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ARAB REPUBLIC OF EGYPT
NATIONAL ORGANIZATION FOR
POTABLE WATER AND
SANITARY DRAINAGE
(NOPWASD)

CANAL CITIES WATER AND WASTEWATER PHASE II PROJECT

USAID CONTRACT 263-0174

DRAFT
ENVIRONMENTAL ASSESSMENT
FOR THE PORT SAID
RAW WATER SUPPLY PROJECT

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ACRONYMS AND ABBREVIATIONS

ARE	-	Arab Republic of Egypt
cm	-	centimeter
°C	-	degrees Celsius
CAPMAS	-	Central Agency for Population, Mobilization, and Statistics
CCWW	-	Canal Cities Water and Wastewater (Project)
CEQ	-	Council of Environmental Quality
CFR	-	Code of Federal Regulations
CMC	-	Construction Management Consultants
EA	-	Environmental Assessment
EEAA	-	Egyptian Environmental Affairs Agency
EIS	-	Environmental Impact Statement
EO	-	Executive Order
EPA	-	United States Environmental Protection Agency
°F	-	degress Farenheit
ICBP	-	International Congress for Bird Preservation
IUCN	-	International Union for the Conservation of Nature
km	-	kilometer
lcd	-	liters per capita per day
LE	-	Egyptian pounds (currency)
m	-	meter
m^2	-	square meter
m^3/d	-	cubic meter per day
mm	-	millimeter
MOD	-	Ministry of Development, New Communities, Housing, and Public Utilities
MPWWR	-	Ministry of Public Works and Water Resources
NOPWASD	-	National Organization for Potable Water and Sanitary Drainage
PID	-	Project Identification Document
PP	-	Project Paper
ppm	-	parts per million
SCA	-	Suez Canal Authority
UNEP	-	United Nations Environmental Programme
USAID	-	United States Agency for International Development

ENVIRONMENTAL ASSESSMENT OF A NEW POTABLE WATER PIPELINE AND PUMP STATION PROPOSED FOR PORT SAID

EXECUTIVE SUMMARY

In accordance with the environmental procedures of the United States Agency for International Development (USAID), this Environmental Assessment addresses the potential environmental effects of augmenting the potable water supply of Port Said. Egypt's National Organization for Potable Water and Sanitary Drainage (NOPWASD) proposes to construct a pump station just south of Qantara to take water from the Port Said Sweetwater Canal and to convey it 45 km north to Port Said via an aboveground 1500-mm pipeline. It will augment currently constricted flow in the Sweetwater Canal, which is, Port Said's present, increasingly inadequate water source. USAID is providing partial funding for the project as part of the Canal Cities Water and Wastewater Project Phase II (263-0174).

The proposed action calls for a pipeline from the pump station travelling northwest along the new Qantara bypass highway and then north in the Suez Canal service corridor adjacent the railroad tracks. The pipeline, service road (where needed), and right-of-way probably will require a strip of land 15-30 m wide, the exact amount to be determined by detailed design. About 300 feddan of land will be lost to other uses, roughly 100 feddan of which is now in agricultural use.

The adverse impacts of the proposed action are mainly on the human environment: loss of agricultural land, destruction and impairment of buildings and other facilities, and distortion of nonagricultural development along the Qantara bypass road. Adverse effects on the physical and biological environment will be minor.

Alternatives to the proposed project are no-action and conservation, widening and lining the Sweetwater Canal, and positioning the pump station and pipeline in another of several possible corridors. No-action is unlikely as the implementing agencies have committed to a project and are well into the design phase. NOPWASD, the Suez Canal Authority, and the Port Said Governorate oppose widening and lining upgrading the Sweetwater Canal, making it also unlikely.

Three alternative routes from the south side of Qantara to the north have been identified by Qantara officials and the study team. From North Qantara to Port Said, the main alternative is putting the pipeline on the west side of the Ismailia-Port Said Highway. The route through Qantara and along the west side of the highway north of Qantara appears to have fewer adverse impacts than the proposed pipeline route.

Mitigation measures, such as compensation and design to minimize the width of the strip of land required, can reduce the adverse effects of the project. Of potentially greater return is choosing a different route. Since preliminary study suggests that there are routes with significantly fewer adverse impacts than those of the proposed action, a more detailed reevaluation of the pipeline route should be considered.

ENVIRONMENTAL ASSESSMENT OF A NEW POTABLE WATER PIPELINE AND PUMP STATION PROPOSED FOR PORT SAID

CHAPTER 1

1.0 INTRODUCTION

1.1 The Proposed Project

Egypt's National Organization for Potable Water and Sanitary Drainage (NOPWASD), in association with the U.S. Agency for International Development (USAID), is proposing to expand the City of Port Said's potable water supply facilities. The proposed facilities include a pumping station located just south of Qantara and a pipeline from it to Port Said's Abu Raswa water treatment plant (Figure 1-1). The proposed facilities will supplement the flow of the Sweetwater Canal, Port Said's present sole water source, whose capacity no longer suffices to meet the needs of the growing city. NOPWASD, a unit of the Ministry of Development, New Communities, Housing, and Public Utilities (MOD), is responsible for building the new pipeline and pump station. After completion, the facilities will be operated by the Port Said Governorate.

1.2 Background

1.2.1 Canal Cities Water and Wastewater Project Phase I

The proposed water supply facilities are one element of the USAID Canal Cities Water and Wastewater (CCWW) Project Phase II (263-0174). Phase II continues more than a decade of effort to rehabilitate the canal cities' war-damaged water and wastewater systems, and to provide capacity for the cities' future growth. Phase I (1978-1988) received a total USAID funding of $166 million. The wastewater component of Phase I allayed the immediate critical problems of raw sewage flooding and ponding on city streets by repairing and expanding the wastewater collection systems, and by building several new wastewater pumping stations. Phase I's water supply component funded upgrading of the three cities' potable water treatment plants and expanding their delivery networks.

The CCWW Project Phase I was keyed to needs and priorities identified in water and wastewater master plans that had been prepared for each of the canal cities in the late 1970s. Port Said's master plan (Hazen and Sawyer 1979) noted that the

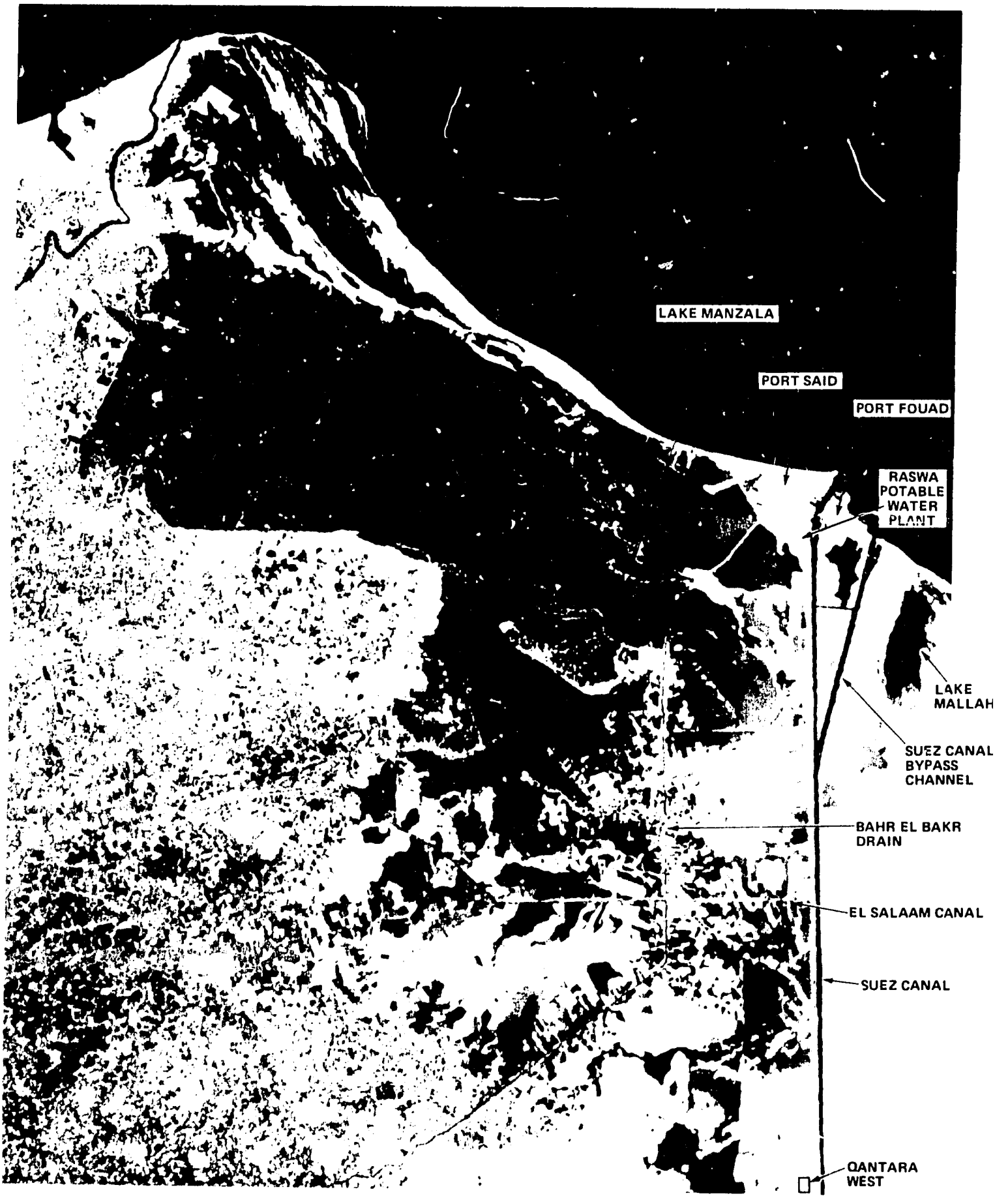


FIGURE 1-1
REMOTE SENSING IMAGERY PROJECT SETTING

unlined Sweetwater Canal had too small a capacity to meet water needs of the city's expected year-2000 population. Since the problem was not immediately critical, expansion was not included in Phase I.

1.2.2 Canal Cities Water and Wastewater Project Phase II

Although the CCWW Project Phase II focuses mainly on wastewater treatment, expanding Port Said's water supply has been a component from the beginning. The Phase II Project Identification Document (PID) listed three project components:

- the construction of wastewater treatment plants in the three Canal Cities;
- the expansion of the source of Port Said's water supply; and
- the improvement of the Canal Cities' water and wastewater organizations' capabilities to manage, operate, and maintain water and wastewater systems.

The PID did not specify exactly how Port Said's water supply should be expanded, stating that it would be augmented by: "Improvement of the Sweetwater Canal or replacement of same with pipelines and pumping facilities . . .." The PID mentioned that the Suez Canal Authority (SCA) claimed the Sweetwater Canal could not b enlarged north of Qantara because it is bordered on the east by a service road and the Suez Canal, and on the west by the railroad. The SCA proposed at this stage of project preparation that Port Said's water needs to the year 2000 be met by building two pipelines from Qantara.

The more detailed Phase II Project Paper (PP) developed the following options for increasing Port Said's water supply and their cost estimates:

	Present Worth 30 years @ 6 % 1987 $ (000)
NO ACTION	0
DUAL 1500 MM PIPELINE WITH BOOSTER STATION	86,934
DUAL 1200 MM PIPELINE WITH TWO BOOSTER STATIONS	97,658
FOUR LOW LIFT STATIONS IN EXISTING CANAL	38,871
LOW LIFT STATION WITH RETAINING WALLS IN EXISTING CANAL	42,587

LINING AND REHABILITATION OF EXISTING CANAL	40,925

The PP recommended lining and rehabilitating the existing Sweetwater Canal, and constructing a 1 million cubic meter lined reservoir at the Abu Raswa Water Treatment Plant. The PP noted as disadvantages to this option: " . . .that the SCA has indicated a strong preference for a dual pipeline with booster stations alternative and that additional feasibility studies are required to confirm the viability of the lining alternative."

1.2.3 GOE Ministry of Development, New Communities, Housing, and Public Utilities Ministerial Decree No. 76 of 1987

While USAID was completing the Phase II Project Paper, the Port Said Governorate made an independent agreement with the Ministry of Development for design and GOE funding to expand Port Said's water supply. The MOD's Ministerial Decree No. 76 of 1987 authorized design and construction of booster stations and dual pipelines to supply raw water to the City of Port Said. The decree designated NOPWASD as the funding agency and appointed Mokhtar Ibrahim Contracting Company to be the design/build contractor. Mokhtar Ibrahim selected as a subcontractor for the design work the Utilities Consulting Engineering Bureau (Utilities).

1.2.4 CCWW Project Phase II Grant Agreement and Project Implementation

Possibly because the GOE was proceeding independently to implement its preferred option, the Project Grant Agreement did not insist that USAID would pay only for canal lining. Annex 1 of the Grant Agreement between USAID and the Government of Egypt (GOE) states in part:

> "The existing raw water transmission facilities from Qantara to Port Said will be rehabilitated and expanded to increase the water supply of the City of Port Said. It is proposed that concrete lining of the existing raw water canal, or other appropriate means including a pipeline, be used to increase the capacity of the systems."

Still, the Grant Agreement based Port Said raw water supply funding authorization of $47,661,000 on this lower cost option.

By early 1990, Mokhtar Ibrahim and Utilities had completed preliminary designs for the water supply facilities and determined a pipeline routing. In May 1990, USAID and NOPWASD agreed that USAID would fund only the pump station. They agreed as well that the CMC would oversee construction for the two agencies and preparation

of an Environmental Assessment. The unspent USAID funds designated for Port Said raw water supply will be reobligated to other components of the project.

1.3 Elements of an Environmental Assessment

An Environmental Assessment (EA) is just one part of the project appraisal process. Other equally important elements include: technical soundness analysis, economic and financial benefit-cost analysis, and social soundness analysis.

An Environmental Assessment compares the probable impacts of the proposed project to those of its alternatives. It focuses on identifying implementable, affordable, and reliable measures to mitigate these impacts. An Environmental Assessment includes the following elements:

- scoping sessions to involve local persons in the proposed project's design;
- a review of the host country's and donor's environmental review procedures and legislation;
- description of the proposed project;
- analysis of alternatives to the proposed project, including the no-action alternative;
- characterization of the existing environment;
- identification of probable impacts on the physical, biotic, and human environments of the proposed project and its alternatives;
- development of mitigation measures to the probable adverse impacts of the proposed project; and
- formulation of an impact mitigation plan.

In accordance with the above, this EA document intends to inform NOPWASD, USAID, and other concerned parties about existing environmental conditions, probable environmental impacts of the proposed project's construction and operation, mitigating measures, monitoring programs, and opportunities for environmental enhancement. This EA endeavors to support the ongoing design of the facilities and their future management.

As part of preparation of this EA, a scoping meeting was held in Port Said on June 19, 1990. Participants voiced their concerns, questions, and comments regarding technical and environmental aspects of the planned facilities. Participants were invited to submit comments in writing to the CMC by July 15, 1990. Appendix A contains the scoping report and a list of meeting attendees.

1.4 USAID Environmental Procedures

USAID's environmental procedures are found in the regulations 22 CFR Part 216, and are further explained in the Agency's Handbook 3, Appendix 2D. The procedures and philosophy have their roots in the U.S. National Environmental Policy Act of 1970 (NEPA). USAID adopted these guidelines in 1976 to formalize its commitment to considering environmental effects of its activities during project design and review. Within this period, likely environmental impacts are identified and alternatives or mitigating measures are recommended.

In addition to 22 CFR 216, several other regulations relate to environmental aspects of USAID-supported activities. They include:

- Foreign Assistance Act of 1961, and amendments (especially sections 117-119);
- Council of Environmental Quality (CEQ) regulations, FR 43:230, November 29, 1978;
- Executive Order (EO) 11514, "Protection and Enhancement of Environmental Quality," March 5, 1970, as amended by EO 11991, May 24, 1977; and
- EO 12114, "Environmental Effects Abroad of Major Federal Actions," January 4, 1979.

The regulations require that USAID do either an Environmental Assessment or an Environmental Impact Statement (EIS) for certain identified classes of projects with likely environmental effects. These include potable water and sewerage projects other than those that are small scale (Section 216.2.d).

USAID regulations require a determination early in project preparation as to whether a project should receive a full Environmental Impact Study, or a less formalized Environmental Assessment. According to 22 CFR 216, an EIS must be prepared when "agency actions significantly affect . . . (1) the global environment or areas outside the jurisdiction of any nation (e.g., the oceans); (2) the environment of the United States; or (3) other aspects of the environment at the discretion of the Administrator" (Section 216.7.a). For (1) and (3) above, an EIS, "will generally follow

An EIS is not required for the Port Said raw water supply project since the impacts will be confined within Egypt's borders.

On projects with environmental effects but when an EIS is not necessary, USAID must perform an Environmental Assessment. USAID regulations define an EA as "a detailed study of the reasonably foreseeable significant effects, both beneficial and adverse, of a proposed action on the environment of a foreign country or countries" (Section 216.1.c.4). A USAID EA may be just as thorough and rigorous as an EIS, but it is not bound to follow a prescribed format. Section 1.3 listed an EA's typical components.

USAID need not perform an EA or EIS for projects in which it is a minor donor if another of the involved parties does an appropriate environmental review. "Minor donorship" is defined as making a total contribution of less than $1,000,000 and less than 25 percent of the total project cost.

USAID must do an EA of the Port Said potable water supply project because USAID's commitment will be more than $1,000,000 and because Egypt lacks legislative requirements for environmental review of the project.

1.5 Egyptian Government Environmental Procedures

Egypt does not yet require study of environmental impacts of public and private sector projects like the proposed Port Said potable water pipeline.

In a step toward better consideration of the environment in public policy, the GOE created the Egyptian Environmental Affairs Agency (EEAA) (Prime Ministerial Decree No. 631/1982). It is administered by the Minister of Cabinet Affairs. The EEAA's mandate calls for it to prepare a national plan for environmental studies, analyze proposals on environmental affairs, follow up on implementation of environmental laws, and advise the Cabinet on environmental matters. The EEAA is an advisory and coordinating entity, with no regulatory authority other than managing Natural Protectorates. Representatives from the EEAA will receive from NOPWASD a draft copy of this document for review.

1.6 Methodology

The June 19 Scoping Meeting defined the issues to be addressed. Study tours of the proposed and alternative pipeline routes were made by a biologist and an agriculturalist. Interviews were conducted with officials from the involved agencies: NOPWASD; USAID; the Port Said and Ismailia Governorates; local offices of the Ministries of Agriculture, and Public Works and Water Resources (Irrigation); and the

contractor, Mokhtar Ibrahim Company. In addition, farmers and residents along the proposed pipeline route were interviewed. Relevant documents, maps, and diagrams were collected in Egypt. This document was then prepared under the supervion of the CMC.

CHAPTER 2

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Background

2.1.1 Port Said Population Projection

After the 1973 War, the Egyptian Government reopened the Suez Canal, rebuilt the three Suez Canal cities, and made plans to develop the region as a countermagnet to growth of Cairo, Alexandria, and the Delta. Experts considered Port Said the least promising of the three cities because of its remote location and shortage of dry developable land. Despite this, a 1976 Master Plan projected the city's year-2000 population at 750,000, though the 1976 population was only 263,000.

The CCWW Project Phase II is using population projections made by the MOD's General Office for Physical Planning (GOPP) during their recent drafting of new master plans for the three canal cities. The GOPP has generated several projections for Port Said's population based on differing assumptions. NOPWASD and the CMC have accepted a "high-growth" projection of 747,100 for a year-2005 population as the basis for potable water and wastewater planning. (Note that the CCWW Project Phase II is using the year 2005 for planning purposes, while earlier documents--the PP, PID, 1976 Master Plan, and 1979 Water and Wastewater Master Plan--used the year 2000.) The high-growth projection assumes that Port Said will continue growing faster than the national average as it has since the 1973 War. The high-growth projection is as follows:

Year	Population	Growth Rate (percent/year)
1976	262,960	
1986	399,793	4.3
2005	747,100	3.3

By contrast, the GOPP's "moderate-growth" projection forecasts a year-2005 population of 714,000, a number not differing substantially for infrastructure planning purposes from the high-growth figure.

2.1.2 Port Said Potable Water Use

In 1988, Port Said's Abu Raswa potable water plant produced an average of 125,000 cubic meters/day (m^3/day) with a peak production of about 156,000 m^3/day. Abu Raswa provides potable water to Port Said including Port Fouad, a subdistrict on the east side of the Suez Canal. The city's 1988 population was roughly 426,000, of

which Port Fouad contained 26,000. Thus, in 1988 Port Said consumed 293 liters per capita per day (lcd) of potable water for all uses and losses.

Table 2-1 presents the CMC's breakdown of Port Said's 1988 water use. The amounts consumed by some users and losses are not known precisely. Households consume the largest share, though only about 80% of the population receives full water service. According to the SCA, these fully connected households consume water at roughly 240 lcd. Industrial use shown for 1988 of 17,000 m^3/day is an estimate. Since Port Said now has few industries, particularly "wet" ones, actual industrial consumption may be significantly less than the estimate of 14% of the total supply. For example, best estimates for Suez, which has several refineries and other major factories, put industrial use at under 10% of total supply (Dames & Moore 1990b). After subtracting household and industrial usage, the balance sheet shows that at least 22,800 m^3/day or 18% of Port Said's potable water disappears in the distribution system or is used in ways unaccounted for. The volume is higher if actual industrial use is less than the estimate.

Besides significant losses, the roughly 240 lcd consumed by Port Said's connected population is high compared to other Egyptian cities and to typical planning standards. In the early 1980s, Egypt's urban areas averaged 167 lcd for all uses (Dames & Moore 1985). An example of planning standards is found in the 1985 Land Master Plan for Irrigation Development (Euroconsult-Pacer Consultants 1985). It used the values shown below for new urban areas with over 10,000 population:

	(lcd)
Domestic	120
Commercial	15
Industrial	20
Public Sector	10
Losses	15
Total	180

If the SCA's estimate of 240 lcd is accurate, Port Said's households consume water at over twice the 120 lcd domestic use rate considered desirable for a city in an arid, developing country. Studies by the CMC (1989) attribute much of this use to "wastage," i.e., uncontrolled flows from leaky faucets and toilets. Another possibility is that the actual number of people present and using water in the city on many days is much higher than the official population. In any case, the city would appear to have much potential for conservation and slowing its potable water demand growth rate.

Table 2-1. Water Demand Projections for Port Said.

