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ACCTS UPON WHICH SIGNIFICANT NEGATIVE FALLING POINTS WERE DISCOVERED

1970-1971

PACIFIC PROVING GROUNDS

DURING

1970-1971

DRAFT

1970-1971

at Eniwetok

In light of [redacted] on Pacific and ENIWEK atolls it is prudent that some consideration be given to fallout from the Pacific Proving Grounds which may have been carried to these atolls during the period of atmospheric testing.

Fallout patterns and [redacted] from Pacific Proving Ground nuclear tests are very limited. However, radiographs are available for nearly all of the tests conducted in the Pacific. These radiographs and available fallout patterns have been [redacted] studied to discern what fallout may have had on Pacific atolls. These radiographs and fallout patterns which [redacted] [redacted] have provided the indications of any significant fallout on these atolls are indicated, as well as the location of such information.

Due to the intense fallout from the 1954 BIKINI event on RONGELAP and UTIRIK atolls, some effort was made to investigate the radioactive deposition on these and a few other atolls in the fallout pattern. Unfortunately, the utility of these investigations was limited due to the ^{Small number of} atolls visited, the [redacted] treatment of the samples (gross gamma, gross beta, and other crude evaluation), and use of instruments only on RONGELAP, BIKINI and ENIWEK atolls have any recent studies been undertaken. The rest of the fallout area ^{apparently has been investigated previously} [redacted] been investigated.

Utilizing various reports, fallout radiographs and radiographs, this investigator has evaluated the data available, [redacted] [redacted] and [redacted] that [redacted] fallout has occurred on several atolls which [redacted] have been investigated previously. This fallout, as well as [redacted] suggesting it, is presented as figures with other pertinent data. Data presented in tabular form for brevity.

COMMENTS ON SOURCE INFORMATIONFallout Patterns

The source documents ([redacted] the references portion of this report) indicate the [redacted] rate patterns for the fallout pattern have been drawn to show the gamma [redacted] rate in roentgens per hour, one foot above the ground, in terms of the one hour reference burst reference line. The $r^{-1.2}$ approximation was used when no actual data was available for direct radiation measurements to the one hour reference time. It is to be noted to recognize the H + 1 hour is used as a reference time, and that for the contours from low yield were complete at one hour after burst. For high yield weapons, fallout over some parts of the vast area shown did not clear until many hours after burst.

Where several fallout patterns were available for a particular event, each has been presented.

Hodographs

The hodographs were drawn for a constant vertical rise rate of 5,000 ft/hr and are presented because other, more meaningful, information is not available. Several hodographs are [redacted] and the H plus times indicated by the number at the end of the arrow. (This is not to be in H plus hours.)

It is recognized that fallout did not necessarily follow the hodographs presented herein. However, a simple comparison of the CASLE BRAVO hodographs with the actual or modelled fallout patterns will show the merit of their consideration.

FINDINGS

[redacted] there are eleven nuclear tests which may have deposited radioactive materials in significant amounts greater than world wide fall-out on several of the Marshall Islands. Based on [redacted] and the atolls they may have contaminated are indicated in [redacted] Table 1. Additionally, the fallout pattern, if [redacted] or several [redacted] diagrams are indicated in Figures [redacted] through [redacted] for each [redacted] event. [redacted] For immediate reference, the habitable [redacted] atolls and their locations are indicated, with population figures and [redacted] where applicable, in Table 2.

It is pertinent to note that in addition to ENIWETOK, BIKINI, AILINGINAE, RONGELAP, RONGERIK, BIKAR, UJA, [redacted] and [redacted] atolls, which have been [redacted] by other [redacted] tests in the [redacted] several other atolls are indicated: AILUK, JEMO, [redacted] UJA, [redacted] UJAE, UJELANG, WOTHIC [redacted] and WOTJE. Since the [redacted] of [redacted] [redacted] LIKIAN, TAKA, LIKIEP and possibly AILINGINAE, [redacted] RONGERIK, and [redacted] somewhat limited, these may also added to [redacted] above [redacted] that, including the "source" atolls of ENIWETOK and BIKINI, a total of 19 atolls may have been contaminated with [redacted] radioactive materials. Only on three, ENIWETOK, BIKINI and RONGELAP, [redacted] pair if UTIKIK is included, is there any [redacted] [redacted]

Since actual fallout patterns are lacking [redacted] of the [redacted] events, an [redacted] was made [redacted] weigh the [redacted] of each event. [redacted]

[redacted] the fallout pattern of the CASLE BRAVO event is well known (and there are three different fallout patterns available) this depositor potential was [redacted] to [redacted]. This [redacted] treatment [redacted] presented in Table 3. The [redacted] expressed here is really a factor, or multiplier, of the CASLE BRAVO [redacted] it may be applied simply by taking the CASLE BRAVO [redacted] distance from the [redacted]

Investigated
the fallout pattern of the CASLE BRAVO
fallout patterns
CASLE BRAVO
This
The results of

similar to the distance from #2, along the path of the event ^{along the path of the event} [redacted] and multiplying it by the "potential" factor. The result should be a "ballpark" estimate of what fallout may be expected at the location in question. Obviously, there is no claim to any precision or accuracy with this method. It is only offered as a [redacted] method to estimate [redacted] possible deposition in the absence of actual data. [redacted]

TABLE 1. POSSIBLE SIGNIFICANT NUCLEAR FALLOUT FROM PACIFIC PROVING GROUNDS, SUSPECTED ATOLLS

EVENT	ATOLL	BLACK - POSITIVE	RED - POSSIBLE
SANDSTONE ZEBRA	ENTWETOK	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK	
GREENHOUSE DOG	ENTWETOK	UJELANG	
CRISTOBAL GEORGE	ENTWETOK	BIKINI, ALLINGINAE, RONGELAP, RONGERIK	
TOMMY KONG	ENTWETOK		
JAMES EARLE	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK, UJELANG, FRENCH FRIGATE SHOALS, MALDEN, PHOENIX		
BRENDA LYNCH	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK, UJELANG		
MARLEN BARKER	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, PIKAR, UJELANG		
WILLIAM KING	BIKINI, ALLINGINAE, RONGELAP, RONGERIK		
FRANK B. BAKER	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK, UJELANG		
WILLIAM BAKER	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK, UJELANG		
WALTER MARIE	BIKINI, ALLINGINAE, RONGELAP, RONGERIK, TAKA, PIKAR, UTIRIK, UJELANG		

* This hodograph indicated that the fallout pattern could have extended southwest as far as Samoa and other nearby atolls.

TABLE 2. HABITATION OF ATOLLS UNDER DISCUSSION

ATOLL or ISLAND	INHABITED (Pop.) yr.	BEING REINHABITED	UNINHABITED	REMARKS
ATLINGINAE			X	Visited by Rongelapese
BUJAP	(200) 1962 ¹			
BYAP			X	
EPELNI		X		
ENIWEKOK		X		
ETAK			X	
FAKAOFO	(2100) 1940			
FAKAOFO	(11) 1962			
FAKAOFO	(1000) 1940			
FAKAOFO	(203) 1962 ¹			
RONGELAP	(208) 1962 ¹			
RONGERIK			X	Visited by Rongelapese
IAKA			X	Visited by Utirikese
TAONGI			X	
UJAE	(116) 1962 ¹			

TABLE 2. Continued

ATOLL or ISLAND	INHABITED (Pop.) yr.	BEING REINHABITED	UNINHABITED	REMARKS
UJELANG	(340) 1973 ³			
WIKI	(100) 1962 ¹			
WIKI	(100) 1962 ¹			
WIKI	(100) 1962 ¹			

¹ _____, SAILING DIRECTIONS FOR THE PACIFIC ISLANDS, H. O. Pub. No. 82, Vol. I., U. S. Naval Oceanographic Office, 1964. (Chapter 5, Marshall Islands). Change 4 Incorporated, 5 December 1970.

² Henderson, John W., et. al., AREA HANDBOOK FOR OCEANIA, U. S. Government Printing Office, Washington, 1971, p. 503.

³ Tobin, J. A., THE ENEWETAK ATOLL PEOPLE, Special Report for the Radiological Survey of 1972-1973, Majuro, 20 April 1973, p. 10.

TABLE 1.1. SEQUENTIAL POTENTIALS ASSOCIATED TO BRAVO

EVENT	POTENTIAL
SANDSTONE ZEPH	0.012
GREENHOUSE D	0.010
GREENHOUSE C	0.015
IVY KING	0.019
CASTLE BRAVO	1.000
CASTLE UNION	0.710
CASTLE YANKEE	1.010
REDWING ZUNI	0.010
REDWING LACR	0.015
HARDTACK MAGNET	0.007
HARDTACK MAPLE	0.007

TABLE 4. NORMALIZED DEPOSITION POTENTIAL APPLIED TO EACH ATOLL BY CONTAMINATING EVENT

ATOLL	WOTIA	UTIRIK	UJULANG	UJUMI	TAFA	TAORAH	TAONGAKAI	TAONGALOU	TAONGALOU	JEKUPU	EXHUMATION	BIKINI	BIKINI	AILUK	AILUK
ATOLL															
WOTIA															
UTIRIK															
UJULANG															
UJUMI															
TAFA															
TAORAH															
TAONGAKAI															
TAONGALOU															
JEKUPU															
EXHUMATION															
BIKINI															
BIKINI															
AILUK															
AILUK															

