los décimos (del intervalo de cuadrícula) entre la línea mencionada y el punto.</p> <p>EJEMPLO DE REFERENCIA</p> <p>Si la información abarca una zona mayor de 9° N S o 18° E O, antepóngase la referencia anterior la designación de la zona de cuadrícula y a</p> <p>MF 82 6 29 9</p> <p>MF826299</p> <p>20KMF826299</p>

LAS LINEAS N...



VILLA PEDRO DIAZ 3 KM. PALMAR DEL ORATORIO 5 KM. PALMAR DE LOS BUJES 3 KM.

Scale 1:50,000



Scale 1:50,000.
Contours by IGM
and vertical
datum revised.

GS-EROS
February
SKYLAB
3. Re-
topogram-
checked or
distribution
American

CONTOUR INTERVAL 20 METERS
WITH SUPPLEMENTARY CONTOURS AT 10 AND 5 METER INTERVALS

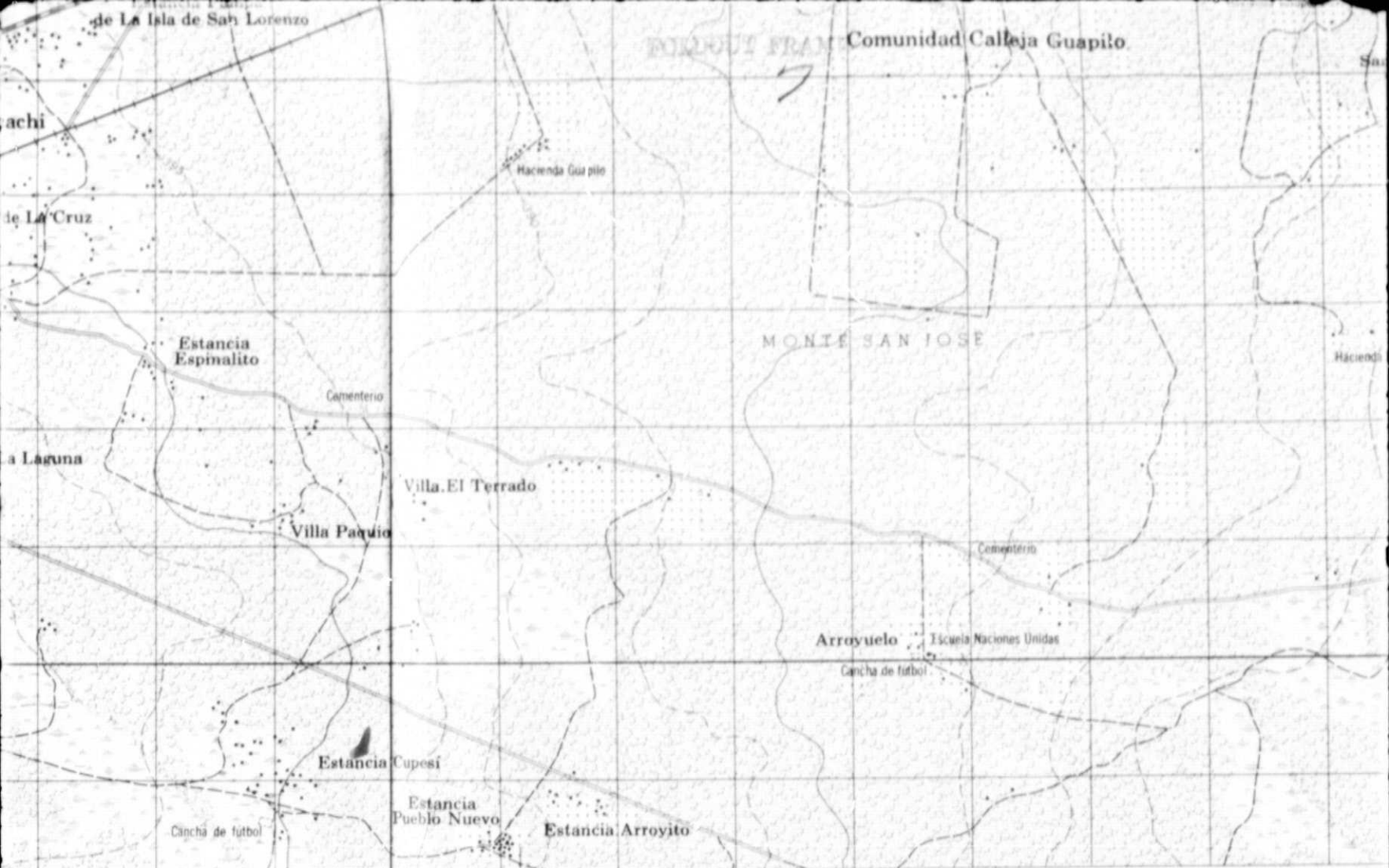
CURVAS DE NIVEL CON INTERVALOS DE 20 METROS
COMPLEMENTARIAS A 10 Y 5 METROS
VERTICAL DATUM: MEAN SEA LEVEL

TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: PROVISIONAL SOUTH AMERICAN DATUM OF 1956

BLACK NUMBERED LINES INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 20, INTERNATIONAL SPHEROID
LAS LINEAS NEGRAS NUMERADAS INDICAN LA CUADRICULA UNIVERSAL TRANSVERSA DE MERCATOR A 1,000 METROS, ZONA 20, ESFEROIDE INTERNACIONAL

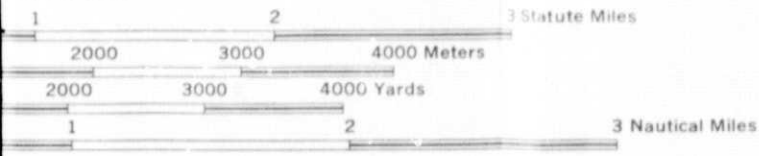
MF
82
6
29
9
MF826299
20KMF826299

USERS ARE URGED TO REFER CORRECTIONS AND COMMENTS FOR INCREASING THE USEFULNESS OF THIS MAP TO COMMANDING GENERAL U. S. ARMY TOPOGRAPHIC COMMAND, WASHINGTON, D. C. 20315



87 88 89 90 9105' 92 93 94 95 96 97 98
 HUIRES 3 KM. MAURITO 11 KM.

Scale 1:50,000
 1-72 PRINTED BY THE U. S. A.



INTERVAL 20 METERS
 MARKERS AT 10 AND 5 METER INTERVALS
 INTERVALOS DE 20 METROS
 MARCAS A 10 Y 5 METROS
 DATUM: MEAN SEA LEVEL

TRANSVERSE MERCATOR PROJECTION
 SOUTH AMERICAN DATUM OF 1956

TRANSVERSE MERCATOR GRID, ZONE 20, INTERNATIONAL SPHEROID
 TRANSVERSA DE MERCATOR A 1,000 METROS, ZONA 20, ESFEROIDE INTERNACIONAL

FOR COMMENTS FOR INCREASING THE USEFULNESS OF
 THE TOPOGRAPHIC COMMAND, WASHINGTON, D. C. 20315

1970 G-M ANGLE
 3° (50 MILS)
 ANGULO C-M DE 1970
 3° (50 MILÉSIMAS)

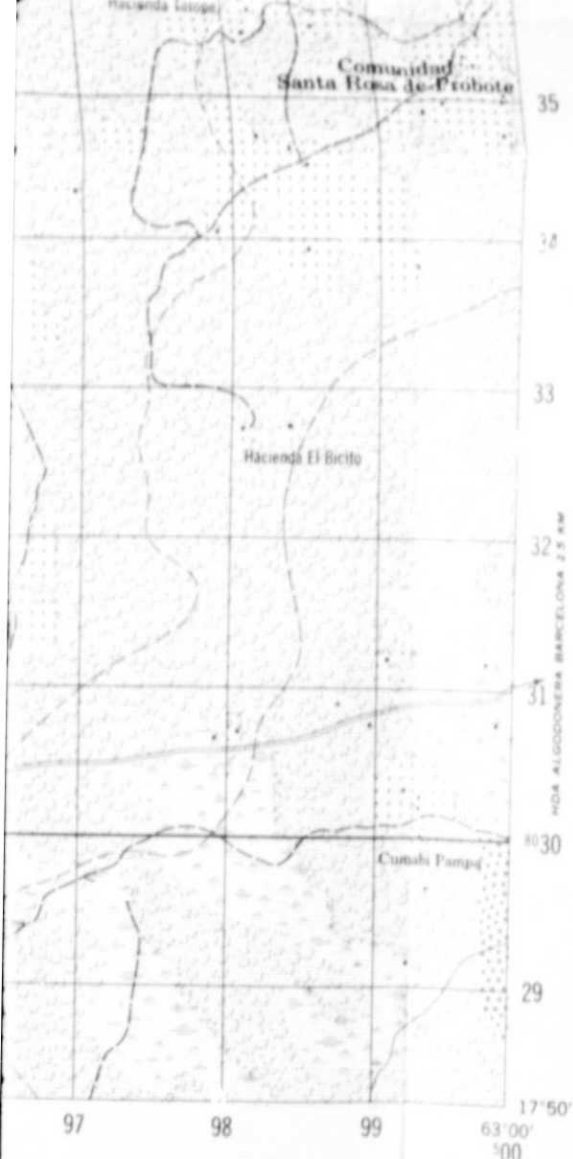


GN
 NC
 GRID NORTH
 NORTE DE LA CUADRÍCULA

GRID CONVERGENCE
 0°02' (1 MIL)
 FOR CENTER OF SHEET
 LA CONVERGENCIA DE LA CUADRÍCULA
 0°02' (1 MILÉSIMAS)
 EN EL CENTRO DE LA HOJA

