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DIRECTORATE OF  
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**Industrial Facilities  
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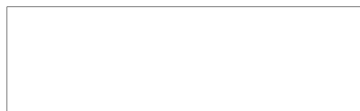
*Basic Imagery Interpretation Report*

**Fu-shun Shale Oil and Chemical Plant East**

**Fu-shun, China**



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INSTALLATION OR ACTIVITY NAME		COUNTRY
Fu-shun Shale Oil and Chemical Plant East		CH
UTM COORDINATES	GEOGRAPHIC COORDINATES	25X1
NA	41-49-57N 124-02-42E	
MAP REFERENCE		
2nd RTS. USATC, Series 200, Sheet M0290-11HL, 5th ed, Apr 71, Scale 1:200,000		
(SECRET)		25X1
LATEST IMAGE BY USER	NEGATION DATE (If required)	25X1
	NA	

## ABSTRACT

Fu-shun Shale Oil and Chemical Plant East refines both crude oil and oil obtained from shale into petroleum products. The main product of the plant is gasoline in a wide range of octane ratings. Other products are coke, kerosene, desulfurized diesel and fuel oils, benzene, toluene, and xylene. Sulfuric acid is also produced. The processing facilities presently complete and operating include one and probably two primary distillation units, a catalytic cracking unit, a thermal cracking unit, a delayed coking unit, an alkylation unit, a catalytic reforming-hydrotreating unit, a coke shell still, two possible blending/treating units, a possible dewaxing unit, an unidentified secondary processing unit, and a sulfuric acid plant.

When the plant was first seen on photography, in June 1962, the capacity and variety of products were very limited. Between May 1963 and January 1967, most of the major refining equipment was installed, making this plant a major refining center. The refinery was in operation on all coverage from June 1962 through February 1972.

This report includes a photograph and line drawing of the refinery, a detailed listing of equipment and facilities with dimensions of storage tanks, a chart showing the construction chronology of individual units, and a discussion of the status of facilities.

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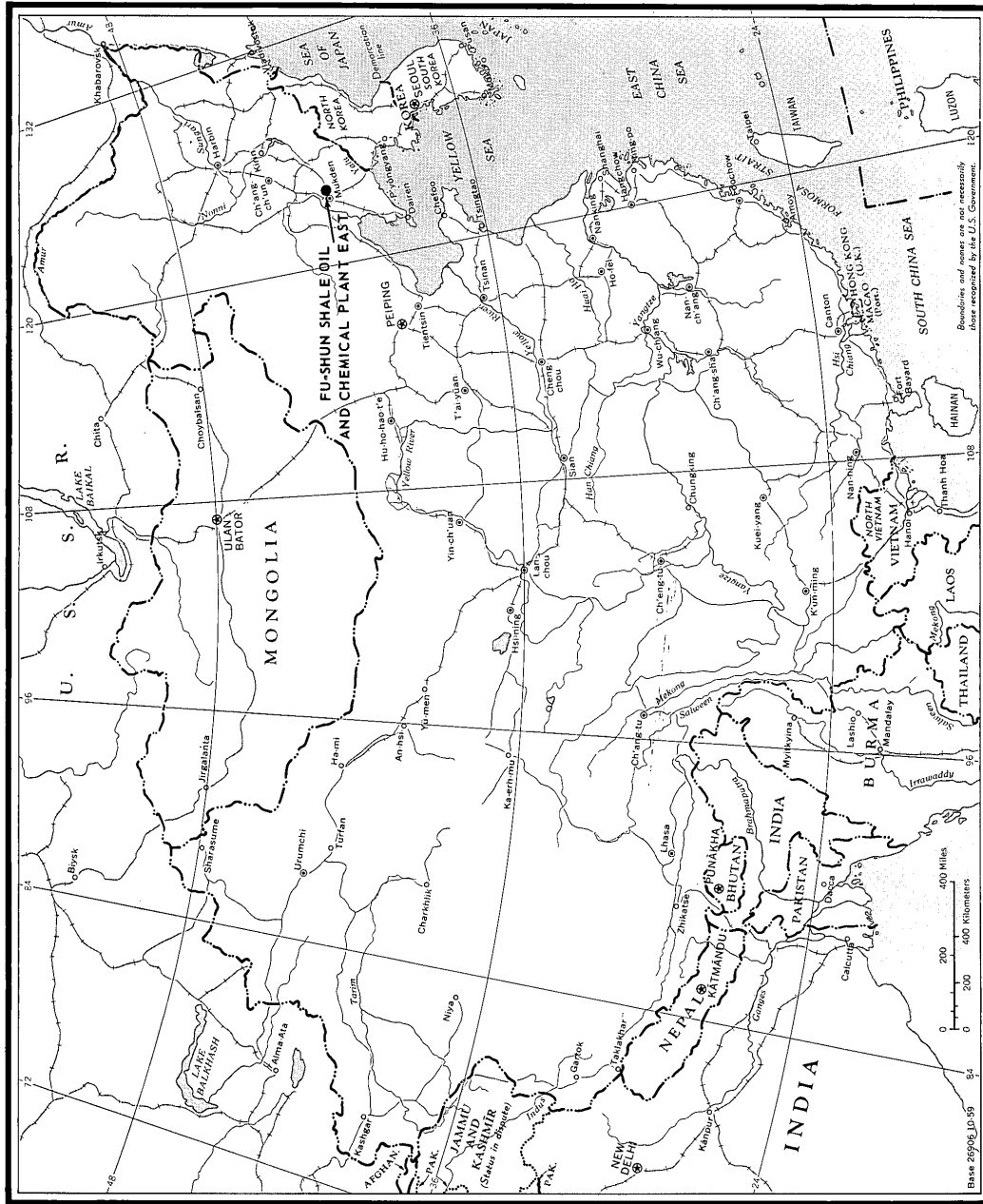