1
 factor
 P.P. 1

ATOLLS ON WHICH SIGNIFICANT NUCLEAR FALLOUT COULD HAVE OCCURRED FROM THE PACIFIC PROVING GROUNDS

x - uninhabited

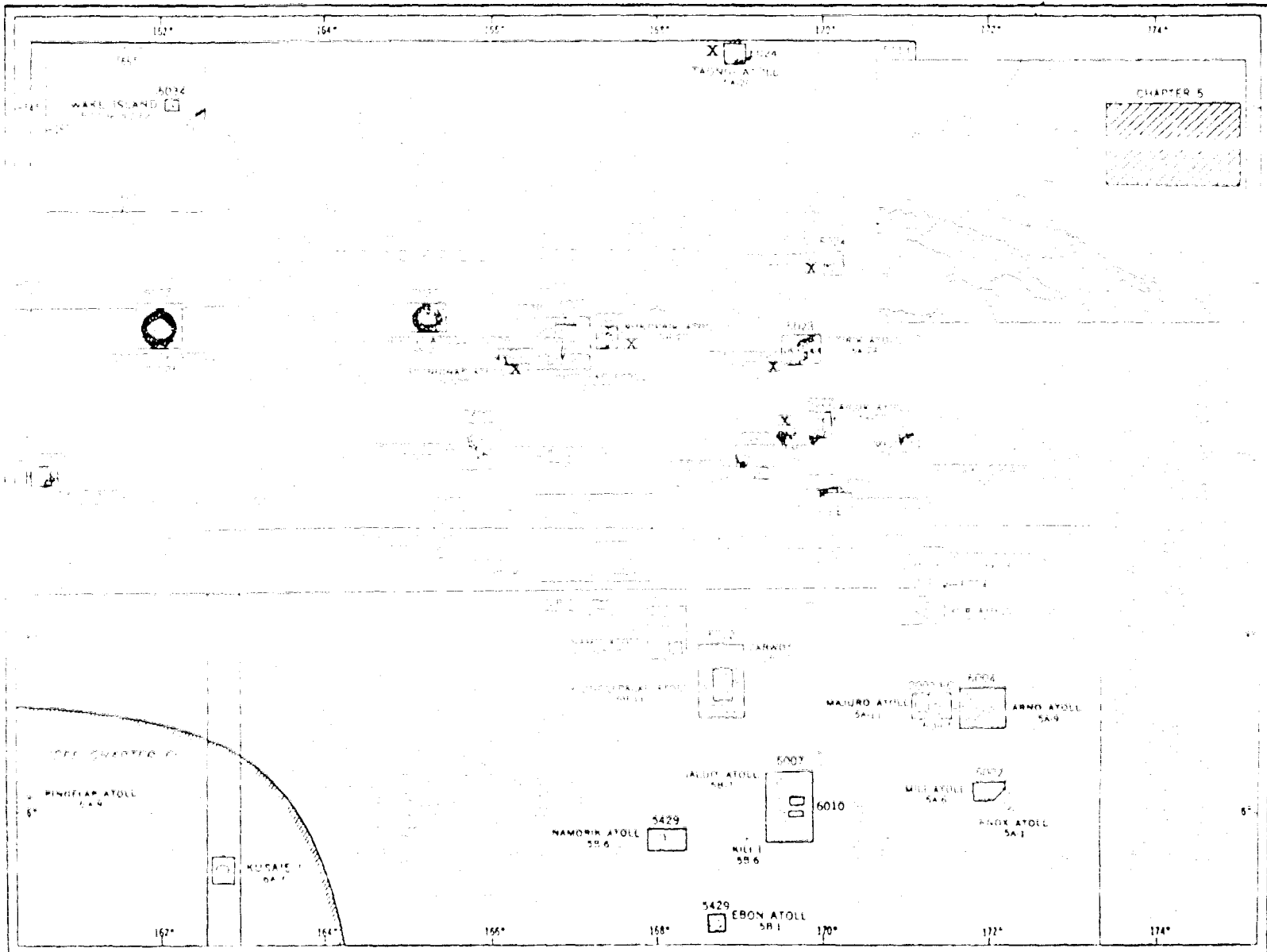


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office. Numbers refer to the section in the text describing a designated locality.

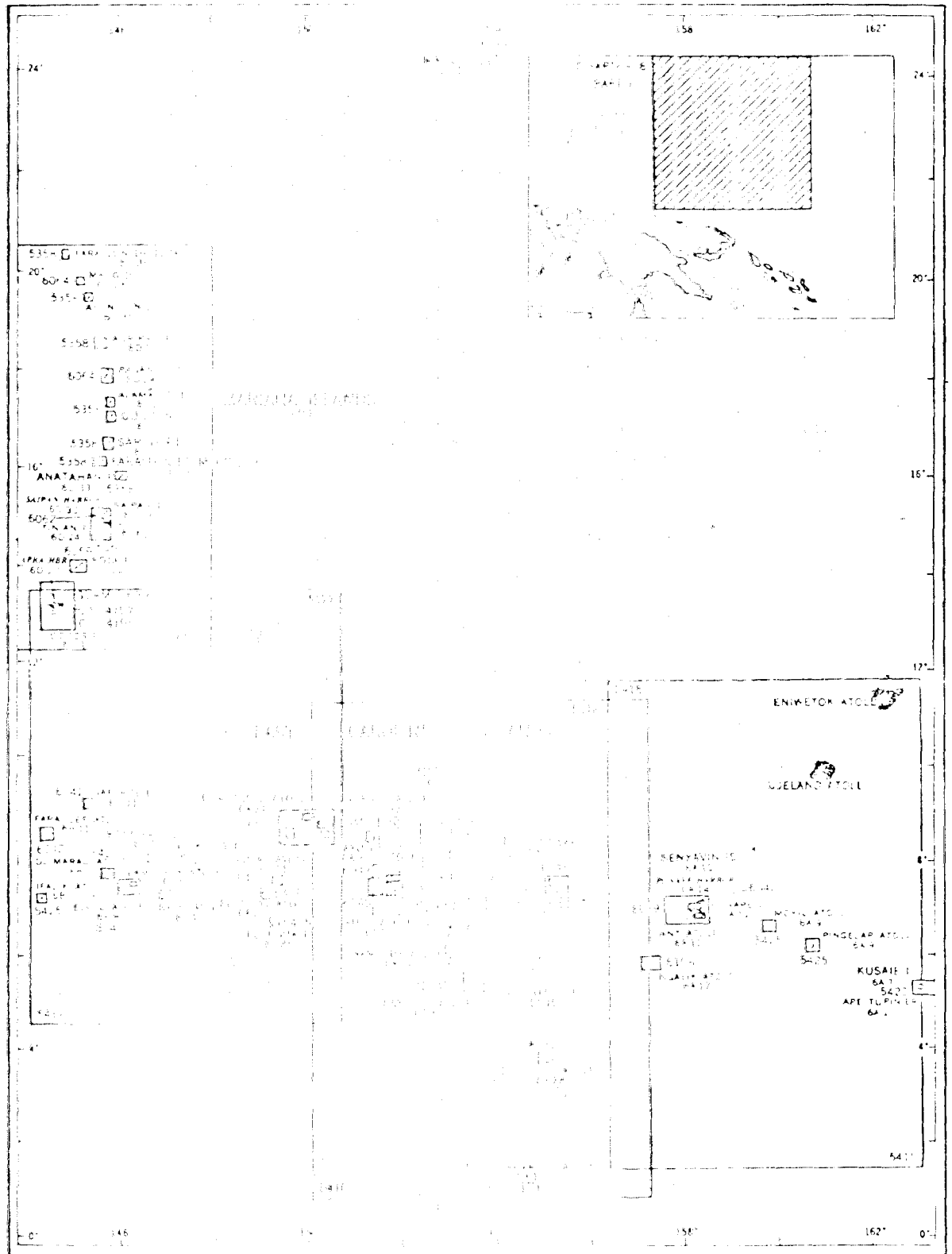
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H. O. 60--CHANGE 1

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ATOLLS IN WHICH SIGNIFICANT NUMBERS OF BIRDS WERE OBSERVED FROM THE PACIFIC PROVINCE, MARCH 1968



Graphic Index of the Pacific Provinces, March 1968, prepared by the Pacific Office, U.S. Fish and Wildlife Service, Honolulu, Hawaii, and the U.S. Fish and Wildlife Service, Washington, D.C.

UNITED STATES GOVERNMENT PRINTING OFFICE

ATOLLS EVALUATED BY DUNNING, AUGUST 1957

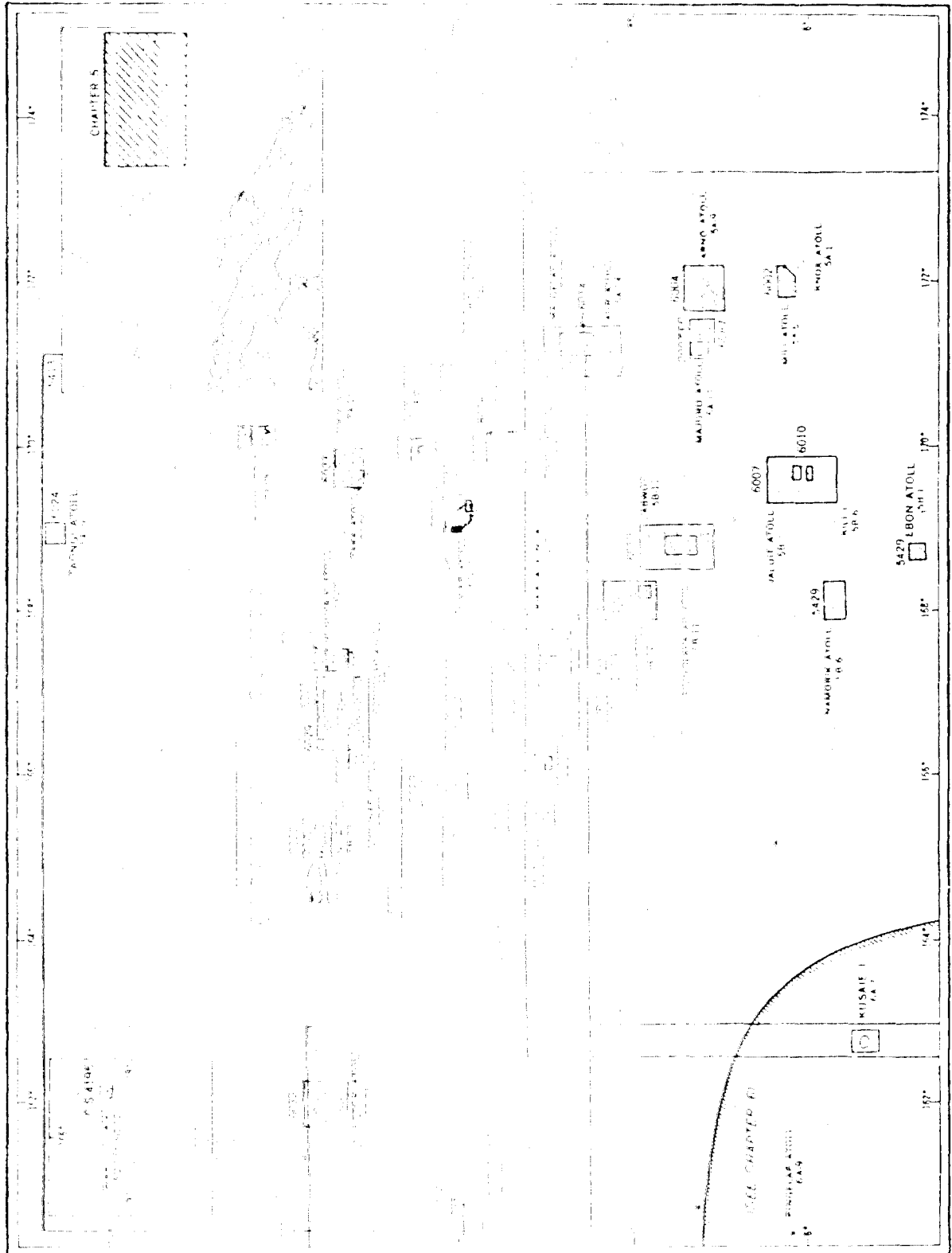
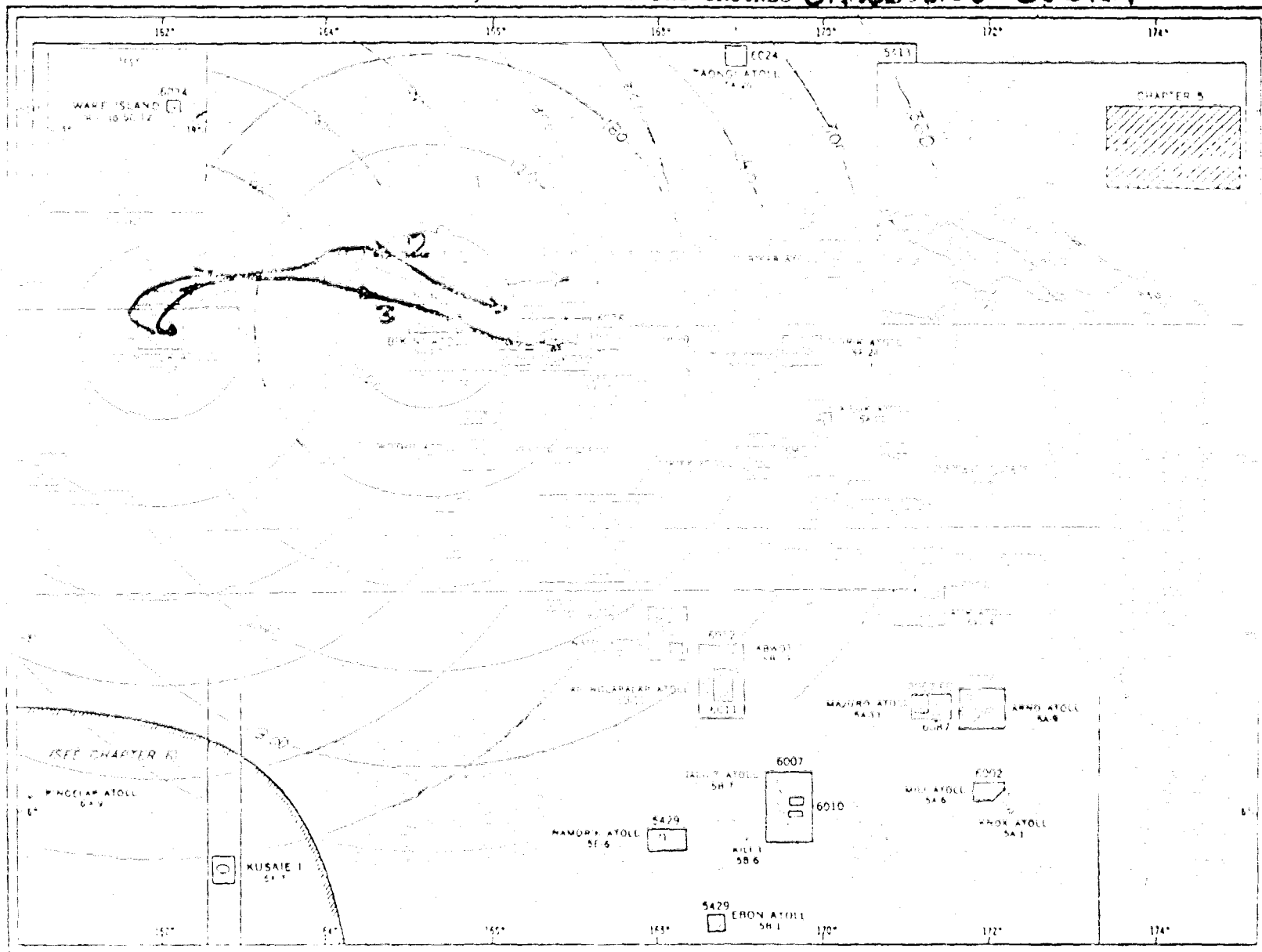