	1988 Actual	2005 Moderate	2005 High
Total Population	426,000	714,000	747,100
Service Area Population	340,800	606,900	672,400
Percent of Population Served	80	85	90
Per Capita Domestic/ Commercial/Institutional Demand (lcd) for full service desired rate = 120 lcd	240	250	275
Per Capita Domestic/ Commercial/Institutional Demand (lcd) for unserved	40	50	60
Domestic/Commercial/ Institutional Demand (m^3/day)	85,200	157,100	189,400
Industrial Allowance (m^3/day)[a]	17,000	31,400	37,900
Losses (m^3/day)[b] Not go down	22,800	30,000	40,000
Total Average Demand (m^3/day)	125,000	218,500	267,300
Maximum Daily Demand (m^3/day)	156,300	273,100	334,100

329,000? Next page

a: Industrial allowance is calculated as 20% of the total domestic/commercial/institutional demand.

b: Losses for 1988 are based on measured quantities. Losses for 2005 assume a nominal increase over the quantity measured for 1988.

Source: CMC 1990.

2.1.3 Port Said Water Demand Projection

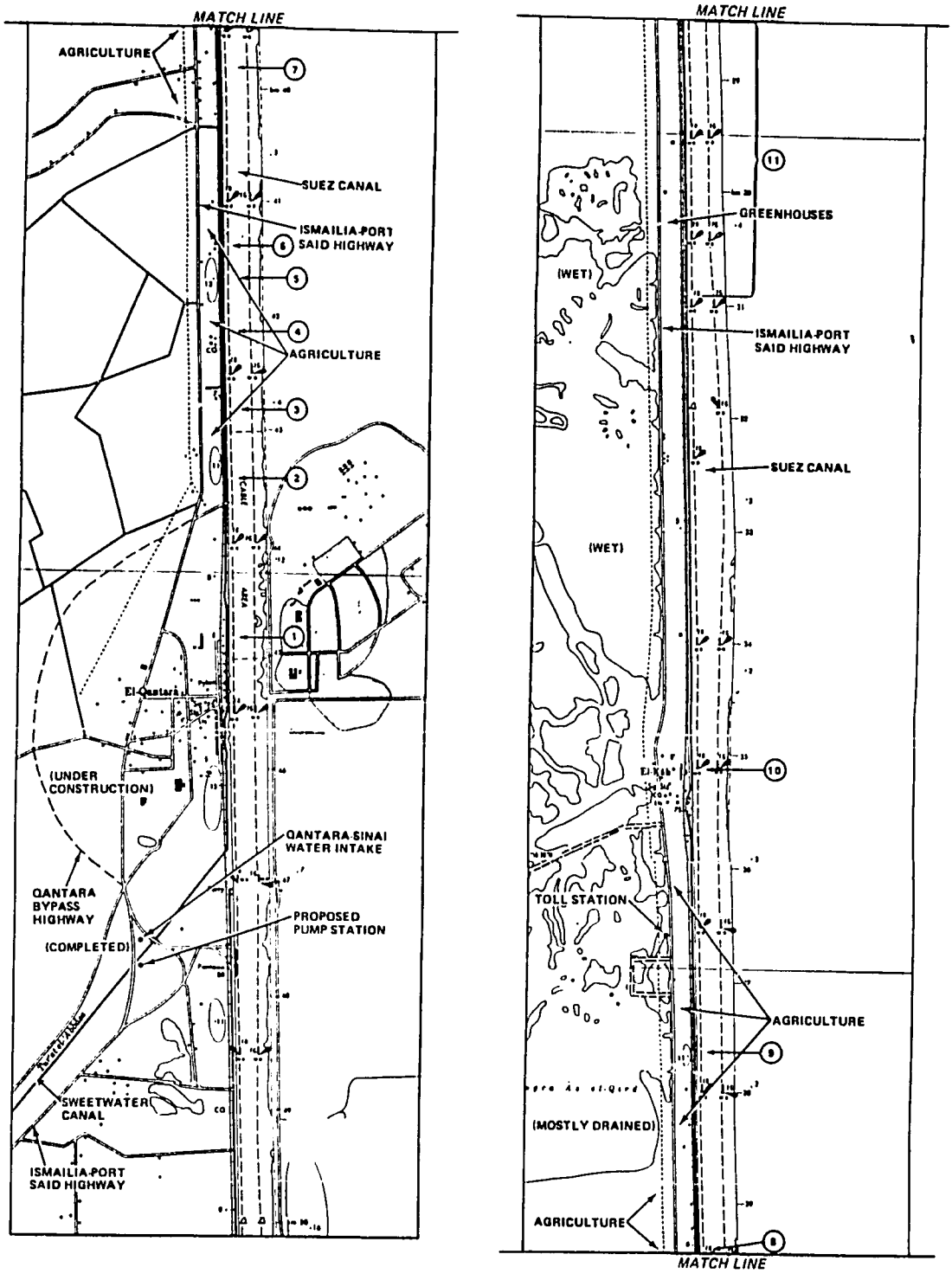
Since the Sweetwater Canal's capacity is only 150,000 m^3/day, and average consumption by 1990 probably exceeds 130,000 m^3/day (it was 125,000 m^3/day in 1988), Port Said cannot continue consuming potable water much longer at the same rate without a new source of supply. In planning expansion of Port Said's potable water supply, NOPWASD and CMC have assumed that per capita water use over the next 15 years will increase modestly and that losses will be reduced (Table 2-1). They project an average year-2005 potable water demand of 256,000 m^3/day (358 lcd for a population of 747,100), and 320,000 m^3/day peak demand.

2.1.4 Port Said Sweetwater Canal

The Port Said Sweetwater Canal, also known as the Abbassa Canal, is Port Said's sole current source of potable water. It branches north from the Ismailia Canal at km 126 of the 128 km long canal, in the middle of Ismailia City. The Ismailia Canal system, with its branches to Suez and Port Said, was built in the mid-1800s to provide potable water to the three canal cities; but the far greater share of its water now goes to irrigation. The Ministry of Public Works and Water Resources (MPWWR) manages the water flow and maintains the canals, including the Port Said Sweetwater Canal branch. The Suez Canal Authority currently operates the potable water plants and delivery systems for the three canal cities.

Between Ismailia and Qantara, the Port Said Sweetwater Canal and its laterals irrigate an uneven strip of land amid the Sharkiya Desert. (The Salheyia Canal, which branches from the Ismailia Canal about 50 km east of Ismailia, also irrigates land between Ismailia and Qantara, though further west.) The Sweetwater Canal then joins the Suez Canal service corridor just south of Qantara near the Sinai ferry crossing point (Figure 2-1). It continues from there to Port Said adjacent the Suez Canal in a narrow space between the two-lane service road and the railroad. The Sweetwater Canal continues to supply water for irrigation after it joins the service corridor. Just north of Qantara, one major lateral passes under the railroad and Ismailia-Port Said Highway to irrigate land west of the highway. Smaller diversions under the railroad irrigate about one-third of the total land area in the 50-300 m wide strip between the highway and railroad between Qantara and Port Said.

South of Qantara, before the Sweetwater Canal enters the service corridor, an intake takes water from the canal and delivers it to a potable water treatment plant supplying Qantara and North Sinai. This is in the vicinity of the proposed Port Said pump station (Figure 2-1).



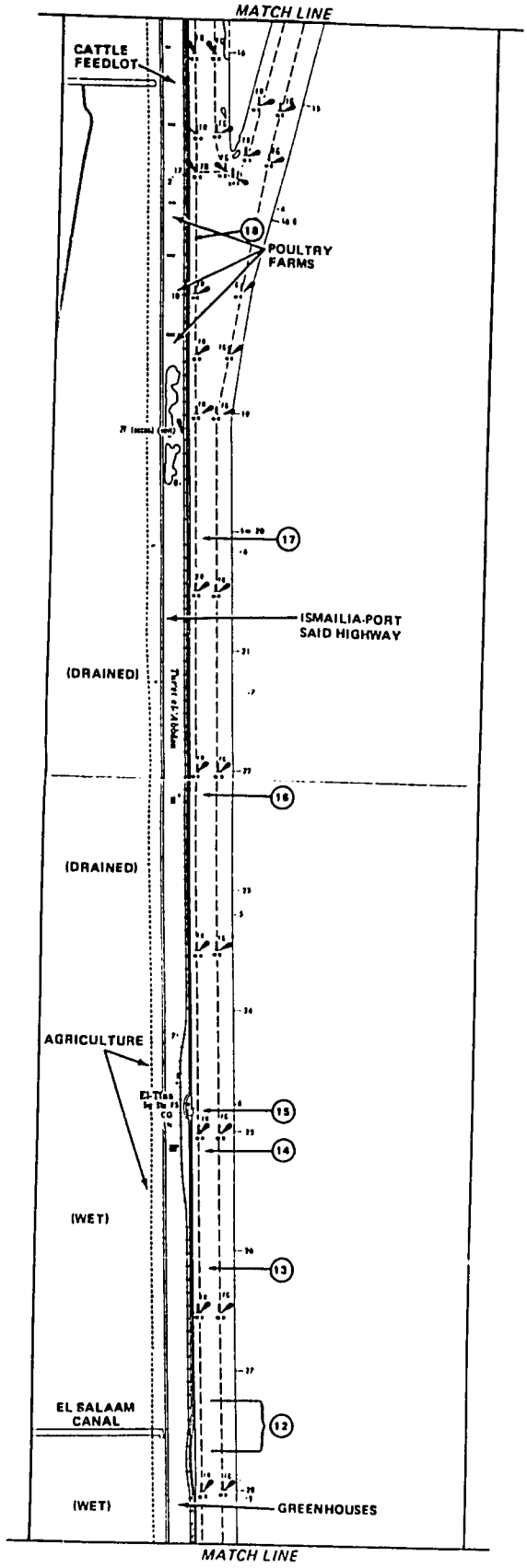
KEY:

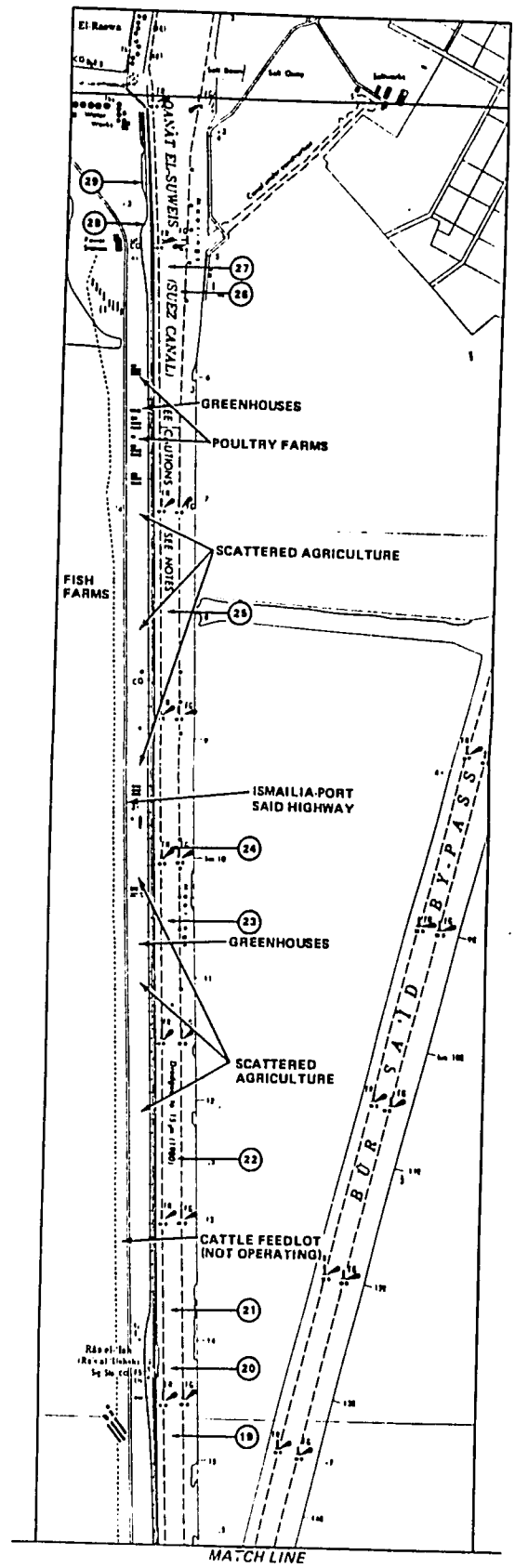
- BUILDING
- RAILROAD
- POWER LINE
- (1) OBSTACLE (APPENDIX D)

SOURCES: U.S. Defense Mapping Agency; Suez Canal Authority Surveys through 1983; and Field Observations 1990.

0 1 2 Kilometers

FIGURE 2-1
QANTARA – PORT SAID, EGYPT





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- BUILDING
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- POWER LINE
- (1) OBSTACLE (APPENDIX D)

SOURCES: U.S. Defense Mapping Agency; Suez Canal Authority Surveys through 1983; and Field Observations 1990.

0 1 2 Kilometers

FIGURE 2-1 (Cont'd)
QANTARA – PORT SAID, EGYPT

Dames & Moore

2.2 The Proposed Action

The proposed pump station will be located adjacent the Port Said Sweetwater Canal just south of Qantara near the start of the new bypass road around the city (Appendix C, photo 1). The pump station and pipeline right-of-way will be designed for a future capacity of 400,000 m^3/day.

The proposed pipeline will be 1500 mm in diameter with a capacity of 170,000 m^3/day. The pipeline will originate about 3 km south of Qantara (30° 51' N, 32° 19' E) and travel about 45 km north to Port Said (31° 14' N, 32° 18' E) (Figure 2-1). The pipeline will be positioned on a gravel bed about 8 m wide and covered (Figure 2-2). Alongside it will be a single-lane, gravel-surfaced service road 6 m wide.

The proposed pipeline will travel adjacent the new Qantara bypass road until the road rejoins the main Ismailia-Port Said Highway, the "Moahada" Road (Figure 2-3, and Appendix C, photos 2 and 3). It will then pass under the highway and continue to Port Said along the western edge of the Suez Canal service corridor aside the rail line. This service corridor now contains from east to west: the Suez Canal service road; the Sweetwater Canal; and the railroad (Figure 2-3 and Appendix C, photo 8)).

According to present drawings (Figure 2-2), the pipeline and service road will cover a strip about 20 m wide, although the exact width is still in doubt. Less land may be required when only one pipeline is present, closer to 15 m. If the service road proves unnecessary along the Qantara bypass road, more land will be saved. The total land lost to other uses probably will be larger than occupied by the pipeline and service road alone, since in at least one communication the railroad sought a 10 m clearance between the rail line and the pipeline (NOPWASD 1988). For the Qantara bypass road segment, it is unclear yet whether land use will be restricted 5-10 m on either side of the pipeline.

The proposed action intends that the Sweetwater Canal continue to supply up to 150,000 m^3/day, with the pipeline making up the balance. There would be no need for constructing a reservoir at the Abu Raswa potable water plant as proposed in the PP, since with two sources of supply at least some water will reach the plant if one source is interrupted.

After 2005 when demand should reach the capacity of the combined canal and pipeline, the proposed action calls for constructing a second 1500 mm pipeline and ending use of the Sweetwater Canal. This will provide a total capacity of 400,000 m^3/day.

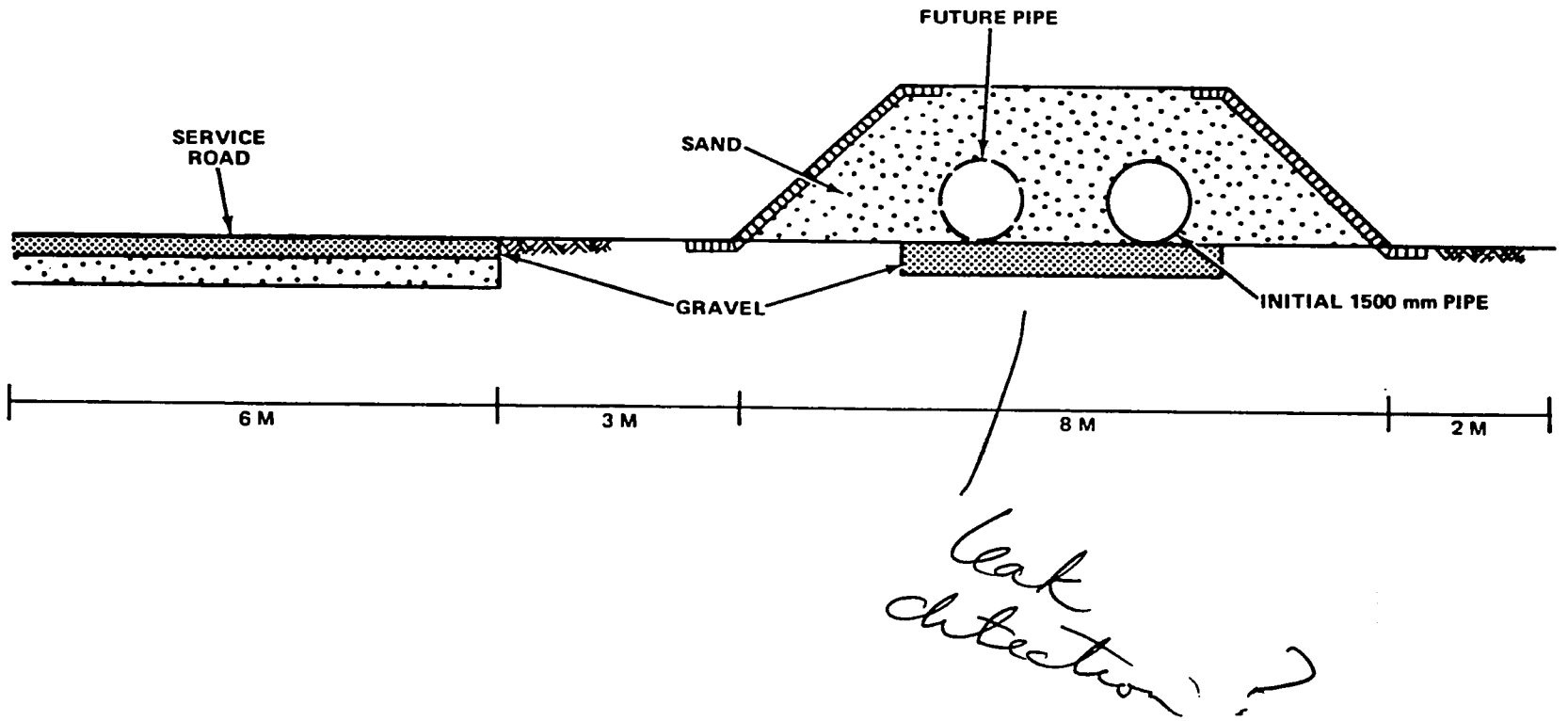

FIGURE 2-2
PRELIMINARY DESIGN FOR POTABLE WATER PIPELINE,
PORT SAID RAW WATER SUPPLY

SOURCE: Hazen and Sawyer, 1979.

Dames & Moore

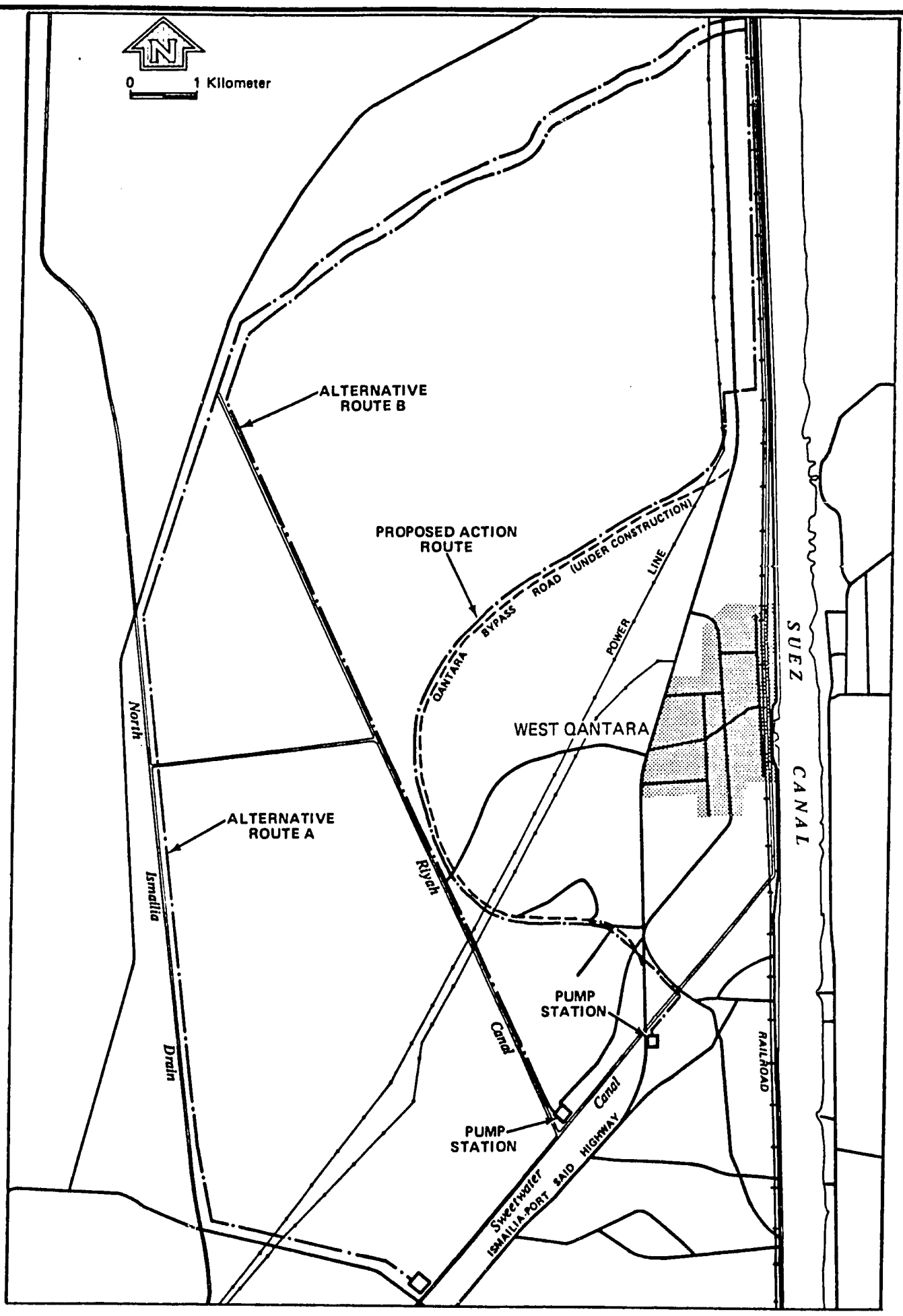

FIGURE 2-3
QANTARA, EGYPT

Dames & Moore

2.3 Other Alternatives

Section 1.2.2 presented five alternatives to the proposed action considered in the CCWW Project Phase II Project Paper. They include a no-action alternative and variations on pipelines and lining of the Sweetwater Canal. These and other alternatives are listed below. Their potential impacts are examined in Chapter 4 along with those of the proposed action.