FIGURE 1. LOCATION MAP.

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## INTRODUCTION

Fu-shun Shale Oil and Chemical Plant East is located 7 nautical miles (nm) east-southeast of Fu-shun and 27 nm east of Shen-yang, in Liaoning Province, northeast China (see Figure 1). Fu-shun Shale Oil Plant West is located 8 nm west-northwest of the plant. Shale to charge the retorts is brought in by rail from a large open-pit mine 8 nm west-northwest of the plant. Crude oil, probably from the Sa-erh-tu Oilfield, is also processed at this plant.

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Steam and electricity are provided by the collocated Fu-shun Thermal Power Plant 2. Rail service is provided by lines from the city of Fu-shun.

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## BASIC DESCRIPTION

The plant measures approximately 7,750 by 3,750 feet and occupies 670 acres (see Figures 2 and 3). It is secured by a wall.

Operational Functions

This plant was originally designed to obtain oil from oil shale using heat and pressure generated in retorts and to process it into petroleum products. In June 1962, when the plant was first seen on photography, the units used to process the oil from shale included two shell stills, two possible blending/treating units, and a possible dewaxing unit. The sulfuric acid plant was also operating. The capacity and variety of products produced at the plant were very limited at that time.

During the early-to-mid 1960's the facilities at this refinery were expanded to handle crude oil in addition to shale oil. Storage and handling facilities for crude oil were added. One of the original shell stills was deactivated, and one and probably two primary distillation units were constructed to process the crude oil and the oil from shale. Several secondary processing units were added, including a catalytic cracking unit, a thermal cracking unit, a delayed coking unit, an alkylation unit, a catalytic reforming-hydrotreating unit, and an unidentified secondary processing unit. The addition of these primary and secondary processing units made the plant a major refining center.

The main product of the plant is gasoline in a wide range of octane ratings. Other products are coke, kerosene, and desulfurized diesel and fuel oils. The aromatic hydrocarbons benzene, toluene, and xylene are produced in the catalytic reforming-hydrotreating unit. It cannot be determined whether these aromatic hydrocarbons are separated from the reformat for individual use. They may be left in the reformat as high-octane components of the gasoline produced. Sulfuric acid is also produced at the plant.

Construction and Operational Status

In June 1962, when the plant was first seen on photography, one shale oil retort was operating and one was being dismantled. Only the oil produced in the retort (no crude oil) was being processed in the plant. However, a significant number of storage tanks were under construction, suggesting that the plant would begin to process crude oil.

Between May 1963 and January 1967 most of the major refining equipment was installed. The fluid catalytic cracking unit, the delayed coking unit, and the primary distillation unit (Area N) were all nearly complete by December 1964. However, they were not seen in operation until the next available coverage in December 1965. The catalytic reforming-hydrotreating unit was in the early stages of construction in December 1964. The unit appeared nearly complete in February 1966, but it was not seen in operation until the next available coverage in January 1967.