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.

Numbers refer to the section in the text describing a designated locality.

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POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **SANDSTONE ZEBRA**



CIRCLE DISTANCES
IN UNITS OF 60 NM.
APPROXIMATE POSITIONING
ON GROUND TRACKING
SOUNDINGS

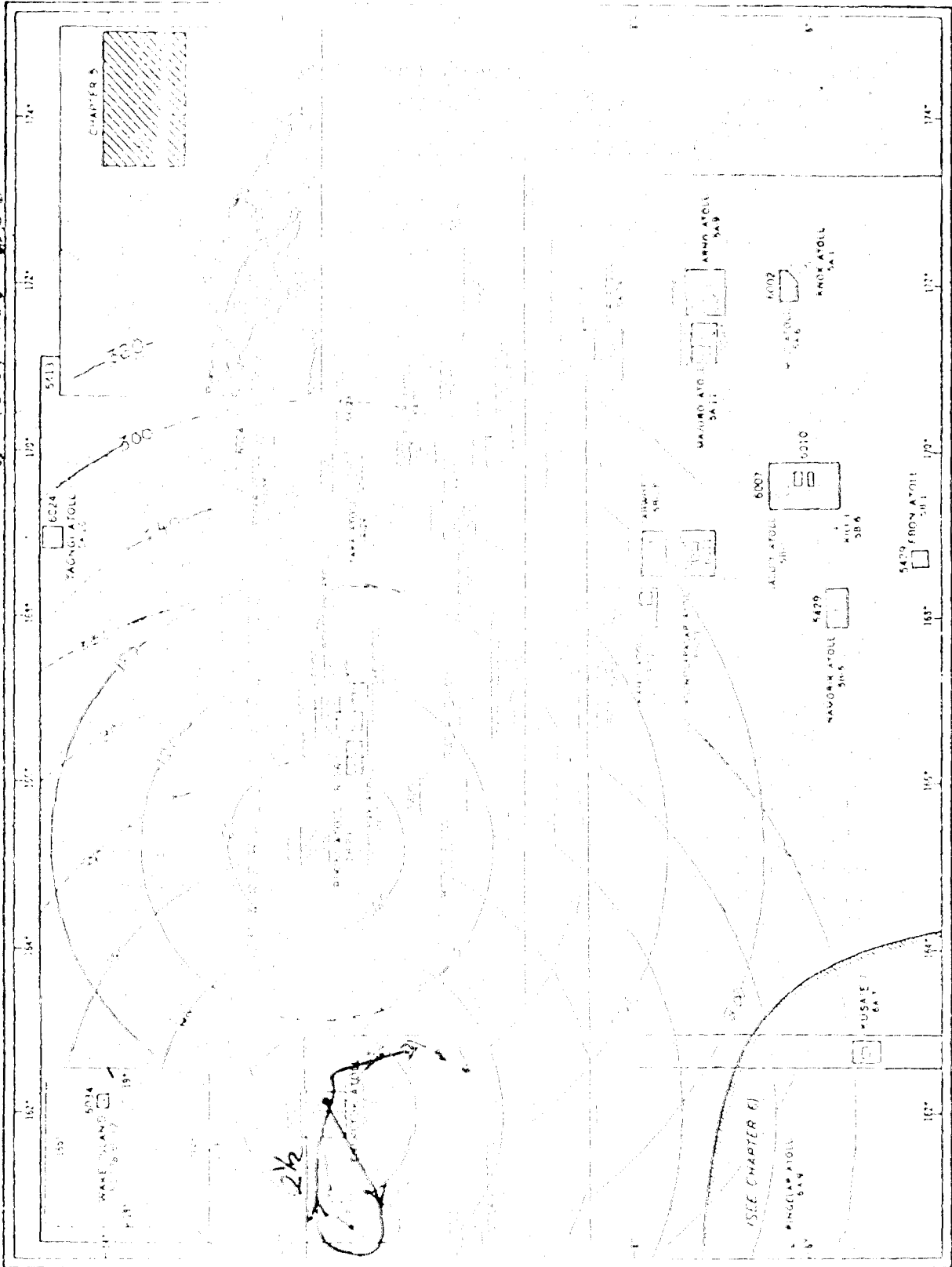
Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Numbers refer to the sections in the text describing a designated locality.

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11.0. 67—Change 3

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS GREENHOUSE DOG



CIRCULAR DATA FROM
SOURCE OF CONTOUR

ALPHABETICALLY

Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Numbers refer to the section in the text describing a designated locality.

