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UNCLASSIFIED

SPECIAL REPORT

STRATEGIC ENGINEERING STUDY

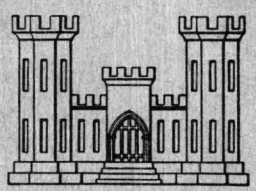
NO. 88

SAKHALIN ISLAND

(JAPAN AND U.S.S.R.)

TERRAIN INTELLIGENCE

PREPARED BY
U. S. GEOLOGICAL SURVEY
UNDER DIRECTION OF
CHIEF OF ENGINEERS
U. S. ARMY



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INTELLIGENCE BRANCH
OFFICE, CHIEF OF ENGINEERS
OCTOBER 1943

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10/43 NP 1943

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Prepared by:

Section of Military Geology
U. S. Geological Survey

Under Direction of
Chief of Engineers, U.S. Army

Strategic Studies Section
Intelligence Branch
Office, Chief of Engineers
October, 1943

TABLE OF CONTENTS

INTRODUCTION

A. GENERAL

This folio of maps and explanatory tables outlines the principal terrain features of Sakhalin Island. Each map and table is devoted to a specialized set of problems; together they cover the subjects of terrain appreciation, climate, rivers, water supply, construction materials, suitability for roads, suitability for airfields, fuels and other mineral resources, and geology. In most cases, the map of the island is divided into two parts: N. of latitude 50° N., Russian Sakhalin, and south of latitude 50° N., Japanese Sakhalin or Karafuto. These maps and data were compiled by the United States Geological Survey during the period from March to September, 1943.

B. GENERAL MAPS

The general map was compiled by transliteration from Russian and Japanese maps and locates and names towns, important villages, and most important geographical features. Because no satisfactory hypsometric maps of the entire island were available, a terrain model was constructed from maps, sketches, and descriptions of parts of the island; photograph of the model is included. The communications map shows existing railroads, roads, telegraph lines, cables, and ports.

C. TERRAIN APPRECIATION

Terrain appreciation is based on map reconnaissance and reading of physiographic and geologic literature. Terrain appreciation appraises the effects of topography and kind of ground on movement, cover, and concealment of troops and supplies. The country has been divided into 15 terrain units, outlined on an accompanying map. The topography and kind of ground of each terrain unit is discussed, with special emphasis on movement. Types of vegetation, settlements and existing roads and railroads are briefly summarized to complete the terrain setting. For further appraisal of the cultural features, the reports of other intelligence units should be consulted. Climatic data are summarized in a separate table, accompanied by maps and graphs.

D. VIEWS

A series of views, with an index map, illustrates the principal types of terrain.

E. RIVERS

The maps and table present a general picture of the character of river valleys and rivers; ease of movement across and along valleys is discussed. A large-scale map of Japanese Sakhalin (in 2 parts) shows the character of the river valleys.

F. WATER SUPPLY

Potential water supplies are reviewed chiefly for use in planning operations, and to assist geologists attached to water-supply battalions in locating ground-water supplies. Maps and table appraise potential supplies and suggestions are made concerning equipment needed for their development.

G. SUITABILITY FOR AIRFIELDS

Areas containing ground suitable for landing fields with 6,000-foot runways are indicated on a map. Detailed maps are given of possible sites in the south part of the island, for which large-scale topographic maps were available. Accompanying tables describe the topography, climate, kind of ground, vegetation, materials available for construction, water supply, and accessibility of favorable areas and suitable sites. Locations and number of existing airfields should be checked against the latest intelligence reports.

H. SUITABILITY FOR ROADS

The country is divided into several units, outlined on an accompanying map, each of which has common problems of road construction. The accompanying tables discuss problems of road-building and maintenance related to topography, kind of ground, stream crossings, and construction materials available. Existing roads are mentioned.

I. CONSTRUCTION MATERIALS

This table and accompanying map show the distribution of rocks suitable for building stone and masonry, riprap, road metal, ballast, lime, mortar, cement, concrete aggregate, and brick. Existing quarries and sources of oil and asphalt are shown.

J. FUELS AND OTHER MINERAL RESOURCES

Locations of coal-bearing rocks, coal mines, oil fields, and synthetic oil plants are shown on the map. The accompanying tables give data on quality, reserves, production, and accessibility of coal and oil and a brief discussion of other mineral resources.

K. GEOLOGY

The basic data from which much of the foregoing was derived are summarized on the geologic map. The table provides a general lithologic description of the rocks, their structure, and the geologic history and geomorphology of the island, for the use of geologists who may be assigned specific problems of terrain intelligence.

Method of compilation and reliability of data

These data have been assembled from published reports and maps, principally geologic. A selected bibliography is included. The data presented necessarily involve more or less interpretation on the part of the compilers and the reliability depends very largely on the adequacy of the original reports and maps of the area. Each compilation is given a reliability rating as judged by the compilers. These ratings are:

Class A: Original data so complete that the compilation involves little or no interpretation by the compilers.

Class B: Original data seem accurate but incomplete for this purpose, and have required much interpretation.

Class C: Less accurate and less complete than B, better than D.

Class D: Original data very sketchy; inaccurate as well as incomplete.

Maps are rated in four classes, as follows:

Surveyed map: The original map represents an actual instrumental survey and should be entirely reliable for the scale.

Reconnaissance map: The original map was not surveyed but seems to have been carefully prepared. General features are correctly shown but the details are incomplete and inaccurate for the scale.

Sketch map: The original map is highly diagrammatic and may contain gross errors.

Generalized map: Small-scale maps generalized from large-scale surveyed or reconnaissance maps.

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General

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Yamasaki, N., A glimpse of the Island Sakhalin: Proc. Pan-Pacific Science Cong. (Australia), vol. 2, pp. 1334-1344, 1923.
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*Tokyo Geographical Society, Jour. Geography, vol. 51, no. 486, August, 1929.
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*Damperov, D. I., and Eliseev, D. N., On the Quaternary deposits of the North Sakhalin in connection with the problem of Quaternary terraces: Second Internat. Conf. on Quaternary Period in Europe, Leningrad, 1932, Trans., fasc. 3, pp. 137-147, 1933.
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*Sakhalinskaya gorno-geologicheskaya ekspeditsiya 1925 goda: Geologicheski Komitet, Materialy Po Obshchei i Prikladnoi Geologi, vyp. 112, Leningrad, 1927. (Sakhalin Geological and Mining Expedition: Geological Committee, Materials on General and Applied Geology, fasc. 112, Leningrad, 1927.)
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In English. Oil analyses.

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Kanehara, N. (Editor), The geology and mineral resources of the Japanese Empire: Imperial Geol. Surv. of Japan, 136 pp., Tokyo, 1926.
In English. Lithology. Notes on economic uses of rocks.

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In English. Cross-section and map of Nayoshi laccolith, northwest Japanese Sakhalin. Table of volcanic activity and map of igneous rocks of Sakhalin.

*Khomenko, I. P., Stratigrafiya tretichnykh otlozheni Polyostrova Shmidta (sev. Sakhalin): Neftyanoi Geologo-Razvedochny Institut, Trudy, seriya A, vyp. 103, 1938. (Khomenko, I. P., Stratigraphy of the Tertiary deposits of Schmidt Peninsula: Geological Oil Institute, Trans., series A, fasc. 103, 1938.)
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*Yoshimura, Toyofumi, Diabases in the Muika River basin, Sakhalin: Jour. Geol. Soc. Japan, vol. 46, p. 560 ff., Nov., 1939.
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NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 54° 53° 52° 51°

Sakhalin Gulf

Gulf of Tartary

OKHOTSK SEA

SEA

Tartary Strait

SIBERIA

Kaiba Island

La Perouse Strait (Soya Strait)

Aniwa Bay

Taraika Bay (Patience Bay)

Kaikio Island

Cape Marii
Severny Bay
Cape Elizavety
Nyvrų
Kuegda Bay
Neurtu Bay
Tumi
X 1300'
Mt Espenberga
Schmidt Peninsula
Mt Tri Brata 2360'X
Cape Levenshterna
Longri
Lake Tront
Koldu Bay
Pomrų
Pomrų Bay
Lake Khankes
Moskalvo
Okha
Urkt Bay
Viskvo
Ushi I
Astrakhanovka
Baikal Bay
Ekhabi Bay
Odoptu Bay
Rybnoe
Cape Tamlevo
Vereshchagino
Tocci
Nikolayevsk
Amur
Pomanovka
Sabo
Saba
Piltun Bay
Verkhne-Mikhailovskoe
Langri
Piltun
Kyakrvo
Uste Chingaya
Purko
Mt Ossoi X 1200'
Noksi
Kutovo
Cape Nyide
Tragi
Goromai
Val
Khanduza
Askasgai
Chaivo
Chaivo Bay
Mt Engiz-Pal 1780'X
Cape Uaz
Pogobi
Uangi
Dagi
X 2000
Mt Dae-khure
Lyarvo
Tugmach
Uini
Nyivo
Nyiski Bay
Dzhimdan
Nogliki
Lakh
Cape Lakh
Chagma
Tyk Bay
Tyk
Cape Tyk
Viakhtu
Viakhtu Bay
Katangli
Nabilski Bay
Nysh
X 1600'
Mt Ververpal
Trambaus
Cape Uandi
Nabil
Orkuni
Lunski Bay
Khoi
Cape Khoi
Albvo
X 3000'
Adatymovo
Tym
Mgach
Slava
Pilngvo
Apkovo
X 5500'
Mt Lopatina
Chamgu
Aleksandrovsk
Mt Dichun X 2800'
Nampi
Cape De Lisle de la Croyere
Due
Derbinskoe
Aleksandrovsk
Malotymovo
Kirovskoe
Oktyabrski
Vengeri
Cape Ratmanova
Ust Agnevo
Cape Furugelma
Agnevo
Longori
Mt Nevelskogo X 6602'
Valza
Pogranichnoe
Nai-Nai
Cape Mosiya
Shirokaya Pad
Khandacy
Valza
Poronai
Onor
Mt Aimi-Yama X 5400'
Langeri
Pilevo
Cape Korsakova
Grodekovo
Pilenga
Pilenga

Mt Aumi X 3314'
Kandasawa
Ambetsu
Oketsu
Koton
Muiko
X 3800'
Mt Okimi
Asase
Sokunai (Ennai)
Asase
Shirunai
Yokunai
Kitasoya
Nishisakutan
Keton
Keton
Mirukunai
Saren
Poronai
Nishisakutan
Onnai
Atsunai
Funadomari
Furiro
Chikoro
Sarutsu
Hoe
Hoe
Rukutama
Cape Aniwa
Yamakae
Kitanayoshi
Shomon
Motomari
Cape Morotsu
Morotsu
Mt Shikuka X 4350'
Shomon
Lake Taraika
Lake Tadao
Kamishikuka
Shikuka
Nokoro
Taraika
Nokoro
Itone
Toro
Nalkawa
Okasawa
Shikuka
Yamukenai
Kitashiretoko
Cape Osaka
Ohira
Esutoru
Nairo
Chirigue
Chikunai
Esutoru
Kamiesutoru
Niitoi
Tomarigishi
Cape Noteto
Nakasenochi
Peninsula
Horogishi
Horochi
Niitoi
Konto
Enton
Ushiro
Otoi
Cape Ushiro 3586'X
Mt Kamafuku
Shiritori
Cape Shimakutomo
Higashisakutan
Sakaigawa
Kotan
Chishini
Shiritori
Cape Kitashiretoko
Nakasoko
Raichishi
Kitaenkotan
Higashirebun
Lake Raichishi
Chinnai
Higashiporonaipo
Chinnai
Kashiho
Shodasu
Motodomari
Rukushi
Maguntan
Moeru
Ehisu
Shiraishizawa
Ushike
Noborippo
Kushunnai
Takarazawa
Kushunnai
Nayoro
Manui
Chirai
Shiraura
Tomarioru
Daiei (Osaksae)
Horo
Tomon
Tomarioru
Ote
Mt Nodasan X 3376'
Odasamu
Cape Chikai
Shirahama
Aushi
Aihama
Noda
Noda
Naibuchi
Sakaehama
Konotoro
Cape Konotoro
Kenotoro
Ochiai
Totsi
Otani
Nosamu
Rantomari
Kawakami
Horotomari
Enko
Konuma
Minamiobusaki
Maoka
Shimizu
X 3428'
Osaka
Futamata
Mt Susuya
Minamienkotan
Hiroshi
Mizuho
Toyohara
Ochiho
Tarandomari
Rutaka
Nakazawa
Susuya
Toyomatsu
Tonnai
Cape Airo
Minakishi
Tonnai Bay
Asanai
Oko
Otoyo
Shimba
Airo
Kaizuka
Cape Oyakuti
Honto
Tokombo
Kenoshi
Tarannai
Rutaka
Chitose Bay
Odomari
Merci
L Wasi
Tarannai
Ushinizawa
Poronaiho
Nagahama
Naihoro
Suwinai
Uryu
Tofuchi
L Tofuchi
Okunaihoro
Yoshini (Minaminayoshi)
Okunayoshi
Uryu
Akaiwa
Minabetsu
Cape Minabetsu
Hishitoru
Yaman
Mita
Romonai
Towada
Moshu
Dorokawa
Furue
Ohoye
Cape Chichine
Chichine
Satto
Hota
Naisha
Shiraiwa
Chiho
Soni
Cape Soni
Mochinai
Chishiya
Chikatomari
Shiranushi
Nanaye
Cape Nakashiretoko
Cape Nishinotoro

0 50 Miles
0 50 Kilometers

Compiled by U. S. Geological Survey chiefly from
Geological map of South Sakhalin: Tokyo Geog. Soc., 1939. (In Japanese).
Great Soviet World Atlas, vol. 2, 1939. (In Russian).

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 54° 53° 52° 51°

Cape Elizavety
Cape Marii
Schmidt Peninsula
Sakhalin Gulf
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Tartary Strait of
Piltun Bay
OKHOTSK SEA
SIBERIA
Chaivo Bay
Nyiski Bay
Cape Tyk
Nyish
Katangli
Nabilski Bay
Tym
Adatymovo
Aleksandrovsk
Due
Derbinskoe
Kirovskoe
Cape De Lisle de la Croyere
Reported railroad, existence doubtful
Shown on Army Map Service Special Strategic Map as secondary road
Pilevo
Poronai

Ambetsu
Poronai
Shown on Army Map Service Special Strategic Map as a secondary road
Kitanayoshi
Shikuka
Nairo
Esutoru
Kitashiretoko Peninsula
Ushiro
Taraika Bay (Patience Bay)
Cape Kitashiretoko
Shiritori
Kaikio Island
Gulf of Tartary
Chinnai
OKHOTSK SEA
Kushunnai
Manui
Army Map Service Special Strategic Map shows railroad extending to Ushiro
Tomarioru
Shiraura
Ochiai
Maoka
Toyohara
Honto
Rutaka
Odomari
Kaiba Island
Aniwa Bay
Cape Nakashiretoko
Cape Nishinotoro
La Perouse Strait (Soya Strait)

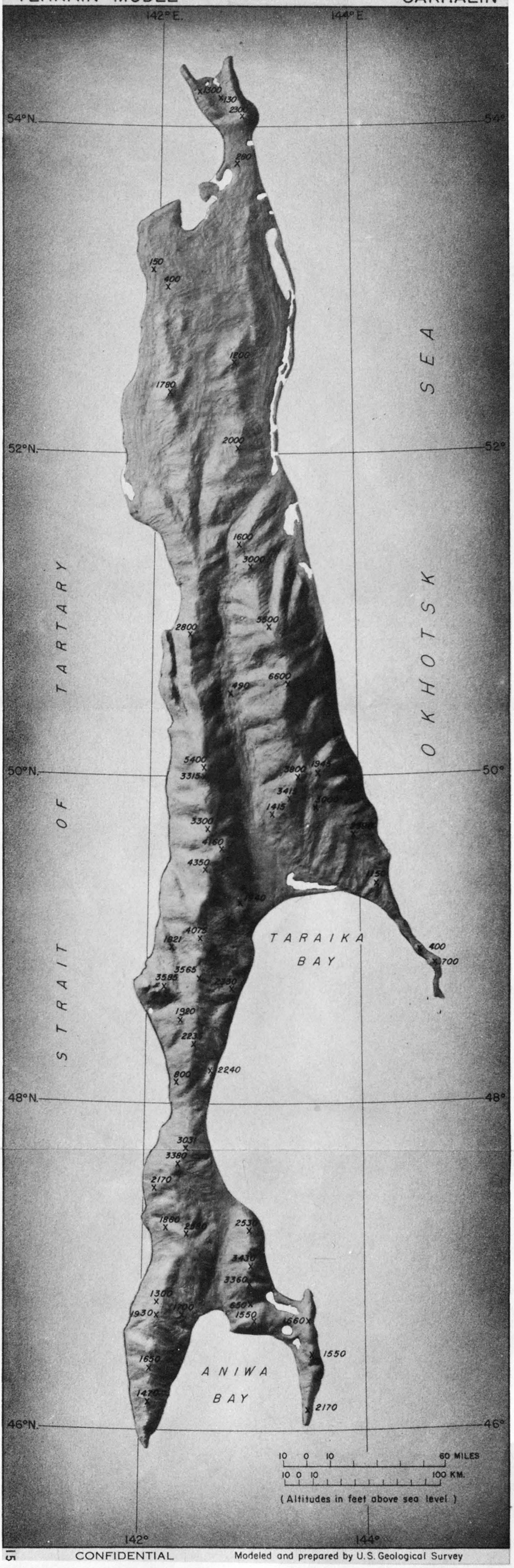
EXPLANATION

- Railroad, standard gage (3 feet wide in Japanese Sakhalin)
- Railroad, narrow gage (usually 2 feet wide)
- Primary road
- Secondary road
- Trail
- Telegraph line
- Road and telegraph line
- Cable
- Anchorage
- Harbor

10 0 50 Miles
10 0 50 Kilometers

Compiled by U. S. Geological Survey

TERRAIN MODEL CONFIDENTIAL SAKHALIN



CONFIDENTIAL Modeled and prepared by U.S. Geological Survey

TERRAIN APPRECIATION

CONFIDENTIAL

SAKHALIN ISLAND

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

SIBERIA

Sakhalin Gulf

Strait

Tatar Strait

OKHOTSK SEA

La Perouse Strait (Soya Strait)

Aniwa Bay

Taraika Bay (Patience Bay)

Cape Elizavety
Cape Marii
Schmidt Peninsula
Tri Brata
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Piltun Bay
Langri
Chaivo Bay
Cape Pogobi
Engiz Pal
Nyiski Bay
Nabilski Bay
Cape Tyk
Katangli
Adatymovo
Aleksandrovsk
Due
Derbinskoe
Kirovskoe
Cape De Lisle de la Croyere
Pilevo
Ambetsu
Kitanayoshi
Esutoru
Shikuka
Nairo
Kitashiretoko Peninsula
Cape Ushiro
Shiritori
Cape Kitashiretoko
Kaikio Island
Chinnai
Kushunnai
Shiraura
Tomarioru
Ochiai
Maoka
Toyohara
Rutaka
Odomari
Honto
Lake Tennai
Yaman
Minabetsu
Cape Nakashiretoko
Kaiba Island
Cape Nishinotoro

1200'
1670'
1600'
650'
820'
338'

50°
49°
48°
47°
46°
54°
53°
52°
51°

141°
142°
143°
144°
145°

EXPLANATION

- Flat plains.
- Sandy beaches.
- Swampy areas on flat plains.
- Rough, hilly land.
- High mountains.
- Abrupt cliffs.
- Routes and passes across mountains. Altitude of pass, (where known) in feet.
- Terrain area boundary.

Terrain Areas:

1. Shiretoko Peninsula.
2. Tonnai Depression.
3. Susuya Mountains.
4. Toyohara Plain.
5. South part of Western Range.
6. Central part of Western Range.
7. North part of Western Range.
8. Kitashiretoko Peninsula.
9. Eastern Range.
10. Poronai Plain.
11. Tym Plain.
12. East Coastal Plain.
13. West Coastal Plain.
14. Northern Upland.
15. Schmidt Peninsula.

Sketch map

Reconnaissance map

50 Miles
50 Kilometers

Compiled by U. S. Geological Survey

Introduction

Sakhalin is composed principally of north-trending mountain ranges, which form a mountainous coast line edged in places by narrow beaches or coastal terraces. Ranges are separated in the center of much of the island by elongate depressions. The Western Range, the main range of Sakhalin, extends from the south tip of the island north to about latitude 51°30' N. At the south end the Western Range is separated from the Susuya Mountains and the mountainous Shiretoko Peninsula (Area 1) to the east by an elongate depression, the Toyohara Plain. At the north the Western Range is separated from the large Eastern Range, which forms the highest point of the island, by an elongate, swampy, peat-covered depression occupied by the north-flowing Tym River and the south-flowing Poronai River, the two largest rivers in Sakhalin. Between the Eastern Range and Susuya Mountains the island is very narrow, consisting only of the Western Range which is narrower and lower here than elsewhere. Mountains on the east side are rugged, formed of hard, massive rocks; while the Western Range is more rounded, and formed of softer rocks. In all mountains bedrock is covered by a thin soil and outcrops are uncommon. The depressions are filled with thick deposits of soft unconsolidated materials. Sloping alluvial fans extend from the foot of bordering mountains into central flats of the depressions. North of about latitude 51° N., the mountains are progressively farther inland and the coasts are formed by wide, terraced plains, swampy and peaty in many places. The mountains become discontinuous masses and peaks, lower to the north and die out near the Schmidt Peninsula. The interior of the north part of the island is poorly known, but the mountains are thought to be divided in the central part of the island by a depressed area consisting of an uplifted and dissected, terraced plain. The Schmidt Peninsula at the north tip of Sakhalin is similar to the south part of the island but on a much smaller scale. It is formed by coastal mountain chains, separated at the north by a central depression.

Sakhalin is within the East Asia monsoon region. In summer south winds predominate, in winter winds are dominantly from the north and from the interior. On the east side of the island is the extremely cold Okhotsk Sea but the southwest coast is warmed by a warm branch of the Japanese current. Strong winds and cold, wet climate are typical. Winters are very rigorous on the coasts. The east coast is colder and has more fogs but is less cloudy than the west coast. Fogs occur in summer. Sakhalin is very cloudy the entire year, least cloudy on east coast in winter (65% cloudiness). Most precipitation occurs in summer and fall (July to October), but is fairly well distributed throughout the year. Rivers flood in spring, when valley snow melts and again when mountain snow melts, and in summer, when most rain falls. Snow cover is from two feet in south to seven feet in mountains at the north and winds pile up high drifts in valleys. Humidity high, least in spring and fall but the lowest monthly average is above 60%. Low temperatures retard evaporation and ground is almost constantly moist. Evaporation is greater on west coast than on east coast and there is less evaporation during September, the rainiest month, than in the rest of the summer and fall. As a result dirt roads are in extremely bad condition in September and especially so on the east coast.

Soils are for the most part podzols (intensely leached, moist, gray soil with thick humus layer at surface). Most of the island is covered by forest. In the mountains are thick fir, spruce, and larch forests (called taiga), full of windfalls and with thick underbrush of low, spreading pine (Pinus pumila) and Kurilean dwarf bamboo, which also cover the few high peaks and ridges above timber line. Deciduous forests cover lower slopes and valleys. Valleys and lowlands contain grassy undergrowth 10 feet or more in height. A few meadows of grass and roses, tulips, irises and other flowers. North of Taraika Bay much of the interior lowlands and coastal plains are a tundra, covered with sphagnum moss and a few dwarf larch. Dryer portions of the coastal plains contain spreading pine, huckleberry, raspberry, and cranberry bushes and a type of heath (Ledum). At the far north the trees of the conifer forests are smaller and at the coasts become dwarfed. Mountain slopes and plains on the north and east coast of Schmidt Peninsula contain only growths of spreading pine. The thick undergrowth of the island is very difficult to penetrate and many thorny plants, such as the rose, burdock, berry bushes, hawthorn and others, are destructive to clothing. Large fires are common in the entire island and there are many large burned-out areas in the forests, covered by a second growth of birch, alder, and larch. Fires are most common in the fall. Some reported to have lasted as long as three consecutive years.

No. and Name of Area	Topography	Kind of Ground	Climate and Vegetation	Settlements and Communications a/ (Data incomplete; consult other intelligence sources)	Movement and Obstacles	Cover, Concealment, and Observation
1 Shiretoko Peninsula	Low, rugged mountains; altitude of crest 1,300 to 2,170 feet. More rugged than main, western, range of Sakhalin. Both coasts are steep; cliffs (up to 325 feet high) descend directly into sea or have narrow strips of flat, rocky shore at the base. North tip of peninsula is lower, more rounded than the rest of area. Streams flow east and west, are small; have steep gradients and narrow, steep-walled valleys.	Granite, limestone, and other hard crystalline rocks covered in most of area by a foot or less of residual, rocky clay and sand soil. Bare rock is rare, occurring in a few valley walls and some high peaks. Valleys filled with gravel and broken rock. Lower valleys of largest streams may have thin sand and gravel alluvium covered by soil. Drainage fairly good.	Climate similar to Area 3. Peninsula is covered by fir and spruce forest with mixture of deciduous trees. Many areas of burned-out land, now covered by brush and young second growth. Forests contain windfalls and thick bamboo and tendril undergrowth.	Trails follow the coast and cross the peninsula in several places along narrow valleys and over passes. Poor road crosses the central part of peninsula. Fishing villages are almost restricted to south half, along trails; and majority are on west coast, where a short road connects them with central part of island. Several rock quarries. Largest town in area, Yaman (population less than 1,000) is connected to coal mine in the mountains by a short narrow-gage railroad.	Area is a barrier. Movement is difficult. Best route is a poor road (6 to 9 feet wide) across central part of area from Yaman to Minabetsu harbor on east coast; follows narrow river valleys and crosses pass at 820 feet altitude. From Yaman north along west coast a road can be followed to central part of island. Trails along coast and over passes are passable with difficulty only by foot or pack train. Off the trails movement even on foot is very difficult because of high slopes, thick forest, and underbrush.	Forest provides concealment and cover everywhere except in burned-out areas, which can be avoided. Vegetation everywhere conceals rock and soil. Conifer forest remains the same unvariegated dark green color the year round, but in winter is largely covered by snow. Valleys and irregular mountain forms of the area provide topographic cover, however shallow soil and hard bedrock do not permit excavation for hasty fortifications. Locally, cover may be found in the small frame and timber houses of the villages and in the few quarries. Observation limited by rugged topography and forest cover.
2 Tonnai Depression	Low, rolling land containing a number of very large lakes and lagoons which make up about half the area and divide it into compartments. The Aniwa Bay coast and east part of Okhotsk Sea coast are low sandy flats. Inland areas are rolling hills and terraces. The highest points are 400 to 650 feet in altitude. Hills and terraces form low cliffs at west half of north shore with sandy beaches at base. In the northeast, rivers and lagoons are bordered by small swampy areas. Streams are small and have shallow valleys.	Terraces and hills composed of moderately hard to hard rock (shale and sandstone) overlain by a few feet or less of residual soil. At the south the shore and land between the lakes is composed of sand bars and unconsolidated sand and gravel deposits. At the north similar deposits form the east and northeast shore of Lake Tonnai.	Climate similar to Area 3. The entire area, hills, terraces and sandy flats, covered with coniferous forest (spruce, fir, larch). A strip of deciduous forest borders streams in northeast.	Road along south coast and poor road or trail along north coast. Villages only on these roads, with exception of a single small settlement on inland shore of Lake Tonnai. Trails follow foot of mountains on west edge of area and inland edges of lakes and lagoons.	Topographic corridor. East-west movement can be accomplished by road and trails. Off the road and trails movement is hindered by forest but might be possible on foot or horseback, especially along sandy coasts where forests are thinnest. North-south movement limited by lakes; possible only on east and west edges of area where a few trails exist. Mechanized movement possible only on the south road.	Low rolling hills and terrace scarps are only topographic cover in area. Forest cover and concealment possible throughout area. In rolling land and terraces, hasty fortifications easily made (except in winter when ground is frozen) and would be fairly well drained. Bedrock, if reached, could in most cases be excavated by hand tools without great difficulty. Sandy areas near coast are easily excavated and shallow fox holes in most places would probably be free of water. Small frame and timber houses in villages. Thin strips of sandy beaches bare of vegetation; sand-yellow in color. In rest of area, ground completely covered by light and dark green conifer forest and along streams by light green deciduous strips which turn brown in fall. Snow in winter covers the forests. Mountainous areas on either side command views of Tonnai Depression.
3 Susuya Mountains	Rugged, north-trending mountains separated into two masses by a central northeast trending belt of rounded, low hills, 600 to 650 feet in altitude. Northern mountains are the higher (highest point 3,430 feet altitude, near south end), with steep slopes descending on one side to the Toyohara Plain and on the other to the sea as perpendicular cliffs. Boulders and rocks at base of cliffs. Southern mountain mass is smaller, rises abruptly above terraced south coast; terraces up to 100 feet high; also occur along Tonnai Lake. Streams flow east and west from central divide in narrow, rocky valleys.	North and south mountains formed of hard, massive rock; exposed in many places. Northeast-trending low belt is composed of moderately hard sandstone and shale. Most of area is covered by thin residual soil (generally a foot or less). Ground is well drained. Valleys filled with coarse rock debris. At Odomari ground freezes in winter to depth of 1.5 to 2.0 feet.	At Odomari mean annual precipitation is 28 inches, highest June to Sept. (4 inches monthly). Snow falls from end of Oct. to middle of May. Average temperature of warmest month, Aug., is 63° F., of coldest month, Jan., 12° F. Predominantly freezing weather from middle of Nov. to middle of April. Maximum cloudiness in July (76%). Most fogs in July (average 10 fogs in July in Aniwa Bay). Winter winds predominantly from north, summer winds from south. Area covered by mixed forest of larch, birch, some fir and spruce. Thick undergrowth, in the north mainly low spreading pine; and in part dwarf bamboo. Low foothills and terraces on the east side have meadows, partly under cultivation, dotted with groves of birch, poplar, and some oak, larch, spruce, and fir. Rocky summits are bare of forest but covered with a growth of spreading pine.	Settlements along the coasts fewer and connected by trail on the rocky north coast; thicker and connected by road on the terraced south coast. On the south coast is largest town, Odomari, population over 35,000. Low hills between north and south mountains are crossed by two roads and several trails; contain a number of villages. High mountains have no settlements; are crossed by only a few trails.	Corridors of movement across the mountains westward by road on the terraced south coast and in the central hilly area, where roads follow stream valleys. Elsewhere no means of crossing except on foot or by pack train on a few narrow, difficult trails over passes at heads of valleys. No route north except by trail on rocky, steep northeast coast.	Rough mountain topography and forest provide cover and concealment everywhere except on some bare summits. Hasty fortifications in mountains difficult because of thin soil and hard bedrock. Probably suitable for hasty fortifications in low hills where soil is a little thicker and rock softer. Cover in settlements provided by frame and timber houses, and possibly a few stone buildings in Odomari. Vegetation colors are perennial dark green of coniferous trees, and light-green deciduous foliage, turning brown in fall. Mountain summits of gray and brown rock are spotted by dark green spreading pine. Irregular topography and forest limit observation in most of the area. Mountain passes can probably be commanded from surrounding heights.
4 Toyohara Plain	Low plain occupied by large north- and south-flowing rivers. River banks 5-10 feet high. Small tributaries cut 30 to 50 feet into plains; channels usually almost dry. Area bounded on east and west by mountains, from whose bases alluvial fans spread out onto central flats. Small swamps are at the base of the fans. In places terraces border the mountains; on the west side terraces at about 200 feet altitude. Lagoons and swamp lands, edged with sand bars and dunes on north and south coasts. In the north, swamps continue along the rivers for some distance inland.	Plain composed of soft, unconsolidated, clayey sand and gravel, which are permeable and well drained except in swampy areas near coasts. Dunes, bars, and beaches of sand at the shore. At Ochiai, ground freezes in winter to about 1.5 feet in depth.	Sheltered from severe winds; climate less severe than at coast. At Ochiai, strongest winds in April and May (average velocity 9 miles/hour). Winds from north and south all year except in fall when southerlies predominate. Mean annual precipitation 30 to 33 inches, highest in July to Oct. Cloudiest in July and Dec. (79%). Average temperature in Aug., warmest month, is 63° F., in Jan., coldest month, 6° F. Snow falls from late Oct. to late May. Mean maximum snow cover 3 feet. Predominantly freezing weather from early Nov. to middle of April. Most of plain covered by low spruce, fir, and larch forest; deciduous trees along streams; mixed coniferous and deciduous forest and open meadows on alluvial fans. Much forest area has been cleared and is under cultivation. Swampy areas covered with coniferous forest, or treeless and covered with yellowish reed or drab-green moss. Dunes of north shore are covered with numerous spreading pines.	Main agricultural and most highly settled area in Sakhalin. Standard-gage railroad and highway (15 to 18 feet wide) extend length of plain with many branching routes. Many settlements, including large towns of Toyohara (over 35,000 population), Rutaka, and Ochiai (populations over 10,000).	Topographic corridor leading north. Railroads and highways provide good routes. Land flat and low, most ground dry. Main streams are obstacles to movement except in center of area at low divide between north- and south-flowing drainage. Tributary streams, flowing over fans, have little water. Forest hinders movement in part of area.	No topographic cover and concealment except in rolling land near center and margins of area. Forest provides cover and concealment in much of area, but flat, treeless, cultivated land is completely exposed. Frame and timber houses and, in largest towns, a few brick and stone buildings. Coniferous forest dark green, deciduous forest light green, turning to brown in fall; swamp yellowish and drab-green; grain fields green in spring, yellow in fall; and beaches yellow sand. High, steep, bordering mountains provide commanding views of plain, particularly on east side

(continued)

No. and Name of Area	Topography	Kind of Ground	Climate and Vegetation	Settlements and Communications a/ (Data incomplete; consult other intelligence sources)	Movement and Obstacles	Cover, Concealment, and Observation
5 South part of Western Range	Long, high, north-trending range. Highest point, 3,380 feet altitude, in north, but at extreme north, range is narrow and low (about 800 feet altitude) and has upland flats. Range terminates at south by a rocky cape bordered with steep cliffs. Similar coast line continues north on both sides of range to about latitude of Honto. In places on west coast, however, are small beaches at foot of cliffs. North of Honto, are terraces at foot of mountains; level strip 30 to 300 feet wide along beach, behind it several terraces 25 to 150 feet above sea level. To the north, terraced shore is interrupted in many places by stretches of precipice 100 feet high. On Okhotsk Sea, coast is narrow sandy beach at foot of mountains, widening at river mouths. Streams drain east and west from central divide, trend generally northwest. Most are narrow; largest widen and become flat-bottomed near mouths. Rutaka River, largest in area, has a flat, one half to one mile wide, valley extending into range a long distance. Valley is terraced, river winding, cuts into both sides of valley and in places forms steep, bluff walls.	Poorly consolidated to moderately hard rocks (mainly sandstone and shale) covered by less than a foot of rocky, sandy, clay soil. Few exposures of bedrock. Ground fairly well drained. Wider valleys filled with sand and gravel alluvium covered by sandy clay soil. At Maoka ground freezes in winter to a depth of about 1.5 feet.	West coast very cloudy all year, maximum cloudiness in Dec. (90% at Honto). Mean annual precipitation 30 inches, highest July to Nov., otherwise fairly evenly distributed. Snow falls from middle Oct. to Middle May. Predominantly freezing weather middle Nov. to April. Average temperature in August, 65° F., in January, 15° F. Winters, though less cold than in other parts of island, are severe because of strong winds, strongest in winter and spring. At Maoka winter winds average 15 miles/hour. Timber line is as low as 1,000 feet altitude at coasts because of winds, considerably lower than in north part of range. Summits above timber line covered by low spreading pine. Slopes elsewhere densely covered by forest of fir, spruce, some larch and birch; thick undergrowth of spreading pine and dwarf bamboo. Valleys are overgrown by deciduous forest of oak, birch, alder, elm, willow, poplar, beech, maple, cherry, and undergrowth of shrubs (including thorny roses) and grass which grows over 10 feet high. At north on low mountains, deciduous forest has wide extent, and on slopes and summits are many small fields clear of trees, covered by dwarf bamboo.	Principal area of settlement is west coast. Several large towns, Maoka, Tomariory, populations over 10,000, and Honto, population over 5,000, numerous smaller towns, connected by highway (12 to 15 feet wide) and, along most of the coast, by standard-gage railroad. Most of east coast also followed by highway (15 to 18 feet wide) and in north by standard-gage railroad. East coast towns small (largest is Shiraura, population over 5,000). From Maoka a railroad and highway (15 feet wide) cross the range to Toyohara; another highway leads to Rutaka through Rutaka Valley. At north, a highway crosses range between Kushunnai and Shiraura. Mountainous interior is sparsely settled and, besides transverse railroad and highways, is supplied only by a few, generally short trails, roads and narrow-gage railroads. Industry is lumber, fishing, and coal mining.	Barrier region. Can be crossed at north end, lowest and narrowest part of range, by highway which follows wooded, about ½ mile wide, flat valleys from both coasts and crosses low divide by narrow wooded pass. At Maoka range can be crossed by a highway which is steep and winding in narrow canyon, crosses a high divide and forks, one route going east to Toyohara, crossing a second, higher, pass, and the other turning south to Rutaka and following low, about one mile wide, flat Rutaka Valley which contains farming areas crossed by small roads and trails. Road follows narrow valley west from south end of Rutaka Valley, crosses high pass near west coast and continues down steep valley to Honto. Elsewhere range can be crossed only at a few trails on foot or by pack train; travel even on foot off the trails is very difficult because of forest and thick undergrowth. North-south movement of vehicles possible only on coasts on highways and for short stretches on the beaches.	Mountainous topography and extensive forest provide cover and concealment in most of the area. Settlements have frame and timber houses, few stone buildings. Soil in mountains too shallow for fox holes but in some places bedrock is soft enough to permit shallow excavation by hand tools. Valley alluvium can be easily excavated. Drainage on most slopes adequate. Slopes have dark green color of conifers; valleys light green of deciduous trees, turning brown in fall; beaches sand-yellow. In winter everything covered by snow. Observation generally limited by rough topography and forest. Passes can probably be commanded from surrounding heights.
6 Central part of Western Range	Highest part of massive, north-trending Western Range, highest point about 4,350 feet altitude. North part of area is rugged. In region of Cape Ushiro, high mountains surmounted by several peaks, possibly volcanic, and at the shore form a rocky cliff about 200 feet high. South of cape, west border of range is terraced and has a low shore line, high cliffs in only a few places at shore, but north of cape, the mountains end in a straight, high cliff with a narrow beach at base which widens at mouths of a few large valleys. South part of east coast is steep precipice alternating with terraced shore, but in north, a wide sandy beach follows base of mountains. Streams drain east and west from central divide; several of the largest have wide, flat, terraced valley bottoms for some distance from mountain front.	Similar to Area 5. Exposed bedrock in valley walls at the north.	Mean annual precipitation 30 inches. At Ambetsu, highest precipitation in September (5 inches). Cloudiest in winter. Snow falls between middle Sept. and middle May. Mean maximum snow cover is 2 feet. Predominantly freezing weather from Nov. to middle of April. Average temperature in Aug., 62° F., in Jan., 3° F. Storms and strongest winds in Dec., average wind velocity 9.5 miles/hour. Winds predominantly from northeast in winter; southwest in summer. Vegetation similar to that in Area 5. Coniferous forest and thick underbrush on slopes, summits covered by spreading pine, valleys covered by deciduous forest and grassy undergrowth.	Highway, 15 to 18 feet wide, and standard-gage railroad on east coast. Highway on west coast 12 to 15 feet wide. Mountains crossed by a road from Esutoru east. Settlements almost entirely on coasts. Shiritori, which has the largest wood pulp plant in the Far East, and Kitanayoshi, have populations over 20,000. Industries are lumbering, fishing, and coal mining.	Barrier region. Range can be crossed east from Esutoru by steep and winding road, which follows narrow valleys in part and crosses several divides. At highest pass it narrows and may be just a trail, not passable to vehicles. Vehicles can use highways on west and east coasts. Short dead-end roads, passable to vehicles, lead inland along a few larger valleys. From coastal roads, many short trails lead to interior and can be followed on foot or by pack train. No trails cross the divide, and except for road east of Esutoru, movement across the range, even on foot, is very difficult because of steep high slopes and thick forest and underbrush.	Similar to Area 5. Bedrock soft enough to be excavated by hand tools exists only in small areas along the east and west margins.
7 North part of Western Range	High north-trending range, widest and highest in south (highest point 5,400 feet in altitude), gradually becomes lower and narrower to north. South of Aleksandrovsk, mountains descend abruptly into the sea and form steep cliff 300 to 700 feet high, with slope up to 70°; at its base is a sandy beach, exposed only at low tide, and in places covered by large rocks. North of Aleksandrovsk the foot of the range is terraced in most places. Terraces form a bluff 60 to 100 feet high, at the base of which is a narrow sandy beach not inundated at high tide. To the east, range descends steeply toward the Tym and Poronai Plains, but flattens out at the alluvial fans at its base. East- and west-flowing streams have narrow steep valleys except near mouths of largest streams, where valleys widen (up to half a mile) and have flat, terraced bottoms; terraces up to 40 feet high. Some narrow streams form waterfalls and cascades at coastal cliffs. Large valleys interrupt the sheer coastal cliffs by wide notches and provide the only access to the interior. Largest area of flat land in the range is a straight, flat-bottomed, less than one mile wide, depression trending parallel to the range; occupied by Aleksandrovka and Agnevo Rivers. Depression is terraced, slightly swampy in part.	Moderately hard rock covered by a few inches of sandy-clay soil full of rock fragments. Little bedrock exposed. On the coast, from Aleksandrovsk south, many areas of hard massive rock. Mountain slopes fairly well drained. Flood plains and terraces of larger valleys filled with alluvium, gravel overlain by sand and covered by dark-brown sandy-clay soil. Gravel often shallow and sometimes at surface. Alluvium averages 6 feet in thickness, but at Aleksandrovsk a river terrace, on which town is built, is composed of gravel 35 feet thick. On lower slopes and in places in Aleksandrovka Valley, surface soil is peaty to a depth of 8 inches or less.	Windy and cold, but not as cold or severe as east coast. North and northwest winds in winter; south and southeast winds in summer. Average annual temperature is slightly below freezing. Average temperature in January, -7.2° F. Spring begins with April, summer the middle of June, fall Sept., and winter Dec. Predominantly freezing weather from Dec. through April. Blizzards every 10 days or so Dec. through Feb. Rivers freeze from mid-November to late March or early April. At Aleksandrovsk annual precipitation 28 inches, highest in Aug. and Sept. (3 inches a month), lowest in Feb. (1 inch). Rains about 100 days a year; snows 75 to 100 days a year. Snow falls from mid-October to mid-May. Snow up to 7 feet deep remains in the mountains until the middle of July. Average cloudiness 65% to 70%, least in winter. Fogs in summer; occur 13 days a year. Area is heavily forested except for some summits and high slopes. Interior slopes of mountains covered by fir and spruce forest to 2,300 feet altitude. Coastal slopes, exposed to ocean winds, covered by conifer forest only to 1,600 feet altitude. Higher slopes and summits covered by thick growths of spreading pine, also present in conifer forest as heavy undergrowth. Some larch, alder, and above 700 to 1,000 feet altitude, mountain birch. In places on slopes, in valleys, and in passes, thickets of dwarf bamboo form the undergrowth. Valleys are covered by deciduous forest: alder, elm, ash, poplar, willow, elder, bird-cherry, sorb, and thorny hawthorn. Undergrowth in valleys is high grass (9 to 13 feet high): burdock, buckwheat, high nettles, and thorny rose. Fires are common and slopes have large burned-out areas. In these and cut-over areas, young growths of birch and alder cover ground. Near Pilevo a thorny shrub grows in underbrush.	Settlements almost restricted to coast and Aleksandrovka-Agnevo Depression. Coal mining, fishing, and lumber towns. Agriculture practiced to very limited extent in Aleksandrovka-Agnevo Depression. Aleksandrovsk (15,000 population) is administrative center of Russian Sakhalin. Other towns are quite small. Highway joins Aleksandrovsk with Derbinskoe in the interior, open all year. Poor road along west coast. Several trails cross range and follow Aleksandrovka-Agnevo Depression.	Vehicle movement across the range only possible by highway (usable all year) between Aleksandrovsk and Derbinskoe, which, on both sides, follows valleys and crosses the divide by a pass. Highway is steep and winding. In several places trails lead from coast up wide valleys, which narrow a short distance inland, over passes at divide and down similar valleys on east slopes of mountains. Though trails in the lower part of valleys might be passable to vehicles, passes are too narrow to accommodate them and usually are so thickly overgrown with dwarf bamboo that even movement on foot or horseback is difficult. Road along coastal edge of mountains is poor, narrow, crosses rough terrain and is difficult for vehicles. South from Aleksandrovsk, beach at low tide is passable on foot or horseback without difficulty, except at some rocky capes. Precise timing of such travel is necessary to avoid incoming tide (two tides daily) which floods the entire beach and may trap the traveler against unscalable cliffs which extend for long distances. North from Aleksandrovsk the narrow beach is easily passable, even by vehicles, and entirely above flood tide. Movement in the Aleksandrovka-Agnevo Depression is generally limited only by forest and undergrowth; in cleared places is fairly free but such places are probably few and not large. Movement off the trails in mountains and most valleys is very difficul even on foot because of steep slopes, thick forest, and particularly, thick underbrush: tough, slippery bamboo and low, spreading pine which has a network of branches concealed by slippery foliage, difficult for footing and dangerous to step through.	Mountainous topography and extensive forest provide cover and concealment everywhere. Except in valleys, soil is too thin for hasty fortifications. In valleys drainage apt to be poor. Settlements constructed mainly of rough timber houses. In the Aleksandrovka-Agnevo Valleys cover can be found in timber houses of a number of small abandoned settlements, now overgrown with vegetation. Mines and wooden mine buildings can be used in coastal area. Perennial dark-green of conifers predominates; with light-green deciduous forest, turning brown in the fall in valleys. Yellow strips of sand beach on coast. In winter forest covered by snow. Rough topography and forest limit observation. The Aleksandrovka-Agnevo Depression and the passes are commanded by surrounding heights.
8 Kitashiretoko Peninsula	Long narrow peninsula of low, rolling hills, interrupted by flat lowlands containing lakes and lagoons. Flat-topped hill, 700 feet in altitude, in south half of peninsula; steep-sloped conical hill, altitude 400 feet, in north. Sandy beach at coast, low scarp in places. In south, west coast is terrace scarp, up to 65 feet high.	Hills of hard rock covered with thin residual soil. Hill south is hard, massive rock. Sand and gravel in flats and beaches. Few swamps, area mostly well drained.	Climate similar to Area 9. Coniferous forest covers all of hills and much of the flats. Some flats open, covered by grass and spreading pine.	A few fishing villages on coast which is followed by poor trail.	Movement easiest along sandy beaches on coasts; however, no continuous north-south routes passable to vehicles. Hills are barriers to vehicles but can be crossed on foot or by pack train. Flats provide corridors across peninsula. Narrowest part, in north, contains a lake and flat, sandy, land strips on either side are so low and narrow (500 feet wide) that small boats are dragged across them from the Okhotsk Sea on the east to Taraika Bay on the west.	Indented, rolling, forested slopes of hills provide cover and concealment. Lowlands are exposed, have no topographic cover, only partly forested. Hasty fortifications easily excavated in lowlands; probably free of groundwater in much of area. In hills, the soil probably too shallow for hasty fortifications. Small wooden houses in villages provide some cover. Forests mainly dark green, covered by snow in winter. Yellow sand-colored beaches and coastal cliffs. Hills command views of the low corridors.
9 Eastern Range	Very rugged, north-trending range. Highest mountains in Sakhalin. Highest part, 6,600 feet altitude, near center. West slope steep, east slope more gentle. Bare rocky summits. East coast mostly low narrow beach at base of terraces. Mountains front a short distance inland. In a few places high terraces form abrupt cliffs 150 to 200 feet high along shore. Rivers flow east and west from central divide, many in gorges. Some develop flat-bottomed valleys, up to a mile wide in lower courses. Langeri Valley is terraced, wide, and flat for a long distance inland.	Hard massive rock covered by a foot or less of rocky, sandy, clay soil. Well drained. Exposed bedrock on summits and in places on slopes. Softer rock in small mountain areas on east coast and most coastal terraces. Terraces covered by gravel up to 12 feet thick. Apparently no permanently frozen ground. Alluvium in wider valleys.	Climate colder and more severe than west coast. Strong winds and cold fogs. Fogs frequent in spring and summer. Winter lasts 6 to 7 months (Oct. to April). Snow on mountains until middle of July. Mountains covered by thick coniferous forest of fir, spruce, and some larch. Spreading pine covers summits and, with dwarf bamboo, forms undergrowth in forests.	Practically unsettled. Only a few fishing villages on coast. Trail along coast in Japanese part and a few trails over range in Russian part.	Barrier region. Impassable to vehicles. Movement on foot or by pack train possible with difficulty over range by several trails which follow valleys and cross high narrow passes. East coast can be followed on foot or by pack train; no very large rivers to cross. Rugged topography and thick undergrowth of spreading pine and dwarf bamboo make movement on foot almost impossible on mountain slopes; difficult in valleys.	Mountainous topography and forest provide cover and concealment everywhere. Coniferous forests dark green, covered by snow in winter. Rough topography and forest limit observation. Some passes might be commanded from surrounding heights.