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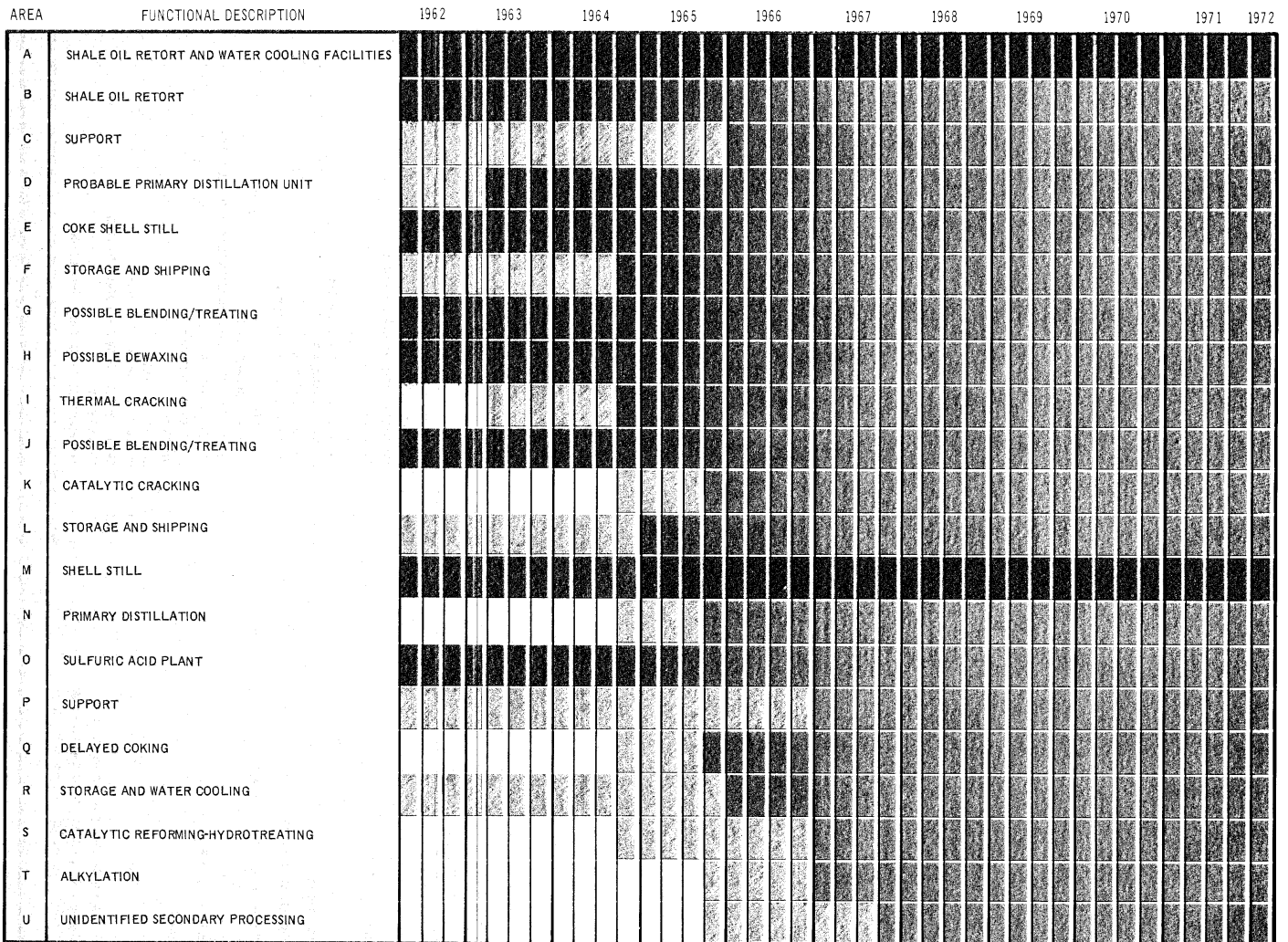
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LEGEND

- UNDER CONSTRUCTION
- COMPLETE
- BEING DISMANTLED OR IN DISUSE

FIGURE 4. CONSTRUCTION CHRONOLOGY, FU-SHUN SHALE OIL AND CHEMICAL PLANT EAST, CHINA.

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The fractionation columns associated with the shell still in Area M have been removed. This unit has not been seen in operation since December 1964.

The plant was operating on all coverages from June 1962 through February 1972. Figure 4 shows the construction chronology for the individual units.

### Facilities and Equipment

Table 1 lists the functional areas and equipment within the refinery. All measurements are rounded to the nearest 5 feet.