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **GREENHOUSE GEORGE**

CIRCULAR DISTANCE
IN UNITS OF 60 N.M.L.
APPROXIMATE PROXIMATE
SOUTHWEST CORNER
EARTH

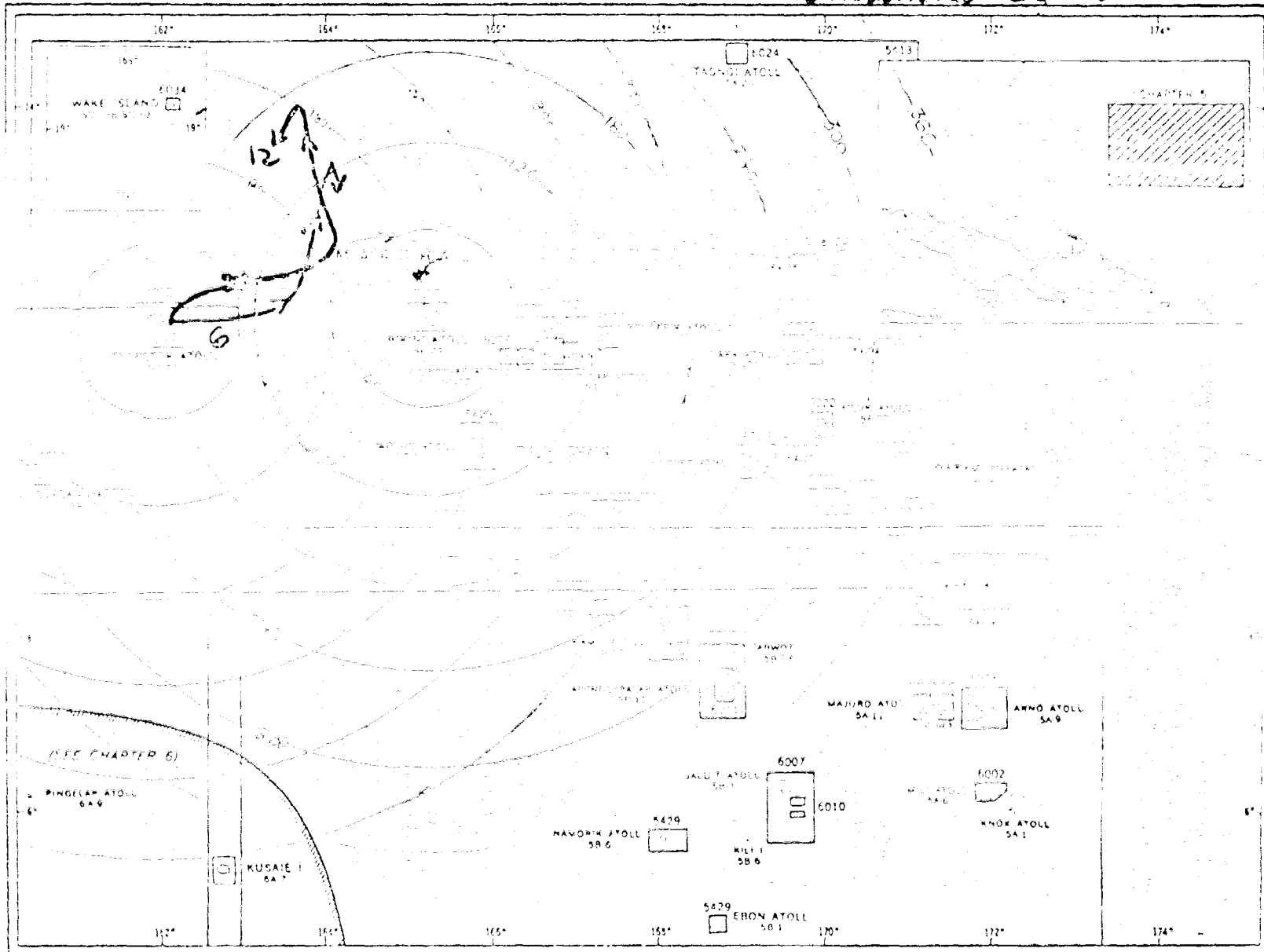


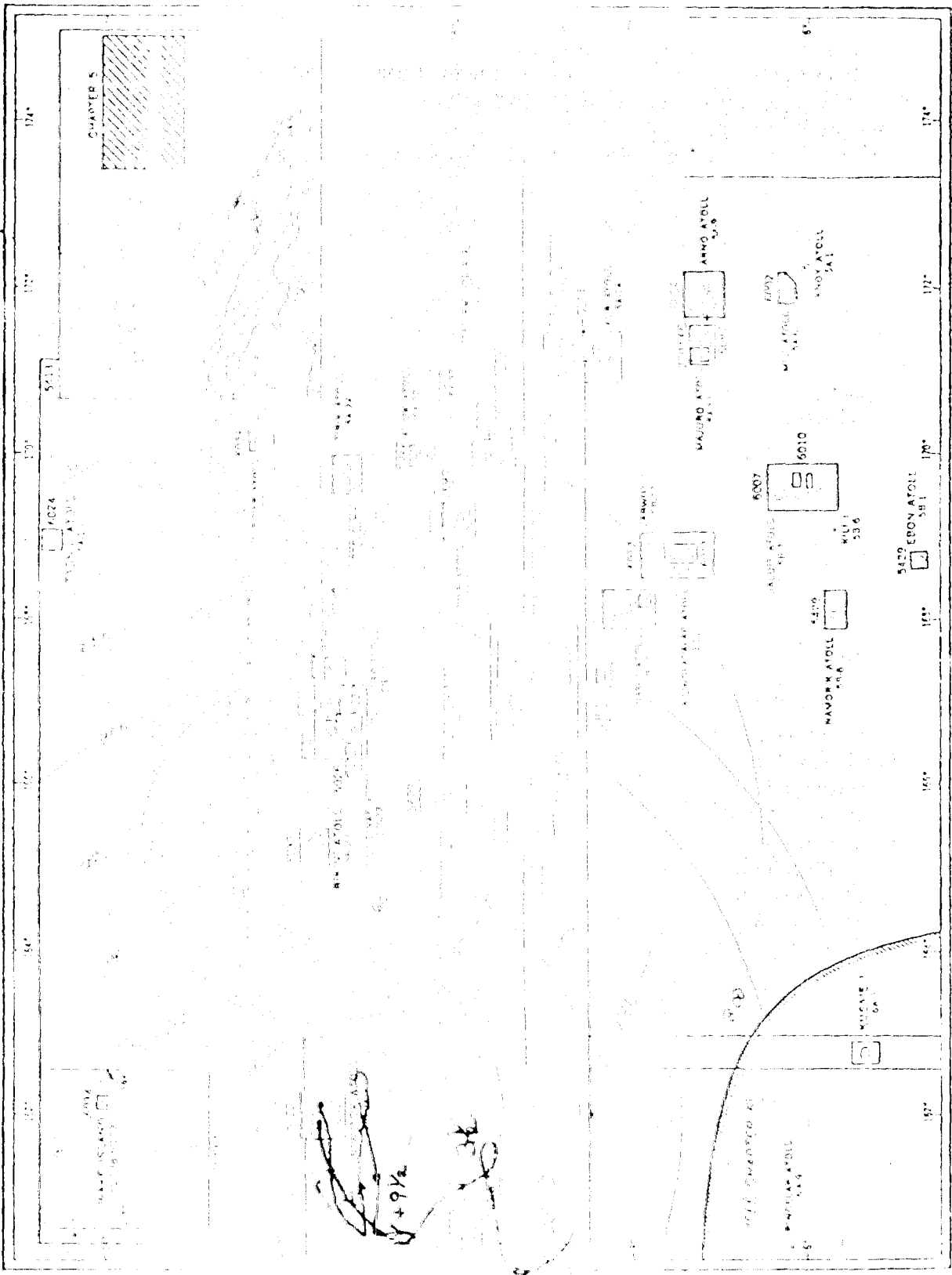
Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Numbers refer to the section in the text describing a designated locality.

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H.O. 82 - CHANGE 3

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC FROVING GROUNDS IVY KI 13



1. PURPOSE OF STUDY
 2. SCOPE OF STUDY
 3. SUMMARY OF FINDINGS

Chart line is shown use of the best available charts issued to naval vessels by the U.S. Naval Oceanographic Office.
 Numbers refer to the section in the text describing a designated locality.

POSSIBLE SHOOTING AND PROVING GROUNDS **WY KING**

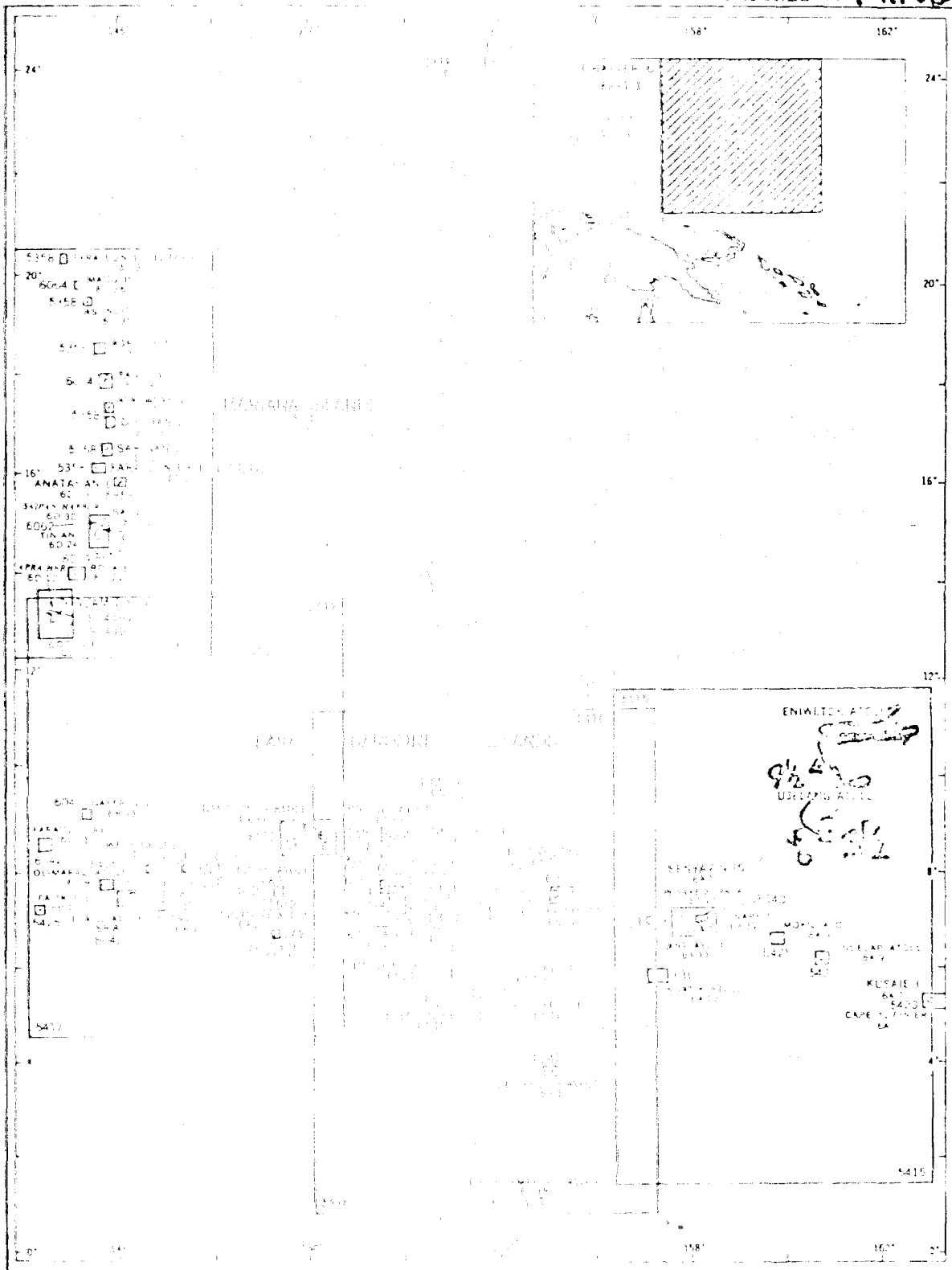
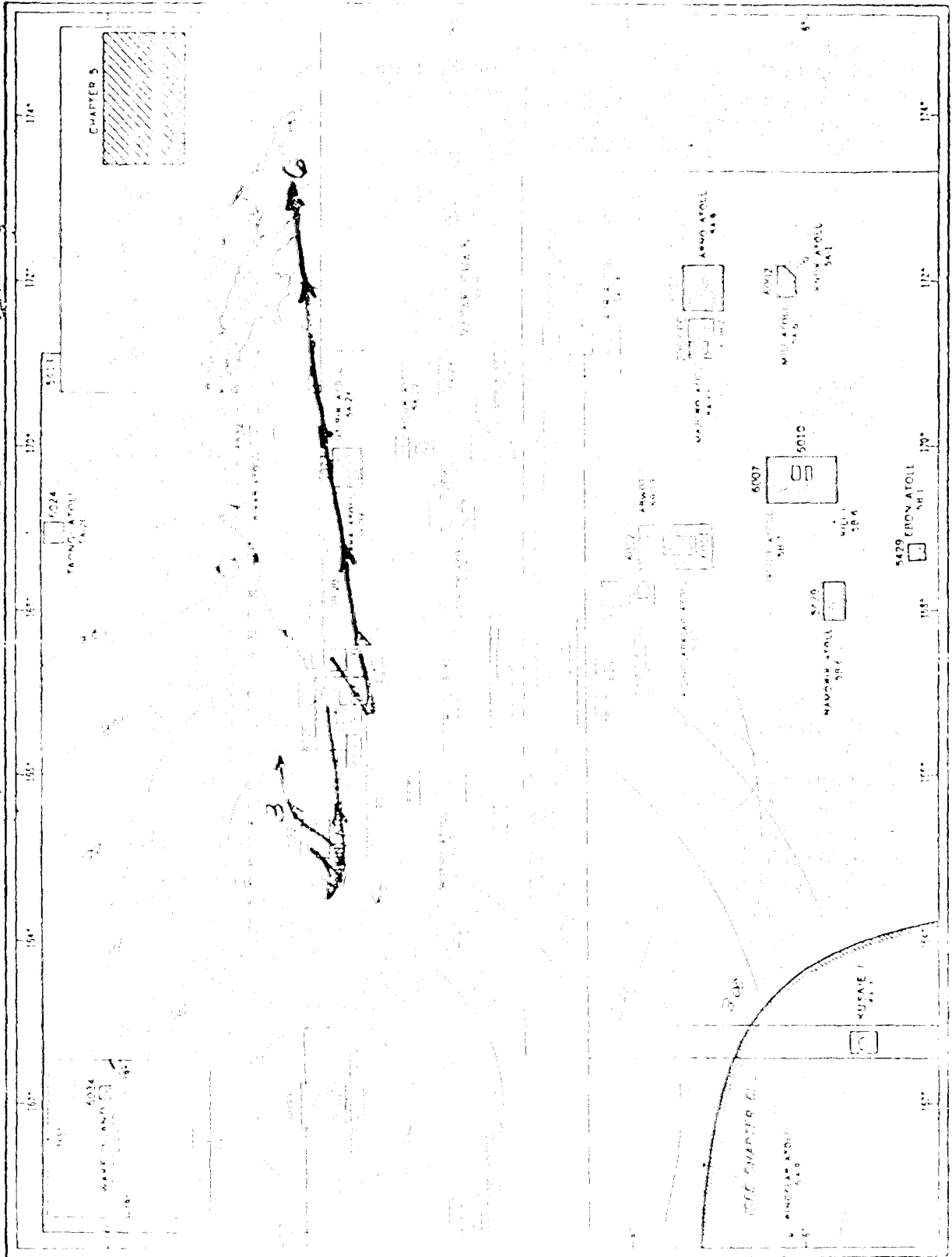


Chart prepared by the Hydrographic Office, U.S. Navy, from the survey of the U.S.S. Albatross, 1841-42, and other sources.
 (GRAPHIC C, PART I, GRAPHIC INDEX)

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS CASTLE BRAVO



CIRCULAR DISTANCES
 50 MILES OR 60 KM

ANNOUNCED FALLOUT
 IN THIS REGION

This chart shows the best available information on the location of the test site and a designated locality.
 Numbers refer to the location of the test site.

