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14 July 1972

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MEMORANDUM FOR: Chief, Asian Communist Forces Division, OSR  
 ATTENTION: [REDACTED] Chief, Theater Forces Branch  
 THROUGH: Acting Chief, Geography Division, OBGI  
 SUBJECT: Transmittal of Lan-chou Military Region -- A Geographic Appraisal

1. The attached study, Lan-chou Military Region -- A Geographic Appraisal, is being forwarded to you in response to your request of 25 February 1972. The study is comprised of a text, photographs, and two hand-annotated maps. Additional copies of the text will be sent to you when we receive printed copies of maps that are now being prepared in Cartography Division specifically for this text.

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2. If there are any further questions or need for clarification, please contact the responsible analyst,  
 [REDACTED]

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[REDACTED]  
 Chief, Far East/Pacific Branch, OBGI

Attachment:  
 a/s

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Lan-chou Military Region  
A Geographic Appraisal

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Maps

Lan-chou MR -- Terrain Regions

Selected Railroads in Lan-chou MR (Schematic)

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Lan-chou Military Region Photo Captions

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- Figure 1. Yu-men oil field. China's oldest oil field is located in the low hills south of Yu-men (The Jade Gate) at the western end of the Kansu Corridor.
- Figure 2. The Loess Plateau northwest of Sian. Every square inch appears cultivated; settlements are located on the interfluves and in the valleys. Steep-walled valleys would make off-road movement extremely difficult.
- Figure 3. Cultivated hill tops, valley walls, and valley floors in the Loesslands west of the Liu-p'an Shan. Millet, corn, and winter wheat predominate; oats and buckwheat are grown in the uplands.
- Figure 4. Cave dwellings in the Loess Plateau near Yen-an.
- Figure 5. The Wei Valley. The broad, flat plain of the Wei River is the economic heartland of the Lan-chou Military Region. Irrigated fields and wide canals would hinder off-road movement. The deeply eroded foothills of the Tsinling Shan rise in the background.
- Figure 6. A sand stabilization project in the southern Ala Shan Desert near Chung-wei. Its purpose is to prevent the sand from encroaching onto cultivated land. Note the sea of moving dunes in the background.
- Figure 7. The Ningsia Plain. Members of a commune near Yin-ch'uan transplant rice,

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probably in late May or early June.  
Rice is not commonly grown in this  
part of China unless abundant and  
dependable supplies of water are  
available and soil conditions are  
suitable.

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Figure 8. An irrigation project in the Wu-wei -  
Min-ch'in area. Melt-water from snow  
fields in the Ch'i-lien Mountains  
enable the oases in the Kansu Corridor  
to grow a wide variety of crops.

Figure 9. The grasslands of northern Tsinghai.  
Forests of needleleaf evergreens grow  
on the northern slopes of the Nan  
Shan in this scene north of Koko Nor,  
and small trees and bushes line the  
banks of the stream in the middle  
distance. The flat, firm surface  
offers unimpeded off-road movement.

Figure 10. Sand dunes in western Tsaidam. A  
geological prospecting team picks  
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an oil producing area. These dunes  
have been stabilized by tamarisk, a  
drought resistant shrub, growing  
naturally in many parts of the desert.

Figure 11. On the road from Ko-erh-mu to Tibet in  
the mountains of southern Tsinghai.  
This natural surface road, frozen in  
winter, must be kept free of snow  
that could block it at any time from  
October to April. Spring thaws may  
make it slippery and muddy.

Figure 12. Tibetan nomads inhabit the grasslands  
in the Kansu-Tsinghai border area on  
the upper reaches of the Huang Ho.

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- Figure 13. Building the Lan-chou - Pao-t'ou  
Railroad on the flat Ningsia Plain  
east of the Ho-lan Shan.
- Figure 14. Trail in Tsinghai. Consumer goods are  
being delivered to a village in the  
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the steep drop-off to the side of  
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- Figure 15. The Black Gobi north of Yu-men. The  
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- Figure 16. The Ala Shan Desert near Chung-wei.  
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- Figure 17. A ferry crossing on the Huang Ho. Two  
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adequately handle traffic crossing  
the Huang Ho in Ningsia. The Loess  
Plateau gently rises on the horizon.