TO CONVERT A
 MAGNETIC AZIMUTH
 TO A GRID AZIMUTH
 SUBTRACT G-M ANGLE
 PARA CONVERTIR
 UN AZIMUT MAGNÉTICO
 A UN AZIMUT DE CUADRÍCULA
 RÉSTESE EL ÁNGULO C-M
 TO CONVERT A
 GRID AZIMUTH TO A
 MAGNETIC AZIMUTH
 ADD G-M ANGLE
 PARA CONVERTIR
 UN AZIMUT DE CUADRÍCULA
 A UN AZIMUT MAGNÉTICO
 SÚMESE EL ÁNGULO C-M



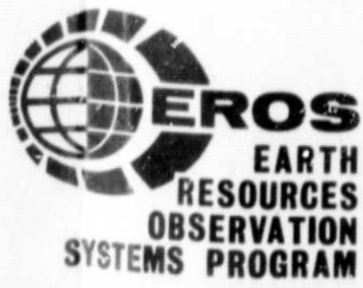


Aeropuerto	airport
Arroyo	stream
Canche de fútbol	soccer field
Carcel publica	jail
Catedral	cathedral
Cem	cemetery
Ceramica	ceramic factory
C-circunvalación	circumferential highway
Colegio	school
Colegio militar de aviación	military aviation school
Compañía de Gas	gas company
Convento	convent
Cuartel Regimiento	barracks
Curtiembre	laundry
Escuela de Agronomía	agronomy school
Estación central	railroad station
Estación de bombeo	pumping station
Eciz	farm
Estadio	stadium
Fábrica	factory
Fábrica de cerveza	brewery
Facultad de Veterinaria	veterinarian school
Hda.	farm
Hospital	hospital
(ingenio azucarero)	sugar mill
Loma	ridge
Ministerio de Agricultura	Ministry of Agriculture
Núcleo escolar	school
Oleoducto	oil pipeline
Pampa	plain
Parque	park
Pista de aterrizaje	landing strip
Planta de agua potable	filtration plant
Plantación de Algodón	cotton plantation
Puesto militar	military post
Quebrada	stream
Rio	stream
Refinería petróleo	petroleum refinery
Tel.	telegraph or telephone line
Templo	temple
Universidad	university
Vado	ford

1-72 PRINTED BY THE U. S. ARMY TOPOGRAPHIC COMMAND

ADJOINING SHEETS

6941 III	6941 II	7041 III
6940 IV	6940 I	7040 IV
6940 III	6940 II	7040 III



SANTA CRUZ, BOLIVIA
STOCK NO. H731X69401***01

DMA TAGS EROS SKYLAB EXPERIMENT

TOPOGRAPHIC MAP OVERLAY

SANTA CRUZ, BOLIVIA 1:100,000



PHOTOGRAPH TAKEN JUNE 1973 BY CAMERA S190A.
 ENLARGED FROM 1:3,000,000 TO 1:100,000 SCALE





DMA IAGS-EROS SKYLAB Experiment 496B

March 1974

PLANIMETRIC MAP, CONCEPCION, PARAGUAY, 1:100,000 SCALE

This planimetric map of the Concepcion area, Paraguay, is the first sheet to be produced in Latin America from SKYLAB photography utilizing photogrammetric procedures. Although it was prepared as a part of the DMA IAGS-EROS SKYLAB experiment 496B, the final map is a valuable product in an area not previously mapped at large scales.

The photography used was SL-3 190-A, Roll 35, Frames 87-88, Camera Station 5, design band width .6 to .7, Pan-X, aerial black and white, type SO-022 film. Photography from Camera 5 was selected because of the approximation in tonal response to conventional panchromatic aerial photography.

The 70 mm negative received from NASA was enlarged two times to an approximate scale of 1:1,500,000 and a physical size of 140 mm for use in the Wild A-9. Using a gear ratio of 1:4, an approximate scale of 1:100,000 on the plotting table was obtained. Since control positions were not available at time of compilation, a definite scale was not possible.

The stereo pair was oriented in the Wild A-9 and level approximated using the average terrain elevation and drainage. Because the area contains terrain difference of less than 100 meters, the model should be level within ± 50 meters resulting in a near orthographic projection free of distorting camera tilts.

Compilation of the sheet was supported by field classification dated 1971. With the exception of landmark buildings and road data so indicated in the legend, no additional information was added that could not be seen on the SKYLAB model.

