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No. 2

# AIR TARGET SYSTEM FOLDER

# JAPANESE SHIPPING

JOINT TARGET GROUP,
WASHINGTON, D.C.

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By Authority of
The Commanding General
Army Air Forces

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**15 January 1945**

## GENERAL NOTE

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Material contained in this folder is published in the office of AC/AS, Intelligence, AAF, by combined personnel of United States and British services for the use of Allied Forces.

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*AIR TARGET SYSTEM FOLDERS* are designed for the use of operating air units in the field and are published in a quantity to permit distribution to level of Air Force Groups (American) and Naval Aircraft Carriers.

The material in this folder is divided into three parts as follows:

*GENERAL ANALYSIS*

This gives an over-all appreciation of the target system so that the importance of individual targets within the system can be readily evaluated. It also lists the essential details of the main targets in the system.

*LOCATION MAP*

This shows the location of the principal targets.

*DATA ON INDIVIDUAL TARGETS*

This is to contain Target Information Sheets and Illustrations and Economic Damage Assessment Reports as issued for individual targets in the system.

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Addenda consisting of revised sheets and additional sheets will be issued from time to time. The folder is designed to permit ready substitution or addition of such material.

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SECRET

ATSF/S
10 APRIL 1945

# Japanese Shipping Industry
(Marine Transportation)

# GENERAL ANALYSIS

SECRET
By Authority of
The Commanding General
Army Air Forces
25 April 1945 (Date) (Initials)

JOINT TARGET GROUP
WASHINGTON, D. C.

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JOINT TARGET GROUP, WASHINGTON, D. C.
GENERAL ANALYSIS

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# SUMMARY

## I. SIGNIFICANCE

### A. GENERAL

Marine transport is essential to Japan's ability to maintain war production and to supply and reinforce her troops outside of the home islands. In the future it may also become of prime importance for the shifting of military supplies and troops within Japan proper and possibly for repatriation of troops abroad.

### B. HOME ISLANDS WAR PRODUCTION

War production in Japan is dependent upon imports and upon coastwise shipment of raw materials.

**1. Imports.**

The items of principal significance and the percentage of essential requirements which must be imported is as follows:

| | | *Percent* |
|---|---|---|
| Aluminum | Virtually | 100 |
| Iron | Over | 72 |
| Coking Coal | Virtually | 100 |
| Oil | | 70 |
| Salt | | 56 |
| Foodstuffs | | 10 |

In addition, relatively small amounts of ferro-alloys, non-ferrous metals and other specialty items must be brought in.

**2. Coastwise.**

Over 71 percent of Honshu's minimum coal requirements of 29 million tons must be shipped from Hokkaido and Kyushu if essential raw materials are to continue to move from the mainland. Part of the probable 17 million tons from Kyushu moves via the Kammon Tunnel; the Hokkaido movement is entirely by sea or rail ferry.

**3. Out-Bound Military Traffic.**

Because of low scales of military activity of most Japanese forces outside the home islands, reliance on local resources for food and forage and considerable stockpiling in the past, current exports of military supplies are low. It is estimated that the regular out-bound movement does not exceed a rate of 700,000 tons per year. Even if 300,000 to 600,000 men became continuously and actively engaged in a major campaign outside Japan, exports of military supplies would be unlikely to exceed a rate of 2 million tons annually.

## II. SUSCEPTIBILITY OF MARINE TRANSPORT TO AIR ATTACK

### A. GENERAL INDUSTRIAL PATTERN

Marine transportation has two main elements, the ships by which cargo is moved from place to place, and ports, which furnish facilities for the handling of cargo between land transport and ships. Shipyards provide for the maintenance and replenishment of the shipping supply.

### B. CAPACITY AND DEGREE OF USE

**1. Ships.**

The Japanese merchant marine, consisting in early March of about 1.9 million g. r. t. of vessels over 1,000 g. r. t. and of other craft, is being intensively used but is not carrying more than about 50 percent of the cargo necessary for full war production in Japan. Resort has been had to small wooden vessels, both engine driven and sail propelled and in coastal waters, to towage. Rail transport has been substituted for water wherever possible.

Allied capture of the Philippines, by forcing abandonment of the shipping routes from Japan to areas south of Formosa, will probably bring about a temporary increase in the amount of shipping available for the transport of goods from the mainland to Japan. Past sinking rates in home waters have not equalled new building though total sinkings in 1944 exceeded building by around 190,000 g. r. t. per month.

**2. Ports.**

As a result of ship sinkings, the degree of usage of port capacity in Japan and on the mainland is low. The present total charge against a capacity in the home islands of over 146 million tons is about 72 million tons, of which 60 million is accounted for by 30 million tons of coastwise cargo, part of which could be moved by rail. The Shimonoseki and Kobe-Osaka area ports have been extremely active while the Tokyo Bay ports have been only moderately occupied. Shimizu and Nagoya have been virtually inactive during the past 6 months. Japan Sea and north Honshu ports have been busier than in prewar times. Against total mainland port capacity (north of Shanghai) of around 97 million tons, the total charge is not more than 32 million. Points of maximum activity are Fusan and other South Korean ports, Rashin, Tsingtao and Dairen.

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**3. Shipyards.**

The current annual rate of Japanese ship construction is estimated at 1.2 million g. r. t. This is 240 percent of the maximum pre-war rate and implies full usage of existing facilities and some building of new yards. Prefabrication of 850-ton steel vessels has been observed at Wakamatsu and similar construction is going on at some location in the Nagasaki area which is as yet uncertainly identified.

Facilities for the construction of wooden ships have been much expanded since the beginning of the war and major companies such as Mitsui and NYK are participating. There is a high degree of activity at such of the numerous yards as have been photographed.

Dry docks and maintenance facilities are not heavily used since they were built to service a much larger fleet than now exists.

### C. NUMBER OF TARGETS TO BE ATTACKED

**1. Ships.**

Ships constitute a highly dispersed target. To effect a 50 percent reduction in tonnage of vessels over 100 g. r. t. requires destruction of at least 203 targets. Vessels below 100 g. r. t. are numbered in the thousands.

Concentrations in ports have been observed to run as high as 10 percent of the total fleet over 1,000 g. r. t. at Kobe and Shimonoseki but most shipping concentrations do not exceed 2.5–3 percent of the fleet.

**2. Ports.**

Forty-nine Honshu and Kyushu ports are available for handling current traffic. Complete denial of the use of the 10 largest would be necessary to cut through the cushion of excess capacity and interdiction of the 24 largest would be required to effect a 66 percent reduction in capacity. In the larger ports, there would be multiple aiming points. Several ports can in many cases be closed with a single mine field so that port concentration is considerably higher for mining purposes than for bombing. Twenty-five to thirty fields would close all important Honshu and Kyushu ports.

Six principal and eight secondary ports are available for the outbound shipment of coal from Hokkaido to Honshu and eight principal and nine secondary ports for the movement out of Kyushu. High capacity coal loading equipment exists at Wakamatsu, Miike, Kanda, Otaru, Muroran, Kushiro, and Rumoi.

On the mainland, there are 26 ports. At least the 13 largest of these would have to be closed to dispose of excess capacity and at least the 17 largest to effect a 60 percent reduction in exports to Japan.

**3. Shipbuilding.**

Steel shipbuilding presents a moderate target concentration with 62 percent of production in 16 major yards. Wooden shipbuilding can be carried on with virtually no yard facilities. Twenty to thirty locations account for a large fraction of current Japanese wooden shipbuilding. Osaka is the largest center. The construction of engines for such craft is dispersed among scores of small shops, many of them in Osaka and to a lesser extent in Kobe.

### D. PHYSICAL VULNERABILITY FACTORS

Ships present a small target but apart from that factor are easy to destroy completely.

Port facilities generally are difficult to put out of action for any considerable time by bombing. If hit directly, high speed coal loading equipment which exists at seven Japanese ports will be repaired only in a matter of weeks or months but medium to low level attack would probably be necessary on account of the size of the targets. Ports can be effectively denied to vessels over 250 g. r. t. by mining.

Shipyards are moderately vulnerable to bombing attack. Mold lofts are highly susceptible to incendiary bombing but are a small part of the entire plant. Ships on ways are less vulnerable than ships afloat.

## III. RELATIONSHIP BETWEEN CARGO MOVEMENT AND ENEMY MILITARY CAPABILITIES

### A. GENERAL ATTACK

General attack on enemy marine transport will, because of the greater volume of shipping and relative priorities involved, affect the movement of economic cargo essential to war production well in advance of the time when it will reduce troop and military supply movements. The effect of reduction in cargo movement will depend in part upon priority determinations made by the Japanese General Staff since some opportunity will exist to adjust the pattern of cargo movement to minimize the results of the decrease.

The probable effects of reducing Japanese imports to three different levels, 8.75 million tons (Scale A), 3.5 million tons (Scale B), and 1 million tons (Scale C) are as follows: Scales A and B would not decrease enemy air strength so long as aircraft manufacture continues to be given top priority. Scale C might effect a reduction of 20 percent in the aluminum supply required for air-

craft production at 1944 levels. Such levels will not prevail during 1945 in any event, however.

Steel production would be reduced from the current 5-million ton rate to 4.25 million tons under Scale A (—15 percent), 3 million under Scale B (—40 percent), and 1.4 million under Scale C (—70 percent). The first two scales would, after a time lag which could run into months, decrease ground armaments production, naval construction, and repair or merchant shipbuilding. If the Japanese General Staff reduced naval and steel merchant vessel construction by about 60 percent, no effect would be produced on land armaments by Scale A blockade. To maintain ground armament production at 1944 levels under Scale B blockade, the Japanese would have to stop naval and steel merchant vessel building and cut indirect military uses of steel by more than 50 percent. Scale C would force heavy cuts in allocations of steel to armaments no matter how drastically other uses are adjusted.

Coking coal necessary to process the iron ore available would continue to be imported under all three scales of blockade. Other grades of coal would be in surplus supply on Hokkaido and Kyushu. The Honshu supply would depend upon water and rail transport from those islands and Karafuto rather than on imports from the mainland.

Scale A blockade would cut salt resources by over 25 percent and Scale B by over 34 percent. Chemical production important to ground force supply would be reduced by either scale, the amount depending to a considerable degree on the extent to which food preservation uses believed to be essential to the food supply, were reduced. Scale C would reduce salt supplies to 44 percent of current resources. Both food preservation and chemical uses would have to be cut severely.

Foodstuffs imports were considered sufficiently important in 1944 to warrant their maintenance even at the cost of substantial cuts in armaments production. Under Scale A blockade food imports at the rate of around 2 million tons annually could be expected. These would permit supplies to be maintained at subsistence levels. At Scale B food imports would have to be cut by around 75 percent to maintain a steel production of even 3 million tons. Current supply would then fall short of sustaining a subsistence level of food consumption by about 8 percent, a deficit which could probably be made up out of stocks for at least several months and perhaps longer. Under Scale C it would be impossible to continue any significant food imports and after stocks of uncertain size were exhausted there would be at least a 10-percent over-all deficit. This deficit would tend to be concentrated upon the urban industrial population and in those areas would very considerably exceed the over-all percentage.

## B. SELECTIVE ATTACK ON COAL

Japan's inter-island traffic consists primarily (perhaps 75 percent) of coal. Any large decrease in marine and rail transport between Honshu and the islands of Kyushu and Hokkaido will, therefore, tend to be concentrated upon coal movement. Mining of Hokkaido and Kyushu coal ports and bombing of high capacity coal loading equipment at these ports would accentuate this inherent concentration of effect.

If marine movement of coal to Honshu from Kyushu and Hokkaido were held to 5 to 10 million tons a year and operations against the Kammon Tunnel and Hakodate-Aomori car ferries were conducted simultaneously, a coal deficit of from 40 to 60 percent would be produced in Honshu which is the main military and product producing area in Japan. The shortage would be felt pervasively over the whole war economy. No considerable opportunity to shift the impact would exist, since the level of consumption below which the cut would be made allows but 2 million tons annually for civilian consumption. Certain lower priority military end product output would fall relatively quickly owing to decreases in the supply of power, process steam and process coal. Top priority military end products manufacture would be affected only after the further cut in raw material supply which would follow the coal shortage had time to make itself felt.

The success of the operation against coal by combined attack on water and rail transport from Kyushu and Hokkaido does not depend upon general blockade but would be strengthened in about the same degree by either of the three scales.

## C. NATURE AND SCALE OF EFFORT REQUIRED

### 1. General Reduction of Imports.

*a. By sinking ships.*—Reduction of cargo movement by cutting down the tonnage of vessels available will require greatly increased sinkings in home waters. If losses are increased 500 percent it will take 3.5 months to reach Scale A blockade, 5 months to reach Scale B and 5.6 months to reach Scale C. Halving ship efficiency would decrease these times by a month to six weeks.

A rate of sinkings of 250,000–300,000 g. r. t. per month in home waters might well cause the enemy to cease exposing his ships and lead to interdiction of traffic some time before reduction in tonnage available imposed a decisive reduction in cargo movement.

**2. By Denial of Ports.**

Denial of the use of the principal active ports will make an immediate reduction in cargo movement. If diversions to other ports are countered as they occur it will be possible to attain Scale B blockade within the time required to make the primary attacks. If mining is the method of denial resorted to only ten to twelve areas would have to be attacked initially with counter diversion follow-up attacks upon up to 20 additional ports, three of which would have to be bombed because mining to closure would be impossible.

Denial of ports by bombing alone would be an expensive operation in view of the much larger number of targets to be attacked and the short recovery time.

Reduction of the shipbuilding rate by 50 percent would hasten the attainment of the various levels of blockade by ship sinkings by one to one and a half months at the higher attrition rates and by three months or more at the lower rates.

**3. Selective Attack Against Honshu Coal Shipments.**

To cause a 40 to 60 percent coal deficit on Honshu would require mining of 9 coal handling ports on Kyushu and Hokkaido, bombing of high capacity coal handling equipment at three Kyushu and four Hokkaido ports, interdiction of the Hakodate-Aomori rail ferries either by mining or preferably by sinking the eight ferries, and interdiction of Kyushu to Honshu rail traffic, either by attack on the Kammon Tunnel, Hikoshima Viaduct or other suitable point. A counter diversion effort against up to a dozen secondary ports might be necessary. The results of such a campaign on military end products would be somewhat more immediate than general blockade and would require less effort.

## IV. RELATIVE AIR TARGET MERITS OF VARIOUS TYPES OF MARINE TRANSPORT FACILITIES

Among marine transportation targets denial of ports offers the best opportunity for producing a quick and decisive effect on military strength despite the excess capacity. Mining is the only form of operation which will permit an economical attack of the widespread nature demanded. Precision bombing of at least one and preferably of several railroad targets will also be required if inter-island traffic is the object of attack.

Attack on ships is to be preferred if the scale of effort available against ports is too small to secure interdiction, where the type of aircraft available is not suited to mining, or where specialized craft such as car ferries are essential to the particular traffic it is desired to interdict.

Bombing of steel shipbuilding yards is of low priority. If substantial shipping attrition is being imposed, the enemy interruption of shipbuilding will hasten the effects only slightly. If it is low, no prompt effect on enemy strength will be produced even if no ships are built. On the other hand, destruction of shipyards might have the serious disadvantage of increasing the availability of steel for ground armaments (the aspect of enemy strength which it is most important to reduce) by denying the facilities to put steel into the higher priority use.

Wooden shipbuilding is a high priority target despite its dispersion since small vessels are best adapted to blockade running and to the transport of troops and military supplies to areas of active fighting. Once operational, such vessels are difficult to deal with in the narrow waters in which they may henceforth be expected to move, because of their small size, ease of concealment, and ability to hug coastlines.

# I. SIGNIFICANCE

## A. GENERAL

Marine transport is presently essential to two elements of Japanese military strength, first, to Japan's ability to maintain war production, second, to her ability to supply and reinforce her military forces outside of the Home Islands. For the long run, its relation to armaments production in Japan proper is the more important.[1]

In the future, marine transport may be expected to become of vital importance to the movement of troops and military supplies from place to place within the Home Islands as our air power denies the enemy the use of his railroad system. If the Japanese General Staff should decide to withdraw troops from the mainland for the defense of Japan, marine transport would be of significance for the repatriation of such forces.

## B. HOME ISLANDS WAR PRODUCTION

Marine transport is, of course, essential to war production in the Japanese Islands both for the import of necessary raw materials from abroad and as a part of the domestic transportation system.

### 1. Imports.[2]

*a. Nature and use.*—The Japanese Islands are deficient in many raw materials necessary to the production of armaments on a scale sufficient to permit sustained opposition to our forces. The items of principal importance are aluminum bearing ores, iron, coking coal, oil, salt, and miscellaneous ferroalloys, non-ferrous metals, certain refractories and other special materials. Foodstuffs must also be brought in.

To operate the Japanese steel industry at the rate of 7–8 million tons a year and maintain a comfortable food and textile supply would require total imports of about 25 to 35 million tons annually (as opposed to the current rate of around 12 million tons, a steel production of around 5 million, and a tight food and textile situation).

The detailed position as to each of the principal materials is as follows:

*b. Aluminum.*—Japan must import virtually 100 percent of her aluminum needs, which at the rate of aircraft production prevailing in January, 1945, amount to about 200,000 tons[3] annually This must be shipped either in the form of raw material (bauxite or shale), alumina or the finished metal. The bulk of present movement, which is estimated to amount to around 750,000 tons annually, is in the form of 725,000 tons of aluminous shale mined mainly in North China and about 25,000 tons of aluminum produced in Manchuria and Korea. Press and radio reports indicate that attempts are being made to develop local raw materials but it is improbable that Japan could achieve any substantial aluminum production from domestic ores within the next 2 years.

The rapid expansion of the aircraft industry coupled with the stringent position in shipping seems to have prevented the building up of any substantial stockpiles of bauxite in the Home Islands.

In sum, it appears that Japanese air strength (the aircraft industry is, of course, by far the largest user of aluminum) will continue to depend upon marine transport for its raw material.

*c. Steel.*—The Japanese steel industry at its current rate of steel production of around 5 million tons annually is dependent upon imports from the mainland (North China, Manchuria, and Korea) for about 72 percent of its consumption of iron. Since this low steel rate, attributable to the lack of shipping, has, even under present conditions of low consumption of military end products, forced the Japanese to restrict production of basic armaments items such as ammunition, heavy artillery and tanks, it is obvious that domestic production alone cannot sustain the Japanese war effort.

Japan is studying methods of increasing present production from domestic ores, estimated at 1.5 million tons of contained Fe, by processing iron sands and other iron sources. Technical limitations, however, are such that it is unlikely that any substantial reduction of import requirements could be achieved in 1945 and 1946.

The Japanese steel industry is also presently dependent upon outside sources for coking coal. While domestic coals can be used for blending with foreign coal for the manufacture of metallurgical coke, about 25 to 30 percent of total coking coal requirements must be composed of high grade coking coal from Karafuto, Manchuria, or China. The small amounts of coking

[1] No attempt is here made to appraise the significance to marine transport to the maintenance of the Japanese position in the conquered territories on a basis independent of Japan. Though obviously important, it has not been felt feasible to deal with this subject in the present paper.

[2] The analysis is made as of the situation in early March 1945 and on the basic assumption that no large volume of movement to Japan from Formosa areas to the south will henceforth be possible.

[3] "Tons" means "metric tons" when used in reference to amounts of material or cargo unless otherwise noted.

coal on Hokkaido will probably not exceed requirements for smelting local ores.

There are almost certainly no important stock piles of coking coal in Japan.

*d. Salt.*—Salt is essential to the production of aluminum, chemicals, artificial textile fibers, and to food preservation. Japan requires about 1,000,000 tons of salt annually for industrial purposes and about 600,000 for food preservation. Domestic production amounts to 650,000 to 700,000 tons leaving a net import requirement of around 900,000 tons which is met from Manchuria and China.

It is doubtful that domestic salt production could be greatly increased in much less than a year. The use of considerable amounts of coal and manpower would be necessary for any quick rise in output.

Stocks on hand are unlikely to exceed 400,000 tons.

*e. Oil.*—Inner Zone oil production is sufficient to supply only about one-half of Japan's oil requirements even at the reduced rates of naval and merchant shipping activity implied by operation north of Formosa and at the low levels of military consumption presently prevailing. Movement of oil products from shale and coke oven and synthetic production on the mainland could not, even if there were no consumption in that area whatever, exceed a million tons in 1945 or about 22 percent of estimated requirements. It is unlikely that more than half a million tons could be forwarded from the continent.

Japan, however, is estimated to have accumulated stocks sufficient to last at least 14 months at present consumption rates.

While marine transport is essential to Japan's long-term oil position, it is apparent that virtually the entire effect which can be anticipated during the next year from an interference with imports of oil has already been achieved by the recapture of Luzon.

*f. Foodstuffs.*—Given normal domestic crops and fish catch Japan must import annually foodstuffs with a caloric value of 5 billion, about 10 percent of total calories required to maintain a subsistence diet for her population. It is estimated that if all imports of food were cut off, Japan's total supply would be but 80 percent of prewar consumption.

The fish catch has almost certainly declined under the combined impact of fuel shortage, fishing vessel requisitions for military and naval use and the drafting of manpower for the armed forces and merchant marine. As far as domestic crops are concerned, a declining supply of phosphatic fertilizer which must be imported, and drafting of agricultural manpower for the army and war industry may have tended toward somewhat lower yields, though area bombing may tend to make farm labor somewhat more plentiful in the months to come. Use of grain and potatoes for the manufacture of industrial and fuel alcohol has come into conflict with food needs. These factors have probably been balanced by the drive for self-sufficiency in food which has led to increases in the areas under cultivation,[4] increases in plantings of high yield food crops such as potatoes and the like. However, such measures plus imports from the mainland of around 2.5 million tons of foodstuffs annually have not sufficed to alleviate a domestic food situation which a member of the Japanese Imperial Diet described to that body in January 1945 in the course of a debate on the subject as "quite pressing." In the course of the same proceedings, Premier Koiso conceded that, no matter what measures were taken in the Japanese Home Islands, "a certain amount of food must be imported."

It seems unlikely that this situation of dependence on the mainland will change radically in the near future.

Annual foodstuffs imports are about half a million tons, or perhaps 2.5 percent in excess of the amount necessary to maintain a subsistence level diet in Japan without drawing on stocks. The latter are unlikely to exceed 2 years imports and are probably considerably smaller.

In addition to direct imports of foodstuffs, Japan must bring in phosphatic fertilizer and salt for food preservation purposes. Measures are now being taken to economize the use of salt for food purposes, even to the extent of using raw sea water in certain applications. Domestic salt production is about equal to food preservation requirements alone.

*g. Miscellaneous items.*—No detailed analysis of the Japanese dependence on a number of miscellaneous items imported from the mainland, including tungsten, manganese, fluorite, magnesite, lead, zinc, and copper, has been undertaken because the volume of essential movement of such of them as cannot be dispensed with for limited periods of time is so small that nothing short of 100 percent blockade would be likely to prevent their shipment.

## 2. Coastwise Traffic.

Marine transport between Japanese ports is very nearly as important to the Japanese war economy as that between foreign ports and the islands. Of top importance is the coal traffic. In

[4] By campaigns to secure planting of former waste lands, including forested areas and small plots such as railroad embankments and by planting areas formerly given over to nonfood crops such as mulberry culture.

addition to its use as a fuel, coal is vital as a principal raw material of the power, chemical and synthetic oil industries. Only by the manufacture of oil from coal can Japan hope to bring her domestic oil economy into balance in the long run.

Hokkaido and Kyushu are large coal producing areas with surpluses over minimum war needs of about 10 and 17 million tons respectively. Honshu, however, is a deficit area with minimum requirements at the steel production rate of early 1945 (4.7 million tons) of about 30 million tons annually. Of this, Honshu itself currently supplies about 7 million, with imports of about another 3 to 4 million from the mainland and Karafuto. The remaining 19 to 20 million tons plus an additional amount in excess of minimum requirements, which may run up to 7 or 8 million tons, comes from Hokkaido and Kyushu.

As far as marine transport is concerned the Hokkaido movement, though the smaller, is the more important of the two since there is no possibility of substituting rail shipment if waterborne traffic is stopped.

Of lesser importance are movements of timber from Hokkaido and Shikoku to Honshu, of about half a million tons annually of pig iron and steel, 1.4 million tons of foodstuffs (fish and potatoes), and an undetermined amount of wood pulp from Hokkaido to Honshu. Kyushu to Honshu movements include about 2,000,000 tons of iron and steel products, perhaps 750,000 tons of foodstuffs, an undetermined amount of chemicals and substantial quantities of finished and semifinished goods. The division of such shipments and the coal shipments between rail and marine transport is unknown but about four to five million tons of the total movement is probably by sea.

Coastwise marine transport is of considerably less importance for the movement of finished and semifinished goods. Even before the war this type of traffic was less than 10 percent of total coastwise movement and it has now almost certainly been shifted to the railroads.

Coastwise shipping is indispensable to the bulk movement of petroleum products between points in Japan. It has never been necessary for the Japanese to use rail transportation in the bulk distribution of oil products since the main source of supply has been imports and the large consuming centers are at or close to the ports. In consequence tank car holdings are very low. In 1935[5] Japan had but 220 such cars and there has been no economic occasion for any drastic increase since.[6] If large scale military operations in Japan proper call for movement of oil between points within the islands, package movement by rail will consequently be the only substantial alternative to coastwise marine shipments.

## C. OUT-BOUND MILITARY TRAFFIC

Marine transport is, of course, essential to the maintenance of enemy island positions outside of Japan proper and, if a major land campaign on the continent is anticipated, to the enemy position on the mainland. In both areas, however, substantial stocks of military supplies and, where this is not locally available, of foodstuffs, exist so that forces there are to a considerable degree self-sufficient on a short run basis. Current wastage of military supplies outside of the relatively limited regions of active fighting is small.

These factors result in a regular military supply movement outbound from Japan at the rate of around 700,000 tons per annum or about 5 percent of the inbound movement. Even if 300,000 to 600,000 men became actively engaged, regular outbound supply shipments would be unlikely to exceed a rate of 2 million tons annually. Appendix B supplies further details and sets out the method of calculation.

[5] The last year for which official figures are available.

[6] Holdings were increased in 1935 by only 12 cars. Outside of the oil fields there are no pipe lines.

# II. SUSCEPTIBILITY OF MARINE TRANSPORT TO AIR ATTACK

## A. GENERAL INDUSTRIAL PATTERN

The two main elements of any marine transportation system are the ships in which cargo is moved from one port to another and the port facilities through which the cargo is transferred between shore and ship. Port facilities vary from one port to another but fall into the main subdivisions of shelter for vessels, equipment for moving cargo from a vessel to the land (which may vary from lighters, tugs, and shoal water quayage to deep water wharfage with elaborate cargo handling machinery), land transport facilities to move cargo from the wharfside (typically freight yards and spurs) and storage buildings to protect cargo from the weather in the interval between land and water transport. Shipyards constitute the means of maintaining and replacing the merchant marine and the effect of attack on them will be that of an attack on ships.

## B. CAPACITY AND DEGREE OF USE

A major factor in the susceptibility of an industry to air attack is the degree to which the available productive equipment is being fully used. The presence or absence of excess capacity is particularly important in regard to transportation where the facilities are widely scattered and idle and active capacity cannot normally be destroyed simultaneously.

### 1. Ships.

*a. Presently available.*—As of the beginning of March 1945, the enemy is believed to have afloat about 3.54 million gross registered tonnage of vessels of which 1.9 million are over 1,000 g. r. t.[1] The following table shows the distribution of these vessels by types. Figures are in millions of gross registered tons.

| Type | Afloat | Operable |
|---|---|---|
| Over 1,000 g. r. t. | [1] 1.90 | 1.52 |
| 1,000–250 g. r. t. | .38 | .33 |
| Engine driven vessels 250–20 g. r. t.: | | |
| Full-powered | .28 | .22 |
| Auxiliary | .58 | .50 |
| Sailing vessels over 20 g. r. t. | .40 | .34 |
| | 3.54 | 2.91 |

[1] As contrasted with a pre-war total of around 6 million. A substantial number of these ships are tankers. As noted, there is no longer need for much of this tanker tonnage in the movement of oil imports. Since such vessels can be easily converted to the carriage of other cargo, they must be included in the supply of dry cargo shipping as a potential factor.

Of the cargo carrying fleet, 15 to 25 percent will, on the average, be laid up for ordinary maintenance and repair of war damage at any given time. The higher percentage of lay-ups have been characteristic of tonnage allocated to the runs to the south on which there has been much exposure to war damage, while the lower percentage has prevailed in regard to ships making the sheltered mainland run. Virtually the entire tonnage of engine-driven vessels is suitable for at least the short Tsushima Strait run to the mainland and the cargo carrying capacities of these smaller vessels on the short voyages to the mainland and the coastal runs is large enough to make them a substantial factor in the situation. Making due allowance for weather conditions, engine-driven vessels in the 250–20 g. r. t. class should on the average be able to move 225,000 metric tons per year per 10,000 g. r. t. and auxiliaries in the same class, about 200,000. Capabilities of such vessels are appraised at some length in Appendix A.

The extent to which competing uses such as naval auxiliary and patrol, weather observation, aircraft warning and fishing reduce the total available for cargo carrying is subject to considerable fluctuation and the intelligence is too scanty to permit any satisfactory quantitative statement. Our advance toward Japan is, of course, steadily reducing military marine transport and naval auxiliary demands. Specialized uses such as dredging and car ferrying, also reduce the total tonnage available for cargo carriage.

The regions south of Formosa are now virtually cut off from Japan so far as regular sea communication is concerned, and therefore only vessels in home waters are now of major importance to the Japanese war economy. It is probable that the tonnage of vessels over 250 g. r. t. afloat in home waters and free for cargo carriage amounts to 1–1.2 million, including tankers, and in the smaller class about 300,000–400,000 of engine-driven craft and 150,000–200,000 g. r. t. of sailing craft.[2]

*b. Degree of usage.*—Available Japanese merchant tonnage is being used to capacity. The need for additional shipping is now such a limiting factor on the Japanese war economy that drastic rationalization measures have been adopted. The length of shipping hauls has been reduced and that of rail haul extended whenever

[2] Taking into account the amount of shipping formerly on the southern run and the proportion of such tonnage as would normally have been north of Formosa prior to the recapture of the Philippines and the general withdrawal of shipping from the Pacific Island areas.

a rail and ship movement is involved and, wherever possible, rail shipment has been substituted for marine transport. By the spring of 1944, coastwise civilian supply traffic to Tokyo, Shimizu, Nagoya, and Kobe-Osaka had been transferred to the railroads. Millions of tons of bulk commodities from North China, Manchuria, and Korea are now moved to South Korean ports by rail, Kyushu coal is largely hauled through the Kammon Tunnel and a large proportion of Hokkaido coal moves via the expanded rail ferry service to Honshu or is landed in such north Honshu ports as Niigata and Shiogama. In Japan proper passenger travel was formerly a much heavier element in total rail traffic than in that of any other country. In March 1944, however, it was placed on a permit basis preparatory to a further substitution of rail freight for shipping. It was announced that passenger cars freed by this action would be converted to freight carriage and it appears that substantial conversions have in fact taken place.

As early as the fall of 1942 the Japanese withdrew all vessels of 2,000 g. r. t. and over from Inland Sea runs. Since that time, they have integrated the carrying trade in the hands of several quasi-official regional shipping pools. Sailing vessels are not brought under the jurisdiction of such groups because of the specialized operating problems involved but all other engine-driven craft including auxiliaries are included.

A measure of the shipping stringency is found in the adoption of the following expedients:

(i) Government requisitioning in the spring of 1944 of all vessels of over 50 g. r. t.,

(ii) Military and naval requisitions in 1943 of large numbers of fishing craft (up to 30 percent in some areas) despite a tight food situation,

(iii) Japanese requisitions of small vessels and junks on the China and Korean coasts,

(iv) Extension of marine insurance to junks and their cargoes at the same rates as those prevailing for ordinary merchant vessels,

(v) Improvement of facilities for the shipment of Kyushu coal by towage and the institution of towage in the Inland Sea by steamers of strings of cargo carrying sailing vessels.

All of these betray the enemy's need to employ every ton of cargo carrying capacity available regardless of its efficiency.

*c. Ship supply trend.*—(1) *Closing of the southern route.*—The virtual interruption to the south will drastically affect the shipping supply. Although considerable tonnage has been and will be sunk on its way back to Japan, at least 100,000–200,000 g. r. t. may well be added to the fleet in home waters over the next few months by withdrawals from the south. This will be added to the approximate 200,000 g. r. t. of shipping regularly trading below Formosa which can be assumed to have been north of that island when the southern route was cut and included in the 1.2 million g. r. t. already noted as in home waters and now free for the mainland runs. Tonnage formerly trading with the south will be far more productive on Japan-mainland runs. The distance to Singapore from Shimonoseki is 2,500 miles while distances to mainland ports average around 500 miles. And the long convoy delays which led to turnarounds of over 2 months on the Singapore run during the middle of 1944 are likely to be considerably reduced. The number of round voyages per year by this tonnage should increase from 6 to around 15 (150 percent).

(2) *Attrition.*—During 1944 net losses of Japanese merchant vessels over 1,000 g. r. t. amounted to about 2,225,000 g. r. t. or sinkings of around 190,000 g. r. t. per month in excess of a building rate of about 100,000 g. r. t. a month. Sinkings occurred predominantly, however, in areas outside home waters and during 1944 averaged only about 60,000 g. r. t. per month north of Formosa or considerably less than new construction. Since the traffic essential to Japanese war production is now almost exclusively confined to this area, only an increase of around 67 percent in ship sinkings in home waters or a drop in ship construction will prevent the Japanese from strengthening their marine transport position.

Factors operating in favor of augmented home waters sinkings are the establishment of air and submarine bases in increasing proximity to Japan and our ability to conduct carrier operations close to enemy shores. Factors operating against a drastic increase in home waters sinkings are enemy ability to confine ship movements to areas where constant air and naval patrols can be maintained and some protection secured from mine fields and shore based antiaircraft. No useful purpose will be served by venturing to predict which set of factors will control, but it is clear that the air target value of shipping will depend, to a large degree, on the extent to which naval action alone can continue to reduce the present shipping pool.

Very little is known of attrition rates of vessels under 1,000 g. r. t. Losses among such of this class of vessels as have been requisitioned for military and naval use in the Southwest Pacific have been high, running perhaps up to 33 percent, but since most of this class of craft has operated in home waters and since submarine attack has singled out the larger vessels, total losses in the class have been comparatively light and have

probably been exceeded by new construction. In consequence, the distribution of Japanese shipping is shifting toward the smaller classes and may be expected to continue to do so despite very substantial new construction of the large sizes of vessels.

**2. Ports.**

In sharp contrast to the situation in regard to ship usage, ports both in Japan and on the mainland are being employed at a small fraction of their capacity.

a. *Japan proper.*—JANIS lists 106 principal and secondary ports in Japan proper suitable for ocean-going vessels with a total capacity on a single 10-hour shift basis of at least 133 million metric tons per year. This figure makes an inadequate allowance for lighterage, which because of cheap labor, has been highly developed in the Far East. Even in large well-developed ports, such as Yokohama and Nagoya, a very large percentage of the traffic has been handled by this method and it is known that bulk cargo is handled by lighter into small craft harbors not even listed as ports, at rates not very different from those prevailing at established harbors. Accordingly, port capacity listed by Janis must be taken as only a fraction of the total actually available.[3]

Imports passing through Japanese ports amounted to about 35 million metric tons in 1937. Exports (exclusive of those to Korea and Manchuria) were about 11 million tons. Data as to the tonnage of pre-war coastwise movement are unsatisfactory but the general order of magnitude was around 100 million tons.

Present port usage is only a fraction of capacity, owing to the scarcity of ships to move cargo. Imports from the mainland as of early March 1945 were at an annual rate in the neighborhood of 12 million tons. Imports from the south are too uncertain to estimate since the capture of the Philippines but are certainly not in excess of a rate of 2 to 3 million tons a year. Out-bound movement of military supplies is at an annual rate of around 700,000 tons. Coastwise shipments have been radically reduced and a very large, though undeterminable, part diverted to the railroads. Present annual coastwise cargo movement may amount to 30 million tons. The above estimates indicate an excess of capacity over cargo handling requirements of at least 75 percent[4] on a single shift basis and over 250 percent on a double shift basis.[5]

Certain ports are, of course, heavily loaded despite the light usage of port capacity in general. The submarine threat on the Pacific side of the islands has virtually interdicted the use of certain south coast ports including Nagoya and Shimizu and reduced the use of Tokyo Bay ports. It has resulted in a very high degree of use of Kobe and Osaka, at the eastern end of the protected Inland Sea passage, and in common with the general shipping shortage has led to increased activity in the Shimonoseki Straits and related ports which are now among the busiest in Japan. Japan Sea ports, particularly Tsuruga have for the same reason become considerably more important than in pre-war days. Activity has also increased at northern Honshu ports such as Niigata and Shiogama as an incident to the shortening of the runs of colliers carrying Hokkaido coal to Honshu. Aomori is reported to be handling a volume of traffic considerably larger than pre-war as a result of additions to the Hokkaido rail ferry service and coal shipments from the same island pursuant to the general policy of substituting rail for sea movement where possible. There is no direct evidence on the activity at Kamaishi since 1942 but since this port handles coal for the smelting of Japan's sole large deposit of iron ore, it may be inferred that the same high scale of usage of the specialized coal unloading facilities at this port continues. At the opposite extremity of the chain, Kagoshima has shown continuous activity in recent photographic cover, probably because its location minimizes shipping distance to the south.

Certain Hokkaido ports continue to be of considerable significance as originating points of coal shipments to Honshu. These are Hakodate, which is the northern terminus of the Honshu-Hokkaido rail ferries, and Muroran, Kushiro and Otaru, all of which have large coal loading piers with specialized high capacity equipment.[6] Mechanical coal handling facilities have also been developed at the port of Rumoi.

The Kyushu ports of Wakamatsu, Kanda (Karita), and Miike also are important as coal shipment points with specialized equipment, though these are of less importance than the Hokkaido ports so long as the Kammon Tunnel remains available as a substitute.

Appendix C lists the amounts of shipping photographed in recent months at various ports. This data is, of course, only of general illustrative value since port activity is subject to daily fluctuations and only the most recent photographic cover is to be relied on for current activity intelligence.

b. *Mainland.*—Twenty-seven mainland ports between the mouth of the Yangtze and Siberia which

[3] Clearance capacity is not taken into consideration in these figures.

[4] Coastwise movement is a double charge on port capacity.

[5] It is not intended to suggest, of course, that all ports could be operated at capacity simultaneously.

[6] The Muroran coal pier is reported to have loaded a 6,000 g. r. t. vessel in 10 hours.

are suitable for the ocean-going vessels transporting vital raw materials and semi-processed goods to Japan have a total estimated capacity in excess of 80 million metric tons [7] per year on a single-shift basis.

The primary function of mainland ports is the transshipment of economic goods bound for Japan and of military supplies destined for the interior. Prior to the occupation of the Philippines, the Japanese apparently dedicated most of their available shipping to the military and economic traffic between Japan and the southern regions. Consequently, the volume of movement through such world trading ports as Tientsin and particularly Shanghai has been but a small fraction of that of pre-war days.

As stated above, the exports from the mainland to Japan as of early March 1945, amounted to around 12 million tons annually and the movement of military supplies from Japan to around 700,000 tons. Coastwise traffic among mainland ports was an important factor in the pre-war economy but with the reorientation of the mainland economy under Japanese occupation and with the development of the shortage of shipping, the volume and significance of such traffic has decreased sharply. If it be assumed that the coastwise traffic among these ports amounts to 10 million tons annually (probably an overestimate), the total burden of coastwise, import and export traffic on the port facilities would not exceed 32 million tons per year,[8] leaving an excess capacity of 150 percent. And, in case of need, most of the coastwise movement could be eliminated.

With the high premium on cargo space for mainland-Japan traffic and a still limited submarine threat in the East China Seas, some temporary increase in mainland port activity will occur as shipping no longer usable on runs to the south is shifted to mainland runs. This, however, should not be sufficient to alter the general situation of a very large excess of mainland port capacity over requirements.

Some idea of the general level of activity at certain mainland ports may be gained by inspection of the tabulation of tonnage photographed in them at various times during the past 8 months, which is contained in Appendix C.

[7] This figure is known to be an understatement so far as North China and Manchurian ports are concerned. There seemed to be no occasion, however, to delay publication of this target analysis until a restudy of these ports could be completed since the result would merely strengthen the point already made by the figures currently available. ONI OP-16-FE has made a careful study of Korean port capacities, the results of which are available in the Port chapter of the JANIS on Korea.

[8] Twelve million tons of exports plus 10 million tons coastwise which is a double charge on port capacity.

### 3. Shipbuilding.

The degree of use of facilities in the shipbuilding section of the steel industry is very high.

