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CHAPTER II

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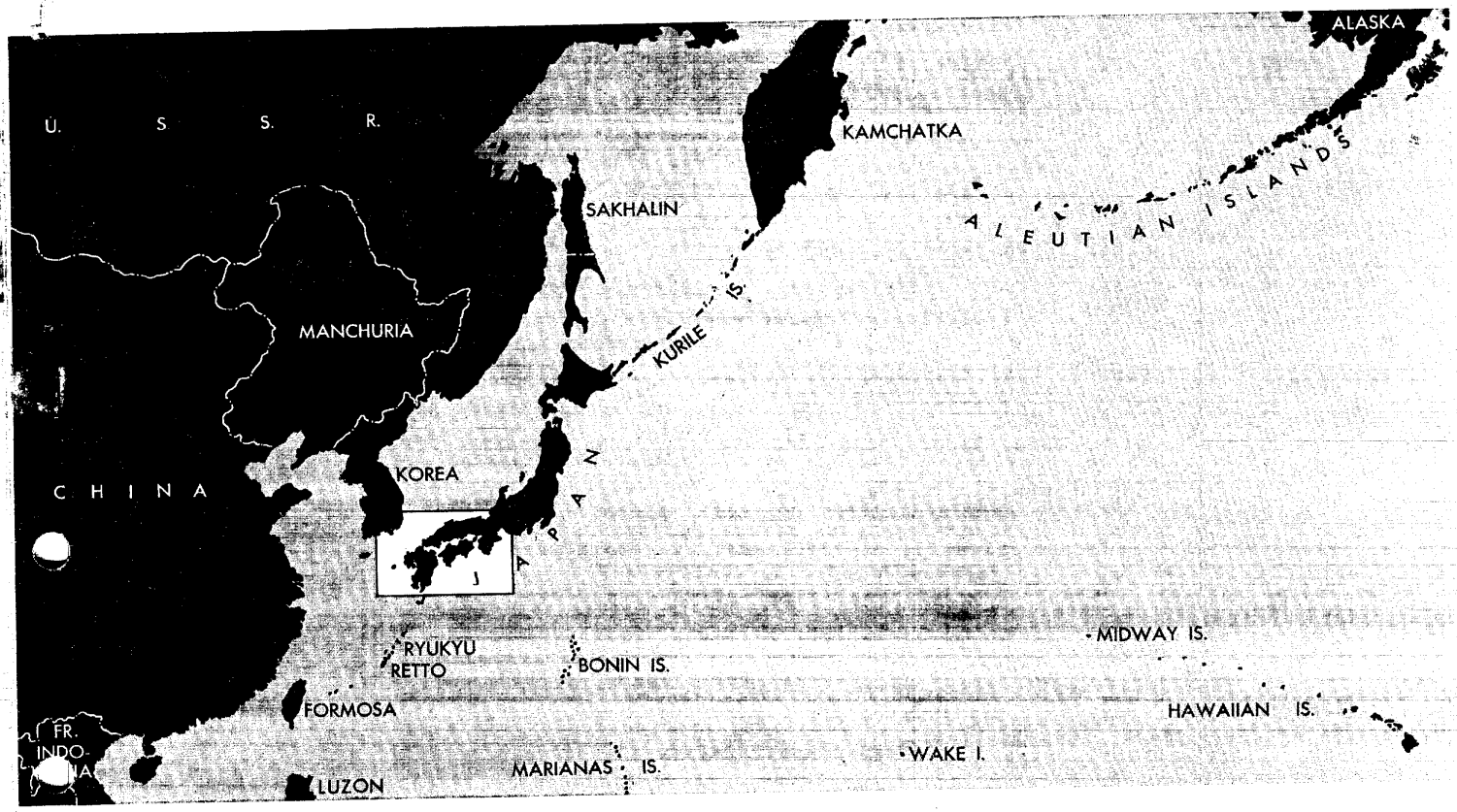

JOINT ARMY-NAVY INTELLIGENCE STUDY

OF

SOUTHWEST JAPAN:

Kyūshū, Shikoku, and Southwestern Honshū

MILITARY GEOGRAPHY

AUGUST 1944

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Chapter II

MILITARY GEOGRAPHY

20. Introduction

This chapter describes the terrain of Southwest Japan, emphasizing the influences such terrain would have on military operations. The principal topics discussed are relief, drainage, soil trafficability, and vegetation. Because of the diversity of the terrain, particularly relief, in Southwest Japan, the topical paragraphs which follow, with the exception of drainage, are treated regionally. The regions (FIGURE II - 107) have been set up in 3 rough categories:

AREAS IN WHICH MOVEMENT IS LEAST DIFFICULT. This type of region includes plains and associated basin and valley networks more than 5 miles in extent. Movement to most parts is over low grades, less than 10%. In the uplands which surround the tributary valleys and basins there are many commanding heights which overlook the lowland strips. Passes in these highlands are generally below 1,500 feet elevation.

AREAS IN WHICH MOVEMENT IS DIFFICULT. These regions consist of many basins and valleys but are without large plains. In some places the valleys form complete nets. Most of the area has slopes exceeding 30%, but some routes with less steep slopes are available. These routes are few in number, are restricted, and have many commanding heights. Passes are generally above 1,500 feet.

AREAS IN WHICH MOVEMENT IS VERY DIFFICULT. Rugged uplands predominate, with only single or short disconnected valley and basin routes available. Nearly all of the area has slopes in excess of 30%. Passes are generally above 1,500 feet.

A brief summary of the terrain characteristics of the entire area is given in CHAPTER I, TOPIC 2. Somewhat more detailed information can be obtained in the "A" or general sections of TOPICS 21, 22, 23, 24, 26, and 27 which follow. TOPIC 25 is a summary table giving the bare essentials of the terrain for each terrain region and sub-region.

Much detailed terrain information may be derived by careful use of the hypsometric map (PLAN 38), the slope maps (PLANS 39 and 40), and the vegetation maps (PLANS 41 and 42). The slope and vegetation maps contain a detailed natural drainage pattern. Canals and irrigation ponds are not shown on these maps, but can be located on individual Japanese General Staff topographic maps, scale 1:50,000. Additional textual descriptions of certain areas can be obtained from the sources listed in Paragraph 28, and from other chapters, particularly Chapters IV, VII, and IX.

21. Relief

A. General.

The relief of Southwest Japan* is characterized by great variety of landforms and complex arrangement. Most of the area has rugged or steep-sided block uplands, difficult to penetrate. Scattered among and at the borders of these uplands are small basins or coastal lowlands. These lower lands contain the main settlements, and are the main military objectives in Southwest Japan. Most of these lowland pockets are protected from surface attack by great outer barriers of highland. Only those of southeastern Kyūshū, southern Shikoku, and southern Honshū east of the Kii-hantō (peninsula) are exposed to direct amphibious attack from the Pacific. The Nagoya Plain of Honshū is the largest of these exposed lowlands, but is somewhat protected by the shallows of Ise-wan (bay), and the hills which overlook the mouth of the bay. East of Nagoya, the Hamamatsu coast is entirely exposed. Because of the ruggedness of the uplands and the small size of the scattered lowlands, there is only limited room for deployment; cross-country movement is difficult everywhere except on the larger plains. Even on the plains, however, mobile operations are handicapped seriously by the muddy rice fields, and the numerous streams and farm hamlets. Most valleys and other natural passages between the larger lowlands are difficult to traverse, and have numerous places where strong defense lines could be established.

The major relief features of Southwest Japan are arranged roughly in 3 parallel lines which extend southwest - northeast following the main trend of this part of the Japanese Islands. The 2 outer lines are predominantly uplands; the inner line is largely a series of basins and small plains. Sections of the northern and southern uplands, together with the central part of the lowland belt, have sunk below sea level thus forming the Inland Sea and separating Kyūshū and Shikoku from Honshū. East of the Inland Sea, another low break in the southern upland belt is occupied by Ise-wan. The eastern and western sections of the interior belt of lowlands, in northern Kyūshū and west central Honshū, consist of numerous small coastal plains and basins separated by low but rugged uplands. These basins are the most extensive lowlands in Southwest Japan and are densely settled and intensively developed. Small coastal plains are scattered along the outer flanks of the 2 great upland belts, and a few small basins are found within the highlands. Few of these lowlands are interconnected by easily passable natural routes. Landforms within the upland belts vary from low rugged hills of 600-1,000 feet to plateaus and mountains of 2,500-5,000 feet, with some peaks reaching 8,000-10,000 feet (PLAN 38). Most hills and mountains are relatively steep-sided and sharp-crested although some, especially in central Kyūshū, have smoother surfaces of lava or volcanic ash. Almost all uplands are forested, or are in grass and scrub. All lowlands and most valleys and flattish uplands are intensively cultivated. Wet rice fields occupy a large part of the crop area on the plains and in the larger valleys.

In the following sections the terrain regions of Southwest Japan are grouped into 4 divisions (FIGURE II - 107): Kyūshū, Shikoku, West Central Honshū (east of line from Kōbe to Tsuruga) and Western Honshū (west of the Kōbe-Tsuruga line). Within each of these divisions the major regions are described in an approximately counter-clockwise order. Each major region is first treated as a whole, then the more critical areas are discussed in greater detail.

B. Relief regions: Kyūshū.

Kyūshū and its western fringe of smaller islands form a quadrangle 200 miles north - south by 120 to 160 miles east -

* There may be some difference between spellings of place names in the text and on maps. Correct spellings are given in the Gazetteer, Chapter XV.

west (FIGURE II - 108). On the northwest the Gotō-rettō (chain) extends an additional 35 miles westward. Central Kyūshū is occupied by rugged barrier mountains of moderate height which are part of the southern upland belt of Southwest Japan. This highland belt extends southwest - northeast across the island between 32°N and 33° N. To the north and south of the central mountains, small plains and basins alternate with low rugged mountains, hills, and steep-sided plateau blocks. Most of the small plains are interconnected by narrow lowlands or relatively smooth upland strips, but no easily passable natural routes extend north - south across or around the central mountains. Several sections of the central mountains, and large parts of the regions to the north and south are covered with a thick layer of volcanic ash. The ash cover smooths some slopes, but even small streams cut deep, steep-sided valleys in the light material. These numerous valleys greatly increase the difficulty of cross-country travel.

(1) Southern Kyūshū Lowlands and Highlands.

The Southern Kyūshū Lowlands and Highlands lie south of a line extending northeast from the Sendai-kawa (river) on the west coast to Nobeoka on the east coast (FIGURE II - 107). Within the regions are 3 large lowlands, described in some detail below, and many small basins. The 3 large lowlands are the Makurazaki-Kushikino Coastal Plain on the west, the Ariake-wan (bay) - Miyakonojō Lowland on the south, and the Miyazaki-Nobeoka Coastal Plain on the east (FIGURE II - 107). These large lowlands are from 3 to 10 miles wide and 20 to 50 miles long; they are connected by a series of fairly level but narrow and winding valleys and flat ridge tops which form an irregular line around the northern end of Kagoshima-wan (bay) and eastward through the Miyakonojō Basin to the Miyazaki Plain. The passageways between lowlands are ½ to 5 miles wide, and 10 to 50 miles in length.

Upland areas of Southern Kyūshū vary in form but are mostly low, rugged mountains and hills, and flat-topped, steep-sided ridges and plateau blocks. Elevations of mountains and plateaus are from 1,500 to 2,500 feet, but a few peaks, mostly volcanoes, reach 3,500 to 5,500 feet (FIGURE II - 1). These upland areas, although numerous, are individually small, usually less than 25 miles in extent. Some of the uplands consist mostly of granite and have a rounded appearance.

FIGURE II - 1. *Kirishima volcano. Southern Kyūshū.* Kirishima volcano, rising above the plateau of Southern Kyūshū. Note bare slopes in background and scrub vegetation in foreground. Dry stream bed in middle foreground. March 1914.

A layer of volcanic ash, 10 to 100 feet thick, covers much of the western part of Southern Kyūshū. Railways and roads are cut down 6 to 20 feet into this loose material and the cuts have almost vertical side walls. Other soils on the uplands are rocky with some clay on the more nearly level areas. The non-ash lowland soils, found chiefly in the east, are largely loam and clay.

Vegetation on the lowlands is a mixture of wet-field rice, dry-field crops, and strips of woodland. The uplands have patches of dry-field crops on the lower flatter areas, and have forests of mixed broadleaf-needleleaf trees on the remainder. Peaks above 4,000-5,000 feet have some bare slopes. Undergrowth is dense in some of the forested sections.

(a) Makurazaki-Kushikino (Satsuma) Coastal Lowland. This lowland belt consists of 2 small coastal plains joined by 2 low narrow valleys. One plain extends 11 miles east from Makurazaki town along the south coast of the Satsuma-hantō (peninsula). The other plain extends 24 miles south from Kushikino village along the west coast of the peninsula. The connecting valley sections, north of Makurazaki, are only 6 miles long (Route 11).* The southern, or Makurazaki, Lowland is triangular, and varies from 2 to 6 miles in width; it is flattish to gently rolling. The Kushikino Plain, farther northwest, is long and narrow. It has scattered sand dunes along the coast; at its northern end hill spurs approach to within a few hundred yards of the sea. Both plains are in crops, chiefly wet-field rice on the western plain and dry-field crops on the southern. Inland, separating the 2 lowlands from Kagoshima-wan (bay), are rugged hills 300-800 feet high; these are penetrated by narrow winding valleys (ROUTE 10). Surface materials on the plains are chiefly volcanic ash and clay loam; on the hills are clay and loose rock. Hill lands have a dense forest of mixed broadleaf and conifers. The plains and valleys have patches of woodland among the cultivated fields and on the sand dunes.

Cross-country movement is relatively easy across the plains except on the rice fields when they are flooded from May to August. The dune areas along the west coast, and the hills back of the plains offer poor possibilities for movement due to the steep slopes and loose sand-ash soils.

(b) Ariake-Miyakonojō Lowland. The main parts of this area are 2 small lowlands lying respectively west and north of the head of Ariake-wan (bay) and connected by narrow valleys. The western or Ariake Coastal Plain is nearly square, 10 by 10 miles. From its northeastern corner narrow valleys lead northward through low hill land to the Miyakonojō Basin which is 6 miles wide and 10 miles long (ROUTE 1). Both lowlands have floors which consist of a series of flat terraces. Major streams have cut valleys 20-100 feet deep across the terraces thus dividing them into large level blocks which average 1 to 2 miles in width. These flat areas are in crops, chiefly wet-field rice in the Miyakonojō Basin and dry crops on the Ariake Plain. Deployment and movement is easiest on the level areas in the lowlands from late August to early May, when the rice fields are not flooded. Patches of woodland are scattered throughout the plains, and dense forest covers the surrounding

* The index to natural routes is shown in FIGURE II - 53. Details for individual routes are given in FIGURES II - 54 through II - 106.

hills and low mountains. Although part of the Ariake Plain has clay-sand soils, most of it, as well as all of the Miyakonojō Basin and the uplands to the north and west, are mantled with a deep layer of loose, medium-textured volcanic ash.

The western gateway of the Ariake Plain is difficult to use because a narrow, 1 to 4 mile, belt of hills separates the lowland from the east shore of Kagoshima-wan (bay). Low narrow valleys leading from the plain to the bay are the only means of exit, because the hills are 200 to 500 feet high and have steep sides covered with loose ash. The best western approach to the Ariake-Miyakonojō Lowland is by way of the flat-topped, ash-covered ridge which occupies most of the area between Miyakonojō Basin and the head of Kagoshima-wan (ROUTE 2). The central 4 miles of this 12 mile passageway is obstructed by rugged hills, 500 to 1,000 feet high. Several deep narrow valleys cross the hills. Movement is easy on the flat ash ridges but is moderately difficult in the winding valleys of the hilly areas. Many parts of the valleys are within machine gun range of adjacent hills. A northeastern gateway connects the Miyakonojō Basin and the south end of the Miyazaki-Nobeoka Coastal Plain (ROUTE 1). Across this route is a 10- to 12-mile belt of low, moderately steep, heavily forested, ash-covered hills. These rise 600 to 700 feet above the valleys. The railway and most roads avoid the deeper valleys and cross the hill divides by means of tunnels or deep cuts in the volcanic ash. Cross-country movement is difficult.

(*c*) *Miyazaki-Nobeoka Coastal Plains.* These coastal plains are almost adjacent to each other, and extend along the southeast coast of Kyūshū from 31°50′N to 32°35′N, nearly 52 miles. The 2 plains are separated by a 12-mile belt of low hill land north of Mimizu village, 32°20′N (ROUTE 1). Each plain has good beaches, level areas covered with wet rice fields, and valleys leading inland to difficult passes in the central mountains (ROUTES 3 and 4). Thus, although the plains are accessible, and are large and flat enough to permit limited deployment and cross-country movement, they do not have good outlets inland across the Central Kyūshū Mountains.

The Miyazaki Plain is triangular, 33 miles long, and from 5 to 6 miles wide in the south, and ½ to 1 mile wide in the north. Its floor consists of a series of flat terraces ½ to 1½ miles wide and aligned north - south, the highest terraces being farthest inland. The terraces are cut into 1- to 2-mile blocks by streams from the highlands on the west. The wider stream valleys and most of the flat blocks are covered with paddy fields which are flooded most of the time from May to August. Edges of terraces and hill spurs which project onto the plains are covered with mixed grass and woodland. Farther inland are low mountains, 1,000 to 2,500 feet in elevation, and covered with dense forest. Soils in the Miyazaki Plain are chiefly loam and clay on the flats, with sandy and rocky soils on the hilly areas.

The Nobeoka Plain is a small triangle 3 by 7 miles, composed of the combined deltas of the Gokase-gawa (river) and the Kita-kawa. On the deltas are numerous flat wedge-shaped areas, ½ to 1 mile wide, which are separated by the lower channels of the rivers. Wet rice fields occupy almost all the flat areas; small grassy glades and dense woods occupy the remaining delta land and the surrounding hills. Soils, chiefly clay and clay loam, are sticky when wet.

The southern outlet, between the Miyazaki Plain, and the Miyakonojō Basin has been discussed in connection with the latter lowland (Route 1). The only western outlet of the Miyazaki Plain which is even moderately passable is the Hitotsuse-gawa valley which connects with the Hitoyoshi Basin in the Central Kyūshū Mountains (ROUTE 3). The Hitotsuse-gawa valley is very narrow, 500-800 feet, and has many sharp bends. Commanding heights rise 200 to 1,000 feet above these turns. Another route follows the winding Gokase-gawa valley westward from Nobeoka. This route is similar to the Hitotsuse-gawa valley but is slightly wider, 1,000 to 1,200 feet (ROUTE 4). Northward from Nobeoka the narrow, irregular Kita-kawa valley leads through low mountains; it affords a poor passageway to Saeki on Saeki-wan (ROUTE 1). The railway which follows this route uses numerous short tunnels in crossing the rougher part of the uplands.

(*2*) *Central Kyūshū Mountains.*

This region consists of a southern belt of moderately high, rugged mountains, aligned southwest - northeast across the island between 32° and 33°N, and a northern area of slightly lower and less rugged plateaus and hills, which extend almost to the northern end of the island (PLAN 38). Although the uplands are not high, averaging 3,000 to 4,000 feet in the south and 1,800 to 3,000 feet in the north, they are serious barriers to cross-country movement. Even the best natural passageways through the mountains have many places where strong defensive positions could be established. No easy, or only moderately difficult, natural routes entirely cross the mountains from northwest to southeast. One moderately difficult passageway crosses the upland from west to east by way of Aso-zan (mountain) crater and the Ono-gawa (river) valley (ROUTE 5). This passageway follows the dividing line between the mountainous section and the rugged plateau and hilly section.

Within the southern, rugged mountain section of the Central Kyūshū Mountains deployment and cross-country movement are extremely difficult except in the isolated Hitoyoshi Basin on the upper Kuma-gawa. Almost all conditions of the terrain handicap these operations. Slopes everywhere are steep. Except in the Hitoyoshi Basin, flattish areas are few and tiny. Stream valleys are crooked and narrow; and many commanding heights rise 1,000 to 1,600 feet above the valley bottoms. Most peaks reach 3,500-4,000 feet, and a few, mostly volcanoes, reach 5,000 feet. The southwestern and northern flanks of the southern rugged mountains are covered with a deep, 50 to 100 foot, layer of loose volcanic ash. Other surface materials are chiefly loose rock on the highest slopes and rock mixed with clay on the lower slopes. A dense forest with heavy undergrowth occupies all but the northern slopes and highest areas, as well as the area around Aso-zan (mountain) where coarse grass grows on the fresh ash (FIGURE II - 2).

The Hitoyoshi Basin is an oblong depression which trends roughly east - west along the upper Kuma-gawa (river). The basin is 7 miles wide and 18 miles long, but only the 3- to 4-mile-wide belt south of the river has a flat surface. Here the clay and loam soils are planted chiefly with wet-field rice, but there are small areas used for dry crops. Tributary streams have cut shallow valleys in the basin floor, dividing it into flat blocks

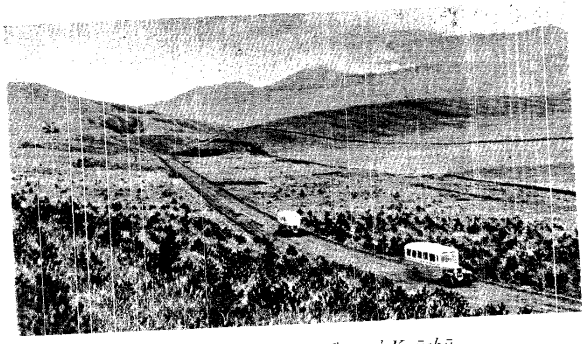

FIGURE II - 2. *Aso-zan, Central Kyūshū.*
Much of the land near Aso-zan is suitable for military operations; slopes are low and vegetation is mostly coarse grass.

FIGURE II - 3. *Aso-zan, Central Kyūshū.*
Cultivated land at the foot of Aso-zan.

measuring 1 to 2 miles across. Landing strips might be constructed on these blocks. The lower Kuma-gawa, below the outlet from the basin, runs through a deep, narrow, winding valley which has numerous commanding heights and extreme narrows (ROUTE 3).

The Aso-zan - Ono-gawa (river) passageway across the Central Kyūshū Mountains is the least difficult route through the upland (ROUTE 5). The western part of the route, leading into and through the crater of Aso-zan, is level or gently sloping and is fairly wide (FIGURE II - 2). This section is well-drained, except for the rice fields on the crater floor. These rice fields are flooded from June to August and are muddy all the year (FIGURE II - 3). The steep grade up the east wall of Aso-zan crater is very difficult for several miles. The long outer eastern slope of the crater is gentle, but is covered with fresh loose ash on which a coarse grass grows. Many valleys are cut deeply into this ash slope but are parallel to the route. This drainage pattern blocks extensive deployment on either side of the route, but does not interfere seriously with east - west movement along the route. East of the outer ash slopes of Aso-zan, the Ono-gawa valley (FIGURE II - 4) extends northeastward to Beppu-wan (bay). The Ono valley, only moderately wide at the bottom, is fairly deep, and winding. Several strong defensive positions may be set up facing either up or down stream (FIGURE II - 5). These could take advantage of commanding heights and of forest cover. Most of the Ono valley slopes and the surrounding hills are covered by a deep ash soil. Coarse grass is the chief type of vegetation. Rice fields and woodlands occupy most of the lower Ono valley and the small Beppu coastal plain. A railway follows the Aso-zan - Ono-gawa route all the way, and a road parallels the railway.

The northern arm of the Central Kyūshū Mountains is a series of broken lava plateaus of moderate height, 1,500 to 3,000 feet, with scattered volcanic peaks which reach 4,000 to 5,000 feet. Most valleys are cut down 800 to 1,000 feet below the adjacent plateau masses. Few of the plateau blocks have flat tops more than a half mile in extent; most of these areas have been reduced to valley slopes. The valleys are winding and narrow at the bottom (FIGURE II - 6). Movement along the valleys is difficult and there is no room for deployment within the uplands. At the northeastern edge of the region are narrow coastal plains or sills. Pockets of fairly level alluvium have accumulated on these narrow plains where rivers come down to Beppu-wan (bay) and to the Suō-nada (sea) coast

FIGURE II - 4. *Beppu, Central Kyūshū.*
Beppu is located on a small plain backed by steep hills and mountains. The Ona-gawa valley leads from this plain southwestward through the mountains to Aso-zan. Looking NW. 1935.

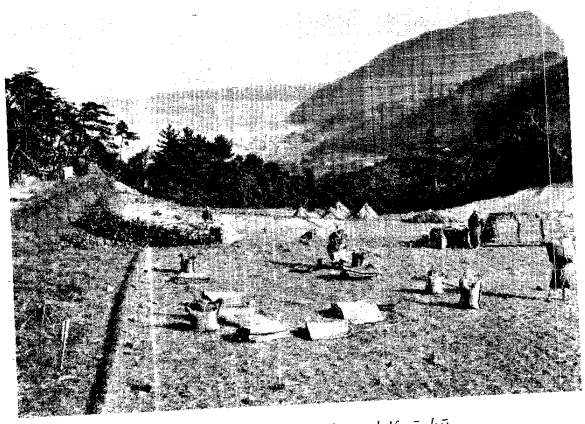

FIGURE II - 5. *Beppu, Central Kyūshū.*
Looking SE. Rice field on upland behind Beppu. Enemy positions established on such terraces would be difficult to reach. Note abrupt coastline in background.

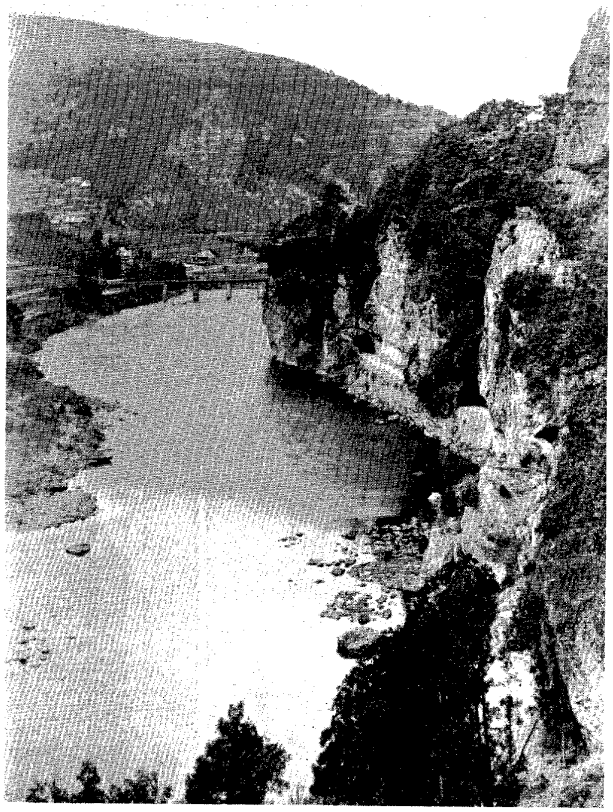

FIGURE II - 6. *Yabakei, Central Kyūshū.*
Typical valley route in Kyūshū. Such routes can be blocked easily and the road destroyed. Note highway tunnels at right, and railroad bridge in middle background.

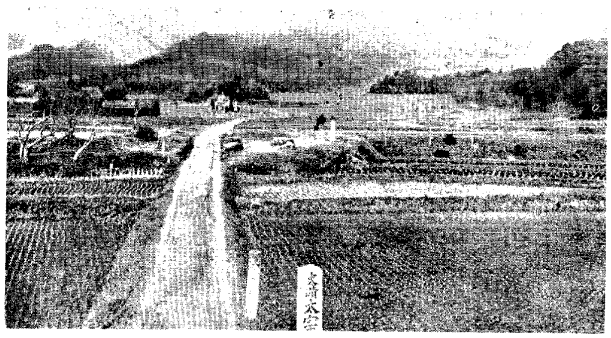

FIGURE II - 7. *Dazaifu, Northern Kyūshū.*
Near Entsukaichi, Kyūshū; showing terrain on the best route between Fukuoka and Saga.

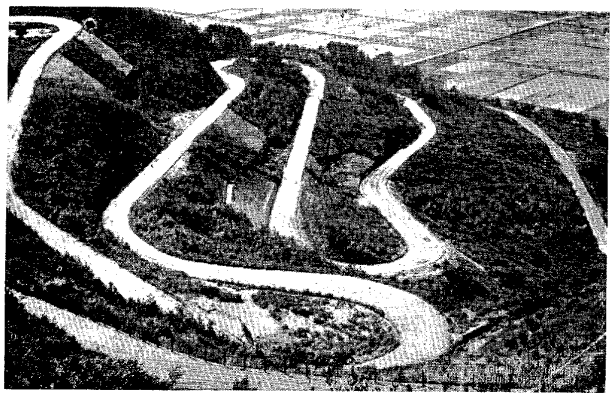

FIGURE II - 8. *Karatsu, Northern Kyūshū.*
Road mounting steep slope in Northern Kyūshū. Note flooded paddy fields in background, and sparsely forested slopes.

near Nakatsu and Nagasu. Each compartment of these tiny coastal lowlands is less than 5 miles across and is broken by stream channels and ditches leading to the wet rice fields. Moderately heavy forest covers most of the area which is not in crops, although a belt of grassy uplands extends northeastward from Aso-zan to Beppu-wan. The southern part near Aso-zan (mountain peak) has a deep volcanic ash soil. Elsewhere rocky clay soils prevail in the uplands, and clay and loam in the larger valleys and on the coastal sills.

(3) Northern Kyūshū Lowlands and Highlands.

This is a long narrow region, 100 by 25 miles, lying north and west of the Central Kyūshū Mountains and extending northeast - southwest from Shimonoseki-kaikyō (strait) to the head of Yatsushiro-wan (bay). Dominant types of relief are low rugged mountains and hills, and flattish lowlands.

The most significant terrain areas are a series of interconnected lowlands aligned north - south through the center of the region and flanked on the northeast and northwest by low but rugged uplands. Short but strategic valleys penetrate the northeastern upland; and narrow but equally significant coastal lowlands separate it from Shimonoseki-kaikyō (strait). The larger lowlands are the Kumamoto and Saga Coastal Plains on the south, and Fukuoka Plain facing Fukuoka-wan (bay) on the north.

The Saga and Kumamoto Lowlands are exceptionally large for Kyūshū. Deployment is possible and cross-country movement is relatively easy within the lowlands and along the several passageways which connect them. These southern plains are roughly quadrilateral; the Kumamoto Plain measures 26 by 11 miles and the Saga Plain is 31 by 16 miles. The Saga and Fukuoka Lowlands are joined by a corridor at Futsukaichi (ROUTE 10b and FIGURE II - 7). The Fukuoka Plain and the Fukuoka-Saga corridor are connected with the narrow Yawata-Shimonoseki Coastal Lowland and the Onga-kawa (river) basin by short but steep and crooked routes across spurs of the northeastern highland (ROUTES 7 and 10). These routes follow flat valleys most of the way but can be blocked easily in the rugged sections.

The northwestern or Seburu upland is a low rugged broken hill and mountain land. Its numerous valleys are narrow and crooked. From them steep slopes rise to sharp crests, 1,500 to 3,000 feet high. Many roads and trails cross the upland north - south but all have sharp bends and steep grades, and may be blocked at many points (FIGURE II - 8). Most of the surface material in the northwestern, or Seburu, upland is clay mixed with sand and loose rock. The vegetation is dominantly forest in the eastern half of the upland and coarse grass in the west. Wet-field rice and some dry crops occupy the valleys and small basins.

The northeastern, or Chikuhō upland, consists of irregular

and widely spaced ranges of low mountains between which are lower, scattered ranges of hills. Many flat-bottomed valleys deeply penetrate, but do not cross, the hill belts. Elevations reach 600 to 1,000 feet in the hills, and 1,600 to 2,500 feet in the mountains. Most mountain slopes are steep, but the hillsides have only moderate inclinations. Both these types of terrain have rocky, sandy soils and forest cover with scattered grassy areas. Valleys have clay and loam soils, which are intensively cropped. Wet-field rice predominates. Deployment within this area would be limited to the broader valleys, such as the upper Chikugō and lower Onga, which are 1 to 3 miles wide. Cross-country movement is difficult on the sloping, forested, high ground, but is relatively easy in the valleys, particularly when the rice fields are driest, from October to late June or July. The broader valleys do not extend entirely across the region. Upper sections of the valleys, near passes, although nearly level and straight, are also narrow. Commanding heights rise 600 to 1,000 feet above these narrow valleys.

(*a*) *Saga Plain.* This is the largest lowland on Kyūshū Island. It extends 31 miles northeast - southwest, from the Futsukaichi corridor past Saga city to the head of Ariakeno-umi (sea), and 16 miles northwest - southeast along the east side of Ariakeno-umi. Inland near Kurume city the plain narrows to 6 miles, but widens to 12 miles farther northeast.

The plain is nearly flat, and is divided into ½- to 2-mile blocks of wet rice land by a complex grid of stream channels and artificial ditches. The larger ditches and streams are significant barriers at all seasons, and would have to be bridged in order to handle most types of field equipment. On the rice paddy fields between these barriers deployment and cross-country movements are easiest from September to June when water and mud are at a minimum. Operations also would be influenced somewhat by the small settlements of farm dwellings which are scattered over the plain at intervals of ½ to ¾ mile. Each hamlet contains 10 to 40 dwelling units (house with attached buildings) made chiefly of wood and averaging 15 to 20 feet in height.

Chief land gateways to the plain are the Futsukaichi corridor to the Fukuoka Plain on the north, and winding valleys through low but rugged hill land southward to Kumamoto and westward to Sasebo (ROUTES 9, 10, 10a, and 10b). The Futsukaichi corridor has been discussed under the Northern Kyūshū Lowlands and Hills Region (ROUTE 10b). The southern gateway consists of a narrow coastal plain or sill, along Ariakeno-umi (sea), and 3 alternate inland routes through rugged hills. The length of these routes varies from 30 to 35 miles. The coast route deviates inland just north of Kumamoto city to avoid an isolated mass of low, 2,000 feet, mountains which reach the coast at that point (ROUTE 10a) North of this upland mass the coastal plain is ½ to 1½ miles wide, flat, covered with wet rice fields, and crossed by many streams (FIGURE II-9). The inland routes follow valleys which vary in width from 400 feet to 2 miles (ROUTE 10). The narrow sections of these routes are winding, and a few parts are steep. The adjacent heavily forested heights rise steeply 400 to 1,000 feet above the valleys.

The western outlet of the Saga Plain leads westward across the narrowest part of the plain from Saga to Ushizu and from there extends west 35 miles to Sasebo in Northwestern Kyūshū (ROUTES 8 and 9). The first 12 miles west of Ushizu, as far as Takeo, is along the flat, mile-wide valley of the Rokkaku-gawa. Westward from Takeo the route leads 23 miles through the low but rugged hills of Northwestern Kyūshū.

A second narrow passageway leads northwestward from Ushizu to Karatsu through similarly rugged country.

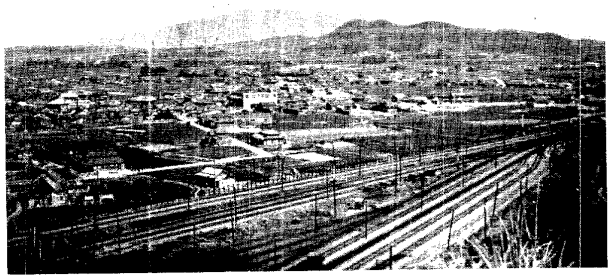

FIGURE II-9. *Barumanda, Northern Kyūshū.*
Looking E. Part of coastal route between Saga and Kumamoto.
Note low hills rising out of plain at right.

(*b*) *Kumamoto Plain.* This lowland extends 25 miles north - south and 11 to 12 miles east - west. North of Kumamoto city it is separated from Ariakeno-umi (sea) by a southern extension of the rugged lands between Saga and Kumamoto Plains. South of Kumamoto the plain faces Ariakeno-umi for 6 miles. South of Udo village a 5 mile wide coastal plain forms a short, 18 mile, corridor along the east side of Yatsushiro-wan (ROUTE 10). This Yatsushiro corridor ends abruptly against the northern flank of the Central Kyūshū Mountains.

Yatsushiro corridor and the coastal delta area southwest of Kumamoto city are flat and covered with a grid of wet rice fields separated by streams and drainage ditches, as in the Saga Plain to the north. Near Kumamoto, however, the streams are even more numerous, and the flat areas are only ½ to 1½ miles across. Farm hamlets are ½ to ¾ mile apart as on the Saga Plain. Soils of the southern Kumamoto Plain are sandy clay with much volcanic ash intermixed. The central section of the plain, north and east of Kumamoto city, is part of the long, gentle* western slope of Aso-zan (mountain) (FIGURE II-2). This gently sloping, ash-covered part of the plain is cut into a series of almost flat-topped, fan-shaped segments by the broad shallow valleys of streams flowing down Aso-zan. The valleys are ¼ to 1 mile wide and their flat bottoms are in wet-field rice. Much of the volcanic ash surface of the dry flats between streams is covered with trees, but other parts of these interstream areas are in grass and dry-field crops and are suitable for cross-country movement. Almost all the farm hamlets are found in or near the shallow valleys. At the northern end of the Kumamoto Plain wet rice fields occupy a large area in the broad valley of the upper Kikuchi-gawa (river). Flat segments of ash-covered plain which lie between branches of the river are planted with trees and dry-field crops.

The only short and easily traversed gateway to the Kumamoto Plain is the multiple route north to the Saga Plain (ROUTES 10 and 10a). This route has already been discussed in connection with the Saga Plain. The only other approaches to the Kumamoto Lowland are 2 mountain valley and basin

* See slope scale on PLAN 39.

routes across the rugged Central Kyūshū Mountains. These 2 difficult passageways are the Ono-gawa - Aso-zan route from the east and the Kuma-gawa - Hitoyoshi Basin route from the south (ROUTES 3 and 5). Both have been treated in connection with the Central Kyūshū Mountains.

(*c*) *Northeast Coastal Lowlands and Hills.* This narrow interrupted belt of lowlands includes the Fukuoka Plain on the west, and curves around the northern end of the Chikuhō upland to include the small Yukihashi coastal plain on the Suō-nada (sea) arm of the Inland Sea. The lowland strip varies in width from 9 miles at Fukuoka-wan (bay) on the west to an average of ½ to 1 mile at the industrial-urban belt between Wakamatsu and Kokura (in the center) and then widens to 5 miles at Yukihashi on the east. At 2 points, the base of Mojihantō (peninsula) and between Tobata city and the Onga-gawa (river), the lowland lies inland behind the coastal hill ranges. Low hill spurs cut completely across the lowland at several points in the section between Fukuoka-wan and the mouth of the Onga-gawa. To avoid these, the main highway and the railway follow a series of transverse valleys 4 to 5 miles inland (ROUTE 8). The Northeast Coastal region, though small and broken, is important. It contains the largest region of heavy industries in Japan (Yawata-Tobata district); it controls the western, or Shimonoseki-kaikyō (strait), entrance to the Inland Sea; it is one of the nearest points to the Asiatic mainland, in Korea; and its western section has one of the largest groups of good landing beaches in Kyūshū. This is one of the critical areas of Southwest Japan.

The westernmost, or Fukuoka, plain and the easternmost, or Yukihashi, plain are occupied almost completely by wet rice fields. These flat fields are flooded or have deep mud from July to October. The rice field areas are divided into blocks 1 to 2 miles in extent by streams which flow out from the uplands. Most of the lowlands between Fukuoka and Yukihashi are narrow but are covered also with wet rice fields. Exceptions are the sand dune areas on the beaches which have coarse grass or small needleleaf trees, and the built-up urbanized strip between Yawata and Kokura. Lower hill slopes are terraced and occupied by dry-field crops and some irrigated rice; upper hill slopes are in forest with open grassy areas. Soils are mostly clays and clay loams.

Chief land approaches to the North Coastal Lowlands are westward along the Suō-nada coast from Nakatsu and northward through the natural Futsukaichi corridor from the Saga Plain. The approach from Nakatsu is a narrow coastal plain 4 to 5 miles wide, occupied by wet rice and dry crop fields, and cut transversely by many streams from the mountains. A railway and highway use this route (ROUTE 1). The easiest and most used gateway is the Futsukaichi corridor (ROUTE 10 and 10b). This passageway narrows to ¾ mile near Futsukaichi village but widens rapidly north and south to 5 miles. The corridor has a flat floor of loamy soil which is occupied almost completely by wet rice fields (FIGURE II - 7). Two railway lines and 2 highways use the passageway and all pass through Futsukaichi. Hills on either side of the corridor rise 300 to 900 feet within 9 miles. They are covered with grass and some patches of woodland. A highway and a railway turn north from a point near Futsukaichi and cross the hills and low mountains to the upper Onga-gawa valley (ROUTE 10). These routes are much used but do not afford a good military passageway because they have many turns and steep grades in the rugged 10-mile section across the divide. The railway uses several tunnels; one, under the divide, is nearly a mile long.

The only other approach to the North Coastal Lowlands is the road and rail route eastward along the seacoast from Karatsu to Fukuoka (ROUTE 8). A large part of this route is a 1- to 5-mile wide coastal plain covered with wet rice fields, and is similar to the coastal lowland east of the Fukuoka Plain. The chief handicap is a 5-mile section east of Hamasaki. There steep slopes and cliffs rise 300 to 500 feet above the shore. The road and rail beds are cut through numerous rocky headlands. Seven short tunnels are used by the railway in passing this 5-mile section.

(*4*) ***Northwestern Kyūshū Broken Lands.***

This region includes the long irregular peninsula north and west of Ariakeno-umi (sea), and the adjacent islands. The main islands and groups of islands are the Amakusa-jima and nearby islands on the south, the Goto-rettō (chain) on the west, and Iki-shima on the north. The peninsula, with its immediately adjacent islands and its inshore waters, extends 70 miles north - south by 40 miles east - west. The Amakusa group measures 40 miles along the northeast - southwest axis and averages 18 miles in width (northwest - southeast). Similar in orientation, but of less width, is the Goto-rettō, 57 by 11 miles. Iki-shima, 16 miles offshore, is nearly square, 11 miles north - south by 9 miles east - west.

The major landforms in this irregular-shaped region are flat-topped, steep-sided, lava-covered highlands of 800 to 2,000 feet elevation between which are belts of rugged hill lands of only 300 to 600 feet elevation. Many shallow but narrow and winding valleys run through the hill belts, and numerous side valleys cut back into the lava uplands. A few higher peaks, mostly volcanoes, rise above the uplands and reach 3,500 to 4,000 feet. Soils of the valleys and lower slopes are mostly clay and loam; upland soils have more sand and loose rock.

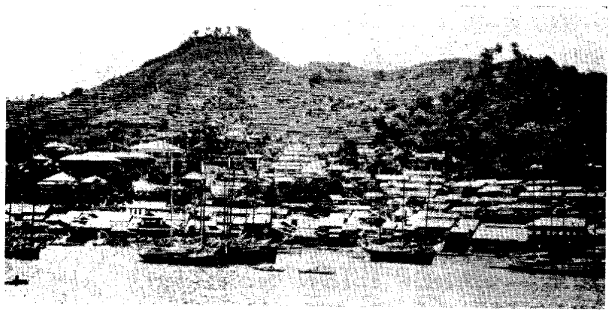

FIGURE II - 10. *Nagasaki, Northwestern Kyūshū.* Terraced hillsides rise steeply from the waters edge in much of the Nagasaki area.

Wet-field rice covers most of the narrow valley bottoms. In many areas wet-field rice also occupies the terraced lower slopes and small flattish areas in the lava highlands (FIGURE II - 10). The rice fields are flooded and are deep in mud from late June until September, and are wet throughout the year. Patches of dry-field crops and large areas of woodland and grass occupy the higher parts of the hill belts and most of the

higher uplands. The highest and steepest slopes in the uplands are in scrub forest or are bare.

Wide deployment is almost impossible in the region. Cross-country movement is possible but difficult in the hill belts, and very difficult in the highlands.

The 2 chief land passageways within the northern part of the region lead from Ushizu on the Saga Plain, one westward to the Sasebo Naval Base on the west coast, the other northwestward to Karatsu port on the north coast. These routes follow narrow winding valleys in the low (200 to 500 foot) hilly areas. Deployment and cross-country movement are very difficult in this low but rugged country.

Low, broken hill country is the dominant type of terrain on the route southward from Sasebo to Nagasaki. This passageway is used by a railway which extends along the eastern and southern sides of Omura-wan (bay). Most of the way the railway is built across small coastal flats or through rough, forested, hill country of only 200 to 300 feet elevation. At 2 points the line crosses high rugged areas of 800 to 1,200 feet elevation. The first is a 3- to 4-mile section north of Sonogi village on the northeastern side of the bay. There, 600- to 1,500-foot ridges reach the sea, and the rail line is carried through these by means of deep cuts and short tunnels. The second high rugged area is immediately northeast of Nagasaki where the railway crosses a low mountain mass, of 800 to 1,000 feet elevation, by means of many turns and several tunnels.

The terrain of Iki-shima, the Gotō-rettō, the Amakusa-jima, and nearby islands is similar to that of the peninsula. Chief relief forms are rugged hills of 300 to 800 feet elevation, with a few high peaks of 1,800 to 2,000 feet. The Amakusa-jima and nearby islands are hilly throughout, but the Gotō-rettō and Iki-shima have a few small plains 1 to 3 miles in extent. These plains have some flat areas used for rice fields, but are otherwise moderately rolling. Upland areas on the islands, like those on the peninsula, are covered with forest in which are scattered grassy openings.

C. Relief regions: Shikoku.

Shikoku is located northeast of Kyūshū and south of Western Honshū. It is a large island with the long axis extending northeast - southwest for 138 miles. The island is narrower in the center than at either end. The western enlarged portion has a maximum width, north - south, of 95 miles. The eastern portion has a maximum width, also north - south, of 80 miles. The slender central neck of the island is 35 miles across, north - south, and extends only 33 miles along the main northeast - southwest axis (PLAN 40).

Shikoku is mountainous throughout with the exception of a series of narrow plains along the north and northeast coasts and a group of tiny lowlands around Kōchi in the central part of the south coast. On the 2 northern peninsulas the highlands are rounded, steep-sided ridges and blocks, oriented in various directions. In the small northwestern peninsula (between Matsuyama and Imabari) a large irregular highland mass reaches 4,000 feet, but on the broader northeastern peninsula only a few of the scattered hills and ridges reach 1,600 feet. In contrast, the rugged, sharp-sided, folded mountains of central and southern Shikoku, which are oriented chiefly northeast - southwest, reach 3,500 to 4,500 feet, and many peaks attain 5,000-6,000 feet. Long, narrow, deep, winding valleys are aligned northeast - southwest between the ridges, and in many places cut through the ridges in almost impassable gorges. Most of the major valleys are 2,000 feet below the adjacent ridge tops. In the southwestern peninsula several of these valleys combine with narrow interior basins to make a series of difficult passageways, not true corridors, through the mountainous interior (ROUTES 13, 14, and 15). These routes lead across the peninsula roughly from east to west. There is no combination of lowlands leading north - south across the island. The only north - south railway connecting the northeastern coastal lowland to the Kōchi Plain on the south is forced to use several long tunnels in order to get through the divides (ROUTE 17).

Soils in Shikoku are chiefly clay-loam and clay on the small plains and coastal valleys, and clay-loam in the mountain valleys of the interior. Upland slopes have thin sand or clay soil, with much loose rock on the slopes.

Vegetation in the lowlands is dominantly wet-field rice, with small areas of dry crops on the coastal strips; in the mountain valleys the cultivated lands are mostly in dry crops, but with some rice. Most of the upland areas are forested, but extensive grassy areas appear on the west- and north-facing slopes of the southeastern and central highlands, especially north of Kōchi and south of Mishima.

(1) Southwestern Shikoku Broken Lands.

This rugged highland region includes the southwestern peninsula and all adjacent lands southwest of a line from Susaki on the south coast to the Matsuyama lowland on the northwest coast.

In this region, sharp-crested, steep-sided ridges with thin, rocky soils and heavy forests rise 1,000 to 2,000 feet above narrow winding valleys. Paddy fields occupy the few narrow coastal flats and the clay loam soils of the larger interior valleys. Dry-field crops, particularly mulberry groves, are on lower slopes.

Deployment is almost impossible in this mountainous region. Cross-country movement is difficult in the narrow valleys, in which allowance must be made for deep stream crossings; wet, muddy rice fields; forests; and high, steep, commanding heights. Cross-country movement outside the valleys is extremely difficult, due to the unbroken succession of high, steep, forested slopes.

There are no good natural land gateways to the region. One railway enters the northwestern corner by a series of narrow coastal plains and valleys (ROUTE 20). A highway enters from the Kōchi plain by way of Susaki, but it is forced to cling to the sides of coastal headlands and valley slopes in many places (FIGURE II - 11). This region is distinguished from the Central Shikoku Mountains region chiefly because several combinations of valleys, coastal sills and interior basins form narrow, deep, difficult, but nevertheless usable passageways across the southwestern peninsula. The more significant of these passageways, including those from Shimoda to Sukumo and Shimoda to Yawatahama are utilized by ROUTES 13 and 14.

(2) Central Shikoku Mountains.

These rugged, forest-covered highlands of 3,500-4,000 feet elevation, and their sparsely inhabited, deep narrow valleys,

FIGURE II - 11. *Central Shikoku.*
Typical road in Central Shikoku. This road is on a narrow bench on a valley side, with steep slopes above and below.

have already been described in the introduction to Shikoku Island. They are like the Southwestern Shikoku Broken Lands except that trans-peninsular or trans-regional natural passageways are lacking. Cross-country movement is difficult in the valleys, due to the swift streams, the forests, and the numerous commanding heights. In moving across a divide from one valley system to another a climb of 1,000 to 2,000 feet must be made over a steep, narrow, timbered ridge. The few roads over these divides have many deep cuts, high fills, tunnels and sharp turns (FIGURE II - 12). The lower Naka-gawa (river) valley provides a short passageway into the region from the Kii-suidō coast on the northeast. Broad, low, easily traversed gateways do not exist (ROUTE 18). The difficulty of using existing mountain routes of travel through the Central Shikoku Mountains is shown on studies of ROUTES 16, 17, and 18 (FIGURES II - 75, 76, and 77).

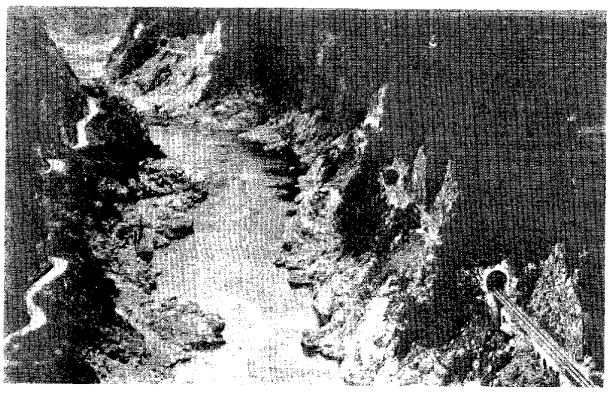

FIGURE II - 12. *Central Shikoku.*
Near Yamada, Shikoku. Road and railroad find scant space in the narrow valleys of Shikoku.

(3) *Kōchi Plain.*

This lowland is really a series of parallel, east - west, flat-floored valleys separated by low but rugged hill ridges. The lowlands merge along the lower Monobe-gawa valley southeast of Kōchi and reach the sea along an 8-mile front. The central lowland extends 14 miles eastward from Kōchi to the

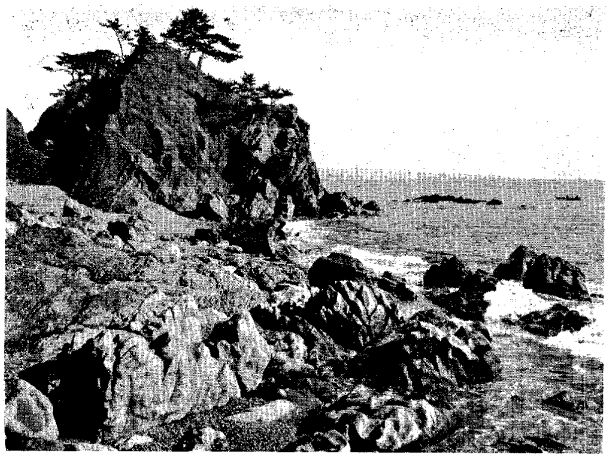

FIGURE II - 13. *Kōchi Plain, Shikoku.*
The southern coast of Shikoku is mostly steep and rocky. Looking E.

river and then 8 miles southward to the sea. The east - west part is 2 miles wide, and the north - south part is 4 to 8 miles wide. Other lowlands, each ½ to 1 mile wide and several miles long, branch from the central plain, chiefly to the east and west. Where hill ridges reach the sea the coast is rocky (FIGURE II - 13).

The flat valley areas have deep alluvial loam soils, and are devoted almost entirely to wet rice fields. These fields remain muddy throughout the year. A few small areas of mulberry groves and other dry crops occupy slightly raised sand and gravel areas and lower hill slopes in the northern and western parts of the region. Deployment and cross-country movement are possible on the central Kōchi Plain and the larger valleys nearby, but are handicapped by wet rice fields, by farm hamlets at ¾-mile intervals, by streams and canals, and by hill ridges which form commanding heights of 500 to 1,000 feet elevation. Cross-country movement is very difficult across the hill ridges, and over the forested higher mountain ridges to the north.

There are no natural gateways. A highway follows the coast eastward and westward from the region, but is forced to use many sharp turns and deep cuts. A railway tunnels and cuts through the ridge to the north of Kōchi in a series of S-curves (FIGURE II - 12).

(4) *Eastern Shikoku Plain.*

The heart of this region is a long, narrow, wedge-shaped lowland, 46 by 4 miles, drained by the deep, east-flowing Yoshino-gawa (river). The remainder of the region is a 14-mile strip of coastal flats and hill land which extends south along the Kii-suidō coast. This extension is only 1 to 2 miles wide. Major landforms in the lowland are flat-topped terraces along the north side of the Yoshino basin, and low deltaic flats in the coastal section. Along the Yoshino-gawa is a low ¼ to ½ mile wide belt of coarse sand and gravel which is subject to flood, and is left in wild grass. The delta areas along the coast, and the terrace flats in the Yoshino basin are cropped intensively. Most of the crop area is in wet rice fields, although mulberry groves and areas of other dry crops are scattered throughout the lowland. The steep, 800- to 1,800-foot uplands which surround the narrow lowland are forested.

Deployment would be localized on the various delta and terrace fragments. Cross-country movement would be possible throughout the lowland, but is handicapped by the wet rice fields, steep slopes along terrace margins, the meandering stream channels, and the forested commanding heights. There are no natural gateways to the region, but the south coast highway enters the coastal strip, and 2 railways, one at either end, cross the high ridge which forms the region's northern border (ROUTES 17 and 19). All of these routes use hairpin turns, fills, cuts, and, in the case of the railways, tunnels in order to maintain usable grades through the uplands.

(5) *Northern Shikoku Lowlands.*

These lowlands rim the north coast of Shikoku for 130 miles but extend inland only 2 to 8 miles. Exceptions are the Nyūgawa and Matsuyama plains on the northwestern peninsula, which extend inland 6 and 10 miles respectively (FIGURE II - 14). Rounded and flat-topped forested hills rise out of the 8-mile wide plain on the northeastern peninsula. Elsewhere there are flat plain surfaces and flat-topped terrace remnants near the highland margins. All of these are intensively cropped. Wet rice fields dominate, although patches of dry crops are near the numerous villages, and mulberry groves and orchards occupy some of the lower hill slopes (FIGURE II - 15).

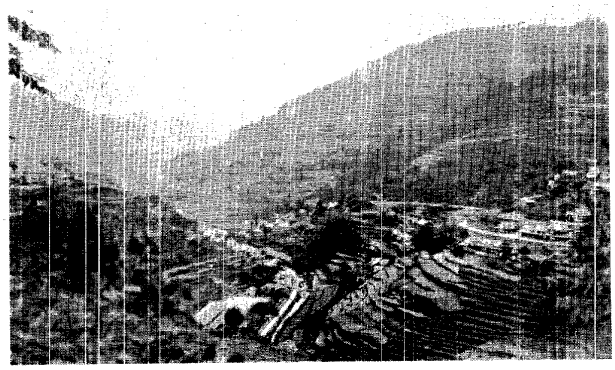

FIGURE II - 14. *Matsuyama Valley, Northern Shikoku.*
The extensive terracing near Matsuyama reflects the overcrowding of the small bits of level land suitable for crops. Commanding heights are available almost everywhere along the routes of Southwest Japan.