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Lan-chou Military Region -- A  
Geographic Appraisal

Introduction

1. The Lan-chou Military Region (MR) is a large, physically and culturally diverse region that comprises nearly a sixth of China's total area. Second largest of China's eleven military regions, it includes administratively the provinces of Kansu, Shensi, Tsinghai, and the Ningsia Hui Autonomous Region. The ethnic composition and population densities vary widely within the MR: most of central and northern Shensi and southeastern Kansu contain well populated agricultural areas of Han Chinese settlement; in contrast, nearly all of Tsinghai and sizable portions of Kansu are sparsely populated by a largely non-Han Chinese population. Headquarters of the MR is at Lan-chou, a key transportation hub and traditional gateway city from which radiate major routes that serve the sizable but lightly populated western provinces of China.

2. Precipitation is the most significant physical element in this large region. The yearly total -- which ranges from less than 5 inches in the northwest to more than 30 inches in the southeast -- helps account, in combination with such physical features as landforms and elevation, for the widely different population densities, ethnic distributions, and agricultural patterns. In general, non-irrigated crops can be grown only if the annual precipitation is at least 15 inches

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-- the area with this amount of precipitation includes principally Shensi Province, southeastern Kansu, and the southern half of Ningsia. To the north and west, however, as precipitation amounts decline sharply, intensive agriculture is limited to a few oases. Grasslands are common in these drier areas and support a largely pastoral population whose livelihood depends upon their sheep, goats, and cattle. The 15-inch line of annual precipitation (whose location varies somewhat from year to year) thus marks a rough but reasonably accurate zone of transition running across the MR from northeast to southwest, and separating areas of Han Chinese settlement and intensive agriculture from those of non-Han groups engaged in herding and oases agriculture.

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3. The diversity of the Lan-chou MR is caused not only by its physical differences but also by the long history of man's occupance of this area -- particularly the eastern third lying within the drainage basin of the Wei River. Here the Chinese state and people evolved; here too in modern times the Chinese Communists conceived and perfected their strategy and programs later imposed upon all of China. Because ancient China's political power base was located in or adjacent to the Wei Valley in Shensi Province, the need to protect this key area early became a major state objective. In the drier north and west, various nomad groups posed a constant threat to emerging Han Chinese hegemony; hence the building of walls was begun, later to be joined into the Great Wall, to provide warning and defense against these "barbarians" of the northern steppes.

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4. The population of the Lan-chou MR is uncertain because of the lack of current statistics and recent provincial boundary changes. According to 1957 data, the population totaled about 35 million, but since then the population has increased, and the present figure may be as great as 40 million. Of these, the vast majority are Han Chinese. About one-third of China's 3 million Hui People -- Han Chinese of the Muslim faith -- live in Ningsia and Kansu. Small numbers of Mongols, Tibetans, and various Turkic peoples inhabit Tsinghai and southwestern Kansu. Large areas in northern Kansu and western Tsinghai are uninhabited.

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5. Agriculture is the backbone of the Region's economy, but an important and expanding segment of China's mineral production and industrial capacity also is located here.

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6. Coal, petroleum, iron, copper, and various minerals from desert salt lakes are exploited in the Region; some of these deposits are served by refineries built nearby (see Figure 1).

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Regional Divisions

7. The Lan-chou MR contains portions of five major physical regions. Most of the eastern third of the military region is termed the Loesslands -- a unique area of wind-deposited soil. To the south, high mountains rise sharply above the Loesslands to form another region, the Southern Mountains. The northern part of the MR consists of largely uninhabited desert, steppes, and barren mountains -- the Northern Deserts Region -- part of a far larger physical realm loosely termed Inner or Central Asia. To the south a narrow corridor of oases and transport routes -- the Kansu Corridor (Region) -- separates the deserts from the lofty heights (10,000 to 17,000 feet) of the (Tibet-) Tsinghai Plateau, the fifth physical division.

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The Loesslands (See attached map, back of folder.)

8. The Loesslands Region is the most densely populated portion of the Lan-chou MR even though much of its topography typically consists of rounded and flat-topped hills that are separated by a vast number of steep-walled ravines and valleys. Here and there scattered mountains rise above the plateau surface; occasional basins and broad river valleys -- such as that of the Wei -- also are found. The area's thick blanket of wind-deposited soil, termed loess or huang-ti (yellow earth), makes it one of the most unusual physical regions on earth. In places the loess is 1,000 feet thick, though its average depth is much less, and except for the higher ridges and peaks, all landforms have been blanketed by it (see Figure 2).