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **CASTLE BRAVO**

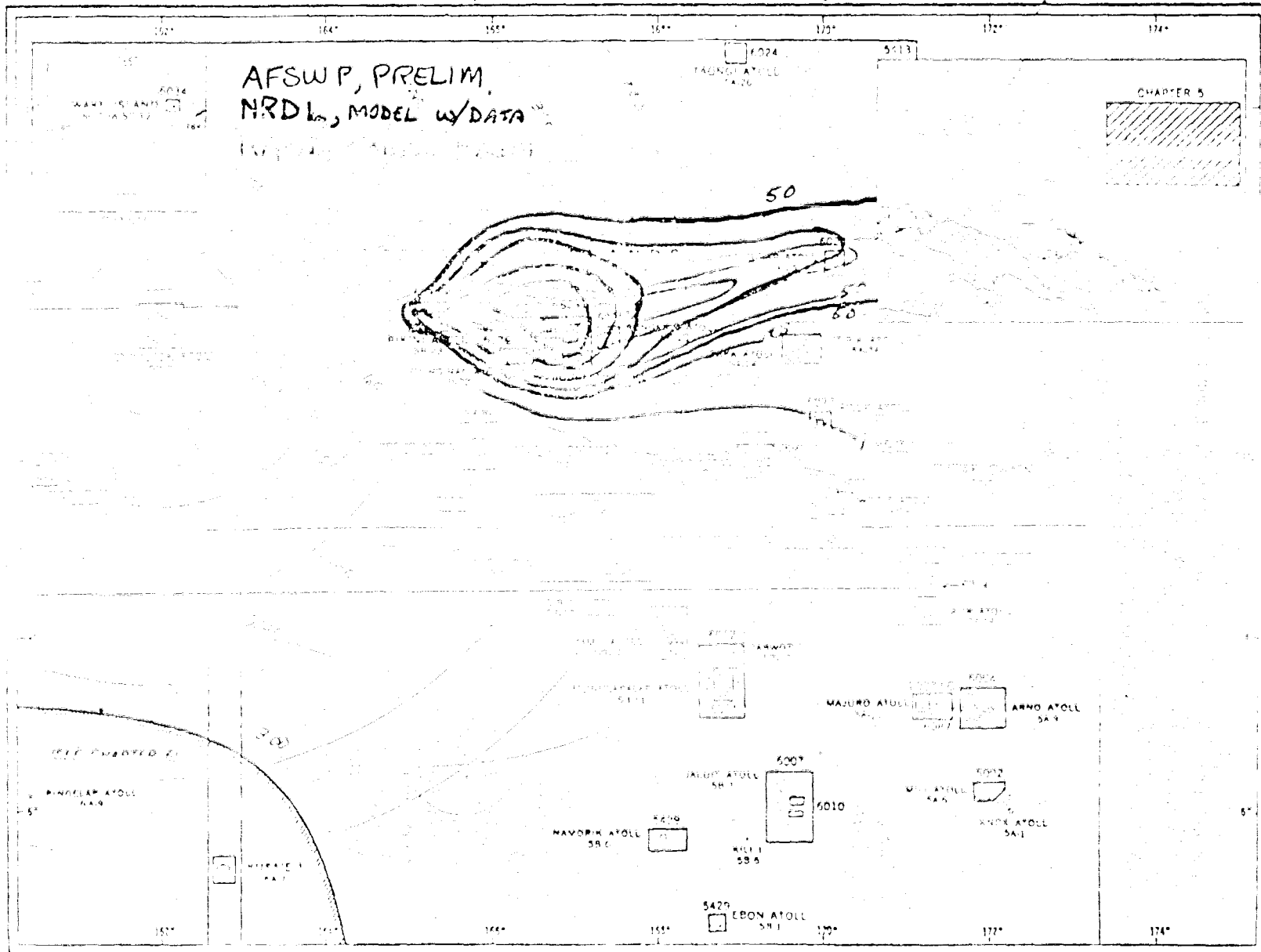
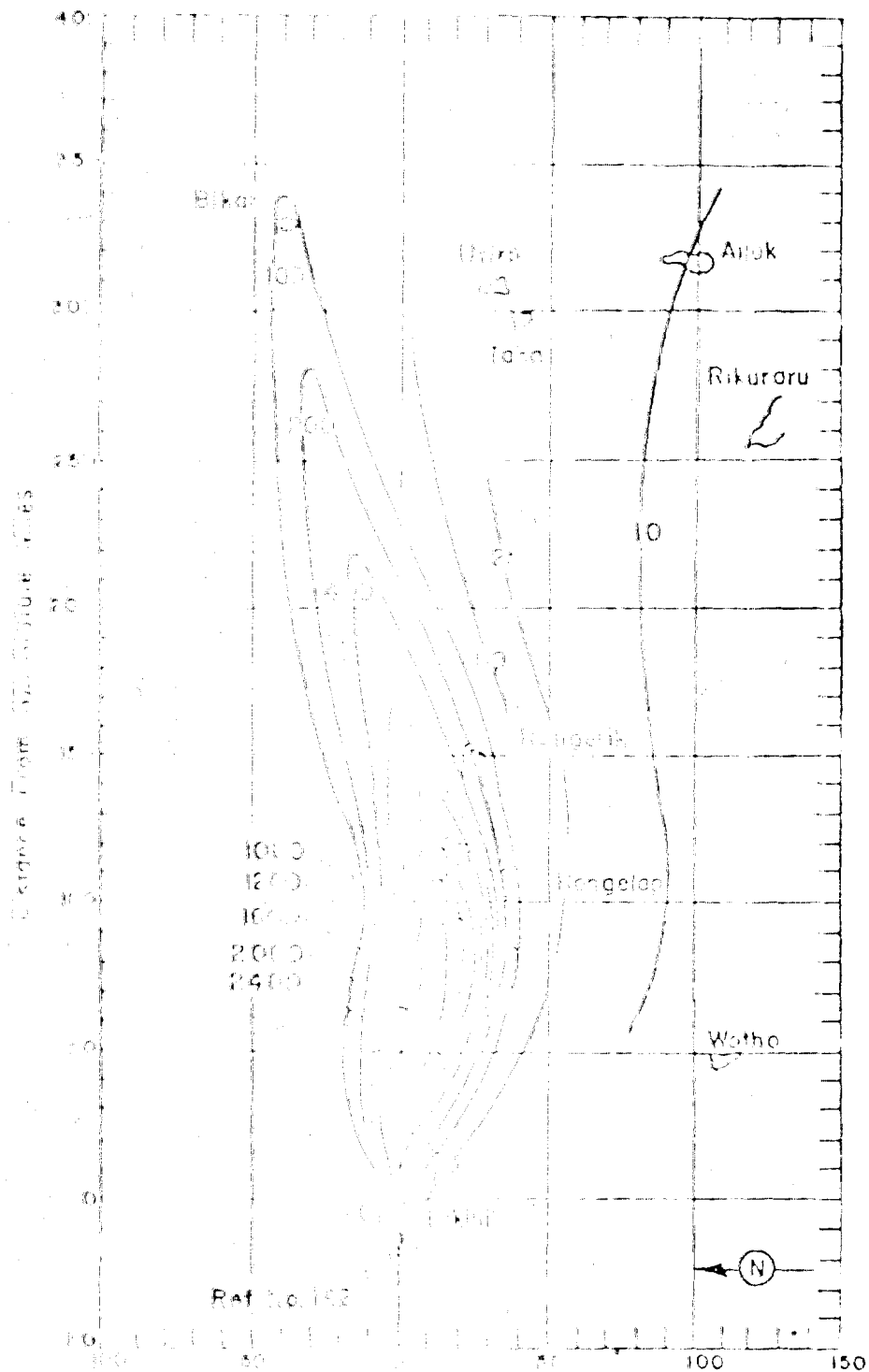


Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Naval Oceanographic Office. Numbers refer to the section in the text describing a designated locality.

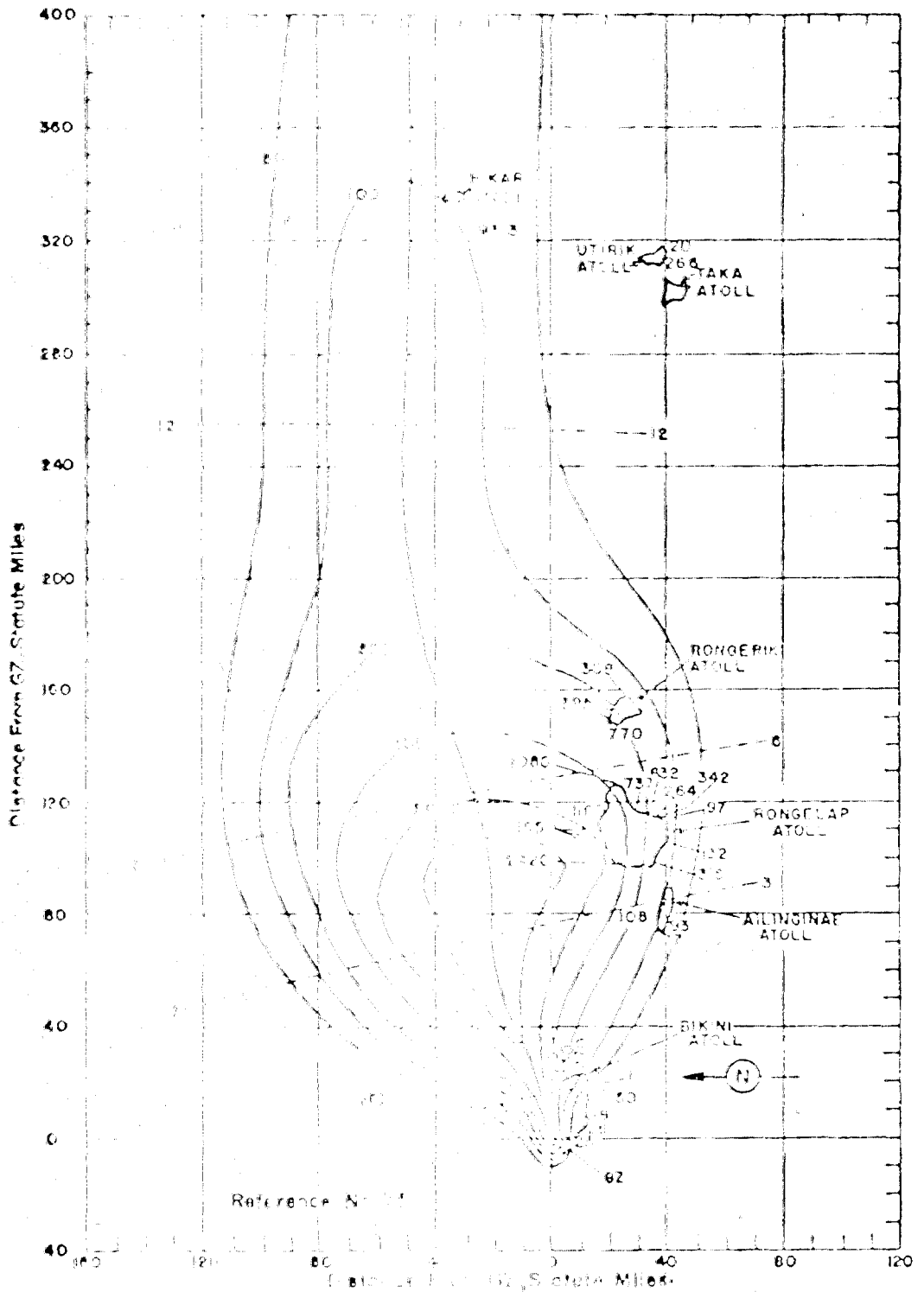
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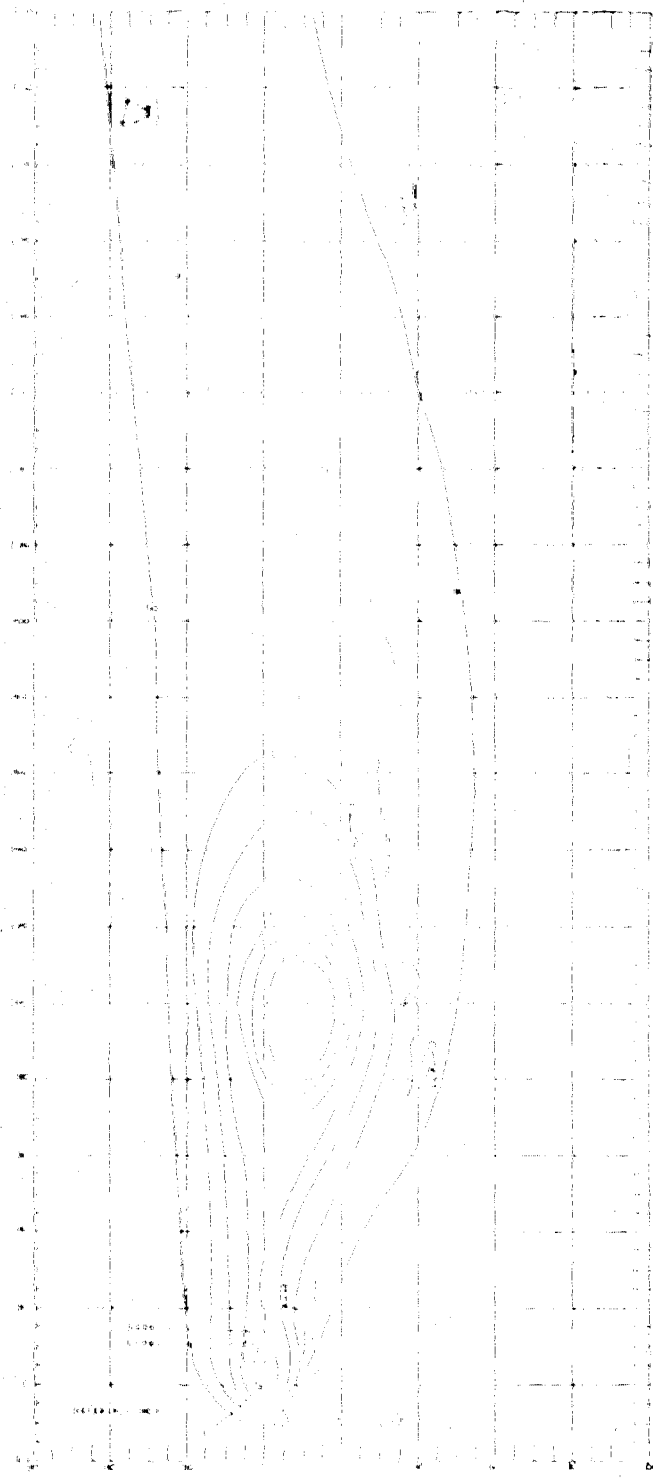
Distance from C7, statute Miles