(continued)

No. and Name of Area	Topography	Kind of Ground	Climate and Vegetation	Settlements and Communications[a] (Data incomplete; consult other intelligence sources)	Movement and Obstacles	Cover, Concealment, and Observation
10 Poronai Plain	Low wide swampy plain bordered on each side by steep high mountains and occupied by south-flowing Poronai River. Poronai meanders considerably; cut-off channels and lakes numerous. Plains on either side of river are composed of several low terraces covered almost completely by swamps. Natural levees are ½ to 1 mile wide. Wider dry areas at edges of plain on alluvial fans at foot of mountains. Lagoons and stretch of sandy beach along south coast.	Swampy areas covered by peat up to 18 feet thick, underlain by clay and gravel. In dryer places clay and sand underlain by gravel at depth of 1½ feet or less. Gravel is water bearing. Natural levees composed of gravel, sand, and silt. In north half of area at least, ground is permanently frozen at a depth of about three feet.[b] At Shikuka ground freezes in winter to a depth of three feet or more.	Mean annual precipitation 30 inches at Shikuka, highest in September (4.5 inches). Cloudy in summer but winters have relatively low cloudiness for Sakhalin (45% in January). Fogs frequent in summer. Snow falls from middle Oct. to middle May. Mean maximum snow cover 3 feet. Predominantly freezing weather from Nov. to middle April. Average temperature 61° F. in Aug., warmest month; 0° F. in Jan., coldest month. Strongest winds in Dec. and Jan. (average 9 miles/hour). South winds in summer; north winds in winter. Most of area covered with tundra vegetation (lichens, moss, a few dwarfed larch and stumps of burned trees) or larch forest with moss undergrowth. Among the tundra are small, dry areas covered by brownish red heath. Dry strips of land along rivers covered with mixed deciduous and coniferous forest; rarely open meadow. Meadows and undergrowth covered by high grass and brush.	Shikuka largest town in area (pop. over 10,000). Connected with Nairo and south part of island by coastal railroad and highway. East from Shikuka is a trail along the shore on which are several villages. North from Shikuka, highway (15 to 18 feet wide), leading to Tym Plain, crosses relatively dry, west edge of plain. A few villages along road. In Russian part a second poor road follows east bank of Poronai River, and is connected by cross-roads to highway.	Topographic corridor leading north. Vehicle movement almost restricted to roads because of swampy ground. Horses bog in tundra, men sink in to a depth of a foot or more. Even higher ground on west edge is swampy in places and difficult for movement off highway. Several large tributaries on west side form additional obstacles. Vehicle movement across area is possible by the trail and sandy beach on the coast but mouths of several large streams and lagoon inlets, at present crossed by ferries, present obstacles. Inland, no roads or trails east across plain, except in Russian part. Poronai River, additional barrier to eastward movement, is 750 feet wide at mouth, 150 feet wide near Russian border; has a soft alluvial bottom and cannot be forded except in uppermost part. River itself is route of northward movement, can be used by boats of 4.5-foot draft for about ten miles from mouth, and for most of its length by native log boats. Frequent log jams interfere with navigation.	Topographically exposed. No cover other than forest, and saturated ground prevents excavation of fox holes. Settlements have timber and frame houses. Forest provides concealment over much of area. Forested region is variegated dark and light green in summer, turning brown in fall. Tundra areas are drab green moss, variegated with reddish brown heath. Area covered with snow in winter. About 35 miles north of Shikuka on east bank of Poronai, a small, steep-sided hill, about 200 feet high, provides good commanding view of level plain and river.
11 Tym Plain	Continuation of Poronai Plain (Area 10), occupied by north-flowing Tym River. No sharp topographic division between Tym and Poronai Plains. Drainage divide is slightly rolling plain, at altitude of 490 feet. Below Derbinskoe, Tym is meandering, forms cut-off channels and lakes. Terraced plains on both sides of river; western one much wider, passes into gently-sloped alluvial fans at foot of Western Range. On east, terraced plain is narrower, passes abruptly into steep slopes of Eastern Range. Area is swampy, but less so than Poronai Plain. Swamps on lower terraces, and commonly at margin of mountains (Areas 7 and 9). Natural levees along banks of Tym.	In much of area black, peaty, silty soil underlain by bluish-gray clay and below that, gravel. Peat generally 1 to 2 feet thick but near mouth of Tym 5 feet thick. In places, mostly in south part (upper course of Tym), soil is dry, sandy clay, an inch to 2 feet in thickness, underlain by gravel. Natural levees are mixture of gravel, sand, and silt. Permanently frozen ground a few feet below surface under peat, lacking or at greater depths under drier areas.[b]	Continental climate, colder than west coast, fewer fogs and less strong winds. Average temperature in Jan., coldest month, -9.2° F. In July temperature as high as 90° F., in winter as low as -56° F. At Kirovskoe mean annual precipitation 21.5 inches, highest in Aug. and Sept. (up to 4 inches a month). Predominantly freezing weather Dec. through April. Snow begins in Oct.; snow storms in Nov. and Dec.; snow melts beginning of May. Plants in foliage by June. Swampy, peaty parts of plain covered by larch forest and moss undergrowth. Dry parts of plain covered by birch and larch forest. Larch trees up to 115 feet high, 3 feet thick. Large burned-out areas covered by young birch and larch. Along river channels strips of deciduous forest: alder, ash, poplar, willow, elder, bird-cherry, sorb, and thorny hawthorn. Tall grass undergrowth. In places on plains on west side and along channel are meadows and open farm fields.	Only farming region in Russian Sakhalin. Several towns and villages along Tym River in south part, almost no settlements in north part. In south, highway connects towns; another leads from Derbinskoe to Aleksandrovsk on west coast. In north, highway changes to very poor road leading along Tym to east coast, but travel in that direction is more often by native boats on river.	Corridor leading north. In south part, movement can follow highway and, in small areas, open farm lands. Vehicles generally limited to highways and roads by forest and swampy ground. Movement on foot or horseback possible across plain by several trails and to some extent off trails. South of Derbinskoe, river can be forded. In north, northeast-southwest movement limited to poor, swampy road along Tym River, which is passable to pack trains but may not be passable to vehicles. Movement across plain is blocked by river, difficult to ford, and by forest and swamps. Tym River navigable by flat-bottomed motor boats as far as mouth of Nysh tributary in low water, up to Adatymovo in high water. Native log boats are used throughout most of course. Many tree jams and several rapids hinder navigation. Freezes in winter but in places ice is thin or even lacking. In May and June, and in rainiest months, July to Sept., river floods, often covering much of plain. In winter deep snow hinders movement.	No topographic cover. Forest provides cover and concealment over much of plain. Timber houses in towns and villages provide some cover. Ground soft; poorly drained, water usually at very shallow depths and much of area unsuitable for even shallow excavations. Colors predominantly light green in summer, brown and yellowish in fall. Snow cover everywhere in winter. Mountain spurs projecting into plain on each side give good vantage points in many places. Constricted portion of plain at Derbinskoe is commanded by mountains from both sides.
12 East Coastal Plain	Terraced coastal plain, up to 5 miles wide, at base of interior mountains. Coast formed by chain of large lagoons cut off from Okhotsk Sea by dune-covered bars, less than 60 feet high, and ½ to 1 mile wide on the average. Inner shores of lagoons bordered by low scarps. As many as four terraces farther inland, from 16 feet to 250 feet above sea level. Dunes on bars and terraces. Terraces flat to rolling, margins usually dissected; rise gradually, though steep scarps present locally. Swamps cover terraces in many places. Farther inland are higher, narrower, more dissected, and discontinous terraces forming foothills at base of inland mountains, and included in Areas 9 and 14. North of Okha, terrace scarp, 65 feet high, back of lagoons, and a lower, dune-covered terrace with 15- to 25-foot scarp forms areas between lagoons. Terraces cut by large streams flowing east to lagoons in wide deep incised valleys. At north valleys are narrower, streams smaller.	Terraces composed of unconsolidated sand and gravel with rare lenses of clay, 50 to 200 feet thick; usually gravel and coarse sand at base, sand and clay lenses above. Gravel locally cemented by iron oxide. Bars and beaches sand. Locally many large granite boulders (up to 5 feet in diameter) in lagoons, stream valleys, and terrace deposits. Where swampy, terraces covered with peat up to 5 feet thick; ground is permanently frozen below a depth of 1 or 2 feet. Frozen ground is thought to be about 50 feet thick. Where peat is lacking and sand and gravel are at surface, permanently frozen ground is probably absent.[b]	Severe climate. Coast open to storms, cold fogs, and strong winds of Okhotsk Sea. Colder, foggier, and higher precipitation than west coast. Temperatures 3° to 5° colder than comparable latitudes on west coast. Average annual precipitation 15 to 20 inches, may be as high as 30 inches. Worst fogs in May, June, and July. Winter lasts 6 to 7 months (Oct. to April). At Okha, in some years, freezing temperatures all year. Snow falls from late Oct. to late May. Snow remains in valleys till end of June. Swampy areas have tundra type of vegetation: moss and scattered dwarf larch trees. Elsewhere terraces covered by low larch (about 15 feet high, a foot in diameter) and birch forest in which spreading pine forms undergrowth. Valleys are forested. Bars and dunes are barren or covered with reeds, grass, heath, and spreading pine.	Oil field towns and ports are distributed along coast. Each field has settlements of both Russian and Japanese concessionaires. Largest is Okha, population about 20,000. Communication mainly by sea. Okhotsk Sea navigation season from July to Oct. (4 to 5 months). Locally short roads and trails between oil fields and between fields and ports. Railroad connects Okha with Moskalvo on west coast. Another railroad, which is reported to lead south from Okha through north part of area, then turn inland toward Aleksandrovsk, is probably non-existent. Much travel along coast is by native boats in lagoons, sheltered from Okhotsk Sea; can be followed most of distance between Okha and Tym River with only rare portages. On land, in addition to railroad, horse and reindeer pack trains and in winter, dog sleds, are only methods of transportation.	Land is low and flat, but movement is restricted. Vehicles can be used only locally. Travel easiest on bars at outer edge of lagoons, where ground is usually dry and forest sparse; very difficult in stormy weather. Sometimes bars can be followed for long distances; at other times sea washes gaps across bars into the lagoons and travel must go around inland edge, usually on terraces. Chief obstacles are streams which cut across terraces. Scarps often along valleys; larger streams are not fordable. On flat upper surface of terraces, swamps and forests hinder movement. Movement inland is best in valleys, but it is difficult because of forests and winding rivers; swamps are common.	Valleys, terrace scarps, and dunes provide low topographic cover and concealment. Topography mostly open. Low forest, lacking on bars and beaches and in swampy areas on terraces, provides concealment and almost only cover on terrace plains. Granite boulders locally provide cover. Houses in settlements are timber and frame. Oil wells and storage tanks easily fired. Ground suitable for shallow excavations but drainage poor in swampy tundra and forested areas; good on some bars and in dunes on terraces. Much of coast has mottled appearance, yellowish-gray sand splotched by brownish red heath and dark green spreading pine. Swamps are drab green; forests light green. Snow cover everywhere in winter. Bars and beaches are exposed and many commanding positions on adjacent terraces. Mountains to west may provide good observation points over coastal plains.
13 West Coastal Plain	Wide, terraced coastal plain, with sandy, in places in south marshy, beach. Low scarp (6 to 25 feet high) marks edge of swampy, gently rising terrace. Farther inland three more terraces pass into terraced, dissected foothills of mountains. Sand dunes cover parts of lower terraces. To north, higher terraces are nearer the sea, and on north shore a terrace scarp 50 to 80 feet high faces the sea. From Baikal Bay to Schmidt Peninsula, three terraces, at 16, 65, and 130 feet, highest rising inland to form very gently swelling, almost level divide of the isthmus, at 280 feet altitude. West-flowing streams are large and sluggish.	Sandy narrow beach. In north, part of beach and lower terraces covered by sand dunes. Much of terrace area covered by swamp, underlain by peat up to 10 feet thick. In south part, mucky tidal marshes cover the shore. Terrace deposits consist of sand and gravel and, at top, thin clay lenses. In swamps peat usually lies on clay. Permanently frozen ground probably exists at a shallow depth in most of area.[b]	Colder than Aleksandrovsk (Area 7) but warmer and with a lower precipitation than east coast. Average annual temperature 27° F. Average temperature in Jan., coldest month, is -6.9° F. Annual precipitation 15 to 20 inches. Snow falls from late Oct. to late May. Average wind velocity 14 miles/hour. At Moskalvo heavy storms in late Oct. sometimes throw barges as far as 100 yards inland. At other times sea is fairly quiet. Beaches and sand dunes are barren or covered by reeds, grass, and brush. Barren tidal flats form much of shore in south. Swamps are a tundra, covered by moss and few trees. Inland thick, low, conifer forest (larch, fir, spruce) on terraces. Large fields of berry bushes, including huckleberry, raspberry and cranberry, heath, and thorny rose on dune land on the northwest coast.	Sparsely settled, mostly in north where there are several fishing villages and Moskalvo, port for Okha oil field to which it is connected by railroad and oil pipe line. Several native settlements on the coast. Trail along coast which, north of Langri River and in south, alternates with poor road. Langri River is potential oil field, which may now be under development. A few trails follow river valleys into interior. Travel is by pack train and, in winter, by dog sleds. When the Strait of Tartary is frozen (middle of Dec. to end of Jan.) mail is carried from Cape Pogobi to mainland by dog sleds.	Low, flat land. Movement along shore hindered by swamps and large, quiet but generally unfordable streams. Inland the forest is extremely difficult to penetrate. Wheeled vehicles cannot be used except with difficulty on short sections of poor road. In south travel may be easier wading on sandy bottom of shallow sea than on marshy shore. In north movement somewhat easier, as coast is less swampy, with many dunes.	Beaches and shores are exposed except for small amount of cover and concealment provided by sand dunes. Swampy areas generally exposed. Inland thick low forest provides cover and concealment. Farther inland dissected and rolling terraces provide some topographic cover. Unfrozen ground easily excavated but is usually too poorly drained for fox holes, with exception of a few drier areas of sand dunes and rolling terrace land. Colors mainly yellowish gray on beaches, green on moss-covered swamps, and dark green in conifer forest. In north, wide areas of land are covered by reddish brown growths of huckleberry, cranberry and heath. Snow cover everywhere in winter. Mountains on east may provide commanding views of coastal plains, but generally are far inland and adjacent plains are thickly wooded. In north, terrace scarps in places command views of open beaches and bars.
14 Northern Upland	South part is a mountain mass, continuation of Eastern and Western Ranges. Low mountain chain extends northward on east side, gradually becoming lower and narrower, finally dying out at low isthmus of Schmidt Peninsula. A number of east-flowing streams cut completely across mountain chain, and head inland, beyond mountains. Altitudes range from 650 feet to 2,000 feet, highest point near southern end. On west side, mountains continue north for a shorter distance and are composed of several high peaks connected by low, hilly ridges. Largest peak is Engiz-Pal, rising prominently to an altitude of 1,800 feet. Country between east and west mountain chains consists of a dissected, rolling, terraced, uplifted plain (altitude 400 to 500 feet), narrow at south, widening to north, and passing gradually into the lower, less dissected, terraced land of northwest coast. Similar dissected terraces form foothills on coastal slopes of mountains, gradually passing into lower terraces of coastal plains (Areas 12 and 13). Streams rise in central plains and flow east and west, cutting through the marginal mountains in deep, relatively narrow, terraced valleys. Near mouths, larger valleys are half a mile or more wide.	Terraced plains composed of unconsolidated sand and gravel and small amounts of clay. In places swampy areas covered with peat deposits. Mountains composed of poorly consolidated to moderately hard shale and sandstone, almost everywhere covered by thin, rocky, clayey sand soil. Permanently frozen ground is present in plains and even on slopes, at depths of 3 to 6 feet or shallower.[b]	Mountains exposed to cold coastal winds; fogs and cold winds less frequent in the interior. Thick conifer forest (larch, fir, spruce) covers area except for a few summits, as top of Engiz-Pal. Forest trees are smaller than in the south, larch rarely 65 feet high, 1.5 to 2 feet thick. Spreading pine undergrowth in mountains. Plains and valleys have moss and lichen undergrowth, which is used by natives to pasture reindeer.	No settlements of any kind. Area is poorly explored and little known. Two trails used by native hunters cross the area in east-west direction.	Not passable for vehicles. Pack trains can cross area in east-west direction by following east-flowing river valleys through mountains into interior plains, and there crossing a low flat divide into similar valleys running west. Movement is difficult because valleys are deep, relatively narrow, and forested. During floods (in spring and late summer) valleys filled completely by river. Wide Nysh Valley, tributary to the Tym, is followed by a trail. At its head a pass over mountains leads to west coast. Also possible to continue north from Nysh headwaters over a low rolling divide into interior plains, but movement northward in plains probably more difficult than across them, because of numerous east- and west-flowing valleys that must be crossed. In general movement everywhere in area is hindered by thick forest and rough topography.	Forests and mountainous to rolling topography provide cover and concealment everywhere. Hasty fortifications can be excavated, but drainage in plains apt to be poor. Forest light and dark green, covered with snow in winter. Forest and rough topography generally limit observation.

(continued)

No. and Name of Area	Topography	Kind of Ground	Climate and Vegetation	Settlements and Communications[a] (Data incomplete; consult other intelligence sources)	Movement and Obstacles	Cover, Concealment, and Observation
15 Schmidt Peninsula	Mountain ranges on east and west, with steep high bluffs bordering sea; joined at south end but in north separated by central lowland. Lowland is terraced plain; at coast in north are two lagoons cut off from sea by sand bars. Inland plain is 100 to 130 feet in altitude. Narrows to south, attains 300 feet altitude, and passes into mountainous south edge of peninsula. Altitude of west range from 800 to 1,650 feet. Forms rocky Cape Marii at its northern end. Altitude of east range from 1,000 to 2,300 feet. Highest point is mountain at south end, crowned by three peaks called Tri Brata. At north, range forms rocky Cape Elizavety. Greater part of west coast is terraced, but entire east coast is an abrupt cliff. Cliffs at shores of north capes contain small caves. Streams mainly drain east and west, flow across or parallel to ranges. Largest rivers, such as Pil in southwest and Longi in southeast, have flat-bottomed valleys; floodplains wider on north sides, and swampy in many places. Valley slopes are steep and dissected.	Lowland in north is soft, unconsolidated sand and gravel. Ranges composed mainly of poorly consolidated to moderately hard shale, sandstone, and sand, covered by thin, residual, rocky soil. Northern capes however composed in large part of hard massive rock. Locally hard rock occurs in other parts of ranges. Rock is rarely exposed except in coastal cliffs. Landslides and rock debris common on north and southwest coasts. Drainage poor in lowland and in valley bottoms, which are covered with peat in part. Permanently frozen ground probably exists at shallow depths.[b]	North and east coasts exposed to severe winds and cold of the Okhotsk Sea. As a result, east coast has no forest, valleys contain only meadow grass, uplands are bare or covered with moss and to south, with spreading pine which may grow down to sea level. North shore is an open tundra with a few stunted fir and spreading pine. Interior and west coast, which are more sheltered, covered with low forest of fir and spruce which has spreading pine, moss, and fern undergrowth. Some birch also grows in low areas. Peaks are bare and swampy tundra occurs in places in the interior.	A few native settlements on west and north coasts connected by a poor, rarely used trail. Communication is more often maintained by boats on the sea. On land, pack trains and, in winter, dog sleds are used.	Poor trail on west shore turns inland near south end of Cape Marii and crosses low pass, continuing on north shore. Capes Marii and Elizavety and east shore are abrupt, rocky, and almost impassable. Tri Brata can be crossed from south by high pass between the two northern peaks which gives access to interior lowland and to west shore along Pil Valley. No vehicle routes exist. Movement limited mainly by rough topography; by forest in west range and central lowland; by swampy ground in valleys and part of the central lowland.	Mountainous and rolling topography provides cover and concealment. Cliffed coasts offer cover of caves and large boulders. Hasty fortifications can possibly be excavated in lowland and in part of mountain area; however permanently frozen ground might be very close to surface, and drainage in lowland is poor. Forests and areas covered with spreading pine are dark green. Tundras are drab green, valley meadows green to brown and drab. Rock exposed along cliffs is sand yellow and dark brown. Area covered by snow in winter. Tri Brata command a view of central lowland and west range.

a/ Most population figures are as of 1930. Japanese standard-gage railroad in Sakhalin is 3 feet. See Communications map for location of roads, trails, and railroads.

b/ See Strategic Engineering Study, no. 62, "Permafrost or Permanently Frozen Ground and Related Engineering Problems".

Reliability rating: Class C.
Compiled by U. S. Geological Survey.

SAKHALIN ISLAND

Index to views

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

Sakhalin Gulf

Gulf of Tartary

Strait of Tartary

OKHOTSK SEA

SIBERIA

Cape Elizavety
Cape Marii
Schmidt Peninsula
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Piltun Bay
Chaivo Bay
Nyiski Bay
Cape Tyk
Katangli
Nabilski Bay
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Maoka
Toyohara
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Rutaka
Odomari
Kaiba Island
Aniwa Bay
Cape Nishinotoro
La Perouse Strait (Soya Strait)
Cape Nakashiretoko

EXPLANATION

Large numbers and heavy lines indicate areas shown on Terrain Appreciation map and described in Terrain Appreciation table.

Small numbers refer to views shown on following pages.

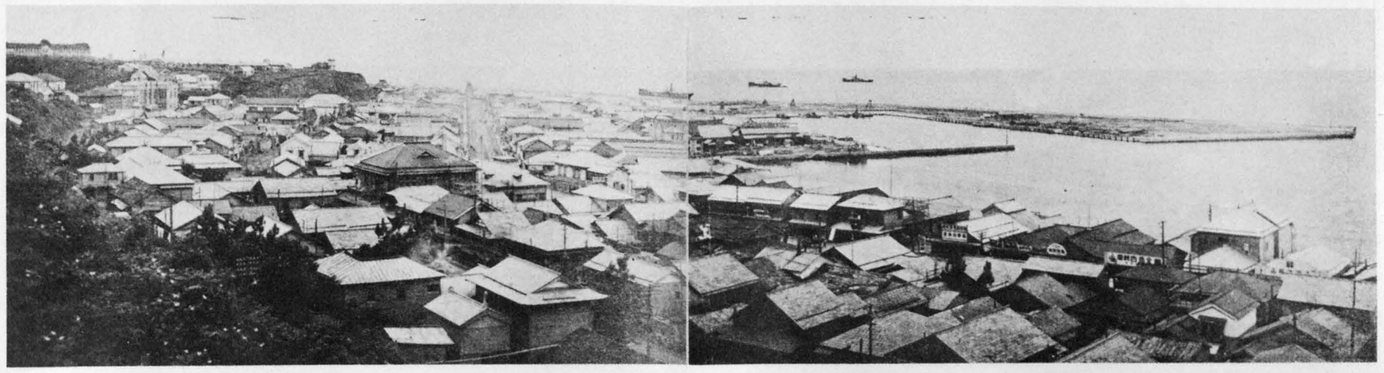
● Location known.

■ Location uncertain.

50 Miles
50 Kilometers

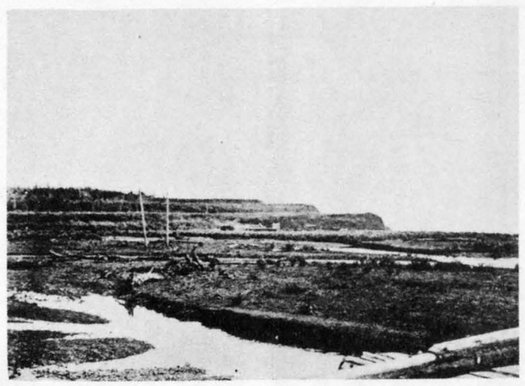
Compiled by U S Geological Survey

1 Flat, grassy well-drained Toyohara Plain (Area 4),the only large area in Sakhalin permitting free motorized movement. Susuya Mountains (Area 3) in background. Nihon Chiri Taikei, Tokyo, 1930.

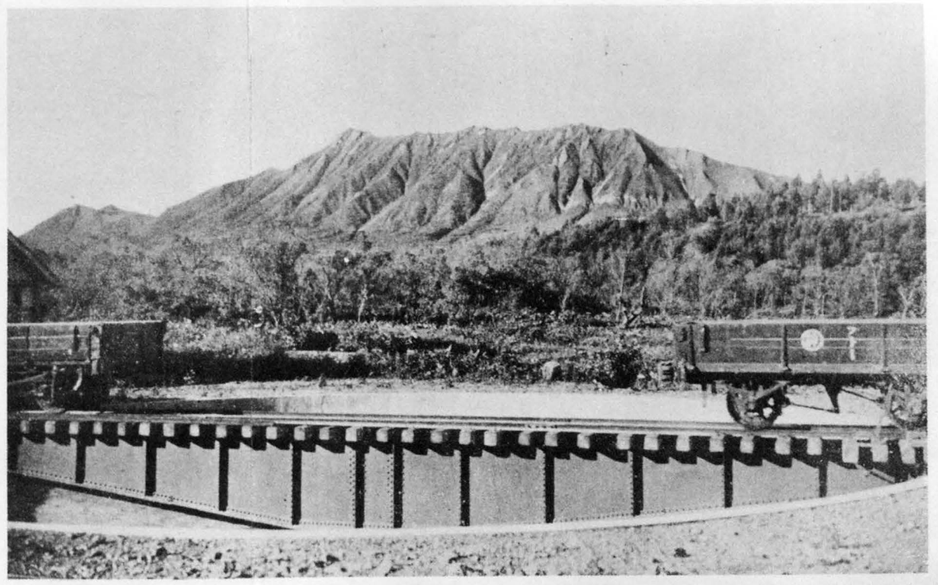


4 Port of Maoka (in Area 5). Pulp factory in distant background. Maoka has one of the several good harbors in Japanese Sakhalin. The buildings are typical for the largest towns in Japanese Sakhalin. Nihon Chiri Taikei, Tokyo, 1930.

2 Highway across Western Range (in Area 5) between Honto and Rutaka. Probably gravel surfaced; representative of highways in Japanese Sakhalin. Jour. Mining Inst. Japan, 1936.

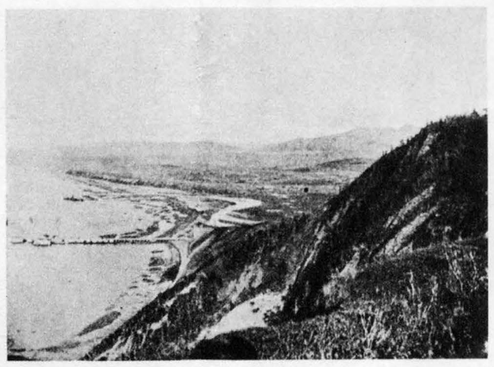


6 Narrow coastal terraces that form the shore at the foot of mountain cliffs in many parts of the island. These are at the mouth of the Arkovo River (in Area 7). Tikhonovich and Polevoi, Russ. Geol. Committee, 1915.

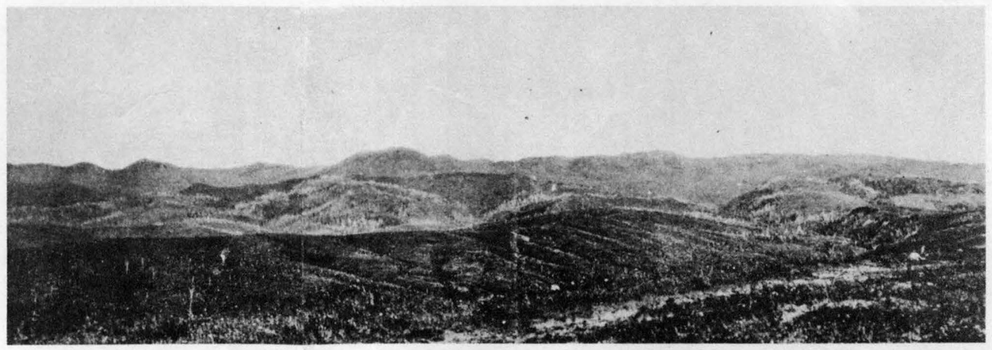


5 West side of Tosso Mountain (in Area 6), a small coastal ridge typical of the higher ridges and peaks of the Western Range. Railroad in foreground follows east coast of Japanese Sakhalin, from Shikuka to Ochiai. Nihon Chiri Taikei, Tokyo, 1930.

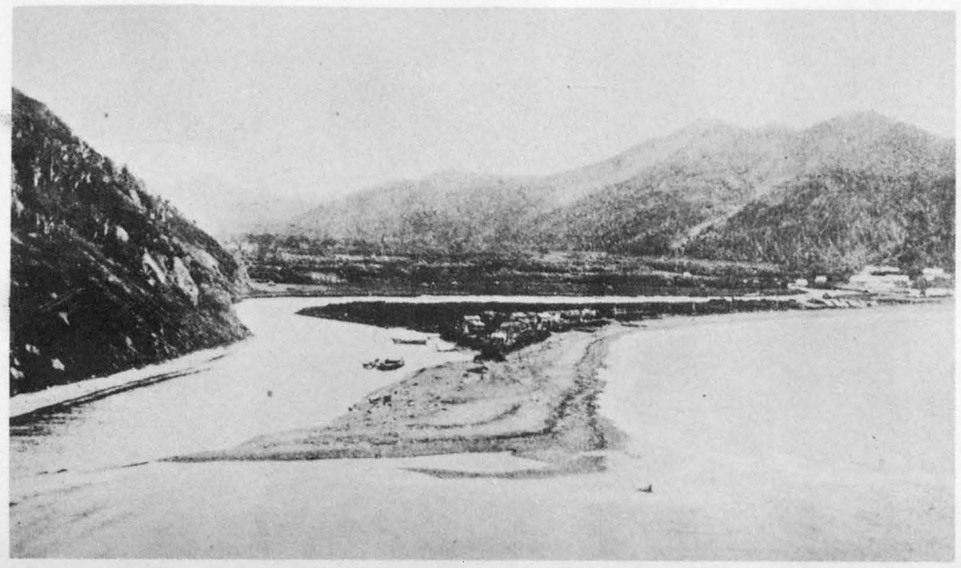
3 Upper part of Naibuchi River (in Area 5). Nihon Chiri Taikei, Tokyo, 1930.



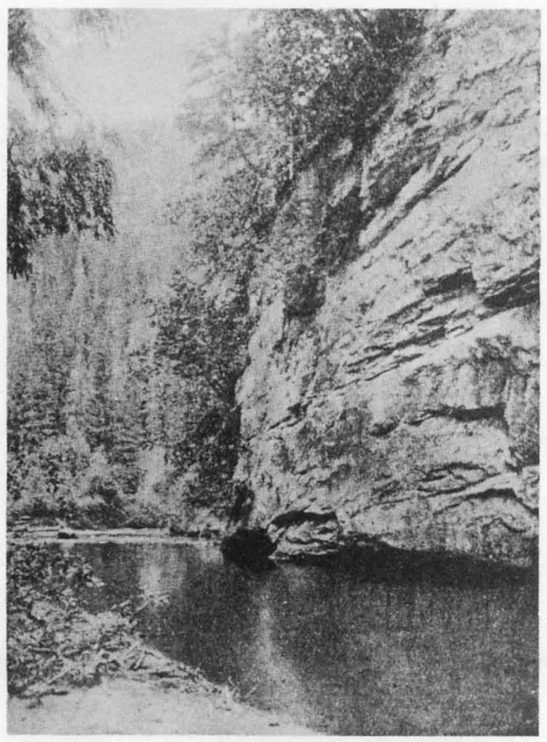
7 Mouth of Aleksandrovka Valley and a portion of the harbor and town of Aleksandrovsk, capitol of Russian Sakhalin (in Area 7). Tikhonovich and Polevoi,Russ. Geol. Committee,1915.



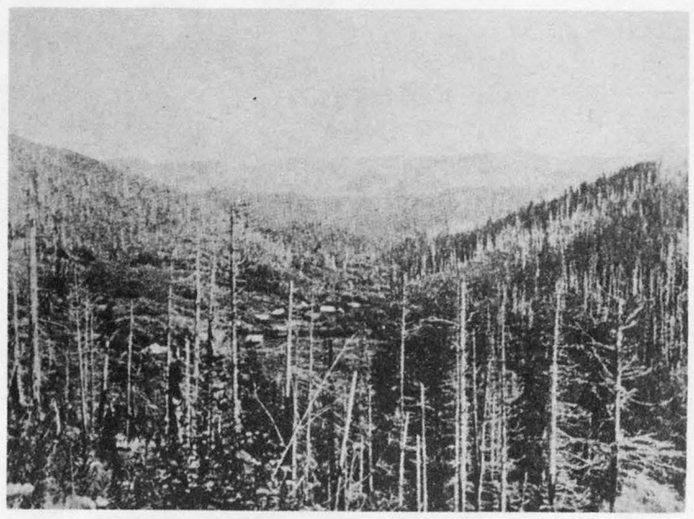
8 Western Range (Area 7) looking east from Aleksandrovsk. Tikhonovich and Polevoi, Russ. Geol. Committee, 1915.



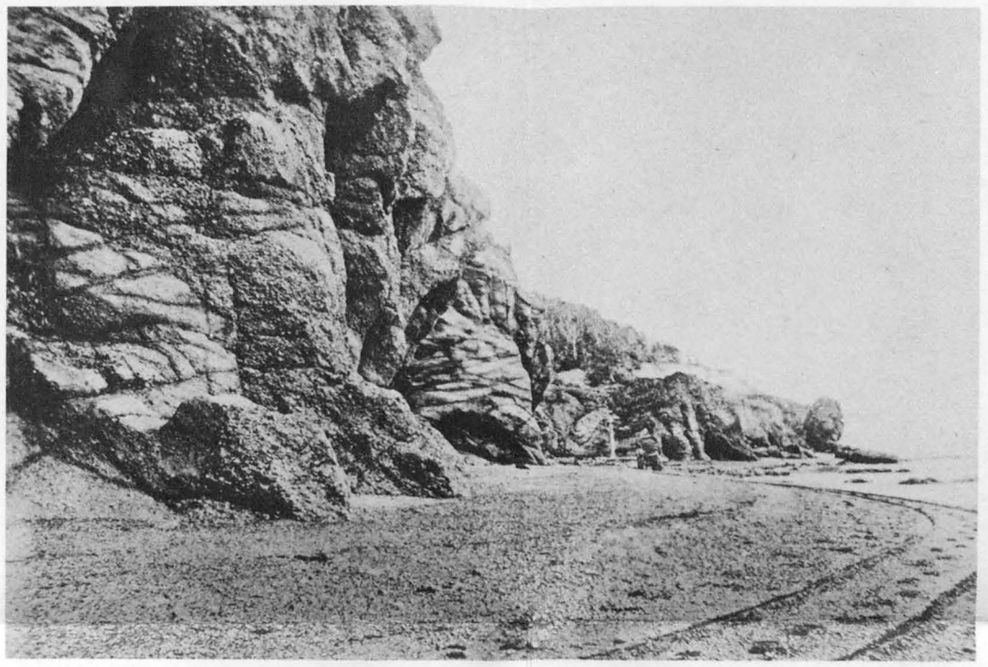
9 Mouth of Pilevo River (in Area 7). Typical of large valleys which form the best means of access into the interior where the coasts are formed by steep mountain cliffs, as is the case along much of the western and eastern ranges. Such valleys are the loci of settlement. Tikhonovich and Polevoi, Russ. Geol. Committee, 1915.



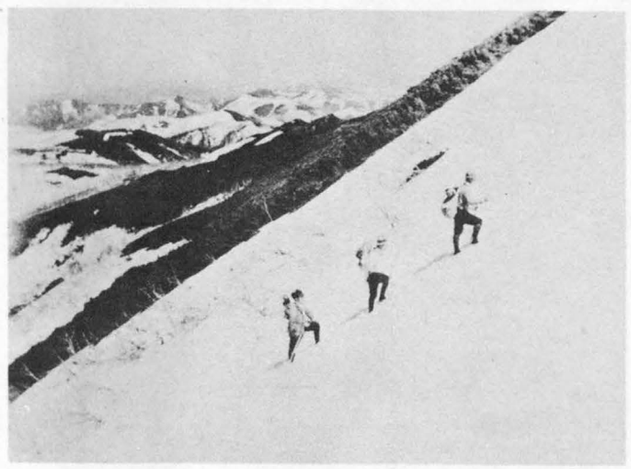
10 Upper course of Agnevo River (in Area 7). Typical of mountain valleys. D.V. Sokolov, Zemlevedenie, 1912.



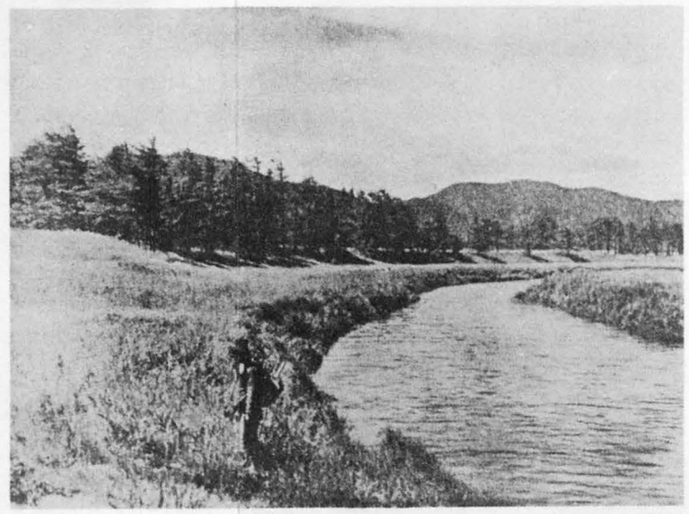
11 Western Range (Area 7), covered by forest of fir, spruce, and larch. In valley is one of the abandoned villages common in mountain valleys south of Aleksandrovsk. D. V. Sokolov, Zemlevedenie, 1912.



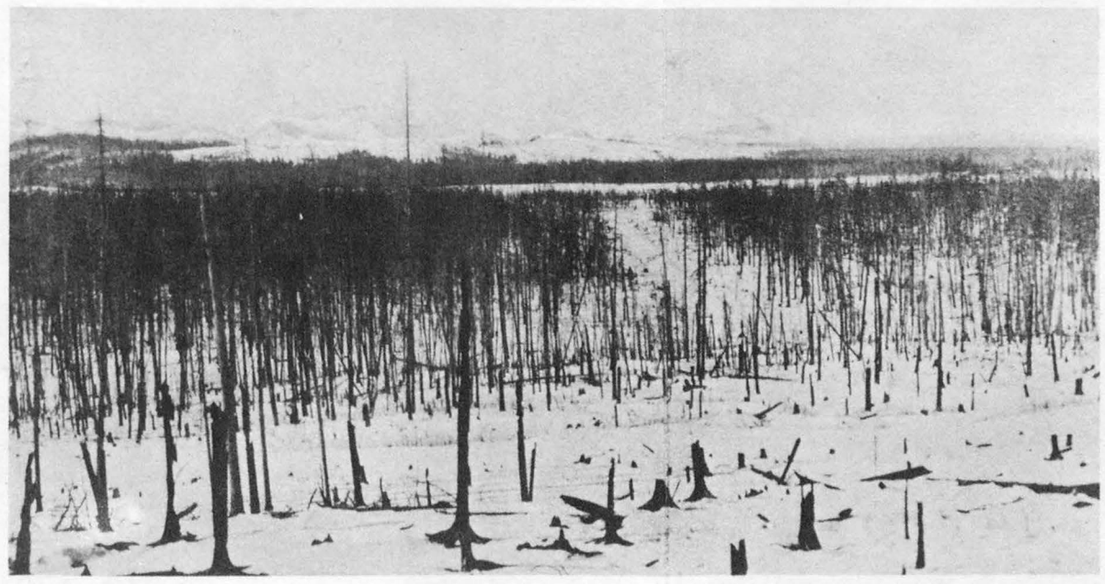
12 Beach at foot of coastal cliffs (in Area 7). Such beaches can be used for travel in many parts of the island. Tikhonovich and Polevoi, Russ. Geol. Committee, 1915.



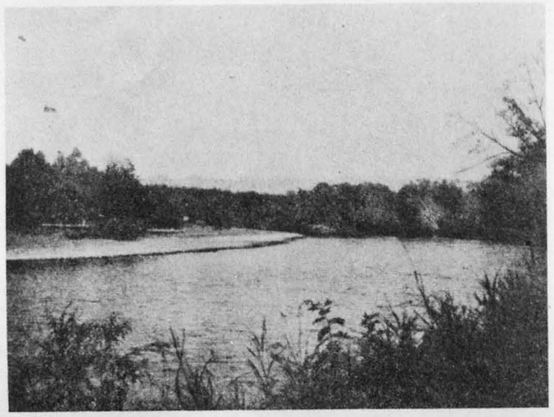
13 Eastern Range (Area 9), highest and most rugged mountains in Sakhalin. Imp. Jap. Land Survey, 1935-36.



