2 ACHIEVEMENTS

2-1 Aerial Photography

The aerial photography was carried out for the study area along the Pacific Ocean coastline of Nicaragua. LeicaRC-30 Camera (f= 152 mm, 23 cm ×23 cm) with GPS mounted on aircraft was used. Black &White aerial photographs at a scale of 1/40,000 were taken for the Topographic mapping purpose in the Study area. Photographs covered about 12,000 km^2 with 33 courses, flight length of about 2,600 km. Also color aerial photographs on 1/20,000 scale was taken over the Terica-El Hoyo volcanic area for interpretation purpose of the volcanic hazard mapping.

Totally, 288 colors and 814 black and white, aerial photographs were taken during the aerial photography mission. All photographs have 60% overlap and 30% sidelap as a standerd technical specification for mapping pupose. All photographs were rasterlized by a high precision scanner with a resolution of 20 micron.

Photo 2-1 Leica RC 30 Aerial Camera

Photo 2-2 Aircraft on the Ground

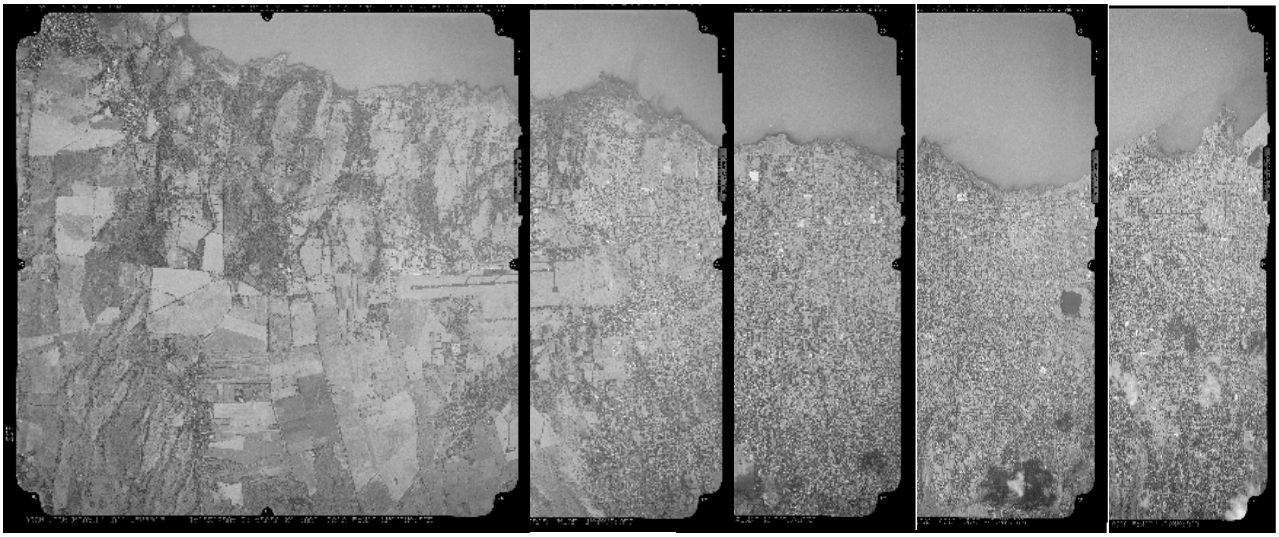

Figure 2-1 Black &White Aerial Photographs Over Managua City

2-2 Topographic Mapping in Managua (1/5,000)

Topographic maps at a scale of 1/5,000 were prepared for the Managua city area plus the watershed area of southern part for various purposes such as city planning, flood control, construction of reservoir and others. The large scale mapping was the first attempt in Nicaragua. The mapping system used the new coordinate system (WGS84 and UTM), the same as the basic map at a scale of 1/50,000, for the benefits of end users. Digital plotting was carried out to acquire road, house, public facilities and landmarks and others. The interval of the intermediate contour is two meters. Where distances between the intermediate contour lines become wide in flat areas, supplementary contour lines with an interval of one meter were inserted. The formats of the final data delivered were to be the DXF and DGN which were the general formats commonly accepted by end users such as INETER, the City of Managua, and ENACAL and others.