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9. Although not exceptionally fertile, loess is an easily worked soil and being extremely porous, retains much of the meager amount of moisture falling upon it. Man has cultivated the Loesslands since prehistoric times -- the valley bottoms, the flat and rounded hill tops, and, by constructing terraces, the steep valley walls (see Figure 3). In some areas, caves honeycomb valleys, providing dwellings that are economical to construct and are cool in summer and easy to heat in winter (see Figure 4). They present hazards to the occupants, however, since loess is lightly cemented and unstable when wet. Flash floods and earthquakes cause many to collapse.

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10. Scant natural vegetation remains -- mainly patches of grass and, along water courses, low shrubs and meager stands of trees -- all thinning toward the north and west as the climate becomes drier. Extensive conservation measures have been initiated to stabilize the soil and reduce erosion by planting fast-growing grass, shrubs, and trees.

11. The climate of the Loesslands is marginal for agriculture, with scant precipitation, cold and blustery winters, and sharp daily and seasonal temperature contrasts. Yearly precipitation averages between 13 and 20 inches with amounts decreasing from southeast to northwest -- though topography influences totals locally. Distinct wet and dry seasons exist, and normally 60 to 75 percent of all precipitation occurs from June through September. In contrast, the winter months are very dry, and from December through February normally only one-half inch of precipitation -- usually snow -- is recorded. Occasional dry years

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and dry cycles are critical to agriculture in view of the marginal amount of precipitation in the Loesslands region. Although very heavy rainfalls are infrequent, their occurrence usually causes great local hardships as accelerated erosion collapses valley walls, and growing crops are covered with a thick layer of mud.

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12. January temperatures average 15°F to 20°F overall with lower readings in the north and higher in the south. Sian, located in a sheltered site in the Wei Valley, has an average January temperature of just under freezing. Summer temperatures can be high -- normally with maxima in the 80's at mid-day in most areas but reaching into the 90's at places, such as at Sian. Severe duststorms are a hazard, occurring mainly in winter and spring.

13. The Wei Valley is the economic focus of the Loesslands. It contains a portion of China's major east-west transportation routes, including the Lung-Hai Railway; it has important industrial and transportation centers; and the Valley is intensively cultivated to small grains, corn, vegetables, and fruit (see Figure 5). Winter wheat is planted in September and October and harvested from late May to mid-June. Potatoes are planted in late March with other crops following in April. The harvest season extends from early to mid-August through early November.

14. The two major urban centers of the Lan-chou MR -- Sian and Lan-chou -- have expanded markedly during the past two decades with estimated populations of near 1 million for Lan-chou and well over that figure for Sian. Sian is noted for its

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textiles and electrical equipment and Lan-chou for its [REDACTED] petroleum refinery, petrochemicals, and chemical fertilizer products. Additionally, Lan-chou is the key transportation hub from which major rail and roads lead to all principal areas within the Lan-chou MR as well as to connections with other major regions of China.

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#### Southern Mountains

15. The Southern Mountains Region consists of two rugged, parallel ranges -- the Tsinling and Ta-pa Shan -- separated by the sizeable basin and valley of the upper Han Shui (river), centered at Han-chung. This mountainous barrier forms what has been called the most significant physical divide in China. Not only does it separate the drainage basins of China's two great rivers, the Huang and Yangtze, but considerable climatic, vegetative, and crop differences occur north and south of these mountains. The Tsinling and Ta-pa Shan are sufficiently high (generally 8,000 to 10,000 feet elevations) and broad to afford considerable protection to the Szechwan Basin to the south by blocking most of the cold, bitter air masses that affect northern China. Conversely, the mountains prevent much of the moist, monsoonal air of summer sweeping into China from the south and southwest from reaching the Loesslands and deserts to the north.

16. The climate of the Southern Mountains varies considerably because the great differences in elevation and exposure produce marked local variations. Generally, precipitation amounts total about 30 inches annually with the heavy concentration during the summer months. Moderate

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temperatures in the uplands plus increased precipitation result in an abundant and varied vegetation cover -- needleleaf evergreen forests, shrubs, and open grasslands throughout, with stands of broadleaf deciduous forests toward the east. Forests are generally thicker on the northern slopes. Lower slopes and valley floors are usually cultivated.