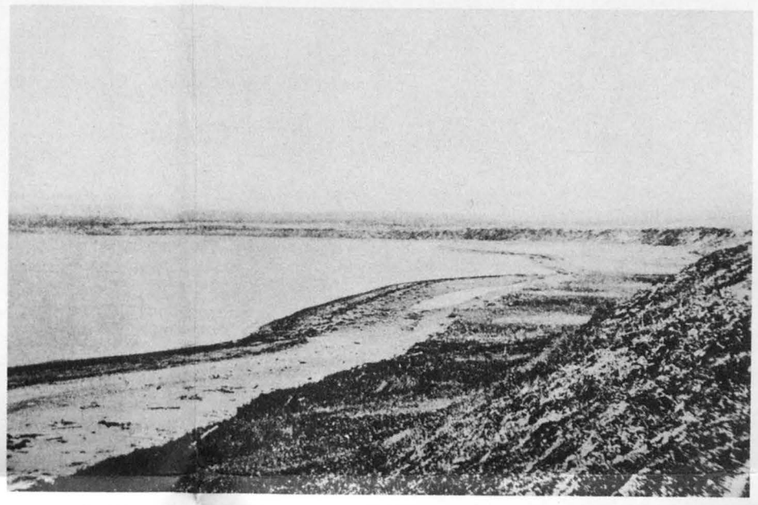
14 Khoi River near mouth (in Area 9). Typical of large streams that flow across the coastal terraces along east coast of Russian Sakhalin. D. V. Sokolov, Zemlevedenie, 1912.



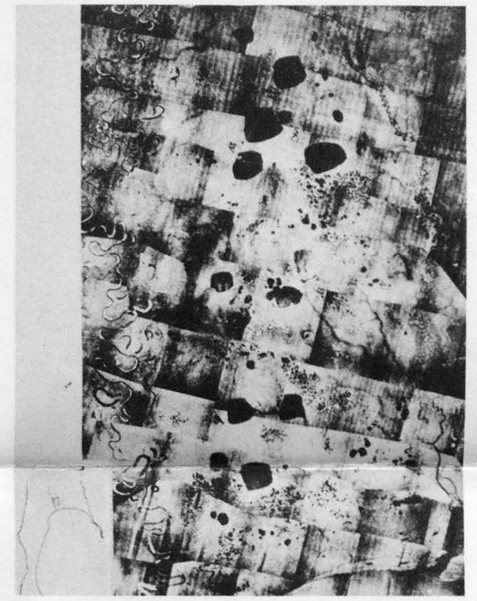
15 Poronai Plain (Area 10) near Russian-Japanese border. Covered in part by larch forest. Nihon Chiri Taikei, Tokyo, 1930.



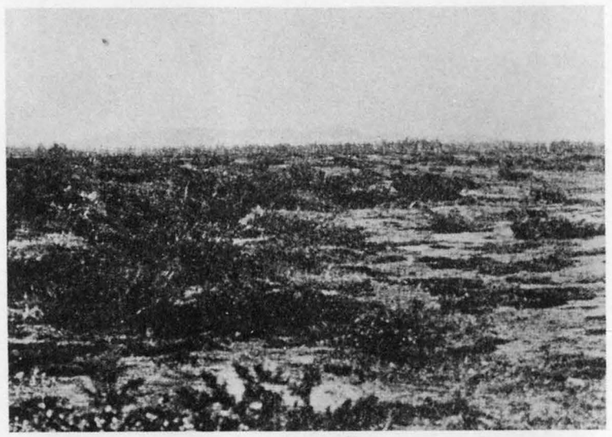
19 Tym River in its middle course (in Area 11). River has sandy, wooded banks. E. E. Anert, Russ. Geol. Committee, 1908.



22 Uandi Bay, typical of bays in Area 13. Sandy beach bordered by scarp of lowest terrace; progressively higher terraces in background. Tikhonovich and Polevoi, Russ. Geol. Committee, 1915.



16 Aerial mosaic of a portion of the low, flat, tundra plain of the Poronai River (Area 10). Meandering Poronai River at left with many ox-bow lakes along its course. Meandering Furito River at east, emptying into Taraika Lake in the lower right-hand corner of the picture. Between the rivers is swampy tundra with numerous lakes. Imp. Jap. Land Survey, 1932-34.

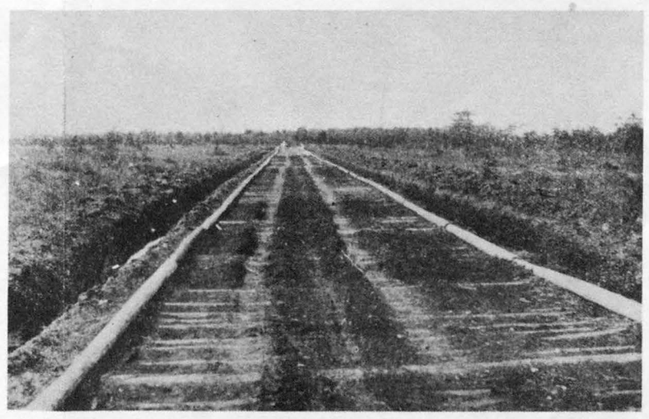


20 Terrace plain on east coast (Area 12). Coastal plains in places near the shore are covered by tundra type of vegetation and spreading pine (Pinus pumila), as in the foreground; elsewhere covered by thick coniferous forest, as in background. D. V. Sokolov, Zemlevedenie, 1912.

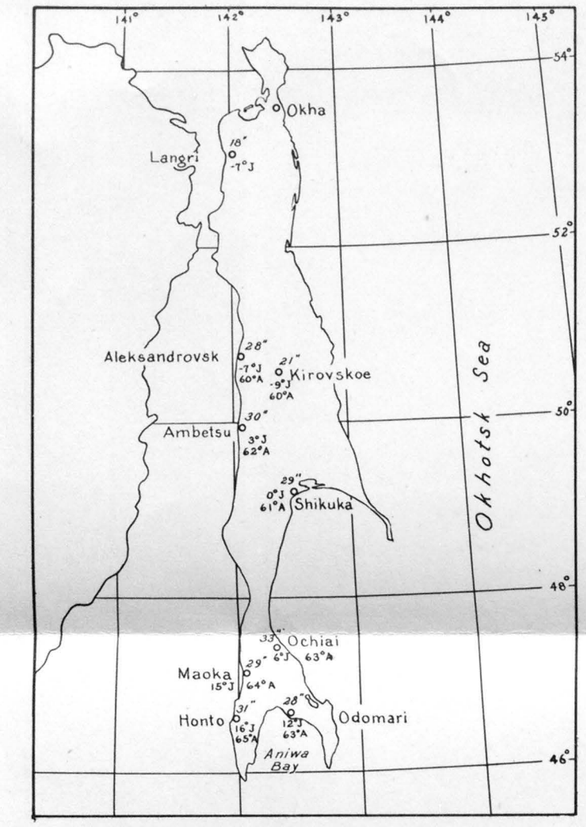
23 Cape Elizavety, formed by eastern coastal range of Schmidt Peninsula (Area 15), and part of beach at north end of central lowland. Tikhonovich, Russ. Geol. Committee, 1914.

21 Inner shore of Piltun Bay (in Area 12). Shore and adjacent plain covered by thick coniferous forest (taiga), typical of terraced coastal plains. Tikhonovich and Polevoi, Russ. Geol. Comm., 1915.

17 Poronai River (in Area 10). Banks are forested; plains back from river are a swampy tundra. Nihon Chiri Taikei, Tokyo, 1930.



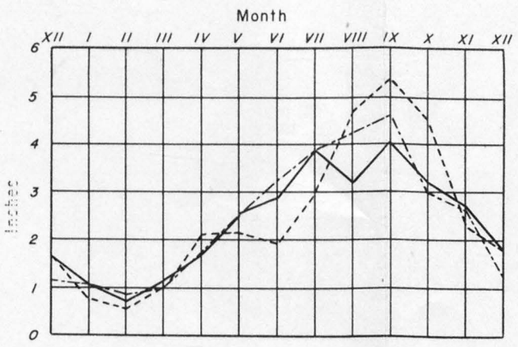
18 Corduroy road on tundra in Poronai Plain (Area 10). Might be a section of the highway along west edge of plain, connecting Shikuka with Russian Sakhalin. Nihon Chiri Taikei, Tokyo, 1930.



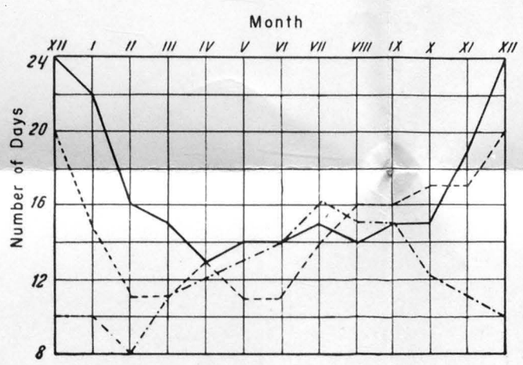
PRECIPITATION AND TEMPERATURE

Figures in inches (as 11") represent average annual precipitation.

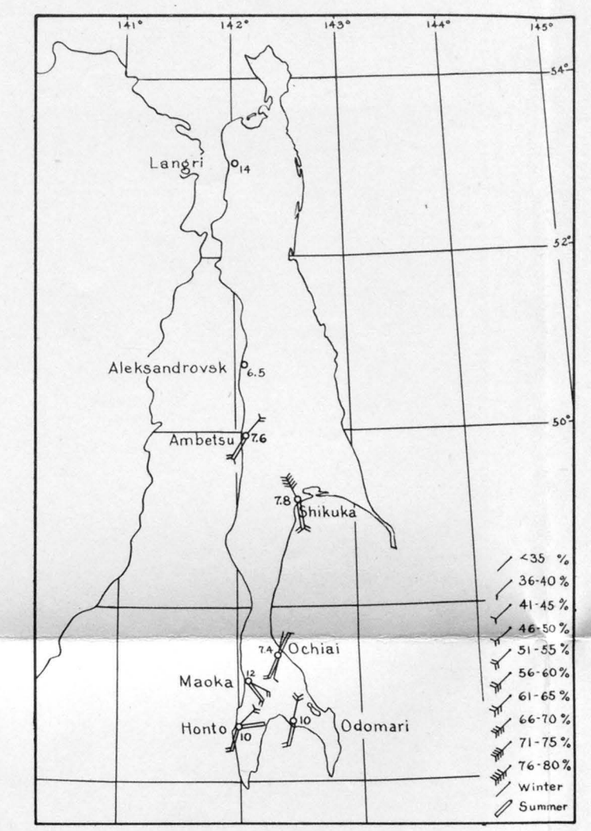
Figures in degrees (as 60°J,A) represent average temperature in Fahrenheit in January and August.



Average monthly precipitation

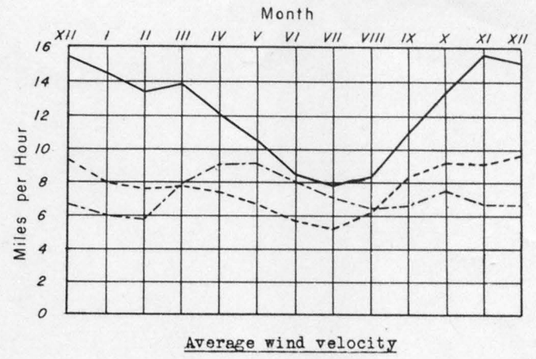


Average days per month with precipitation

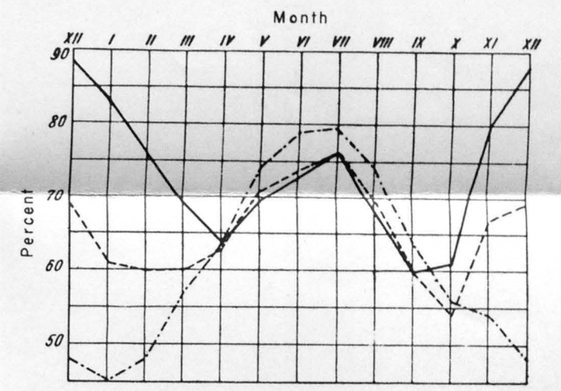


WIND DIRECTION AND VELOCITY

Arrows indicate the middle of the quadrant from which the most frequent winds blow. Bars on arrows indicate frequency of those winds in percentage of total observations. Numbers indicate annual average velocities, in miles per hour.



Average wind velocity



Average cloudiness

INTRODUCTION

Sakhalin is within the East Asia monsoon region. Winter winds blow strongly from the north and the interior; weaker summer winds blow off the ocean from the south. The east coast, chilled by the extremely cold Okhotsk Sea, is colder and more foggy than the west coast which is warmed in the south by a branch of the Japanese current. Winters are long, cold and humid; the short summers are foggy and rainy; the days may be very warm, but nights are cool. The interior of the island is colder in winter than the coasts but, because the winds are not as strong, the climate is somewhat less rigorous than in the coastal regions, particularly the southwest and the far north where the winds are very strong. The skies are cloudy much of the time.

WINDS

Winter winds are predominantly from the north and from the interior; summer winds are predominantly south. There are few calm periods. Summer is the quietest period of year except at the north end, where February is the quietest month. Winds are strongest in the southwest, where the average winter velocity is about 15 miles per hour, and the average annual velocity is 12 miles per hour, and in the far north, where the average annual velocity is 14 miles per hour. In other parts of the island the average annual wind velocity is 6 to 7 miles per hour and the average winter velocity is 7 to 9 miles per hour. Gales are rare in summer and not strong. Winter gales are stronger and more common, occurring about 3 to 6 times a month in the north half, and attaining a velocity of 80 miles per hour (at Odomari). Gales blow from various directions, but rarely from the south or east.

TEMPERATURE

The average annual temperature is about 32° F. Average temperatures decrease from south to north at the rate of about 2 to 3° F. for every 1° of latitude. The east coast is 3 to 5° colder than the west coast at the same latitude. Winter temperatures are about 5° lower in the interior than along the coasts; summer temperatures are about 1° higher. The average temperature in January, the coldest month, ranges from -7° F. in the north to 16° F. at the south end. The average temperature in August, the warmest month, is slightly below 60° F. in the north half, slightly above 60° F. in the south half. The coldest temperature recorded at Aleksandrovsk is -28° F.; at Kirovskoe, -58° F.; at Ochiai, -49° F.; (all in January). Summer temperatures in the interior occasionally reach 90° F. Freezing weather occurs from the end of October or early November to early or middle April. In most of the island frosts may occur in all months except July and August. It is reported that at Okha, in the far north, in some years frosts occur in every month.

PRECIPITATION

The average annual precipitation is about 30 inches at the south, 15 to 20 inches at the north. It is highest from July to October (3 to 5 inches per month); precipitation occurs on fewer days (about 15 days per month on the average) than in other months but is more intense. Snow falls from October to April. Snow cover is from 2 to 3 feet deep in valleys and lowlands, and as much as 7 feet deep in mountains of the north. Winds pile up high drifts in valleys. Because of thick and complete snow cover, sleds pulled by horses, reindeer, or dogs are used for winter transportation. Sleds can be used when snow cover is 4 inches deep.

EVAPORATION

Low temperatures retard evaporation and the ground is almost constantly moist. In the southern half of island on the east coast the evaporation from an open pan of water is 25 to 30 inches a year; it is highest in July and August (3.5 to 4 inches a month), and lower (about 3 inches) in September, the rainiest month. As a result, dirt roads on the east coast are in very bad condition in September. Evaporation on the west coast is somewhat higher (6 to 8 inches annually).

HUMIDITY

Humidity is high. The average annual relative humidity is 70 to 80%. It is highest in July and August (average 80 to 85%), and lowest in spring and fall, but the average relative humidity in no month is below 60%. Winter average 70 to 80%.

VISIBILITY

Visibility is generally poor. Skies are overcast 150 to 200 days a year. The average annual cloud cover is 65 to 75%; it is greater in summer (75 to 80%). The west coast is also very cloudy in winter (average cloud cover 80% on most of coast, 90% in the southwest), less cloudy in the spring, and least cloudy in September and October (55 to 65%). On the east coast winters are relatively clear (average cloud cover 45% in January). On the west coast 3 to 5 days a month are clear in spring and fall, 1 to 2 clear days a month in January. At Shikuka, on east coast, there are 10 clear days in January. Fogs are most frequent in May to September; the west coast is less foggy than the east coast. On the west coast fogs occur on about 20 days or less a year, mostly in June and July (6 to 7 fogs a month), but a few as early as March and as late as November. On the east coast and in Aniwa Bay there are 35 to 40 fogs a year, which may occur in almost every month but are most frequent in June and July (7 to 10 fogs a month); they are rare in winter. In the interior fogs are less common.

Sources: North half, Climate and weather of Soviet Sakhalin etc., M.I.S. Confidential Rept. (6745). South half, Koloskov, P.I., Climate description of Southern Sakhalin. Principal Geophysical Observatory, 1936. (In Russian).

Compiled by U. S. Geological Survey.

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

Cape Elizavety
Cape Marii
Schmidt Peninsula
Sakhalin Gulf
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Tartary Strait of
Piltun Bay
Langri
Piltun
OKHOTSK SEA
SIBERIA
Chaivo Bay
Yangi
Dagi
Lakh
Nyiski Bay
Cape Tyk
Viakhty
Katangli
Nabilski Bay
Nysh
Nabil
Khoi
Tangi
Tym
Adatymovo
Lower Pilenga
Aleksandrovsk
Due
Upper Pilenga
Derbinskoe
Kirovskoe
Lake Ka
Amevo
Cape De Lisle de la Croyere
Nampi
Langeri
Khoi
Pilenga
Pilevo
Onor
Poronai
Ambetsu
Muika
Kitanayoshi
Kitanakoshi
Shikuka
Rukuma
Esutoru
Pyssyotoru
Nijitori
Taraika Bay (Patience Bay)
Kitashiretoko Peninsula
Cape Kitashiretoko
Kaikio Island
Shiritori
Shiritori
Raichishi
Chinnai
Chinnai
Gulf of Tartary
Kushunnai
Kushunnai
Shiraura
Tomarioru
Naibuchi
Kontoro
Ochiai
Maoka
Toyohara
Honto
Rutaka
Odomari
Kaiba Island
Aniwa Bay
Cape Nakashiretoko
Cape Nishinotoro
La Perouse Strait (Soya Strait)

EXPLANATION

Numbers refer to areas described in table.

1. Tym Plain.
2. Poronai Plain.
3. Toyohara Plain.
4. South part of mountain ranges.
5. North part of mountain ranges.
6. Northern upland and coastal plains.

For more detailed map of area south of 50°N. latitude see following pages.

10 0 50 Miles
10 0 50 Kilometers

Sketch map

Reconnaissance map

Compiled by U. S. Geological Survey

Introduction

The Tym and Poronai Rivers are the only navigable rivers on Sakhalin Island. Some of the others are used for timber rafting. The string of lagoons along the northeast coast are also used for navigation. Because of the high precipitation (20 to 30 inches annually), which is fairly evenly distributed throughout the year, and the slow spring thaw, the rivers carry considerable water the year round. Rivers freeze over from November to May. High water and floods occur in the spring when snow melts, and in summer when the greatest rain falls. Most of the island is composed of north-trending mountain ranges where river valleys provide the most feasible crossing routes. In the ranges, rivers flow east and west from the central divide, and are generally short and small. The ranges are separated by two central depressions which contain the largest rivers. The rivers provide the main obstacles to movement and because of soft bottoms and banks must be crossed by bridges or ferries. In the only other natural routes of travel, the terraced coastal plains and beaches, numerous river mouths must be bridged or ferried. For the purpose of description the island has been divided into topographic areas containing streams and valleys with common characteristics rather than into drainage areas. Topographic maps on a 1 to 50,000 scale are available for the Japanese half of Sakhalin only, but the map coverage is not complete, and in some parts of the detailed map of Japanese Sakhalin, mainly north of latitude 49° N., information is lacking and the position of streams may be inaccurate. In Russian Sakhalin streams may be incorrectly shown, particularly in the poorly explored north interior. It should be noted that two or even three rivers in different parts of Russian Sakhalin may bear the same name, for example, the Pilenga Rivers in Areas 1 and 5.

No. and Name of Area	Topography	River Characteristics	Movement	Navigability
1 Tym Plain	Plain 2 to 5 miles wide, underlain by thick unconsolidated deposits, crossed by meandering, northward-flowing Tym River. Low, rolling divide at south end, about 500 feet altitude, from which plain gently descends northward to sea at average slope of 5 feet per mile. Plain in south wider, bounded by and parallel to high mountain ranges; in north, (north of Nysh River) plain narrower; cuts across east mountain range. In south part west edge covered by alluvial fans; more gently sloping than east edge. One to three low terraces, swampy in many places, on both sides of river. Plain on west side wider than on east. Natural levees present. Northern narrow part of plain quite swampy. Near mouth, Tym River crosses a short distance of low, tundra-covered coastal plain and empties into Nyiski Bay. Except for some farms in the south and some open tundras, plain is forested entire length.	Tym River is largest stream in Sakhalin; about 250 miles long. Meanders extensively over alluvial plain. Islands, bars, and rapids in places. Bottom soft; banks of gravel and sand, 6 to 8 feet high. In upper course river does not completely fill channel and overflows banks only in high water. Above Nysh confluence, flow is rapid, about 5 miles/hour, in places so swift that spots remain unfrozen in winter. Below Nysh confluence, river is slower, flows between low banks, has several rapids. Near its mouth river is slow, wide; flows between low banks of overhanging peat; contains considerable brown-stained water. Wide delta at mouth is crossed by three channels; middle one deepest. River 300 feet wide at mouth, gradually narrows upstream to 150 feet. Channel, generally near steeper bank, 50 to 60 feet wide in lower course. Channel 15 to 20 feet deep for about 10 miles above mouth, suddenly decreases to 4 feet. Mouth shallow at low tide. Tym River carries considerable water all year. Frozen from Oct. to April except locally where current is swift. Does not freeze completely to bottom. Highest water in spring (May and June), once when valley snow melts, again when mountain snow melts. High water again in summer (July to Sept.) when rainfall is highest. Many log jams increase flooding effects of high water. Exceptionally heavy floods raise river 13 feet above normal stage. Lowest water in Oct., another low water in late June and early July. Several large tributaries, largest are Nysh and Lower Pilenga Rivers.	Movement lengthwise and across valley made difficult by swamps (particularly below Nysh confluence), forest cover, and larger rivers. Tym River must be bridged or ferried. No bridges are known to exist below Nysh River. Fords might possibly be made at some rapids above Nysh confluence. A few wooden bridges cross upper Tym. Lower courses of Nysh and other large tributaries must probably also be bridged. In winter probably much of the Tym and tributaries can be crossed by ice, but in places ice may be thin or even lacking.	Nyiski Bay can be entered by boats with 6- to 7-foot draft. Frozen from Dec. to April. Flat-bottomed motor boats can go up Tym River as far as Nysh River in low water, as far as Adatymovo in high water (3 to 4 months during year). Native log canoes, which can navigate most of river's length, make trip from Derbinskoe to coast in 5 days. Log jams and rapids hinder navigation. Nysh, Lower Pilenga, Upper Pilenga, and Belaya Rivers suitable for rafts.
2 Poronai Plain	Wide, swampy plain, 10 to 15 miles wide; continuation of Tym Plain from which it is separated by low undulating divide (altitude 500 feet). Bordered by high mountain ranges. Plain gradually descends southward to sea level at average slope of about 5 feet/mile; underlain by thick unconsolidated deposits; crossed by meandering Poronai River. Flat plain on both sides of river except at point in middle course, where steep-sloped, hard rock hills rise above east bank. Plain on both sides of river is continuous swamp behind natural levees about a mile in width. On west edge of plain, sloping alluvial fans built up by large perennial tributary streams, are at the foot of mountains. Valley forested except for open patches of tundra on swamps.	Poronai River only slightly shorter than Tym River, is large, slow, and strongly meandering, with cut-off channels and ox-bow lakes along its course. Bottom soft. Banks low and steep, of soft sand and gravel, in places may be peat and clay. Channel contains numerous rapids and log jams. Water is stained brown much of length. River 750 feet wide at mouth, 150 feet wide close to Russian-Japanese border. 14 to 20 feet deep at mouth. Carries considerable water all year; does not freeze through in winter. Frozen over from Oct. to April. Floods twice in spring, when valley snow melts and when mountain snow melts, and again in late summer. Floods aggravated by log jams; cover large portions of flat plain on both sides of river.	Movement across plain restricted by extensive swamps and Poronai River, which must be bridged or ferried. No bridges across Poronai known to exist. Mouth of Poronai and old channel several miles to east are crossed by ferries. Movement along plain is best on relatively dry alluvial fans at west side, which are followed by highway which bridges large tributaries of Poronai. Natural levees also form possible route of travel, but thick forest is obstacle and mouths of tributaries will have to be bridged or ferried.	Poronai is navigated by boats of 4.5-foot draft for distance of 10 miles above mouth. Native log canoes can be used for most of course. Rapids and log jams interfere with navigation.
3 Toyohara Plain	Low plain, about three to ten miles wide, underlain by thick unconsolidated deposits; crossed by several large north- and south-flowing streams. Swampy at north; bordered on east and west by mountains from whose bases alluvial fans spread out into central flats. Open fields and forests on plain.	Two largest rivers, Naibuchi and Rutaka, flow for some distance in bordering mountains before entering plain. Other large streams head in plain. Rivers have soft bottoms and banks. Susuya and Takoi Rivers have steep banks 5 to 10 feet high; others have low, sloping banks. Rutaka River is 800 feet wide, 10 feet deep at mouth. Naibuchi more than 100 feet wide, about 15 feet deep at mouth. Takoi less than 100 feet wide except near mouth; 10 feet deep in lower course. Some small streams, which head in bordering mountains and flow over porous alluvial fans, are dry in lower courses except during floods. Other streams carry considerable water all year. Frozen over from Oct. to April. High water in spring and in late summer.	Movement in plain is free except for large streams which must be bridged. Network of roads and many existing bridges and ferries.	Naibuchi and Rutaka Rivers used for logging and could be rafted.
4 South part of mountain ranges	High mountain ranges extending north-south; rivers flow east and west from central divides. Largest streams have flat-bottomed, alluvium-filled valleys in lower courses. Some flat valleys, as Rutaka Valley, extend for long distance into mountains; streams are very winding, cut into alternate sides of valley. Many streams cross narrow, flat, swampy areas at mouth, some deltas. Smaller streams flow in narrow-bottomed, steep-walled valleys for entire length; some form cascades or waterfalls when reaching the ocean. All valleys forested.	Largest streams have soft alluvial bottoms and banks; some banks steep and high. Streams generally swift, with clear water; high gradients. Rapids in many places. Largest streams 100 feet or more wide in lower courses; up to 8 feet deep, though majority are less than 5 feet deep. Rivers rise rapidly after spring thaws and heavy rains; flow all year. Frozen over from Oct. to April. Highest water in spring and late summer.	Valleys provide best route for crossing mountains. Crests are crossed by passes through low divides at river heads. Movement is easiest in wide valleys but winding streams must be crossed many times. In general streams are fordable, except in lower, soft-bottomed courses of largest streams. Most wide valleys are followed by roads with many wooden bridges. Many flat valley bottoms are cultivated; crossed by a network of roads and trails. Much of coastline is followed by highway and railroad which cross river mouths by wooden or steel bridges.	Most larger streams are navigated by rafts and used for floating timber to coasts.
5 North part of mountain ranges	High mountains similar to Area 4. Mountains form high, steep bluffs on west coast; narrow coastal terraces on east coast, widen to the north where there are two large lagoons. The Aleksandrovka and Agnevo Rivers flow in one elongate depression, more or less parallel to coast; valley bottoms are about a mile wide, flat, terraced, and swampy in places; rivers meander; low, rolling divide between rivers in depression. Pilevo, Nai-Nai, Onor, Upper and Lower Pilenga (Tym River tributaries), Nysh, Nabil, Langeri, Pilenga (on east coast), and some other rivers have flat-bottomed, terraced valleys in lower courses, usually less than a mile wide. Widest part of valley bottom is usually on north side of stream. All valleys forested.	Rivers are small, rapid, and cascading, rise quickly when snow melts in spring and after summer rains. Perennial streams. Frozen over from Oct. to April or May. Soft alluvial banks in wide-bottomed valleys, in places steep and high. Soft bottoms in lower courses of largest streams.	Large valleys provide best route across mountains. On southwest coast, abrupt cliffs descend into deep water, and flat valley mouths of Agnevo, Nai-Nai, and Pilevo Rivers interrupt an otherwise unapproachable shore and provide access into interior. North side of east-west valleys are commonly widest; can be followed without crossing main stream. In Aleksandrovka-Agnevo Valleys, main streams are winding and must be crossed in many places. West coast road bridges river mouths and a highway between Aleksandrovsk and Derbinskoe, in interior, bridges streams several times. Elsewhere valleys are followed only by trails; bridges are few. Streams can generally be forded, except soft-bottomed lower courses of largest streams.	Largest streams are navigated by rafts in lower courses. Nabilski Bay navigable by boats with 10-foot draft.
6 Northern Upland and Coastal Plains	Wide coastal plains at borders of north-trending mountain chains. Mountains on both sides of a central uplifted, dissected, terraced plain. Streams head in central, dissected plain; flow east and west across mountain chains in deep narrow valleys; continue across coastal plains in narrow valleys incised in tundra-covered terraces of plains. On east shore, rivers empty into elongate coastal lagoons and bays, cut off from the sea by sand bars, but usually connected to open water by narrow, shallow, tidal gap across bars. On west shore, lagoons near north end only. Valleys forested except near mouths. Schmidt Peninsula mountainous at south end, from which ridges continue north on each coast, separated by central lowland; all streams are small. Two largest streams, Longi and Pil Rivers, have flat-bottomed, alluvium-filled, terraced valleys, swampy in spots. Valleys in interior and on southwest coast are forested, others have fields or low brush.	In valleys through the mountains, streams are swift with high gradients, and rapids. On west coastal plain, streams are sluggish, with low gradients; contain much water, stained brown by peat, and flow on soft bottoms between low soft banks, in places formed by overhanging walls of peat. On east coastal plain, rivers are similar but generally faster and deeper than on west coast. Dagi River, and probably others, have sandy and gravelly shoals, and log jams near mouths. Largest streams are 75 to 100 feet wide near mouths, narrowing to 30 to 40 feet several miles upstream. In lower courses, streams may be 5 feet or more deep. Rivers silt up near mouths; may be very shallow during low tide. At low water, banks are 5 to 10 feet above water level. In high water channels are completely filled. Highest water near end of April. Rivers freeze from Oct. to April or May.	Valleys form best route to interior and across island, but movement is difficult. Streams must be crossed at many places in valleys, which may involve bridging in lower courses. A few short roads on both shores bridge several streams, elsewhere bridges are lacking. No roads, and only a few trails in valleys.	Few large streams might be navigable by rafts. Chaivo Bay can be entered by boats with 20-foot draft. Baikal Bay has important port for Okha oil field; can be used by large steamboats. The string of elongate lagoons on east shore provide a good route along coast, used by small boats and native canoes which go from Tym River almost to Okha with only a few crossings of narrow sandy land between adjacent lagoons. Water of lagoons is sheltered from stormy Okhotsk Sea.

Reliability rating: Class C.
Compiled by U. S. Geological Survey.

RIVERS (SOUTH HALF)

CONFIDENTIAL

JAPANESE SAKHALIN

142° 30′ 143° 30′ 48° 30′ 47° 30′ 46°

OKHOTSK SEA

TARTARY STRAIT

ANIWA BAY

Kushunnai R. 8.5 5.
Manui 3.3
Nayoro R. 41 57
Tomariotu R. 4.6 4. 2.3 2.
Tomon R. 66 40 58 33
Pote R. 3.6 1.3 1.6 3.3 1.6 2.3 1.0 1.6
Ogasawara R. 2.6 2.6
Naibuchi R. 1.6 2.0 3.3
Athama R. 1.6 2.
Hakucho Lake 13 14.
Honochi 1.3 .6 2.3
Noda R. 1.3 1.0 4.2 2. 2.4
Tofutsu R. 1.6
Konotoro R. 1.3
3.6 3. 1.1 .6 .6
4.6 10 10 10 5.2 2. 8.
10 2.3 2.6 1.6 2.
1.3 1.3
Takoi R. 5. 4.6
Susuya R. 5.6 1.3
Makano R. 2.3 1. 1.6 4. 4. 5.6
Fushimi Bay
Ochiho R. 1.3 4.
Omuto Lake 1.6 2.6
Tonnai Lake 7.5 5. 5.
Waiwai Lake 1.3 5. 4.3 3.3 8. 5.
Tofuchi Lake 1.6 TOFUCHI R. 2.
Naioto R. 2. 2.3 1.6
Minabetsu Bay
Minabetsu R. 1.6
Yaman R. 1.6
Chichine R. 1.6
1.3 1.3 1.0
2.3 1.3 1. 2. 2. 20 1.6 26 1.3 2.3 1.6 2. 3.3 42 2.6 5. 6.5
Kuryaka R. 3.6 3.3 7. 3.6 1.3 2 2.3 1.6 37 8. 10.
Tarannai R. 23 1.6 1.3 1.6 1.3 1. 2. 2.6 1. .6 2.6 33 3.3 5.
Uryu R. 1.6
Tokombo R. 8. 1.6 2.3 2.3 1.6
Minamitayoshi R. 1.6 6.5 1.0 8. 2.3 8. 8. 11 2.
Nishitoru R. 1.3 1.6 26
Boto R. 1.6 8. 2. 3.3
Futue R.
Naisha R. 1.0 4. 6.

EXPLANATION

River more than 100 feet wide.

River less than 100 feet wide.

Steep banks.

Wide, flat-bottomed valley, river does not cut into valley sides.

Flat-bottomed valley, river cuts into valley sides.

Narrow "V" shaped valley occurring as a local constriction along a flat-bottomed valley.

Where no valley symbols are shown, valley is narrow and "V" shaped.

5. Depth of water at point indicated (in feet).

25 Height of bank at point indicated (in feet).

R Rapids not all rapids are shown on map.

Point below which rafts can be used; used for floating timber.

Compiled mainly from Imperial Japanese Army Land Survey Bureau, 1:50,000 scale topographic maps; 1911 to 1935. In much of the area north of latitude 49° N. and in small areas in other parts, map coverage was lacking and information is incomplete.

10 0 10 20 Miles

10 0 10 20 30 Km.

142° 30′ 143° Long. Greenwich 30′

Compiled by U. S. Geological Survey

28

RIVERS (NORTH HALF)

CONFIDENTIAL

JAPANESE SAKHALIN

142° 30′ 143° 30′ 144° 30′

50° 30′ 49° 30′ 48°

STRAIT OF TARTARY

OKHOTSK SEA

TARAIKA BAY

Shirunai R.
Mujko R.
Matsumuro R.
Hoe R.
Poronai R.
Shomon R.
Furiho R.
Rikutaga R.
Lake Tarai-ka
Sanka R.
Nokgra R.
Tadao R.
Kitanayoshi R.
Sanchi R.
Shikuka R.
Esutoru R.
Horochi R.
Nitoi R.
Raichishi R.
Shiritori R.
Kitenkoton R.
Raichishi Lake
Chinnai R.
Kashino R.
Kushunnai R.

10 0 10 20 Miles

10 0 10 20 30 Km.

EXPLANATION

River more than 100 feet wide.

River less than 100 feet wide.

Steep banks.

Wide, flat-bottomed valley, river does not cut into valley sides.

Flat-bottomed valley, river cuts into valley sides.

Narrow "V" shaped valley occurring as a local constriction along a flat-bottomed valley.

Where no valley symbols are shown, valley is narrow and "V" shaped.

(5) Depth of water at point indicated (in feet).

[25] Height of bank at point indicated (in feet).

R Rapids; not all rapids are shown on map.

Point below which rafts can be used; used for floating timber.

Compiled mainly from Imperial Japanese Army Land Survey Bureau, 1:50,000 scale topographic maps; 1911 to 1935. In much of the area north of latitude 49° N. and in small areas in other parts, map coverage was lacking and information is incomplete.

Long. Greenwich

Compiled by U. S. Geological Survey

WATER SUPPLY

CONFIDENTIAL

SAKHALAN ISLAND

NORTH PART
(U.S.S.R.)

SOUTH PART
(JAPAN)
(KARAFUTO)

SIBERIA

Sakhalin Gulf

Strait of Tartary

Gulf of Tartary

OKHOTSK SEA

La Perouse Strait
(Soya Strait)

Taraika Bay
(Patience Bay)

Aniwa Bay

Cape Elizavety
Cape Marii
Schmidt Peninsula
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Piltun Bay
Chaivo Bay
Nyiski Bay
Cape Tyk
Katangli
Nabilski Bay
Nyva
Tym
Aleksandrovsk
Due
Derbinskoe
Kirovskoe
Cape De Lisle de la Croyere
Pilevo
Poronai
Ambetsu
Kitanayoshi
Esutoru
Shikuka
Kitashiretoko Peninsula
Cape Kitashiretoko
Kaikio Island
Shiritori
Chinnai
Kushunnai
Shiraura
Tomarioru
Naibuchi
Ochiai
Takoi
Maoka
Toyohara
Sosuya
Honto
Rutaka
Odomari
Kaiba Island
Cape Nakashiretoko
Cape Nishinotoro

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 54° 53° 52° 51°

EXPLANATION

Large numbers and heavy lines refer to areas listed below and described in table.

Area 1 Toyohara Plain
Area 2 Mountain Ranges
Area 3 Tym-Poronai Plain
Area 4 Coastal Plains
Area 5 Northern Upland
Area 6 Schmidt Peninsula

Known cold spring

Known thermal spring

Area of ground water in flat-lying or gently dipping, pervious, unconsolidated or poorly consolidated rocks; shallow or deep wells may be successful in almost all parts.

Area of steeply dipping, bedded, hard rocks or massive crystalline rocks; ground water localized, well prospecting uncertain.

50 0 50 Miles
50 0 50 Kilometers

Sketch map

Reconnaissance map

Compiled by U. S. Geological Survey

Introduction

Water is generally abundant. The mean annual precipitation is 20 to 33 inches, highest in late summer, but fairly well distributed throughout the year. Mountainous areas contain many clear, small streams which are perennial although in some places they are barely large enough to supply the towns which utilize them. The interior lowlands and coastal plains are crossed by larger streams many of which are stained brown by peat and swamp deposits. Springs are generally mineralized, often high in sulfate but probably majority are potable. In the lowlands the ground is usually saturated at shallow depths. Settlements use surface water and shallow wells to some extent, but both are subject to pollution. Drilling in the oil fields on the east coast has given evidence of deeper artesian aquifers, which undoubtedly exist in all the lowland area and should be a good source of water supply. Ground water in mountain areas is in hard rock and localized in fissures or steeply dipping beds; well drilling is uncertain and requires preliminary investigation in the field by trained personnel. Permanently frozen ground is present in Russian Sakhalin within a few feet or less of the surface in lowlands where the ground is peaty, and sometimes underlying all the lowlands and part of the mountain slopes as well. Its distribution and thickness is highly variable. It might continue a considerable distance south into Japanese Sakhalin. Permanently frozen ground precludes shallow wells in many places, but water occurs beneath it and sometimes within it, usually under pressure. The special problems of groundwater supply it presents are discussed in the special report, Strategic Engineering Study no. 62, "Permafrost or Permanently Frozen Ground and Related Engineering Problems".