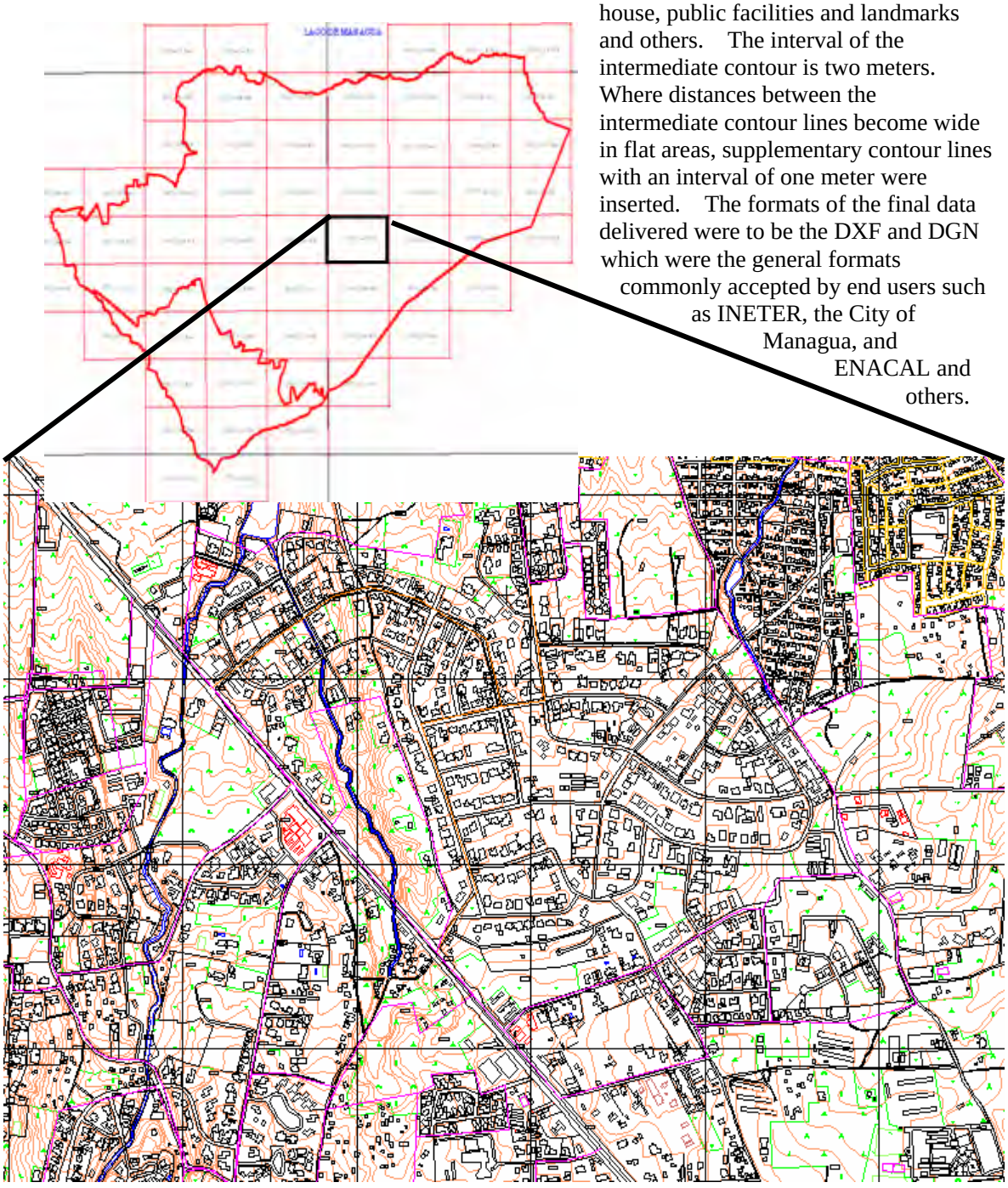

Figure 2-2 Topographic Map (Managua City at A Scale of 1/5,000)

2-3 Topographic Mapping (1/50,000)

Map symbols are required to be based upon the specification prepared by the country concerned. In the Republic Nicaragua, the cartographic representation of the geographic entities of the real world on maps is in accordance with the Manual of Specifications PS/3AA/101 “Specifications for the Production of Topographic Maps of Foreign Territories at a scale of 1/50,000” produced by Defense Mapping Agency in the United States. The contour line interval is 20m and the supplementary contour line is used every 10 meters in flat areas.

As for the projection and ellipsoid, Worldwide Geodesic System 1984 (WGS84) and Universal Transverse Mercator Projection (UTM) were adopted for the new system.

The cartographic accuracy is 0.5 mm in the map for planimetry, 1/3 of the contour interval for the altitude and 1/2 of contour interval for contour lines.

The printing color is divided in five layers which correspond to the colors cyan, magenta, yellow, and black (CMYK), and the sepia color for the contour lines.

