

OPTIONAL
WORKING PAPER NO. 24

REVIEW OF EXISTING SINAI TRANSPORT SYSTEMS

SINAI DEVELOPMENT STUDY - PHASE I

PERFORMED FOR THE ADVISORY COMMITTEE FOR RECONSTRUCTION
OF THE MINISTRY OF DEVELOPMENT

BY DAMES & MOORE

(in association with Industrial Development Programmes SA)

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EXECUTIVE SUMMARY

The transport of goods and people in Sinai is dependent mainly on roads. Airfields are controlled by military authorities and, therefore, severely restricted for general public use. Railroads are currently non-existent in Sinai. The two existing seaports are small and accommodate only fishing boats; these harbor facilities are underdeveloped. There are no canals or pipelines in Sinai that transport bulk commodities, except for the El Qantara-Bir El Abd water pipeline which is presently under construction.

During August 1981, a field survey was conducted to ascertain existing conditions of Sinai roads. Survey findings indicate that about 165 kilometers of road are in good condition and require no immediate maintenance. Minor road repair is estimated for 1,102 kilometers which are classified as in fair condition, and 712 kilometers are in poor condition. Surfaces of the poor condition roads require major maintenance or complete reconstruction to permit safe travel. The cost to upgrade the fair condition roads and the poor condition roads is estimated to be about LE 28 million and about LE 71 million, respectively.

A traffic survey was conducted at the Suez Canal ferry crossings to determine the amount and type of freight and the number of travellers entering and leaving Sinai. As determined by the two-week survey and in general, freight entering Sinai originates from Cairo or one of the major Suez Canal cities of Port Said, Ismailia or Suez, usually contains building materials or petroleum and averages about 1,900 tons per day for all ferry crossing locations. Westbound freight (i.e., leaving Sinai) averages about 500 tons per day, comprises finished products or perishable food and originates from Israel, North Sinai or Port Fauad. Approximately 2,200 people and 140 vehicles entered Sinai daily from Egypt, while about 2,400 people and 130 vehicles were recorded as leaving Sinai from the six crossing locations during the September survey period.

This working paper presents only existing conditions; future transportation requirements will be presented in a topic paper when the strategy analysis has been completed.

1.0 Introduction

This optional working paper presents information of existing transport systems in Sinai. It fulfills the requirements of Task 8.2 (Review of Existing Transport Systems). Most of the paper focuses on the Sinai road system. Additionally, it contains findings of a traffic survey for movement of goods and people across the Suez Canal. Due to a dearth of information, not much depth is provided for railroads, airfields, ports and harbors, and canals and pipelines, but these transport modes are of minor non-military economic importance at the present time. Future aspects of Sinai transport requirements will be provided after strategy analysis in a transportation topic paper.

2.0 Roads

2.1 Background

Historically, roads in Sinai have provided routes of overland transport for people and goods. According to religious accounts, there are a number of well-known roads in Sinai. The ancient pilgrim road to Mecca and Medina is one of the most famous. Another ancient Sinai road is the one used by the Prophet Moses, as he traversed Sinai going to Egypt from Israel and later returning with his Jewish followers. The El Farama north coast road was used by the Prophet Abraham. It was also used by Joseph and Mary, when they were forced to flee Palestine with the Christ Child to avert certain annihilation of the Baby Jesus. For centuries, Sinai roads have been used by merchants, traveling between the African, Asian and European continents. In addition, ancient military forces used the roads in Sinai to attack Egypt.

More recently, these same roads have largely been used for military operations: to wit, 1967 and 1973 wars with Israel. Even today, the Egyptian military forces place heavy reliance on roads in Sinai for transporting troops and equipment. At the same time, roads in Sinai play an increasingly important role in providing routes for civilian travel. However, many roads are in poor condition due to lack of proper maintenance, inappropriate construction techniques, previous military operations and drifting sands. Some roads are not open to general travel, because they are exclusively used in military operations. Throughout Sinai, considerable road reconstruction is taking place. The Roads & Bridges General Corporation (Ministry of Transport) and the Ministry of Housing & Reconstruction Development are jointly funding these major reconstruction programs. Current level of activity is estimated at:

	<u>North Sinai</u>	<u>South Sinai</u>
- Total Cost of New Reconstruction (LE million)	36.25	26.23
- Total Road Length (kilometers)	304	260

The following section presents an overview of existing road conditions in Sinai.