Table 1. Equipment and Facilities at Fu-shun Shale Oil and Chemical Plant East  
(Keyed to Figure 3)

<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>
A	Shale Oil Retort and Water Cooling Facilities (Being Dismantled)	Equipment not listed
B	Shale Oil Retort	1 Large retort building 5 Clusters of processing equipment 26 Miscellaneous processing columns 2 Shale crushing buildings 1 Shale screening building 1 Ash bunker 2 Cooling towers 93 Miscellaneous buildings 14 Cylindrical storage tanks 2 70-foot-diameter 3 50-foot-diameter 2 40-foot-diameter 2 30-foot-diameter 2 25-foot-diameter 3 20-foot-diameter
C	Support	131 Miscellaneous buildings
D	Probable Primary Distillation	1 Unit with 6 columns 3 banks of heat exchangers/ accumulators/cooling coils 4 furnaces 1 processing building 1 pump building 4 support buildings 3 cylindrical storage tanks, 15 feet in diameter 2 horizontal processing/storage tanks
E	Coke Shell Still (In Disuse)	1 Unit with 1 shell still for coke produc- tion 2 columns 2 clusters of processing equip- ment 1 furnace 4 processing buildings 3 horizontal processing tanks 8 support buildings

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<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>
F	Storage and Shipping	<ul style="list-style-type: none"> <li>2 Loading racks</li> <li>17 Support buildings</li> <li>56 Cylindrical Storage Tanks               <ul style="list-style-type: none"> <li>2 90-foot-diameter</li> <li>1 85-foot-diameter</li> <li>1 75-foot-diameter</li> <li>2 65-foot-diameter</li> <li>3 50-foot-diameter</li> <li>5 45-foot-diameter</li> <li>4 40-foot-diameter</li> <li>16 30-foot-diameter</li> <li>13 25-foot-diameter</li> <li>7 20-foot-diameter</li> <li>2 15-foot-diameter</li> </ul> </li> </ul>
G	Possible Blending/Treating	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>2 clusters of processing equipment</li> <li>2 processing buildings (one with 6 horizontal tanks)</li> <li>12 support buildings</li> <li>6 cylindrical storage tanks                   <ul style="list-style-type: none"> <li>4 25-foot-diameter</li> <li>2 10-foot-diameter</li> </ul> </li> </ul> </li> </ul>
H	Possible Dewaxing	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>4 processing buildings (one with 3 horizontal tanks)</li> <li>1 support building</li> </ul> </li> </ul>
I	Thermal Cracking	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>1 cracking section with                   <ul style="list-style-type: none"> <li>5 columns (including 1 reactor, 1 flash tower, and 1 fractionator)</li> <li>1 cluster of processing equipment</li> <li>2 banks of heat exchangers/cooling coils/accumulators</li> <li>2 furnaces</li> <li>1 pump building</li> <li>3 support buildings</li> </ul> </li> <li>1 vapor recovery section with                   <ul style="list-style-type: none"> <li>2 columns</li> <li>1 bank of heat exchangers/cooling coils/accumulators (on the roof of a processing building)</li> <li>1 processing building</li> <li>1 compressor building</li> <li>2 support buildings</li> <li>2 cylindrical storage tanks, 10 feet in diameter</li> <li>3 horizontal storage tanks                       <ul style="list-style-type: none"> <li>1 25-foot-long</li> <li>2 15-foot-long</li> </ul> </li> </ul> </li> </ul> </li> </ul>
J	Possible Blending/Treating	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>3 processing buildings</li> <li>9 support buildings</li> <li>14 cylindrical storage tanks                   <ul style="list-style-type: none"> <li>10 45-foot-diameter</li> <li>4 35-foot-diameter</li> </ul> </li> </ul> </li> </ul>