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17. Most of the Southern Mountains Region is sparsely populated; a major exception is the fertile Han-chung Basin (about 60 miles by 10 in size), plus a few smaller basins and valleys -- as at An-k'ang. Han-chung and An-k'ang are not only the largest population centers in this region, but they also are important rice-growing areas -- extensions of the agricultural patterns of the Szechwan Basin -- favored by 90°F mid-summer temperatures and adequate summer rain. Planting of seedbeds and transplanting take place from early March through April. Harvest begins in early October and lasts for a month, coincident with the planting of winter wheat. Wheat is harvested early in May. Corn is an important upland crop, planted in March and May and harvested in July and late August.

18. Aside from its rugged terrain, the most distinctive feature of the Southern Mountains is its isolation. This region traditionally has been little affected by changing conditions elsewhere in China because of its remoteness and difficult access. Settlement and transportation routes are principally confined to the valleys. Roads in the Han Valley connect Ch'eng-tu in Szechwan Province with the Wei Valley, the North China Plain, and

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middle Yangtze region. The Pao-chi - Ch'eng-tu Railway, completed in 1956 and the major transport link between northern China and Szechwan Province, winds tortuously north-south through the Southern Mountains, utilizing many long bridges and tunnels, often alternating in rapid succession. The gradient of the 57-mile section between Pao-chi and Feng-hsien is so steep that auxillary electric engines must be used. A rail line is being constructed from Yang-p'ing-k'uang -- on the Pao-chi - Ch'eng-tu line in southern Shensi -- eastward to Wu-han in Hupeh Province; when completed it will greatly improve accessibility from the middle Yangtze region.

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Northern Deserts

19. The Northern Deserts Region, a largely negative, barrier area of barren gravel plains, deep sands, and low hills and mountains, has assumed much greater strategic and military importance during the past decade as Sino-Soviet relations worsened and a Soviet military buildup in Mongolia commenced.

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20. Physically, the region consists of one of the most arid and least populated portions of the extensive desert and steppe country that comprises the inner Asian frontiers of China. Because of the meager precipitation -- in most places less than 5 inches annually -- pastures are few. Settlements are largely restricted to discontinuous and relatively small agricultural areas -- most of them adjacent to the Huang Ho in the Ningsia Hui Autonomous Region.

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21. Efforts to increase agricultural production along the southern margins of the Region have included construction of irrigation works, planting numerous shelter belts to halt blowing sand from encroaching upon agricultural lands, and desalinization of some desert soils (see Figure 6). A large dam built in the Ch'ing-t'ung Gorge of the Huang Ho south of Yin-ch'uan, for example, controls flooding and provides a more reliable year-round water supply. The dam also provides 260,000 kw of electricity for the area -- a major factor in the decision to build the Chin-chi Aluminum Plant just 3 miles to the west along the Lan-chou - Pao-t'ou Railroad.

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22. Spring wheat is the major crop; planted in late March and early April, it is reaped in late July and early August. Potatoes are planted immediately after wheat and are harvested in September. Millet, oats, and buckwheat planted from late April to early June are harvested in September and early October. Rice and cotton may be included in this latter cycle, with the cotton harvest lasting into early November (see Figure 7).

23. The Northern Deserts Region contains the largest concentration of Hui in China, most of whom live in agricultural settlements in the Ningsia Hui Autonomous Region. Incorporated into Kansu Province in 1954, the Autonomous Region was reestablished again in 1958 after considerable agitation by the Hui, who have a history of discontent under and uprisings against the Han. Elsewhere, the Deserts Region is almost empty of people with exceptions in the oasis at Min-ch'in



and small settlements along the lower O-chi-na Ho in the west. Some land reclamation has been attempted in these areas.

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24. Most of the Northern Deserts Region was detached from the Inner Mongolian Autonomous Region in late 1969 and added to Kansu and Ningsia. The change was probably in response to the Sino-Soviet border incidents in 1969, the continuing Soviet military build-up in Mongolia, and the consequent need to reorganize military and administrative functions and missions in this increasingly strategic area.

#### Kansu Corridor

25. The Kansu Corridor is a narrow strip of relatively densely populated land, some 600 miles long, that has served since ancient times as the major land route between "China Proper" and Central Asia. In the past caravans plodded their way on this first leg of the storied Silk Road; today, the Lan-chou - Sinkiang Railroad and a major highway provide quick transport to China's westernmost province of Sinkiang.