2.2 Inventory of Existing Roads

During August 1981, a field reconnaissance was conducted of all existing roads in Sinai. This survey covered 1,979 kilometers of public roads, opened to general travel; it excluded roads designated for military use

only. Figure 2-1 shows existing locations and lengths of roads in Sinai; it also denotes the existing road conditions. Additionally, an estimation of use in terms of average daily traffic (ADT) volume is indicated. For example, the road segment between El Qantara and Baloza is 25 kilometers in length; it is paved, in good condition currently and requires no immediate maintenance or reconstruction; and it carries an average traffic volume of 350 vehicles per day. Another example -- the road between Nakh1 and El Thamada is 61 kilometers; it is gravel, in poor condition currently and needs maintenance or reconstruction; no estimate of average daily traffic volume was obtained.

Tables 2-1 and 2-2 present an inventory listing of main roads and secondary roads in Sinai. Column 2 shows the length of road segment in kilometers. Column 3 shows the existing road condition. Column 4 indicates an estimate of average daily vehicle traffic.

Based on the road survey taken during August 1981, the following data summarize existing conditions for primary and secondary roads in Sinai.

<u>Road Condition</u>	<u>Total Length (Kilometers)</u>	<u>Estimated Traffic Volume (No. of Vehicles/Day)</u>
A - Good	165	880
B - Fair	1,102	1,160
C - Poor	712	980

Table 2-3 shows a listing of road segments under various stages of maintenance. The level of maintenance varies from complete reconstruction to surface filling of holes and cracks.

Approximately 120 kilometers of roads are exclusively used for military operations; these roads were not surveyed.

TABLE 2-1 INVENTORY LISTING OF MAIN SINAI ROADS - August 1981

ROAD SEGMENT	LENGTH (km)	CONDITION (a)	EV (b)
El Qantara - Bir El Abd	76	-	350
a) - El Qantara - Baloza	25	A	-
b) - Baloza - Romana	8	C	-
c) - Romana - Bir El Abd	43	A	-
Bir El Abd - El Arish	82	B	350
Ismailia - Khatmia Pass to Bir Gifgafa (junction Bir El Abd & Bir El Thamada)	90	C	150
Bir Gifgafa - Junction Maghara Road	41	B	15
Junction Maghara Road - Junction Arish Bir el Hassana("Road El Quarir")	17	B	15
El Kubri - Mitla Pass	31	B	50
Mitla Pass - Sudr El Heitan	35	B	25
Ras Sudr - Junction Hadhi			
Nakhl - El Thamada	61	C	n.e. (c)
El Qantara - Ismailia	41	C	100
Ismailia - Little Bitter Lake Junction Giddi Road	61	B	50
Little Bitter Lake - El Kubri	21	A	10
El Kubri - El Shatt	13	C	25
El Shatt - Ras Sudr	43	A	150
Ras Sudr - Abu Zenima	85 (d)	B	150
Abu Zenima - Abu Rudeis	25	B	150
Abu Rudeis - Wadi Feiran	32	B	50
Junction Wadi Feiran - El Tor	64	B	25
El Tor - Ras Mohammad	100	B	n.e.

(a) - CONDITION CLASSIFICATION:

A - Good condition - double lane or more. Paved. Drifting sand may be present but does not obstruct traffic flow appreciably. No immediate maintenance required.

B - Fair condition - double lane. Paved. Drifting sand present and affects traffic flow. Road surface contains holes and cracks. Minor maintenance necessary to ensure safe operating speeds and to avoid further deterioration.

C - Poor condition - double lane or less. Not paved or gravel. Road surface requires major maintenance or reconstruction to permit safe travel conditions.

(b) - Estimated Volume in average daily traffic (ADT), i.e., average number of vehicles per day.

(c) - n.e. denotes no estimate.

(d) - 31 Km of 85 Km estimated as poor condition due to flash flooding in the Winter 1980-81. This part under reconstruction.

Source: Dames & Moore, Sinai Roads Survey, August 1981.

