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برنامج تقدير موارد الثروة المعدنية والبترولية والمياه الجوفية

MINERALS, PETROLEUM & GROUNDWATER ASSESSMENT PROGRAM

AID Project 263-0105

Egyptian Academy of Scientific research and Technology

Desert Research Institute

Egyptian General Petroleum Corporation

Egyptian Geological Survey and Mining Authority

Remote Sensing Center

To: Project Officer, S. Arif

From: Project Coordinator, D. T. Snow

Subject: Bimonthly Report for Jan. 15 - March 15, 1985

Your Ref. Our Ref. Date May 7, 1985

Attached are three copies of subject report.

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Egyptian Geological Survey and Mining Authority

Task I Regional Mapping

Three field parties are working in Area NF-36 on basement rocks, sedimentary rocks and sedimentary rocks west of the Nile. In Area NF-35, another party is mapping sediments of the W. D., while in NH-35, sedimentary rocks of the northwestern desert are being mapped. In addition, parties are mapping the southern Sinai and the Fayoum area.

No new map products have been reported, except a training map at 1:250,000 scale. The long-awaited Wadi Qena Metallogenic Map, ready for printing except for paper a year ago, has been relegated to a high-ranking committee, some of whom want it drastically revised in color and symbol codes, work requiring months to perform. An arbitrary completion order will be sought from the Director. The Ras Banas and Wadi Kuffa maps, long stalled by the retired editor, are finally getting his attention. A product may eventuate.

Cartographer training is continuing, with the sole remaining USGS graduate working with four junior people, all of whom are nearly trained. An Egyptian cartographer desirous of working with EGSMA as a consultant has been located. In the event that a group of new trainees is appointed by EGSMA, it may prove worthwhile to fill the TDY position with this Egyptian, since it would be cost-effective in comparison with hiring an American.

In view of EGSMA's success in salvaging cartography, I am encouraged to think that the new process camera should be among the commodity acquisitions.

Task II Geophysical and Geochemical Studies

A test area in the southeastern desert lying close to the Qena-Safaga road has been selected for geophysical and geochemical work. The aeromagnetic map from Aeroservice Co. is being compared to an older (1972)

survey, and the magnetic field is being related to the structure, the paleomagnetism and the magnetic susceptibility of the basement rocks. Detailed correlation of the airborne radiometry with surface properties is to be done. Whole-rock and stream-sediment samples are being taken for geochemical analyses. Hopefully, a systematic program for anomaly checking will develop from this E. D. work. The interpretation to be furnished by Aeroservice Co. will be the starting point for the on-going program of anomaly-checking.

In the southwestern desert, a program of resistivity soundings is underway for purposes of groundwater exploration in the Nubian sandstone. The Geophysics Dept. is also collaborating with Helwan Inst. and Woodward-Clyde Consultants in various aspects of the Aswan High Dam study, including microseismicity, fault geology and hydrology.

A geochemical prospecting program in the South Sinai is extended for another year, and a second party is working on the Dohala area.

The paleomagnetism laboratory staff tired of waiting for a line conditioner from MPGAP, so found their own solution to the problems of maintaining their electronic equipment.

Task III Economic Viability and Estimation of Potential Reserves

The potash program is at a halt, awaiting stimulus. A report of the laboratory results of core analyses from the two Ras El Behar drill holes is being prepared, but the preliminary results are unfavorable: radioactive beds in the Zeit formation are apparently of polyhalite, not sylvite. Deeper horizons in the uppermost salt of the South Gharib formation are more attractive, being thicker and more likely to have favorable mineralogy. Because they are in the 1000 m depth range, EGSMA is incapable of drilling it. It is hoped that one of several prospective foreign mining companies that have inquired about the potash resources will undertake the exploration, or that a sulfur-mining program under negotiation will result in new data and samples of penetrated radioactive beds. An alternative would be for government funding of contract drilling, either Egyptian or American. I am still firm in the

belief that potash is present, in very favorable market circumstances, waiting for discovery. The terms of Egyptian participation will be improved if the discoveries are made before concessions are let.