Now that NOPWASD has in hand more detailed plans and a proposed pipeline route, Qantara officials, the Suez Canal Authority, and others have suggested alternate routes that may consume less agricultural and built-up land, and avoid further congestion of the Suez Canal service corridor (see Appendix A, Attachments C and D). Choice of pipeline route is a prime remaining issue facing NOPWASD for this project.

2.3.1 No-Action and Conservation Alternative

Failing to expand Port Said's source of potable water would mean increasing shortfalls over the coming 5-10 years. The city already suffers shortfalls during peak demand periods. Since wastage and losses are high (Section 2.1.2), Port Said probably could cope for awhile through rationing and a water conservation program that makes the delivery system more efficient and reduces household use. Within a decade, though, a potable water supply limited to 150,000 m^3/day would constrain urban growth and threaten public health.

NOPWASD and the Port Said Governorate appear set to proceed shortly with one or another version of the proposed action, with or without USAID's minor contribution to the total cost. The no-action alternative will not happen.

2.3.2 Lining and Enlarging the Sweetwater Canal

Lining the Sweetwater Canal alone would increase its capacity by ending seepage and boosting the rate of flow since water friction with the walls would be less. Coupled with widening and deepening, the Sweetwater Canal could meet Port Said's potable water demand at least until 2005. The PP estimated that a lined canal would have a capacity of 370,000-450,000 m^3/day. It proposed a trapezoidal canal cross section 8.5 m at the bottom and depth of at least 1.75 m. With a 1.5:1 side slope and 10 percent freeboard, the canal's top would be roughly 15 m wide. It is now about 13 m wide (Figure 2-4). As described in Section 1.2.2, the PP found canal rehabilitation and lining the least-cost option and recommended it.

Figure 2-4 depicts the main drawback to this option: the limited space between the service road and railroad constrains widening the Sweetwater Canal. In places

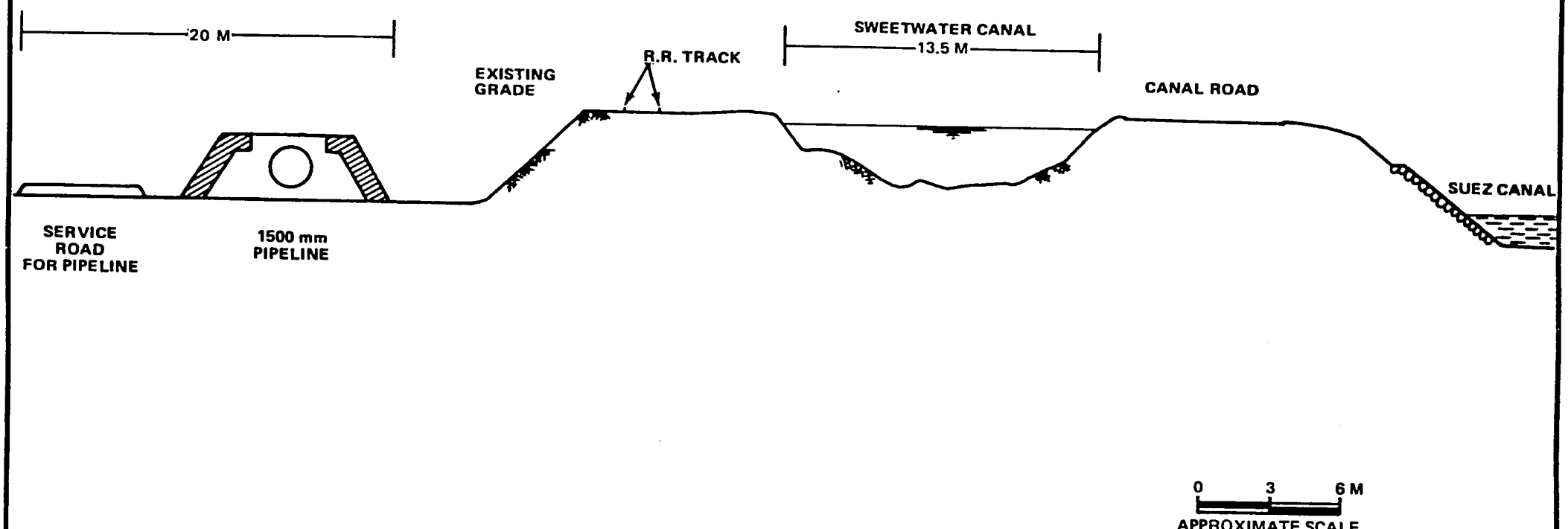

FIGURE 2-4
PORT SAID SWEETWATER CANAL:
TYPICAL CROSS SECTION BETWEEN QANTARA AND PORT SAID

SOURCE: Mokhtar Ibrahim Contracting Co.

Dames & Moore

housing has been built on the canal banks, also constraining widening. A canal 15 m wide would not fit easily at several points.

Since the Sweetwater Canal is Port Said's sole water source, lining also presents the technical challenge of maintaining water flow during construction.

Another obstacle to continued use of the Sweetwater Canal is the MPWWR's objection to maintaining the canal north of Qantara since there it is primarily a potable water line. But canal maintenance would be simplified by lining, and the burden could be shifted to another agency.

Finding the exact capacity of a lined Sweetwater Canal requires more detailed study. In any case, a lined and enlarged Sweetwater Canal probably would not meet Port Said's potable water demand much beyond 2005. Eventually, a pipeline must be built if the road or railroad is not to be sacrificed for the sake of a wider Sweetwater Canal. This does not mean, though, that upgrading the Sweetwater Canal at this time is unsound. The lined and enlarged canal would have a useful life of 30 years, and its flow could be supplemented after the first 15 years by one or more pipelines. Detailed study would likely find that, although lining and enlarging the Sweetwater Canal presents some technical challenges, none are insurmountable. Lining should be considered technically feasible, and probably remains the lowest cost option.

2.3.3 Alternative Pipeline Routes

Alternative pipeline routes fall into two categories: other paths from the pump station to north of Qantara, and from that point to Port Said.

For the Qantara area, local officials have proposed two alternative routes, both west of the proposed route: one, along the Riyah Canal, the Sweetwater Canal's final lateral (Alternative Route B in Figure 2-3); and the other, further west along the North Ismailia Drain (Alternative Route A in Figure 2-3). Both routes aim to avoid further loss of agricultural land along the bypass road (Appendix C, photo 2).

The EA study team identified an additional alternative route in the Qantara area: continue from the proposed pump station along the Sweetwater Canal to the railroad right-of-way, and then north through Qantara west of the rail line. A preliminary reconnaissance found much of the needed land to be nonagricultural and undeveloped, with few construction obstacles.

The main alternative north of Qantara is putting the pipeline on the west shoulder of the highway. This side of the highway is much less developed than the east, where the pipeline will lie according to the proposed action, and land use conflicts may be fewer.

2.3.4 Alternative Pump Station Sites

Pump station location was not an issue in the Scoping Meeting, nor in earlier project documents. Qantara officials have proposed different pump station locations for their alternative routes. Any number of potential alternative sites exist, and some, should they be technically feasible, entail fewer kilometers of pipeline, hence fewer land use conflicts than the proposed action.

2.3.5 Burying the Pipeline

The proposed action calls for laying the pipeline above ground on a gravel bed instead of burying it because of burial's extra cost due to the highly reactive, corrosive soils and groundwater. Burial cannot be avoided at several points, such as where it crosses the Ismailia-Port Said Highway; but it requires special, expensive pipe materials. Since the design engineers have ruled out complete burial because of its high cost, this option will not be discussed further.

CHAPTER 3

3.0 EXISTING ENVIRONMENT

3.1 Regional Setting

The area north of Qantara is flat and low lying, apart from some low hills around Qantara. Elevations do not exceed 2 m at Port Said and 5-10 m at Qantara. Lake Manzala, a large, shallow, island-filled water body occupies about 200,000 feddans south and west of Port Said. It is the region's most prominent ecosystem. Mainly shallow wetlands lie along the west side of the Ismailia-Port Said Highway. A mix of agriculture, wetland, waterlogged highly saline soils, and buildings occupy the 50-300 m wide strip east of the highway between it and the railroad. Low-elevation flat plains with heavy, saline, waterlogged soils dominate the lands north of Qantara. These soils are primarily alluvial, deposited by the Nile when its delta was much wider, extending into the Sinai.

The region's physical environment has changed drastically over the past 100 years as Egypt has gained control of the Nile River, built the Suez Canal, and expanded its cultivated area. Most of the land and ecosystems directly affected by the project no longer resemble anything construable as their "natural" states. The region's most striking geographic feature is the Suez Canal, which splits the African continent from Asia. The Suez Canal now ecologically cleaves the once more intimately connected Sinai and mainland Egypt, affecting distributions of plants and land-bound wildlife. Lake Manzala has shrunk to less than half its size at the turn of the century because of land reclamation along its southern and western shores; it continues to shrink. This has affected most notably the lake's abundant avifauna.

3.2 Physical Resources

3.2.1 Geology and Soils

The proposed potable water pipeline will traverse a geologically distinguished area. It will parallel a rifted fault line lying more-or-less under the Suez Canal, which has its source far south in the East African Great Rift Valley fault system. Metcalf and Eddy (1979) report that in the Suez Canal region the fault is stable. This fault separates the Sinai from Africa for geographic purposes, although its geologic ancestry is African. Lake Manzala, just west of the proposed pipeline route, was formed in antiquity by earthquake-induced subsidence. Several former branches of the Nile passed through the area of the present lake. The Pelusaic Nile branch reached even further east into the Sinai as recently as 2000 years ago.

For the most part, the soils found along the pipeline route consist of medium to fine fluvio-marine montmorillonite clay deposits. The 1985 Land Master Plan for new irrigated lands development describes the soils north of Qantara as predominantly fine, poorly ripened clays (Euroconsult 1985). Salinity and alkalinity, and sulphur and boron toxicity constrain agriculture. The problems increase going north as the texture becomes finer. Areas adjacent the Suez and Sweetwater Canals may contain mixed soil materials dug and dredged from the canal. This probably includes parts of the pipeline bed along the proposed route. Some coarser aeolian deposits occur, mainly in the south and Sinai.

Despite such soil limitations, the GOE intends to reclaim for agriculture large areas along the southern shore of Lake Manzala, along the Ismailia-Port Said Highway north and south of the El Salaam Canal, and in North Sinai.

3.2.2 Climate

Climate amounts to an environmental "resource" in the same sense as soil or minerals. The region's arid climate largely determines and controls its ecology. Like other deserts along this latitude, summers (May-October) are hot and rainless, while the winters (November-April) are mild with occasional storms. The ocean somewhat moderates temperature and humidity at Port Said, and rainfall there is slightly higher than at Ismailia (Table 3-1). Rainfall averages only about 30 mm at Ismailia, but increases to 72 mm on the coast. Annual evaporation, though, is well over 2000 mm (2550 mm at Ismailia), dwarfing either rainfall volume (Dames & Moore 1990).

The potential for flash flooding is often an important consideration in Egypt in facilities design; but for the already wet, flat, low lying route of the proposed pipeline the risk should be slight.

3.2.3 Water Resources

The region's water resources consist of interconnected freshwater and salt water systems. The salt water system includes the Suez Canal, Lake Mallaha, parts of Lake Manzala, and scattered salt marshes. The area's freshwater system includes Lakes Manzala and Umm el Rish, the drainage canals feeding the lakes, the Port Said Sweetwater Canal, and the new El Salaam irrigation canal.

The Suez Canal is a conspicuous part of the landscape of the project area. Between Qantara and Port Said its depth ranges between 13.0-19.5 m, while the width of the dredged ship channel is about 200 m. The total width of the canal is roughly 350 m between Qantara and the Port Said bypass channel. Over the years, Egypt has widened and deepened the canal several times, including since its postwar reopening in 1975. The bypass channel at Port Said was completed in the early 1980s.

Table 3-1. Ismailia and Port Said Meteorological Data

	Average Daily Temp °C		Rainfall mm		Relative Humidity %	
	IS	PS	IS	PS	IS	PS
Jan	14.2	14.7	4.4	12.4	70	72
Feb	15.4	15.3	4.7	11.3	68	67
Mar	17.4	17.3	3.0	8.5	60	67
April	20.6	19.7	1.1	2.7	41	69
May	24.7	22.6	0.8	2.6	58	70
June	27.5	25.4	0	trace	63	71
July	29.3	27.3	0	0	68	72
Aug	29.5	27.8	0	trace	68	72
Sept	27.3	26.7	0	0.2	69	69
Oct	24.2	24.9	2.2	7.3	70	68
Nov	20.2	21.4	4.7	9.1	74	71
Dec	15.8	16.4	8.5	17.6	78	72
Total			29.4	71.7		

IS = Ismailia; PS = Port Said

Source: For Port Said: Norconsult A.S. 1981; For Ismailia: Meteorological Dept., Ministry of Military Production; Meteorological Station No. 440 (30°26'N, 32°14'E), Period 1946-1956.

Another saline water body is the shallow, hypersaline Lake Mallaha, notable at least in the past as a habitat for flamingos. The lake lies in the northwest Sinai corner bordered by the El Tina Plain salt flats, which the lake's excess waters sometimes inundate (Figure 1-1). The lake was larger prior to construction of the Port Said-Suez Canal bypass channel in the early 1980s. The authorities are trying to restore Lake Mallaha and rejuvenate its fishery.

Lake Manzala is the most important component of the freshwater system. It is now only about half its size at the turn of the century. It covers about 200,000 feddans depending on definitions used. According to one report, its 1988 area was 190,000 fd (Ibrahim and Mahmoud 1988); while another study used 1982 Landsat imagery in determining an area of 215,440 feddans, nearly 50,000 fd of which was islands and reed beds (Reid and Rountree 1982). It is 0.5-2.0 m deep.

Section 2.1.4 described the Port Said Sweetwater Canal, the nearest component of the freshwater system to the proposed pipeline route. Most of its water goes to irrigating lands between Ismailia and Qantara. At Qantara, the Sweetwater Canal becomes mainly an urban potable water conveyor. Just south of Qantara, an intake takes water for a nearby potable water plant that supplies Qantara and North Sinai. A final branch of the canal continues north to Port Said. The Sweetwater Canal irrigates some land north of Qantara, about 2,000 fd, according to local officials. This irrigation shapes the immediate environment of the proposed pipeline.

A major new addition to the area's freshwater system is the El Salaam Canal, an undertaking of national consequence. Egypt has spent the past decade building this canal to irrigate several hundred thousand feddans of land along the southern shore of Lake Manzala and in North Sinai. The El Salaam Canal takes its freshwater from the Damietta branch of the Nile at Faraskor. It then passes along the southern edge of Lake Manzala to the Suez Canal about 27 km south of Port Said. The El Salaam Canal now lies complete up to the Suez Canal, and work should begin on a siphon under it in 1990-1991. Plans call for mixing drainwater otherwise destined for Lake Manzala into the El Salaam Canal to augment the water supply as land reclamation expands. This will diminish Lake Manzala's inflow and foster the lake's continued shrinkage.

Lake Umm el Rish is a shallow wetland fed by drainwater just north of Qantara, more prominent on older maps than current ones. In the past decade, parts of it have been reclaimed for agriculture and made into fish farms. A site visit in June 1990 found the land for 5-8 km north of Qantara to be cropland; then for several kilometers after that: desert, salt ponds, and a very few scattered marshes. Most of this land was inundated formerly by Lake Umm el Rish.

3.3 Biological Resources

3.3.1 Vegetation

Practically the full range of Egypt's ecological settings occurs between Qantara and Port Said: delta-style agriculture, sand dune desert, saline waterlogged soils, freshwater irrigation canals, shallow wetlands (brackish and freshwater), brackish lakes, and hypersaline water bodies. Wetness, salinity, soil type, and human activity mainly determine the kinds of flora found. The following description of the vegetation found along the potential pipeline routes is based on MacLaren (1982).

Agricultural land is a common wildlife habitat, particularly around Qantara where the cropping is intense. Undomesticated flora play only a minor role. Agriculture at Qantara resembles that of the Nile Delta: two or more crops per year of fodder and grains, with minor amounts of fruit and vegetables. Species normally considered weeds in Egypt include: Portulaca oleracea, Stelloria pallida, Amaranthis viridis, Fumaria densiflora, Brassica nigra, and Plantago major. Date palm (Phoenix dactylifera) and windbreak trees such as eucalyptus and casuarina planted between farm fields are important to birds.

Irrigation canals are another important habitat. They are home mainly to reeds, though also a variety of other plant types. Vegetation growing in a canal passing through an arid area, such as the Port Said Sweetwater Canal, can be important to migrating birds. Plants found in and along Egypt's irrigation canals include: Polygonum salicifolium, Polygonum senegalense, Chenopodium ambrosides, Rananculus sceleratus, Potentilla supina, Centaurium pulchellum, Lippia nodiflora, and Centaurea calcitropa. Water hyacinth (Eichornia) has spread throughout Egypt's fresh waters, including to the irrigation canals. Routine canal dredging and cleaning periodically disrupt these plant communities. Herbicides reportedly are used for weed control along the Sweetwater Canal's banks.

Lake Manzala, which averages just over 1 m deep, contains highly productive plant communities in the less eutrophic parts of the Southern and Eastern Sectors. Eichornia is widespread, along with other emergent aquatic species such as Juncus rigidis, Typha domingensis, Phragmites australis, Carex divisa, Scirpus littoralis, and Cyperus laevigatus. According to MacLaren (1982), the plants most adapted to Lake Manzala are the submerged aquatics, mainly: Ceratophyllum demersum, Potamogeton pectinatus, and Naja armata.

A variety of wet, salt-affected soils occurs in the project area, ranging from the salt-encrusted heavy clays of the Tina Plain, which appear to lack vegetation entirely, to the brackish, marshy margins of Lake Manzala. Drainage canals will have some salinity-tolerant plants growing in and around them. The predominant salt-tolerant plants are saltbush (Salicornia) and Holocnemum. The main salt-tolerant woody plant found is Tamarix nilotica, usually growing no larger than a bush. Where there is

enough water for wetland vegetation, reed stands of Typha, Phragmites, Juncus, and Cyperus occur.

3.3.2 Wildlife

Marx (1968) reports 93 species of reptiles and amphibians in Egypt as a whole, but between Qantara and Port Said the increasing human population has reduced diversity considerably. Only five reptiles and one amphibian are common in the Port Said area. The most common reptiles in the northern areas are the Egyptian leopard lizard (Acanthodactylus boskanis) and the Turkish gecko (Hemidactylus turkikus). Some 19 reptile and amphibian species have been reported at Ismailia, most of which probably can be found around Qantara and drier areas further north.

The mammal fauna of the area also is not diverse. Dames & Moore (1990) reports that some 13 mammal species should be present around Ismailia. Their range probably extends to Qantara as well, and some distance further north. The most common species are bats and those associated with humans, such as Mus musculus and Rattus. The fat sand rat (Psammomys obesus) can be found on sand bars. More exotic species possibly found in inaccessible areas at the margins of Lake Manzala or in the desert are the red fox (Vulpes), jungle cat (Felis chaus), Egyptian mongoose (Herpestes icheumon), and weasel (Mustela nivalis). Appendix B contains a list of the reptile, amphibian, and mammal species likely to be found in the project area.

The Port Said Sweetwater Canal undoubtedly contains minor amounts of fish, though the EA study team did not observe anyone fishing and surveys of fish fauna were not done.

The region's most prominent faunal group is the avifauna drawn to Lake Manzala, and migrating between Eurasia and Africa. The fresh water and reed beds of the Sweetwater Canal support a variety of resident waterbirds, including: the little grebe (Tachybaptus ruficollis), little bittern (Ixobrychus minutus), purple gallinule (Porphyrio porphyrio), moorhen (Gallinula chloropus), and painted snipe (Rostratula benshalensis). During migration, the reed habitat offers good resting and hiding places for herons, rails, and waders, such as snipe (Gallinago gallinago), green sandpiper (Tringa ochropus), wood sandpiper (Tringa glareola), and spotted redshank (Tringa erythropus). A few birds of prey and a variety of passerines also may use the reed beds on the Sweetwater Canal's banks.

Since many, if not most, of the above mentioned bird species found using the Port Said Sweetwater Canal are likely to be waterfowl common to nearby Lake Manzala, it is germane to describe briefly Lake Manzala and its birds.

Lake Manzala's rich plant communities, high primary productivity, and shallow depth make it attractive to waterfowl. The lake lies along the broad axis of migration

for palearctic birds between Eurasia and Africa. Meininger and Mullie (1981) estimated that more than 300,000 birds spend the winter on Lake Manzala. Three groups of birds can be found in the northern lake and wetland areas: residents, migrants, and wintering birds. The vast majority are waterbirds and seabirds.

MacLaren (1982) predicted that the following numbers of species are likely to be associated with Lake Manzala (for a listing by species, see Appendix B):

o	Permanent residents	32
o	Summer residents	9
o	Winter residents (found during migration and spending the winter)	53
o	Transients (found during migration only)	24
	Total	118

About 30-35 species breed in the general region. They are a mix of waterbirds and species adapted to urban and agricultural habitats. Most of the breeders are also residents.

The region's common non-waterbirds include: the pied kingfisher (Ceryle rudis), kestrel (Falco tinnunculus), common bulbul (Pycnonotus barbatis), graceful warbler (Prini gracilis), clamorous reed warbler (Acrocephalus stentoreus), house sparrow (Passer domesticus), and hooded crow (Corvus corone).

Table 3-2 presents data from three bird surveys done between 1978 and 1990. The surveys confirm that many different bird species use Lake Manzala. The 1988/89 survey identified 77 different species compared to the above postulated 118. The surveys confirm that continuing rapid changes in the lake's physical character quickly affect its biota. Decreased vegetation due to extreme eutrophication is the likely factor behind a shift in the relative numbers of birds. In the late 1970s, Lake Manzala was an important wintering grounds for coots (Fulica atra), about 40 percent of total counted, which feed on aquatic vegetation. By 1989/90, coot numbers had declined practically to nil. By contrast, little gull (Larus minutus), an insect feeder, increased over the decade from nil to 23 percent. Eutrophication and oxygen depletion probably has increased insect breeding. Another species, the fish-eating cormorant (Phalacrocorax carbo) increased from nil to 11 percent, probably because of fish being easier to catch in the less weedy water.