TABLE 2-2 INVENTORY OF SECONDARY SINAI ROADS - August 1981

ROAD SEGMENT	LENGTH (km)	CONDITION (a)	EV (b)
Ras Sudr - Jct. Suez - Nakhl Road (Sudr El Heitan)	76	C	10
Sudr El Heitan - Bir El Thamada	30	A	5
Bir El Thamada - Bir Hasana	47	B	10
Junction Route 55 - Intersection Rte. 3 (Ismailia - Khatmia Pass)	90	B	100
Intersection Route 3 to intersection Little Bitter Lake/Giddi Pass	65	B	15
Intersection Giddi Pass - Intersection Route 33 (Mitla Pass)	21	C	n.e. (c)
Bir El Abd - Jct. with side road to El Maghara	81	B	n.e.
Bir Gifgafa - Jct. Giddi Pass	32	B	5
Jct. Giddi Pass Road to El Thamada	12	B	5
El Qaurir Junction - Bir Hasana	28	B	15
Bir Hasana - Nakhl	64	C	15
El Arish - Bir Lahfan	18	B	50
El Maghara Coal Mine Road: Km 138 on	35	C	n.e.
Ismailia Abu Aweigila (Middle Road)	46	B	n.e.
Jct. Route 66 - Feiran Oasis	47	B	50
Watia Pass - St. Catherine	25	B	30
Abu Rudeis - Wadi Ferian via Wadi Sidri (tour quois mines)	32	C	50
Jct. Route 66 (north of Abu Zenima) - Wadi Kiholi/Jct. road to Umm Bugma mine	28	C	20
Baloza - Qatia	29	C	25
Qatia - Kasr Wait	9	C	15
Qatia - Rabaa	6	B	15
Rabaa - Sahel Romana	16	B	10
Sahel Romana - Rashed District	12	C	5
Rashed District - Port Fauad	18	C	n.e.
Rabaa - El Bardawil	7	C	25
El Bardawil - Negila	8	C	10
Rowaq - Bir El Abd	3	C	5
El Teila - main road	3	A	15
K 20 Road El Arish - El Sahel	3	C	(d)
El Masa'id - El Sahel	3	C	(d)
Giddi Pass - Mitla Pass	28	C	5
Jct. Umm Bugma - Jct. Abu Zenima	12	B	(d)
Jct. Abu Zenima/Tor - El Bilayim	35	B	25
El Tor - Ras Mohammad	91	C	15

(a) - Condition Classification - Same definition from TABLE 2-1.

(b) - Estimated Volume in average daily traffic (ADT), average number of vehicles per day.

(c) - n.e. denotes no estimates.

(d) - Road blocked due to shifting sands.

Source: Dames & Moore, Sinai Roads Survey, August 1981.

TABLE 2-3 Listing of Sinai Road Segments Undergoing Maintenance - August 1981^a

El Arish	- El Qantara
El Qantara	- Ismailia
Ismailia	- El Shatt
El Shatt	- Ras el Sudr
Ras el Sudr	- Abu Zenima
Abu Zenima	- El Tor
Jct. El Tor Road	- St. Catherine's Monastery
Baloza	- Qatia
Qatia	- Kasrawait
Qatia	- Rabaa
Rabaa	- Sahel Romana
Rabaa	- El Bardawil
El Bardawil	- Negila
El Tulul	- Main Road
K20 El Arish	- El Sahel (Beach)

^a These major reconstruction projects are jointly funded by Ministry of Transport and Ministry of Housing & Reconstruction Development.

Source: Dames & Moore, Sinai Roads Survey , August 1981.

2.3 Cost Estimates

In Section 2.2, an assessment of existing Sinai road conditions is presented. Category A roads are in good condition and presently do not require any maintenance. However, Categories B (fair) and C (poor) need maintenance to upgrade their current condition. According to Section 2.2, there are 1,102 kilometers of road condition B and 712 kilometers of road condition C. For planning purposes, it is assumed, on the average, that LE 25,000 per kilometer will be required to perform minor repairs to Category B roads, and it is also assumed that an average of LE 100,000 will be necessary to conduct major road repairs to Category C roads. Therefore, it appears that cost estimates to simply upgrade existing Sinai roads are forecast at nearly LE 100 million. The Class B roads are computed at LE 27.6 million, and the Class C roads are calculated at LE 71.2 million. These cost estimates do not consider the building of any new roads in Sinai; rather they are considered an estimate of the budget needed in 1981 LE values to upgrade existing roads only.