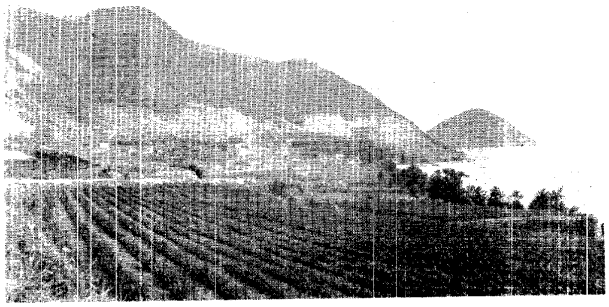

FIGURE II - 15. *Northern Shikoku.*
Small patches of lowland are backed by steep slopes in many parts of Northern Shikoku. Forest plantings can be seen fringing much of the dry-crop area. About 1925.

Soils are chiefly clay and clay loam, with sandy dune areas along the beaches. Upland soils are thin, with much sand and some loose rock. Upper hill slopes and the highland margin to the south are forested. These uplands rise 1,500 to 3,500 feet above the coastal plains.

Local deployment in various segments of the lowland is possible but is handicapped by wet rice fields, numerous streams, canals, villages, and possibilities of enemy fire from commanding hills or marginal ridges. Cross-country movement is fairly easy if the hills are avoided but it suffers the same general handicaps as deployment.

Good natural gateways to the region are lacking. The various rail and highway routes which enter the region from the interior of Shikoku must use sharp turns, fills, and deep cuts, in order to cross the unbroken ridges which limit the region on the south (ROUTES 14, 17, and 20). The railways employ numerous tunnels.

D. Relief regions: West Central Honshū.

West Central Honshū is a rough quadrilateral extending nearly 200 miles northeast - southwest and 100 miles northwest - southeast. It includes that part of Central Honshū west of 138°E (FIGURE II - 107). The western boundary extends northward through Kii-suidō (channel) and Ōsaka-wan (bay) to Kōbe city, and then northeastward past Biwa-ko (lake) to the head of Tsuruga-wan (bay) on the north coast. The northern boundary is fixed arbitrarily at 36°N. On the south, the area fronts on various arms and embayments of the Pacific Ocean. Centrally located in West Central Honshū are the Ōsaka and Nagoya Lowlands which together comprise one of the two critical areas of Southwest Japan.

Relief features of West Central Honshū are diverse in type and irregular in form and distribution (PLANS 38 and 40). Deployment is possible in the interior basins, and on 1 narrow coastal plain, but no broad corridors connect these lowlands. Movement is limited to a series of relatively small separate compartments and narrow passageways. Cross-country movement is easy on the lowlands and in the larger valleys when the rice fields are relatively dry and firm (October to May), but is difficult on the upland areas at all times.

Rugged hills and mountains form a barrier of varying effectiveness across the north side of the region. These highlands increase in height and width toward the northeast. They vary from 2,500 feet elevation and a width of 12 miles, north of Biwa-ko (lake), to 9,000 feet elevation and a width of 75 miles near the eastern boundary (138°E). Equally rugged but less elevated highlands dominate the Kii-hantō (peninsula) on the south, or Pacific face, of West Central Honshū. This southern highland does not extend across the area but is cut off on the east by Ise-wan (bay), and on the west by the Kii-suidō - Ōsaka-wan waterway. Between the Kii-hantō (peninsula) and the northern uplands is a series of small lowlands separated by low but steep-sided ridges and blocks. These lowlands and highlands extend across the area from Ōsaka Plain on the west to the Nagoya and Hamamatsu Plains on the east. One interior basin is almost completely occupied by Biwa-ko (lake); the others have a few wet areas or smaller lakes. All have several levels of terraces, and have loam and sandy soils which are intensively cultivated except on parts of the higher,

rougher terraces. Wet rice fields predominate but dry crops are also important, especially on parts of the higher and more dissected terraces. Rougher lands or terraces, together with the rocky ridges which separate the lowlands, are covered with forest, much of it small second growth. Denser forests of larger trees cover the Kii-hantō (peninsula) uplands and most of the highlands along the northern border of the region.

(1) Kii-hantō Mountain Land.

The Kii-hantō (peninsula) is a large triangular region of rugged highlands. The region extends 105 miles east - west, along the northern, or base, edge of the triangle, and 60 miles south from that base to the triangle point at Shiono-misaki (cape). The peninsula forms a seaward barrier between any invading force and the highly developed, densely populated basins between Ōsaka-wan (bay) and Biwa-ko (lake) (PLAN 40).

The Kii-hantō (peninsula) mountains are of moderate elevation but have steep sides and narrow winding valleys. Average peaks near the coast are 1,500-1,800 feet high. Heights increase inland and reach 5,000-6,000 feet in the west central section (PLAN 38). Almost all mountain slopes are greater than 30% from the horizontal. There are a few pockets of nearly level land along the coast and in the larger valleys. Wet rice fields and dry crops occupy most of the flat or nearly flat areas in these small lowlands.

The only extensive areas of level or nearly level land in the Kii-hantō Mountain Land region are at the eastern and western ends of the northern boundary. The northeastern lowland faces Enshū-nada (sea). There the uplands give way to scattered hill ranges of less than 1,000 feet elevation. Within this hilly area the valleys are ½ to ¾ mile wide and are nearly level. None of these valleys cuts entirely across the upland, but a narrow level coastal route winds around the eastern headlands at Toba (ROUTE 28). Secondary roads cross to Uji-Yamada village by means of narrow tributary valleys which lead to low passes at 800 to 1,000 feet elevation (ROUTE 28).

The northwestern lowland consists chiefly of the Kino-kawa (river) basin. It is a long narrow cleft between the main Kii-sammyaku (mountains) on the south and the boundary (Izumi) range on the north. The lowland is 5 miles wide on the Kii-suidō coast at Wakayama city, but narrows rapidly to 1½ miles at Kokawa, 16 miles inland. This width diminishes upstream (eastward), and the lowland becomes a narrow valley ½ to 1 mile wide. At Gojō, 33 miles inland, 2 narrow passageways lead northward through the Izumi Range to Gose and Takatori in the southern part of the Nara Basin (ROUTE 30). Passes on these routes are only 500 to 600 feet above sea level, but commanding heights rise 2,000 to 2,500 feet on either side. Similar heights rise 1,200 to 1,500 feet above the wider section of the Kino valley below Kokawa. Most of the wide part of the lowland is made up of a series of flat terraces less than ½ mile wide and cut into small ¼ to ½ mile blocks by streams from the mountains. Deep loamy soils cover most of the terraces. Wet rice fields occupy the flatter blocks near the streams; dry crops and farmsteads crowd against the slopes on either side. A sandy, barren, frequently flooded strip parallels the banks of the Kino.

Vegetation on the Kii-hantō Mountains is a dense forest of needleleaf and broadleaf trees. Much timber is cut from these forests.

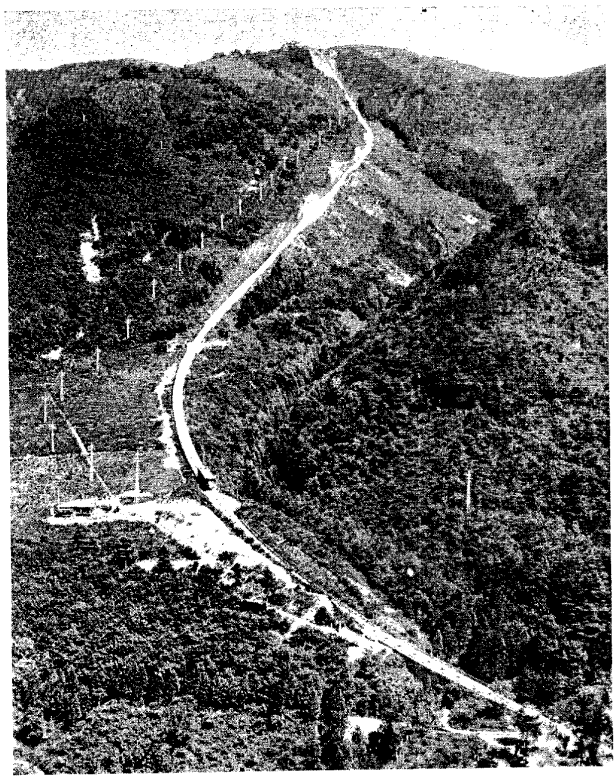

FIGURE II - 16. *West Central Honshū.*
Cable car road to Hiei-san, near Kyōto. Patchy forest and grass are found on the rugged slopes of the mountains surrounding the Kinki Basins.

(2) Kinki Region Lowlands and Highlands.

The Kinki Lowlands and Highlands lie north of the Kii-hantō and extend eastward from Ōsaka-wan (bay) to include the Kasagi Highlands and Suzuka-sammyaku (mountains) southeast of Biwa-ko (lake) (PLAN 38). Dominant landforms within the region are 4 large, flat-floored basins separated by low, but steep-sided, hard rock ridges, and overtopped on the east by the Kasagi Highlands and Suzuka-sammyaku. Numerous low, narrow passageways which cut through the various highlands connect the basins with each other and with the surrounding regions.

The Kinki Lowlands, together with the Nagoya Plain on the east, contain 4 of the 6 great cities of Japan: Kōbe, Ōsaka, Kyōto and Nagoya. The Nara and Kyōto Basins are 2 of the fountain heads of Japanese history and culture.

The highlands of Kinki are of moderate elevation and have rounded or flattish tops, steep slopes, and deep, well-developed valleys. On the east, overlooking the Ise-wan (bay) lowlands, the Suzuka-sammyaku (mountains) have an average elevation of 2,000 to 3,000 feet (FIGURE II - 16). A few peaks reach 4,000 feet. Ridge tops are rounded, and slopes are steep; a thin rocky soil, with sparse forests, covers the surface. Farther west (south of Biwa-ko) the Kasagi Highlands are lower, 1,500 to 2,800 feet, and have flatter tops, but they have similarly steep

slopes and thin soil with a sparse forest cover. Passageways through the Suzuka and Kasagi Highlands form the eastern gateways to the Kinki Basins and are discussed in connection with those lowlands. The ridges and blocks which lie between the Kinki Basins are the lowest in the region, 1,200 to 2,500 feet. They are not easily surmounted, however, because side slopes are steep. These ridges, like the highlands farther east, have a thin soil, a sparse forest cover and rounded tops.

(*a*) *Ōsaka Plain.* The Ōsaka Plain is a large horseshoe-shaped lowland at the head of Ōsaka-wan (bay). The prongs of the horseshoe extend southwestward around the bay, and the rounded toe of the shoe is drawn out northeastward almost to a point. The plain measures 35 miles southwest - northeast along the northern arm and 13 miles along the southern arm. Maximum width is 24 miles, northwest - southeast, at the head of the bay.

The Ōsaka Plain has 3 levels. The first is a narrow, 1 to 1½ mile wide belt of recent alluvium along the shore. This belt is particularly well-developed along the north shore, west of Osaka city. Most of this strip is planted with garden vegetables in dry fields. The second level is 35 to 60 feet above the first and extends back over most of the lowland. This level is devoted largely to wet-field rice. The third level is an old terrace which has been dissected, and now consists of a series of flat-topped dirt hills which rise 80 to 120 feet above the second level. Valleys within this hilly belt are cut down 40 to 60 feet and seriously interfere with movement from one flat ridge top to another. Wet rice fields occupy the valleys between the ridges, and dry-field crops occupy many of the flat ridge tops. Hill slopes are in second growth timber or grass.

Deployment is easy on the flat first and second levels, but is restricted on the third, or hilly level. Cross-country movement is fairly easy on the first 2 levels, from late September to May, when the rice fields are not flooded or soaked. Other barriers to easy cross-country movement are the urban centers, the numerous farm villages, averaging ¾ mile apart, and the major streams and irrigation canals. Cross-country movement in the hilly borderland is greatly handicapped by the strips of wet rice fields in the valleys, and by steep, forested slopes. Movement along the valley roads between the hills is made difficult due to wooded commanding heights on either side.

Chief gateways of the Ōsaka Plain are: westward along the bay shore to Kōbe, northwestward to Ikeda, northeastward along the Yodo-gawa (river) to the Kyōto Basin, eastward through the Yamato-gawa (river) valley to the Nara Basin, and southward along the bay shore to Wakayama. Some of these passageways are utilized by closely parallel routes. Such alternate ways are discussed along with the main routes.

The coastal route westward from Kōbe to Akashi is a narrow flat strip, a few hundred feet wide, at the foot of low hill spurs (ROUTE 33). The hills rise 200 to 700 feet above the coastal strip. This 7-mile passageway is used by a Japanese standard gauge (3′6″) railway, a small "special" railway, and a highway. Houses and small urban units occupy any additional flat space and fill the lower parts of small valleys which cut back into the hills. West of Akashi village the route enters a wide coastal lowland area which extends as far as Himeji, 21 miles farther west.

The route northwestward up the Muko-gawa (river) gorge from Ikeda on the northern edge of the plain is even more restricted than the coastal route west of Kōbe. The narrow, winding gorge of the Muko is only ⅜ mile wide at the top and is cut down 700-800 feet below the adjacent flat-topped plateau remnants. Sides of the gorge are covered with rock debris and sparse forest. Only 1 transport line, a railway, uses the gorge, and it has many turns and one or two tunnels per mile in the 10-12 mile section below Sanda. North of Sanda the valley widens to ½ mile at the bottom and the railway uses fewer turns and tunnels.

A second route leads almost due north from Ikeda, and parallels the upper part of the Ikeda-Sanda railway route. This second route uses the shallower, but steeper and equally crooked valley of the Ina-gawa (river), and is occupied by a highway only. Forest-clad, rocky slopes rise 200 to 300 feet above this route. Both of the passageways from Ikeda north into the Tamba Plateau lack room for deployment and are easily blocked at many points. Two more highway routes, relatively steep and crooked, lead northward over the Tamba Plateau from the northwestern rim of the Ōsaka Plain. Both lead to the Kameoka Basin, where they join the main passageway leading northwestward from Kyōto to the north coast of Honshū.

The only true corridor leading to the Ōsaka Plain is the narrow ¾-mile wide gap at the northeastern apex of the plain, where the Yodo-gawa (river) breaks out of the Kyōto Basin (ROUTE 24). Even here the river and its low, grass-covered flood plain occupy ⅔ of the gap and crowd the 3 railway lines and 2 highways onto a few-hundred-foot wide strip along the northern bank and onto an even narrower ledge on the southern bank. Forest-covered hill spurs rise 400 feet above the river on the south side and 700 feet on the north side, and completely dominate the 1¼ mile length of the gap. The adjacent towns of Hirose and Yamazaki occupy the widest part of the flat area on the north side of the corridor. A parallel railway route crosses the hilly upland 5 miles southwest of the Yodo-gawa gap and turns southward onto the southern arm of the Kyōto Basin. This upland railway rises only 75-100 feet to cross the grass- and forest-covered upland, but it has many cuts and fills and 1 short tunnel at the divide.

The principal eastern gateway to the Ōsaka Plain is the Yamato-gawa gorge through the low, round-topped ridge between the Ōsaka Plain and the Nara Basin (ROUTE 30). One railway and a highway follow this gorge, and rise only 45 feet in the 8 miles through the ridge. The gorge is narrow and crooked, however, and the steep rock- and forest-covered slopes rise 500-600 feet above the valley bottom. In order to avoid exceedingly sharp turns, the railway tunnels through several projecting spurs. Four alternate parallel routes climb across the ridge south of the Yamato gap. These routes—2 railways and 2 highways—are all within 5 miles of the river gateway. These routes climb 300 to 600 feet to low saddles in the ridge, but have fewer turns and tunnels than the route through the gorge.

On the south a coastal rail route crosses the low western end of the Izumi Range south of Fuke and reaches Wakayama in the Kino-kawa lowland of the Kii-hantō (peninsula). The low, forest-covered range is crossed by means of numerous turns but no tunnels are needed. The pass is between 400 and 600 feet elevation. An alternate rail route 6 miles to the east rises only to 35 feet, but uses a 1 mile tunnel under the divide

and several other short tunnels in maintaining its relatively low grade. A highway follows this route and rises to 550 feet on the divide above the tunnel.

(*b*) *Nara Basin.* The Nara Basin is an oblong depression with irregular boundaries. Its maximum dimensions are 16 miles north - south, and 10 miles east - west. It is southeast of the Ōsaka Plain, and south of the Kyōto Basin.

Like the Ōsaka Plain, the Nara Basin has 3 levels. The lowest level is a flat plain of alluvial material 135-165 feet above sea level. It is the most extensive of the 3 levels and covers at least 80 per cent of the basin. This large area is almost flat but is broken here and there by low mounds and isolated hills which rise 20 to 250 feet above the plain. The second level, which is 30 to 60 feet above the first, is a narrow irregular belt of flat terrace fragments lying along the northern and northeastern sides of the basin. These remnants of old terraces are separated by the steep-sided, flat-floored valleys of numerous headwater streams of the Yamato-gawa. The third level is a jumbled mass of hills cut out of old stream deposits. These low but rugged uplands rise 40 to 80 feet above the second level and reach elevations of 275 to 300 feet.

The highland rim of the Nara Basin is composed of steep-sided, round-topped ridges and blocks with maximum heights of 1,500 to 1,800 feet, except on the southwest where a few peaks reach 3,000 feet. A thin, rocky soil and a sparse forest growth cover these uplands. Most of the forest is second growth.

The basin floor, especially the broad lower level, has a loamy surface over a relatively dense subsoil. The carefully tended soil is occupied almost entirely by wet rice fields, which are flooded and muddy from May to September. Much of this area yields a dry crop after the rice is removed. The second level, or flat-topped terrace remnants, has wet rice fields in the valleys and dry crops with some rice on the higher flats between streams. The hilly (third level) areas of the north and west have rice and dry crops in the larger valleys, and woodland on the hill slopes.

The flat floor of the Nara Basin is broken by a network of streams and irrigations ponds, by scattered earth mounds, and by isolated hills. The flat areas between larger streams and large ditches average not more than 1 to 1½ miles across. Small, compact agricultural villages are distributed evenly over these flats. The average distance between villages is ½ to ¾ mile.

Large-scale deployment is relatively easy on the flat lower level, except from early May to September, when the rice fields are flooded. Local, small-scale deployment is possible on the flat terrace remnants of the second level, but is difficult in the valleys between the flat fragments. In the rugged hills of the third, or highest level, deployment is almost impossible. Cross-country movement is possible on the flat lower level, but is handicapped by the muddy fields, scattered mounds and hills, and the numerous ditches, ponds, and hamlets. The greatest of these handicaps is the water and deep mud in the wet rice fields, from May to September.

Principal natural passageways which connect the Nara Basin with other lowlands are: southward through the Izumi Range to the Upper Kino-kawa (river), westward along the Yamato-gawa to Ōsaka, northward through the Nara Hills to Kyōto, and eastward up the Hatsuse valley and on past Ueno to the Ise-wan Lowlands.

The 2 parallel southern routes through the Izumi Range to Gojō on the upper Kino-kawa (river), and the western route to the Ōsaka Plain have been discussed in connection with the Kii-hantō (peninsula) and the Ōsaka Plain (ROUTE 30).

The northern routes between the Nara Basin and the southern or Kizu-gawa (river) arm of the Kyōto Basin cut through a 2-mile wide belt of low hills (ROUTE 31). These hills are a segment of the third or highest level of the basin deposits. Two railways and 2 highways are carried through this rugged area by means of cuts and fills. Roadbed levels rise only a few feet in making the passage. Nevertheless the hills are a considerable handicap to movement because they are irregular, have steep sides, and rise 60 to 150 feet above the roadbeds.

The eastern gateway of the Nara Basin follows the Hatsuse-gawa (river) from Sakurai in the southeastern part of the lowland. The route turns northeastward near Haibara, and, after crossing a low divide, enters a shallow basin and joins the east - west Kizu-gawa passageway at Ueno (ROUTE 26). The route is used by a railway and a highway, both of which have only moderate grades and turns except at the divide west of Haibara. There both rail and road have several sharp turns and the railway has several tunnels. Commanding heights rise 1,200 to 1,500 feet above the roadbeds at many points.

Deployment is either impossible or very difficult within any of the gateways of the Nara Basin, and cross-country movement in the low, but rugged uplands along these routes is also difficult.

(*c*) *Kyōto Basin.* The Kyōto Basin proper is an oblong-shaped depression 14 miles north - south by 5 miles east - west. A narrower arm, the Kizu-gawa (river) corridor, extends 8 miles southward from the southeastern corner of the region to the Nara Hills at the northern end of the Nara Basin. This corridor is only 1½ to 2 miles wide (ROUTE 31). A smaller lowland, the Daigo pocket, projects northeastward 5 miles from the eastern side of the basin toward the southern tip of the Biwa Basin, but is separated from that lowland by a narrow rock ridge. A smaller, lower ridge separates the Daigo pocket from the eastern outskirts of Kyōto city.

Landforms of the Kyōto Basin are much like those of the Nara Basin; therefore only outstanding differences will be discussed in detail. The Kyōto Basin has the same 3 levels: a broad young alluvial floor, surrounded by fragments of low flat-topped terraces, which are backed in turn by a wider belt of rugged dirt hills. Hard rock ridges and low mountains rise above the hill belts and form the rim of the basin (FIGURE II - 17). Average elevations in the 3 basin levels and of the highland rim are successively: 60 feet, 95 feet, 260 feet, and 1,600 feet.

The broad lower level is covered with wet rice fields; and the second or flat terrace level is occupied by dry crops and some rice. Tea bushes, 3-5 feet high, comprise much of the dry-crop area (FIGURE II - 18). As in the Nara Basin, the dirt hills and highland rim are covered with thin forests. Soils on the broad lower level are chiefly loam. On the flat terraces and hill levels clay, sand, and gravel predominate (FIGURE II - 19).

The nearly level surface of the broad low first level of the basin favors deployment and cross-country movement, but

FIGURE II - 17. *Kinki Region, West Central Honshū.* Northern Kyōto Basin from Hiei-san, looking SW. The northern part of the Kyōto Basin is invaded by low, but steep outliers of the surrounding mountains. Part of the city of Kyōto is in the background. Prior to 1933.

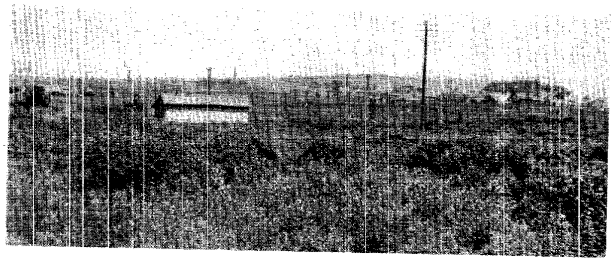

FIGURE II - 18. *Kinki Region, West Central Honshū.* Tea bushes on the flat surface of a low terrace in the east central Kyōto Basin. Looking NE, 1933.

these are handicapped by flooded and muddy rice fields, from May to late September, also by numerous streams and villages, and by 1 large, shallow, swamp-bordered lake, Okura-ike, which is 2 to 2½ miles in diameter. Okura-ike is located in the east central part of the Kyōto Basin. An additional large barrier is Kyōto city which occupies almost the entire northwestern end of the basin (FIGURE II - 20). On the intermediate terrace level, deployment and cross-country movement are relatively easy on the flat surfaces, but are greatly handicapped elsewhere by rice fields in the valleys, and by dense woods and steep slopes on terrace margins. The long, steep slopes of the hilly borderland and the highland rim, covered with loose, rocky soil and sparse forest, are even greater handicaps to military operations.

Chief natural gateways of the Kyōto Basin are the southern or Kizu-gawa corridor to the Nara Basin, the southwestern or Yodo-gawa gap to the Ōsaka Plain, the northwestern or Kameoka route to the north coast, the northeastern tunnels (a man-made route) to the Biwa Basin, and the southeastern or Kasagi route to Ueno and Ise-wan (bay).

The Kizu-gawa corridor is a flat-floored southern extension of the main Kyōto Basin which connects with the Nara Basin across a 2-mile belt of hills as explained in connection with the Nara Basin (ROUTE 31). The Yodo-gawa (river) gateway to the Kyōto Plain was discussed in connection with the Ōsaka Plain (ROUTE 24).

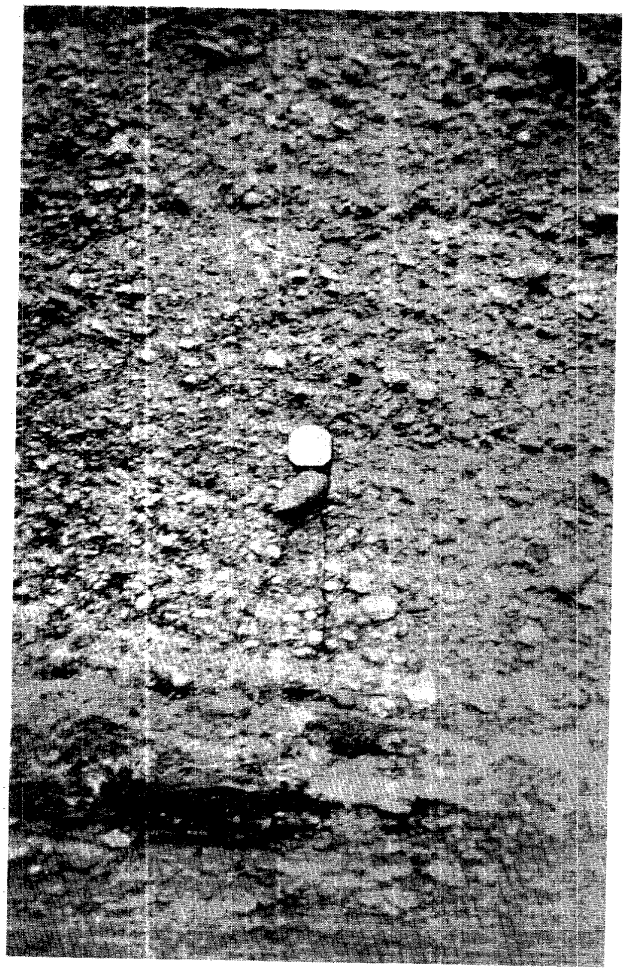

FIGURE II - 19. *Kinki Region, West Central Honshū.* Terrace bank near Uji, Kyōto Basin. Sands and gravels make up the soil of the terraces which rim parts of the Kinki Basins. Three-inch hand compass used for scale. 1933.

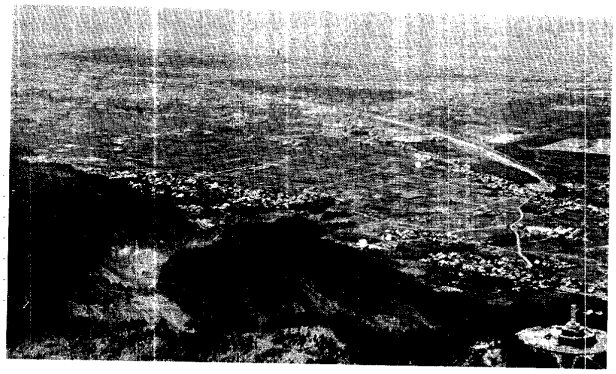

FIGURE II - 20. *Kinki Region, West Central Honshū.* Kyōto city from Hiei-san. Looking SW. Kyōto city lies on the flat floor and lower hill slopes of the northern Kyōto Basin. Prior to 1933.

The northwestern outlet of the Kyōto Basin penetrates the broken Tamba Plateau and eventually reaches the north coast at Maizuru (ROUTE 32). Most of the route is along narrow winding valleys 800 to 1,400 feet below the rugged plateau remnants. The most difficult stretch is the 6½-mile gorge of the Katsura-gawa, west of Kyōto city. Here the gorge is so narrow and winding that the single railway which follows the route is carried through by means of notch-like cuts in the steep side slopes and by tunnels through projecting hill spurs. The upland slopes are forested along most of the route, but north-facing slopes near the Japan Sea are in grass. Wet rice fields and some dry crops occupy the floors of wider valleys including the 2-mile wide Kameoka Basin.

No natural corridor connects the Kyōto Basin and the Biwa Basin. They are separated by a steep-sided, forest-clad ridge which blocks the head of the tributary Daigo pocket east of Kyōto. This ridge is 2 miles wide at its narrowest point and is 1,000 to 1,500 feet in elevation. The Seta-gawa, which drains Biwa-ko cuts across the ridge by an indirect, 13-mile long route, and its canyon is so deep, 800-1,100 feet, and has such steep sides that only parts of it are followed by a road. The central part of this road between the basins climbs out of the canyon and follows the ridge top and several small tributary valleys. An additional handicap of the Seta-gawa route is the swampy nature of the soil where the river enters the Kyōto Basin at Uji. Most of the traffic between the Kyōto and Biwa Basins moves directly east from Kyōto city across the 2 forest-clad ridges on either side of the Daigo pocket, and reaches Biwa-ko at Ōtsu (ROUTE 24). One railway, 1 highway, and 2 aqueducts from Biwa-ko follow this route. In order to surmount the ridges, which are 1½ to 2 miles wide and 500 to 800 feet high, the highway has many sharp turns and 1 short tunnel. The railway and aqueducts have straighter courses but use tunnels as much as 1½ miles in length. Deployment and cross-country movement would be very difficult on the ridges but fairly easy in the Daigo pocket.

The only natural passageway eastward from the Kyōto Basin follows the upper Kizu-gawa valley after it turns eastward at the southern end of the Kyōto Basin. The passageway continues eastward through a series of valleys and basins to Kameyama in the Ise-wan Lowlands (ROUTES 25 and 27). Most of the valleys followed by this 40-mile long route are 1,000 to 1,200 feet below the adjacent uplands, and are less than ½ mile wide. The Ueno Basin is wider, 1½ to 2½ miles, but extends only 6 miles along the route. Wet rice fields occupy the floor of this basin and most of the level spots in the narrow valleys. Other parts of valley floors and adjacent uplands are in forest. Deployment would be possible along this route only in the Ueno Basin and smaller basins along the upper Kizu-gawa. Cross-country movement along the passageway would be moderately difficult, and movement on the adjacent rugged uplands would be very difficult.

(*d*) *Biwa Basin.* This large basin extends northeast from the latitude of Kyōto city to within 10 miles of Tsuruga-wan (bay) on the north coast. The Biwa Basin has the shape of a wedge with its base to the south. It is 39 miles long northeast - southwest, 26 miles wide east - west at the base, and 15 miles wide east - west near the apex (north). The western and northern parts of the basin are occupied by Biwa-ko. This leaves a 17- by 33-mile triangle of lowland southeast and east of the lake. In addition there are small scattered bits of gently sloping land along the western and northern shores of the lake.

On the western side of Biwa-ko these scattered lowlands are small deltas which extend out 1 to 2 miles into the lake and are 2 to 5 miles broad. Small sections of the deltas are in wet rice fields; the remaining surface is forested. These small lowlands are separated by rocky spurs from the Tamba Upland to the northwest. The spurs rise 500 to 1,500 feet above the deltas. Farther inland are forest-clad ridges which rise an additional 1,500 to 2,000 feet. Deployment and cross-country movement are possible on the separate deltas, but such operations are extremely difficult on the steep, rock-covered ridges between the deltas.

East of Biwa-ko an almost solid fringe of deltaic material slopes up gently from the shore. One to 2 miles inland the slopes give way to broad terraces at levels 40 to 50 feet high. The terraces in turn rise even more gently to meet and penetrate between the earth hills and low rocky ridges which form the highland border to the south and east. The hills and ridges rise 900 to 1,200 feet above the flat terraces. Spurs and isolated ridges and hills extend westward into the lowland and reach the lake shore at several points. Between these upland spurs long streamers of flattish lowland reach back 10 to 15 miles from the lake shore. Near the lake the ridges and hills are discontinuous and the lowland areas are connected north - south by numerous flat strips.

The terraces are dissected little by streams from the highlands. On the deltas the major streams have built up their beds until they form elevated barriers 20 feet or more above the delta level. In places roads and railroads tunnel under the rivers.

The deltas and lower terraces have mixed loam and clay soils devoted almost entirely to wet rice fields. The rugged earth hills have much sand and gravel mixed with finer soil material. The higher uplands which surround the basin have a thin, sandy, rocky soil. Forests on these uplands and the hilly lands in the basin have been thinned by repeated cutting; as a result, the soil has been deeply eroded on many slopes.

Chief gateways of the Biwa Basin are: southwestward from Ōtsu to the Kyōto Basin, northward from Kinomoto village to Tsuruga on the north coast, eastward through the Sekigahara gap to the Nagova Plain, and southeastward to Higashitsuge on the Ueno-Kameyama route to Ise-wan (bay).

The southwestern outlet to the Kyōto Basin has been discussed in connection with that area (ROUTE 24). On the north a railway and a highway follow separate deep, narrow, winding valleys from Kinomoto to the north coast of Honshū at Tsuruga (ROUTE 23). A second highway follows similar narrow valleys northward from Imazu, west of the lake, and joins the first 2 routes near Tsuruga. The total road distance on each of these routes is 14-15 miles. All 3 routes have many sharp turns, and the railway has several tunnels. One railway tunnel, under the divide, is nearly a mile long. Steep, forested slopes rise 1,000 to 2,000 feet above the narrow valleys and provide numerous commanding heights and potential road blocks on all 3 routes.

The eastern gateway of the Biwa Basin is the Sekigahara gap, in the Suzuka-sammyaku (mountains); this gap leads to

the Nagoya Plain (ROUTES 23 and 24). The main route through the gateway varies from ½ to 2 miles wide throughout 14 miles of its length, but shrinks to a few hundred feet in the 3-mile section at the divide. This route has a railway and highway. Both rise less than 500 feet to the pass, where the railway uses a short tunnel. Fields of wet rice and dry crops (mostly mulberry groves) occupy the broader flat areas along the route. Forest covers the ridges and spurs, which rise 800 to 1,000 feet above the roadbeds. A second route, occupied by a highway, follows the same general course and crosses the main route from southeast to northwest. This second route is similar to the first, except that almost half of its length is through narrow, relatively steep valleys with abrupt, forested, side slopes. The routes cross in the small, 1 by 1¼ mile, Sekigahara basin, the key section of the Sekigahara gap.

On the southeast, 2 parallel routes follow branches of the Yokota-gawa (river) above Ishibe village and cross a low divide to join the west - east Ueno basin-Kameyama passageway (ROUTE 25). These routes are in broad flat-bottomed valleys until they reach the divide north of the Ueno-Kameyama route where narrow, winding, steep-sided valleys are used. The westernmost of these 2 routes has only 4 miles of these narrow valleys, but the easternmost route has nearly 9 miles of such constricted passage. Slopes above the valleys rise 600 to 1,000 feet and are heavily forested. Wet rice fields occupy the larger lower valleys; the higher narrow valleys are forested.

The Ueno-Kameyama passageway through the Suzuka-sammyaku (mountains) has been described in connection with the Kyōto Basin (ROUTES 25 and 27).

(3) *Ise-wan Lowlands.*

The Ise-wan (bay) region is a large, horseshoe-shaped lowland which curves around the western, northern and eastern sides of the bay. The bay and lowland form an eastern approach to the strategic Kinki Basins (Biwa, Kyōto, Nara, Ōsaka). The western arm of the Ise Lowlands extends 48 miles southward along the bay and is 9 to 11 miles wide. The eastern arm of lowland extends 24 miles southward from Nagoya, at the head of the bay, to the north shore of Atsumi-wan, a small tributary bay. This eastern arm is irregular in shape, as it includes a large bay and peninsula (Chita-wan and Chita-hantō). The arm varies from 8 to 20 miles in width. North of the bay is the Nagoya Plain which is 32 miles long north - south and has an average east - west width of 24 miles. The inland margins of the plain are not sharp. Arms of low flattish land extend back 6 to 15 miles into the surrounding mountains along the lower courses of the major streams (FIGURE II - 21).

The Ise-wan Lowlands have several levels similar to those in the Kinki Basins. Along the bay shore there are low, flat lands less than 25 feet above sea level. These extend back 2 to 5 miles from the western and eastern shores of the bay and 15 to 20 miles from the northern or Nagoya shore. Inland from these low deltas are older higher sediments rising 50 or 60 feet above sea level. A gentle, continuous, smooth slope connects the 2 levels. The higher flat lands are 5 to 10 miles wide. They are bordered inland by highly dissected terrace remnants which form hilly areas 100 to 200 feet above the flat lowlands. These steep-sided dirt hills give way in turn to the hard-rock ridges and spurs of the surrounding highlands. These rise sharply 500 to 2,500 feet above the hilly areas. A few high peaks near the margin of the Ise Lowlands reach 3,500 to 3,800 feet.

Rugged hilly land is almost continuous back of the deltas along the western arm of the lowland, south of Kuwana. This hill belt is 2 to 8 miles wide and merges into the western highland rim. Only a few scattered hilly areas lie against the northern upland rim. A 3- to 10-mile wide hilly zone borders the eastern side of the Nagoya Plain, however, and extends southwestward to cut the coastal delta lowland in two and form the Chita-hantō (peninsula). This low but rugged hill barrier separates the small Okazaki Plain from the Nagoya Plain.

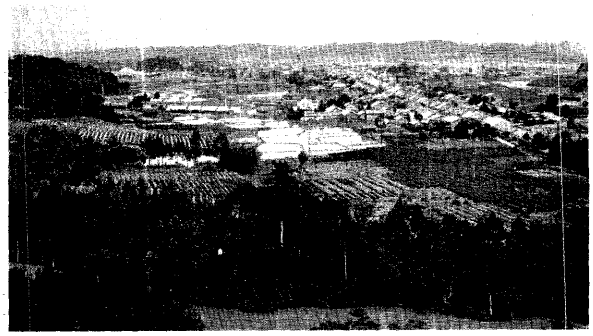

FIGURE II - 21. *Ise-wan Lowlands. West Central Honshū.* Seki village. Level, rice-covered alluvial bottom land; lower slopes in dry crops; middle and higher slopes in forest; an elongated village, innumerable telephone, telegraph, and electric lines—a typical Japanese basin or valley landscape. 1931.

Only 1 ridge from the surroundings highlands reaches far out into the plain. This highland block extends southeastward from the Sekigahara passageway and reaches the upper end of the Kiso-gawa delta above Kuwana. Dissected terrace foothills which surround the ridge reach to within 2 miles of the bay shore at Kuwana.

Soils of the lowland flats are mostly loam, with sand and much clay along the river channels. Hilly areas have sandy and gravelly soils mixed with clay, and higher uplands are covered with loose, rocky, sandy soils.

Vegetation on the low flat plains and river bottoms is chiefly wet-field rice. Higher parts of the flat land and less steep slopes in the hill lands are in dry crops. Mulberry groves dominate these dry-crop areas west of the bay and north and east of Nagoya. Many orchards are on the flat areas east of Nagoya. Forests cover the steeply sloping land in the hills and highland rim.

Deployment is possible on the flat lowlands, including the larger valleys, but is handicapped by deep mud in the rice fields, and by the numerous streams, canals, and farm villages. Cross-country movement is also relatively easy on the broad flat lowlands, but it meets the same handicaps that affect deployment. The hill belts have few flat areas, but there are many narrow valleys interconnected by low saddles. As a result, deployment and cross-country movement are greatly restricted in these areas. In the rugged highland rim of the region both deployment and cross-country movement are very difficult.

Chief gateways of the Nagoya Plain are the coastal route

to the eastern end of the Kii-hantō (peninsula) on the south; the Kameyama and Sekigahara passageways to the Kinki Basins on the west; and 3 routes to Toyohashi and Hamamatsu on the southeast. The passageways to the Kii-hantō (peninsula) and the Kinki Basins have been discussed in connection with the Kii and Kinki regions (ROUTES 23, 24, 25, 26, 27, 28, and 30). The railway routes through the high mountains to the northeast are not natural passageways but are long and extremely difficult man-made ways along a series of deep, winding, forested valleys. These routes are not discussed here, because a large part of each way lies north of 36°N, the northern limit of this study.

At the southeastern tip of the Nagoya Lowlands 3 routes cut through the narrow belt of highlands south of Okazaki and reach Toyohashi in the Hamamatsu-Toyohashi coastal region. Two of these routes lie inland, the third follows the coast. The 2 inland routes follow a series of narrow but fairly straight valleys. The easternmost of these 2 inland routes is the old Tōkaidō Road (FIGURE II - 22), now replaced in this section by a new highway and a light railway (ROUTE 22). This route, the highest of the 3, rises only 330 feet in crossing the upland. The western inland route, a railway, follows the coast from Toyohashi city to Gamagōri, and then turns north and crosses the upland with a climb of only 135 feet. A short tunnel carries the road through a small ridge east of Gamagōri. The outer or coastal route, also a railway, follows the shore of Atsumi-wan (bay) to Ishiki and there turns northward around the western end of the highland. This route passes through a 24-mile section of rugged coastal highland east of Ishiki. Correspondingly difficult sections on the other 2 routes are 4 miles of narrow valleys along the Gamagōri railway and 26 miles of rugged country along the eastern or Tōkaidō route. Commanding heights rise 350 to 850 feet above the narrow sections of all 3 routes.

FIGURE II - 22. *Ise-wan Lowlands, West Central Honshū.* A view of the old Tōkaidō Road in the vicinity of Nagoya. Trails somewhat similar to this are found throughout Southwest Japan. 1931.

Wet rice fields cover the floors of all but the narrowest valleys. Groves of mulberry and other dry-field crops occupy parts of lower slopes above the routes. Higher slopes and summits are forested. Cross-country movement along or parallel to these routes is made difficult by rugged terrain, forests, wet rice fields, and many small villages. Deployment is possible only in the broader northern sections of the central and western (railway) routes, and is handicapped there by rice fields, streams, and villages.

(4) Hamamatsu-Toyohashi Coastal Lowland.

This narrow coastal region extends eastward from the mouth of Ise-wan (bay) past the eastern boundary of the area covered in this study (138°E). A more detailed study of the entire region is given in JANIS 85, which covers Central and Northern Honshū. Only a brief discussion is given here, and this is limited to the 54-mile long section lying between Ise-wan and 138°E. This western section is 8 to 14 miles wide from the Pacific Ocean beaches northward to the rugged foothills of the Central Honshū Highlands.

Major divisions of the region are the river valley and terrace lands east of Hamana-ko (lake), the hilly lands of Atsumi-hantō (peninsula) west of Hamana-ko, and the triangular Toyohashi coastal plain north of Atsumi-hantō.

East of Hamana-ko the 8- to 10-mile strip between the sea and the mountains is divided almost equally between low flat river plains and broad terrace remnants which are in various stages of dissection. Along the coast there are good beaches backed by lines of sand dunes, 20 to 40 feet high, and several parallel sand ridges 6 to 10 feet high. Narrow, 1- to 3-mile wide strips of flat sandy coastal plain lie between these low ridges and the outer edges of the terraces. These narrow coastal flats form low east - west corridors between the river plains, and make possible a continuous east - west lowland route as far west as Hamana-ko. The 2 flat river plains, Tenryū and Ōta, are respectively 27 miles and 10 miles wide east - west, and each extends back 6 to 8 miles from the outer tips of the terraces. The terraces, which lie between the river plains are 40 to 50 feet high at their outer, or southern, ends, and rise inland in a series of benches and gentle slopes until they reach 300 to 350 feet at their junction with the foothills. The terrace surfaces are broken into segments by many long, narrow, north - south valleys, the floors of which lie 40-100 feet below the original terrace levels. The flat-topped segments between the valleys are generally less than 1 by 2 miles wide but on the large terrace north of Hamamatsu some flat areas measure 2½ miles.

Soils of the river basins are mostly loam and sand. On the terraces, the small valleys have sand and loam with some gravel; the terrace flats are chiefly a fine volcanic ash material overlying sands and gravels. The large terrace flats north of Hamamatsu have a compact clay surface soil that is difficult to break with hand tools even after a heavy rain.

Vegetation east of Hamana-ko (lake) is grass and scrub pine on the beach dunes and ridges, wet-field rice and some dry crops in the river plains and coastal flats, and dry crops (chiefly tea) and thin forest on the terraces. In the Tenryū-gawa (river) plains most of the dry crops are on small raised sand and gravel mounds 2 to 4 feet above the surrounding wet rice fields. Rugged uplands which bound the region on the north have a cover of thin forest with many grassy openings.

West of Hamana-ko (lake), rugged hills 200 to 1,000 feet high are scattered throughout the Atsumi-hantō (peninsula). A narrow ¼ mile belt of sand dunes and sand flats extends along the north and south coasts and widens to 1 mile on the west, at the mouth of Ise-wan. Hill spurs break through to the coast and form rocky headlands at a few places. Narrow valleys and wider pockets of lowland extend inland between the hills and cross the peninsula in several places. A similar lowland belt cuts across the base of the peninsula at Futagawa and provides a narrow but easy passageway between the mouth of Hamana-ko and the Toyohashi plain (ROUTE 22).

Soils and vegetation on Atsumi-hantō (peninsula) are similar to those described above. One difference is that on the peninsula most of the dry-crop area, on flats and lower slopes, is in mulberry groves instead of tea bush.

The small triangular Toyohashi plain north of Atsumi-hantō (peninsula) forms a flat amphitheater, 7 by 9 miles, at the head of Atsumi-wan (bay). The plain is mostly clay-sand material brought down by the Toyo-kawa (river) and several smaller streams. Almost all of the lowland is in paddy fields. Along the Toyo-kawa (river), in the northeastern section, and south of Toyohashi city, mulberry and other dry crops occupy much of the low flat area and some of the lower hill slopes. Most of the rugged foothills which rise 600 to 1,000 feet above the plain are forested, but a few slopes are covered with coarse grass.

Within the Hamamatsu-Toyohashi region deployment and cross-country movement are least handicapped on the river plains of the Ōta, Tenryū, and Toyo. More difficulties are encountered in the eroded terraces east of Hamana-ko (lake) and in the low hilly lands of eastern Atsumi-hantō (peninsula). Most difficult are the steep outer slopes of the terraces and the high rugged hills on western Atsumi-hantō and along the inland border of the region.

On the river plains and coastal flats, including the dune areas, chief handicaps to mobile operations are sand dunes and ridges 6 to 40 feet high, numerous streams and drainage ditches, many closely built agricultural hamlets, and almost continuous wet rice fields which are water-soaked and deep in mud the year around. In the terrace and low hilly areas alternate flat land and steep slopes, with wet rice fields on much of the flat land, greatly limit deployment and cross-country movement.

In the higher areas, deployment and cross-country movement are limited, both in area and in direction, by steep slopes, by loose rock, and by scrub forest.

Critical points which must be passed in moving from the beaches toward the important Ise-wan Lowlands are: the dune belts back of the beaches; the narrow 1- to 3-mile coastal flats between the terraces and the sea, south of Hamamatsu and Nakaizumi; Hamana-ko (lake), which extends completely across the lowland; and the 5-mile hill belt between the lake and the Toyohashi plain.

Only 2 natural passageways form land gateways to the Toyohashi-Hamamatsu region. These are the northwestern routes through the rugged lands north of Toyohashi and the eastern continuation of the Hamamatsu Lowland beyond 138°E. The first of these routes northward from Toyohashi has been discussed in connection with the Ise-wan Lowlands (ROUTE 22). The second, or eastern, outlet is outside the limits of this study, and is treated in JANIS 85.

(5) *Central Honshū Rugged Highlands.*

The rugged highlands north and east of the Nagoya Plain are part of the extensive mountains of Central Honshū. Only about half of this great barrier is within the area of this report; the highland region as a whole is described in JANIS 85. Measuring 150 miles north to south and 100 miles west to east, these high rugged mountains occupy the full width of Honshū and include its highest mountain ranges. They are the major obstacle to communication and movement between Southwest and Central Honshū. General elevations increase from west to east and from south to north, from about 3,000 feet in the southwest to about 10,000 feet in the northeast. In the east are 3 major ranges, oriented from north to south, the Hida-sammyaku, the Kiso-sammyaku, and the Akaishi-sammyaku, separated from each other by the Kiso-gawa and the Tenryū-kawa. The Kiso-sammyaku is the only one of the 3 ranges which lies largely within the area of this report. Northwest of the Nagoya Plain a 3,000- to 5,000-foot rugged highland extends westward from the Hida and joins an extension of the Suzuka-sammyaku north of Sekigahara pass to complete the encirclement of the Nagoya Plain on its landward side. The terrain throughout the Central Honshū Rugged Highlands consists almost exclusively of a maze of high, sharp-crested, forested ridges, of steep slopes, and deep narrow canyon-like valleys. Settlements have avoided the region, and few roads and railways penetrate or traverse it.

There are 3 lowland areas within the part of Central Honshū Rugged Highlands included in this report. These are the Fukui Plain, the Iida valley and the Nakatsu Basin. The Fukui Plain is the southern extremity of the coastal lowland of Kanazawa described in JANIS 85. The Iida valley, on the upper Tenryū-kawa (river) is about 35 miles long, and 2 to 5 miles wide. It is isolated by mountains, and consists of a string of disconnected, flat, rice-covered river plains, at best a mile wide, bordered and separated by undulating higher gravel plains or by low hill ridges 100 to 300 feet above the river plains. These transverse hills are most extensive on the western side of the valley. Below Iida the southward draining Tenryū-kawa crosses the mountainous terrain in a wild, practically inaccessible gorge. The Nakatsu Basin is on the middle course of the Kiso-gawa. It has strongly rolling hills, 300 to 600 feet high, and is separated from the Nagoya Plain by even higher hills. The Kiso-gawa flows along the northern edge of this basin in a narrow gorge 600 to 1,000 feet deep. Within the basin the valleys are shallower and wider, movement is easier, and some roads and settlements have been established.

The Central Honshū Rugged Highlands are an effective barrier between Southwest Japan and Tōkyō. Land communication along Honshū's south coast follows the Hamamatsu-Toyohashi Coastal Lowland, but to the east of the area covered in this report the mountains reach the Pacific Ocean, and roads and railroads are forced to use steep slopes or tunnels. On the north (outside the area under consideration) the mountains reach the Japan Sea, blocking the coastal routes for a distance of about 15 miles. No good natural passageways go through the Central Honshū Mountains entirely. The best route through

part of the region is via the Iida valley, eastward from which other basins, separated by hill and mountain ranges, could conceivably be used in an advance upon Tōkyō from the west. Penetration of the Iida Valley from the west, however, would be a major undertaking. From Nagoya it would be necessary to cross the rugged hill country of the lower Kiso-gawa to the Nakatsu Basin, thence over 2 high passes, 4,000 to 4,300 feet, in the central part of the Kiso-sammyaku. Mountain roads from Nakatsu to Iida now follow these routes.

E. Western Honshū.

Western Honshū is the long peninsula that extends westward from the Kinki Basins (Ōsaka, Kyōto, Biwa) to the Shimonoseki-kaikyō (strait) between Honshū and Kyūshū (FIGURE II - 107). Islands fringing the southern or Inland Sea margin of Honshū are included. Major dimensions of the region, including the islands on the south are 285 miles east - west, and 80 miles north - south. On the west, the peninsula tapers to a width of 33 miles north - south.

Highlands of moderate height, 2,000 to 4,000 feet, dominate the peninsula (PLAN 38). Gently rounded or flattish crests are common, but most side slopes are steep. A few small, irregular plains are scattered along the south coast, and 1 group of such lowlands occupies the center of the north coast. Scattered hills dot the small plains, and reduce the continuous level areas to 5 or 6 miles at most. Interlocking nets of valleys penetrate the highlands deeply at several points (PLAN 40). Many other valleys cut far back into the highlands, and at several places parts of valleys are connected by low passes and form passageways across the peninsula. All of these passageways as well as the valley nets are deep, narrow, and crooked throughout most of their courses, and can be blocked at numerous points. The islands in the Inland Sea resemble the neighboring mainland areas, as most of them are hilly with small pockets of low level land.

Lowland soils are mostly loam in the southeastern section and clay with some loam in the remaining areas. Upland slopes have thin soils, mostly coarse sand and rock with some clay.

Vegetation on the plains and in the valleys is dominantly wet-field rice. Even the narrow tributary valleys in the higher uplands have strings of tiny rice fields, most of them soaked and muddy the year around. Small patches of dry-field crops are on the unirrigable flat areas and lower slopes near most villages. Uplands are in mixed needleleaf and broadleaf forest with many extensive areas of coarse grass on middle and higher slopes. These grassy openings in the forest are larger and more widespread toward the eastern and western ends of the region.

Terrain subdivisions of Western Honshū will be discussed in roughly counter-clockwise order beginning with the Tamba Broken Plateau on the east and proceeding westward along the north coast. Only the most significant subdivisions are presented in any detail.

(1) Tamba Broken Plateau.

The Tamba Plateau is significant chiefly as a barrier upland west of the highly strategic Kinki Lowlands of Ōsaka, Kyōto, Biwa, and Nara. The plateau is roughly square, 60 miles east - west by 65 miles north - south. A narrow section, maximum width 8 miles, reaches southward to the coast west of Kōbe. The plateau's most important characteristic as a military topographic feature is its broken nature; therefore, the western boundary is placed arbitrarily west of the Maruyama-gawa - Ichi-kawa passageway across the peninsula (ROUTE 34). Long, narrow, mountainous Awaji-shima (island), 8 by 32 miles, on the south is included as an outlying part of this region. General statements concerning the region apply also to the island. Awaji-shima has military significance in that it separates the waters of Harima-nada, Ōsaka-wan, and Kii-suidō, and thus dominates the water approaches to the critical Kinki Basins.

The Tamba Plateau uplands are low, 1,000 to 3,500 feet, are round or flat-topped, and are cut into numerous ridges and blocks by narrow, winding, steep-sided valleys, and by larger, 1- to 2-mile wide, basin-like depressions. Several of the larger valleys from opposite coasts are linked by low passes or interior basins, and thereby form long, narrow, low, but difficult passageways across the region. All of the passageways are now utilized and have either highway or railway lines. The most important of these routeways have been discussed previously in connection with the western gateways of Ōsaka and Kyōto Lowlands and are discussed further under Topic 27 (ROUTES 32 and 34). None of the passageways is a true corridor; all are quite difficult in spots, with many narrows and commanding heights. The routes can be blocked easily at such points.

Soils and vegetation conform to the basic pattern for Western Honshū. Lowlands have mostly clay and loam soils and uplands have a thin, rocky, clay soil. Vegetation in the valleys and narrow basins is chiefly paddy rice with some dry crops; vegetation on the uplands is chiefly forest, with many grassy areas.

Deployment is almost impossible in this region. Cross-country movement is least difficult in the valleys and small basins, but there it is handicapped by muddy rice fields and numerous farmsteads, streams, and commanding heights.

(2) Matsue-Tottori Coastal Lowlands.

These lowlands, on the north coast, are a series of small deltas. Some of these deltas are connected by fairly level routes along the outer slopes of a line of large volcanoes. Low but rugged hills reach the coast along the south shores of Shinji-ko and Nakano-umi and near the town of Aoya. These rough stretches form low but fairly effective barriers between adjacent delta flats. The region extends 90 miles east - west and a maximum of 3 to 6 miles north - south. These maximum distances reach to the heads of the deltas. At the western end of the region is the Shinji-Matsue-Yonago trough which lies between the mainland and a hilly, 43-mile-long offshore peninsula to the north. Deltaic deposits have filled in the 3-mile wide mouth of the western embayment of this trough, thus forming a small plain (FIGURE II - 23). The head of the western embayment, now blocked off from the sea, forms Shinji-ko. East of this lake is a rocky isthmus, to the east of which is Nakano-wan and a long curved sand spit which separates Nakano-wan from Mio-wan and the Sea of Japan. The sand spit curves northwestward 11 miles from Yonago and is 2 miles wide. Most of the spit area is nearly flat, and forms a small sandy plain. The 40-foot dunes on this spit and the 40- to 150-foot coastal dunes south of Taisha and north of Tottori, are the most notable minor relief features in the region.