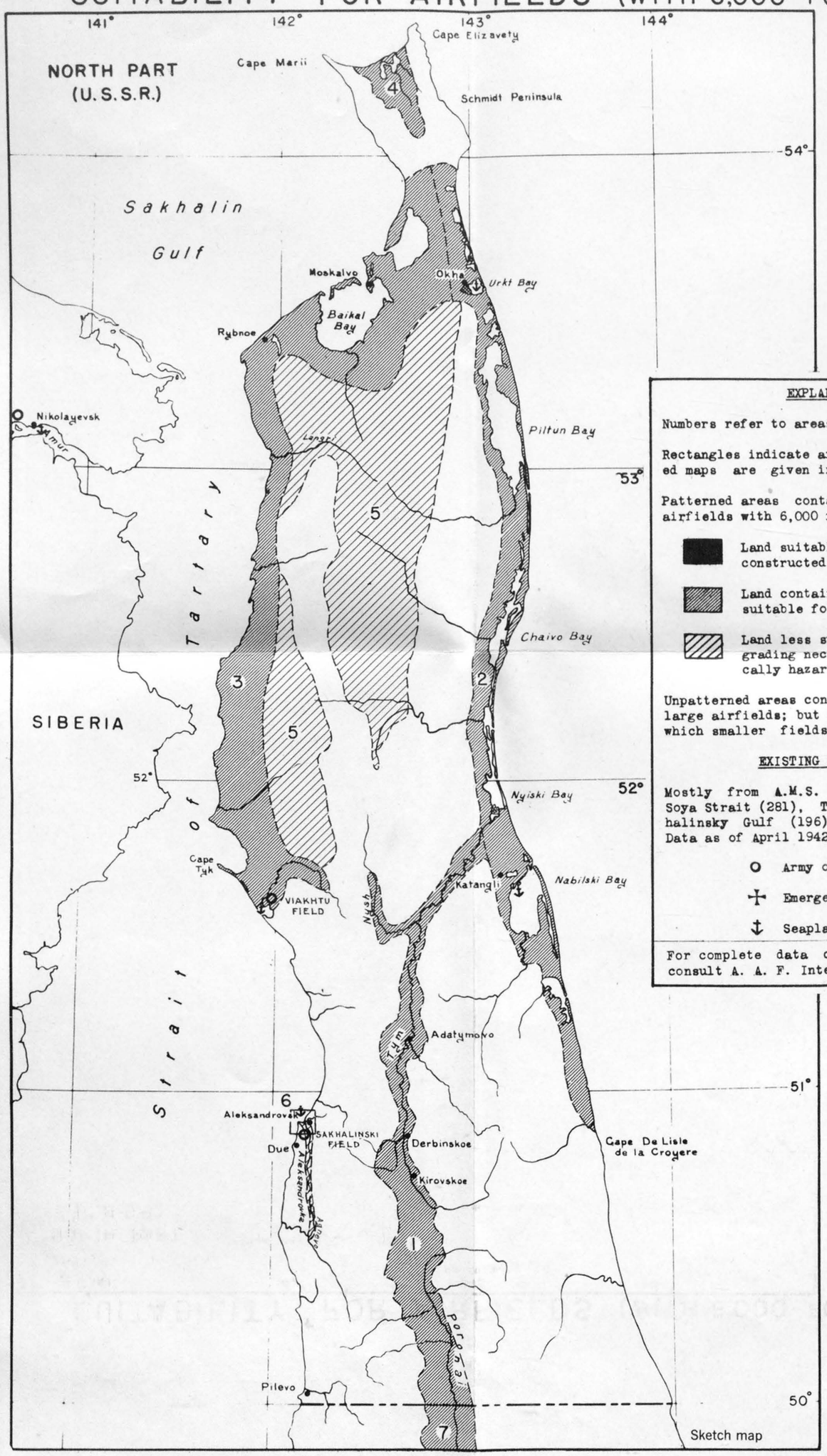
Area	Ground-water Geology	Surface Supply	Springs	Water Available for Wells	Recommended Supplies	Equipment Needed
1 Toyohara Plain	Elongate plain between north-trending mountains, occupied by south-flowing Susuya River and north-flowing Naibuchi River and it tributary, Takoi River. Filled with thick, unconsolidated, pervious deposits of sand, gravel, and some clay. Ground surface is well drained except near coast. Alluvial fans of coarse sand and gravel at foot of mountains spread out onto plain; best developed on east side. In places, edge of plain is terraced. North and south coasts formed by sandy beaches and bars, and swamps.	Larger streams provide a good supply throughout year. Naibuchi River heads in mountains; is large stream where enters plain. Takoi and Susuya flow for most of length on the plain. Their tributaries, flowing off mountain slopes, lose much water in porous alluvial fans at base of slopes; lower courses of many, particularly on east side, are nearly or completely dry. Mean annual precipitation at Toyohara is 31 inches.	Some probably occur at edges of terraces and at base of mountain slopes.	A large supply of good water should be obtainable in any part of plain both at shallow depths and at deeper horizons. Shallow water may be polluted. Water in both deep and shallow wells will rise close to surface.	Main streams will furnish good supplies; ample supplies available throughout to drilled wells; dug wells will furnish small supplies, subject to pollution.	Shallow wells can be dug by hand but small rotary or jetting rigs capable of a few hundred feet depth are recommended. Casing of wells is necessary. Shallow and surface water is subject to pollution and should be treated.
2 Mountain Ranges	Mountains made up principally of steeply dipping and faulted bedded rocks: impervious clay, shale, slate, and schist; pervious sandstone, volcanic ash and conglomerate. Smaller areas of massive crystalline rock: marble and granite east of Toyohara Plain; lava rock in large area between Esutoru and Chinnai, and extending in narrow belts along coast as far north as Aleksandrovsk. In many places rocks contain coal beds. Within mountains are a number of small flat areas (wide terraced valley bottoms and lowlands) filled with pervious, unconsolidated sand, gravel and clay, in most cases less than 10 feet thick, and never over 50 feet thick.	Numerous short, small mountain streams provide small supplies, in some cases barely sufficient for settlements using them. Annual precipitation 22 to 33 inches.	Numerous springs issue from mountain slopes. Many are high in sulfate, sodium, and iron; some carry methane gas. Most are probably potable. Some are thermal (100° to 130° F.). Springs can be expected at fault zones and from fissures in marble and lava rock.	In wide valley bottoms, terraces, and lowlands underlain by unconsolidated materials, water can usually be obtained by dug wells or driven sand points less than 50 feet deep. In most of area ground water occurs in steeply dipping, bedded rock or massive crystalline rock. Well prospecting is uncertain but in places can be successfully undertaken by trained personnel. Sandstone, conglomerate, limestone, and volcanic rocks are most likely to bear water. Wells may need to be several hundred feet deep. Some ground water may be highly mineralized; water in coal-bearing beds apt to be high in sulfate and not potable.	Probably no large supplies of water easily available. Small supplies available from streams, supplemented perhaps by shallow driven or dug wells and springs.	Percussion rigs needed for deep, hard rock drilling. Hand tools, sand points, or light rotary or jetting machines can be used in valley deposits. Wells require pumps and casing. The use of springs will require pipe for distribution. Some water will need treatment for high mineral content; shallow and surface supplies will need to be treated against pollution.
3 Tym-Poronai Plain	Elongate plain between north-trending mountain ranges, occupied by north-flowing Tym and south-flowing Poronai Rivers. At edges, plain passes into alluvial fans of coarse sand and gravel at foot of ranges. One or more terraces (in places, four) form plainson either side of rivers; widest on west side. Much of area covered by swamps and underlain by peat deposits in places 18 feet thick. Peat is underlain by clay, which lies on thick deposits of pervious sand and gravel. In upper terraces, gravel lies within a few feet of surface. Along river are natural levees, strips of well-drained land up to one mile wide, slightly higher than swampy land beyond; composed of sand, silt, and gravel.	Tym and Poronai are the largest streams of the island, and provide large supply of water throughout year. Tym is 300 feet wide, 15 feet deep near mouth; Poronai 450 feet wide. Tym is swift and clear, except near mouth where it is sluggish and water is stained brown by peat. Poronai is less swift and carries brown water most of course. Annual precipitation 30 inches at Shikuka, 21 inches at Kirovskoe.	Probably some at edges of terraces and near foot of mountains.	In most places water can be found a few inches below surface. Gravel and sand deposits carry large amount of water; deeper water probably better than shallow, swampy water. In north two-thirds of plain, permanently frozen ground occurs in peat at depth of a few feet. Thickness variable, in places about 50 feet. Water, usually under hydraulic pressure, occurs below frozen ground and sometimes in unfrozen layers within it.	Large quantities of water available from streams, supplemented by shallow wells in areas away from streams.	Rotary drilling rigs recommended because of loose caving materials; may be employed to advantage in frozen ground by using heated drilling fluid. Casing and pumping equipment needed. Shallow ground water and surface water probably bad tasting and may be polluted; treatment always necessary.
4 Coastal Plains	Wide, terraced coastal plains. On east shore many lagoons and lakes cut off from sea by sand bars; on west shore series of open, gently curving bays lined by sand beaches and, on south, by marshes. From inland shores of lagoons and beaches rise several terraces, swampy and covered with peat up to 10 feet thick. Particularly swampy on west coast. Upper parts of terraces composed of unconsolidated sand, gravel, and some clay, which overlie bedded, flat-lying or gently dipping, poorly consolidated deposits: pervious sand, gravel, sandstone, and conglomerate; and impervious clay. Some beds are oil bearing.	Many streams, some quite large. Water usually sluggish and stained brown by peat and swamps. Rivers on east coast in places polluted by oil from natural seeps and oil-drilling operations. Some inland lakes contain potable water; one supplies town of Okha (pop. 20,000 in 1935.)	Many springs, similar to those in Area 2. Springs on east coast are in oil-bearing region and some are highly mineralized and carry methane gas. Many springs of potable water emerge at edges of terraces from gravel at base of superficial unconsolidated materials.	Shallow water is abundant in terraces. At Okha, water was obtained by borings less than 10 feet deep but became polluted and wells were abandoned. Deeper water under pressure is present at different horizons from 100 to 700 feet or more in depth. In areas covered by peat, and possibly elsewhere, ground is permanently frozen from a few feet or less below surface to indefinite depths, probably not more than 100 feet. Water occurs beneath frozen ground and possibly in unfrozen layers within it, usually under pressure. Ground water on east coast is associated with oil and may be highly mineralized.	Moderate supplies available in most places from streams; supplemented in some localities by shallow wells and springs for immediate supplies and deeper wells for permanent supplies.	Same as Area 3. Use of springs requires pipe for distribution. Mineralized spring and well water will need treatment.
5 Northern Upland	Area is poorly explored and information is incomplete. On east and west edges are ridges and isolated mountain peaks which are continuations of mountain ranges to south. Decrease in size to north, gradually passing into coastal terraced lands. Interior appears to be an area of low dissected terraces, swampy in part, widest at north where it unites with coastal terraces. Mountains are composed of bedded rocks: sand, clay, and poorly consolidated to moderately hard, permeable sandstone, volcanic ash, and conglomerate. Rocks are folded and in places faulted but less intensely than rocks of ranges farther south. Interior terraces composed of unconsolidated sand, gravel, and clay overlying flat lying or gently folded rocks similar to those of mountains.	A number of large streams head in interior and flow east and west, cutting through mountains at borders of area.	Probably many springs in mountains and at the edges of terraces.	In the terraced interior, ground-water conditions are probably very similar to those in Area 4. Shallow water and deeper water under pressure should be abundant. In mountainous area much rock is quite permeable and probably well prospecting will meet with good results. Permanently frozen ground underlies the terraced land and in places the mountain slopes as well.	Moderate supplies available in many places from streams; supplemented, in some localities, by shallow wells for immediate supplies and deeper wells for permanent supplies.	Same as Area 4.
6 Schmidt Peninsula	Mountains form the east and west sides of peninsula; united at south end but at north separated by low, flat, terraced depression. Mountains are composed of folded and faulted bedded rock: sandstone, volcanic ash, clay, and some conglomerate. Terminate at north by two prominent capes, composed of hard, crystalline rock. West cape contains much trap rock; east cape some marble. Central depression is filled with pervious unconsolidated sand and gravel and some clay. Larger valleys, such as Pil and Longi, contain alluvial flood plains and terraces, in places swampy.	Water of streams is probably good but supplies in most places are small.	Mountains have several springs, high in sulfate and similar to those in Areas 2 and 4. Small springs probably occur at edges of terraces.	Central depression probably has much shallow, unconfined water and deeper water under pressure. Many materials in mountains are pervious and should carry much water, but trained personnel will be required to pick locations. Permanently frozen ground underlies the lowlands and probably some slopes.	Small supplies available from streams; large supplies probably available from drilled wells in lowland areas.	Same as Area 4.

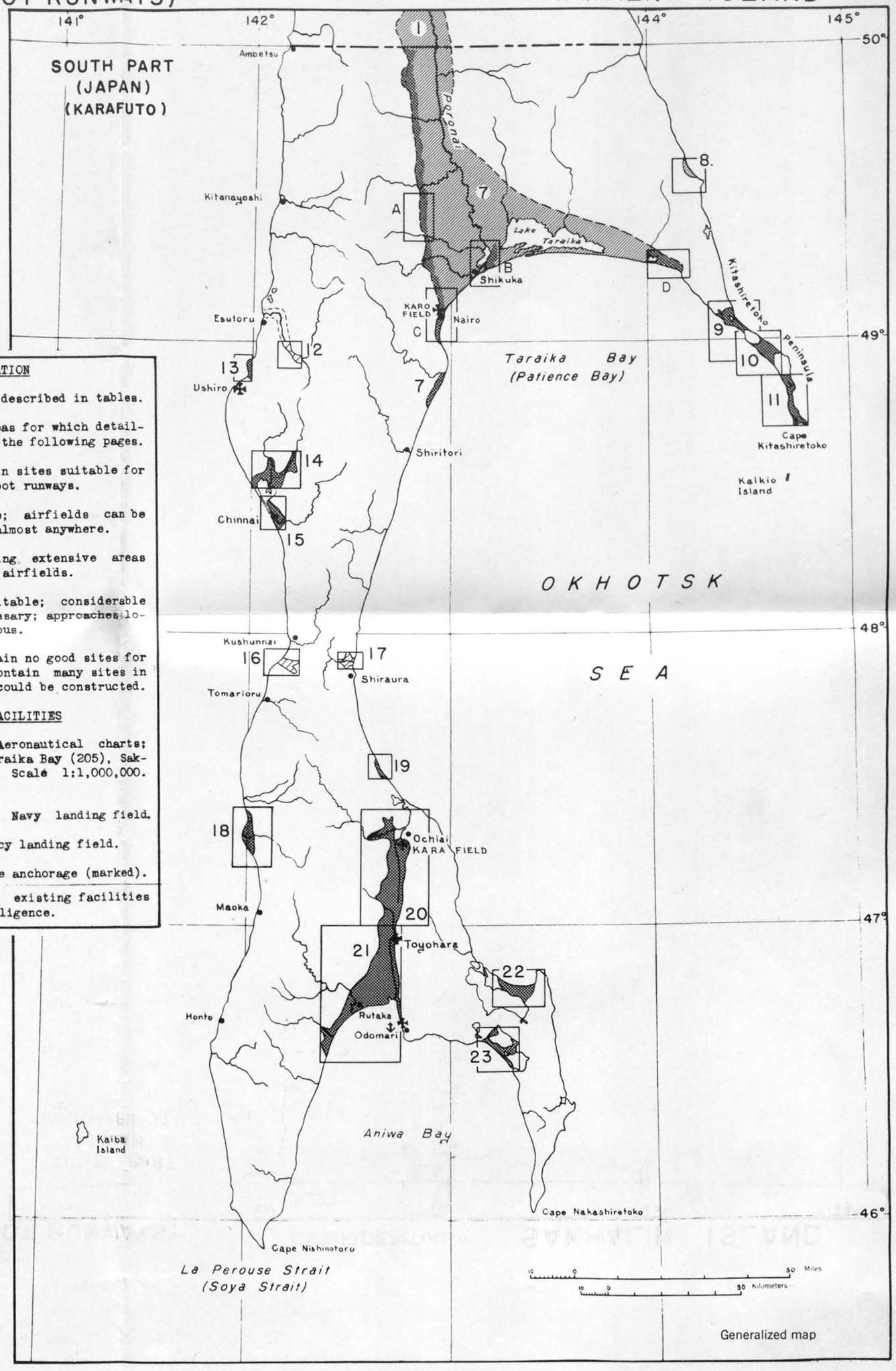
Reliability rating: Class C.
Composed by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS (WITH 6,000-FOOT RUNWAYS)

CONFIDENTIAL

SAKHALIN ISLAND





EXPLANATION

Numbers refer to areas described in tables.

Rectangles indicate areas for which detailed maps are given in the following pages.

Patterned areas contain sites suitable for airfields with 6,000 foot runways.

- Land suitable; airfields can be constructed almost anywhere.
- Land containing extensive areas suitable for airfields.
- Land less suitable; considerable grading necessary; approaches locally hazardous.

Unpatterned areas contain no good sites for large airfields; but contain many sites in which smaller fields could be constructed.

EXISTING FACILITIES

Mostly from A.M.S. Aeronautical charts; Soya Strait (281), Taraika Bay (205), Sakhalinsky Gulf (196). Scale 1:1,000,000. Data as of April 1942.

- Army or Navy landing field.
- Emergency landing field.
- Seaplane anchorage (marked).

For complete data on existing facilities consult A. A. F. Intelligence.

RUSSIAN SAKHALIN

Detailed topographic maps of Russian Sakhalin are lacking. Areas having generally flat to rolling topography in which suitable sites can be found are indicated by pattern. The numbers refer to areas that are described on the following pages. A regular air route, using seaplanes, has been operating since 1933 between Khabarovsk (on the Siberian mainland), Aleksandrovsk, and Okha. All the lagoons and lakes on the east and north coasts are good landings for seaplanes. Army or Navy landing fields at Viakhtu and Aleksandrovsk are probably small.

Permanently Frozen Ground: Much of the low, flat land, particularly in the north, is underlain at shallow depths by permanently frozen ground. Removal of vegetation and peaty soil, deep cuts, and warmed buildings disturb the temperature equilibrium of the ground, and the frozen ground may thaw and become supersaturated and unstable. Springs may burst forth, flooding the construction and freezing. For these reasons it is best to leave the ground as little disturbed as possible and fills are preferred to cuts. High subgrades and thick, coarse base course are necessary for drainage and to minimize frost heave. Construction throughout the area should be preceded by an investigation of frozen ground and ground-water conditions. For a detailed discussion of the construction problems involved see Strategic Engineering Study No. 62, Permafrost or Permanently Frozen Ground and Related Engineering Problems. Oil fields on the northeast coast can provide abundant crude oil and some asphalt for runway surfacing needs. Soil cement stabilization is not recommended because, in the north, every month may have freezing weather.

JAPANESE SAKHALIN (KARAFUTO)

Extensive level areas suitable for airfield sites are the wide plains along the Poronai River and north and south of Toyohara. Smaller suitable areas are to be found along the coasts, on terraces, and at the widened valley mouths of the large rivers. Also a few valleys in the interior have bottoms wide enough for longitudinal runways but high valley walls and surrounding mountains make hazardous approaches. Detailed topographic maps are available for areas south of latitude 49° and for some areas farther north. Sites suitable for 6,000-foot runways aligned in several directions and requiring little or no grading are indicated on the index map and shown on large-scale maps with accompanying descriptions on the following pages. Shorter runways could be accommodated on coastal terraces, beaches, and in valleys, but these sites are not described. The ground is not permanently frozen except at the north end of the Poronai Valley, but provision should be made against frost heave. Oil fields in Russian Sakhalin and two synthetic oil plants in Japanese Sakhalin can provide abundant crude oil for runway-surfacing needs. Because of cold climate soil cement stabilization is not recommended. Small emergency airfields, (probably 2,000 feet long or less) are located at Nairo, Ochiai, Toyohara, and Odomari. Scattered lagoons and coastal lakes are good natural landings for seaplanes and the calm anchorages behind breakwaters at Honto, Maoka, and Odomari, and on the northeast coast of Kaiba Island can also be used.

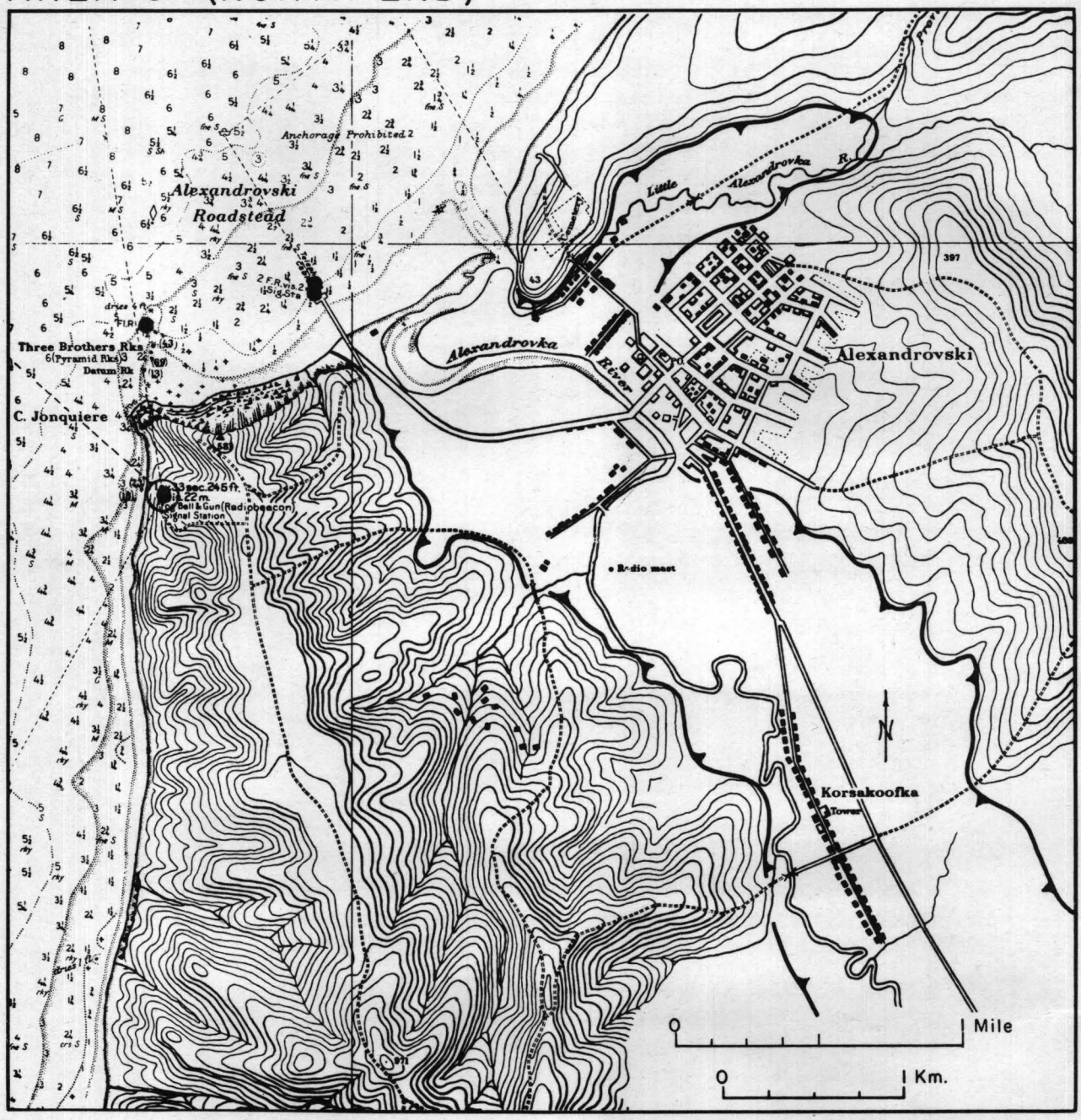
Compiled by U. S. Geological Survey

Name, No. of Area	Topography	Topographic Hazards	Climate	Ground[a], Vegetation	Construction Materials[b], and Water Supply[c]	Accessibility
1 Tym-Poronai Plain	Wide plain between high mountain ranges, occupied by the large, meandering Tym and Poronai Rivers. Sites can be selected where grades are 1% or less, little leveling would be necessary and 6,000-foot runways could be aligned in any direction. The plain on both sides of the rivers is terraced and at the edges passes into gently-sloping alluvial fans rising to the foot of the adjoining mountains. Large parts of the plain are swampy, particularly on the Poronai River. Along the Poronai River the most suitable areas are on the lower slopes of the alluvial fans where the topography is similar to parts of site 7 (see map A for site 7). The divide between the Tym and Poronai Rivers is a gently rolling plain (altitude 430 feet) on which good sites can probably be found. On the Tym River, south of the Nysh River tributary, some areas are rather well drained and sites can be found. Farther north, on the lower course of the river, the Tym valley is narrow, more swampy and good sites are probably lacking. Lowlands, extending some distance from the river, are subject to flooding.	The highest peak of the western range is 5,400 feet altitude; the highest peak of the eastern range is 6,600 feet altitude. Hills several hundred feet high border the Tym-Poronai Plain; mountains rise several thousand feet a few miles from margins of plain.	Fewer fogs and fewer severe winds than along the coasts. Mean annual precipitation at Kirovskoe is 21.5 inches, highest in August and September (up to 4 inches a month). Mean temperature in January, the coldest month, is -10° F.; in July, the warmest month, 62° F. Floods in May and early June, when snow melts; and late July through September, after heavy rains. Snow fall begins in October; snow storms common in November and December; snow melts in the beginning of May.	In swampy areas peaty soil (A-8) 1 to 18 feet thick, underlain by clay (A-7) and, below it, gravel (A-2 and A-3). Dry areas, suitable for sites, covered by a few inches to 2 feet of sandy clay soil (A-6 or A-7), lying on gravel (A-2 and A-3). Permanently frozen ground a few feet below surface in areas with peaty soil; deeper or absent in dry areas. High subgrade probably necessary. Dry areas covered by thick larch and birch forest in some of the plain but much land is cleared and cultivated, or has been burned out and only brush and young second-growth will need to be cleared.	Sand, gravel, and clay in plain. Sandstone and small patches of limestone and granite, in bordering mountains. Timber abundant. Oil seeps in hills west of Kirovskoe might provide some surfacing material, but access probably difficult. fields near mouth of Tym river probably more accessible. Water abundant: Tym, Poronai, and other rivers can be used and shallow wells will yield ample supplies. Deeper wells will yield water of better quality and less subject to pollution.	One of the most populated areas in Russian Sakhalin. Several large towns (less than 10,000 population). A highway extends from Adatymovo south into Japanese Sakhalin. The plain is connected with Aleksandrovsk, the administrative center and chief port of Russian Sakhalin, by all-weather highway, about 25 miles long. Several side roads cross the plain. Access to the east coast is difficult: a poor road follows the lower course of the Tym River, and a few trails cross the range. The commonest method of reaching the east coast is by small boats down the Tym River.
2 East Coastal Plain	Wide, terraced coastal plain at foot of mountains. Shore formed by chain of large lagoons and lakes cut off from Okhotsk Sea by dune-covered sand bars less than 60 feet high and generally ½ to 1 mile wide. Some of the widest sand bars can accomodate 6,000-foot runways aligned in several directions. Dune areas will require some light grading. Terraces rise from the inland edges of the lakes. Terrace tops flat to rolling, many are swampy. Some sites will need but little leveling and can accomodate 6,000-foot runways aligned in any direction. One such possible site is in a terraced valley at the town of Okha. Lagoons and lakes provide good landing places for seaplanes.	Foothills at inland edge of plains are 200 to 400 feet high. The mountains beyond are 600 to 5,500 feet high.	Severe climate. Open to storms from the Okhotsk Sea, cold fogs and strong winds. Worst fogs in May, June and July. Bars are particularly exposed. Predominantly south winds in summer, north and northwest winds in winter.	Terraces composed of unconsolidated sand and gravel (A-3 and A-2); lenses of clay near the surface. Bars and beaches are sand (A-3), locally contain large boulders. In swampy areas the terrace deposits are covered by peat up to 5 feet thick (A-8). In peat areas ground a few feet below the surface is permanently frozen; permafrost at greater depths or absent in dry areas. High subgrade necessary. Sites in most of the dry areas of the terraces will need to be cleared of thick coniferous forest.	Sand, gravel and clay in area. Crude oil and asphalt for surfacing, in large quantities at several producing oil fields, and in smaller quantities at numerous oil seeps along the entire coast. Timber abundant. Many of the large streams often have water stained brown by swamps, but some are suitable for supply. Many springs, particularly common at foot of terrace scarps. Shallow wells should yield good supplies.	Access poor, mainly by sea. Many anchorages in lagoons. Okhotsk Sea navigable from July to October, at other times is ice bound. Urkt Bay, at Okha, and Nabilski Bay near Katangli have marked out seaplane landings. Several oil field settlements in the area, the largest is Okha (population about 20,000) at which a good site can probably be located. Railroad from Okha to Moskalvo, a port on the west coast. Short trails and roads in places along some parts of the coast and leading along the Tym River into the interior, all would need improvement.
3 West Coastal Plain	Wide, terraced coastal plain. In north, sandy beach, in south marshy beach along shore. Behind it is low flat-topped terrace. Farther inland, the terrace rises into undulating or rolling ground, some of which would require little or no leveling. Most of the surface is swampy. Largest dry areas at north and south ends. Some dry areas are large enough for 6,000-foot runways in any direction.	East edges of plain rise into rolling hills and dissected ridges several hundred feet high. In the central part of its length the plain is closely approached by high hills and peaks up to 1,000 feet high.	Colder than Aleksandrovsk. Warmer, with less precipitation and fewer fogs than east coast, and storms are less frequent and less severe; in the north end, however, heavy storms occur in October. Skies cloudy much of the time in winter. Predominantly south winds in summer, north winds in winter.	Swampy areas underlain by 10 feet or less of peat (A-8). Dry parts of terraces composed of sand and gravel with thin clay lenses at the top (A-3 and A-2). Permanently frozen ground probably at shallow depths in most of area. May be deeper or lacking in dry areas. Drainage poor, high fill and subgrade necessary. Shoreline is a sandy beach (A-3) except in the south where mud flats occur at some places (A-7). Sand dunes (A-3) cover parts of beaches and terraces. Most sites on the dry ground of the higher country will need clearing of thick, low conifer forest. The swampy ground is tundra (covered by moss and few withered trees).	Sand, gravel and clay in plain and hills on the east. Oil for surfacing might be obtainable from oil field on the Langri River. Timber abundant. Rivers can be used for water supply but some are sluggish; water is stained brown by swamps and may be unsuitable for drinking. Wells should yield abundant ground water.	Accessibility poor. Strait of Tartary is frozen from November to April. Sparsely settled. Ports of Moskalvo and Viakhtu at north and south ends. Between are fishing villages. Probably a settlement at the Langri River oil field; a short road leads north from field. A short coastal road at south end of area but elsewhere coast followed only by a poor trail. Viakhtu has a seaplane anchorage and an army or navy airfield.
4 Central Plain of Schmidt Peninsula	Wide, flat, terraced plain between mountains. North coast contains lagoons. Plain rises inland, becomes narrower and rolling. Sites can be found in which 6,000-foot runways could be aligned in any direction with little leveling necessary.	Mountains bordering west side 500 to 1,650 feet above plain, on east side 700 to 2,300 feet above plain.	Strong winds and much fog. Bad weather much of the time. Inland part of plain sheltered by bordering ranges but climate still severe.	Sand and gravel, some clay lenses at surface (A-3 and A-2). Sand beaches and bars along coast (A-3). Area probably underlain by permanently frozen ground at shallow depths. High subgrade necessary. Clearing of low forest or brush necessary except near coast.	Sand and gravel in plain. Clay in mountains. Trap rock in mountains to west and limestone in mountains northeast of plain. Water supply can be obtained from streams. Wells can probably find abundant ground water but frozen ground creates difficulties.	A few native settlements on coast, where boats can find anchorage. No roads. Poor trails on coast. Best access by sea.
5 Northern Interior Lowland (Little is known of this region.)	Rolling to rough, dissected, terraced lowland between mountain chains. Some small areas are somewhat less dissected, but will probably require extensive grading to be usable as sites.	Adjacent mountains rise on each side from a few hundred to more than a thousand feet above lowland.	Less severe than at coasts.	Sand, gravel, and small amounts of clay (A-2 and A-3). Poorly drained, swampy in part (A-8). High subgrade would be necessary. Probably all underlain by permanently frozen ground. Thick forest will need to be cleared.	Sand and gravel, some clay in area. Timber abundant. Water supply can be obtained from streams and shallow wells should yield abundant water.	No settlement in entire region. A few poor trails lead to the coasts.
6-23	Described individually on following pages.					

a/ Symbols in parentheses indicate the appropriate soil group according to the Public Roads Administration Classification.
b/ For locations of construction materials see Construction Materials map and table.
c/ For additional information see Water Supply map and table.

Reliability rating: Class C.
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 6 (NORTH END)



EXPLANATION

Contour interval is irregular; contours used only to show land form.

Spot elevations in feet above mean sea level.

Possible airfield site.

Source: U.S. Hydrographic Office, Chart No. 5432, 1:25,000; from Japanese surveys in 1920 and 1921, with small corrections in 1942.

U. S. GEOL. SURVEY

SAKHALIN ISLAND — SUITABILITY FOR AIRFIELDS AREA 6

TOPOGRAPHY: Only the north end of Area 6 is shown on the large-scale map. The rest of Area 6 is topographically similar; its full extent is shown on the index map. Wide-bottomed valleys of the Aleksandrovka and Agnevo Rivers. Bottoms are terraced and not wide enough to permit 6,000-foot runways transverse to the valley, however probably in several places runways could be aligned parallel to the valleys. Some leveling would be necessary on terraces above flood level. The part at the town of Aleksandrovsk is probably as good a site as any in the area. There 6,000-foot runways could be aligned along the valley.

TOPOGRAPHIC HAZARDS: Mountains rise abruptly on each side. At Aleksandrovsk those on the west side are 970 feet above the valley and on the east side 466 feet. In other parts of the area they are as high or higher. Approaches from north and south directions are limited.

CLIMATE: Mean annual precipitation at Aleksandrovsk 28 inches, highest in August and September (3 inches a month), lowest in February (one inch). Snow cover up to 7 feet deep. Blizzards every 10 days or so from December through February. Cold, strong winds. Predominantly north winds in winter, south winds in summer. Mean temperature in January, coldest month, is -7° F.; in July and August, the warmest months, is 60° F. Fogs in June and July.

GROUND, VEGETATION: Sand underlain at shallow depths by gravel, (A3 & A2)[a/]. Valley bottom of peat interbedded with sandy clay (A-6 or A-7 and A-8).[a/] Terraces at edges are gravel (A-3).[a/] Poorly drained. High subgrade necessary. Valleys cleared of forest in parts, but forest or brush will need to be removed in some places.

CONSTRUCTION MATERIALS AND WATER SUPPLY: Sand and gravel in valleys. Trap rock and sandstone suitable for construction in mountains on either side. In places coal beds with associated clays suitable for brick. Coaly shales can be burned to make clinker for surfacing. Water can be obtained from rivers, and sufficient supplies might be obtained from wells dug in valley bottoms.

ACCESSIBILITY: Valleys followed by road or trail south from Aleksandrovsk. Aleksandrovsk is the administrative center of Russian Sakhalin and its chief port. It has a seaplane anchorage and an Army or Navy airfield, which is probably small. An all-weather highway (not shown on map) leads east from the town into the interior.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class C,
Compiled by U. S. Geological Survey.

EXPLANATION OF SYMBOLS USED ON TOPOGRAPHIC MAPS NUMBERS 7 TO 23

787 Spot elevation in meters

5 meter contour

10 meter contour

20 meter contour

National highway

State highway

Road over 9 3/4 feet wide

Road over 6 1/4 feet wide

Road over 3 1/4 feet wide

Trail

Standard gage railroad (3 feet wide)

Narrow gage railroad (2 feet wide)

1.7 Depth of stream in meters

Meadow

Swamp

Burned trees

Coniferous forest

Deciduous forest

Dwarf pine

Anchorage

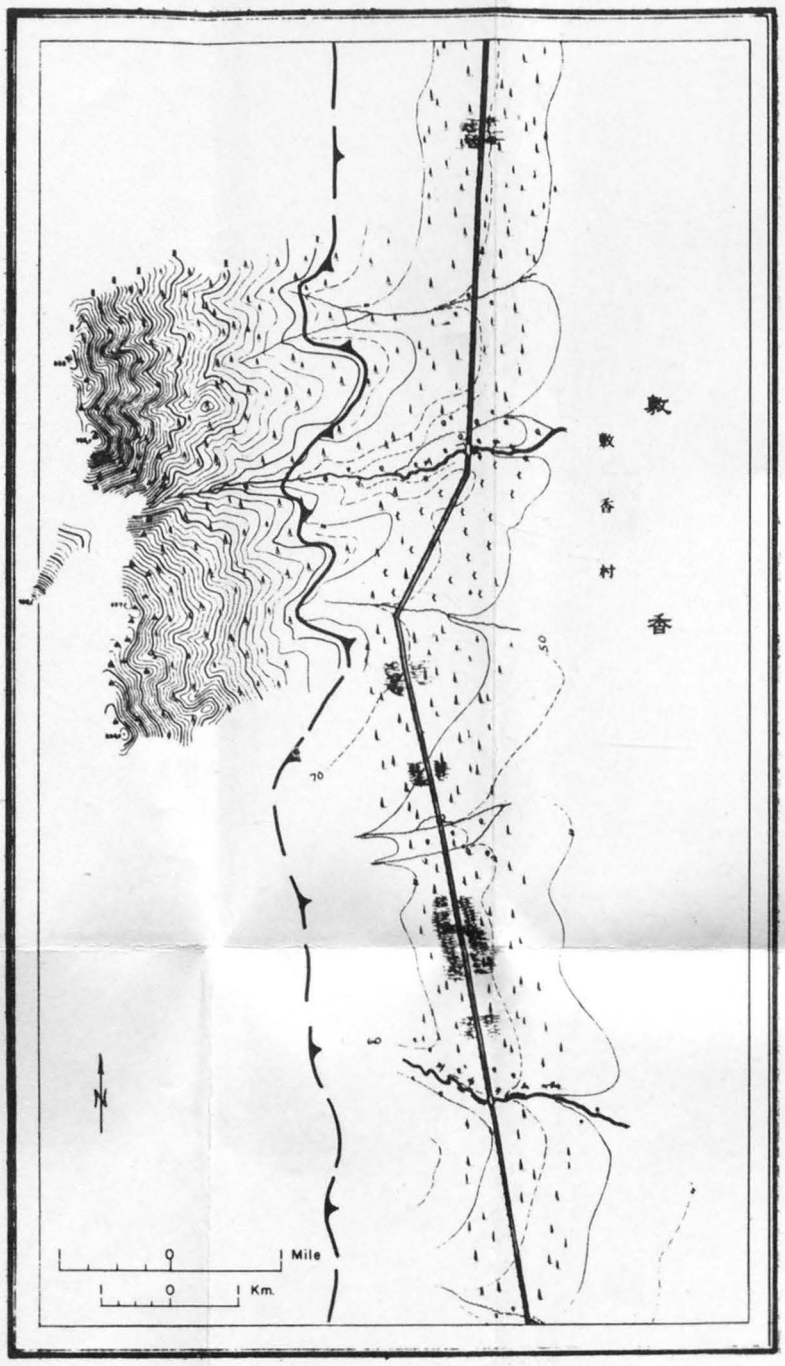
Mooring place

Boundary of area suitable for airfields

Scarp

Power line or telegraph line

SUITABILITY FOR AIRFIELDS, AREA 7 — SAKHALIN ISLAND



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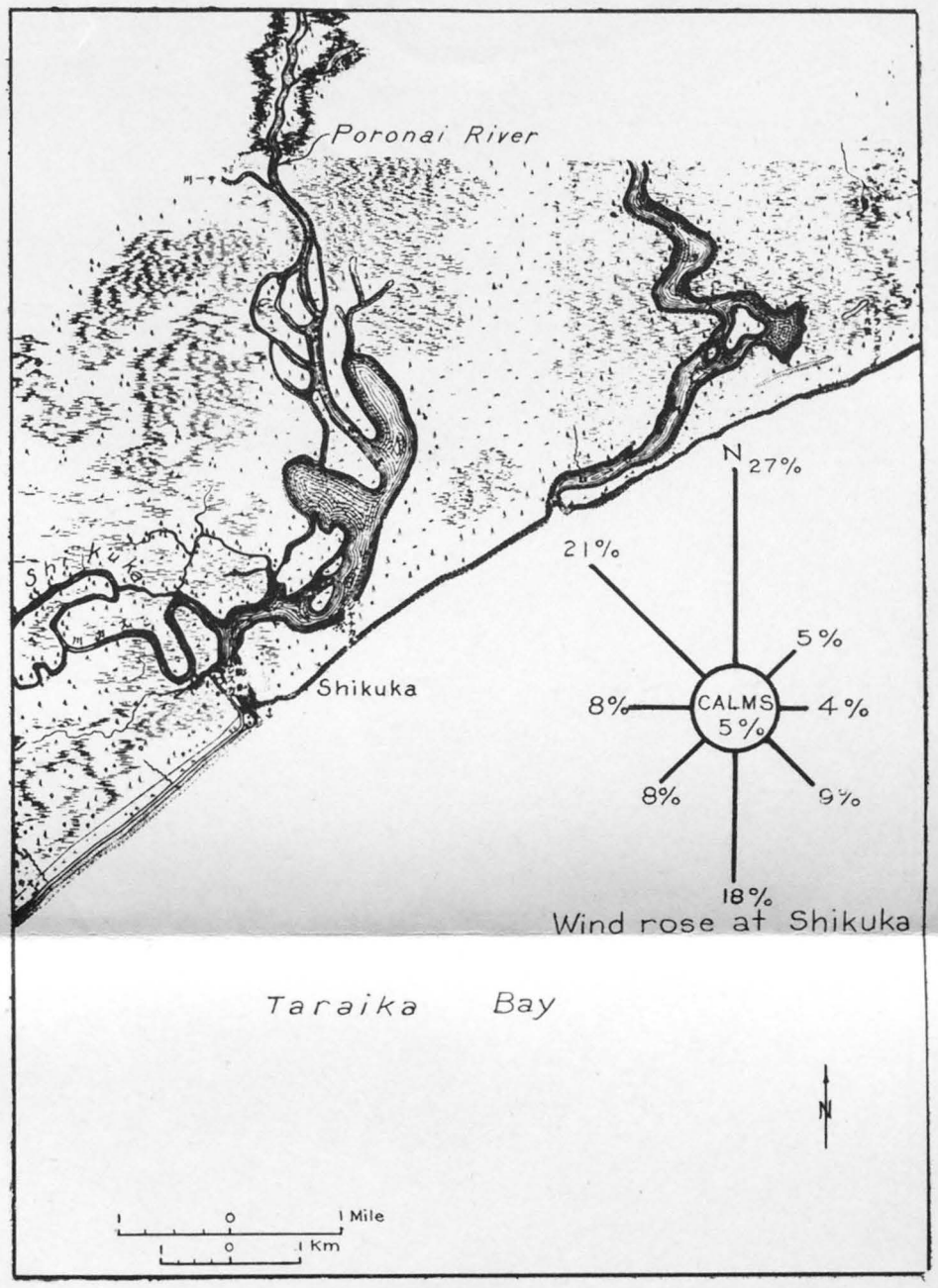

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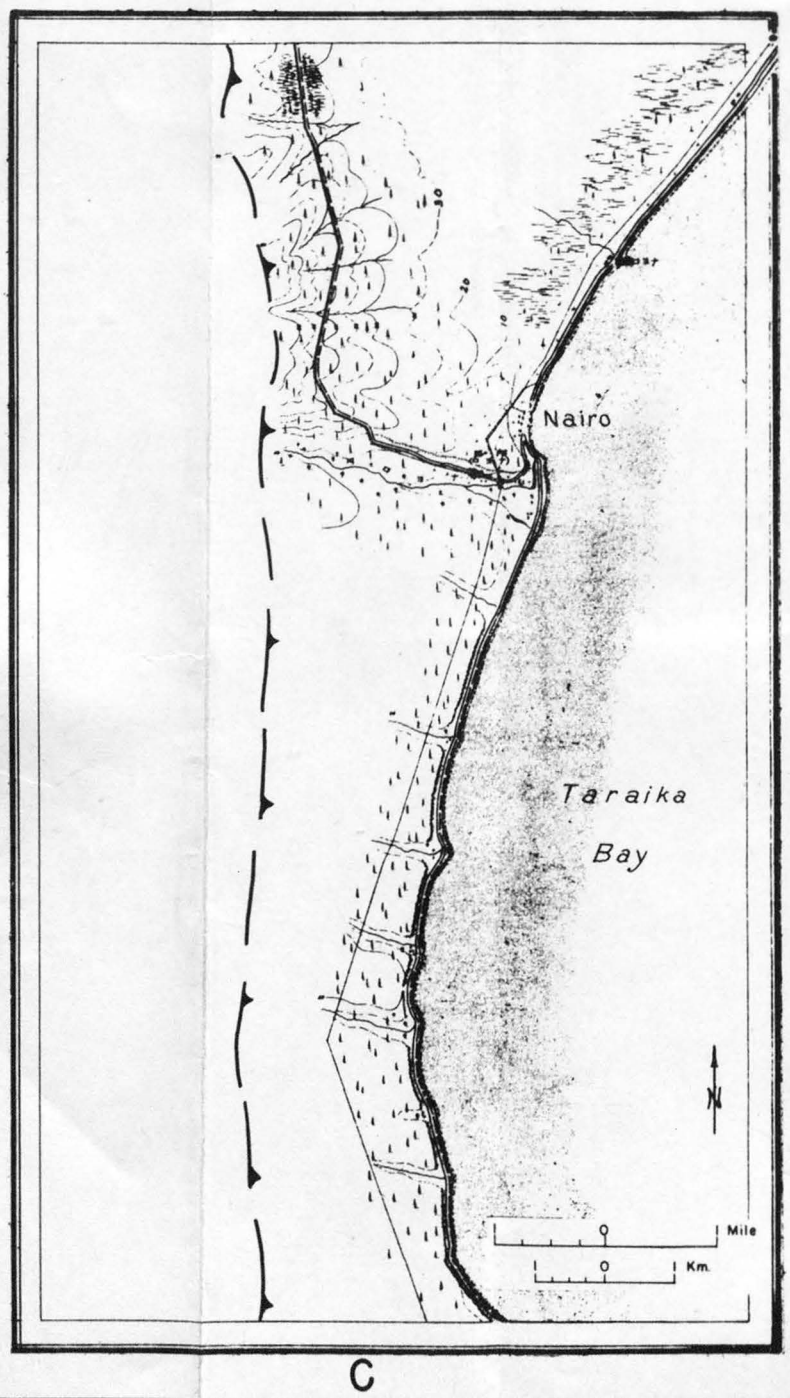

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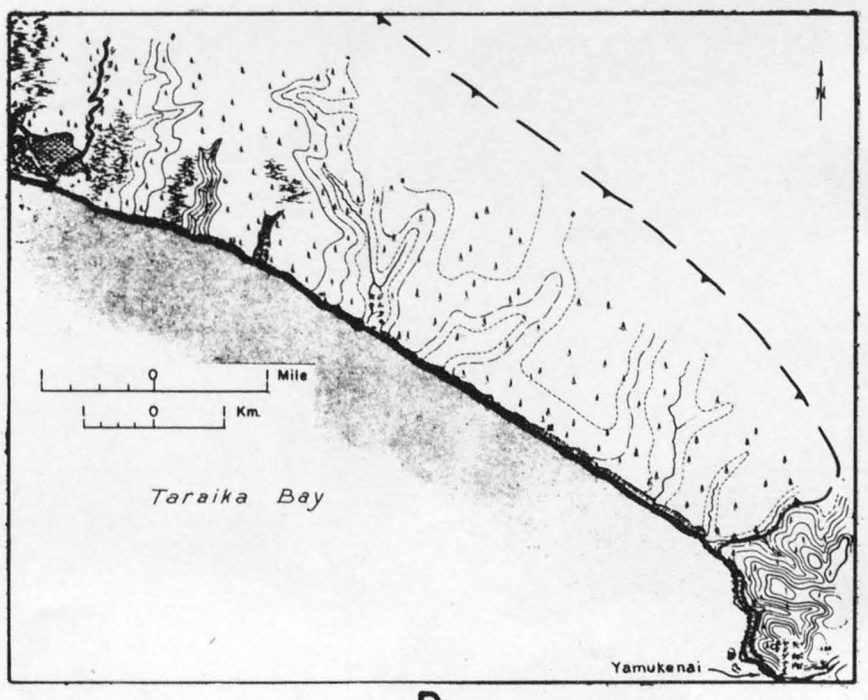


D

For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

General Description

A large flat area including the Poronai Valley and extending for some distance on the coast east and southwest of the river mouth. The Poronai River is large and meandering, has numerous lakes and cut-off channels along its course, and the wide plain on either side is covered almost completely by swamps. At its outer edges, the plain rises into gently rolling alluvial fans covering the foot of high steep-sloped mountains which border it. In the Poronai Valley the largest areas of dry land, most suitable for airfield sites, are on the fans, although even they are spotted with swamps. A narrow strip of dry land ("natural levees") also follows the river's edge but is is usually too narrow for good sites and is subject to floods. Floods sometimes cover most of the swampy flats. The coast east of the Poronai River contains a large lake, as well as smaller lakes and lagoons. The coastal plain, which extends some distance inland is flat and consists of swamps interspersed with irregularly shaped areas of dry land. Such dry areas may be used for a site in the vicinity of Shikuka. At the east end the low coastal plain passes onto a terrace, separated from the sea by a low scarp. This terrace has undulating surface, is better drained than the low flats and is a good airfield site. Southwest of the Poronai River the swampy flats pass into a narrow coastal terrace, which is bordered by a scarp at the sea edge; the top of the terrace is flat to gently undulating, and contains a good site for an airfield close to Nairo. Topographic maps of the Poronai Region are incomplete and, though most of the area not covered is probably in swamps and unsuitable, a few possible sites may also exist on the east edge of the depression. Such sites would be very inaccessible. The following are the most suitable parts of the known area:

	Topography	Topographic Hazards	Climate	Ground, Vegetation (Class C data)	Construction Materials [b] and Water Supply [c] (Class C data)	Accessibility
7A. Alluvial Fans on West Edge of Poronai Plain. (Good Site).	Alluvial fans at edge of mountain range. Slightly rolling ground with about 1% slope east. Little leveling will be necessary and 6,000-foot runways can be oriented in any direction. The land is beyond any flood of the Poronai River. (Large-scale map of a portion of the fans shows conditions typical of the entire west edge of the area.)	Mountains at the west edge of the fans rise steeply 2,000 to 3,000 feet.	Similar to that at Shikuka, see below.	Gravel and sand, some clay on the surface (A-2 and A-3)[a]. Most of ground is fairly well drained, but many small swamps spot the fans. Swamps have peaty soil (A-8). Materials are unconsolidated but in places, particularly below swampy areas in the north, the ground may be permanently frozen below a depth of about three feet. Subgrade necessary. Forest covers the ground and will need to be cleared except in areas where it has been burned out, which are not uncommon, where clearing will involve only brush and young second-growth.	Sand, gravel and clay at sites and in vicinity. Hard sandstone suitable for construction in bordering mountains. Timber abundant. Many mountain streams with good water. Abundant ground water at shallow depths can be tapped by wells. Shallow water may become polluted; deeper wells will give good quality water.	Belt of alluvial fans on west edge of Poronai Plain is followed by highway leading north from Shikuka into Russian Sakhalin; providing excellent access to all parts of area. Few scattered villages along highway.
7B. Low Coastal Plains near Shikuka. (Close to town of Shikuka but poorly drained and may be subject to flood).	Coastal flats, crossed by Poronai River and containing lagoons and lakes. Swamps and irregular patches of drier ground. Grade very low, almost flat. Area subject to flooding. 6,000-foot runways can be oriented in any direction. (The detailed map shows only the area in the vicinity of Shikuka but it is typical of all the coastal country and the land around the inland shores of the large Lake Taraika, to the east.)	Mountains at inland edges of flats, rise abruptly to 1,000 to 2,000 feet.	Cold and wet. Skies overcast much of the time in summer; clear skies in winter. Snow falls from about the middle of October to the middle of May. Snow cover up to 3 feet. Predominantly freezing weather from the end of October to the middle of April. In winter winds predominantly from north (41%) and northwest (39%); in summer winds predominantly from south (35%) and southeast (18%). Average wind velocity less than 10 miles per hour. Climatic data collected at Shikuka are listed below. The Poronai River floods in spring when snow melts and in late summer, during the rainiest season.	Peaty soil (A-8)[a] underlain by several feet of clay (A-7) which in turn lies on sand and gravel (A-3 and A-2). Unconsolidated materials, can be easily worked by scrapers. Drainage poor, high subgrade necessary. Ground remains wet for a long time after a rain. Covered by tundra vegetation: reeds, moss and scattered larch trees.	Sand, gravel and clay in area. Construction stone in mountains at both sides. Sluggish streams have brown-stained water. River water may be brackish under certain conditions. Shallow ground water abundant, can be tapped by dug wells but is subject to pollution.	Area just east of Poronai River is suitable for airfield site; close to Shikuka (town now larger than shown on map), which is an anchorage and a railroad terminus (railroad leading southwest from town, not shown on map). Several miles of road will need to be built to the town. The river is crossed by ferry. All the eastern coastal region is served only by a trail which follows coast, crossing lake outlets by ferry. Sites will require the construction of long roads and bridges.
7C. Coastal Terrace near Nairo. (Good site. Close to large town of Nairo).	Flat to slightly rolling coastal terrace, bordered along shore by a low scarp and passing on inland side into mountains. Cut into blocks by a system of small, parallel, east-flowing streams. Scarp at terrace edge subject to landslides. Grades on surface are about .5%, little if any leveling is necessary and 6,000-foot runways can be oriented in any direction. (The terrace in the vicinity of Nairo is shown on the map. To the south is another area topographically similar in all respects.)	Mountains rise from west edge of the terrace (about 2 miles or more west of the shore). The highest peak is 2,000 feet high (about 3.5 miles west of shore).	Weather similar to that at Shikuka, see above.	Gravel and sand, possibly a little clay on the surface (A-2 and A-3).[a] Fairly well drained. Fill or high subgrade not necessary. Conifer forest which covers the terrace will need to be cleared. Small springs may be present at the terrace scarps and at the foot of the mountains. Shallow wells will yield small amounts of water.	Sand and gravel in area. Clay in lowlands north. Sandstone suitable for construction might be found in mountains to the west. Traprock, suitable for crushed rock and building stone, on railroad about 30 miles south. Water supply can be drawn from small mountain stream.	On coastal highway and railroad (not shown on map). Field can be located near town of Nairo (now a larger town than shown on map).
7D. Coastal Terrace at Southeast Corner of Area. (Good site but poorly accessible)	Coastal terrace, slightly rolling on top, cut by several small south flowing streams. Scarp 50 to 65 feet high at shore edge. Grades about 1%. 6,000-foot runways can be built in any direction. Terrace edge subject to landslides.	High mountains several miles inland. Mountains to east rise 600 feet and higher.	Similar to that of Shikuka, see above.	Sand and gravel, some clay at surface (A-2 and A-3)[a]. Fairly well drained. High subgrade probably not necessary. Covered by conifer forest which will need to be cleared.	Sand, gravel and clay in area. Sandstone suitable for construction in bordering mountains. Small limestone deposits may be present in mountains beginning 20 miles northwest of area; however, no roads or trails lead to the mountains. There is traprock a few miles southeast of the area on the shore of Taraika Bay. Water can be obtained from mountain streams, shallow wells, and possibly from springs at terrace scarps and edges of mountain slopes.	A few small fishing villages on coast. Nearest town, Shikuka, can be reached only by 50 miles of coastal trail. The construction of a road in its place will require several bridges or ferries.