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<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>
K	Catalytic Cracking	1 Unit with 1 cracking section with 1 reactor 1 regenerator 1 flash tower 1 fractionator 2 catalyst hoppers 1 bank of heat exchangers/ cooling coils/accumulators 1 furnace 2 processing buildings 1 pump building 1 cylindrical storage tank, 25 feet in diameter 1 vapor recovery section with 2 columns 1 bank of heat exchangers/ cooling coils/accumulators 1 compressor building 2 support buildings
L	Storage and Shipping	1 Loading rack 18 Miscellaneous buildings 39 Cylindrical storage tanks 4 40-foot-diameter 16 25-foot-diameter 19 15-foot-diameter
M	Shell Still (Partially Dismantled and in Disuse)	1 Unit with 1 battery of 10 shell stills 2 clusters of processing equipment 1 furnace (several associated distillation columns have been removed) 1 bank of heat exchangers/ cooling coils/accumulators 20 miscellaneous buildings 3 cylindrical storage tanks, 20 feet in diameter
N	Primary Distillation	1 Unit with 1 atmospheric column 1 vacuum column 7 other columns (4 are probably recycle columns) 3 banks of heat exchangers/ cooling coils/accumulators (one is on the roof of a processing building) 2 processing buildings (one with 3 cylindrical processing/storage tanks) 3 furnaces 1 pump building 2 support buildings 2 Support buildings
O	Sulfuric Acid Plant	Facilities not listed

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<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>
P	Support	<ul style="list-style-type: none"> <li>1 Cooling tower</li> <li>46 Miscellaneous buildings</li> <li>20 Cylindrical storage tanks               <ul style="list-style-type: none"> <li>1 90-foot-diameter</li> <li>1 80-foot-diameter</li> <li>2 50-foot-diameter</li> <li>2 45-foot-diameter</li> <li>4 35-foot-diameter</li> <li>2 30-foot-diameter</li> <li>8 10-foot-diameter</li> </ul> </li> <li>1 Covered water reservoir</li> </ul>
Q	Delayed Coking	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>2 coking drums</li> <li>1 fractionator</li> <li>6 other columns (4 are for vapor recovery)</li> <li>1 bank of heat exchangers/cooling coils/accumulators</li> <li>2 furnaces</li> <li>3 processing buildings</li> <li>1 pump building</li> <li>3 support buildings</li> <li>1 overhead crane</li> <li>14 cylindrical storage tanks                   <ul style="list-style-type: none"> <li>8 40-foot-diameter</li> <li>6 20-foot-diameter</li> </ul> </li> </ul> </li> <li>2 Support buildings</li> </ul>
R	Storage and Water Cooling	<ul style="list-style-type: none"> <li>4 Cooling towers</li> <li>45 Miscellaneous buildings</li> <li>42 Cylindrical storage tanks               <ul style="list-style-type: none"> <li>2 150-foot-diameter</li> <li>14 90-foot-diameter</li> <li>12 65-foot-diameter</li> <li>6 50-foot-diameter</li> <li>6 45-foot-diameter</li> <li>2 25-foot-diameter</li> </ul> </li> <li>5 Water storage/treatment basins</li> <li>1 Flare tower</li> </ul>
S	Catalytic Reforming-Hydrotreating	<ul style="list-style-type: none"> <li>1 Unit with               <ul style="list-style-type: none"> <li>14 columns</li> <li>8 clusters of processing equipment (some contain reactors)</li> <li>5 furnaces</li> <li>7 processing/pump buildings</li> <li>5 cylindrical processing/storage tanks</li> <li>8 support buildings</li> <li>24 cylindrical storage tanks                   <ul style="list-style-type: none"> <li>7 45-foot-diameter</li> <li>4 30-foot-diameter</li> <li>1 20-foot-diameter</li> <li>3 15-foot-diameter</li> <li>3 10-foot-diameter</li> <li>6 5-foot-diameter</li> </ul> </li> <li>9 horizontal storage tanks                   <ul style="list-style-type: none"> <li>6 60-foot-diameter</li> <li>2 50-foot-diameter</li> <li>1 45-foot-diameter</li> </ul> </li> </ul> </li> </ul>

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<u>Area</u>	<u>Functional Description</u>	<u>Equipment and Facilities</u>
T	Alkylation	1 Unit with 6 columns 1 cluster of processing equipment 1 reactor building with 6 reactors 9 horizontal processing/settling tanks 1 compressor building 1 support building 2 cylindrical acid storage tanks, 25 feet in diameter
U	Unidentified Secondary Processing	1 Unit with 7 columns 2 clusters of processing equipment 1 bank of heat exchangers/cooling coils/accumulators 1 furnace 4 processing buildings 16 cylindrical processing/storage tanks 6 support buildings 4 cylindrical storage tanks, 15 feet in diameter 1 horizontal storage tank, 50 feet long 10 Support buildings

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REFERENCES

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Map

2nd RTS. US Air Target Chart, Series 200, Sheet M0290-11HL, 5th edition, April 1971, Scale 1:200,000 (SECRET)

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Requirement

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Support Number 428921

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