The gypsum program has not been officially extended by EGSMA, but its chief exponent, Mr. Abdel Moneim Kamel is continuing studies, extending surface geological examinations and sample analyses to deposits north of Ras Malaab, west of Alexandria, and along the North Sinai lagoonal coast. Also, analytical work from the Zeit Bay drill samples is continuing. The results, to be available soon in English, may be disseminated to help at least the Egyptian mining and building industries. Publication is intended.

The gold exploration program is undergoing changes as a result of Dr. Laurence James' reports and recommendations. Umm Rus camp has been closed. Some underground development was done, surface and subsurface maps prepared, samples were collected and assayed. But attempts to pump out the 2nd and 3rd levels were frustrated by antiquated equipment. Atud exploration is continuing, with more diamond drilling and sampling being done.

The best news is that management sees opportunity for Egypt if the types of mineral deposits described by Dr. James can be proved to exist in economic size and grade. Namely, there may be found disseminated gold in a) sulfide-bearing submarine volcanic rocks, b) iron formations, c) stockworks of veinlets and d) hydrothermally altered rocks. These are now understood as models for future explorations that can lead to high-tonnage, low-grade deposits, the object of most gold exploration programs in Canada and Australia today. Improved detection levels in AA spectrometry will be needed, as well as institution of analysis for pathfinder elements such as antimony, mercury and arsenic. The overall geologic mapping must be improved, in order to undertake meaningful geochemical sampling programs. It is encouraging to have consultants' recommendations taken seriously.

The 1985-86 gold exploration program will include two field parties of about 5 geologists each, assigned to semi-detailed mapping and

selective sampling of sulfide-bearing rocks at two promising areas nominated by Dr. James. A reconnaissance of all such target areas cannot easily be done in a season because adequate equipment, especially vehicles, is not available for many small camps. Working two targets per year from medium sized camps seems a reasonable compromise, and if areas already mapped on a regional scale are chosen, the intermediate stage of exploration, mapping at, say, 1:20,000 can facilitate a strategic sampling program.

The work programs EGSMA has going in construction materials have never been mentioned in these reports. In connection with the Sinai Manganese Co., there has been a successful and continuing exploration in N. Sinai for kaolin and glass sand, resulting in the El Tih kaolin discovery recently, and the Gebel Yalaq white sands 80 km W. of El Arish. For the Inst. of Building Materials, a program to sample all existing quarries of limestone, dolomite, basalt, granite, sandstones, plus clays, sands, gravels and gypsum has been completed within 100 km of Cairo and is being extended this year to the rest of Egypt. The object is to document 20 years' reserves, to advise the Institute on availability of building materials, to establish royalties to the governorates and perhaps most significantly, to make EGSMA the source of publications and information for all the country, instead of leaving those responsibilities to the governorates.

The brick clay reconnaissance promoted by MPGAP has not materialized yet, though John Burger has nominated two consultants that should be useful in helping EGSMA get a program organized.

The coal explorations at Maghara are continuing and drilling is being done to find new deposits at the Safe and Gida areas of the N. Sinai.

A program to explore white sands deposits in South Sinai and other refractory materials is in progress.

Task IV Upgrading the Analytical Laboratories

The acquisition of x-ray diffraction and fluorescence equipment can now be let to bid since the Minister of Petroleum and Mineral Wealth has

settled the budget problem in favor of EGSMA: $1.7 million of the Aero-service contract is to be charged to EGPC's budget.

It has never been satisfactory to consider equipment as the only upgrading to be done when it has been clear that the great resources of the laboratory were not being used to optimum advantage. Dr. Larry James has provided insight into better utilization: if gold exploration is to be effective the AA detection limits for gold must be better than 0.1 ppm, whereas present usage is not better than 0.3 ppm. We will have to provide consultation on laboratory techniques, especially concentration procedures. Furthermore, the flame spectrometry procedures should be examined. Procedures for routine detection of As, Sb and Hg in samples should use either AA or colorimetric methods, according to Dr. James.