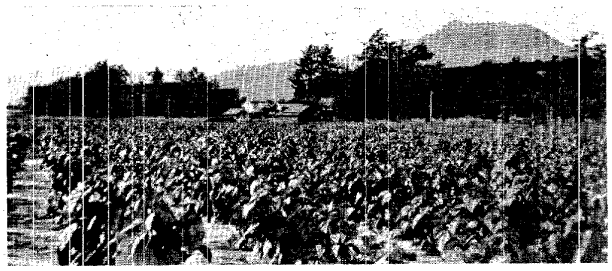

FIGURE II - 23. *Matsue-Tottori Lowlands, Western Honshū.*
Dry crops on Shinji Plain. Looking SW. Note farmstead windbreak, also steep, rugged mountain in background. 1931.

Uplands rise 600 to 1,100 feet in the areas north and south of the Shinji-Matsue-Yonago trough, and on the landward margins of the other deltas. Between the eastern (Kurayoshi-Tottori) deltas, isolated and roughly conical volcanoes rise 4,000 to 5,000 feet, but the summits are 8 to 10 miles inland. All these highlands have steep middle and upper slopes covered with forests and patches of coarse grass.

Vegetation of the lowlands is chiefly wet-field rice on the flatter areas, and dry crops, chiefly mulberry, on the coastal dunes and lesser sand ridges.

Soils are sandy in the coastal areas and in strips marking old dune sites farther inland. Other delta soils are clay and clay loam. The uplands have thin sandy soils with much loose rock on the slopes.

The lowlands are so separated by the Shinji-Nakano water bodies and rocky slopes that only restricted deployment is possible on the separate low flat areas. Even there, deployment and cross-country movement are greatly restricted by streams and large drainage ditches, by numerous farmsteads on the raised sandy (old beach-dune) ridges, and by the widespread rice fields which are muddy even in winter. An additional local handicap to both movement and ground observation is imposed by rows of 20- to 40-foot high tree windbreaks on the northern and western sides of farmsteads.

Cross-country movement is even more difficult in the upland border and high dune areas. There the chief handicaps are steep slopes, loose sand- and rock-soil, and forest cover.

The Matsue-Tottori Coastal Lowlands have no easily traversed natural gateways (ROUTES 36, 37, and 40). A first-class railway and a highway run east and west along the Japan Sea coast and connect the lowlands with other coastal areas. These routes use many sharp turns, however, and pass through numerous cuts in order to get around the rocky headlands. The railway is forced to tunnel through some of the steeper spurs. Similar turns, cuts, and tunnels are used by the railways and roads which lead southward across the peninsula from Shinji, Yonago, Kurayoshi, and Tottori. These routes can be blocked easily at many places in the 50- to 60-mile sections which lie in the more difficult parts of the highlands.

(3) *Western Honshū Rugged Highlands.*

This region includes the mountainous interior of Western Honshū westward from the Tamba Plateau. It reaches only the north coast, to the west of the Shinji delta area. The highlands of this region are mostly steep-sided, round- or flat-topped blocks separated by narrow winding valleys (FIGURE II - 24). They decrease in average elevation from around 2,000 feet on the east to slightly under 1,000 feet on the west. Scattered peaks, many of which are volcanoes, rise above these levels and reach 4,000 to 5,000 feet. Although average elevations are not high, slopes are steep, most of them being well in excess of 30 per cent (PLAN 40).

Most soils are sandy with clay areas in the scattered valleys and ridge-top flats. Much loose rock is mixed with the thin soils on slopes.

Vegetation is dominantly forest with many grassy openings, including recently cleared sections of the flatter ridge tops. These open grassy areas are located chiefly on the flat-topped blocks near the western border. Tiny rice fields occupy the less steep sections of the valleys and parts of the lower slopes. Patches of dry-crop land are on upland flats and near the scattered farmsteads in the valleys.

Deployment is possible to a very limited extent in the few scattered segments of wide valley bottomland and on some of the larger of the ridge-top flats. Cross-country movement is extremely difficult due to steep, rocky forested slopes, to the absence of corridor or valley openings longer than a few miles, and to the presence in the valleys of wet rice fields, numerous farmsteads, and swift unbridged streams. The routes which cross this region all have segments of exceptional difficulty (ROUTES 36, 37, 40, 41, 44, 45, and 46).

(4) *Western Honshū Broken Lands.*

This region comprises the southern coastal areas, the tributary inland areas, and the adjacent islands of Western Honshū. It extends eastward for 225 miles from the narrow water gateway of Shimonoseki-kaikyō (FIGURE II - 25) to the lowlands

FIGURE II - 24. *Western Honshū Rugged Highlands.*
Low but rugged mountains of western Honshū greatly limit deployment and cross-country movement. 1931.

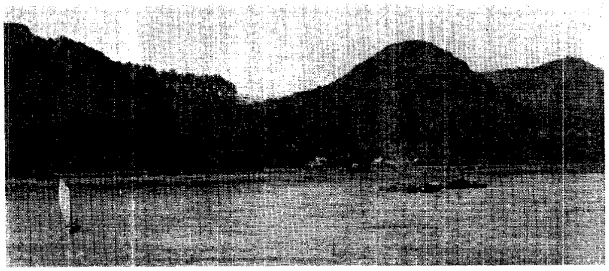

FIGURE II - 25. *Western Honshū Broken Lands.*
Shimonoseki-kaikyō, Honshū, looking N. Low, steep, forested hills of western tip of Honshū rise directly from the shore of the strait.

around Himeji (FIGURE II - 26). Including the island groups, the region varies from 15 to 60 miles in width north - south.

This region is distinguished from the rugged mountains on the north by numerous flat-floored valleys and small basins which form complicated nets. These valley nets reach 50 to 60 miles inland and converge to form small spider-like basins around Miyoshi and Tsuyama. Similar valley groups, plus extensive delta fills around inshore islands, have produced an irregular hill-dotted coastal plain in the Fukuyama-Okayama area (FIGURE II - 27).

Hills, ridges and upland blocks which surround, and, in places, invade the lowland are round-topped with smooth, moderately steep-sided slopes (FIGURE II - 28). Heights range from 800 to 2,500 feet. The uplands have thin, sandy, rocky soils, and a spare forest cover, much of which has been cut over repeatedly by charcoal burners. Grassy openings in this forest are smaller, fewer, and farther apart than in the higher uplands to the north. Lowlands have mostly sandy loam and clay soils in the larger valleys and coastal plains, with some sandy clay soils. Landforms and soils on the islands are similar to those just described (FIGURE II - 29), except that lowland areas consist of coastal strips and pockets rather than valleys, and only the large eastern and western islands, such as Shōdo-shima and Yashiro-shima, have many heights over 1,500 feet.

Most of the flatter lowlands and parts of the lower slopes have been leveled or terraced and made into paddy fields. Many small areas of dry-field crops occupy dry terraces and lower slopes especially in the central Fukuyama-Okayama area (FIGURE II - 30). A special wet-field crop which competes with rice for space in the flooded lowland fields is "I", the reed used to make Japanese "tatami" floor matting.

Deployment and cross-country movement are possible in the plains, basins, and larger valleys but encounter the usual difficulties found in restricted Japanese lowlands; these are: flooded rice and "I" fields (less muddy from September to May), and numerous streams, canals, and villages. Many commanding heights overlook the valleys; and outlying hills furnish potential emplacements even in the larger basins and coastal plains. Cross-country movement is possible also in the uplands but is greatly restricted by prevailing steep slopes, loose rock, forest cover, and commanding heights.

The chief natural gateways of the Western Honshū Broken Lands are: westward across the narrow Shimonoseki-kaikyō to

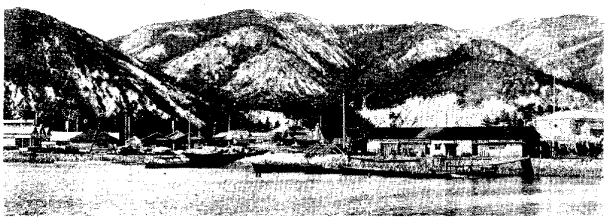

FIGURE II - 27. *Western Honshū Broken Lands.*
Okayama, looking N. Narrow coast strip section of Okayama Lowland, backed by typical low rounded hills with thin soil and forest cover. 1919.

FIGURE II - 28. *Western Honshū Broken Lands.*
Mountains inland from Hiroshima. Cross-country movement is difficult along routes through the highlands of Western Honshū. Note rocky soil and thin forest cover.

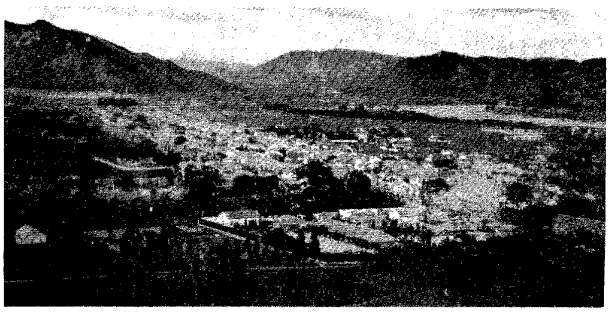

FIGURE II - 26. *Western Honshū Broken Lands.*
Himeji Plain, looking N. The Himeji-Yashiro Lowland is a series of flat strips among hills and ridges. 1922.

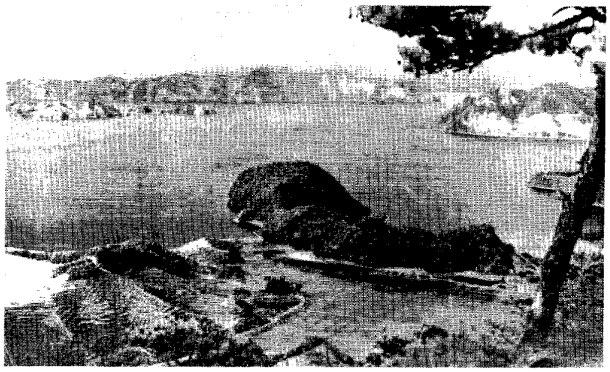

FIGURE II - 29. *Western Honshū Broken Lands.*
Omi-shima. Looking W. Typical cultivated pockets, and barren hills on islands of Inland Sea. Note wet rice fields and terraced lower slopes. 1933.

the Moji-Yawata industrial area of northeastern Kyūshū, eastward to the Himeji Lowland, and northward to Senzaki on the northwest coast of Honshū. The Shimonoseki-kaikyō has been underpassed by railway tunnels, and is now a land as well as a water link. The eastward outlets to Himeji are 2 winding valley routes from Tsuyama and Okayama. Railways and highways now use these valleys, but forested commanding heights up to 1,500 feet make the passageways difficult as natural routes. The route northward from Ube on the Inland Sea to Senzaki on the Japan Sea, near the western end of Honshū, passes through similar winding valleys below forested heights of 500 to 2,000 feet (ROUTE 46). The higher ridges and narrower valleys are encountered in the northern part of the route where it leads through the western end of the rugged interior highlands of Honshū.

FIGURE II - 30. *Western Honshū Broken Lands.* Inland Sea near Tomo. Looking eastward. Dry crops on terraced lower slopes of broken land along the Inland Sea. Note rugged islands in background.

(5) *Himeji-Yashiro Lowland.*

This small, irregular lowland is a series of converging alluvial valleys cut back into rugged dirt hills 300 to 600 feet high, above which rise low, rounded, rock-ridges and blocks 800 to 2,800 feet high. The lowlands of the region are small delta plains backed by a close net of flat-floored valleys (FIGURE II - 26). The entire region including hill belts and isolated heights extends 18 miles north - south and 25 miles east - west. Its location west of the strategic Ōsaka Coastal Plain increases its importance.

Lowlands have mostly loam soils with some sandy areas. Wet rice fields occupy almost all flat areas and lower slopes. A few patches of dry crops are near settlements; and thin forest occupies the hills and rocky uplands. Soils on these uplands are coarse alluvium on the hills and thin, sandy, rocky types on the higher ridges.

Deployment and cross-country movement are possible in the lowlands but such operations must allow for commanding heights except along the coast, for rice fields which are muddy most of the year, and for numerous agricultural hamlets, streams, and large drainage ditches. Cross-country movement is also possible in the hill- and rock-ridge areas but is handicapped by steep slopes, rocky soil, woodland, and commanding heights.

The region has no broad, level, natural gateways; but 3 pairs of routes, each used by a railway and a highway, lead respectively westward, northward, and eastward (ROUTE 34). All of these passageways conform to the main type found in western Honshū and follow fairly deep, narrow, and generally winding valleys or coastal sills. These routes are not treated here because they have already been discussed in connection with the Western Honshū, Tamba Broken Plateau, and Ōsaka Basin regions.

22. *Drainage and Water Supply*

FIGURE II - 109 shows the drainage pattern of Southwest Japan.

A. General.

There are no rivers in Southwest Japan comparable to the large rivers of continental areas, as barriers to cross-country military operations. Drainage has a significant but secondary influence upon such operations, however, particularly on the lowlands. The great majority of Japan's rivers have short courses, and flow through deep, narrow gorges in their headwater areas, debouching suddenly upon flat to gently sloping coastal plains or interior basins. In their upper, mountainous reaches, the streams are rapid, have a high rate of flow considering the small size of their catchment areas, and have rough, rocky stream beds, but they do not present any greater difficulties than the general terrain through which they flow (FIGURE II - 12). In the lowlands, streams normally constitute only minor hindrances to movement, but on occasion they may become major barriers; there is always the threat of floods following severe storms in the summer months or following the destruction of storage or power dams upstream. Few of the rivers of the plains have deep channels; instead, they tend to flow in broad, debris-choked beds, with many islands, and several ill-defined, shifting channels (FIGURE II - 31). Near the mouths of the larger rivers, however, particularly in the vicinity of the coastal delta cities, the channels have been canalized, and few fords are available.

Few of the rivers could be considered as effective water barriers; nevertheless, the dikes and natural levees that parallel the lowland streams, and the low alluvial terraces that also are common along many such streams, form natural bunkers. These are well-adapted for defense against enemy movement laterally across the lowlands. The rice paddy fields that cover a large area of lowlands are a drainage element of no little significance to military operations (FIGURE II - 32). During practically all of the year they would be traversable only by foot troops or by certain types of tracked vehicles. Although most of the irrigation ditches are small and shallow, and would not hinder troop movement materially, some of the larger main-diversion ditches would be troublesome (FIGURE II - 33). Irrigation ponds and "tanks" are common on many of the larger lowland areas. Their close spacing and depth—commonly 3 to 8 feet—would make them effective tank traps, especially when supplemented by minefields. Some of them are elevated a few feet above the level of the plains, and if drained, would provide numerous defensive bunkers.

Swamps and marshes are insignificant areally in Southwest

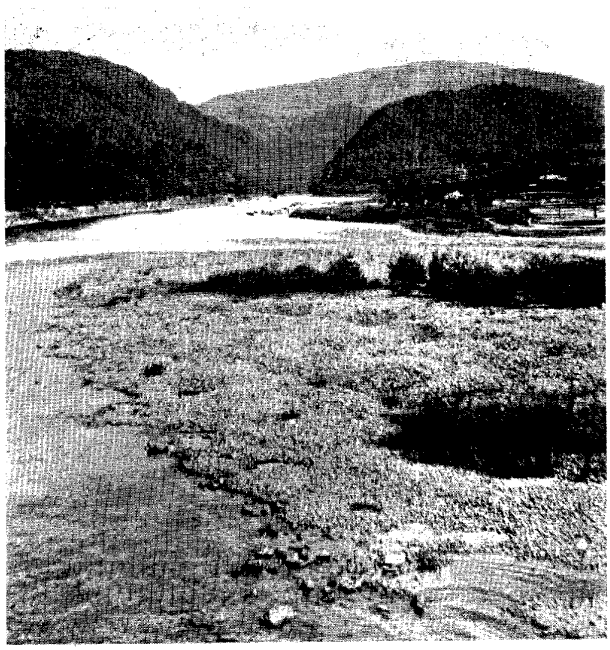

FIGURE II - 31. *Uji-gawa, Kyōto Basin.*
Looking SE. Shallow stream with debris-choked channel, at point where river enters interior basin from mountains. August, 1933.

FIGURE II - 32. *Rice field, Honshū.*
Water several inches deep in rice fields will make movement difficult across most of the lowlands of Southwest Japan in summer. Many of the fields remain muddy throughout the year.

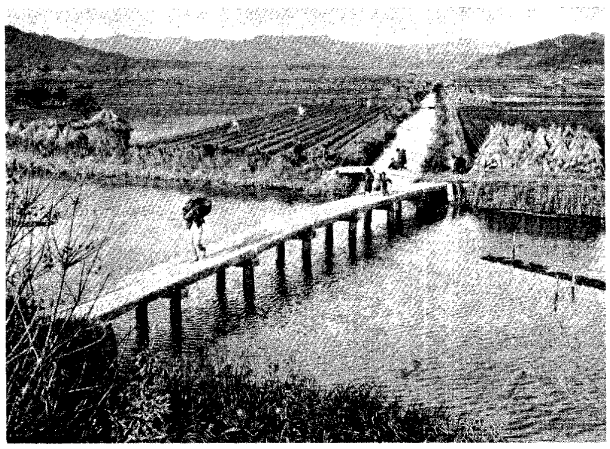

FIGURE II - 33. *Main irrigation canal near Ogori.*

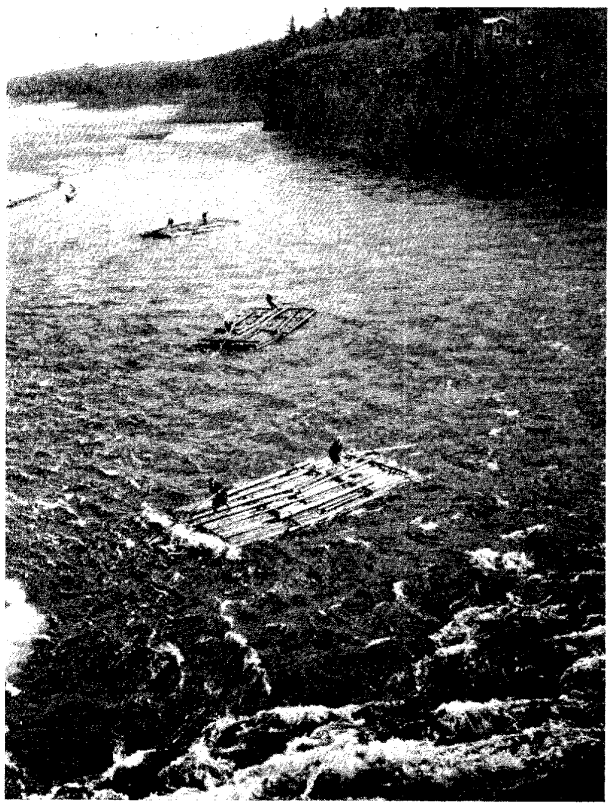

FIGURE II - 34. *Kiso-gawa, Honshū.*
Rafts on the turbulent Kiso-gawa.

Japan. Most areas which once were swampy or marshy have been drained and adapted for rice cultivation.

Abundant supplies of water generally are available in nearly all parts of the area. The only possible exceptions would be on small off-lying islands, and in some of the isolated inland basins during occasional drought periods. The gravels and sands of the lowlands provide a good supply of water in shallow wells at a depth of 30 to 100 feet. Such wells supply approximately half the total population. On the alluvial terraces, wells would have to be considerably deeper. Municipal water supply systems utilize artesian wells, springs, rivers, lakes and ponds. Disinfection of municipal water supplies is not common, filtration being the principal method of treatment; therefore the danger of pollution is always present, regardless of source, and all water should be properly treated.

B. Rivers.

The upper, middle, and lower reaches of most Japanese streams are in marked contrast, and are here described separately.

(1) Upper reach.

The sources of nearly all streams in Southwest Japan are in the mountainous interior of the islands. Tributaries are short, and the collecting areas are small. Because of the steep slopes, run-off is extremely rapid. Stream gradients are steep, and falls and rapids are common (FIGURE II - 34). Hydroelectric power resources have been developed extensively in

Japan. Water storage dams are found on the upper reaches of most of the larger streams. Besides these, many of the smaller streams have small dams for use in the rice irrigation systems.

Detailed data on stream flow are available for the upper reaches of the principal streams. These data indicate some seasonal as well as regional differences. Selected examples of these are given on FIGURE II - 109. The most consistent seasonal regimes are found on Kyūshū and the Pacific side of Shikoku. They all show remarkable peak flows during the summer months, particularly in June, July, and August. These correspond to the unusually heavy rains occurring at that season. On Honshū, peak flows often occur both earlier and later in the year, from April through October. Also common on Honshū, and mostly absent farther south, is a subsidiary high water period corresponding to the cyclonic rains of spring. The winter months, November through February, are consistently low water periods throughout Southwest Japan, although the minimum flow may occur in any month of the year. Mean annual stream flows are fairly uniform, the larger streams on Honshū showing the greatest variation from year to year. Individual peak flows, however, vary considerably from year to year. Data on observations, however, are mostly for only 5- to 10-year periods, hence should not be considered to be wholly representative of average conditions.

(2) *Middle reaches.*

The larger streams generally pass through 2 successive reaches below their main catchment areas and before they reach the coastal lowlands. The first is their passage across the interior basins, where they temporarily attain many of the characteristics of the coastal lowland reaches. After leaving the basins, they flow through winding canyon-like valleys, with only a narrow strip of valley flat between the towering valley walls. These narrow valleys, like the upper reaches, have numerous water storage dams, generally somewhat larger in size.

(3) *Lower reach.*

This portion of the average river course consists of its passage across the coastal lowlands to the sea. At the upper portion of this reach, the stream gradient suddenly decreases, and the river bed becomes choked with sand, gravel, or cobbles. Commonly, the river is elevated slightly above the general level of the plain. More or less paralleling the river course are dikes which confine the river waters during flood periods. These dikes are spaced about ½ to 1 mile apart, on opposite sides of the river. They are usually from 10 to 20 feet high, are wide enough on the top for single-lane roads, and in many places are faced with stone on the river side. A considerable number of the rivers have fairly consistent average depths exceeding 5 feet in their main channels (FIGURE II - 109), but shifting sand and gravel bars interfere with river navigation. These bars, however, provide possible sites for fording (FIGURE II - 31). In addition, the practice of diverting water from the rivers to irrigate rice fields causes many of the streams to be nearly dry during some periods in mid-summer. The boats that commonly use the rivers of the lowlands are of very shallow draft, usually about 2 feet. Many such small river craft go far into the interior on the larger streams (FIGURE II - 35). Many rivers are used also to float rafts of logs from the forests. Although many of the streams have an appreciable current on the lowland reaches, it would not be very difficult to throw pontoon bridges across them, for the banks are quite firm, and the gravel, sand and cobbles of the bottom would provide good anchorage (FIGURE II - 36). Muddy banks and bottoms are unusual in Southwest Japan. Broad, bare, sand and gravel flats border most of the downstream river courses (FIGURE II - 37).

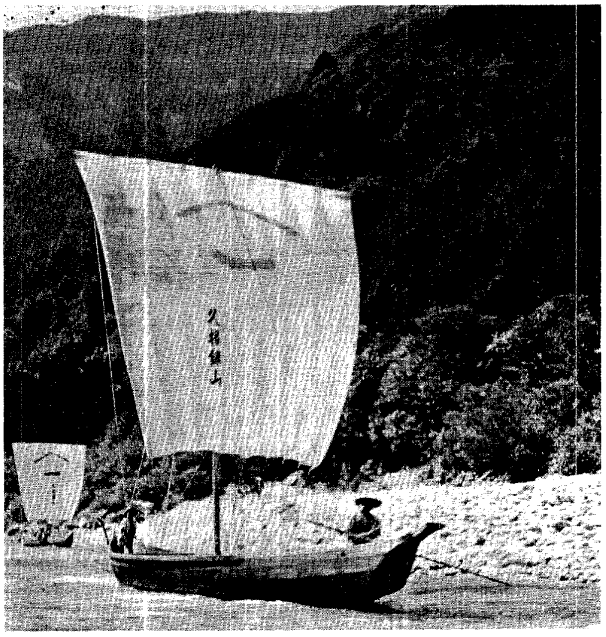

FIGURE II - 35. *Kiso-gawa, Honshū.*
Boats such as these can navigate stretches of the mountain streams of interior Honshū.

(4) *Canalization.*

Most of the larger cities of Southwest Japan are ports, located on the deltas of the larger rivers. To accomodate the large volume of shipping that enters and leaves these ports, many of the multiple river mouths in the vicinity of the ports have been deepened. These channels are bordered by artificial levees, commonly faced by stone or by wooden piling. The numerous channels in or near Ōsaka, Nagoya, Hiroshima, and other Inland Sea ports would be effective elements in the defense of these cities. In some of the larger cities of the interior plains, such as Kyōto, the stream courses have also been deepened, narrowed, and confined.

C. Lakes.

The lakes of Southwest Japan appear to have little significance to military operations. Most of them are very small, and consist mainly of volcanic crater lakes, water reservoirs, or stream mouth lakes dammed by dunes or beach ridges. Biwa-ko is the only really large lake in the area, and is located northeast of Kyōto. It is a deep lake, and presumably would be suitable for float plane use, although mountains rise steeply on its western side. The many sheltered harbors along the coast, however, provide much more suitable seaplane anchorages than do inland water bodies. The influence of the thousands of storage ponds of Japan on military operations has already been dis-

FIGURE II - 36. *Bridge at Uji, Kyōto Basin, Honshū.*
Bridge over a part of the middle reach of the Uji-gawa. Looking N. This stream is shallow, but the current is swift. August 1933.

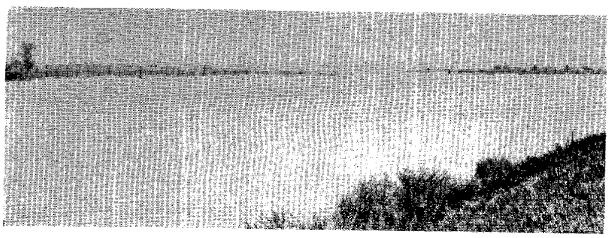

FIGURE II - 37. *River in Honshū.*
Wide, shallow lower course of a Japanese river. Note firm levee bank in background.

cussed. Specific areas where these ponds are especially numerous are in northeastern Shikoku east and west of Takamatsu, in the Nara Basin south of Kyōto, on the Ōsaka Plain, on the Himeji-Akashi Coastal Plain, on the plain west of Tamashima, and on Awaji-shima (island) in Harima-nada.

23. *Soil Trafficability*

A. General factors affecting soil trafficability.

Soil trafficability refers to the capacity of soils to support the movement of military vehicles. It refers especially to cross-country movement of vehicles and to traffic on unimproved roads made of local soil, rather than to traffic on improved or surfaced roads. Soil trafficability is determined by the type of soil (textural grade, organic matter content, and other profile features), topography, vegetation, and weather factors. In this area, the important weather factors are: precipitation (duration, intensity, and character); temperature as it affects evaporation, plant growth, and the freezing and thawing of soil; and wind, cloud cover, and humidity, which affect evaporation of soil moisture. Weather information used in this section was obtained from Chapter V.

The general soil trafficability is moderately unfavorable in this area. At most places the precipitation is high, ranging from 50 to 190 inches annually, with the greater part of the area experiencing between 60 and 80 inches. That part of the area south of the central mountain ranges of Honshū experiences a distinct dry period during November through February, and the consequent concentration of precipitation during the remaining months results in periods of poor trafficability. Although there is no very marked variation in monthly precipitation in Honshū north of the central mountain range, the terrain is generally less favorable than south of the mountain ranges, and nontrafficable conditions during the winter months are more common because of greater total winter precipitation and snowfall.

The poorest trafficability conditions throughout the area accompany the torrential rains associated with typhoons and increased cyclonic activity, particularly during September. During this period, lowlands are often flooded by stream overflow, and coastal lands may be swept by extremely high tides which follow in the wake of typhoons. Rainfall of 8 to 30 inches in 24 hours may occur during the passage of a typhoon, and vehicular movement is halted.

Over most of the area, precipitation falls on 140 to 220 days a year, and south of the central mountain ranges of Honshū, rainfall frequencies resemble rainfall amounts in areal and seasonal contrasts. North of the central mountain ranges, particularly during fall and winter, precipitation is usually light but frequent, and the number of days with precipitation equal to or greater than .004 inch ranges from 14 to 22 a month. Consequently, there is little time for the soil to regain normal trafficability between successive periods of precipitation.

Moderately high humidity is characteristic of this region in all seasons and impedes the rapid evaporation of soil moisture. Relative humidity at all coastal stations ordinarily averages over 70% for the months with the lowest humidities, and south of the central mountain ranges of Honshū it is particularly high during summer.

In much of the area, snow on the ground is seldom an obstacle to the movement of vehicles. This is particularly true on the exposed southern coasts where snow usually falls on only 1 to 3 days during each winter. In the central mountain ranges of Honshū and in the region north of them, snow usually falls on more than 10 days a month during January and February and, for short periods, will restrict the movement of vehicles.

The occasional soil freezing that occurs in most of the area should not affect trafficability except insofar as it disrupts normal soil drainage. In mountain areas of Honshū, freezing occurs more frequently, but even there it probably very seldom hardens the soil sufficiently to support vehicles. If shallow freezing occurs when the soil is already saturated, vehicles will break through the crust, and trafficability will be poor.

It is evident, then, that the weather factors alone result in

poor trafficability, at least seasonally. In addition, a large part of the interior of the area consists of rough mountain ranges, where trafficability is poor regardless of soil or weather conditions, and where vehicular movements are restricted to discontinuous coastal plains separated by mountainous headlands, or to the usually narrow valleys extending into the interior. Furthermore, much otherwise favorable terrain is used for wet rice fields, and poor trafficability results over large areas. The general distribution of rice land is shown on the accompanying soil trafficability map (FIGURE II - 110). Detailed distribution of rice land is shown on the vegetation maps (PLANS 41 and 42).

In areas of favorable terrain, soil conditions are important in determining general routes of movement. The soil trafficability map shows considerable variation in soil types in these areas. In general, fine-textured and medium-textured soils cover approximately equal areas. Clay constituents predominate in the fine-textured soils, which are slippery and muddy whenever wet. The fairly even division of sand, silt, and clay constituents in the medium-textured soils gives them more favorable drainage properties. Coarse-textured soils, which are generally trafficable except during heavy precipitation or when flooded in river valleys, cover less area than the other types.

B. Soil trafficability by regions and seasons.

The legend on FIGURE II - 110 is self-explanatory insofar as it indicates the relative trafficability of the different soil types in their natural state. Caution is urged in the use of the map, since it gives an over-all view of the soils and soil trafficability rather than detailed information for any one place.

The central mountain ranges of western Honshū constitute an important climatic and soil trafficability boundary for Southwest Japan. The part of Southwest Japan south of that boundary is treated below under (1), (2), and (3). The area north of that boundary is treated under (4).

Considering the southern area as a whole, the most favorable trafficability conditions occur in southern Kyūshū and along the shores of the Inland Sea. The period of most favorable trafficability is during November through February, and there is usually a shorter favorable period, during August, in the protected areas adjacent to the Inland Sea. Conditions are moderately to extremely unfavorable during June and July, and are least favorable of all during September.

(1) *Kyūshū.*

On Kyūshū, soils having favorable trafficability are particularly widespread south of the 32° parallel and extend in a narrowing strip northward along the east coast to Nobeoka. In this area, the inland soils are predominantly ash loams which drain rapidly. Where terrain and land use permit, these ash loams afford good cross-country trafficability except during and immediately after heavy precipitation. Coastal sands which are usually trafficable occupy an almost continuous strip along the east coast between Miyazaki and Nobeoka. Medium-textured soils of somewhat less favorable drainage than the ash loams of the south are common in the lower valleys of northwestern Kyūshū and on the east coast between Beppu-wan and Tsurumi-zaki. In other northern areas of Kyūshū there is a predominance of clay soils which are nontrafficable when wet to the extent of being generally slippery and muddy and locally causing miring of vehicles engaged in cross-country movements. In addition, there are large areas of wet rice fields extending inland from the coast.

(2) *Shikoku.*

On Shikoku, the most favorable soils occur in northern coastal areas from Mitsuhama to Sambommatsu, and on the east coast from Muya to Muroto-zaki. Coastal and alluvial sands are particularly common along the north coast. The drainage properties of the medium-textured soils are similar to those of northern Kyūshū, and they are trafficable except during and immediately after medium and heavy rains. Wet rice fields are also common in northern and eastern Shikoku. Fine-textured soils having poor drainage combine with high rainfall to produce general poor trafficability throughout the year in southern Shikoku.

(3) *Western Honshū south of central mountain ranges.*

South of the central mountain ranges on Honshū, medium-textured soils predominate east of 132°, although large areas are planted to wet rice. The coastal sands occur as discontinuous strips, which are most common in the vicinity of Hiroshima, Ushimado, Ōsaka, and south of Hamamatsu. Fine-textured soils are especially localized in areas west of 132°, in the vicinity of Miyoshi, and on the peninsula which extends south of Nagoya into Ise-wan.

(4) *Western Honshū north of central mountain ranges.*

Most of the terrain in this area is rough and unfavorable for cross-country vehicular movements, regardless of soil or weather conditions. Furthermore, fine-textured clay soils, which are slippery and muddy whenever wet, predominate in the short narrow valleys. Wet rice fields also are common. There are discontinuous coastal strips of well-drained sandy soils, however, between 132°E and 135°E. The areas west of 132°E, and along the southeastern shores of Wakasa-wan are particularly unfavorable.

Although seasonal differences in trafficability are not as great in this area as they are south of the central mountain ranges, the most favorable period occurs during April and May. There is also a less well-defined favorable period during August in the area west of Miyazu. The least favorable periods occur in September, during December through March, and during June and July.

24. *Vegetation*

Vegetation distribution is shown on PLANS 41 and 42, which should be studied concurrently with the text. The small scale of these plans makes it impossible to show minor areas. Detailed analysis of vegetation distribution can be made from the Japanese Imperial Land Survey Department topographic maps 1:50,000.

A. General.

About 50 per cent of the non-urban area of Southwest Japan is in forests; about 17 per cent is in cultivated crops; and some 2 per cent is in villages, dwelling sites, lakes and rivers; the remainder is miscellaneous wasteland including grassland, barrens, and scrubland.

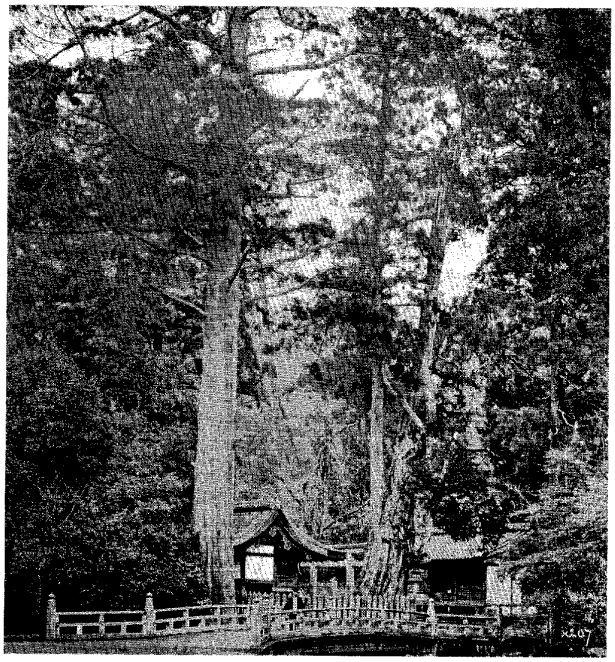

FIGURE II - 38. *Shrine at Nara, Honshū.*
Concealment is provided by large trees in shrine grounds, typical throughout Southwest Japan. 25 April, 1914.

FIGURE II - 40. *Bamboo grove, Kagoshima, Kyūshū.*
This stand of bamboo is in a private garden, but is fairly typical of bamboo clumps in forests or around villages. 16 March, 1914.

The most significant effect of vegetation on military operations is that, with few exceptions, wheeled vehicles will not be able to deploy freely off the roads. Steep slopes are almost universally forest-covered; and the low, flat lands are mainly in rice paddies (where rice is grown in flooded fields; also called "wet rice"). The dikes, drainage and irrigation ditches, and mud of these paddy areas effectively prevent deployment of wheeled vehicles (FIGURE II - 32). Tracked vehicles, however, may deploy freely over most of the lowlands. The predominant vegetation along the beaches consists largely of groves of black pine, which are fairly easily penetrable, but afford considerable concealment.

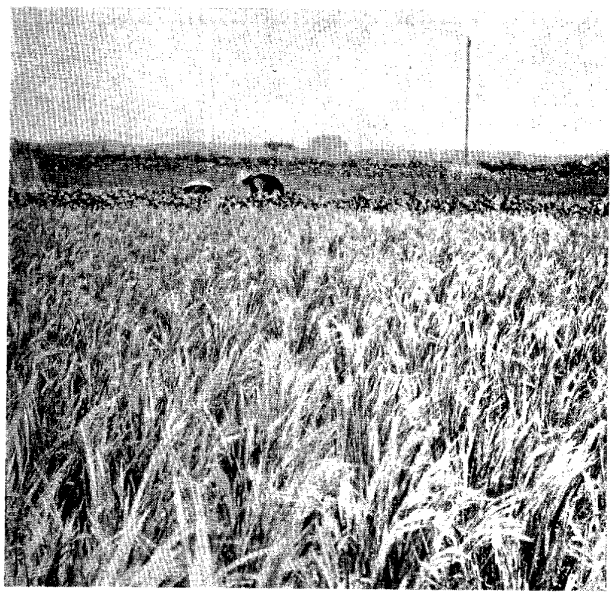

FIGURE II - 39. *Rice ripening, Honshū.*
Some concealment is possible in rice areas. The women are gathering beans growing on the paddy field dikes.

Troops operating on the lowland areas will be almost constantly in the open, with little concealment from air observation. The best concealment on lowlands is found in the villages and about temple sites (FIGURE II - 38). Near the coast of the Japan Sea, closely spaced rows of trees act as windbreaks around farm buildings, and offer some concealment. When prone, foot troops will be able to find a little concealment in the rice paddies, particularly when the rice is fully grown and is ripening (FIGURE II - 39).

Deployment of foot troops is relatively easy on the lower slopes of the hills. Here most commonly are found the tea or mulberry groves, fruit orchards, and fields of dry crops, such as wheat. Where these slopes are forested, they are likely to be planted to groves of pine or cryptomeria (Japanese cedar). All are easily penetrable by foot troops. Bamboo thickets are numerous and vary as to penetrability (FIGURE II - 40). Open scrubland and grassland are found mainly high up on the hills.

Paratroop landings could be effected easily in the rice paddies and dry-crop fields. The scrub and grassland of the hill country may be suitable over small areas for paratroop or glider landings, but slopes are generally too steep or too broken up by valleys.

In the rougher mountainous parts of this section of Japan, the forests are dense, with much undergrowth. The difficulty of penetration accentuates the ruggedness of the terrain, and cross-country operations in such areas will be largely confined to

trails. Limited quantities of construction timber will be found in almost any part of the area.

B. Description of uncultivated vegetation types.

The description of the dominant vegetation types in the paragraphs that follow does not conform exactly to the groups shown on the map of vegetation distribution (Plans 41 and 42). All types of forest are grouped together on the map, but the various types and their general distribution are described below. Mulberry is included in "orchards" on the map. Tea is included under "dry crops."

Most uncultivated vegetation is located on the hill and mountain areas that are too steep for cultivation.

The major type of uncultivated vegetation is forest. Japanese forests consist of both broadleaf and coniferous (cone-bearing) trees, in either pure or mixed stands. A much smaller part of the areas of uncultivated vegetation is in scrub or grass.

(1) *Broadleaf evergreen forest.*

A variety of sub-tropical forest composed of trees with broad, evergreen leaves covers a large area in Southwest Japan. Common trees in this forest include various species of the "live" or evergreen oaks, similar to those that are common in the extreme southern part of the United States. Other broadleaf evergreen trees associated with the oaks include various members of the laurel family (one of which is the camphor tree), and hollies (FIGURE II - 41). In the southern islands there are relatively large areas containing live oaks and an undergrowth of evergreen shrubs almost exclusively. Pure stands of this type of forest are progressively less extensive as one proceeds northward through Southwest Japan and are found mainly in the more inaccessible parts of the area. In nearly all sections of Southwest Japan, barring high altitudes, representative species are found mixed with other forest types. The upper (elevation) limit of their occurrence gradually descends northward, and is at sea level at the northern boundary of this study. Toward the northern and upper boundaries of this forest, deciduous trees (trees that lose their leaves seasonally) become mixed with the evergreens.

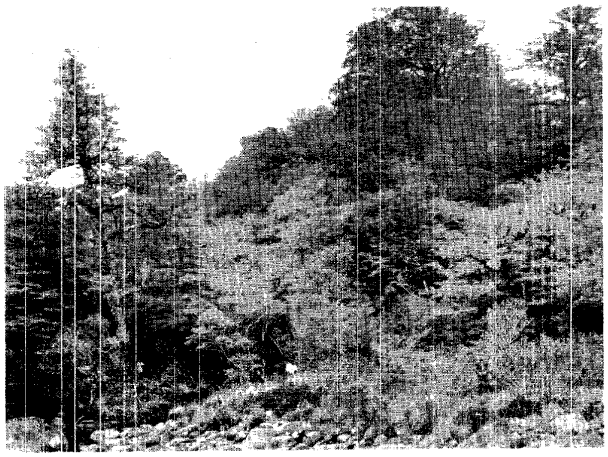

FIGURE II - 41. *Broadleaf evergreen forest, Yakushima.* Yakushima is a small island 35 miles south of Kyūshū. Note occasional conifers and much undergrowth. Typical also in Southwest Japan. 24 February, 1914.

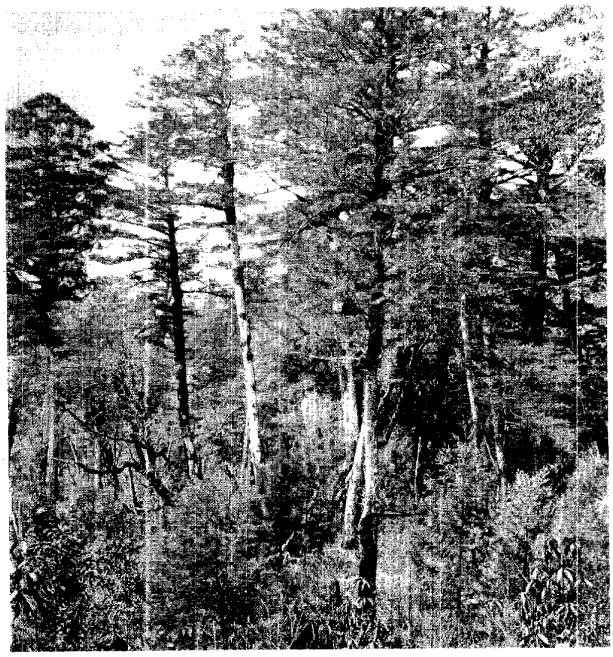

FIGURE II - 42. *Coniferous forest. Yakushima.* Natural forest composed mainly of conifers of varying sizes. This type of forest is also typical of Southwest Japan. 24 February, 1914.

The trees of the broadleaf evergreen, when allowed to mature, attain a diameter of 10 to 24 inches at the butt. Individual trees in temple grounds and parks sometimes reach a height of 100 feet, with a diameter of 3 feet. The overhead canopy of a broadleaf evergreen forest is not regular in height. The undergrowth is generally fairly dense, consisting of tree ferns, bamboo grass, vines, and small trees. One of the many tropical vines in these forests is known as the "iron creeper"; its cords are so strong that they are often used to support bridges. There is little seasonal change in the forest. Penetration by foot troops is slow and difficult, but there are well-kept, though steep, trails throughout the forest areas. These trails provide relatively good means of communication.

(2) *Coniferous forest.*

Pines, firs, hemlocks, and cryptomeria constitute a significant element in the forests of Japan. They are frequently mixed with broadleaf trees throughout Southwest Japan (FIGURE II - 42) and are used almost exclusively in Japanese reforestation projects. Of the pines, black pine is the most numerous in Southwest Japan. It has been estimated that about 20 to 30 per cent of the forest area of Japan has been reforested; hence some idea of the dominance of the conifers can be obtained.

The most common areas for planted conifers are found on the lower slopes adjacent to the densely populated plains, and above the mulberry and tea groves on the hillsides. Conifers also are the most common trees of the temple grounds and form the principal shade trees in villages. When found in pure stands, as is the case particularly in reforested areas, the coniferous trees are characterized by a regular spacing and by lack of undergrowth; especially is the latter true when the stand is of pine. As a rule, conifers are planted about 6 feet apart each

way, and are thinned to a wider spacing in the older stands. Such forests are easily penetrable on foot if slopes are not too steep.

The cryptomeria is not only important as a source of lumber but is also the most common ornamental tree; it is probably more widely used for plantings than any other tree (FIGURE II - 22). In temple grounds and along avenues where they are not cut, these magnificent trees may reach a height of 150 feet with a diameter of 4 to 8 feet. The red pine, also a popular tree for planting, sometimes grows to a height of 100 feet when allowed to stand, but trees in a forest are generally cut before attaining such size. For ½ to ¾ of its height, its trunk is bare of branches. The fir also has a tall, straight trunk bare of branches for ½ of its height. Where the black pine grows closely mixed in a forest with other trees, principally the red pine, it forms a nearly straight trunk, at maturity being 60 to 90 feet high with a diameter of 20 to 30 inches. More often, the black pine grows as a single specimen or in scattered stands open to the winds, and is a twisted tree with crooked, irregular limbs. It is similar in appearance to the Monterey pine of California. It is the most common type of vegetation cover on coastal beach ridges and sand dunes. The wood is of less economic value, except for fuel, than that of other types of conifers, but is much used.

(3) Broadleaf deciduous forest.

This forest is found mainly at higher elevations in Southwest Japan, although individual species comprise a significant part of the mixed forest described in the next paragraph. The principal deciduous trees are oaks, some specimens attaining 50 to 60 feet in height. Other trees include the beech, maple, birch, chestnut, ash, dogwood, honey locust, and sumac. As a general rule, the trees of this forest are not as tall as those at lower elevations, and are not as closely spaced, although the undergrowth is dense, bamboo grass being especially troublesome to penetrate. Conifers are likely to be scattered here and there throughout the forests, but are not dominant except in reforested areas.

(4) Mixed forest.

In terms of area, this type of forest is by far the most common. It may consist of mixtures of all the 3 types of forest described in the preceding paragraphs, and in addition may include the thickets of second growth that follow clearing. It has no general pattern of distribution, but is likely to be found more at intermediate elevations and toward the north. The mixed forest often represents stages in the natural regrowth of the broadleaf evergreen forest. Mixed forests in various stages of this replacement process may be found scattered throughout Southwest Japan. No generalization can be made concerning typical densities or size of trees in these forests, since they are subject to great variation. Underbrush in the mixed forest generally is thick, and the majority of the vines, bushes, and shrubs are evergreen. There is little seasonal difference in ease of movement through the forest.

(5) Wasteland, scrubland, and grassland.

This open terrain constitutes a very appreciable part of the total area. It includes areas covered with low brush and weeds, those with a very sparse tree growth, areas denuded by mining operations and volcanic action, the stretches of flats and hillsides covered with tall, coarse grass or fernbrakes, and places where bamboo grass is widespread (FIGURE II - 1). The largest areas of the scrub wastelands will be found at or near hill summits or in areas of steep slopes where erosion has carried away most of the top soil. Considerable areas of deforested land where regrowth has not reached the stage of trees are included. Grasslands are not widespread on Kyūshū or Shikoku, but are extensive in southwestern Honshū, where they are found mainly on north-facing hillsides and along the lower slopes of the principal volcanoes. The grass is often of a tall coarse variety, somewhat similar to the *cogon* grass of the Philippines or the *kunai* and *alang-alang* of the East Indies. The blades have sharp edges and will cut exposed skin of troops.

C. Description of cultivated vegetation types.

The pressure of population in Japan has resulted in extremely intensive use of all arable land. Rice is by far the principal food crop, and paddy fields are universal in low, flat areas. Other small crops are planted on the paddy field dikes. Villages are compact. Fields are small. Dry crops, orchards, and tea and mulberry groves are found largely on slopes. Idle farm land and pasture are seldom seen, except seasonally. For this reason, the vegetation of Japan is in close correlation with land surface configuration (Compare PLANS 38, 39, and 40 with PLANS 41 and 42) and helps greatly in the analysis of terrain from aerial photographs, once the characteristic location of the various crops is understood. Paddy fields, especially, should be identified easily.

(1) Paddy rice.

Paddy rice is a lowland crop, although some is grown in terraces on the sides of hard rock hills, particularly in Kyūshū. Flat lands not in paddies are those with sandy or volcanic ash soils. Rice constitutes about 54 per cent of the total cultivated land in Japan; in Southwest Japan this figure would be considerably higher.

On the flattish coastal lowlands there are multitudes of irregularly-shaped paddy fields, or water-lily fields which have many of the same characteristics, averaging about 1/10 to ⅛ of an acre in size. These are enclosed by dikes 10 to 15 inches wide and of about equal elevation (FIGURES II - 32). Generally the expanses of paddies are interrupted here and there by villages, sometimes tree- or hedge-enclosed, rising like islands above the inundated paddies. Elevated footpaths or roads traverse the plains, usually in rectangular patterns. Irrigation and drainage canals line fields and paths and there are numerous ponds. In places, scattered dry fields, elevated 2 feet or more above the paddies and bearing unirrigated crops, stand out conspicuously above the lower rice fields.

The dikes of paddy fields are more or less temporary and are of mud or soil scooped out from the ditches, or fields. At irregular intervals, however, a wider, usually permanent dike carries a well-trodden footpath or narrow roadway (FIGURE II - 43). Where the wet rice fields ascend the lower slopes of the hills by means of terraces, the dikes, or terrace edges, are rock-faced.

Irrigation canals are small, and generally are not the obstacles to overland travel that they are in China, or in parts of

India. Very few of them would be too deep to ford, although the mud in them would tend to bog down wheeled vehicles.

The character of the paddy landscape changes with the seasons. Spring is the time for the preparation and sowing of rice-seed beds which by May or June make themselves conspicuous as they stand out in green patches on what may be fallow, muddy plains. In early summer, with the transplanting of the young rice seedlings to the paddies, the flooded fields form a much-subdivided water surface pricked with the shoots of the young rice plants (FIGURE II - 32). By mid-summer, the scene has changed, and green is the prevailing color, the individual fields still being obvious, owing to the interruptions at the dikes (FIGURE II - 39). Green changes to yellow in autumn, and after harvest, the plains look bare.

FIGURE II - 43. *Wide path on paddy field dike.*
Permanent dikes frequently carry a wide path. Light motor vehicles can use the dense network of such paths on the lowlands of Southwest Japan. Straw stacks on right.

Probably 60 to 70 per cent of the paddy area of Japan remains fallow during the winter season, much of it covered with water. This means that a considerable area of the paddy fields generally is a barrier to wheeled vehicles the year around. The trafficability of paddy fields is improved somewhat by the firm "floor" of the fields, a relatively impervious layer which lies beneath the mud.

The water depth in the flooded fields varies somewhat but generally it is shallow and grades downward into soupy mud. In general, troops standing in a flooded rice field will sink in to a depth of 10 to 14 inches. Vehicles will sink deeper.

Where the paddy fields dry out sufficiently to be planted in winter crops such as wheat, barley, and rape, they are spaded into a series of narrow, parallel ridges and troughs, the former 12 to 18 inches wide and 12 inches high. Water frequently stands a few inches deep in the troughs. The grain is sown very thickly on these ridges in single or double rows. Wheeled traffic in such fields would be extremely difficult.

Because the dikes of paddy fields are usually planted with beans, vetch, rape, or occasional mulberry bushes, there is sufficient horizontal concealment for a large number of foot troops over a square mile of paddy rice fields. There is no natural concealment from air observation. Gun positions would probably be located in villages, temple grounds, or on adjoining wooded slopes, utilizing the paddy fields ahead of them as open fields of fire.

(2) Dry-field crops.

Dry-field crops are found for the most part on the lower slopes of hills bordering the lowland plains and river valleys, and as winter crops on the better-drained paddy areas. Small areas are also found on relatively level hilltops, gravel terraces, and volcanic ash uplands. Grains like wheat, barley, unirrigated rice, and naked barley are the common winter crops, sown in the fall and harvested the following early summer. Vegetables, particularly beans and sweet potatoes, comprise the principal summer crops of the annual type on the dry fields, and are frequently inter-tilled between the rows of grain in early summer and fall. The dry fields, therefore, are seldom fallow at any time of year. Like the paddies, the dry fields are very small. Many small areas of dry-field crops, especially where they are not continuous, could not be shown on the vegetation map, due to limitations imposed by the small map scale.

Ridging of the upland fields for winter grains, similar to the practice on the paddy fields, is common in some areas. The irregular surface of the grain fields is not apparent from a distance when the grain is fully grown, and then the fields could afford some cover and adequate concealment for snipers. This is all the more significant when it is realized that many such fields are on slopes directly overlooking the flat, open rice paddies below.

(3) Orchards.

Fruit orchards, although present in nearly all parts of Japan, are small, many of them too small to show on the vegetation map. Furthermore, the area shown as orchards includes mulberry groves. Citrus fruits, particularly oranges (mandarins), are the most common orchard fruits (FIGURE II - 44). They are common on hillside terraces along the Inland Sea and on the Pacific east of Ise-wan. Persimmons, loquats, and pears are also found frequently, the last named tree in some places occupying lowland sites, its limbs and fruit supported on horizontal wooden trellises. Orchards, although small in area, may afford good bivouac areas. They furnish some concealment, and deployment is easy.

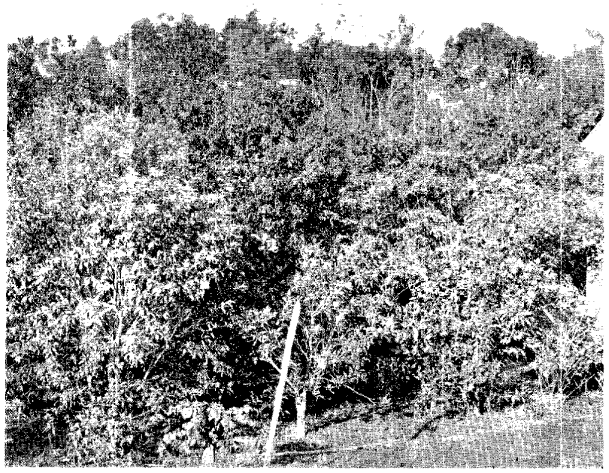

FIGURE II - 44. *Citrus grove near Kagoshima, Kyūshū.*
Fruit-laden citrus trees on slope of hill. Maximum height of these trees about 18 feet. Grove bordered by forest. 3 March, 1914.

FIGURE II - 45. *Tea gathering, Honshū.*
Flooded, irregular paddy fields on flat plain, bordered by terraced hills. Tea garden in foreground. Villages on higher lands of plain.

(4) Mulberry.

The mulberry is cultivated for feeding silkworms. It is a small tree with a trunk from a few inches to a few feet high and 2 to 4 inches in diameter. Shoots up to 30 feet in length grow from this trunk and from the roots. During the summer when there are leaves on the shoots, these shrubs offer considerable concealment. In winter the shoots are cut back and there is little concealment. Plants are set about 5 feet apart. They would offer obstacles only to the lighter vehicles.

The mulberry is found in small patches on most farms having any hill land too steep for rice, and is mixed in among the orchards and dry crops on the lower hillsides. In some places it occupies river dikes or flat lands with poor soil.

(5) Tea.

The small tea gardens of Japan occupy less than 8/10 of 1 per cent of the total area in dry crops. In Southwest Japan this figure would be somewhat higher, but areally the tea gardens are relatively unimportant, except locally. They are found typically on steep hill slopes or on gravel upland surfaces (FIGURE II - 45). Some tea is grown in small patches around the dwellings in villages. The tea plants are grown either as hedges or as individual bushes. They are about 3 to 4 feet high, and are spaced about 3 feet apart. They would provide good concealment for snipers. Since the bushes are evergreen, this concealment would be available throughout the year.

D. Distribution of vegetation by terrain regions: Kyūshū.

The distribution of vegetation in Kyūshū is shown on PLAN 41. Because of the limitations imposed by scale this map is generalized, and many of the smaller areas have had to be omitted.

(1) Southern Kyūshū Lowlands and Highlands.