Endangered and threatened bird species is an important problem in the project area. The Convention on the Conservation of Migratory Species of Wild Animals, the "Bonn Convention," of which Egypt is a member, lists all migratory species that are endangered or face special problems. The Convention lists the species of special

Table 3-2. Summary of Three Winter Bird Surveys at Lake Manzala.

Species	Season					
	Winter[a] 1978/79		Winter[a] 1979/80		Winter[b] 1989/90	
	(numbers, percent)					
Podiceps cristatus	37	<1	56	<1	174	<1
Podiceps nigricollis	-	-	16	<1	82	<1
Phalacrocorax carbo	256	<1	285	<1	22500	11
Egretta garzetta	51	<1	137	<1	1073	1
Egretta alba	87	<1	74	<1	58	<1
Ardea cinerea	194	<1	753	1	400	<1
Tadorna tadorna	1011	2	40	<1	14	<1
Phoenicopterus ruber	-	-	10	<1	333	<1
Anas penelope	2	<1	49	<1	647	<1
Anas crecca	381	1	4733	4	4445	2
Anas platyrhynchos	-	-	5	<1	1364	1
Anas acuta	250	<1	104	<1	34	<1
Anas clypeata	291	1	8833	7	12021	6
Aytha ferina	45	<1	1257	1	407	<1
Rallus aguaticus	32	<1	12	<1	8	<1
Gallinula chloropus	257	<1	251	<1	17	<1
Porphyrio porphyrio	11	<1	10	<1	1	<1
Fulica atra	22193	43	51272	41	410	<1
Charadrius pecuarius	11	<1	4	<1	35	<1
Charadrius hiaticula	1	<1	716	1	563	<1
Charadrius alexandrinus	56	<1	6490	5	4323	2
Charadrius leschenaultii	37	<1	13	<1	-	-
Pluvialis sguatarola	9	<1	56	<1	254	<1
Hoplopterus spinosus	29	<1	25	<1	110	<1
Vanellus vanellus	275	1	28	<1	75	<1
Calidris minuta	540	1	6219	5	8838	4
Calidris alpina	-	-	4693	4	11275	5
Philomachus pugnax	141	<1	8	<1	292	<1
Gallinago gallinago	35	<1	49	<1	81	<1
Limosa limosa	22	<1	-	-	935	<1
Numenius arguata	17	<1	5	<1	39	<1
Tringa totanus	1148	2	3418	3	3247	2
Tringa nebularia	9	<1	12	<1	43	<1
Tringa stagnatilis	2	<1	14	<1	12	<1
Tringa glareola	16	<1	10	<1	16	<1
Actitis hypoleucos	6	<1	14	<1	17	<1
Larus minutus	1	<1	-	-	47316	23
Larus ridibundus	16726	32	24236	20	45080	21
Larus genei	236	<1	641	1	2269	1
Larus cachinnanus/armenicus	140	<1	1497	1	1584	1
Chlidonias hybridus	7080	14	7410	6	39331	19
Sterna sandvicensis	4	<1	223	<1	100	<1
Total count	51639		123678		209823	

a: Meininger and Mullie 1981.
b: Data from the IWRB/FORE, 1989/90 winter waterbird counts (in preparation).

concern under two categories. The first are the "Appendix I" species, which the Convention considers to be in immediate danger of extinction. The second are the "Appendix II" species, which are migratory animals requiring special international agreements for their conservation and management. Another listing of endangered and vulnerable species is the ICBP/IUCN Bird Red Data Book (Mountfort 1988).

Several Appendix I and II globally threatened and declining species of birds migrate through or winter in the Lake Manzala area. Appendix I endangered species occasionally in the region include the white pelican (Pelecanus onocrotalus) and dalmatian pelican (Pelecanus crispus). There are also several resident declining or threatened species, such as the little tern (Sterna albifrons). Many other species, such as the white headed duck (Oxyura leucocephala) and marbled teal (Marmaronetta angustirostris), that used to inhabit Lake Manzala have vanished already.

Candidates for inclusion in the next edition of the ICBP/IUCN Red Data Book include: marbled teal (Marmoranetta angustirostris), corncrake (Crex crex), sociable plover (Chettusia gregaria), and imperial eagle (Aquila heliaca).

Besides facing a shrinking and rapidly evolving habitat, the region's birds are hunted and trapped intensively. Studies done a decade ago by MacLaren (1982) revealed the extent and economic importance of bird catching: 98,000-162,000 waterbirds killed annually with roughly 2,000 people involved in the activity. The numbers are not likely to be lower in 1990. MacLaren found hunting pressure on waders to be particularly high, accounting for about 40 percent of the birds offered for sale. This included annually: 12,000-21,000 Calidris alpina, 12,000-20,000 Calidris minuta, 4,000-6,000 Charadrius alexandrinus, and 1,000-2,000 Recurvirostra avosetta.

3.4 Human Resources

3.4.1 Non-agricultural

The proposed water pipeline will lie within a major transportation corridor. Considering the volume of truck, rail, and ship traffic travelling between Qantara and Port Said within a less than 1 km wide passage, non-agricultural roadside development is modest. A high water table and poor soil quality are probably the main constraints. Land on the east side of the Ismailia-Port Said Highway to the railroad is more heavily used than that on the wetter west side. Land along the Qantara bypass road, which the proposed route follows, is mainly farmed.

Figure 2-1 and Appendix C (photos 3-6) display land uses along the Qantara-Port Said corridor, and Appendix D itemizes obstacles found by the contractor to be specifically in the proposed pipeline route. While the corridor is not highly developed, facilities probably impinged upon by the proposed and alternate routes include: housing, military fortifications, military camps, the Port Said police compound, Suez

Canal signal stations, warehouses, a road construction marshalling yard, a mosque and cemetery (west side), poultry farms, fish farms (west side), greenhouses, cattle operations, and salt drying basins. Some facilities, such as that shown in Appendix C photo 6, directly abut the rail line.

There are three Suez Canal signal stations between Qantara and Port Said spaced about 10 km apart; from north to south, they are: Ras el Ish, El Tina, and El Kab. Ras el Ish and El Tina are also train stops, and thus have railroad station facilities besides those for the signal station (Appendix C, photo 4, and Appendix D, cross-section numbers 10, 15, and 20).

Military fortifications along the Suez Canal include several mounded-hill strongpoints on the western edge of the railroad. There are at least 10 between Qantara and Port Said.

The most built-up area along the proposed and alternative pipeline routes is the final 3-5 km to the Raswa water treatment plant. It is an urban fringe with intensive small-farm agriculture, housing, roads, and police facilities.

3.4.2 Agricultural

Agriculture is the most important human activity in terms of land use around Qantara and along the route north. It takes two basic forms. The first is developed, settled small farming typical of the Nile Valley. This occurs around Qantara and in the area just south of the Raswa water treatment plant. Cultivation south and west of Qantara resembles that found in the Nile Valley. The four-lane, 5-km long Qantara bypass road passes through intensively cropped land. This area receives its irrigation water from the El Riyah Canal, the final branch of the Port Said Sweetwater Canal. The land drains west into the North Ismailia Drain. The area just south of the Raswa water treatment plant also is intensively cultivated, no doubt due in part to the stimulus of the nearby urban market. This bit of cropland amounts to water-bound Port Said's market garden fringe.

The second form of agriculture is the less refined, apparently more ad hoc cultivation and land reclamation found between Qantara and Port Said in the 50-300 m wide strip between the railroad and Ismailia-Port Said Highway. North of Qantara, the Sweetwater Canal continues to supply irrigation water to lands west of it via diversion structures under the railroad. Most of the structures irrigate land lying in the narrow strip between the highway and railroad. Between Qantara and the El Kab signal station, there are at least 15 such diversion points (Appendix C, photo 7). One more substantial diversion structure 5 km north of Qantara passes west under both the railroad and highway to irrigate a large area north of Qantara west of the highway (Figure 2-1).

According to an official from the agricultural bank at Qantara, the Sweetwater Canal north of Qantara irrigates 350-500 fd in the strip between the Ismailia-Port Said Highway and railroad, and about 2,000 fd just north of Qantara (M. Bayoumi, personal communication). The reported figures imply that agriculture occupies about 25-30 percent of the strip (assuming it is 200 m wide), which fits with visual impressions. Very little cropping occurs on the west shoulder of the highway. A small amount of land is cultivated on the banks of the Sweetwater Canal between the canal and railroad.

Farming along the west bank of the Sweetwater Canal north of Qantara probably dates to construction of the canal itself over 100 years ago. Several farmers interviewed claimed they, or their families, had been cropping there over forty years. Most farms are small, under 5 fd, though the study team did encounter one man, reputed to be the strip's largest farmer, cropping 30 fd. Farmers describe their tenure as either being by formal title, or legally implied through usufruct. Few farmers apparently live along the road near their fields. Except at the northern and southern ends of the proposed pipeline route north of Qantara, farming is not "intensive." Poor drainage apparently is the main constraint.

As mentioned, agriculture between Qantara and Port Said will become more consequential when irrigation projects on the western side of the Ismailia-Port Said Highway north and south of the El Salaam Canal come into service.

3.4.3 Public Health

The residents of Port Said will be the main beneficiaries of the proposed potable water pipeline. Their general health depends, albeit only in part, on their supply of potable water. Taking the trend in infant mortality as a crude indicator, public health in Port Said, and in Egypt as a whole, has improved over the past decade (Table 3-3).

3.4.4 Archaeological Resources

According to maps and description in MacLaren (1982), there are several archaeological sites around Qantara, most notably Kom Dafana and Tell El Saidi. But they lie 4-5 km west and southwest of the current city, at least 1 km from the bypass road. MacLaren reports no known archaeological sites in the corridor between Qantara and Port Said.

Table 3-3. Trends in Infant (age 0-1) Mortality Rates: Egypt and Canal Cities 1980-1987

(Registered deaths per 1000 births)

	1980	1981	1982	1983	1984	1985	1986	1987
Egypt	76	70	70	65	62	49	47	45
Suez	86	78	74	56	71	39	46	36
Ismailia	65	55	52	45	53	33	33	33
Port Said	56	59	46	41	33	28	28	27

Source: CAPMAS 1989.

CHAPTER 4

4.0 IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

4.1 Introduction

This chapter reviews the expected impacts of the proposed action and its alternatives. To summarize the findings, adverse impacts from the proposed project to the physical and biological environment should be few, localized, and not severe. They are inconsequential compared to those being wrought by larger development forces at work in the region. Most affected will be the human environment. Certain benefits, drawbacks, and lack of impacts are common to all options, and are dealt with together in this introduction.

The gains from augmenting Port Said's potable water supply are the same whether it is done by lining the Sweetwater Canal, or by laying a pipeline along any of several possible routes. Port Said's population will be assured an adequate amount of safe drinking water until at least the year 2005, and the lack of it will not deflect the city from its expected growth trajectory. It is unlikely, though, that the project will provoke any detectable improvement in health statistics such as those in Table 3-3. Nearly everyone already has access to potable water, and the 80 percent of households with individual hookups use water liberally. Even if Port Said were forced to ration water the rest of the decade, its population's health would not necessarily suffer.

Negative repercussions to Port Said itself from augmenting their water supply are nearly nil, but they do include: greater wastewater flow than with the no-action alternative, which implies higher wastewater treatment budgets and more wastewater-related environmental impacts; and encouraging excess potable water consumption, since incentives to conserve would wane when the threat of shortfall fades.

Neither the proposed action nor its alternatives will significantly affect:

- o climate;
- o air quality;
- o non-bird wildlife;
- o Lake Manzala; and
- o the Suez Canal.

Effects likely to be minor for most options include:

- o wetland loss;
- o soil loss;
- o habitat disturbance; and
- o vegetation loss.

Installing a pipeline above ground obviously entails terrain alteration, disturbance of soil, and loss of vegetation. The pipeline will impede the movement of some land-bound animal species and rechannel surface drainage flows. But the effect should be modest, since for most of the way the pipeline will parallel existing barriers such as the Qantara bypass road and railroad line, both of which are on raised beds, and the Suez Canal. For non-agricultural vegetation, that lost to the 10-20 m wide strip grows in abundance elsewhere, and no known endangered plant species are threatened. The project should not seriously affect any known endangered animal species. All alternatives, except no-action, do cause minor disruption of habitats, but these habitats are highly disturbed already.

Accidental rupture of the pipeline by a vehicle, or even a derailed train, is an issue common to all alternative routings. The main adverse impact of a rupture is flooding and water damage to structures and crops. Such impacts should be localized, since pressure-sensitive shutoff valves and and shutdown of the pump station can limit the volume of water escaping.

No archaeological ruins or other important cultural artifacts are known to lie in the proposed and alternative routes. If a chance find occurs, established procedures for notifying the Ministry of Antiquities and evaluating the find should limit damage.

Switching from open-channel to pipeline conveyance should improve, at least marginally, the quality of Port Said's water. Infiltration of saline groundwater, use of herbicides for canal weed control, and various other contaminants introduced by human activity along the Sweetwater Canal banks degrade the water quality to some extent. Port Said's shift to pipelines should reduce and ultimately eliminate the possibility for quality degradation during the water's final 45 km journey.

During the pipeline construction period, nearby residents not directly in the project's path will suffer noise and dust annoyances. The extent of these impacts obviously will be less for the less populated of the route alternatives.

The important adverse impacts are loss of agricultural land, disruption of the irrigation system, and the costs of displacing facilities now in the pipeline right-of-way. Almost all the adversely affected people live south of Port Said and will receive none of the project's benefits.

The project's impacts should be seen in the context of the region's rapid, continuous environmental change. The region's environment promises to continue changing at an even increasing pace as land reclamation based on the new El Salaam Canal begins in earnest, and improvements in Cairo's wastewater treatment begins to affect Lake Manzala. The El Salaam Canal borders the lake's southern shore and will extend into northern Sinai. As El Salaam-based land reclamation spreads, Lake Manzala will continue shrinking and the North Sinai will change from a near vacant

desert to a busy agricultural area, at the cost of extensive environmental change. Any adverse impacts of the potable water project on, for example, birds and wetlands will be minute on a regional basis.

4.2 The Proposed Action

The extent of adverse impacts from the proposed action depends partly on how much land the pipeline and service road directly cover and require in right-of-way. As mentioned in Section 2.2, the precise total width remains for detailed design to establish. Fifteen meters for both the pipeline bed and service road have been working figures, although one preliminary drawing by the contractor shows a width of 19 m (Figure 2-1). A service road will require 5-6 m, but there should be no need for it where an existing road is nearby, such as the portion of the route along the Qantara bypass road. Another question remaining unresolved is whether there will be a 10 m wide buffer between the railroad and pipeline. In early discussions between NOPWASD and the railroad authority, the latter indicated that the pipeline should be no closer than 10 m to the rail line (NOPWASD 1988). Similarly, final designs may stipulate land use restrictions or buffers totalling 10-20 m or more along the Qantara bypass road between the pipeline, road, and farm fields.

The pipeline, service road, and right-of-way probably will claim about 300 fd, the precise total depending on their final widths. If the total width is 20 m along the 5 km Qantara bypass road, the proposed action will consume about 24 fd in this route segment. If the pipeline, service road, and right-of-way span 30 m in the 40 km long strip north of Qantara, about 275 fd will be lost there to other uses. Nearly all the 24 fd along the Qantara bypass road is agricultural land, and, therefore, will be lost to that use. About 25 percent of the strip north of Qantara is cropped (Section 3.4.2), so about 69 fd of the right-of-way's 275 fd is agricultural. Thus, the proposed action will directly cost nearly 100 fd of agricultural land.

Indirect losses of agricultural land will be much larger should pipeline construction fail to include rebuilding the many irrigation diversion structures that carry Sweetwater Canal water under the railroad. Officials at the Scoping Meeting assured that these irrigation systems would be preserved, but detailed designs do not yet exist reflecting that assurance. The 2,000 fd just north of Qantara on the west side of the Ismailia-Port Said Highway, which apparently receives its water via one diversion, seems too substantial to abandon; but the more ad hoc, dispersed farming in the strip area east of the highway may lose all or part of its irrigation water. If no diversion structures are rebuilt, some 300-500 fd of agriculture in the strip will be lost. Assuming 5 fd per household, 60-100 farm families would be affected.

Without irrigation, the 300-500 fd in the highway-to-railroad strip would revert to desert, sabkha, and wetland, depending on location and drainage. Many present agriculture-oriented wildlife species would be displaced.

Of lesser magnitude, farms along the Qantara bypass road may suffer some disruption of water delivery during construction where the route crosses irrigation canals and pipes. We assume that, as with construction of the bypass road, the irrigation system will be returned to its original function.

Concern was expressed at the Scoping Meeting that laying the pipeline around Qantara along the new ring road would constrain the city's growth. It should not constrain it in the sense of limiting population growth, but it could distort the settlement pattern. Without the pipeline, the new ring road would attract commercial development and housing to both its shoulders, much like a beltway around a larger city. The pipeline could distort this growth pattern by making access to and development of the west shoulder more difficult. Without mitigation, this would rank among the most adverse impacts of the proposed action.

Besides farmland loss, many facilities and obstacles lie in or near the proposed route, including: housing, military fortifications and camps, three Suez Canal signal stations, poultry farms, and greenhouses (See Section 3.4.1 and Appendix D). The extent of disruption will depend on the pipeline and right-of-way width. Field surveys indicate that the mounded-hill military fortifications and small farmhouses are the most numerous structures directly in the pipeline route. The Suez Canal signal stations, and most of the poultry farms and greenhouses appear to have adequate clearance, at least for a 15-20 m pipeline and right-of-way.

4.3 No-Action and Conservation Alternative

The no-action alternative would avoid--for the moment--most of the negative impacts of building and operating a pipeline or lining the Sweetwater Canal, though at the cost of daily inconvenience to the nearly 500,000 residents of Port Said for whom ample potable water no longer would be a certainty. No-action, coupled with water conservation would likely have the fewest environmental impacts. More detailed study probably would find delaying construction and a 5-10 year water conservation program more cost effective than a $58 million pipeline.

Inevitably, a pipeline must be built if Port Said continues to grow and desalination does not become cheaper. Choosing the no-action alternative is really a matter of choosing to postpone for a few years pipeline or canal lining construction. Since the Ministry of Development through NOPWASD has committed itself to building a pipeline, the no-action alternative and conservation are options only in the abstract.

4.4 Lining the Sweetwater Canal

The direct impact to the physical environment of lining the Sweetwater Canal is losing the sometimes copious vegetation growing in the canal and on its banks (Appendix C, photo 8). With Lake Manzala's 200,000 fd, the area north of Qantara does not lack for freshwater aquatic habitat; but the Sweetwater Canal probably offers a slightly less brackish habitat than the lake. Its loss might have some small impact on bird species that migrate through the Suez Canal region. This effect on species numbers and distribution should be minor at worst, given the small share of the Suez Canal region's freshwater habitat that is the Sweetwater Canal. Although small and minor, these adverse impacts would be greater than from leaving the Sweetwater Canal unchanged and building a pipeline.

Other animal species now found in and along the Sweetwater Canal are common elsewhere, so significant adverse impacts on them are not expected.

NOPWASD and the Port Said Governorate are no longer seriously considering lining the Sweetwater Canal because of potential technical problems and the SCA's opposition to widening the canal. From an environmental standpoint, this alternative ranks second in fewest adverse impacts behind no-action and conservation. Loss of riparian habitat and adverse effects on waterfowl would be minor in the regional context, while the adverse effects on agriculture and other human activity--important for all alternatives involving a pipeline--would be almost nil.

As discussed in Section 2.3.2, canal lining must be done in a way that does not interrupt Port Said's water supply. Even short breaks in supply would be disastrous for the city since it lacks water storage capacity.

Irrigation via the Sweetwater Canal's many diversion structures probably would be disrupted during lining construction. Irrigation would be interrupted permanently should the diversion structures not be rebuilt. Impacts to the human environment would be negligible, if irrigation from the Sweetwater Canal north of Qantara is preserved. If it were not, 300-500 fd of irrigated land would be lost and 60-100 farm families adversely affected.

4.5 Alternative Pipeline Routes

4.5.1 Qantara Area

Qantara officials have proposed two routes as alternatives to the proposed action of laying the pipeline along the new bypass road: one along the Riyah Canal (Alternative Route B), and the second (Alternative Route A), further west along the North Ismailia Drain (Figure 2-3, and Appendix A, Attachments C and D). Both then follow the southern edge of the Lake Manzala barrier and join the Ismailia-Port Said

Highway about 3 km north of Qantara. The EA study team has identified a third route, Alternative Route C: north directly through Qantara along the Sweetwater Canal.

A preliminary site tour along the Riyah Canal found the area to be about as densely settled and farmed as along the bypass road. A narrow one-lane road runs directly along the Riyah Canal; in places, houses abut directly onto the road. Putting the pipeline along the east shoulder of the Riyah Canal would require widening this small road and cost some housing. In the absence of more complete data, the advantage to this route simply may be spreading among rural landholders the adverse impacts from infrastructure construction in the Qantara area. Those along the 5-km bypass road already have lost land for the dubious gain of a very busy, noisy thoroughfare. The study team was unable to tour the area of Alternative Route A, along the North Ismailia Drain. Both routes entail more pipe and higher costs than the proposed action.

A preliminary tour along the Sweetwater Canal from the proposed pump station site to the north edge of Qantara found few obvious obstacles to Alternative Route C, i.e., building the pipeline adjacent the Sweetwater Canal from the outset. One obstacle (housing) has been recorded by the contractor (Appendix D, No. 1), but much of the needed land through town is nonagricultural and undeveloped. Some agriculture does occur along the Sweetwater Canal in the roughly 1 km between the pump station and the point where the Sweetwater Canal joins the Suez Canal service corridor, and again at the north end of town.

Table 4-1 compares the impacts to the human environment in the Qantara area of the proposed route and the three alternative routes. Alternative Routes A and B, proposed by Qantara officials, avoid the adverse effects of the proposed action's route on urban development, but at the cost of more agricultural land and housing. A preliminary site tour suggests that Alternative Route C has the fewest adverse impacts, since it parallels existing barriers to access and urban development--the Sweetwater Canal and rail line--and requires little land now in agricultural use.