2.4 Sand Dune Stabilization

Shifting sands and the presence of sand dunes near well-travelled roads in Sinai create a potentially dangerous hazard for safe travel. Not only do sand drifts impair travel safety, but also they impose a serious, costly maintenance problem. As reported in a recent working paper^{*}, "...The first step required in defense against the movement of shifting sands is to know the direction of sand-carrying wind and the main lines along which sand is most constantly driven." Further, it is reported that a simple Bedouin method comprised "...the setting out of long, closely-placed rows of plant stalks at right angles to the wind draft, which tend to check the progress of the blown sand in a very noticeable manner..."

Three other potential solutions to stabilize shifting sands and to safeguard existing Sinai roads are: (1) the use of petroleum products to preclude their ease of movement, (2) the installation of a polyethylene mesh near areas that require protection (samples of this mesh were supplied to the Desert Institute by a French company for experimental testing in 1980.^{*}) and (3) plant drought-tolerant species near sand dune areas.

* cf. Sinai Development Study, Phase I, Working Paper No. 22, "Shifting Sands in Sinai;" Dr. Abdou Shata, November 1981.

Additionally, it may be feasible to plant shelterbelt windbreak, consisting of a variety of perennials, shrubs and trees. During the 1930's, extensive shelterbelt plantings in the Great Plains of the USA proved to be largely successful in protecting the soil resources base and barren agricultural lands from intense wind storms. In the interim, adequate road maintenance will be required. As a minimum, maintenance crews with road graders, tractors with front-end loaders, and dump trucks should be assigned frequently-covered reaches of the roads.

2.5 Traffic Movement Across Suez Canal

The movement of freight and people across the Suez Canal is a significant economic activity between Sinai and the rest of Egypt. Currently, there are six Suez Canal crossing locations. From north to south they are Port Said, El Qantara, Ismailia, Sarabiom, Gamal Nasim and Ahmed Hamdi. (See Figure 2-2 of the various locations.) As shown in Table 2-4, these crossing locations provide alternative modes to cross the Suez. Military forces use these crossings extensively. In addition, the Egyptian Army operates ferry boats at Ismailia, Gamal Nasim and Ahmed Hamdi crossings. At the latter two crossings, which are located in the Suez, area civilian use is restricted to two hours in the morning and in the afternoon. Although not indicated in Table 2-4, a privately-owned motor launch serves the Suez-El Shatt crossing area; its operating schedule is generally irregular.

During September Dames and Moore conducted a traffic survey at the Suez Canal ferry crossings. The purpose of the survey was to acquire information on the amount of freight and the number of travellers entering and leaving Sinai. This survey was not intended to be an exhaustive data collection effort, such as the one proposed in Project Summary No. 8, but rather a preliminary assessment of the volume of traffic movement across the Suez Canal. A copy of the survey form appears as Table 2-5. Thus, the information gathered focussed on freight origin-destination, type and quantity of commodities in transit, plus the number of people and passenger vehicles using the crossings. During the time period of September 7-20, 1981, each of the six Suez Canal crossings were surveyed twice during their normal daily hours of operation. Table 2-6 presents general operating information for the ferry crossings.

TABLE 2-4 Location of Suez Canal Crossings and Mode of Crossings

<u>Suez Crossings</u>	<u>Mode of Crossing</u>
- Port Said	Ferry boat
- El Qantara	Ferry boat, motor launch, pontoon bridge
- Ismailia	Ferry boat
- Sarabiom (a)	Ferry boat, motor launch
- Gamal Nasim (b)	Ferry boat, pontoon bridge
- Ahmed Hamdi (b)	Ferry boat, tunnel

Footnotes:

- (a) ferry boat under construction; presently motor launch is only means of crossing at Sarabiom.
- (b) basically military operations, serving the Suez area for crossing into central and south Sinai. The Ahmed Hamdi Tunnel (Suez Tunnel) is scheduled to be opened to civilian traffic in November 1981.