Another area of improved laboratory usage is to decrease the time for reporting analytical results (perhaps 1-month turnaround) to the field party that collected them. Thereby the current sampling program can be steered to anomalous areas within the season instead of waiting a year. Speed can be accomplished by reducing the number of samples and by appropriate management of sample preparation, transport, lab priority and reporting methods (radio to Marsa Alam!) These changes are believed essential to a successful gold exploration program aimed at new types of mineralization.

Task V Geologic Museum

It is a pleasure to report the progress made in recent months under Mme. Arzuela's direction: the museum is nearly ready to start receiving visitors. All the display cases, overhauled after transport from Tahrir Square, have been neatly set up in the large, well-lighted hall in Dar-Es Salaam on the Corniche. The mineral and fossil collections, somewhat reduced from their former display size but enhanced by selection, are nearly all in position. Labelling is in progress.

The Museum Library is well shelved and organized, with guidance from our consultant, Mohsen El Arini, and a new catalogue is to be prepared.

The research building has finally received power and water, and some spaces are already in use. The staff will soon be relocated there from the temporary spaces in Abbassia.

Landscaping, masonry and pavement in exterior areas have not yet been accomplished. Much of the cost of finishing has been defrayed from private funds.

Task VI Mineral Commodity Program

The 3rd MPGAP Symposium, to be convened before Ramadan in May, has already suffered postponements, and is currently awaiting the Minister's approval. The plan, subject of much communication over the last six months, involves speakers from several developing countries and the UN, from whose experience we hope to learn much that can help Egypt's program of foreign investment in mining.

In his role as a commodity specialist, Mr. Randall Chew III has developed his own system of data storage for use with the IBM PC, incorporating some of the features of the Project Coordinator's earlier, untried system. It will be a method for filing data on mineral commodities by country of origin and consumption, as well as Egypt's import and export potentials.

It is rumored that three contracts negotiated by EGSMA are pending approval by the Minister. The important news is that EGSMA is willing to let the profit-shared production vanish so that a new venture could devote all production (except a small royalty) to the cost of operating and financing. This is perhaps the most significant change in two years, because it reflects the great difference in returns expected from mining as opposed to petroleum exploration.

Task VII Publication and Documentation Center

The first mineral information package to be completed is on limestone. Mr. Randall Chew has edited the summary statement and assisted in the organization and content of supporting documents, which include maps, sections, reserve estimates, analyses, many internal reports and prospect data on a variety of deposits.

As a test of effectiveness, Mr. Chew has recently inspected limestone deposits near Beni Suef-Minya, posing as a potential investor studying the package. EGSMA may thus learn what investors would require for commitment.

That is Mr. Chew's third (brief) field trip in as many months, visiting gold, barite, iron ore and limestone deposits. It is essential that he do this if he is to help EGSMA in commodity promotion activities. I encourage him to continue these field trips in spite of pressures for written products that may develop. The Project Coordinator and Resident Director have been unable to perform the desired field assistance and the idea-generating sequels of field work, so perhaps Mr. Chew can do so in our stead.

The gold package is said to be complete except for the text on one gold district. It consists of about 100 pages, including many years of internal reports and maps. These documents will be announced in newsletters upon completion of the editing.

Mr. Chew is working with two editor-trainees, reportedly having difficulty with English.

Annal No. 13, product of Larry Stout's year here, is to be published next week, I am told.

Newsletter

Proceedings of the 2nd MPGAP Symposium are ready for publication, since all 30 papers have been edited and stored on diskette using our new IBM word processor.

Desert Research Institute

Task I Groundwater Exploration

By this time, DRI has completed all it can do in Area I (Quseir-Ras Banas) until it has the drill rig functioning. A report has been prepared containing all the data from known water-points, the interpretation

of the many completed resistivity soundings, the geology of wadi alluvial settings for all major drainages, both East and West off the Red Sea Hills, analyses of water chemistry and pumping tests completed in all suitable wells.