Figure 2-3 Sample of Topographic Map

2-4 GIS Database of Infrastructures for Disaster Mitigation

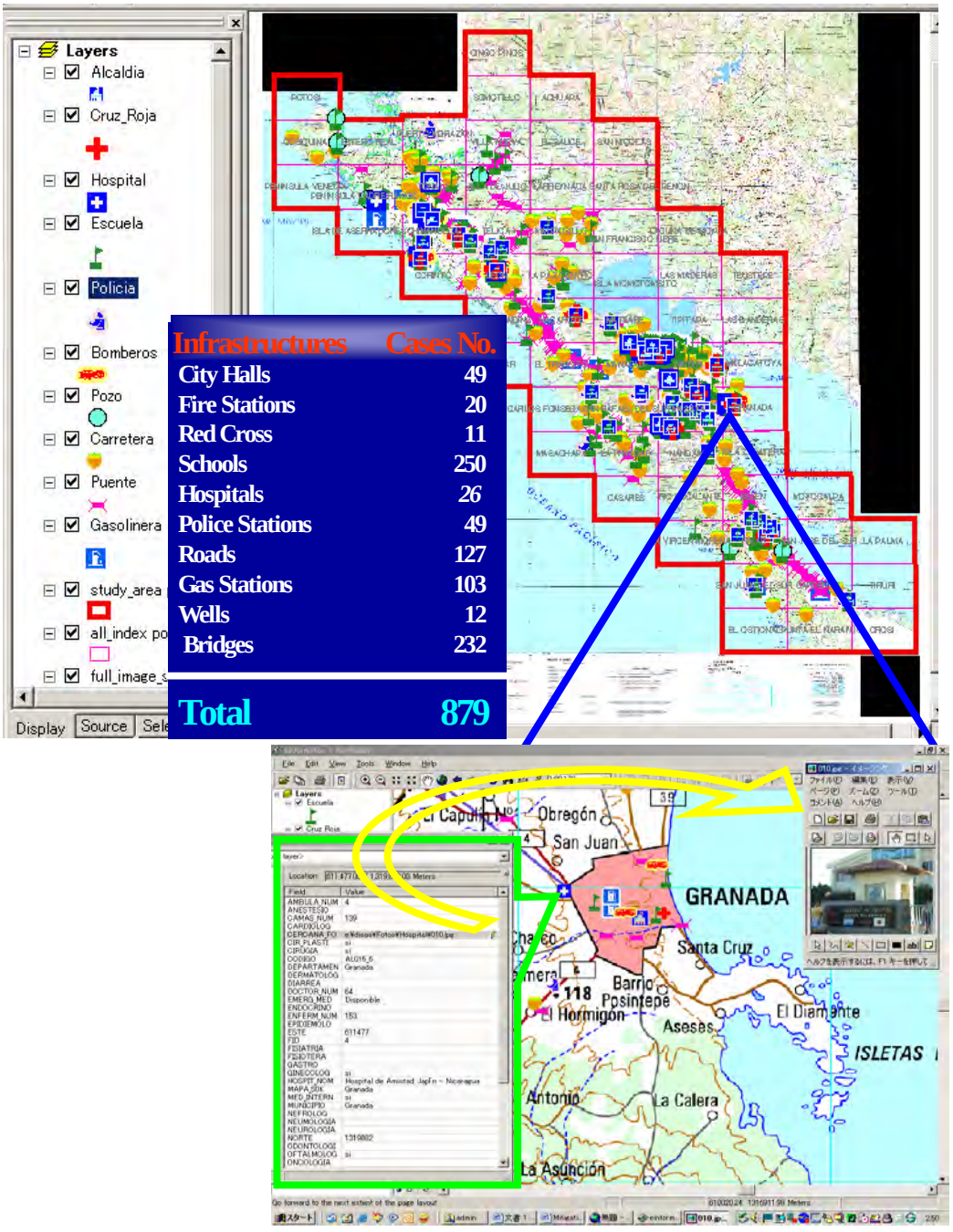

Figure 2-4 GIS Database of Infrastructures for Disaster Mitigation

Various types of basic information on infrastructures related to disaster mitigation have been organized as database files and then inputted into ArcGIS. All disaster mitigation related infrastructures have been symbolized, and a legible and appealing display system has been designed to show detailed information of each feature along with its images when it is clicked. Recently mapped 1/250,000 scale Topographic Raster Maps provided by INETER have been used as background in the display system. The information files are in the ArcGIS format so that the files can be used in INETER. And at the same time, for those who do not have access to ArcGIS, their PMF (Portable Map Format) format has been prepared which can be opened using ArcReader Product of ArcGIS. This product is freely downloadable from the ESRI (USA) Internet web site.