*a. Steel.*—As noted, new construction of steel merchant vessels during the past 14 months has been at the rate of about 100,000 g. r. t. per month. This rate of building is 240 percent of the maximum prewar rate. It has been attained by giving shipbuilding a priority on men and materials second only to aircraft, by expansion of existing yards, particularly certain of the smaller ones, by building new yards, by adoption of standardized types of vessels and in at least one yard, prefabrication, and by intensive use of existing facilities.[9] The increase of production has been accomplished simultaneously with the maintenance of a high rate of naval building.

The sum of available intelligence indicates the steel shipbuilding industry is working to the limit of present capacity and that expansion of facilities is still continuing. If major naval construction should cease, a further substantial increase in merchant vessel construction would become possible.

*b. Wooden.*—As Japan's merchant marine has dwindled under our constant attack and as it has been made apparent to her that attempts to operate ordinary merchant vessels in areas of active operations will only increase such losses, she has turned to the building of standardized wooden vessels of 70, 100, 150, and 250 g. r. t. The undertaking of this type of construction is in part due to the steel shortage, in part to a policy of dispersion of risk in the face of attack, in part to a hope of achieving a large increase in new construction not only in Japan proper but in conquered areas, without a heavy investment of new plant and skilled manpower.

Despite considerable fanfare in the Japanese press, the participation in the program of such major concerns as Mitsui and NYK [10] and the building of over a score of new yards, little progress was achieved in 1943 and the early part of 1944 in securing new construction of wooden vessels on a large scale. Recent photographs of port areas in Japan and on the mainland and certain prisoner of war reports show, however, that large numbers of standardized wooden craft are operational and that building is extremely active.

[9] While photographic reconnaissance shows that not all ways in major yards are occupied, this is rather an indication that other yard facilities than ways are the limiting factor on production than evidence of idle plant equipment.

[10] Mitsui alone is reported to have had a program for the construction of 200 of the 250 g. r. t. type for 1944.

In addition to power-driven wooden vessels, great numbers of wooden junks are being built on the mainland. Cover of Antung in February 1945 shows over a hundred of these ships of a standard type about 115 feet long.

*c. Repair and maintenance.*—The repair and maintenance side of Japanese shipyards is not so fully occupied. Total drydock capacity in Japan and on the mainland from Hongkong north is somewhat in excess of 600,000 g. r. t. Assuming that the average vessel drydocked occupies about 70 percent of the dock's capacity, some 420,000 g. r. t. of merchant shipping can be simultaneously drydocked. These facilities were built to take care of the needs of a merchant fleet of triple the present tonnage as well as of a much larger naval fleet. While the damage the yards are now called upon to repair is more severe than that occurring in peacetime and while the percentage of ships laid up for repair is larger, these factors are not sufficient to counterbalance the shrinkage of the fleets and there is substantial unused repair capacity available.

## C. NUMBER OF TARGETS TO BE ATTACKED

The number of targets to be attacked, of course, constitutes an important factor in the desirability of any target system. In the field of marine transportation, the concentrations of targets of primary importance are low. The particulars follow:

### 1. Ships.

Ships, in general, constitute a widely dispersed target. The largest individual targets to be encountered in any number are ships of the 10,000 g. r. t. class, any one of which amounts to only about four-tenths of 1 percent of the total shipping afloat.

A tentative break-down among tonnage classes of the total Japanese merchant marine of 100 g. r. t. upwards made by ONI [11] demonstrates the comparative lack of concentration of ships of even the larger sizes as a target. To eliminate 25 percent of the total full powered shipping over 100 g. r. t., for example, would require a successful attack on at least 73 targets. Destruction of an additional 25 percent would require such attack on at least 130 more and to secure a further 20 percent of the total would require attack on at least 220 targets. The number of auxiliaries, sailing vessels and of full powered vessels under 100 g. r. t., of course, runs into the thousands.

As continued attack weeds out the larger ships and as prefabrication of such ships as type E and wooden shipbuilding shifts the tonnage distribution more and more into the smaller classes, the number of targets which must be hit to accomplish a significant reduction in the merchant marine will increase.

Prior to interruption of the routes to the south, this dispersion was partially offset by the fact that ships, especially the larger ones, were usually to be found in groups—either moving in convoy, at anchor at rendezvous or breakup points, or in port. A study of convoy patterns in the period July–October 1944 [12] indicated that the convoys between Singapore and Japan averaged 11.5 ships and between Takao and Japan, 14 ships. Those off the main North-South axis of shipping were smaller—ranging from 2 to 5 ships. Two coastwise runs along Japan proper were reported to average 2 ships per convoy with 3 in convoys to the Bonins and single ships to such outposts as the Kuriles. Since the occupation of the Philippines, the traffic between Japan and the southern regions presumably has declined to the point where there are no longer enough ships on the run to form convoys of the reported size. Intelligence is scanty on convoy practices in the East China Sea, Yellow Sea, and Japan Sea runs between Japan proper and the mainland. In view of the lesser threat from submarine and aircraft in these areas, particularly in the Japan Sea, it seems unlikely that convoying is as yet standard practice on those runs. Even a convoy of 10 ships averaging 4,000 g. r. t. would represent a concentration of less than 2 percent of the total tonnage afloat. If the size of convoys declines as shipping is progressively confined to the inner zone neither the convoys at sea nor ships at rendezvous and breakup points will represent any great degree of concentration.

Concentration at ports is somewhat greater. For example, there were in Kobe harbor on 27 February 1945, 61 merchant vessels constituting a total of 144,600 g. r. t. and another 9 vessels totaling 65,000 g. r. t. were fitting, under repair or building. This was about 10 percent of the total tonnage afloat of ships as large or larger than the smallest size included in the tally and perhaps 16 percent of the tonnage of vessels afloat in home waters. In ports in the Shimonoseki area at the end of March 1945 there were 237,000 g. r. t. of vessels over 200′ (around 12%).

Concentrations at other ports at various times are listed in Appendix C. Except at Kobe, Osaka, and Shimonoseki, the percentage of the total fleet in any one principal harbor at any one time has ranged from 2.5 to 5 percent.

From the foregoing, it appears that shipping presents a target characterized by an unusually high degree of dispersion. Where target selection for carrier operations is concerned, too much

[11] Op-16-FE, Serial 13-45 (Confidential).

[12] Op-16-FE, Serial 54-44 (Secret).

weight need not be given to this factor, however, since carrier forces have demonstrated that they can, within a few days, successfully attack shipping in a number of different harbors scattered over a considerable area.

**2. Ports.**

The number of targets to be dealt with assuming attack on marine transport by denying port facilities depends both on the number of ports to be dealt with and the number of installations within each port which must be attacked to deny use of the port.

*a. Japan proper*—In considering the number of ports to be attacked, the traffic to be interrupted must be taken into account. For the purposes of in-bound movement, the ports of Honshu and Kyushu constitute a distinct group since the two islands are linked by the Kammon Tunnel and contain the main industrial areas of Japan. There are 79 Honshu and Kyushu ports which must handle around 12 million tons of imports and perhaps 25 million tons of coastwise traffic. They have a 2-shift capacity of at least 220 million tons. Complete denial of the use of at least the 9 largest ports would be necessary to cut through the cushion of excess capacity. To achieve a 33-percent reduction of present marine cargo movement both import and coastwise, it would require complete denial of a total of the 16 largest ports and to achieve a 66-percent reduction, complete denial of the 26 largest ports.

To prevent the movement of cargo from Hokkaido, most of which is coal comprising around 20 to 25 percent of Honshu requirements, would require the denial of 5 primary ports and those of the 9 secondary ports through which the enemy directed traffic.

Interruption of marine transport in ocean-going vessels to and from Kyushu would call for denial of 11 primary ports and part of the 14 secondary ports.

From the point of view of interdiction operations such as mining, the number of ports is not a fair measure of target concentration since several ports can often be closed by a smaller number of operations. Notable examples in regard to mining are Tokyo Bay, 3 ports—1 mine field, Shimonoseki Straits, 6 ports—3 fields, Ise Bay, 3 ports—1 field. Only about 25 to 30 mine fields need be laid to close all important Honshu and Kyushu ports. On the other hand, where bombing attack is in question the number of individual attacks necessary will be far higher than the number of ports which must be denied since in each large port a number of different areas would have to be attacked. At all the principal ports, such as Tokyo, Yokohama, Nagoya, Osaka, Kobe, and Moji, the dock and wharf areas extend for miles along the waterfront and attack on no one target would seriously impair the functioning of the port.

At coal handling ports such as Wakamatsu, Miike, Kanda, Muroran, Kushiro, Otaru, Rumoi, and Kamaishi, however, the specialized loading and unloading equipment presents a small number of targets, destruction of which will, to a very large extent, wipe out the usefulness of the port for economic traffic.

Japanese ports are listed in Table 1 and shown on Map A. The available intelligence as to their installations and characteristics has been collected and evaluated by JANIS and will be found in the port and city chapters of JANIS 81, 84, and 85.

*b. Mainland ports.*—As noted, there are on the Asiatic mainland from Shanghai to Siberia, 27 recognized ports with rail connections and suitable for ocean-going vessels. These are all served by a single integrated standard gauge railroad system which is Japanese administered and, except perhaps in certain of the Chinese areas, efficiently operated. While the rail facilities are insufficient to channel the entire traffic flow through the ports at the extreme north or the extreme south as port capacity would permit, in general port capacities are interchangeable throughout the area.

Of the total capacity of over 80 million tons, 63 million is accounted for by the 13 largest ports and the balance of approximately 13 million by the remaining 14.

Certain geographic factors dictate consideration of the mainland ports into three groups. The first of these is composed of the southerly Korean ports and includes:

| | *Annual capacity (metric tons)* |
|---|---|
| P'ohang-dong (Hoko) | 825, 000 |
| Pusan (Fusan) | 6, 194, 000 |
| Masan | 2, 475, 000 |
| Yosu (Reisui) | 1, 089, 000 |
| Mokp'o (Moppo) | 1, 089, 000 |
| Kunsan (Gunyan) | 396, 000 |
| Inch'on (Jinsen) | 5, 115, 000 |
| | 17, 183, 000 |

These ports are principally significant in the movement of coal, iron, and foodstuffs, originating in north central Korea and Manchuria and to a lesser, though significant, extent in North China. Their use permits the saving of very considerable amounts of shipping space by shortening the length of voyages between the mainland and Japan. This affects particularly the use of small coasters and wooden vessels since on short runs limitations imposed by the slower speed and poorer sea-keeping qualities of these craft are minimized

The ease of operating small vessels between these ports and Japan would deprive the mining of this group of much of its effectiveness. A surer method of attack on traffic passing through these ports is rail interdiction in the mid-section of Korea between 37° and 38° N., where there are but two through lines.

The second group is composed of the following ports:

| | *Annual capacity (metric tons)* |
|---|---|
| Unggi (Yuki) | 2, 400, 000 |
| Najin (Rashin) | 7, 530, 000 |
| Ch'ongin (Seishin) | 5, 820, 000 |
| Songsin (Joshin) | 1, 980, 000 |
| Ch'aho (Shako) | 1, 170, 000 |
| Hungnam (Konan) | 4, 650, 000 |
| Wonsan (Genzan) | 3, 480, 000 |
| | 27, 030, 000 |

This group normally serves the north Korean and southeast Manchurian hinterland. Coal, iron ore and foodstuffs make up the bulk of the traffic. In case of need, these ports could also serve central and northwest Korea and southwest Manchuria and North China. The route from the latter two areas would, of course, be roundabout. Traffic from these ports to Japan will be more difficult to attack from present bases than that from other mainland ports but the concentration of target sis high.

Twelve Yellow Sea and East China Sea harbors from Shanghai to Chinampo make up a third grouping. They are:

| | *Annual capacity (metric tons)* |
|---|---|
| Chinnamp'o | 1, 980, 000 |
| Kyomip'o (Kenjiho) | 600, 000 |
| Tasa-do (Tashito) | 360, 000 |
| Yongamp'o (Ryugampo) | 180, 000 |
| An-tung/Sinuiju | 600. 000 |
| Dairen | 8, 250, 000 |
| Hu-lu-tao | 1, 500, 000 |
| Ch'in-huang-tao | 1, 650, 000 |
| Tang-hu/Taku | 2, 750, 000 |
| Ch'ing-tao (Tsingtao) | 4, 268, 000 |
| Hsu-kow (Laoyoo or Lienyun) | 1, 100, 000 |
| Shang-hai/Wo-sung | 11, 000, 000 |
| | [1] 34, 238, 000 |

[1] The estimated capacities of Manchuria and North China ports are taken from data supplied by WDGS-MIS, while the estimates for Korea ports are from Ch. VI Janis 75. In instances where both schedules include estimates for the same ports, the Janis estimates are from 1 to 6 times the MIS estimates and are believed to be more reliable.

These ports are the best located on the mainland from the point of view of access to the producing areas where pig iron, iron ore, coal, salt, foodstuffs, and aluminous shale originate and would normally be the most important. The need to economize shipping plus the increasing insecurity of enemy sea routes in the Yellow and East China Seas reduces their present significance. In view of the railroad bottleneck between Chinhuangtao and Mukden, however, continued operation of Hsukow (Lienyun), Chingtao (Tsingtao), Tangku, and Chinhuangtao is essential to Japanese exploitation of North China resources at even the present somewhat limited rate.

Detailed evaluated intelligence as to the layout and facilities of Korean ports is contained in the port chapter of Janis 75.

### 3. Shipbuilding.

*a. Steel.*—Japan's steel shipbuilding is heavily concentrated in the Japanese islands which have more than 92 percent of total production. It is believed that the mainland is producing at the rate of less than 100,000 g. r. t. at best. While there are important yards at Hongkong and Shanghai, production has been retarded by lack of supplies from Japan, and by air attack. There are only 2 yards known to be on the mainland north of the Yangtze. These 2 yards, one at Dairen and the other at Fusan, are credited with an annual capacity of 25,000 g. r. t. each.

Sixty-two percent of current steel merchant tonnage building capacity is accounted for by 16 major yards. These contain 60 ways constituting 36 percent of the total number of ways available. In addition, these 16 major yards contain 24 ways estimated to be assigned to naval construction. Forty-six minor yards with about 106 building ways (65 percent of ways in Japan) account for 38 percent of steel merchant tonnage capacity.

The distribution of ways between major and minor yards in Japan proper, and the maximum gross tonnage in merchant vessels that can be accommodated simultaneously, set forth below, indicates a somewhat higher concentration of construction facilities for vessels over 2,000 g. r. t., with about 70 percent of the ways appropriate for this type in the 16 major yards.

| Tonnage class | 16 major yards | | 46 minor yards | | Total, 62 yards | | |
|---|---|---|---|---|---|---|---|
| | Number of ways | G. r. t. | Number of ways | G. r. t. | Number of ways | G. r. t. | Percent of g. r. t. |
| 2,000 g. r. t. and over | 55 | 251, 950 | 50 | 116, 520 | 105 | 368, 470 | 90 |
| 1,000 g. r. t./500 g. r. t | 5 | 4, 830 | 56 | 37, 980 | 61 | 43, 010 | 10 |
| Total | 60 | 256, 780 | 106 | 154, 500 | 166 | 411, 480 | ---- |
| Percentage distribution | 36 | 62 | 64 | 38 | 100 | -------- | 100 |

The degree of concentration in the major yards is higher than that indicated by the above summary of way capacity. While a uniform building rate of three vessels per way per year will produce 1,234,000 g. r. t., it is likely that the building rate has been higher in the major yards and proportionately lower in the minor ones, where yard equipment, especially cranage, is less adequate to

reported under construction in four shipbuilding centers of Japan Proper, while a ship of 2,500 g. r. t., of steel frame and wooden planking, is reported as launched in Tientsin (North China), November 1944.

While some mainland yards for the building of full-powered wooden ships have been reported, especially on the west coast of Korea, the bulk of capacity to produce these types north of Formosa is in Japan Proper. A notable example of junk production, however, is in the extensive yard at Antung, where some 150 "ways" are shown by photo reconnaissance (5 February 1945); 13 ways are occupied by incomplete junks, and some 75 junks are afloat alongside, and at anchor off the yard.

## D. PHYSICAL VULNERABILITY FACTORS

Among the factors influencing the physical vulnerability of a target system are the size of vital installations, and the ease with which lasting damage can be inflicted by the weapons available.

### 1. Ships.

Individual ships present a difficult target for high level bombardment because of their maneuverability and their small size (about 25 percent of the fleet is composed of ships between 550 and 440 feet long, the balance of the fleet is of ships under 440 feet). Where ships are crowded into a limited anchorage area as is the case at some Japanese and continental ports, target size is in effect greatly increased and high level bombing attack can be made with considerable prospect of success. Even small and maneuverable ships can be successfully attacked at lower levels of bomb release.[15]

Mining is, in many circumstances, an alternative to bombing and rocket attack on ships. It has the advantage that great accuracy is not required and, unlike a bomb, a mine can threaten more than one target. If one ship does not come within its lethal area, another may. It can lie in wait for weeks or even months until a target presents itself and it can by its mere threat immobilize ships and interfere with cargo movement even though it does not sink a single ship. The use of mines against ships is limited by the fact that vessels under 250 g. r. t. generally are not susceptible to ground mines.

From the point of view of susceptibility to lasting damage ships afloat are, of course, highly vulnerable. Sinking, except in shallow water, will mean total loss, but whether the ship is entirely destroyed or later salvaged, replacement will ordinarily require at least several months.

### 2. Ports.

*a. Nature and significance of facilities.*—Port facilities fall into four main categories. The first category includes those which create and maintain a sheltered area within which ships may load and unload cargo and be serviced. Where shelter does not exist in nature, it is generally provided either in the form of breakwaters, harbor locks and gates, or in the form of dredging. Harbor gates are used in two important Japanese controlled ports, Miike and Jinsen. Wakamatu Osapa, Tokyo and river ports in Japan Proper need to be dredged continuously and the Chinese Yellow Sea ports are also dependent upon dredging for continued functioning.

The second category includes those facilities essential to the loading and unloading of cargo. These may be relatively simple and consist of no more than lighters, tugs, and shallow water quayage, or may be more complex and include deep water piers and wharves. The latter may be equipped with cranes. In certain ports through which large volumes of bulk cargo move, highly specialized loading and unloading equipment is used. Such equipment is available at Wakamatsu, Miike, Kanda, Muroran, Kushiro, Otaru, Kamaishi, and Rumoi.

The third category includes facilities for the storage of cargo in the interval between land and water transport. Warehouses will be required for general and some bulk cargo, but for types of bulk cargo not susceptible to weather damage only open storage space is necessary.

Railroad yards and spurs and roads in the harbor area by which cargo is moved into and out of the wharf areas constitute the final category of port facilities.

The facilities enumerated are of varying significance. The shelter aspect of a port is its most important characteristic. Rail and road access and rail yards are essential to a continuous flow of traffic through a port and rank with the shelter area in importance. Rolling stock repair and maintenance facilities at the port itself, however, are not essential to its continued functioning since, if necessary, they can be provided elsewhere. Specialized loading and unloading equipment is always associated with a heavy and continuing movement of bulk economic traffic. The disparity between the rate of handling which can be achieved by such facilities and the rates attainable by ordinary methods is so great that denial

[15] Refer to "Selection of Bombs and Fuses for Bombardment Targets," AAF Board Report prepared in collaboration with the Navy Department and approved by Joint Army-Navy Committee on Bomb and Fuse Selection.

of specialized unloading equipment is tantamount to blockage of the major portion of such traffic flow.[16] Facilities of this type therefore rank high in importance.

Wharves and piers of some sort are necessary for the landing and loading of cargo. But as a result of a much greater pre-war use of lighterage than in the Occident in virtually all Inner Zone ports, large numbers of lighters are available and lighterage techniques are highly developed. Consequently, denial of deep water berthage is not likely to be of major significance in Japanese ports so long as extensive quay areas for the loading and unloading of lighters continue to be available.

Wharfside warehouses are convenient for the handling of transit goods but are not essential for many types of freight, particularly Japan's vital raw material imports and many types of military supplies.

*b. Size.*—The size of important port installations varies, of course, from one harbor to another.

Lock and wet dock gates are so msall as to be difficult targets for even low level attack.

Dredges are comparable in size to the smaller types of merchant craft.

Specialized coal loading equipment will vary in size. Typically it is a medium sized target. The facilities in Japan range from 2,236 to 500 feet in length and are from 40 to 165 feet wide. In a few cases the equipment consists of nothing larget in area than large gantry cranes,[17] but is usually composed of a pier with an elevated trestle structure for the coal cars and several movable hopper-converyor- crane structures operating on tracks on the pier which transfer the coal to the ship's hold. The elevated structures are usually elevated anh range between 500 and 2,300 feet in length, and one or two railroad tracks in width. The loader tracks generally parallel the elevated structure. The loaders occupy areas about 50 squa.e feet.

Piers and wharves are typically long, narrow targets of lengths running into thousands of feet and breadths of up to a few hundred feet.

Rail facilities associated with port activities are usually rather widely dispersed through the wharf and pier areas, and the yards are likely to have comparatively few tracks. Major yards in the region of the port are also likely to be of some importance in port clearance, however.

[16] At Muroran, for example, the coal loading equipment can handle about 1,000 tons an hour. This is at least 10 times the rate attainable without mechanical means for a single ship and considerably more than that for a continuous movement of many ships.

[17] Janis chapters on port facilities furnish photographs of this coal loading equipment.

Warehouses and storage areas are comparatively large and easy to hit.

*c. Susceptibility to lasting damage.*—It is practically impossible to damage permanently such shelter facilities as breakwaters. Lock gates and dredges, of course, are easily destroyed if hit. Virtually the only methods of denying the use of the shelter of a harbor are to make the approach too dangerous by mining or submarine attack, by making the port untenable by repeated attacks on the shipping attempting to use it, or by sinking ships in narrow approach channels of river mouth ports. All except the last imply continuous effort. Where depths exceed 25 fathoms, currents exceed 2 knots, or the tidal range is great, aircraft mining will be impracticable.

The use of rail lines and roads can be denied by bombing for only a few days at a time in the absence of especially vulnerable installations such as bridges or tunnels on bottleneck sections. Yards may be largely put out of operation for weeks at a time, especially if sidings are heavily loaded and the cars can be set afire. In such an event, cars are immobilized and clearance takes a considerable period. In the case of classification yards the area presented is so large that a major attack will cause hundreds of craters and complete restoration of the classification function will take weeks (though through lines will be repaired in a few hours).

Wharves, piers, and quayage in Japan are typically of masonry and fill construction and are virtually immune to any but superficial damage. Only the very heaviest weight of attack of the type which would plough up the whole area would be effective and then only for a few days to a week.[18] Where only limited wharfage is available, however, denial of facilities for a period of many weeks might result from sinking vessels alongside. Floating piers exist at a few harbors, notably Kagoshima. These, of course, are easily destroyed if hit.

Warehouses are comparatively easy to destroy and their contents are often highly inflammable. Shelter against the weather in the form of temporary structures can, however, be fairly quickly provided.

The gantry and conveyor portions of coal loading equipment will require long periods of repair. The elevated track structures will be comparable to rail bridges in repair characteristics and may be put out of service for a few days to a number of weeks.

[18] The problem would be much the same (though somewhat less difficult) as that of airfield neutralization. Repair techniques would be similar.

**3. Shipyards.**

*a. Nature and significance of facilities.*—Shipyard facilities include shops and building ways. In the major yards there are heavy cranes both at the ways and at the fitting out piers. Engine building shops and graving docks are also available at the large yards, and a few yards have floating drydocks. The yard shops include mold lofts, plate rolling shops, and machine shops. The mold loft is the most vital part of the plant.

*b. Size.*—Effective bombing of a shipyard depends in part on its layout and size. In many yards it will be possible to select a single aiming point for attack on a number of types of installations. In other cases the yard may be strung out along a straight water front so that choice must be made between installations. Graving dock gates and cranes though of vital importance are so small as to present difficult targets even for low level bombing. Single docks, and ways are comparatively small targets, but in the case of the ways particularly, are likely to be found in groups. Because ship ways by themselves are only slightly susceptible to damage they are likely to be desirable objects of attack only when they have ships on them. The effectiveness of an attack, therefore, will depend on the number and juxtaposition of vessels under construction. The shop areas in major yards are substantial in size ranging from half a million to 2 million square feet.

*c. Susceptibility to lasting damage.*—Susceptibility to lasting damage is high in the case of ships even when on the ways or in drydock though the possibility of causing total loss, of course, is considerably less than in the case of ships afloat.

Empty graving docks and ways are difficult to damage severely though if cranes, gates or pump houses are directly hit, repairs may take a matter of months. As to graving docks in low lying ground, it is likely that perforations of the side or bottom would admit large quantities of water and mud.

Floating drydocks have somewhat the same susceptibility to damage as ships though they are more compartmented and less subject to fire damage.

Shops in shipyards have about the same susceptibility to damage as heavy engineering works. Mold loft shops are susceptible to incendiary attack, but the heavy machine shops are relatively poor incendiary targets.

# III. RELATIONSHIP BETWEEN MARINE CARGO MOVEMENT AND ENEMY MILITARY CAPABILITIES

## A. EFFECT OF POSSIBLE GENERAL REDUCTION IN IMPORTS

### 1. Introduction.

Successful attack on marine transport may affect enemy capabilities by restricting movement of troops and military supplies, by reducing imports and by affecting coastwise traffic. The movement of troops and supplies for defensive purposes will presumably have top priority. It will require but a fraction of the capacity needed for economic traffic, and will, particularly so far as mainland troop supply is concerned, involve flows in the opposite direction. The movement of the economic traffic will therefore be seriously affected before the military traffic is reduced at all. The military result of decreasing the movement of troops and supplies will depend in each case upon the tactical situation involved. For these reasons no appraisal of the effect on enemy strength which may be produced in this manner is here attempted.

In evaluating reduction in marine transport from the point of view of war production, it is necessary to assume certain levels of cargo movement to which the enemy may be reduced by successful attack. It is necessary also to propose a hypothesis as to the possible priority determinations by the Japanese General Staff, since cutting down the total cargo movement will in most instances still leave the enemy some freedom in determining where the impact of the attack will fall.

### 2. Extent of Effect of General Attack.

Three levels of imports, Scales A, B, and C, have been studied and a probable pattern of distribution of these tonnages among different products has been set up in accordance with an estimate of the relative importance of imports of the various commodities to the enemy war effort. For purposes of comparison, the present estimated pattern of imports has been set up in a parallel column.

Scale A assumes imports at a level of 8.5 million tons a year of which 6.75 million are assumed to be landed on Honshu and Kyushu. Scale B assumes imports of 4.4 million tons annually with 3.5 million landed on Honshu and Kyushu. Scale C assumes imports of 1 million tons annually.

Scale C would reduce coking coal imports to around 400,000 tons and aluminous shale to around 550,000 tons. Aluminum would continue to be imported to the extent of perhaps 25,000–30,000 tons and miscellaneous materials would drop to around 20,000–25,000 tons.

Neither Scale A nor Scale B attack will affect air strength through reduction in aluminum supplies so long as aircraft manufacture continues to be given its present top priority position in Japan. Scale C would reduce aluminum production by about 20 percent. If aluminum consumption in the aircraft industry had not already been cut by this amount by direct attack, this would affect enemy air strength.

| Product | Present scale of imports | Amount in thousands of tons | | | |
|---|---|---|---|---|---|
| | | Scale A | | Scale B | |
| | | Honshu and Kyushu | Hokkaido | Honshu and Kyushu | Hokkaido |
| Aluminous shale and aluminum | 750 | 750 | 0 | 750 | 0 |
| Pig iron | 2,540 | 2,540 | 0 | 1,340 | 600 |
| Iron ore and concentrates | 2,700 | 235 | 1,100 | 0 | 0 |
| Coal | 2,610 | 625 | 225 | 500 | 50 |
| Coke | 0 | 0 | 250 | 0 | 100 |
| Salt | 900 | 350 | 100 | 250 | 100 |
| Foodstuffs | 2,500 | 2,000 | 100 | 500 | 100 |
| Miscellaneous | 400 | 250 | 50 | 100 | 50 |
| Total | 12,400 | 6,750 | 1,825 | 3,440 | 900 |
| | | 8,575 | | 4,340 | |

Scale A reduces steel production to about 4.25 million tons, Scale B to about 3 million, and Scale C to about 1.4 million. It is clear that the first two reductions in steel output amounting to 15 and 40 percent respectively, would produce a reduction in either ground strength, naval strength or merchant shipbuilding. Up to the present, shortages in steel supply have been taken out of ground armaments. In 1944, the prospect of an annual steel rate no higher than about 4.5 million tons forced the Japanese to cut manufacture of ammunition 57 percent, and that of weapons generally by 28 percent from 1943 levels and to stop completely the production of tanks and heavy artillery.

By dropping building of steel vessels of over 250 g. r. t. from its present top priority position in steel allocations, the Japanese could free up to around 20 percent of steel supplies for the building up of land armaments. A mine blockade which made a considerable percentage of the existing merchant fleet useless would, of course, provide a strong incentive for such a change of priority and to that extent would tend somewhat to delay its own effects. If the reduction in the steel rate were the result of loss of ships rather than denial of ports, a cut in shipbuilding priority would be somewhat less likely. If the Japanese General Staff determined to rely on increased land armaments for the defense of Japan at the expense of sea power and upon wooden shipping for maintenance of im-

ports, no substantial drop in the production of ground armaments would occur under Scale A blockade. Scale B would guarantee at a minimum that ground and air armament combined would be held to the 1944 level and might force a reduction in these items. The 1944 rate could be maintained under Scale B only at the cost of eliminating building of steel merchant vessels and naval ships, reduction of naval repair and cutting indirect military uses of steel by more than 50 percent. Scales C blockade would force substantial cuts in allocations of steel to armaments no matter how drastically other uses are readjusted.

Necessary coking coal would continue to be available on the three main islands under blockade Scales A or B since as steel output declined as a result of lack of ore, coking coal requirements would also fall. Under Scale C only domestic iron ore would be available. So far as smelting of domestic ores is concerned, necessary imports of coking coal for blending with domestic coal could be reduced to around 400,000 tons. This tonnage would be likely to come in as long as any small vessel movement whatever, either from the mainland or Karafuto continued to be possible.

Other grades of coal would be in surplus supply on Kyushu and Hokkaido under any scale of blockade. The situation which would prevail on Honshu would depend upon the coastwise shipping situation and the availability of the Kammon Tunnel and Hakodate-Aomori rail ferries. If present movement by these facilities were reduced to say 5 to 10 million tons, reducing imports to Scale A and Scale B levels would produce coal deficits on Honshu of 40 to 60 percent, respectively, below the minimum essential to current levels of war production. The enemy would then be presented with the choice of an immediate and severe restriction in the operations of the long list of war industries using coal or of accepting a severe impairment of his long term position by decreases in the amount of synthetic oil production and further deep cuts in steel output and food imports in order to decrease the coal deficit to around 25 to 40 percent. Under Scale C blockade no significant adjustment of imports to minimize the coal shortage would be possible.

Scale A attack would cut Japan's current salt resources by over 25 percent and Scale B by over 34 percent. It is clear that some effect on production of chemicals important to the supply of enemy ground forces would be produced by either decrease in salt supply though the effect cannot be stated in quantitative terms. The depth of the cut would depend to some extent on the reduction which the Japanese felt able to make in the use of salt for food preservation purposes. Since the largest use in the field is in the preservation of fish and since the Japanese diet is already dangerously low in proteins, it is doubtful that any great saving could be made in this direction. Scale C blockade would reduce salt supplies to 44 percent of current resources. This would affect both chemical and food supplies.

Foodstuffs imports were, in 1944, considered of sufficient significance by the enemy to be maintained in the face of reductions in output of basic armaments caused by lack of shipping space. Relative priorities are likely to change, however, in view of the more immediate threat to the centers of Japanese power which now exists.

The probable allocations of limited cargo movement listed in the tables above are based, to a considerable extent, on the assumption that the Japanese will seek to keep imports at a level sufficient to maintain food supplies without drawing on stocks. An enemy administration which was willing to gamble on the continuance of normal crops for a year or two could, if current estimates of food stocks are correct, cut annual food imports to one-half million tons annually for about a year. This cut in food imports might be made under Scale A blockade. If the 1.5 million tons of cargo capacity thus freed were applied to import of iron ore and coking coal, the enemy could hold the cut in steel production under Scale A to 5 percent.

A cut in food imports would almost certainly be made for at least a year under Scale B blockade. In the long run, however, Scale B blockade will compel a reliance upon stored stocks which can be continued for only a limited period without condemning part of the population to slow starvation. Given perfect distribution of food supplies, a drop in food imports of 80 percent such as is postulated under Scale B, or a complete stoppage such as would occur under Scale C would result in a deficiency in the Japanese diet of 8 to 10 percent below bare subsistence level. Since distribution in Japan is very far short of perfection, the situation would in fact be far more serious than the figures indicate and after stocks were depleted imports of armaments materials could be expected to be still further reduced in favor of food imports. Restoration of balance between supply and requirements would, under Scale B, imply a cut in steel output to about 2.5 million tons or slightly over 50 percent of the current inadequate rate. Under Scale C the enemy could not balance his food situation even by foregoing all other imports.

## B. SELECTIVE REDUCTION OF COAL SHIPMENTS TO HONSHU

As noted, general attack against transport, including marine transport, tends to be nonselective and to affect the movement of those commodities which the enemy regards as most important only after the shipment of items of lesser significance has been stopped. Granted this fact, it is nevertheless evident that the pattern of the supply and utilization of coal on Honshu is such that attack upon transport can cut heavily into coal shipments, high in priority though they are.

Coal consumption on Honshu is believed to be at the current annual rate of about 35 million tons. Available intelligence indicates that, even at this rate, the cushion of low-priority uses is comparatively small. The fact that Kyushu blast furnaces and coke ovens are almost fully active while Honshu facilities are largely shut down is to be explained in part by the effort to minimize the movement of coal. Shortages of electric power in the Tokyo area during the recent dry season indicate a lack of coal to run the steam plants. Even before the war, coal was little used for domestic heating and cooking, and the use of coal for commercial space heating had been sharply reduced. Domestic consumption of gas is small compared to industrial use.

Coal production on Honshu totals only about 7 million tons, or 20 percent of the present rate of consumption. Reductions in inbound shipments must inevitably make a relatively heavy proportionate cut in total consumption.

Coal constitutes about 75 percent of the total inter-island traffic (both water and rail) to Honshu. The impact of any substantial attack upon this traffic must perforce fall upon coal, whatever priority it may be assigned.

Present coal imports, totalling about 2.6 million tons, account for about 21 percent of all imports into Japan. Imports of noncoking coal will be among the first to be affected by any further limitation of imports, and remaining tonnages will be a minor factor in the total supply position on Honshu.

Analysis of coal consumption on Honshu indicates that, for uses essential to the continuance of present war production, about 29 million tons are required. As will be noted in the next section, there is a reasonable probability that coal supplies on Honshu can be held to 15 to 17 million tons, particularly if attack is made on specialized coal handling equipment. It is evident that the resulting shortage of 42 to 50 percent (13 to 15 million tons) would be felt pervasively over the whole war economy. No considerable opportunity to shift the impact of the shortage would exist. The 29-million-ton requirements figure assumes that the requirements of raw materials industries will have been minimized by shifting production so far as possible to Kyushu and allows only about 2 million tons for minimum civilian requirements. Certain of the lower priority military end product and component industries would probably be affected relatively quickly both through decrease in the power supply and through reduction of the supply for raw material and for the production of heat and steam. The percentage reduction in the operations of heavy industry would be likely to parallel that of the coal supply both in amount and timing. Top priority military end product output would, however, be affected mainly by decreased raw material supplies and the impact on such items would therefore be delayed for a number of months.

## C. NATURE AND SCALE OF EFFORT REQUIRED

### 1. General Reduction of Imports.

*a. By sinking ships.*—The following table states the levels to which tonnage in home waters available for cargo movement must be reduced [1] to attain the three levels of blockade discussed above if blockade by ship attrition is sought and the time required to make such sinkings at loss rates, three, four and five times those which prevailed in home waters during 1944.[2]

| Extent of blockade | Point to which shipping must be reduced (g. r. t.) | Time required to effect reduction at various sinking rates | | |
|---|---|---|---|---|
| | | 300 percent (180,000 g. r. t. per month) | 400 percent (240,000 g. r. t. per month) | 500 percent (of 1944 home waters average 300,000 g. r. t. per month) |
| | | *Months* | *Months* | *Months* |
| Scale A (8.75 million tons of imports) | 550,000 | 8.7 | 5 | 3.5 |
| Scale B (3.5 million tons of imports) | 216,000 | 12.3 | 7 | 5 |
| Scale C (1 million tons of imports) | 66,000 | 14.1 | 8 | 5.6 |

In practice these times might be somewhat reduced. The confusion and administrative friction which would be caused by a high sinking rate in home waters plus increased convoying would impair efficient use of the shipping available. Even if efficiency were halved, however, times to attain Scale B would be decreased by only a month to 6 weeks and to attain Scale C by only a week or two. It seems likely therefore, that reduction in ship supply alone, even if losses are greatly increased in home waters, cannot impose a decisive

[1] Assuming 15 round trips per year.
[2] Assuming monthly new construction of 100,000 g. r. t.

measure of blockade on Japan for around 4 to 5 months after the increase takes place.

Ability to maintain the higher rates of sinking might well imply an ability to interdict virtually all traffic between the mainland and Japan. Sinkings of 300,000 tons monthly amount to a 20 percent loss rate which in the case of mine fields is considered a sufficient risk to cause complete stoppage of traffic. If the sinkings were occurring in all areas through which traffic could pass between Japan and the continent and the Japanese reacted to the threat by ceasing to operate ships except on a blockade running basis, a significant cut in imports would be attained considerably sooner than it would be as a result merely of reduced ship supply.

*b. By denial of ports.*—Blockade of Japan by denial of ports will have an immediate effect on the movement of cargo. And, provided enemy diversion efforts are promptly countered, commodity shipments will be stopped even before all ports which could handle shipments are closed.[3] Since there will be a time lag of some months in any event in the effect of a decrease in raw material supply on enemy military end product output, the advantage of port attack over ship attrition which does not result in interdiction is substantial.

Bombing attack on ports is as noted, a relatively expensive means of denial both because the number of targets to be hit is high and because of the short repair time. Mining can deny groups of ports by a single pattern of mines and recovery time will be prolonged at least for weeks as a result of mine sweeping difficulties. Attack by this means supplemented by bombing and rocket attack against unminable ports and vessels invulnerable to mining can, together with submarine operations on the current scale, impose a close blockade of Japan probably somewhat in advance of the time when it will be possible to establish such a blockade by naval surface and submarine operations in the Tsushima Strait and Japan Sea.

Twenty-five to thirty ports would have to be closed to secure Scale A blockade and up to ten more plus bombardment of three unminable ports to reduce imports to Scale B and Scale C levels. Appendix D contains a list of mining priorities for Japan proper.

Blockade will be tightened and the effects of ship attrition speeded if the use of small vessels on shuttle runs to the mainland can be cut down by stoppage of rail traffic to South Korean ports.

[3] Since current movement is concentrated to a considerable extent, it can be temporarily *but not permanently* blocked by closure of a part of the ports. Thus blockade will be secured even before all diversionary ports are closed.

## 2. Selective Attack Against Honshu Coal Shipments.

Such an operation, which has greater promise of immediate reduction of enemy strength than any other form of attack on marine transport, would consist of an attack on marine transport supplemented by bombardment of certain rail facilities. The sea part of the program would include mining of the nine coal handling ports of Kyushu and Hokkaido, bombing of the specialized coal handling equipment at these ports so as to obviate the efficient use of lighters and small vessels, and interdiction of the Hakodate-Aomori rail ferries either by sinking the eight ferries (which in view of the specialized nature of these vessels would have the most lasting effect), mining the two ports, or keeping the ferry landings unserviceable. The rail part of the program would involve bombardment at intervals of perhaps two weeks, of the Dairi yard and Kammon Tunnel entrance which are particularly vulnerable, the Hikoshima yard and associated viaduct and the Hatabu yard. In addition, it would be necessary to count on the expenditure of a substantial number of sorties to counter diversions to other ports and to small craft.

If air effort on the mainland were available, a combined program of mining Chingtao (Tsingtao), Hsukow (Lienyun) and Tangku and bombing the Luan River and Miyun River bridges on the Peiping-Mukden lines would exacerbate the Japanese coal situation considerably by cutting off the principal source of mainland supply, including the best coking coal.

The principal program would call for from 9 to 11 mine fields, 9 coal loading piers, 1 combined rail yard and tunnel target, 1 combined bridge and rail yard target and 1 rail yard. Attack on 8 car ferries or 2 ferry landings could be substituted for one of the mine fields or added to it for increased assurance of traffic interdiction. The mainland supplement would require 3 mine fields and 3 bridge targets. In advance of experience as to Japanese reaction, it is impossible to state how often attacks would have to be repeated but the range of probability lies within one to four missions a month for the mine fields and coal loaders and 2 to 3 missions for the rail targets.