Control for the sheet consisted of seven first order traverse stations and two SMC picture points. Since the complete control identifications and the coordinates were not available at time of compilation, it was necessary to identify control without the aid of plotted positions. The compilation was then rectified to the plotted control resulting in a precise orientation to three first order traverse stations (shown on the map) and the two SMC points.

After rectification, a negative was made of the compilation and scribe guidelines were prepared for culture, drainage, projection and grid. The

SKYLAB photography was rectified to the compilation to provide photographic image background for the final map. Type was added and the map printed using the conventional three-color lithographic method.

Street patterns were depicted to illustrate and emphasize the amount of detail which can be seen on a stereo model of satellite photography having an original scale of 1:3,000,000. The map symbolization departs somewhat from the national map standards (Paraguay) concerning road classification. This departure was done to expedite production and is clarified in the legend.

CONCLUSION

This product is evidence that mapping can be done using SKYLAB photography. The relationship of the amount of area covered to the number of man hours is impressive for SKYLAB photography. To cover this area of 960 square miles using SKYLAB photography, 25% of the one stereo model used, required a total of 36 man hours in compilation; whereas, to accomplish a similar type compilation of the same area using 1:60,000 scale photography, would require 50 stereo models and 250 man hours.

Although only two years have elapsed since the field classification of the area was completed, changes in cultural features were apparent. An example is the new road which appears along the north central edge of the sheet.

The amount of detail which is visible also makes SKYLAB photography a valuable tool for map revision using conventional photo lab and photogrammetric equipment available in most Latin American mapping agencies.

As co-investigator, the Instituto Geografico Militar (IGM), Paraguay, established the field control and performed the field classification surveys required for this experiment.

Comments about this product and its potential value will be appreciated. Please address them to:

DMA Inter American Geodetic Survey
ATTN: IAGS-EROS Coordinator
Drawer 934
Fort Clayton, Canal Zone

FOLDOUT FRAME

PARAGUAY



450,000m.E.

23°00' 57°30'

60

20

7,456,000m.N.