When holes can be drilled, presumably by about July, 1985, Area I will be first priority. Several test holes in alluvium will be drilled to check the geophysical soundings, to sample the alluvium, determine actual depths to the water table and to sample subsurface water. Most significant will be the interpretation of pumping tests, for these will make possible, at last, quantitative evaluations of groundwater production possibilities, a groundwater budget for a watershed (or more) and the volume of water available to support extraction for mineral process and support requirements. It will be necessary and sufficient to evaluate only a selection of sites to indicate the typical occurrence in wadi alluvium, as a guide to future expectations and groundwater explorations by potential investors in mineral deposits.

We wish to avoid repetition of the experience in Saudi Arabia: Their Mad Ad Dahab gold deposit, 10^6 tons proven reserves containing an average of 26 g/T, cannot be extracted yet because process water supplies have not been developed.

Meanwhile, the second-year program of DRI has moved to Areas 2 and 4, Ras Gharib and Bahariya Oasis. After surveying all water-points between Quseir and Ras Gharib, a camp has been established at Ras Gharib. Hydrological, geophysical and geological work is proceeding on schedule, much as was done in Area 1.

Bahariya Oasis is a study area chosen because the water resources of the Nubia sediments are important for the development of iron-ore deposits at El Gedida. It has long been known that the solution of the salt-accumulation problem in the Helwan furnaces can be solved best by ore beneficiation at the mine site, concentrating the iron for economic transport while removing the salt. But the process is water-consumptive. Therefore, a hydrologic analysis of Bahariya Oasis is fitting to MPGAP aims. The prospect of producing barite from the horizons under the stripped iron ore, another water-consuming process, makes it even more imperative.

Task II Data Organization and Analysis

Our librarian specialist, Mr. Mohsen El Arini, has devoted about a day per week to DRI library improvement. First, he has advised the staff on improvements in physical storage. The library of Prince Youssef Kamel has been set aside in a room by itself for safe-keeping. The periodicals and maps have their own designated rooms where adequate shelving is designed. A separate library for Geology has been established in the main office building.

Several of the staff have been sent to Al Ahram's P-1 course, and Mr. El Arini has lectured on librarianship. DRI has for many years maintained a Dewey Decimal System catalogue. Preparations have been made to start filing also on floppy disks, pending receipt of a personal computer.

Remote Sensing Center

Task I Data Organization and Analysis

The Center's small working library of texts and reports with large documentary holdings has received some help from Mr. El Arini, who has advised the staff on matters of filing and cataloguing holdings. MPGAP has bought many up-to-date texts in the past year. To organize the holdings of maps, mosaics, photos and other images, paper or tape, we engaged Prof. Larry Carver from U. California, Santa Barbara. His report of findings and recommendations provides guidance on the acquisition of storage facilities and their optimum use.

Task II Production of Atlas

After many months awaiting Wimvex action to procure equipment, RSC grew impatient and has leased disk-drives and accessories to put the MDAS into operation for Landsat image processing. Otherwise, the two trained people who went to ERIM for the purpose cannot get going on the Atlas production, already months behind schedule. So, finally, the first Egyptian-produced scene is in production. Mr. Barry McRae of ERIM came to Cairo to assist in making the hook-up. The procurement of hardware

and software for all upgraded MDAS needs has been bid, with three companies competing. The evaluation, leading ultimately to an award, is in process at this time.

Task III Remote Sensing Workshops

Because the workshops must use the upgraded MDAS system, there is no point in sending the instructors to Ann Arbor until the hardware delivery date is known. Thus this task has also been deferred.