# IV. RELATIVE AIR TARGET MERITS OF VARIOUS TYPES OF MARINE TRANSPORT FACILITIES AND MARINE MOVEMENTS

Ships, shipyards and ports which constitute the main categories of marine transportation targets have the following merits and demerits from a target standpoint.

## A. SHIPS

### 1. Merits.

Ships are being used to capacity and are already a limiting factor on the enemy war economy. Ships are being and will continue to be attacked by the Navy. Consequently, air and naval strength will complement each other and both will be concentrated and brought to bear simultaneously on a vital element of the enemy war economy. Ships are highly susceptible to physical damage.

### 2. Demerits.

Ships constitute a highly dispersed target. Even the largest concentrations do not exceed 10 percent of the total and most concentrations are considerably smaller. Consequently, many targets must be attacked before any substantial result will be achieved.

Because of the dispersed target character of ships, the total tonnage available can be decisively reduced only over a period of months of protracted campaigning. Effect of attack on enemy production will therefore be comparatively slow. If a sufficient weight of attack to accomplish traffic interdiction is possible, however, the effect will, of course, be much more immediate.

Ships present a very small target for high level bombing.

## B. SHIPYARDS

### 1. Merits.

Shipyards building steel vessels present a moderate target concentration with 62 percent of production in 16 installations.

Annual new steel ship construction amounts to about 60 percent of tonnage afloat. So long as a high rate of attrition exists, any change in the building rate will rapidly reflect itself in the total amount of shipping available to the Japanese. Wooden ship construction is an even higher proportion of tonnage of this type afloat and such craft are hard to attack once they become operational. Shipbuilding facilities are being used to capacity and some expansion is taking place. Susceptibility to physical damage is at least fair in steel shipbuilding yards and very high in yards building wooden ships.

### 2. Demerits.

Shipbuilding is consuming large quantities of steel which would otherwise go into the manufacture of armaments. Since it is easier to sink ships at sea that to prevent the manufacture of ground armaments, and since ground forces constitute that aspect of enemy strength which it is most difficult for our forces to overcome, it would be disadvantageous to deprive the enemy of the means of putting steel into ships. This consideration does not apply to wooden shipbuilding nor to sinking ships fitting out. The effect on cargo movement of the destruction of ship yards would be slow and not of major proportions. And since yards build steel ships at the rate of three or four per way per year, 50 percent of the effect of complete destruction would not be felt for 6 to 8 months and there will always be some time lag before the loss of an incomplete vessel is felt in cargo movement. Wooden shipbuilding yards are small, dispersed and numerous.

## C. PORTS

### 1. Merits.

Denial of port capacity will have an immediate effect on cargo movement. Port facilities, while less highly concentrated than shipyards, are very much more concentrated targets than are ships. This is particularly true if mining is the form of attack chosen. Ports of primary significance in the coal trade constitute a group of nine targets.

Interdiction of ports by mining will demand only a low scale of bombing accuracy at least until enemy sweeping techniques are perfected.

### 2. Demerits.

There is much idle port capacity. Hence, a considerable cushion must be cut through before cargo movement will be affected by attack. Port facilities are relatively invulnerable to bombing. This is not true of specialized loading equipment but this will be best attacked by low level precision bombing.

## D. SUMMARY

On balance, it appears that among marine transportation targets, ports offer the best targets for producing a quick and decisive effect on enemy military strength, with mining the preferred form of attack.

Attack on ships is, of course, to be preferred where the number of ports which can be attacked is too small to secure traffic interdiction, where the type of aircraft available is not suited to mining, or where specialized vessels such as car ferries are involved.

Bombing of steel shipbuilding yards has a low priority and should not be undertaken since the possible short term effect would be to increase the enemy's strength in ground armaments where we will have the most difficulty in overcoming it. Ships fitting out are, however, desirable targets.

Wooden shipbuilding, is a desirable though dispersed target system since a marked increase in enemy holdings of this type of vessel will be of considerable military and economic importance and will be very hard to deal with once the craft go into operation.

Possible choices of objects of attack are the general import movement and the movement of coal from Hokkaido, Kyushu and the mainland to Honshu. Direction of the attack against the shipment of coal to Honshu will pay larger and more immediate dividends in terms of diminishing the production of armaments than will a general reduction of imports to any but the lowest level. Coal is a current supply for military end products industries as well as a source of raw material, and no substantial stockpiles or substitutes exist. A general reduction in imports will produce an impact principally upon steel production. While this is already limiting armaments output, the pool of circulating scrap will permit the enemy to delay for six months or more the effect on arms building of a decrease in steel production to even a Scale C level. Desperate measures such as the cannibalization of unused industrial plant would permit even longer deferment of the effects of attack.

To carry out attack on coal shipments will require a substantially smaller commitment of force than will interdiction of imports from the continent.

The air forces in China can make a distinct contribution to the success of either program.

# APPENDIX A—POTENTIAL OF VESSELS UNDER 1,000 G. R. T.

## 1. General.

Statistics generally quoted as to the Japanese shipping position deal with vessels over 1,000 g. r. t. Until recently these have furnished adequate data for an appraisal of the relationship between shipping and Japan's war potential. As the total tonnage of vessels of over 1,000 g. r. t. has dwindled under the impact of naval and air attack, and as Japan has been stripped of its overseas conquests at an ever accelerating rate and thrown back more and more on its own resources and those of the nearby Asiatic mainland, the question of the extent to which the enemy can meet his needs for marine transport with vessels under 1,000 g. r. t. has, however, become of much increased significance. This significance is greatly augmented on the one hand by the shortness of the voyages now involved in maintaining economic traffic (which reduces the need for the advantages of speed and sea-keeping qualities inherent in the larger vessels) and on the other by the possibility of mining attack in Japanese waters on all engine driven vessels over 250 g. r. t.

This appendix does not claim to be a definite study of small shipping potential. It does indicate that, on the face of the rather inadequate intelligence which is now at hand, the 1.6 million tons of vessels between 1,000 and 20 g. r. t. plus a substantial tonnage of barges do have the potentiality if fully employed and not attacked, of considerably alleviating the effects of mine blockade and sinkings of larger craft. Further collection and analysis of evidence on the question is indicated. The more important factors are discussed below.

## 2. Engine Driven Vessels.

Engine-driven vessels have been considered in two categories, those from 1,000 to 250 tons, which can be attacked by present types of ground mines, and craft under 250 tons which generally cannot be so attacked.[1]

(*a*) *1,000–250 g. r. t.*—(i) *Tonnage available for cargo carriage.*—As of 20 January 1945 there were afloat vessels totalling 380,000 g. r. t. in this size range.[2]

Of this tonnage 50,766 tons are identified as specialized vessels, dredges, car ferries, whale killers salvage, picket and rescue boats, "honey" barges and so forth which would have to be excluded as potential cargo carriers.

At least another 21,538 tons is made up of fishing vessels. These could carry bulk cargo if necessary though their comparatively small hatches would lead to slow loading and unloading. Since, however, these vessels if not taken over by the army or navy are contributing to the already straitened food supply, their diversion would increase the deficit to be made up by imports. In theory, they could probably bring in more calories and even more proteins if employed in hauling soy beans from Manchuria than in fishing, but it is likely that any substantial shift of this tonnage to cargo carrying would be made only under conditions of the most extreme pressure.

A portion of the balance of 307,696 g. r. t., undeterminable but probably not in excess of 115,000 tons is allocated to Army and Navy use.[3]

These exclusions from the 380,000 ton total leave around 192,000 g. r. t. available for cargo carriage.

(ii) *Cargo carrying capacity of tonnage available.*—Only an approximation of the magnitude of the weight of cargo ships in the 1,000–250 class available for economic traffic might carry is possible. Among the variables which affect any such calculation are, distance to be run, speed of vessel under various conditions of wind, sea, and current, cleanness of the ship's bottom and degree of maintenance of her engines, turn-around time in port (which will be affected by port congestion, availability of dock labor, bunkering efficiency, and so forth), convoy practice if on a convoyed run, ratio between gross and deadweight tonnage of individual ships, and nature of the cargo carried.

Without having attempted a lengthy statistical analysis, inspection of tabulated characteristics of gross and net tonnages and discussion with officers of the United States Maritime Commission indicates that the gross to deadweight tonnage ratio is only slightly lower in the 1,000–250 g. r. t. class than in the medium cargo vessels. A ratio of 1 to 1.3–1.5 (depending on the nature of the cargo) is generally accepted for the latter. Accordingly a ratio of 1 to 1.25 has here been taken for the smaller vessels.

Speeds in this class are, of course, more likely

[1] According to Office of Chief of Naval Operations, Mine Warfare Sections.

[2] Unless otherwise noted, tonnage afloat figures in this Annex are taken from a report dated 22 January 1945 on distribution of small ships in the Japanese merchant marine supplied by Op 16 FE, CNO.

[3] This allocation is not hard and fast but fluctuates with military and naval requirements. As far as areas other than the mainland are concerned the former have recently declined drastically. As far as mainland needs are required military and economic cargo needs are complementary since the movements are in opposite directions.

to be affected by adverse weather. For this reason and because the Army is likely to have requisitioned the better vessels, the average cruising speed of 9 knots shown by Op 16 FE for army transports of this size is probably too high for this port of the merchant fleet generally. Eight knots is a more likely figure.

Japan and Yellow Sea mainland ports are within 500 nautical miles of either the northern or southern open ports in Japan. Transit time at 8 knots on a 1,000-mile round voyage will run to almost exactly 5 days. Allowing a week in port at each end would result in a total turn-around time of 19 days. Weather conditions should not interdict operations for more than 65 days per year. Given 300 operational days per year, 15 round trips annually could be made.[4]

Annual bulk cargo carrying capacity on this basis would be as follows:

192,000 g. r. t. − 15% for layups =
163,200 g. r. t. × 1.25 × 15 = 3.06 million metric tons per year.

(*b*) *Vessels 250–20 g. r. t.*—(i) *Tonnage available for cargo carriage.*—Full powered vessels in this size range totalled 288,000 g. r. t. on 20 January 1945 and auxiliaries 582,000. Of these tonnages, 163,000 and 232,000 respectively were in units of 100 g. r. t. or more.

Of the full powered craft, at least 25,656 g. r. t. fell into one of the specialized classes mentioned above in paragraph (*a*) (i).

About 50,000 g. r. t. or half of the total shipping in the 100–500 g. r. t. class shown by Op 16 FE as allocated to army and navy use, has been allowed for the 100–250 g. r. t. block. No data is available for the 20–100 g. r. t. block other than that hundreds of such craft have been requisitioned. If the same ratio between total tonnage in the size range and military and naval requisitions is applicable, a deduction of 38,000 g. r. t. follows.

On this basis full powered tonnage in the 250–20 g. r. t. range is not likely to exceed 175,000 g. r. t.

The deductions applicable to full powered craft do not, with the exception of fishing craft, apply to auxiliaries.

Vessels in the 250–100 g. r. t. block have been identified as fishing type craft to the extent of at least 25,686 g. r. t. The data available do not allocate these between full powered and auxiliary units and there is no indication that auxiliaries are included.

There is no data on the percentage of the tonnage in the 100–20 g. r. t. range constituted by fishing vessels. Comments made above as to the improbability of large scale diversion of fishing craft in the 1,000–250 g. r. t. class to cargo carriage apply with equal force to vessels in the 250–20 g. r. t. range.

The tonnage of 250–20 ton vessels definitely identified as fishing craft is only a small portion of the total fishing tonnage in this size range. The residual of 730,000 g. r. t., calculated by the use of these figures, therefore, merely represents the known top limit on the number of vessels of this size available for economic traffic. While, as noted, data from which a precise determination of the true figure could be made is lacking, it would be reasonable, judging from the size and importance of the fishing industry in Japan generally and the fact that two-thirds of the fish catch is made in local waters by smaller craft, to reduce this residual by 50 to 60 percent in appraising enemy capabilities.

(ii) *Cargo carrying capacity of the tonnage available.*—Sampling of gross-net tonnage ratios in the 2,000–3,000 ton size range and the 250–100 ton range indicates that the gross tonnage to deadweight tonnage ratios should not be very different for the two sizes so far as full-powered vessels are concerned.[5] A ratio of 1 to 1.25 is therefore believed to be conservative.

Auxiliary-powered vessels, of course, have a net tonnage which more closely approaches gross tonnage than that of full-powered vessels.[6] A gross to deadweight ratio of 1–1.6 has been taken as a fair basis for figuring bulk cargo capacity.

Speed of full-powered vessels in the 250–20 g. r. t. size range has been taken as 7 knots which is a downward adjustment of the 8-knot average for vessels in this class in use by the Army. Data is lacking on speeds of Japanese auxiliary-powered vessels. A speed of 3 knots seems a reasonable assumption.

The 250–20 g. r. t. class of vessels if used for cargo carrying would be employed in coastal waters and for choice predominantly in the sheltered waters of the Inland Sea. Prisoner of war and other reports indicate that vessels of about 200 g. r. t. were being used in the Inland Sea coal trade in 1941–43. Use of vessels in the 250–100-ton range on coastal runs,[7] in trade between Hakodate and Aomori and even in carrying coal and iron between the mainland and Japan [8] have also been received. Insofar as the enemy attempts to maintain traffic with the mainland by use of craft in the 250–20 g. r. t. class, he is likely to route the vessels between south Korean ports and the Shi-

[4] Japanese Staff Logistics Manual gives the same figure.

[5] The sampling has been only partial and is not claimed to be statistically conclusive. This is occasion for further research on this point.

[6] Since their propelling machinery, being smaller in relation to the size of vessel, takes up less of the total volume of the vessel.

[7] A POW report (14J-957-NA) states that early in 1944, 80 250 g. r. t. wooden ships were carrying coal from Muroran to Shiogama. Reports of expansion of rail connections to Shiogama broadcast in the fall of 1944 tie in with this.

[8] ONI 49, Change 16, p. 35.

moneseki Straits area so as to shorten the run as much as possible.

On these assumptions, annual bulk cargo movement per 10,000 g. r. t. of vessels available has been calculated for three runs which should be typical of those attempted by craft of this size range, i. e., Muroran-Shiogama, Shimonoseki-Kobe and the Tsushima Strait run.

These routes involve round trip distances of 600 (nautical) miles, 480 miles, and 250 miles, respectively.

On the Muroran-Shiogama run, there will be an average of 290 days a year with seas no more than 9 feet high [9] and this has been taken as a fair figure for the number of operational days per year to be expected for the full-powered vessels in question. For auxiliaries this figure has been further reduced by 40 days.

On the Inland Sea weather conditions are unlikely to be a serious problem except in the severest weather. Hiroshima averages only 2 days a year with winds of over 35 [10] m. p. h. and Kobe but 5.[10] At Shimonoseki, the average is 31 [10] and since this is one vital terminal for the traffic under discussion, conditions at this point have been taken as controlling; 330 operational days annually have accordingly been allowed for this run.

Traffic across Tsushima Strait must contend with prevailing winds from northerly quarters during the winter season. There are, however, an average of 275 days a year when seas in the Strait are no more than moderate [11] and on which operations should be possible for full-powered vessels. For auxiliaries, a further adjustment of 40 days has been made.

On the basis stated above, the annual bulk cargo carrying capacity of full-powered and auxiliary vessels on the stated runs would be about as follows:

*Shiogama-Muroran:*

*Full-powered Craft:*

Transit time=600 (n. mi.)÷7 (knots)=85.7 hrs.=3.5 days.

Time in port—3 days at Muroran (coal loading time would be virtually negligible since mechanical loaders can handle 500 tons per hour), 5.5 days at Shiogama (there is a bridge-crane for the unloading of coal at this port).[12]

Total turn-around time=3.5+3+5.5=12 days.

Round trips per year=290 (operational days) ÷12=24.

Annual bulk cargo movement per 10,000 g. r. t.= 24 (round trips)×10,000 (g. r. t.)×1.25 (gross to deadweight tons)=300,000 tons.

*Auxiliaries:*

Transit time=600 (n. mi.)÷3 (knots)=200 hours=8.3 days.

Time in port—(as above)=8.5 days.

Turn-around time=8.3+8.5=(rounded) 17 days.

Round trips per year=250 (operational days)÷17 (days per round trip)=14.7.

Annual bulk cargo movement per 10,000 g. r. t.= 14.7 (round trips)×10,000 (g. r. t.)×1.6 (gross to deadweight tons)=233,600 tons.

As noted, it is reported that in early 1944, the Japanese had allocated eighty 250 gross ton standardized wooden vessels to haulage of coal between Muroran and Shiogama. 80×250= 20,000 g. r. t. On the above basis this amount of vessels could deliver 600,000 tons of coal to Shiogama annually.

*Inland Sea:*

*Full-powered Craft:*

Transit time—480 (n. mi.)÷7=68 hours= (rounded) 3 days.

Time in port=Other than coal=14 days Coal—3 at Wakamatsu [13]+6 for unloading=9 days.

Turnaround time, 12–17 days.

Round trips per year=330 (operational days)÷ 12–17 (days)=27 to 19.

Annual bulk cargo movement per 10,000 g. r. t.= 19–27 (round trips)×10,000 g. r. t.×1.25 (gross to deadweight tons)=237,500 to 337,500 tons.

*Auxiliaries:*

Transit time=480÷3 knots=160 hours= (rounded upwards) 7 days.

Port time (varied as above) 9 to 14 days.

Turn-around time, 16 to 21 days.

Round trips per year=300 (330−30 days)÷ 14–21=14 to 18.75.

Annual bulk cargo movement per 10,000 g. r. t.= 14–18.75 (g. r. t.)×10,000 (g. r. t.)×1.6 (gross to deadweight tons=224,000 to 300,000 tons.

*Tsushima Straits:*

*Full-powered Craft:*

Transit time=250 (n. mi.)÷5 (knots)=50 hours=(rounded), 2 days.

Time in port, 14 days.

Turnaround time, 16 days.

Round trips per year=275 (operational days)÷ 16 (days)=18.

Annual bulk cargo movement per 10,000 g. r. t.= 18 (r. t.)×10,000×1.25=225,000 tons.

*Auxiliaries:*

Transit time=250 (n. mi.) ÷3 (knots)=83 hours=(rounded), 3.5 days.

Time in port, 14 days.

Turnaround time (rounded upward), 18 days.

Round trips per year=235 (operational days) (275–40)÷18=13.

Annual bulk cargo movement per 10,000 g. r. t.= 13 (r. t.)×10,000×1.6=200,800 tons.

## 3. Sailing Vessels.

(a) *Tonnage available.*—Information concerning Japanese sailing vessels is, as might be expected, scanty. The Japan Times Yearbook for 1943 [14] puts the total tonnage of this type of vessel in 1940 at 1,112,254 g. r. t. The data on engine-driven vessels in the same publication appears to to be somewhat of an understatement of the

[9] Janis 81, Ch. III, p. 7.
[10] Janis, 84 Ch. V, p. 45.
[11] Janis 84, Ch. III.
[12] Janis 85, Ch. VI.
[13] Which has large mechanical coal loading facilities.
[14] Domei Jiji Nankan (Tokyo 1943), p. 284–288.

actual tonnage. And the sailing vessel figure corresponds closely with that in ONI 49, Change 16, prior to the revision on 20 January 1945. That revision, however, gives the following round figures for three size ranges:

| | |
|---|---|
| Over 100 g. r. t. | 100,000 |
| 20–100 g. r. t. | 300,000 |
| 5–19 g. r. t. | 60,000 |

ONI estimates that about 75 percent of the sailing tonnage is composed of fishing craft. The latter almost certainly fall at the low end of the size range. If this allowance is correct, around 115,000 to 278,000 g. r. t. are available for cargo haulage in coastal waters.

(*b*) *Cargo carrying capacity.*—Sailing vessels are best adapted, so far as Japan is concerned, to the movement of bulk cargo in the Inland Sea and the appraisal in this Annex of their capabilities is based on their being so used.

Estimate of speeds to be expected must be based mainly upon judgment since data on actual experience in these waters is not at hand. Study of weather data for the Inland Sea indicates that moderate and fairly continuous winds persist through most of the year (average wind velocities at Shimonoseki, Hiroshima and Kobe are as follows, 8, 4.3, and 5.6 knots). There are calms at Hiroshima on an average of only 7 days per year. The data for winds over 35 m. p. h. has already been cited. The winds predominantly have a northerly or southerly component in this area which favor sailing passages in an east-west direction. An overall passage speed of 1.25 knots has been allowed so as to cover delays while waiting for tides or adverse winds.

Since sailing vessel cargo space is not reduced by propulsion machinery, the gross to deadweight tonnage ratio is estimated to be not less than 1 to 2.

Annual cargo capacity for the Inland Sea run for the estimated tonnages available would therefore be about as follows:

Transit time=480 (n. mi.)÷1.25 (knots)=384 hours÷24 (hours)=16 days.
Time in port=14 days.
Turn-around time=30 days.
Round trips per year=300 (operational days)÷30 (days per r. t.)=10.

Annual bulk cargo movement:

115,000 g. r. t.=10×115,000×2=2.3 million tons.
278,000 g. r. t.=10×278,000×2=5.56 million tons.
10,000 g. r. t.=10×10,000×2=200,000 tons.

## 4. Barges.

(*a*) *Tonnage available.*—There are no statistics on the subject. Persons familiar with Inland Sea shipping before and during the war report that there was a very substantial movement of bulk cargo, including coal, by barge. Barges ranged up to 500 tons in size and tows contained up to six units.

There are at least 22,000 g. r. t. of tugs in Japan.

(*b*) *Cargo carrying capacity.*—Speed in this category is also problematical. Office of Defense Transportation,[15] on the basis of long experience with coal tows on inland waters, including a difficult canal passage, between New York and Boston (a distance closely comparable to that between Shimonoseki and Kobe) has estimated turnaround time with crane unloading at around 21 days.[16] Though American tugs are more powerful than Japanese, American barges are several times as large. Moreover, delays occur on the New York-Boston run owing to difficulty in getting into and out of the Cape Cod canal in weather which would permit continued passage in less confined waters. The navigational hazards in the Inland Sea appear to be less.

A gross to deadweight tonnage ratio of 1 to 2 is stated to be conservative for barges.

Annual bulk cargo capacity per 10,000 g. r. t. would on the above basis be as follows:

Round trips per year=300 (operational days) ÷ 21 (days per round voyage)=(rounded) 14.
Annual capacity per 10,000 g. r. t.×14×10,000×2=280,000.

## 5. Summary and Conclusion.

The following table indicates in millions of metric tons possible annual Inland Sea bulk cargo movement by vessels in the 250–20 g. r. t. range in the various categories assuming the above calculations are valid approximations of capabilities.

| G. R. T. allocation | Full-powered | Auxiliary | Sail | Barge |
|---|---|---|---|---|
| 100,000 | [1] 2.43 | [1] 2.25 | 2 | 2.8 |
| 200,000 | [2] 4.86 | 4.50 | 4 | 5.6 |
| 300,000 | [2] 7.29 | [2] 6.75 | [2] 6 | [1] 8.4 |
| 400,000 | [2] 9.72 | [2] 9.00 | [2] 8 | [1] 11.2 |

[1] Calculated on a minimum basis.
[2] These tonnages would be applicable in the indicated class only if there was very substantial building or fishing conversions.

The above figures as to capacities of various types of vessels of less than 1,000 g. r. t. are not to be taken as an indication of net additional marine transport capacity which is now idle and which could be called into play in case cargo movement in larger vessels were interdicted. It is probable that most small tonnage which can carry cargo has already been pressed into service. Photo-

[15] Charles Kellers-Regional Director-Water Division, ODT, New York City.
[16] Since the above was written intelligence has come to hand indicating that the towage turnaround time between Kanda and Kobe was 21 days until the completion in 1944 of mechanical coal loading facilities at Kanda which reduced the turnaround to 15 days.

graphs of Korean and Japanese ports indicate considerable activity on the part of such craft as standardized wooden coasters.

The pattern of economic traffic carried in small vessels is only partially known. Bulk cargo such as coal, iron ore, and beans is undoubtedly a major component but the extent to which low priority traffic which could be dispersed with in an emergency is unknown.

Certain points do emerge clearly. If the Japanese are able to allocate 200,000 g. r. t. of vessels in the 250-class to the Kyushu-Honshu coal trade, they should be able to move at least 4 to 5.6 million tons of coal annually to Honshu. This would be sufficient if combined with rail tunnel and car ferry capacity (Annex B), to move all coal available for export from Kyushu to Honshu.

If this allocation could be increased to around 400,000 tons, the load on rail facilities could be very substantially decreased but complete substitution for the railroad would require 175,000 g. r. t. of full-powered craft, 200,000 g. r. t. each of auxiliary and sailing craft and 100,000 g. r. t. of barges. It is doubtful if the Kyushu ports could handle the more than 4,500 vessels which would be involved and they certainly could not without creating a congestion which would not only greatly increase turn-around time but offer vulnerable bombing targets.

# APPENDIX B—THE EXPORT OF MILITARY SUPPLIES

The volume of military supplies shipped from Japan to the northern military areas on the continent during the spring of 1944 is here made the basis of two estimates. One is of the present volume of military supplies shipped to all inner zone theaters. The other estimate is a schedule of the different volumes of military supplies which would be shipped from Japan proper [1] in the event that the Japanese were forced to maintain various numbers of troops in active battle status on the continent.

Military supplies shipped from Japan to Korea, Manchuria, North China, and Central China during the 5 months, February through June 1944 averaged 100, 891, 376, and 345 cubic meters per day, respectively. These amounts related to the averages of the forces indicated in the Weekly Japanese Order of Battle Bulletins, WDGS—MID for that period amount to 1.03, 1.18, 1.05, and 1.00 cubic meters per 1,000 men per day for the respective areas. The captured Japanese Staff Logistics Manual [2] shows the minimum rate of routine supply to be 0.1 cubic meter per person per month, as much as 70 percent of which may be provision and forage. Assuming the latter to be available locally a rate of supply of 1.00 cubic meters per 1,000 men per day from Japan is represented which agrees almost exactly with intelligence as to the amount moved during 5 months of 1944.

The estimate of 4,507 cubic meters per day of military supplies shipped from Japan proper to inner zone areas as of 10 January 1945 is based on the assumption that the troops in the same four continental areas on 10 January 1945 were being supplied from Japan at the same rate as in the February–June period. It is also assumed that the rates for the men in the Ryukyus, Formosa, and Bonins were similar to those for the continental areas except that for the Bonins a lower degree of self-sufficiency as to food is assured. The rate of supply for the Kuriles is based on the statement in Japanese Staff Logistics Manual that 1.0 cubic meter per man per month must be provided in the northeast areas. On the latter islands very little fodder will be needed and some provisions (fish) will be locally available. The minimum deduction of 50 percent for provision and fodder is therefore taken for this area. The estimated rate for Karafuto is similarly computed except that use is made of the basic rate of 0.5 cubic meter per man per month which is the maximum rate of ordinary field supply according to the Manual. The resulting estimated rates are 16.67 cubic meters per 1,000 men per day to the Kuriles and 8.33 to Karafuto.

For the purpose of estimating the rate at which military supplies may be shipped from Japan as of any particular date in the not too distant future, several assumptions are made. One is that those areas now in a comparatively tenuous military position, namely, the Kuriles, Bonins, Ryukyus, and Formosa, will have been taken or interdicted by Allied operations and it will no longer be necessary or possible to supply them from Japan. It is further assumed that the size, function, and degree of activity of the forces in the remaining areas will be substantially unchanged. From the estimate as of 10 January 1945 and the foregoing assumptions it follows that the flow of supplies from Japan for the occupation forces would continue at about the rate of 2,637 cubic meters per day which is the estimated daily rate as of 10 January 1945 excluding the supplies to the tenuous inner zone areas.

For convenience in building up a table of possible expenditures, it has also been assumed that if any substantial Japanese force on the continent became engaged in a major campaign, such as the opposition to an American invasion of China or a Russian invasion of Manchuria, the number of troops engaged would represent a net increase in the number of troops on the continent. In other words, while the actual troops involved in the engagement may be from among the numbers now on the continent, the net number of troops remaining in occupation or reserve status would not be materially reduced but kept up to present strength by transfers from Japan proper. Shipments to maintain mainland troops in present status are comparatively small. This assumption, therefore, even if erroneous, introduces but a small overestimate into the computation. It seems unlikely that the number of garrison status troops would increase substantially. As the size of force which would be involved in battle action on the continent is so undeterminate, the final estimates of military supplies exported from Japan are given as a schedule of amounts for various assumed numbers of men in battle status.

*Battle status requirements.*—The captured *Staff Logistics Manual* indicates the range of supply requirements for troops in ordinary field status ("routine supply") to be from 0.3 to 0.5 cubic meter per man per month. Of those supplies,

[1] Discounting the possibility of securing any substantial quantity of ordnance supplies on the mainland.

[2] CINCPAC-CINCPOA, Special Translation No. 1 (Confidential), p. 28.

indicates that from 50 to 70 percent are provisions and forage. If the latter are locally obtained on the continent and the least deduction is applied to the highest rate and vice versa, the maximum range of requirements from Japan proper becomes 0.09 to 0.25 cubic meter per man per month or 3.0 to 8.3 cubic meter per 1,000 men per day for men in ordinary field status. Table 13 (pp. 26–27) of the Manual indicates that battle rates of replenishment for 13 major supply items are from 1 to 3 times the routine field rate. The unweighted average ratio of 1.87 does not reflect the expenditure of ground ammunition. The ratio between battle and routine ammunition expenditure rates is subject to a wide range of variation, but it would undoubtedly be greater than for any other category of military supplies and would constitute an important if not a major portion of the total of supplies required. If the average battle rate of replenishment for all supplies is taken as 3 times that of the routine field rate, lower and upper limits of the estimated battle rate of 9.0 and 25.0 cubic meters per 1,000 men per day result. The wide range between those limits provides adequately for and at the same time is justified by the wide range of possible variation in the rate of ammunition expenditure under active fighting conditions.

TABLE A.—*Daily cubic volume*

| Area | 10 Jan. 1945 | | | Future date | | |
|---|---|---|---|---|---|---|
| | Order of battle (1,000 men) | Cubic meters per 1,000 men per day | Cubic meters per day | Order of battle (1,000 men) | Cubic meters per 1,000 men per day | Cubic meters per day |
| Japan proper: | | | | | | |
| Kyushu, Honshu, and Shikoku | 898 | ------- | ------- | ------- | ------- | ------- |
| Hokkaido | 85 | ------- | ------- | ------- | ------- | ------- |
| Tenuous areas: | | | | | | |
| Kuriles | 98 | 16.67 | 1,634 | ------- | ------- | ------- |
| Ryukyus | 93 | 1.00 | 93 | ------- | ------- | ------- |
| Bonins | 29 | 1.67 | 49 | ------- | ------- | ------- |
| Formosa | 94 | 1.00 | 94 | ------- | ------- | ------- |
| Quiet areas in: | | | | | | |
| Karafuto | 14 | 8.33 | 783 | 14 | 8.33 | 783 |
| Korea | 127 | 1.03 | 131 | 127 | 1.03 | 131 |
| Manchuria | 668 | 1.18 | 788 | 668 | 1.18 | 788 |
| North China | 340 | 1.05 | 357 | 340 | 1.05 | 357 |
| East China | 124 | 1.00 | 124 | ------- | ------- | ------- |
| Central China, South China | 454 | 1.00 | 454 | 578 | 1.00 | 578 |
| Totals | ------- | ------- | 4,507 | 1,727 | ------- | 2,637 |
| Battle areas: | | | | | | |
| Minimum | ------- | ------- | ------- | ------- | 9.00 | ------- |
| Maximum | ------- | ------- | ------- | ------- | 25.00 | ------- |

The basic derivation of the estimates in Table A are made in terms of cubic meters of supplies. As a measure of the port capacity, the estimated annual rates in cubic meters have been converted to show in Table B the rates in metric tons at which supplies must be moved annually through the ports. The cubic meter estimates are also converted to gross registered tons to show the rates at which shipping space must be provided annually and the amount of shipping required to provide it. All three derived estimates are computed from the commonly accepted working assumptions that 1 short ton of these military supplies occupies 80 cubic feet and that 1 gross registered ton of shipping capacity is required for each 1½ ship tons (or 60 cubic feet). The conversion factor for the weight of the supplies is, therefore, 2.5 cubic meters per metric ton and for total shipping space, 1.7 cubic meters per gross registered ton. The operable ship tonnage required is computed from the assumption of 15 trips per year per vessel [3] (equivalent to an average turn-around time of 24⅓ days).

Consistent with other estimates of port and shipping requirements, the estimates derived in Table B are expressed for convenience in comparison with other figures in the main paper as annual rates although it is realized that it is unlikely that any given number of men will operate under active battle conditions throughout an entire year.

The estimated annual rates of export of military supplies from Japan and the shipping requirements are shown as of 10 January 1945 and for various assumed orders of battle as of some date in the future are shown in Table B. The estimates for the future date are given as a schedule for values of the number of men in battle status varying from 0 to 1,000,000 in units of 200,000. The order of battle and degree of activity of the men not in battle status is assumed to be the

TABLE B.—*Estimated annual rates of exort of military supplies*

| Date of estimate, 10 Jan. 45 | Order of battle (thousands of men), 2,041 | | | Amount of supplies (thousands of metric tons), 658 | | Shipping space (thousands of gross tons), 968 | | Ship tonnage (thousands of gross tons), 65 | |
|---|---|---|---|---|---|---|---|---|---|
| | Number and status as of 10 Jan. | Additional number in battle status | Total | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| Future date | 1,727 | 0 | 1,727 | 375 | 375 | 566 | 566 | 38 | 38 |
| | 1,727 | 200 | 1,927 | 637 | 1,105 | 952 | 1,640 | 64 | 110 |
| | 1,727 | 400 | 2,127 | 901 | 1,835 | 1,339 | 2,713 | 90 | 181 |
| | 1,727 | 600 | 2,327 | 1,163 | 2,565 | 1,725 | 3,787 | 115 | 253 |
| | 1,727 | 800 | 2,527 | 1,426 | 3,295 | 2,112 | 4,860 | 141 | 324 |
| | 1,727 | 1,000 | 2,727 | 1,689 | 4,025 | 2,498 | 5,934 | 167 | 396 |
| | If tenuous areas are not interdicted, add the following to respective schedules | | | | | | | | |
| | 314 | 0 | 314 | 273 | 273 | 402 | 402 | 27 | 27 |

[3] This figure squares with present performance and is also the Japanese Army allowance according to the Staff Logistics Manual.

same as on 10 January 1945. The estimates of supplies for the total of men in battle status and in the 10 January status excludes supplies to the Kuriles, Bonins, Ryukyus, and Formosa which are listed as tenuous areas in Table A. These areas are excluded on the assumption that they will have been taken or cut off by the Allies by the time that a major engagement develops on the continent. If these areas were not interdicted the estimates for the future date would all be increased by the amounts on the bottom line of Table B. Those amounts are the same as are used for those areas in the estimates for 10 January 1945. The estimates of supplies and shipping are given as minimum and maximum amounts, reflecting the respective limits of the rate of supply for the men in battle status.

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# APPENDIX C—CONCENTRATIONS OF MERCHANT VESSELS OVER 1,000 TONS SHOWN BY CERTAIN PHOTO RECONNAISSANCE BETWEEN 18 JUNE 1944 AND 11 MARCH 1945.

| Port | Date of photography | Operational | | Building/fitting repairs | | Total shipping | |
|---|---|---|---|---|---|---|---|
| | | No. | G. r. t. | No. | G. r. t. | No. | G. r. t. |
| Japan Proper: | | | | | | | |
| Tokyo | 11 Mar 45 | 5 | 5,100 | 16 | 37,500 | 21 | 42,600 |
| Yokohama | 28 Jan 45 | 16 | 34,120 | 13 | 77,950 | 29 | 112,070 |
| | 14 Feb 45 | 26 | 65,500 | 5 | 45,500 | 31 | 111,000 |
| Shimizu | 5 Nov 44 | 1 | 1,300 | 1 | 1,800 | 2 | 3,100 |
| Nagoya | 9 Mar 45 | 1 | 2,400 | 3 | 4,500 | 4 | 6,900 |
| Yokkaichi | 13 Nov 44 | 2 | 7,825 | ---- | --------- | 2 | 7,825 |
| Owase | 10 Dec 44 | 3 | 3,450 | ---- | --------- | 3 | 3,450 |
| Osaka | 27 Feb 45 | 54 | 87,000 | 11 | 13,800 | 65 | 100,800 |
| Kobe | 20 Jan 45 | 53 | 129,770 | 6 | 35,400 | 59 | 165,170 |
| | 4 Feb 45 | 56 | 109,062 | 9 | 54,508 | 65 | 163,570 |
| | 6 Feb 45 | 54 | 118,492 | 9 | 54,508 | 63 | 173,000 |
| | 27 Feb 45 | 61 | 144,600 | 9 | 65,300 | 70 | 209,900 |
| Shimonoseki-Moji | 18 Jun 44 | 66 | 144,900 | 5 | 11,800 | 71 | 156,700 |
| Wakamatsu-Yawata | 18 Jun 44 | 8 | 35,600 | 7 | 8,400 | 15 | 44,000 |
| Nagasaki | 17 Nov 44 | 4 | 10,555 | 12 | 18,085 | 16 | 28,640 |
| | 9 Mar 45 | 11 | 22,000 | 10 | 59,200 | 21 | 71,200 |
| Kagoshima | 25 Dec 44 | 11 | 21,600 | ---- | --------- | 11 | 21,600 |
| | 26 Dec 44 | 14 | 25,400 | ---- | --------- | 14 | 25,400 |
| | 1 Jan 45 | 12 | 21,700 | ---- | --------- | 12 | 21,700 |
| Mainland: | | | | | | | |
| Fusan | 21 Aug 44 | 5 | 20,700 | 2 | 7,200 | 7 | 27,900 |
| | 17 Nov 44 | 3 | 12,200 | 3 | 8,800 | 6 | 21,000 |
| Dairen | 9 Sept 44 | 19 | 34,800 | 5 | 10,800 | 24 | 45,600 |
| | 13 Dec 44 | 10 | 23,400 | 6 | 8,400 | 16 | 31,800 |
| Tsingtao [1] | 8 Sept 44 | 11 | 16,100 | ---- | --------- | 11 | 16,100 |
| | 14 Feb 45 | 14 | 38,720 | ---- | --------- | 14 | 38,720 |
| Laoyao | 8 Sept 44 | 6 | 5,780 | ---- | --------- | 6 | 5,780 |
| | 6 Jan 45 | 4 | 6,320 | ---- | --------- | 4 | 6,320 |

[1] 26 additional vessels over 100 feet long.

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# APPENDIX D—MINING PRIORITIES

## 1. Mining To Cut Off Imports From The Mainland.

Assuming a full-scale mining attack against traffic with the Asiatic mainland, priorities should be as follows:

*First phase.*—During this phase the objective would be (*a*) blockade of access to the Inland Sea from the Japan Sea, (*b*) creation of mine risk in regard to large ship concentrations in Japanese home waters and maximum interference with known traffic flows, (*c*) immediate denial of the most obvious diversion points so as to develop a situation where the enemy has a strong incentive to accept submarine risks on the Pacific side of the islands. Points of attack should be:

*Shimonoseki Straits.*—(Objectives (*a*) and (*b*).) Both sides of the Straits, the roadstead at Mutsure Island and, if possible, the rail ferry landings should be attacked.

*Kobe-Osaka.*—(Objective (*b*).)

*Nagasaki.*—(Objectives (*b*) and (*c*).)

*Sasebo.*—(Objectives (*c*) and denial of naval base facilities.)

*Fukuoka.*—(Objectives (*b*) and (*c*).)

*Second Phase.*—During this phase Objective (*b*) would be further pursued, the attack to attain Objective (*c*) fully developed and notice served on the enemy that the nonminable ports will not be available to him. Known traffic flows, particularly to the main north coast ports would be further interrupted and considerable effort expended to discover and prevent diversions to ports which could be used without danger from submarines. During this phase approach toward the final objective of imposition of blockade by denial of ports would be made.

*Tsuruga.*—(Objectives (*b*) and (*c*).)

*Niigata.*—(Objectives (*b*) and (*c*).)

*Kure-Hiroshima.*—(Objectives (*b*) and (*d*) plus denial of naval and military bases and installations.)

*Kagoshima.*—(Bombing and mining. Objectives (*b*) and (*d*).)

*Aomori.*—(Objectives (*b*) and (*c*).)

*Fushiki.*—(Bombing. Objectives (*b*) and (*d*).)

*Other West and North Coast Ports.*

*Karatsu, Omuta-Miike Misumi, Maizuru, Sakai, Nanao, Miyazu and Hamada.*—Such of these ports as are found to be in use as points of diversion should be attacked. If reconnaissance difficulties are encountered, the first four should be closed even if current information is lacking. (Objectives (*b*) and (*c*).)

*Higashi-Iwase.*—(Bombing. Objectives (*b*) and (*d*).)

*Kamaishi.*—(Objectives (*b*) and (*c*).)