4.5.2 North of Qantara

The main alternative route north of Qantara is putting the pipeline on the west shoulder of the Ismailia-Port Said Highway. This side of the road is much less developed than the east side, probably because of the more ready availability of irrigation on the east side. The main obstacles are: roads, such as the roads to Dahr El Gebel and Bahr El Bakr; the El Salaam Canal; and the fish farms just south of Port Said. Whereas with the proposed route the El Salaam Canal will pass by tunnel under the water pipeline on its way under the Suez Canal, putting the pipeline on the west side of the highway means that the pipeline must do the crossing. Housing occurs at a few locations on the west side of the road, such as at the junction of the road to

Table 4-1. Qantara Area: Comparison of the Effects on the Human Environment of the Proposed Route and Alternative Routes around Qantara.

	Alternative Route			Proposed
	A	B	C	Corridor
Loss of Agriculture[a]	13 km	10.7 km	<5.1 km	6 km
Loss of Housing	unk[b]	yes	no	no
Constraints on Urban Development	no	no	no	yes

a: Length of corridor; percent of length occupied by agricultural land is approximately 100% for all but Alternative Route C.

b: Unknown; route has not been surveyed.

Dahr El Gebel 4 km north of Qantara, at the El Kab signal station, at the ambulance station 23 km north of Qantara, and at the police compound just south of Port Said. As with the proposed route, the final 3-5 km to the Raswa water treatment plant are congested with agriculture, housing, and other facilities.

More of the west side is or was wetland, so more wetland potentially would be lost with this route compared to the proposed route. Much of the wetland on the west side has already been drained, however, and very little vegetated wetland remains in the pipeline corridor along the highway embankment. The total effect on the physical environment still would be small since the loss would be a minuscule fraction of the area's total remaining wetland.

As with the preferred action, about 275 fd will be lost to other uses, but the fraction that is being cropped presently is much smaller.

Putting the pipeline near the highway could eliminate the need for a service road, saving both money and land.

Another possible advantage of putting the pipeline on the west side of the Ismailia-Port Said Highway is fewer impacts in the crowded final 3-5 km just south of the Abu Raswa Water Treatment Plant. The Suez Canal Authority has expressed a desire that the railroad and Sweetwater Canal be relocated out of the service corridor from the point of the bypass channel north. Locating the pipeline on the west side of the highway would be consistent with this wish.

4.6 Alternative Pump Station Sites

In the case of all proposed pump stations sites, the same amount of agricultural land would be lost. Thus, there is no difference in impact between pump station sites. The logic behind considering alternative pump station sites is not reducing the station's direct impacts, which should be modest, but reducing the amount of land lost to the pipeline in the Qantara area. Qantara officials have proposed two pump station site alternatives tailored to their alternative routes (Figure 2-3). In both cases, these sites entail longer pipelines (Table 4-1).

Two other alternative pump station sites that would reduce the pipeline impact merit noting. The first is at the junction of the Sweetwater Canal with the Suez Canal service corridor. The pipeline would proceed from that point adjacent the railroad north through Qantara, and then on either the east or west side of the Ismailia-Port Said Highway to Port Said. The second is along the Sweetwater Canal north of the city near the point where the bypass road rejoins the highway.

CHAPTER 5

5.0 MITIGATION

The adverse effects of the proposed project are mainly on the human environment, but they are reducable through mitigation. The most important adverse impacts are: loss of agricultural land, destruction and impairment of buildings and other structures, and distortion of development along the Qantara bypass road. These effects can be reduced through: compensation, modifications in project design, construction sensitive to reducing temporary adverse impacts, selection of an alternative route, proper pipeline maintenance, contingency planning for pipeline rupture, and water conservation.

5.1 Compensation

Probably about 300 fd will be occupied by the pump station, pipeline, and right-of-way, the exact amount depending on final design. The main concern expressed by those likely to be affected is compensation.

The Government of Egypt has procedures for compensating those displaced when it exercises emminent domain. It has guidelines for valuing land and structures. An example familiar to those in the project area is construction of the Qantara bypass road, for which a compensation committee was established to determine and settle claims.

Compensation for the proposed project should cover:

- land loss;
- land use impediment and easements;
- structure damage and loss;
- irrigation water loss; and
- crop production loss.

The above are standard, but some items are more important in Egypt than elsewhere. Compensation should include crop loss where construction temporarily disrupts irrigation water delivery. If the proposed action does not include rebuilding the irrigation diversion structures that carry water from the Sweetwater Canal under the railroad, then compensation should be paid to the affected farmers. Compensation could be either cash or agricultural land elsewhere, such as new land developed in conjunction with the nearby El Salaam Canal.

The tenure of those occupying the strip north of Qantara between the Ismailia-Port Said highway and the railroad may be less than full, since, in theory, the Suez

Canal Authority enjoys a 3-km right-of-way on either side of the Suez Canal. Over the years, though, the SCA has formally recognized and informally tolerated use of land in the right-of-way. Care should be taken to recognize usufruct tenure of those losing land in the strip, particularly small farmers.

Compensation should be timely, and the procedures streamlined as much as possible.

5.2 Design and Construction

Adverse impacts can be reduced by making the strip occupied by the pipeline, service road, and right-of-way as narrow as possible. If the pipeline can be positioned directly adjacent the railroad and Qantara bypass road, doing so should be considered. If the pipeline is built on the west side of the highway north of Qantara, a service road should be superfluous. If the railroad authority requires a space between the pipeline and rail line, then the service road might be put in this buffer instead of on the pipeline's far side as present drawings call for (Figure 2-4). The main reason for rights-of-way is shielding the pipeline from vehicle and, conceivably, train damage. Other safeguards that use less land--berms, guardrails, or a thicker pipeline cover--deserve study.

The 1.5 m pipeline, which will be nearly 3 m high with its sand cover and cap (Figure 2-2), will not be easily gotten over on foot and expensive to bury under crossroads. Without crossing points, the proposed 5 km of pipeline on the west shoulder of the Qantara bypass highway will constrain westward access from the highway and distort land development along that shoulder. In this and other areas where people live, pedestrian cross points should be built, probably at least every 500 m. Vehicle crossing points will be required to make the Qantara bypass highway accessible to those living on its west side and to permit future development on the far shoulder. The precise number of vehicle cross points should be determined from study of the local road network and the likely growth pattern of Qantara; at least one should be built on initial construction to serve immediate needs.

North of Qantara, a design that includes irrigation diversion structures from the Sweetwater Canal under the pipeline, service road, and right-of-way will avert the loss of 300-500 fd of irrigated land and dislocation of 60-100 farm families. Despite these obvious adverse effects, there are some gains to ending irrigation in the strip from the Sweetwater Canal, so the matter warrants more detailed study. Issues to consider include: development pressures on the highway's east shoulder (how much land will be soon converted to nonagricultural use), the SCA's wishes (it prefers that the pipeline not go into the service corridor), the potential for irrigating all or part of the strip with water from the El Salaam Canal, whether Port Said's potable water supply via the Sweetwater Canal will increase if irrigation is curtailed, and the benefits from agricultural production versus the cost of reconstructing the diversions.

The use of impact-sensitive construction methods can reduce temporary adverse impacts from the construction itself. The contractor should try to avoid unnecessary and overlong disruptions of agriculture, such as by cutting off irrigation water supply. Workers should be alert in general for archaeological finds, but particularly at the pipeline road crossings and other points where it is buried.

5.3 Alternative Routes

Adverse impacts from the proposed route around Qantara appear sufficiently greater than those of at least one alternative route (Alternative Route C, Figure 2-3), thus, NOPWASD should consider reviewing options for pipeline routes. If possible, putting the pipeline along the Qantara bypass road should be avoided because of the loss of agricultural land, disruption of traffic patterns, and distortion of development it causes in this increasingly busy area. Qantara officials have proposed alternative routes that have the advantage of locating the pipeline in less busy areas, but at higher cost and still entailing loss of agricultural land and housing (Figure 2-3). Other options should be studied, including putting the pump station north of Qantara; or, if it must be south of town, laying the pipeline adjacent the Sweetwater Canal from the outset.

North of Qantara, the proposed action's route adjacent the railroad is unpopular in several quarters. By cursory study, it faces more obstacles and causes more disruptions than the main alternative: putting it on the west side of the highway. The tradeoffs of these two options should be reweighed.

5.4 Operation

The main likely adverse impact during operation is flooding from a rupture. Minimizing possible adverse impacts from this threat involves training of pump station operators, periodic inspection and maintenance of the pipeline, fitting the pipeline with pressure-sensitive shut-off valves at frequent intervals, and standby emergency repair procedures.

5.5 Conservation

The expense of expanding its potable water supply and the adverse impacts of constructing new facilities can be reduced by instituting a program of water conservation.

REFERENCES

CAPMAS Population Studies and Research Center. 1989. Infant and Child Mortality Rates in Egypt 1980-87. Cairo, Egypt.

CMC. 1989. Canal Cities - Phase II Project Population and Flow Study. Prep. for NOPWASD, Cairo, Egypt.

CMC. 1990. Proposed Action Plan for Port Said Raw Water Supply Facilities. Prep. for NOPWASD, Cairo, Egypt. (May 1990)

Dames & Moore. 1985. Sinai Development Study. Prep. for the Egypt Ministry of Development, USAID Grant No. 263-0113.

_____. 1990a. Environmental Assessment for the City of Ismailia Wastewater Treatment Plant. Prep. for NOPWASD, Cairo, Egypt. (Draft, June 4, 1990)

_____. 1990b. Environmental Assessment for the City of Suez Wastewater Treatment Plant. Prep. for NOPWASD, Cairo, Egypt. (Draft, May 16, 1990)

El Easa, M., E.A. Imam, M. Faisal, and M.M. Ibrahim. n.d. Pathomorphological studies in *Tilapia* spp. infested with trematodes metacercariae in relation to pollution with domestic sewage in Manzala Lake. Faculty of Veterinary Medicine, Cairo University, Cairo, Egypt.

Euroconsult-Pacer Consultants. 1985. Land Master Plan. Prep. for GARPAD, Egypt Ministry of Agriculture and Land Reclamation, Cairo, Egypt.

Hazen & Sawyer. 1979. Port Said Water and Wastewater Master Plan. Ministry of Development, Cairo, Egypt.

Ibrahim, E.A. and M.A. Mahmoud. 1988. Case Study of Manzala Lake. Mimeo, International Council for Bird Preservation, Cairo, Egypt.

MacLaren Engineers, Planners & Scientists Inc. 1982. Lake Manzala Study. EGY/76/001-07, UNDP. Prep. for Egypt Ministry of Development, Cairo, Egypt.

Marx, H. 1968. Checklist of the reptiles and amphibians of Egypt. United States Naval Medical Research Unit Number Three, Cairo, Egypt.

Meininger, P.L. and W.C. Mullie. 1981. The significance of Egyptian wetlands for wintering waterbirds. The Holy Land Conservation Fund, New York.

Metcalf & Eddy. 1979. Ismailia Waterworks & Wastewater Facilities Master Plan. Prep. for Egypt Ministry of Development, Cairo, Egypt.

Mountfort, G. 1988. Rare Birds of the World. International Council for Bird Preservation. Collins, London.

NOPWASD. 1988. Minutes of a meeting between officials from NOPWASD, Railway Authority, Mokhtar Ibrahim Co., and Port Said Governorate. Held at NOPWASD, Cairo, Egypt.

NORCONSULT AS. 1981. Solid Waste Management - Suez Canal Region Feasibility and Design Study.

Reid, T. and J. Rowntree. 1982. The Northern Nile Delta Lakes and Their Fisheries. USAID-Egypt Ministry of Agriculture Agricultural Development Systems Project, Economics Working Paper No. 90, Cairo, Egypt.

LIST OF PERSONS CONTACTED

Awad, Isam Mohamed. Farmer, Port Said. Meeting, 21 June 1990.
Bayoumi, Mohamed Ahmed. Farmer, Qantara. Meeting, 20 June 1990.
El Al Hussein, Mohamed Abd. Farmer, Port Said. Meeting, 21 June 1990.
El Wafa Shahat, Abu. Farmer, Qantara. Meeting, 20 June 1990.
El Wafa Shahat, Mohamed. Farmer, Qantara. Meeting, 20 June 1990.
Hassan, Mahmoud Mohamed. Farmer, El Kab. Meeting, 21 June 1990.
Khalil, Mrs. Khalil Mohamed. Farmer, Port Said. Meeting, 21 June 1990.
Khalil, Shoukry Yusef. Farmer, Qantara. Meeting, 19 June 1990.
Noor, Mohamed. Chairman of Cooperatives, Qantara. Meeting, 20 June 1990.
Salemy, Ahmed Mohamed. Farmer, Qantara. Meeting, 20 June 1990.

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APPENDIX A

SCOPING REPORT

SCOPING REPORT
ENVIRONMENTAL ASSESSMENT OF A NEW POTABLE WATER SUPPLY LINE AND PUMP STATION FOR PORT SAID

Government of Egypt-United States Agency for International Development: Canal Cities Water and Wastewater Project - Phase II

June 19, 1990

Port Said

INTRODUCTION

Egypt's National Organization for Potable Water and Sanitary Drainage (NOPWASD), in association with the United States Agency for International Development (USAID), is proposing to expand the potable water supply facilities for the City of Port Said. The proposed facilities include a new pumping station located immediately south of Qantara, and a new pipeline from the pumping station to the existing water treatment plant at Port Said. The proposed facilities will supplement the Port Said Sweetwater Canal, whose capacity is no longer large enough to meet the needs of the growing city. NOPWASD, a unit of the Ministry of Development, New Communities, Housing and Public Utilities, is responsible for building the new pipeline and pump station. After completion, it will be operated by the Port Said Governorate.

The proposed pipeline and pump station is one element of Phase II of the Canal Cities Water and Wastewater Project, partially funded by USAID. Phase II continues more than a decade of effort to rehabilitate the Canal Cities' war-damaged water and wastewater systems, and expand these systems to serve future urban growth of this important region. The potable water component of Phase I upgraded and expanded delivery of safe drinking water. Phase II includes funds for expanding Port Said's potable water delivery system.

Phase II construction and related activities are being managed for NOPWASD and USAID by Construction Management Consultants (CMC), a team supplied through a joint venture of the firms Black & Veatch International and James M. Montgomery of the United States, in association with Sabbour Associates of Egypt. Dames & Moore International serves as a subcontractor to the CMC, and bears responsibility for environmental, geotechnical, and related studies.

In 1987, the Ministry of Development, New Communities, Housing, and Public Utilities issued Ministerial Decree No. 76 designating the Mokhtar Ibrahim Contracting Company to be the design-build contractor for a new Port Said water pipeline and

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pumping facilities. Preliminary designs have been produced by Mokhtar Ibrahim's subcontractor, Utilities Consulting Engineering Bureau.

NOPWASD, the Suez Canal Authority, and USAID tentatively agree with designs for a pump station at Qantara that lifts water from the Port Said Sweetwater Canal and pumps it through a single 1500 mm pipe approximately 50 km to Port Said. For the most part, the pipeline will be above ground, built on a raised gravel bed. Engineering studies over the years have considered other options for increasing Port Said's water supply, most of which involve expanding and lining the existing Sweetwater Canal. After review, the contractor, consultants, and authorities agree that for the next 10-15 years Port Said's water should be provided by the unlined Sweetwater Canal augmented by a single 1500 mm pipeline. In the longer term, the Sweetwater Canal would be closed and Port Said's water conveyed entirely by pipeline.

Augmenting Port Said's water supply by the proposed pipeline will benefit the residents of Port Said. Their water supply will be assured for the coming years, and the inconvenience, as well as adverse health effects, of a water shortfall will be avoided. Nevertheless, construction of the new pipeline may have some environmental impacts along its 50 km route from Qantara.

NOPWASD, in association with USAID, is conducting an Environmental Assessment of Port Said's proposed new potable water pipeline and pump station. The Environmental Assessment (EA) will be conducted with the assistance of Dames & Moore International. An Environmental Assessment (EA) provides decision-makers with information concerning: existing environmental conditions, potential environmental impacts of the proposed project's construction and operation, possible mitigating measures, monitoring programs, and opportunities for environmental enhancement.

As part of preparing the EA, a scoping meeting was held in Port Said on June 19. The meeting's purpose was to bring together all parties with an interest in Port Said's proposed new potable water pipeline to assist NOPWASD and USAID in identifying environmental issues that should be addressed by the Environmental Assessment Study Team. Participants were invited to voice their concerns, questions, and comments regarding technical and environmental aspects of the planned raw water supply facilities. Participants were further invited to submit comments in writing to the CMC by July 7. This scoping report summarizes oral and written comments received for the Port Said potable water supply project EA. It provides a work plan based in part on these comments, and a tentative outline for the EA report. A list of scoping meeting attendees is attached.

PROJECT DESCRIPTION

Background

In 1988, Port Said's Abu Raswa potable water plant produced an average of 125,000 cubic meters/day (cmd) with a peak daily production of approximately 156,000 cmd. This plant provides water service for the cities of Port Said and Port Fouad. The combined 1988 population of these two cities is roughly 426,000. Approximately 80 percent of this total population is provided with full water service, and this portion of the population consumes potable water at an approximate average rate of 240 liters per capita per day (lcd). The remainder of the total water consumption is attributable to public water fountains, industrial users, and losses, which include wash water at the plant.

A medium-expectation projection shows the city's population growing to 714,000 by the year 2005. The average year-2005 potable water demand is forecast at 256,000 cmd, with a peak demand of 320,000 cmd. Since the Sweetwater Canal has a capacity of only 150,000 cmd, Port Said will be unable to continue to consume potable water at the same rate without a new source of supply.

Port Said apparently uses water at a comparatively high per capita rate for a city with few "wet" industries. Precise explanations are lacking, but probably include "wastage" from leaky faucets, toilets, and distribution lines, and the possibility that the actual number of people present and using water in the city on many days is much higher than the official population.

Design Parameters

The proposed pipeline will be 1500 mm in diameter with a capacity of 170,000 cmd. The pump station and pipeline right-of-way will be designed for a future capacity of 400,000 cmd.

The proposed pump station will be located adjacent the Port Said Sweetwater Canal just south of Qantara near the start of the new Qantara bypass road. The pipe will be positioned on a raised gravel bed about 8 m wide and covered. Alongside it will be a single-lane service road 6 m wide. The total required right-of-way will be about 15 m wide.

The pipeline will travel adjacent the new Qantara bypass road until the road rejoins the main Port Said highway, the "Moahada" Road. It will then pass under the highway and continue to Port Said along the western edge of the Suez Canal service corridor next to the rail line. This service corridor now contains from east to west: the Suez Canal service road, the Sweetwater Canal, and the railroad.

ENVIRONMENTAL CONSIDERATIONS

Impacts from the proposed pipeline will stem mainly from occupation of land by the 15 m wide right-of-way over the roughly 50 km route. Along the 4 km Qantara bypass road, this land is almost entirely in intensive agricultural use. Military facilities also lie in the proposed right-of-way along the ring road near the southern end. North of Qantara, a 100-300 m strip of land lies between the main Moahada highway and the Suez Canal service corridor. Despite high groundwater and heavy saline soils, about one-third of this strip is cropped. Cropping is most intensive in the first 15 km north of Qantara. The irrigation water appears to come mainly from the Sweetwater Canal via diversions under the rail line. Poultry farms, housing, warehouses and military facilities can also be found in this strip of land, some built to the edge of the rail line. Agricultural use of the 15-m wide right-of-way will be lost, and other land uses will require adjustment. Should the authorities deem that irrigation of the land between the highway and pipeline right-of-way be preserved, then irrigation delivery structures will have to be built under the new pipeline. Otherwise, irrigation from the Sweetwater Canal north of Qantara will largely cease since the new construction will block existing irrigation structures.

Building the pipeline will cause some changes in the total area of wetland with some effects on plant and animal communities. If cropping of the strip north of Qantara between the highway and right-of-way ends, the land will revert to desert, salt marsh, and lake.

To some extent, the impacts of expanding both water supply and treatment systems can be lessened by reducing losses and wastage. Conservation is one alternative to the proposed project, but not a practical one given the immediacy of Port Said's water problem. In the longer term, conservation may prove an effective way to reduce the need for expanding water supply capacity.

COMMENTS RECEIVED

Several participants at the scoping meeting offered comments relevant to the scope of the EA. The following briefly summarizes these comments.

Oral Comments

- Concern was expressed about the loss of agricultural land to the 15 m wide pipeline right-of-way, about compensating the farmers, and about maintenance of irrigation water delivery to the unaffected areas.

- Qantara officials stated that its positioning along the bypass road will "constrain" the city's expansion.

- It was stated that the sweetwater canal irrigates about 2,000 feddans north of Qantara, and that in the future water could be delivered to these areas by the El Salaam Canal.

- The validity of tenancy of farmers to the land between the Port Said highway and the railroad north of Qantara was questioned. This land apparently falls within the 3 km buffer zone on either side of the Suez Canal and belongs to the Suez Canal Authority.

- The proposed pipeline route was objected to by other commenters for a variety of reasons in addition to the loss of agricultural land. Most favored putting the pipeline west of the highway.

- The Suez Canal Authority said it was requesting relocation of both the railroad and sweetwater canal from km 18 north (the beginning of the Port Said bypass channel).

- Several comments were made expressing concern about O&M of the pipeline and pump station, and about managing accidents that might disrupt flow through through the pipeline.

- Complaints were voiced about the difficulty with maintaining the sweetwater canal, and expressing a desire to convert entirely to supplying Port Said's potable water by pipeline.

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Written Comments

The mayor of West Qantara sent the attached memorandum to the chairman of NOPWASD expressing concern about the effects of the proposed pipeline route on the development of West Qantara. It proposed two alternative routes (Attachment C).

Summary

Based on preliminary analysis by the EA study team and comments received at the scoping meeting and after, the following appear to be issues of main concern:

- loss of agricultural land, housing, and other structures to the pipeline right-of-way;
- compensation to farmers and others for loss of land and other property to the pipeline right-of-way; and
- identification of alternative routes for the pipeline that have fewer adverse impacts particularly to the human environment.

WORK PLAN

A tentative outline of the EA is attached. The detail at which the points will be addressed is partly determined by comments received in the scoping meeting.

The work plan includes tours of the proposed pipeline route and alternative routes by a biologist and an agriculturalist. Interviews will be made with officials from the involved agencies: NOPWASD, USAID, offices of the Port Said and Ismailia Governorates, local offices of the Ministries of Agriculture and Land Reclamation (MALR), and Public Works and Water Resources (Irrigation), and the contractor Mokhtar Ibrahim Company. In addition, farmers and residents along the proposed pipeline route will be interviewed. Relevant documents, maps, and diagrams will be collected in Egypt.

