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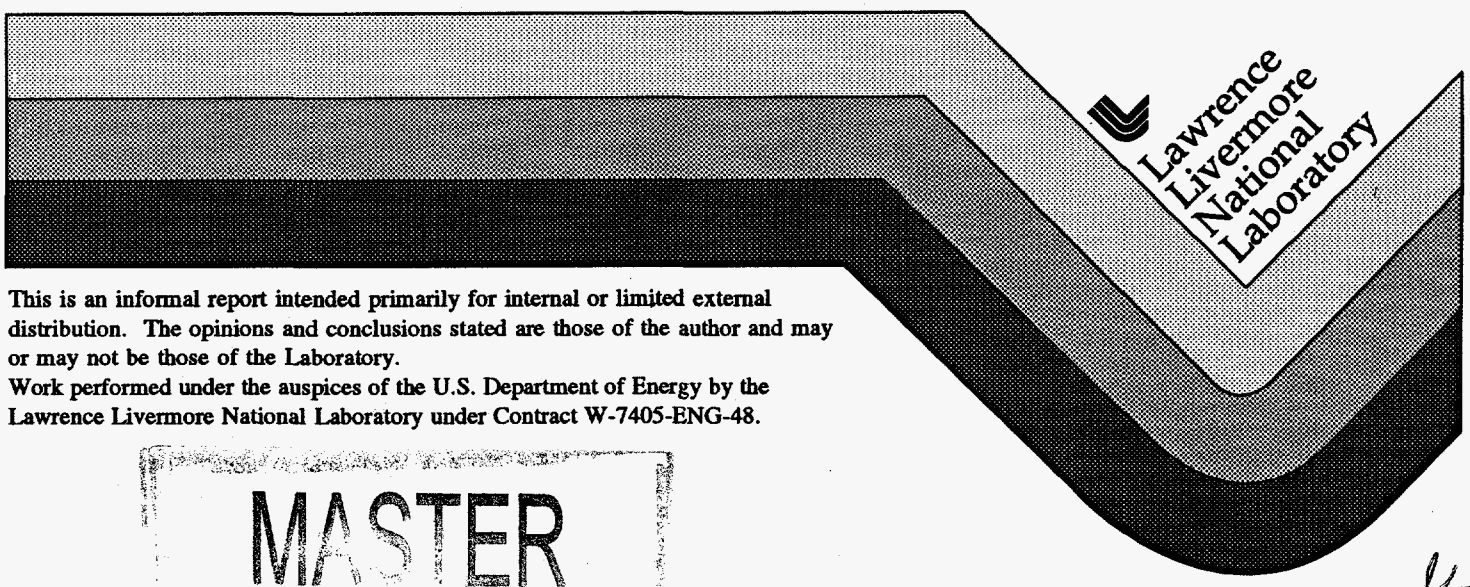
UCRL-ID-124767

Use of Nuclear Explosives for Excavation of Sea-Level Canal Across the Negev Desert (Canal Studies Filefolder)

H. D. MacCabee

DISCLAIMER

July 1, 1963



Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

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J. Krasz

67/299

July 1, 1963

May 24, 1965

ASG
10/31/72

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MEMORANDUM

TO: G. H. Higgins

FROM: H. D. Maccabee HDM

SUBJECT: The Use of Nuclear Explosives for the Excavation of a Sea-Level Canal across the Negev Desert in Israel, connecting the Mediterranean with the Gulf of Aqaba

DECLASSIFICATION STAMP ON REVERSE.

INTRODUCTION

Another interesting application of nuclear excavation would be a sea-level canal 160 miles long across Israel, connecting the Mediterranean with the Gulf of Aqaba (and thus the Red Sea and the Indian Ocean). Such a canal would be a strategically valuable alternate to the present Suez Canal and would probably contribute greatly to the economic development of the surrounding area. The difference in elevation between sea level and the Dead Sea (30 miles away and 1286 feet below sea level) might also be used to generate hydro-electric power.

The maximum depth of excavation to be encountered is on the order of 1500 feet. Conventional methods of excavation of this magnitude are prohibitively expensive, if indeed possible, but it appears that nuclear explosives could be profitably applied to this situation.