*Third Phase.*—During this phase the diversions to south coast ports forced during the first two phases would be countered and submarine attacks against the resulting increased shipping concentrations reinforced by mining, so as to capitalize on the situation created during earlier phases of the campaign. Diversions to North Honshu ports would also be countered.

*Tokyo Bay.*—(Objective (*b*) and (*c*) plus denial of Yokosuka Naval Base.)

*Tokuyama.*—(Objective (*b*), plus denial of naval oil storage.)

*Bisan Seto.*—(Objective (*b*).)

*Ise Wan and Shimizu.*—(Objective (*b*), *providing that activity at these ports, now practically nonexistent, has been renewed.*)

*Owase.*—(Objectives (*b*) and (*c*).)

*Kammon Tunnel.*—(Bombing. To reinforce effect of mining on coastwise traffic.)

*Kagoshima, Fushiki, and Higashi-Iwase.*—(Repeat bombings if these ports are still in use. Objectives (*b*) and (*d*).)

Possible diversionary ports which should be watched and closed if found to be in active use including: Funakawa, Tsuchizaki, Sakata, Miyako, Hachinobe, Ofunato, Hagi, Obama, and Susa.

## 2. Mining To Cut Off Honshu Coal Supply.

*First Phase.*—Wakamatsu, Kanda, Miike, Otaru, Hakodate, Muroran, Kushiro, Rumoi, and Aomori.

The Kammon Tunnel and Hikoshima Yard and Viaduct should be bombed simultaneously with the mining attack.

*Second Phase.*—Fukuoka, Karatsu, Nagasaki, Sasebo, Misumi, Oita, Iwanai, Wakkanai, and Kagoshima.

Other ports on Hokkaido and Kyushu would have to be watched for possible diversions but these are unlikely to be serious in the case of a large volume movement.

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# APPENDIX E–SUMMARY SCHEDULES

## TABLE 1

### Japanese Controlled Ports; Shanghai–North[1]

#### PORTS IN JAPAN PROPER

| Port | Port Area Number[2] | Approximate Coordinates | Capacity Classification[3] | Approximate Annual Capacity (metric tons)[4] | Remarks |
|---|---|---|---|---|---|
| KURILES | | | | | |
| Kataoka | 91:1-3499 | 50-44:156-11 | S | | naval station, fishing |
| KARAFUTO | | | | | |
| Esutoru | 90:1-3596 | 49-05;142-02 | S | | coal |
| Otomari | 90:1-3597 | 46-38;142-46 | S | | ferry to WAKKANAI |
| HOKKAIDO | | | | | |
| Abashiri | 90:2-3405 | 44-01;144-17 | S | 885,000 | fishing, lumber |
| Biroo | 90:2-3402 | 42-17;143-19 | S | 300,000 | fishing |
| Esashi | 90:4-3409 | 41-25;140-07 | S | 105,000 | lighterage port |
| Hakodate | 90:4-3512 | 41-46;140-43 | P | 3,960,000 | rail ferry terminus (from AOMORI) |
| Hanasaki | 90:2-3403 | 43-17;145-35 | S | 105,000 | lighterage port |
| Iwanai | 90:3-3599 | 42-59;140-31 | S | 495,000 | lighterage port |
| Kushiro | 90:2-3598 | 42-58;144-22 | P | 1,515,000 | mechanical coal loading |
| Mashike | 90:2-3408 | 43-51;141-32 | S | 105,000 | lighterage |
| Mombetsu | 90:2-3406 | 44-21;143-22 | S | 495,000 | fishing |
| Muroran | 90:3-3590 | 42-20;140-59 | P | 3,030,000 | steel products, mechanical coal loading |
| Nemuro | 90:2-3404 | 43-20;145-35 | S | 105,000 | embarkation to Kuriles |
| Otaru | 90:3-3593 | 43-12;141-01 | P | 2,580,000 | mechanical coal loading |
| Rumoi | 90:2-3401 | 43-57;141-39 | P | 1,485,000 | coal and lumber |
| Wakkanai | 90:2-3407 | 45-25;141-41 | S | 990,000 | fishing, lumber, ferry to OTOMARI |
| HONSHU | | | | | |
| Amagasaki | 90:25-3419 | 34-43;135-25 | P | 2,000,000 | associated with OSAKA |
| Aomori | 90:5-3585 | 40-50;140-45 | P | 611,000 | rail ferry terminus (from HAKODATE) |
| Chiba | 90:14-3432 | 35-36;140-07 | M | | landing |
| Choshi | 90:14-3414 | 35-44;140-50 | S | 214,000 | fishing port |
| Ezumi | 90:26-3421 | 35-31;132-58 | S | 187,000 | fishing and coasters |
| Funakawa | 90:6-3507 | 39-53;139-51 | S | 330,000 | oil, rice |
| Fushiki | 90:11-3586 | 36-48;137-04 | S | 396,000 | port of TAKAOKA |
| Go Kasho Wan | 90:24-3546 | 34-19;136-41 | M | | anchorage |
| Habu | 90:29-3578 | 34-17;133-11 | S | | shipyard |
| Hachinohe | 90:5-3556 | 40-32;141-32 | S | 214,000 | fishing and industry |
| Hagi | 90:32-3418 | 34-25;131-24 | S | 132,000 | lumber |
| Hamada | 90:26-3422 | 34-54;132-04 | S | 181,000 | fishing |
| Hibi | 90:27-3427 | 34-27;133-56 | M | | landing |
| Higashi-Iwase | 90:11-3587 | 36-45;137-14 | S | 396,000 | port of TOYAMA |
| Hirohata/(Shikama) | 90:27-3514 | 34-47;134-39 | S | | port of HIMEJI, steel |
| Hiroshima/Ujina | 90:30-3574 | 34-21;132-28 | P | 1,749,000 | embarkation |
| Ishinomaki | 90:10-3415 | 38-25;141-19 | S | 115,000 | fishing |
| Itsukushima | 90:30-3524 | 34-17;132-19 | M | | landing |
| Kamaishi | 90:8-3520 | 39-16;141-53 | P | 429,000 | steel |
| Kamo | 90:6-3416 | 38-46;139-44 | S | | fishing |
| Kawasaki | 90:17-3522 | 35-29;139-43 | P | 7,458,000 | steel, shipbuilding, warehouses |
| Kobe | 90:25-3523 | 34-40;135-10 | P | 10,890,000 | shipbuilding |
| Kudamatsu | 90:32-3424 | 33-59;131-52 | S | | oil, salt |
| Kure | 90:30-3527 | 34-14;132-33 | P | 1,089,000 | naval base |
| Maizuru | 90:22-3530 | 35-27;135-20 | S | 759,000 | commercial port, (see also SHINMAIZURU) |
| Matsue | 90:26-3420 | 35-28;133-03 | S | | small drydock |
| Matsure Shima | 90:34-3536 | 33-58;130-52 | M | | anchorage |
| Mihara/Itosaki | 90:29-3426 | 34-23;133-06 | S | | oil |
| Misaki | 90:17-3399 | 35-08;139-37 | M | | landing |
| Miyako | 90:8-3564 | 39-38;141-59 | S | 297,000 | fishing, lumber |
| Miyazu | 90:22-3570 | 35-32;135-12 | S | 858,000 | general cargo |
| Murotsu/Kaminoseki | 90:30-3425 | 33-50;132-07 | M | | landing |
| Nagoya | 90:20-3538 | 35-04;136-53 | P | 6,105,000 | industrial products |
| Nanao | 90:11-3591 | 37-03;136-58 | S | 394,000 | cement chemicals |
| Naoetsu | 90:9-3576 | 37-11;138-14 | S | 214,000 | port of TAKADA |
| Niigata | 90:9-3541 | 37-56;139-04 | P | 554,000 | embarkation, oil, chemicals |
| Ofunato | 90:8-3411 | 39-04;141-43 | S | 429,000 | timber, cement |
| Ominato | 90:5-3592 | 41-15;141-09 | S | | naval station |
| Onoda | 90:32-3543 | 33-59;131-11 | M | | landing |
| Onomichi | 90:29-3521 | 34-24;133-12 | S | 115,000 | boat repair |

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| Port | Port Area Number[2] | Approximate Coordinates | Capacity Classification[3] | Approximate Annual Capacity (metric tons)[4] | Remarks |
|---|---|---|---|---|---|
| HONSHU (cont'd) | | | | | |
| Oo | 90:27-3429 | 34-47;134-28 | S | | shipyard |
| Osaka | 90:25-3544 | 34-40;135-28 | P | 14,700,000 | general industry, shipyards |
| Owase Wan | 90:24-3542 | 34-04;136-12 | M | | landing, lighterage observed |
| Ryozu | 90:9-3417 | 38-05;138-26 | S | 165,000 | port of SADO SHIMA |
| Sakai | 90:26-3551 | 35-33;133-14 | S | 759,000 | fish, oil, rice |
| Sakata | 90:6-3577 | 38-55;139-50 | S | 214,000 | coastwise |
| Senzaki | 90:32-3423 | 34-24;131-12 | M | | rice |
| Shimizu | 90:18-3581 | 35-01;138-30 | P | 1,089,000 | landing |
| Shimonoseki | 90:34-3558 | 33-57;130-57 | P | 2,590,000 | aluminum, boat building |
| Shimotsu | 90:25-3534 | 34-06;135-09 | S | | general industry, rail ferry terminus (from MOJI), ship-building |
| Shin Maizuru | 90:22-3430 | 35-29;135-22 | P | 874,000 | coastwise |
| Shiogama | 90:10-3410 | 38-19;141-02 | P | 1,518,000 | naval base |
| Sumoto | 90:25-3435 | 34-20;134-54 | M | | small craft from HOKKAIDO |
| Taketoyo | 90:20-3531 | 34-51;136-56 | S | | landing (AWAJI SHIMA) |
| Toba | 90:24-3528 | 34-29;136-51 | S | 660,000 | coastwise |
| Tokuyama | 90:32-3571 | 34-02;131-49 | P | 1,452,000 | assembly point |
| Tokyo | 90:17-3567 | 35-39;139-46 | P | 7,458,000 | naval oil station |
| Tsuchizaki | 90:6-3569 | 39-45;140-04 | S | 115,000 | general industry |
| Tsuruga | 90:22-3594 | 35-39;136-05 | P | 1,420,000 | port of AKITA, oil refining |
| Ube | 90:32-3573 | 33-57;131-15 | S | 1,089,000 | Japan Sea Trade |
| Uno/Tama | 90:27-3428 | 34-28;133-57 | S | 1,089,000 | coal export, shipyard |
| Uotsu | 90:11-3545 | 36-48;137-22 | M | | rail ferry terminus (from TAKAMATSU) shipyard |
| Uraga | 90:17-3413 | 35-14;139-43 | S | | landing |
| Wakanoura Wan | 90:25-3547 | 34-11;135-10 | M | | shipbuilding |
| Yokkaichi | 90:20-3595 | 34-58;136-38 | P | 760,000 | anchorage |
| Yokohama | 90:17-3582 | 35-27;139-39 | P | 20,460,000 | oil |
| Yokosuka | 90:17-3400 | 35-17;135-40 | P | | general industry, shipbuilding |
| Yonago | 90:26-3431 | 35-25;133-20 | M | | naval base |
| | | | | | landing |
| SHIKOKU | | | | | |
| Imabari | 90:29-3439 | 34-04;133-00 | S | 430,000 | coastwise |
| Kannonji | 90:27-3438 | 34-07;133-39 | S | | small |
| Kochi | 90:28-3433 | 33-33;133-33 | S | 973,000 | coastwise |
| Komatsuchima | 90:27-3500 | 34-01;134-35 | S | 973,000 | coastwise |
| Mitsuhama | 90:29-3513 | 33-52;132-43 | S | | coastwise |
| Niihama | 90:29-3508 | 33-58;133-16 | S | 214,000 | chemicals |
| Sakaide | 90:27-3436 | 34-20;133-52 | S | 214,000 | small |
| Susaki | 90:31-3434 | 33-23;133-17 | S | | coastwise |
| Tadotsu | 90-27:3437 | 34-16;133-45 | S | | coastwise |
| Takahama | 90:29-3539 | 33-53;132-35 | S | | small |
| Takamatsu | 90:27-3516 | 34-21;134-03 | S | 1,518,000 | rail ferry terminus (from UNO) |
| Uwajima | 90:31-3518 | 33-13;132-33 | S | 1,204,000 | coastwise |
| Yawatahama | 90:31-3440 | 33-27;132-25 | S | 1,089,000 | coastwise |
| KYUSHU | | | | | |
| Abaratsu | 90:38-3444 | 31-34;131-25 | S | 214,000 | fishing, timber |
| Beppu | 90:33-3449 | 33-16;131-31 | S | 214,000 | small |
| Fukuoka (Hakata) | 90:35-3511 | 33-36;130-24 | P | 1,518,000 | coal loading, oil |
| Hososhima | 90:33-3445 | 32-26;131-40 | S | | coastwise |
| Kagoshima | 90:38-3519 | 31-35;130-34 | P | 429,000 | general cargo |
| Kanda (Karita) | 90:34-3588 | 33-47;130-59 | S | | coal |
| Karatsu | 90:36-3565 | 33-28;130-00 | P | 660,000 | coal |
| Kokura | 90:34-3589 | 33-53;130-53 | P | 660,000 | general industry |
| Matsushima Ko | 90:36-3535 | 32-56;129-36 | S | | coal |
| Minamata Ko | 90:37-3412 | 32-12;130-23 | S | | coastwise |
| Misumi | 90:37-3442 | 32-37;130-27 | S | 610,000 | lumber, cement |
| Moji | 90:34-3533 | 33-56;130-57 | P | 3,300,000 | mechanical coal loading |
| Nagasaki | 90:36-3537 | 32-43;129-50 | P | 1,650,000 | shipbuilding |
| Oita | 90:33-3448 | 33-14;131-35 | S | 214,000 | coastwise |
| Omuta/Miike | 90:35-3532 | 33-00;130-25 | P | 940,000 | mechanical coal loading |
| Saeki | 90:33-3503 | 32-58;131-55 | M | | anchorage |
| Sakito | 90:36-3441 | 33-01;129-34 | S | | coal |
| Sasebo | 90:36-3552 | 33-10;129-43 | P | 3,630,000 | naval base |
| Shibushi | 90:38-3443 | 31-28;131-06 | S | 214,000 | coastwise |
| Tobata | 90:34-3566 | 33-54;130-49 | P | | general industry |
| Totoro | 90:33-3446 | 32-30;131-41 | S | | fishing |
| Tsukumi | 90:33-3447 | 33-04;131-52 | S | | cement |
| Unoshima | 90:33-3450 | 33-37;131-08 | S | | small |
| Usunoura Ko | 90:36-3451 | 33-12;129-37 | S | | coastwise |
| Wakamatsu | 90:34-3575 | 33-53;130-47 | P | 2,310,000 | mechanical coal loading |
| Yawata | 90:34-3579 | 33-53;130-48 | P | 660,000 | mechanical ore unloading |
| **MAINLAND PORTS** | | | | | |
| KOREA | | | | | |
| Ch'aho (Shako) | 84:1-3554 | 40-12;128-38 | P | 1,170,000 | ore loader for IWON ore, possibly Musan concentrates. |
| Changhang-Ni | 84:8-3480 | 35-38;126-54 | S | | non-ferrous |
| Changjon-Hang | 84:4-3467 | 38-44;128-12 | M | | landing, fishing |
| Changsungp'o-Ri | 84-7:3476 | 34-52;128-44 | M | | anchorage |

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping after sheet ATSF/S, Appendix E, page 1.

JOINT TARGET GROUP, WASHINGTON, D. C.
GENERAL ANALYSIS



| Port | Port Area Number[2] | Approximate Coordinates | Capacity Classification[3] | Approximate Annual Capacity (metric tons)[4] | Remarks |
|---|---|---|---|---|---|
| KOREA (Cont'd) | | | | | |
| Chinhae (Chinkai) | 84:7-3457 | 35-08;128-40 | P | | naval station |
| Chinkai see Chinhae | | | | | |
| Chinnamp'o | 84:3-3504 | 38-44;125-24 | P | 1,980,000 | mechanical coal loaders |
| Chisep'o | 84:7-3477 | 34-50;128-43 | M | | anchorage |
| Ch'ongjin (Seishin) | 84:1-3454 | 41-46;129-48 | P | 5,820,000 | probable outlet for Musan concentrates. |
| Chumunjin | 84:5-3469 | 37-54;128-50 | M | | landing, fishing |
| Fusan see Pusan | | | | | |
| Genzan see Wonsan | | | | | |
| Gunzan see Kunsan | | | | | |
| Hoko see P'ohang-dong | | | | | |
| Hungnam (Konan) | 84:2-3526 | 39-50;127-37 | P | 4,650,000 | chemicals, general industry |
| Inch'on (Jinsen) | 84:6-3517 | 37-28;126-38 | P | 5,115,000 | wet dock, port of KWONGSONG (KEIJO) |
| Jinsen see Inch'on | | | | | |
| Joshin see Songjin | | | | | |
| Kaishu see Yongdang-P'O/Haeju | | | | | |
| Kenjiho see Kyomip'o | | | | | |
| Kamp'o-Ri | 84:7-3473 | 35-48;129-30 | M | | landing, fishing and trade |
| Kojo | 84:2-3466 | 38-58;127-54 | M | | landing |
| Konan see Hungnam | | | | | |
| Kunsan (Gunzan) | 84:8-3510 | 36-00;126-42 | S | 396,000 | wheat port |
| Kuryongp'o-Ri | 84:7-3472 | 36-00;129-34 | M | | landing |
| Kyomip'o (Kenjiho) | 84:3-3481 | 38-44;125-38 | S | 600,000 | steel |
| Masan | 84:7-3458 | 35-12;128-34 | P | 2,475,000 | possible small boat shuttle |
| Mokp'o (Moppo) | 84:8-3460 | 34-47;126-23 | S | 1,089,000 | rice port. |
| Mukhojin-ni | 84:5-3470 | 37-34;129-06 | M | | landing |
| Najin (Rashin) | 84:1-3453 | 42-12;130-18 | P | 7,530,000 | naval station |
| Odaejin | 84:1-3462 | 41-22;129-46 | M | | landing, fishing |
| Pango-ri | 84:7-3474 | 35-29;129-36 | M | | landing |
| P'ohang-dong (Hoko) | 84:5-3471 | 36-02;129-22 | S | 825,000 | important fishing port |
| Pusan (Fusan) | 84:7-3456 | 35-06;129-02 | P | 6,194,000 | possible small boat shuttle |
| Rashin see Najin | | | | | |
| Reisui see Yosu | | | | | |
| Ryugampo see Yongamp'o | | | | | |
| Samch'onp'o | 84:7-3479 | 34-56;128-04 | M | | landing |
| Seishin see Ch'ongjin | | | | | |
| Shako see Ch'aho | | | | | |
| Sinch'ang | 84:2-3464 | 40-08;128-28 | M | | landing |
| Sinp'o | 84:2-3465 | 40-02;128-12 | M | | landing, fishing |
| Songjin (Joshin) | 84:1-3455 | 40-40;129-12 | P | 1,980,000 | possible outlet Musan concentrates |
| Sosura | 84:1-3461 | 42-16;130-36 | M | | landing, fishing |
| Taep'o-ri | 84:5-3468 | 38-10;128-36 | M | | landing |
| Tasa-do (Tashito) | 93:2-3482 | 39-48;124-26 | S | 360,000 | general industry, port of ANTUNG |
| Tashito see Tasa-do | | | | | |
| T'ongyong | 84:7-3478 | 34-51;128-26 | S | 1,650,000 | fishing, trade, no RR |
| Ulsan-man | 84:7-3475 | 35-30;129-24 | M | | landing |
| Unggi (Yuki) | 84:1-3452 | 42-20;130-24 | P | 2,400,000 | alternate to NAJIN |
| Wonsan (Genzan) | 84:4-3509 | 39-10;127-26 | P | 3,480,000 | oil loading |
| Yonam-ni | 84:1-3463 | 40-28;128-54 | S | | under construction |
| Yondangp'o/Haeju (Kaishu) | 84:3-3557 | 38-00;125-42 | S | | general industry, rice |
| Yongamp'o (Ryugampo) | 93:2-3483 | 39-56;124-22 | S | 180,000 | YALU river development |
| Yosu (Reisui) | 84:8-3459 | 34-44;127-44 | S | 1,089,000 | possible small boat shuttle |
| Yuki see Unggi | | | | | |
| MANCHURIA | | | | | |
| An-tung/Sinuiju (Shingishu), Korea | 93:2-3484 | 40-07;124-23 | P | 600,000 | general industry, junk building |
| Dairen | 93:5-3506 | 38-56;121-39 | P | 8,250,000 | mechanical coal loading, general industry |
| Hu-lu-tao | 93:3-3583 | 40-44;121-01 | P | 1,500,000 | coal |
| Newchang see Ying-k'ou | | | | | |
| Port Arthur see Ryojun | | | | | |
| Ryojun (Port Arthur) | 93:5-3505 | 38-48;121-16 | S | | naval station |
| Ta/Tung | 93:2-3485 | 39-54;124-11 | S | | small |
| Ying-k'ou (Newchang) | 93:3-3486 | 40-41;122-12 | S | | coastwise |
| CHINA | | | | | |
| Amoy see Hsia-men | | | | | |
| Canton/Whampoa see Kuang-chou/Huang-pu | | | | | |
| Chefoo see Chih-fou/Yen-t'ai | | | | | |
| Chen-kiang (Chinkiang) | 83:1-3489 | 32-10;119-30 | S | 150,000 | Yangtze port |
| Chih-fou/Yen-t'ai (Chefoo) | 83:11-3487 | 37-30;121-25 | S | | coastwise, no RR |
| (Ch'ing-tao) Tsingtao | 83:11-3568 | 36-05;120-19 | P | 4,268,000 | coal, ore, salt, general cargo |
| Ch'in-huang-tao (Chinwangtao) | 83:12-3584 | 39-55;119-37 | P | 1,650,000 | coal landing |
| Chinkiang see Chen-chiang | | | | | |

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping after sheet ATSF/S, Appendix E, page 2.

| Port | Port Area Number[2] | Approximate Coordinates | Capacity Classification[3] | Approximate Annual Capacity (metric tons)[4] | Remarks |
|---|---|---|---|---|---|
| CHINA (cont'd) | | | | | |
| Chinwangtao see Ch'in-huang-tao | | | | | |
| Chiu-chiang (Kiukiang) | 83:8-3491 | 29-45;115-55 | S | 150,000 | Yangtze port |
| Foochow see Min-hou | | | | | |
| Han-k'ou/Wu-ch'ang | 83:8-3493 | 30-33;114-17 | S | 150,000 | Yangtze port, military |
| Hong-kong/Kowloon | 83:4-3515 | 22-17;114-10 | P | | convoy staging, ship repair, military |
| Hsia-men (Amoy) | 83:3-3496 | 24-25;118-05 | S | | military |
| Kiukiang see Chiu-chang | | | | | |
| Kuang-chou/Huang-pu (Canton/Whampoa) | 83:4-3498 | 23-06;113-26 | P | | military |
| Laoyao | 83:11-3580 | 34-44;119-27 | P | 1,100,000 | coal loading |
| Lienyun see Laoyao | | | | | |
| Min-hou | 83:3-3495 | 26-00;119-20 | S | | military |
| Nan-ching/P'u-k'ou (Nanking/Pukou) | 83:1-3540 | 32-05;118-45 | P | 250,000 | Yangtze port, rail ferry |
| Shang-hai/Wu-sung | 83:1-3555 | 31-19;121-33 | P | 11,000,000 | general cargo, military |
| Shan-t'ou (Swatow) | 83:3-3497 | 23-30;116-40 | S | | military |
| Shihweiyao | 83:8-3492 | 30-12;115-03 | S | 150,000 | Yangtze port of TAYEH mines |
| Swatow see Shan-t'ou | | | | | |
| Tang-ku/Taku | 83:12-3562 | 39-00;117-40 | P | 2,750,000 | coal, salt, ore, rice |
| Tsingtao see Ch'ing-tao | | | | | |
| Wei-hai-wei | 83:11-3488 | 37-30;122-05 | S | | coastwise, no RR |
| Wenchow see Yung-chia | | | | | |
| Wu-hu | 83:1-3490 | 31-20;118-22 | P | 360,000 | Yangtze transshipment port |
| Yung-Chia (Wenchow) | 83:2-3494 | 28-00;120-40 | S | | military |
| FORMOSA | | | | | |
| Kiirun (Keeling) | 91:3-3549 | 25-09;121-45 | S | | convoy staging |
| Mako, (Pescadores Islands) | 91:7-3553 | 23-33;119-34 | S | | naval station |
| Takao | 91:6-3548 | 22-37;120-16 | P | | convoy staging |

[1] All primary and secondary ports are included which current intelligence indicates are available for ship-rail transshipment within the inner zone. Some but not all minor landings and protected anchorages available as harbors of refuge and shipping hideouts are included. As others come to light they will be assigned Port Area numbers and Port Shipping Plots issued.

[2] Port area numbers are assigned from the block of AAF target numbers 3300 through 3599. They refer to the entire port area, including harbor approaches and anchorages, shown by the Port Shipping Plots prepared and released from time to time by JTG. The Port Areas include, in many cases, individual harbor installations or portions of harbors to which harbor facility target numbers have already been assigned. Those targets remain as defined in the A.O. Folders.

[3] P = Primary
S = Secondary
M = Minor

These classifications are not priority indications. They are based entirely on the capacity of the facilities. They do not take into account the degree of activity which is, of course, the principal factor determining the significance of a port. Activity will fluctuate with the strategic and tactical situation. For some indication of relative activity up to 11 March 1945 see Appendix C, p. Ap–C 1. It will be noted that the primary ports of Nagoya and Shimizu are virtually inactive and hence of little present importance. A priority list of ports as of any given time must take into account current intelligence as to activity as it becomes available in the field and this is in no sense such a list.

[4] The approximate annual capacity is computed from estimates of daily or monthly capacity given in Janis studies or WDGS–MIS material. Computations are based on the assumption that the ports in Hokkaido, Northeastern and Northwestern Korea north of 38–OON, and Manchuria can operate 300 days per year while others can operate 330 days per year.

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping after sheet ATSF/S, Appendix E, page 3.

## TABLE 2
## Japanese Commercial Shipbuilding and Repair Facilities
### MAJOR SHIPYARDS

| Target Name | Target Number | Location | Number of Building Ways | Number of Drydocks: Large (Over 300 feet) | Number of Drydocks: Small (Under 300 feet) |
|---|---|---|---|---|---|
| Akunoura Engine Works | 90:36-542 | Nagasaki | — | — | — |
| Asano Dockyard | 90:17-70 | Yokohama | — | 2 | — |
| Fujinagata Shipbuilding Co. | 90:25-273A | Osaka | 3 | 1 | 2 |
| Fujinagata Shipbuilding Co. | 90:25-273B | Osaka | 3 | — | — |
| Habu Shipyard | 90:29-927A | Innoshima Island | 6 | 2 | 2 |
| Hakodate Dockyard | 90:4-974 | Hakodate | 4 | 2 | — |
| Muroran Shipyard | 90:3-1683 | Muroran | ? | 1 (?) | — |
| Harima Shipyard | 90:27-1296 | Oo Bay | 5 | 2 | — |
| Ishikawajima Dockyard (Tokyo) | 90:17-330 | Tokyo | — | — | — |
| Susaki Dockyard | 90:17-1459 | Tokyo | 4 | 2 | — |
| Kawaminami Industry Co. Shipyard | 90:36-860 | Nagasaki | — | 1 | 1 |
| Kawasaki Heavy Industry | 90:25-171 | Kobe | 7 | 1 | — |
| Mitsui Tama Shipyard | 90:27-1295 | Tama | 6 | 3 | — |
| Mitsubishi Dockyard (Nagasaki) | 90:36-543 | Nagasaki | — | 3 | — |
| Mitsubishi Heavy Industries | 90:25-169 | Kobe | 5 | 3 | — |
| Osaka Iron Works, Unit No. 1 | 90:25-272 | Osaka | 5 | 1 | — |
| Shannosho Shipyard | 90:29-927B | Innoshima Island | 2 | 1 | 1 |
| Tategami Shipyard (Nagasaki) | 90:36-544 | Nagasaki | 7 | — | — |
| Tsurumi Steel Shipbuilding Co. of Asana Co. (Yokohama) | 90:17-122 | Kawasaki | 6 | — | — |
| Uraga Dockyard No. 1 (Yokosuka) | 90:17-1460 | Uraga | 3 | 1 | — |
| Uraga Dockyard No. 2 (Yokosuka) | 90:17-1461 | Uraga | 3 | 1 | — |
| Heavy Industries Corp. (Yokohama Docks) | 90:17-69 | Yokohama | 5 | 3 | — |
| | | | 74 | 30 | 6 |

sheet in Air Target System Folder: Japanese Shipping
Holders of Joint Target Group Folders should insert this
after sheet ATSF/S, Appendix E, page 4.

## MINOR SHIPYARDS

| Target Name | Target Number | Location | Number of Building Ways | Number of Drydocks: Large (Over 300 feet) | Number of Drydocks: Small (Under 300 feet) |
|---|---|---|---|---|---|
| YOKOHAMA | | | | | |
| Kotaki Dock | 90:17-N/A | Yokohama | 1 | — | — |
| Yokohama Iron Works | 90:17-N/A | Yokohama | 3 | — | — |
| Yokohama Engineering Works | 90:17-N/A | Yokohama | 1 | — | — |
| OSAKA | | | | | |
| Amagasaki Shipyard | 90:25-N/A | Osaka | 1 | — | 1 |
| Endo Shipyard | 90:25-N/A | Osaka | 2 | — | — |
| Harada Shipyard | 90:25-N/A | Osaka | 1 | — | 2 |
| Horai Shipyard | 90:25-N/A | Osaka | 1 | — | 2 |
| Kizugawa Dockyard | 90:25-N/A | Osaka | 1 | — | 2 |
| Midsuno Shipyard | 90:25-N/A | Osaka | 2 | — | — |
| Mihara Shipyard | 90:25-N/A | Osaka | 2 | — | — |
| Nakada Shipyard (Minami Okajima) | 90:25-N/A | Osaka | 2 | — | — |
| Nakada Shipyard (Tsumori) | 90:25-N/A | Osaka | 3 | — | — |
| Namura Shipyard | 90:25-N/A | Osaka | 2 | 1 | 1 |
| Naniwa Dockyard | 90:25-N/A | Osaka | 3 | 1 | — |
| Nihon Diseru Shipyard | 90:25-N/A | Osaka | 2 | — | — |
| Nitta Shipyard | 90:25-N/A | Osaka | 3 | 2 | 1 |
| Ohara Shipyard | 90:25-N/A | Osaka | 1 | — | 1 |
| Ono Iron Works Shipyard | 90:25-N/A | Osaka | 5 | — | 3 |
| Osaka Iron Works Yard, Unit # 2 | 90:25-699 | Osaka | 1 | 1 | — |
| Osaka Shipbuilding Works Co., Ltd. | 90:25-1711 | Osaka | 3 | 1 | — |
| Sanoyasu Shipyard | 90:25-N/A | Osaka | 2 | 1 | — |
| Urabe Shipyard | 90:25-N/A | Osaka | 4 | — | 1 |
| Yamamoto Shipyard | 90:25-N/A | Osaka | 2 | — | 1 |
| INLAND SEA | | | | | |
| Amagasaki Shipyard | 90:25-N/A | Amagasaki | 2 | — | — |
| Hashihama Dock | 90:29-N/A | Hashihama | 2 | — | 3 |
| Kasado Dock Co. | 90:32-668 | Kasado Island | 2 | 2 | — |
| Kumagaya Shipyard | 90:29-N/A | Saisaki | 3 | — | 2 |
| Mukaijima Dock | 90:29-N/A | Mukaijima | 2 | 2 | — |
| Onomichi Dock | 90:29-N/A | Onomichi | 1 | — | 1 |
| Ujina Shipbuilding Co. | 90:30-1889 | Ujina | 3 | — | — |
| Urabe Iron Works | 90:29-N/A | Innoshima | 5 | — | 2 |
| SHIMONOSEKI STRAIT | | | | | |
| Ishihara Shipyard | 90:34-N/A | Shimonoseki | 2 | — | — |
| Mitsubishi Shipyard | 90:34-1846 | Hikoshima | 4 | 2 | 1 |
| Osaka Iron Works | 90:34-43B | Hikoshima | 3 | — | 2 |
| Tanokubi Shipyard | 90:34-1673 | Hikoshima | 2 | — | — |
| Tochigi Company | 90:34-558 | Wakamatsu | 2 | 1 | — |
| Wakamatsu Shipyard | 90:34-1672 | Wakamatsu | — | — | — |
| MISCELLANEOUS | | | | | |
| Ishiguro Shipyard | 90:26-N/A | Yonago | 2 | — | — |
| Kanezashi Shipyard | 90:18-N/A | Shimizu | 6 | — | 1 |
| Kawaminami Industry | 90:36-N/A | Uranosaki | 3 | — | — |
| Matsuura Shipyard | 90:28-N/A | Higashino | 3 | — | — |
| Miho Shipyard | 90:18-N/A | Shimizu | 3 | — | — |
| Nagoya Shipyard | 90:20-N/A | Nagoya | 3 | 1 | — |
| Nihonkai Dock | 90:11-N/A | Fushiki | 2 | — | — |
| Niigata Iron Works | 90:9-N/A | Niigata | 2 | 1 | — |
| Toba Dockyard | 90:24-1216 | Toba | — | — | 1 |
| Tohoku Dock | 90:10-N/A | Shiogama | 3 | — | 1 |
| Yamamoto Shipyard | 90:26-N/A | Kochi | 3 | — | — |
| MAINLAND | | | | | |
| Chosen Heavy Industry Co. | 84:7-N/A | Pusan (Fusan) Korea | 3 | — | 2 |
| Manchuria Dockyard | 93:5-10 | Dairen | 3 | 2 | — |
| Dockyard (Tangku) | 83:12-N/A | Tang-ku/Taku | — | — | 1 |
| Drydock, Ch'ing-tao | 83:11-93 | Ch'ing-tao | 2 | 1 | — |
| International Dock | 83:1-119 | Shanghai | — | 1 | — |
| Kiangnan Dock and Engineering Works | 83:1-117 | Shanghai | 3 | 3 | — |
| Kiousin Docks | 83:1-122 | Shanghai | 2 | — | — |
| Lunghwa Dock and Engine Works | 83:1-N/A | Shanghai | — | 2 | — |
| Ping An Dock | 83:1-123 | Shanghai | 2 | — | — |
| Tungkadoo Dock | 83:1-121 | Shanghai | — | 1 | — |
| Yangtzepoo Docks, Nos. 1 and 2 | 83:1-118 | Shanghai | — | 2 | — |

## Wooden Shipbuilding Centers

### JAPAN PROPER

| Location | Target Area | Approximate Coordinates |
|---|---|---|
| Aomori | 90:5 | 40-58;140-46 |
| Funakawa | 90:6 | 39-53;139-55 |
| Hachinohe | 90:5 | 40-31;141-32 |
| Hakata | 90:35 | 33-37;130-24 |
| Hakodate | 90:4 | 41-46;140-43 |
| Hirazawa | 90:6 | 39-17;139-58 |
| Ishinomaki | 90:10 | 38-25;141-19 |
| Kobe | 90:25 | 34-40;135-10 |
| Kushimoto | 90:24 | 33-28;135-47 |
| Matsue | 90:26 | 35-28;133-04 |
| Miyako | 90:8 | 39-39;141-58 |
| Nanao | 90:11 | 37-03;136-58 |
| Noshiro | 90:6 | 40-14;140-02 |
| Ofunato | 90:8 | 39-02;141-44 |

| Location | Target Area | Approximate Coordinates |
|---|---|---|
| Okazaki | 90:27 | 34-11;134-37 |
| Onomichi | 90:29 | 34-25;133-12 |
| Osaka | 90:25 | 34-40;135-28 |
| Sakaide | 90:27 | 34-20;133-51 |
| Sakata | 90:6 | 38-56;139-49 |
| Shimabara | 90:25 | 32-47;130-22 |
| Tokushima | 90:27 | 34-04;134-34 |
| Tokyo | 90:17 | 35-39;139-46 |
| Tonoura | 90:38 | 31-30;131-23 |
| Tsuruga | 90:22 | 35-40;136-04 |
| Tzuchizaki | 90:6 | 39-45;140-05 |
| Uwajima | 90:21 | 33-13;132-34 |
| Yokohama | 90:17 | 35-27;139-39 |

### MAINLAND

| | | |
|---|---|---|
| Antung | 93:2 | 40-07;124-22 |
| Ch'ing-tao (Tsingtao) | 83:11 | 36-05;120-19 |
| Chinnamp'o | 84:3 | 38-43;125-24 |
| Dairen | 93:5 | 38-56;121-39 |

| | | |
|---|---|---|
| Pusan (Fusan) | 84:7 | 35-07;129-03 |
| Shanghai | 83:1 | 31-18;121-34 |
| T'ien-ching (Tientsin) | 83:12 | 39-06;117-13 |
| Ying-k'ou (Newchang) | 93:3 | 40-41;122-12 |

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping after sheet ATSF/S, Appendix E, page 5.

Location Map

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JOINT TARGET GROUP - WASHINGTON, D. C.