50

RIO AQUIDABAN

ARROYO PITANONAGA

AIR STRIP

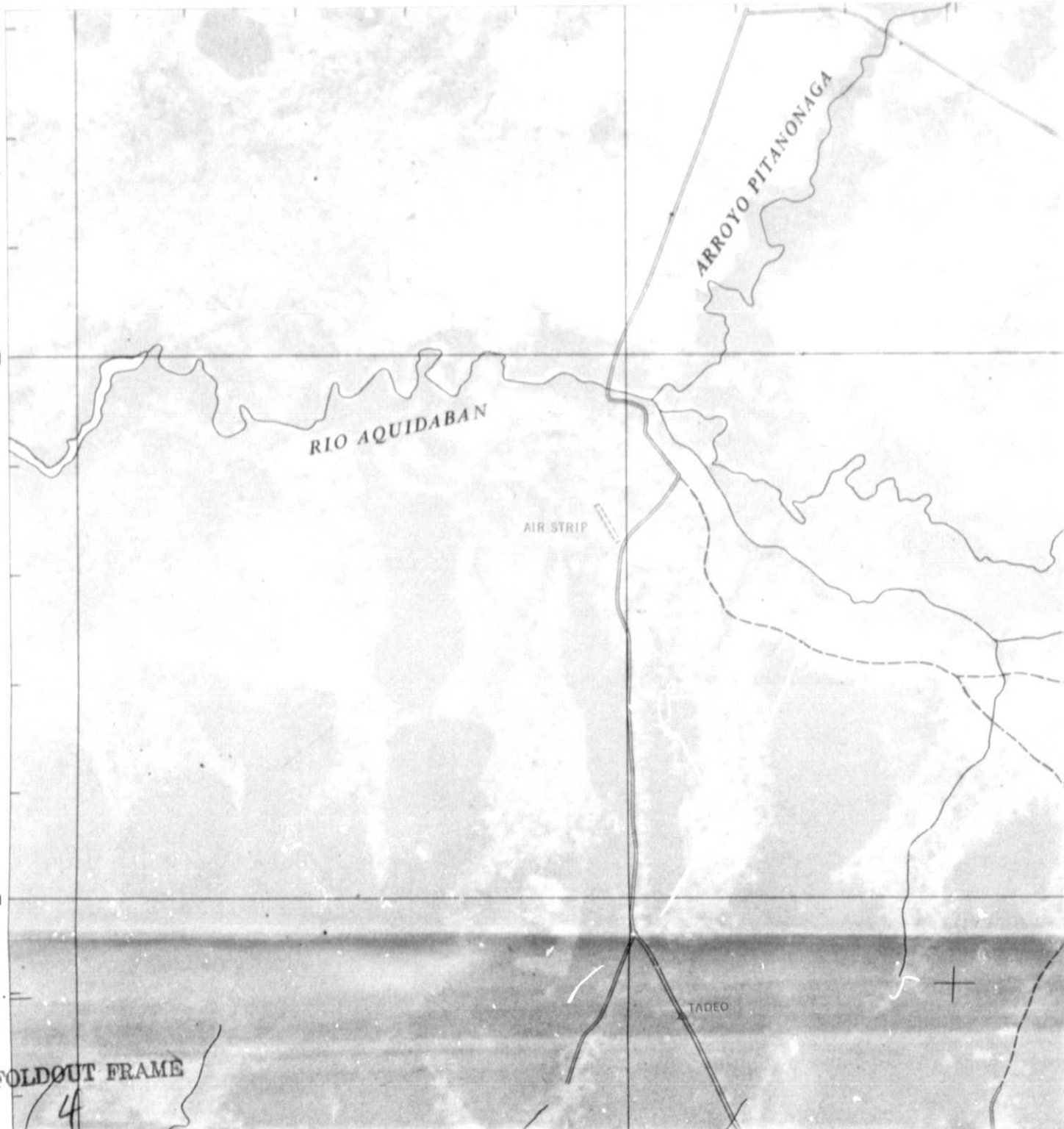
40

10

TADEO

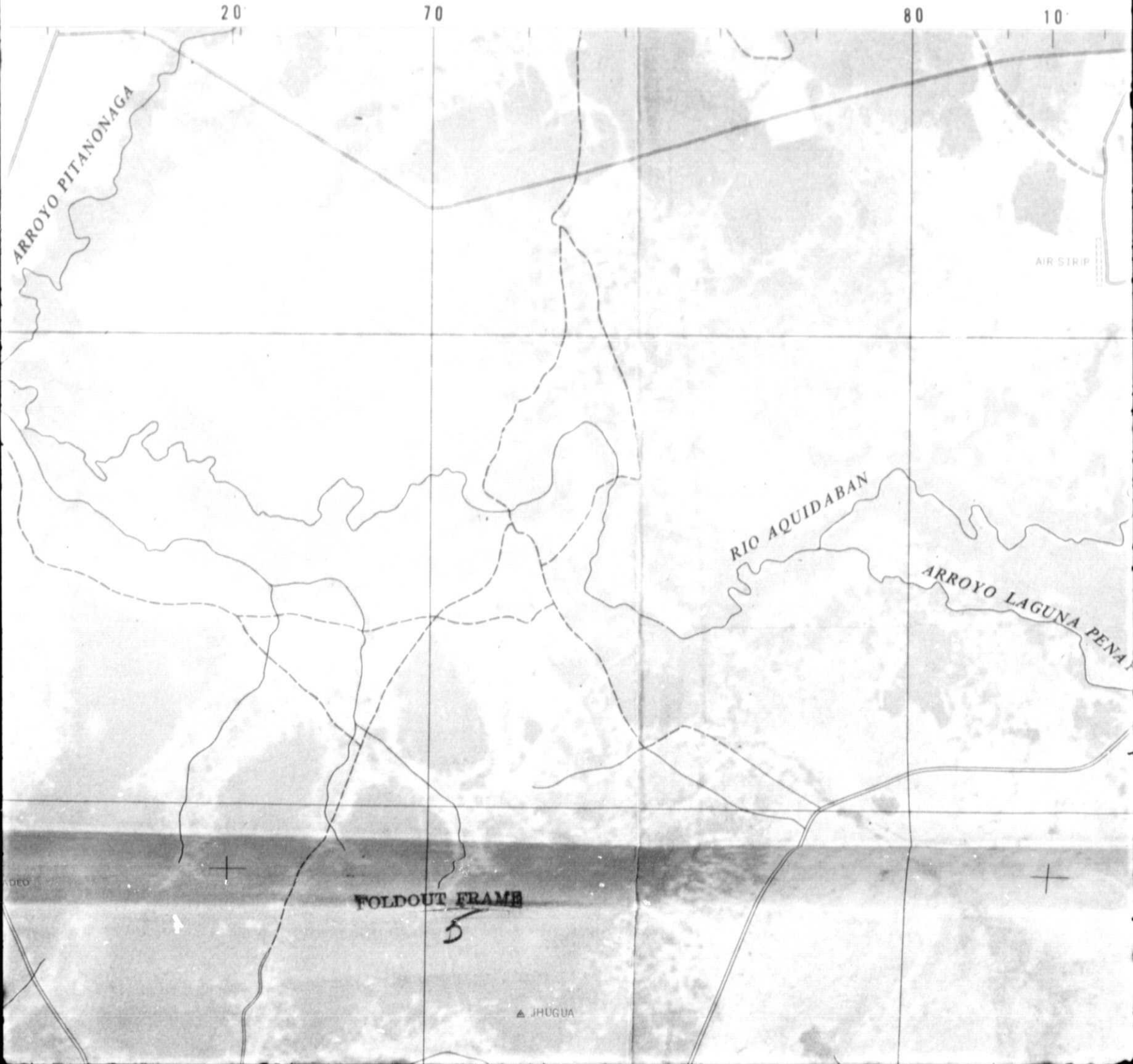
FOLDOUT FRAME

4



FOLDOUT FRAME

CONCEPCION



FOLDOUT FRAME



SHEET 5474

500,000m. E.