LIST OF ATTACHMENTS

A - LIST OF ATTENDEES

B - TENTATIVE OUTLINE OF ENVIRONMENTAL ASSESSMENT REPORT

C - CORRESPONDENCE BETWEEN QANTARA OFFICIALS AND NOPWASD

D - MINUTES OF A MEETING BETWEEN QANTARA OFFICIALS AND NOPWASD

ATTACHMENT A
LIST OF ATTENDEES

NAME	POSITION
Port Said Governorate	
General Samy Khodier	Governor
Aly Magayery	General Secretary
Farouk Ismail	Agriculture Dept.
Mohamed El Naba	Environment Dept.
Ahmed H. Abdel Razek	Environment Dept.
El Sayed M. Shafik	Environment Dept.
Rushdy Zenou	Wastewater Dept.
El Dosoky Abd El Hakim	Wastewater Dept.
Alaa Abdel Rehim	Wastewater Dept.
Hossam Abdel Hady	Health Dept.
Fouad Said	Economic Development Dept.
Abdel Mounem Kassam	Utilities Dept.
Mohamed Khodier	Land Planning Dept.
Fayza Momtaz	Land Planning Dept.
Ezzidin Abu Summra	Port Fouad District
Aly El Atawy	Parliament Member
Hassan Ahmed	Parliament Member
Ministry of Development, Housing, and New Communities	
Abdel Salam Awad	Undersecretary
Mohamed Abdel Haleem	Port Said Dev. Zone
Mostafa Sharoush	Port Said Dev. Zone
Abdel Mouniem Ayoub	GOPP Ismailia
Mohamed Ibrahim	GOPP Ismailia
General Abdel Moniem El Katory	Sinai Dev. Authority
NOPWASD	
Mahmoud Abdel Haleem A. Aal	Chairman
Alia El Gebaly	Head, Design Dept.
Mostafa Sharaf	Head, Implementation Dept.
Mohamed Negm	Head, Research & Studies
Said Momtaz	Design Dept.
Said Helal	Design Dept.
Aly Seleem	Design Dept.
Aly Hussein	Implementation Dept.

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Samira Nekola	Research Dept.
Mohamed Mostafa	Research Dept.

Suez Canal Authority

Abdel Aziz Basyouni	Head, Works Dept.
Hany El Bonn	Works Dept. Port Said
Mohamed El Kholy	Water Dept. Port Said

Ministry of Public Works and Water Resources

Artin Haleem	Undersecretary
Abdel Galil Semeda	Gen'l Mgr. East Delta
Mohamed Fathy Ahmed	Ismailia Irrigation Dept.

Suez Canal University

Ahmed Dewedar	Vice President
Abdel Fattah Mohamed	Deputy of Dean

Municipality of West Qantara

Saad Ahmed Hussein	Mayor
El Said El Shahat	Deputy Mayor
Fawazy Fahmy	Agriculture Dept.
Ahmed Mohamed	Local Council
Shoukry Yousef	Local Council
Mohamed Tawfik Hamam	Local Council
Mohsen Ahmed Bayoumy	Local Council
Mohamed El Daidamony	Local Council

USAID

John Saccheri
Peter Downs
Medhat Wissa

CMC

David Williams	Manager
Harvey Van Veldhuizen	Environmental Specialist
Omar El Farouk	Deputy Manager
Mohamed Abdel El Fattah	Engineer
Mohamed Moustafa	Engineer

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Others

Aly El Hakim	Utilities Co. Engineer
Maher Khedr	Arab Contractors
Saadawy Aly	Arab Contractors
Mohamed El Tohamy	El Gumhuriya Newspaper

ATTACHMENT B
TENTATIVE OUTLINE
PORT SAID RAW WATER SUPPLY PIPELINE EA

Title Page
Table of Contents
Executive Summary

Introduction
- The Proposed Project
- Background
- The Environmental Assessment
- USAID Environmental Procedures
- Egyptian Environmental Procedures
- Methodology

Proposed Action and Alternatives
- Background
- The Proposed Action
- Other Alternatives

Existing Environment
- Introduction
- Physical Resources
- Biological Resources
- Human Resources

Environmental Impacts of the Proposed Action and Alternatives
- Impacts on the Physical Environment
- Impacts on the Biological Environment
- Impacts on the Human Environment

Mitigation Measures

References

List of People Contacted

Appendices

- A - Scoping Report
- B - Fauna of the Qantara-Port Said Area
- C - Site Photos
- D - Obstacles along the Proposed Route
- E - Archaeological Chance Find Procedures

ATTACHMENT C

To: Chairman of NOPWASD

Date: June 21, 1990

According to the scoping meeting held in Port Said on June 19 for the Environmental Assessment of the raw water project from Qantara to Port Said, we found that:

1. The proposed route will prevent any further extension of the city.

2. The width of the route is about 15 m. This means:

   A. A loss of 250 feddans of the best agricultural land.

   B. Destruction of houses in the route. This will cause housing problems, in addition to the high restitution that will be paid.

Thus, we suggest a committee to study the best solutions, and we suggest two alternative routes:

1. Starts from the Ismailia Sweetwater West Canal at Salheya Bridge, and passes along the Salheya Road until its intersection with the North Ismailia Drain. It then passes along this drain until Lake Manzala, then along the barrier of the lake until its intersection with the Ismailia-Port Said Road. The route then continues along the railroad line until Port Said.

2. Along the El Raya Sweetwater Canal, then along the barrier of Lake Manzala until the Ismailia-Port Said Road. The route then continues along the railroad line until Port Said.

These routings avoid closing the outlets from the Port Said Sweetwater Canal north of Qantara that irrigate about 2000 feddans in West Qantara.

We hope to set a date for a meeting in the Ismailia Governor's office to discuss this subject.

Signatures

Ismailia Local Council
Mohsen Bayyoumi
Shukri Khalil

Mayor of West Qantara
Saad Hussein

ATTACHMENT D

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MINUTES OF MEETING

DATE: Sunday, June 24, 1990

PLACE: NOPWASD Building

SUBJECT: The letter sent from representatives of West Qantara to NOPWASD concerning their complaint about the route of the raw water pipeline from Qantara to Port Said

ATTENDEES:

NOPWASD

Eng. Alia El Gebali	Head of Design Section
Eng. M. Negm	Head of Research Section
Eng. Said Momtaz	Director, Hydrological Design
Eng. Mohamed El Gohari	Engineer, Hydrological Design

West Qantara City

Eng. Saad Hussein	City Manager
Eng. Shoukri Youssef	Ismailia Local Council
Eng. Mohsen Bayyoumi	Ismailia Local Council

THE ATTENDEES AGREED THAT:

1. The West Qantara Council members would locate their two proposed alternative routes on maps, and send them to NOPWASD before July 10, 1990.

2. The two proposed alternative routes will be studied with the consultant of the project to find the best solution.

3. After study, a committee from the NOPWASD consultant and Council representatives will make a site visit.

Signatures

NOPWASD

West Qantara Representatives

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APPENDIX B
AUNA OF THE QANTARA TO PORT SAID, EGYPT AREA

Reptiles and Amphibians

The following are the reptile and amphibian known or expected at Port Said and its environs, with notes about their habitat requirements (sources: Anderson, 1988; Marx, 1968 and Baha el Din personal observations).

Turkish gecko *Hemidactylus turcicus.* Usually found in houses where it feeds of insects, but also lives in rocky areas.

Natterer's Gecko *Tropicolotes steudneri.* This species inhabits flat open deserts with scattered vegetation where it hides under rocks.

Stenodactylus petrii. A gecko species which is highly adapted to the sand dune ecosystem. It is rather rare in Egypt and is known only from a handful of localities.

Pale Agama *Agama mutabilis.* This lizard species is an uncommon inhabitant of flat sparsely vegetated stony desert and occasionally sandy desert.

Savign's Agama *Agama flavimaculata.* A widespread species of flat sandy desert and sand dunes.

Bosc's lizard *Acanthodactylus baskianus.* This is probably the most numerous reptile in Egypt. It inhabits a variety of habitats ranging from salt marshes to rocky desert and sand dunes.

Egyptian leopard lizard *Acanthodactylus pardalis.* A widespread species in the Egyptian deserts preferring sandy situations. It is reported on the sand bar west of Port Said.

Eyed skink *Chalcides ocellatus.* A sand dwelling species, usually found near dry agricultural areas and in semidesert often near water. This species is one of Egypt's most common reptiles.

Audouin's skink *Sphenops sepsoides.* A characteristic species of the sand dune ecosystem. It was commonly found at the site of the planned treatment plant on a field visit to the site on 8 April 1990.

Sandfish *Scincus scincus.* Highly adapted for living in soft sand, but is less widespread and common that the previous species.

Common chamaeleon *Chamaeleon chamaeleon.* A widespread species in the northern desers of Egypt. It lives in a variety of habitats with well-developed vegetation, including sand dunes.

Diademed sand-snake *Lytorhynchus diadema.* Characteristic of sand dunes and highly adapted for living in soft sand. It is widespread and recorded from various localities from Egypt, often found on barren sand sheets.

Diced water snake *Natrix tessellata.* A widespread aquatic snake found in most of the Nile Delta's wetlands, including Manzala. It can tolerate moderately saline wetlands. Feeds on small fish and frogs.

Montpelier snake *Malpoln monspessulanus.* An uncommon snake of Mediterranean coastal vegetation and scrub. Reported on the sand bar to the west of Port Said.

Clifford's snake *Spalerosophis diadema.* Inhabits semi deserts and well-vegetated rocky areas usually close to fresh water sources.

Sand viper *Cerastes vipera.* A species which is highly associated with the sand dune ecosystem. It is widespread and common in suitable habitats.

Loggerhead turtle *Caretta caretta.* A widespread, but declining, marine turtle in the Mediterranean Sea. It is known to nest on the sandy beaches of North Sinai, and are caught occasionally in fishing gear in the area. Carnivorous, feeding largely on jellyfish.

Green turtle *Chelonia mydas.* Less widespread and more vulnerable than the previous species. It is occasionally caught in fishing gear in the area, and is suspected to nest on Egyptian shores. Unlike the previous species it is restricted to sea weed beds where it feeds on marine vegetation.

Reuss's toad *Bufo regularis.* The most common and widespread amphibian in Egypt. At Ismailia it is found in agricultural land and gardens.

Mascarene frog *Rana mascareniensis.* Strictly confined to fresh water. At Ismailia it is found in agricultural areas in canals and in marshes.

Mammals

Following is a list of the known mammals of Port Said (sources: Osborn and Helmy, 1980; Baha el Din personal observations).

Hare *Lepus capensis.* Inhabits vegetated wadis and sand dunes, where it hides amongst vegetation and in burrows during the day time.

Greater gerbil *Gerbillus pyramidum.* A large Gerbil which prefers well vegetated areas. It is found regularly in palm groves and near cultivation.

Lesser gerbil *Gerbillus gerbillus.* A widespread inhabitant of the Egyptian deserts. Lives in sandy wadis where sand accumulates around bushes and shrubs.

Anderson's gerbil *Gerbillus andersoni.* A small gerbil, which inhabits sandy areas in palm groves and vegetated semidesert.

Pigmy dipodil *Dipodillus henleyi.* This small desert rodent lives in a variety of habitats including vegetated wadis, coastal marshes, cultivated areas and among rocks.

Silky jird *Meriones crassus.* Found in vegetated wadis and coastal areas.

House rat *Rattus rattus.* A common urban dweller, but also inhabits wetlands and coastal areas.

House mouse *Mus musculus.* A common urban dweller.

Fat sand rat *Psammomys obesus.* Inhabits saline soils and salt marshes with stands of succulent holophytic vegetation.

Egyptian spiny mouse *Acomys cahirinus.* The melanistic *A.c.cahirinus* is a widespread urban dweller, while several other desert subspecies are rock dwellers.

Bandicot rat *Nesokia indica.* Found in cultivated areas (the type locality is Shallufa north of Suez). It is found in damp localities and at the borders of saline lakes.

Lesser jerboa *Jaculus jaculus.* Lives in open sandy areas.

Red fox *Vulpes vulpes.* Lives in a variely of habitats ranging from well vegetated wadis and rocky desert to cultivated areas. At Ismailia it is largely found in the agricultural area and its border with the desert.

Egytian Mongoose *Herpestes ichneumon.* A widespread carnivore in the Nile Valley and Delta. It favors areas close to wetlands and often found near canals and wetlands.

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Birds

This is a list of the important and regularly recorded bird species of Port Said and its environs. Abbreviations indicate the status of each bird: **RB** = Resident Breeder; **MB** = Migrant Breeder; **WV** = Winter Visitor; **M** = Migrant.

Species	Status
Little grebe *Tachybaptus ruficollis*	RB+WV
Great-crested grebe *Podiceps cristatus*	WV
Cormorant *Phalacrocorax carbo*	WV
White pelican *Pelecanus onocrotalus*	M
Dalmatian pelican *Pelecanus crispus*	M
Grey heron *Ardea cinerea*	M+WV
Purple heron *Ardea purpurea*	M
Little egret *Egretta garzetta*	M+WV
Squacco heron *Ardeola ralloides*	M
Cattle egret *Bubulcus ibis*	RB
Squacco heron *Ardeola ralloides*	M
Night heron *Nycticorax nycticorax*	M
Little bittern *Ixobrychus minutus*	M (RB?)
Spoonbill *Platalea leucorodia*	M
White stork *Ciconia ciconia*	M
Black stork *Ciconia nigra*	M
Glossy ibis *Plegadis falcinellus*	M
Greater flamingo *Phoenicopterus ruber*	M
Shelduck *Tadorna tadorna*	WV
Mallard *Anas platyrhynchos*	WV
Wigeon *Anas penelope*	M
Teal *Anas crecca*	M+WV
Gargany *Anas querquedula*	M
Pintail *Anas acuta*	M
Shoveler *Anas clypeata*	M
Tufted duck *Aythya fuligula*	M
Pochard *Aythya ferina*	M
Ferruginous duck *Aythya nyroca*	M
Osprey *Pandion haliaetus*	M
Black kite *Milvus migrans*	M
Sparrowhawk *Accipiter nisus*	M
Steppe buzzard *Buteo buteo vulpinus*	M
Long-legged buzzard *Buteo rufinus*	M (WV?)
Marsh harrier *Circus aeruginosus*	M
Hen harrier *Circus cyaneus*	M
Kestrel *Falco tinnunculus*	RB+M
Quail *Coturnix coturnix*	M
Water rail *Rallus aquaticus*	WV (RB?)

Crane *Grus grus*	M
Moorhen *Gallinula chloropus*	RB+WV
Purple gallinule *Porphyrio porphyrio*	RB
Coot *Fulica atra*	M+WV
Painted snipe *Rostratula benghalensis*	RB
Black-winged stilt *Himantopus himantopus*	M (RB?)
Avocet *Recurvirostra avosetta*	M
Little ringed plover *Charadrius dubius*	M
Ringed plover *Charadrius hiaticula*	WV+M
Kentish plover *Charadrius alexandrinus*	B+WV+M
Kittlitz's sand plover *Charadrius pecuarius*	RB?
Greater sand plover *Charadrius lechenaulti*	WV
Grey plover *Pluvialis squatarola*	WV+M
Spur-winged plover *Hoplopterus spinosus*	RB
Timmincks's stint *Calidris timminckii*	M+WV
Little stint *Calidris minuta*	WV+M
Dunlin *Calidris alpina*	WV+M
Curlew sandpiper *Calidris ferruginea*	M
Black-tailed godwit *Limosa limosa*	WV+M
Bar-tailed godwit *Limosa lapponica*	WV
Redshank *Tringa totanus*	WV+M
Greenshank *Tringa nebularia*	WV+M
Marsh sandpiper *Tringa stagnatilis*	M
Common sandpiper *Tringa hypoleucos*	WV+M
Green sandpiper *Tringa ochropus*	WV+M
Ruff *Philomachus pugnax*	M
Snipe *Gallinago gallinago*	WV+M
Black-headed gull *Larus ridibundus*	WV+M
Mediterranean gull *Larus melanocephalus*	WV
Little gull *Larus minutus*	WV
Slender-billed gull *Larus genei*	
WV+M(+RB?)	
Lesser black-backed gull *Larus fuscus*	M+WV
Yellow-legged gull *Larus cachinnans*	WV
Armenian gull *Larus armenicus*	WV
Gull-billed tern *Gelochelidon nilotica*	M
Common tern *Sterna hirundo*	M
Caspian tern *Sterna caspia*	WV+M
Sandwich tern *Sterna sandvicensis*	WV+M
Little tern *Sterna albifrons*	RB+M
Whiskered tern *Chlidonias hybridus*	M
Balck tern *Chlidonias niger*	M
White-winged black tern Chlidonias leucopterus	M
Stock dove *Columba oenas*	WV
Turtle dove *Streptopelia turtur*	M (MB?)

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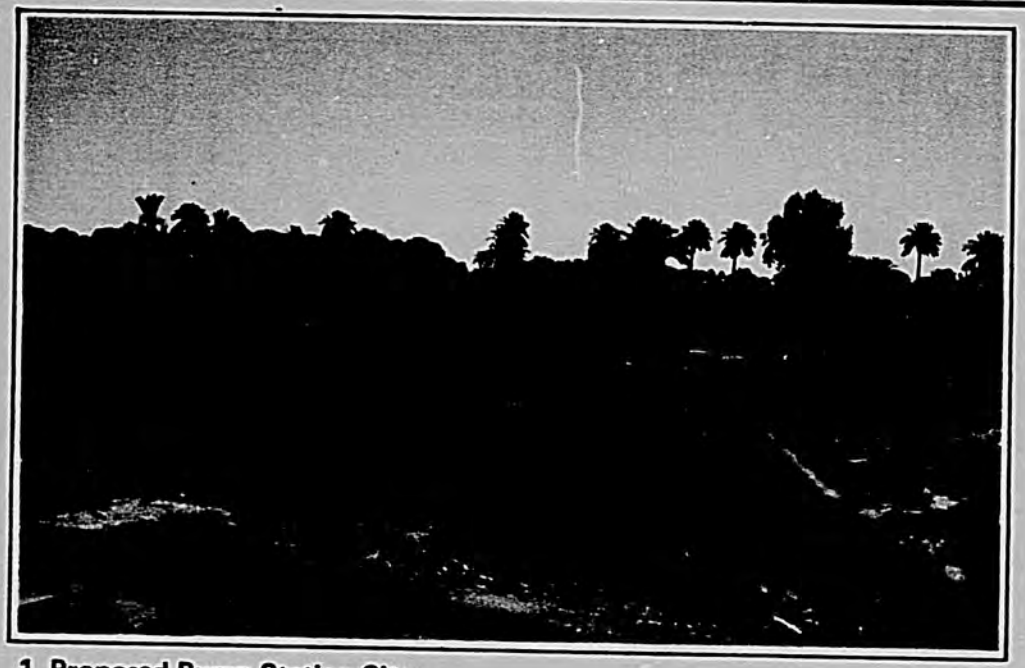
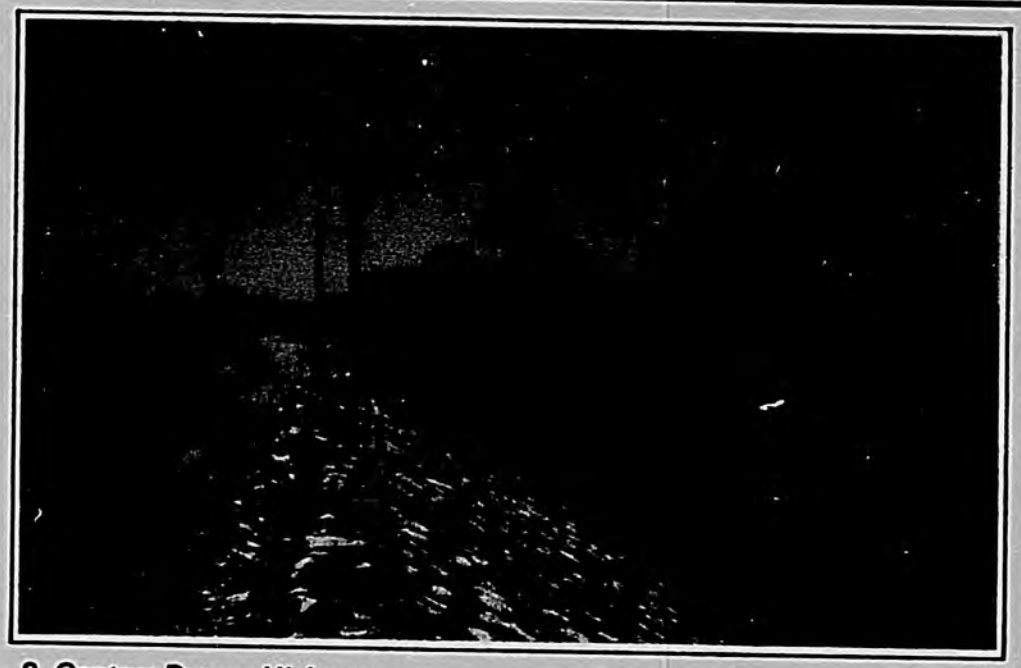
Palm dove *Streptopelia senegalensis*	RB
Barn owl *Tyto alba*	RB
Egyptian nightjar *Caprimulqus aegyptius*	MB?
Pallid swift *Apus pallidus*	M
Bee-eater *Merops apiaster*	M
Blue-cheeked bee-eater *Merops superciliosus*	M
Kingfisher *Alcedo atthis*	M
Pied kingfisher *Ceryle rudis*	RB
Hoopoe *Upupa epops*	RB
Short-toed lark *Calandrella cinerea*	M
Skylark *Alauda arvensis*	M
Crested lark *Galerida cristata*	RB
Swallow *Hirundo rustica*	RB+M
Sand martin *Riparia riparia*	RB+M
Meadow pipit *Anthus pratensis*	M
Red-throated pipit *Anthus cervinus*	WV
White wagtail *Motacilla alba*	WV
Yellow wagtail *Motacilla flava*	M
Bulbul *Pycnonotus barbatus*	RB
Red-backed shrike *Lanius collurio*	M
Reed warbler *Acrocephalus scirpaceus*	M
Clamorous reed warbler *Acrocephalus stentoreus*	RB
Fan-tailed warbler *Cisticola juncidis*	RB
Graceful warbler *Pirinia gracilis*	RB
Olivaceous warbler *Hippolais pallida*	MB+M
Lesser whitethroat *Sylvia curruca*	M
Sardinian warbler *Sylvia melanocephala*	WV
Chiffchaff *Phylloscopus collybita*	WV
Wheatear *Oenanthe oenanthe*	M
Isabelline wheatear *Oenanthe isabellina*	WV
Redstart *Phoenicurus phoenicurus*	M
Bluethroat *Luscinia svecica*	WV+M
Goldfinch *Carduelis carduelis*	RB
Linnet *Acanthis cannabina*	WV
Spannish sparrow *Passer hispaniolensis*	WV
House sparrow *Passer domesticus*	RB
Hooded crow *Corvus corone*	RB