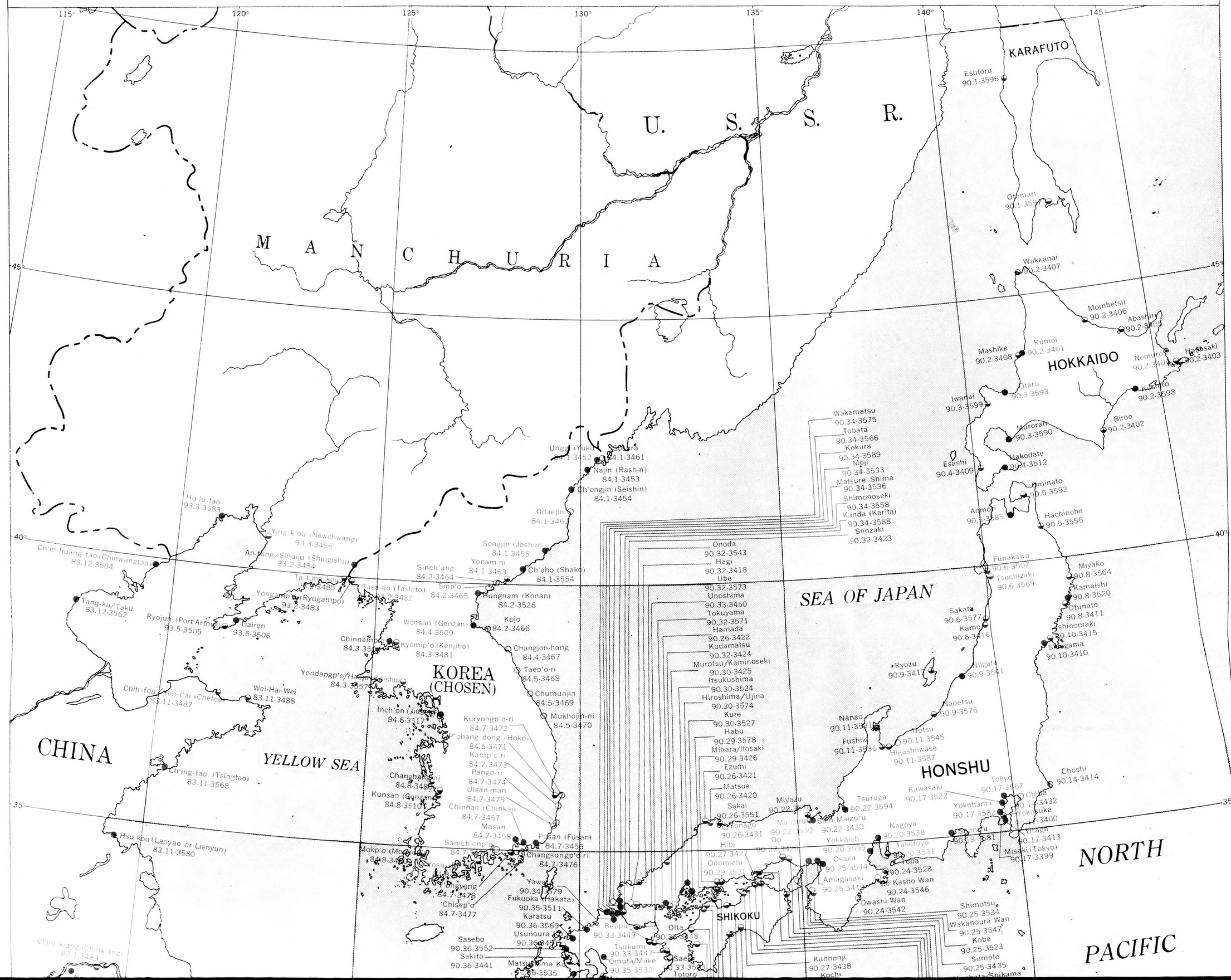
# JAPANESE PORTS IN THE INNER ZONE

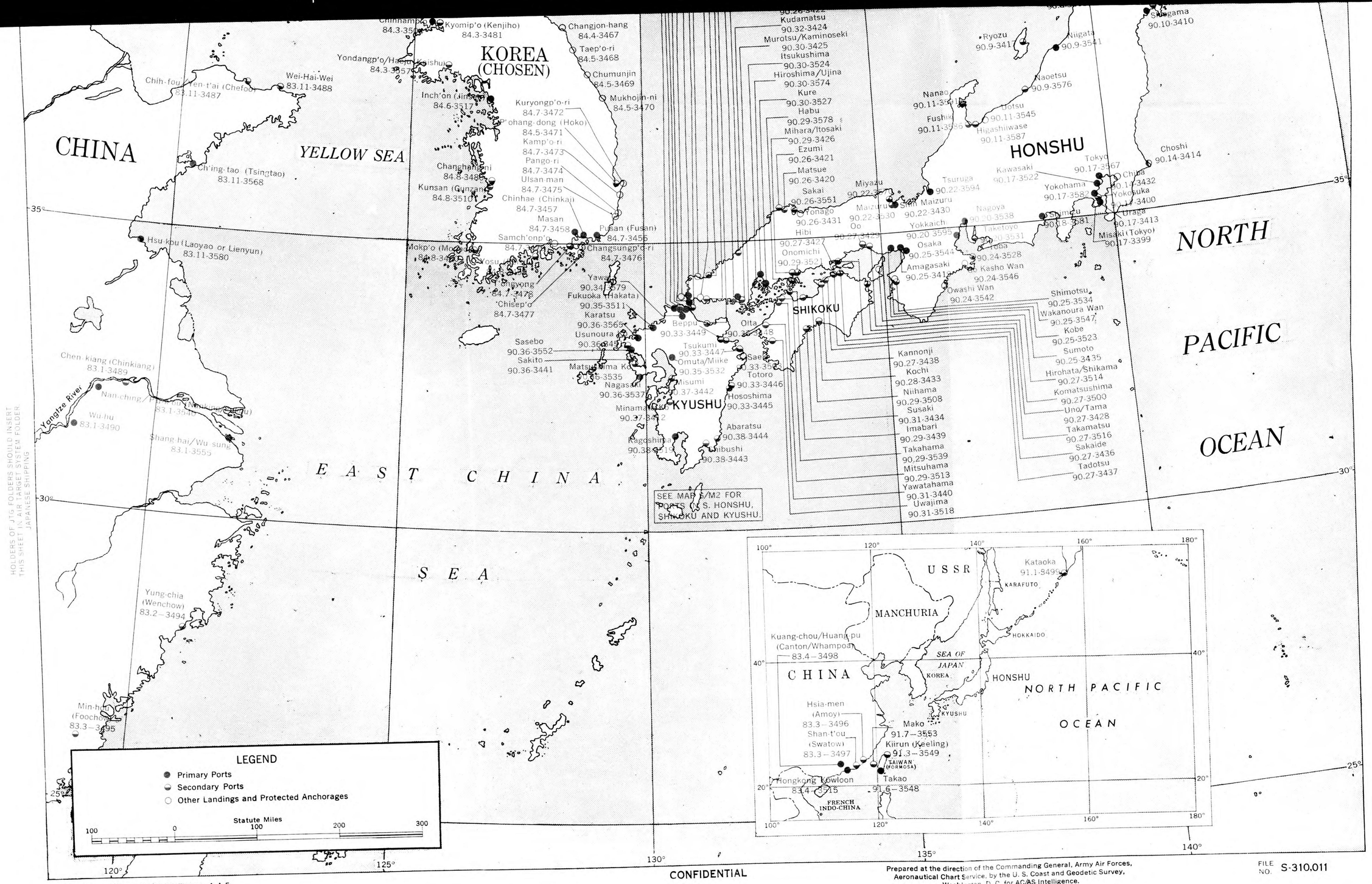
INCLUDING PRINCIPAL PORTS NORTH OF THE PHILIPPINES

GENERAL LOCATION MAP

SHEET NO. S/MI

DATE 15 MAY 1945






HOLDERS OF JTG FOLDERS SHOULD INSERT THIS SHEET IN AIR TARGET SYSTEM FOLDER JAPANESE SHIPPING

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May 1945

FILE NO. S-310.011

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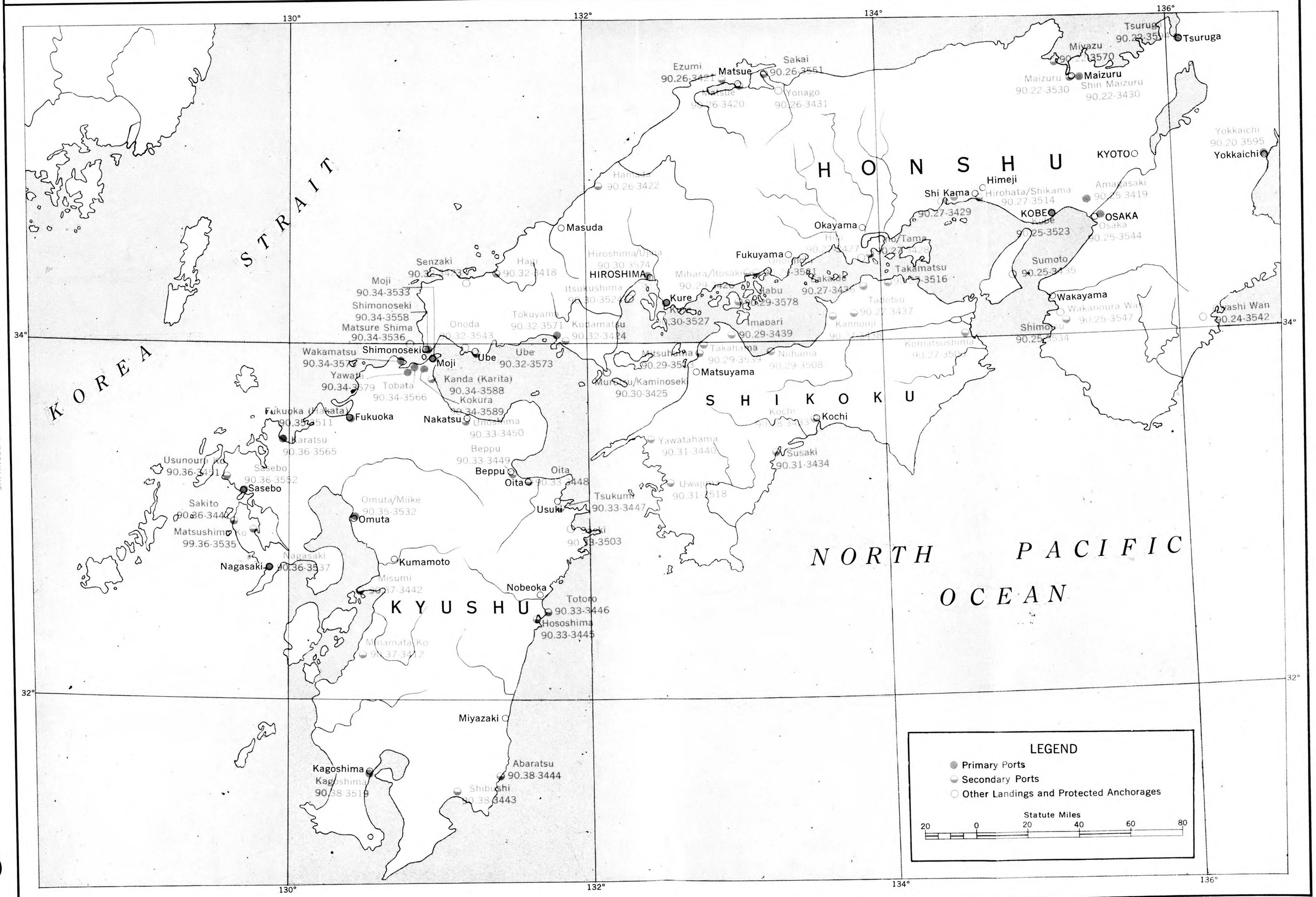
JOINT TARGET GROUP - WASHINGTON, D. C.

SHEET NO. S/M2
DATE 15 MAY 1945

# INSET OF JAPANESE PORTS IN S. HONSHU, KYUSHU AND SHIKOKU

## GENERAL LOCATION MAP




HOLDERS OF JTG FOLDERS SHOULD INSERT THIS SHEET IN AIR TARGET SYSTEM FOLDER JAPANESE SHIPPING AFTER PAGE S/M1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SOIL CONSERVATION SERVICE WASHINGTON, D. C. 1945


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May 1945

FILE NO. S-311,011

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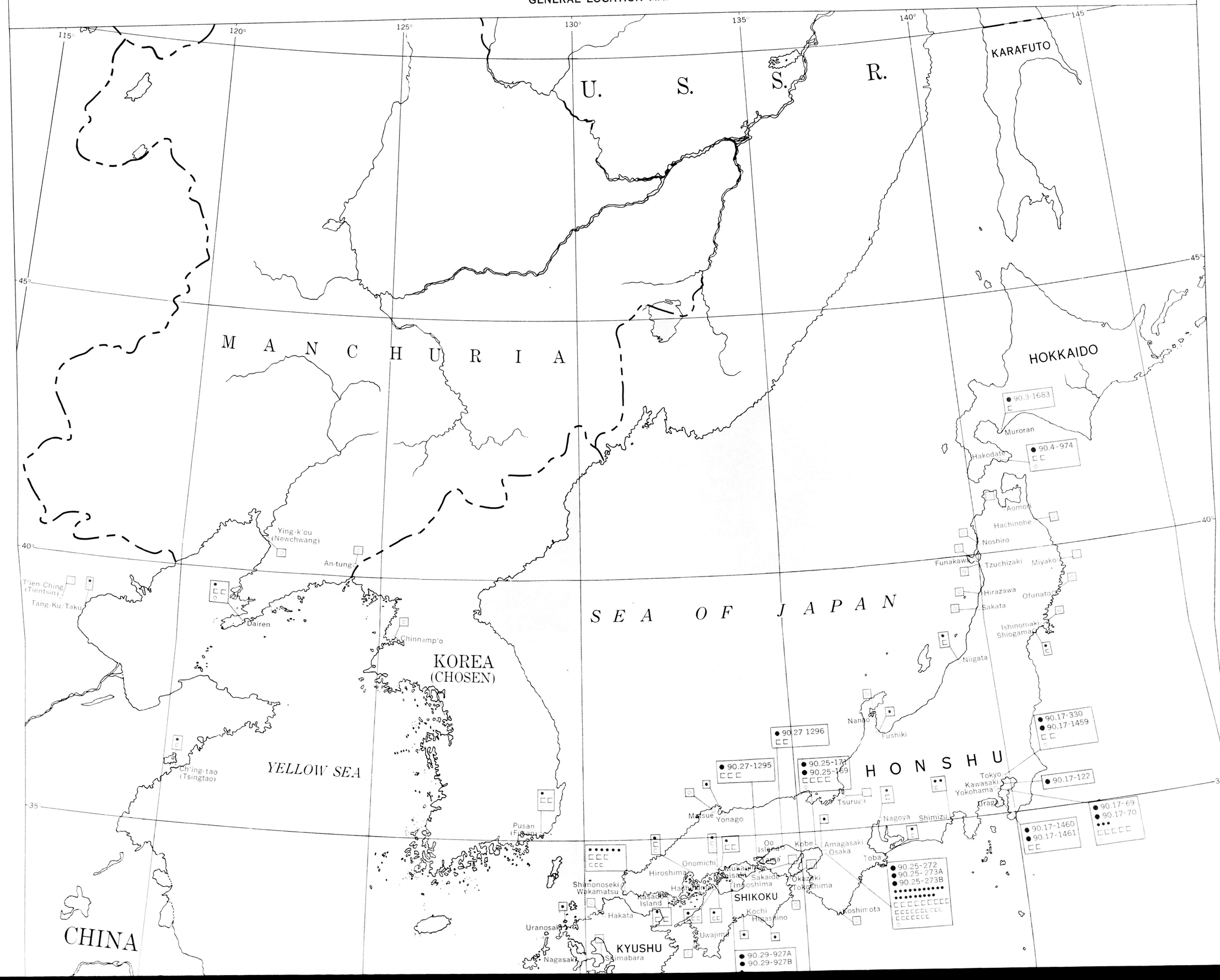
JOINT TARGET GROUP - WASHINGTON, D.C.

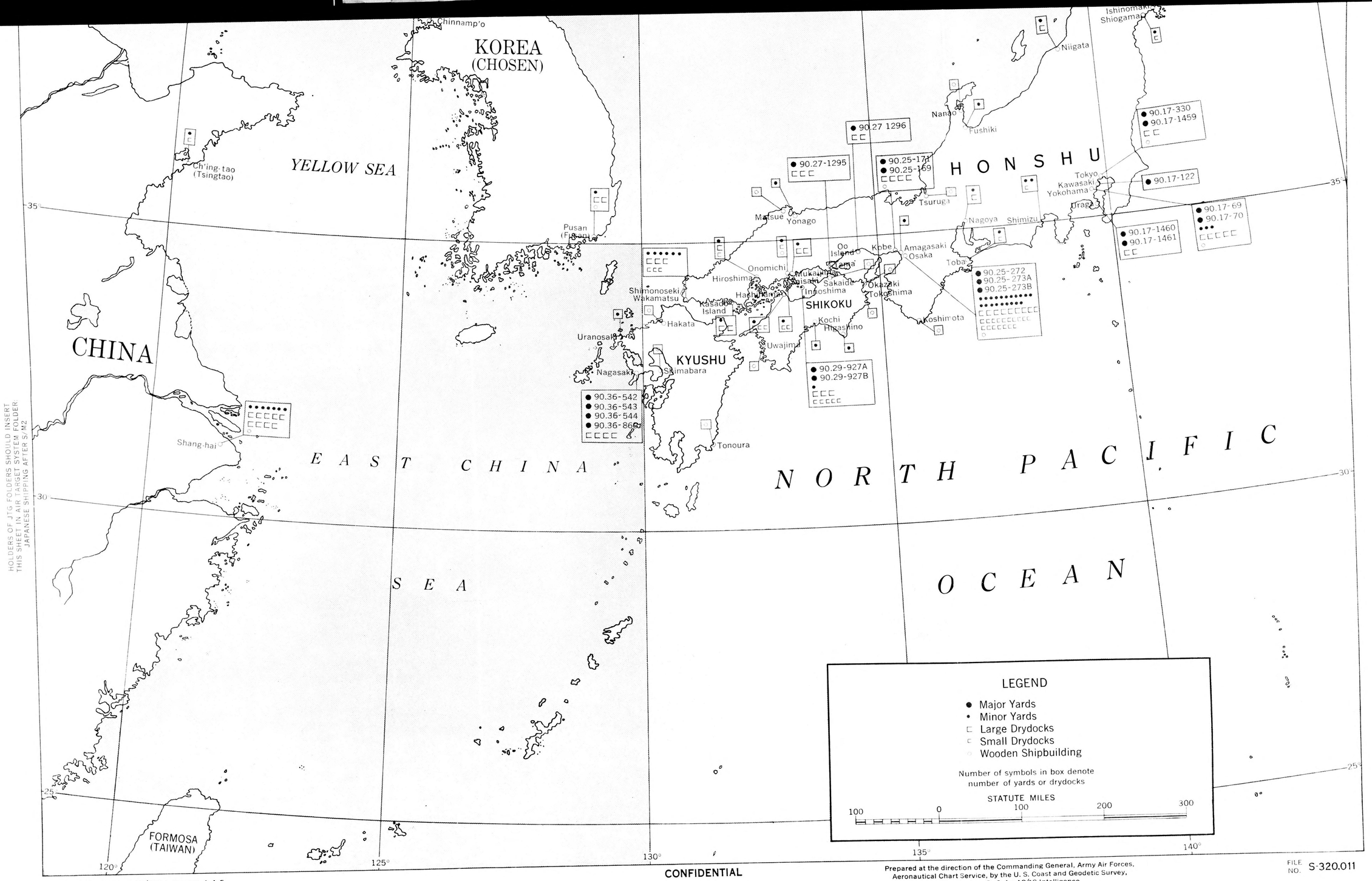
SHEET NO. S/M3

DATE 15 MAY 1945

# JAPANESE COMMERCIAL SHIPBUILDING AND REPAIR FACILITIES IN THE INNER ZONE

## GENERAL LOCATION MAP






HOLDERS OF JTG FOLDERS SHOULD INSERT THIS SHEET IN AIR TARGET SYSTEM FOLDER JAPANESE SHIPPING AFTER S/M2

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Prepared at the direction of the Commanding General, Army Air Forces, Aeronautical Chart Service, by the U. S. Coast and Geodetic Survey, Washington, D. C. for AC/AS Intelligence.
May 1945

FILE NO. S-320.011

Target Material

# JOINT TARGET GROUP, WASHINGTON, D. C.
# AIR TARGET INDEX—JAPANESE WAR
## PART I—SYSTEM INDEX

Sheet **ATI/1/S/1**
Date **5 February 1945**
Page **No. 1** (**4 pages**)

## SHIPPING—PORT FACILITIES

ALL PREVIOUS SHEETS CANCELLED

| TARGET NAME | TARGET NUMBER |
|---|---|
| Aomori, Japan | 90.5-993 |
| Balikpapan, Borneo | 94.4-3501 |
| Bangkok, Thailand | 98.2-3502 |
| Chinkai, Korea | 84.7-101 |
| Chinnampo, Korea | 84.3-3504 |
| Chinwangtao, China | 83.12-24 |
| Dairen, Manchuria | 93.5-3506 |
| Funakawa, Japan | 90.6-3507 |
| Fusan, Korea | 84.7-97 |
| Fushiki, Japan | 90.11-867 |
| Genzan, Korea | 84.4-3509 |
| Gunzan, Korea | 84.8-3510 |
| Hakata (Fukuoka), Japan | 90.35-2511 |
| Hakodate, Japan | 90.4-3512 |
| Higashi-Iwase, Japan | 90.11-862 |
| Hirohata, Japan | 90.27-3514 |
| Hongkong-Kowloon, China | 83.4-3515 |
| Hulutao, Manchuria | 93.3-172 |
| Jinsen, Korea | 84.6-3517 |
| Jukong Wharf, China | 83.1-112 |
| Kagoshima, Japan | 90.38-3519 |
| Kamaishi, Japan | 90.8-3520 |
| Kanda, Japan | 90.34-1867 |
| Kawasaki, Japan | 90.17-3522 |
| Kobe, Japan | 90.25-3523 |
| Kokura, Japan | 90.34-1866 |
| Kolaka, Celebes | 94.5-3525 |
| Konan, Korea | 84.2-3526 |
| Kure, Japan | 90.30-3527 |
| Laoyao (Lienyun), China | 83.11-79 |
| Lutong, Borneo | 81.1-3529 |
| Maizuru, Japan | 90.22-3530 |
| Masan, Korea | 84.7-130 |
| Matsure, Japan | 90.34-3536 |
| Miike, Japan | 90.35-3532 |
| Moji, Japan | 90.34-3533 |
| Moppo, Korea | 84.8-99 |
| Muroran, Japan | 90.3-381 |
| Nagasaki, Japan | 90.36-3537 |
| Nagoya, Japan | 90.20-3538 |
| Nanao, Japan | 90.11-870 |
| Nanking-Pukow, China | 83.1-3540 |
| Niigata, Japan | 90.9-3541 |
| Ominato, Japan | 90.5-996 |
| Onoda, Japan | 90.32-3543 |

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# JOINT TARGET GROUP, WASHINGTON, D. C.
# AIR TARGET INDEX—JAPANESE WAR
## PART I—SYSTEM INDEX

Sheet **ATI/1/S/2**
Date **12 April 1945**
Page **No. 2** (**4 pages**)

## SHIPPING—PORT FACILITIES—Continued

ALL PREVIOUS SHEETS CANCELLED

| TARGET NAME | TARGET NUMBER |
|---|---|
| Osaka, Japan | 90.25-3544 |
| O Shima (Tokuyama), Japan | 90.32-3545 |
| Otaru, Japan | 90.3-992 |
| Palembang, Sumatra | 94.2-53 |
| Rashin, Korea | 84.1-14 |
| Reisui, Korea | 84.8-98 |
| Saigon, French Indo China | 85.2-3550 |
| Sakai, Japan | 90.26-3551 |
| Sasebo, Japan | 90.36-3552 |
| Seishin, Korea | 84.1-13 |
| Shako, Korea | 84.1-3554 |
| Shanghai, China | 83.1-3555 |
| Shenchiayuan, China | 83.8-114 |
| Shihweiyao, China | 83.8-115 |
| Shimonoseki, Japan | 90.34-3558 |
| Singapore, Malay States | 92.2-3559 |
| Si Chang Island, Thailand | 98.2-3561 |
| Soerabaja, Java | 94.3-3560 |
| Tangku Taku, China | 83.12-3562 |
| Tandjoeng Priok, Java | 94.4-3563 |
| Tarakan, Borneo | 94.4-3572 |
| Tashito, Manchuria | 93.2-85 |
| Tatung, Manchuria | 93.2-188 |
| Tobata, Japan | 90.34-3566 |
| Tokuyama, Japan | 90.32-3571 |
| Tokyo, Japan | 90.17-3567 |
| Tsingtao, China | 83.11-3568 |
| Tsuchizaki, Japan | 90.6-3569 |
| Tsuruga, Japan | 90.22-1950 |
| Ube, Japan | 90.32-3573 |
| Ujina, Japan | 90.30-3574 |
| Wakamatsu, Japan | 90.34-3575 |
| Whampoa, China | 83.4-51 |
| Woosung, China | 83.1-111 |
| Wuhu, China | 83.1-116 |
| Yawata, Japan | 90.34-3579 |
| Yingkou, Manchuria | 93.3-174 |
| Yokkaichi, Japan | 90.20-1737 |
| Yokohama, Japan | 90.17-3582 |
| Yuki, Korea | 84.1-15 |

These port area target numbers refer to the entire harbor area, which in many cases includes individual harbor installations to which specific target numbers have already been assigned. The

Continued next page

Holders of Joint Target Group folders should insert this sheet in Air Target System folder: Japanese Shipping after ATI/1/S/1, page 2.

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AIR TARGET INDEX—JAPANESE WAR

PART I—SYSTEM INDEX

Sheet **ATI/1/S/1**
Date **5 February 1945**
Page **No. 3** (**4 pages**)

## SHIPPING—PORT FACILITIES—Continued

ALL PREVIOUS SHEETS CANCELLED

'Port Area' as designated by these numbers, may also include anchorage areas outside of the breakwaters which are characteristic of Japanese ports.

This list of Port Facilities includes the principal ports available to the Japanese for cargo-handling in support of their war effort. It is not a priority list since priority will depend to a large extent on activity. Not all of the port areas listed are in current use. For instance, Nagoya is included as available although current photo reconnaissance shows no shipping present; on the other hand, many outports of relatively low capacity and useable to by-pass the larger port areas if the need should arise, are excluded for the sake of brevity.

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# JOINT TARGET GROUP, WASHINGTON, D. C.
## AIR TARGET INDEX—JAPANESE WAR
### PART I—SYSTEM INDEX

Sheet **ATI/1/S/1**
Date **5 February 1945**
Page **No. 4** (**4 pages**)

## SHIPPING—SHIPBUILDING AND REPAIR

ALL PREVIOUS SHEETS CANCELLED

| TARGET NAME | PLACE NAME | TARGET NUMBER |
|---|---|---|
| Asano Dockyard | Yokohama (Japan) | 90.17-70 |
| Drydock and West Wall Area | Singapore (Malay States) | 92.2-20 |
| Fujinagata Shipbuilding Co. | Osaka (Japan) | 90.25-273A |
| Fujinagata Shipbuilding Co. | Osaka (Japan) | 90.25-273B |
| Habu Shipyards | Innoshima (Japan) | 90.29-927A |
| Hakodate Dockyard | Hakodate (Japan) | 90.4-974 |
| Harima Shipyard | Oo (Japan) | 90.27-1296 |
| Ishikawajima Dockyard | Tokyo (Japan) | 90.17-330 |
| Kasado Dock Co. | Kasado Island (Japan) | 90.32-668 |
| Kawanami Industry Co. Shipyard | Koyagi Island (Japan) | 90.36-860 |
| Kawasaki Heavy Industry Co. | Kobe (Japan) | 90.25-171 |
| Kiangnan Drydocks | Shanghai (China) | 83.1-117 |
| Kowloon Dockyard | Kowloon (China) | 83.4-55 |
| Kure Naval Shipyard | Kure (Japan) | 90.30-657B |
| Maizuru Naval Base | Maizuru (Japan) | 90.22-1041 |
| Manchuria Dockyard | Dairen (Manchuria) | 93.5-10 |
| Mitsubishi Shipyard | Hikoshima (Japan) | 90.34-1846 |
| Mitsubishi Heavy Industries | Kobe (Japan) | 90.25-169 |
| Mitsubishi Dockyard | Nagasaki (Japan) | 90.36-543 |
| Mitsui Tama Shipyard | Tama (Japan) | 90.27-1295 |
| Muroran Dockyard | Muroran (Japan) | 90.3-1683 |
| North Wharf Area | Singapore (Malay States) | 92.2-22 |
| Osaka Iron Works | Hikoshima (Japan) | 90.34-43B |
| Osaka Iron Works, Unit No. 1 | Osaka (Japan) | 90.25-272 |
| Osaka Iron Works, Unit No. 2 | Osaka (Japan) | 90.25-699 |
| Royal Navy Yard | Hongkong (China) | 83.4-54 |
| Sasebo Naval Dockyard | Sasebo (Japan) | 90.36-752 |
| Shannosho Shipyards | Innoshima (Japan) | 90.29-927B |
| Taikoo Dockyard | Hongkong (China) | 83.4-53 |
| Tategami Shipyard | Nagasaki (Japan) | 90.36-544 |
| Tsurumi Steel and Shipbuilding Co. | Kawasaki (Japan) | 90.17-122 |
| Uraga Dockyard No. 1 | Uraga (Japan) | 90.17-1460 |
| Uraga Dockyard No. 2 | Uraga (Japan) | 90.17-1461 |
| Yokohama Dockyard | Yokohama (Japan) | 90.17-69 |
| Yokosuka Navy Yard | Yokosuka (Japan) | 90.17-274 |

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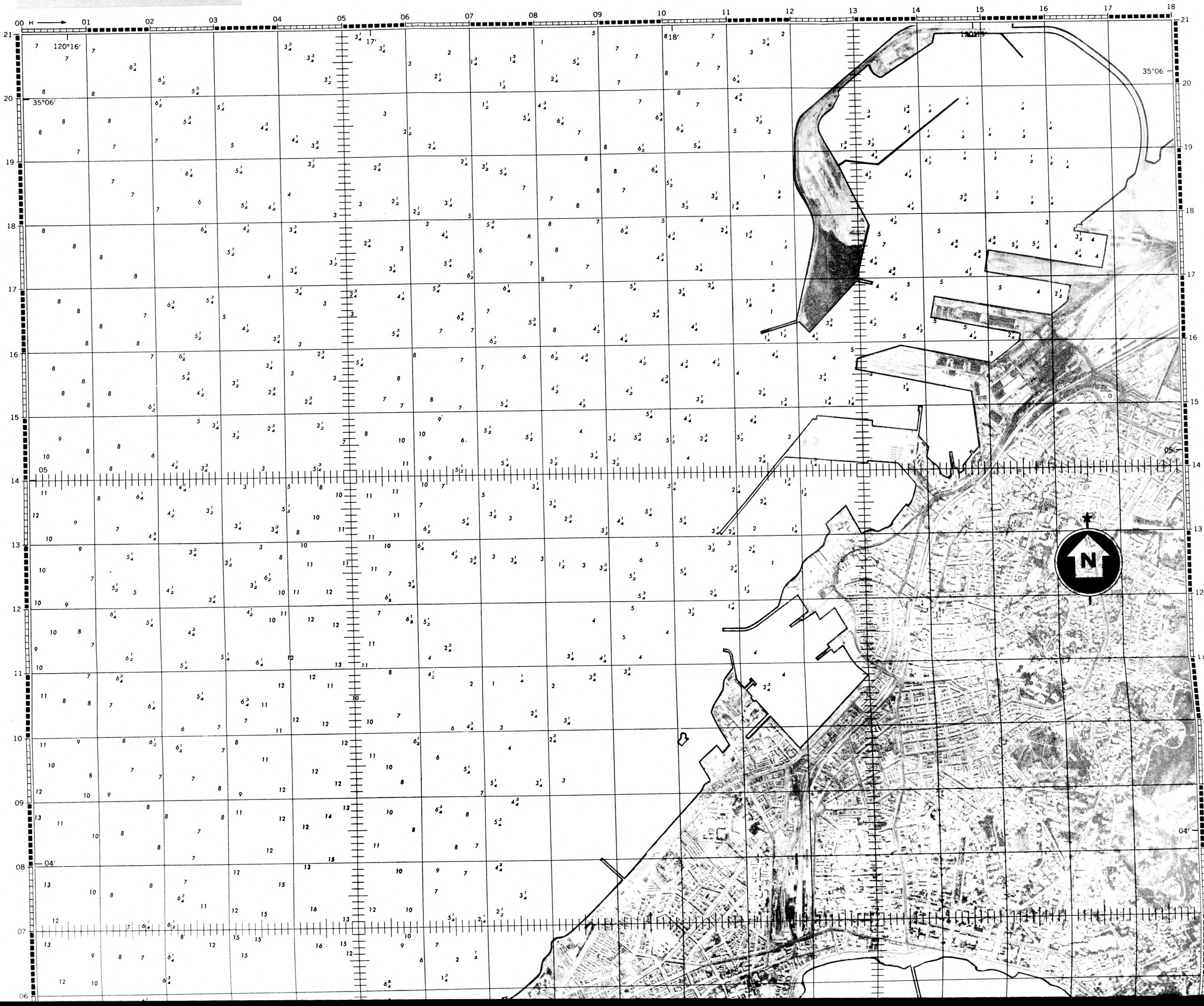
# CH'ING-TAO (TSINGTAO) CHINA

Scale 1:12,500

ILLUSTRATION No. . . . . 83.11-3568 PSP
DATE. . . . . 7 May 1945

JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT



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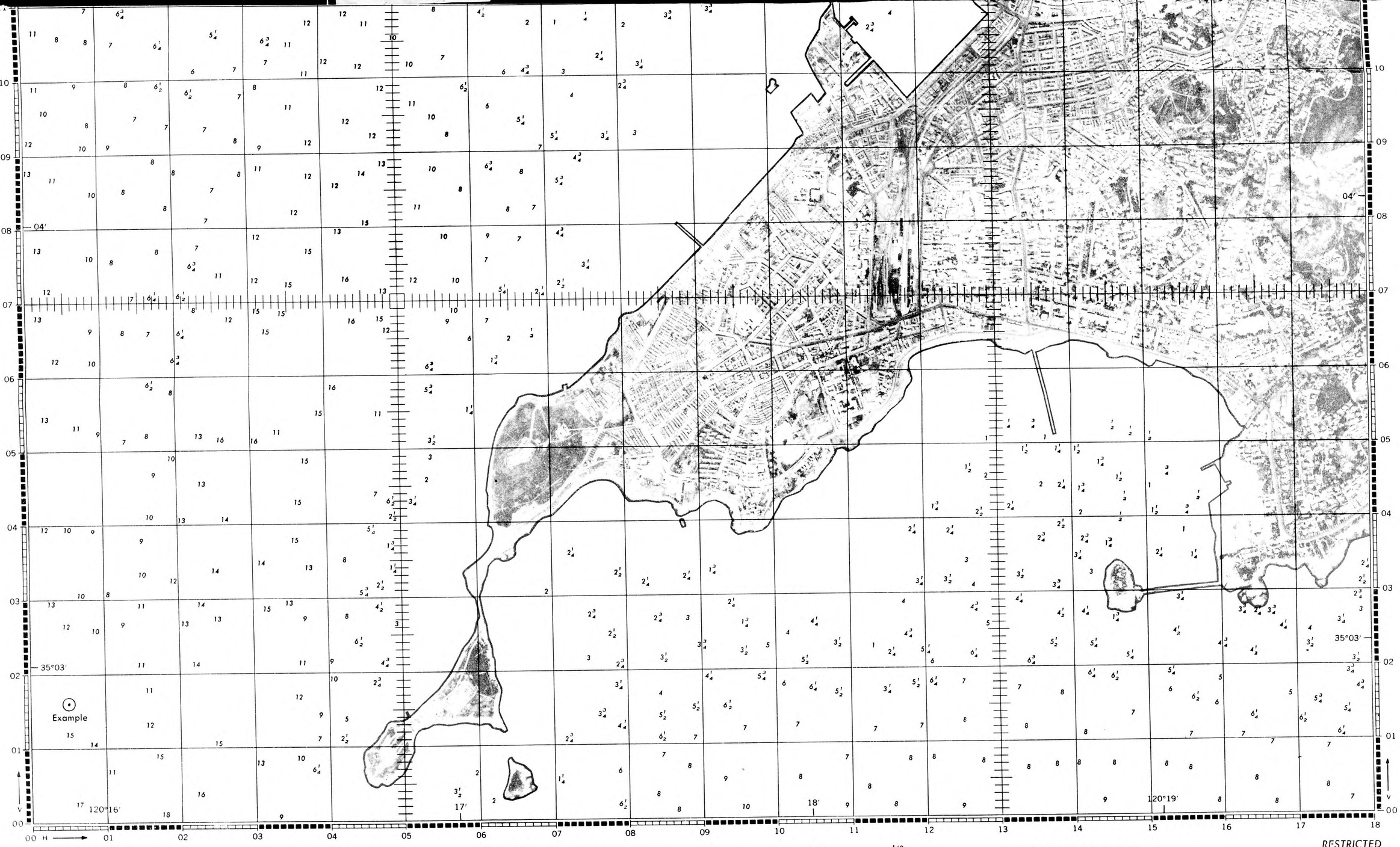


RESTRICTED

⊙ EXAMPLE Grid Reference Reading:
*Ch'ing-tao (or 83.11-3568)PSP H005 V016*
Always Use Three Digits Preceded by H & V

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Uncontrolled Mosaic by AC/AS Intelligence and P.I.C. Div. of Naval Intelligence from photography of 9 Sept. '44. USHO Chart 5489 '36 cor. to '44. JHO Chart 378, '34 cor. to '39.

Statute Miles 1/2 0 1/2
Nautical Miles 1/2 0 1/2

500 0 500 1000 Yards
1"=1041.7 Ft 0 1000 2000 3000 Feet

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

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**CH'ING-TAO (TSINGTAO), PSP**

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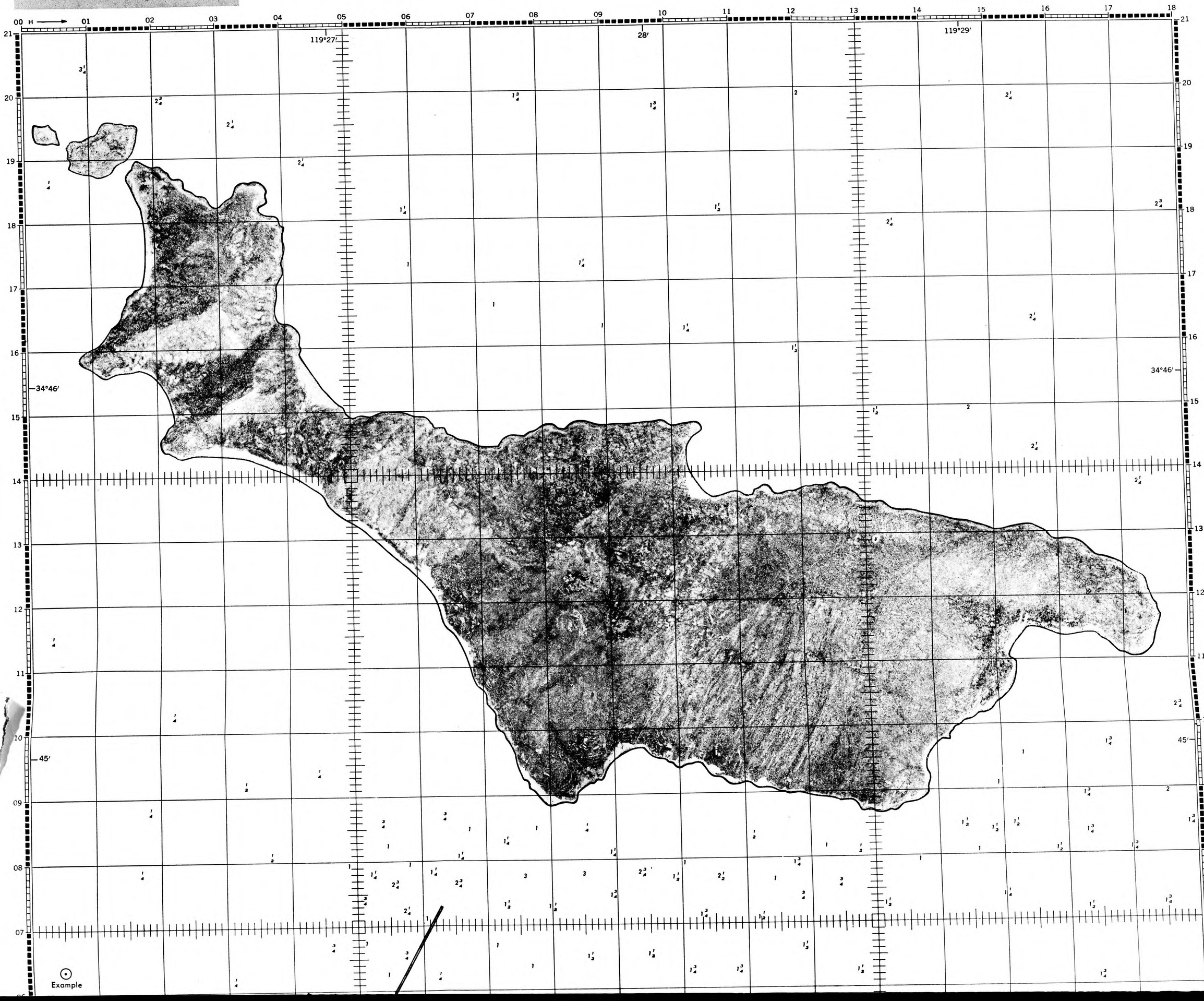
JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

# LIEN-YUN (LAO-YAO), CHINA

Scale 1:12,500

ILLUSTRATION No. . . . . 83.11-3580 PSP
DATE . . . . . 7 May 1945



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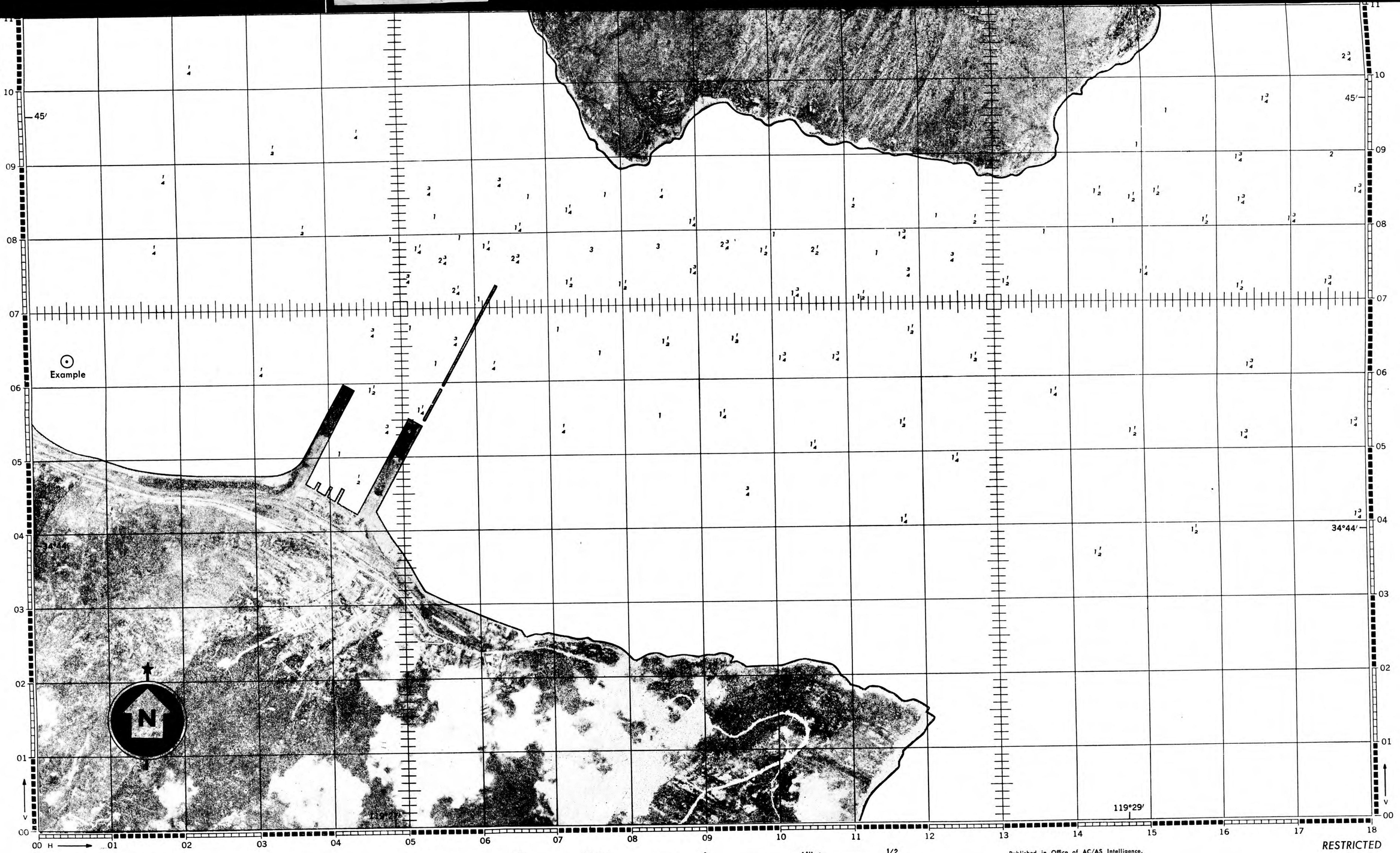


RESTRICTED

⊙ EXAMPLE Grid Reference Reading:
*Lien-yun (or 83.11-3580)PSP H005 V064*
Always Use Three Digits Preceded by H & V

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Uncontrolled Mosaic by AC/AS Intelligence and P.I.C. Div. of Naval Intelligence from photography of 9 Sept. '44. JHO Chart 388, '40.