57° 00'

23° 00'

80

10

90

7,456,000m. N.

50

40

10

AIR STRIP

AIR STRIP

RIO AQUIDABAN

ARROYO LAGUNA PENAYO

FOLDOUT FRAME

6

ABAN

40

10

FOLDOUT FRAME

4

TABED

30

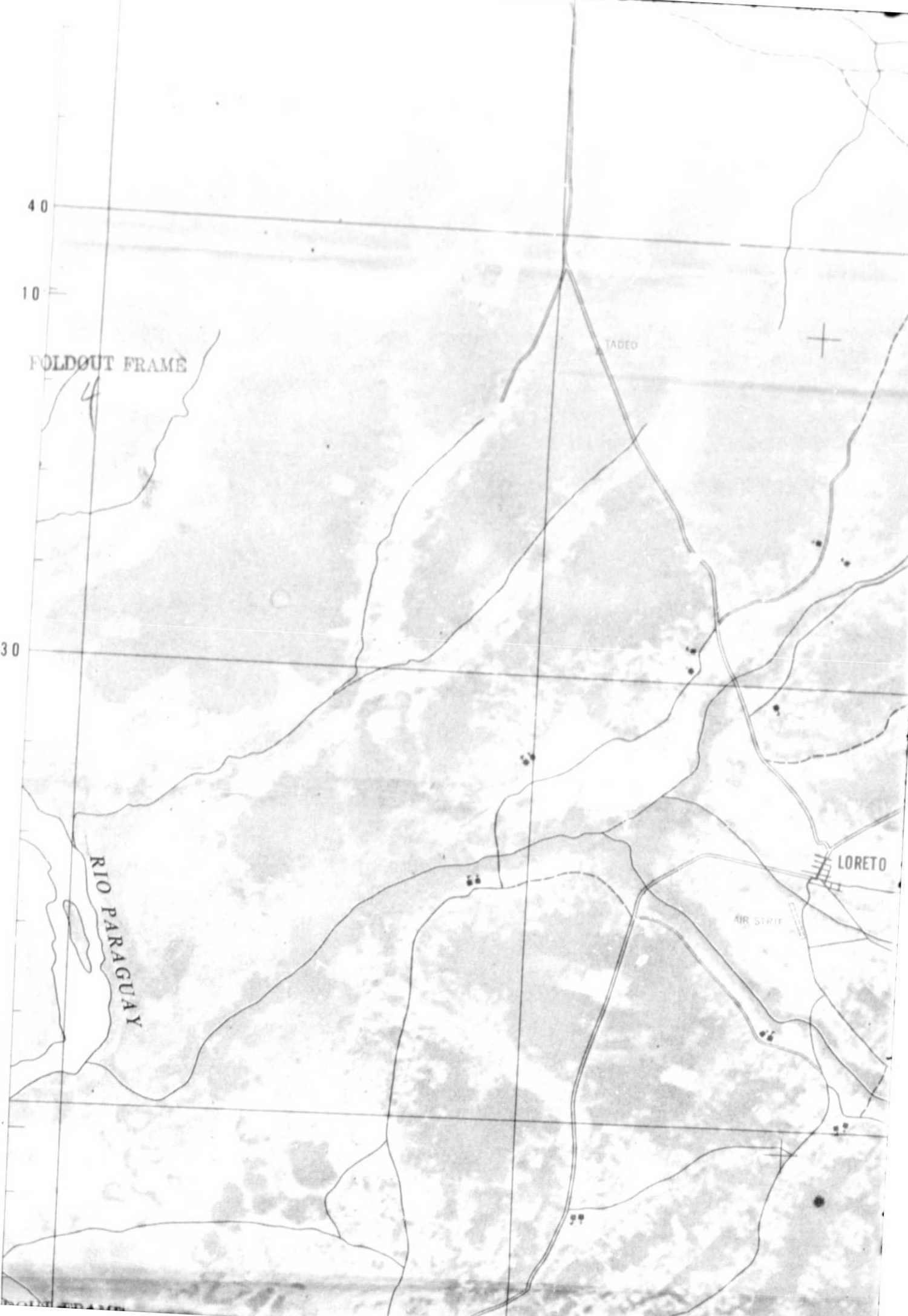
RIO PARAGUAY

LORETO

AIR STRIP

20

20





RIO AL

ARROYO L

TAGEO



FOLDOUT FRAME

5

JHUGUA

LORETO

AIR STRIP

ARROYO ISLA NARANJA

RIO AQUIDABA

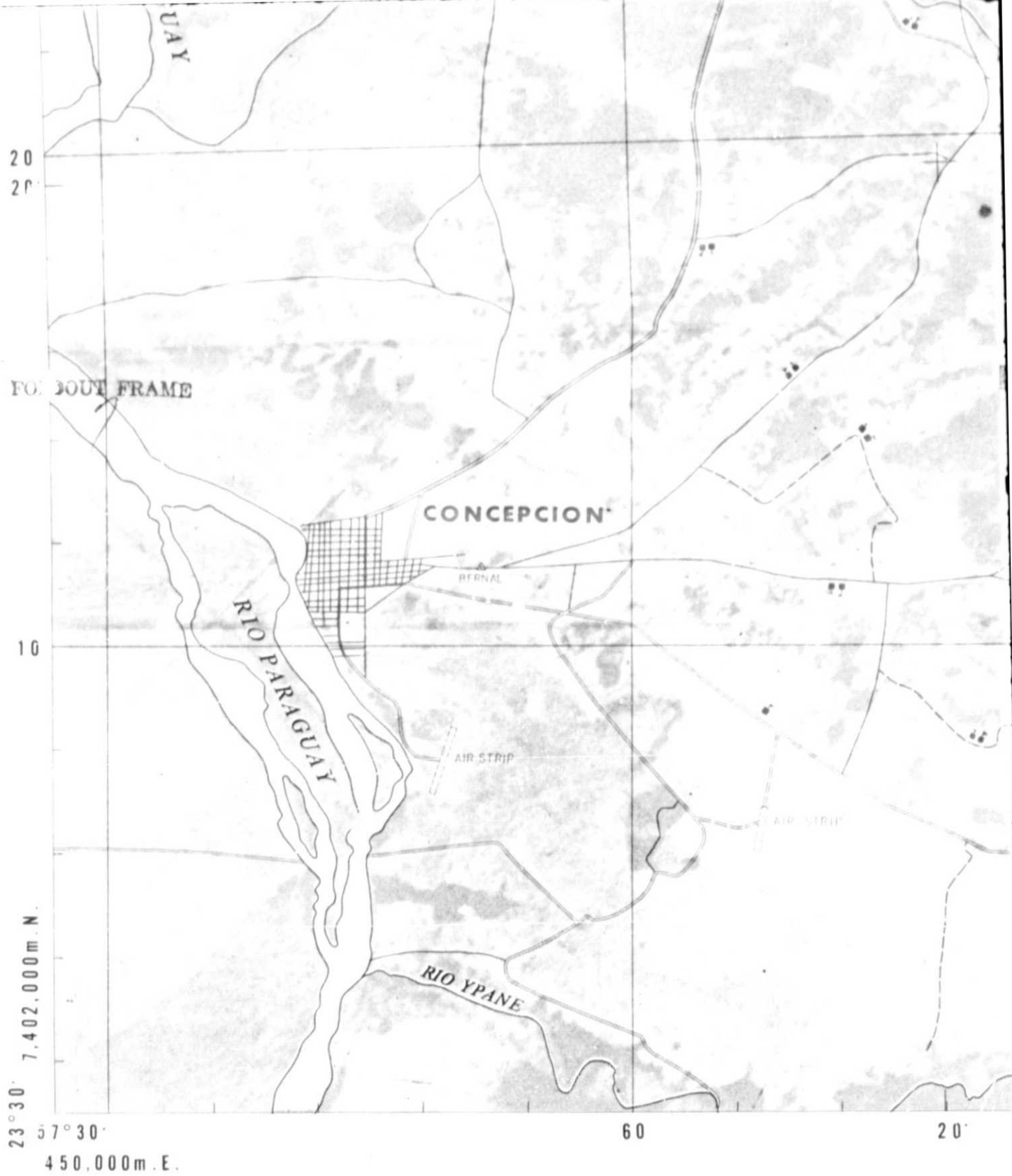
ARROYO LAGUNA PENAYO

FOLDOUT FRAME

6

HORQUETA





Prepared by the IAGS-EROS team in the Panama Canal Zone, February 1974 as an initial photogrammetric experiment with SKYLAB photography (camera S190A Station 5) taken September 1973. Planimetric map features compiled by photogrammetric methods (WILD A9). Road classification and land mark features were extracted from 1:50,000 field classification data 1971. Authorization for use and distribution of this map was approved by the Paraguayan Government February 1974.