Task IV Aerial Photography

EGSMA and RSC have agreed to a photo mission proposed by Dr. Lepley: Subject to final approval, an area of E.D. basement rock with much potential mineralization is to be flown in color. One selling point is that no color aerial photography service is available in Africa or the Middle East. RSC can acquire the equipment and special techniques to offer a valuable service. Rather than tool up for standard large-format, ordinary color, the project is to leap-frog the technology by using a small-format (70 mm) camera, made possible by the new-generation computer-generated precision lenses which make enlargement to full 15" size prints possible while retaining resolving power. The result is a 5-fold cost decrease. Simultaneously, color-enhancement techniques will be taught by consultant Dana Slaymaker, who uses special emulsions and filters to emphasize differences in rock type and mineralization. Because exploration is not geometrically sensitive, photogrammetric precision can be sacrificed. The project cost exceeds the MPGAP budget for this task, but by hiring Slaymaker with EGSMA budget money and stretching the AID budget for this project, a very meaningful result can be achieved that can help RSC and Egypt in mineral exploration.

Egyptian General Petroleum Corporation

a. Aeromagnetic Study in the Eastern Desert

Most of the deliverables have already been completed, except interpretation maps for Areas IA, II and III. All materials are temporarily stored at GPC, pending completion of final facilities at EGPC and EGSMA.

I am unaware of any preparations at the former, and am certain that the data storage facility at Petroleum Research Institute cannot safely help keep the many documents and tapes until major space modifications are made. At EGSMA, the room is cleared but storage racks believed to cost $20,000 are not even budgeted. Since the deluge of data is scheduled for about May, a crisis is approaching.

The products of Area IA are being used by GUPCO in modelling basement on the west side of the Gulf of Suez, (Bakr West, especially). Also, the $600,000 obtained by sale of Area IB data to ESSO is being reserved for MPGAP use. The EGSMA is using the AM data in a test project in Area II. NMC is recipient of the radiometric data and AM profiles, but because of lack of communication, utilization is unknown. I recommend MPGAP membership to alleviate such deficiencies, and I have suggested the Coordinating Committee put it on the agenda.

A proposal has been written by Mr. Wahab Youssef of EGPC to undertake additional aeromagnetic surveys, including the Nile Delta and Sinai north of Gebel El Tih to offshore in the Mediterranean Sea, plus a small area in SW Sinai not well covered by the GUPCO consortium survey of the Gulf of Suez. A greater area of coverage was initially proposed by Dr. Wafik Meshref, but a canvass of oil companies conducted by EGPC disclosed little interest in the Mediterranean shore areas west of Alexandria. However, most companies expressed willingness to subscribe to the mentioned areas if they could acquire the data for only $50,000 each. Since the job may cost $2.5 million, the participation is only a token of approval.

In a recent visit, Dr. William Hinze has expressed approval of the plan, and furnished specifications, governed by experience with the 1983-4 Aeroservice Co. contract. GPC's Dr. Kamel would be designated Manager, so the organization to administer such a contract is already functioning. Mr. Edward Gribi, petroleum geologist hired to evaluate six new EGPC proposals for AID has expressed his approval of the aeromagnetic project, and I also approve of them in principle as cost-effective aids to exploration.

b. Seismic Study in the Eastern Desert

This project was shelved, pending interpretation of the Area IB AM data. It has been revived recently by a proposal by EGPC, with the option of refraction or reflection profiling across several basins of 10,000-12,000 ft. apparent depth located by the magnetics in the Assiut-Sohag area on both sides of the Nile. The location is 100-200 km distant from ESSO's E. D. concession, and in Mr. Gribi's opinion, the project is worthwhile to seed exploration because it may otherwise be many years before a concessionaire would invest in it. Gribi has recommended conditions and terms for contracting, which call for a flexible work plan, so that the seismic work may be designed according to preliminary field experiment.

c. Seismic Data Storage System and Data Library

EGPC hired an experienced data-processor from the GUPCO staff, and a training/development program aimed at well-data filing and ADP is underway. Initially, they are inventorying Egypt's wells.