TABLE 2-6 Operating Information, Suez Canal Ferry Crossings,
September 1981

<u>Crossing Location</u>	<u>General Operating Information</u>
- Port Said	- 24-hour per day <u>ferry boat</u> service. No motor launch or pontoon bridge in operation. 2 ferry boats have 140 ton capacity and 3 ferry boats have 45-ton capacity. A complete technical operating crew works 8 hour shifts. Ferry rates are: truck with semi-trailer 15PT; pick-up truck or van 10PT; car or taxi 3PT; and donkey carts 2PT.
- El Qantara	- a 45-ton capacity <u>ferry boat</u> operates 11 hours per day. Ferry rates are: truck with semi-trailer 200PT; small truck 100PT; taxi 25PT; private car 10PT. Crossings are free to military personnel and governmental officials. 70% of income to Suez Canal Authority and 30% of income to El Qantara East Municipality.
	- 2 <u>motor launches</u> with technical operating crew from El Qantara East Municipality work 17 hours per day (6 a.m. to 11 p.m.). Motor launch capacity of 150 persons. Fees are: Egyptians 2PT and tourists/foreigners 10PT. Ferry income is divided as indicated above between two authorities.
	- <u>pontoon bridge</u> is placed in position by the Army during night time hours when canal navigation is stopped. This type of crossing is used mostly by heavy trucks and military vehicles. Most of the traffic that use the pontoon bridge wait long hours to cross (average six hours).
- Ismailia	- a free-of-charge <u>ferry boat</u> operates 10 hours per day by Suez Canal Authority. No motor launch or pontoon bridge in operation. The Army operates a ferry boat exclusively for military vehicles.

TABLE 2-C (Continued)

<u>Crossing Location</u>	<u>General Operating Information</u>
- Deverswar	- no public transport crossing available; however, 2 <u>pontoon bridges</u> for Army vehicles only.
- Sarabom	- 2 small <u>motor launches</u> serve employees of the nearby village of New Mit Abul Kom. Suez Canal Authority provides this service free of charge.
- Gamal Nasim	- under Army control a <u>ferry boat</u> with a 90 ton capacity operates for non-military traffic 2 hours daily: 9-10 a.m. and 4-5 p.m. - a <u>pontoon bridge</u> also operates under control of Army. Like other pontoons it goes into place only at night after Suez Canal is closed for large vessel navigation.
- Ahmed Hamdi	- <u>ferry boat</u> is under operational control of Army and conditions are similar as those stated above under Gamal Nasim. - <u>Suez tunnel</u> is still under construction although very limited traffic can use the tunnel with special governmental approval. The tunnel is scheduled to officially open near the end of November 1981.
- El Shatt	- 2 small <u>motor launches</u> serve the El Shatt-Suez crossing. One motor launch which is owned by Suez Canal Authority operates 12 hours per day free of charge. The other motor launch is privately-owned and operated; it operates 10 hours per day for a fee of 5PT per person.

Results of the Suez Canal crossing survey are reported in Tables 2-7 and 2-8. Freight movement information is shown in Table 2-7.

In general, eastbound freight, i.e. going into Sinai, originates from Cairo or one of the major Suez Canal cities of Port Said, Ismailia, or Suez, usually contains building materials or petroleum, and the aggregate daily volume for the five crossing-points averages about 1900 tons per day. Westbound freight, i.e. leaving Sinai, originates from Israel, North Sinai, or Port Fauad. The destination of the cargo is to Cairo or one of Suez Canal cities. Finished products and perishable food comprise the main commodities crossing the Suez Canal westbound. The aggregate daily volume for the three reported westbound freight movements averages about 500 tons per day.

As shown in Table 2-8, most of the eastbound personnel originated from Cairo, Port Said, Ismailia or Suez. Approximately 2,200 people per day and 140 vehicles per day entered Sinai using six Suez Canal crossing points. Israel, North Sinai, and South Sinai were the origin points of westbound personnel, and their destinations were usually Cairo or one of the major Suez Canal cities. Approximately 130 vehicles per day and 2400 people were recorded as leaving Sinai from the six crossing locations during the September survey period.