1/2 Statute Miles 0 Miles 1/2
1/2 Nautical Miles 0 1/2

500 0 500 1000 Yards
1″=1041.7 Ft 0 1000 2000 3000 Feet

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

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**LIEN-YUN (LAO-YAO), PSP**

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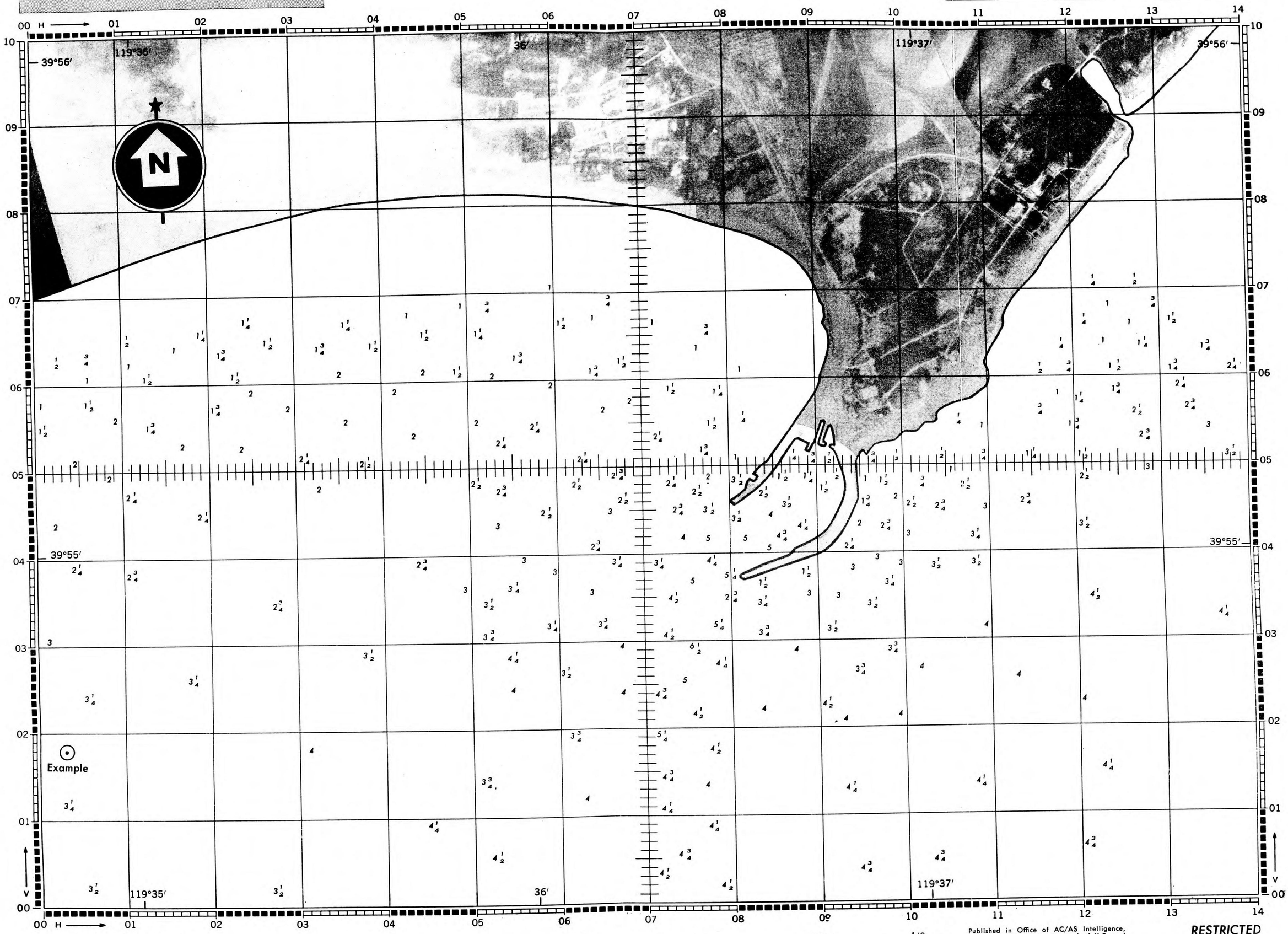
JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

# CH'IN-HUANG-TAO (CHINWANGTAO), CHINA

Scale 1:12,500

ILLUSTRATION No. . . . . 83.12-3584 PSP
DATE . . . . . 7 May 1945

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⊙ EXAMPLE Grid Reference Reading:
*Ch'in-huang-tao (or 83.12-3854)PSP H003 V018*
**Always Use Three Digits Preceded by H & V**

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Washington, D. C. 1945 from Uncontrolled Mosaic by AC/AS.
Intelligence from photography of 9 Sept. '44. USHO Chart 2493 '36 cor. to '42. JHO Chart 377 '31 cor. to '42.

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

1/2 Statute 0 Miles 1/2
1/2 Nautical 0 Miles 1/2

500 0 500 1000 Yards
1"= 1041.7 Ft 0 1000 2000 3000 Feet

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**CH'IN-HUANG-TAO (CHINWANGTAO), PSP**

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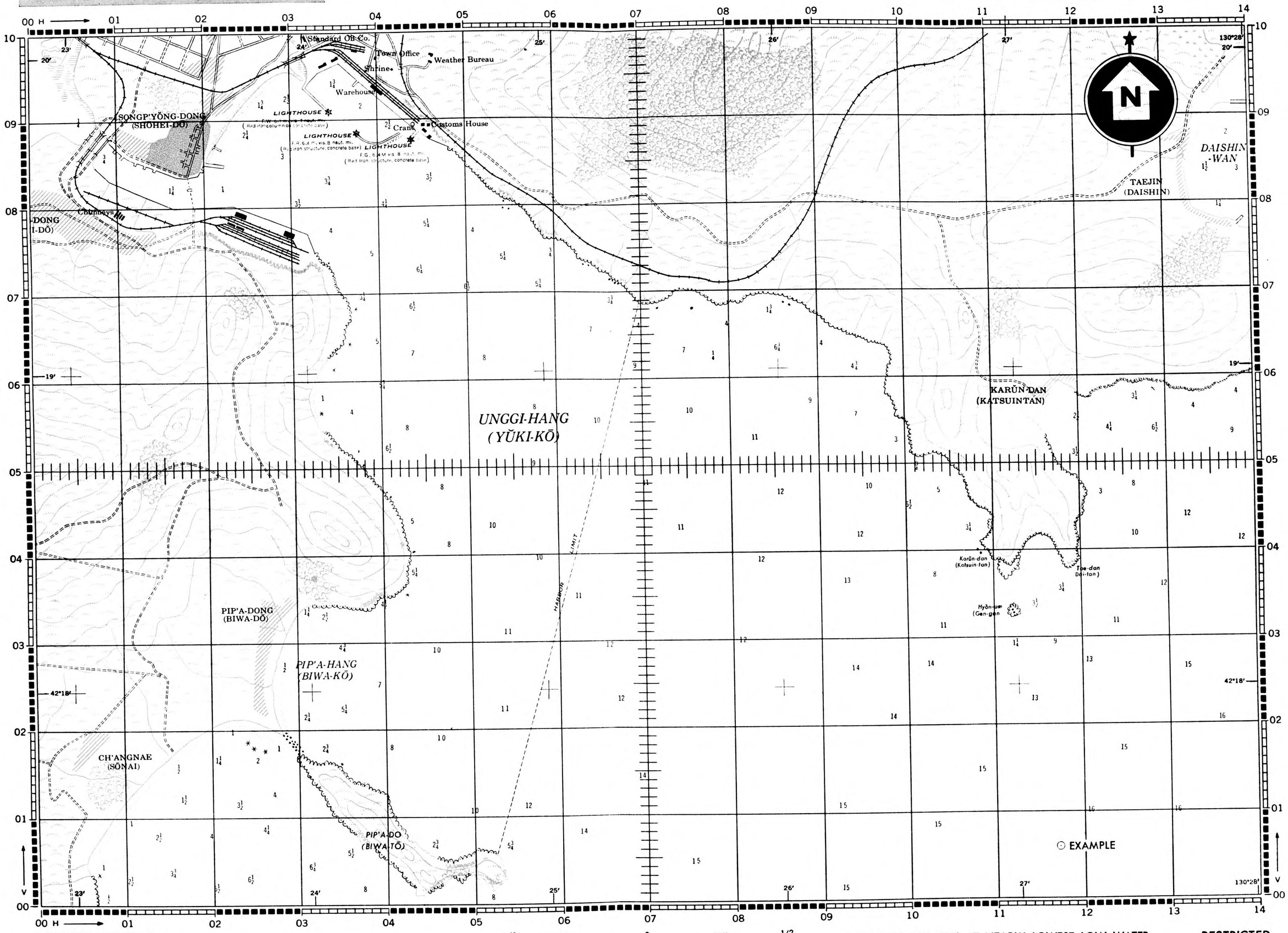
PORT SHIPPING PLOT

# UNGGI (YUKI)—KOREA

Scale 1:20,000

ILLUSTRATION No. . . . . 84.1-3452 PSP
DATE. . . . . 12 May, 1945

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⊙ EXAMPLE Grid Reading
UNGGI (or 84.1-3452) PSP H118 V007
Always Use Three Digits Preceded by H & V

Prepared from A.A.F. City Plan UNGGI, 1944
Hydrography Corrected to 1932

Statute Miles 1/2 0 1/2
Nautical Miles 1/2 0 1/2

500 0 500 1000 Yards
1"=1666 Ft 0 1000 2000 3000 Feet

DEPTHS IN FATHOMS AT NEARLY LOWEST LOW WATER

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# TARGET INFORMATION SHEET

Sheet No. 90.17-274-T1
Date 9 Feb. 1945
Page No. 1 ( 3 pages)

Obj. Folder 90.17
Obj. Area 90.17
AAF Target No. 90.17-274

Place Yokosuka (Japan)
AIR TARGET
SYSTEM Shipping- Shipbuilding and Repair

Lat.: 35° 17'N
Long: 139° 40'E
Alt.: 10 feet

NAME OF TARGET YOKOSUKA NAVY YARD

ALL PREVIOUS SHEETS CANCELLED

*SIGNIFICANCE*

This is one of the four largest and most important navy yards in Japan. It is compactly laid out and equipped to repair, construct and fit out every type of Japanese naval vessel. It contains six dry docks, two of which can accommodate the largest type naval vessels, four building ways, and a marine railway. Two of these ways are relatively wide and will accommodate several small vessels at one time. The yard contains complete repair facilities including a foundry, forge shop, boiler shop, diesel engine plant, and machine, ordnance and engine shop; also two structural shops, a new and old mold loft, a landing craft engine factory, and many other supplemental and complementary buildings. There are several thousand feet of docking space, a long slender finger pier and many large fixed, movable, and floating cranes. Important engineering research laboratories are reported to be located here. It is apparent that there is considerable activity at this yard. Photography of 1 November 1944 showed the docks, wharves and piers to be crowded with small and medium size naval vessels, landing craft, and small boats. The dry docks and building ways are all in use.

*LOCATION*

Along the entire W side of Yokosuka Peninsula which lies about 27 air miles S of Tokyo, at the southern end, western side, of Tokyo Bay. Sagami Bay is about 5 miles to the SW across the Miura Peninsula on which hills rise to about 800 feet. The base is about 10 miles N from the S tip of Miura Peninsula. Chiba Peninsula across Uraga Strait, is about 8 miles to the E at its closest point. It is connected with Yokohama by a branch line RR and a 3 lane macadam highway. A second branch connects with the Tokaido Mainline RR at Ofuna about 8 miles to the NW.

*DESCRIPTION AND LAYOUT*

(Refer to Illustration No. 90.17-274 P4). The target area is of irregular shape measuring about 7,000 feet long from N to S and about 3,000 feet wide at its widest point. The buildings, ways, docks and wharves are tightly packed in every available space throughout the yard. Relatively high hills have been cut into and land has been reclaimed. Railroad tracks and roads serve all parts of the yard.

The S end of the target area is occupied by three slipways, 1100 920, 260 feet in length (Slipways Nos. 1, 2 and 4), a marine railway, 525 feet in length (Slipway No. 3), a structural shop and old mold loft (Bldgs. 4 and 5), and supplementary structures. Photography of 1 Nov. 1944 showed four destroyer-type and a number of smaller vessels under construction in these ways.

The central section of the yard, on a small peninsula jutting NW into Yokosuka Harbor, has at its northern end dry dock No. 5, about 1,015 feet in length and dry dock No. 4, about 750 feet long; at its southern end, dry dock No. 3, about 300 feet in length, dry dock No. 2, approximately 460 feet long, and dry dock No. 1, about 420 feet long. Photography of 1 November 1944 showed that dry dock No. 1 contained two vessels 135 and 120 feet long, dry dock No. 2 a 350 foot vessel, dry dock No. 3 possibly a small submarine, dry dock No. 4 a 265-foot vessel (afloat), dry dock No. 5 two 280-foot vessels. All five of these docks are served by the major buildings adjacent to them on the small peninsula, including a foundry and machine shop (34), forge shop (27 and part of 28), boiler shop (33 also reported as a forge shop) diesel engine shop (59), and a machine, ordnance and engine shop (46, also reported as a pattern shop, 47 and 49). Other identified shops such as copper, pipe, electrical and sheet metal shops are also located in this area. A landing craft engine factory (17) is also located on this peninsula. The N edge of this

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peninsula is used as fitting out and repair and replacement area, as is the water's edge N from this small peninsula to dry dock No. 6. A long slender finger pier (pontoon) extends into the opening formed between Yokosuka Peninsula and the small peninsula. Photography of 1 November 1944 showed a large number of small vessels tied up along this dockage, including six or seven destroyer-type vessels.

The N end of the target area, the most recently constructed section, contains the largest dry dock in the yard, No. 6, over 1060 feet long. This is a construction dock, equipped with six large cranes, a large new structural shop (91), about 690 feet long and about 485 feet wide at its widest point, new mold loft (90), and supporting shops and equipment. Immediately to the NW of this structural shop are located several contiguous slipways (Slipway 5), 435 feet long, 165 feet wide, for the construction of small vessels, and presumably supporting shops. Photography of 1 November 1944 showed several small craft under construction on these ways.

There appeared to be, in the photography, a large quantity of material stored adjacent to the building ways and dry docks. There were many 80 foot to 110 foot vessels along the fitting-out wharves and piers. Adjacent to the landing craft engine factory (17) were craft measuring approximately 50 feet in length. Large numbers of small boats were also packed around the S end of the yard adjacent to Slipway 4.

(Refer to Illustration No. 90.17-274 P2). There is known to be extensive anchorage facilities for all sizes and types of ships in Yokosuka and nearby Harbors. On the E side of Yokosuka Peninsula are located an artillery school, military warehouses, naval barracks, naval hospital, machinist school, and a naval headquarters. On the W side of Yokosuka Harbor are located huge oil storage areas (Azuma Peninsula), the Azuma Oil Storage (TARGET 90.17-297); Yokosuka Arsenal and Armament Works (TARGET 90.17-282); and Oppama Naval Air Station (TARGET 90.17-298).

*PRIMARY OBJECTIVES*

(Refer to Illustration No. 90.17-274 P4). The primary objectives vary, depending upon whether repair facilities, new construction plant, or work in process is given the principal weight in evaluation. The machine, ordnance, and engine shops (46, 47, and 49) are probably the most vital area from a repair standpoint, the new and old structural shops and new and old mold lofts (4, 5, 90, and 91), are the most important from a new construction viewpoint, and the actual work in process in the dry docks, alongside the wharves, and on the ways, the most important for immediate front line effect. The destruction of the dry dock caissons and pump houses would probably put the dry docks out of operation for the longest period of time, but are very small targets and the pump houses may be cross connected.

*CONSTRUCTION VULNERABILITY*

(Refer to Illustration No. 90.17-274 P4). The majority of the buildings are one-story steel frame with corrugated iron roofing and siding. Sawtooth roofed buildings have spans of about 35 feet and are approximately 38 feet high to the eaves. Spans of 85 feet are found in monitor roofed buildings whose heights to eaves are about 45 feet. The smaller shed type buildings have spans of 30 to 40 feet and are 15 to 18 feet high to the eaves. Buildings 27, 28, 33, 34, 49, 59, and 91 probably contain gantry cranes which necessitate extra heavy steel framing along the side walls. Drydocks are of standard heavy concrete or granite block construction.

*WEAPON RECOMMENDATIONS*

Instructions with regard to weapons will usually be given in Field or Operational Orders, but in the absence of such instructions and to assist Planners in formulating such orders the following information is given:

A preliminary structural and occupancy analysis of the yard indicates that weapon recommendations should vary according to the following objectives:



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TARGET INFORMATION SHEET *(Contd.)*

| *OBJECTIVE* | *WEAPON RECOMMENDATIONS* |
|---|---|
| 1. Heavy engineering shops (repair and new construction facilities) | 1. 2000-lb G.P., fuzed 0.1 sec. nose/ 0.025 sec. tail<br>Alternate: 1000-lb G.P., fuzed similarly. |
| 2. Caissons and pump houses (dry docks) | 2. 500-lb G.P., fuzed 0.1 sec. nose/ 0.025 sec. tail.<br>Alternate: 1000-lb G.P., fuzed similarly. |
| 3. Ships (work in progress) | 3. 500-lb G.P., fuzed 0.1 sec. nose/ 0.025 sec. tail.<br>Alternate: 1000-lb G.P., fuzed similarly. |

Large G.P. bombs are necessary to cause maximum damage in the heavy engineering shops, which contain large, massive equipment and in some units, gantry cranes. The 2000-lb bomb, which produces a crater 40 to 45 feet in diameter, has the best chance of undermining two or more main columns and thus causing primary collapse of the crane runway. Maximum cratering will result from 0.025 fuzing.

The caissons and pump houses of the dry docks are small. Direct hits with bombs of 500-lbs upwards are needed for maximum effectiveness.

Photography of 1 November 1944 shows most of the vessels in the area to be destroyer-type or smaller craft. Therefore, the 500-lb bomb is recommended rather than larger G.P.'s.

Incendiary bombs are not recommended against this target, as the objectives are largely non-combustible.

*LEVEL OF DAMAGE*

*CAMOUFLAGE, DECOYS AND SMOKE SCREENS*

Photography of 1 November 1944 shows no attempt at camouflage or use of decoys. No use of smoke screens has been reported.

*ADDITIONAL INFORMATION*

The following changes in targets at Yokosuka have been made: TARGETS 90.17-276, 277, 278, 295, 1452, 1453, 1454, 1457, and 1458 are cancelled. The name of TARGET 90.17-274 is changed from "Shipyard of Yokosuka Naval Base" to "Yokosuka Navy Yard" and the boundaries of the target area are extended to include the former TARGETS 90.17-276, 277 and 1454. The arsenal area of this base, TARGET 90.17-282, is located about 9,000 feet W of this yard.



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JOINT TARGET GROUP • WASHINGTON, D. C.

**TARGET No. 90.17–274**

COORDINATES 35° 17′ N 139° 40′ E

PHOTOGRAPHED 1 NOVEMBER 1944

# YOKOSUKA NAVY YARD
# YOKOSUKA, JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE

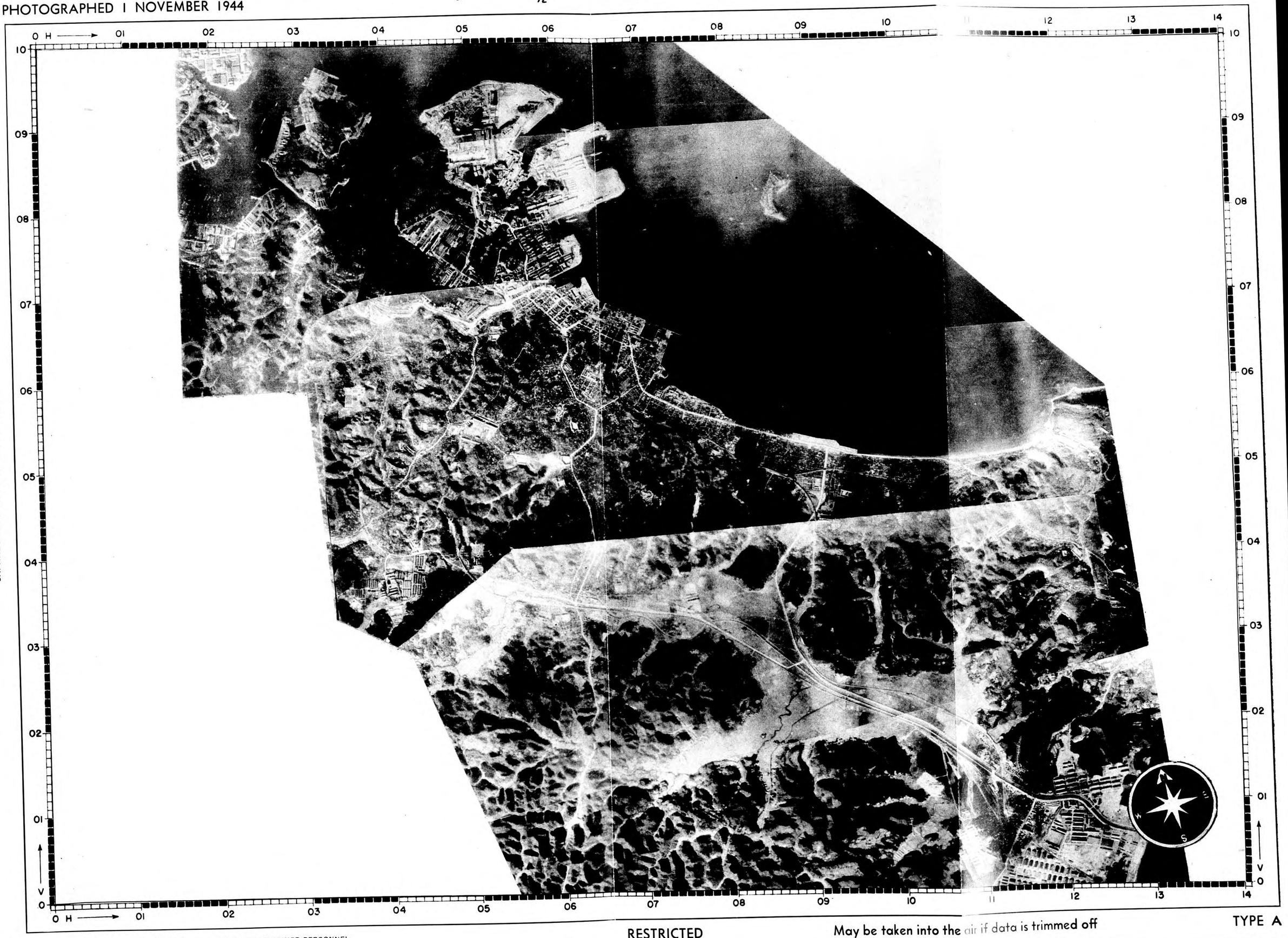
1:32 000 APPROX.

**ILLUSTRATION No. 90.17–274 P1**

ISSUED 22 FEBRUARY 1945

RESTRICTED

HOLDERS OF JTG FOLDERS SHOULD INSERT THIS SHEET IN AIR TARGET SYSTEM FOLDER: JAPANESE SHIPBUILDING AND REPAIR.

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May be taken into the air if data is trimmed off

TYPE A

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**TARGET No. 90.17–274**

# YOKOSUKA NAVY YARD
# YOKOSUKA, JAPAN

**ILLUSTRATION No. 90.17–274 P2**

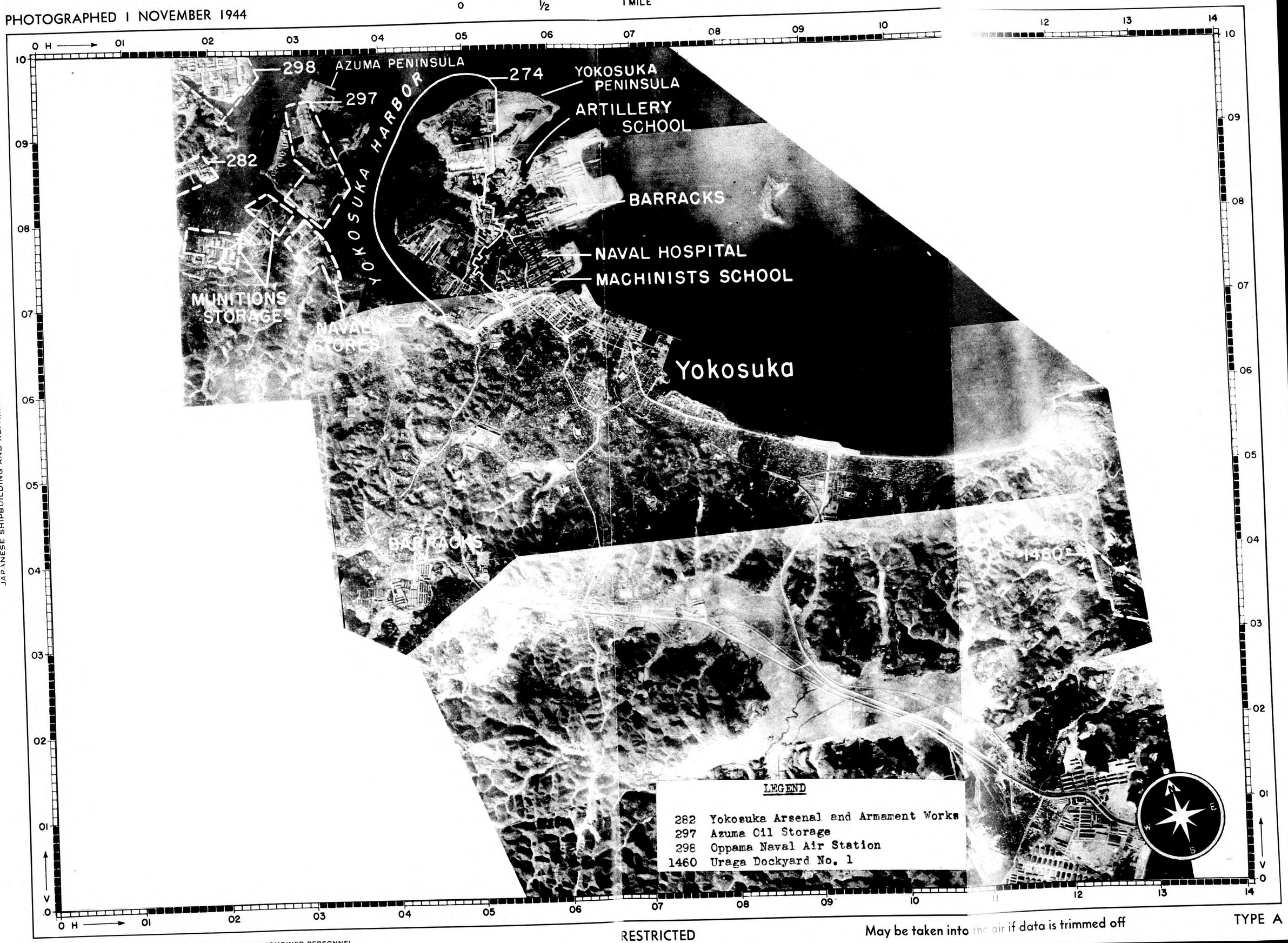
ISSUED 22 FEBRUARY 1945

RESTRICTED

COORDINATES 35° 17′ N 139° 40′ E

PHOTOGRAPHED 1 NOVEMBER 1944

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

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TYPE A

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# YOKOSUKA NAVY YARD
# YOKOSUKA, JAPAN

**TARGET No. 90.17–274**

COORDINATES 35° 17′ N 139° 40′ E

PHOTOGRAPHED 1 NOVEMBER 1944

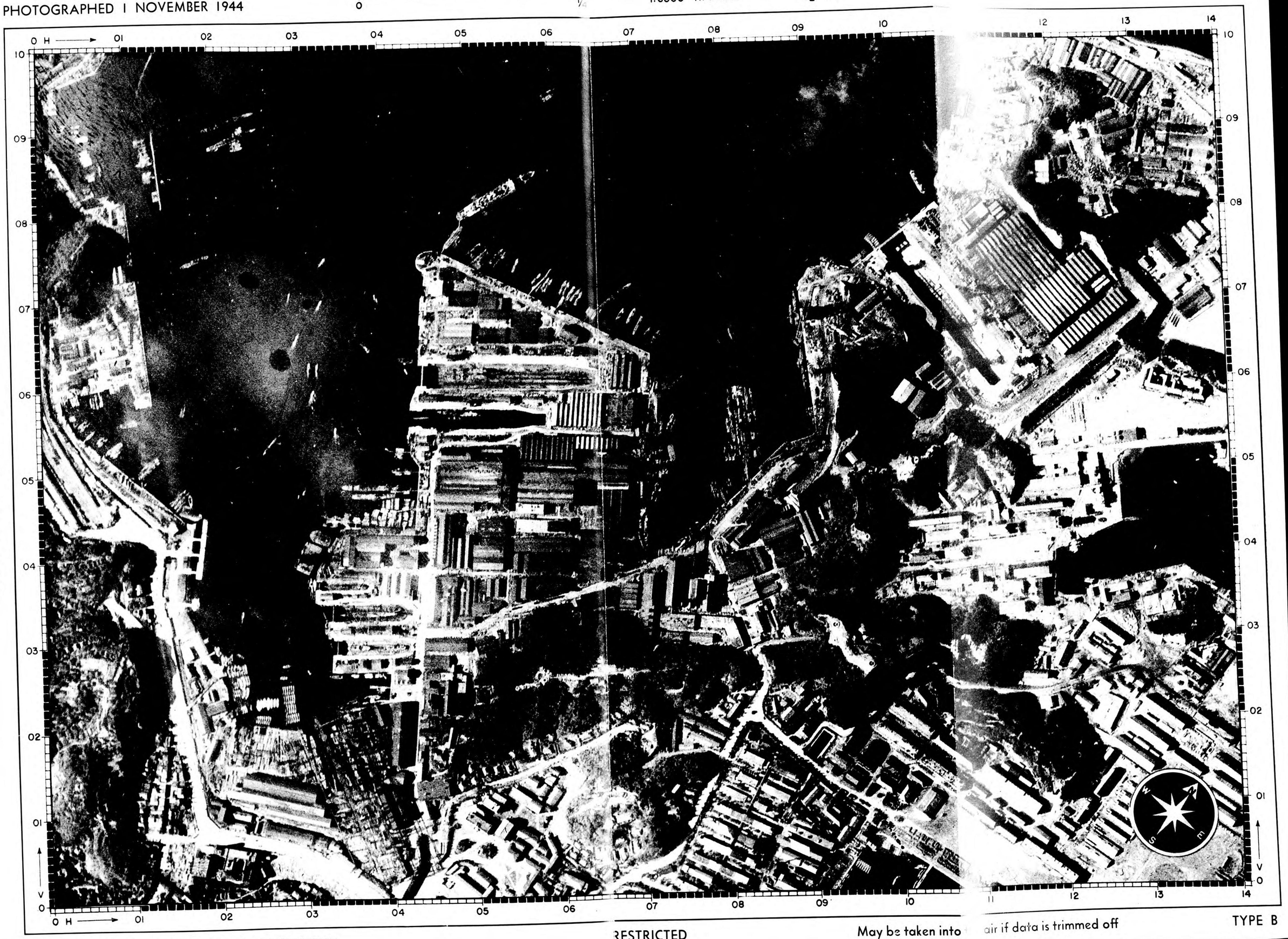
0 500 1000 1500 2000 2500 3000 FEET

0 ¼ 1:6000 APPROX. ½ MILE

**ILLUSTRATION No. 90.17–274 P3**

ISSUED 22 FEBRUARY 1945

RESTRICTED




HOLDERS OF JTG FOLDERS SHOULD INSERT THIS SHEET IN AIR TARGET SYSTEM FOLDER: JAPANESE SHIPBUILDING AND REPAIR.

RESTRICTED

May be taken into air if data is trimmed off

TYPE B

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RESTRICTED

JOINT TARGET GROUP
WASHINGTON, D. C.

# YOKOSUKA NAVAL YARD
## YOKOSUKA JAPAN

0 500 1000 1500 2000 2500 3000 FEET
0 1/4 1:6000 APPROX. 1/2 MILE

ILLUSTRATION No. . . 90.17-274 P4/1
DATE . . . . . 13 May 1945
TARGET No. . . . . 90.17-274
COORDINATES . . . 35°17'N 139°40'E
PHOTOGRAPHED . 1 November 1944

LEGEND

1. Small Boat Shop
2. Boat Shed - Tracks appear to enter building from landward and water sides
3. Probably small storage offices, etc.
*4. Structural Shop
*5. Offices and probably old Mold Loft
6. Tool Lockers and Small Stores
7. Offices
8. Ship Shed and adjoining Shop - Marine Railway Tracks continue through building
9. Small Shop
10. Probable Warehouse (Mess Hall reported to be in building)
11. Small Shop
SW 3. Marine Railway - Tracks appear to enter and continue through building No. 8. 925' from edge of water to building
SW 1. Shipbuilding way - Max. length is 1110'. 130' appear submerged
SW 2. Shipbuilding way - Max. length is 930'. Approx. 100' appear submerged
SW 4. 7. Way for small vessels. 260' x 100' wide
12. Unidentified
13. Unidentified
DD 1. 420' x 75' Pump House probably on gate end of strip between DD 1 & DD 2
14. Active Storage Shed
DD 2. 460' x 90' Pump Houses probably located on Gate end of strip each side
DD 3. 300' x 45' Pump House probably located on Gate end of strip between DD 2 & DD3
15. Probably Rigger, Paint and Dock Shops
16. Unidentified - probably warehouse
*17. Landing Craft and Small Boat Engine Mfg. Plant
18. Office
19. Office and reported Warehouse
20. Offices
21. Offices
22. Offices (Reported Dockyard Super Office)
23. Offices
24. Warehouse
25. Warehouse
26. Warehouse
*27. Forge Shop
*28. Forge Shop (East part reported as Transportation Dept. Warehouse)
29. Unidentified
30. Unidentified
31. Reported Pattern Shop
32. Reported Pipe Shop
*33. Boiler Shop
*34. Foundry - East corner reported devoted to laboratory or engineering research
DD 4. 750' x 85' Pump House - Probably at Gate end of South side of DD
DD 5. 1015' x 115' Pump House - Probably at Gate end of strip between DD 4 and DD 5
35 thru 44. Rigger Paint & Dock Shop - General outdoor storage area for Repair Tools and Materials
45. Probably Rigger, Paint and Dock Shops
*46. Machine, Ordnance and Engine Shop
*47. Machine and reported Sheet Metal Shop
48. Hammer-Head Crane at Fitting out Wharf
*49. Machine, Ordnance and Engine Shop
50. Possible Welding Shop
51. Reported administration building and Watchman's House
52. Reported Engine Parts Finishing Shop
53. Reported Copper Shop
54. Reported Welding Shop
55. Reported Welding Shop
56. Warehouse
57. Warehouse
58. Unidentified (Reported Electric Power Plant - very doubtful)
*59. Diesel Shop (North Wing reported as Diesel Testing Shop)
60. Unidentified
61. Unidentified
62. Reported Battery Recharging Department
63. Reported Wood Working Shop
64. Reported Aircraft Engine Testing Shop
*65. Power Station with o'head conveyor to waterfront
66 thru 69. Unidentified - Possible experimental laboratories located in this area
70. Office
71. Unidentified
72. Unidentified
73 thru 75. Repair and Replacement Shops
76. Fitting out Shops
77. Fitting out Shops
78 thru 81. Repair and Replacement Shops
82. Fitting out Shop
83A. Hammer-Head Crane - Total length 330' - Prob. fixed
83B. Hammer-Head Crane - Also Fitting out Wharf
83C. Hammer-Head Crane - Probably Movable on Pier in Bay
84. Work Shed
85. Unidentified
86. Probably Storage Warehouse
87. Probably Storage Warehouse
88. Unidentified
89. Unidentified
*90. New Mold Loft
*91. New Structural Shop
92. Small Tool, Storage and Work Sheds
93 thru 96. Small Tool, Storage and Work Sheds
DD 6. 1070' x 160'
97 thru 102. Hammer-Head Cranes - All appear [illegible] each side DD
103 thru 106. Travelling Over-Head Cranes
SW 5. 455' x 165' There appears to be a [illegible] back of forward line. This 90' plus an additional 50' appear submerged [illegible] photographs
No Stereo Cover for the following:
107 thru 116. Unidentified - Possibly work shop to [illegible] building
117 thru 139. Unidentified - Appears to be Storage [illegible] buildings
140. Reported Torpedo Boat Plant
141. Unidentified
142 thru 146. Unidentified

* D[illegible]

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping in place of 90.17-274 P4.

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JOINT TARGET GROUP, WASHINGTON, D. C.
TARGET LOCATION SHEET

# SUSAKI DOCKYARD
# TOKYO JAPAN

SHEET ..... 90:17-1459—TL
DATE ..... 30 May 1945
CATEGORY
Bsc. Eqpt. Ind.—TRNSPTN. EQPT.
COORDINATES ..... 35°39'N 139°48'E
ALTITUDE ..... 10 feet

## SIGNIFICANCE:

One of 7 major shipyards ranking after the largest 5 in Japan, this building yard and the nearby engine works (Target 90:17-330), properties of the ISHIKAWAJIMA Shipbuilding and Engineering Corp., build 6,670 ton standardized freighters, smaller merchantmen and small naval types. The fabrication and erection shop lies E of the 2 drydocks and 6 ways. Fitting and repair buildings are to the N. Destruction of the small buildings to the S on 10 March 1945 probably did not materially lengthen the 15½ week building period for the 6,670 ton ships revealed in earlier cover.