26. Physically, the Corridor lies in a trough at elevations between 4,000 to 6,000 feet between the high wall of the Ch'i-lien Shan-Mo, the northernmost range of the Tsinghai Plateau, and considerably lower and broken mountains to the north, which are collectively termed the Pei Shan. Alluvial deposits carried by glacial-fed streams originating in the Ch'i-lien Shan pave most of the Corridor with a hard, flat to rolling surface that is interrupted occasionally by rocky outcrops, the spur of a low mountain ridge, or sand dunes. Cut off by high mountains, the Corridor receives less than 10 inches of precipitation annually.

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27. A string of oasis settlements running the full length of the Corridor provided food, water, and markets for travelers of the ancient Silk Road. Today, agriculture has expanded through increased and improved irrigation facilities and some limited industry has been introduced (see Figure 8). Wheat, cotton, rice, and numerous varieties of fruits and vegetables are the principal agricultural commodities. Stock grazing is also important.

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28. The construction of the Lan-chou - Sinkiang Railroad through the Corridor in the 1950's marked the beginning of the rapid industrial buildup, including advanced weapons facilities, in the area. Important rail spurs serve these plants and sites. A major highway parallels the railroad, with a branch road extending south into Tsinghai and Tibet.

#### Tsinghai Plateau

29. Part of the highest and most continuous highland in the world, Tsinghai is the most remote and sparsely populated of the physical divisions of the Lan-chou MR. Mountains form the boundaries of the region to the north and south, and elsewhere they occasionally interrupt the plateau landscape. Most of this region is treeless and uninhabited, relieved only by often luxuriant grasslands, occasional brackish or saline lakes, and a few streams and rivers. In the central and western higher portions of the plateau, streams flow in broad, shallow valleys; in the lower eastern and southeastern portions, however, valleys are often V-shaped and the terrain moderately dissected. Two distinctive basins are located in the north -- the Tsaidam Basin, comprising nearly a fourth

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of Tsinghai Province, and the smaller but higher basin surrounding Koko Nor (Ch'ing Hai), the brackish lake from which the province takes its name.

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30. Extensive grasslands cover much of Tsinghai with the best in the lower elevations of eastern Tsinghai and in the highlands northeast of the Tsaidam Basin (see Figure 9). The grasslands support a major animal husbandry industry; large numbers of sheep, goats, and cattle are herded by nomadic Tibetans, Mongols, and smaller ethnic groups. Scattered stands of needleleaf evergreens occur at lower elevations in the east and northeast and are most common on northern slopes and along stream beds.

31. The Tsaidam Basin is an arid, flat to rolling basin with comparatively low elevations (8,000 to 10,000 feet) for Tsinghai. Vast expanses of sand dunes, some 300 feet high, gravel plains, and salt flats cover the western portion of the basin (see Figure 10); salt and brackish marshes and lakes -- fed by streams originating in the surrounding mountains -- and extensive grasslands cover the eastern and lower half. The western half of the basin is uninhabited, except for settlements such as those established to support the exploitation of the small petroleum fields at Leng-hu and Mang-vai. In the east, a number of small settlements are located along the southern margins of the basin -- mostly transport-oriented to support shipment of supplies to Tibet. Salts are taken from some of the salt lakes in the eastern Tsaidam.

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32. The climate of the Tsinghai Region varies with elevation and local terrain conditions, but the general characteristics prevailing in western China are present; climatic problems, however, are intensified by very high elevations -- certain areas are over 20,000 feet. Although 90 degree temperatures have been recorded, summer maxima normally are in the 70's, and throughout the year extreme daily temperature variations -- particularly in summer and fall -- are common. Winter temperatures average well below freezing and are often accompanied by fearsome winds; in the higher portions of the plateau, temperatures may drop to -20°F or lower. Precipitation is generally less than 15 inches, most of it occurring during the period from May through October.