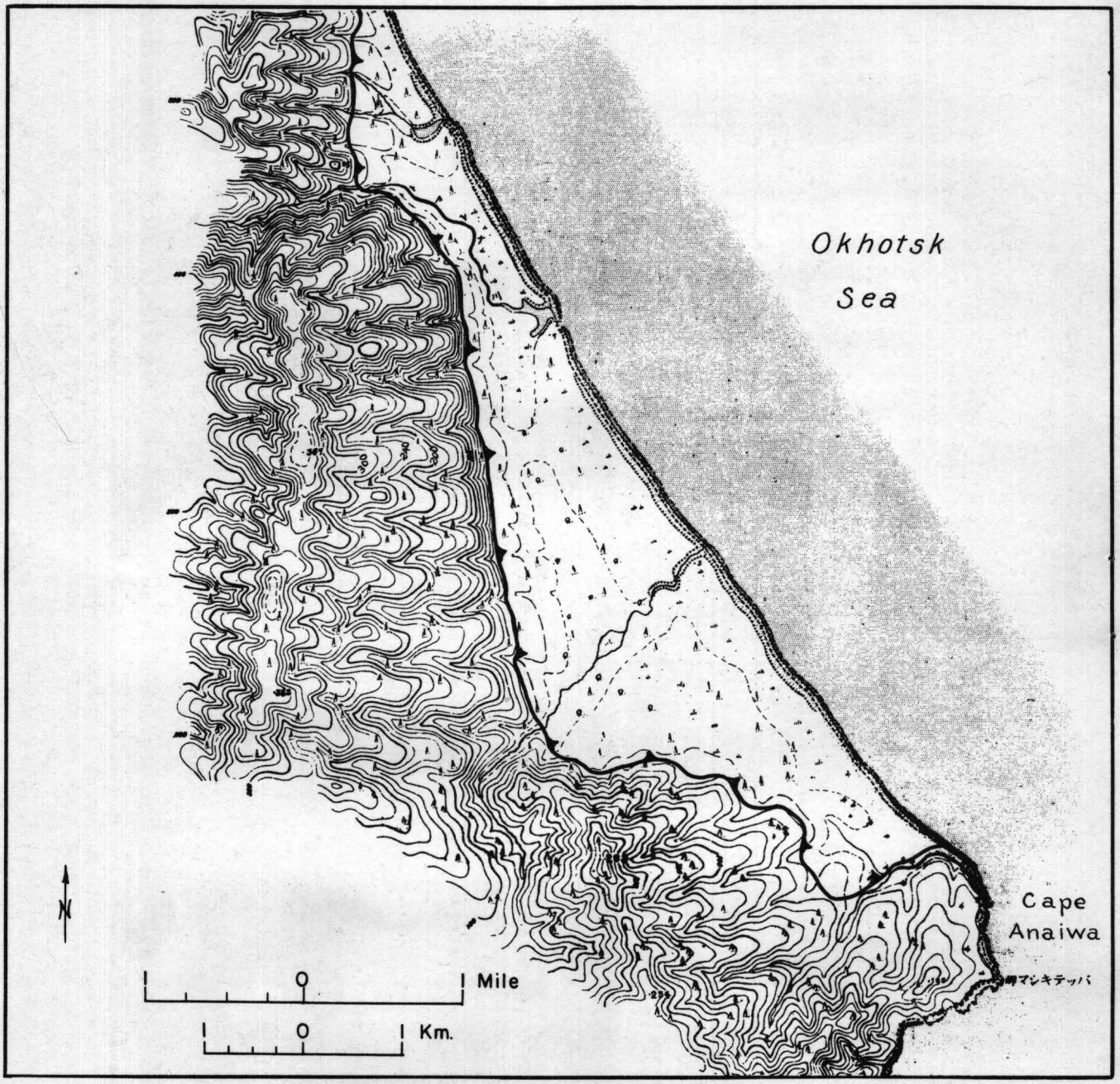
Data collected at Shikuka over a period of 22 years:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average wind velocity, miles per hour	9.1	7.8	8.2	7.8	7.6	6.9	6.7	6.9	7.8	8.0	8.0	9.1	7.8
Maximum wind velocity, miles per hour	54	49	45	45	40	36	27	49	43	38	40	54	54
Average monthly precipitation, inches	1	.8	1	1.7	2.5	3.2	3.7	4.1	4.5	2.8	2.6	1.1	29
Average number days with precipitation	10	8	11	12	13	14	16	15	15	12	11	10	147
Maximum daily precipitation, inches	1.1	.8	1	1.2	2.3	2.3	2.3	5.3	2.7	4.7	2.4	1	5.3
Average number days with overcast skies	7.4	6.8	9.3	11.8	17.3	18.3	19.7	16.9	12.3	9.6	8.3	7.2	144.9
Average number days with fog	0	0.1	1.3	2.2	5.5	7.5	8.0	6.5	3.6	2.0	0.7	0.2	37.6
Average number clear days	10.5	7.1	4.6	3.0	2.0	1.3	1.5	1.7	4.0	5.2	5.6	9.3	55.8
Average thickness snow cover, inches	20.6	21.5	35	20	7.4	0	0	0	0	.8	8.2	13.6	
Average air temperature, Fahrenheit	0	5	16	31	39	48	56	61	53	41	23	7	32
Average maximum air temperature, Fahrenheit	9	15	26	38	46	54	62	67	61	49	31	16	39
Average minimum air temperature, Fahrenheit	-10	-7	4	23	33	42	51	54	45	32	14	-1	23
Average relative humidity at 2 p.m., percent	72	68	65	69	73	81	83	80	75	62	65	71	72

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.
b/ See Construction Materials map and table.
c/ See Water Supply map and table.

Reliability rating: Class B, except as otherwise indicated.
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 8



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND — SUITABILITY FOR AIRFIELDS — AREA 8

Topography suitable, but accessibility and weather conditions poor.

TOPOGRAPHY: Low flat arcuate plain on coastal terrace at foot of mountains. Slopes very gently (1% or less) toward the sea, ending at the shore in a low scarp. Danger of landslides at the seaward edge. Little leveling necessary. Flat ground sufficiently wide for 6,000-foot runways in any direction but ridges around the western edge of the plain block approaches so that runways cannot be used crossways of the plain.

TOPOGRAPHIC HAZARDS: Mountain ridges which bound the inland edge of the plain are 800 to 1,200 feet high, rise steeply and abruptly.

CLIMATE: Very foggy. Worst fogs in May, June and July. Strong cold winds from Okhotsk Sea. Temperatures lower on this coast than on west coast or interior. Winter winds from north and northwest, summer winds from south. Snow cover about 3 feet.

GROUND, VEGETATION (Class C data)[a]: Gravel and sand, possibly a little clay (A-2 and A-3). Fairly well drained. Can be worked by scrapers except when frozen. High subgrade and fill probably unnecessary. Open meadow with patches of forest, hence little clearing necessary.

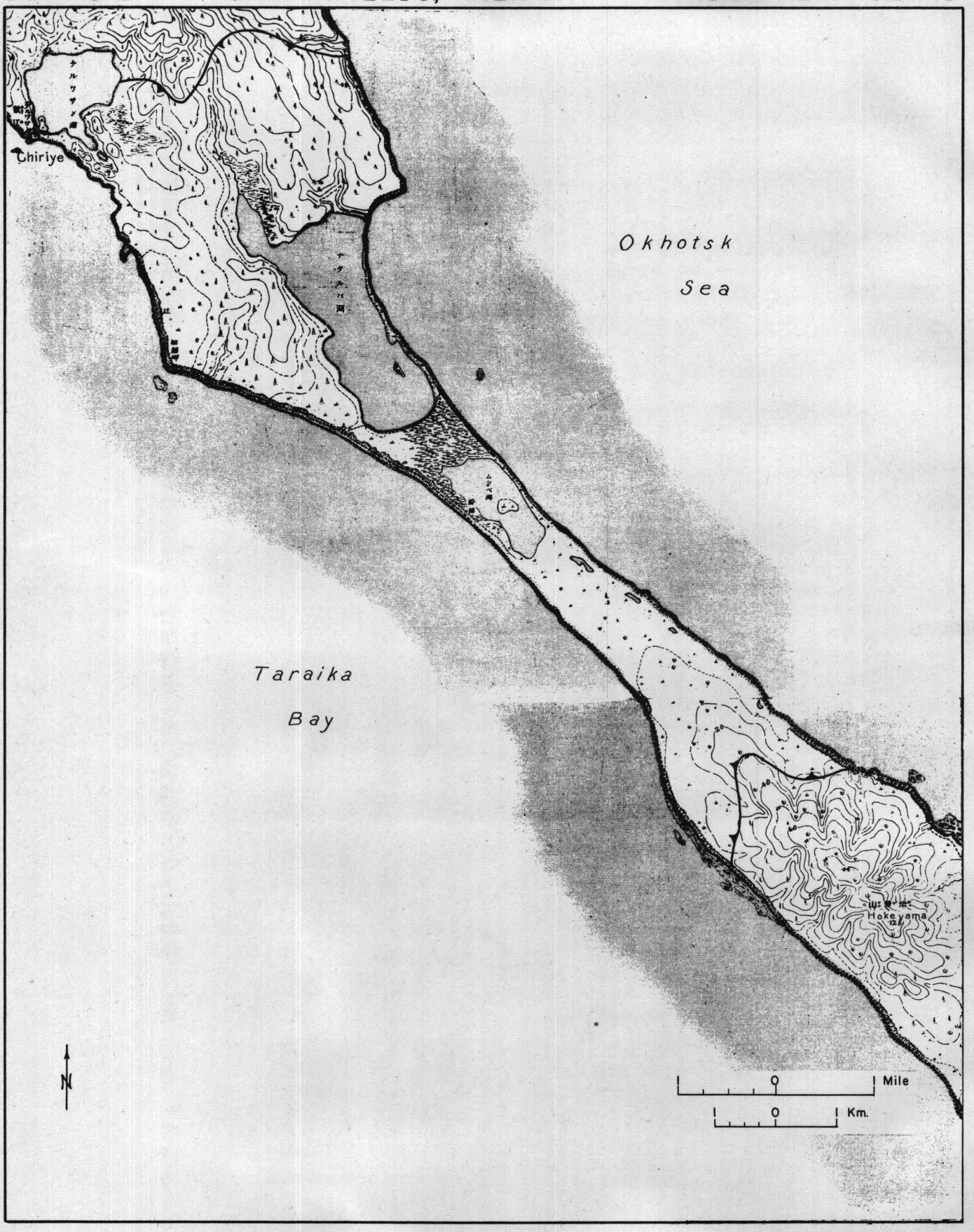
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand and gravel on area. Clay might be found in adjacent mountains. Sandstone and traprock suitable for building stone and crushed rock in mountains; possibly some granite a few miles south of the area. Timber on slopes. Water supply probably inadequate. Mountain streams are small. Small springs might be found at the foot of the mountains and at base of coastal scarp. Shallow dug wells can yield only a little water.

ACCESSIBILITY: Very poorly accessible. In an unsettled mountainous region. Coast is straight and rocky and has no anchorages. A few small fishing villages several miles north and south of area. The coast is followed by a poor trail, the only means of communication with the rest of the island. A road to the settled interior will need to be built either west over high rugged mountain range or else south along the coast and around the shore of Taraika Bay for almost a hundred miles.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, AREA 9 SAKHALIN ISLAND



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS

AREA 9

Topography suitable, but accessibility and weather conditions poor.

TOPOGRAPHY: One of several narrow flats strung along the Kitashiretoko Peninsula, separated by low hills. South and central parts low, flat (grades up to 1%) and very narrow; some land is less than 5 feet above sea level. Scarps at shore at south end; shore edged by beaches in central part. 6,000-foot runways can be oriented only north to northwest and no leveling is necessary. North end is wider, higher, and rolling, has grades of about 2% and will need some leveling. Bordered at shore by high scarps. 6,000-foot runways can be oriented in various directions. Small swampy areas in north and central parts.

TOPOGRAPHIC HAZARDS: Hills 470 feet high north of area; hill 410 feet high south of area.

CLIMATE: Climate severe. Area exposed to cold, strong winds from Okhotsk Sea which often has violent storms. Fog frequent, particularly in May, June and July. Winter winds predominantly from north and northwest, summer winds from south.

GROUND, VEGETATION (Class C data): Beaches and low ground are sandy, contain some gravel (A-3).[a] Higher, rolling ground is composed of bedrock (sandstone and shale, possibly some traprock) overlain by a few feet or less of sandy loam soil (A-2). Swampy ground is A-8. Grading may involve hard rock excavation. Ground generally well drained, fill not necessary and subgrade need not be high. Much of flat land is open meadow covered in part by low spreading pine; in places conifer forest will need to be cleared.

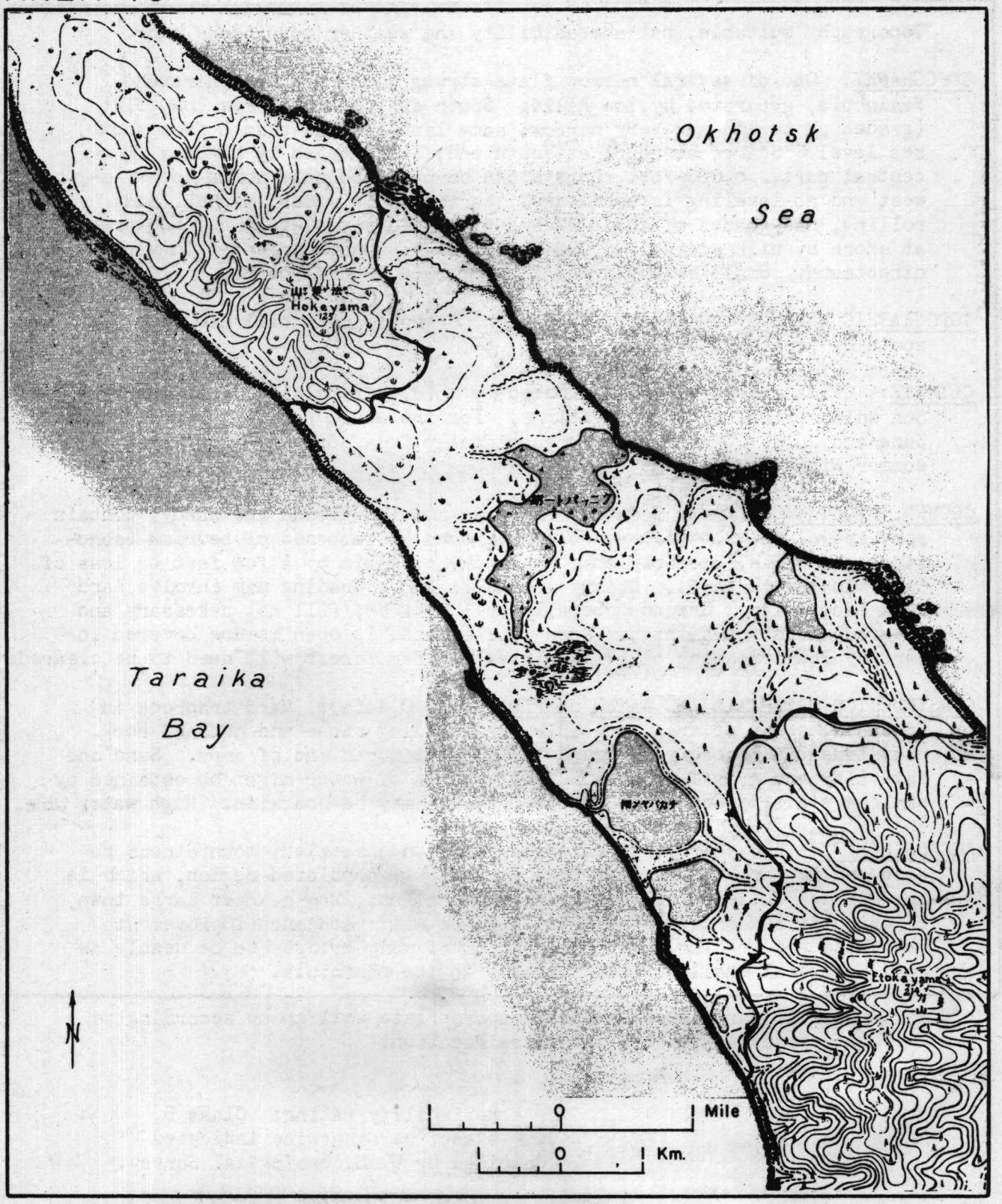
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Hard traprock in Hokeyama, south of area, suitable for building stone and crushed rock. Sandstone can probably be found in hills at north end of area. Sand and some clay and gravel in area. Small amount of water might be obtained by shallow wells; probably inadequate. Lakes may be brackish. High water table.

ACCESSIBILITY: Kitashiretoko Peninsula joins an unsettled, mountainous region and is far removed from the nearest well populated region, which is the Poronai Valley. Area 70 miles from Shikuka, the nearest large town, to which it is connected by a trail which will need much improvement (widening and grading) and construction of many bridges to be usable as road. Several small fishing villages in the peninsula.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 10



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS
AREA 10

Topographically good but accessibility and weather conditions poor.

TOPOGRAPHY: Narrow, low flat section of Kitashiretoko Peninsula, bordered on north and south by hills. Land 5 to 20 feet above sea. East and west shores formed by alternating scarps and beaches. Contains several lakes and a small swamp. Grades about .5%. No leveling necessary. 6,000-foot runways can be aligned in various directions.

TOPOGRAPHIC HAZARDS: Hill 410 feet high north of area; hill 700 feet high south of area.

CLIMATE: Same as Area 9.

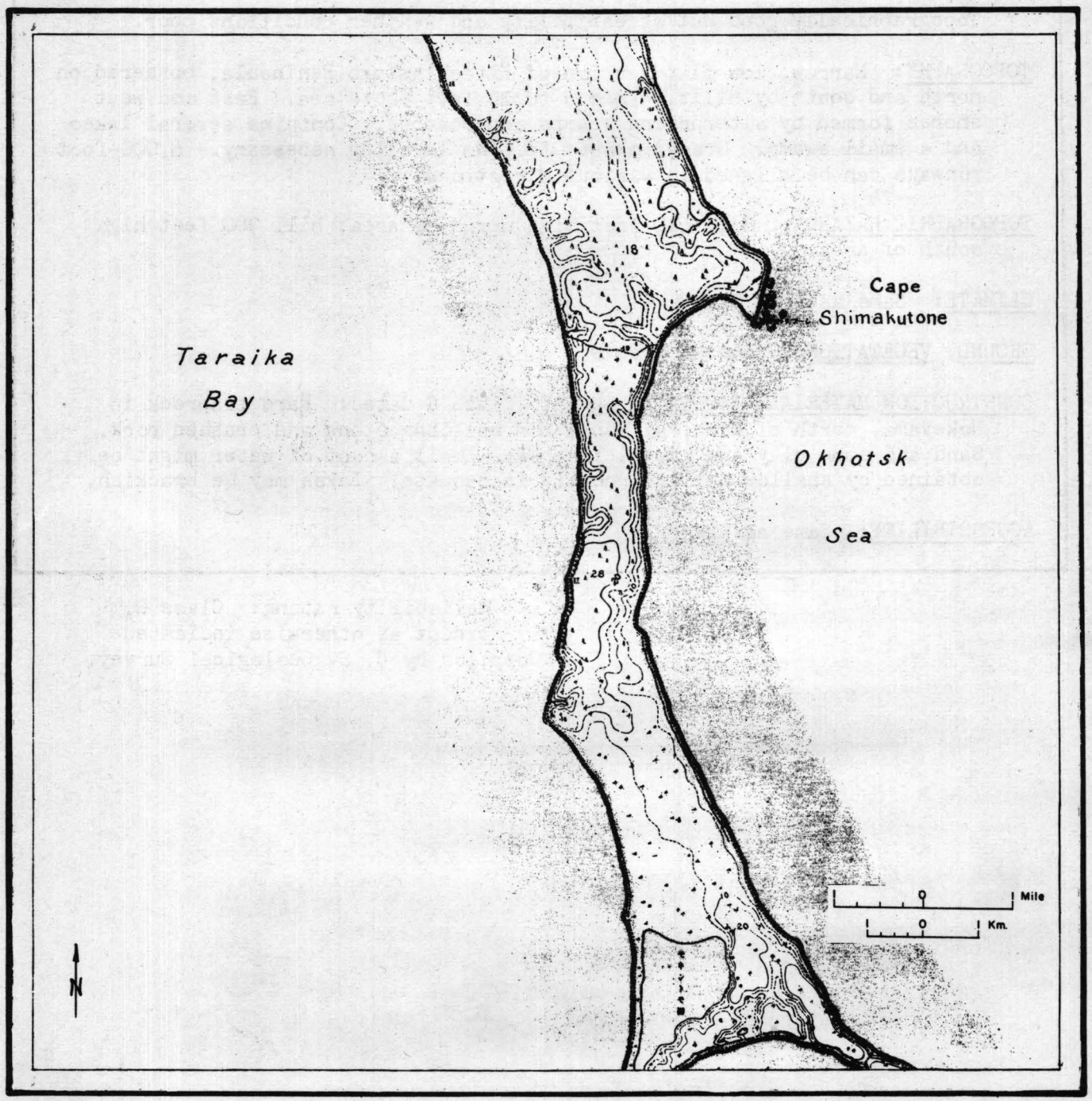
GROUND, VEGETATION: Same as Area 9.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Hard traprock in Hokeyama, north of area, suitable for building stone and crushed rock. Sand and some clay and gravel in area. Small amount of water might be obtained by shallow wells; probably inadequate. Lakes may be brackish.

ACCESSIBILITY: Same as Area 9.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA II



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS
AREA 11

Topographically good but accessibility and weather conditions poor.

TOPOGRAPHY: Narrow, low, flat tip of Kitashiretoko Peninsula, 5 to 30 feet above sea. Shore mainly sandy beach, scarp in a few places. Grades .5 to 1% in most of area. Little or no leveling necessary. 6,000-foot runways can be aligned lengthwise of peninsula in all parts of area, crosswise in the north end only.

TOPOGRAPHIC HAZARDS: Hill 700 feet high north of area.

CLIMATE: Same as Area 9.

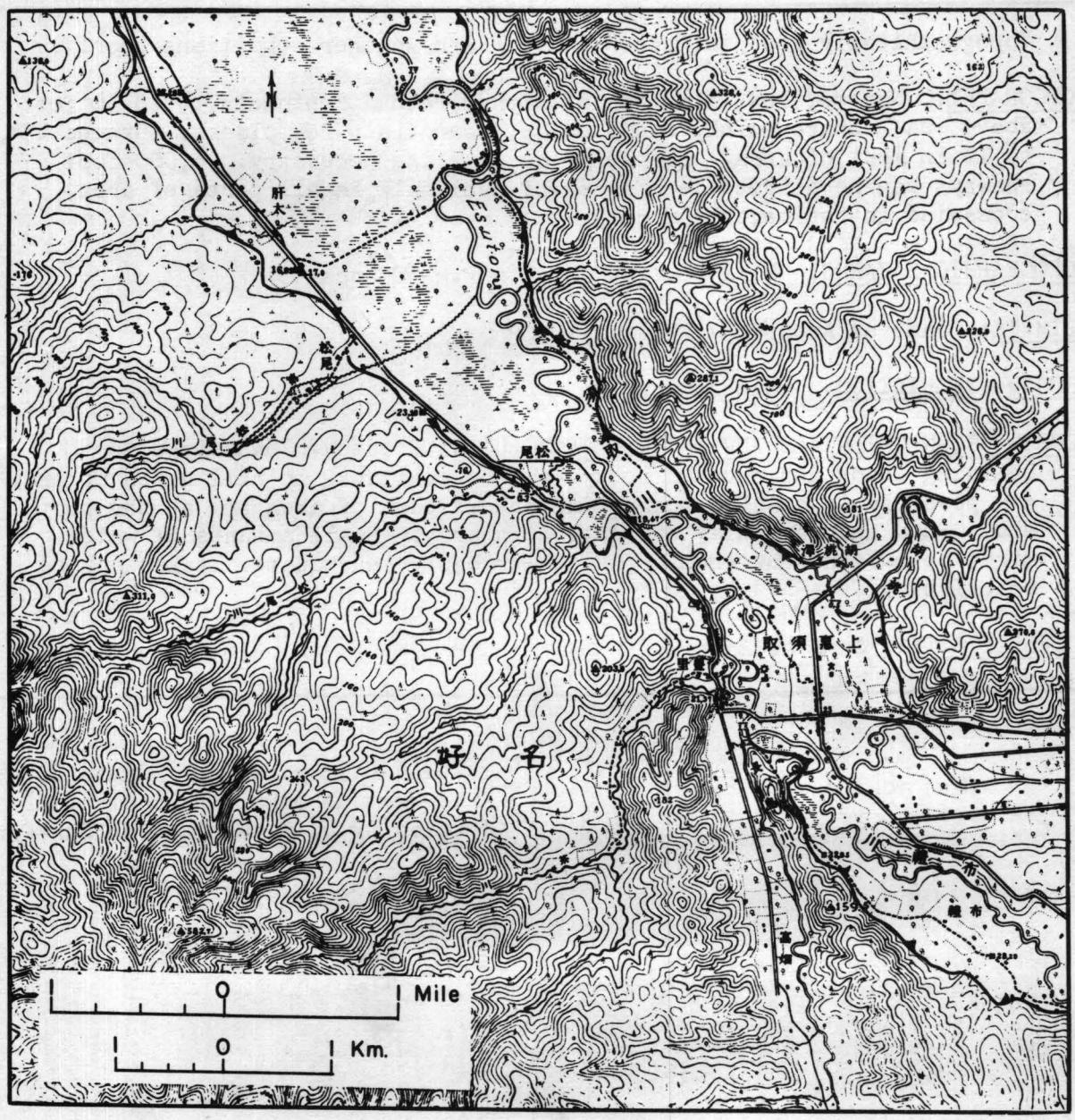
GROUND, VEGETATION: Same as Area 9.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sandstone for building stone and crushed rock might be available in hill north of area and possibly in coastal scarps in central part of area and at the south end. Sand and some clay and gravel in area. Small amounts of water might be obtained by shallow wells; probably inadequate. Lakes may be brackish.

ACCESSIBILITY: Same as Area 9.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND
AREA 12



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS

AREA 12

Poor location for site: wet, small, surrounded by high mountains.

TOPOGRAPHY: Valley floodplain, flat, swampy, subject to floods. Little if any leveling necessary. Flat ground large enough for 6,000-foot runways in any direction but mountains on both sides of valley block approaches for east to northeast runways. Similar valley, possibly wider, continues north and west to the coast, but no map was available of that area.

TOPOGRAPHIC HAZARDS: On the east side mountains rise abruptly to about 1,000 feet. On the west side mountains rise more gently but attain 400 to 650 feet within a half mile of valley bottom and up to 2,000 feet within 2.5 to 3 miles.

CLIMATE: Not known. Probably similar to west coast but somewhat sheltered from coastal winds and fogs.

GROUND, VEGETATION (Class C data): Unconsolidated river alluvium: sand, gravel and clay, finest materials on top (A-2 and A-6).[a] Easily worked by scrapers. Ground is poorly drained, swampy in part, where soil is class A-8. Grading for drainage and high subgrade necessary. Much of the valley floor is probably now under cultivation.

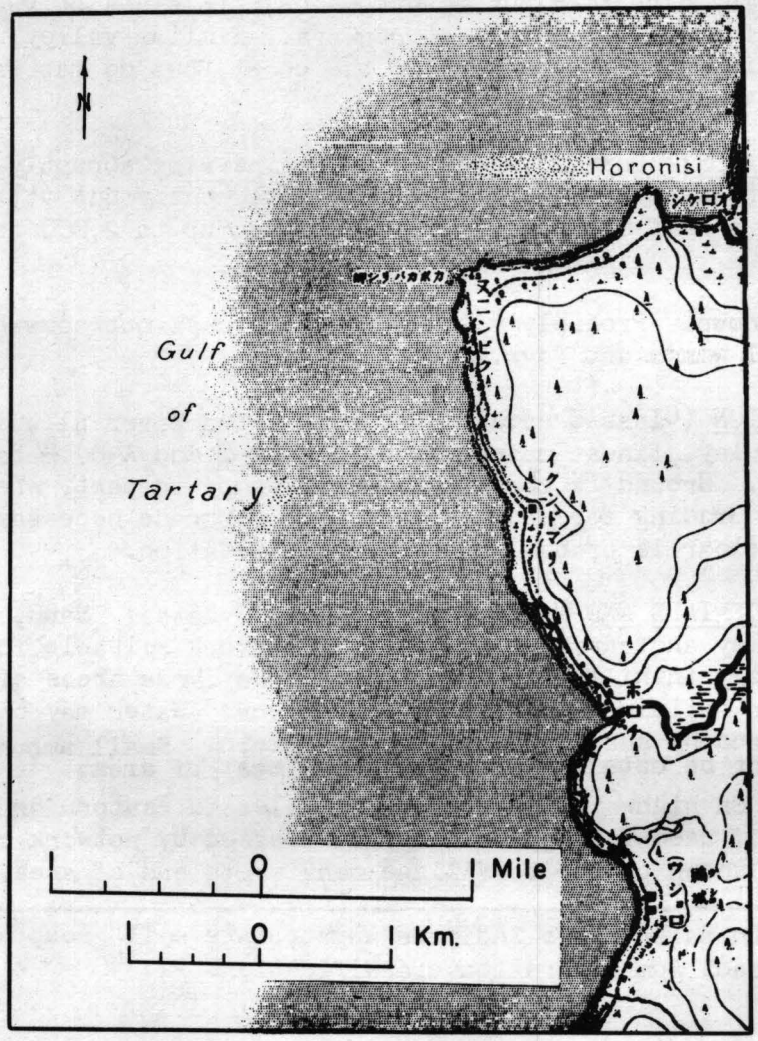
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand, gravel and clay in valley and surrounding hills. Traprock suitable for crushed rock, probably in hills. 10 miles south are large areas of traprock, suitable for building stone and crushed rock. Water may be obtained from river and by shallow wells in flood plain. Small amounts of oil or asphalt might be obtained from oil seeps west of area.

ACCESSIBILITY: On highway leading about 8 miles to Esutoru on coast. Valley bottom used for agriculture and crossed by network of roads and trails (not shown on map). Village near south end of area.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 13



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

Good location for site, but will probably involve rock excavation.

TOPOGRAPHY: More or less level-topped promontory. Up to 15% slopes at edges. Top with low grades, rolling, and will need leveling. 6,000-foot runways possible in any direction.

TOPOGRAPHIC HAZARDS: May be some hills near interior edge.

CLIMATE: Probably intermediate between conditions at Maoka to the south and Ambetsu to the north. Cold climate; winters windy and uncomfortable. Winds predominantly from south and east in summer, from the north and east in winter. Windy most of the time all year, but least windy in summer. Most rain in late summer. Fogs in summer. Greatest cloudiness in winter. Freezing weather from early November to middle of April. Snow falls from middle of October to middle of May. Snow cover up to 2 feet. See below for additional data at Maoka and Ambetsu.

GROUND, VEGETATION (Class C data): Hard traprock overlain by thin, rocky, clay soil (A-6 or A-7)[a/], probably not more than a few feet thick. Leveling will involve rock excavation. Soil probably will be sticky when wet but area well drained and ground will dry quickly after a rain. Conifer forest will need to be cleared from part of area.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Traprock in area suitable for crushed rock for surfacing and concrete aggregate (unless found to contain zeolites, injurious to cement). Sand, gravel and clay on hills at shore a few miles north of area. Oil seep near coast, about 25 miles south may provide sufficient oil or asphalt for surfacing (see Construction Materials map, for location). Rivers can be used for water supply. Springs may be found in the vicinity and wells into rock may tap large flows but well prospecting is highly uncertain.

ACCESSIBILITY: Coastal highway (not shown on map) skirts east edge of area, connects it with small towns and anchorages several miles away north and south.

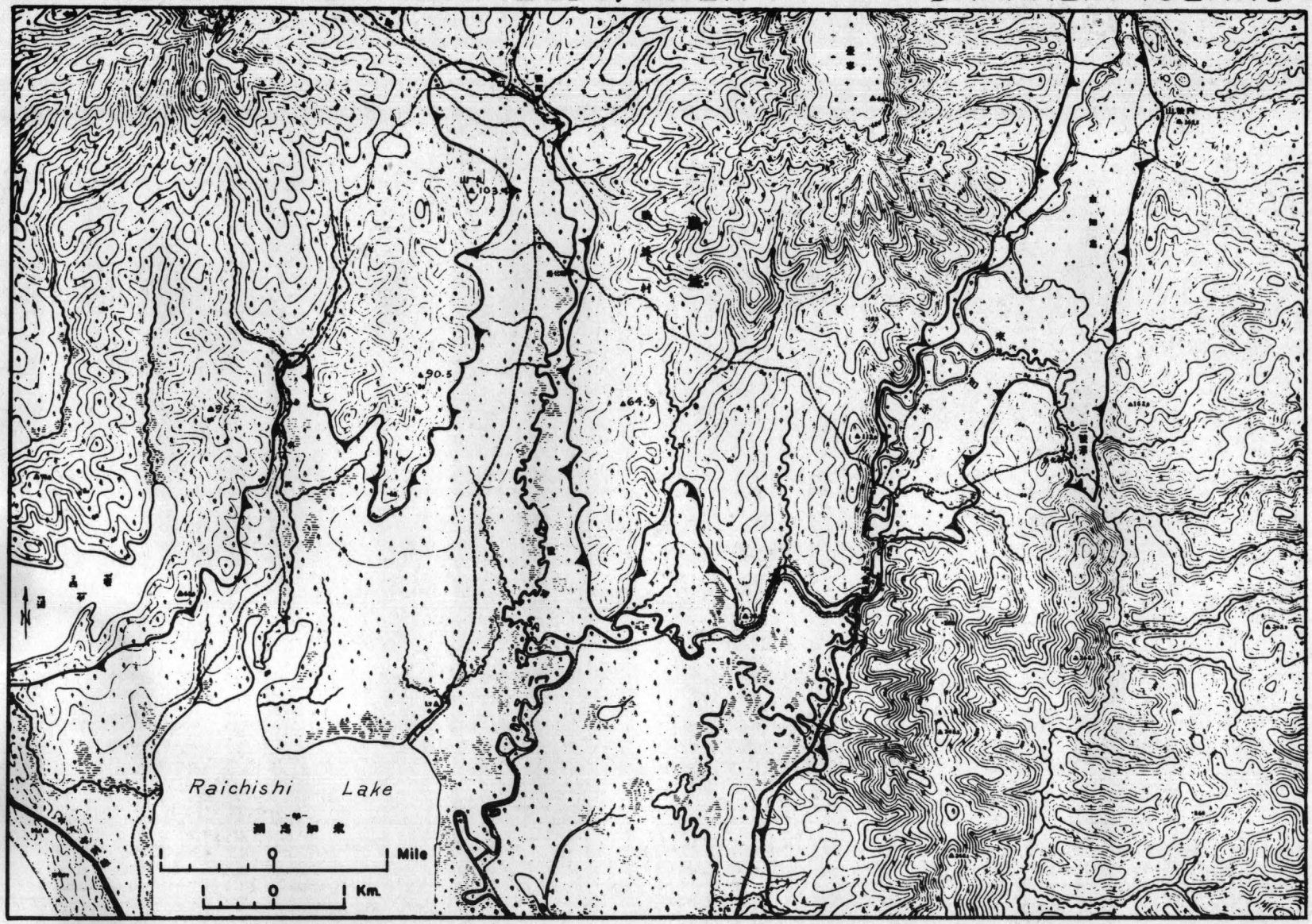
Statistics collected at Maoka over a period of 15 years or more and at Ambetsu over a period of 7 years:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average wind velocity miles per hour													
Maoka	14.5	13.4	13.9	12.0	10.5	8.2	7.8	8.2	10.9	13.4	15.7	15.4	12.0
Ambetsu	8.0	7.6	7.8	7.4	6.7	5.6	5.1	6.0	8.2	9.1	9.0	9.4	7.6
Maximum wind velocity miles per hour													
Maoka	69	60	58	56	45	38	38	43	54	54	67	67	69
Ambetsu	38	38	40	43	36	29	25	36	49	40	45	38	49
Average monthly precipitation, inches													
Maoka	1.2	.8	1	1.7	2	2.5	3.8	3.6	3.6	3.5	3.2	2.3	29
Ambetsu	.7	.6	1	2.1	2.1	1.9	2.9	4.7	5.3	4.5	2.2	1.6	30
Average number days with precipitation													
Maoka	22	16	15	13	14	14	15	14	15	15	19	24	196
Ambetsu	15	11	11	13	11	11	14	16	16	17	17	20	172
Maximum daily precipitation, inches													
Maoka	.6	.6	.8	1.1	2	2.3	2.9	5.3	1.6	2.8	1.9	1.3	
Ambetsu													
Average number days with overcast skies													
Maoka	20.4	14.8	13.9	11.6	14.9	16.0	17.7	14.0	10.1	11.5	18.5	23.5	186.9
Ambetsu	12.9	8.3	8.7	13.3	13.1	12.1	13.7	14.3	13.6	14.7	18.6	19.0	162.3
Average number days with fog													
Maoka	0	0	0.2	1.2	4.4	7.1	7.3	2.5	0.4	0	0	0	23.1
Ambetsu	0	0	0	2.1	4.6	5.1	7.3	2.7	0.3	0.3	0.1	0	22.5
Average number clear days													
Maoka	0.6	0.9	2.5	3.1	2.9	2.3	1.5	2.9	4.2	4.0	1.2	0	26.1
Ambetsu	5.0	5.4	5.6	3.6	3.1	3.6	3.3	2.0	5.3	3.4	0.4	1.7	42.4
Average thickness snow cover, inches													
Maoka													
Ambetsu	22	26	22	10	1.2	--	--	--	--	1.2	7.8	14	
Average monthly air temperature, Fahrenheit													
Maoka	15	17	24	36	44	52	60	64	57	46	32	21	39
Ambetsu	3	7	19	32	42	51	60	62	55	42	27	12	34
Average maximum air temperature, Fahrenheit													
Maoka	20	23	30	42	51	59	66	71	65	53	38	26	46
Ambetsu	10	12	26	38	49	58	66	68	61	48	32	18	41
Average minimum air temperature, Fahrenheit													
Maoka	9	10	17	29	36	45	54	58	50	38	25	16	32
Ambetsu	-3	0	11	26	34	43	53	55	48	34	21	7	27
Average relative humidity at 2 p.m., in percent													
Maoka	73	67	66	68	73	79	83	78	73	67	69	71	72
Ambetsu	79	75	69	70	69	73	78	79	72	67	68	77	73

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, AREA 14 SAKHALIN ISLAND



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS
AREA 14

Good location for site.

TOPOGRAPHY: Low flat land on inland shores of coastal lagoon. Contains a large, meandering stream and several smaller ones, cut-off channels, ox-bow lakes, and spotty areas of swamp. Very flat and no leveling necessary unless runways located at north and west edges where ground becomes slightly rolling; better drained than flats, and there are suitable areas with 1 to 2% grade. Flats subject to floods.

TOPOGRAPHIC HAZARDS: Hills at north edge up to 300 feet high. Mountain at east edge 1,200 feet high. Mountains several miles north of site 1,400 feet high.

CLIMATE: Similar to area 13.

GROUND, VEGETATION (Class C data): Unconsolidated sand, gravel and clay (A-2)[a/] covered in part by peaty soil (A-8). Poorly drained in flats where fill and high base course will be necessary. Conifer forest will need to be cleared in almost all the area.