CANAL ROUTE

One possible route for such a canal across the Negev desert has been sketched out in Figure 1. The route extends northward from Eilat on a bearing of 5° for 83 miles, then turns westward on a bearing of 295° for 20 miles to pass between two mountains, then turns northward again on a bearing of 348° for 58 miles, to the Mediterranean, passing by Beersheba and the Gaza Strip.

Approximately 130 miles of the 160 mile length of the route are in virtually unpopulated desert wasteland, and are thus amenable to nuclear excavation methods. Conventional methods could be used in the vicinity of the populated [redacted]at, Beersheba, and the coastal plain near Gaza) for an aggregate distance [redacted]0 miles -- these areas will also be the least difficult to excavate, as [redacted]airly close to sea level.

[redacted]

Classification (Declassification/Review Date) Changed to:
UNCLASSIFIED
(Insert appropriate classification level or indicate Unclassified)

by authority of R2D2-COPKA-65-12 1/9/96 (date)
(Authority for change in classification, e.g., the memorandum number)

by Stephen Hoffard 5/30/96 (date)
(Signature of person making the change)

verified by R. Jane Barron 6/4/96 (date)
(Signature of person verifying this is the correct document or model)

COSTS

In the absence of accurate profiles of the route and accurate information on costs of mass-produced nuclear explosives, a very crude first approximation to costs of such a canal is given here.

Assuming (very roughly) an average depth of cut of 750 feet, this dimension controls and leads to a device spacing of 1300 feet (using 2 megaton devices buried at a depth of 1300 feet) in order to get a channel width of 1000 feet in rock.[1]

Assuming a hole drilling cost of $200 per foot for 1300 foot holes, and a shot cost of $250,000, we are led to a total single shot cost of $ 0.5 x 10^6, and at a spacing of four shots per mile, a cost of $ 2 x 10^6 per mile.

Thus; Nuclear Shot Cost:	130 miles x \$2 x 10^6/mi	= \$260 x 10^6
Conventional Excavation:	30 miles x \$3 x 10^6/mi	= \$ 90 x 10^6
Engineering, Auxiliary Construction and Safety Program		= \$150 x 10^6
15% Allowance for Contingencies		= \$ 75 x 10^6
Approximate Total Cost		= \$575 x 10^6

CONCLUSION

The results of this crude preliminary investigation indicate that a sea level canal across Israel appears to be within the range of technological feasibility. It is more difficult to judge its economic feasibility, but some information may be gained by noting that the Suez Canal Company was offered \$80 x 10^6 as compensation when Egypt nationalized the Suez Canal, and this figure is probably only a percentage of its real value.

Another problem which has not been considered is that of political feasibility, as it is likely that the Arab countries surrounding Israel would object strongly to the construction of such a canal.

HIM:

[1] See Table 3.2 p. 3-14 of the Panama Canal Report by Graves et. al.