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33. The political and economic focus of Tsinghai is in the relatively narrow corridor of the Huang Shui and its tributaries extending eastward from Koko Nor. Tsinghai's capital, Hsi-ning, a city of more than 400,000 inhabitants, is a key supply and transportation center for Tsinghai and Tibet. A branch of the Lan-chou - Sinkiang Railway connects Hsi-ning with Lan-chou, and from Hsi-ning extensions

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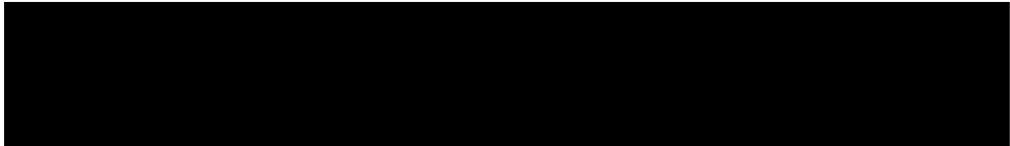


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northward to the Ta-t'ung coal mining district. Important roads extend into southern Tsinghai and westward across the Tsaidam Basin to Sinkiang. The Tsinghai-Tibet road extends southward from Ko-erh-mu (see Figure 11).

34. Most of the 2.8 million population of Tsinghai inhabit the northeastern portion of the province. At least half of the population are Han

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Chinese who live mainly in the few urban centers and villages located in the Huang Shui Valley and its tributaries. Elsewhere the population is widely scattered and mostly nomadic, composed mainly of Tibetans, plus a scattering of Hui, Mongol, and Turkic groups (see Figure 12).

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#### Transportation

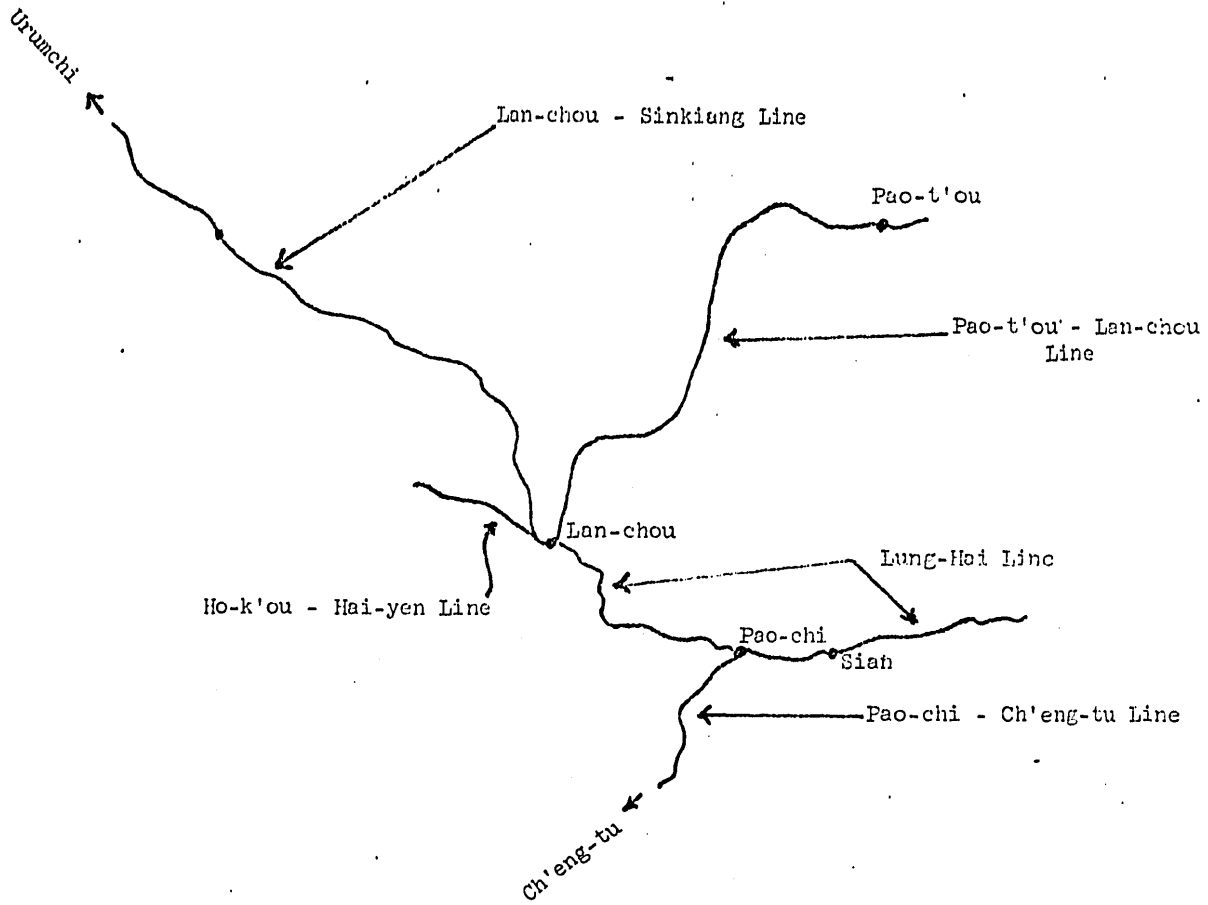
35. The Wei Valley and the Kansu Corridor, connected in the vicinity of Lan-chou by valleys through the eastern Ch'i-lien Shan and the Loess Plateau, have throughout history been occupied by routes leading west into Central Asia. Today the Lung-Hai Railroad and its continuation, the Lan-chou - Sinkiang Railroad, represent the key transportation facility in the Lan-chou MR. Important connecting lines include the Lan-chou - Pao-t'ou, Pao-chi - Ch'eng-tu, and the Ho-k'ou - Hai-yen lines. Additionally, numerous shorter lines and spurs lead from the main lines to service industrial and military installations.