APPENDIX C

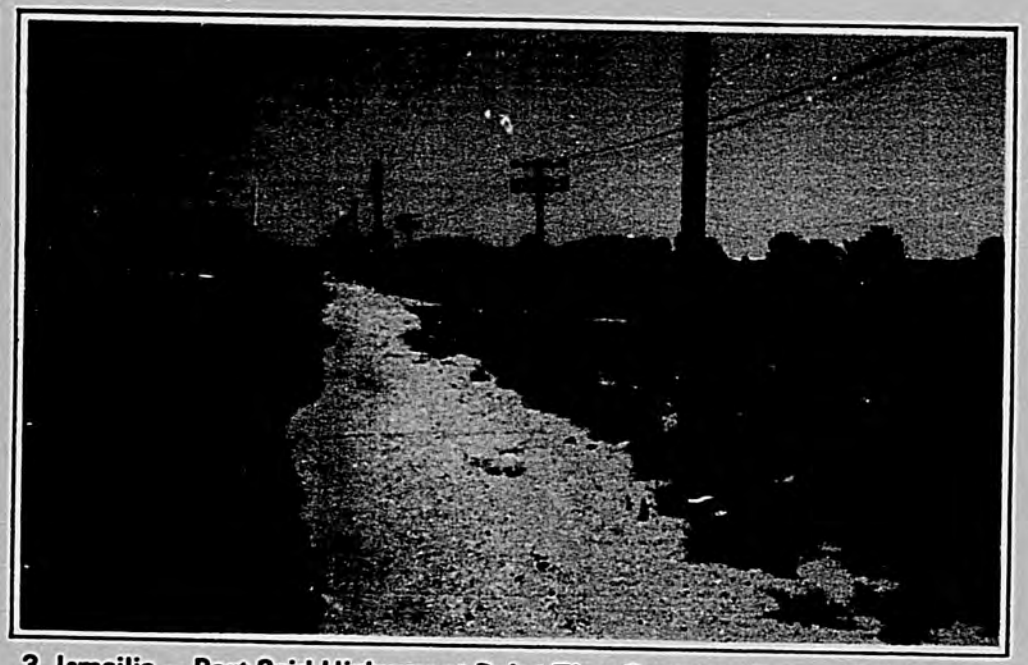
PHOTOS



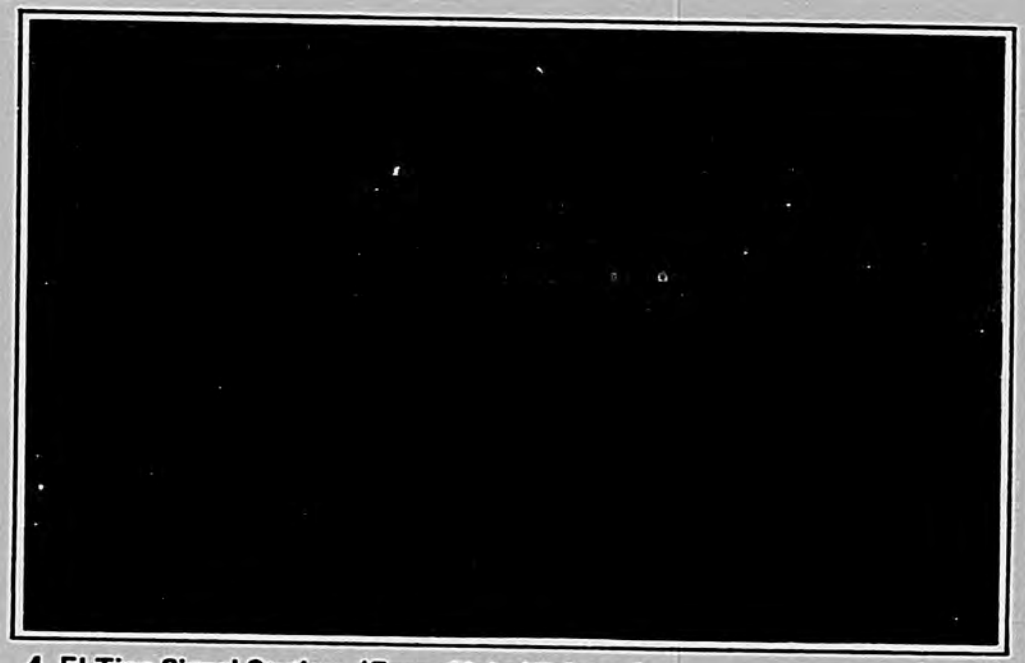
1. Proposed Pump Station Site.



2. Qantara Bypass Highway.



3. Ismailia — Port Said Highway at Point That Quantara Bypass Rejoins It.



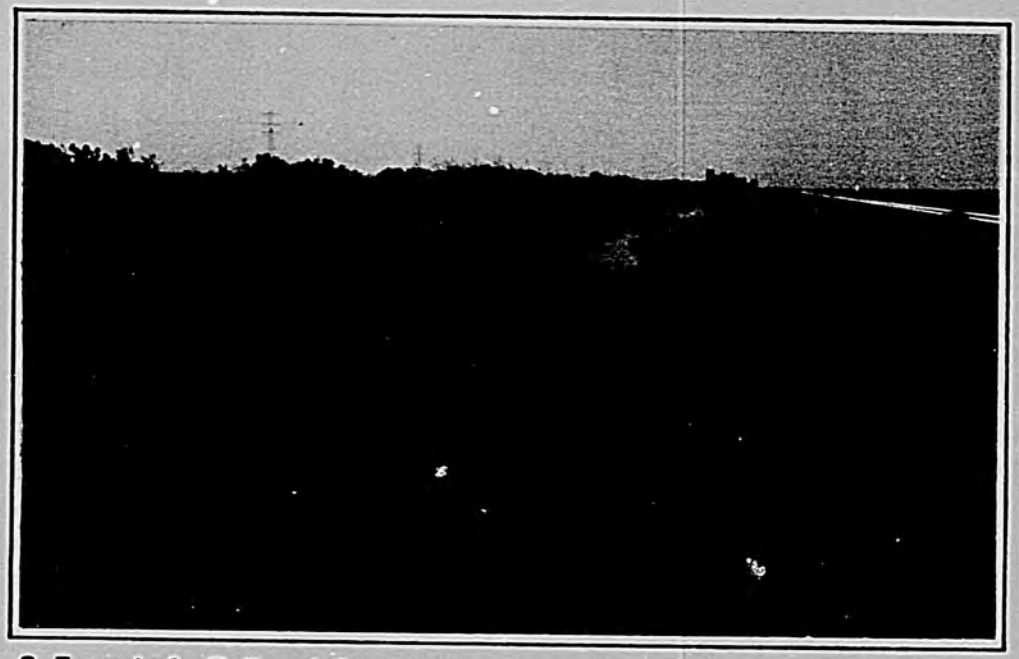
4. El Tina Signal Station. (From Main Highway)

Dames & Moore

5. Strip Between Ismailia — Port Said Highway and Railroad North of El Kab.

6. Strip Between Ismailia — Port Said Highway and Railroad Just South of Ismailia.

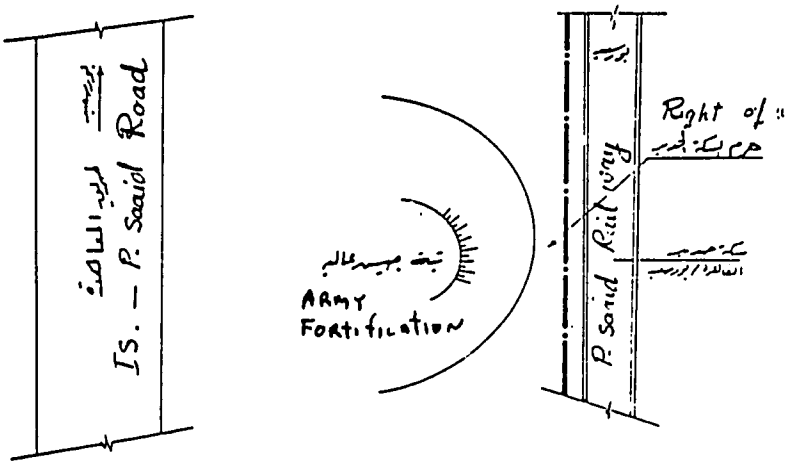
7. Irrigation Diversion Structure From Sweet Water Canal Under Railroad.



8. From Left: Railroad, Sweet Water Canal, Service Road, and Suez Canal.

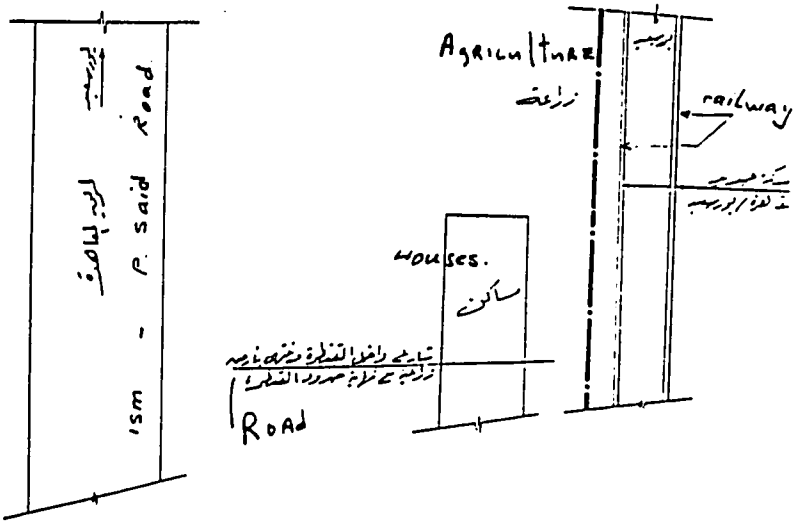
APPENDIX D

OBSTACLES ALONG THE PROPOSED ROUTE



Km. 4.50

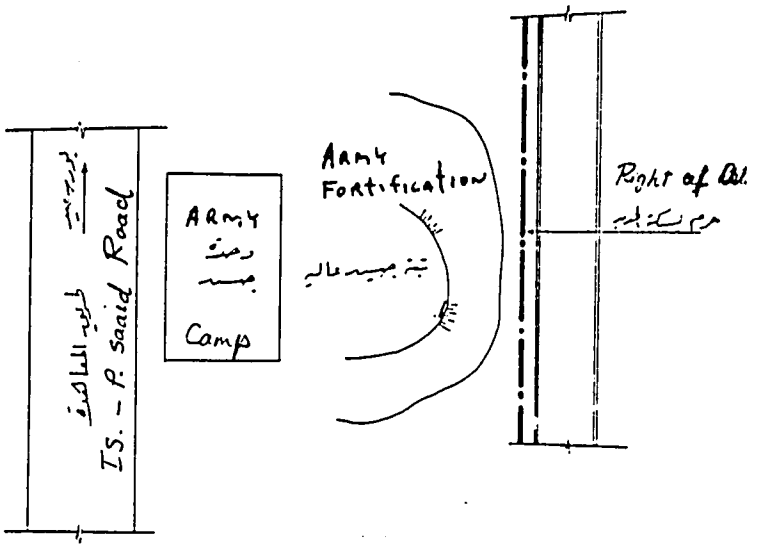
No. 2



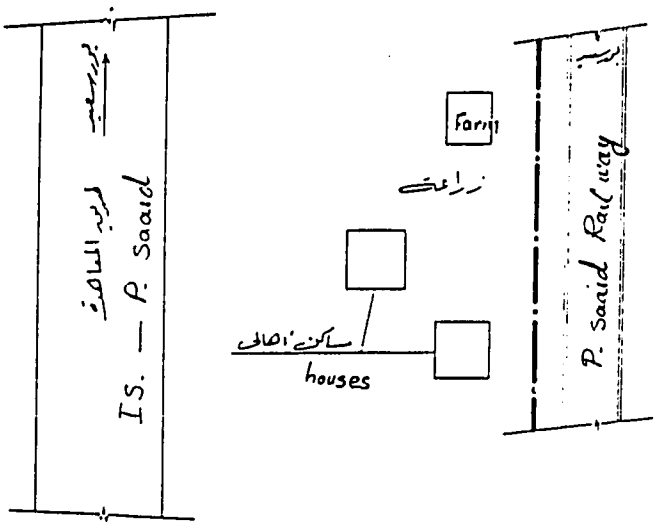
Km. 3.00

No. 1

138003
J&J COLUMBIA MD

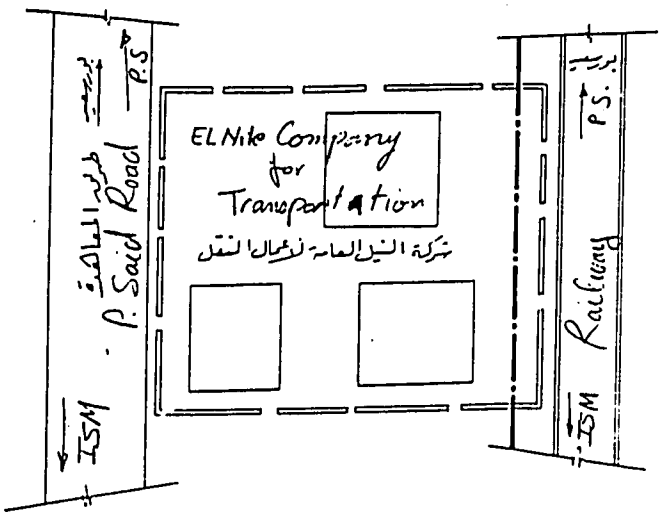


Km. 5.6 No. 4



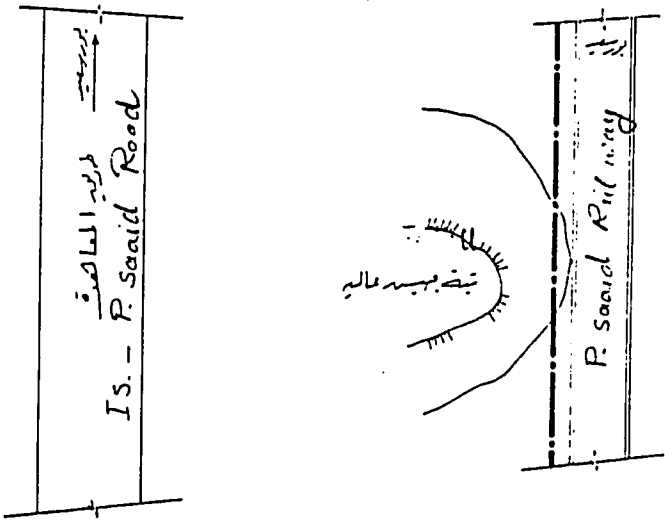
Km. 5.150 No. 3

J&J COLUMBIA MD



Km. 6.500

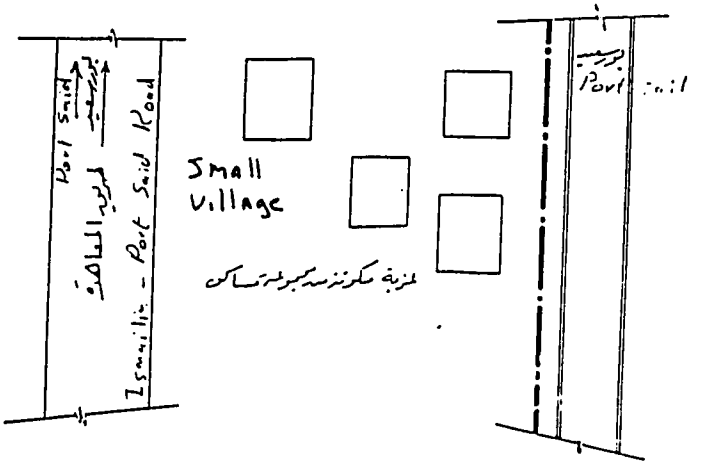
No. 6



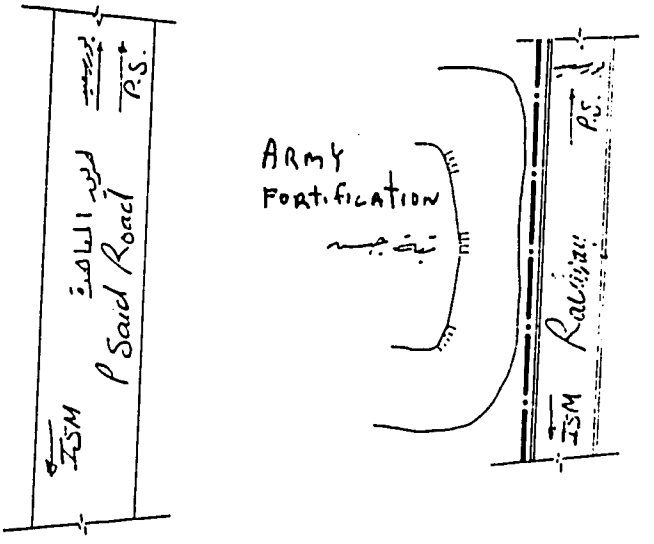
Km. 6.200

No. 5

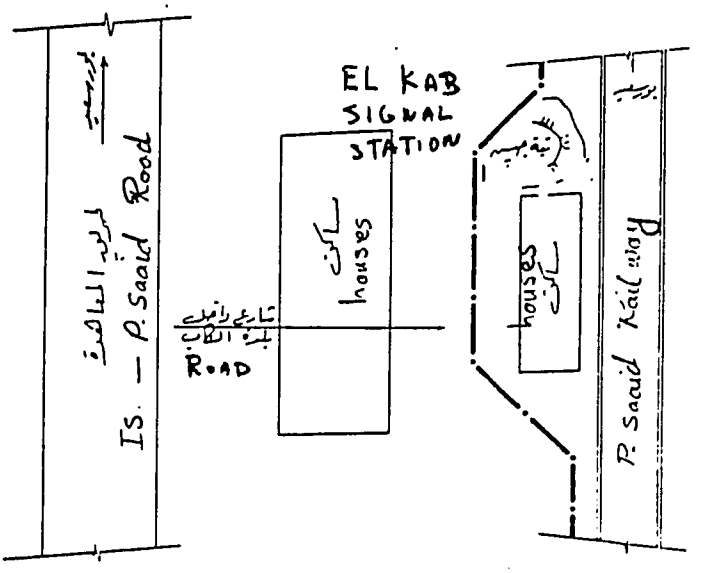
130093
:&J COLUMBIA ND



Km. 8.500 No. 8



Km. 8.00 No. 7



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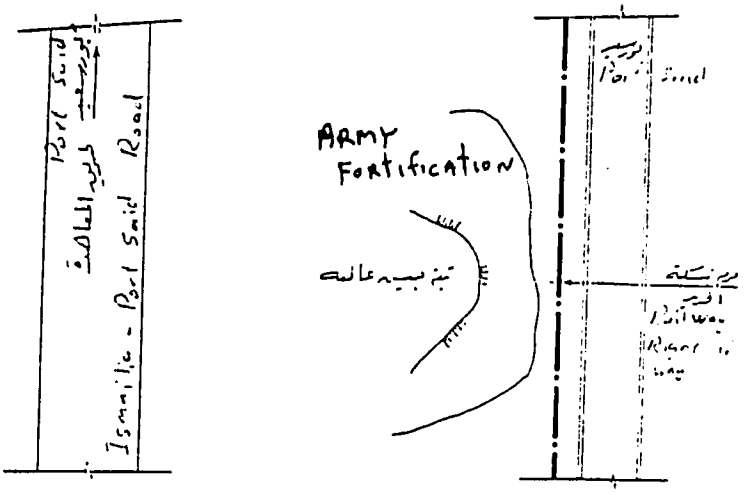

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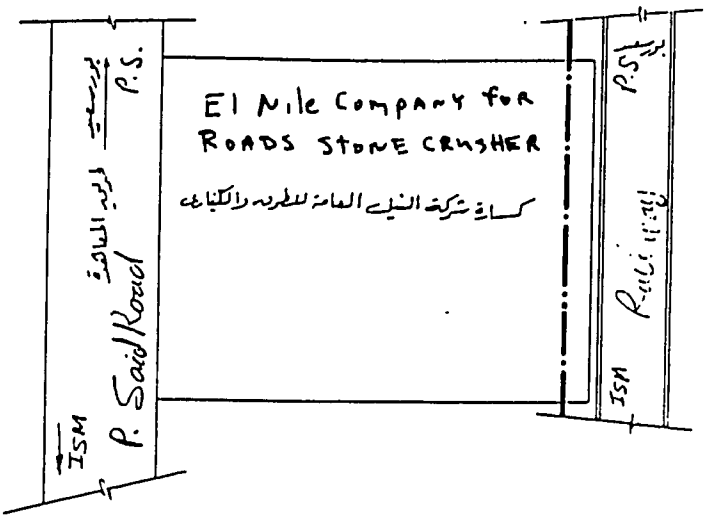
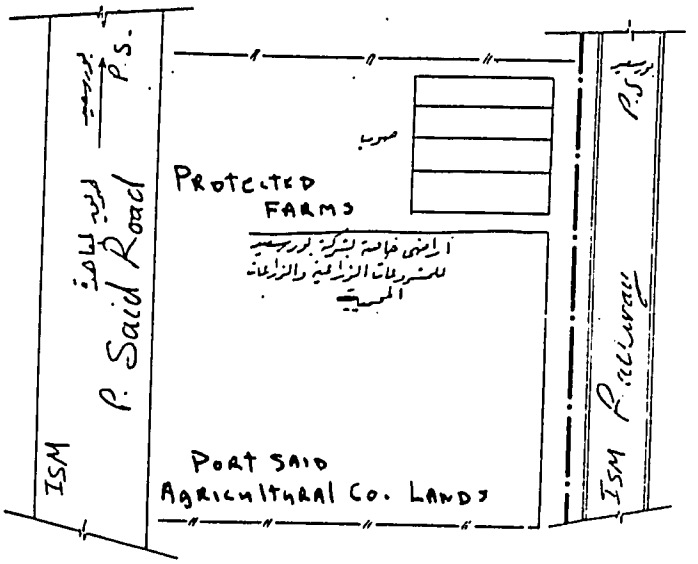