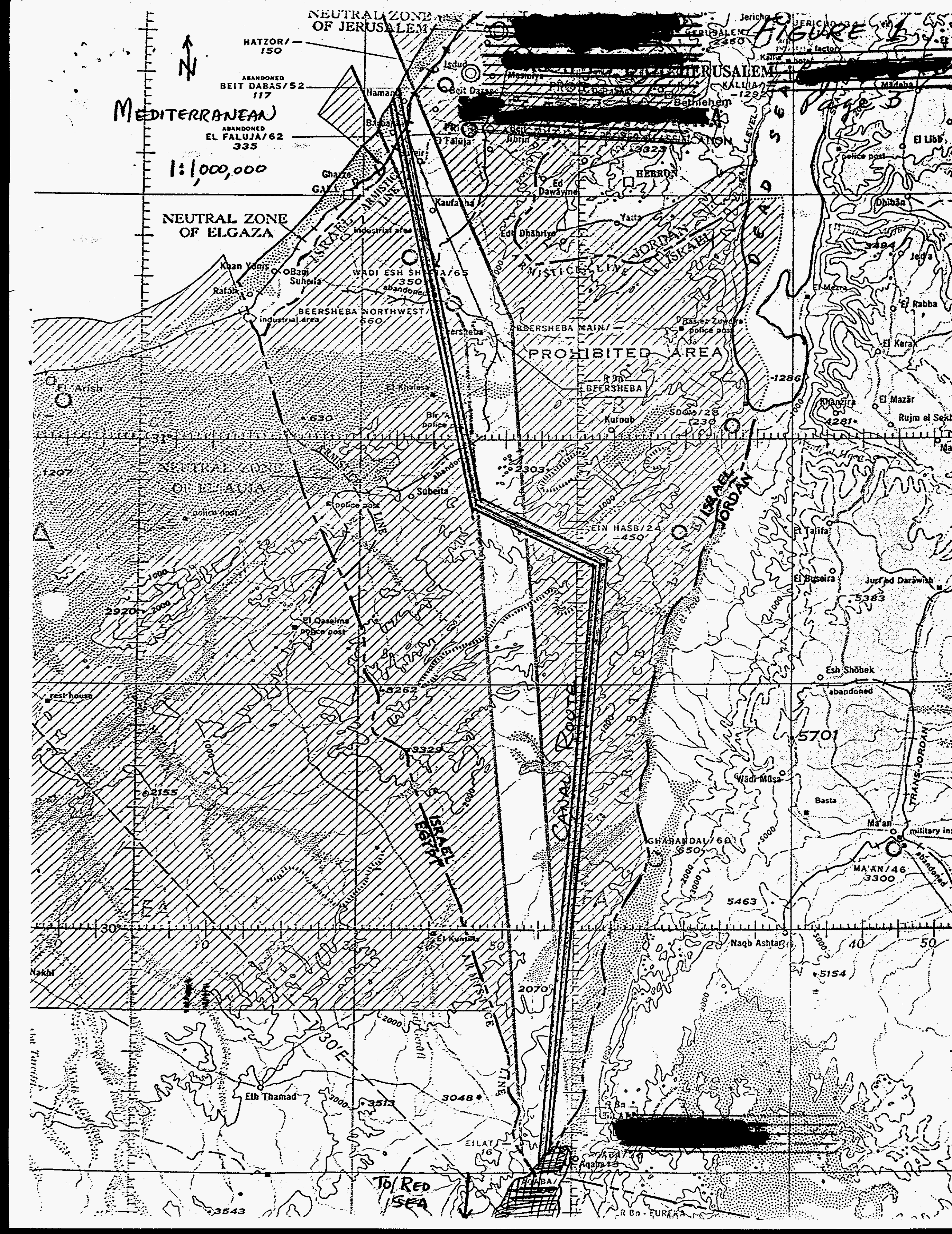
FIGURE 1
Page 3
[redacted]
MEDITERRANEAN
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N
NEUTRAL ZONE OF JERUSALEM
HATZOR/ 150
ABANDONED BEIT DABAS/52 117
ABANDONED EL FALUJA/62 335
NEUTRAL ZONE OF ELGAZA
JERUSALEM
Jericho
Bethlehem
HEBRON
Isdud
Beit Daras
El Faluja
Gaza
Khan Yunis
Rafah
Kaufakha
Edh Dhahriya
Yatta
Ed Dawayme
ISRAEL ARMISTICE LINE
JORDAN ISRAEL ARMISTICE LINE
WADI ESH SHA... /65 350
BEERSHEBA NORTHWEST/ 660
BEERSHEBA MAIN/
PROHIBITED AREA
BEERSHEBA
Kurnub
SDOM/28 -230
DEAD SEA
El Arish
NEUTRAL ZONE OF EL AUJA
Subeita
police post
EIN HASB/24 -450
ISRAEL JORDAN
El Qasaima police post
CANAL ROUTE
ISRAEL EGYPT
ARMISTICE LINE
El Kuntilla
GHARANDAL/60 650
MA'AN/46 3300
Ma'an
TRANS-JORDAN
Wadi Musa
Esh Shobek
El Buseira
El Tafila
El Kerak
Dhiban
Madaba
El Libb
Jurf ed Darawish
Naqb Ashtar
Nakhl
Eth Thamad
EILAT/ 16
Aqaba
TO RED SEA
30°
31°
30°E
[redacted]