DMA IAGS-EROS SKYLAB EXPERIMENT 496B



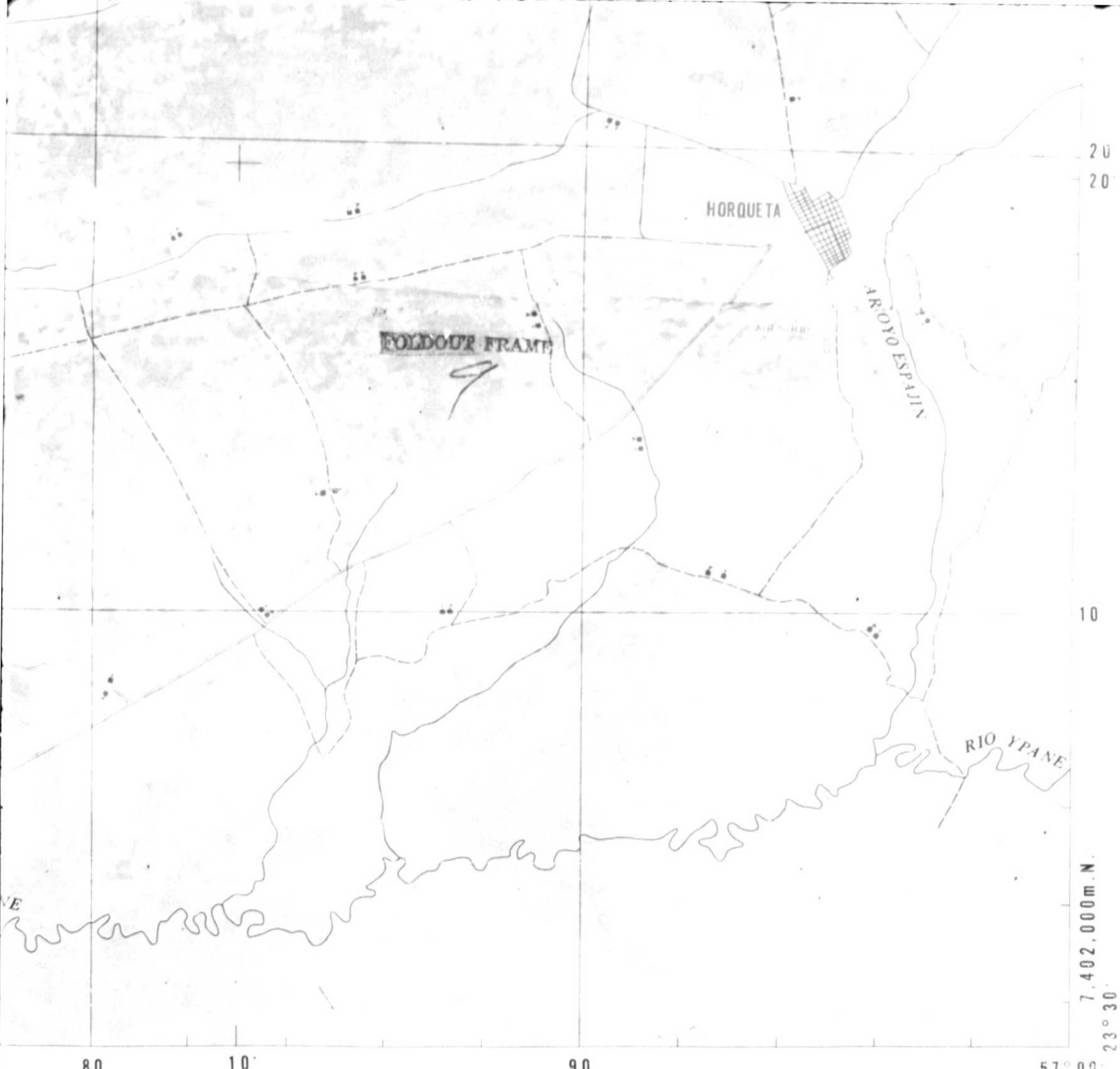
60 20' 70 80

Scale 1:100,000



TRANSVERSE MERIDIAN PROJECTION
HORIZONTAL DATUM: CHUA ASTRO DATUM

NUMBERED LINES INDICATE THE 2 000 M UTM GRID ZONE, INTERNATIONAL SPHEROID ZONE 21



LEGEND

- Fair or dry weather roads
- Improved, loose or light surface two lanes wide
- Unimproved, Dirt
(Extracted from field classification data)
- Cart track, Trail
(Extracted from field classification data)
- Church; School



500,000 m. E.

7,402,000 m. N.
23° 30'

CONCEPCION, PARAGUAY

SPHEROID ZONE 21