LARGE SCALE ILLUSTRATION—SCALE APPROX.: 1:10,000

SMALL SCALE ILLUSTRATION—SCALE APPROX.: 1:66,000

File No. 542,459.1



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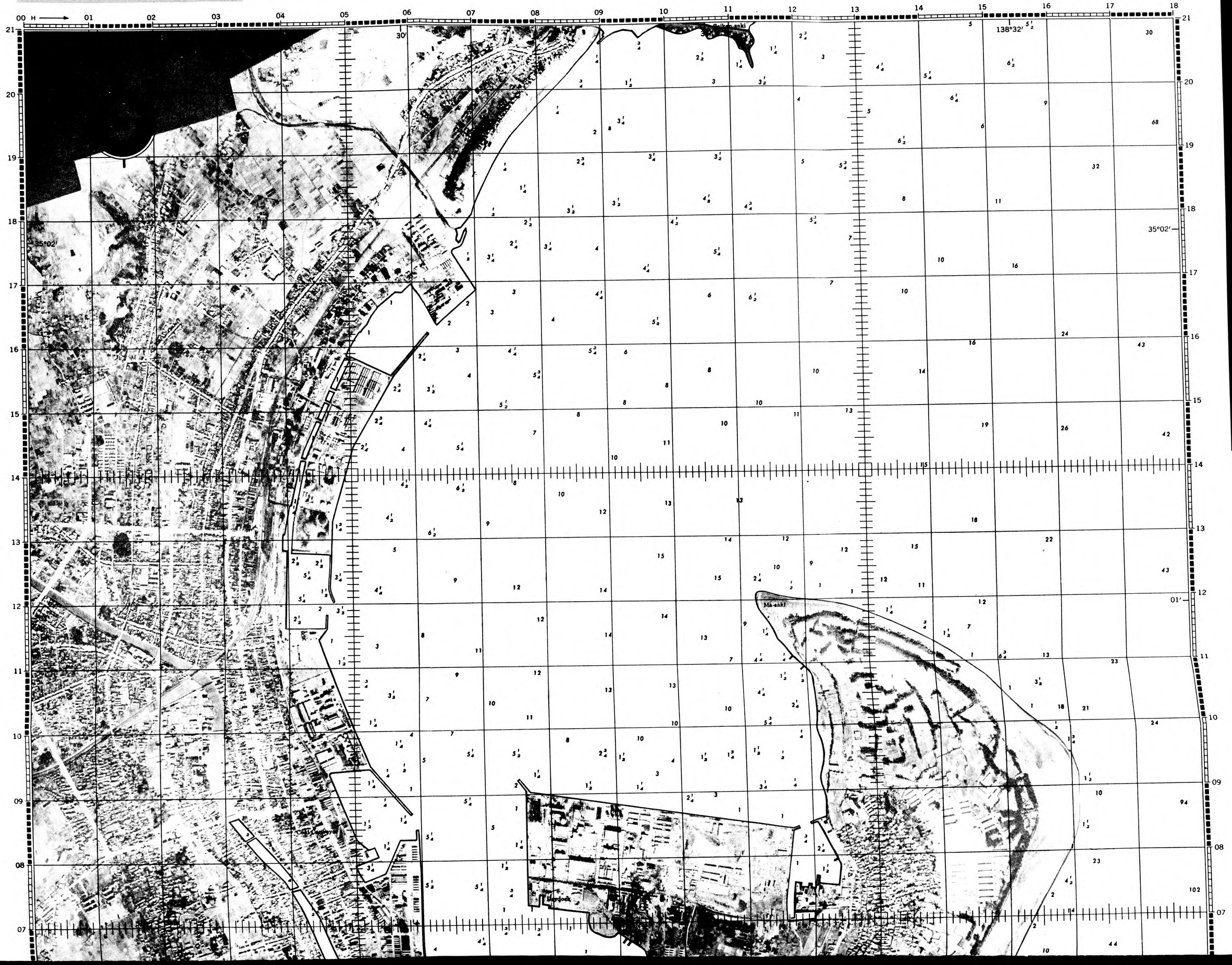
JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

# SHIMIZU, JAPAN

Scale 1:12,500

ILLUSTRATION No. . . . . 90.18-3581 PSP
DATE. . . . . 7 May 1945



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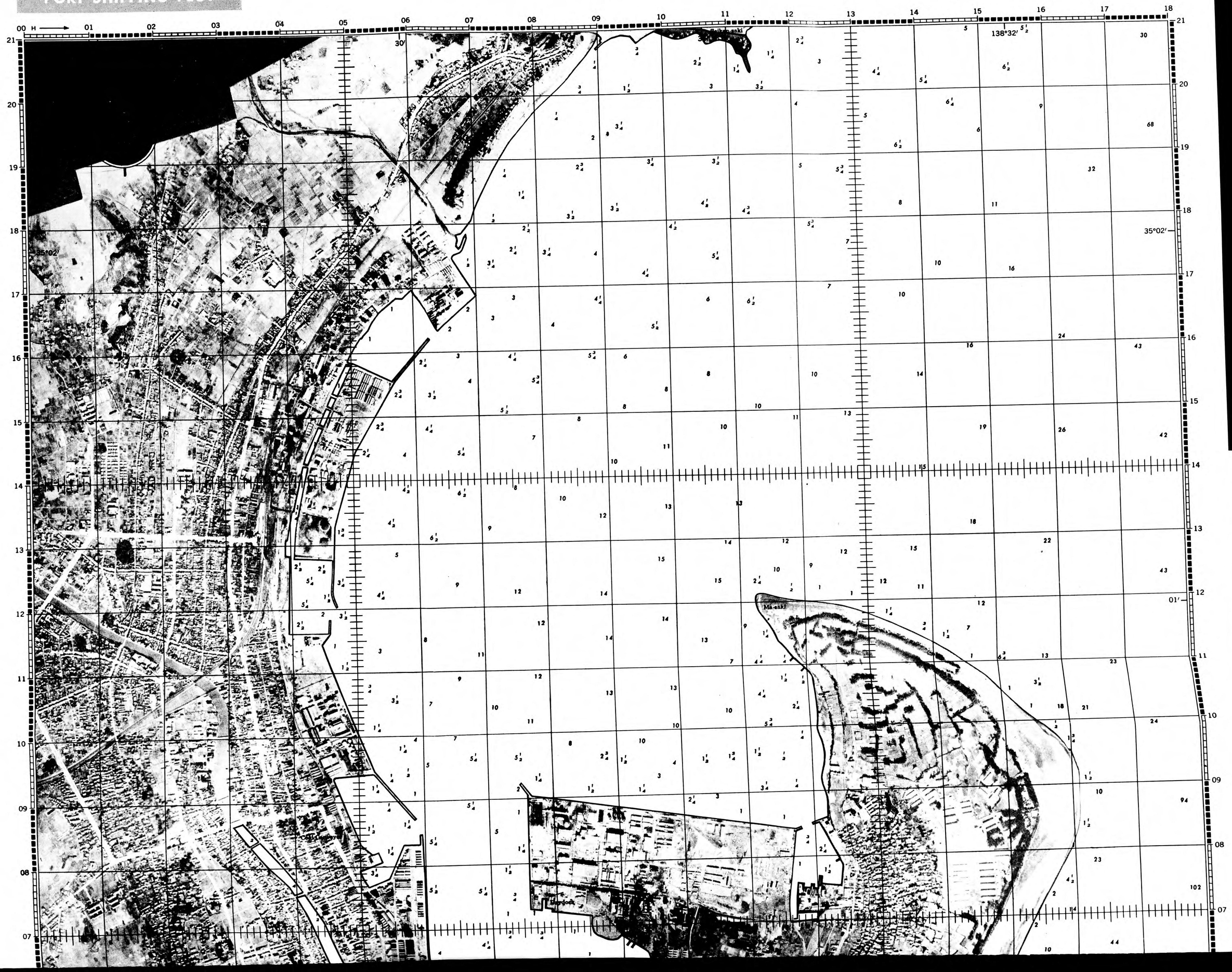
JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

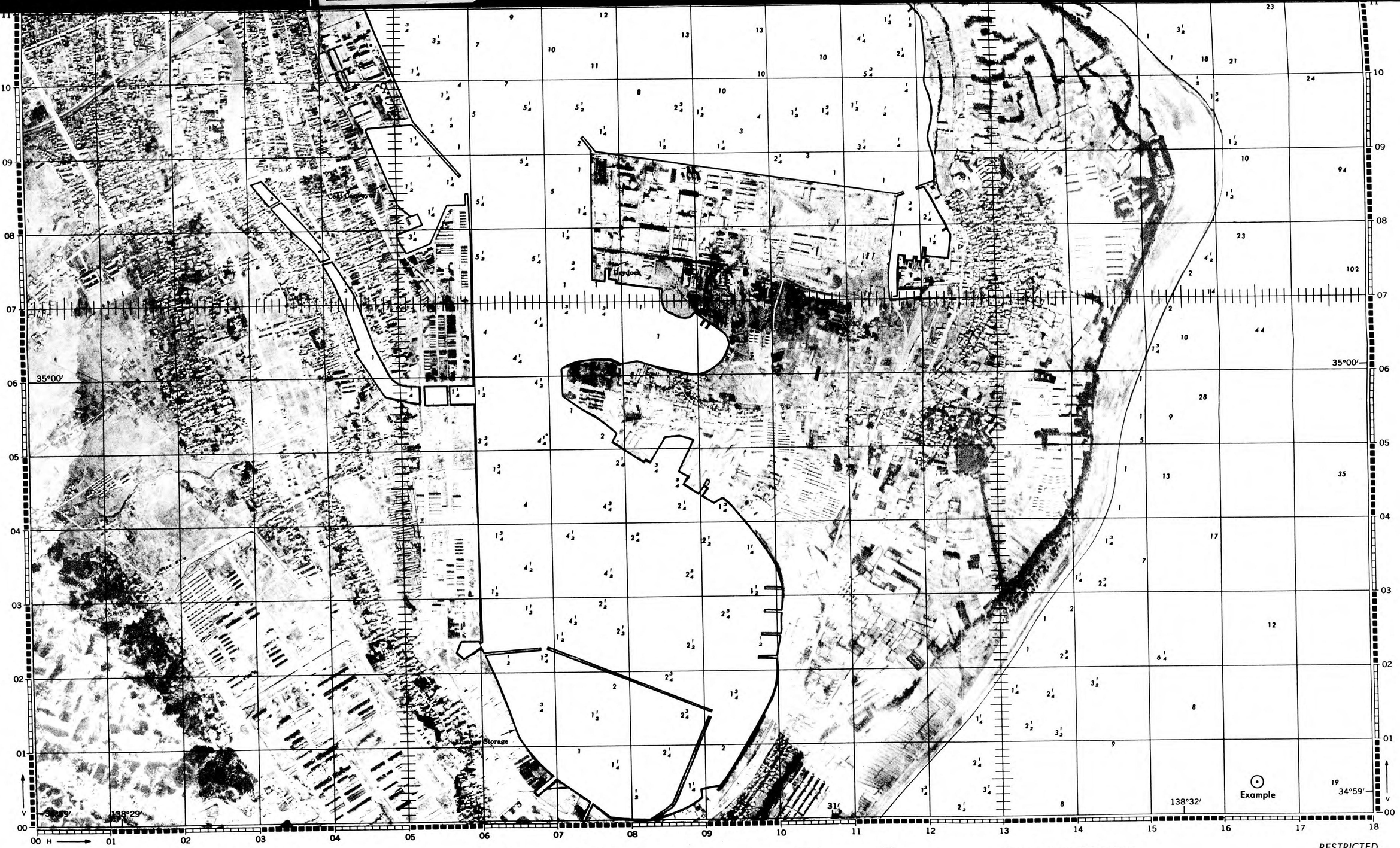
# SHIMIZU, JAPAN

Scale 1:12,500

ILLUSTRATION No. . . . . 90.18-3581 PSP
DATE. . . . . 7 May 1945



Holders of Joint Target Group Folders should ...
sheet in Air Target System Folder: Japanese S...

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⊙ EXAMPLE Grid Reference Reading:
*Shimizu (or 90.18-3581)PSP H164 V004*
Always Use Three Digits Preceded by H & V

Statute Miles 1/2 0 1/2
Nautical Miles 1/2 0 1/2

1"=1041.7 Ft 500 0 500 1000 Yards
0 1000 2000 3000 Feet

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Uncontrolled Mosaic by APL, AAA, USDA, Wash., D.C. 1944. Aerial photographs flown by U.S.AAF. (Sortie): 4M-2 5 Nov. '44. AAF City Plan, Shimizu '44.

**SHIMIZU, PSP**

JOINT TARGET GROUP, WASHINGTON, D. C.
TARGET INFORMATION SHEET

SHEET No. . . 90.25-169-TI
DATE. . . . . 5 May 1945
PAGE . . . . . 1

# MITSUBISHI HEAVY INDUSTRIES

(Mitsubishi Jokogyo KK)

KOBE JAPAN

TARGET No. . . . 90.25-169
OBJ. AREA . . . . . 90.25
OBJ. FOLDER No. . . . 90.25
CATEGORY . . . . . Shipbuilding/Elec. Equipment

LAT. . . . . 34°39'N
LONG. . . . . 135°11'E
ALT. . . . . 10 feet

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping with other 90.25-169 material.

## SIGNIFICANCE

One of Japan's 16 major shipyards and also a leading manufacturer of heavy electrical equipment. The shipyard is equipped to build all types of merchant vessels and, with four dry docks and extensive fitting-out berths, is a principal yard for operational repairs to merchant vessels. Photography of 28 March 1945 shows considerable building and fitting activity. The extensive shop facilities, with a production capacity in excess of the needs of this yard, supply other building yards in Japan with engines and components. A large group of subsidiary shops was burned out in the attack of 17 March 1945, but the engine building and main machine shops were not affected. Loss of these shops is probably slowing down construction here but does not affect production of the main components, which may therefore be flowing in increasing quantities to other yards in Japan.

The plant is one of the half dozen most important producers of electrical equipment in Japan. It is believed to manufacture transformers, heavy generators (about 20% of the total Japanese output), turbines (over 5%), medium and large electric motors (nearly 5%), rotary converters, mercury arc rectifiers, frequency changers, condensors, circuit breakers, and many other items, including much marine and railway equipment. Although much of the production is used in shipbuilding, its output for industrial and railway use is also important. In addition, this plant is known to make some light electrical equipment, including small generators and aircraft indicating instruments such as artificial horizons, bomb controls, gyro compasses, and temperature gauges. Considerable damage was caused to this part of the target in the attack of 4 February 1945, resulting in a probable 35% production loss of heavy electrical equipment for 3 months. Production of light electrical equipment and small components for heavy equipment was also affected.

## LOCATION

(Refer to Illustration No. 90.25-169 P2.) At the tip of Wada-misaki (cape) forming the S end of Kobe Harbor on the NW side of Osaka Bay, about 12 miles W of the breakwater entrance to Osaka Harbor. The N tip of Awaji Island, forming the division between the Sea of Harima and Osaka Bay, is about 11 miles WSW. The Kobe Harbor breakwater runs E from the target for about one mile and then turns N. The compound is bounded by densely built-up area on the W and NW, by Kobe Harbor on the NE and E, and by Osaka Bay on the S.

## DESCRIPTION AND LAYOUT

(Refer to Illustration No. 90.25-169 P4.) The target area is roughly triangular in shape, measuring about 3800 feet N-S and 3500 feet E-W at the base. Production of electrical equipment takes place in Area "A." This area is bisected by a street running S to the waterfront from the W tip of building 23. Heavy electrical equipment is produced mainly on the E side of this street, light equipment on the W. The principal shops of the heavy equipment section are 114, 115, 118, and 119, in which the construction and assembly of heavy electric motors, generators and transformers takes place. Production of light electrical equipment, mostly aircraft indicating instruments, is mainly in the multi-story shops 122 and 134 but also in buildings 124-126. Small parts for heavy electrical equipment are probably fabricated in this section also. The plant's research department is housed in building 120 and formerly in the destroyed building 121.

Area "B," a majority of the target, is devoted to ship construction and repair. Construction takes place in ways 72, 74, 76, 77 and 80 at the SE corner of the area, supported by the group of shops 82-99. Final outfitting is probably carried on at pier 5 at the N end, supported by shops 1, 3a, 4, 7, 9. Underwater repairs are made in floating drydocks 69 and 70, on the E side, and the adjacent piers and docks including 71, and in the floating drydock 102. Construction of the large graving dock (18), N of the floating drydocks, was apparently abandoned at an early stage. The supporting shops are Nos. 19-22. The large group of smaller shops and offices, 47-68 (most of which are now destroyed), and shops 27-30 in the S center of the compound, were probably used in connection with both construction and repair. Shops 43 and 44 are devoted to production of Diesel engines.

Photography of 20 January 1945 showed three of the five building ways in use, with 200 foot, 350 foot, and 375 foot vessels under construction. Two of the three floating drydocks were occupied and fitting-out work proceeding on four vessels at pier 5 and W of drydock 69. Cover of 28 March shows no change in building activity, but somewhat less repair and fitting out work was proceeding.

## PRIMARY OBJECTIVES

(Refer to Illustration No. 90.25-169 P4.) In Area "A": for heavy electrical equipment, shops 114, 115, 118 and 119; for light electrical equipment, buildings 122 and 134. In Area "B": for shipbuilding, shops 85 (a-i) and 90; for ship repair, shops 19-21; for both



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building and repair, shops 27-29; for Diesel engine production, shops 43 and 44 (a-c).

## CONSTRUCTION AND VULNERABILITY

(Refer to Illustration No. 90.25-169 P4.) Principal buildings, constituting approximately 70% of the total building area, are large, one-story, steel-framed buildings (some with mezzanine floors) of which the majority have greater than normal height and normal spans with simple double-pitched or monitor roofs placed side by side. Sawtooth roofs comprise only a small percentage of the construction. The larger buildings in the Electrical Equipment Section (A) as well as the Shipbuilding Section (B) have reinforced steel frames to accommodate overhead travelling cranes. Roof surfacing is of light weight noncombustible sheet material in major buildings. Minor buildings (storehouses and small shops) are generally small and combustible. Administration and office buildings appear to be of fire-resistant reinforced concrete construction. Buildings are compactly grouped.

## WEAPON RECOMMENDATIONS

(Refer to Illustration No. 90.25-169 P4.)

Instructions with regard to weapons will usually be given in Field or Operational Orders, but in the absence of such instructions and to assist Planners in formulating such orders the following information is given:

A preliminary structural and occupancy analysis of the target indicates that weapon recommendations will vary according to the following objectives:

HEAVY ENGINEERING SHOPS (Shipbuilding, Area "B," and Electrical Equipment, Area "A"— includes multi-story, fire-resistant buildings in Area A).

An attack with high explosive weapons only is recommended. Air cover of 28 March 1945 reveals that most of the combustible and small buildings were destroyed in the attacks of 4 February and 17 March 1945:

| | High Explosive | Fuzing |
|---|---|---|
| Preferred: | 2000-lb GP | 0.1 nose/0.025 tail |
| Alternative: | 1000-lb GP | 0.1 nose/0.025 tail |
| | 500-lb GP | 0.1 nose/0.025 tail |
| Not recommended: | Smaller GP bombs | |
| | SAP or AP bombs | |
| | Depth bombs | |

Notes: (a) Use 0.1 tail fuzes if 0.025 tail fuzes are not available. 0.025 tail fuzing is recommended to give maximum cratering, necessary to cause collapse of the crane runway in heavy buildings.

(b) The above recommendations are on a weight for weight basis.

### CAISSONS AND PUMPS (Drydock and floating drydocks)

An attack with high explosive weapons only is recommended (these targets are small and difficult to hit, and require direct hits for maximum effectiveness):

| | High Explosive | Fuzing |
|---|---|---|
| Preferred: | 500-lb GP | 0.1 nose/0.025 tail |
| Alternative: | 1000-lb GP | 0.1 nose/0.025 tail |
| | 250-lb GP | 0.1 nose/0.025 tail |
| Not recommended: | Other GP bombs | |
| | SAP or AP bombs | |
| | Depth bombs | |

Note: (a) The above recommendations are on a weight for weight basis.

### SHIPS (under construction or repair)

An attack with high explosive weapons only is recommended:

| | High Explosive | Fuzing |
|---|---|---|
| Preferred: | 1000-lb GP | 0.1 nose/0.025 tail |
| Alternative: | 500-lb GP | 0.1 nose/0.025 tail |
| | 2000-lb GP | 0.1 nose/0.025 tail |
| Not recommended: | Smaller GP bombs | |
| | SAP or AP bombs | |
| | Depth bombs | |

Note: (a) The above recommendations are on a weight for weight basis.

## CAMOUFLAGE, DECOYS, AND SMOKE SCREENS

Photography of 28 March 1945 shows no use of camouflage or decoys. Use of smoke screens has not been reported in this area.

## ADDITIONAL INFORMATION

1. This plant has been damaged by area attacks on Kobe as follows:
   a. Attack of 4 February 1945—Destroyed: Shop 144; storage buildings 132, 138 and 146-149; research building 121; offices 133, and 139-142; living quarters and mess hall 135 and 136; and the unidentified buildings 112, 123, and 127-129. Seriously damaged: heavy shops 115 and 118; research building 120; and unidentified building 14. Moderately or slightly damaged; shop 63; transformer shop 119; office building 111.
   b. Attack of 17 March 1945—Destroyed: Shops 6, 8, 17, 56 and 63; storage building 16; office buildings 3d, 12, 47, 54 and 60-62; unidentified buildings 2, 3b and c, 14, 48, 49, 52, 55, 57-59, 67, and 81. Damaged: shops 1 and 7.
2. Other Mitsubishi electrical equipment plants:
   a. Light: Mitsubishi Electric Mfg. Co. (Nagoya), 90.20-254—also machine tools.
   b. Heavy: Mitsubishi Electric Co., Itami Plant, 90.25-2119; Mitsubishi Electric Mfg. Co. (Nagasaki), 90.36-829.

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping after 90.25-169 TI page 1.

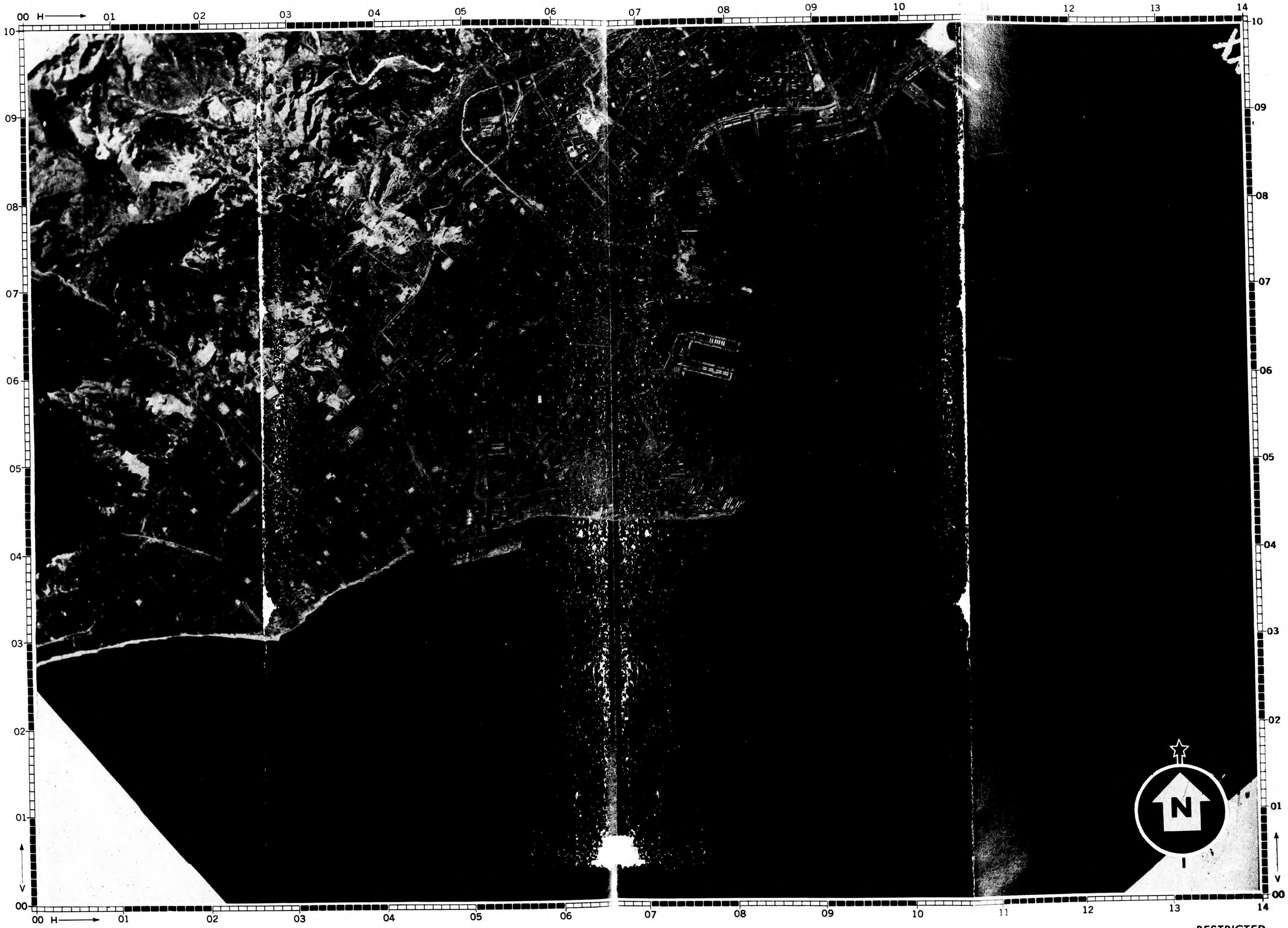
RESTRICTED

JOINT TARGET GROUP
WASHINGTON, D. C.

# MITSUBISHI HEAVY INDUSTRIES
## KOBE JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:3 000 APPROX.

ILLUSTRATION No. . . . . 90.25-169 P1
DATE. . . . . 12 May 1945
TARGET No. . . . . 90.25-169
COORDINATES. . . 34°39'N 135°11'E
PHOTOGRAPHED. 20 January 1945




Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping with other 90.25-169 material.

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# MITSUBISHI HEAVY INDUSTRIES
## KOBE JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:12 000 APPROX.

ILLUSTRATION No. . . . . 90.25-169 P2
DATE. . . . . 12 May 1945
TARGET No. . . . . 90.25-169
COORDINATES. . . 34°39'N 135°11'E
PHOTOGRAPHED. 20 January 1945

**LEGEND**

| | |
|---|---|
| 90.25-11 | Kawasaki Locomotive and Car Co. |
| 90.25-169 | Mitsubishi Heavy Industries |
| 90.25-171 | Kawasaki Heavy Industry Co. |
| 90.25-538 | Imperial Government Railway Shops |
| 90.25-1745 | Kawanishi Machine Shop |

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping with other 90.25-169 material.

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JOINT TARGET GROUP
WASHINGTON, D. C.

# MITSUBISHI HEAVY INDUSTRIES
## KOBE JAPAN

| | |
|---|---|
| ILLUSTRATION No. | 90.25-169 P3 |
| DATE | 12 May 1945 |
| TARGET No. | 90.25-169 |
| COORDINATES | 34°39′N 135°11′E |
| PHOTOGRAPHED | 20 January 1945 |

0 500 1000 1500 2000 2500 3000 FEET
0 1/4 1:6000 APPROX. 1/2 MILE

Users of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping with other 90.25-169 material.

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JOINT TARGET GROUP
WASHINGTON, D. C.

# MITSUBISHI HEAVY INDUSTRIES
## KOBE JAPAN

ILLUSTRATION No. . . . . 90.25-169 P4
DATE. . . . . 12 May 1945
TARGET No. . . . . 90.25-169
COORDINATES . . . 34°39'N 135°11'E
PHOTOGRAPHED . 20 January 1945

0 500 1000 2000 2500 3000 FEET
0 1/4 1:6000 APPROX. 1/2 MILE

## LEGEND

### Electrical Equipment Section—Area "A"

| | |
|---|---|
| 104 | Probable storage |
| 105 | Unidentified |
| 106 | Probable storage |
| 107 | Unidentified |
| 108 | Probable forge |
| 109 | Unidentified |
| 110 | Engineering Laboratory |
| 111 | Offices |
| 112 | Unidentified |
| 113 | Machine shop |
| P114, P115 | Heavy machine shops |
| 116, 117 | Sheet metal shops |
| P118 | Heavy machine shop and assembly building |
| P119 | Transformer shop |
| 120, 121 | Research and experiment buildings |
| P122 | Small parts machine shop |
| 123 | Unidentified |
| 124-126 | Small parts machine shops |
| 127-129 | Unidentified |
| 130-131 | Open storage areas (Many lo stores) |
| 132 | Storage |
| 133 | Office |
| P134 | Small parts machine shop |
| 135 | Workers homes |
| 136 | Mess hall |
| 137, 138 | Probable storage |
| 139-142 | Probable offices |
| 143 | Unidentified |
| 144 | Machine shop |
| 145 | Unidentified |
| 146 | Probable offices |
| 147-149 | Storage |

### Shipbuilding Section—Area "B"

| | |
|---|---|
| 1 | Fitting-out shop |
| 2 | Unidentified |
| 3a | Probable light machine shop |
| b, c | Unidentified |
| d | Probable Offices |
| 4 | Fitting-out shop |
| 5 | 650 foot fitting-out pier |
| 6 | Fitting-out shop |
| 7 | Machine shop |
| 8 | Probable machine shop |
| 9 | Machine shop |
| 10 | Probable storage |
| 11 | Probable light machine shop |
| 12 | Offices |
| 13, 14 | Unidentified |
| 15 | Under construction |
| 16 | Probable Storage |
| 17 | Probable repair shop |
| 18 | Drydock (lengthening project in progress) |
| P19-P21 | Structural shops |
| 22 | Structural shops |
| 23 | Storage |
| 24a | Machine shop |
| b | Probable press shop |
| 25 | Railroad turntable |
| 26 | Possible forge |
| P27-P29 | Heavy machine shops |
| 30 | Forges and heavy machine shop |
| 31 | Probable offices |
| 32-35 | Offices |
| 36 | Drafting and design offices—Probably associated with Diesel Engine Works |
| 37 | Storage—Probably associated with Diesel Engine Works |
| 38, 39 | Light machine shops |
| 40 | Unidentified |
| 41 | Probable planning offices |
| 42 | Probable storage |
| P43, P44 (a-c) | Diesel Engine shops |
| 45, 46 | Probable storage |
| 47 | Probable planning offices |
| 48, 49 | Unidentified |
| 50 | Open storage area |
| 51, 52 | Unidentified |
| 53, 54 | Probable offices |
| 55 | Unidentified |
| 56 | Probable pattern shop and layout offices |
| 57-59 | Unidentified |
| 60-62 | Probable dockyard offices |
| 63 | Probable ship repair shop (Wood working) |
| 64, 65 | Probable ship repair shops |
| 66 | Coppersmith shop |
| 67 | Unidentified |
| 68 | Probable ship repair shop |
| 69 | 550 foot floating drydock(Reported10,000 Tons) |
| 70 | 400 foot floating drydock (Reported 7,000 Tons) |
| 71 | 1200 foot fitting-out and repair pier |
| 72 | Scaffolded shipbuilding ways |
| 73 | Travelling hammerhead crane |
| 74 | Shipbuilding ways |
| 75 | Travelling hammerhead crane |
| 76, 77 | Shipbuilding ways |
| 78, 79 | Travelling hammerhead cranes |
| 80 | Shipbuilding ways |
| 81 | Unidentified |
| 82 | Probable storage |
| 83 | 225' finger pier |
| 84 | Crane |
| P85 (a-h) | Probable structural shops |
| i | Possible pattern layout section |
| 86 | Under construction |
| 87 | Unidentified |
| 88 | Under construction |
| 89 | Unidentified |
| P90 | Machine shop |
| 91, 92 | Machine shops |
| 93 | Storage tank 50 foot Diam. |
| 94 | Unidentified |
| 95-99 | Machine shops |
| 100-101 | Probable storages |
| 102 | 450 foot floating drydock (Reported 16000 Tons) |
| 103 | 1000 foot pier |

P Primary Buildings

H of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Shipping with other 90.25-169 material.

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JOINT TARGET GROUP, WASHINGTON, D. C.
TARGET LOCATION SHEET

# OSAKA IRON WORKS, UNIT NO 1
## OSAKA JAPAN

SHEET ..... 90:25-272—TL
DATE ..... 2 June 1945
CATEGORY
Bsc. Eqpt. Ind.—TRNSPTN. EQPT.
COORDINATES ..... 34°40'N 135°26'E
ALTITUDE ..... 10 feet

**SIGNIFICANCE:**

One of 7 major shipyards ranking after the largest 5 in Japan, this yard specializes in the construction of medium and small standardized freighters and tankers. Principal structural shops lie W of the single graving dock and 5 building ways. The shops in S quarter of the yard are associated with fitting and repair. This company also operates the larger HABU Shipyard on INNOSHIMA (Target 90:29-927A).

LARGE SCALE ILLUSTRATION—SCALE APPROX.: 1:15,000

SMALL SCALE ILLUSTRATION—SCALE APPROX.: 1:61,000

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File No. 621,272.1

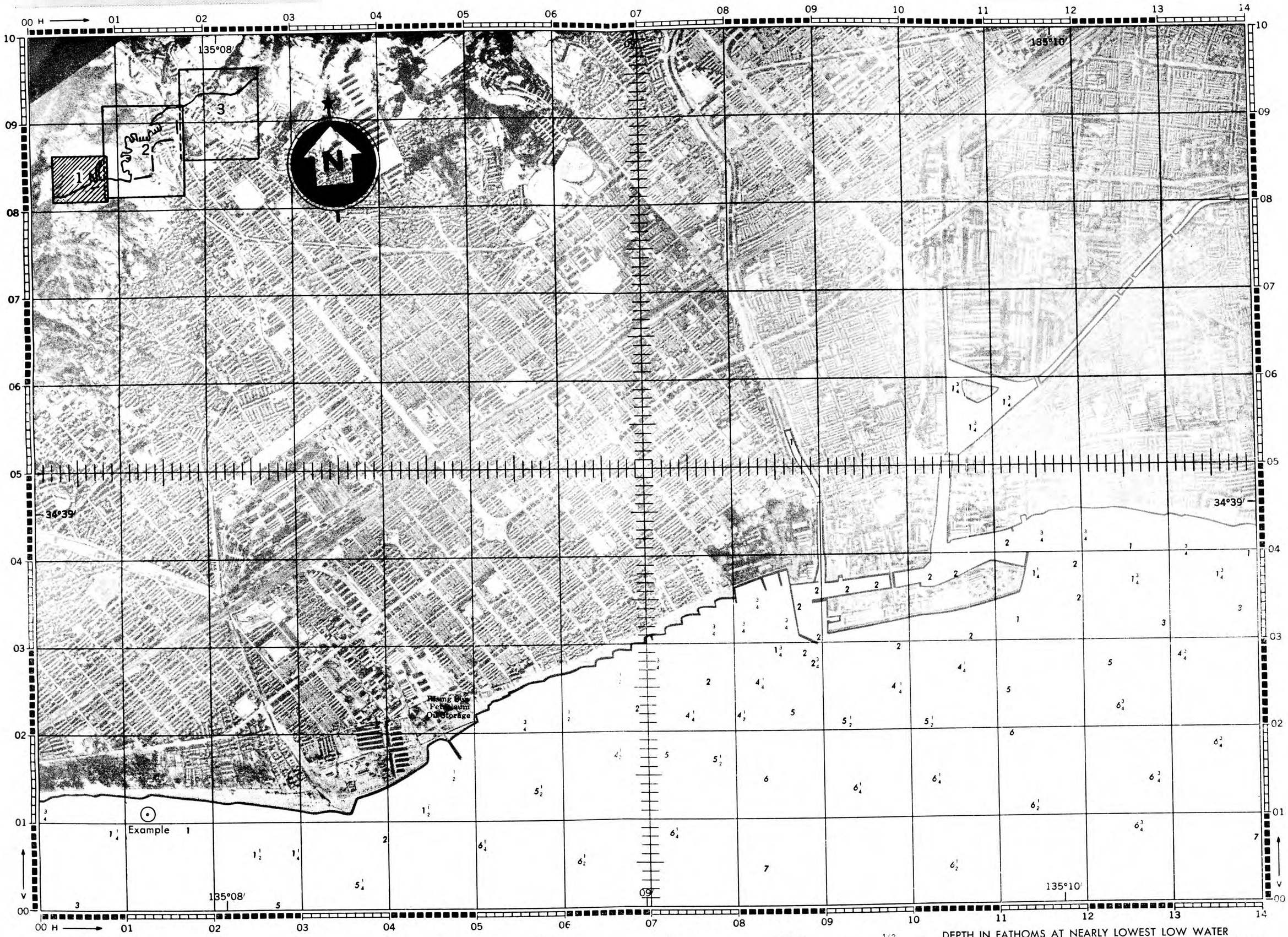
RESTRICTED

JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

# KOBE, JAPAN

Scale 1:12,500

ILLUSTRATION No. . . . . 90.25-3523 PSP 1
DATE . . . . . 7 May 1945




EXAMPLE Grid Reading:
Kobe (or 90.25-3523)PSP1 H014 V011
Always Use Three Digits Preceded by H & V

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Controlled Mosaic by the Army Map Service, U.S. Army, Washington, D.C. 1945. Aerial photographs flown by U.S.AAF. (Sorties): 5M-19 24''V Jan. '45, 5M-32 24''V Feb. '45. AAF City Plan Kobe Proper. JHO 1103 Cor. '42.

Statute Miles: 1/2 0 1/2
Nautical Miles: 1/2 0 1/2
500 0 500 1000 Yards
1'' = 1041.7 Ft 0 1000 2000 3000 Feet

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

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RESTRICTED
KOBE PSP 1

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JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

# KOBE, JAPAN

Scale 1:12,500

ILLUSTRATION No. . . . . 90.25-3523 PSP 2
DATE. . . . . 7 May 1945

Should insert this
where Shipping

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⊙ EXAMPLE Grid Reading:
*Kobe (or 90.25-3523)PSP2 H132 V012*
**Always Use Three Digits Preceded by H & V**

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Controlled Mosaic by the Army Map Service, U.S. Army, Washington, D.C. 1945. Aerial photographs flown by U.S.AAF. (Sorties): 5M-19 24"V Jan. '45, 5M-32 24"V Feb. '45. AAF City Plan Kobe Proper. JHO 1103 Cor. '42.

1/2 Statute 0 Miles 1/2
1/2 Nautical 0 Miles 1/2

500 0 500 1000 Yards
1"=1041.7 Ft 0 1000 2000 3000 Feet

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

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RESTRICTED

**KOBE PSP 2**

RESTRICTED

ILLUSTRATION No. . . . . 90.25-3523 PSP 3

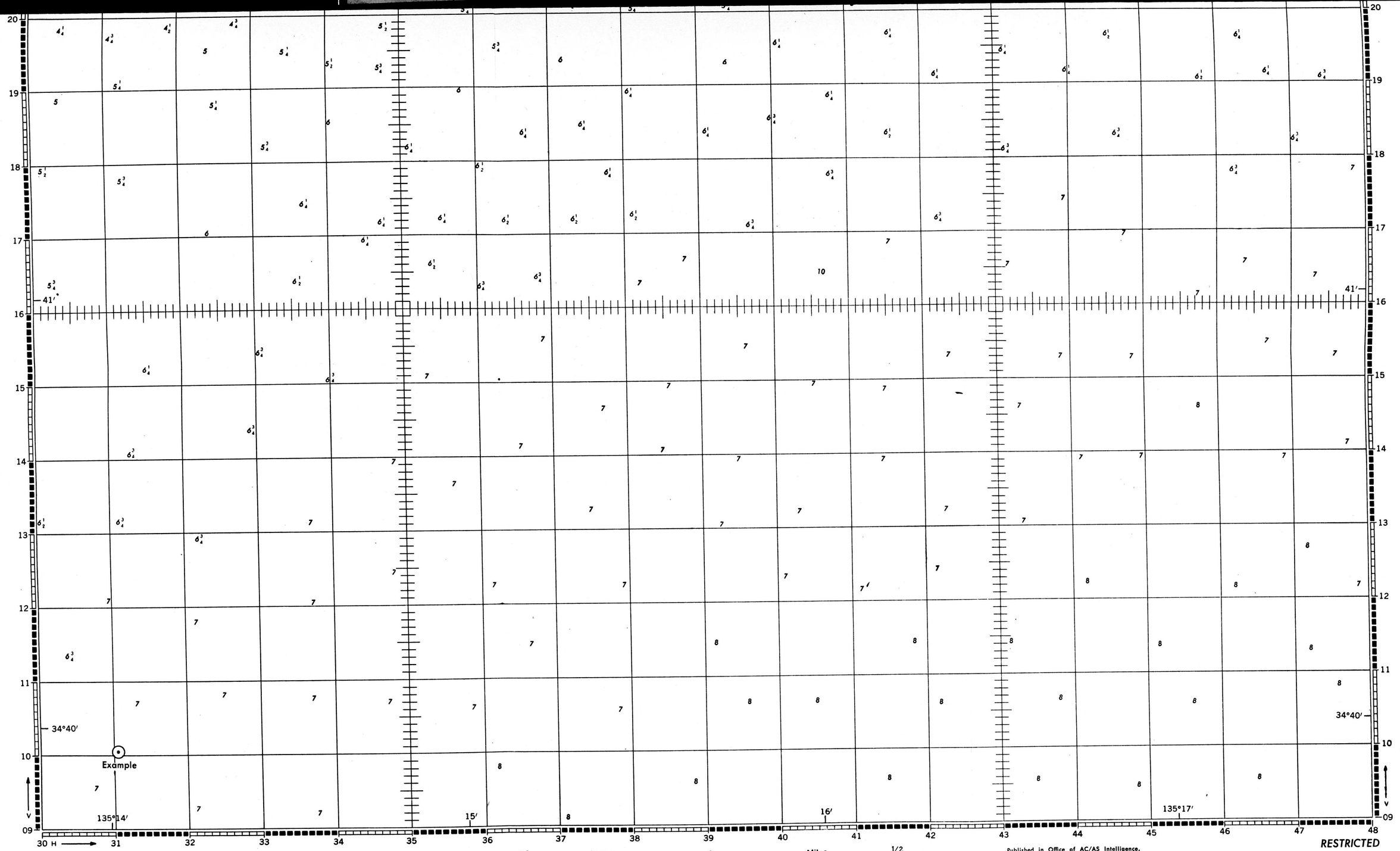
DATE . . . . . 7 May 1945

# KOBE, JAPAN

Scale 1:12,500

JOINT TARGET GROUP, WASHINGTON, D. C.
PORT SHIPPING PLOT

Holders of Joint Target Group Folders should in
sheet in Air Target System Folder: Japanese S




RESTRICTED

⊙ EXAMPLE Grid Reading:
Kobe (or 90.25-3523)PSP3 H312 V101
Always Use Three Digits Preceded by H & V

Prepared under the direction of the Aeronautical Chart Service by Aero Service Corp., Phila., Pa. 1945 from Controlled Mosaic by the Army Map Service, U.S. Army, Washington, D.C. 1945. Aerial photographs flown by U.S.AAF. (Sorties): 5M-19 24"V Jan. '45, 5M-32 24"V Feb. '45. AAF City Plan Kobe Proper. JHO 1103 Cor. '42.