36. Transport on the main rail lines is generally unimpeded by terrain with exceptions where several lines enter the highlands surrounding Lan-chou (see Figure 13). The Lung-Hai line, for example, must rise nearly 3,300 feet in elevation through twisting valleys of eroded loess to reach Lan-chou, and the Lan-chou - Pao-t'ou and Sinkiang lines must pass through the outliers of Ch'i-lien Shan. Numerous bridges and tunnels and several tight hairpin curves must be negotiated. Generally, tunnels and bridges are less than 1,000 feet long, although one tunnel just north of the Pai-yin copper complex, north of Lan-chou on the Lan-chou - Pao-t'ou line, is 4,200 feet in length. Another

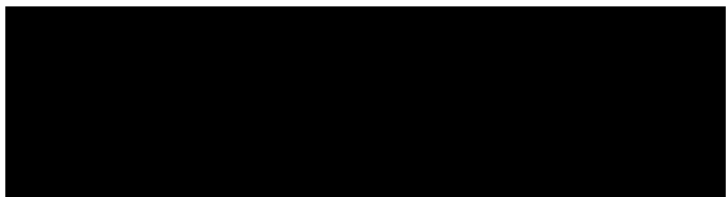


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SELECTED RAILROADS IN LAN-CHOU MR



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37. The rail net adequately handles the existing traffic. About 30 stations, rail yards, and transshipment points with five or more tracks are located within the Lan-chou MR. Lan-chou has five rail yards with a total of 64 tracks, and Sian has three with a total of 89 tracks.

38. The primary road net follows in part the east-west trending valleys and corridors used by the major rail lines. Roads serve as extensions to the railroad system, linking key areas of the Lan-chou MR with almost all of Tsinghai, most of Ningsia, northern Shensi, and much of eastern Kansu. The primary roads are usually two-laned and classified as "loose surface, all weather," which could mean any type of "all weather" surface short of black top -- including crushed rock, rolled native soil, and, in the Tsaidam Basin, salt. Some roads in the immediate vicinity of Sian are paved.

39. Secondary and tertiary systems consist of fair weather roads, trails, and tracks (see Figure 14). They generally serve local destinations and connect to the primary system at irregular intervals. Large areas in the Northern Deserts, the Tsaidam Basin, southwestern Tsinghai and the higher mountains are not served by any type of route.

#### Environmental Conditions and Special Military Problems

40. Extremes of weather, the effects of thin air at high altitudes, and related problems associated with the physical environment provide significant



constraints to the establishment and operational effectiveness of military units in the Lan-chou MR.

41. Road use problems in the Lan-chou MR are seasonal in occurrence and primarily caused by the effects of weather on road surface materials. Only in restricted areas, such as the Southern Mountains and in a few places elsewhere, does the terrain create major problems of grade, sharp curves, and switchbacks. Most problems are related to excessive moisture -- normally summer rains -- that cause washouts, landslides, and muddy and boggy conditions. Spring thaws create slippery and often hazardous conditions locally for brief periods on many of the roads. This problem is intensified at higher elevations in Tsinghai where thaw-freeze cycles are of longer duration and severity. Winter and spring snow also creates occasional road problems in a few and generally limited areas of very high elevation in Tsinghai.