The vegetation of this region includes more tropical and subtropical species than does that of any other part of the country. Probably less than ⅓ of the highland area reaches an elevation of 1,500 feet and only some 9 or 10 peaks rise slightly above 2,800 feet, the general altitudinal limit of the zone of evergreen oaks (PLAN 38). Thus, in the forests of Southern Kyūshū there are many evergreen oaks, camphor and other

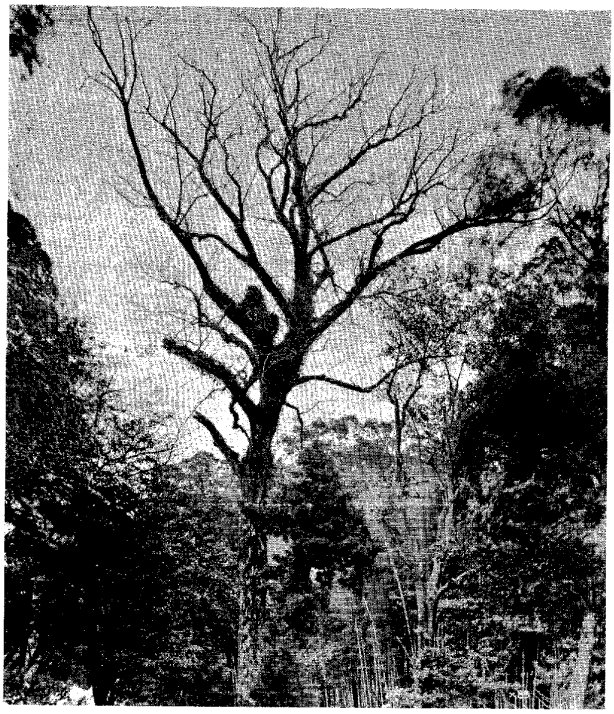

FIGURE II - 46. *Mixed forest, Kirishima, Kyūshū.*
Mixed forest at base of Kirishima volcano. Large tree is 90 feet high. Note bamboo in right background. 5 March, 1914.

species of the laurel family, hollies, magnolias, beeches, pines, and other trees usually associated with them. The undergrowth of the mixed forests is very dense and in addition to the usual shrubs of the subtropical forest there are found here a variety of tropical plants (FIGURE II - 46). Among these are tree-ferns, cycas (between tree-fern and palm in appearance) and lemons. Half or more of Southern Kyūshū is given over to forests, but only a small area is in conifers. These are scattered in the hills and lowlands near the southern tips of the 3 peninsulas, on the lowlands back from the western coast of Satsuma-hantō (peninsula), and in irregular patches over the southern part of Miyazaki-Nobeoka Coastal Plain. Grassland and scrubland occupy a relatively small part of Southern Kyūshū. It is impossible, however, from data available, to distinguish always between forest and scrubland; therefore, parts of the area shown as forest on PLAN 41 may actually be scrub. There are small patches of grassland along the southeastern arm of Satsuma-hantō (peninsula) extending from Ikeda-ko (lake) both ways along the ridge. Between Kagoshima-wan (bay) and Ariake-wan there is much more grass, scattered in areas of various sizes among the forests, and bordering many of the paddy fields.

Lowlands which can be irrigated are devoted almost exclusively to rice. These paddy areas occupy the narrow stream valleys and the coastal plains. The most extensive paddy areas in Southern Kyūshū are: from the southwestern coast of Ariake-wan (bay) inland to Kanoya and Shimonaka at the head of Kagoshima-wan (bay) along the Oyodo-gawa (river) north and south of the town of Miyankonojō; and along Hitotsuse-gawa (river) where it crosses the Miyazaki Plain. Farther south

on the Miyazaki Plain are various smaller rice areas. Narrow strips of paddy fields also border the streams in their narrow valleys between the higher terraces and farther upstream in the hilly borderlands. Rice is harvested in this part of Kyūshū in late August.

Wheat is as important a crop as rice in Southern Kyūshū. Some of the paddy fields support this winter crop, but the greater part of the wheat grows on the uplands. Wheat, barley, and sweet potatoes are the main crops of the upland fields. Vegetables, some fruit, mulberries and, to a limited extent, tea share these fields. The most extensive upland areas devoted to miscellaneous crops are at the southern end of Satsuma-hantō (peninsula). Smaller areas of dry crops are found along the western shore of the peninsula and on the slopes above the head of Kagoshima-wan (bay). A relatively large area devoted to mulberries is on gently sloping land about mid-way between Kagoshima-wan (bay) and Ariake-wan, northeast of the town of Kanoya. Small, discontinuous, cultivated areas, which may be surrounded by woods or grassland, in many places border rice paddies, or lie on the slopes immediately above.

The volcanic cone, Sakura-shima, facing Kagoshima city, has much rock surface exposed.

(2) ***Central Kyūshū Mountains.***

Some of the high mountain area in the south central part of this region rises above 2,800 feet elevation and thus is above the zone of evergreen oaks. Smaller areas on the upper slopes of isolated peaks also lie above the evergreen oak zone. Such areas are covered with deciduous forests interspersed with small irregular areas of grassland. However, since the greater part of the mountain surface lies below 2,800 feet, its forest cover consists of broadleaf evergreen trees and mixed deciduous and coniferous trees (FIGURE II - 46). Pure stands of coniferous forest appear here and there (FIGURE II - 47), some of them having been planted (FIGURE II - 48). There are pure stands of broadleaf trees also, but for the most part, the forests are mixed. Passage through their dense undergrowth is difficult (FIGURE II - 49). These mountain forests are an important source of timber in Japan. Although the forests are more or less difficult of access, timber for various purposes may be obtained there.

The most extensive grasslands and scrublands of Kyūshū are in this central region. They occupy the greater part of a belt some 10 to 15 miles wide spreading southwestward from the foothills near the head of Beppu-wan (bay) past Aso-zan to the Kumamoto Plain. An isolated section of grassland lies near the coast of Usuki-wan (bay), and extends inland several miles. A few limited areas are devoted to paddy fields and other cultivation.

The slopes of Futago-yama, the mountain forming the circular peninsula of Kuni-saki, are covered with successive strips of paddy fields, forests, and grasslands. Interspersed among them on the lower slopes are small areas planted to dry crops, fruit orchards, and mulberries.

In Central Kyūshū are 4 important areas under cultivation. The largest of these is on the coastal plain along the southern shore of the Suō-nada (sea). Paddy fields occupy practically the entire plain. Some paddies lie fallow in winter; others are covered with wheat or a legume. The second exten-

FIGURE II - 47. *Coniferous woodland, Kyūshū.*
Coniferous stand of scattered red pines and grass openings on slopes of Kirishima volcano. Planted conifers in background. 8 March, 1914.

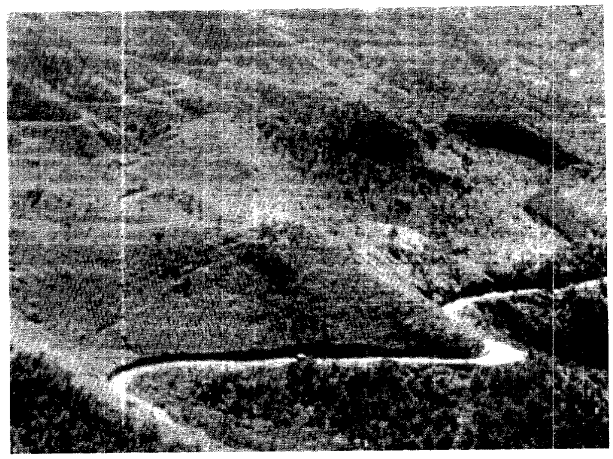

FIGURE II - 48. *Kyūshū, between Shim-bara and Unzen.*
Block of planted conifers at center and left. Patches of scrub and grass scattered over slopes.

FIGURE II - 49. *Dense forest on Yakushima.*
Mixed forest, with cryptomeria and hemlock predominating. Thick undergrowth exposed along stream. Typical also of much of Southwest Japan. 19 February, 1914.

FIGURE II - 50. *Terraced fields near Beppu, Kyūshū.* Irregular, terraced rice fields near Beppu. After harvest the stacks stand in fields which are rough with stubble.

sive paddy area borders a part of the southern shore of Beppu-wan and extends southwestward up the Kata-gawa (river) valley. Along the bay to the east of the paddy fields are upland fields devoted to dry crops or terraced rice (FIGURE II - 50). At various places on the foothills facing Beppu-wan (bay) are fruit orchards, although the areas are too small to show on the accompanying vegetation map.

The Hitoyoshi Basin in the southern part of Central Kyūshū provides the third large cultivated area. The basin is some 18 miles long and 7 miles wide and is surrounded by mountains, except for the gorge of the Kuma-gawa (river). Almost all of the upper part of the basin and much of the lower part are devoted to paddy fields irrigated by the Kuma-gawa. Many fields on terraces are planted to other crops in winter. Several of the mountain slopes enclosing the basin are cultivated, producing vegetables, sweet potatoes, wheat, tea and mulberry. The fourth important cultivated area is the upper valley of the Kuro-kawa and is devoted almost entirely to paddy fields. A narrow border of forest almost encircles this paddy area, separating it from the surrounding grasslands.

In the extreme southwestern part of the region, facing the Amakusa-nada (sea) the hills are broken by the valleys of the Sendai-gawa and Komenotsu-gawa. These valleys are connected by a narrow coastal plain. The Sendai-gawa and many of its tributaries are lined with paddy fields for miles; at the mouth of the Komenotsu-gawa is a fairly wide area devoted to rice, bordered by dry-crop fields. The greater part of this southwest coast, however, and of the northeast coast not already accounted for, is backed by forests with some grassland.

(3) *Northern Kyūshū Lowlands and Highlands.*

Northern Kyūshū is not typical of most Japanese regions. Probably ⅓ to ⅔ of the entire region is in paddy fields, and in addition more land is devoted to dry crops than in the regions previously discussed. Consequently, a relatively smaller part of the region is covered with evergreen broadleaf forest, grassland, or scrubland.

The widest extent of paddy fields in the region is on the Saga Plain bordering the northern shore of Ariakeno-umi (sea) and spreading northward and northeastward, connecting with paddy fields of the Fukuoka Plain along Fukuoka-wan (bay). Thus, practically the entire lowland around the head of Ariakeno-umi is an expanse of mud and water throughout the year. Around Fukuoka-wan and along the coast extending northeastward from it, many of the paddy fields are planted to winter grains or are planted to vegetables in early spring. Initial flooding of the paddy fields for the rice crop is frequently delayed there until mid-July, and the period of their flooding extends to late October or early November. In the block of hills in the northern part of the region and in the high hills to the west are narrow strips of paddy fields along the streams, and many small tracts of irrigated terrace. The hills to the west are covered mostly by forests in their eastern section and by grass in their western section. Fairly extensive paddy areas lie between the northern hills and the Suō-nada (sea).

The nearly continuous coastal plain extending southward from the Saga Plain to Yatsushiro is devoted almost exclusively to paddy fields. The relatively low hills a few miles inland are covered for the most part by broadleaf evergreen forests, but some of the lower slopes are planted to orchards. Between these hills and the steep western face of the highlands of Central Kyūshū, east and northeast of Kumamoto, is an extensive area of slopes used for dry crops. Mulberry bushes are planted extensively there. The hilly, 10-mile long peninsula extending westward from this plain is forest-clad, with a few patches of grass. On the narrow lowland of its southern shore are many small areas of paddy fields.

Many groves of the wax tree occupy the various hill slopes of Northern Kyūshū, where they are grown more extensively than elsewhere on the island. The tree is small, growing to a height of only 15 to 20 feet. It has a spreading crown and rather small leaves. A grove of wax trees offers concealment and cover approximate to those offered by an apple orchard.

(4) *Northwestern Kyūshū Broken Lands.*

As in most of Japan, the predominant vegetation for this region is forest of the broadleaf evergreen type, except on the upper parts of Unzen-dake (mountain) and Tara-dake, which rise above the evergreen zone. Where hills are close to the shore, and in some places where they are not, the evergreen forest skirts the coast or lies just back of it. From the only available maps for the fortified area surrounding Sasebo it is inferred that there are extensive grasslands in this area. The lower courses and deltas of many streams of Northwestern Kyūshū are covered with paddy fields, and along several rivers such fields extend relatively far inland. Most of the area planted to dry crops is on the lower slopes of Unzen-dake and Tara-dake. Paddy fields occupy terraces which ascend these lower slopes. Grass borders much of the relatively steep western coast of the Sonoki-hantō (peninsula).

E. Distribution of vegetation in Shikoku.

The distribution of vegetation in Shikoku is shown, to the extent possible on a small scale map, on PLAN 42.

(1) *Southwestern Shikoku Broken Lands.*

This area of hills and valleys is mostly wooded. Only a small upper part of a few mountains lies above an altitude of

2,500 feet, the average altitudinal limit of the evergreen broadleaf forests in Shikoku. Thus, practically the entire region is in the subtropical forest zone. Broadleaf evergreen, especially oak, trees predominate but there are also many conifers. Near the coast of Tosa-wan (bay) camphor trees are relatively numerous. Forests are more continuous in the south central part of the region than elsewhere, although broken by some relatively small grassy areas, and by irrigated rice paddy areas in a few narrow valleys.

Many strips of paddy fields stretch inward from the coast, following the course of streams. These frequently are bordered by cultivated slopes, many of which are occupied by mulberry groves. In various stretches along the coasts of Hokkezu-wan (bay) and Uwajima-wan, the cultivated slopes and terraces skirt the shore; in others a margin of trees lies between shore and crop. Forests occupy the greater part of the area, however. The connected valleys of the Shimando-gawa and the Matuda-kawa form a fairly broad passageway across the southern part of Shikoku, and are covered for the most part with paddy fields; with dry crops, including mulberry groves, orange, persimmon, and pear orchards, barley, and sweet potatoes; and with grasslands. In the northwestern part of the region mulberry groves and cultivated dry fields are fairly numerous. More than half of the dry fields and paddy fields in Shikoku grow both summer and winter crops.

(2) *Central Shikoku Mountains.*

This region is primarily a forested one. Perhaps ⅓ of its area has an altitude exceeding 2,500 feet. Thus the forests of the region include the trees of the evergreen, broadleaf oak forest on the lower slopes and valleys, and the trees of the deciduous, broadleaf forest on the upper slopes. There are 2 important timber producing areas in the region. They are the catchment area of the Monobe-gawa in the east, and of the Shimando-gawa in the west. There are large areas of grassland in the extreme western section of the region. These are mainly on the ridges of the mountains, spreading irregularly down the slopes. The upper half of the north-facing slopes of the long east - west mountain ridge overlooking the eastern part of Hiuchi-nada is perhaps the most extensive grassland on the island. Other sections with much grass are in the extreme eastern part, and in a belt stretching across the region northeastward from the city of Kōchi.

Relatively little irrigated rice is grown in this region except near the eastern coast where many narrow valleys are filled with long lines of paddy fields, and in the extreme northwest where a few broader valleys are irrigated. In the mountains, however, there are innumerable hillsides devoted to dry crops, part of which is upland rice. In the vicinity of the towns of Ochi and Ikegawa in the western part of the region many hillsides are planted to a variety of the paper mulberry tree. Where these are grown in the open they provide scant concealment and no cover, for they are allowed to grow only about 6 feet high and are cut nearly to the ground in November. Sometimes they are grown under sumac trees.

(3) *Kōchi Plain.*

A large part of the Kōchi Plain is in paddy fields, bordering the various streams that wind around its hills and cross it to the sea. The largest of these paddy areas is in the eastern part, watered by the Monobe-gawa and the Kokubu-gawa. Many of these paddy areas extend almost to the sea, only a sandy beach or fringe of pine trees intervening. Two crops of rice per year are grown on some of these paddy fields. Thus they are under water for a longer period than most paddy fields. The first flooding takes place in late March or early April, and the fields are drained for harvesting in late July or early August. Flooding for the second planting takes place immediately after the first harvest, and continues until the second crop ripens in November.

Spread over some of the unirrigable lands in the northeastern part of the region, adjacent to the Monobe-gawa, are extensive mulberry groves. The Monobe-gawa and the Niyodo-gawa, in the western part of the region, are both bordered by strips of sand and gravel, mostly unirrigable and bare. Various small sections, however, are occupied by mulberry groves, and some parts are covered with coarse grass.

The hills are low, few reaching 1,000 feet in elevation. These, with other uncultivated areas, are mostly covered with forests of the broadleaf evergreen oak forest zone. Along parts of the shore, particularly in the westernmost part, steep, forest-covered hills rise from the rocky shores. East of the Niyodo-gawa the shores are mostly sandy, and frequently tree-fringed or forested. There is relatively little grassland in the region.

(4) *Eastern Shikoku Plain.*

Cultivated crops cover almost all of this region, with the exception of the belt of gravel and sand bordering the Yoshino-gawa (river) from Hiruma to the sea. The few hills near the coast reach an elevation of about 800 feet and are forested, mainly with conifers, but among these are various species of evergreen, broadleaf trees and shrubs. There is little grassland in the region except on sections of the gravel and sand belt along the Yoshino-gawa. Clumps of bamboo are found here and there along the valley.

The greater part of the region is irrigable and is devoted to paddy fields. These fields are, for the most part, in the wide part of the area near the coast, but they extend in disconnected sections all the way up the river to Hiruma. Wheat or barley is grown as a winter crop on approximately 50 per cent of the paddy fields. A large part of the cultivated land in the narrow valley, and some areas on the delta plain are occupied by mulberry groves. Other dry crops, besides vegetables and fruit, are tobacco and indigo, neither of which provides concealment from air observation.

(5) *Northern Shikoku Lowlands.*

The greater part of this region is in paddy fields, joined for the most part in fairly large, irregularly shaped areas. On the eastern peninsula they encircle many small hills. About two-thirds of the paddy fields have winter crops, largely wheat, barley, or vegetables. Some of the lower slopes of the hills, and the various lowland areas which cannot be irrigated are devoted mainly to vegetables, mulberry groves, and fruit orchards. A relatively large area is planted in vegetables in the eastern peninsula, and to citrus groves in the western one. Mulberry groves are few in the greater part of the eastern peninsula, but in the western part and elsewhere in the region they are fairly numerous.

The large rivers of the region, including the Shigenobu-

gawa, the Nakayama-gawa, and the Doki-gawa are bordered for miles by sandy-gravelly strips which support a sparse, coarse grass cover in places.

Practically all the hills of this region are forested. Conifers predominate and there are many pure stands of coniferous trees. There are relatively large areas of scrub pine in some sections. The region lies within the evergreen, broadleaf forest zone; thus many of the trees and shrubs are of evergreen, broadleaf varieties. Along a great part of the coast, particularly of the eastern peninsula, wooded hills rise from the shore, and pines usually fringe the sandy shore even where the adjacent land is low and devoted to crops. The region has little grassland although a number of hillsides have grassy patches.

F. Distribution of vegetation in West Central Honshū.

(PLAN 42).

(1) *Kii-hantō Mountain Land.*

The major streams of this region have many tributaries from the adjacent highlands. Tributaries and main streams alike provide water for the irrigation of paddy fields along their courses, and these tributaries and fields are particularly numerous in parts of the western section of the northern depression. Many of the slopes are occupied by fruit orchards and some mulberry groves. Much of the floor of the delta plain at the western end of the depression is in paddy fields.

In the highest part of the depression, and on many of the adjacent slopes are wide areas of grassland. Other areas in the depression and many steep slopes which rise from its floor are covered with evergreen oak forests. The mountainous peninsula to the southward is forest-covered for the most part, the natural forests being divided between those of the evergreen oak zone and of the deciduous forest zone. Probably ¼ to ⅓ of the area of the peninsula has an altitude exceeding 1,800 feet, the approximate altitude at which the evergreen oak forests give way to the deciduous forests. In addition to the natural forest, there are large reforested areas. Conifers generally are planted in these areas, the cryptomeria being the most popular for this purpose. The most important deciduous trees are different species of oak, beech, maple, alder, ash, chestnut, and cherry, which grows wild through these woods. The conifers include cryptomeria, pine, fir, cypress, and yew. This region is one of the most important sources of timber in Japan, and wood for almost any purpose should be available there. Scattered throughout the mountains, except in the highest parts, are small isolated areas of paddy fields or of dry crops, and large areas of grass and scrubland. More extensive paddy areas occupy the valley floors along the lower courses of many streams; at the mouths of some streams are fairly wide delta plains devoted to paddy fields. Along most of the peninsula's coast line, trees border the beach or rocky shore, although fields of rice or other cultivated crops are not far inland. On the hills of the small peninsula immediately south of Kainan village, much land is devoted to fruit orchards.

(2) *Kinki Region Lowlands and Highlands.*

The Kinki Region is a composite of cultivated basins and forested upland blocks of irregular shape and arrangement. Probably more than ¼ of the area is in cultivated crops, and some 90 per cent of the cropped area is in paddy fields. These paddy fields occupy the floors of the basins and some terraces, wherever water for irrigation can be conducted to the fields from rivers, ponds, and wells. Throughout the lowlands, various small raised areas are devoted to dry crops and orchards, the latter being particularly important. Fruit trees also line many of the roads and some dikes. The more extensive areas devoted to dry crops and orchards, however, are the lower slopes of the hills which border the basins or enclose the many narrow valleys tributary to the plains.

A fringe of conifers, mainly black pine, lines much of the Ōsaka Plain coast south of Ōsaka. Behind the trees a chain of tiny villages has been built parallel to the shore. Stretching back beyond these villages, and filling the spaces between, the rice paddies occupy most of the plain to the base of the wooded hills and to the foot of the Tamba Plateau on the north. On the northeast, the Ōsaka Plain merges with the Kyōto Basin, the western and northern sides of which abut against the forested slopes descending from the Tamba Plateau. The Kyōto Basin is very much smaller than the Ōsaka Plain but, like it, is devoted almost exclusively to rice cultivation. Extensive stands of bamboo grow along its western margin, bordering the plateau. Dry crops are less important in this area than farther south, although much tea is grown along the eastern margin. Eastward from the Ōsaka Plain and shut off from it by wooded ranges of hills is the Nara, or Yamato Basin. The Nara Basin is another extensive rice area. Because of the good drainage in a large part of the basin, many paddy fields are planted with winter crops of wheat, barley, or rape. These crops are harvested in June, and by the end of that month most of the basin has been converted into one great flooded rice paddy. It remains so until November, the rice harvest taking place early in that month. From November to June the fields that are occupied by winter crops are relatively dry, and thus do not present the same difficulty in crossing as do the wet fields. However, they are built into ridges on which the grain is planted. Moreover, since the streams flowing into the Nara Basin are subject to floods in summer and autumn, unusually high dikes and levees—some as high as 16 feet—are built where they will minimize this danger. Small "islands" of higher land dotted among the rice fields are frequently planted to fruit trees and thus offer some concealment. Some of these "islands" are occupied by tree-studded villages (FIGURE II - 51). Other sources of limited concealment in this basin are the tree-covered tops of some hundred or more tombs built centuries ago. These tombs are man-

FIGURE II - 51. *Kyōto Basin, West Central Honshū.*
Looking E. Trees mark presence of villages in Kyōto Basin, near Uji. Characteristic of the Nara Basin also. August 1933.

made hills on the floor of the basin, mainly near the southern and northen ends; some are as high as 35 feet, with a length of more than 350 feet. They usually have a shrine on their summit, but some may be fortified. The original moats surrounding them have been turned into paddy fields and the slopes planted with dry cops. A few isolated natural hills have a greater height.

Another outstanding paddy area is on the plain bordering Biwa-ko (lake). This plain varies greatly in width, being from 2 to 15 miles wide along the southeastern and northern shores and averaging scarcely a mile in width along the western side of the lake. In some places it disappears altogether where steep, wooded hills reach to the water's edge. On some of the moderate slopes dry crops or orchards are grown. Long fingers of paddy fields, more or less bordered by fields of dry crops, reach back into the valleys of the streams draining the northwestern slopes of the Suzuka-sammyaku. In a few places these paddy areas spread to a width of some 2 miles in small basins in the mountains. In addition, the Biwa Basin has many hillside tea gardens, and even more area planted to mulberry groves. In some cases these border the roads, but the latter are more frequently bordered by paddy fields. Tea and mulberries offer slight obstruction to deployment but give a small amount of horizontal and oblique concealment. At the northern end of this range, paddy fields extend well into the Sekigahara pass, leading from Biwa-ko to Nagoya.

About ⅓ of the area of the uplands of this region lies below an elevation of 1,600 feet; thus its natural forests are of the evergreen oak type except where replanting, mostly in conifers, has taken place. Much cutting has occurred in these forests, however, and there is little of the original subtropical forest remaining. Large areas shown as forest on PLAN 42 are covered now with scrub pine. Trees of the deciduous forest zone are found on the uplands above 1,600 feet elevation. A few grass and scrub areas are scattered through the uplands. There are more such areas in the south, near the depression separating this region from that of the Kii-hantō (peninsula).

(3) *Ise-wan Lowlands.*

With few exceptions, this lowland region encircling Ise-wan lies below 600 feet elevation. Much of its area consists of coastal plain, and the rest is of low rolling hills except for a narrow range of hills lying immediately west of and almost parallel to the west arm of the Kiso-gawa (river). This range, more than 20 miles long, has an elevation above 1,600 feet for some 14 miles and a maximum elevation of about 2,100 feet. The southern end of its higher part is grass-covered and other large grassy areas appear along the ridge and its slopes. Elsewhere, except for scrub areas, forests cover the ridge. Around the base of the ridge the trees are primarily conifers. Between them and an average elevation of about 1,600 feet is a belt of the evergreen oak forests. Deciduous forests, interspersed with the grasslands, occupy the top of the ridge. On a few of the hills along the northern margin of the region some areas are in the evergreen oak forests, but most of the forests of the region (other than those on the range previously described) are coniferous. Broken areas of these forests grow over the low hills on both sides of Ise-wan, where they are interrupted by the strips of paddy fields bordering the many streams flowing through the hills. Many of the paddy areas are bordered in turn by mulberry groves and other dry-crop fields. On the west side of the bay, mulberry groves predominate; on the east side, other dry crops are of first importance. The northwestern shore of Ise-wan has a relatively long and wide strip of contiguous paddy fields. Black pines grow in scattered clumps or thin broken lines along much of the eastern and western shores of the bay. At the head of Ise-wan, except for the site of Nagoya city, the paddy fields are practically continuous for miles, joining those of the northwestern shore, and reaching northward beyond the city of Gifu. On the hills to the northeast of the extensive paddy fields, and interspersed among them to some extent, are numerous and extensive mulberry groves, and here and there are areas devoted to dry crops. On the hills to the east, fruit orchards and mulberry groves occupy considerable areas. Fruit orchards afford more concealment than do the dry crops or mulberry groves. Across Chita-wan (bay) from the Chita-hantō (peninsula) in the southeastern part of the region is another extensive area, roughly 5 by 10 miles, which is devoted largely to paddy fields. Many mulberry groves, however, are planted on higher lands among the paddy fields, particularly in the southern part. At the southeastern corner of this large expanse of cultivated land is a group of hills, maximum elevation about 900 feet, covered with conifers. Some of these conifers, however, are mere scrub pine, the original forest presumably having been burned over.

(4) *Hamamatsu-Toyohashi Coastal Lowland.*

About half the area of this region is under cultivation and its vegetative cover varies with the seasons. Lands which can be irrigated are in paddy fields and constitute a larger area than is in any other crop. Perhaps ⅓ of the paddy area also bears a winter crop of wheat, barley or legumes. Thus much of the irrigated land stands bare and muddy from the collected rains through the winter. From June to September or October a much larger part is covered with a sheet of water a few inches deep.

Spread over the lower slopes of many of the hills east of Hamana-ko (lake), in some cases over the entire hill, are extensive tea gardens. Along some slopes these gardens are contiguous for several miles. Usually there are forests higher up on the slopes, above the tea and covering the tops of the hills. These forests are almost entirely coniferous, and include much reforested land. The forests are relatively open, with little undergrowth. They provide better concealment than the tea gardens below, and some cover. Although tea occupies a very large part of the dry crop fields in this region, other dry crops are grown, particularly vegetables. Fruit orchards and mulberry groves also occupy considerable areas. Mulberries are grown in sandy areas not suitable for irrigation; such areas line some streams. Clumps of bamboo are sometimes found interspersed with these, but the areas are too small to show on the vegetation map. The bamboo clumps, which may cover an acre or more, provide better concealment than the mulberry bushes (provided they are not too thick to enter), but very inadequate cover. The lower course of the Tenryū-kawa, as it crosses this region, is divided into various meandering streams. Most of the large islands formed between the channels are bare, sandy wastes; a few are grass-covered, and clumps of trees are found here and there. The trees are mostly broadleaf—some evergreen, some deciduous—in contrast to the conifers on the hills. But the

entire river strip provides practically no concealment or cover. It is bordered mainly by paddy fields, by dry fields of vegetables, and by mulberry groves.

West of the Hamana-ko (lake), hills cover a greater part of the area than east of it, and their forests include many broadleaf evergreen trees as well as conifers. Mulberry groves rank next to paddy fields in area occupied, and there are extensive groves up the sides of the valley leading from the head of Atsumi-wan (bay). Many smaller areas of mulberry spread over the Atsumi-hantō (peninsula), bordering the paddy fields along the streams. A wide strip of mixed pine forest, scrub pine, and grass, borders the western sandy shore of the peninsula and spreads irregularly over the hills along the middle of the peninsula. Fields, mainly of mulberries and vegetables, skirt almost the entire northern and southern shores of the peninsula, but in some parts a strip of trees, some deciduous, some coniferous, intervene between the sandy beach and the cropped land.

Most of the coast east of the Atsumi-hantō (peninsula) is sandy, with some grass cover. In the extreme east, dunes apparently have been reclaimed and planted to vegetables.

(5) *Central Honshū Rugged Highlands.*

The hills and mountains of this region are covered for the most part with mixed forests. In the lower part of this forest the most conspicuous coniferous trees are the cryptomeria, cypress, and yew; at higher altitudes the firs predominate, then the larches appear. The deciduous trees include the oaks, beeches, maples, alders, ashes, and chestnuts. There are some broadleaf evergreen species at low elevations. Some of the high mountains, reaching 7,000 to 10,000 feet elevation, have considerable bare rock at their summits surrounded by an alpine flora typical of high mountains. Near the top grow some species of alder, willow and other shrubs. Upper edges of the forest are frequently bordered by a dwarf pine.

Many areas of grass and scrub, ranging from those too small to show to areas of many square miles, are scattered over the mountain. These are almost invariably found on relatively steep slopes. Some extensive areas of bamboo, as well as small clumps, grow in these mountains. The scrubland is most widely distributed over mountainsides between about 1,300 and 2,300 feet.

Strips of paddy fields are strung along the water courses at the bottoms of the narrow valleys, or on terraces. On many cultivable areas which irrigation cannot reach, dry crops and mulberry groves are planted. There is only 1 sizable area of land under cultivation. This is the long, narrow, steep-walled Iida Valley, which is a section of the upper valley of the Tenryū-kawa, and occupies the extreme northeastern part of the region. Rice paddies cover the valley floor, but between the 2 main belts of paddies in the northern part lies a belt of mulberry groves. Farther down the valley the division of land between the 2 crops is very irregular as the surface is less uniform. In some places the paddy fields extend from the steep slopes of one enclosing wall to the other; in other places the mulberry groves do practically the same thing. In parts of the valley gentle slopes intervene between the valley floor and the steep sides of the towering ranges on either side. The greater part of these slopes supports mulberry groves and, except for the relatively small area planted to dry crops, the remainder is occupied by coniferous forests. Small patches of forest, mostly coniferous, are scattered through the valley. These few trees and the disconnected woods on the foothills provide the only concealment throughout the length of the valley, except for the limited amount which the mulberry bushes afford foot troops.

The narrow coastal plain bordering part of the Tsuruga-wan (bay), where this region meets that arm of the Japan Sea, is planted mainly to dry crops. These crops afford little or no concealment and no cover. Back of the strip of coastal plain are the forest-covered hills.

G. Distribution of vegetation in Western Honshū.

(1) *Tamba Broken Plateau.*

The very irregular surface of this region is covered primarily with forests. Most of the region has an altitude less than 2,000 feet; the native forests, therefore, are of the evergreen oak type, except in the northern part facing the Japan Sea. There the deciduous forests, interspersed with pure stands of conifer, cover the hills to their base at sea level. Scattered through the uplands, particularly in the west and northwest, are many areas of grassland and scrub. The bushes of the scrub provide a small amount of concealment, but neither grassland nor scrub offers cover.

A number of river valleys are relatively open, with irrigable plains several square miles in area. These plains are devoted to paddy fields. The valley of the Sonobe-kawa, in the southeast, has the greatest extent of paddy field area. Mulberry groves, providing limited concealment, occupy unirrigable land bordering the course of the Yura-gawa, the Marugawa-kawa, and the Sonobe-gawa, for several miles in each valley. Some other river bottomlands and some hillsides support groves to a lesser extent. Areas of fruit orchards and dry crops are found in many valleys, but are usually small and isolated. A concentration of chestnut orchards on terraced hillsides is found in the southwestern part of the region. Bamboo groves or bare sandy stretches frequently adjoin the mulberry groves of the river banks.

(2) *Matsue-Tottori Coastal Lowlands.*

Hills, wooded for the most part, but partly grass-covered, fringe the coastal plain on the south. The surface of the lowland is irregular and cannot all be cultivated. In some parts the forests reach the shore. These forests consist of deciduous and coniferous trees. About ⅓ of the plain is in paddy fields, and approximately half as much land is in mulberry. Mulberry groves occupy hill slopes and river levee banks; the areas most intensively devoted to this crop are the beach ridges on the sand spit at the eastern end of Nakano-umi. Throughout this peninsula there are rows of mulberry groves interspersed with narrow strips of paddy fields, dry crops, and clumps of bamboo. A narrow strip of grass borders the sandy beach on the northeastern shore; inland is an irregular belt of pines, behind which are fields. The groves and dry fields of this peninsula offer firm ground for wheeled vehicles. Daikon-shima is also covered with mulberry groves behind a narrow border of paddy fields.

Most of the land behind the Shinji range is irrigable and is in paddy fields. Forests are found along parts of the shores of

both Nakano-umi and Shinji-ko. The plain west of Shinji-ko is essentially one expanse of paddy fields, except at its western end where a belt of low hills skirts the shore. These hills are covered mostly with mulberry, orchards, and some vegetables and grain. A fringe of pine borders the beach, and pines are also scattered in the hills. Throughout this region the farmsteads are protected on their north and west sides by windbreaks of trees 20 to 50 feet high, trimmed square on top. Each farmstead appears to be a small grove of trees (FIGURE II - 52). These windbreaks provide considerable concealment.

The Shinji range has many irrigable valleys with ribbons of paddy fields bordering the streams. Scant area is devoted to dry crops; forests, grass and scrub cover the hills and steep slopes. There is only a little land under cultivation on the seaward side of the range.

FIGURE II - 52. *Matsue-Tottori Lowlands, Western Honshū.* Looking SW. Windbreaks protect farmsteads near Matsue. Water shows between rows of young rice. Rows of beans mark the dikes. 11 July, 1931.

(3) *Western Honshū Rugged Highlands.*

The highlands of Western Honshū extend westward from the Tamba Plateau to the Shimonoseki-kaikyō. The greater part of the region is forested, but there are many wide expanses of grassland. A larger part of this area is grass-covered than any other region of Southwest Japan. There is also much cut-over and wasteland. Deciduous forests occupy most of the lower elevations and coniferous the higher land, except for the large grass area. The grass is not suitable for fodder, although there are a greater number of cattle in this region than elsewhere in Southwest Japan. Numerous valleys criss-cross the irregular highlands, and are occupied by strips of paddy rice. Dry crops border some of the paddy areas, and are also found around many of the villages.

(4) *Western Honshū Broken Lands.*

The Western Honshū Broken Lands are composed of the series of small coastal plains along the Inland Sea from Himeji to Shimonoseki. The low hills which separate these plains are included, together with the lower slopes of the Western Honshū Rugged Highlands. Paddy fields cover the irrigable parts of the small plains and valleys leading into the hills. Rice is found also on terraced hillsides. The largest of the paddy areas along the western part of the coast are on the deltas of the Fushino-gawa and the Saba-gawa. In the eastern part the most extensive paddy area borders 2 sides of Kojima-wan (bay), surrounds the city of Okayama, and extends long arms to the north, west, and east. The delta and valley of the Ashida-kawa, some 30 miles west of Kojima-wan, also have considerable paddy area. A part of the irrigable land along the margin of the Inland Sea is used for growing a reed crop, called "I", used for making floor matting. In the northern part of the eastern plateau there is a series of broad, open valleys whose irrigable floors are devoted to paddy fields.

Many terraces and slopes are planted to various dry crops and to fruit orchards. Some of these are on hills overlooking the Inland Sea; others face each other across the valleys. Mulberry groves and other dry crops are planted here and there on the levees of the streams and on small raised "islands" among paddy fields. In the extreme eastern part of the region, tea gardens occupy a small part of the cultivated land.

By far the greater part of the region is covered with forests, either natural or planted, but there are also many areas of grassland and scrub. Individual grasslands are not extensive, and the grass is of little value as fodder.

The natural forests of this region have been replaced largely by deciduous-broadleaf and coniferous species. Practically all of the plantings are coniferous, mainly cryptomeria. There are relatively large areas of scrub pine, particularly south of Kojima-wan. The hills south of Hiroshima are an important source of timber, and are more accessible than those of the interior.

Most of the coast is backed by tree-covered hills. Clumps of bamboo are found at intervals along many streams.

The vegetation on the islands of the Inland Sea which are included in this region is similar to that found on the mainland.

(5) *Himeji-Yashiro Lowland.*

This is the coastal region of Honshū between Akashi and Himeji. This region is low, and practically all of it within 5 miles of the coast is in flooded fields. Occasional hilltops rise above 700 feet and are forested. The evergreen oak forest zone includes this region, but the natural forests of this type have been much depleted by cutting and fire, being replaced by oak, beech, alder and sumac. Conifers predominate, however, in most of the region, and include various species of pine, fir, cedar, cryptomeria, and cypress. Some of these have been planted. Patches of grass and bamboo are found along streams and in the forests.

Some of the rice fields reach the edge of the sea. The paddy area is divided by low hills, extensions of the higher hills to the north. In the valleys of the Ichi-kawa and the Kako-gawa paddy fields extend almost continuously across the region. Other paddies form a series of flooded areas in the broad basins between the hills which extend across the center of the region from east to west. Seemingly countless small streams are lined with paddy fields in this Himeji-Yashiro Lowland. Some of the slopes and terraces, dikes and levees along the larger streams are planted to dry crops, wheat or barley in winter and vegetables in summer. Many of the rice fields are planted to grains in the winter.

25. Regional Summary

The relief, drainage, and vegetation of Southwest Japan are summarized by terrain regions in Table II - 1 below.

TABLE II - 1.

REGION	RELIEF	DRAINAGE	PREDOMINANT VEGETATION
Kyūshū			
(1) Southern Kyūshū Lowlands and Highlands	Three coastal lowland areas among rugged uplands of moderate height; narrow passageways between lowlands; some rice on larger lowlands. Deployment and cross-country movement is fair in lowlands, poor in passageways, very poor in uplands.	*Highlands*: Stream gradients steep, with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats. *Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Rice on irrigable lowlands and narrow valley floors. Mulberry groves, fruit orchards, and other dry crops on many lower slopes. Forests, broadleaf evergreen and coniferous, cover most of uplands. Patches of grassland and scrub scattered through forests.
(2) Central Kyūshū Mountains.	Southern highland belt has rugged blocks with scattered higher volcanoes, narrow deep valleys, few passageways; rice in most valleys. Northern highland arm does not reach coast; has lower blocks and peaks, some hills, wider valleys, a few narrow valley routes. In both areas deployment almost impossible, cross-country movement very difficult.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Rice on coastal plains and narrow strips along streams. Dry crops on lower slopes above rice. Grasslands and scrub occupy wide belt across northern part of region; scattered patches elsewhere. Forests cover most of region; deciduous and coniferous trees above about 2800 feet; broadleaf evergreen and coniferous trees lower down.
(3) Northern Kyūshū Lowlands and Highlands.	Low rugged mountain areas rimmed by hills and separated by flattish lowlands which face enclosed bays. Narrow corridors connect lowlands; many heights dominate corridors; rice fields on lowlands. Deployment and cross-country movement possible on lowlands, restricted in corridors, difficult in uplands.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats. *Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Much rice on Saga and lesser plains. Terraced paddy fields bordering Saga Plain. Dry crops on hillsides, especially northeast of Kumamoto. Grass on western uplands, and scattered patches elsewhere. Broadleaf and coniferous forests on other uplands. Less forest area, proportionately, in this region than in most regions.
(4) Northwest Kyūshū Broken Lands.	Series of long narrow irregular peninsulas and offshore islands; rugged hills and low mountains; few high volcanoes; narrow winding valleys; no corridors; some rice in valleys. Deployment and cross-country movement difficult.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Narrow strips of paddy fields along streams. Dry crops on many slopes in southeast. Grass over wide areas in west and north. Forests over most of region; broadleaf evergreen and coniferous except in high elevations; deciduous and coniferous there.
Shikoku			
(1) Southwestern Shikoku Broken Lands.	Rugged mountains, moderate heights; many long, narrow, deep, winding, valleys form fair passageways, are not corridors; rice fields in most valleys. Deployment and cross-country movement very difficult.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats	Most of region covered with broadleaf evergreen and coniferous forests. Camphor trees relatively numerous in Tosa-wan area. Grass and scrub patches mainly in northeast. Paddy fields in strips along streams. Dry-crop fields, many mulberry groves, on slopes of northwest and west. Orchards on south coastal and valley slopes.
(2) Central Shikoku Mountains.	Rugged, steep, 3500-6000 ft. ridges; long deep, narrow, valleys; winding streams and some rice fields in valleys; no low passes; no corridors. Deployment and cross-country movement very difficult.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Forests, conifers with deciduous trees in high mountains and broadleaf evergreen over most of region. Extensive grass and scrub areas in west, lesser ones in east. Paddy areas few; mostly in valleys of extreme northwest and tributary to east coast. Dry crops on many interior slopes. Paper mulberry in southwest.
(3) Kōchi Plain.	Small coastal plain where several valleys converge; largest clear flat areas 6 by 8 miles; rice fields on flats; ridges between valleys form commanding heights. Deployment and cross-country movement possible.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Extensive paddy fields over most of lowlands; two crops annually. Mulberry important dry crop of low slopes and gravelly borders of streams. Broadleaf evergreen forests on hills and unirrigable lowlands.

TABLE II - 1 (*Continued*)

REGION	RELIEF	DRAINAGE	PREDOMINANT VEGETATION
(4) Eastern Shikoku Lowlands.	Narrow wedge-shaped lowland and coast strip; low flat-topped terraces in wedge; small flat deltas on coast; much rice; all exits over high ridges; comanding heights on ridges. Deployment and cross-country movement possible.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields cover more than half of region. Dry crops, chiefly mulberry, on higher lands along river and on delta. Forests, mainly conifers, on the few hills.
(5) Northern Shikoku Lowlands.	Series of lowlands along coast for 130 miles; narrow, flat connections between most lowlands; scattered hills on lowlands and on rugged highland rim form commanding heights; rice fields on lowlands. Deployment and cross-country movement possible.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields cover greater part of region, 2/3 also used for winter grain or vegetables. Mulberry, fruit, and vegetables on lower slopes and unirrigable lowlands. Conifers, broadleaf evergreens, and grassy patches on hills.
West Central Honshū			
(1) Kii-hantō Mountain Land.	Large triangular peninsula; high rugged mountains; narrow winding valleys with many commanding heights; no corridors; two small coastal lowlands; rice in lowlands and some valleys. Deployment and cross-country movement very difficult in mountains, possible in small lowlands.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Forests cover most of region; coniferous and broadleaf deciduous on highest parts, coniferous and broadleaf evergreen at lower elevations. Paddy fields on irrigable land of lowlands, and in strips along some valleys and small deltas. Fruit orchards and other dry crops on south-facing hills of one small lowland.
(2) Kinki Region Lowlands and Highlands.	Four large flat-floored basins separated by low steep-sided ridges; higher blocks and ridges along eastern boundary; many passageways and a few good corridors between basins; long narrow valleys and one short passageway through eastern highlands; commanding heights above all passageways and corridors. Deployment and cross-country movement possible in basins and corridors, difficult in passageways, very difficult on ridges.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats. *Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields on irrigable parts of basins, narrow valleys, and terraces. Dry crops on small, raised "islands" in paddy areas, and on hillsides above paddy fields. Fruit orchards, flowering trees numerous. Tea on some slopes in basins. Forests cover uplands and most slopes; coniferous and broadleaf deciduous widespread. Small areas of grass and scrub scattered through forests.
(3) Ise-wan Lowlands.	Large horseshoe-shaped lowland around bay: marginal terraces and rugged hills on east and west; square 24- by 32-mile Nagoya Plain on north; rice on plain and in small valleys among hills. Deployment and cross-country movement is possible on plain and in valleys, moderately difficult in hill and terrace areas.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields cover the irrigable coastal plains and many narrow valleys. Dry crops on unirrigable lowlands and lower slopes. Mulberries on "islands" of plain and eastern and western hills. Fruit orchards on hills in east part. Forests on higher hills and upland rim. Grass patches scattered through forests.
(4) Hamamatsu-Toyohashi Coastal Lowlands.	Long, narrow coastal lowland; series of river plains separated by large high terraces and rugged hilly areas; hills and terrace margins form commanding heights. Much rice on plains and between hills. Deployment and cross-country movement possible on river plains and terrace flats; difficult on terrace margins and hills.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields on irrigable lowlands. Winter grain and legumes on 1/3 of paddy area. Tea gardens on many terrace slopes in eastern part of region. Mulberries predominant on lower slopes of hills in western part. Other dry crops on some slopes. Open, coniferous forest on terraces and hills above tea and mulberries.
(5) Central Honshū Rugged Highlands.	High rugged mountain ranges on the east; rugged ranges and dissected blocks of lesser height on west; long, narrow, winding, deep, valleys and narrow basins; many commanding heights. Rice in basins and in few sections of valleys. Deployment and cross-country movement difficult in valleys and basins; very difficult in highlands.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Forests cover large part of region; mostly conifers and mixed broadleaf deciduous; broadleaf evergreen at low elevations; alpine flora on some high mountain tops, other tops bare. Grass and scrub areas usually on very steep slopes. Paddy fields on irrigable parts of Iida Valley; in narrow strips along other streams. Dry crops on slopes above these strips. Mulberries on unirrigable parts of Iida Valley and on bordering low slopes.
Western Honshū			
(1) Tamba Broken Plateau.	Low but steep-sided blocks and ridges, separated by long narrow valleys and interior basins which form passageways but not true corridors; many commanding heights above passageways. Rice fields in many valleys. Deployment and cross-country possible in valleys, very difficult in highlands.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Forests, mixed coniferous and deciduous, on hills bordering Japan Sea. Mixed broadleaf (mainly evergreen) and coniferous over most of region. Much scattered grass and scrub. Strips of paddy fields along many streams. Mulberry groves on unirrigable borders of streams in northwest. Small areas of fruit orchards and dry crops on scattered slopes.

TABLE II - 1 (*Continued*)

REGION	RELIEF	DRAINAGE	PREDOMINANT VEGETATION
(2) Matsue-Tottori Coastal Lowlands.	Series of small deltas and one large sand spit; some deltas are connected by narrow coastal flats. Lakes and rock ridges separate larger flat areas. Many rice fields. No corridors or easy passageways inland. Commanding heights above most of deltas and all coastal flats. Deployment and cross-country movement possible on deltas and sand spit, difficult elsewhere.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields on irrigable lowlands. Dry crops, largely mulberry, on unirrigable lowlands and lower slopes. Forests, deciduous and coniferous, on hills. Windbreaks of trees protect farmsteads. Scant grass areas.
(3) Western Honshū Rugged Highlands.	Rugged ridges and flat-topped blocks with steep sides; these decline in west to form rugged hills; many long narrow valleys; no corridors; commanding heights above all valleys; rice in larger valleys.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats.	Forests cover most of region: coniferous and deciduous along Japan Sea north of about 34° 30′ N, and at high elevations; coniferous and various broadleaf mixed elsewhere. Extensive areas of coarse grass and scrub in eastern and western thirds of region. Strips of paddy fields along many streams. Dry crops on slopes around villages.
(4) Western Honshū Broken Lands.	Rugged highland blocks and isolated ridges separated by nets of narrow valleys and basins. Several small hill-dotted coastal plains with tributary valley nets; commanding heights above all valleys and most plains. Rice in coastal uplands and in larger valleys. Deployment and cross-country movement possible on coastal plains; difficult in uplands.	*Highlands*: Stream gradient steep with many falls and rapids except in scattered tiny basin flats; streams fill narrow valleys and meander from side to side in basins; some water storage and power dams; danger of flash floods even on basin flats. *Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields on coastal lowlands and in valleys, also on lower slopes above some valleys. Cultivated reeds in some flooded fields. Dry crops on many slopes, river levees, and "islands" in paddy areas. Thin forest of coniferous and mixed broadleaf covers uplands between valleys.
(5) Himeji-Yashiro Lowland.	Small irregular hill-dotted coastal lowland with tributary valley net penetrating Tamba Plateau to north. Commanding heights above valleys and most of plain. Much rice in coastal plain and larger valleys. Deployment and cross-country movement possible in plain, difficult in valleys and on hills.	*Lowlands*: Streams elevated slightly; dikes common; barren flats exposed between dikes and stream at low water; muddy banks and bottom unusual; streams canalized in urban areas; numerous irrigation ponds and canals on many larger lowlands; natural swamps rare; rice field swamps in all lowlands.	Paddy fields cover extensive areas near coast and in basins behind low hills. Dry crops on some slopes. Forests, mainly conifers (partly scrub pine), including deciduous and evergreen broadleaf, cover hills and unirrigable lowlands.

26. *Natural Critical Areas*

There are 2 natural critical areas in Southwest Japan: Northern Kyūshū, and the Kinki Basins Region of Central Honshū.

The Northern Kyūshū critical area, at the western end of the Inland Sea, includes a great industrial zone. Together with the southwestern tip of Honshū it controls Shimonoseki-kaikyō, one of the entrances to the Inland Sea. In large measure it also controls the Tsushima-kaikyō and Chōsen-kaikyō. It is the nearest to the continent of Asia of any of Japan's important areas.

The second natural critical area is the Kinki Basins Region at the eastern end of the Inland Sea. Here a group of 5 lowlands—2 coastal: Ōsaka and Nagoya; and 3 interior: Nara, Kyōto, and Biwa—combine several factors of importance. The Ōsaka Plain is highly industrialized. Kyōto and Nara are cultural and historical centers of national significance, and Kyōto contains some industry. The Biwa Basin has a large fresh-water lake and is a key point of important trans-island routes. Nagoya is industrialized, and its surrounding lowland is the most exposed to amphibious attack of any of the large plains of Southwest Japan. The Kinki Basins, as a group, contain the largest extent of flat land in Southwest Japan. Even though these lowlands are separated by mountain and hill barriers, there is room for the construction of airfields and base facilities.

27. *Routes to Natural Critical Areas*

There are many routes to the critical areas of Japan, but few of them are really good natural passageways. Forty-six of the possible routes leading toward the principal objectives of Southwest Japan have been selected for detailed treatment. There are many others. The location of the routes is shown on FIGURE II - 53 and on PLANS 39 and 40. On the plans, the routes can be assessed in relation to the topography they cross.

A. General.

The greater part of all routes in Southwestern Japan are in rugged hill and mountain country. Within such terrain, routes are confined to valleys and small basins which are separated at drainage divides by high steep ridges.

Most of the valleys are deep, narrow, and winding. Valley floors, where flat or gently sloping, are covered with muddy rice fields or with dry crops. Farmsteads and compactly built farm hamlets cling to the lower slopes. Steep, forested slopes rise 200 to 2,000 feet on either side and provide commanding heights for almost all sections of the routes.

Shallow, but swift, mountain streams completely fill the narrower sections of most valleys, and meander from side to side of the wider parts. These streams are subject to sudden flash floods during summer and early autumn (June to mid-September).

Because of the various handicaps to mobile operations within the mountain sections of the routes, deployment off the route is extremely difficult. Cross-country movement is equally difficult. Established lines of communication along the routes are forced to use many bridges, cuts, fills, and sharp turns, in order to get through. Railways have numerous tunnels.

Those sections of routes which lie in the larger basins and small coastal plains of Southwest Japan have easier grades, and there is room for deployment off the routes, but if bridges and roadways are destroyed, both deployment and cross-country movement become difficult. Chief handicaps are muddy rice fields, numerous streams, irrigation ditches and ponds, and a large number of small but compactly built farm hamlets at ¾ to 1 mile intervals. On many of the larger plains, major streams flow between levee walls 20 to 40 feet high. Stream levels are frequently high enough to cause local flooding by breaking the levees. Flash floods from heavy rains are also to be expected on the lowlands during summer and autumn (July through September).

Many plains and almost all the basins and large valleys have marginal highlands and outlying hills and ridges which provide commanding heights above the lowland routes.

B. Description of individual routes.

The individual routes are described on FIGURES II-54 through II-106. These routes lead from either the Pacific Ocean, East China Sea, or the Japan Sea to the 2 critical areas of Southwest Japan, or to localities which contribute to their defense, such as Kii-suidō, Bungo-suidō, Shimonoseki-kaikyō, Hiroshima and Kure, and Okayama.

The selection of the routes is somewhat arbitrary, and is based fundamentally on natural geographic factors of ease of movement overland, and secondarily on the presence of established transportation routes. All of the possible routes are not included, but most of the usable natural routes are described. Additional routes are discussed in CHAPTER VII.

The detailed route studies below are arranged with an arbitrarily selected start and finish. Branching and connecting routes are similarly arranged. Any combination of routes that join each other may be used, and movement of troops in either direction may be planned.

For the purpose of the route studies, areas which are predominantly in rice have been classified as favorable for deployment even though wheeled vehicles will undoubtedly bog in such areas during most seasons.

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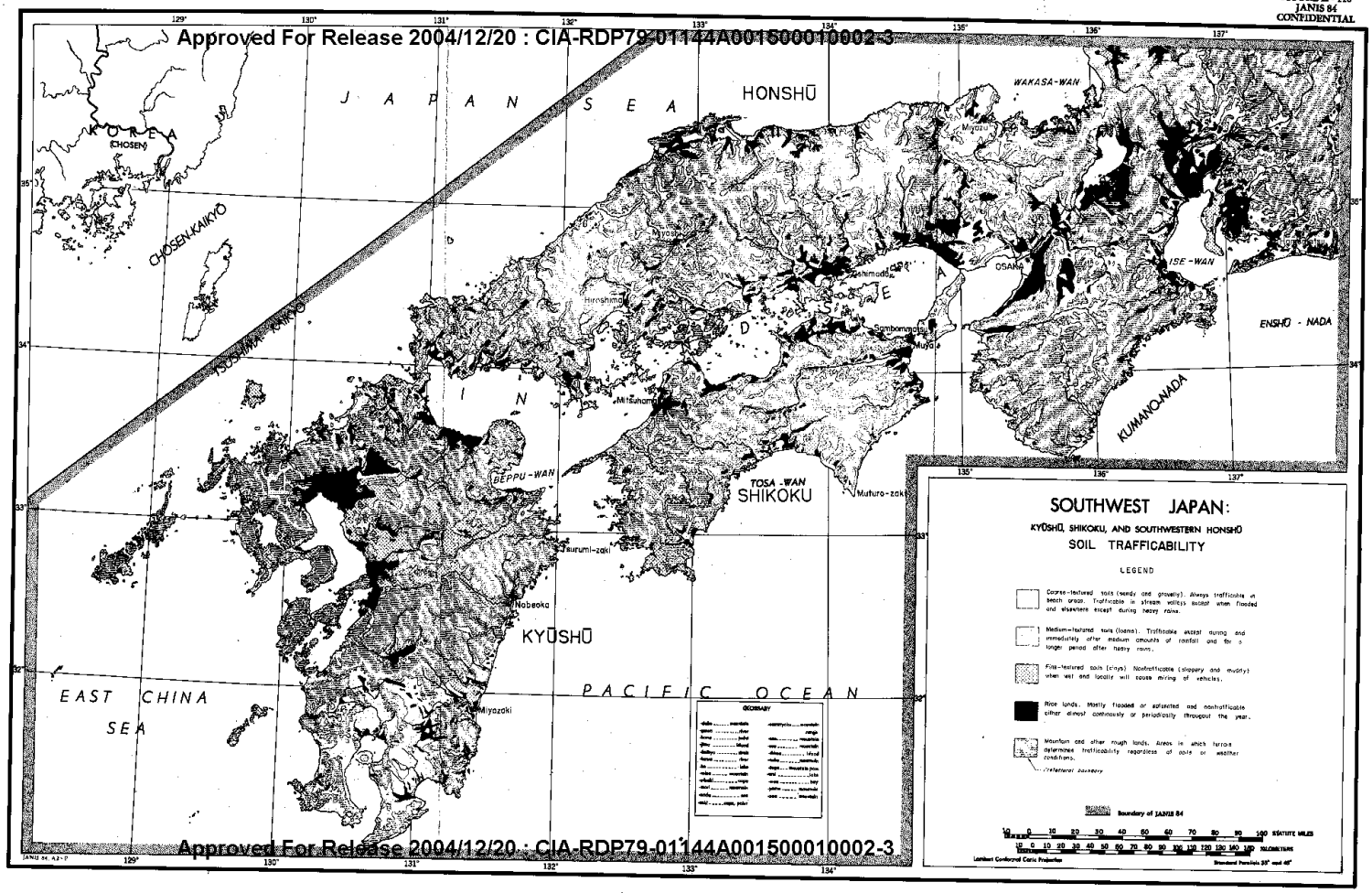


FIGURE II - 110. *Soil Trafficability.* (P).