Contour Interval - 100 ft. above.

Pressure from surface (altitude 0) at 11 hour (APR 67).

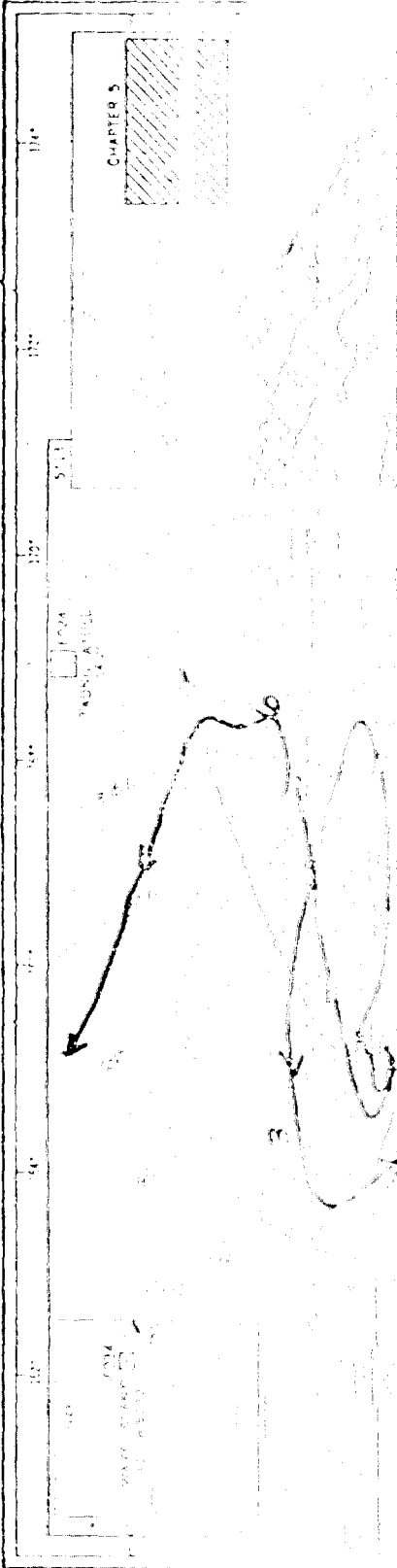


Quantities (Miles) - Part I - By vo.
 Quantities (Miles) - Part II - By vo. at H+3 hour (MPL).

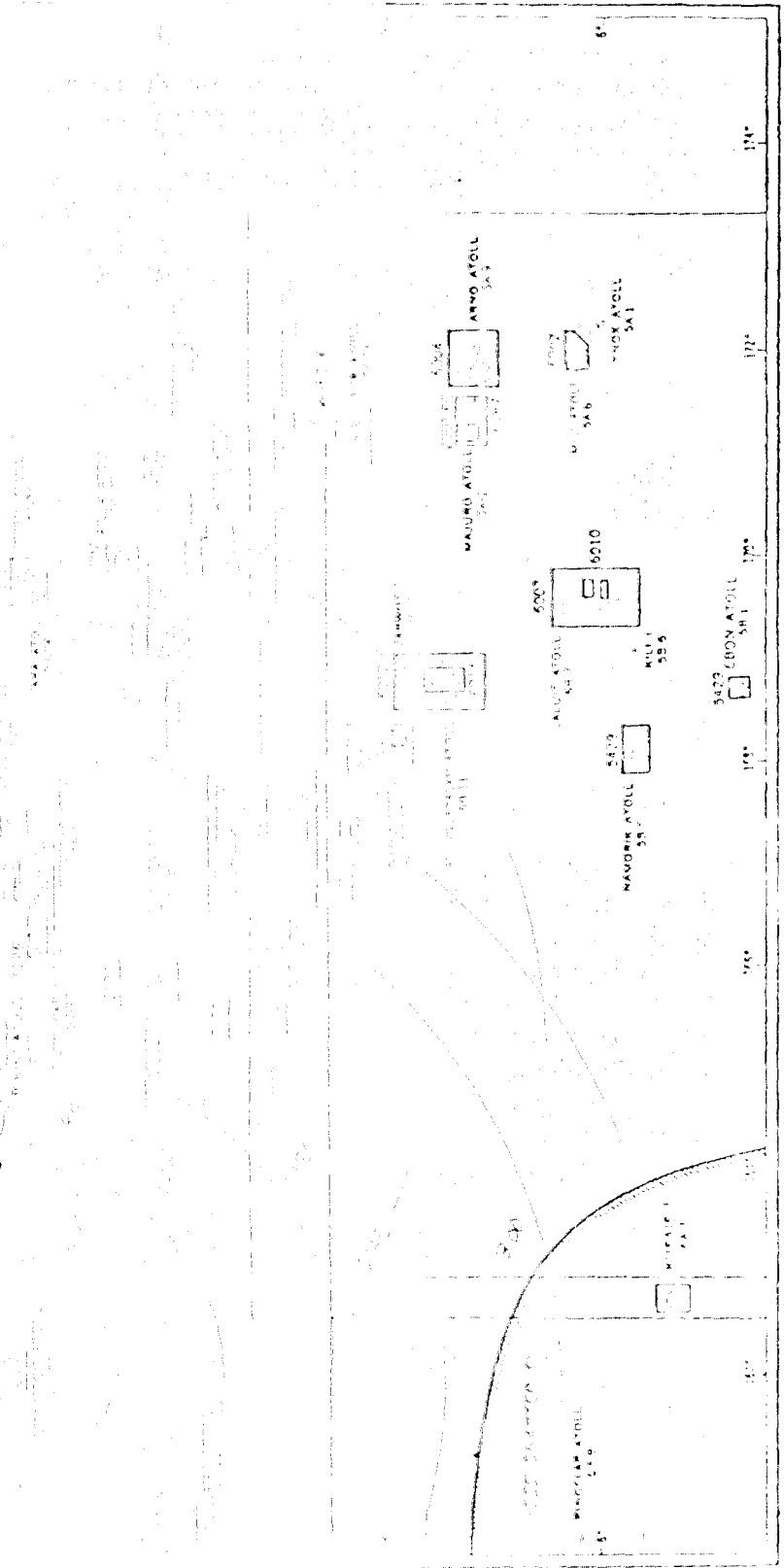


Operation Galdar. Contour of Bravo.
0.5-1.0 contour in r/hr at M+1 hour (BAND).