42. Soil conditions in the loess areas present special problems. Loess, when dry, is firm and offers good footing for man and machine. When wet, however, it is unstable and becomes miry. Movement across the interfluves in heavily dissected loessial areas requires constant detouring to avoid the steep-walled valleys. Routes on the valley floors constantly change direction as one twisting valley feeds into another. Additional hazards are narrow roads, often deeply incised into the soft loess, and narrow, low capacity bridges.

43. The firm, gravel-surfaced Gobi provides excellent traction year-round for off-road travel,

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and similar conditions exist at least seasonally in much of the high plateau country of Tsinghai (see Figure 15).

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Conventionally equipped vehicles would have difficulty in extensive bands of deep sand and dunes, however, of the Ala Shan Desert (see Figure 16). High dunes would require detours. Blowing sand and dust, most common in winter and spring when winds are strongest, cover tracks, reduce visibility, and impair the operating efficiency of man and machine. Steep, rugged slopes, often strewn with boulders, almost preclude off-road movement in mountainous areas. Northern Tsinghai's vast grasslands and the firm sand and gravel margins of the Tsaidam Basin offer unimpeded passage. The marshes and sand dunes of the central basin and salt pans where the water table is close to the surface would have to be avoided. Otherwise, salt is an excellent surface as demonstrated by its use as pavement.

44. Beginning with the spring thaws and continuing on through the summer rains, streams and rivers rise sharply. Not only do swollen rivers frequently wash out roads and bridges, but their enlarged widths present formidable barriers, limiting use of fords and ferries. The Huang Ho surpasses 1,000 feet in width and reaches depths of 30 feet in August and September on the flat Ningsia Plain (see Figure 17). Only three road bridges cross the Huang Ho in its loop around the part of the Ordos Desert within the Military Region

25X1C

[REDACTED]

and the Loesslands -- on the dam in the Ch'ing-t'ung Gorge, at Shih-tsui-shan, and at Wu-pao. The road across the dam is not a primary route, but the Shih-tsui-shan bridge carries road traffic from Pao-t'ou, and the bridge at Wu-pao carries a road from T'ai-yuan, capital of Shansi, into northern Shensi.

25X1C

45. Rock usable as road building material and for other construction work is commonly available in the Kansu Corridor, in the Southern Mountains, and in Tsinghai; however, in much of the Northern Deserts and loessial areas bedrock is often 20 or more feet below the surface. Ample quantities of sand and gravel are found in the desert regions and in stream valleys throughout the Lan-chou MR. Timber is locally available in the Tsinling Mountains, in eastern and northeastern Tsinghai, and in the Southern Mountains. Elsewhere, timber is scarce or lacking and either construction substitutes are used or timber is hauled in from other areas.

46. Extreme cold and high elevations of 10,000 to 17,000 feet in Tsinghai present special problems. Personnel from the lowlands have to go through a period of acclimatization. Cold weather clothing is required, and eyes have to be protected from the glare of bright sun, reflected off sand and snow. Engines must be winterized and modified for operation in rarified air and extreme cold. (Engines lose 3% of their power for every 1,000 feet of elevation, and spark plugs become fouled and pistons coated with carbon.) Special fuels and lubricants are required. Fixed-wing aircraft need longer runways -- 650 feet for every 1,000 feet of elevation.

25X1C

47. Most of the Lan-chou MR has limited supplies of surface water during at least half the year -- from late fall through spring or early summer. Large rivers and streams have water the year round, although it may require treatment and will be muddy at times, and quantities reduced during periods of freezing. Smaller streams, dry 4 to 5 months of the year, usually have water from March to November.

25X1C

48. Depths and amounts of ground water vary greatly. In most areas supplies of fresh water are limited or, as in the loess areas, locally plentiful but at considerable depths. Fresh water can often be found, however, at depths of less than 20 feet in the alluvial fans of the Kansu Corridor and in the valleys of the O-chi-na Ho and Su-lo Ho that drain portions of the Corridor; along the southern margins of the Tsaidam Basin; and around Koko Nor. Lenses of fresh water can be found at depths of from 20 to 200 feet at scattered places in the deserts; as salt and brackish water also are present, care is required in tapping fresh water supplies.