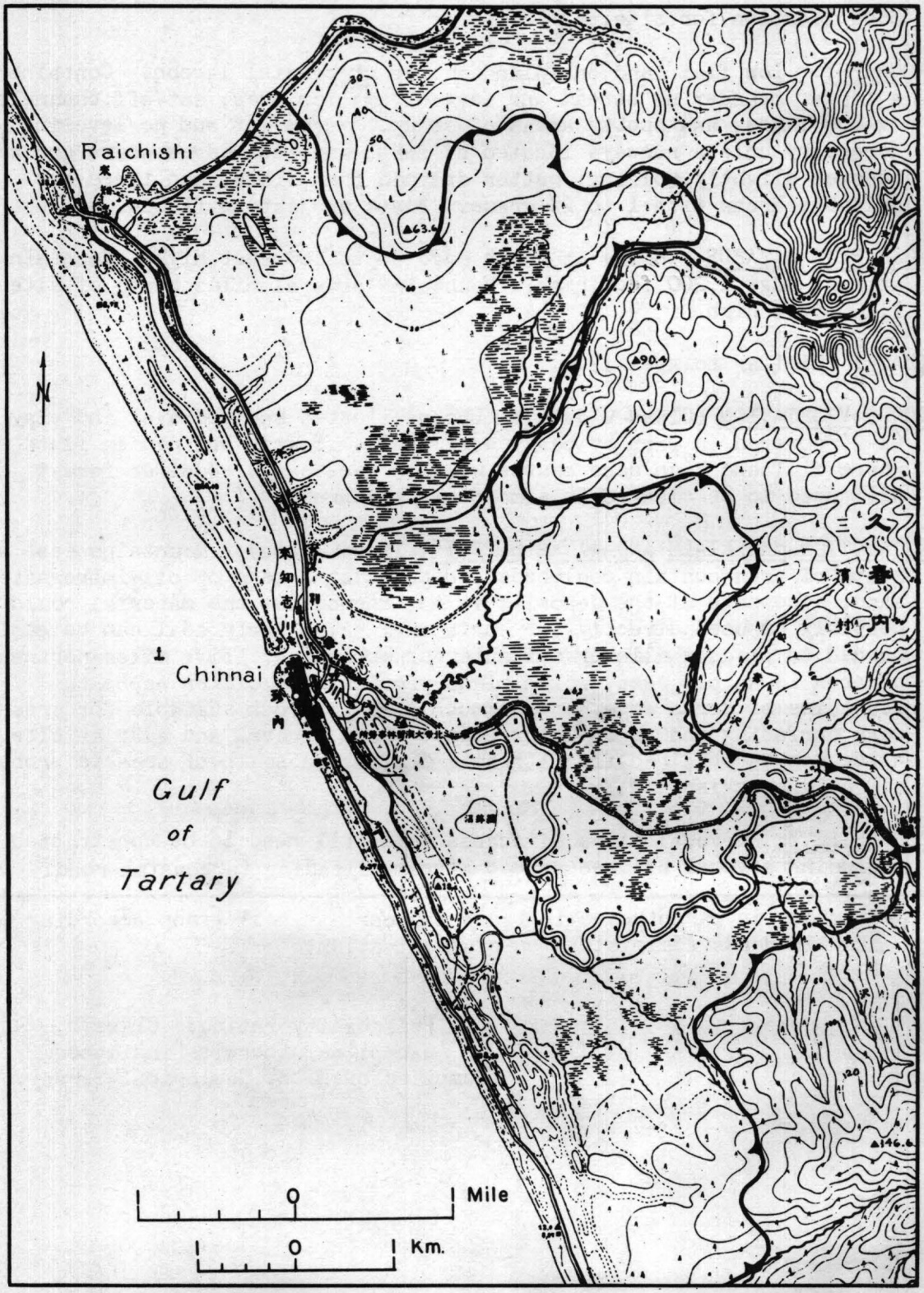
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Mountains east and south of area contain coal beds and associated beds of oil-impregnated sand. The size of the deposits is not known, but the material could possibly be used directly for surfacing. Also shaly coal can be easily burned to produce clinker suitable for surfacing. Five miles northwest of area is an oil seep, which might provide some oil or asphalt. Mountains at north edge contain much hard traprock suitable for crushed rock surfacing and as building stone. Sand, gravel and clay at site. Water can be obtained from stream. The lagoon south of area is probably slightly brackish.

ACCESSIBILITY: Several miles of access road will need to be constructed, including several bridges across streams leading to coastal road.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 15



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS

AREA 15

Good location for site but may be poorly drained.

TOPOGRAPHY: Flat swampy plain at coastal edge of mountains. Crossed by meandering stream, on either side of which is flat swampy ground passing into dry rolling ground with grades of 1 to 4% or higher. 6,000-foot runways can be aligned in any direction on fairly well-drained ground in the rolling areas but some leveling will be necessary. Flats subject to flooding. Sand bar along the shore is well drained, grade lengthwise is less than .5% and a runway can be constructed lengthwise of it.

TOPOGRAPHIC HAZARDS: Ridge extending north along the east side is 700 to 1,200 feet high.

CLIMATE: Similar to area 13.

GROUND, VEGETATION (Class C data): Unconsolidated sand, gravel and clay (A-2 and A-7).[a] Wet and swampy in flats where some soil is class A-7 and much fill and high subgrade will be necessary. In rolling land soil better drained, but clayey and may remain wet for some time after a rain. May be good soil for mechanical stabilization. Bar at the coast is sand (A-3), well drained. Conifer forest will need to be cleared in much of the area.

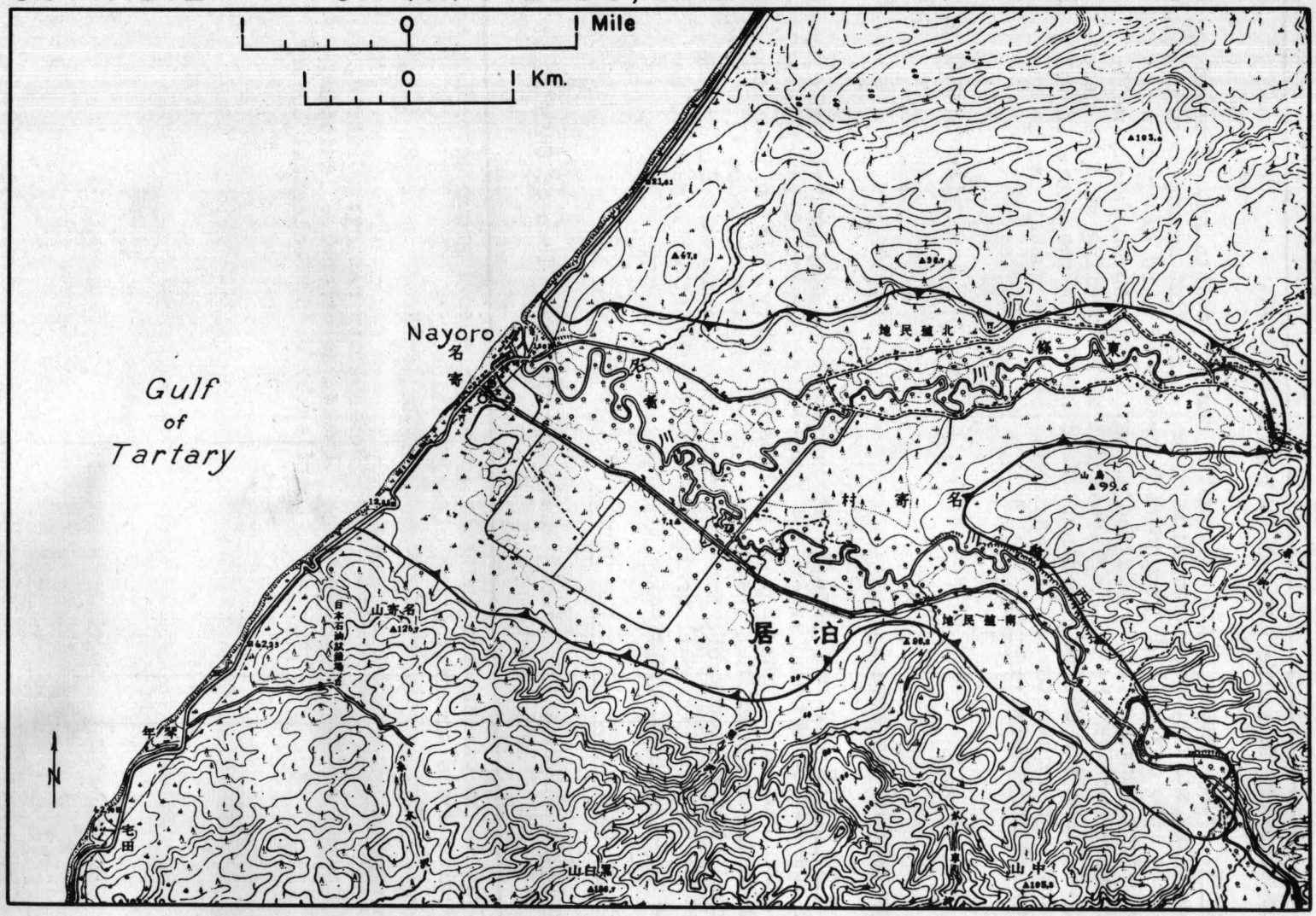
CONSTRUCTION MATERIALS AND WATER SUPPLY: Same as area 14.

ACCESSIBILITY: Highway runs along west edge of site. Town of Chinnai at the site has a large anchorage.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, AREA 16 SAKHALIN ISLAND



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND — SUITABILITY FOR AIRFIELDS

AREA 16

Location for small site.

TOPOGRAPHY: Wide, flat valley at mouth of large stream. Flat area is small. Area south of river has a grade of about .5%, large enough for 6,000-foot runways in any direction but hills at the south block approaches and south runways can be used only on the rolling coastal area north of the river where grades are about 3% and grading will be necessary. Railroad (not shown on map) crosses area running north and may interfere with the location of an east-west runway.

TOPOGRAPHIC HAZARDS: Mountains at south edge rise 400 to 600 feet above plain. At east edge hills are 300 feet high. Two miles south peaks up to 1,000 feet high.

CLIMATE: Similar to area 13. Weather probably much like that at Maoka.

GROUND, VEGETATION (Class C data): River alluvium: sand and clay, underlain by gravel (A-2).[a/] Easily worked by scrapers. Drainage poor. Needs grading for drainage and high subgrade. Subject to flood. Partly meadow, partly covered by deciduous forest. Probably considerable cultivated land.

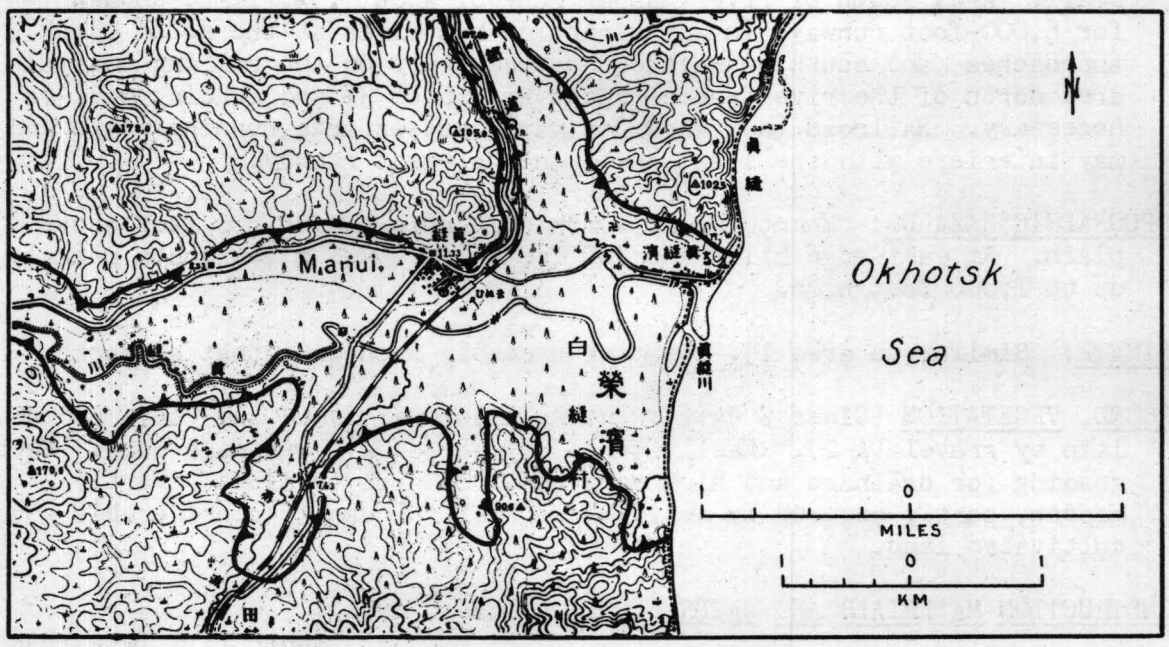
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Lumber mill less than 10 miles south, on railroad. Sand, gravel and clay in area and in hills at edges. Traprock, suitable for crushed rock, might be found in hills. Mountains 10 miles or more inland may have hard sandstone suitable for construction. River will give good water supply; shallow wells will probably yield adequate supplies.

ACCESSIBILITY: Crossed by railroad (not shown on map) and several highways. At small town of Nayoro. Less than ten miles north of Tomarioru, a large town and anchorage.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND
AREA 17



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND — SUITABILITY FOR AIRFIELDS — AREA 17

Poor location for site; very small.

TOPOGRAPHY: Widened valley mouth. River is large, meandering. Space only for east-west 6,000-foot runway. Area probably subject to flood.

TOPOGRAPHIC HAZARDS: Valley sides rise 300 feet. Peak three miles south rises 1,000 feet. Mountains west of area 600 feet high.

CLIMATE: Bad weather 150 days a year, most in January (20 days); on the average 60 days a year of rainy weather, most in July and August (13 to 14 days each month). Snow 90 days a year on the average, mostly in December to February. More cloudy in summer than west coast.

GROUND, VEGETATION (Class C data): River alluvium: sand, clay and gravel (A-2).[a/] Easily worked by scrapers. Covered by conifer forest which will need clearing.

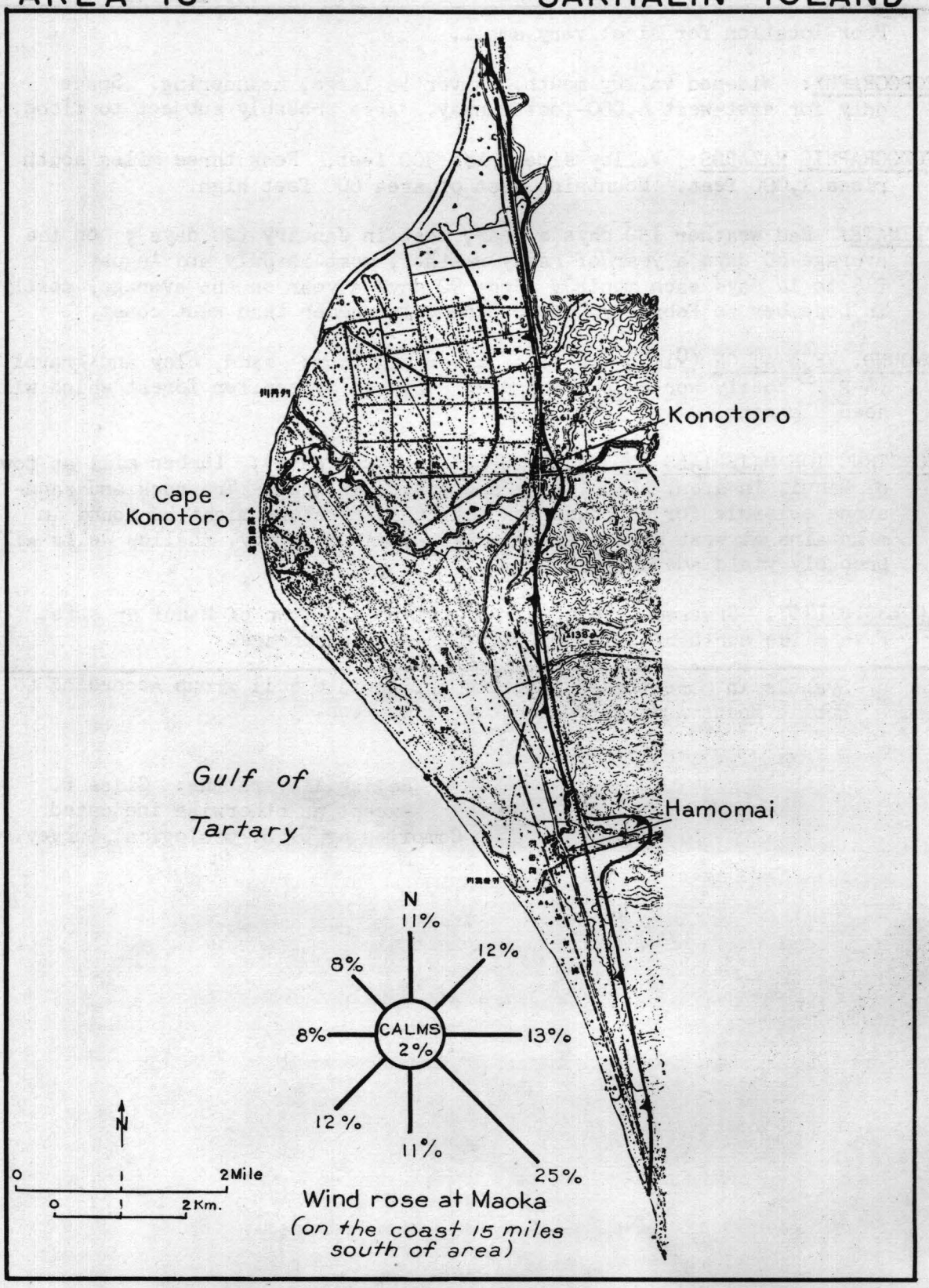
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Lumber mill at town of Manui, in area. Sand, clay and gravel in area. Traprock and sandstone suitable for crushed rock and building stone might be found in mountains at west side. River provides water supply, shallow wells will probably yield adequate supplies.

ACCESSIBILITY: Crossed by highway and railroad. Town of Manui at site. Five miles north of Shiraura, which has an anchorage.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, AREA 18 SAKHALIN ISLAND



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Fumio Saito: Tokyo Geog. Soc., Jour. Geog., Vol. 44, 1932

U. S. GEOL. SURVEY

SAKHALIN ISLAND — SUITABILITY FOR AIRFIELDS — AREA 18

Good location for site.

TOPOGRAPHY: Low area extending from foot of mountains to sea. Crossed by meandering river and broken up by a number of cut-off river channels, elongate lakes and swamps. Ground is slightly rolling. Dry areas at north and south ends large enough for 6,000-foot runways in any direction. Grades .5% or less. Little grading necessary except for drainage.

TOPOGRAPHIC HAZARDS: Approach from the east is interfered with by mountains 400 feet high at the site edge, up to 1,000 feet high two miles farther inland.

CLIMATE: Similar to that at Maoka, see table given for area 13. Strong north winds in winter. Winters cold but somewhat warmer than east coast. Maximum cloudiness in winter, and fogs only in summer. Greatest rainfall in summer. Freezing weather from middle of November to early April. Snow falls from late October to middle of May. Snow cover up to 2 feet.

GROUND, VEGETATION (Class C data): Sand, gravel and clay (A-2)[a/]. Swampy areas covered by soil of class A-8. Poorly drained, probably stays wet a long time after rains. Grading for drainage and high subgrade will be necessary. Conifer and deciduous forest cover will need to be cleared but there are patches of open meadow and cleared farm fields.

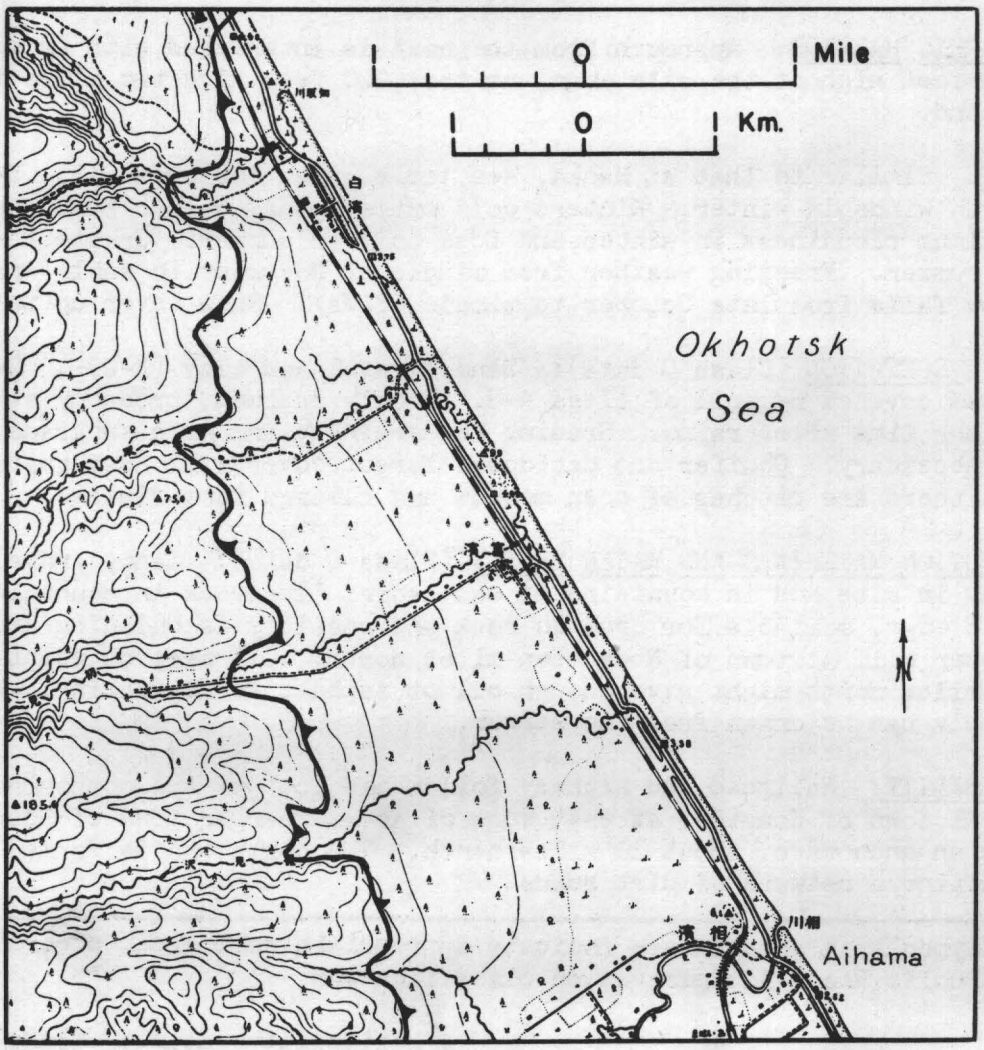
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand, gravel and clay in site and in mountains at east edge. Traprock in mountains at east edge, suitable for crushed rock and possibly as building stone. Lumber mill at town of Noda, ten miles north. Oil seep on coast about 15 miles north might give enough oil or asphalt for surfacing. Water supply can be drawn from the stream.

ACCESSIBILITY: Railroad and highway follow the foot of the mountains. Small town of Konotoro at east edge of area. Larger town of Noda, which has an anchorage, about 10 miles north. The north end is farmed and contains a network of dirt roads.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 19



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND SUITABILITY FOR AIRFIELDS AREA 19

Good location for site, well drained.

TOPOGRAPHY: Wide beach, twenty feet above sea level at west edge, slopes gently east toward sea. Cut across by several small parallel streams. At the south end, between two streams, is sufficient space for 6,000-foot runways in any direction. Little leveling if any is necessary. Grades about .5%.

TOPOGRAPHIC HAZARDS: Low hills at west edge, highest point 600 feet, two miles west of area. Four to five miles west of site is a mountain ridge 1,800 feet high.

CLIMATE: Exposed to strong winds and cold fogs of Okhotsk Sea. Climate similar to that at Ochiai (see table given for area 20), but somewhat more severe.

GROUND, VEGETATION (Class C data): Sand and gravel, possibly a little clay on surface (A-3 and A-2)[a]. Can be easily worked by scrapers. Well drained. East half open meadow, west half covered by forest which will need to be cleared.

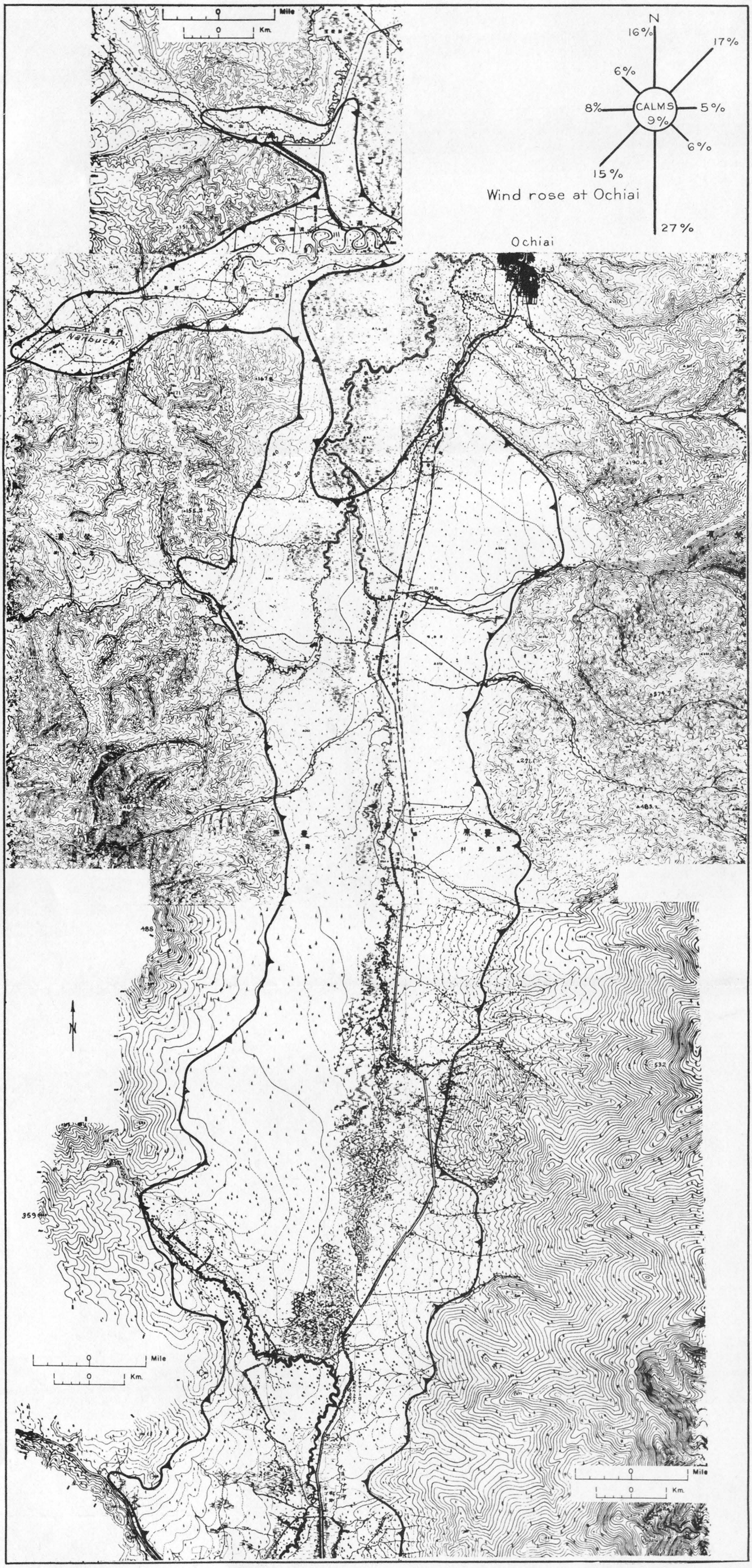
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand and gravel in area and in hills at west side. Clay in hills. Some hard sandstone suitable for construction might be found on ridge several miles west of area. Water can be obtained from small mountain streams. Shallow, dug wells might yield adequate supplies.

ACCESSIBILITY: Railroad and highway on coast at east side. Small town at southeast corner.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND
AREA 20 CONFIDENTIAL



For explanation of map symbols see page preceding large-scale map of Area 7.

Source; Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

Good location for field near Ochiai.

TOPOGRAPHY: Low wide plain between high mountains. Middle part flat, swampy, occupied by large streams, is subject to flooding. Edges are alluvial fans which slope away from mountains at grades of about 1% on west side and 1 to 2% on the east side. Best locations are on the fans. 6,000-foot runways can be aligned in all directions. Small amount of leveling would be necessary on east side.

TOPOGRAPHIC HAZARDS: Mountains on both sides rise 1,000 to 1,500 feet or more within a mile or so of the suitable land.

CLIMATE: Wet and cloudy. Fogs mainly in summer. Winds predominantly from south, but also much of the time from north, northeast and southwest. Calmest in winter (17% calms) and spring (10% calms). Winters cold but more comfortable than on coast because of fewer winds. Freezing weather from early November to middle of April. Snow falls from late October to late May. Snow cover up to 3 feet. Floods in spring and late summer. For additional data at Ochiai see below.

GROUND, VEGETATION (Class C data): Unconsolidated sand and clay (A-2)[a/] underlain by gravel (A-3). Materials are coarser in alluvial fans, probably little clay,(A-3). Drainage good on fans, poor in middle portion of valley where the soil contains organic material (A-8). Many areas cleared and under cultivation (not shown on map) but forest may need to be cleared in places.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand, gravel and clay in plain and bordering mountains. Hard sandstone in mountains on west and hard sandstone, quartzite and possibly limestone in mountains on east side, can be used for building stone and crushed rock. Streams and shallow wells will give abundant supplies of water. Synthetic oil plant reported west or north of area (see Fuels and Other Mineral Resources sheets).

ACCESSIBILITY: Area south of Ochiai is on railroad and highway leading from the town. Flatter land, southwest of Ochiai is farther from town and less easily accessible. It is reached from the highway south of Ochiai by a poor road or trail which will need improvement.

Data collected at Ochiai over a period of 22 years

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average wind velocity, miles per hour	6.	5.8	8	9	9.1	8.2	7.2	6.5	6.7	7.6	6.9	6.7	7.4
Maximum wind velocity, miles per hour	51.5	40	51.5	43	40	34	29	29	36	43	45	60	60
Average monthly precipitation, inches	1.6	1.2	1.2	1.7	3	3.2	4	3.8	4.4	3.8	3	2.2	33
Average number days with precipitation	20	16	16	13	14	14	16	14	16	16	18	21	194
Maximum daily precipitation, inches	1.5	2.9	1.2	1.9	2.5	2.5	3.6	6.3	3.2	3.5	2.7	2.9	
Average number days with overcast skies	13.0	10.6	12.6	11.8	14.8	16.2	16.5	14.1	11.5	10.3	14.0	15.5	160.9
Average number days with fog	0.1	0.2	0.6	1.8	2.8	4.1	4.0	3.9	2.1	1.4	0.5	0.2	21.7
Average number clear days	2.6	2.5	3.2	3.7	2.7	2.0	1.9	2.2	3.8	4.7	1.7	1.1	32.1
Average monthly air temperature, Fahrenheit	6	8	18	33	42	51	59	63	54	43	30	15	35
Average maximum air temperature, Fahrenheit	17	19	29	41	52	62	69	72	65	53	36	24	45
Average minimum air temperature, Fahrenheit	-8	-7	6	25	34	42	51	54	45	33	20	4	25
Average relative humidity at 2 p.m., in percent	74	71	67	63	62	67	72	68	67	59	69	73	68

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

Wind rose at Odomari

For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau; 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

Good location for fields near Toyohara or Rutaka.

TOPOGRAPHY: Low, wide plain between high mountains. A continuation of plain of area 20, but wider and drier. Plain quite flat in the middle, grades less than .5%, crossed by several large meandering streams, swampy in spots. Lowland is subject to flooding. The edges of the plain are slightly rolling alluvial fans, sloping away from the mountains at grades up to 1%, and in places, near the mountains, to 2%. 6,000-foot runways can be constructed in all directions with little or no grading. Best locations are on the lower part of the fans where the drainage is good, the ground is above flood level, and runways will be at a sufficient distance from the bordering mountains. Coastal strip of flat land at the southwest slopes toward the bay with a grade of about 0.5%; runways can be aligned only north to northeast.

TOPOGRAPHIC HAZARDS: Mountains on both sides rise 500 to 1,000 feet within a mile or so of the plain. Peaks over 3,300 feet altitude several miles east of Toyohara.

CLIMATE: Mean annual precipitation at Toyohara is 30 inches, and at Rutaka is 20 inches, where the highest monthly precipitation is in September (2.5 inches). In summer south and east winds are predominant. In winter north winds are predominant. Floods occur in spring when snow melts, and in summer (July to September) when the greatest rains come. Weather at south coast similar to that at Odomari where statistics have been collected over a period of about 25 years (see table below).

GROUND, VEGETATION (Class C data): Unconsolidated sand and clay (A-2)[a/] underlain by gravel (A-3). Materials are coarser in alluvial fans (A-3), probably little clay, and drainage on them is good. In the middle flat area the drainage is poor in many places, the soil probably contains organic matter (A-8). Many cleared areas under cultivations (not shown on map) but forest may need to be cleared in places.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Lumber mill at Rutaka. Brick kiln at Toyohara. Sand, gravel and clay in plain and in bordering mountains. Hard sandstone, quartzite and possibly limestone in mountains at northwest edge suitable for building stone and crushed rock. Large streams can be used for water supply and wells less than a hundred feet deep should yield abundant good water.

ACCESSIBILITY: Fields can be located close to Toyohara, the largest town in Sakhalin (1930 population over 35,000), and Rutaka, a somewhat smaller town. Area well served by railroads and highways.

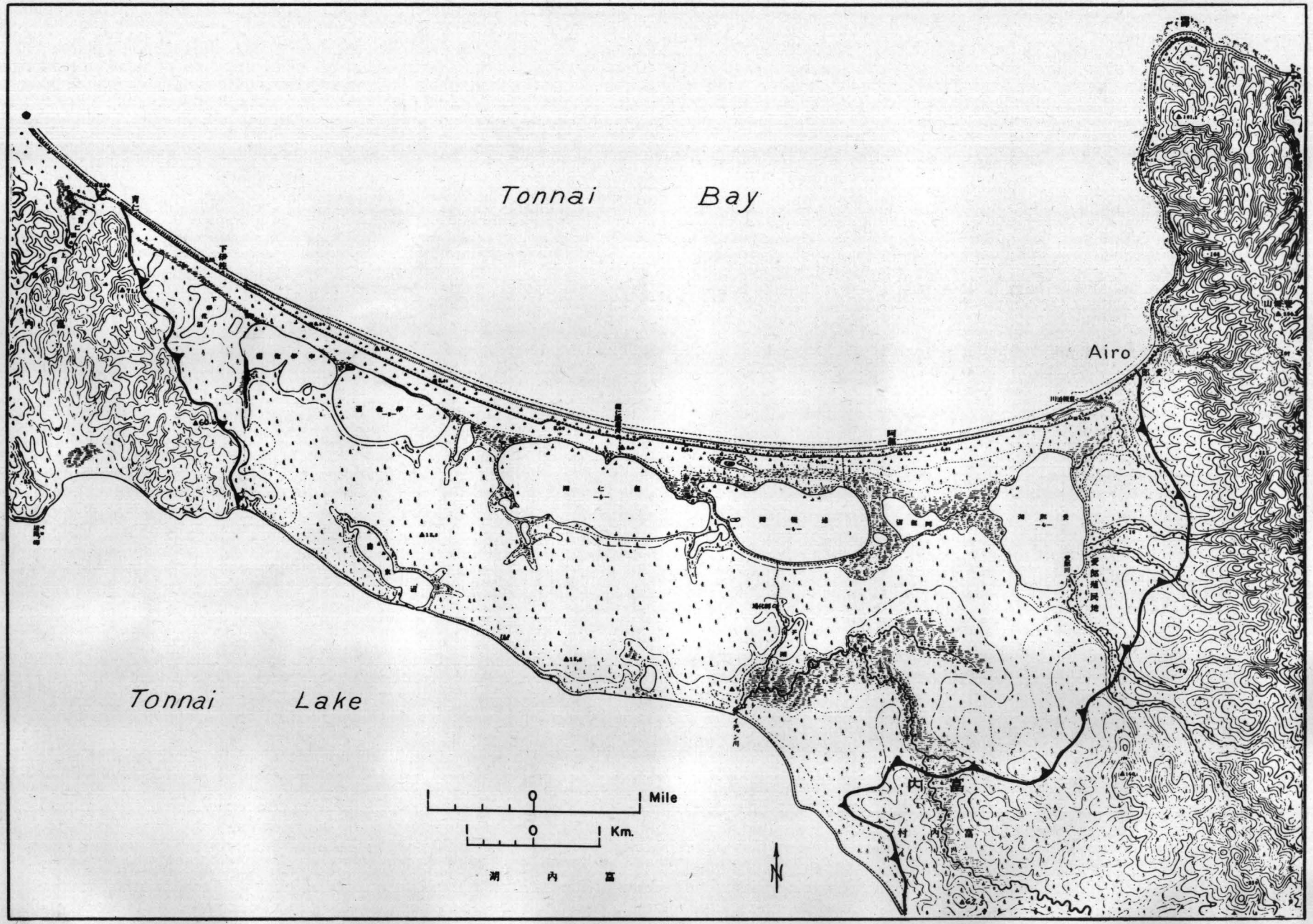
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average wind velocity, miles per hour	10.5	9.4	10.7	10	9.4	8	7.4	7.6	9.1	11	12.3	11.6	10
Maximum wind velocity, miles per hour	51.5	56	60	49	49	43	34	45	58	51.5	82	56	82
Average monthly precipitation, inches	1	.7	1.1	1.7	2.5	2.8	3.8	3.1	4	3.1	2.6	1.6	28
Average number days with precipitation	15	13	14	12	12	12	14	12	14	14	16	18	166
Maximum daily precipitation, inches	1	.9	1.1	1.3	1.4	1.7	2.6	3.1	2.3	3.2	1.2	2.2	
Average number days with overcast skies	10.8	8.5	10.5	11.8	15.8	16.6	18.5	15.3	11.0	8.8	12.1	13.0	152.7
Average number days with fog	0	0.4	1.3	2.7	4.7	7.7	9.6	5.8	3.2	1.6	0.6	0.1	37.7
Average number clear days	3.4	2.8	3.8	3.5	2.8	1.8	1.8	2.6	4.2	5.4	1.9	1.5	35.5
Average thickness snow cover, inches (at Toyohora)	19	26	31.6	2.7	0	0	0	0	0	0	1.5	6.2	
Average monthly air temperature, Fahrenheit	12	4	22	34	42	50	59	63	56	45	31	19	37
Average maximum air temperature, Fahrenheit	19	22	29	41	50	58	65	70	63.5	53	38	26	45
Average minimum air temperature, Fahrenheit	4	5	14	27	35	43	52	56	49	37	24	12	30
Average relative humidity at 2p.m., in percent	70	68	68	69	71	76	81	78	73	67	68	71	72

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, AREA 22

SAKHALIN ISLAND



For explanation of map symbols see page preceding large-scale map of Area 7.

U. S. GEOL. SURVEY

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

Good location for site.

TOPOGRAPHY: Narrow strip of land between Tonnai Lake and sea, broken up by several small lakes and swamps. Surface is a flat to very slightly rolling plain about 50 feet above sea level and edged by a scarp along most of the shore on both sides. Grades are .5% in central part, increase at the shore edges. 6,000-foot runways can be constructed in all directions with little or no grading necessary and clear approaches.

TOPOGRAPHIC HAZARDS: About 5 miles east is a north trending mountain range, about 800 feet high. To the west the flat land passes into hill 300 feet high. **SE. of site, mountains rise to 1,660 feet altitude.**

CLIMATE: Similar to that at area 20 though probably more windy and more severe.

GROUND, VEGETATION (Class C data): Unconsolidated sand, gravel and clay (A-2)[a/], swampy areas contain peaty soil (A-8). Can be easily worked by scrapers. Drainage outside of swampy areas probably fairly good but will need some improvement by grading. Conifer forest will need clearing.

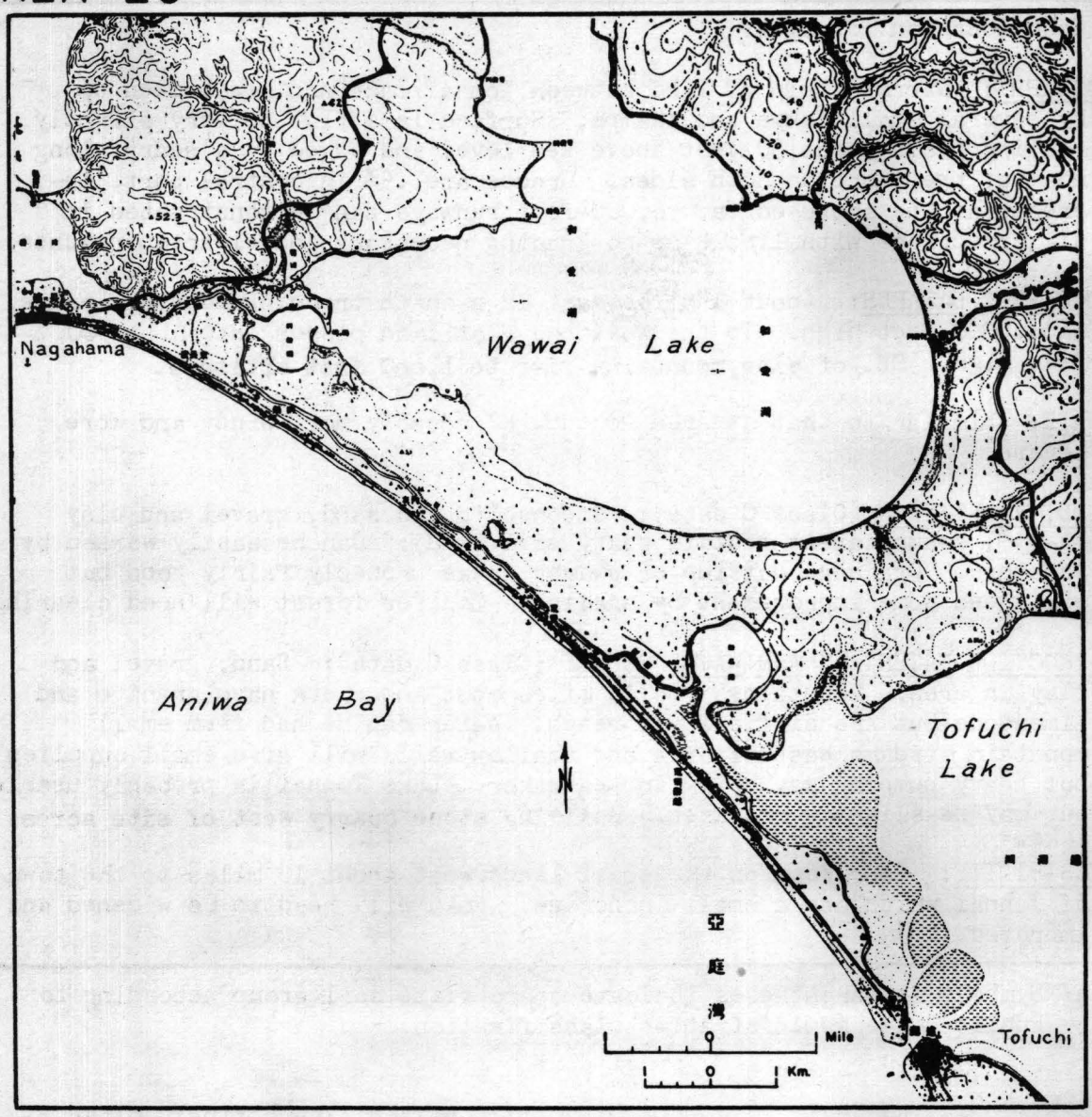
CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand, gravel and clay in area. Mountains 5 to 10 miles east and south have granite and limestone but are difficult to reach. Water can be had from small mountain streams east of area and shallow wells will give small supplies but heavy pumping may bring in sea water. Lake Tonnai is probably usable but may be slightly brackish. **Building stone quarry west of site across lake.**

ACCESSIBILITY: Poor road on the coast leads west about 10 miles to the town of Tonnai which has a small anchorage. Road will need to be widened and improved.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B, except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR AIRFIELDS, SAKHALIN ISLAND AREA 23



For explanation of map symbols see page preceding large-scale map of Area 7.

Source: Imperial Japanese Army Land Survey Bureau, 1:50,000 topographic maps; 1911 to 1935.

U. S. GEOL. SURVEY

SAKHALIN ISLAND **SUITABILITY FOR AIRFIELDS**
AREA 23

Good location for site.