TABLE 2-7 Freight Movement Across Suez Canal, September 1981 ^a

LOCATION SUEZ CROSSING	EAST BOUND FREIGHT TRAFFIC				WEST BOUND FREIGHT TRAFFIC			
	ORIGIN (FROM)	DESTINATION (TO)	DAILY VOLUME (TONS/DAY)	MAIN COMMODITIES	ORIGIN (FROM)	DESTINATION (TO)	DAILY VOLUME (TONS/DAY)	MAIN COMMODITIES
PORT SAID - Ferry Boat	Port Said Ismailia	Port Fauad	270-320	- Building Materials - Petroleum	Port Fauad	Port Said Cairo	190-320	- Finished Products - Perishable Food
EL QANTARA - Ferry Boat	Ismailia Cairo	North Sinai	80-200	- Building Materials - Perishable Food	Israel North Sinai	Cairo Port Said	130-270	- Perishable Food
- Pontoon Bridge	Ismailia Cairo	North Sinai	280	- Building Materials - Petroleum	Israel North Sinai	Cairo Port Said Ismailia	60-70	- Perishable Food - Livestock Feed - Newsprint/Paper
ISMAILIA - Ferry Boat	Cairo, Ismailia	North and South Sinai	470-610	- Building Materials - Petroleum - Fertilizer	North and South Sinai	Ismailia Cairo Suez	20-40	- Fish; birds - Finished Products - Perishable Food
GAMAL NASIM - Ferry Boat	Suez Port Said Alexandria	South Sinai	270-370	- Building Materials - Petroleum	<u>b</u>	<u>b</u>	<u>b</u>	<u>b</u>
- Pontoon Bridge	Suez Port Said	South Sinai	140	- Building Materials - Petroleum	<u>b</u>	<u>b</u>	<u>b</u>	<u>b</u>
AHMED HAMD1 - Ferry Boat	Suez Ismailia Port Said	South Sinai	230	- Building Materials - Petroleum	<u>b</u>	<u>b</u>	<u>b</u>	<u>b</u>

^a SOURCE: Dames and Moore, Sinai Interregional Traffic Survey, September 1981

b No freight movement reported

TABLE 2-8 Personnel Movement Across Suez Canal, September 1981 ^a

LOCATION SUEZ CROSSING	EAST BOUND PERSONNEL				WEST BOUND PERSONNEL			
	ORIGIN (FROM)	DESTINATION (TO)	VEHICLES ^b (NUMBER)	PEOPLE ^c (NUMBER)	ORIGIN (FROM)	DESTINATION (TO)	VEHICLES ^b (NUMBER)	PEOPLE ^c (NUMBER)
PORT SAID - Ferry Boat	Port Said Ismailia	Port Fauad	26	110	Port Fauad	Port Said Ismailia	29	150
EL QANTARA - Ferry Boat	Cairo Ismailia	North Sinai Israel	26	240	North Sinai Israel	Cairo Ismailia	32	210
- Pontoon Bridge	Cairo Ismailia Port Said	North Sinai Israel	23	210	North Sinai El Arish Israel	Cairo Ismailia Port Said	21	330
- Motor Launch	<u>d</u>	<u>d</u>	<u>d</u>	1,050	<u>d</u>	<u>d</u>	<u>d</u>	1,350
ISMAILIA - Ferry Boat	Cairo Ismailia	North and South Sinai Israel	29	260	North and South Sinai Israel	Ismailia Cairo Alexandria	20	180
SARABIOM - Motor Launch	<u>d</u>	<u>d</u>	<u>d</u>	120	<u>d</u>	<u>d</u>	<u>d</u>	80
GAMAL NASIM - Ferry Boat	Suez Cairo	South Sinai St. Catherine	12	100	South Sinai	Suez Cairo Ismailia	8	40
- Pontoon Bridge	Suez Cairo	South Sinai	7	60	South Sinai	Cairo Ismailia Suez	7	20
AHMED HAMD I - Ferry Boat	Suez Cairo Ismailia	South Sinai	11	60	South Sinai	Cairo Suez	7	50
- Tunnel ^e	Ismailia Suez Cairo	South Sinai	5	20	South Sinai	Ismailia Suez Cairo	6	20

^a Dames and Moore, Sinai Interregional Traffic Survey, September 1981.