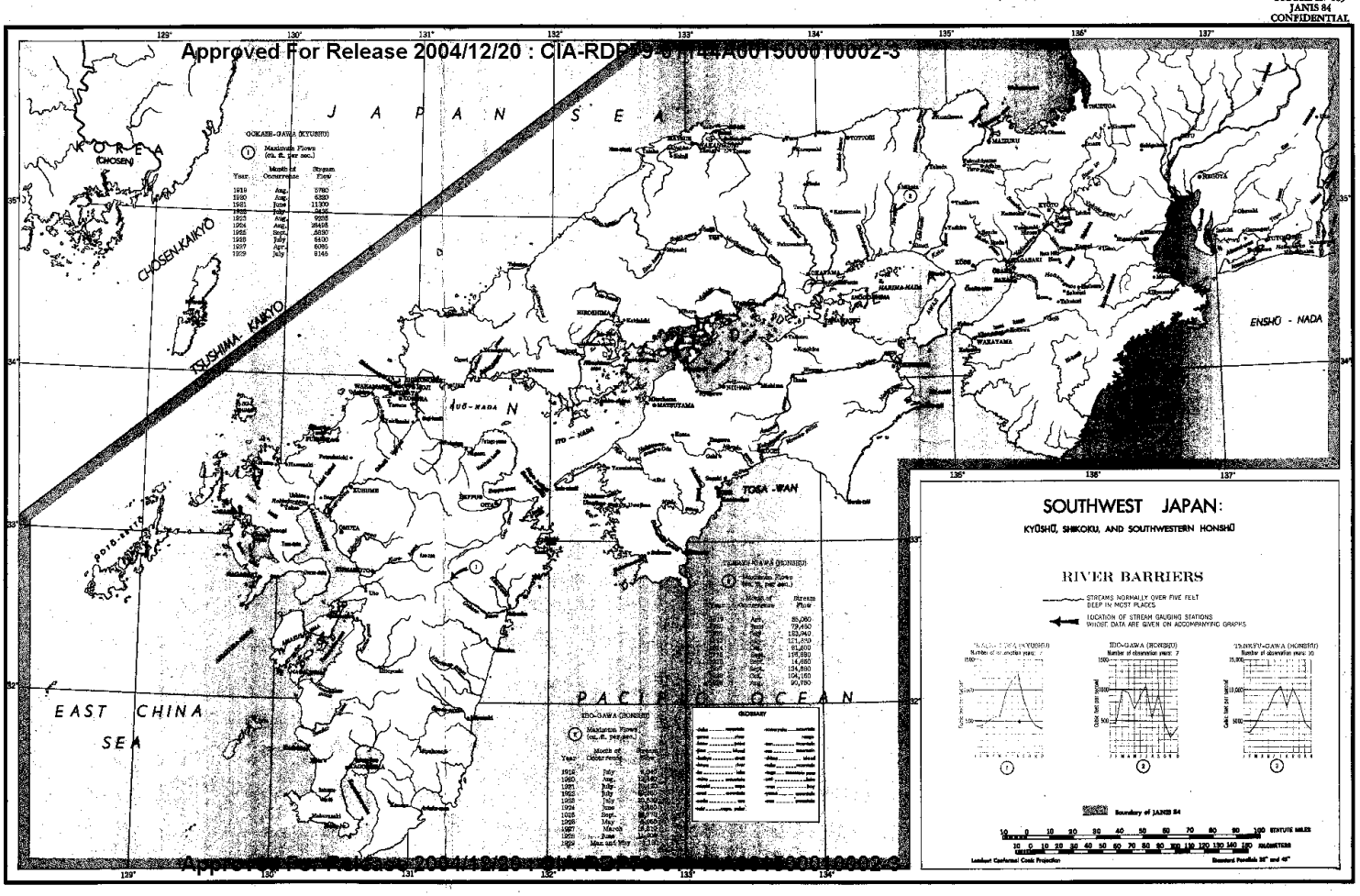


FIGURE II - 109. *River Barriers.* (H, L, M, N, E, O)

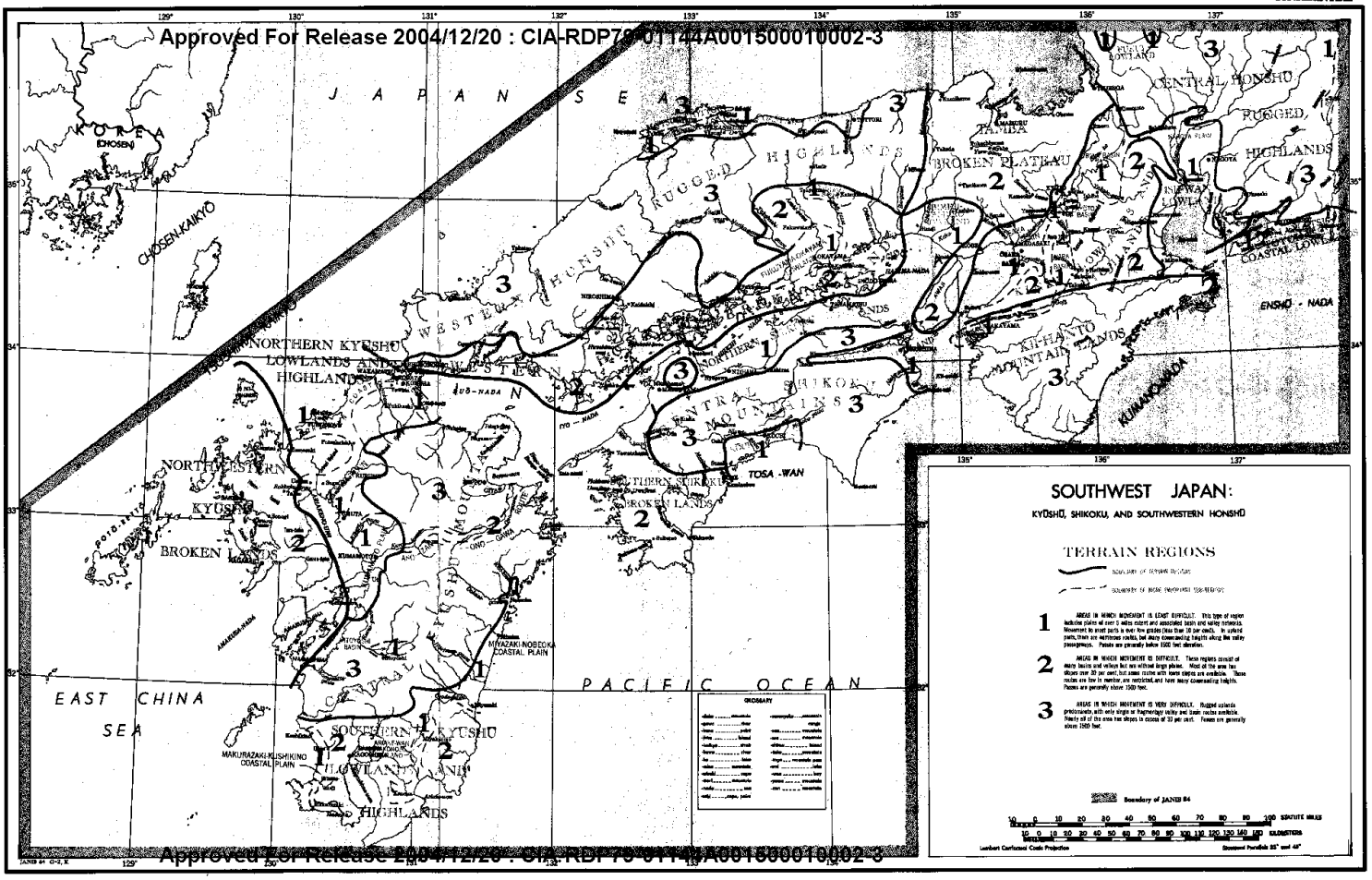


FIGURE II - 107. *Terrain Regions.* (K, J, I, L, M, N).

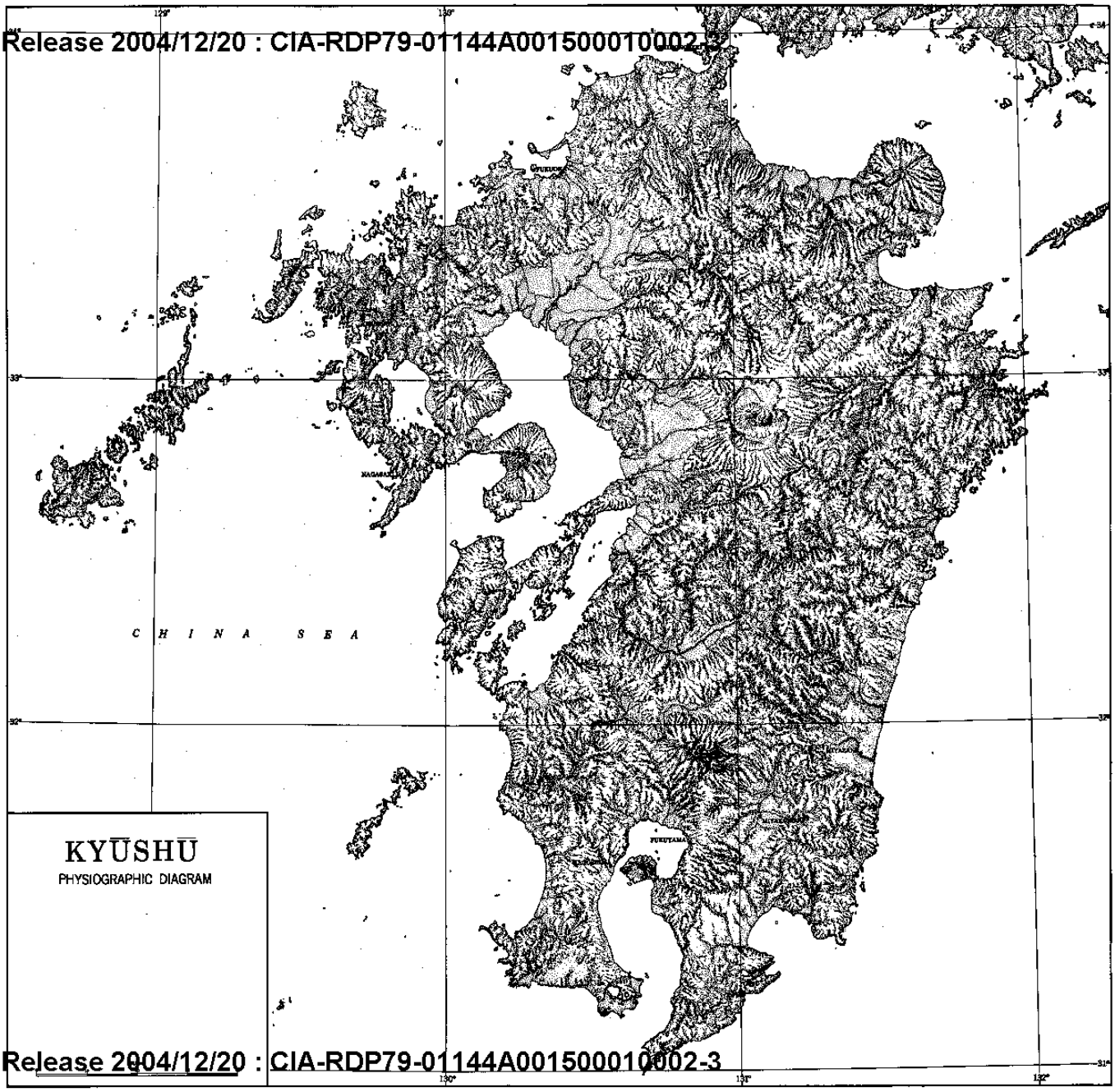


FIGURE II - 108. *Physiographic Diagram: Kyūshū.*
(901, 894, 895)

ROUTE No. 46

HONSHU: SENZAKI TO SHIMONOSEKI

READING DOWN
This is right side of Road

FAVORABLE
Road parallels coast. Shore about 200-300 feet. Low and level. Road right along coast. Gentle slope. Rolling. Valley width -1 mile. Narrow to 400-500 yards beyond. 1-2 miles, hills less steep beyond bottleneck.

VERY DIFFICULT
Bottleneck highest elevation of road 600-700 feet. Steep slopes. Alternate route along steep slopes.
Steep slopes. Valley is narrow 200-300 yards. Rice cultivation. Valley widens near Oichi.
Steep slopes, 700-1000 feet. Valley 300-400 yards wide to bottleneck.
Steep slope to bottleneck. 700 feet elevations right of road.
Valley low and level. 1 mile wide.

FAVORABLE
Beyond bottleneck, slope is moderate and valley widens.

VERY DIFFICULT
Steep slopes to and beyond bottleneck. Numerous curves 1-3 miles north of Tabe. Slopes 800 feet right of road.

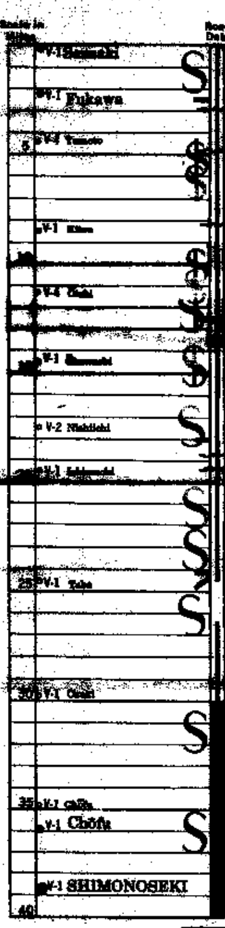
FAVORABLE
Alternate road follows low, narrow valley to Tabe. Railroad skirts hill north of Ozuki from main valley.

DIFFICULT
Slopes 400-600 feet border alternate road.

FAVORABLE
Hilly with moderate slope.
A lowland widens right of Ozuki.
Rice cultivation. Railroad crosses to right of road about 2 miles north of Chofu.
Narrow lowland right of road.
Moderate slope. Broadens to right.

DIFFICULT
Narrow ridge 300-600 feet high, about 1000 yards to right of road.

READING UP
This is left side of Road.



READING DOWN
This is left side of Road

FAVORABLE
Low and level. Rice cultivation. Low hills ½ mile beyond.
Road parallels river. Valley wide, then narrows. Rice cultivation.
Railroad between road and river.
Beyond bottleneck, valley widens, slopes less steep, rice cultivation.

VERY DIFFICULT
Steep slopes, sharp curves to bottleneck. Valley narrow 200-300 yards.

DIFFICULT
Steep slopes. Road turns right about 1 mile from Oichi and parallels main valley. Cliffed valley.

FAVORABLE
Valley widens beyond bottleneck.

DIFFICULT
Steep slopes 400-500 yards from road. Hilly country. Rice cultivation in valley. Valley narrow to bottleneck. Slope increases.

FAVORABLE
Valley low and level beyond bottleneck.
Low and level. Road near center of valley. Rice cultivation.
Valley wide then narrows to 200-300 yards about 1½ miles beyond Ichinomachi.

VERY DIFFICULT
Steep slopes, 500-1000 feet border valley.

FAVORABLE
Valley 800-1000 yards wide.
Low and level. Rice cultivation.
Railroad follows valley about 1 mile and turns right.

Coastal lowland narrows to Chofu.
Rice fields extend to coast.
Road is low and level.

Road is parallel and close to shore.

Road parallels coast. Shoreline about 300-600 yards to left. Land is low and rolling. Probably cultivated.

READING UP This is right side of Road

ROAD – NATIONAL HIGHWAY (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000–over
● 20,000–100,000
• 5,000–20,000
• 0–5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.
DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.
FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.
VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

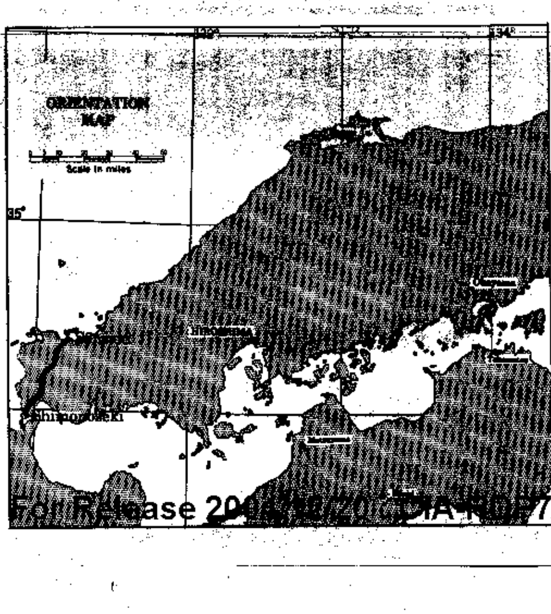


FIGURE II-106
JANIS 84
CONFIDENTIAL

ROUTE NO. 44
HONSHU: GOTSU TO HIROSHIMA

READING DOWN — left side of road

FAVORABLE
Low 250 feet hills near Gotsu; then difficult, steep 1000 feet forested hills; road mile away from sea. Railroad parallels.

DIFFICULT
Railroad is backed immediately by steep forested hills 600-1500 feet high; few narrow paths leading to hills.

Level land nearly totally absent; road backed immediately by steep forested hills 600-1500 feet high; railroad crosses and parallels the road; few narrow paths leading into small villages in restricted basins beyond.

VERY DIFFICULT
Cliffs and steep forested hills 800-1500 feet immediately banks road. Road zigzags in very narrow steep gullies seldom over 200 yards wide; defile for about 1½ miles south of Inbara - winding river.

FAVORABLE
Some rolling country with rice fields and houses for about 1 mile; then difficult bordered by moderate to steep forested hills 1000-1800 feet high.

Short distance south of Shimo-Todokoro is favorable; rice fields; gentle to steep hills.

DIFFICULT
Narrow belts of rice fields and houses; moderate slope hills; road junction leading to ... about 2 miles away.

FAVORABLE
Rice fields 100-400 yards wide; moderate slope, 1000 feet grass and forest covered hills.
Broad rice fields 300 yards to mile wide; gentle hills beyond.

Rice fields 200-400 yards wide; gentle forested hills; broad rice fields lie beyond steep hills adjacent road.

DIFFICULT
Steep forested mountains 1200-2500 feet high; rice fields 100-200 yards wide.

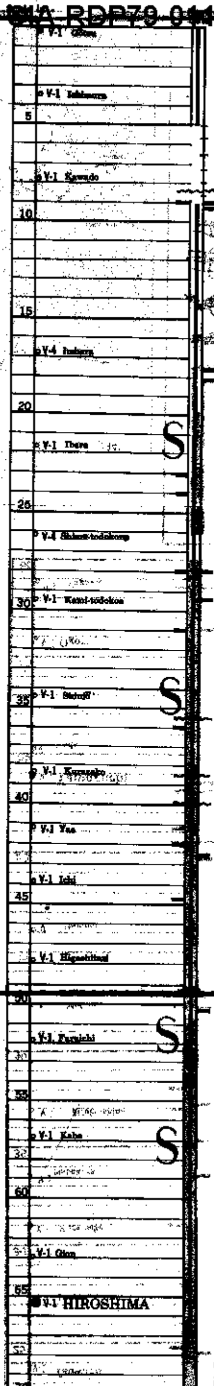
Very little level land; steep forested ridges 1000-2000 feet high; sharp turns in road.

Gentle foothills adjacent road, steep mountains beyond; favorable near Kabe; rice fields over mile wide; river short distance away from road.

FAVORABLE
Broad rice fields 200 yards to nearly 1 mile wide; gentle to steep hills, 300/1500 feet high beyond.

Level rice fields, steep hills 800-1000 feet high beyond; heavy settlements, Hiroshima city - railroad parallels.

READING UP
This is left side of Road



READING DOWN — right side of road

FAVORABLE
Rice and mulberry fields 200-300 yards wide; backed by moderate to steep forested hills 400-800 feet high; river parallels and close to road.

DIFFICULT
Narrow belts, 100 yards or less; bamboo thickets; Go-gawa (river) closely parallels the railroad the whole way; river depths about 10 feet at Kawado.

FAVORABLE
Railroad follows primarily the Go-gawa river valley, 200 yards to of mile wide filled with mulberry fields and bamboo thickets; river parallels all the way; steep hills beyond.

VERY DIFFICULT
Steep rounded forested hills and long ridges; 800-1700 feet high bank and beyond road; practically no level land; some rolling country near Ibara; winding river; defile.

FAVORABLE
Rolling forested hills for about ... mile with rice fields and houses; then difficult bordered by steep forested hills 1000-1700 feet high.

Rice fields 200-800 yards wide; houses; rolling forested hills and some depressions.

DIFFICULT
Moderate to steep forested hills; favorable near ...; rice fields mile wide;

FAVORABLE
Narrow belts of rice fields; moderate to steep slope 1000-1700 feet hills - grass and forest covered.

Rice fields over mile wide; rectangular pattern local streets; steep 1400 feet forested hills beyond river parallels.

Rice fields to over 1 mile wide; gentle hills and rolling country - forested - nearby.

Rice fields 300-500 yards wide; some gentle slope and rolling country near Ichi.

DIFFICULT
Rice fields 100-300 yards wide - gentle to steep forested hills.

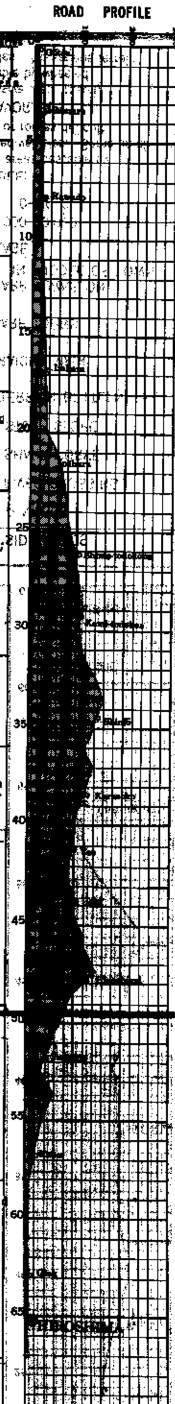
Steep forested hills, 300-1700 feet high; favorable near Kabe - rice fields ...

FAVORABLE
Rice fields over 1 mile wide; railroad and rivers short distance from road; embankments and numerous ditches.

Extensive rice fields; low hills 300-700 feet high short distance from road; near Hiroshima Bay.

READING UP
This is right side of Road

ROAD PROFILE



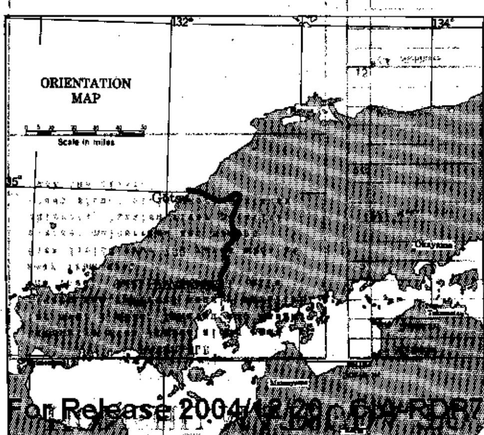
ROAD - NATIONAL HIGHWAY. (Main Prefectural Road) — SIDE ROADS
TUNNELS
RIVER CROSSINGS
ROAD - IMPROVED (10 Ft. or more wide.) — SHARP CURVE
STEEP SLOPE
ROAD or TRAIL - UNIMPROVED — TERRAIN BOTTLENECKS
Road classification is not based on reconnaissance. Reliability uncertain.

- V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
- V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
- V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
- V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over • 5,000-20,000
• 20,000-100,000 • 0-5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.
FAVORABLE: Large areas passable by wheeled vehicles. Some small areas of routes difficult.
DIFFICULT: Large areas impassable or difficult ... Some small areas or routes impassable.
VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

ORIENTATION MAP



ROUTE NO. 45
HONSHŪ: MATSUDA TO KAGAWA VIA YAMAGUCHI

READING DOWN — This is right side of Road

FAVORABLE
Extensive rice fields along road for over 1 mile; Takatsu and Masuki rivers and railroad nearly parallel the road; Takatsu about 1 mile away from sea.
Rice fields over 700 yards wide at places; mulberries and bamboo thickets; Takatsu river parallel; steep sloped hills short distance back the river.

DIFFICULT
Steep forested 400 foot hills.

VERY DIFFICULT
Half of the way--cliffs and steep hills; little flat land.

Steep forested hills 300-1400

Steep forested hills 600-1200 feet high; some sharp cliffs - Defile for about ½ mile.

DIFFICULT
Some rice fields 200-300 yards wide; rounded forested hills 1000-2000 feet elevation.

VERY FAVORABLE
Extensive rice fields and orchards; level terrain and some ditches

FAVORABLE
For about ... mile; banked by steep hills 700-1000 ... railroad parallels the road.

DIFFICULT
Rugged forested mountains 900-2700 feet high nearby.
Rugged hills 900-1800 feet immediately back the road; some rolling country near Tashiro; railroad parallels; deep canyon about ½ mile away from Midhara.

Rice fields 200-300 yards wide; steep ridges 700-2000 feet high; river parallels part of the way.

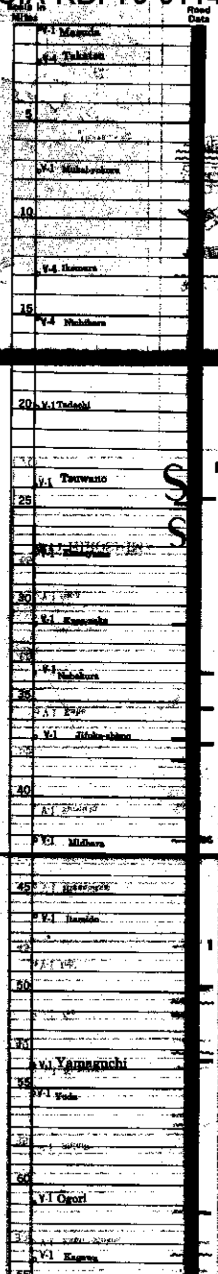
Steep forested hills 1000-1800 feet high; more favorable about 1 mile north of Yamaguchi - Defile for about 1 mile.

VERY FAVORABLE
Extensive level rice fields; numerous local roads, ... rectangular pattern.

FAVORABLE
For about mile, then banked by low rolling hills 80-700 feet high-forested; railroad parallels.

Low hills about 1 to 2 miles away.

READING UP — This is left side of Road



READING DOWN — This is left side of Road

FAVORABLE
For a short distance, then difficult; narrow belts of rice fields; forested hills about 200 feet high; gentle slopes.

DIFFICULT
Steep forested hills 300-400 feet high nearly bank the road.
Narrow belts 200-300 yards wide of rice fields; moderate to steep hills, 600-1100 feet high; railroad and river parallel.

FAVORABLE
Some steep country; river parallels the road.

VERY DIFFICULT
and railroad parallel; some rice fields near Tadachi.

DIFFICULT
Some rice fields, 200 yards wide, for nearly a mile; steep hills 600-1100 feet high; railroad parallels.

FAVORABLE
Some rice fields and forested rolling country 700-1600 feet high.

Rugged mountains nearly 1700 feet high; extensive rice fields near Tokusa-Kamigo ... steep hills beyond.

Rice fields to 1 mile wide; steep hills 1600-2000 feet high beyond.

For of a mile; banked by steep hills 700-1700 feet high; more level land near Tashiro; railroad and river parallel.

DIFFICULT
Steep mountains 1000-2000 feet high ... railroad parallels.

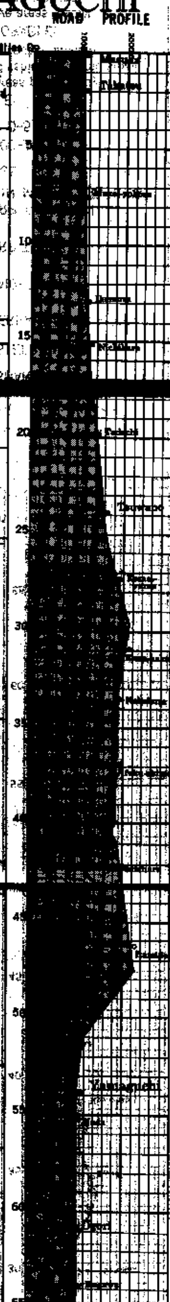
Steep hills; more rolling and level country about 1 to 2 miles north of Yamaguchi.

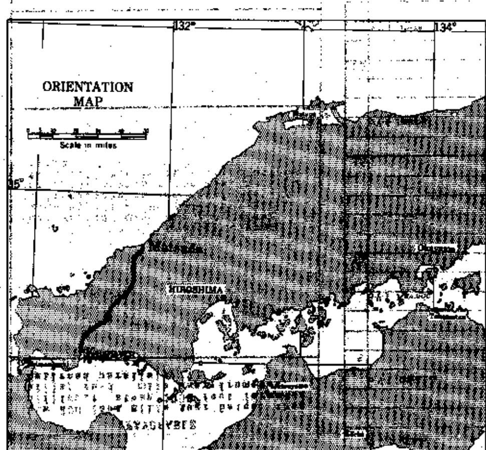
FAVORABLE
For about ... mile, banked by ... forested hills 200-400 feet high; railroad parallels

Immediate north of Ogori; some 1400-foot steep mountains; river parallels.

Extensive rice fields; railroad parallels about 2 miles away from the sea.

READING UP — This is right side of Road





(Main Prefectural Road)
ROAD - IMPROVED
(10 Ft. or more wide)
ROAD or TRAIL - UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
• 20,000-100,000
• 5,000-20,000
• 0-5,000

VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

ROUTE NO. 42

HONSHU MIYOSHI TO HIROSHIMA

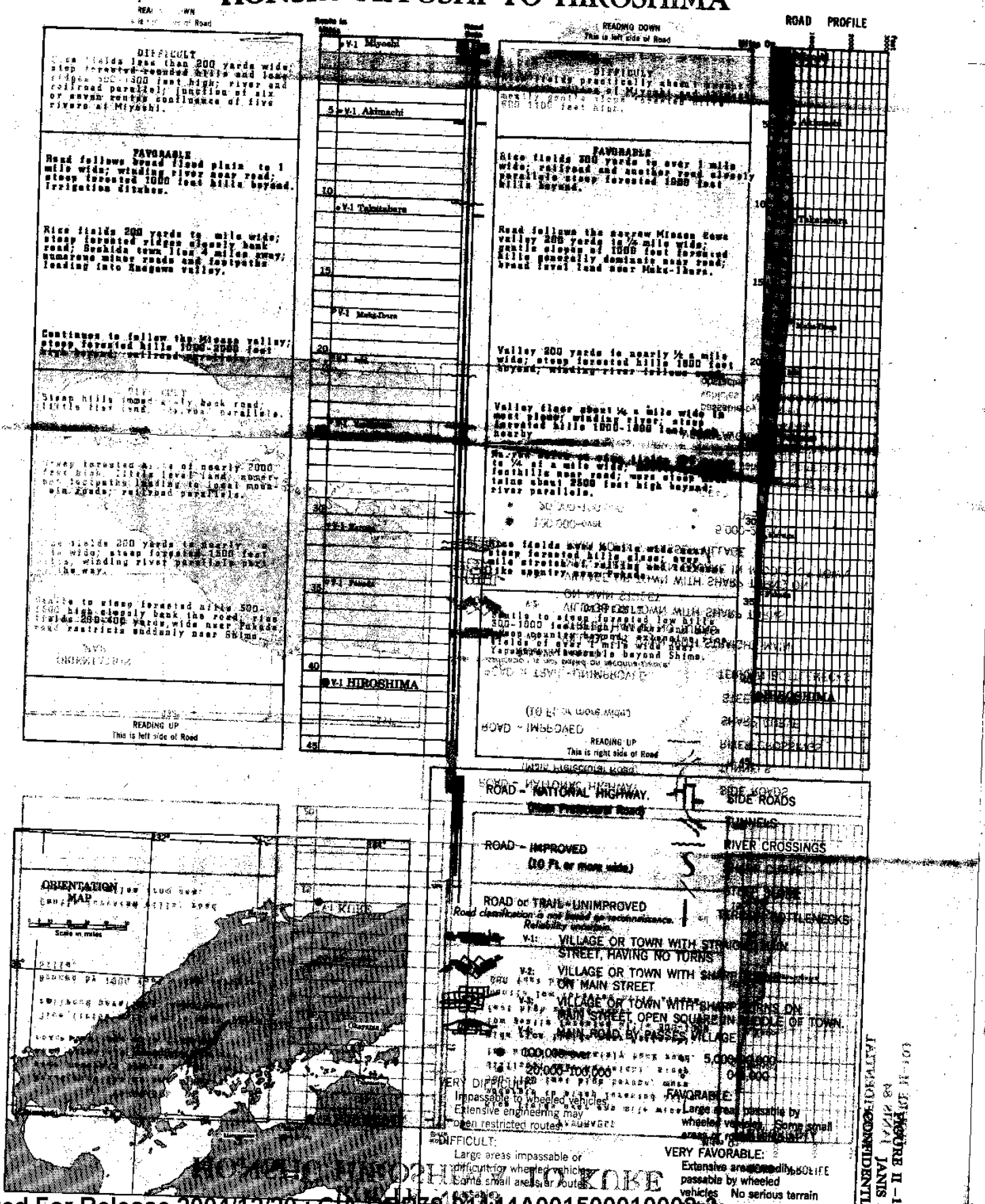
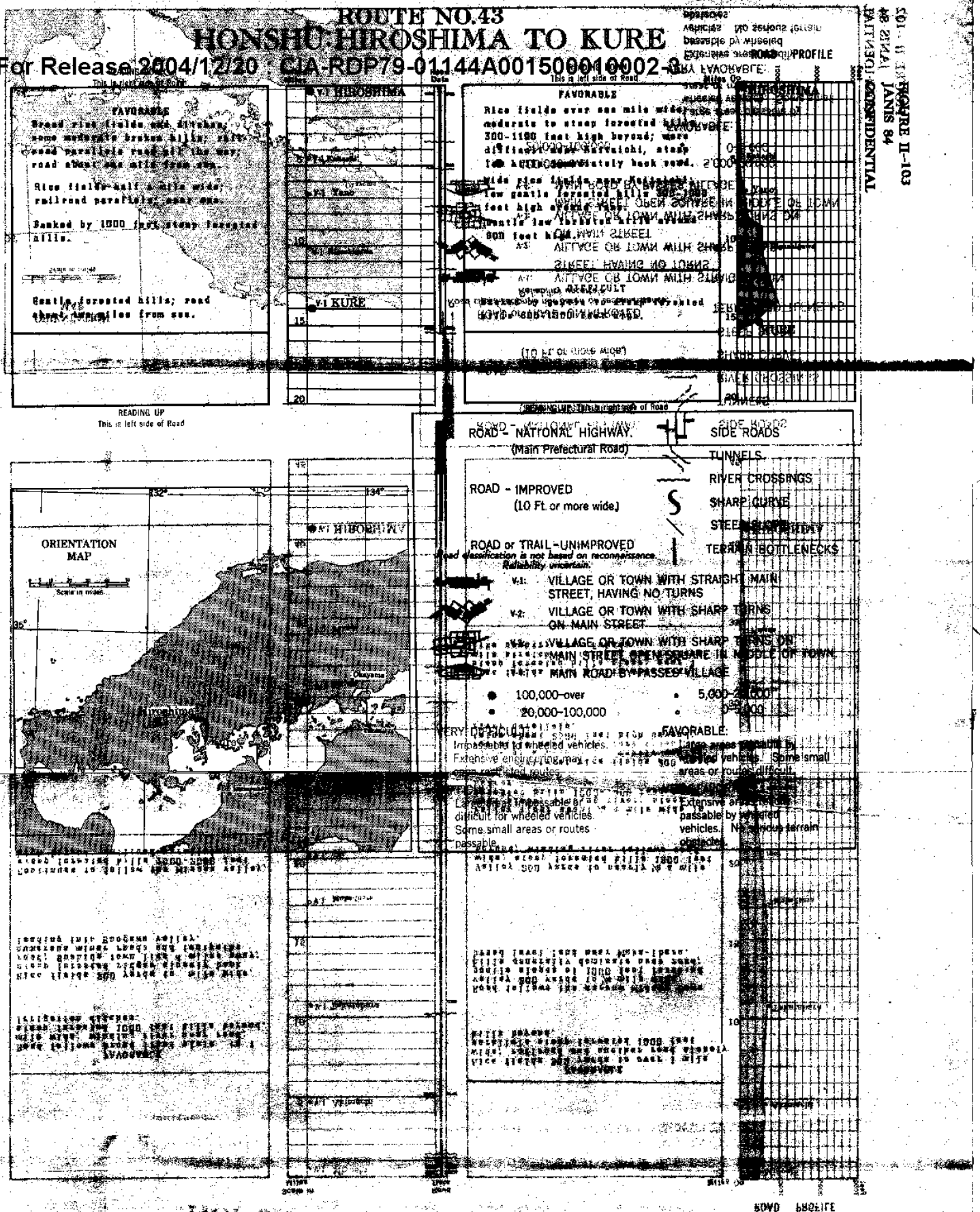


FIGURE II – 102
JANIS 84
CONFIDENTIAL

ROUTE NO.43
HONSHU: HIROSHIMA TO KURE



ROUTE NO.43
HONSHU: HIROSHIMA TO KURE

Approved For Release 2004/12/20 : CIA-RDP79-01144A001500010002-3

ROUTE NO.41

HONSHU: IMBARA TO MIYOSHI

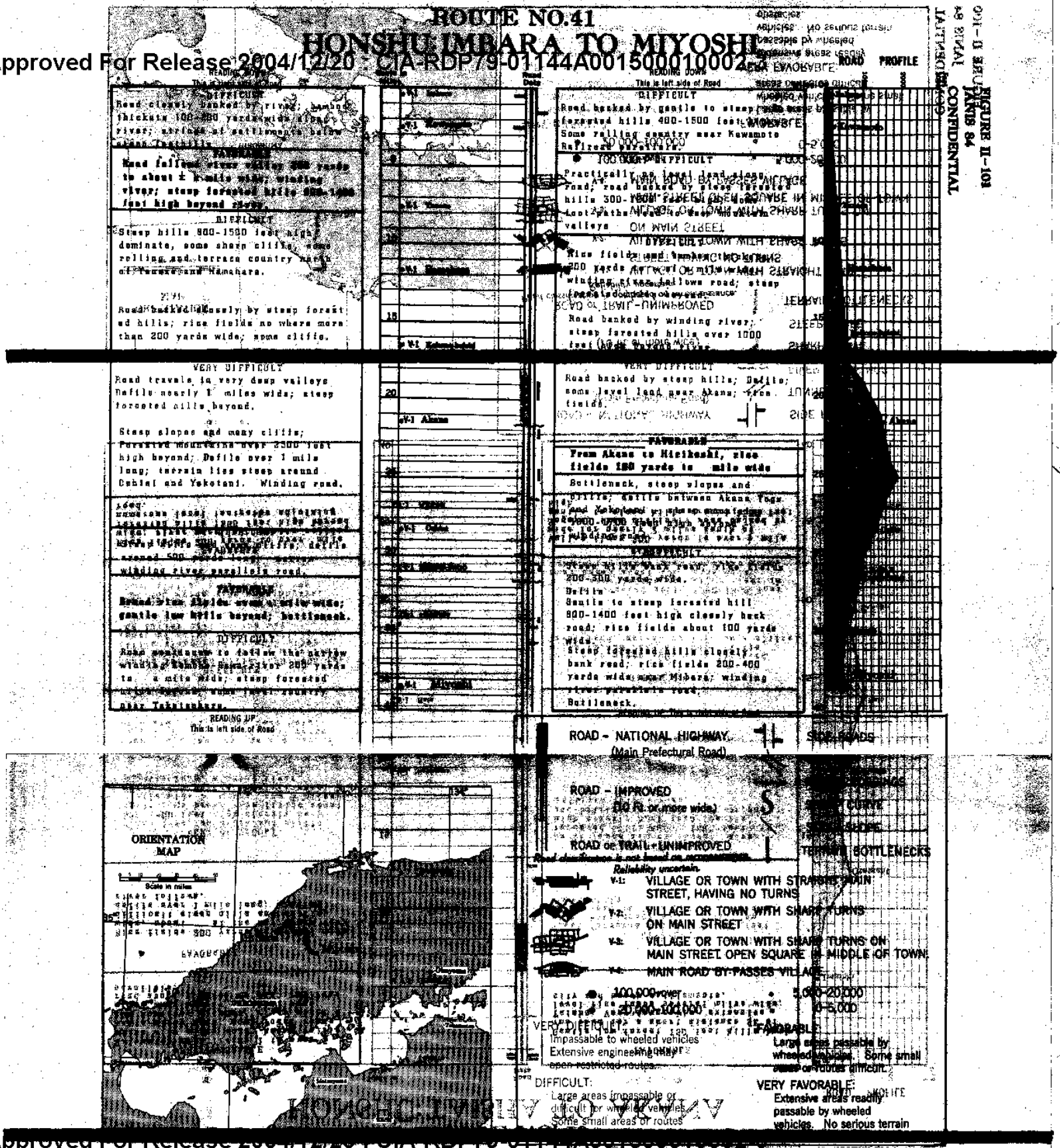


FIGURE II-103
JANUARY 84
CONFIDENTIAL

HONSHU: TAISHA TO ARAKA

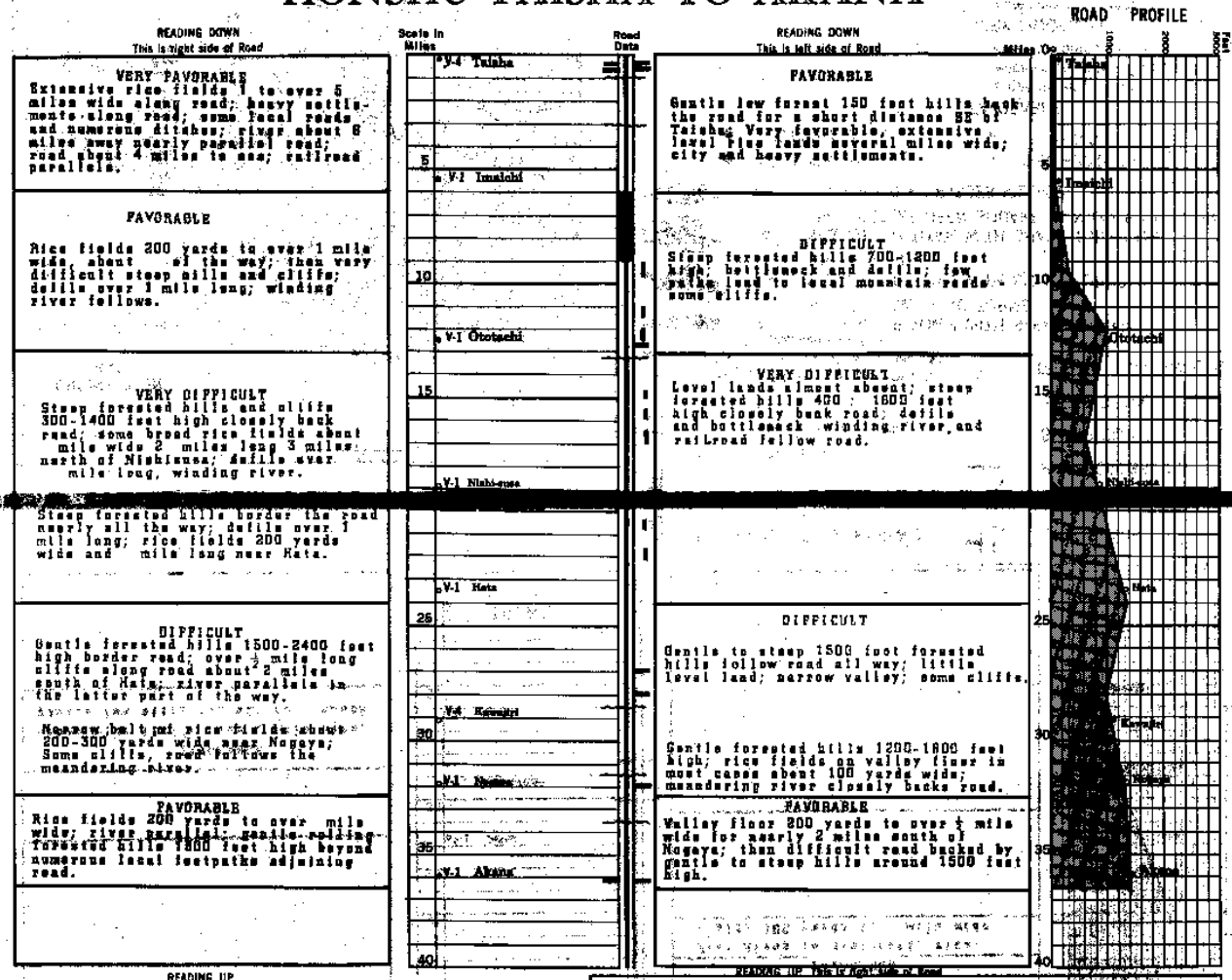


FIGURE II-100
JANIS 64
CONFIDENTIAL

ROUTE NO.39
HONSHŪ: MIYOSHI TO FUKUYAMA

FIGURE II-99

Scale in Miles	Road Data	ROAD PROFILE
	V-1 Miyoshi	Miyoshi
	V-1 Shiomachi	Shiomachi
5		
	V-1 Mirasaka	Mirasaka
10		
	V-1 Kisa	Kisa
15		
	V-1 Naka-yasuda	Naka-yasuda
20		
	V-1 Kōzan	Kōzan
25		
	V-2 Unzio	Unzio
30		
	V-1 Ichi	Ichi
35		
	V-1 Fuchū	Fuchū
40	V-2 Shinichi	Shinichi
45		
	V-1 Sanda	Sanda
50	V-1 FUKUYAMA	FUKUYAMA

FAVORABLE
Especially at the vicinity of Miyoshi and Shiomachi - extensive rice fields; gentle low forested hills border road; railroad parallels road all the way - some swamps

FAVORABLE
Road follows closely the bend of meandering river; narrow belts - 100-400 yards wide of rice fields interspersed by gentle low hills.

FAVORABLE
Road follows winding river; valley floor 500 yards to over ½ a mile wide; very restricted valley floor near Fuchu; steep forested hills 500-1400 feet high beyond.

VERY FAVORABLE
Road traverses on broad flood plain over 1 mile wide; winding river and railroad parallel.

FAVORABLE
Winding river closely follows road; mulberry and rice fields 300 yards to about ½ a mile wide; steep forested and grass covered hills border; several large populated Mura-villages near road.

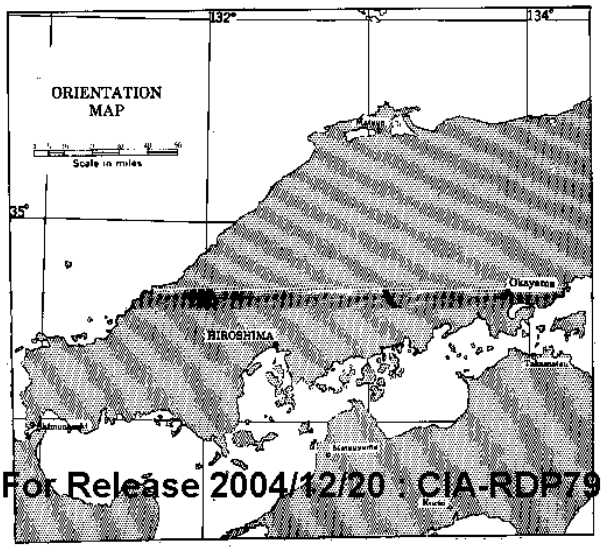
FAVORABLE
Rice fields 300 yards to over ½ a mile wide; river borders road all the way; gentle to steep forested hills 800-900 feet high beyond.
Valley floor 300 yards to over a mile wide - in rice -
Low 500-1000 foot gentle hills near Mirasaka; river parallels.

FAVORABLE
For about 1 mile from Kisa, rice fields 200 yards to about ¼ mile wide; then difficult, very steep forested hills of 1500 foot bank road; terrain more gentle near Naka-Yasuda; meandering dominates most of the way.

FAVORABLE
Rice fields 200 yards to over a mile wide; gentle to steep forested and bare hills 1000-1500 feet high; some very steep hills SW of Fuchu.

VERY FAVORABLE
Extensive level country, rice and mulberry fields; steep forested low 500 foot hills beyond.

FAVORABLE
For about 2 miles from Shinichi where the road is bordered by steep forested low hills about 500 feet high; then very favorable; extensive featureless plain of several miles wide; numerous local roads, ditches and embankments.
For about ¼ of a mile; then difficult 700 foot steep hills border road until reaching the broad plain of Fukuyama; numerous local roads - railroad parallels.



ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide.)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000–over
● 20,000–100,000
▪ 5,000–20,000
▪ 0–5,000

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

ROUTE NO. 38
HONSHŪ: KURE TO SAIJO

ROAD PROFILE

FAVORABLE
Rice fields _mile wide near Shimkai; Steep forested hills beyond.

Road follows narrow river valley mile or less wide; 1800-foot forested hills border.

Road continues to follow river valley floor plain, widens; rice fields nearly mile wide along road.

Rice fields 800 yards to over mile wide; gentle hills beyond.

Little local relief, gentle 1000 foot forested hills and some rice fields beyond; no rice fields along road; numerous footpaths adjoining road.

READING UP
This is left side of Road

V-1 KURE
V-1 Shimkai
V-1 Gōhara
V-1 Maruyama
V-1 Ōtake
V-1 Saijō

FAVORABLE
Rice fields over 1 mile wide south of Shimkai; railroad parallels - road about 1 mile from sea.

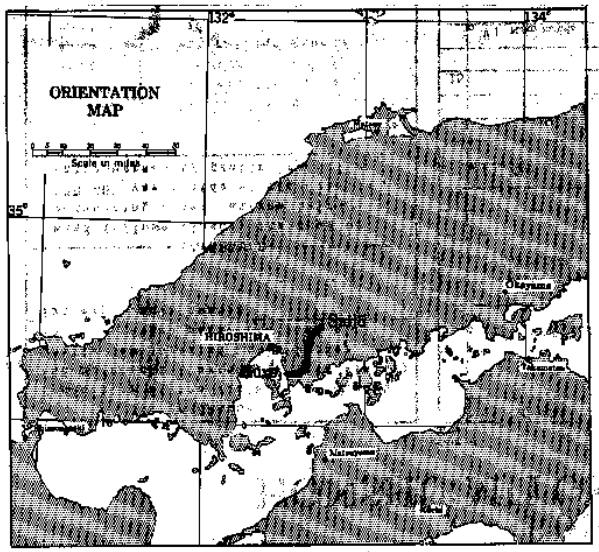
DIFFICULT
No rice fields; road banked by steep forested hills.
Hills parallel road all the way. Few rice fields, except little stretches near Maruyama.

FAVORABLE
Rice fields nearly 1 mile wide all the way, gentle hills beyond; Winding river parallels the road.

Little local relief; broad flood plains, gentle 1800 foot forested hills beyond; rice fields to miles wide near Saijō.