TOPOGRAPHY: Low flat plain on bar across mouth of lagoon, 15 feet above sea level, bordered on most of seaward and lagoonward sides by a scarp. Surface flat or gently undulating, grade .5% or less. To the east it passes into rolling land between adjacent lagoons where grades are 1%. Little if any leveling is necessary. 6,000-foot runways can be constructed in any direction with clear approaches.

TOPOGRAPHIC HAZARDS: Three miles inland from east end hills are up to 230 feet high. Mountain range eight miles east with peaks 1,200 to 1,600 feet high. Mountains eight miles west 1,000 feet high.

CLIMATE: Similar to that of area 21. Closest town where climatological data available is Odomari, about 25 miles west, see table for area 21.

GROUND, VEGETATION (Class C data): Loose, unconsolidated sand, gravel and some clay (mostly at east end), (class A-3 and A-2)[a/]. Easily worked by scrapers. Fairly well drained. Natural slopes at east end probably sufficient for drainage but flat, west portion will need some drainage grading. High subgrades may not be necessary. In east and west conifer forest will need to be cleared. In central part forest is burned out.

CONSTRUCTION MATERIALS AND WATER SUPPLY (Class C data): Sand, gravel and clay in area. Limestone deposit suitable for quarrying in hills a mile or less east of isthmus between Waiwai Lake and Tofuchi Lake. Limestone quarry near coast about 10 miles south produces stone for lime burning and suitable for cement manufacture. Quarry connected to area by dirt road. Twenty miles or more farther south are granite quarries. Water can be drawn from mountain streams on east and west edges. In the area shallow wells (15 feet or less) will probably give some water but heavy pumping may draw in salt water. Lakes may be brackish.

ACCESSIBILITY: Not shown on the map is a road which branches east from the coastal road, crosses the isthmus between the two lakes and extends along northeast shore of Tofuchi Lake. The coastal road connects area with small towns (which have small anchorages) several miles north and south of it. Between the towns are several villages. Roads are now better than shown on map and may need no improvement.

a/ Symbols in parentheses indicate appropriate soil group according to Public Roads Administration classification.

Reliability rating: Class B,
except as otherwise indicated
Compiled by U. S. Geological Survey.

SUITABILITY FOR ROADS

CONFIDENTIAL

SAKHALIN ISLAND

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

SIBERIA

OKHOTSK SEA

Sea of Japan

Sakhalin Gulf

Tartary Strait

Gulf of Tartary

Taraika Bay (Patience Bay)

Aniwa Bay

La Perouse Strait (Soya Strait)

Cape Elizavety
Cape Marii
Schmidt Peninsula
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Piltun Bay
Chaivo Bay
Cape Pogoloi
Nyiski Bay
Nabilski Bay
Cape Tyk
Tymovskoe
Adatymovo
Aleksandrovsk
Due
Derbinskoe
Kirovskoe
Cape De Lisle de la Croyere
Pilevo
Ambetsu
Kitanayoshi
Esuloru
Shikuka
Nairo
Kitashiretoko Peninsula
Cape Kitashiretoko
Kaikio Island
Cape Ushiro
Shiritori
Chinnai
Kushunnai
Manui
Shiraura
Tomarioru
Ochiai
Maoka
Toyohara
Rutaka River
Rutaka
Honto
Odomari
Minabetsu
Yaman
Kaiba Island
Cape Nakashiretoko
Cape Nishinotoro

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 53° 52° 51°

EXPLANATION

Large numbers and heavy lines refer to areas described in table.

- Flat plains, suitable for roads.
- Sandy beaches, suitable for roads.
- Swampy areas on flat plains; poorly suitable for roads.
- Rough land, poorly suitable for roads.
- High mountains, unsuitable for roads.
- 1200' Routes and passes across mountains. Altitude (where known) of pass in feet above sea level
- Abrupt cliffs; coastal road construction very difficult.

10 0 50 Miles

10 0 50 Kilometers

Sketch map

Reconnaissance map

Compiled by U. S. Geological Survey

Introduction

Sakhalin is sparsely settled and existing roads are few and far between. In Russian Sakhalin, the least settled part of the island, roads are almost limited to the south half and all are poor except the highway from Adatymovo south to the Russian-Japanese border, and the all-weather highway between Aleksandrovsk and Derbinskoe. In Japanese Sakhalin two highways extend on opposite sides of the main, western range of mountains from the border to the south end of the island. Highway on the west coast is 12 to 15 feet wide, 320 miles long. Highway on the east side, between the border and Odomari, is 15 to 18 feet wide, 270 miles long. They are used by busses and automobiles in summer, sleds in winter. Highways are connected by two good cross roads, one between Kushunnai and Manui, 19 miles long, and one between Maoka and Toyohara, 15 feet wide, 46 miles long. Both are usable by automobiles the year round. A number of other secondary roads in Japanese Sakhalin are mostly in the south end of the island. Where roads are lacking or on poor roads, much of the travel is accomplished by pack trains of horses or reindeer; dog sleds are commonly used in winter in all parts of the island. Because of the scarcity in much of the island of roads suitable for vehicle travel, and the fact that there are no areas, with the possible exception of some firm sand beaches, where open country can be traversed, military operations will require construction of many new roads. Most of Sakhalin consists of north-trending mountain ranges, from several hundred to several thousand feet high. Throughout much of the island these ranges are separated by elongate basins oriented north-south and forming natural travel routes. Roads are most easily constructed in north-south direction on plains occupying the basins, and on beaches and low terraces which border the coastline for most of its length. Materials are generally unconsolidated and can be worked by scrapers and graders except when frozen. Roads may be straight and level, but will cross much swampy and poorly drained land. Construction of roads crossing the island is more difficult. The only natural route is the narrow isthmus of the Schmidt Peninsula where the mountain chain is interrupted and terraces of the east and west coasts come together to form a low, flat divide. Elsewhere the island can best be crossed by mountain passes where headwaters of east and west-flowing streams are separated by low divides. Many such routes in Japanese Sakhalin are already occupied by roads and highways, others, particularly in Russian Sakhalin, are mere trails. Roads crossing mountains will be steep and winding and require much rock excavation.

Special Construction Problems.-The severe climate creates many construction problems which are not met in more temperate regions. Roads in all parts of the island must be protected against frost heave. Winters are long and cold. Freezing weather lasts from November through March, and in the north, frost sometimes occurs every month. Unconsolidated materials, when frozen, are as difficult to work as rock. Snowfall is heavy. Snow cover ranges from 2 to 3 feet in the south to 7 feet or more in the mountains of the north, and strong winds pile up high drifts in valleys. North of a line several miles south of the Russian-Japanese boundary much of the low ground is an arctic tundra: swampy, peat-covered ground which is permanently frozen below a depth of a few feet. At the far north, not only low swampy ground, but probably all the plains and even some mountain slopes are underlain by permanently frozen ground, which should be a major factor in road construction and other excavation projects. Clearing, stripping, and excavating by removing vegetation and sod (which act as insulators) tend to thaw the permanently frozen ground whose water may supersaturate the overlying surface ground and make the foundation unstable. Water under pressure within or below the frozen ground may break through and flood the road, in winter freezing to masses of ice; consequently fills are preferred to cuts. Fills, however, tend to cause a ridge of frozen ground to form beneath them rising above the general level of permanently frozen ground on either side. Such a ridge forms a barrier to shallow ground-water movement and may force the ground water to the surface at the upslope edge of the fill. Borrow pits should be located some distance from the road. Local frozen ground and ground-water conditions should be thoroughly investigated before construction is undertaken. For a description of the problems involved and methods of overcoming them see Strategic Engineering Study No. 62, Permafrost or Permanently Frozen Ground and Related Engineering Problems. Other construction difficulties are presented by the frequent landslides of coastal terraces, which in many areas are the most convenient or the only suitable routes for roads. In places soil creep may be a problem.

Construction Materials.-Sand, gravel, and rock suitable for crushing, which can be used for the coarse fill and well-drained base course necessary to prevent frost heave, are abundant and widespread. Gravel and rock are also the commonest surfacing materials. Asphalt and crude oil for surfacing are obtainable from oil fields on the northeast coast, from two synthetic oil plants in the south end, and in very small amounts from a few scattered seeps in other parts of the island. They are particularly important because concrete surfacing and soil-cement stabilization are difficult to use where freezing conditions persist through many months of the year. There are apparently no known cement plants on the island, and limy raw materials for cement are scarce. The large peaty areas contain ground unfavorable for soil-cement stabilization, and in other areas underlain by permanently frozen ground, the necessary stripping of the humus layers would cause the ground to thaw. Timber for bridges and corduroy can be obtained almost everywhere. Streams, shallow wells, or springs can supply water in most parts of the island.

Area	Topography	Kind of Ground[a] (Class C data)	Streams and Stream Crossings (Class C data)	Existing Roads[b]	Materials Available[c]
1 Toyohara Plain	Low plain, about 3 to 10 miles wide, cut by several north and south-flowing streams. Bounded on east and west by mountains from whose bases large, gently-sloping alluvial fans extend into central flats. Grades low, and open country permits roads to be built freely in different directions with space for detours and alternate roads. Main obstacles to road construction are several large rivers which must be bridged or ferried. Swamps extensive only at north end of area near coast. In south a few swamps on plain.	Alluvial fans sloping and well drained, composed of coarse sand and gravel (A-2 and A-3)[a]. In flat parts of plain ground is less well drained. Soil is silty (A-4) and clayey (A-6 and A-7), underlain by sand and gravel (A-2 and A-3). In swamps at north end soil is A-8 type, and corduroy will be needed for temporary roads. Ground unconsolidated; can be worked by scrapers and graders except when frozen. Permanently frozen ground not present but cold weather requires construction of thick base course where ground is clayey or silty to prevent frost heave. Snow cover 2 feet or more in thickness. Much of land is planted to cereals or used for pasture, elsewhere clearing of conifer and deciduous forest and brush will be necessary.	Several large streams (majority 100 feet or more wide) with soft bottoms and banks, must be bridged or ferried. Main streams carry considerable water throughout year. Largest ones sluggish and probably freeze sufficiently in winter to permit crossing on ice. High water occurs three times yearly: twice in spring (May and June) when snow in valleys melts, and later when mountain snows melt; in summer (July to Sept.) when heaviest rains fall. Large streams flow between banks 5 to 10 feet high over much of length and flooding of lowland uncommon. Some smaller streams which cross alluvial fans are dry in lower courses; dry washes easily crossed except during flash floods.	Network of good highways and roads cross area. Main highway crosses area from north to south through Toyohara and Ochiai, width 15 to 18 feet; another extends from Toyohara west to Maoka, width 15 feet. Roads straight, have low grades; streams crossed by good bridges.	Sand, gravel, and clay in plain. Sandstone suitable for crushed rock in mountains on east and west. Oil for surfacing might be obtainable from synthetic oil plant believed to be located close to plain in mountains at west or from synthetic oil plant and small oil field on coast west of area. Timber available in plain and surrounding mountains. Water can be obtained everywhere from streams or by digging wells.
2 Tym-Poronai Plain	Low plain, a few miles to about 15 miles wide, crossed by large, meandering, south-flowing Poronai River and north-flowing Tym River. Country near Tym-Poronai Divide is gently rolling, at altitude about 490 feet. North and south of divide plain slopes toward sea at average gradient of about 5 feet to mile. Bounded on east and west by high mountain ranges from whose bases alluvial fans extend into central flats. South end opens into Taraika Bay, where sandy beach can be readily followed by roads and alternate roads and detours constructed. Beach interrupted by large streams and lagoon inlets which must be crossed by ferries or long bridges. Plain drained by Poronai River is swampy tundra. Only dry land is on sloping alluvial fans at west edge of plain and in natural levee along river. Roads along west edge of fans can have long tangents and low grades; room for alternate roads and detours. Several rivers, tributary to Poronai River, must be bridged and a few small swamps must be crossed. Conditions at east edge of plain not known but possibly dry land suitable for roads can be found. Natural levees of Poronai River less suitable for roads; dry parts irregularly distributed and subject to flood. In lower reaches of Poronai, roads crossing plain in east-west direction difficult to build because large swamps must be crossed and river must be bridged or ferries provided. In upper part of Poronai, plain is less swampy and stream might be fordable in places. Divide between Poronai and Tym Rivers readily crossed. Plain drained by Tym River is less swampy than Poronai Plain; many swamps occur at foot of mountains. Natural levees along Tym. Roads can be constructed at river edge; alternate roads and detours possible. Roads crossing Tym River and large tributaries will require bridges. Beyond point where Nysh enters river, Tym turns northeast and cuts through mountains to east coast; this part of valley narrower and difficult to follow because of widespread swamps.	In most suitable areas, without swamps, ground is sandy clay soil (A-2) a few inches to 2 feet thick, resting on thick gravel (A-3). Permanently frozen ground probably lacking; gravel, water bearing at shallow depths. Surface drainage poor. Drainage ditches and thick base course necessary. Detours and temporary roads may require corduroy in places. Natural levees are mixture of sand, gravel, and silt (A-2). Tundras (arctic swamps) are covered with peat (A-8), up to 18 feet thick in Poronai River plain, up to 5 feet thick in Tym River plain. Beneath peat is clay (A-6) underlain by gravel (A-3). In tundra ground is wet, horses bog down and men sink to depth of foot or more. North of line several miles south of Russian-Japanese border, ground of swampy tundras is permanently frozen below depth of about 3 feet. Fill and high base course necessary. Detours and temporary roads need corduroy. Unconsolidated ground extends to considerable depth below plain; can be worked by graders and scrapers except when frozen. Snow cover 3 feet deep in places. Road building in dry areas will require clearing of thick larch and birch forest except in burned-out patches (overgrown with brush and young birch), and in places where land is cleared for agriculture in upper Tym Valley. Swamps usually covered with moss and a few dwarfed larch trees.	Tym and Poronai Rivers are largest on island. Tym River 250 miles long, 300 feet wide at mouth, 150 feet wide in lower course. Poronai River slightly shorter, 750 feet wide at mouth 150 feet wide near Russian-Japanese boundary. Both meander but flow is swift except in lowermost courses. Bottoms and banks soft and rivers fordable only in uppermost courses. Streams contain considerable water all year. In winter can probably be crossed over ice in most places but in some places where current is swift ice does not form. High water three times a year: twice in spring (April to June), when valley snow melts and later when mountain snow melts; in summer (July to Sept.) when heaviest rains fall. Rivers have high banks but numerous log jams pile up water and floods inundate large areas of low plain. Tym and possibly Poronai Rivers bridged in few places in upper courses; in lower courses are crossed only by ferry. North-south roads cross tributaries of Tym and Poronai by bridges.	Good highway north from Shikuka follows alluvial fans on west edge of Poronai Plain to Tym Valley and continues on east edge of Tym River to Adatymovo. From Adatymovo to the east coast river followed by very poor road or trail, swampy and almost impassable to vehicles. Good all-weather highway crosses plain from Derbinskoe west, continuing over mountains to Aleksandrovsk. A second, inferior, north-south road extends south from Kirovskoe along east bank of Poronai to Russian-Japanese boundary and is connected with west highway by two cross roads. Roads are straight, have low grades.	Sand, gravel, and clay in plain. Conglomerate and hard sandstone, suitable for crushed rock, common in most bordering mountains. At east border sandstone and quartzite common and in few small areas quarries can be opened in granite, trap rock, and limestone. Timber abundant. Water can be obtained from streams or by digging shallow wells in all parts of plain.
3 Mountain Ranges	High mountain ranges extend length of island and form most of coastline. In general roads leading north can be more easily constructed along coasts than in interior. On much of coast mountains are bordered by narrow sandy beach or low terraces. Roads on beaches easily constructed except where rocky capes and large rivers are located. On terraces roads have rougher topography to cross, require rock excavation in many places. Roads on terrace edges or just below terrace scarps subjected to landslides. In some stretches of coast (indicated on map by hachures) high cliffs descend into deep water and roads can be built only with difficulty on mountain slopes; steep grades and short-radius curves necessary. In east-west direction, across mountain ranges, road construction is difficult. Best method of crossing is by following river valleys, which drain east and west from central divides. Small streams have narrow valleys entire length; some even drop off into ocean as waterfalls. Larger streams have wide, flat valley bottoms in lower course. On some, as Rutaka, Aleksandrovka and Agnevo Rivers, flat valleys extend for some distance into mountains, and roads will have low grades and long tangents. In most valleys main stream must be bridged many times because winding streams cut back and forth against steep valley walls. Divides are crossed by passes at valley heads. Roads in narrow valleys and over passes will require steep grades, short-radius curves, and much rock excavation. Highest, most rugged, and difficult part of mountains to cross is Eastern Range, which lies east of Tym-Poronai Plain. Lowest and most easily crossed mountains are in narrow part of island between Kushunnai and Shiraura, and in belt south and east of Toyohara, which opens to east into depressed area of large lakes and lagoons separated by low rolling land. With few exceptions, no room for alternate roads and detours in mountain ranges and almost all routes are topographic bottlenecks.	Hard rock in mountains covered by thin, rocky, sandy-clay soil (A-6 and A-7 with large fragments of bedrock) a few inches to a few feet thick, and road building will involve much rock blasting and excavation. Drainage fair. Valley flood plains and few other lowland areas have unconsolidated alluvial material, generally gravel overlain by sand and sandy-clay soil (A-3), workable by graders and scrapers. In places flat areas and sometimes lower slopes are swampy and soil peaty (A-8). Alluvium in valleys has average thickness about 6 feet, greater in other lowland areas. Drainage poor, high base course necessary; temporary roads and detours may need corduroy. In coastal terraces bedrock is covered by variable thickness of gravel and thin sandy soil (A-2, A-3). In many places gravel thin or lacking. Drainage on most terraces fairly good. Beaches are sand and can probably be used as temporary roads with little or no preparation. Thick forest must be cleared in most of area. Highest passes above timber line, filled with dwarf bamboo and dwarf pine. Snow cover from about 3 feet in south to as much as 7 feet in north; winds pile up high drifts in valleys.	Largest streams, which flow in flat-bottomed, alluvium-filled valleys, have soft bottoms and banks; generally unfordable. Cut into alternate sides of valley and roads must cross them in many places. Width 100 feet or more. Most are crossed by numerous bridges and ferries. Smaller streams and upper parts of large streams flow in narrow rocky valleys and are fordable. All carry considerable water entire year. Highest water in spring and late summer. In winter streams freeze and are probably crossable on the ice.	In Japanese Sakhalin most large valleys and passes contain roads or highways. Wide valleys cultivated and crossed by network of dirt roads and trails. Most of coast line followed by highways, poor roads, or trails. Highway on east coast from Ochiai north through Nairo, 15 to 18 feet wide, and on west coast from Cape Nishinotoro to Ambetsu, 12 to 15 feet wide. Both used by automobile and bus in summer, but east highway is difficult to use in wet weather. Sleds used in winter. West range is crossed by highway 46 miles long, 15 feet wide, between Maoka and Toyohara, and by highway 19 miles long between Kushunnai and Manui. Both used by automobiles all year. In Russian Sakhalin west coast is followed by road, poor much of length. All-weather highway between Aleksandrovsk and Derbinskoe is probably only existing road across mountains. Other passes crossed only by poor trails. Range of mountains east of Poronai-Tym Plain has no cross roads in either Russian or Japanese parts, and coast line is followed only by discontinuous trail.	In west range conglomerate and hard sandstone suitable for crushed rock, clay and shale widely distributed. Coal-bearing shale can be readily burned to produce clinker for road metal. Limy shale, possibly suitable for cement, in places in north part. On west coast, from Cape Ushiro north, many outcrops of trap rock and granite-like rock, good for building stone and crushed rock. In east ranges hard sandstone and quartzite common; locally limestone, trap rock, and granite can be quarried. In south oil might be obtainable from two synthetic oil plants, a small oil field, and several small seeps. In north few small oil seeps might possibly be utilized and large amounts of oil can be brought in from east side of Area 4.

(continued)

Area	Topography	Kind of Ground[a]/ (Class C data)	Streams and Stream Crossings (Class C data)	Existing Roads[b]/	Materials Available[c]/
4 Coastal Plains	Wide plains on east and west coasts formed by series of terraces. Terrace nearest shore wide and low; outer edge is scarp 5 to 25 feet high. Inland, four or more wide terraces, progressively higher (up to about 300 feet above sea level), and more dissected. In some places successive terraces separated by scarps, in other places scarps have been eroded to gentle or moderate slopes, so that progress from one terrace to next can be easily made. Lower terraces wide, flat, and swampy; swamps particularly common on west coast. Upper terraces narrower, rolling to rough, few swamps. Terraced land partitioned by incised streams flowing from interior east and west to sea. On terraces roads parallel to coast can be built with long tangents and low grades but swamps, large streams, and deep, steep-sided valleys would be difficult to cross. East and west coastal terraces unite at Schmidt Peninsula isthmus to form slightly dissected plain, up to 280 feet altitude, readily crossed by roads. Along east coast is series of large lagoons and bays, cut off from ocean by long sand bars. Bars very suitable for road construction; tangents can be long, courses level, little or no grading needed. Bars interrupted by widely spaced tidal gaps, which are sometimes filled with sand, but at other times flooded and must be ferried. During storms on Okhotsk Sea bars would be unusable and portions of road might be washed out. Inland shore of lagoons and bays generally formed by scarp of lowest terrace; roads along its base are somewhat difficult to construct, require winding courses and many cuts. Roads at edges of terraces and near foot of terrace scarps subject to frequent landslides. West shore has lagoons at north end only; consists mainly of series of gently curving bays separated by low sandy capes. Bays lined by sand beaches except in south where some are muddy marshes. Roads can have level and long tangents. Beaches interrupted by many large, sluggish streams. In general topography permits alternate roads and detours in all parts of coastal plains.	Terraces composed of gravel overlain by sand with clay lenses (A-2, A-3). Deposits 50 to 200 feet thick in lower terraces, thinner in upper terraces. In north permanently frozen ground probably underlies most of land at depth of about 3 feet. In south peat-covered ground is permanently frozen below depth of few feet. When not frozen, worked by scrapers and graders; gravel locally cemented by iron oxide and very hard. Bedrock exposed in lower parts of scarps and valley walls, and in places in upper, dissected terraces; is poorly consolidated sandstone, conglomerate, and shale, almost as soft as superficial materials; can be worked by graders and scrapers. Swampy areas covered by peat (A-8) up to 5 feet thick on east coast, 10 feet on west coast. Drainage on terraces generally poor; fill and high base course necessary. Temporary roads and detours will need corduroy. Sand beaches and bars (A-3) might be usable as temporary roads with little or no preparation; in places covered by sand dunes (which also cover parts of lowest terraces) where soft, shifting sand might need corduroy. In south part of west coast much of shore is sticky, muddy marsh (A-7, A-8); very difficult to cross. Locally deposits on shores of lagoons, in valleys, and in lower terraces contain many large granite boulders up to 5 feet in diameter. Thick, low forest will need to be cleared on terraces except in some tundra areas (moss and a few stunted trees in marshy environment). Bars and beaches require clearing of brush only. Deep snow cover in winter.	Streams are large and sluggish, soft bottomed; flow between banks of overhanging peat, and must be bridged or ferried. Very few existing bridges. In winter can be crossed on ice. Streams rise in spring and late summer, often filling valleys.	West shore followed by poor road in north and south, intervening distance crossed by trail. East coast contains short stretches of trail and road.	Sand, gravel, clay, and shale in terraces. No rock suitable for masonry except local deposits of granite boulders. Nearest good source of hard rock is in Area 3. Large supplies of crude oil and asphalt at several oil fields on east coast. Sufficient oil not only for local use, but also for shipment to other parts of island. On west coast oil might be obtainable from field on Langri River. Timber abundant. Water can be obtained from lakes, streams, springs, and shallow wells.
5 Northern Upland (Very poorly explored, information meagre and may be erroneous).	Mountain mass at south end, a continuation of mountain ranges of Area 3. Northward extend two chains of mountains, each consisting of several isolated high peaks (highest 2,000 feet altitude) connected by low ridges. Both chains die out to north. Land between chains is elevated, rough, terraced plain (400 to 500 feet altitude), widest at north, where it merges with coastal terraces. To south it narrows and passes into narrow, flat, low divide separating it from valley of Nysh River. Nysh Valley provides good route between north interior and Tym-Poronai Plain (Area 2). Coastal edges of east and west mountain chains bordered by similar dissected, terraced land, which passes into lower terraces of coastal plains (Area 4). Streams head in interior dissected plains, flow east and west across mountain chains. Best way to cross area is by valleys through mountain chains and across low interior divide. Valleys flat-bottomed but narrow, roads must cross streams many times and considerable sectors may be flooded in spring and late summer when streams sometimes fill whole valley bottom. At divide hilly land must be crossed, requiring steep grades and many cuts. North-south roads probably more difficult. Best route is along rough interior terraced land, but much cut and fill and several stream crossings probably necessary; roads would need steep grades and many short-radius curves.	Terraced land composed of unconsolidated sand and gravel with little clay (A-3, in places may be A-5), overlying bedrock of soft sandstone and shale, exposed in many places. Mountains composed of similar bedrock, covered by thin soil. Ground permanently frozen below shallow depth in dissected plains and in places on mountain slopes. Probably most materials, bedrock and superficial, when not frozen can be worked by scrapers and graders. Land poorly drained, swampy in places, surface soil A-8 type. High base course necessary; in many places temporary roads will need corduroy. Alternate routes and detours possible only in limited areas. Entire area heavily forested and clearing necessary. Deep snow cover in winter.	Lower portions of large streams soft-bottomed and must be bridged. Smaller streams can probably be forded. High water in spring and late summer sometimes fills valley bottoms.	No roads. Two or more poor trails used by native hunters cross area.	Sand, gravel, clay, and shale widely distributed. Nearest source of hard rock for construction is in Area 3. Oil might be obtained from fields on Langri River and oil and some asphalt can be brought in from Area 4. Timber abundant. Water can be obtained from streams, shallow wells in valleys and terraces, and probably from springs.
6 Schmidt Peninsula	Mountain mass at south end (highest peak 2,300 feet altitude) from which ranges extend north along east and west coasts each ending in rocky cape. At west shore mountains bordered by narrow terraces. East shore formed by abrupt mountain cliffs. Ranges separated by terraced lowland which forms, at north, a wide shore, partly terraced, partly sandy beach. Roads can be readily constructed along north shore and south over lowland interior, will be straight and level. Road from north shore can cross west range by low pass and continue south on terraced west coast to Area 4. Roads on coastal terraces subject to frequent landslides. South from central lowland, mountains can be crossed by high pass leading to Longi Valley which can be followed to east shore of Area 4. Road over pass will have steep grades, many short-radius curves, and require much rock excavation. Valleys of Longi and Pil Rivers have terraced bottoms, swampy in part. East shore exposed to severe storms; unsuitable for roads, which require deep cuts in steep mountain slopes.	Central lowland composed of sand, gravel, and some clay (A-3), swampy and peaty in part (A-8). Mountains composed largely of soft to moderately hard shale, clay, and sandstone covered by thin soil; north capes and small scattered areas in other parts composed of hard bedrock. Bedrock covered by thin soil, A-2 and A-4, in places might be A-5. Coastal terraces on west coast covered by unconsolidated sand and gravel (A-3) but construction of road would require side cuts in places into bedrock of bordering mountain slopes. Permanently frozen ground underlies much of area at depths of few feet. Deep snow cover in winter. North and east coasts have no forest; road building would involve only clearing of brush and stunted trees. Clearing of low forest necessary in interior and in few places on west coast.	Rivers of central lowland and Pil and Longi Rivers, in lower courses, have soft bottoms and may need to be bridged. Others can be forded. No streams are large. In winter streams are frozen and can be crossed on ice. Probably no existing bridges.	None. Trail along west coast leading to north shore.	Trap rock in northwest cape and north part of west coast. Limestone in northeast cape, suitable for building stone and road metal. On west coast limestone concretions usable for crushed rock occur locally in shale bedrock; terrace deposits contain granite boulders. Sand, gravel, clay, and shale in mountains; sand, gravel, and some clay in central lowland. Crude oil can be brought in from Okha in Area 4. Timber lacking in north and east coast, some available on southwest coast and in interior. Water can be obtained from streams, several springs, and by digging wells in central lowlands and Pil and Longi Valleys.

a/ Soil types referred to are Public Roads Administration Classification.
b/ See Communications map.
c/ For locations see Construction Materials map.

Reliability rating: Class B, except as otherwise noted.
Compiled by U. S. Geological Survey.

CONSTRUCTION MATERIALS

CONFIDENTIAL

SAKHALIN ISLAND

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

SIBERIA

Sakhalin Gulf

Strait of Tartary

La Perouse Strait (Soya Strait)

Sea of Okhotsk

Aniwa Bay

Taraika Bay (Patience Bay)

Cape Elizavety, Cape Marii, Schmidt Peninsula, Moskalvo, Okha, Baikal Bay, Rybnoe, Nikolayevsk, Amur, Piltun Bay, Nutovo, Chaivo Bay, Nyiski Bay, Cape Tyk, Katangli, Nabilski Bay, Aleksandrovsk, Due, Derbinskoe, Kirovskoe, Cape De Lisle de la Croyere, Pilevo, Ambetsu, Kitanayoshi, Esutoru, Shikuka, Kitashiretoko Peninsula, Cape Kitashiretoko, Kaikio Island, Shiritori, Chinnai, Kushunnai, Shiraura, Tomarioru, Ochiai, Maoka, Toyohara, Honto, Rutaka, Odomari, Naihoro, Kaiba Island, Shiretoko Peninsula, Cape Nakashiretoko, Cape Nishinotoro

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 54° 53° 52° 51°

EXPLANATION

Large numbers refer to areas described in table.

1. Sand beaches and dunes. Lenses of gravel and in places large boulders.
2. Sand and gravel, covered in places by clay, silt and peat. Locally limestone concretions, or fragments of trap rock.
3. Clay, sand, soft sandstone, and volcanic ash; small deposits of conglomerate, limy clay, and coal.
4. Moderately hard to hard rocks. Shale and smaller amounts of sandstone, indurated volcanic ash, clay, and conglomerate. Small areas of limestone. Some coal.
5. Hard rocks. Slate, quartzite, chert, sandstone, and indurated volcanic ash. Small areas of limestone and marble.
6. Massive, hard volcanic trap rock and associated unconsolidated to hard, indurated volcanic ash.
7. Massive, hard granite and similar rocks.

- Granite quarry.
- Limestone quarry.
- Limestone deposit, suitable for quarrying.
- Brick kiln.
- Building stone quarry (limestone or sandstone).
- Producing oil field and large asphalt deposits.
- Producing oil field.
- Oil seep, in places small deposits of asphalt or oil-saturated sand.
- Synthetic oil plant.
- Lumber mill.

Sketch map

Reconnaissance map

10 0 50 Miles

10 0 50 Kilometers

Compiled by U. S. Geological Survey

Introduction

Timber is the most common construction material on the island and almost all the houses, buildings, bridges, and other structures are of wood. Granite, limestone, and sandstone are quarried only in the southeast tip of the island, the Shiretoko Peninsula. Elsewhere good building stone occurs in small scattered areas; and in large area between Schmidt Peninsula and Tym River no large masses of hard rock are definitely known. Limy rocks are a very minor constituent of the island. Though small areas of limestone and limy clay (marl) are known in several places in the northern part, apparently lime is produced only in the Shiretoko Peninsula. Some industrial construction in Japanese Sakhalin is of concrete and though definite information is lacking, there may be cement plants on the island; they are most probably located in the Shiretoko Peninsula. Clay and shale suitable for cement and brick are relatively abundant. Brick is known to be manufactured at Toyohara and there may be kilns at other towns. Road construction materials are abundant, the island providing sand, gravel, rock suitable for crushing, asphalt, and crude oil. Asphalt and oil are particularly important as surfacing materials in view of the apparent lack of cement plants, death of lime for manufacturing cement, and the cold climate, which is unfavorable for the use of soil cement stabilization and concrete.

Asphalt and Oil: (For details see Fuels and other Mineral Resources). Several large producing oil fields in north half of Sakhalin can supply crude oil for use in surfacing roads and airfields. In the south the only field is at Naihoro and it is a very small producer. On the surface at some of the fields are also flows and lakes of asphalt. The largest lakes are at Okha (one lake has an area of 280,000 square feet, asphalt a few inches to several feet thick), and at Nutovo (where one deposit is estimated to contain 11,000 tons). At the south end of the island two large plants produce synthetic oil from lignite coal; the location of the one shown southwest of Ochiai is indefinite and it may actually be some distance north or northeast. The oil seeps shown on map are locations where there has been no production as yet, and asphalt deposits are small, but some can supply oil or asphalt for limited local use. Near some seeps, oil saturated sands could be used directly for road surfacing.

Peat: Useful as an insulating material. Occurs in area 2. Largest deposits in the Tym and Poronai Valleys and on the northwest coast.

Lumber: Everywhere abundant and almost all the buildings on the island are of wood construction. Lumbering is a major industry. Mountain tops and slopes covered with coniferous forest of fir, spruce, larch and pine, while lowlands and valleys covered by deciduous forest of larch, birch, alder, elm, willow, poplar, beech, and maple. Best timber is larch which grows straight and tall, over 100 feet high and 3 feet thick, and has very tough, durable wood. Areas lacking forest are small and few, occurring in places along the coast, in valleys and on high mountains and ridges.

Fuel: Fuel is abundant. Coal is widely mined except in the north quarter of the island where producing oil fields can provide fuel. On the wide coastal plains of the north and in the interior basins, peat and lignite are available but are not mined because of the abundance of coal and oil. Wood is everywhere available. For location of coal mines see Fuels and other Mineral Resources map.

Symbol and Area	Kind of Material	Building Stone and Masonry	Riprap	Road Metal and Ballast	Lime, Mortar, and Cement	Concrete Aggregate	Brick
1	Sand beaches and dunes. Lenses of gravel and in places large boulders. Gravel and boulders are quartz, chert, quartzite, slate, shale, trap, and sandstone. Isolated small patches of large granite boulders, up to 5 feet in diameter, are scattered along the coast.	Granite and other hard-rock boulders could be used for some types of rough construction.	Granite and other boulders good source except where well-rounded.	Gravel good source; sand can be used for ballast.	No limy materials. Sand for mortar abundant.	Sand and gravel good source for fine and coarse aggregate. Gravel with shale pebbles should be avoided.	No source.
2	Unconsolidated materials in more or less flat-lying beds. Sand and gravel in terraces along the coast, in interior basins, and in valley flood plains and terraces. Clay, silt and peat on the coastal terraces, in interior basins, and in the larger, wide valleys. In several places along the coast, valley and terrace deposits contain large granite boulders. Gravel similar to that in area 1.	As above.	As above	As above.	No limy materials. Clean sand good source for mortar. Some of clay probably suitable for portland cement.	Sand and gravel where free from clayey material and shale pebbles, good source for fine and coarse aggregate; abundant. Boulders are excellent source for crushed rock aggregate.	Some clay possibly suitable.
3	Unconsolidated and poorly consolidated materials, bedded and moderately to steeply dipping. Clay, sand, soft friable sandstone, somewhat consolidated volcanic ash, and smaller deposits of conglomerate, limy clay (marl), and coal. Beds of ash containing large angular fragments of trap rock common south of about latitude 51° N but are lacking or rare in the areas north of that latitude. A clay bed containing large limestone concretions (up to 20 feet in maximum diameter) occurs on Schmidt Peninsula and in places along northwest coast. Diatomite (a very fine grained silica deposit) occurs on Schmidt Peninsula and has been reported from Japanese Sakhalin. Some sand is oil-bearing.	Better sources generally available nearby, except in northern area. In north limestone concretions might be a good source where locally available. Fragments of trap rock, beds of which occur in the south, may be large enough to be used. Better consolidated volcanic ash excellent source for light construction, good insulator.	Better sources generally available nearby, except in northern area where timber might be substituted for revetments. In the south, trap rock fragments might be usable.	Gravel and trap rock available for road metal. Near many oil seeps, oil saturated sand probably excellent road-surfacing material. Sand and gravel fair source for ballast. Clay associated with coal can be burned to make clinker.	Limestone concretions might be usable as source of lime, but supply is small and sparsely distributed. Limy clay (marl) might be suitable for natural cement but probably will need addition of lime or clay. Diatomite good silica constituent for hydraulic cement. Clay probably suitable for portland cement. Some volcanic ash possibly suitable for puzzolan cement. Sand suitable for mortar.	Sand suitable for fine aggregate. Gravel, where free from shale pebbles, and trap rock, where free from zeolites, can be used for coarse aggregate.	Some clay suitable for brick. Fire clay associated with coal beds.
4	Moderately hard, bedded rock, generally steeply dipping. Shale and smaller amounts of sandstone, indurated volcanic ash, clay and conglomerate. Locally, some beds of coal. Some sandstone is oil bearing, generally at great depth. Small areas of pure hard limestone at Cape Elizavety on the Schmidt Peninsula and Cape De Lisle de la Croyere on the east coast. Some limy shale in the west half of the island.	Hard sandstone and tuff good source. Limestone excellent source, but available only in a few places.	Limestone, sandstone and conglomerate excellent source.	Limestone excellent source where available. Sandstone and conglomerate poor source for metal, good source for ballast. Shale and clay associated with coal can be burned to make clinker.	Limestone can probably be burned for lime or used for portland cement. Shale and clay probably suitable for portland cement.	Limestone good source; some sandstone, and conglomerate fair source for crushed rock aggregate.	Shale and clay in some places suitable for brick. Fire clay associated with coal beds.
5	Hard, bedded, steeply dipping rock, including hard flaky rock, slate, quartzite, chert, and hard, indurated volcanic ash. Narrow strips of hard limestone and marble occur locally. Some chert is limy or contains thin streaks of limestone.	Sandstone and indurated volcanic ash good source. Limestone and marble excellent source, but sparsely distributed; quarried for building stone in the southeast tip of the island. Slate usable for roofing and flooring.	Limestone, marble, quartzite, chert, sandstone and hard foliated rock excellent source.	Limestone, marble, quartzite, chert, and sandstone excellent source for crushed rock and ballast. Hard flaky rock generally undesirable for road metal, good source for ballast.	Limestone and marble suitable for lime burning and portland cement; quarried for lime in the southeast tip of island.	Limestone, marble, quartzite, and sandstone suitable for crushed rock aggregate. Chert probably undesirable.	No source.
6	Massive, hard volcanic trap rock, generally dense, in some places slaggy, and associated unconsolidated to hard, indurated volcanic ash.	Trap rock excellent source. Slaggy trap (full of small holes) is particularly good, being light but strong and a good insulator against cold. Some of the hard, indurated volcanic ash excellent insulator, easily worked and handled, excellent source for light construction.	Trap rock excellent source.	Trap rock excellent source.	No source of lime. Volcanic ash possibly suitable for puzzolan cement.	Some trap suitable for crushed rock aggregate. Some trap contains zeolites, injurious to concrete, and should be avoided.	No source.
7	Massive, dense, hard granite and similar rocks.	Excellent source. Quarried in southeast tip of island.	Excellent source.	Good source for road metal, excellent for ballast.	No source.	Excellent source.	No source.

Reliability rating:
North of about latitude 49°30' N, Class C;
South of this latitude, Class B.
Compiled by U. S. Geological Survey.

FUELS AND OTHER MINERAL RESOURCES

CONFIDENTIAL

SAKHALIN ISLAND

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

SIBERIA

Sakhalin Gulf

Strait of Tartary

La Perouse Strait (Soya Strait)

SEA OF OKHOTSK

Aniwa Bay

Taraika Bay (Patience Bay)

Piltun Bay

Nyiski Bay

Nabilski Bay

Baikal Bay

Chaivo Bay

Kaiba Island

Kaikio Island

Cape Elizavety

Cape Marii

Schmidt Peninsula

Cape Tyk

Cape De Lisle de la Croyere

Cape Rymnik

Cape Kitashiretoko

Cape Nakashiretoko

Cape Soni

Cape Nishinotoro

Moskalvo

Okha

Rybnoe

Nikolayevsk

Amur

Nysh

Tym

Poronai

Naibuchi

Kitashiretoko Peninsula

Notoro Peninsula

Shiretoko Peninsula

141° 142° 143° 144° 145°

50° 49° 48° 47° 46° 54° 53° 52° 51°

OKHA
EKHABI
LANGRI
POROMAI
PILTUN
NUTOVO
GOROMAI
BOATASIN
NOGLIK
KATANGLI
MACHI
MGACH
VLADIMIROVKA
PETROVSKY
POLOVINKA
Aleksandrovsk
VOEVODSKY
DUE
Due
OKTYABRSKY
ARKOVO
NIKLEVICH
Derbinskoe
Kirovskoe
AGNEVO
PILEVO
Pilevo

Ambetsu
AMBETSU
SHIRUNAI
Onnai
KITANAYOSHI
Kitanayoshi
NAYOSHI
TORO
OHIRA
Esutoru
ESUTORU
HOROGISHI
UPPER SHIKUKA
Shikuka
NAIKAWA
NAIRO
TOMARIGISHI and KOTANKISHI
SHIRITORI (and SAFU)
Shiritori
HOKUSHIN and ASAHI
PORONAIPO
TOKAI
KASHIHO (and FUJIYAMA)
CHINNAI
Chinnai
SHODASU
NOBORIPPO
Kushunnai
Glauconite reported
KITATOMARIHO
Tomarioru
Shiraura
SHIRAURA (and CHITOSE)
DAIEI
USO
AUSHI
MUCHISHI and NODA
Noda
Ochiai
KAWAKAMI
Maoka
Toyohara
OCHIHO and SANJO OCHIHO
Honto
Tokombo
USHINIZAWA
Naihoro
NAIHORO
Minaminayoshi
Rutaka
Odomari
Mercury reported
Glauconite reported
YAMAN
MITA

EXPLANATION

- Important coal mine.
- Minor coal mine.
- Producing or potential oil field.
- Synthetic oil plant.
- Oil seep.
- Bituminous coal-bearing rocks.
- Lignite-bearing rocks.

Sketch map

Reconnaissance map

0 50 Miles

0 50 Kilometers

Compiled by U. S. Geological Survey

I. COAL

The island contains much bituminous coal and lignite in Quaternary, Tertiary, and Cretaceous rocks; only the bituminous coal is worked. The coal occurs in strongly folded and faulted rocks; the intensity of deformation and the quality of the coal decrease north and south from Due. Coking coals are found chiefly in Russian Sakhalin, at Due and for some distance north and south.

Coal Production in Russian Sakhalin

Mines produce bituminous coal from older Tertiary and Cretaceous rocks. Mines in the vicinity of Aleksandrovsk were originally worked by the Russians under primitive conditions by prison labor. The Japanese during their occupation of the entire island from 1922 to 1926 did considerable mining. In 1926 the Russians took over and since have intensified production and developed new mines. The Japanese retained concessions at the Due, old (north) Vladimirovka, and Agnevo Mines. Latest production figures are lacking; most information in the table below is no later than 1930 and the present production and development are probably greater than those shown. Reserves of bituminous coal are estimated at about 2,000,000,000 tons. The mines are all on the west coast, close to the sea, and transportation is accomplished by freighters and barges. The coast is straight and abrupt, without sheltered harbors; loading can take place on the average 100 days a year (May to October) and is often difficult.