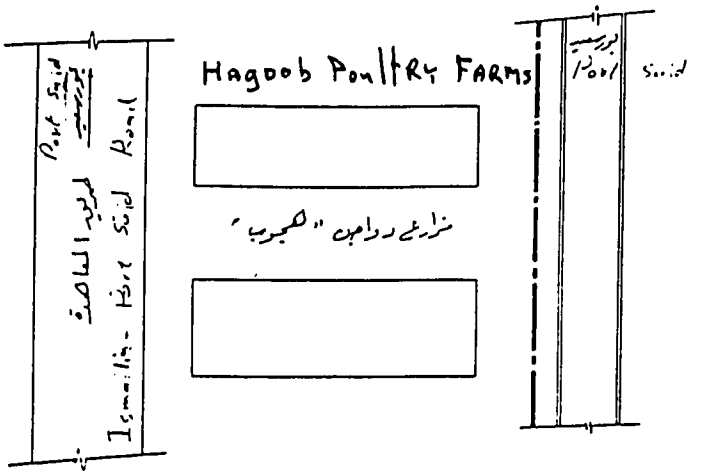
Km. 21.10 to Km. 21.50

No.12



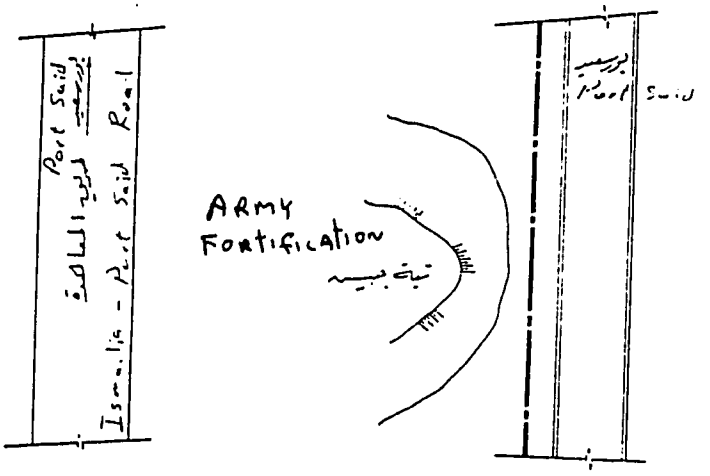
Km. 17.50 to 20.30

No.11



Km. 23.800

No.14



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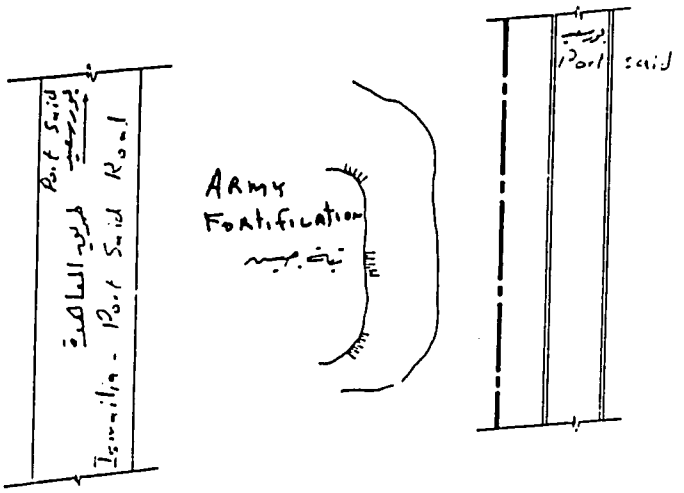

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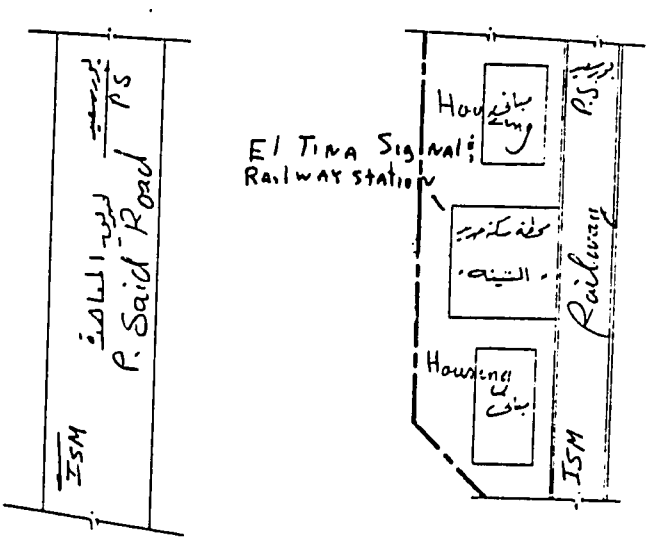

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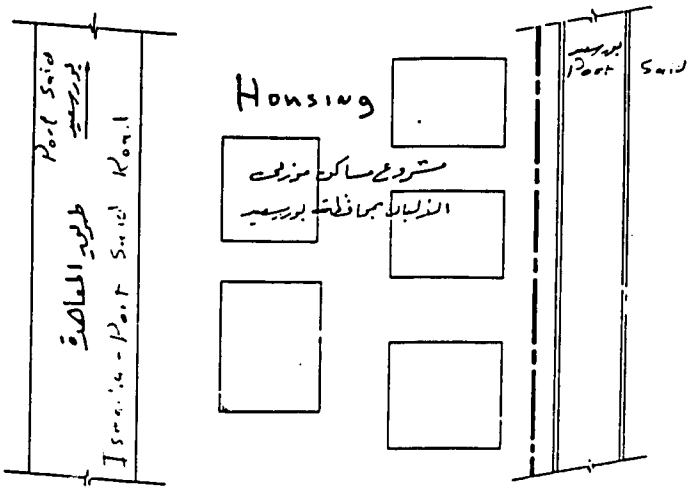

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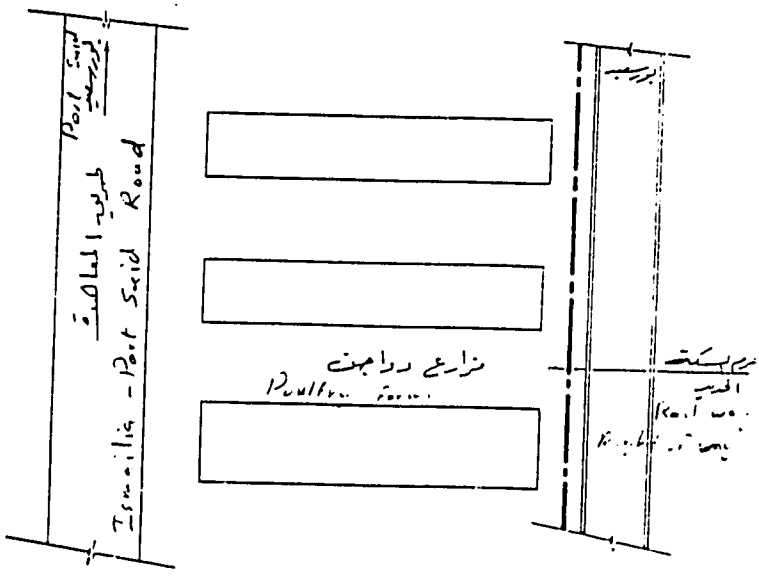

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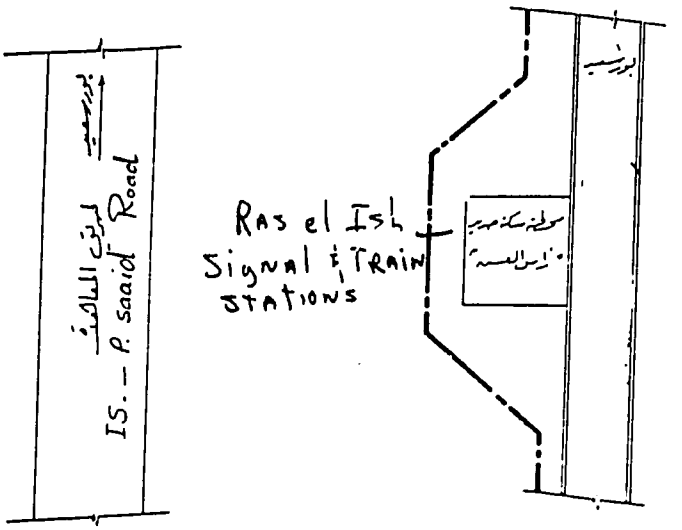

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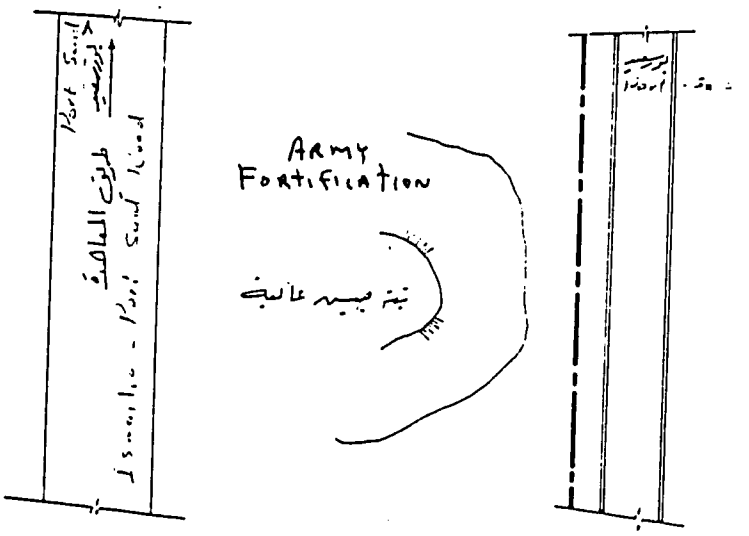
No.20



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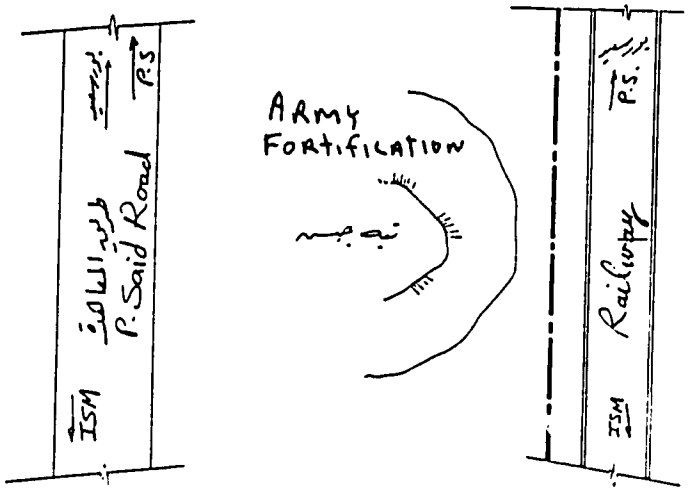

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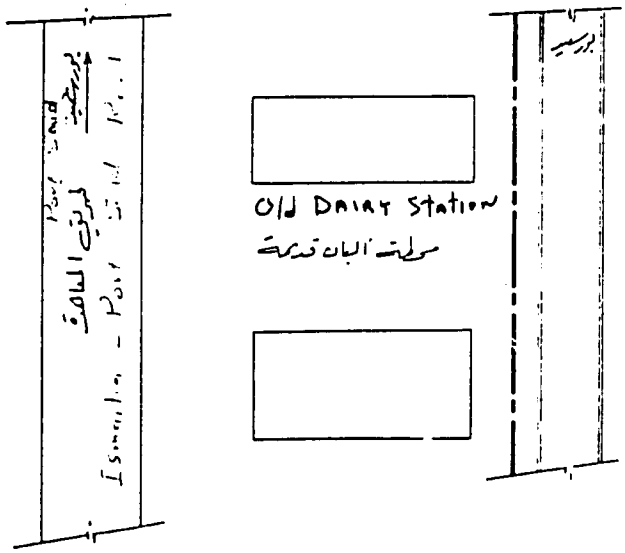

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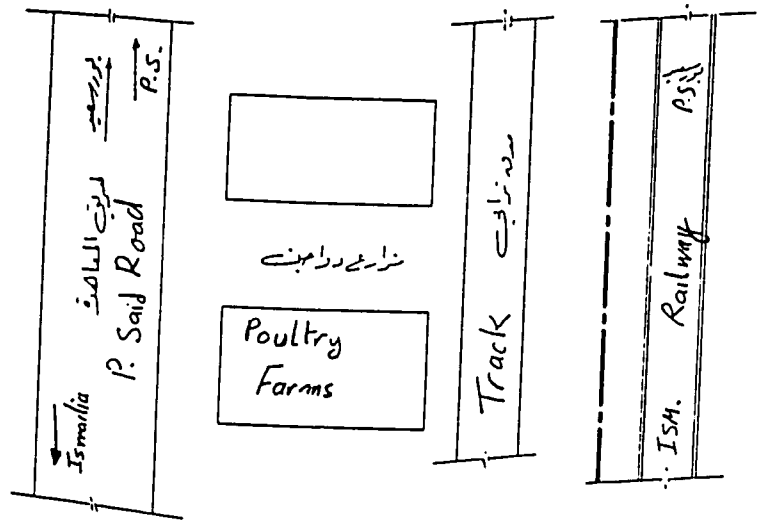

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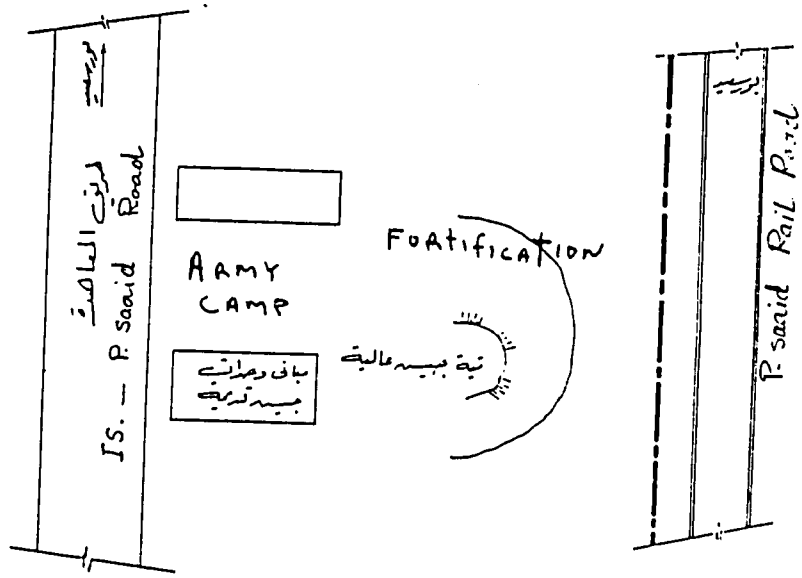
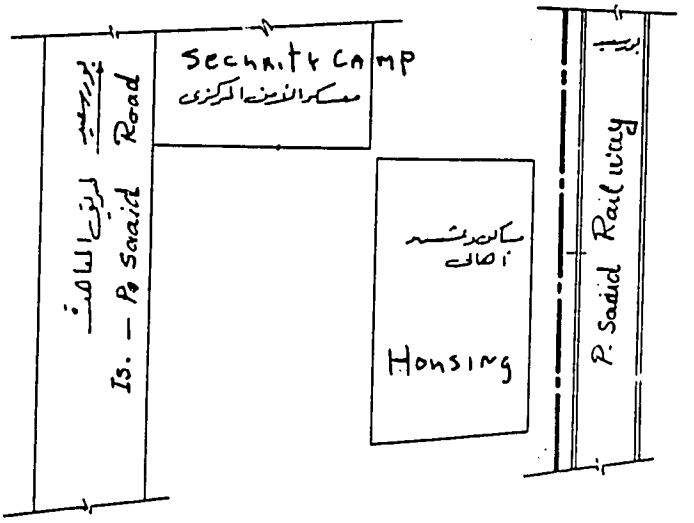


Km. 39.400

No.23

138093
C&J COLUMBIA MD



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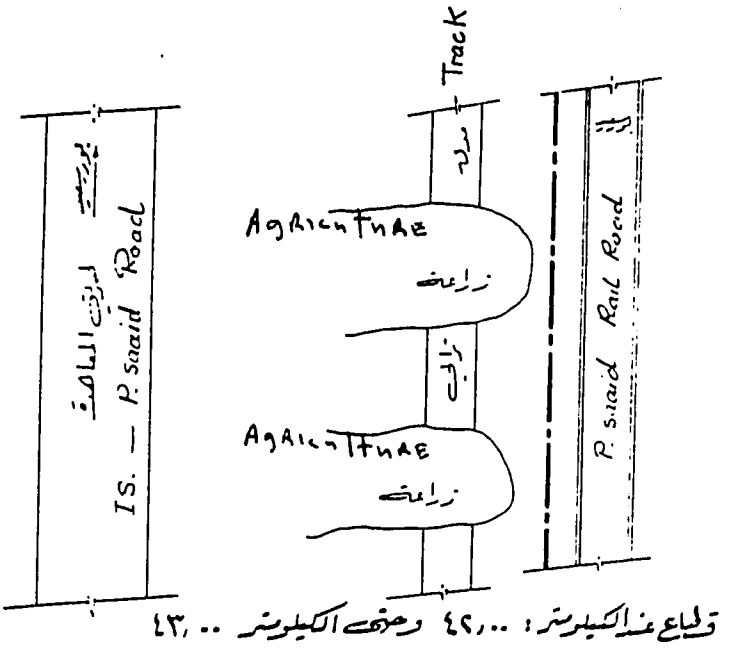
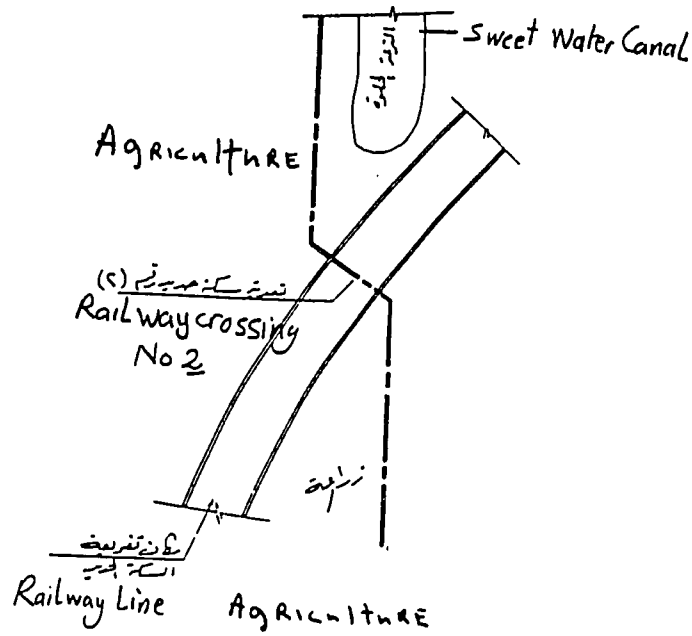


Km. 42 to Km. 43

No.25



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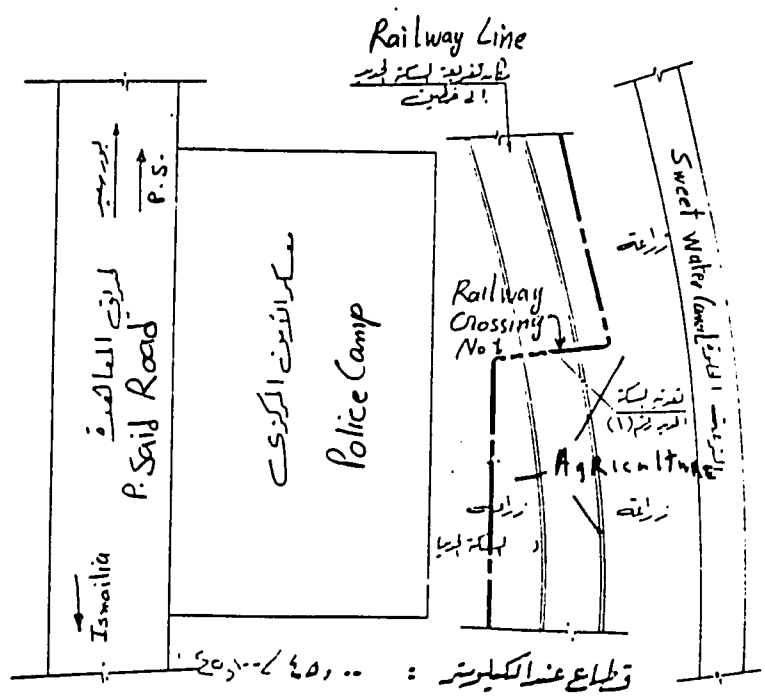

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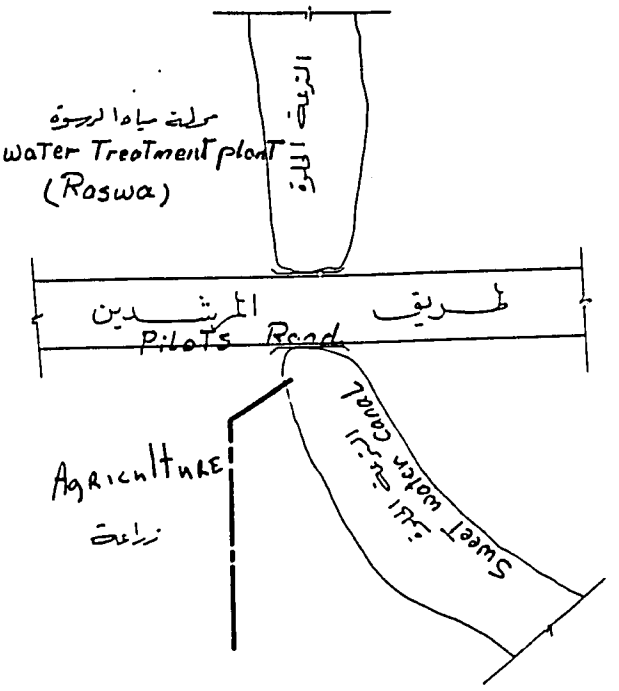
محطة مياه الرسوة
water Treatment plant
(Roswa)
الترعة الحلوة
طريق المرشدين
Pilots Road
Agriculture
زراعة
Sweet water canal
قطاع عند الدخول على محطة مياه الرسوة
Cross Section at Entrance of W.T.P. (Roswa)

No.29