2-5 Earthquake Hazard Map

Maps showing the peak ground acceleration (PGA) simulated for following five (5) scenario earthquakes among three categories of Scenario Earthquakes posturated for Managua City Region are prepared:

1) Earthquake by Active Fault
   - Aeropuerto Fault
   - Cofradia Fault
2) Volacanic Earthquake
   - Volcano Apoyoque
   - Volcano Masaya
3) Probabilistic Earthquake
   - 100 Year Return Period

Source parameters of these earthquake and applied attenuation formulae are also described in the maps.

In order to understand the concept of PGA, general descriptions of seismic intensity (MMI) in relation with the PGA are also described. Figure 2-5 shows an example of the map.

Figure 2-5 Hazard Map of Aeropuerto Fault Earthquake

2-6 Volcanic Hazard Map

Following three types of hazard maps were prepared regarding the phenomina of lava flow, a pyroclastic flow, volcanic bomb, pyroclastic fall, and lahar.

Map 1: Only a lava flow is displayed. The geological map was displayed together with the lava flow as basic material to supplement understanding on volcanic hazard. (A0)

Map 2: The pyroclastic flow and lahar are overlaid and the distribution of volcanic bombs is displayed. (A0)

Map 3: Only tephra fall is displayed. (A0)

For better understanding on volcanica hazard, the geological maps are displayed in the volcanic hazard areas. The geological maps, shown in Figure 2-6, were prepared during the Study.

The map 2 is shown in Figure 2-7. At the top of the map shows the hazard cone of influence by the pyroclastic flow, and the bottom part shows the influencing areas by volcanic bomb. With the explanation, the disaster photographs of a phyroclastic flow which took place in in Fugendake, Japan in 1991 to facilitate the written explanation. For volcanic bomb, the ballistic orbits of ejecta are included schematically to facilitate images of volcanic bombs.