Two proposals by EGPC have been evaluated by consultant Gribi. There has been unanimous enthusiasm expressed by all oil company explorationists whose views were requested that highest priority, importance and expectations of benefit should be attached to the rectification of data-storage and accessibility, but not much enthusiasm was expressed for digitization of well-logs or seismic profile data. Thus Gribi and I have recommended emphasis be placed on the acquisition of proper physical storage conditions for the thousands of existing and potential magnetic tapes, for paper-copy logs and profile data, for cores and cuttings. The existing spaces at Petroleum Research Institute, Nasr City, are woefully inadequate, and time hardly permits a delay of years for constructing a building. EGPC's Maadi facility is probably too costly to use for storage, so I have recommended that existing buildings at PRI be rehabilitated, using MPGAP funds as needed, to provide ideal conditions with air conditioning, fire and flood protection and up-to-date storage racks to house not only the current collections, but also the many tapes held by geophysical processing firms in Cairo and in oil company laboratories abroad. The safeguarding

of this priceless resource of exploration data deserves highest priority, but not the fancy computer data-processing and digitizing proposed. EGPC should submit a revised proposal.

d. Source Rocks/Oil Migration in the Western Desert

We have learned that this project has been awarded long since to Robertson Research Co. by GPC, and that it is nearing completion. It should be deleted from MPGAP.

e. Sedimentary/Petrographic Study in the Western Desert and Gulf of Suez

Likewise, these topics are covered by Robertson's W. D. project, also to Robertson Research for study of the Gulf of Suez. I recommend deletion.

f. Estimation of Existing and Potential Oil and Gas Reserves in the Gulf of Suez

See e., above.

g. R & D Feasibility Study of Tertiary Enhanced Oil Recovery

An RFTP and draft contract have been completed by GPC, following prequalification of three bidders. This should be submitted immediately.

h. Stratigraphic Study (drilling) in the E. D.

A counter-proposal by EGPC to drill in the central part of the Gulf of Suez was studied in detail by Mr. Gribi, whose 3-week visit to Cairo was primarily for this purpose. His conclusion was that the major investment would not be justified in terms of its unlikely impact on exploration in the Gulf. The door remains open for a strat. test well in the E. D., however, in case the seismic study confirms sufficient depth and volume of sediments in the Assiut area.

i. Training Equipment, Ras Gharib Training Center

The rig-floor simulator was bid by Digitran and Simtran, with the latter proving responsive and $150,000 cheaper than the former. Upon negotiation,

several optional devices were also included to expand the training functions of the simulator. The equipment has all been built and tested at Medway, Mass., air-lifted to Cairo and is awaiting customs clearance before transport to Ras Gharib. The Simtran technician will install during April, and a fully-functioning system should be in place, ready for a second crew to train the GPC staff by May 1.

GPC has a program of training they expect to implement with all oil companies as clients during coming years, and the simulator will be focal to those courses.

Project Coordinator Activities

Two lectures were delivered: On Feb. 17, "Reservoir Induced Seismicity - Case Histories of Koyna and Kariba" to EPIX, the Society of Exploration Geophysicists, and on March 26, "Pore Pressure in the Earth's Crust" to the Faculty of Earth Sciences, King Abdulaziz University, Jedda.

The benefits to MPGAP of the brief Saudi Arabian visit (at no cost) include the status of their cutstone industry, and the exciting news of gold discovery at Mad Ad Dahab, a million tons of 26 g/T ore, and 30 km E of it, a new discovery of unlimited tonnage. EGSMA badly needs such models for their exploration of the Red Sea Hills. Incidentally, BRGM's drilling program at Farasan on the Red Sea Coast of southern Saudi Arabia has developed some potash beds, mostly carnallite, and they are encouraged to drill for more. They are coring at rates up to 150 m/day. We may regret having waited for EGSMA to poor-boy their slow potash exploration program to failure, when an $800,000 program might have discovered competitive deposits a year ago. The market could be lost to Saudi Arabia, instead of Egypt.

Most of the P.C.'s time has been devoted to proposed and current petroleum projects: 1) The finalization of the contract with Simtran for a Rig Floor Simulator, 2) The EOR pre-qualifications questionnaire and extensive technical review of actual staff experience and capabilities of the candidate companies, then the drafting of an RFTP, 3) Evaluation of 6 EGPC proposals, including three weeks with consultant Edward Gribi, visiting most of the oil companies and service companies.