DEPTH IN FATHOMS AT NEARLY LOWEST LOW WATER

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JOINT TARGET GROUP, WASHINGTON, D.C.

# TARGET INFORMATION SHEET

Sheet No. 90.30-657B-TI
Date 22 Feb. 1945
Page No. 1 ( 2 pages)

Obj. Folder 90.27-31
Obj. Area 90.30
AAF Target No. 90.30-657B
NAME OF TARGET KURE NAVAL SHIPYARD

Place Kure (Japan)
Air Target System SHIPPING-
Shipbuilding and Repair

Lat.: 34° 14' N
Long: 132° 33' E
Alt.: 20 feet

**ALL PREVIOUS SHEETS CANCELLED**

NOTE: As an aid to planning, and evaluation of new reconnaissance and other intelligence, this TARGET INFORMATION SHEET is issued in advance of reconnaissance photography of the target. It is correspondingly subject to revision.

*SIGNIFICANCE*

One of the four largest and most important naval shipyards in Japan; headquarters of the Second Naval District. It is a highly integrated yard and is equipped to construct, fit out and repair every type of naval vessel. There are located at this yard boiler shops, forging plants, structural shops, machine shops, and many other supplemental and complementary buildings. The yard also contains at least four drydocks, two of which can accommodate the largest type naval vessel, one large building dock, three buildingways, two long fitting out piers, a fitting out dock, a relatively large amount of dockage space and anchorage area, and many large fixed, movable and floating cranes. Important experimental work is also carried out here.

*LOCATION*

(Refer to Illustration No. 90.30-657B PX2). On the SW inland seacoast of Honshu, approximately 140 air miles W of Kobe, about 12 air miles SSE of Hiroshima. It is situated along the SE side of Kure Harbor about 1 mile S of the city of Kure. Yeta, Nishi-Nomi, and Kura Hashi Islands, large land masses S and SW of Kure Harbor, with the sides of that harbor, give Kure Harbor complete protection from the sea. Contiguous with the target on the SW is the Kure Naval Arsenal (TARGET 90.30-657A). Between the target area and the city of Kure on the N, lie administration buildings, boat basins, barracks areas, naval hospital, etc. (See TARGETS 90.30-657C and D) and the Kure RR Station (TARGET 90.30-798). The target can be considered as the center part of a continuous stretch of buildings along the entire SE side of Kure Harbor. A number of roadways and a railroad parallel the back of the area on the SE. Hills rise abruptly just beyond these roadways to a height of over 1000 feet. Kure Naval Air Base (TARGET 90.30-656) and Hiro Arsenal (TARGET 90.30-794) lie approximately 3.5 miles to the E. Kure is connected with Hiroshima by a single track railroad and with Kobe by a line to Mihara where it joins a main line railroad to Kobe.

*DESCRIPTION AND LAYOUT*

(Refer to Illustration No. 90.30-657B PX1). The total target area is about 4000 feet NE-SW x 2000 feet NW-SE, roughly rectangular with its NE or bay side cut into irregularly by drydocks, slipways, and small basins. The forge, machine, structural, and engine shops are located primarily in the SW section of the target area. Drydocks 1, 2 (approximately 375 and 435 feet in length), the three building ways and a large boiler shop are in the center of the target area. Drydocks 3 and 4 (approximately 700 and 1000 feet in length) and the building way (about 900 feet long) are in the NE end.

The identifications of buildings are based mainly on P/W information and should be assessed accordingly. However, they appear logical and, in a number of cases, are substantiated by other sources.

*PRIMARY OBJECTIVES*

(Refer to Illustration No. 90.30-657B PX1). The machine shops, structural shop, and forging shops (Bldgs. b through i), all closely grouped at the SW end of

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TARGET INFORMATION SHEET *(Contd.)*

| | |
|---|---|
| | the yard, are the most critical facilities, from a repair and/or new construction standpoint. If the most immediate front line effect is desired, however, the work in process at the piers, docks, anchorage, and in the drydocks, building ways and building docks, would become the primary objectives. |
| *CONSTRUCTION & VULNERABILITY* | |
| *WEAPON RECOMMENDATIONS* | |
| *LEVEL OF DAMAGE* | |
| *CAMOUFLAGE, DECOYS AND SMOKE SCREENS* | |
| *ADDITIONAL INFORMATION* | This target together with the Kure Naval Arsenal (TARGET 90.30-657A) can be considered as a single target area. This overall area forms a long irregular but continuous line of buildings on the entire SE side of inner Kure Harbor. The facilities of the two areas are intermingled where they join. Both sub areas are of great importance to the Japanese military forces. Together they are one of the most highly integrated industrial units in Japan). |

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TARGET NO. 90.30-657B

APPROX. COORDINATES 34°14'N - 132° 33'E

JOINT TARGET GROUP-WASHINGTON, D. C.

# KURE NAVAL SHIP YARD
# KURE, JAPAN

ILLUSTRATION NO. 90.30-657B PX 1

ISSUED MARCH 1945
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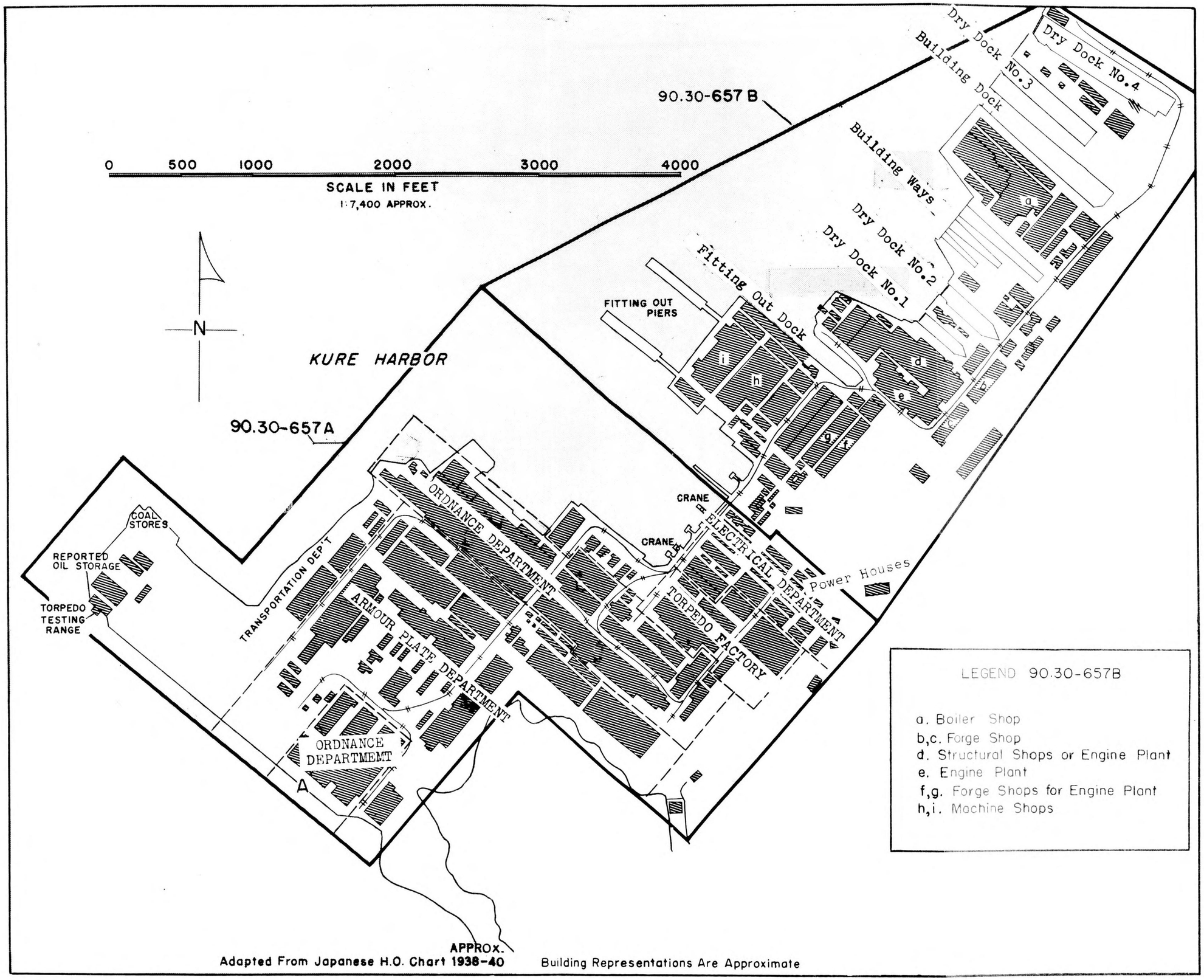


Adapted From Japanese H.O. Chart 1938-40 Building Representations Are Approximate

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JOINT TARGET GROUP-WASHINGTON, D. C.

# KURE NAVAL SHIP YARD
# KURE, JAPAN

TARGET NO. 90.30-657B

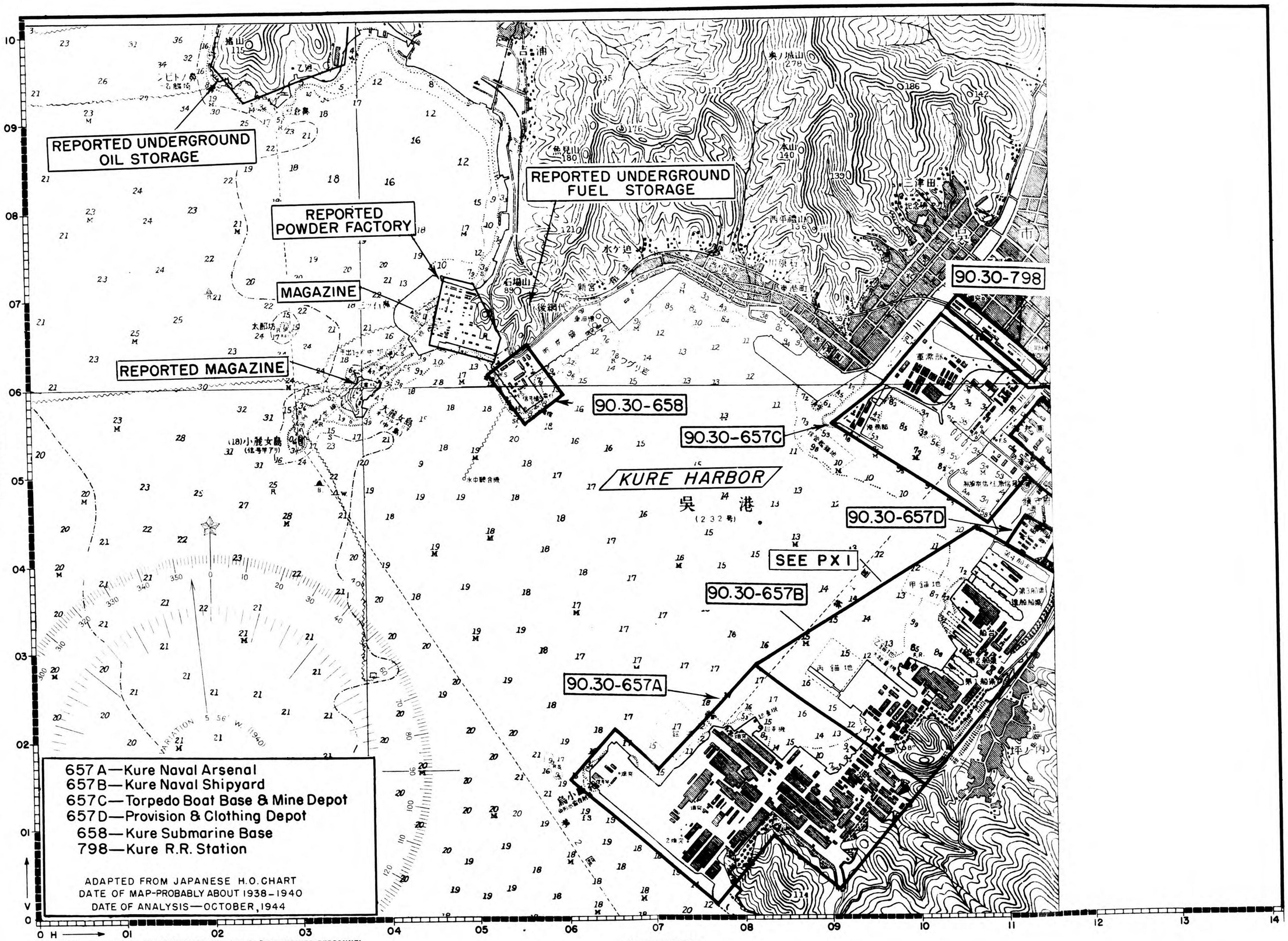
APPROX. COORDINATES 34°14'N — 132°33'E

ILLUSTRATION NO. 90.30-657B PX 2

ISSUED MARCH 1945

CONFIDENTIAL

0 1000 2000 3000 4000 5000
SCALE IN FEET
1:17,500

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TARGET NO. 90.34-32

# WAKAMATSU PORT
# WAKAMATSU, JAPAN

ILLUSTRATION NO. 90.34-32 P3

APPROX. COORDINATES 33° 53' N 130° 48' E

ISSUED OCTOBER 1944

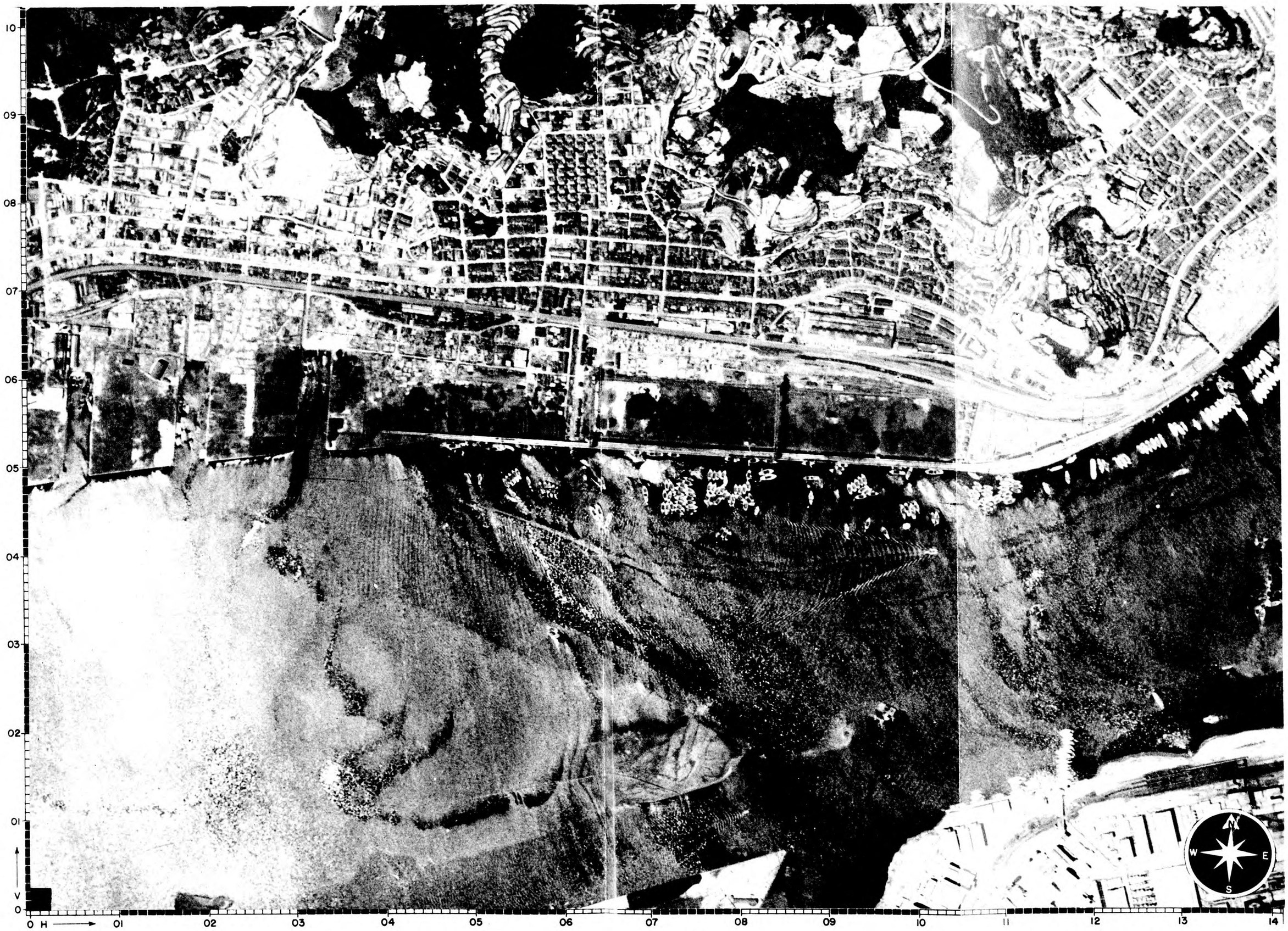
PHOTOGRAPHED 18 JUNE 1944

0 500 1000 1500 2000 2500 3000 FEET

0 1/4 1/2 MILE

1:6000 APPROX.

CONFIDENTIAL

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TYPE B

TARGET NO. 90.34-32

WAKAMATSU PORT
WAKAMATSU, JAPAN

ILLUSTRATION NO. 90.34-32 P4

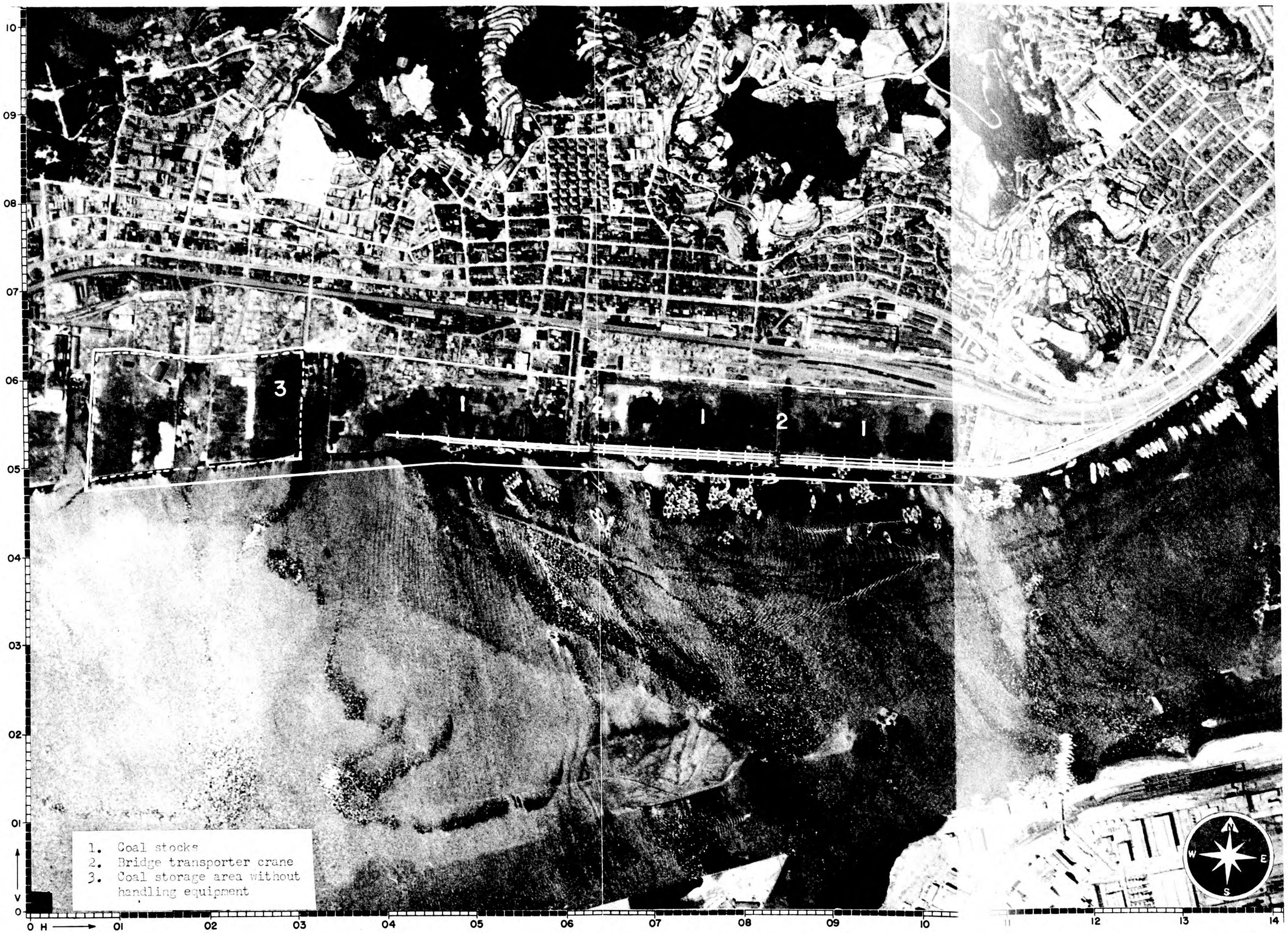
APPROX. COORDINATES 33° 53' N 130° 48' E

ISSUED OCTOBER 1944

PHOTOGRAPHED 18° JUNE 1944

0 500 1000 1500 2000 2500 3000 FEET
0 1/4 1/2 MILE
1:6000 APPROX.

CONFIDENTIAL

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CONFIDENTIAL

TYPE B

TARGET NO. 90.34-33

APPROX. COORDINATES 33° 53' N 130° 49' E

PHOTOGRAPHED 18 JUNE 1944

# TOBATA PORT

## TOBATA, JAPAN

0 2000 4000 6000 FEET

0 ½ 1 MILE

1:32 000 APPROX.

ILLUSTRATION NO. 90.34-33 P I

ISSUED OCT. 1944

CONFIDENTIAL

TARGET NO. 90.34-33

APPROX. COORDINATES 33° 53' N 130° 49' E

PHOTOGRAPHED 18 JUNE 1944

# TOBATA PORT
# TOBATA, JAPAN

0 2000 4000 6000 FEET

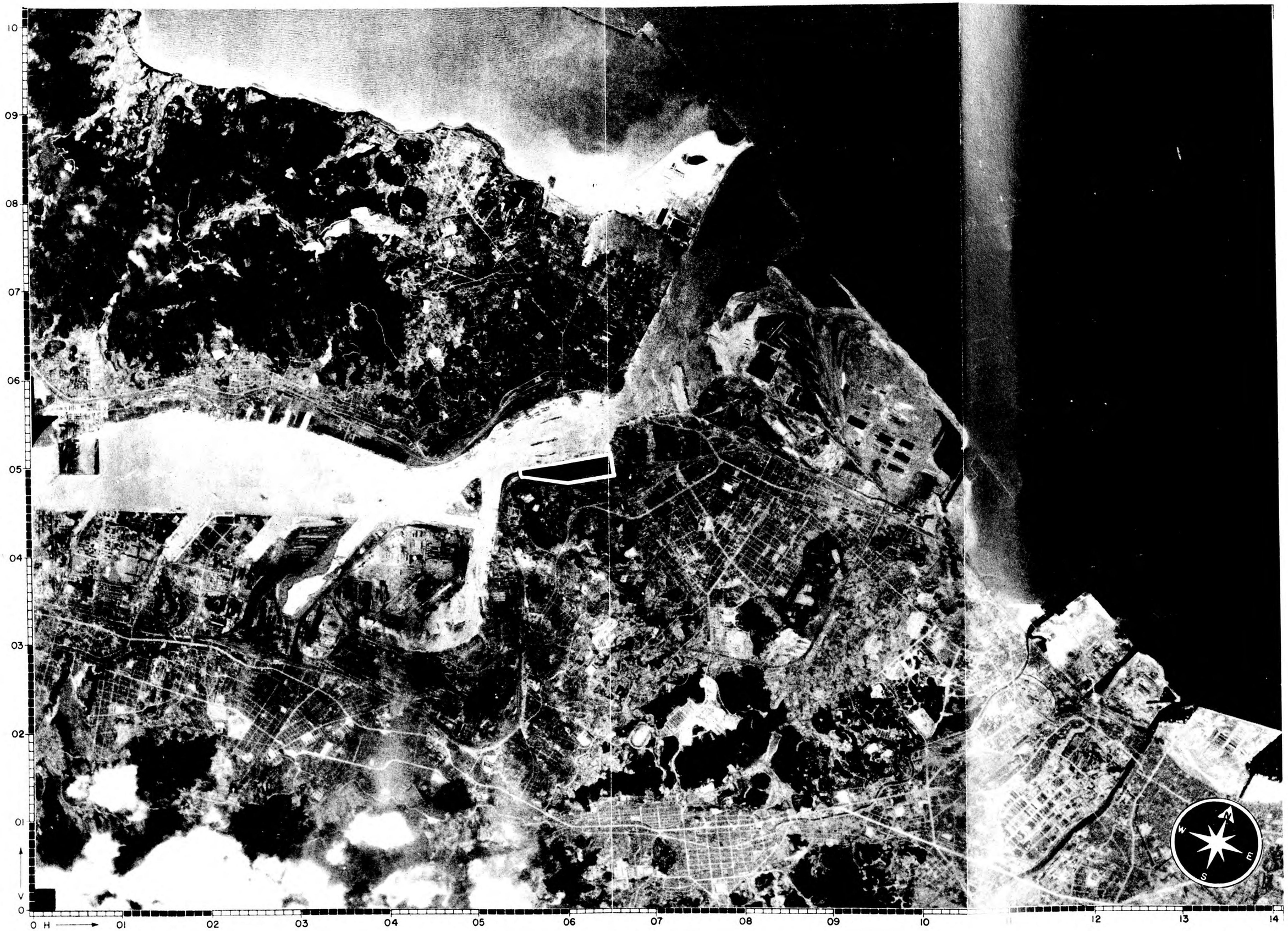
0 1/2 1 MILE

1:32 000 APPROX.

ILLUSTRATION NO. 90.34-33 P2

ISSUED OCT. 1944

CONFIDENTIAL




AC/AS, INTELLIGENCE

CONFIDENTIAL

TYPE A

TARGET NO. 90.34-33

TOBATA PORT
TOBATA, JAPAN

ILLUSTRATION NO. 90.34-33 P3

APPROX. COORDINATES 33° 53'N 130°49'E

ISSUED OCTOBER 1944

PHOTOGRAPHED 18 JUNE 1944

0 500 1000 1500 2000 2500 3000 FEET
0 1/4 1/2 MILE
1:6000 APPROX.

CONFIDENTIAL

AC/AS, INTELLIGENCE

CONFIDENTIAL

TYPE B

TARGET NO. 90.34-33

APPROX. COORDINATES 33° 53' N 130° 49' E

PHOTOGRAPHED 18 JUNE 1944

# TOBATA PORT
# TOBATA, JAPAN

ILLUSTRATION NO. 90.34-33 P4

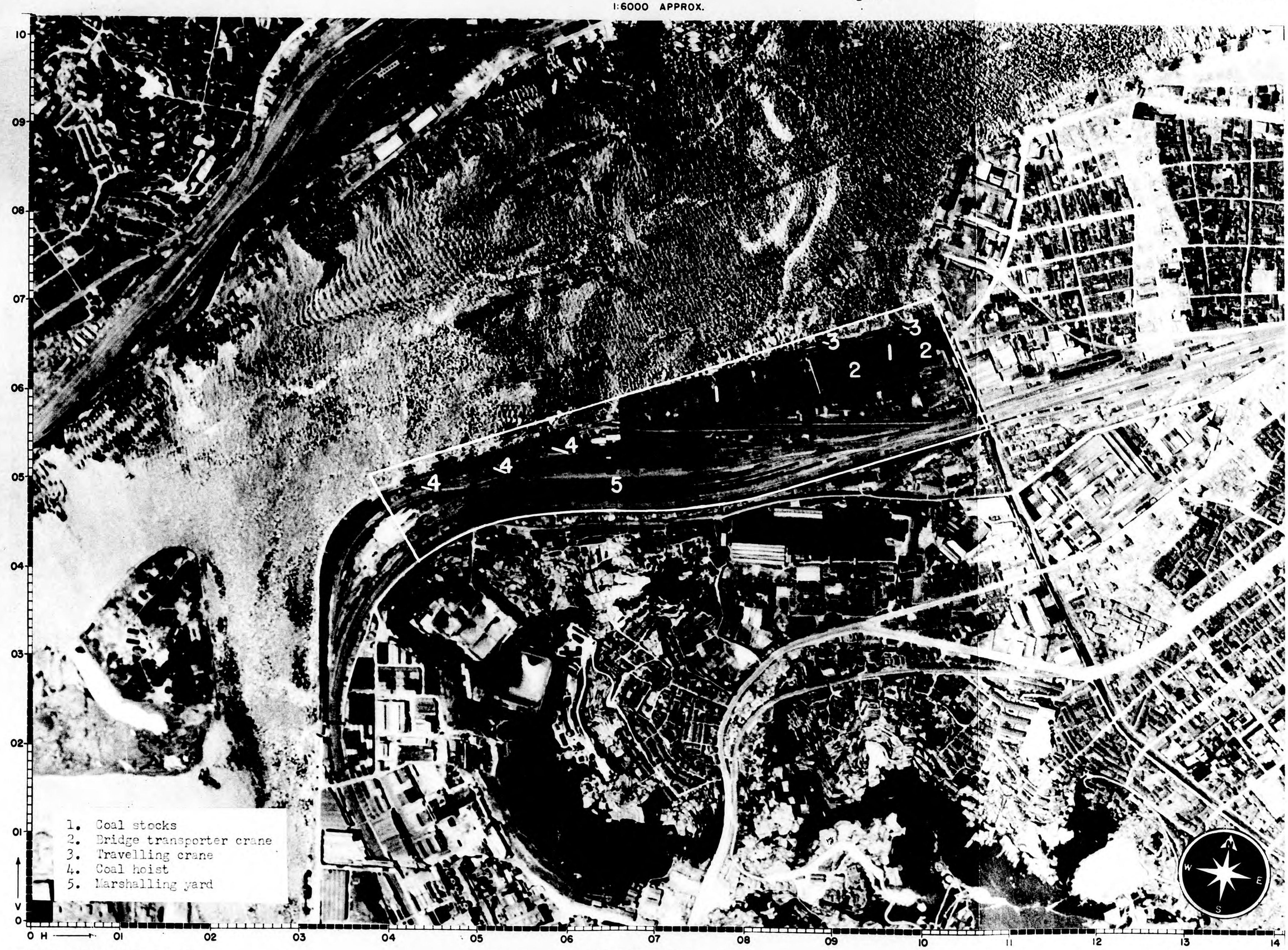
ISSUED OCTOBER 1944

CONFIDENTIAL

0 500 1000 1500 2000 2500 3000 FEET

0 1/4 1/2 MILE

1:6000 APPROX.



TARGET NO. 90.34-42

APPROX. COORDINATES 33° 57' N 130° 57' E

PHOTOGRAPHED 18 JUNE 1944

# SHIMONOSEKI PORT
# SHIMONOSEKI, JAPAN

0 2000 4000 6000 FEET

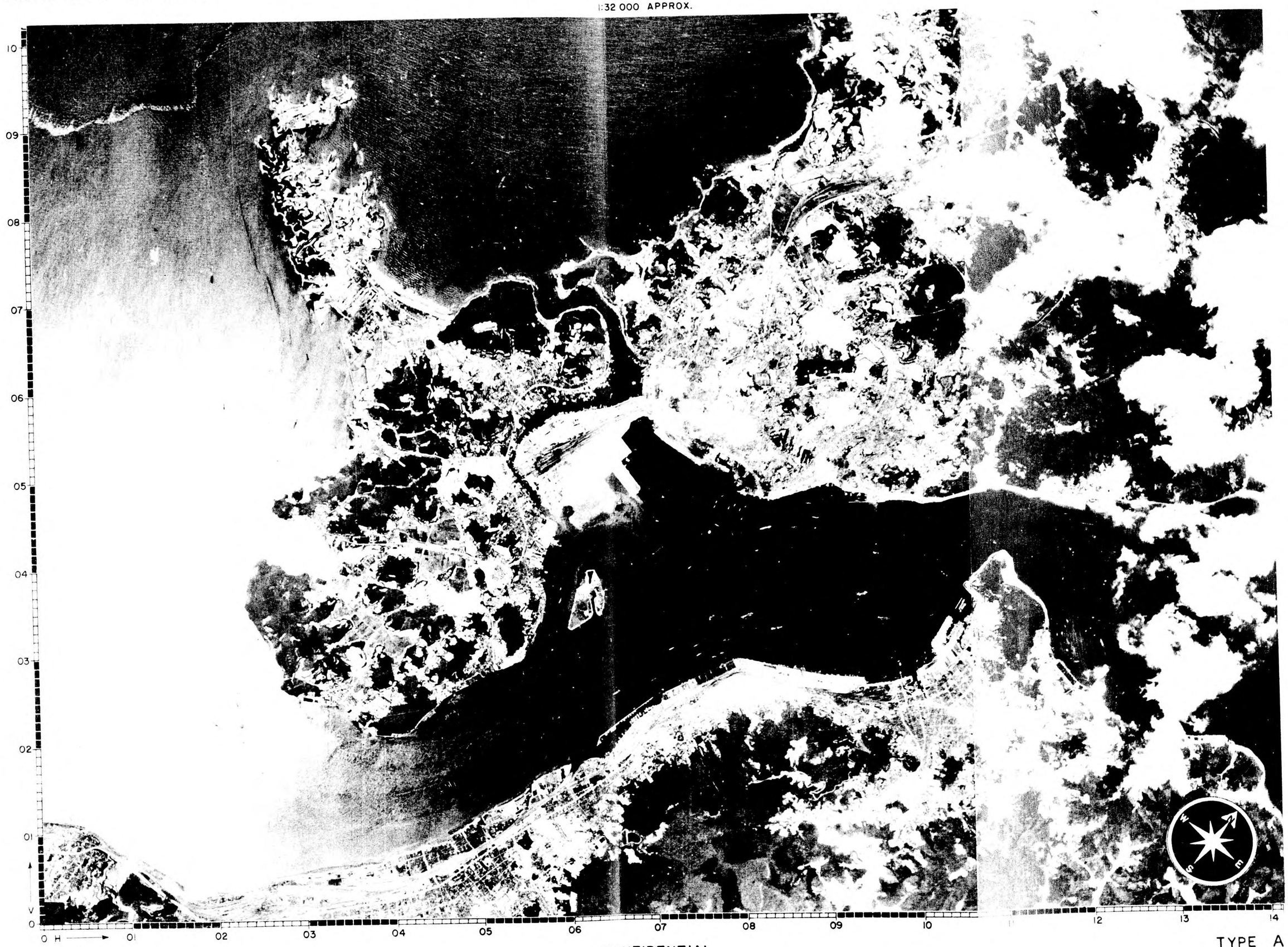
0 ½ 1 MILE

1:32 000 APPROX.

ILLUSTRATION NO. 90.34-42 P I

ISSUED OCT. 1944

CONFIDENTIAL

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TYPE A

TARGET NO. 90.34-42

# SHIMONOSEKI PORT
# SHIMONOSEKI, JAPAN

ILLUSTRATION NO. 90.34-42 P2

APPROX. COORDINATES 33° 57' N 130° 57 E

ISSUED OCT. 1944

PHOTOGRAPHED 18 JUNE 1944

CONFIDENTIAL

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

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CONFIDENTIAL

TYPE A

JOINT TARGET GROUP
WASHINGTON, D. C.

# OSAKA IRON WORKS
## HIKOSHIMA JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

RESTRICTED

ILLUSTRATION No. . . 90.34-43b P2/1
DATE. . . . . 29 April 1945
TARGET No. . . . . 90.34-43b
COORDINATES. . . 33°56'N 130°56'E
PHOTOGRAPHED. . . . . 18 June 1944

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RESTRICTED

TARGET NO. 90.34-44a

APPROX. COORDINATES 33° 57' N 130° 58' E

PHOTOGRAPHED 18 JUNE 1944

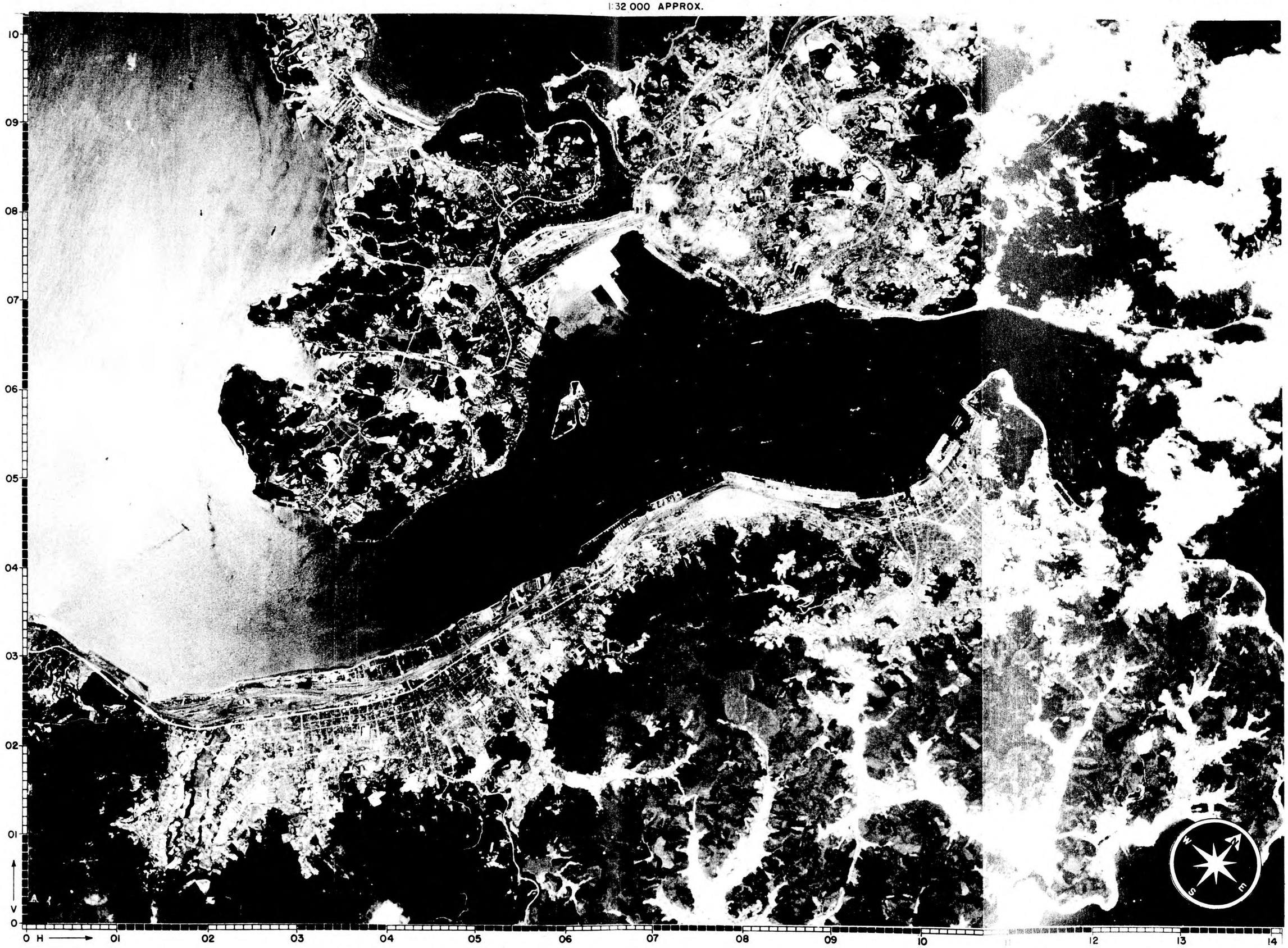
# MOJI CENTRAL WHARF
## MOJI, JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

ILLUSTRATION NO. 90.34-44a P I

ISSUED OCT. 1944

CONFIDENTIAL

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TYPE A