Mines (Listed in geographical order from north to south; most important are starred.)	Estimated Reserves and Production	Quality	Accessibility and Transportation Facilities[a] (as of 1925)	Remarks
MACHI MINE	1923: known reserves 150,000 tons; possible additional reserves 13,000,000 tons to a depth of 1,000 feet. Production not known, small mine.	Non-coking bituminous, similar to Mgach coal.	Not known. Near coast.	Beds faulted and dipping; 7 workable beds; 13 feet total thickness.
*MGACH MINE	1925: known reserves 1,300,000 tons; possible additional reserves 32,000,000 tons. Greatest annual production before Japanese occupation 36,500 tons. Greatest annual production during Japanese occupation 3,239 tons, in 1923. From opening of mine in 1895 to 1925 a total of 300,000 tons produced.	Non-coking, long-burning bituminous. Liable to spontaneous combustion. 60-65% lump, 25% granules, 10-15% fines. Volatile matter 45%; moisture 4%; ash 15%; sulfur 0.7%; hydrogen 6.5%. Heating value 7,120-7,500 calories (12,800-13,500 B.t.u.).	Narrow-gage (31 inches) railroad, one mile long, to a 560-foot pier. No room in narrow valley for storage.	Faulted syncline. Beds dip 45°; 5 workable beds; 30 feet total thickness. Inclined shafts and drifts; longest, 475 feet in 1925.
VLADIMIROVKA (north) MINE	Not known.	Non-coking bituminous. 30 to 40% volatile matter.	Not known. Near coast.	Old mine. Now in concession to Japanese. Faulted syncline. Beds dip 45°; 8 to 6 workable beds; about 27 feet total thickness.
PETROVSKY MINE	1923 production: 3,500 tons.	Bituminous.	Coal removed by primitive methods over steep road.	Two drifts in 1925.
ARKOVO MINE	Not known.	Coking bituminous. Moisture 1.5%; ash 14%; sulfur 0.5%; hydrogen 5%. Heating value, 6,860 calories (12,350 B.t.u.).	Narrow-gage railroad to Aleksandrovsk.	Old mine. Revived in 1930.
*POLOVINKA MINE	1925: known reserves 11,700,000 tons; probable reserves 11,300,000 tons; total 23,000,000 tons. Highest annual production to 1930 was 8,500 tons in 1924. Estimated annual capacity 30,000 tons.	Coking bituminous. Upper beds have higher ash content than lower. Best bed: volatile matter 29%; moisture 1.0%; ash 8.0%; sulfur 0.5%. Heating value, 7,200 calories (12,960 B.t.u.).	Aerial tram 3.5 miles long, average 20 feet above ground; steam powered; weather permits its use from May to middle October. Pier 850 feet long. Mine 7 miles from Aleksandrovsk.	On east side of anticline. 4 workable beds, up to 23 feet total thickness. Beds dip 12 to 25°. In 1925 drifts were 425 feet long, inclined shafts 500 feet long, vertical shafts were begun. Flooding occurred in mine.
VOEVODSKY MINE	Reserves (1925) 2,000,000 tons. 1913 production: 33,500 tons.	Coking, high-grade bituminous. When stored disintegrates under load. Volatile matter 28.7%; moisture 1.1%; ash 4.6%; sulfur 0.7%; coke 62%.	5 miles from Aleksandrovsk by road.	Upper and Lower Due series (Oligocene). 6 workable beds with average total thickness 26 feet. Thickest bed 7.5 feet. Difficult mining. Large fire in 1912 temporarily closed mine.
NIKLEVICH MINE	Possible reserves (1925) 7,000,000 tons. 1924 production: 951 tons.	Coking bituminous.	9 miles from Aleksandrovsk by road.	3 workable beds; total thickness 16 feet. In 1925 a few inclined shafts, 35 to 50 feet deep. Coal was removed in sacks.
*DUE MINE	Reserves (1925) 17,100,000 tons. 1923 production 55,407 tons. Estimated annual capacity 80,000 tons.	Coking, high-grade bituminous. Disintegrates under load when stored. Volatile matter 24.5%; moisture 4.0%; ash 8.5%; sulfur 0.5%; hydrogen 5.0%. Coke 65-75%. Heating value 8,410-8,700 calories (15,140-15,660 B.t.u.).	6 miles from Aleksandrovsk by poor dirt road. One mile long narrow-gage (25 inches) railroad to dock 700 feet long; locomotive. Dock suitable for vessels of 4-foot draft. Loading impossible in rough weather. Tracks covered by board gallery from mine to stock pile.	Japanese concession. Coal in Upper Due series (Oligocene). Highly thrust-faulted syncline. 5 workable coal beds; total thickness 36 feet; thickest bed 12 feet. Stripping abandoned before 1925. In 1925 drifts one above the other, 70 to 100 feet apart; longest 1,800 feet.
*OKTYABRSKY MINE	Principal mine of Rogatinsky Field whose reserves in 1925 were estimated at 16,350,000 tons. Up to 1930 highest annual production of Oktyabrsky Mine, 40,000 tons. Estimated annual capacity 60,000 tons, with improvements, up to 120,000 tons.	Coking bituminous. Volatile matter 19.0%; moisture 3.5%; ash 12.3%; sulfur 0.8%; hydrogen 4.5%. Heating value, 8,330-8,600 calories (15,000-15,480 B.t.u.).	1,600-foot long narrow-gage railroad to shore where coal is stored; protected by gallery; hand powered. Pier 300 feet long; suitable for vessels of 7-foot draft.	Coal occurs in Due series (Oligocene). Faulted syncline; dips 50 to 70° west. 5 workable beds. In 1925 mined by drifts; longest 2,400 feet.
BRODYAZHENSKY FIELD (between Oktyabrsky and Agnevo Mines)	1930: possible reserves 2,000,000 tons to 300-foot depth; 5,000,000 tons to 800-foot depth. Prospected but not producing in 1930.	Coking bituminous. Coal bed 17: volatile matter 21%; ash 9%; heating value 7,480 calories (13,460 B.t.u.). Coal bed 23: ash 1.63%; heating value, 8,120 calories (15,420 B.t.u.).	Main deposit 2 miles from shore.	Coal occurs in Due series (Oligocene). Deposit 12,000 feet long, 3,000 feet wide. 8 workable beds; total thickness 33 feet; thickest bed 5.5 feet. Dip steeply west or almost vertical.
*AGNEVO MINE	Reserves (1925) 10,000,000 to 17,720,000 tons. 1924 production 10,754 tons. Estimated annual capacity 40,000 tons. The Vladimirovka-Agnevo Field, which includes Agnevo Mine and region to south, has reserves (1925) of 183,000,000 tons of coking coal to a depth of 1,300 feet.	Bituminous, coking in part. Coal bed 2: volatile matter 32.6%; moisture 2.7%; ash 24.3%; sulfur 0.6%; heating value 6,078 calories (10,940 B.t.u.). Coal bed 6: volatile matter 36.9%; moisture 1.5%; ash 6.1%; sulfur 2.7%; heating value 8,591 calories (14,664 B.t.u.).	Narrow-gage (25 inches) railroad 2 miles long; small locomotives. Not usable from early December to middle of May because of snow. Pier 450 feet long. 30 miles from Aleksandrovsk.	Faulted syncline in Tertiary beds. 8 workable coal beds, total thickness 10 to 15 feet. Average dip 30°. In 1925 mined by drifts, longest 1,900 feet. In concession to the Japanese.
PILEVO MINE	1915 production: 510 tons. Probably still producing.	Bituminous.	Three miles from shore.	Small mine. Information lacking.

(continued)

Coal Production in Japanese Sakhlin

All the coal mined is bituminous, and occurs in rocks of Oligocene and Miocene age. Lignite deposits are not worked and are not shown on the map. The Japanese designate the Oligocene coal-bearing strata the "lower coal bed" and the Miocene coal-bearing strata the "upper coal bed". Each of these units generally contains two or more coal beds. All the coal-bearing rocks are folded, so that practically every mine is in inclined beds. Dips of more than 45 degrees are common, and in some mines the beds are very steep or vertical. Mines that follow the more steeply inclined coal beds down the dip run into ground water; many mines have to be pumped. This water problem is the reason for the two-fold Japanese classification of coal reserves into "coal above ground water" and "coal below ground water". In 1935, reserves of coal were estimated at 1,609,061,000 tons. Of this, 254,864,000 tons were above ground water and 1,354,197,000 tons were below ground water. In that year, 1,515,647 tons of coal were produced; this figure includes the production from 15 small mines shown on the map but not listed in the tabulation, none of which produced over 5,000 tons in 1935 and most of which produced only a few tens of tons. The only mine in Japanese Sakhalin that produced coking coal was the Horogishi. Some of the coal from mines near the port of Esutoru (not open in winter) is exported to Japan. Coal from other mines is used to supply pulp plants and synthetic oil plants at the mines or shipped by rail to other parts of Japanese Sakhalin.

Mines (Listed in geographical order from north to south)	Estimated Reserves and Production (1935)	Quality	Accessibility and Transportation Facilities[M] (as of 1935)	Remarks
AMBETSU MINE	Principal mine in Shirunai Field, total reserves of which are 4,950,000 tons; 2,030,000 tons above ground water, 2,920,000 tons below ground water. Production of Ambetsu Mine 8,390 tons. (Mine just beginning to produce in 1935).	Fixed carbon, 51.55%; volatile matter, 42.17%; moisture, 0.53%; ash, 5.75%; sulfur, 1.53%; softening temp. of ash, 1,270° C.; heating value, 8,030 calories (14,450 B.t.u.).	Mine about a mile inland from the small sea-coast town of Ambetsu.	Oligocene in age.
SHIRUNAI MINE	A part of Shirunai coal field (see above for reserves). Production of Shirunai Mine 3,823 tons. (Mine just beginning to produce in 1935).	Fixed carbon, 55%; volatile matter, 37.53%; moisture, 0.37%; ash, 7.10%; sulfur, 0.66%; softening temp. of ash, 1,255° C.; heating value, 8,060 calories (14,500 B.t.u.).	Mine about 2 miles inland from the small sea-coast town of Shirunai.	Oligocene in age.
NAYOSHI MINE	Principal mine in Kitanayoshi Field, in which the total reserves are 66,950,000 tons; 15,220,000 tons above ground water, 51,730,000 tons below ground water. Production from Nayoshi Mine, 2,509 tons. (Mine did not begin to produce until late in 1934).	Fixed carbon, 51.38%; volatile matter, 38.78%; moisture, 1.90%; ash, 7.44%; sulfur, 0.30%; softening temp. of ash, 1,450°+C.; heating value, 7,220 calories (13,000 B.t.u.).	Mine a few miles distant from the sea-coast town of Kitanayoshi. Exact location uncertain.	Miocene in age. Mine reported to be operated by the Mitsui Mining Co.
NAIKAWA MINE	Principal mine of Naikawa Field in which the total reserves are 83,488,000 tons; 11,702,000 tons above ground water, 71,786,000 tons below ground water. Production from Naikawa Mine, 31,399 tons. (Rapid increase since 1931).	Fixed carbon, 39.10%; volatile matter, 39.07%; moisture, 15.29%; ash, 6.54%; sulfur, 0.50%; softening temp. of ash, 1,145° C. Heating value, 5,630 calories (10,130 B.t.u.).	Mine connected with Nairo and probably with Shikuka by small narrow-gage railroads. Is near the highway along the west side of the Poronai Valley.	Miocene in age. Nearest source of coal for the pulp factory at Shikuka. Mine operated by the Mitsui Mining Co.
ESUTORU MINE	A part of the Esutoru Field, total reserves of which are 106,456,000 tons; 9,949,000 tons above ground water, 96,507,000 tons below ground water. Production of Esutoru Mine, 77,000 tons. (Rapid increase since 1931).	Fixed carbon, 44.73%; volatile matter, 45.78%; moisture, 6.02%; ash, 3.47%; sulfur, 0.17%; softening temp. of ash, 1,500°+C. Heating value, 6,820 calories (12,280 B.t.u.).	Mine 2 miles inland from the village of Tennai on the sea-coast 5 miles south of Esutoru. Connected with the village and the road along the coast by a small narrow-gage railroad.	Miocene in age. There are reported to be 10 layers of coal, 3 to 30 feet thick. Coal exported through the port of Esutoru.
TORO MINE	A part of Esutoru Field (see above for reserves). Production from Toro Mine, 90,000 tons (rapid increase since 1931).	Fixed carbon, 55.05%; volatile matter, 40.02%; moisture, 2.11%; ash, 2.82%; sulfur, 0.45%; softening temp. of ash, 1,450°+C. Heating value, 7,840 calories (14,110 B.t.u.).	Mine 3 miles inland from the village of Toro on the sea coast 7 miles north of Esutoru; 3 miles north of Ohira Mine.	Miocene in age. Mine operated by the Karafuto Mining and R.R. Co. (Mitsubishi). Coal exported through the port of Esutoru.
OHIRA MINE	A part of Esutoru Field (see under Esutoru Mine for reserves). Production from Ohira Mine, 478,363 tons. The most productive mine in Karafuto (great increase since 1931).	Fixed carbon, 46.83%; volatile matter, 44.22%; moisture, 6.11%; ash, 2.84%; sulfur, 0.26%; softening temp. of ash, 1,310° C. Heating value, 7,100 calories (12,780 B.t.u.).	Mine 5 miles inland (northeast) from Esutoru and connected with Esutoru by a narrow-gage railroad.	Miocene in age. There are reported to be 11 layers of coal 3 to 26 feet total thickness. Mine operated by the Karafuto Mining and R.R. Co. (Mitsubishi). The coal is used by the pulp factories at Esutoru, Noda, and Maoka and is also exported through Esutoru to Japan.
HOROGISHI MINE	A part of Horogishi Field, total reserves of which are 13,327,000 tons; 2,370,000 tons above ground water, 10,957,000 tons below ground water. Production from Horogishi Mine, 320 tons (work resumed late in 1935, after the mine had produced 7,563 tons in 1934).	Coking coal. Fixed carbon, 62%; volatile matter, 30.23%; moisture, 0.74%; ash, 7.03%; sulfur, 0.51%; softening temp. of ash, 1,500°C. Heating value, 8,230 calories (14,810 B.t.u.).	Mine about 3 miles inland from the sea coast village of Horogishi which is on the coast road 10 miles south of Esutoru.	Miocene in age. Mine operated by Matsuda Mining Co. Produces coal suitable for coke manufacture. Coal exported through the port of Esutoru.
SHIRITORI MINE	A part of Kitaenkotan Field, total reserves of which are 122,791,000 tons; 27,742,000 tons above ground water, 95,049,000 tons below ground water. Production of Shiritori Mine, 135,468 tons.	Fixed carbon, 42.24%; volatile matter, 37.66%; moisture, 11.12%; ash, 8.98%; sulfur, 0.17%; softening temp. of ash, 1,270° C. Heating value, 5,770 calories (10,390 B.t.u.).	On outskirts (northwest) of the sea coast town of Shiritori, which is on the Karafuto Railway Co. main line and on the coast highway.	Miocene in age. Mine operated by Toho Tanko Co. Nearest source of coal for pulp factory at Shiritori.
KASHIHO MINE	A part of the Kashiho Field, total reserves of which are 65,667,000 tons; 520,000 tons above ground water, 65,147,000 tons below ground water. Production of Kashiho Mine, 16,434 tons.	Fixed carbon, 40.47%; volatile matter, 44.93%; moisture, 11.10%; ash, 3.50%; sulfur, 0.56%; softening temp. of ash, 1,200° C. Heating value, 6,260 calories (11,270 B.t.u.).	About a mile northwest of the sea coast village of Kashiho, which is on the Karafuto Railway Co. main line and on the coast highway.	Miocene in age.
TOKAI MINE	A part of the Kashiho Field (see above for reserves). Production of Tokai Mine, 11,112 tons. (Rapid increase since 1931).	Fixed carbon, 38.85%; volatile matter, 44.48%; moisture, 12.04%; ash, 4.63%; sulfur, 0.30%; softening temp. of ash, 1,135° C. Heating value, 5,710 calories (10,280 B.t.u.).	Not far north of the Kashiho Mine and not far from the railroad and highway, but exact location unknown.	Miocene in age.
SHIRAURA MINE	A part of the Kashiho Field (see under Kashiho Mine for reserves). Production of Shiraura Mine, 69,382 tons (rapid increase since 1931).	Fixed carbon, 46.31%; volatile matter, 40.37%; moisture, 8.75%; ash, 4.57%; sulfur, 0.75%; softening temp. of ash, 1,150° C. Heating value, 6,520 calories (11,740 B.t.u.).	On outskirts (south) of the seacoast town of Shiraura, which is on the Karafuto Railway Co. main line and on the coast highway.	Miocene in age.
CHINNAI MINE	A part of Chinnai Field, total reserves of which are 14,689,000 tons; 1,900,000 tons above ground water, 12,789,000 tons below ground water. Production of Chinnai Mine, 7,563 tons (rapid increase since 1931).	Fixed carbon, 40.94%; volatile matter, 44.80%; moisture, 1.50%; ash, 12.76%; sulfur, 0.23%; softening temp. of ash, 1,285° C. Heating value, 6,870 calories (12,370 B.t.u.).	On or near Chinnai River about 8 miles inland from the seacoast village of Chinnai, which is about 30 miles north of Kushunnai by road. Whether the West Coast Government Railway line has been extended north from Kushunnai through Chinnai is uncertain.	Oligocene in age. Not to be confused with the Shodasu Mine on the coast 8 miles south of Chinnai, which was being opened up in 1935.
USO MINE	A part of Tomarioru-Noda Field, total reserves of which are 30,450,000 tons; 3,990,000 tons above ground water, 26,460,000 tons below ground water. Production of Uso Mine, 33,648 tons (rapid increase since 1931, when mine was opened).	Fixed carbon, 44.71%; volatile matter, 40.92%; moisture, 9.46%; ash, 4.91%; sulfur, 1.61%; softening temp. of ash, 1,250° C. Heating value, 6,370 calories (11,470 B.t.u.).	Near seacoast midway between Tomarioru and Noda. Near West Coast Government Railways line. Exact location uncertain.	Miocene in age. Is a near source of coal for the pulp factory at Noda. Not to be confused with the Noda Mine, near Noda, which also has an increasing production.
DAIEI MINE	A part of Naibuchi Field, the total reserves of which are 598,147,000 tons; 113,183,000 tons above ground water, 484,964,000 tons below ground water. Production of Daiei Mine, 84,052 tons (steady increase from 60,657 tons in 1928).	Fixed carbon, 42.30%; volatile matter, 48.30%; moisture, 3.35%; ash, 6.05%; sulfur, 0.19%; softening temp. of ash, 1,320° C. Heating value, 7,160 calories (12,890 B.t.u.).	In mountains, 10 miles east of Tomarioru, a seacoast town on the West Coast Government Railway line. Coal is transported about 12 miles by cable car and thence 10 miles by a narrow-gage railroad to Tomarioru.	Oligocene in age. Mine operated by the Karafuto Mining and R.R. Co. The coal is used for fuel in the pulp factories at Tomarioro and Noda.
KAWAKAMI MINES	A part of Kawakami Field, the total reserves of which are 116,157,000 tons; 17,315,000 tons above ground water, 98,842,000 tons below ground water. Production of Kawakami Mines, 306,647 tons.	Fixed carbon, 41.92%; volatile matter, 48.64%; moisture, 3.57%; ash, 5.87%; sulfur, 0.24%; softening temp. of ash, 1,285° C. Heating value, 7,070 calories (12,730 B.t.u.).	In mountains, 17 miles northwest of Toyohara. Reached by the Kawakami branch of the Karafuto Government Railway line, which leaves the main line at Konuma, 5 miles north of Toyohara.	Oligocene in age. Mines operated by the Mitsui Mining Co. Although designated as a separate field, the Kawakami Field is actually a southern extension of the Naibuchi Field.

(continued)

Mines (Listed in geographical order from north to south)	Estimated Reserves and Production (1935)	Quality	Accessibility and Transportation Facilities[a] (as of 1935)	Remarks
NAIHORO MINE	A part of Naihoro Field, the total reserves of which are 69,699,000 tons; 6,237,000 tons above ground water, 63,462,000 tons below ground water. Production of Naihoro Mine, 132,849 tons (rapid increase in production since 1931).	Fixed carbon, 40.66%; volatile matter, 43.03%; moisture, 10.95%; ash, 5.36%; sulfur, 0.18%; softening temp. of ash, 1,170° C. Heating value, 6,140 calories (11,050 B.t.u.).	Mine 2 miles southeast of the seacoast town of Naihoro. Is the terminus of the South Karafuto Railway Company line which runs south from Honto through Naihoro to the mine.	Miocene in age. Coal bed ranges from 2 to 11 feet in thickness; dips steeply. Mine operated by South Karafuto Mining and R.R. Co. Great increase in production coincides with erection of the synthetic oil plant near the mine by Mitsubishi, because the oil is manufactured from coal from the mine.
MITA MINE	A part of Akaiwa Field; no estimate of reserves available. Production of Mita Mine, 17,019 tons (steady increase in production since 1931).	Fixed carbon, 43.21%; volatile matter, 38.87%; moisture, 12.10%; ash, 5.82%; sulfur, 0.43%; softening temp. of ash, 1,320° C. Heating value, 6,090 calories (10,960 B.t.u.).	In mountains, 5 miles east of Yaman, a seacoast village on the east shore of Aniwa Bay. Is connected with Yaman by a road and a small narrow-gage railroad. Also connected by road with Minabetsu Bay on the Okhotsk Sea, 6 miles northeast of the mine.	Miocene in age.

The following fields contain only small mines according to 1935 report. Reserves in these fields have been estimated as follows:

	Reserves above Ground Water (tons)	Reserves below Ground Water (tons)	Total Reserves (tons)
Interior region west of Poronai Valley	868,000	13,280,000	14,148,000
Nishisakutan-Onnai Field	21,030,000	92,190,000	113,220,000
Tokombo Field (Miocene in age)	10,157,000	58,492,000	68,649,000
Minaminayoshi Field (Oligocene in age)	5,341,000	51,802,000	57,143,000
Uryu Field (Oligocene in age)	5,310,000	57,820,000	63,130,000

II. OIL AND GAS

Russian Sakhalin

Along the northeast coast are several commercially producing oil fields on a series of north-trending anticlines. Production is from Tertiary rocks chiefly Pliocene and Miocene; the latest, deep drilling is in Oligocene rocks; the deeper oils are the best in quality. Okha was the earliest developed field and until lately the only producer of any consequence, but other fields may now be producing. Exploration is being carried on in other parts of the island. At Langri, on the northwest coast, exploration has proved successful and the field may now be producing; reserves are said to be larger than those of the Okha Field. Geologic conditions in the Pil River region in southwest Schmidt Peninsula are favorable for finding oil.

The early prospecting and development of oil fields was done by the Japanese during their occupation of the north part of the island, 1922 to 1926. Since 1926 they hold concessions at all the fields, equally sharing drilling rights with the Russians. In 1936 a treaty extended the Japanese prospecting privileges to 1941. Whether the treaty was renewed in 1941 is not known but the Japanese are still (March, 1943) producing and exporting oil from their wells at the concessions. Japanese production was at first the greater but Russian production now equals or exceeds that of the concessionaires. In 1935 total oil production was 239,000 tons, or 2,920,000 barrels, of oil. In 1938 the Russians produced 360,900 tons. The proven reserves estimated in 1935 were 135,000,000 barrels; estimated total reserves 2,000,000,000 barrels (300,000,000 tons).

The crude oil has a density of 17° to 40° Be; 21° Be average. The highest gasoline content is 30%, at Nutovo; some oils have none. The deeper oil has a paraffin base.

There are no refineries in Sakhalin. Oil produced by the Russians is sent to refineries at Khabarovsk and Vladivostok on the Siberian mainland; oil from Okha is carried by pipe line to the west-coast port of Moskalvo; it is reported that the pipe line has been continued across the Strait of Tartary to Nikolayevsk on the mainland. The oil produced by the Japanese is shipped from the east coast by boat to refineries in Japan. Most of the fields are near ports on the Okhotsk Sea which is not frozen for four to five months a year (July to October). Gas is associated with the oil and in places used for fuel or manufacture of benzene; gas reserves estimated at 2,806,500,000 cubic meters.

Field (Listed in geographical order)	Oil Production	Quality of Oil	Development of Field	Transportation Facilities	Gas
OKHA	To 1935 a total of 1,182,000 tons produced. In 9 months of 1934 Russian wells produced 181,690 tons, Japanese wells, 131,572 tons; total 313,262 tons. In 1938 Russian wells averaged 5.4 tons yield each per day, Japanese wells, 3.5 tons; total production of field was 1,300 tons per day.	Upper beds carry heavy, asphaltic crude; lower beds carry light crude with 9% paraffin. Mixture sent to refineries contains 22 to 25% light constituents. Specific gravity, 0.950 to 0.830.	In 1938, Japanese and Russians each had 159 wells, total 318 wells. Depth 2,300 to 2,450 feet. 15 producing horizons below 500 feet. Some wells are gushers. Field includes 2 producing pools.	Field connected to Moskalvo by standard-gage railroad and pipe line. Moskalvo is port suitable for vessels of 20-foot draft. Pipe line for loading extends into the sea. Port on east coast, used by Japanese, is connected with oil field by narrow-gage railroad; for loading boats, 2 oil lines extend 1 mile into the sea, which is very rough.	31 cubic meters of gas per ton of oil. 1932 production: 18,000 cubic meters, 80% combustible. Used for fuel.
EKHABI	Small.	Specific gravity 0.870. 23.8% distilled over, up to 302° F., with specific gravity of 0.761.	In 1933, wells were 1,500 feet deep. Several producing horizons.	Within 8 miles of Okha.	Not known.
NUTOVO	1925 production: about 1,000 gallons (3.5 tons) per day.	30% gasoline. Specific gravity 0.830 to 0.902. Average 37° Be. Paraffin 3.6%. Sulfur 0.13% 23.6% distilled over, up to 302° F.	In 1925, wells were 1,750 feet deep.	Three miles by road from Chaivo Bay anchorage which accommodates vessels of 12-foot draft. Nutovo and Goromai are connected by road and railroad(?) to Boatasin field, about 10 miles south.	Some wells produce as much as 14,150 cubic meters per day. 97% combustible. 91% methane. Used for fuel and partly for manufacture of benzene (0.7 gallons of benzene per 1,000 cubic feet of gas).
GOROMAI	Production not known. New field, developed since 1934.	Specific gravity 0.850. 35.5% distilled over, up to 392° F. Paraffin 5.23%.	In 1937, wells were 3,600 feet deep; 10 producing horizons below 700 feet.	Near Chaivo Bay.	Not known.
KATANGLI	In 1936 a few wells produced 20 to 35 tons per day each.	Specific gravity 0.943. No gasoline. Kerosene 8 to 10%. Sulfur .42 to .44%.	In 1936 a few wells, 2,000 feet deep.	Connected by narrow-gage railroad to port at mouth of Nabilski Bay. Railroad interrupted by lake which is crossed by boat.	Gas reserves estimated at 110,360,000 cubic meters.

Japanese Sakhalin

So far as known, there is no significant production of oil from wells in Japanese Sakhalin. Test wells are known to have been drilled near Ushinizawa in an area a few miles inland from the west coast between Naihoro and Honto, and near Aushi in an area on the west coast between Noda and Tomarioru. Some of the wells near Ushinizawa, drilled by the Nippon Oil Co. operating under government subsidy, are rumored to be producing a small amount of oil. Other areas regarded as favorable for drilling are a strip of the west seacoast north and south of Kushunnai, and an area of Pliocene rocks in the hills west of Ochiai. Drilling of test wells was still going on in 1938, the last year in which published information regarding oil in Japanese Sakhalin is available. During the years 1934 to 1936, the Japanese carried out an intensive oil-prospecting campaign in Japanese Sakhalin. All parts of the country that appeared even remotely favorable for the occurrence of oil were mapped and studied, and test wells were drilled in some of the more favorable areas. Indications of oil -- seeps, rocks impregnated with oil, and gas springs -- were found in nearly all Cretaceous and Tertiary formations, and some test wells encountered large amounts of gas or small amounts of oil, but no productive oil field was discovered. Most of the larger oil seeps are shown on the map; also the location of the wells drilled near Aushi and Ushinizawa.

A program for the production of oil and gasoline from Japanese Sakhalin coal is well under way. A synthetic oil plant with a capacity of 35,000 barrels a year was in operation near the Naihoro coal mine by 1936. The capacity of the plant is reported to have been expanded considerably since that time. Another synthetic oil plant is reported to have been constructed somewhere in or near the Naibuchi coal field between 1936 and 1941 and is reported to be in operation at the present time (1943). The exact location of the plant is unknown, but is believed to be either at or near the Kawakami Mine or at some place along the Naibuchi River.

a/ See Communications Map.

(continued)

III. REFINING MATERIALS

Thick deposits of diatomite (very fine-grained, siliceous, soft rock) occur in beds of lower Pliocene age on the Schmidt Peninsula; it has been tested and found suitable for oil refining. Diatomaceous material has been reported in lower Pliocene beds at several places in Japanese Sakhalin, notably north of Chinnai, but the extent and quality of the deposits is not known. Material which may have bentonitic properties has been found in the Miocene beds of the Schmidt Peninsula, on the Tym River, and on the east coast of Russian Sakhalin south of Cape Rymnik. It is a dense, dull, white, clayey material, thought to be a weathering product of volcanic ash; its suitability for oil refining is not known.

IV. PEAT AND WOOD

Thick peat covers a large part of the lowland areas of Sakhalin. The largest deposits are in the Tym and Poronai Valleys (maximum thickness, 18 feet), and on the northwest coastal plains (maximum thickness 10 feet). Peat is not used for fuel because coal and wood are abundant. Forests cover most of the island and provide a source of fuel almost everywhere.

V. MINERAL RESOURCES OTHER THAN FUELS

Workable deposits of glauconite (a hydrous silicate of potash and iron used in softening water and as source of potash for fertilizer) occur in Tertiary rocks a mile east of Odomari (outcrop several miles long) and about 7 miles south of Kushunnai (outcrop over a mile long). The deposits at both localities range in thickness from a few feet to more than 30 feet and consist of beds of glauconitic sand and shale, alternating with purer beds of glauconite.

No deposits of metallic minerals are commercially important in Sakhalin. A little gold was mined in Russian Sakhalin from several placer deposits on the upper tributaries of the Tym and Poronai Rivers previous to 1906. The best deposit, in the mountains west of Kirovskoe, has a low gold content, about .001 to .01 ounces per ton, and was mined by primitive methods. In Japanese Sakhalin gold is panned in tributaries to the Poronai River, in streams west of Ochiai, and in the Shiretoko Peninsula. Platinum is reported associated with serpentine rocks in the mountains northeast of Odomari and a small amount is known to have been produced in that region, but whether from placers or from bedrock is not known. A deposit of cinnabar (mercury ore) is known 6 to 8 miles northeast of Odomari. Cinnabar occurs in a network of small veins and is reported to contain 60% mercury; the deposit is probably small. Pyrite in small veins in diabasic andesite is found at several places in Notoro Peninsula notably near Cape Soni; it is reported to have been mined to some extent.

Reliability rating: Japanese part, Class A.
Russian part, Class C.
Compiled by U. S. Geological Survey.

SAKHALIN ISLAND

NORTH PART (U.S.S.R.)

SOUTH PART (JAPAN) (KARAFUTO)

141° 142° 143° 144° 145°

54° 53° 52° 51° 50° 49° 48° 47° 46°

Cape Elizavety
Cape Marii
Schmidt Peninsula
Sakhalin Gulf
Moskalvo
Okha
Baikal Bay
Rybnoe
Nikolayevsk
Amur
Tartary
Piltun Bay
Chaivo Bay
SIBERIA
Nyiski Bay
Cape Tyk
Katangli
Nabilski Bay
Strait of
Aleksandrovsk
Due
Derbinskoe
Kirovskoe
Cape De Lisle de la Croyere
Pilevo
Ambetsu
Kitanayoshi
Esutoru
Shikuka
Kitashiretoko Peninsula
Taraika Bay (Patience Bay)
Cape Ushiro
Shiritori
Cape Kitashiretoko
Kaikio Island
Chinnai
OKHOTSK SEA
Kushunnai
Shiraura
Tomarioru
Ochiai
Maoka
Toyohara
L. Tonnai
(Naka) Shiretoko Peninsula
Honto
Rutaka
Odomari
Aniwa Bay
Cape Nakashiretoko
Kaiba Island
Cape Nishinotoro
La Perouse Strait (Soya Strait)

1 2 3 4 5 6 7 8

EXPLANATION

1 — Quaternary. River alluvium, sand dunes and beaches; coastal terraces, and inland terraced plains composed of sand and gravel with beds of clay and peat. Terrace deposits are marine.

2 — Pliocene. Poorly consolidated, chiefly sand some shaly tuff, diatomite, lignite, and marl. Chiefly marine. Locally eruptive complex in lower part. Oil bearing in Russian Sakhalin.

3 — Miocene. Sandstone, shale, and conglomerate; chiefly marine. Locally calcareous concretions. In Japanese Sakhalin contains andesitic volcanic material (tuff, lava, agglomerate). Upper part contains coal and oil.

4 — Oligocene. Black shale, sandstone (shaly or tuffaceous in part), and conglomerate, chiefly marine. Coal and oil bearing.

5 — Cretaceous. Dark shale, sandstone, and conglomerate, continental and marine. Locally contains tuff, breccia, and thin beds and nodules of limestone. Coal bearing.

6 — Undifferentiated pre-Cretaceous. Chiefly metamorphic rocks. Two main units: one is largely slate and quartzite with small amounts of hornstone, graywacke, and limestone; the other is schist, limestone, metadiabase, altered basaltic tuff, pyroxenite, and serpentine.

7 — Extrusive igneous rocks and associated dikes. Chiefly basaltic and andesitic flows and dikes, of Tertiary and Quaternary age.

8 — Intrusive igneous rocks. Chiefly granite and syenite; some quartz diorite and other types. Cut Tertiary and Cretaceous rocks.

50 Miles
50 Kilometers

Compiled by U. S. Geological Survey

Stratigraphy

1 Quaternary: All deposits unconsolidated or very poorly consolidated. Only the larger areas are shown on the map.

Recent: Deposits of gravel and sand along middle and lower courses of larger streams, passing into sand, silt, and clay near their mouths. Alluvial outwash fans of gravelly material along margins of some larger valleys, passing into finer material on the valley floors. Terrace gravels along rivers. Sand and gravel along beaches, bars and spits. Surface sand reworked by wind, forming dunes. Peat deposits in poorly drained depressions, in river valleys and on marine terraces. Peat commonly from a few inches to a few feet thick, but some deposits are as much as 20 feet thick.

Pleistocene: Deposits of gravel commonly 20 to 60 feet thick, but locally as much as 150 feet thick, covering elevated marine terraces or bordering river valleys at a level higher than the Recent deposits. Lenses of sand and clay and, at some places, beds of peat or impure lignite are interbedded with the gravel. Teeth of a mammoth associated with the deposits on the north shore of Taraika Bay indicate that Sakhalin Island was connected with the Asiatic mainland during a part of Pleistocene time. The marine terraces fringe most of the coasts of Russian and Japanese Sakhalin, bevel the underlying rock formations, and rise step-like one above the other. At some places the highest terrace may lie at an elevation of over 400 feet.

2 Pliocene: Poorly consolidated beds; chiefly marine but partly estuarine and continental. Maximum thickness 5,000 feet in Russian Sakhalin; less in Japanese Sakhalin. Contains asphaltic oil. Upper part chiefly sand, locally containing lignite; lower part chiefly sandy shale, locally diatomaceous, tuffaceous, or concretionary (marly). Complex of eruptive rocks in lower part in northern Japanese Sakhalin.

3 Miocene: Sandstone, shale, and conglomerate; chiefly marine but partly estuarine and continental. Maximum thickness 1,200 feet in Russian Sakhalin; 24,000 feet in Japanese Sakhalin. Contains coal beds and some oil. In Russian Sakhalin large calcareous concretions are common in the middle part. In Japanese Sakhalin contains two thick beds of volcanic material, chiefly andesitic tuff, lava and agglomerate; the lower bed is 2,650 feet thick, and the upper, 5,600 feet thick.

4 Oligocene: Black shale, shaly sandstone, tuffaceous sandstone, and conglomerate; chiefly marine, but partly estuarine and continental. Coal-bearing in lower part. Maximum thickness 1,400 feet in Russian Sakhalin; 9,600 feet in Japanese Sakhalin. Contains paraffin-base oil.

5 Cretaceous: Dark shale, sandstone, and conglomerate; partly continental, partly marine. Thickness exceeds 9,800 feet; base not exposed. Continental beds are coal-bearing. Locally contains tuff, breccia, and thin beds and nodules of limestone. Conglomerate is more abundant in upper than in lower part. The Tertiary strata overlie the Cretaceous with a slight erosional break, but are nearly conformable in attitude.

6 Undifferentiated pre-Cretaceous rocks: Heterogeneous sedimentary and metamorphic rocks whose age and structural relations are imperfectly known. One assemblage, which contains mica, chlorite, and graphite schist, marmorized limestone, metadiabase, altered basaltic tuff, pyroxenite, and serpentine, is dynamically and thermally metamorphosed and is believed to be in part equivalent to the pre-Carboniferous Sambagawan system of Japan; its thickness is unknown. Another assemblage, which consists largely of slate, quartzite, hornstone, and graywacke in the lower part, and of shale, basic tuff, and limestone in the upper part, is but slightly metamorphosed; it is at least 23,000 feet thick, and is believed to be in part equivalent to the Permo-Carboniferous Chichibu system of Japan; in southeastern Japanese Sakhalin it is overlain by 3,000 feet of hard slate, sandstone, and conglomerate that lithologically resemble some of the Triassic rocks of Japan and may be in part equivalent to them.

7 Extrusive rocks (and associated dikes): There are no active volcanoes in Sakhalin Island, but basaltic and andesitic lavas of Quaternary age at Cape Ushiro in Japanese Sakhalin form a volcanic field 20 miles in diameter; this volcanic activity began in the upper Pliocene and continued into Recent time. Andesitic lava of middle or lower Pliocene age forms Hokke Mountain, on the Kitashiretoko Peninsula. Basaltic and andesitic lava are interbedded with Tertiary rocks at many other places in Sakhalin Island, but are not shown on the map; in Japanese Sakhalin they are most abundant in the Miocene. Some altered igneous rocks in the pre-Cretaceous formations are ancient lavas, but these are not shown on the map.

8 Intrusive rocks: Granite cuts Cretaceous rocks on the Schmidt Peninsula in Russian Sakhalin, and cuts pre-Cretaceous rocks in the southern part of the Shiretoko Peninsula in Japanese Sakhalin. Quartz diorite cuts Cretaceous (?) rocks in the northern part of the Shiretoko Peninsula. Dikes and sills of alkaline igenous rocks which form a suite of many complex varieties are abundant in Tertiary and Cretaceous rocks at numerous places along the west coast of Sakhalin for 50 miles north and south of the Russian-Japanese boundary; one of these bodies, shown on the map near Kitanayoshi is a laccolith of alkali syenite. Dikes and other intrusive masses of diabase and andesite are widespread in the Tertiary rocks of Japanese Sakhalin, but are too small and too numerous to be shown on the map. Small intrusive bodies of many kinds of igneous rock are common in the pre-Cretaceous formations of the island, but are not shown on the map.

Structure

Cretaceous and Tertiary rocks underlie most of Sakhalin; pre-Cretaceous rocks cover less than one-sixth of the surface of the island. The structure of the pre-Cretaceous rocks is imperfectly known; it is complex, for a part of the rocks are metamorphosed, and all of them record one or more episodes of folding, faulting, and erosion before the Cretaceous rocks were deposited. The structure of the Cretaceous and Tertiary rocks is relatively simple. They are folded along axes that in general trend north; this trend determines the prevailing northerly strike of the rock formations, and coincides with the northerly alignment of all the larger mountain masses and depressions. Many folds are aligned northwesterly at an angle with the prevailing northerly trend, and in some areas the folds have no dominant trend. The folding differs in intensity from place to place; in general it is more gentle in the northern half of Russian Sakhalin than elsewhere on the island. Most of the folding is open; closed or overturned folds are relatively rare, but dips exceeding 45° are common, and dips exceeding 60° prevail in the more tightly folded areas. The Cretaceous and Tertiary rocks are folded to about an equal degree, but the Pliocene rocks are somewhat less intensely folded than the Tertiary rocks older than Pliocene.

Faults cut the Tertiary and older rocks in various directions; most of the faults are measurable in tens or hundreds of feet rather than in thousands. They are relatively numerous in a few areas, but some large areas are without faults. In general the faulting is not complex: only in a few areas do faults form an intricate mosaic. Most faults are normal; some are reverse. No large overthrust faults of low dip are known. Cross-faults, or faults of haphazard trend, are as common as strike faults. Some faulting is obviously related to the folding; much of it is not.

Block faulting is superimposed upon the folded structure of the island: the Japanese geologists regard the large northerly-aligned depressions (Tym-Poronai Valley, Toyohara Plain, and Tonnai Depression) as blocks dropped along faults, and the bordering ranges (the Eastern Range, which forms the eastern part of the island between Taraika Bay and latitude 51°30'; the Susuya Mountains, a north-south trending range extending from near Ochiai to Odomari; and the mountains of the Shiretoko Peninsula), as elevated fault blocks.

The Quaternary deposits are not folded, but some Pleistocene deposits are gently domed or warped. Sets of coast terraces fringe the island and record the latest crustal movements in Sakhalin.

Geologic History

The rocks of Sakhalin Island have many features in common with those of the Pacific Coast of North America. The Tertiary and Cretaceous rocks resemble those of the California coast in lithology, sequence, and even in appearance. Sakhalin, however, has had a less eventful and much less violent tectonic history than California.

The pre-Cretaceous rocks constitute the basement rocks of Sakhalin. They have been little studied and their history is imperfectly known, but it is undoubtedly similar to that of the Sambagawan and Chichibu rocks of Japan, which they resemble. They record a long period of deposition, largely marine, but partly continental, accompanied at times by volcanic activity. They have been folded, faulted, and eroded, and have been invaded by igneous rocks of plutonic type; a part of them, presumably the oldest rocks of the island, have been metamorphosed to crystalline schists and gneisses.

The clearly decipherable history of the island begins with the Cretaceous rocks which overlie the pre-Cretaceous rocks on the Shiretoko Peninsula in Japanese Sakhalin. The contact is an angular unconformity of erosion. From this beginning of Cretaceous deposition until nearly the end of Tertiary time the record is one of repeated submergence and marine deposition broken now and then by relatively short periods of emergence during which continental sediments were deposited. Some of these emergences were accompanied by volcanic activity, during which quantities of tuff, agglomerate, and lava were incorporated with the sediments: much of the volcanic activity took place in Miocene time, when it was widespread; but some of it took place in Oligocene and Pliocene time, and was local. At several different times the fluctuations of submergence and emergence brought about estuarine conditions, during which beds of coal were deposited, notably in the Oligocene and upper Miocene rocks, which contain most of the valuable coal deposits of the island.

The rocks of Sakhalin contain no record of a major orogeny in Cretaceous or Tertiary time. Unconformities of erosion separate Cretaceous and Tertiary rocks and are found between and even within a number of Tertiary formations, but they are not acutely angular and indicate only relatively mild disturbance. Probably the Tertiary rocks were moderately folded, elevated, and eroded at one or more times before the beginning of the Pliocene, for the Pliocene rocks are somewhat less disturbed than the older Tertiary rocks.

A major orogenic disturbance followed the deposition of the Pliocene sediments and probably ended in early Quaternary time. All the rocks of Sakhalin were folded and were cut by faults. The anticlines in Russian Sakhalin in which oil has accumulated were produced at this time. Either during or after the folding the land was broken by faults into irregular but more or less parallel elongate crustal blocks with a northerly alignment. The elevated blocks are the present mountains and the depressed blocks are the major depressions of Sakhalin. Erosion, which is still in progress, has carved a network of valleys in the mountains and has deposited much alluvial material in the major depressions.

Whatever movements have occurred in Sakhalin since the mountain-making period have been mainly vertical and relatively small. They are recorded in the marine terraces, capped with Pleistocene gravel, that fringe the island. Probably they are still going on.

Volcanic activity has played but a minor part in the geologic history of Sakhalin. Outbreaks have occurred from time to time in the past, notably in pre-Cretaceous and Miocene time, but much of it has been sporadic and local. The only field of Quaternary volcanic activity worthy of noting is the area near Cape Ushiro. This volcanic field is surmounted by several cones, but none of them are known to have been active in Recent time.

Although Sakhalin Island is structurally a northern element of the Japanese Island arc it lies beyond the belt of seismic activity in which earthquakes are frequent and destructive. It has experiences no exceptionally severe earthquakes in historic times, so far as known.

Geomorphology

Sakhalin Island is divisible into three distinct zones aligned north and south: two mountain zones, a western and an eastern, and an interior lowland between. The west mountain zone extends most of the length of the island. The interior lowland includes the Toyohara Plain at the south and the Tym-Foronai Plain at the north. The east mountain zone consists at the south of two parallel mountain masses, the Susuya Mountains (extending from Odomari to Ochiai), and the mountainous Shiretoko Peninsula with an intervening lowland, the Tonnai Depression; in northern Sakhalin is the Eastern Range. From the southeast corner of the Eastern Range extends the low Kitashiretoko Peninsula thought to be a continuation of the Tonnai Depression. The characteristic north-south trend is in part due to the alignment of the folding and in part to block faulting along the borders of the depressions. The eastern mountains are composed of Cretaceous and pre-Cretaceous rocks and are higher and more rugged than the Western Range which is composed largely of Tertiary rocks. The highest part of the Eastern Range is over 6,500 feet altitude; the highest part of the Western Range is about 5,400 feet altitude. Cape Ushiro on the Western Range is a large area of Tertiary volcanic flows around a group of high cones (up to 3,600 feet altitude). The lowlands are flat plains, underlain by thick Quaternary deposits; their maximum altitude is 500 feet. Along the lowland borders, wide alluvial fans extend from the adjacent mountains. From about latitude 51°30', the Eastern and Western Ranges pass into low mountains of Tertiary rock, extending north almost to the Schmidt Peninsula isthmus; they are bordered by wide coastal plains formed by as many as five Quaternary marine terraces, the highest of which is at an altitude of about 500 feet. Coastal terraces occur in many other parts of the island as well, as narrow strips at the foot of mountain cliffs. The east coastal plain is fringed at the shore by large lagoons, enclosed by barrier beaches. The interior of the north part of the island is almost unexplored but it is reported that between the low mountains is a hilly lowland, somewhat analogous to the interior lowland zone farther south, formed by dissected Quaternary terraces. At the north this terraced lowland widens and passes into the terraced coastal plains, which extend uninterruptedly across the Schmidt Peninsula isthmus. The Schmidt Peninsula repeats on a much smaller scale the morphology of the main part of the island; it is formed by north-trending coastal mountains with an interior lowland between.

Compiled by U. S. Geological Survey.