READING UP This is right side of road

KURE
Shimkai
Gōhara
Maruyama
Ōtake
Saijō



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ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

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V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000–over
● 20,000–100,000
● 5,000–20,000
● 0–5,000

VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

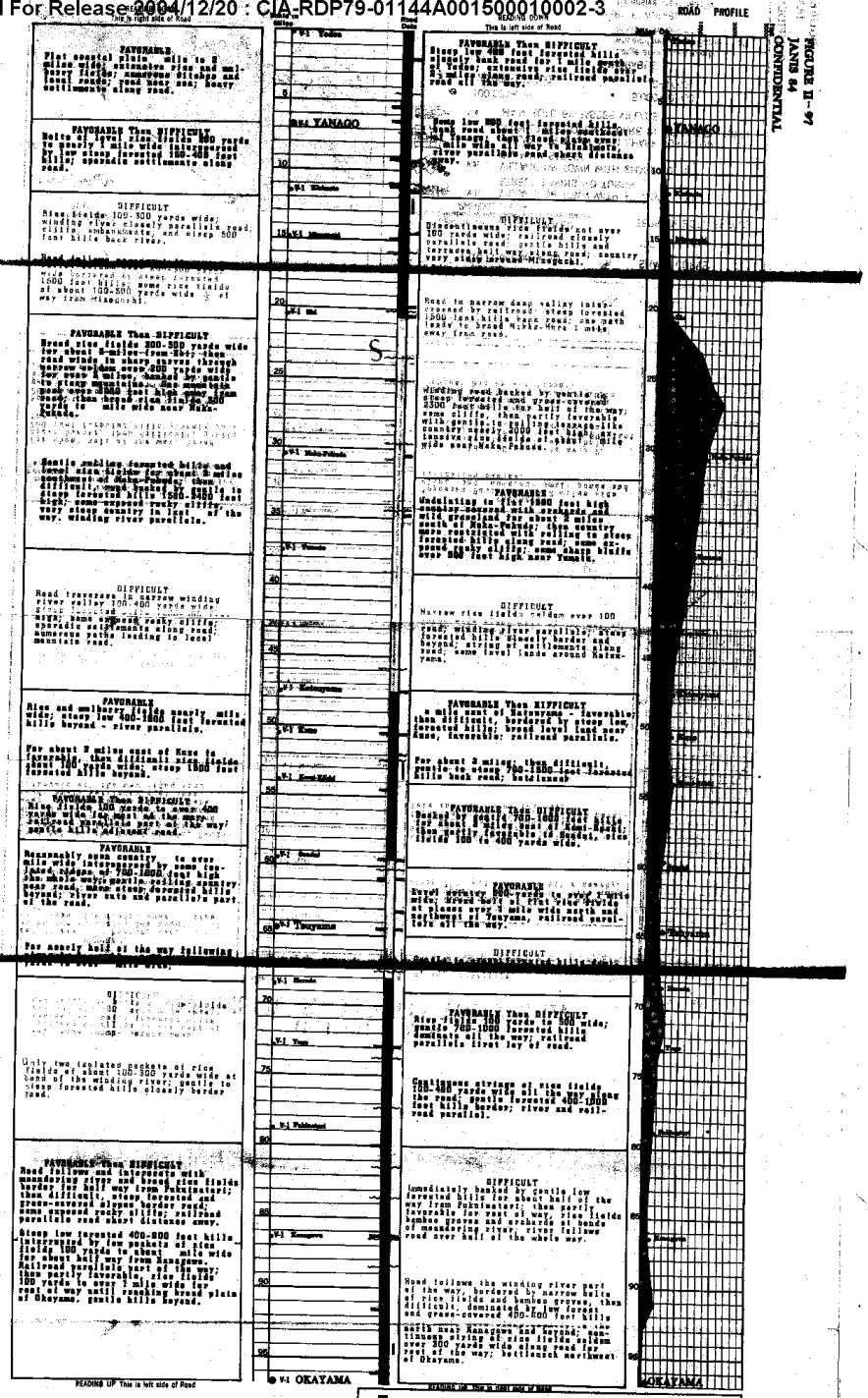
DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

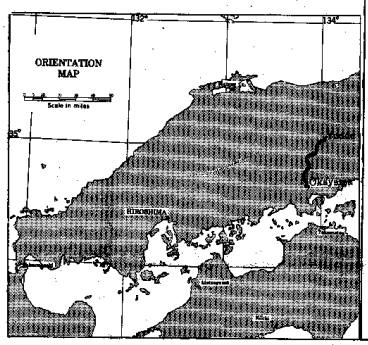
FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

FIGURE II-98
JANIS 84
CONFIDENTIAL

ROUTE NO. 37
HONSHŪ: YODOE TO OKAYAMA





ROAD – NATIONAL HIGHWAY, (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
● 20,000-100,000
• 5,000-20,000
• 0-5,000

DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas of routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

JANIS 64
CONFIDENTIAL
FIGURE II - 37

ROUTE NO. 36
HONSHŪ: KARO TO TSUYAMA

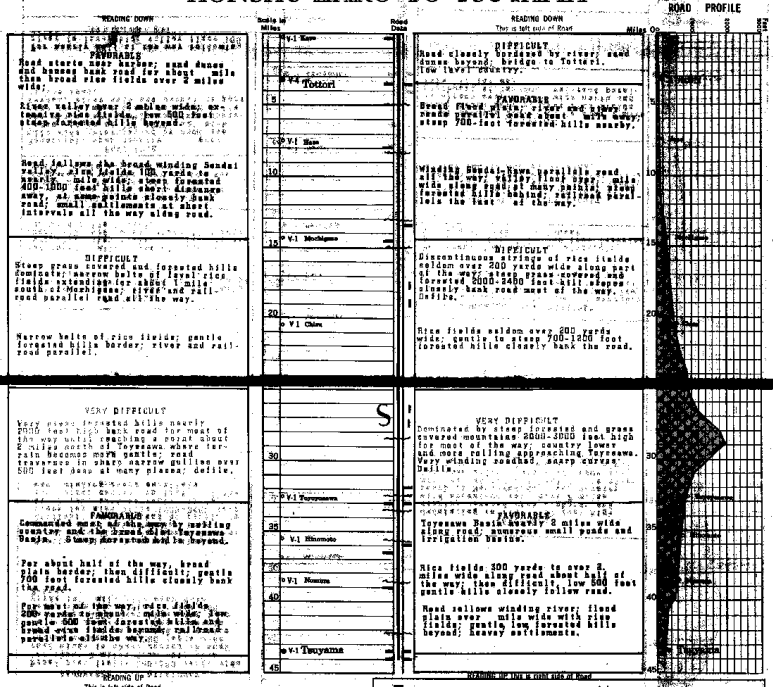


FIGURE II-96
JANIS 84
CONFIDENTIAL

ROUTE NO. 34
HONSHŪ: KINOSAKI TO HIMEJI

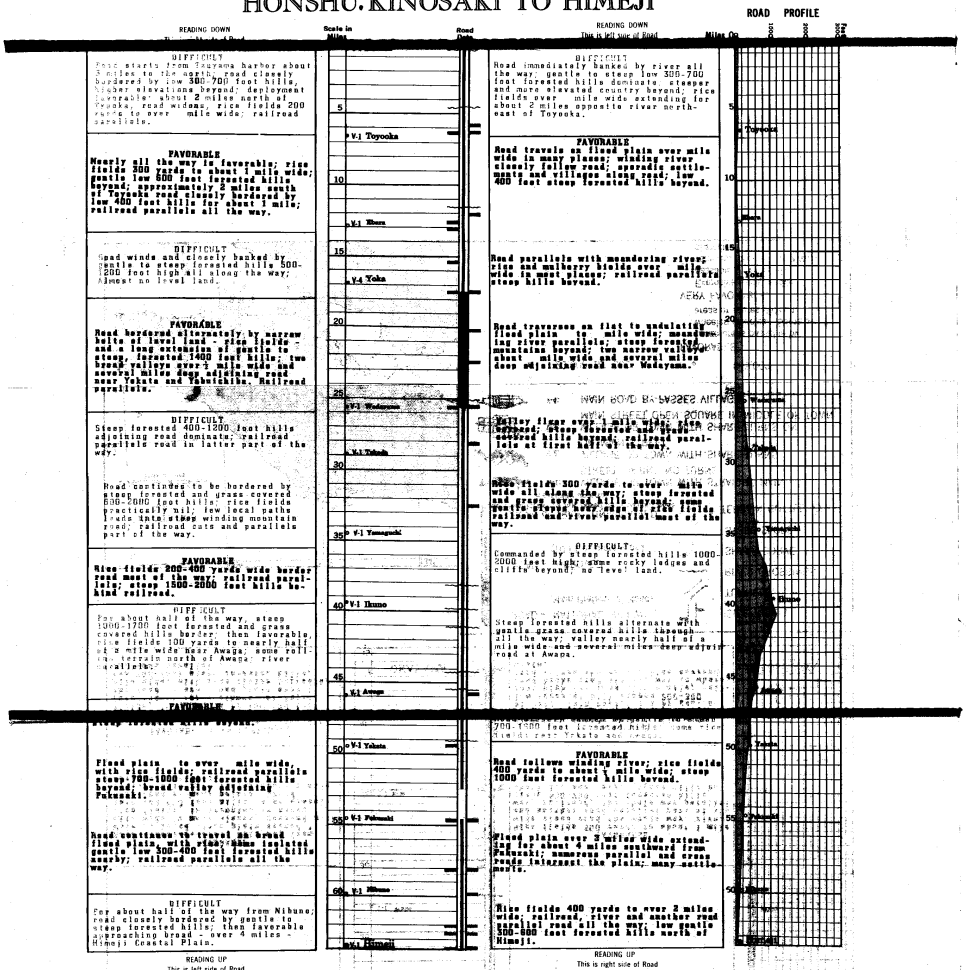


FIGURE II-94
JANIS 64
CONFIDENTIAL

ROUTE NO. 35
HONSHU: TSUYAMA TO OKAYAMA

ROAD PROFILE

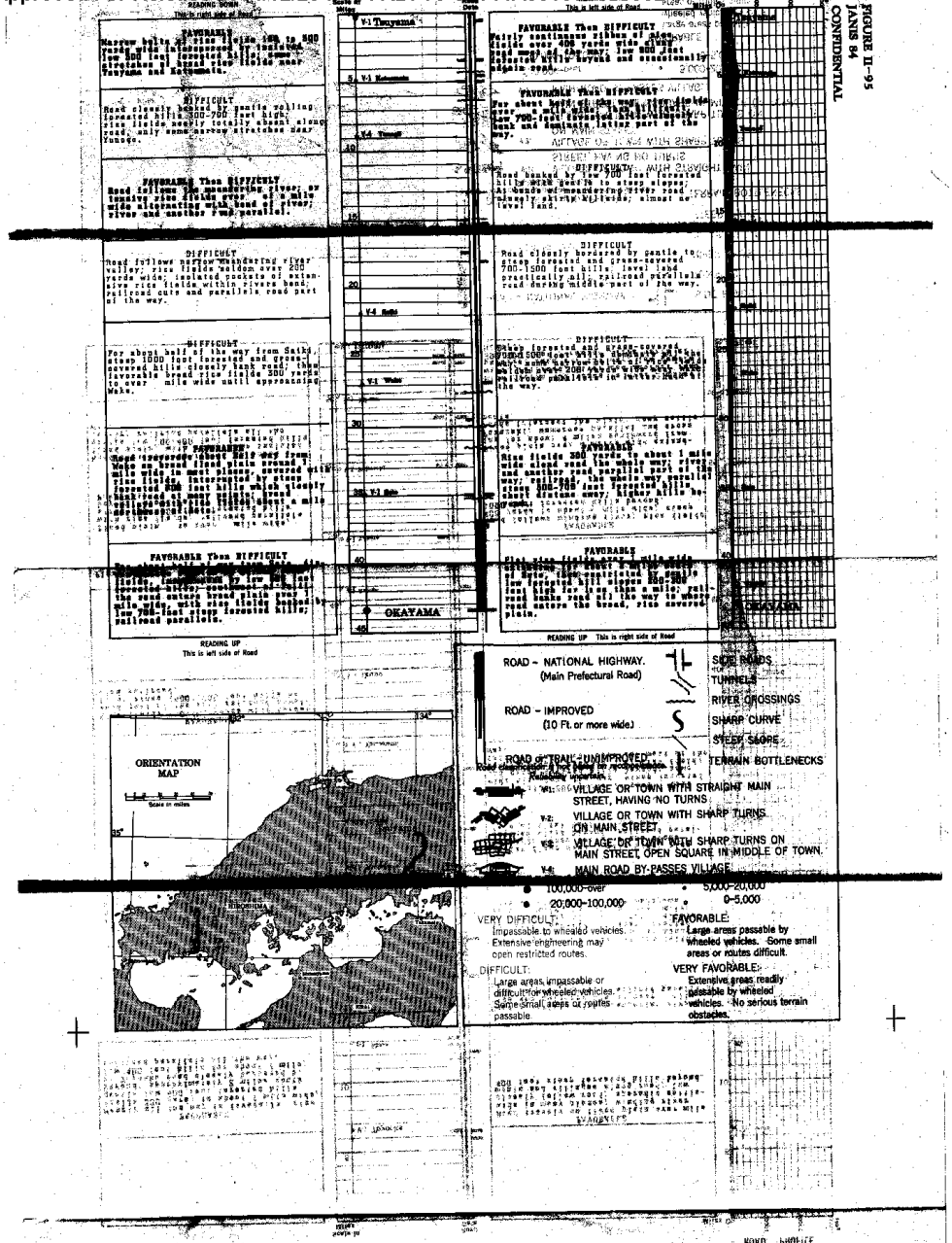


FIGURE II-95
JANS 84
CONFIDENTIAL

ROUTE NO. 34
HONSHŪ: KINOSAKI TO HIMEJI

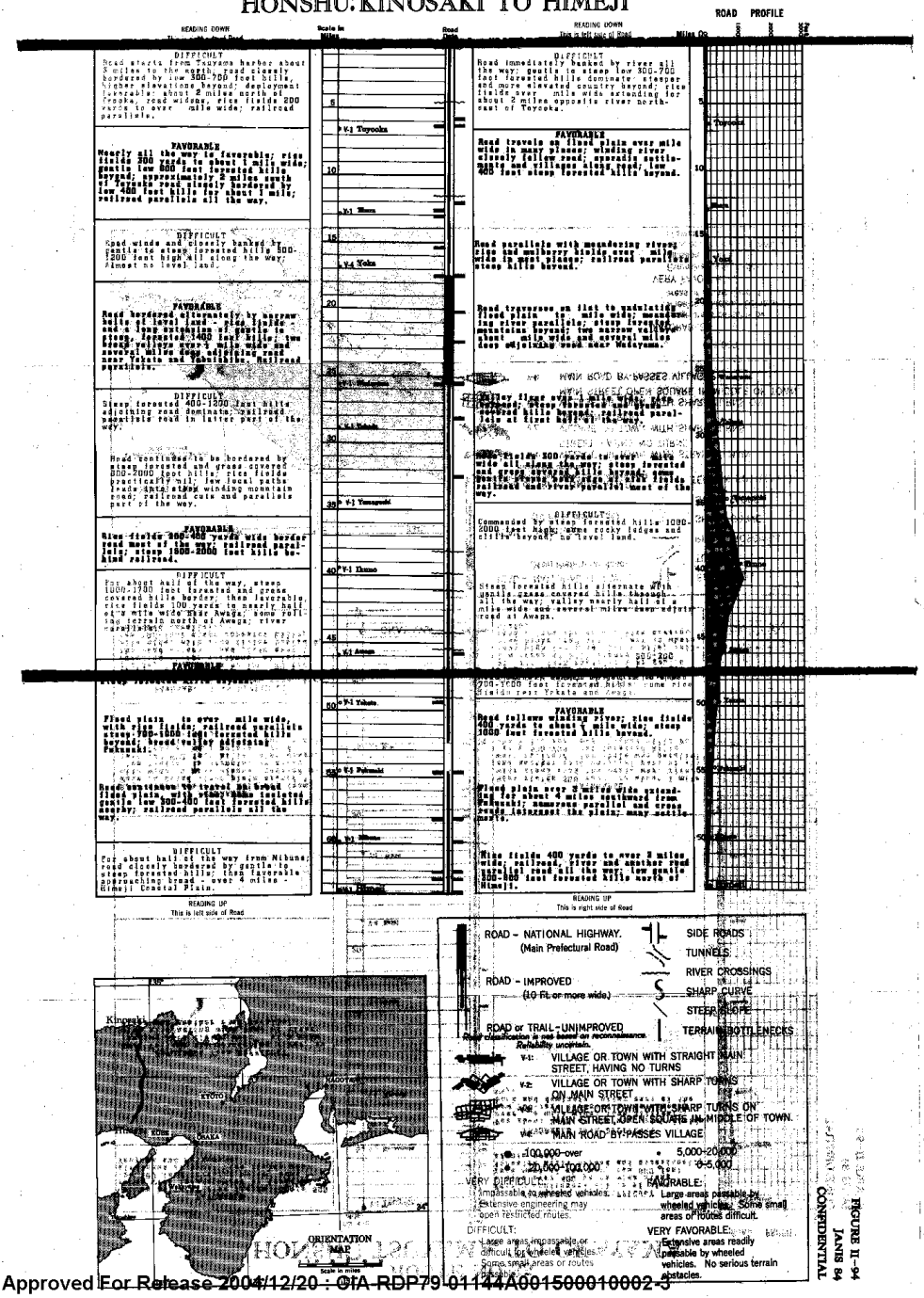


FIGURE II-94
JANIS 64
CONFIDENTIAL

ROUTE NO.33
HONSHŪ: FUKUCHIYAMA TO KŌBE

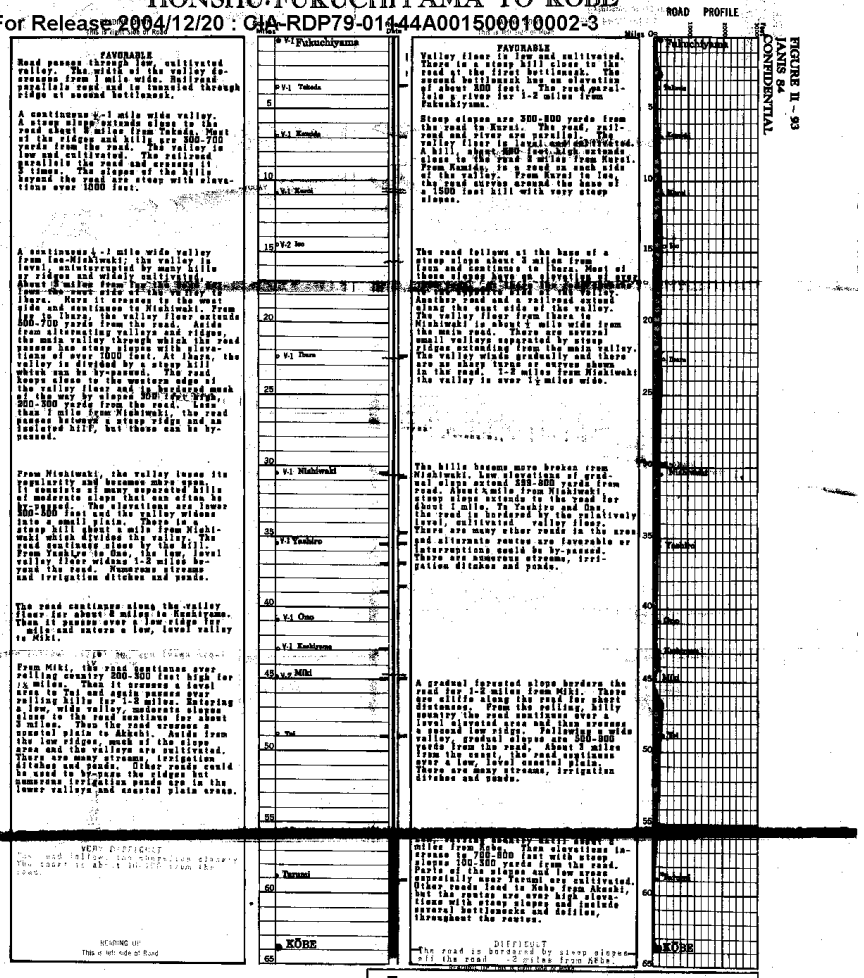


FIGURE II - 93
JANIS 84
CONFIDENTIAL

ROUTE NO.32
HONSHŪ: AMINO TO ŌSAKA-KYŌTŌ HIGHWAY

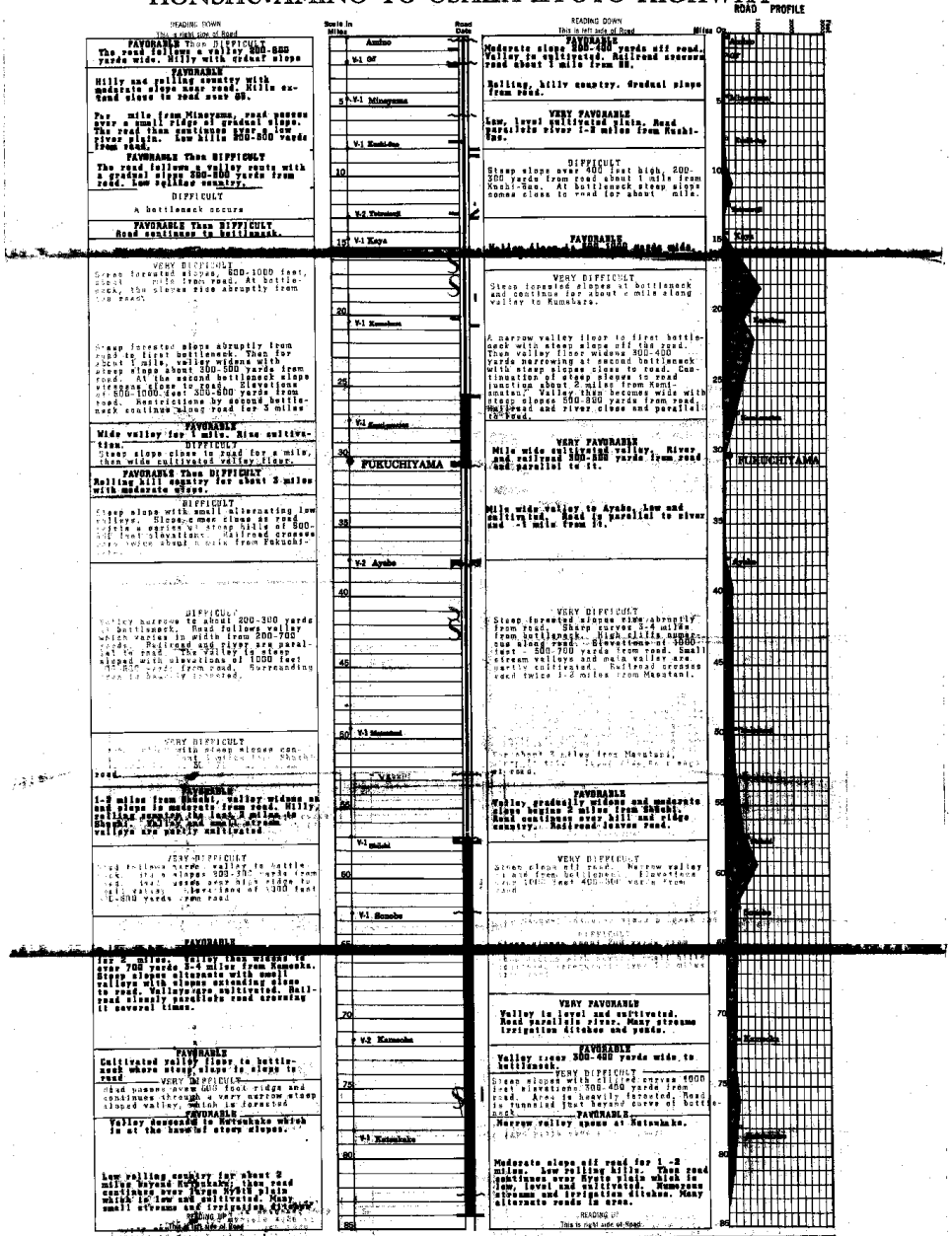


FIGURE II - 52
CONFIDENTIAL
MAS 64

ROUTE NO.31
HONSHŪ:TAKATA TO FUSHIMI

READING DOWN
This is right side of Road

VERY FAVORABLE
Low cultivated plain, part of the Nara Basin. Numerous streams, irrigation ditches and ponds.

Continuation of cultivated plain to Nara. Many streams, irrigation ditches and ponds. Other roads to Nara.

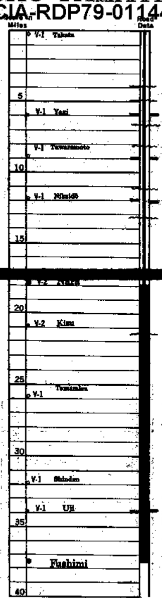
FAVORABLE
Nara is flanked by a steep hill over 1000 feet elevation. The road is separated from the hill by a valley 300-500 yards wide. The road passes over a rolling country of hills and valleys and enters a wide valley floor. About mile from Kizu a railroad crosses the road at this point. There are other roads to Kizu.

The road follows the river near the center of the valley. Steep slopes of 300 feet are 1 mile from road at Kizu to about 300 yards at Shinden. Level plain between road and steep slopes beyond, is cultivated and has many streams and irrigation ditches. Railroad is parallel to road and crosses it about 3 miles from Shinden.

Road passes over low ridge with partly cultivated gentle slope. Hilly, with steep slope 300-400 yards from road.

Wide cultivated plain. Road closely parallels river. Many streams, irrigation ditches and ponds. Steep slope is 1-1 miles from road.

READING UP
This is left side of Road



READING DOWN
This is left side of Road

VERY FAVORABLE
Low cultivated plain, part of the Nara Basin. Numerous streams, irrigation ditches and ponds. Railroad crosses road 2 miles from Yagi.

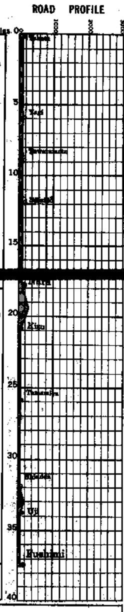
Continuation of cultivated plain to Nara. Many streams, irrigation ditches and ponds. Railroad is parallel to road. Other roads in area. Many towns and villages.

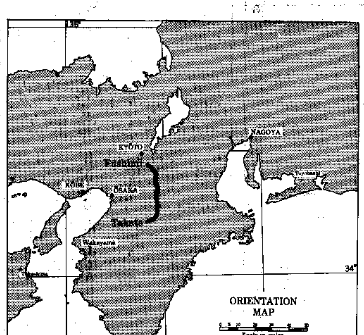
FAVORABLE
Between Nara and Kizu the road crosses a 300 feet ridge which is a series of low broken hills. Wide valley 1 mile from Kizu.

The road continues to Shinden over a southern arm of the Kyōto plain. The plain is level and cultivated. There are many streams and irrigation ditches. The road closely parallels a river most of the way.

Low ridge with gradual slope. It is partly cultivated. Hill or ridge is by-passed by another road.

Low, level cultivated plain. Many streams, irrigation ditches and ponds. Main road is 1-1 miles from eastern shore of Lake Ogura. Another road parallels the lakeshore to Fushimi.





ORIENTATION MAP

ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000–over
• 20,000–100,000
• 5,000–20,000
• 0–5,000

VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas unpassable or difficult for wheeled vehicles. Some small areas or routes

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain

ROUTE NO. 30
HONSHŪ: WAKAYAMA TO ŌSAKA

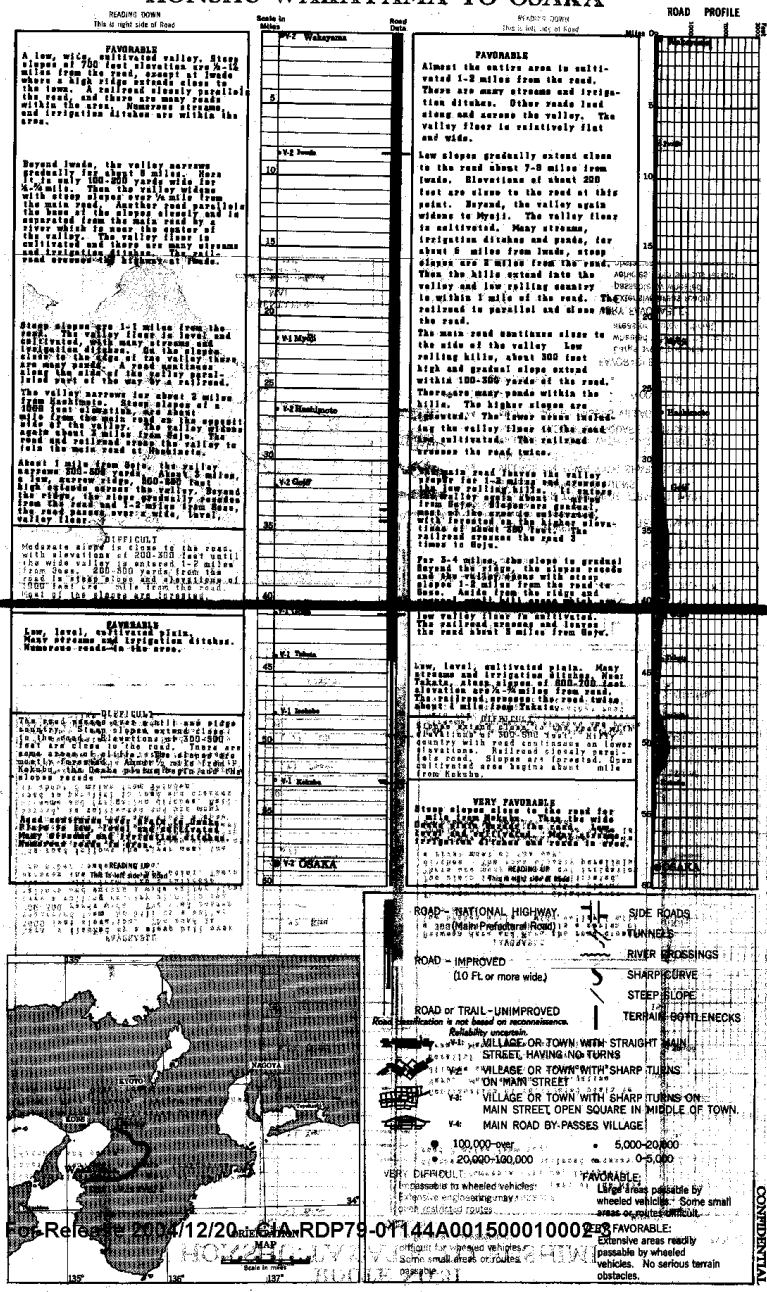


FIGURE II - 30
JANS 64
CONFIDENTIAL

ROUTE NO. 29

HONSHŪ: NAGASHIMA TO MATSUZAKA

READING DOWN
This is right side of Road

VERY DIFFICULT

Moderate than steep slope off road. Elevations of 400-800 feet 800 yards from road. Railroad is tunneled.

DIFFICULT

Steep forested slope, 1000 feet elevations mile from road. Road enters narrow valley. Railroad closely parallels road.

Steep forested slope off road. Road near base of 800 foot elevations. Railroad parallels road to Ase where it crosses road.

VERY DIFFICULT

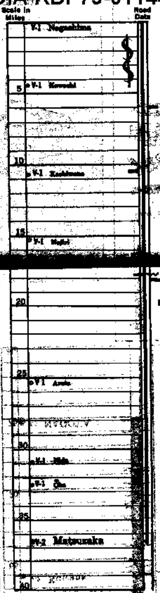
Road continues close to base of steep slope. Elevations of 1000 feet 700-800 yards from road. Steep slope at bottleneck and then hills gradually recedes from road as valley widens near Arata.

FAVORABLE

Alternating gradual and steep slope near road as hills break and valleys extend into hills. Hilly, rolling country. Elevations 300 feet about - mile from road.

Road follows low valleys between hills. Hilly, rolling country. Forested and gradual slope. Low elevations. Road continues over coastal plain about a mile from Matsuzaka.

READING UP
This is left side of Road



READING DOWN
This is left side of Road

VERY DIFFICULT

Steep slopes elevations of 300 feet close to road. Forested hills. Clified narrow. Road passes over high ridge

DIFFICULT

Steep forested slope offroad. Narrow valley begins. 1800 feet elevation 00-500 yards from road.

Valley widens 200-500 yards. Alternating steep slope with small intersecting valleys. 600-800 feet elevations 800 yards off road. Valley floor is cultivated

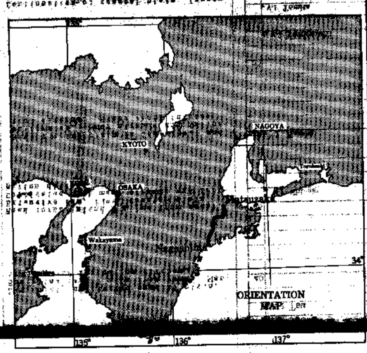
Valley floor 300-600 yards wide. Steep slopes of mile off road. At bottleneck, valley narrows 200-300 yards. Road passes over low ridge. Valley widens mile from bottleneck. Railroad partly tunneled parallels road.

FAVORABLE

Moderate forested slope for 2½ miles. Then steep slope for mile with 300 foot elevation about 300 yards from road. Hills then decrease to gradual slope. Rolling country, Railroad parallels road.

Low, broken hills until about a mile from Matsuzaka, where the road continues over the flat coastal plain. Elevations of 300 feet, mile from road. Railroad crosses road at

READING UP This is right side of Road



ORIENTATION MAP

ROAD – NATIONAL HIGHWAY

ROAD – IMPROVED (10 Ft. or more wide.)

ROAD or TRAIL – UNIMPROVED

Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS

TUNNELS

RIVER CROSSINGS

SHARP CURVE

STEEP SLOPE

TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE.

● 100,000–over
• 20,000–100,000
• 5,000–20,000
• 0–5,000

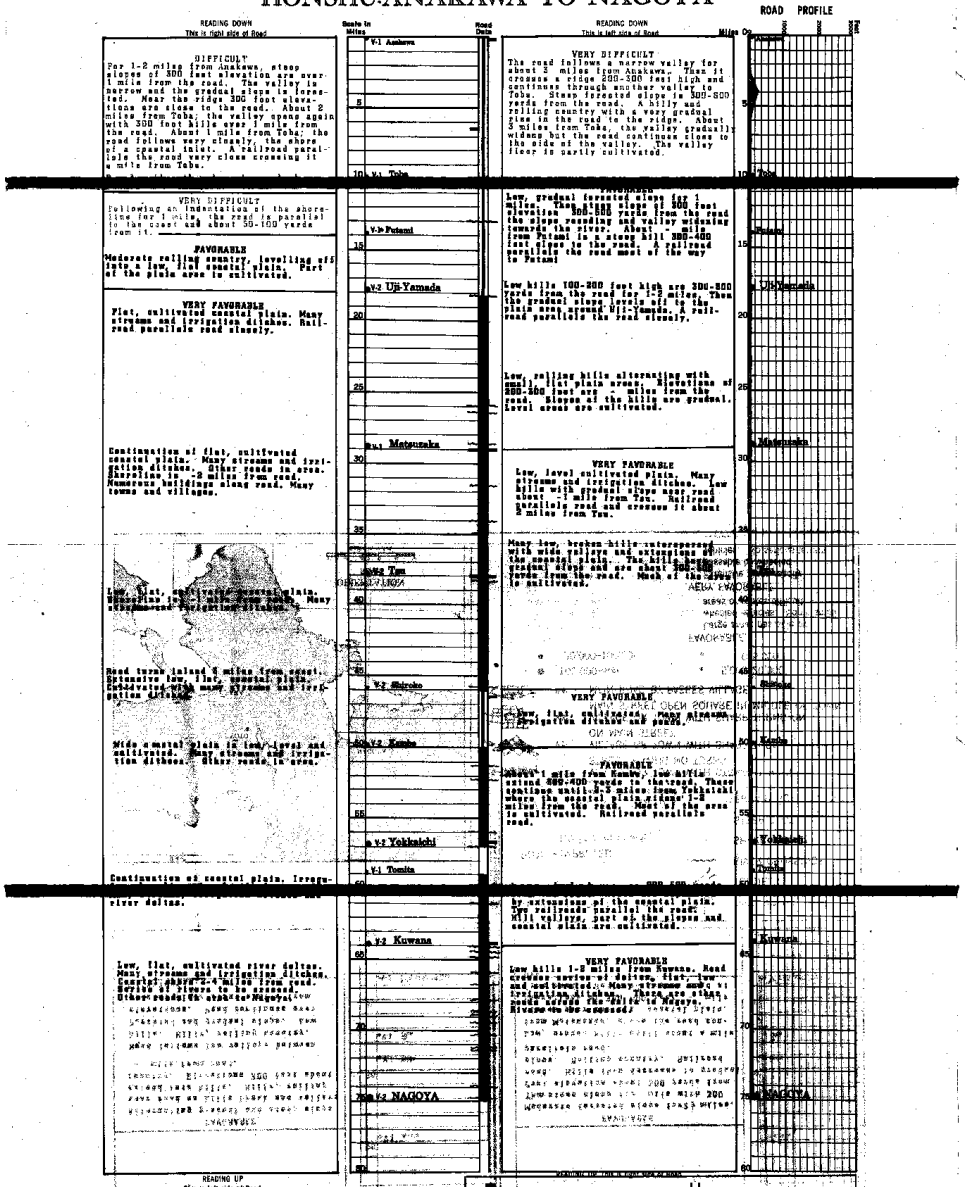
VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. ... passable.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled ... obstacles.

ROUTE NO. 28
HONSHŪ: ANAKAWA TO NAGOYA

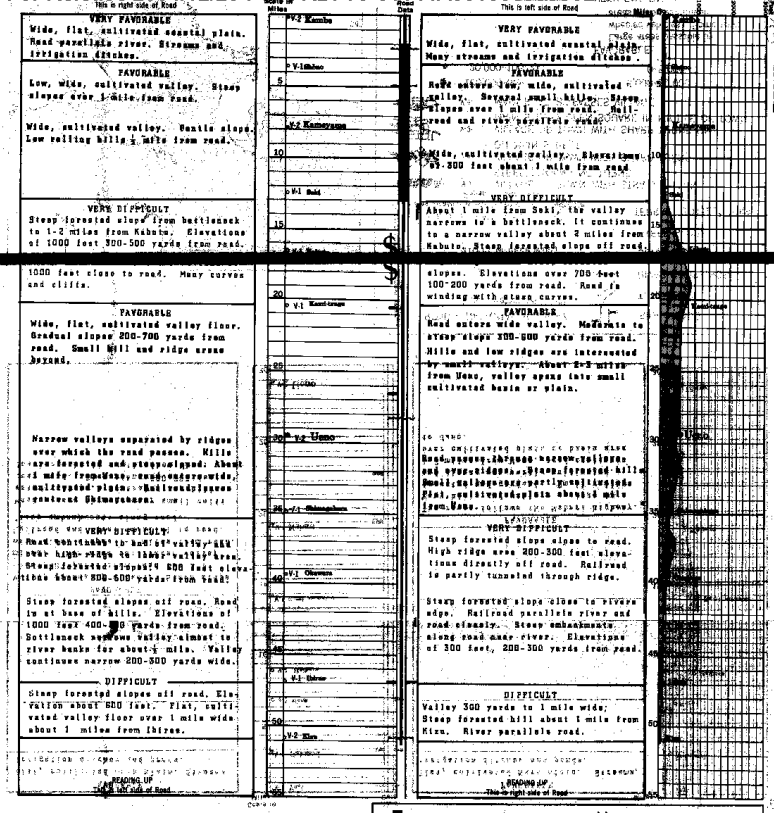


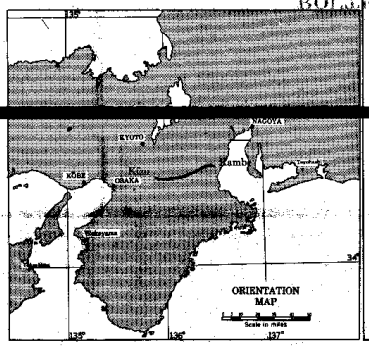
JANIS 84
CONFIDENTIAL

FIGURE II-88

ROUTE NO. 27
HONSHU: KAMBE TO KIZU

ROAD PROFILE





ROAD - NATIONAL HIGHWAY (Main Prefectural Road)
ROAD - IMPROVED (10 Ft. or more wide)
ROAD or TRAIL - UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
● 20,000-100,000
● 5,000-20,000
● 0-5,000

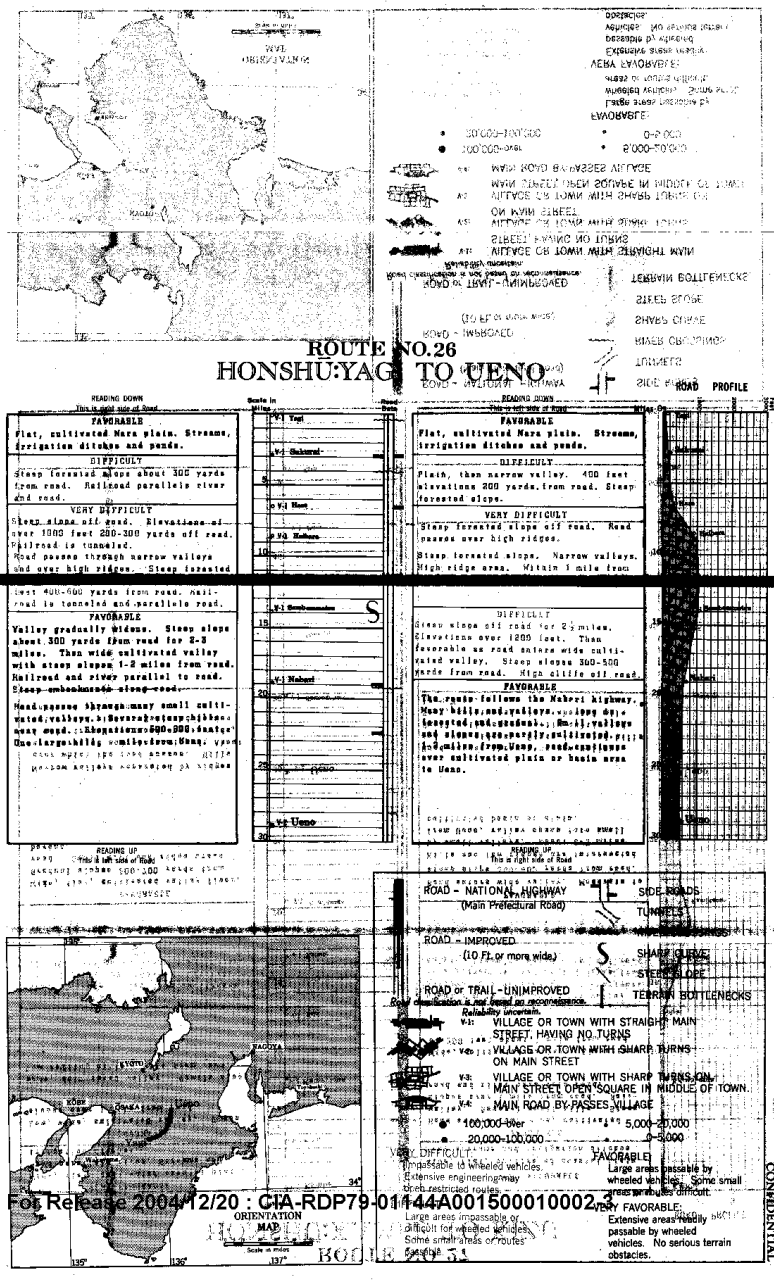
VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

FIGURE II-87
JANIS 84
CONFIDENTIAL



ROUTE NO. 25
HONSHU: YASU TO UENO

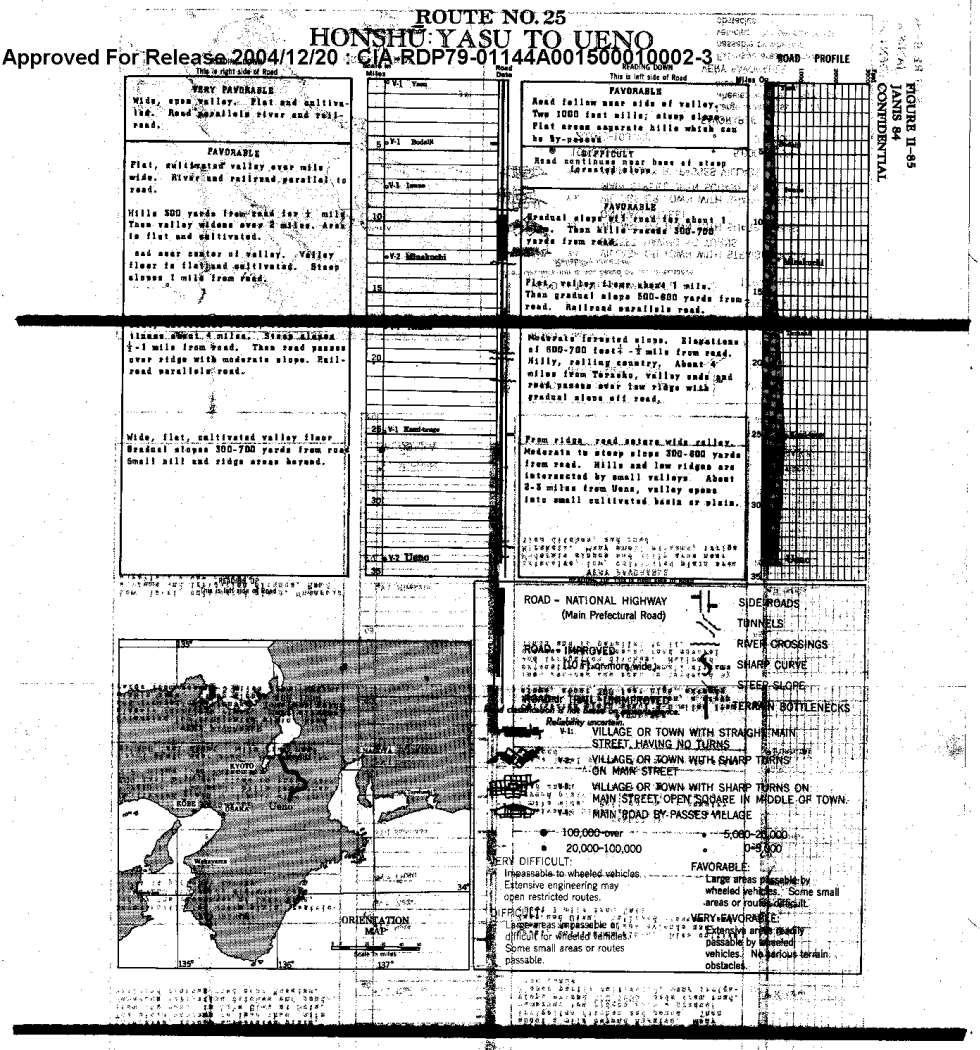


FIGURE II-65
JANIS 64
CONFIDENTIAL

ROUTE NO. 24
HONSHŪ: SEKIGAHARA TO ŌSAKA

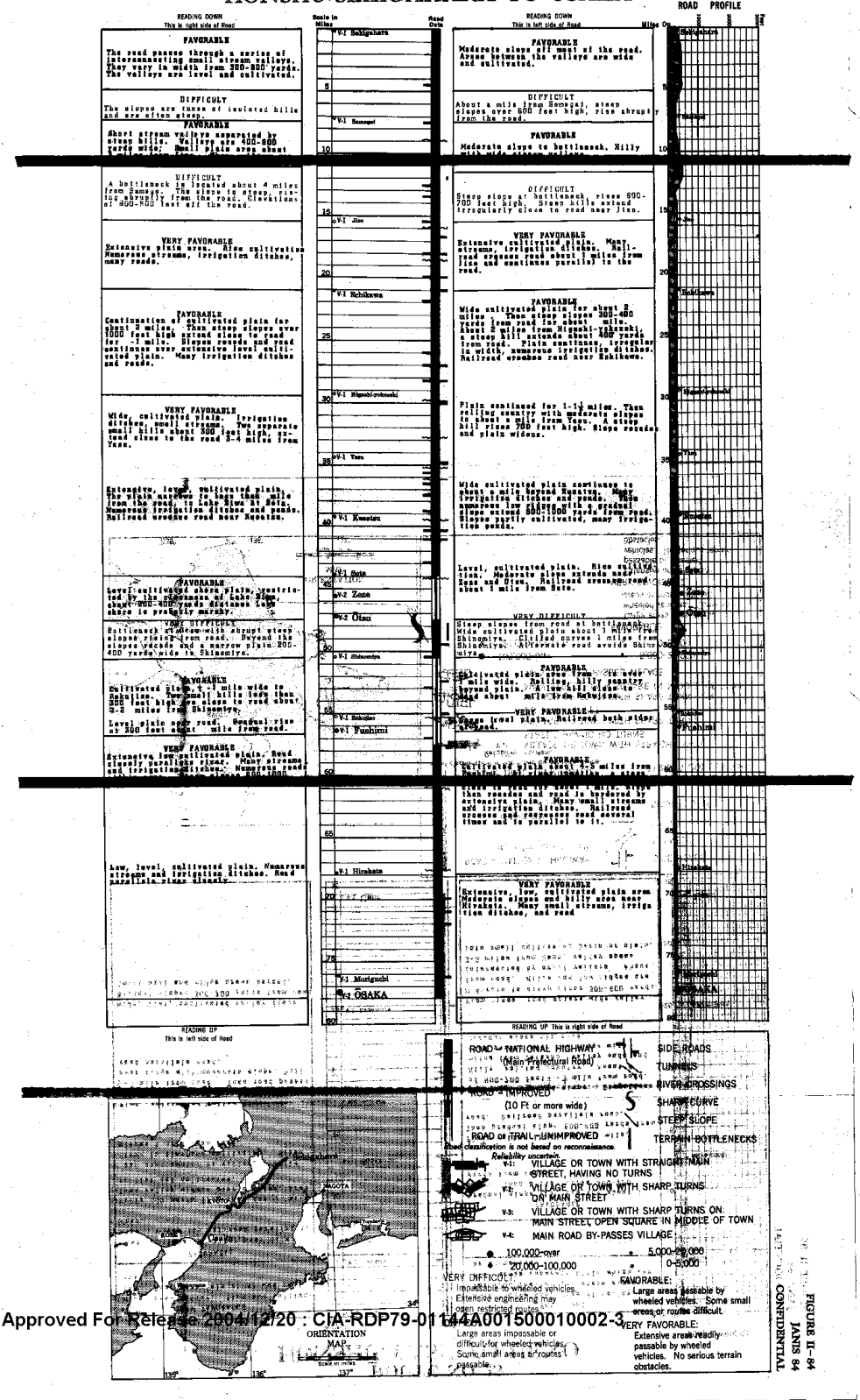


FIGURE II-64
JANIS 64
CONFIDENTIAL

FIGURE II-83
JANIS 84
CONFIDENTIAL

ROUTE NO. 23
HONSHU: TSURUGA TO NAGOYA

READING DOWN — This is right side of Road

FAVORABLE
Low, level, widely cultivated plain area. River 500-700 yards away. Parallels road.

VERY DIFFICULT
Plain abruptly ends. Steep forested slopes, narrow entrance to valley which road follows. Valley only 200-300 yards wide at bottleneck. Rice cultivation in valley. Slopes are forested.

FAVORABLE
Valley widens 700-800 yards. Steep off valley slopes. Rice cultivation

VERY DIFFICULT
Road closely parallels shore of Lake Biwa. The road leaves the shore and continues over a steep slope 600-700 feet high.

FAVORABLE
About 2 miles from Kinomoto, slope descends into a cultivated plain.

A low, wide, level, plain. Almost completely cultivated. About 4-5 miles from Sano, a steep sloped elevation of 600-700 feet is 300-400 yards from the road. Many small streams and irrigation ditches. The road passes through many small towns and villages.

A steep slope extends to the road near Sano. Then a triangular plain borders the road to the bottleneck. The plain is low, level and cultivated [illegible] the plain.

VERY DIFFICULT
The road follows a deep valley bordered by steep forested slopes.

FAVORABLE
Moderate slopes. Valley widens. [illegible]

Steep slopes, 500-700 yards from road. Rice cultivation.

Large, open, low cultivated plain. Many small streams and irrigation ditches.

VERY FAVORABLE
[illegible]

Extensive cultivated plain area. Numerous streams and irrigation ditches. Many roads in area.

READING DOWN — This is left side of Road

FAVORABLE
City is bordered by a hill about 500 feet high. Area parallel to road is low, level and widely cultivated.

VERY DIFFICULT
Abrupt steep slopes, 700-900 feet high. Valley is narrow 300-400 yards. Railroad crosses and recrosses road 5 times. Elevations over 1000 feet 700-900 yards from road.

FAVORABLE
Many short stream valleys. Steep slopes. Elevations 800-900 feet.

VERY DIFFICULT
Steep forested slope rises abruptly from road. Continues to about 1 miles from Kinomoto where slopes

FAVORABLE
A low, level, cultivated plain 800 yards to 1 mile wide. Numerous streams, irrigation ditches.

DIFFICULT
Steep, forested slopes, - 700-1000 feet high extend close to the road 3-7 miles from Sano.

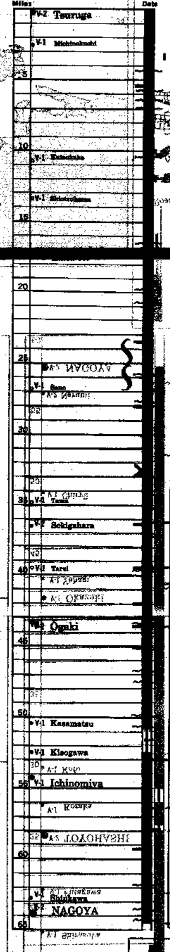
FAVORABLE
A plain bordered by steep slopes about a mile from the road.

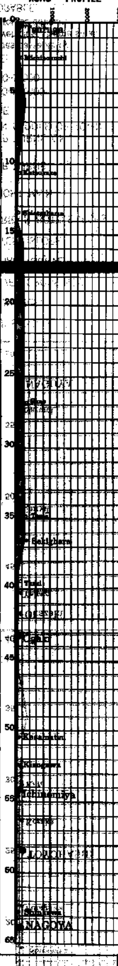
DIFFICULT
[illegible] slopes which then continue to Tawa.

FAVORABLE
Moderate slope, hilly, 600 feet elevations 300-600 yards from road. Rice cultivation.
Valley wide and open. Rice cultivation. Railroad parallels road, crosses it about [illegible] mile from Tarui.
Large cultivated plain. Low and level. Many streams and irrigation ditches.

VERY FAVORABLE
Cultivated plain area. Low and level. Many streams and irrigation ditches. Numerous towns and villages.

Cultivated plain area. Many streams and irrigation ditches. Railroad crosses and recrosses road 6 times.





READING UP — This is left side of Road

READING UP — This is right side of Road

(Main Prefectural Road)

ROAD – IMPROVED (10 Ft. or more wide.)

ROAD or TRAIL – UNIMPROVED

Road classification is not based on reconnaissance. Reliability uncertain.

TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

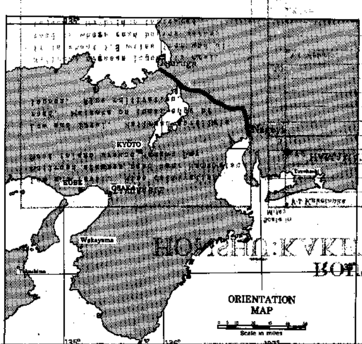
● 100,000–over
● 20,000–100,000
• 5,000–20,000
• 0–5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.



ROUTE NO. 22
HONSHŪ: KAKETSUKA TO NAGOYA

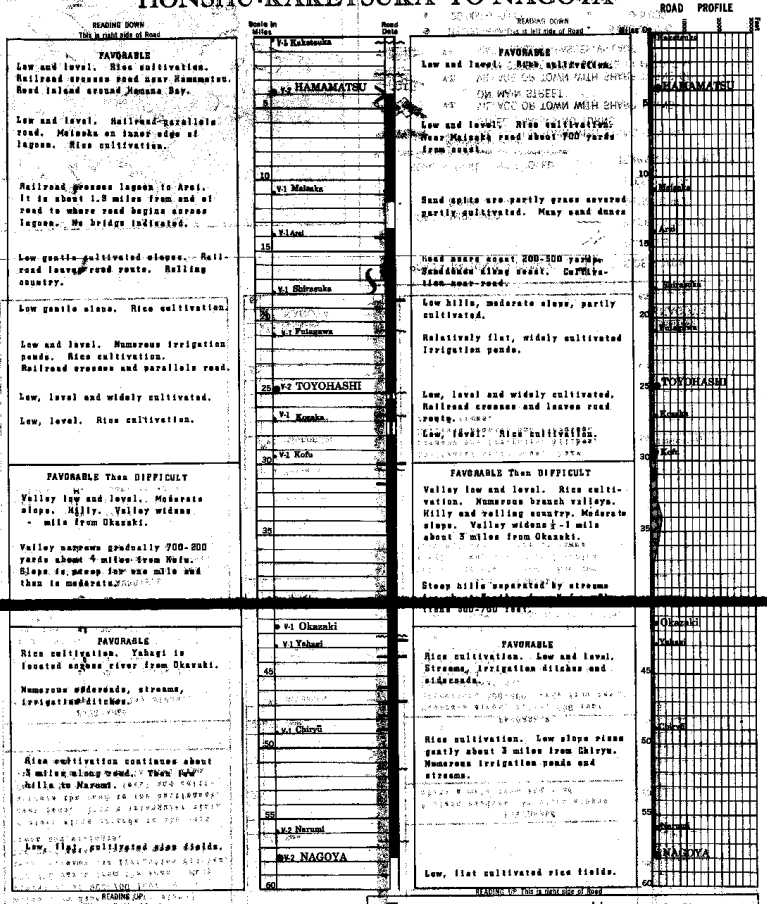


FIGURE II-82
JANIS 84
CONFIDENTIAL

FIGURE II-81
JANIS 84
CONFIDENTIAL

ROUTE NO. 21
SHIKOKU: KOMATSU TO GUNCHŪ VIA IMABARI

Left side of road

FAVORABLE
Extensive rice areas about 1800 yards to the sea.
About 800 yards of rice to the sea.
About 1500 yards of rice to the sea.

DIFFICULT
Low, steep hills 800 yards to the sea. Small rice areas.
Railroad tunnel 600 yards long.

FAVORABLE
600 to 2000 yards of rice.
Ditches, canals, ponds.
Railroad parallel 1500 yards away.
Numerous buildings.

Alternate rice areas 1000 yards long and low hills.

VERY DIFFICULT OR IMPOSSIBLE
Road 10 to 400 yards from coast.

FAVORABLE

FAVORABLE

DIFFICULT
No rice. Steep, 600 foot hills.

FAVORABLE Then IMPOSSIBLE
Road 10 to 300 yards from coast.
Many streams and ditches at right angles to road.

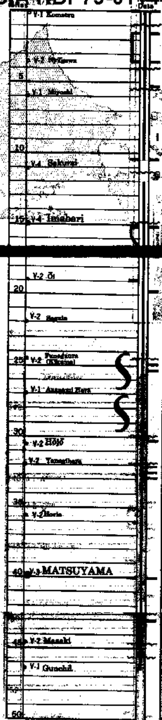
FAVORABLE
About 1800 yards of rice.
Ditches, canals, ponds.

DIFFICULT
City streets.

FAVORABLE
Extensive rice areas. Ditches and canals have rectangular pattern.

FAVORABLE Then IMPOSSIBLE
Crops 300 to 800 yards to beach.

READING UP
This is left side of Road.



Right side of road

FAVORABLE
Extensive rice areas.
Ditches, canals.

DIFFICULT
Low steep hills 500 to 1000 feet high.

FAVORABLE
Extensive rice areas dominated by 1000 foot hills.

Small rice areas dominated by 300 to 400 foot hills.

FAVORABLE

DIFFICULT
Small rice areas dominated by 320 to 400 foot hills.
Railroad close and parallel.