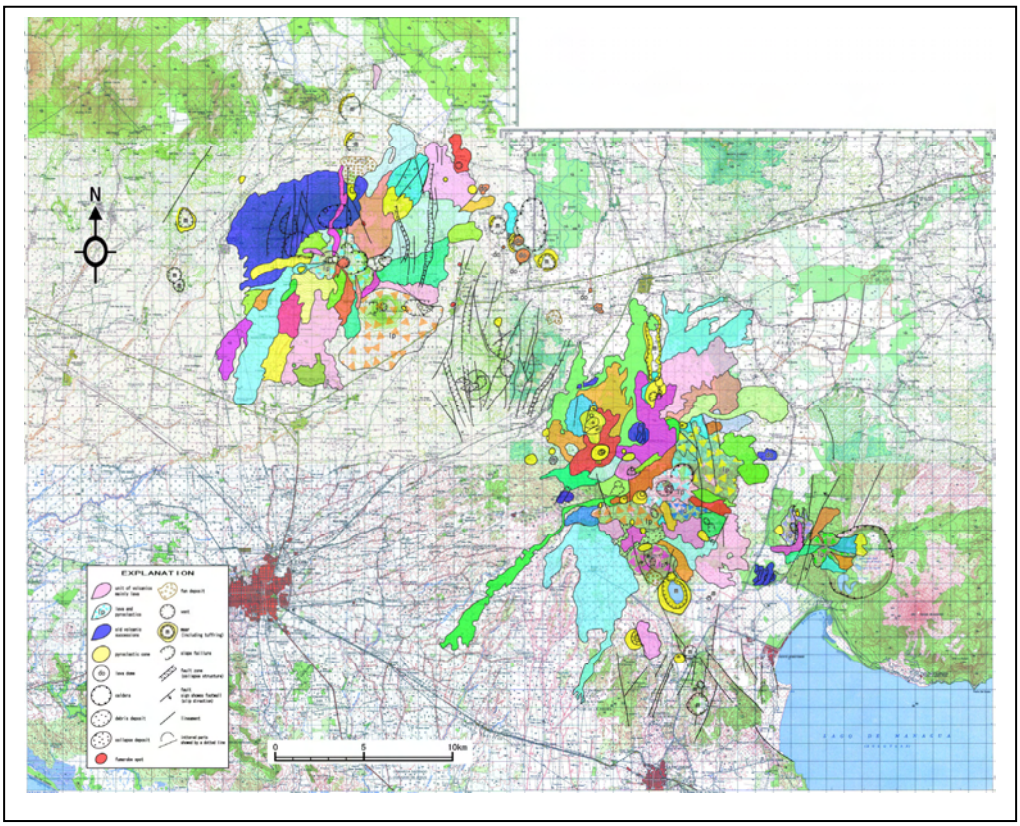

Figure 2-6 Geological Map of the Target Region in Map 1

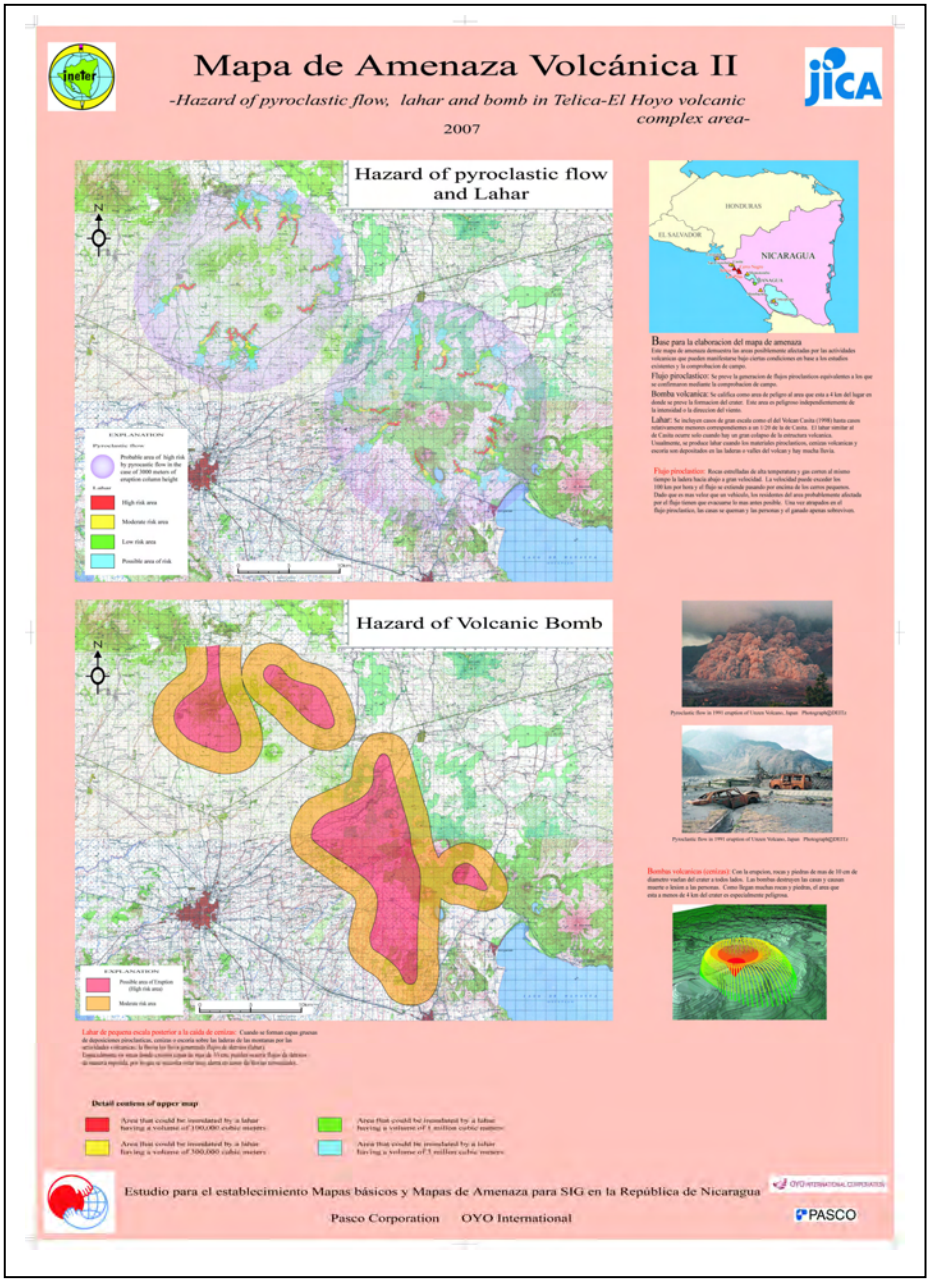

Figure 2-7 Hazard Map 2 of Pyroclastic Flow, Lahar and Bomb