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS CASTLE UNION

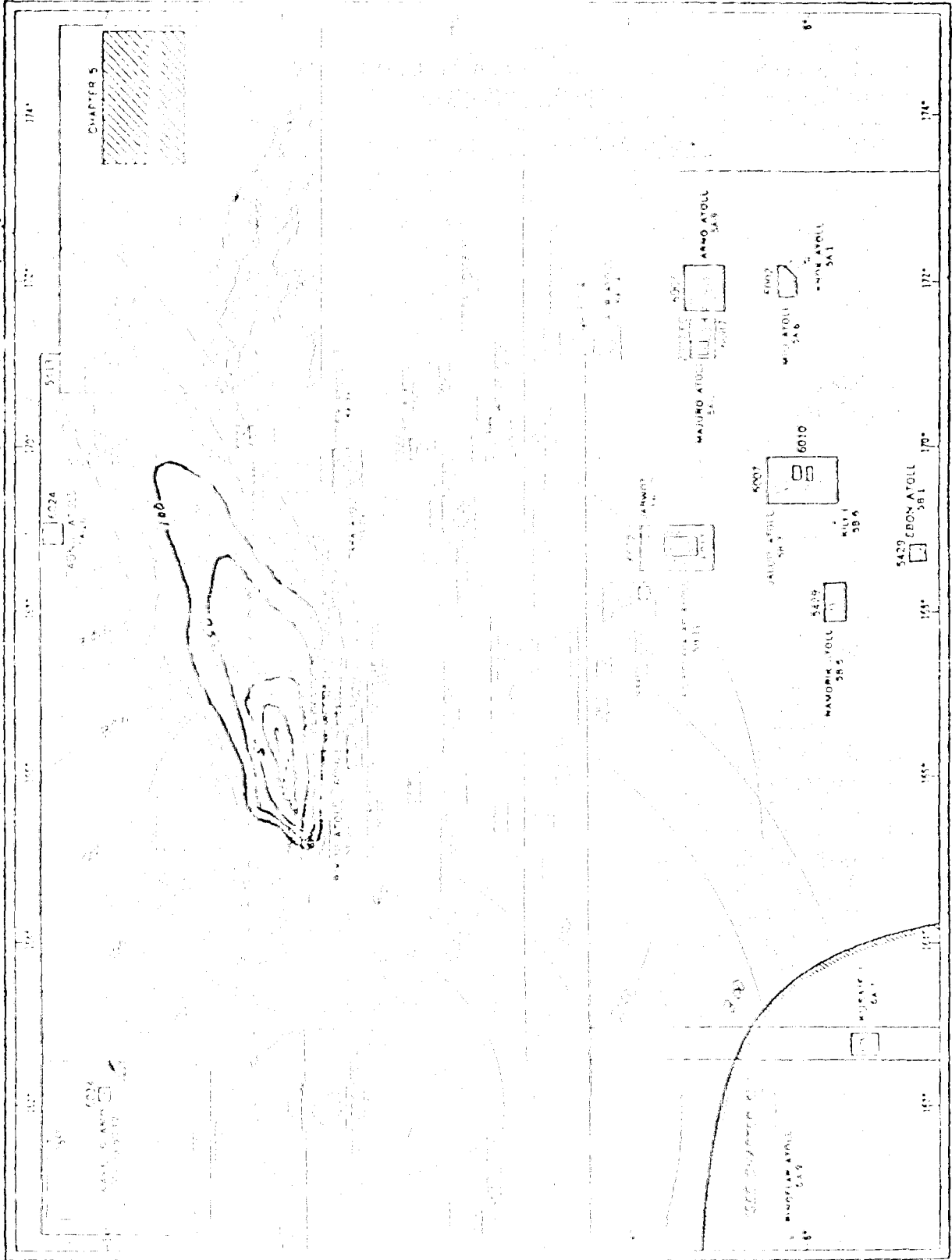


STANDARD DISTANCE
 1/2 MILE OF 60 N.W.S.
 1/2 MILE OF 60 N.W.S.
 1/2 MILE OF 60 N.W.S.



This graphic shows one of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office. Numbers refer to the section in the text describing a designated locality.

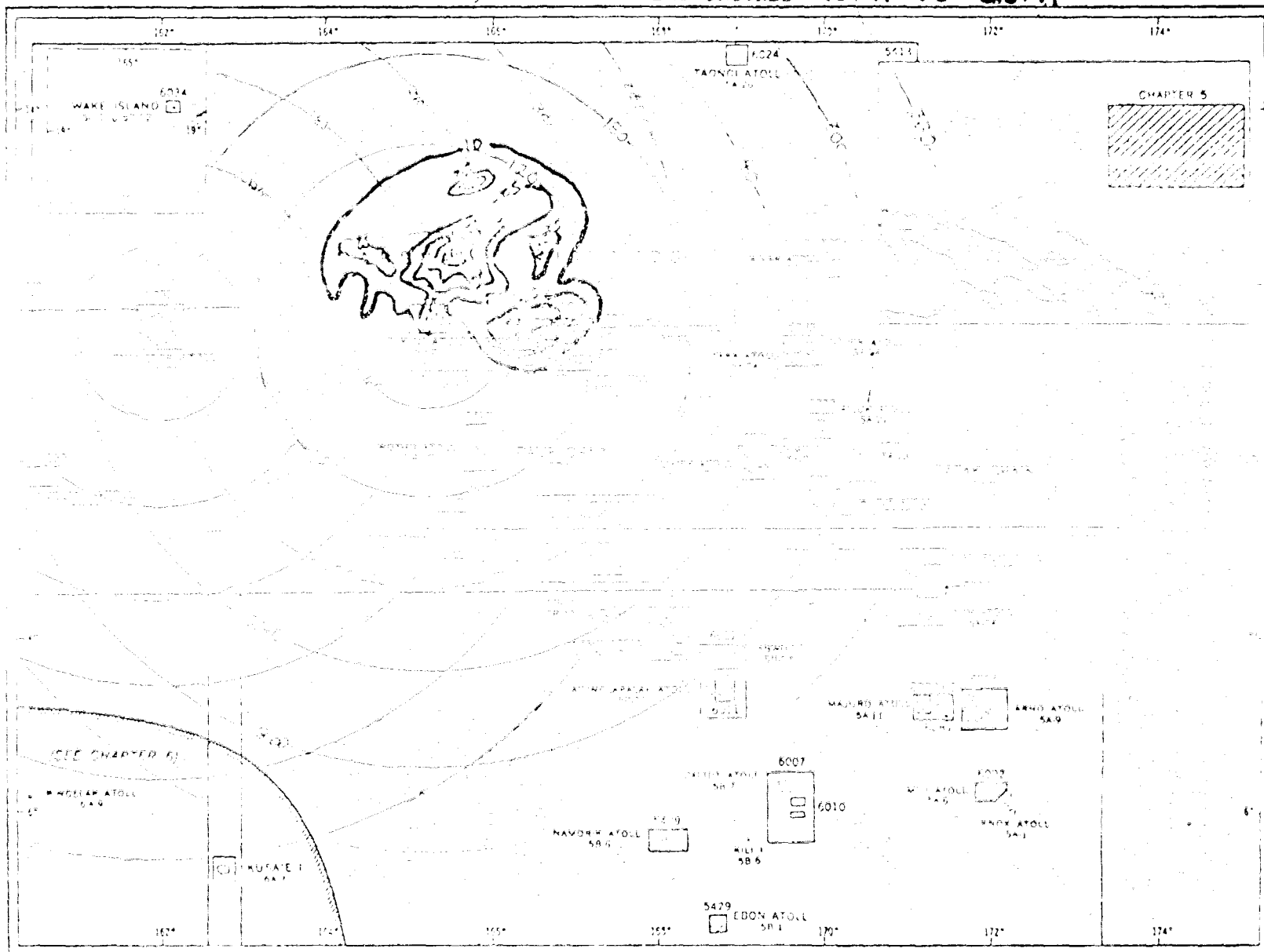
POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS CASTLE YANKEE



CHARTERED BY THE U.S. NAVY
 ON 10/10/54
 R/A 1-0

Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Naval Oceanographic Office. Numbers refer to the section in the text describing a designated locality.

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROOVING GROUNDS **REDWING ZUNI**



CIRCULAR DISTANCE
OF MAPS OF 10 N.M.S.
APPROXIMATE PROPORTION
OF FALLOUT ZONE

R/h 1.0

Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Numbers refer to the section in the text describing a designated locality.