FAVORABLE

FAVORABLE

FAVORABLE

DIFFICULT
No rice. Steep, 600 to 700 foot hills.

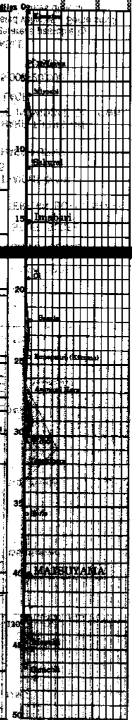
FAVORABLE
Rice. Ditches, ponds.

FAVORABLE Then DIFFICULT
Rice, backed by steep 400 to 500 feet hills.

DIFFICULT
City streets.

FAVORABLE
Extensive rice areas.
Ditches and canals have rectangular pattern.
Area commanded by 100 feet hills.

READING UP
This is right side of Road



ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

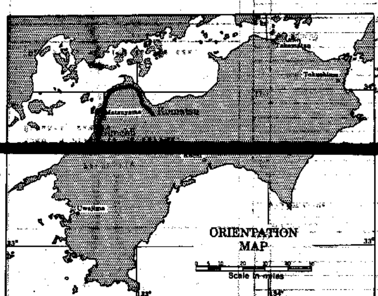
● 100,000–over
● 20,000–100,000
• 5,000–20,000
• 0–5,000

VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.



ORIENTATION MAP
Scale in miles

ROUTE NO. 20 Section 2
SHIKOKU:TOKUSHIMA TO YAWATAHAMA

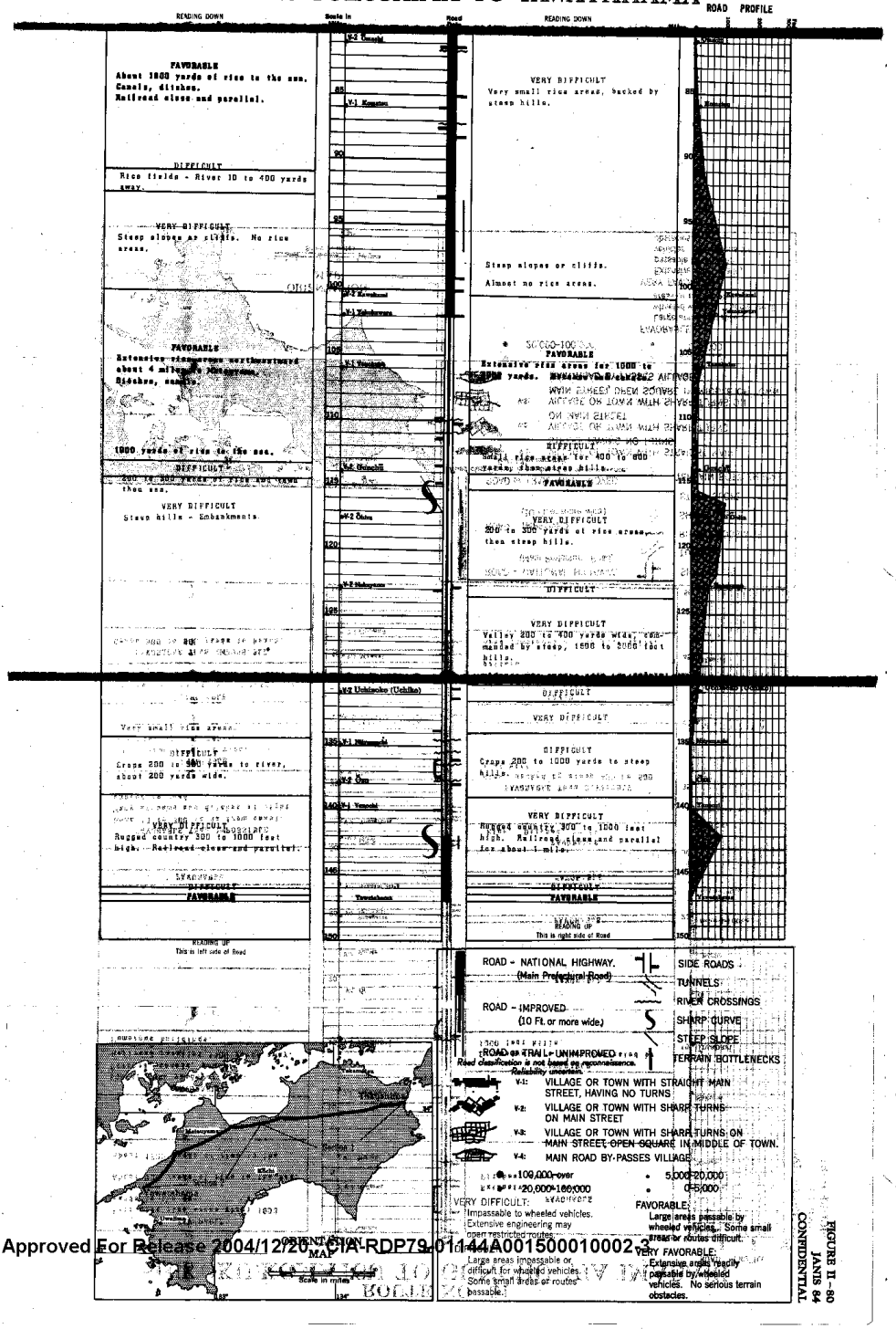
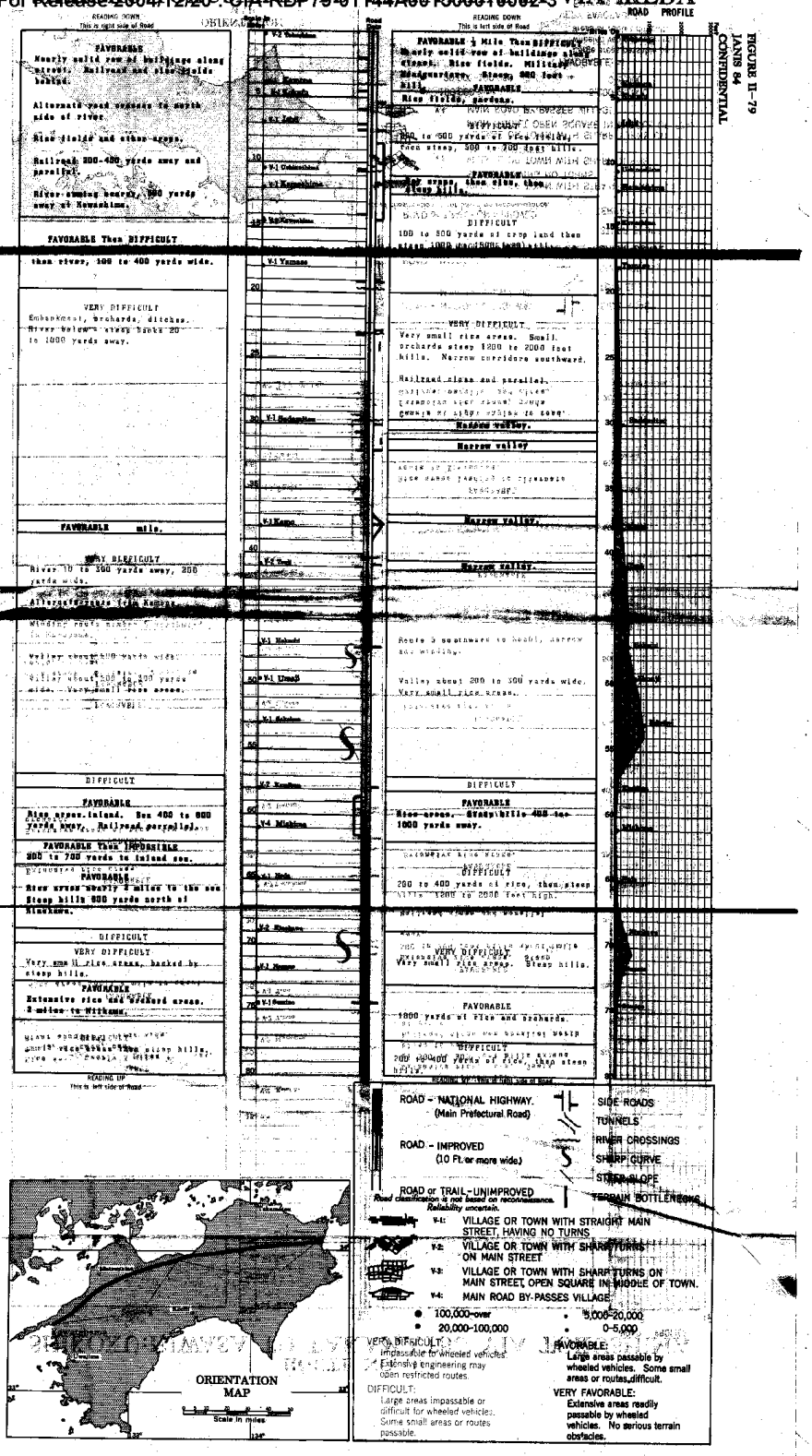


FIGURE II - 80
JANIS 64
CONFIDENTIAL

SHIKOKU: TOKUSHIMA TO YAWATAHAMA VIA IKEDA

FIGURE II-79
JANIS 84



ROUTE NO. 19
SHIKOKU: HIWASA TO TAKAMATSU VIA TOKUSHIMA

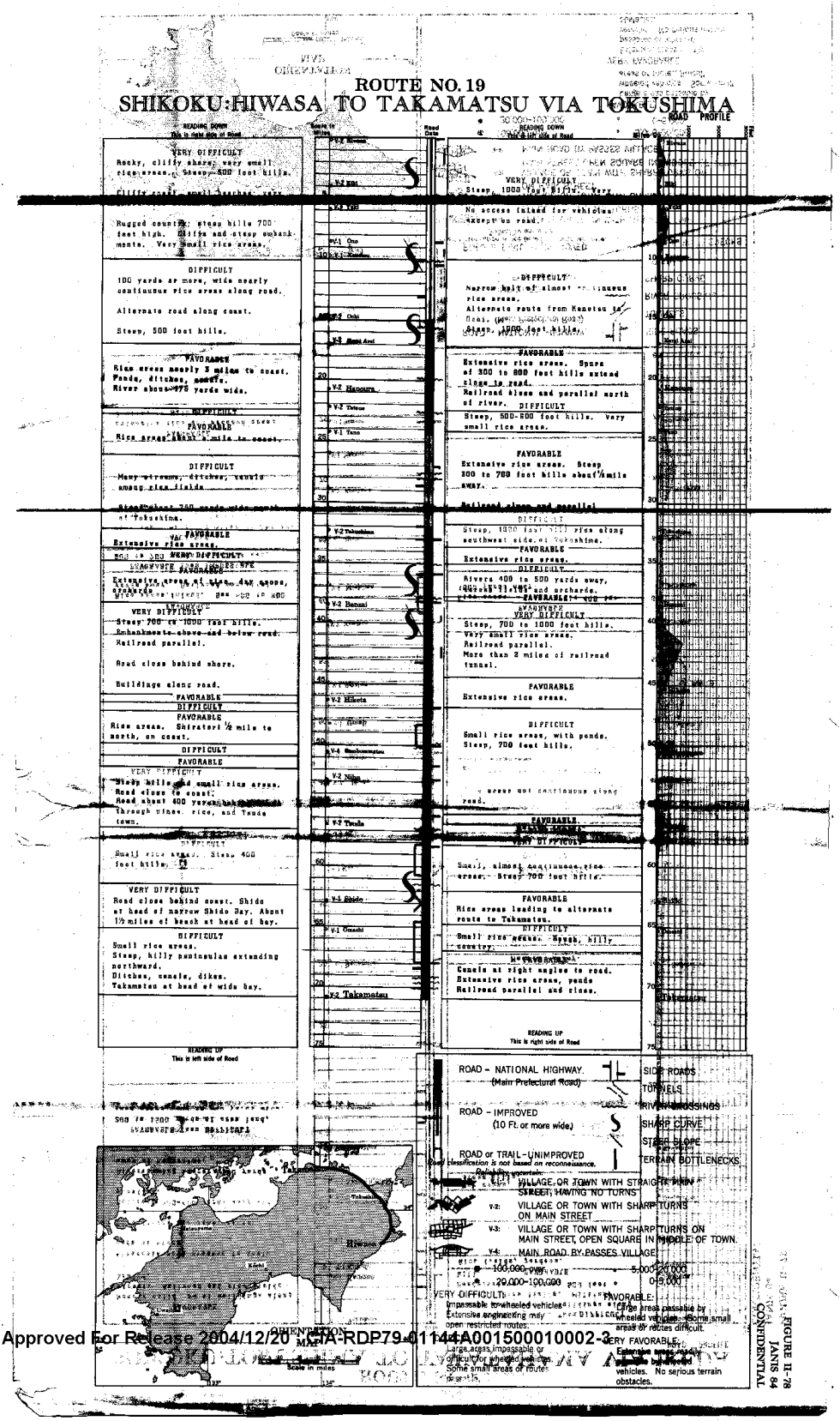


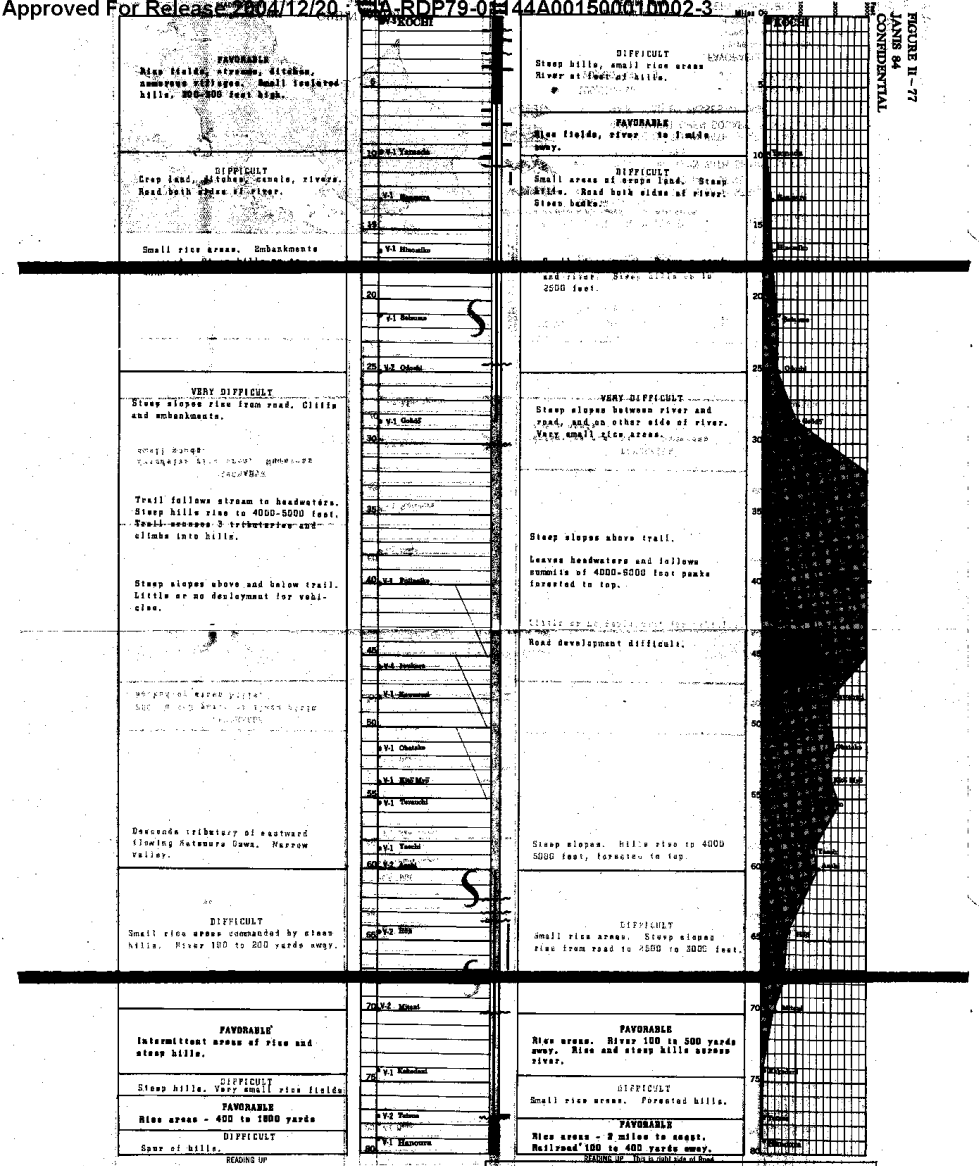
FIGURE II-78
JANIS 64
CONFIDENTIAL

ROUTE NO. 18
SHIKOKU-KOCHI TO TATSUE

ROAD PROFILE

CONFIDENTIAL
JANES 64

FIGURE II-77



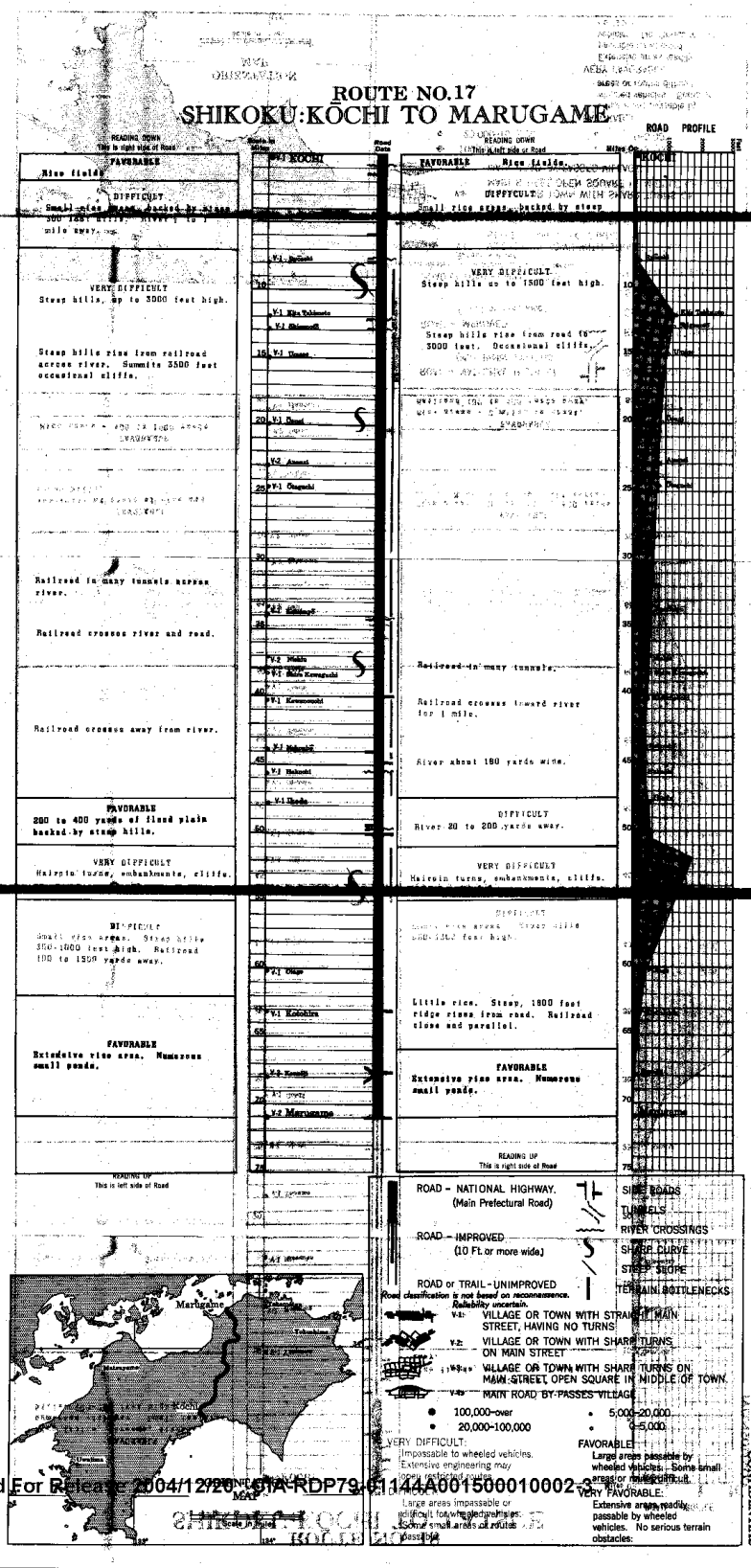
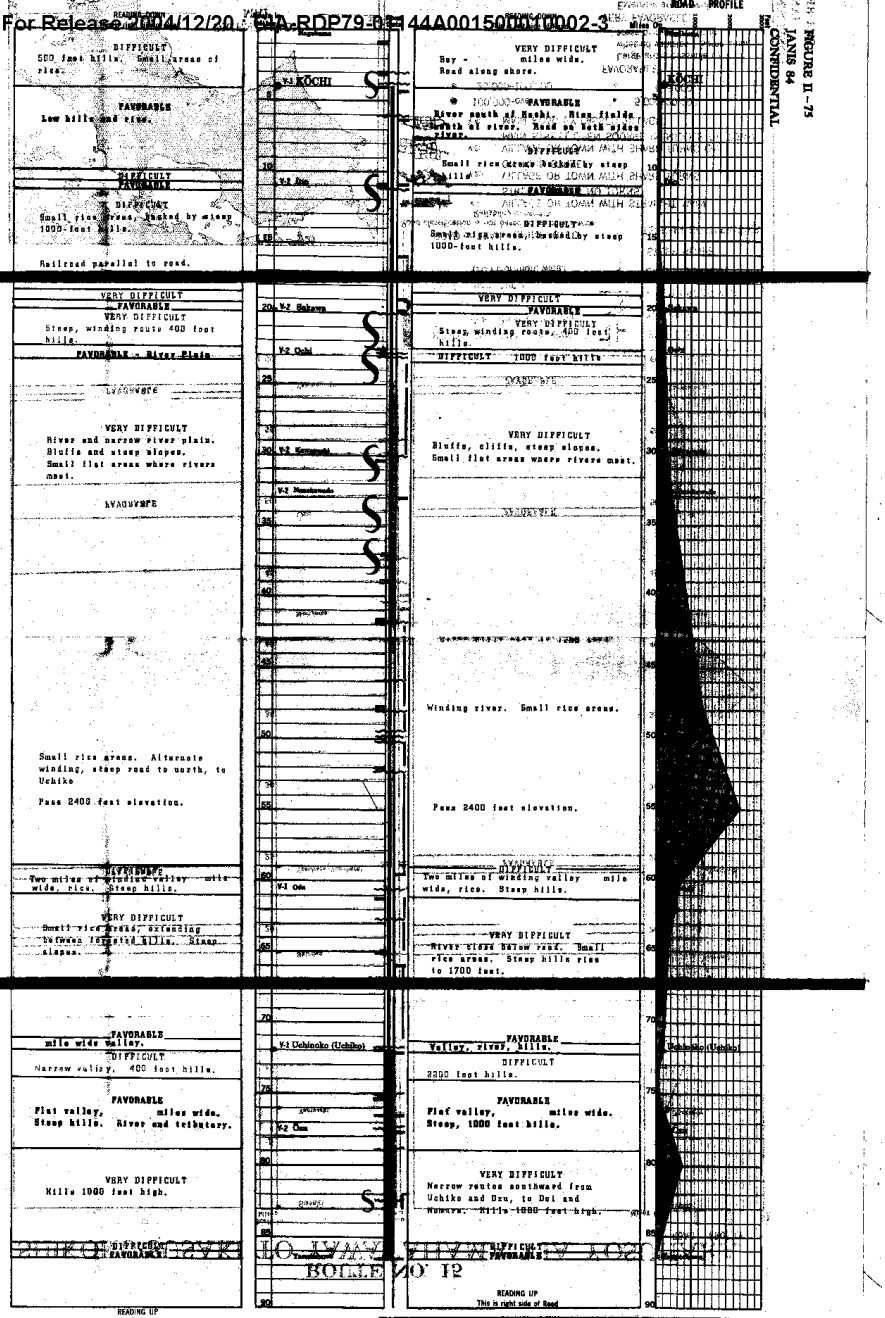
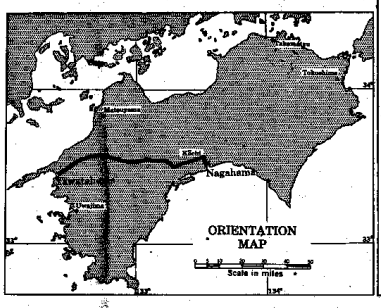


FIGURE II-76
JANIS 84
CONFIDENTIAL

ROUTE NO. 16
SHIKOKU-NAGAHAMA TO YAWATAHAMA

ROAD PROFILE





ROAD - NATIONAL HIGHWAY. (Main Prefectural Road)

ROAD - IMPROVED (10 Ft. or more wide.)

ROAD or TRAIL - UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
● 20,000-100,000
• 5,000-20,000
• 0-5,000

SIDE ROADS

TUNNELS

RIVER CROSSINGS

S SHARP CURVE

STEEP SLOPE

TERRAIN BOTTLENECKS

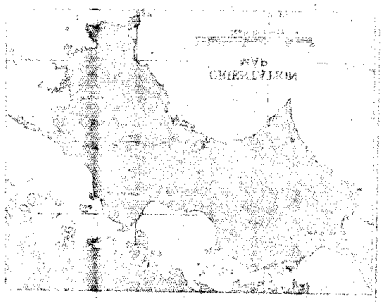
VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

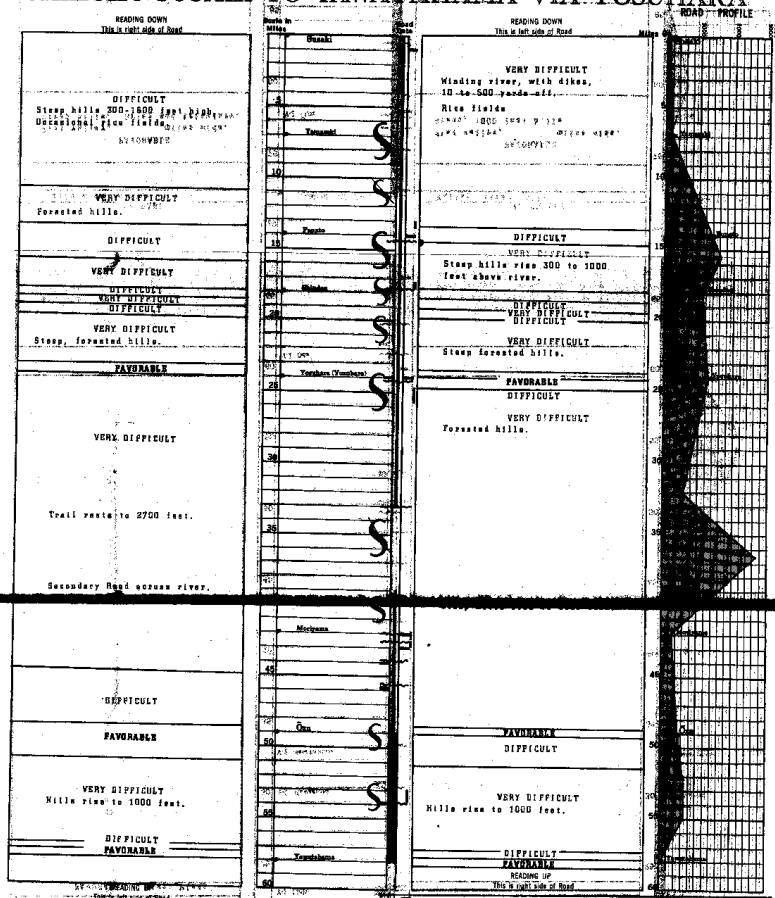
FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

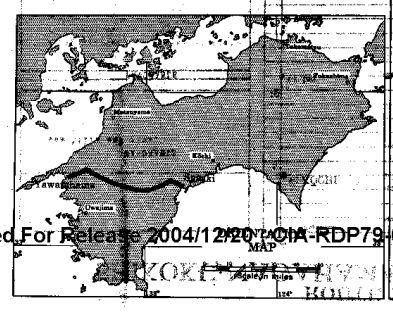
VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

JANIS 64
CONFIDENTIAL
FIGURE II - 75



ROUTE NO. 15
SHIKOKU: SUSAKI TO YAWATAHAMA VIA YOSUHARA





ROAD – NATIONAL HIGHWAY, (Main Prefectural Road)

ROAD – IMPROVED (10 Ft. or more wide)

ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE

- 100,000–over
- 20,000–100,000
- 5,000–20,000
- 0–5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may

DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

SIDE ROADS

TUNNELS

RIVER CROSSINGS

SHARP CURVE

STEEP SLOPE

TERRAIN BOTTLENECKS

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

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JANIS 84

FIGURE II-74

ROUTE NO. 13
SHIKOKU: SHIMODA TO MISHŌ VIA SUKOMO

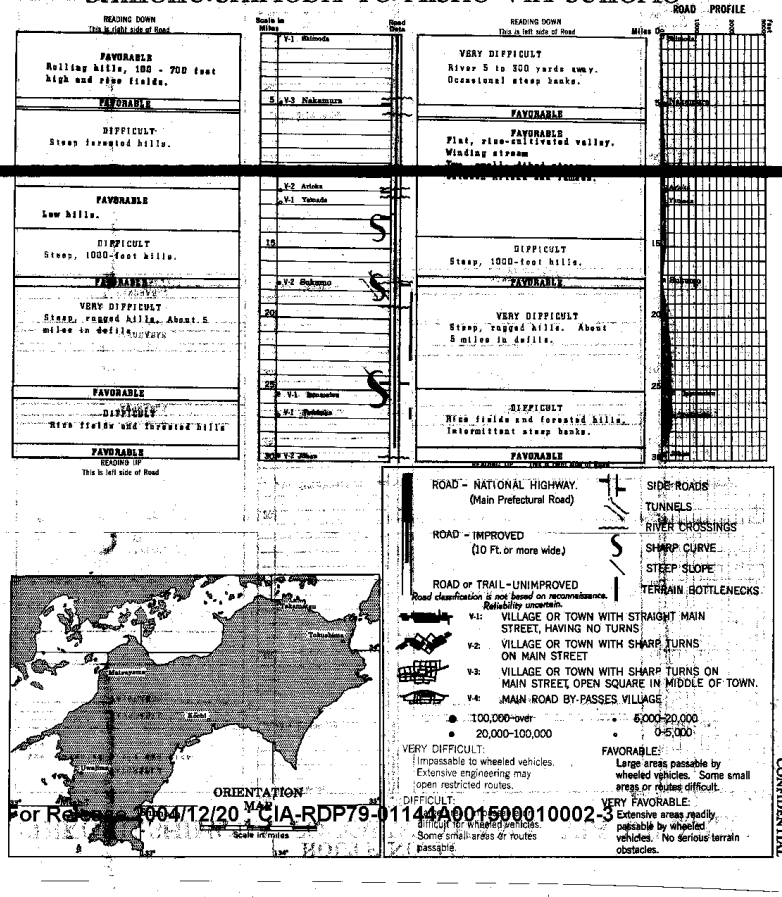
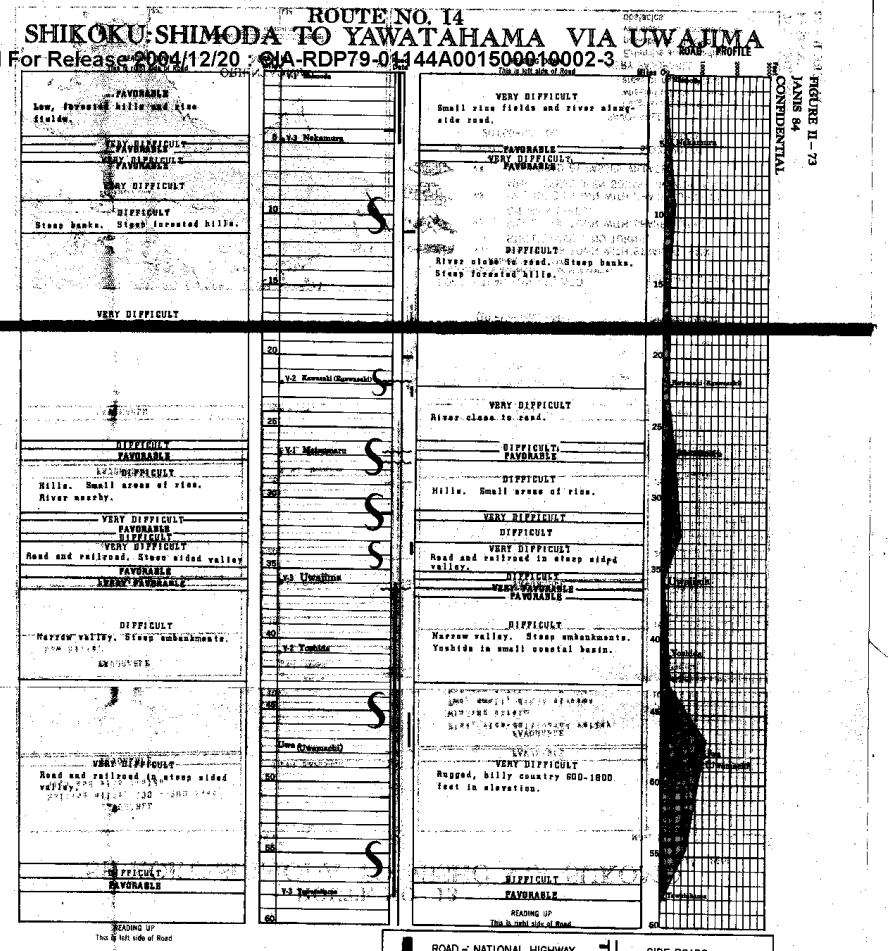


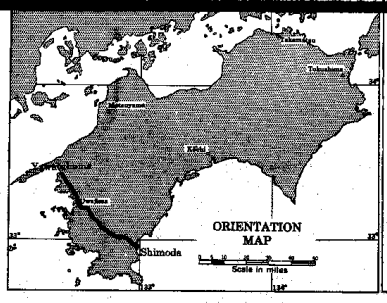
FIGURE II - 72
JANS 64
CONFIDENTIAL

ROUTE NO. 14
SHIKOKU: SHIMODA TO YAWATAHAMA VIA UWAJIMA

JANIS 64

FIGURE II-73





ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)

ROAD – IMPROVED (10 Ft. or more wide)

ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS

TUNNELS

RIVER CROSSINGS

S SHARP CURVE

TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
● 20,000-100,000
• 5,000-20,000
• 0-5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

ROUTE NO. 12

KYUSHU: KOKUBU TO MINAMATA

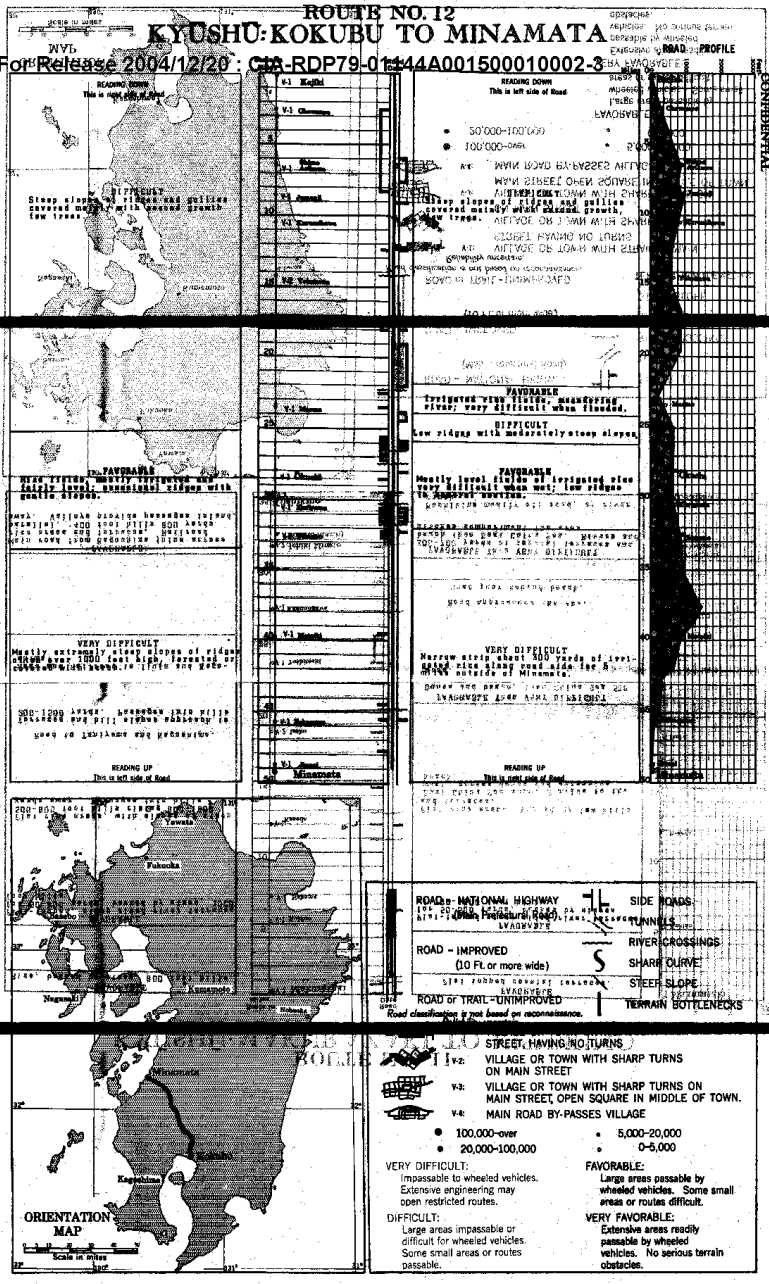


FIGURE II-71

JANIS 64

CONFIDENTIAL

ROUTE NO. 11
KYUSHU: MAKURAZAKI TO KISHIKINO

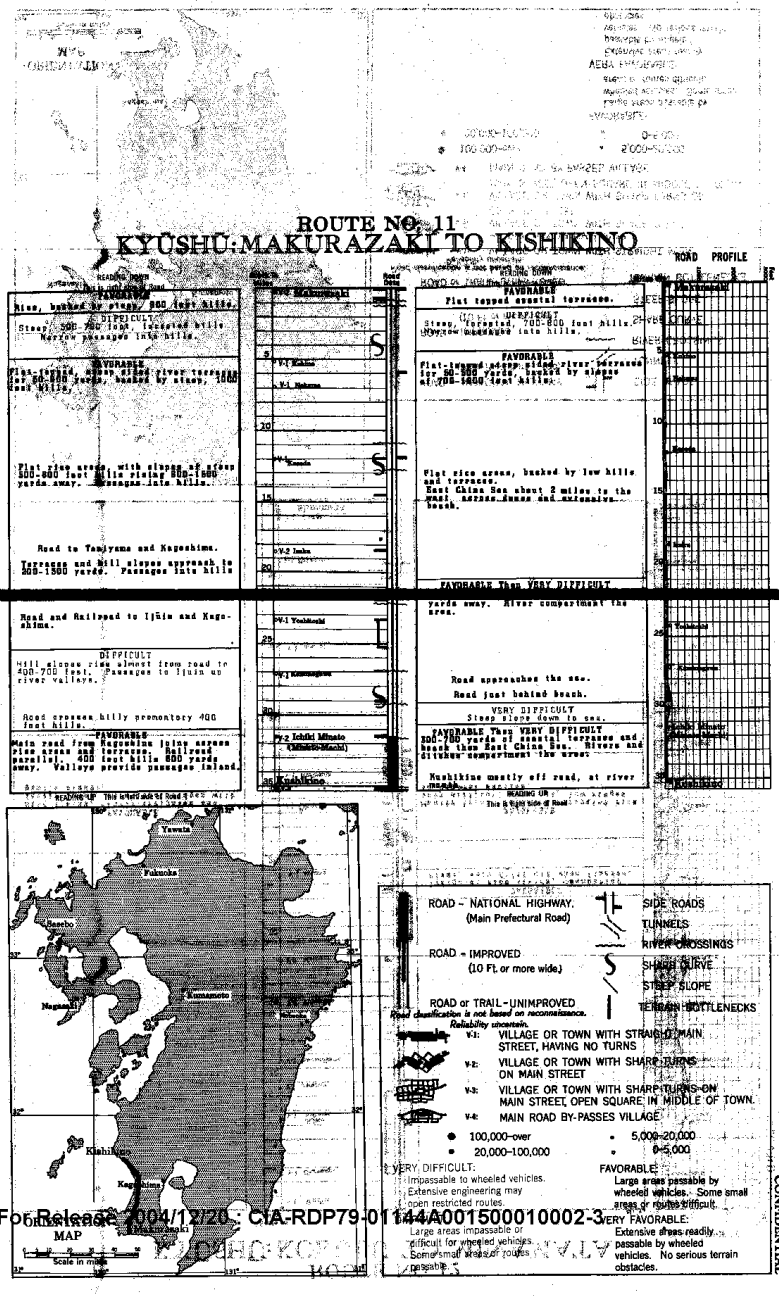


FIGURE II - 70
JANIS 64
CONFIDENTIAL

ROUTE NO. 10 A
KYŪSHŪ: KUMAMOTO TO SAGA

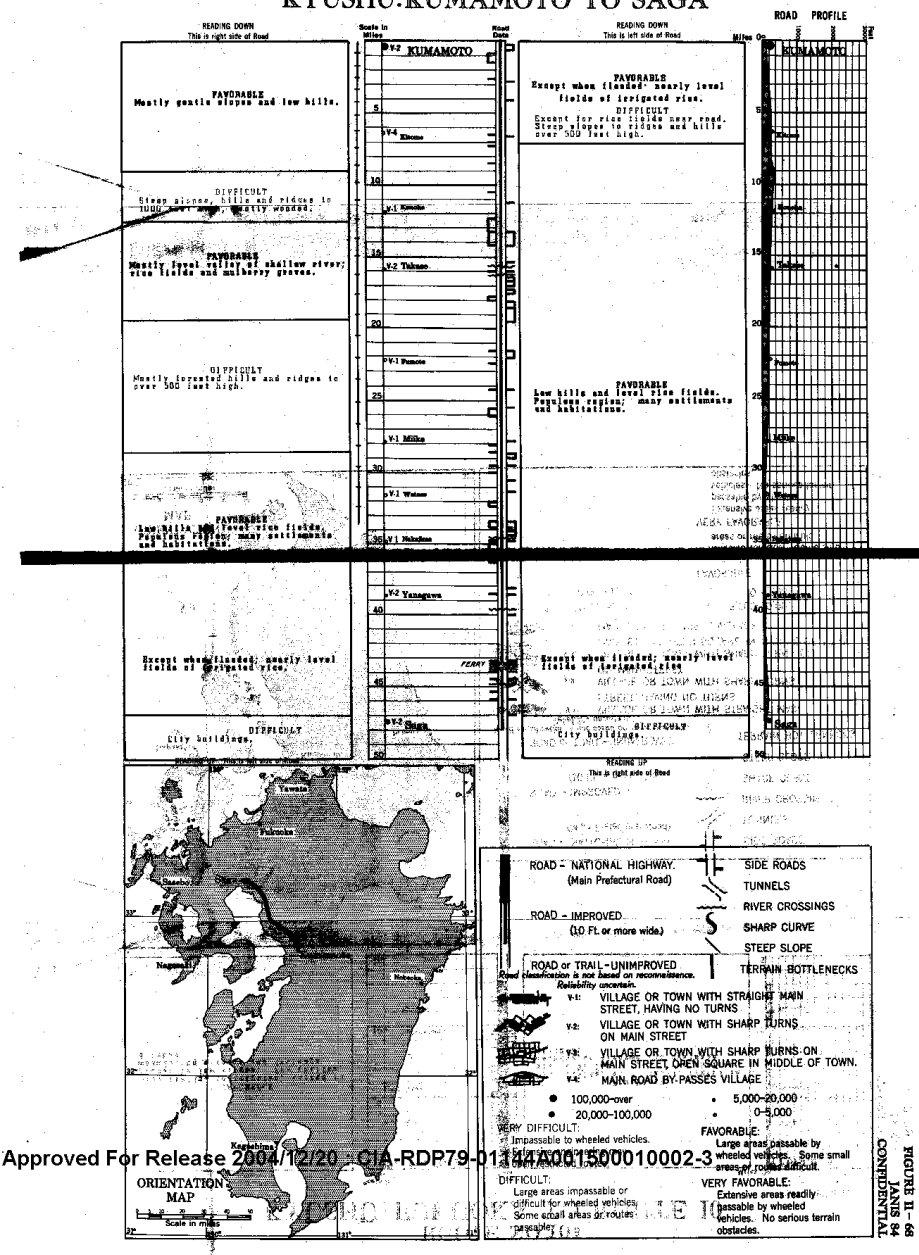
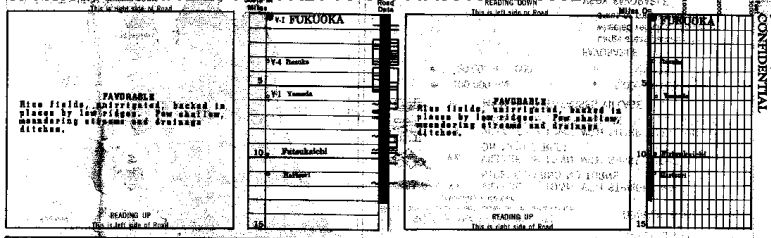
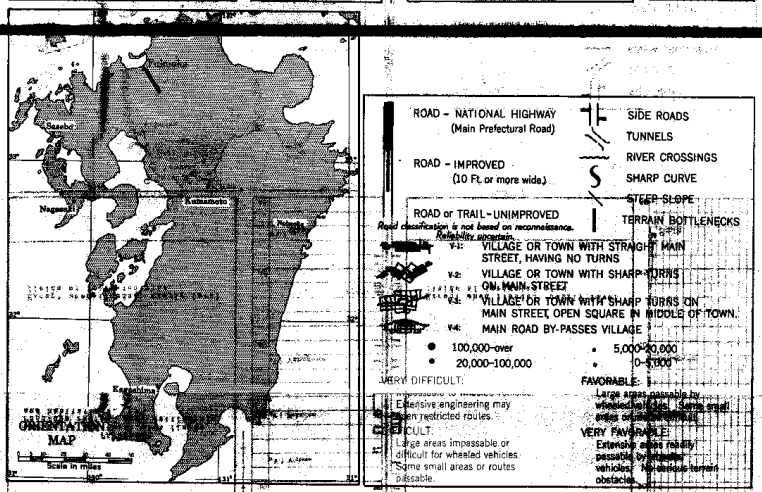


FIGURE II-68
JANS 64
CONFIDENTIAL

ROUTE NO. 10

KYŪSHŪ: FUKUOKA TO ROUTE 10





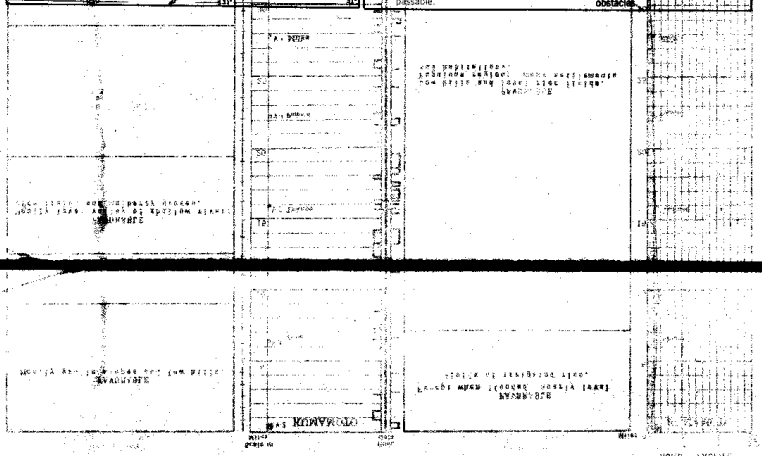


FIGURE II-69
JANIS 84

ROUTE NO. 10 Section 2
KYŪSHŪ: KAGOSHIMA TO MOJI

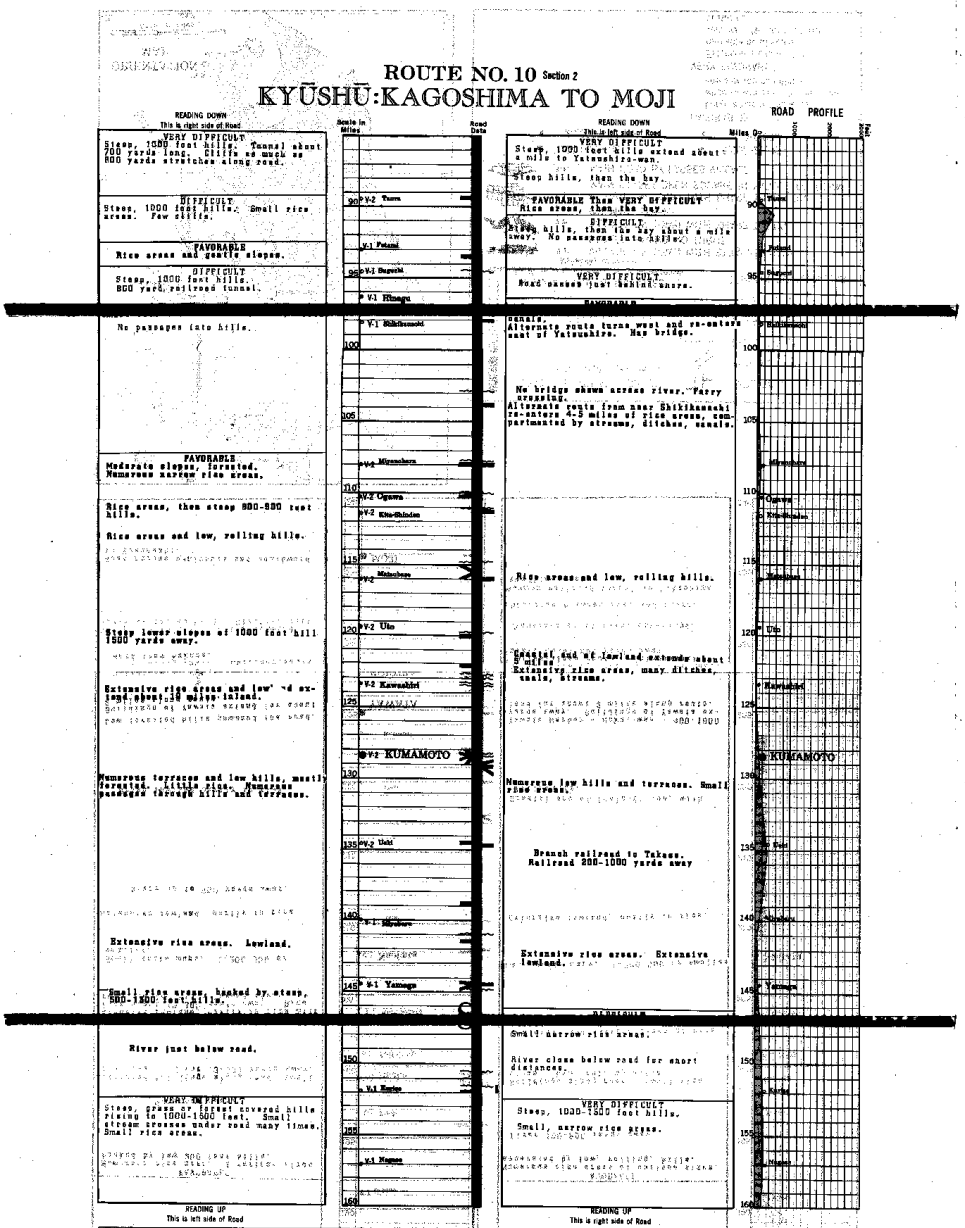
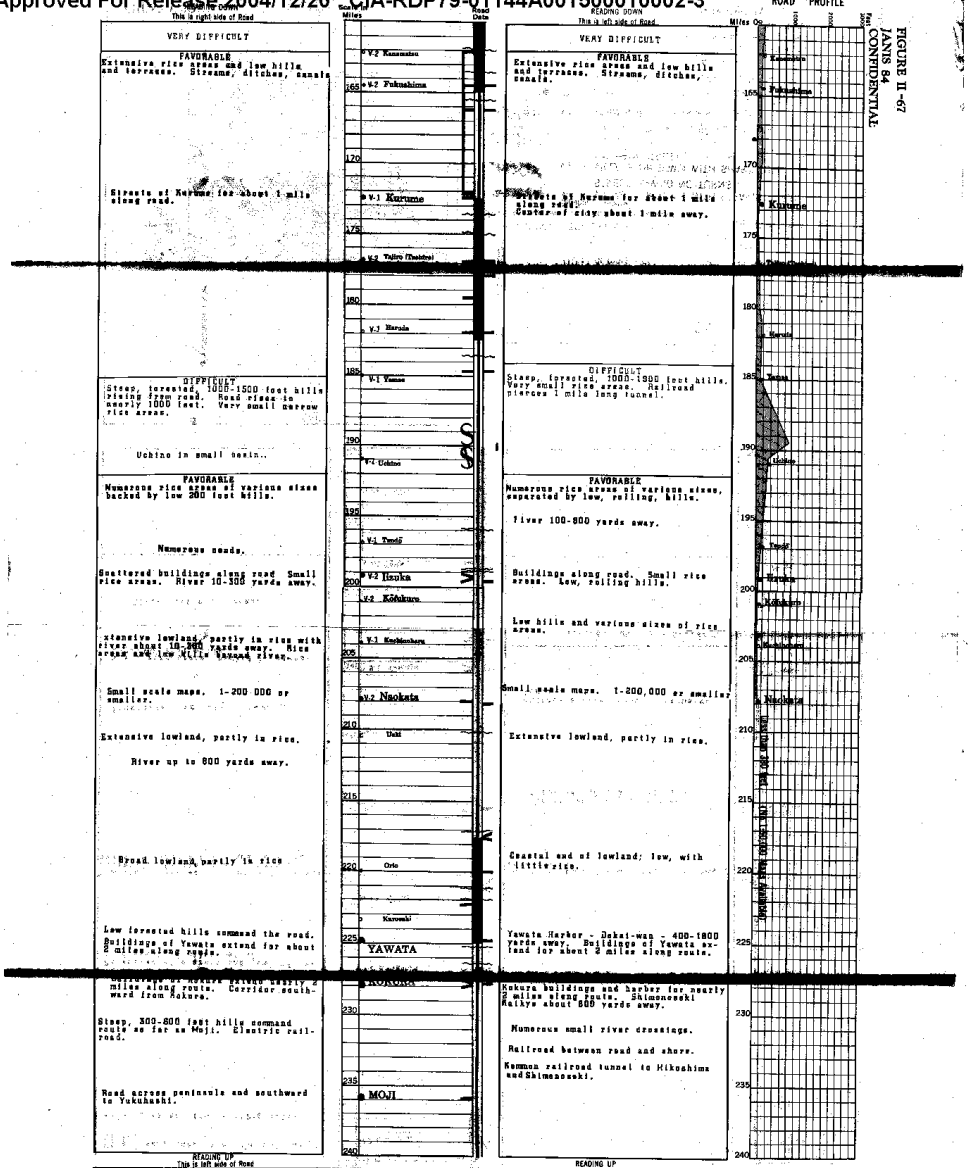


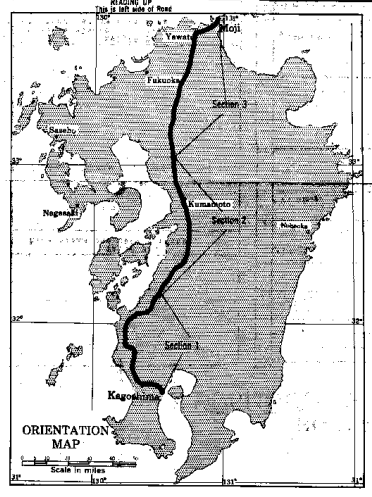
FIGURE II - 66
JANIS 84
CONFIDENTIAL

ROUTE NO. 10 Section 3

KYŪSHŪ: KAGOSHIMA TO MOJI

FIGURE II-67





ROAD - NATIONAL HIGHWAY (Main Prefectural Road)

ROAD - IMPROVED (10 Ft or more wide)

ROAD or TRAIL - UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over ● 20,000-100,000 ● 5,000-20,000 ● 0-5,000

SIDE ROADS

TUNNELS

RIVER CROSSINGS

SHARP CURVE

STEEP SLOPE

TERRAIN BOTTLENECKS

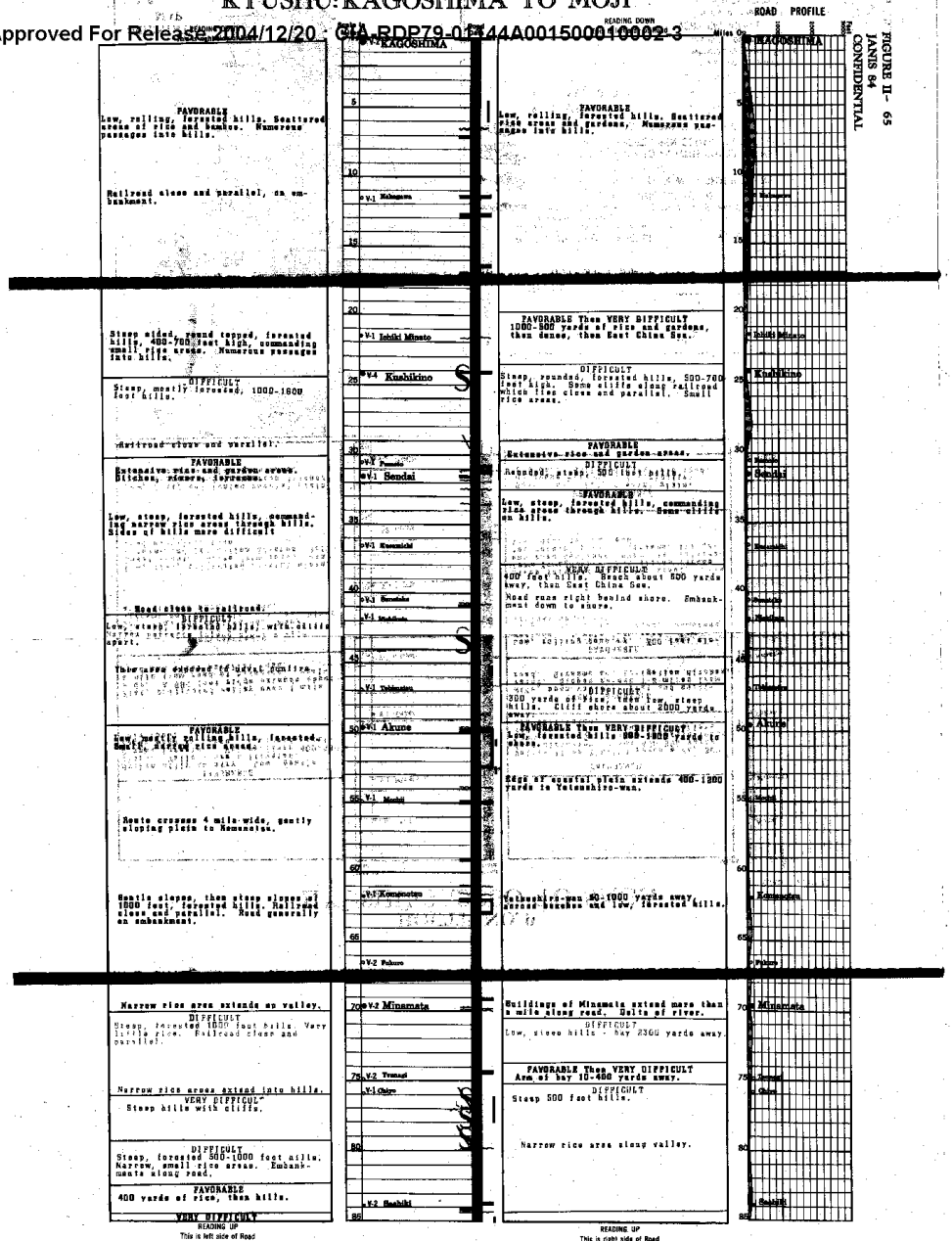
VERY DIFFICULT:
Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

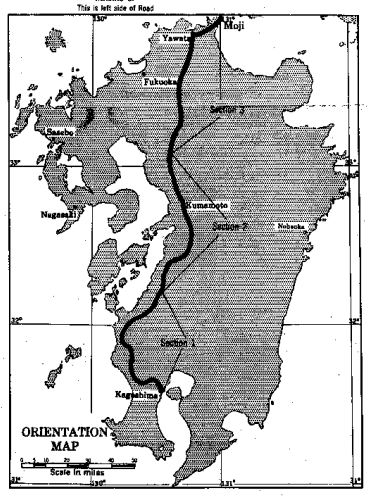
DIFFICULT:
Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE:
Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE:
Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

ROUTE NO. 10 Section 1
KYUSHU: KAGOSHIMA TO MOJI





ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)

ROAD – IMPROVED (10 Ft. or more wide.)