^b Average number of vehicles daily, includes taxis, buses, cars but not trucks.

^c Daily average number of people transported by vehicle plus those on foot.

^d Unknown; no vehicles transported via motor launch - only passengers tallied. Source: Suez Canal Authority

^e Suez Tunnel still under construction; special permission required to use tunnel.

3.0 Railroads

3.1 Background

Prior to the 1967 War with Israel, two rail lines served several northern and western Sinai communities. The northern railroad, also known as the Allenby Railway, followed the northern Sinai coast line, connecting major cities of El Qantara, Bir El Abd, El Arish, Rafah and Gaza. Beginning at Katib El Firdan (west of Suez Canal) and crossing the Suez Canal via a steel trestle swing-bridge, this north coast rail line was prone to drifting sand. Consequently, considerable effort was expended to keep the railroad tracks cleared of sand. This railroad carried predominantly military freight and personnel. The length of this rail line was about 220 kilometers. During the 1967 War, this railroad was dismantled with the tracks and timbers (ties) being used for defensive barriers.

The western rail line, traversing about 90 kilometers along the Suez Canal, connected El Qantara in the north with El Shatt which lies opposite of Suez. Like the Allenby Railway, this railroad was used mainly for military purposes. During the 1967 War, the Israeli forces dismantled the railroad and used the rails to reinforce portions of the Bar Lev Line.

3.2 Existing Railroads

At present, there are no railroads operating in Sinai.

3.3 Potential Railroads

With the discovery of coal in the vicinity of El Maghara, the Egyptian General Railway Corporation is studying the prospect of constructing a railroad from the El Maghara coal fields to Ismailia and to El Arish. The length of this proposed railroad is about 200 kilometers. This planning effort is still under study.

Several potential mining projects in a triangular-shaped area formed by Abu Zenima-Abu Rudeis-Umm Bugma in South Sinai may create a need for rail transport. Kaolin, manganese, glass sands, gypsum, salt, copper and turquoise are commodities that may, at a later date, require rail as an efficient transport mode.

4.0 Ports and Harbors

4.1 El Arish

At present, the El Arish harbor facility is little more than an anchorage area for several fishing boats. During the Summer of 1981, the Suez Canal Authority conducted site investigations to determine the potential for developing a full-scale seaport facility. The site investigations included gradient tests, seabed samples, tide measurements and contour profile determinations. Preliminary engineering findings indicate that it is feasible to construct a small harbor facility at El Arish to accommodate small ocean ships. Although the seaport facilities would emphasize service to a fleet of fishing vessels, the recommended harbor facilities include a series of quays, protective sea walls, an office building, a fish storage building, maintenance workshops and other ancillary features.

4.2 El Tor

Initially constructed over 50 years ago, the El Tor seaport and harbor facilities are dilapidated, archaic, and in a severe state of disrepair. This port facility was constructed mainly as a way-station for pilgrimage purposes. Four quays were originally constructed; only two presently exist but are considered unsafe. Considerable study and planning are required to determine what should be done to reconstruct this once-active seaport facility. A separate fishing port has also been suggested a few kilometers to the south.