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11.01.82 CHANGE 3

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **REDWING** **LACROSS**

© ROUTE D'E TOUJOURS
72 UNITS OF 60 NWS
EXPERIMENTAL AND OBSERVED
RESULTS OF NUCLEAR FALLOUT

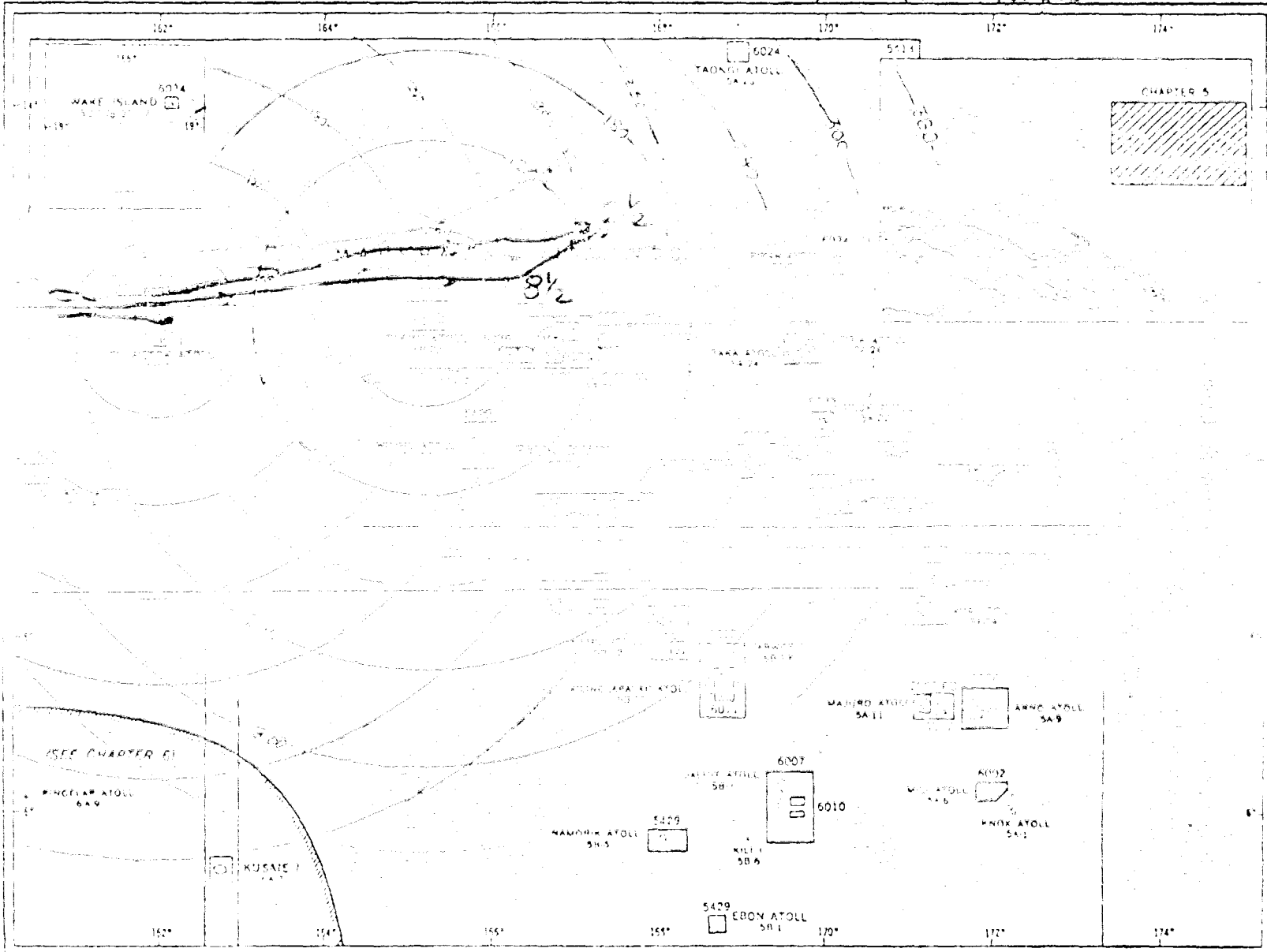


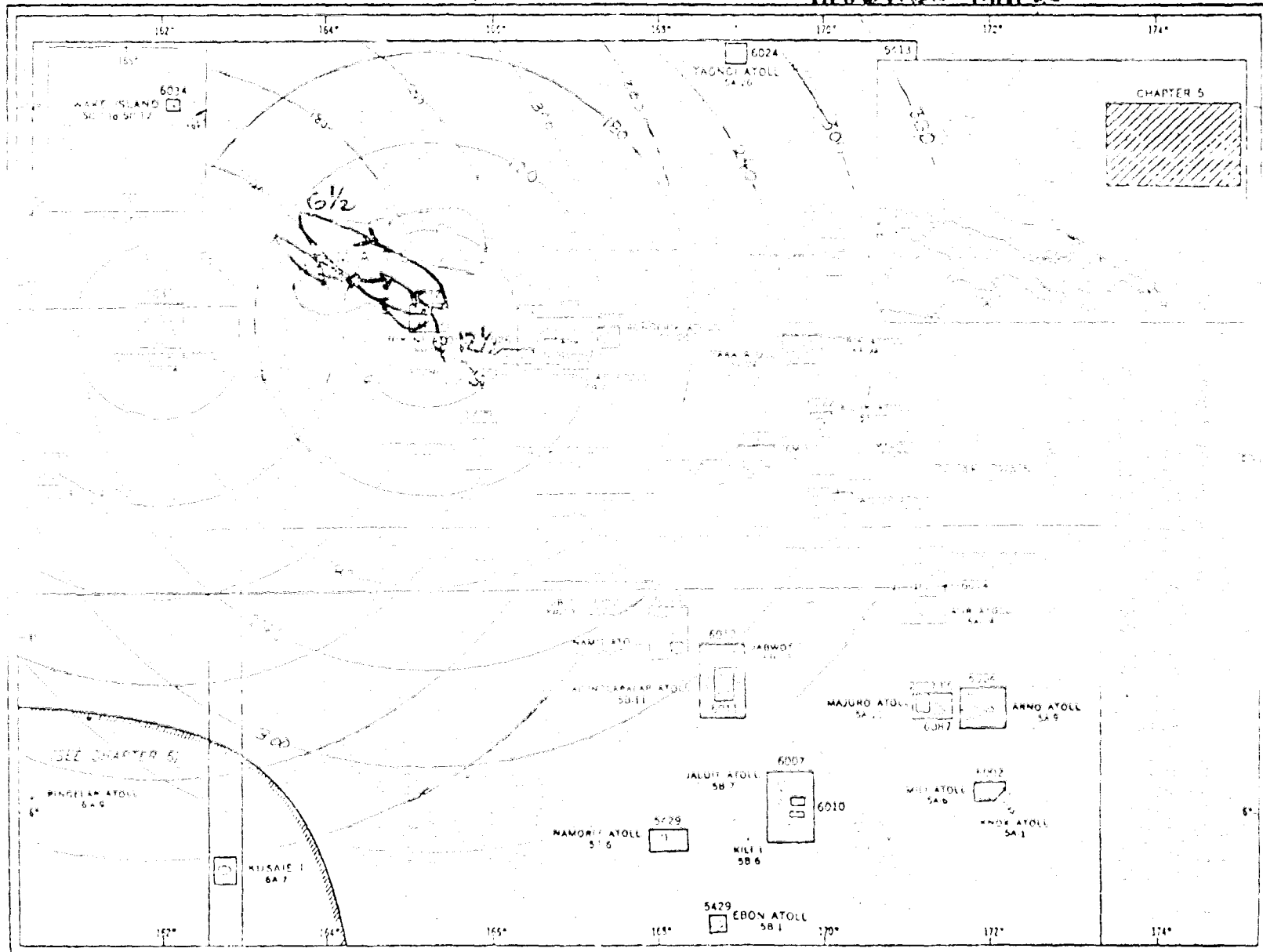
Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Naval Oceanographic Office.
Numbers refer to the section in the text describing a designated locality.

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H.O. 60, CHANGE 3

POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **HARDTACK MAPLE**



C. ROUTE DISTANCE
 AS SHOWN ON CHART
 APPROXIMATE WINDS
 ON 10/10/57
 20-30

GRAPHIC INDEX

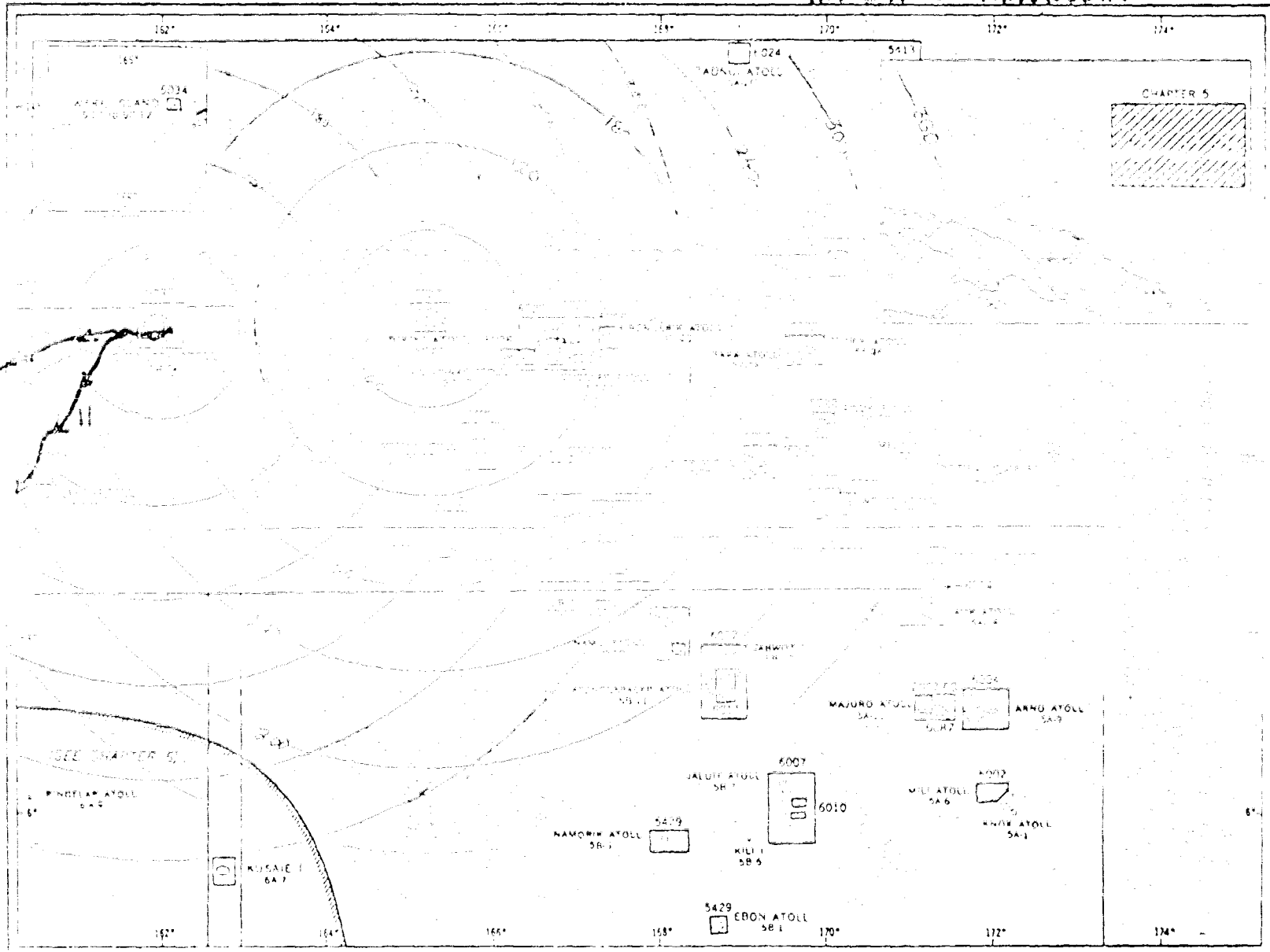
H. O. 89 - Change 3

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Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Naval Oceanographic Office.
 Numbers refer to the section in the text describing a designated locality.

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POSSIBLE SIGNIFICANT NUCLEAR FALLOUT, PACIFIC PROVING GROUNDS **HARDTACK MAGNOLIA**

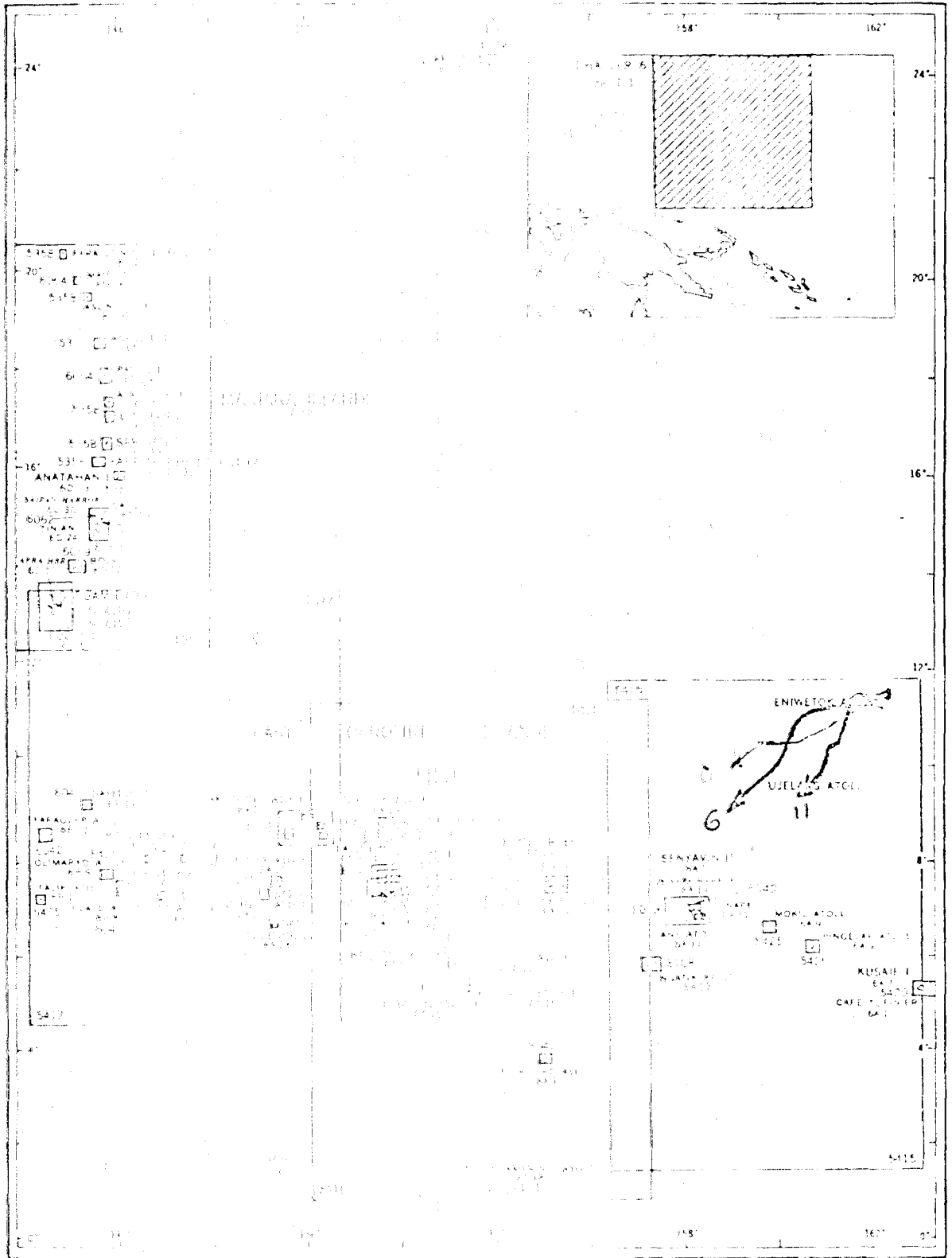


CIRCLE DISTANCES
IN STEPS OF 60 NWS

Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Numbers refer to the section in the text describing a designated locality.

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POSSIBLE SIGHTING OF NUCLEAR SUBMARINE TRACKS AND PROVISIONAL TRACKS
HARD TACK
MAGNOLIA



Graphic Index of Possible Sighting Tracks and Provisional Tracks of the U.S. Naval Oceanographic Office
Produced under the authority of the U.S. Navy, Office of Naval Intelligence

GRAPHIC INDEX, H.O. 82, CHANGE 4