ROAD or TRAIL – UNIMPROVED

Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS

TUNNELS

RIVER CROSSINGS

SHARP CURVE

STEEP SLOPE

TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS

V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET

V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.

V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
• 20,000-100,000
• 5,000-20,000
◦ 0-5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

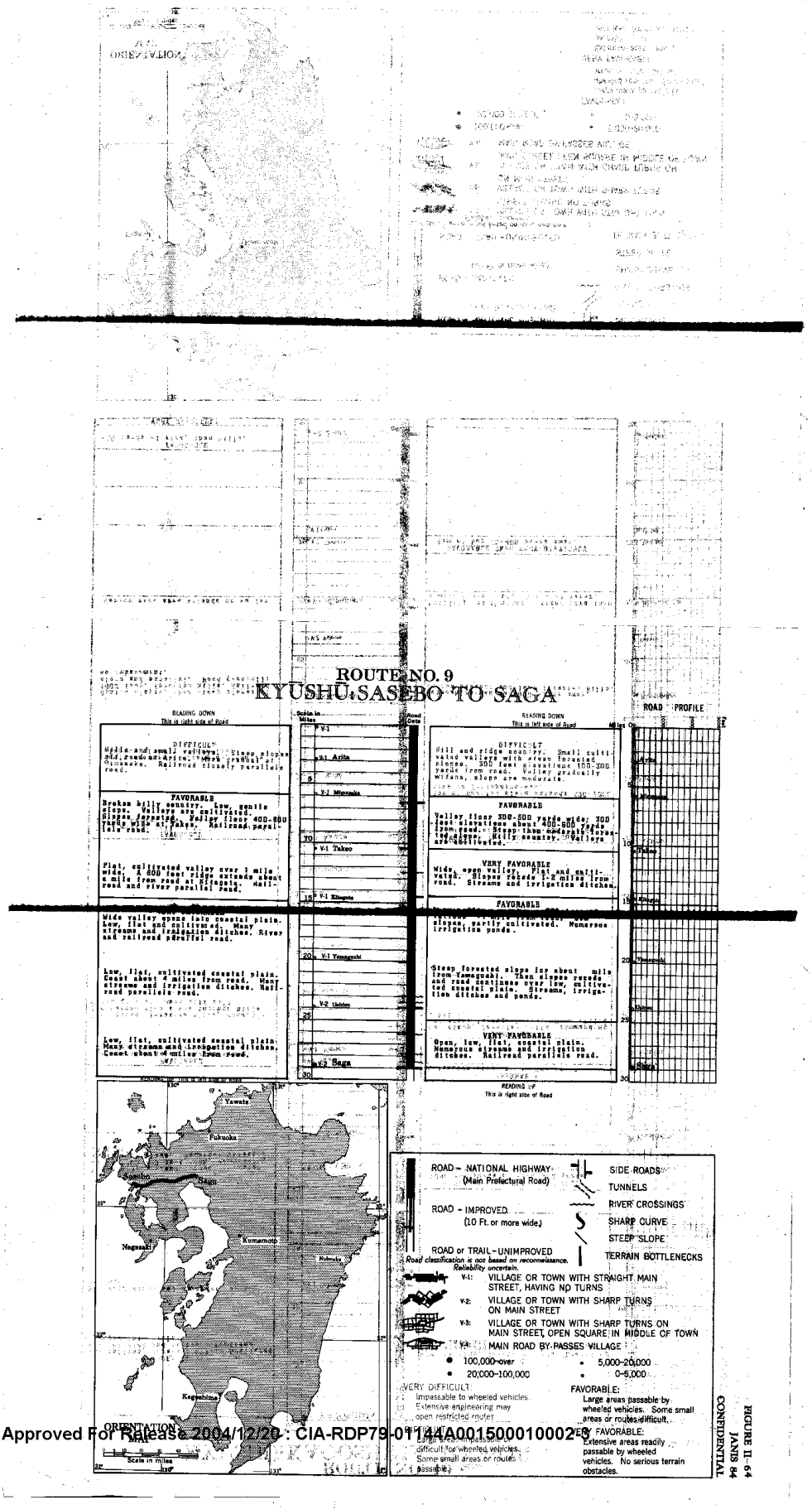


FIGURE II-64
JANIS 84
CONFIDENTIAL

ROUTE NO. 8
KYUSHU-NAGASAKI TO TOSU

ROAD PROFILE

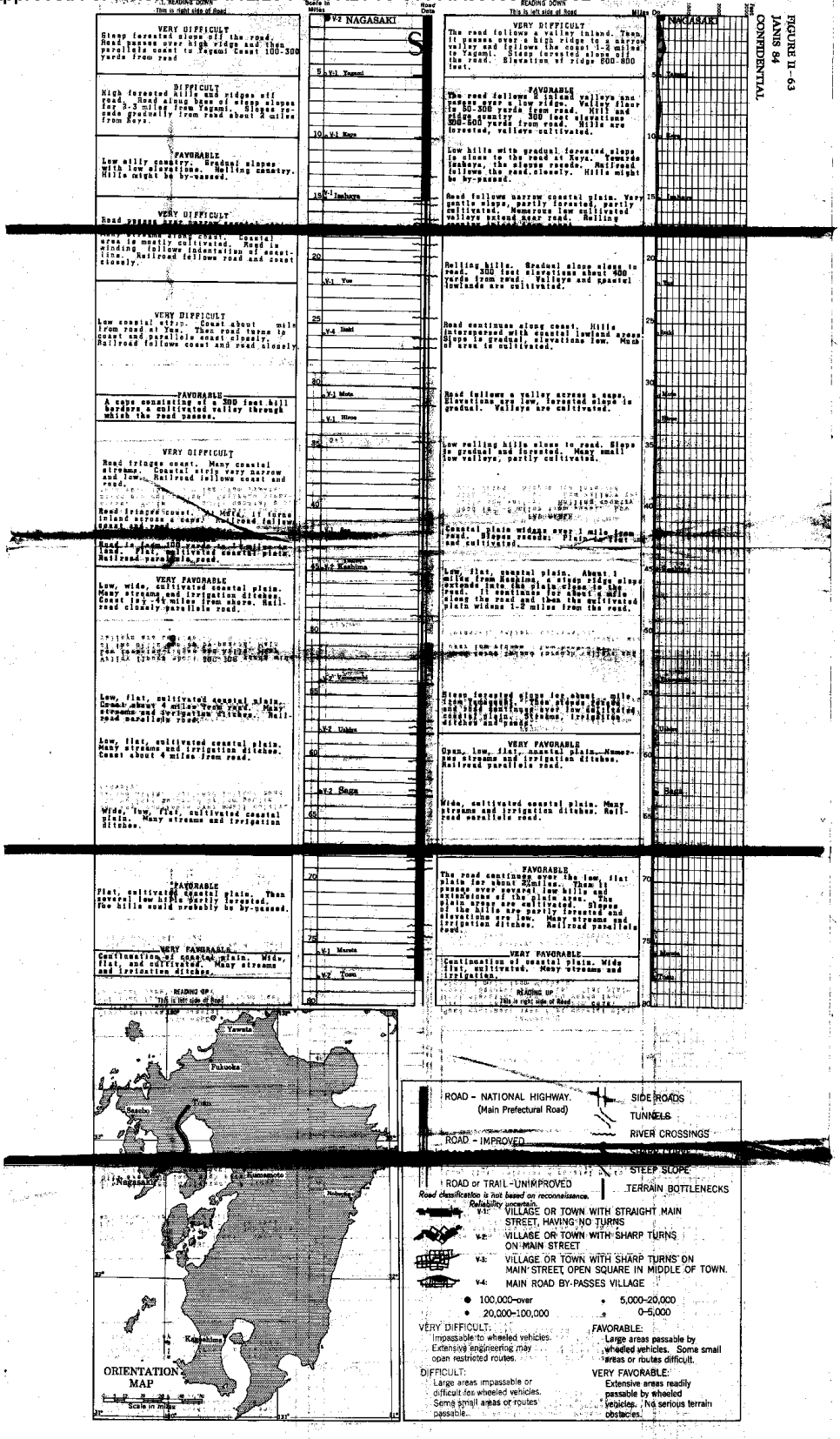


FIGURE II-63
JANIS 64
CONFIDENTIAL

ROUTE NO. 7
KYŪSHŪ: SASEBO TO YAWATA VIA FUKUOKA

READING DOWN — This is right side of Road

FAVORABLE
Road parallels coast from -2 miles inland. Many low hills and valleys with moderate slopes. Valleys are mostly cultivated.

Steep forested slope 400-600 yards from road. Low hills with small valleys. Valley floor is level and cultivated.

Low, gradual slope 200-600 yards from road. Steep forested slope beyond. Valley floor is cultivated. Railroad parallels road.

Low, moderate slope. Small narrow valleys and low ridges. Elevations of 300 feet are 300-700 yards from road. Valleys partly cultivated.

DIFFICULT
Rolling forested country. Moderate to steep slope at bottleneck. Valley gradually widens to over ½ mile at Tokusue. River parallels road.

FAVORABLE
Low cultivated valley floor. Gentle slopes with 300 feet elevations ½ mile from road. Railroad parallels road and river for about 2 miles.

Low, flat and cultivated. A steep hill over 600 feet high extends 200-300 yards from road about 1 mile from Nakahara.

VERY DIFFICULT
The road is backed by steep forested slope, 300 feet elevation 350-400 yards off road. Railroad parallels road.

DIFFICULT
A steep forested hill borders the road about a mile from Fukae. Railroad closely parallels the road.

FAVORABLE
Flat, cultivated coastal plain about 2 miles. Several gradual sloped hills off road for about 5 miles from Maebaru. Railroad parallels road.

VERY FAVORABLE
Low, wide, flat cultivated. Steep slopes over 1 mile from road. Railroad parallels road.

FAVORABLE
Low, flat, wide and cultivated. A 300 feet hill close to the road about a mile from Imajiku. Many streams and irrigation ditches. Railroad parallels road. Buildings along road.

The road continues over small cultivated valleys bordered by low gentle sloped hills. Railroad follows road closely.

Slightly rolling country. Partly forested, partly cultivated. Low elevations. Railroad parallels road.

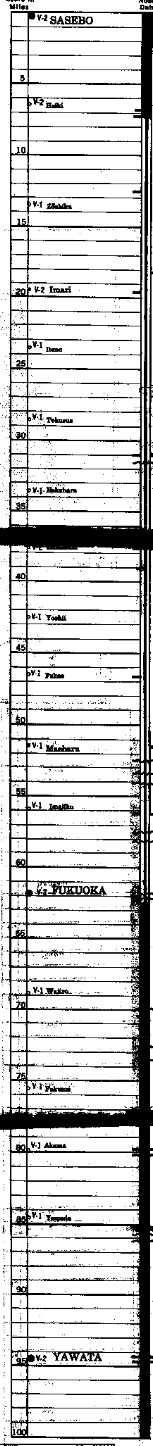
Valley floors about 300-300 yards wide. Low forested ridges and hills.
parallels road

VERY DIFFICULT
Hills and ridge country, with steep forested slopes off road. Railroad parallel to road; is tunneled through ridges. It leaves route about 2 miles from Yamada.

FAVORABLE
Low hills and valleys. Gentle forested slope. Valleys and small coastal plain areas are cultivated. Railroad parallels road about 5 miles from Yawata.

READING UP — This is left side of Road

Scale in Miles / Road Data



READING DOWN — This is left side of Road

FAVORABLE
Low, rolling country. Moderate forested slopes. Road winds through valleys and over low hills. Railroad parallels road closely.

About ½ mile from Haiki, road leaves coast and turns inland through valley. Moderate off road with steep slope beyond valley ridges. Valley floor is level and cultivated. Railroad parallels road.

Valley gradually widens. Moderate to steep slope on high ridges beyond valley ridges. Valley floor is level and cultivated. Railroad parallels road.

Road continues over low ridges and through small valleys of moderate slope. Broken hilly country. Elevations of 300 feet are 300-500 feet from road. Valleys partly cultivated. River parallels road.

DIFFICULT
Low hilly country with moderate forested slopes. About 2½ miles from Tokusue, valley widens 400-600 yards.

FAVORABLE
Wide, low and flat, cultivated valley. Road continues near base of gentle slope. 300 feet elevation 300-400 yards from road. After crossing river slopes recede and wide valley floor is cultivated.

VERY FAVORABLE
Low, flat, cultivated coastal plain area. Shoreline is 200 yards - 1 mile

VERY DIFFICULT
Road parallels coast closely. Shoreline about 50-100 yards from road. Road is low and follows outline of coast.

Road parallels coast. Shoreline 25-200 yards from road. Narrow coastal strip partly cultivated.

FAVORABLE
Road continues over flat coastal plain area 200 yards - 1 mile from coast. 300 feet elevation about 400 yards from road. Several low hills. Flat plain about 1 mile from Maebaru.

VERY FAVORABLE
Low, flat cultivated coastal plain. Many streams, irrigation ditches and ponds.

FAVORABLE
Road parallels coast closely for about ½ mile. Then it continues about a mile inland from the coast. Coastal lowland partly cultivated. Many buildings along road.

VERY DIFFICULT
Road parallels coast closely except for about 2 miles. Here it passes between low forested hills at 300-700 yards from the coast.

FAVORABLE
The road continues about ½ mile from the coast. Slightly rolling with very gradual slope. 200 feet steep slope close to road about ½ mile from Wajiro.

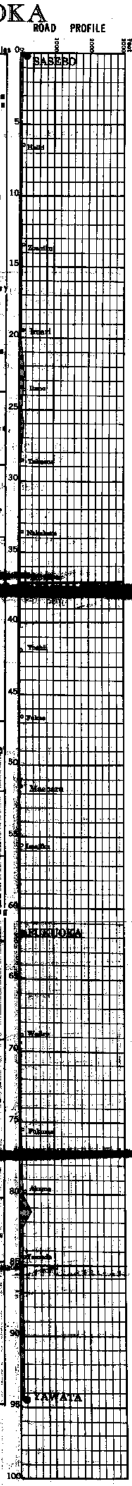
elevations about 300 feet. Slopes are forested, valleys cultivated.

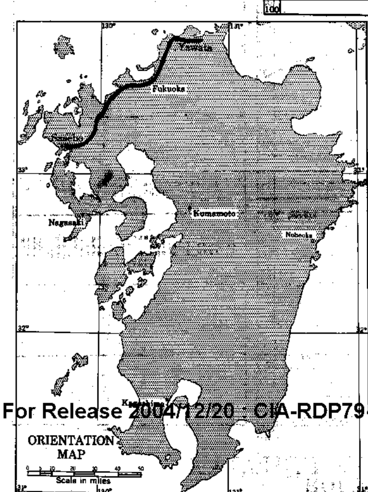
VERY DIFFICULT
Road passes over high ridge about ½ mile from Akama. Then enters narrow valley widening to about 300-500 yards at Yamada. Steep forested slope off road.

FAVORABLE
Road is ½-5 miles from coast. Low hills and valleys. Rolling country with gentle slopes. Low valleys are cultivated. Slopes are forested.

READING UP — This is right side of Road

ROAD PROFILE





ORIENTATION MAP
Scale in miles

ROAD – NATIONAL HIGHWAY. (Main Prefectural Road)
ROAD – IMPROVED (10 Ft. or more wide)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000–over
● 20,000–100,000
• 5,000–20,000
• 0–5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Except some open restricted routes.

DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

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FIGURE II - 62
JANIS 84

ROUTE NO. 6
KYUSHU: OITA TO KURUME

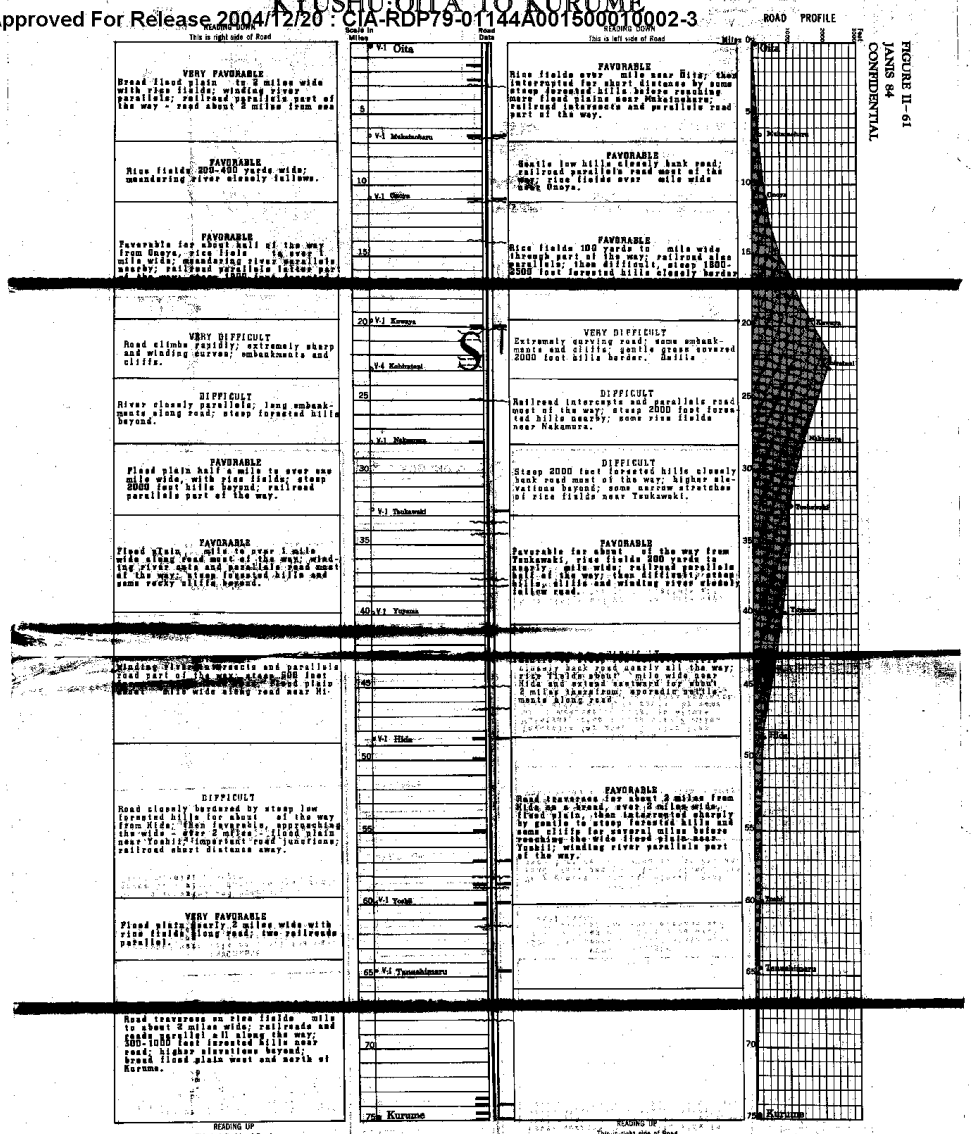


FIGURE II-61
JANIS 84
CONFIDENTIAL

ROUTE NO. 5
KYŪSHŪ: USUKI TO KUMAMOTO VIA OZU

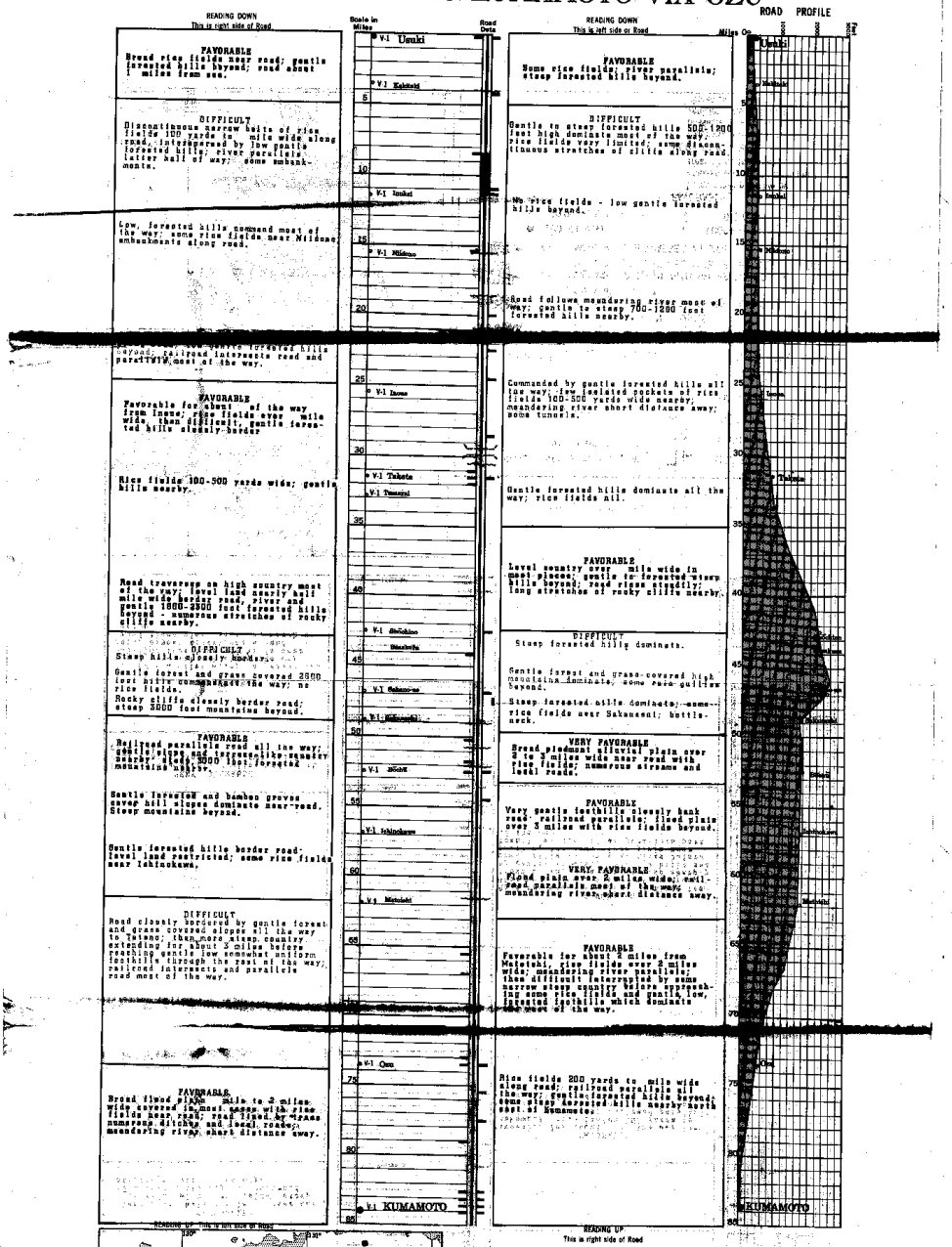
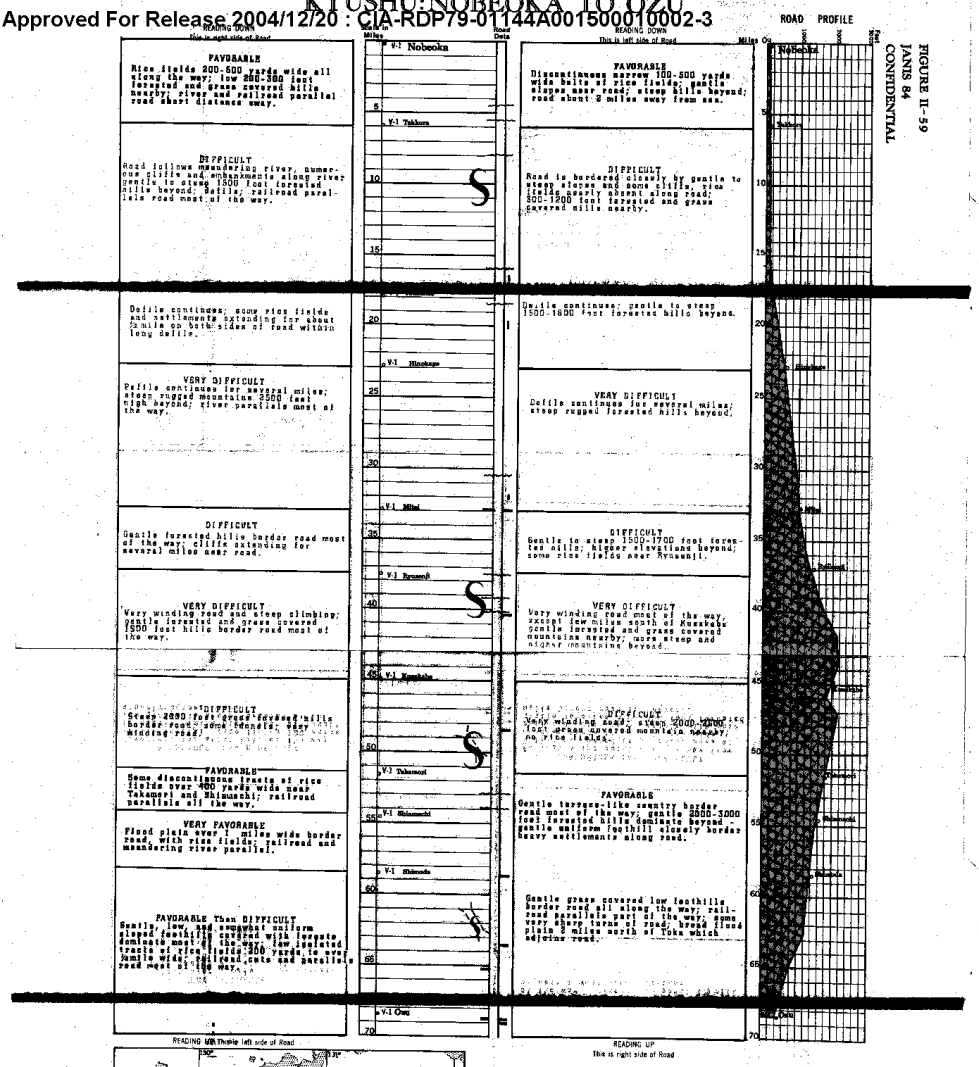
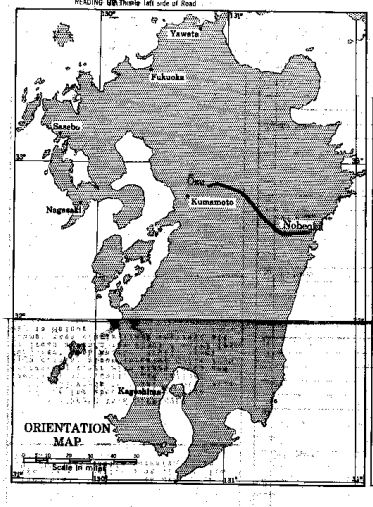


FIGURE II - 60
JANIS 84
CONFIDENTIAL

ROUTE NO. 4
KYŪSHŪ: NOBEOKA TO OZU





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ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over
● 20,000-100,000
● 5,000-20,000
● 0-5,000

VERY DIFFICULT: Impassable to wheeled vehicles. Extensive engineering may open restricted routes.

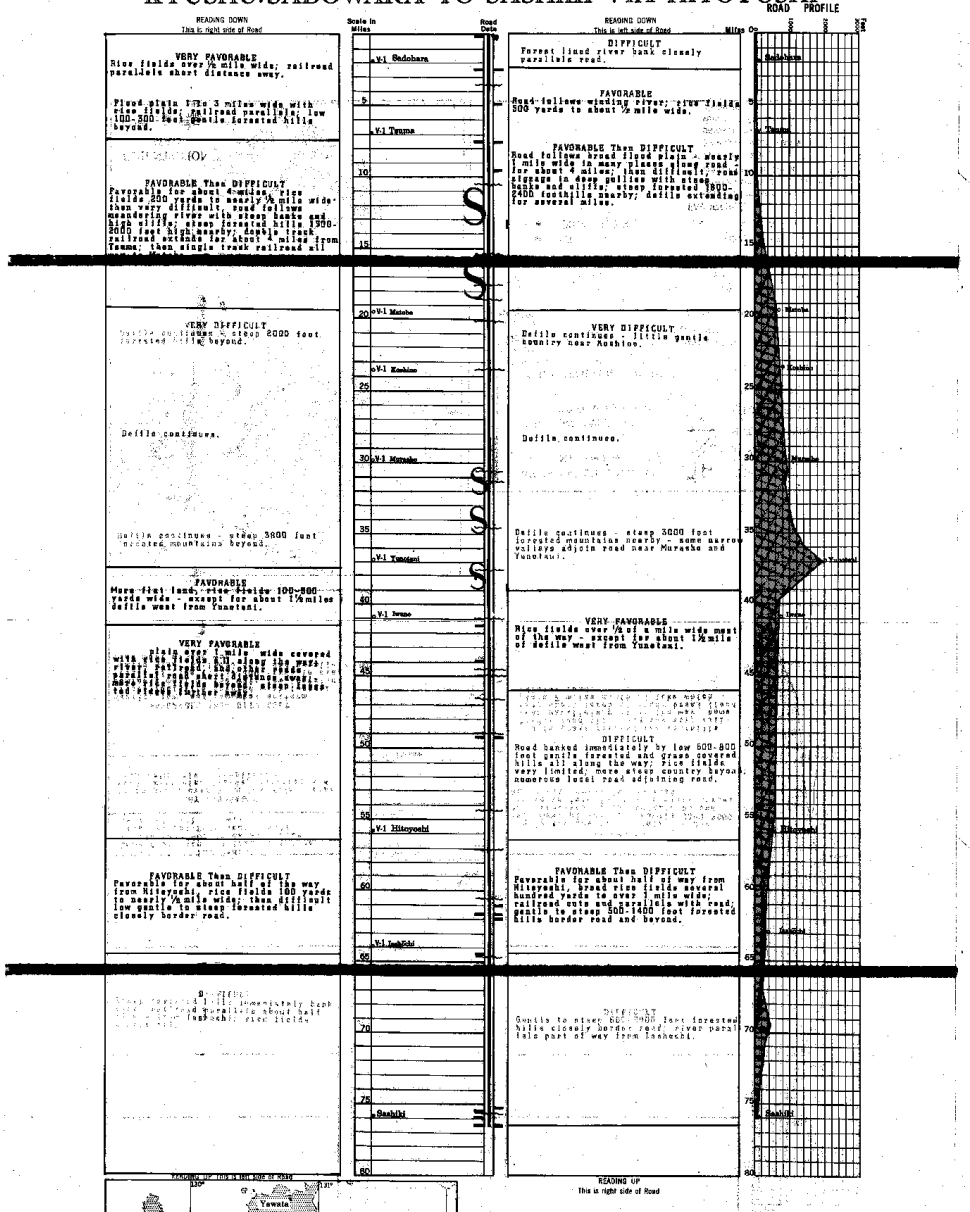
DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.

FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.

VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

FIGURE II-59
JAPAN 64
CONFIDENTIAL

ROUTE NO. 3
KYŪSHŪ: SADOWARA TO SASHIKI VIA HITOYOSHI



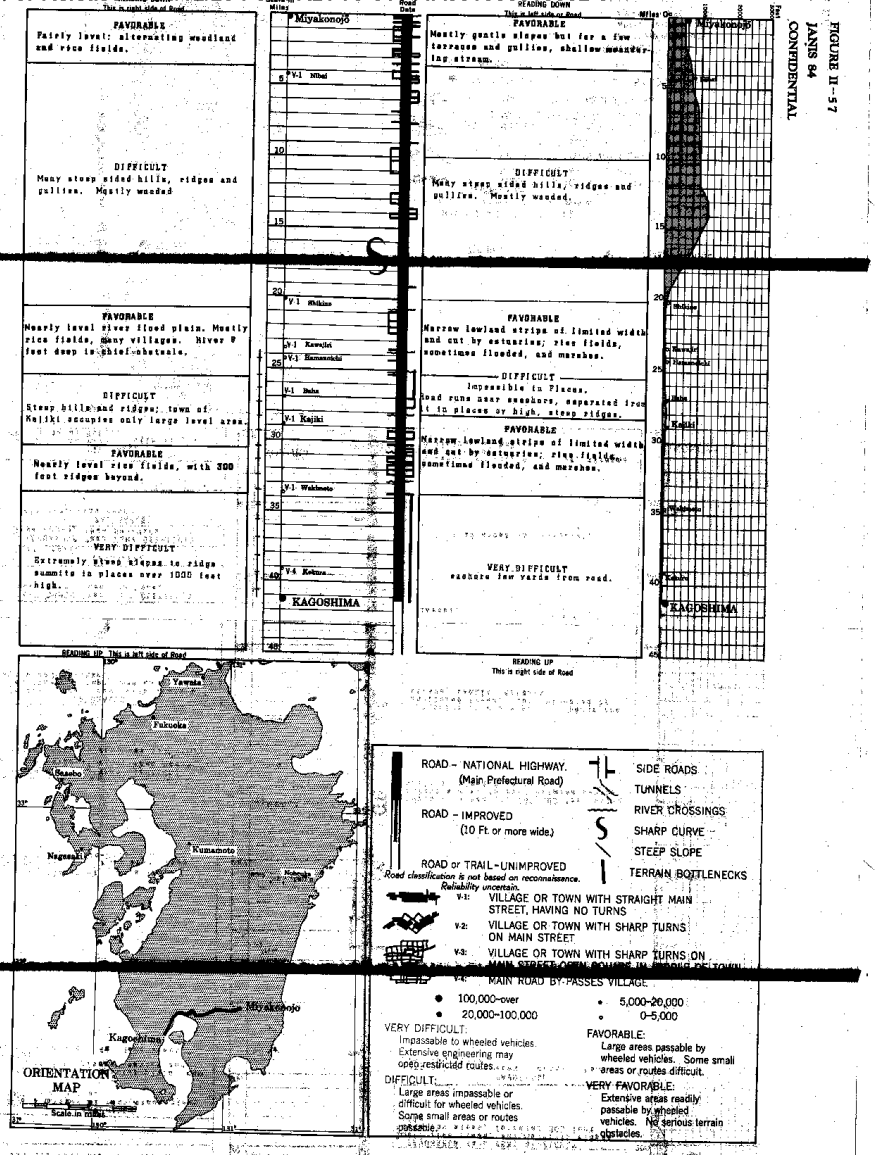
CONFIDENTIAL

IANIS 84

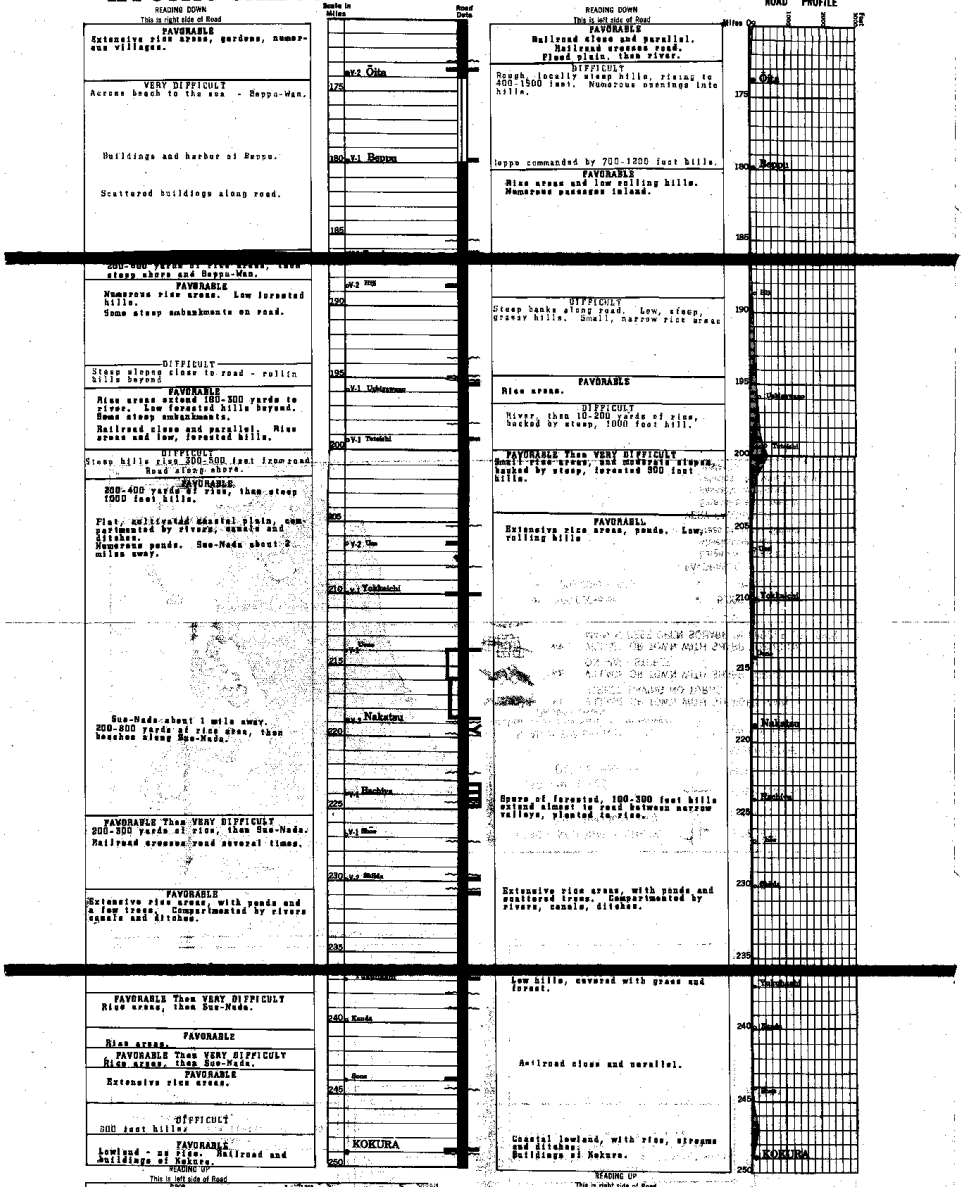
FIGURE II – 58

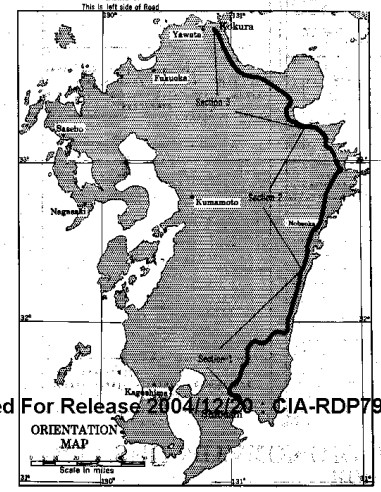
ROUTE NO. 2
KYUSHU: MIYAKONOJO TO KAGOSHIMA VIA KOKUBU

FIGURE II-5-7



ROUTE NO. 1 Section 3
KYŪSHŪ: SHIBUSHI TO KOKURA (EAST COAST ROUTE)





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ROAD – IMPROVED (10 Ft. or more wide.)
ROAD or TRAIL – UNIMPROVED
Road classification is not based on reconnaissance. Reliability uncertain.

SIDE ROADS
TUNNELS
RIVER CROSSINGS
SHARP CURVE
STEEP SLOPE
TERRAIN BOTTLENECKS

V-1: VILLAGE OR TOWN WITH STRAIGHT MAIN STREET, HAVING NO TURNS
V-2: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET
V-3: VILLAGE OR TOWN WITH SHARP TURNS ON MAIN STREET, OPEN SQUARE IN MIDDLE OF TOWN.
V-4: MAIN ROAD BY-PASSES VILLAGE

● 100,000-over ● 5,000-20,000
● 20,000-100,000 ● 0-5,000

VERY DIFFICULT: Impassable to wheeled vehicles except restricted routes.
DIFFICULT: Large areas impassable or difficult for wheeled vehicles. Some small areas or routes passable.
FAVORABLE: Large areas passable by wheeled vehicles. Some small areas or routes difficult.
VERY FAVORABLE: Extensive areas readily passable by wheeled vehicles. No serious terrain obstacles.

FIGURE II-56
JANIS 84
CONFIDENTIAL

ROUTE NO. 1 Section 2

KYUSHU: SHIBUSHI TO KOKURA (EAST COAST ROUTE)

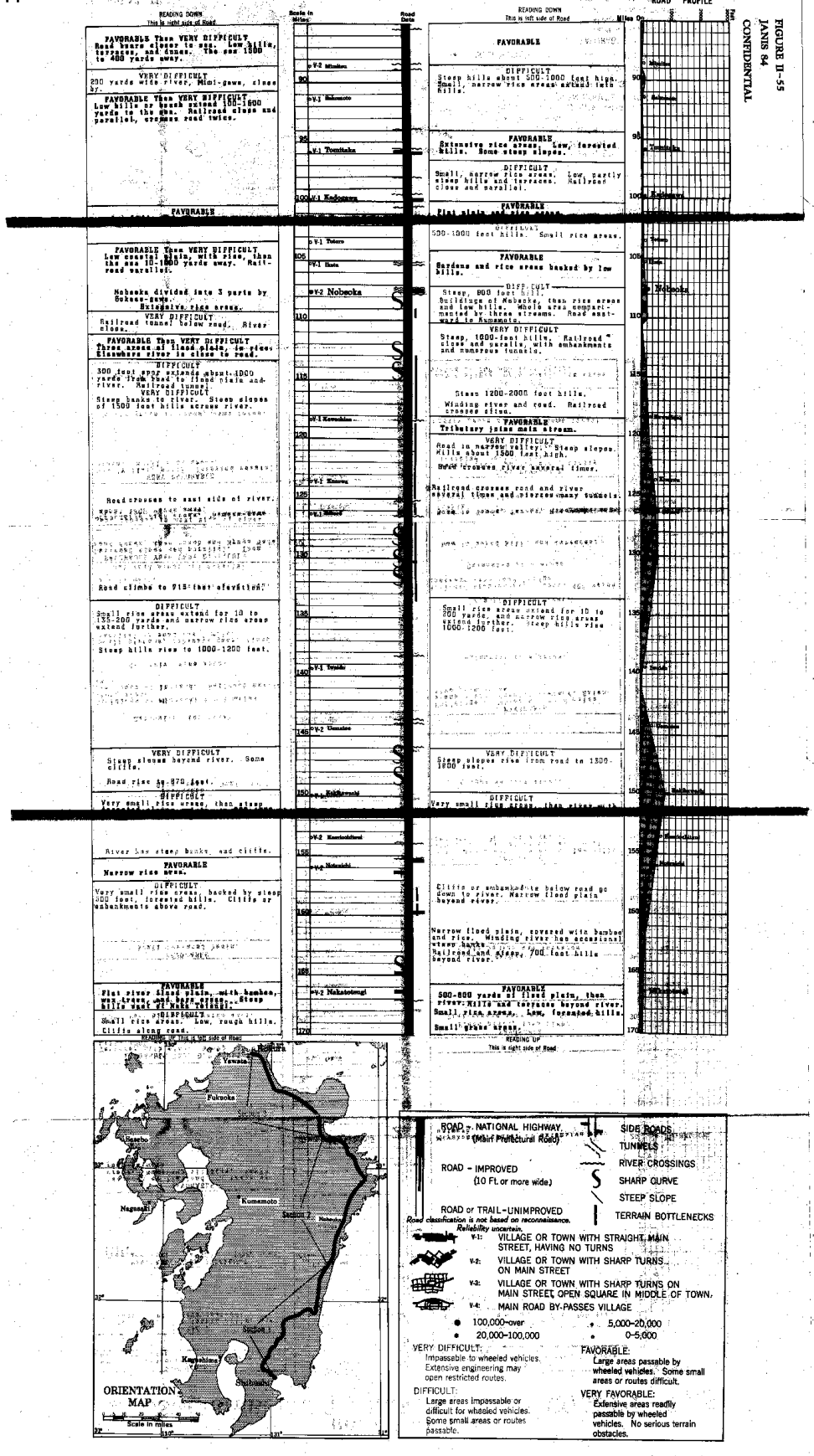


FIGURE II-55
JANIS 84
CONFIDENTIAL

ROUTE NO. 1 Section 1
KYUSHU: SHIBUSHI TO KOKURA (EAST COAST ROUTE)

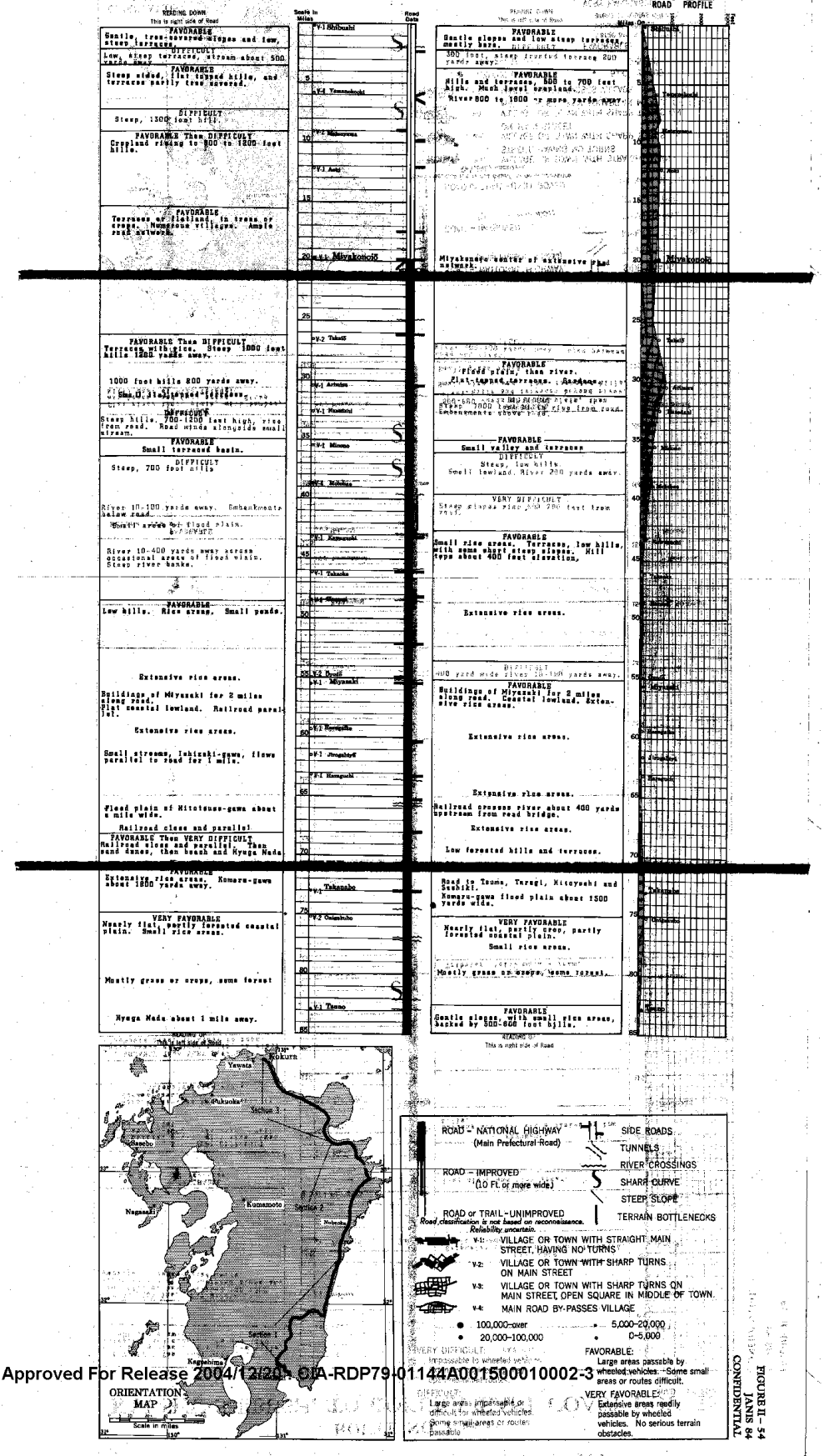
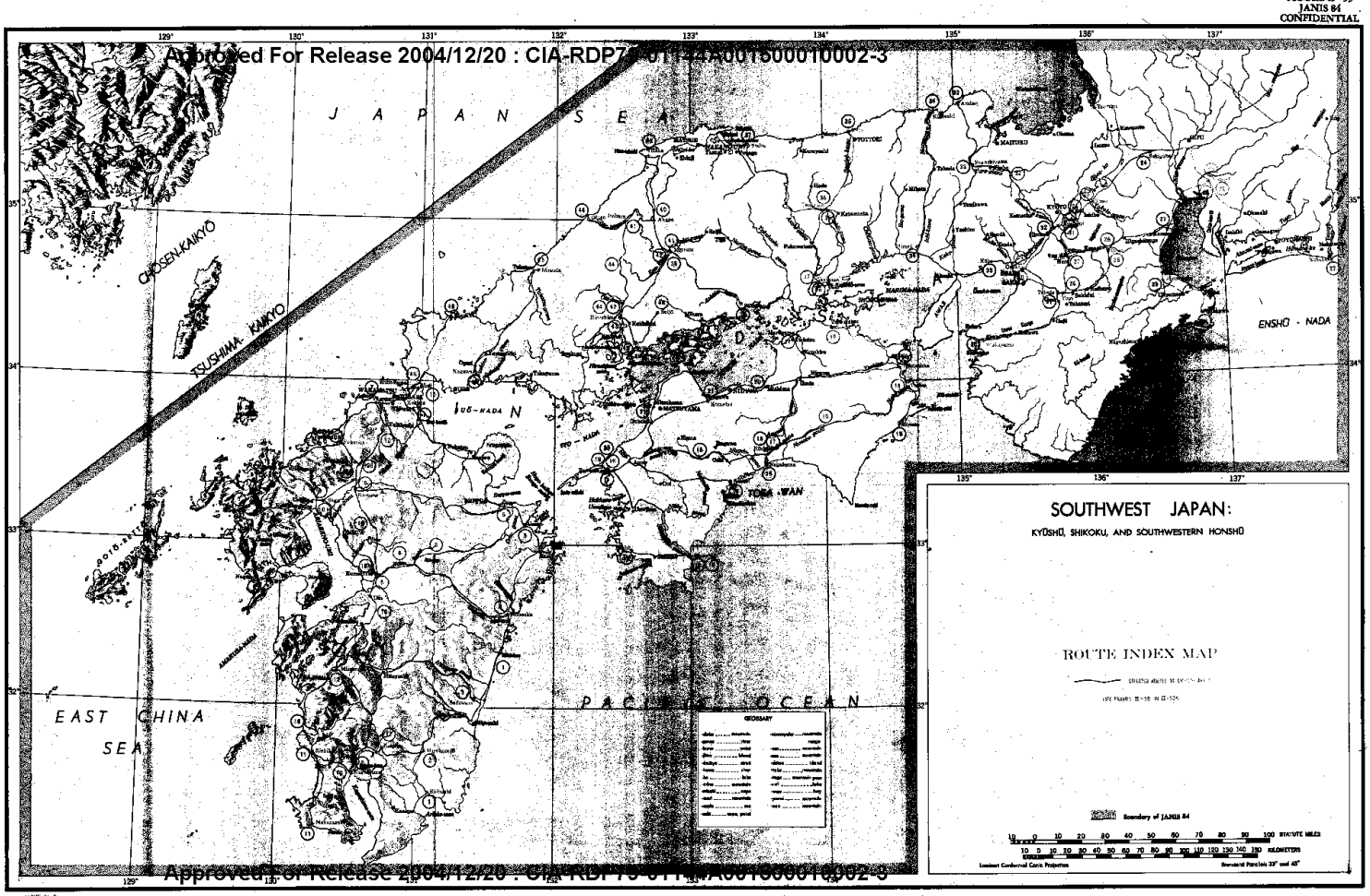


FIGURE II – 54
JANIS 84
CONFIDENTIAL



JANIS 84-5

FIGURE II - 53. *Route Index Map.* (G, I, M, N, O, E).