4.3 Abu Zenima

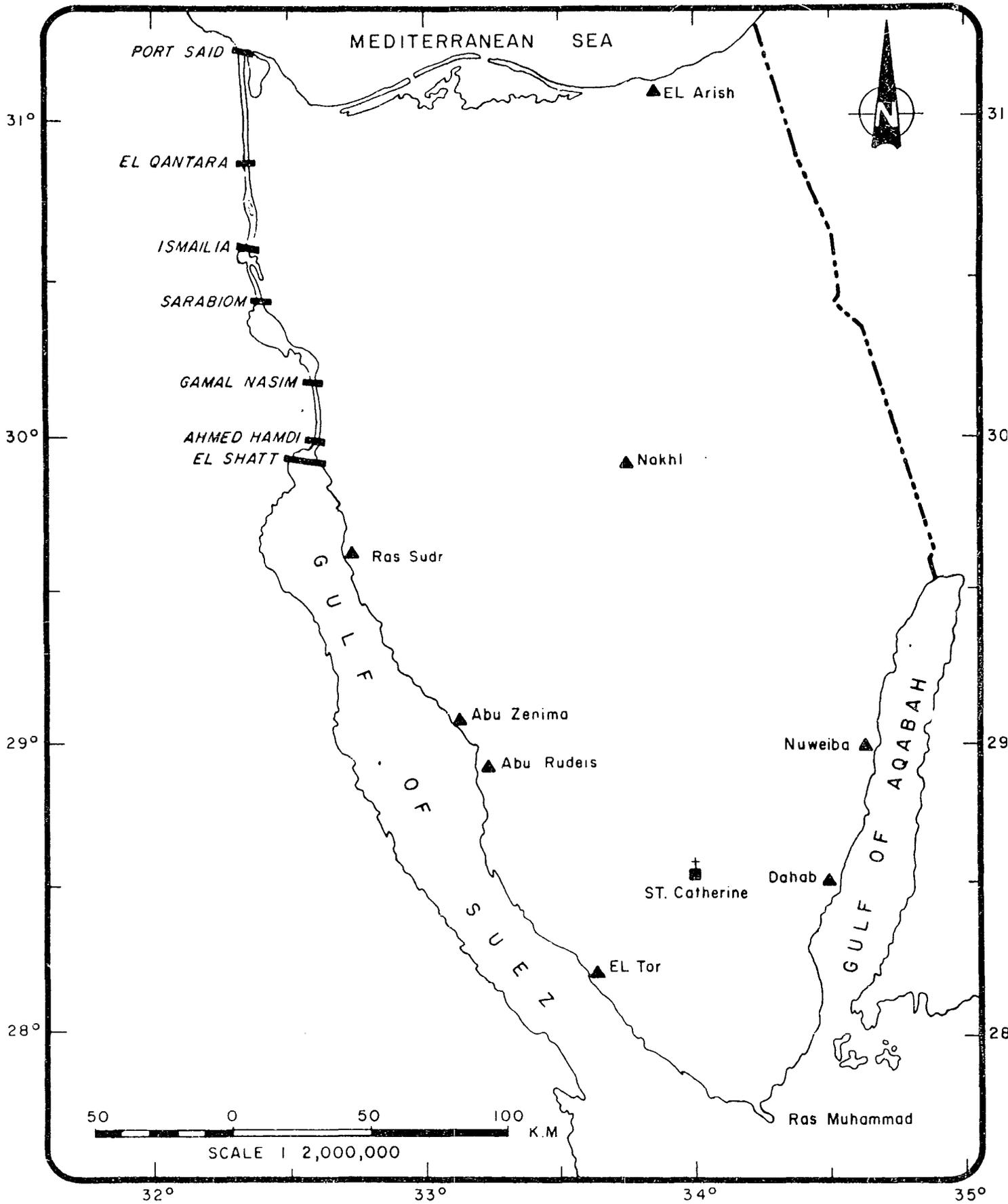
The Abu Zenima harbor facility consists of a steel skeletal quay, used exclusively in the ship-to-shore loading-unloading operation of the Sinai Manganese Company. Currently, the Abu Zenima facility of this company is not conducting extraction operations. No other uses or plans are known about this port facility.

5.0 Airfields

At present, airport and airfield facilities in Sinai are under military control. Because of this situation, little information is available except that known airfields are located adjacent to the following communities: El Arish, El Tor, St. Catherine, Abu Rudeis, Ras Sudr and Nakh1. In addition, approximately 10 isolated airstrips are used exclusively for military purposes.

6.0 Canals and Pipelines

There are no known or proposed canals or pipelines in Sinai for the transportation of bulk commodities, such as, gravel, stone, mineral ores, coal or agricultural products. There is, however, a pipeline under construction between El Qantara and Bir El Abd; when completed, it will transport potable water. Other water pipelines under consideration include an El Qantara-El Arish pipeline, an El Arish-Hasana pipeline and the proposed Hamdi Tunnel-Abu Rudeis pipeline. Information on these water delivery systems will be contained in the Water Resources topic paper.



Sinai Development Study Phase I
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SUEZ CANAL FERRY CROSS LOCATIONS

FIGURE 2-2