PD-AAR-[redacted]
ISN: 39675 203

/1

c/o Egyptian Geological
Survey and Mining Authority
3 Salah Salem St.,
Abbasseya, Cairo, Egypt
July 23, 1983

To: Project Officer, MPGAP

re: Contract No.
NEE-0105-S-00-3035-00, ID 2

From: Project Coordinator

Subject: First Bi-Monthly Report

A detailed implementaion plan, as specified in Art. IDl, will be prepared during the week beginning 4 August, after PC returns from 10 days in the field with an EGSMA working group. On that date, Contractor Bendix's Liaison Officer, John Burger, is scheduled to arrive in Cairo to work with the Resident Project Director, Dr. Larry Lepley and PC to formulate the year's plan. Lepley arrives July 25. It would clearly be unmeaningful for PC to prepare a detailed plan for the whole project before obtaining contractors input. However, the following Report provides a working plan of mineral explorations of the EGSMA, documentaion and dissemination.

Because of recognized urgency in early formulation of EGSMA field tasks in support of MPGAP objectives, the bulk of PC time since arrival May 23 has been devoted to study of publisned and internal geologic reports on the gold mines, the potash deposits and gypsum deposits. Those three areas were identified early by EGSMA Director Behay Issawi as fit subject for MPGAP efforts, and PC has worked closely with the appropriate department heads responsible for the field parties scheduled to begin work on about October 1, 1983. EGSMA has been most responsive to PC's suggestions for field and documentation efforts. Long lead time

is particularly important for scheduling drilling crews and equipment for the diverse explorations. A field trip, July 27-August 4 is to be made for drill hole siting and geological task planning. Specific objectives are included in the following narrations:

Exploitation Plan for Gold Deposits in the Eastern Desert

95 Gold mines worked in Pharaonic times, 20th-century exploration techniques have singled out a handful that have reserves apparently justifying the investments needed to extract the metals economically. These have been studied and sampled to such a degree that sufficient data already exist to support feasibility studies. Further explorations underway are more likely to enlarge reserves than to affect the qualitative results of analysis. Thus it is time to market the well-studied mines rather than to wait for new data.

This brief plan is predicated on the success of Government of Egypt efforts to modify their mining laws in a manner favorable to the investors' interests. A recent Ministry of Industry decree, when made law, will do a great deal to liberalize terms of concessions, raising prospects for profits. Control will largely reside with the Director of the Geological Survey. A concession being negotiated presently with AGRICO for sulphur mining along the Red Sea coast may serve as a model for future concessions, thus its completion is eagerly awaited.

The gold deposits with brightest prospects have been explored intensely from 1964 to the present, stimulated by a Russian-Egyptian cooperative program. By 1974, they had driven 1077 m of exploratory drifts, 5245 m of diamond drill-hole and 2763 m of test trenches. 66,092 lump samples and 2069 channel samples across quartz-vein ores had been collected and assayed. Comprehensive geological and geochemical mapping was done. Most results are in unpublished internal English language reports. Subsequent drifting, drilling, sampling and mapping programs of the Egyptian Geological Survey have served to increase mineable reserves and to explore low-grade gold mineralization in voluminous altered wall-rocks. These programs are continuing with two field parties, each of about 30 professionals and labourers, scheduled for field tasks on the gold mines in the working season from October 1983 to April 1984.

In the following table are the salient results of explorations, expressed as reserves for several mines (blocked out by inclined shafts and horizontal drives with channel samples on as close as one-meter spacings), with average widths, ore grades of veins and tonnages:

Gold Reserves

Name of Mine	Proven (Metric tons)	Probable	Dumps	Vein Width (m)	Ore Grade (Grams/ton)
Umm Kus	6700		850	.35	11 Au, 10 Ag
Atud	55000	14000	1600	.66	13 Au
Umm Ud	10000	4000	1240	.45	24 Au
Sukari	12000	60000	32000	2.4	18 Au, 3 Ag dumps 2.8 Au
Hangalia	3600	1500	315	.23	23 Au, dump 18 Au
Barramiya	8.4×10^6	1×10^6	30000	4 to 14	4 Au
Fatiri	70000		8000	.76	9 Au, dumps 8 Au
Semna	17500	4000		1.0	11 Au
Erediya	20000	50000		.46	13 Au

In many of the quartz lodes, it can be demonstrated that the primary ores are native gold associated with sulfides. Surface samplings in many cases show very low values, whereas the richest specimen ore (an ounce or more per ton) occurred at 30-45 meters depth. At 200-300 m depth, many of the veins have but a few g/t, and water also limited the depth of early workings. Thus secondary enrichment seems to have operated; the high-grade ores have been largely mined out by the ancients, whereas present reserves are in the thinner extentions of the veins. So thorough were the early explorers that modern methods have failed to discover major new gold mines, though other metals have been found. Disseminated gold in hydrothermally altered wall-rocks does occur, greatly increasing the total gold present, but to date, these ores have been disappointing. A few g/t have been found diffused a few meters away from the quartz veins in quartz-carbonate or graphitic wall-rocks. To date, secondary wall-rock enrichment has been proven only at Sukari, though the deeper portions of wall-rocks apparently barren at the surface have not been drilled as yet.

The deposits are remote but readily accessable via the wadies. Only meager water-supplies exist due to the thin and dirty character of the alluvium. A high priority has been set on water explorations by the Desert Research Institute. In some cases, adequate process water supplies are predicted for vat leaching but not heap leaching.

If these gold mines are to produce significant returns, they need to be mined at a rate of a few hundred tons per day, at least. Thus most mines have short expected life. Mines in close proximity could be considered as a group in economic evaluations, because semi-portable plant facilities can be built. Thus it is desireable to package all geological and sampling data for each group of mines. The reproduction of internal reports, laboratory data and geologic maps and sections, requiring hand coloring, etc., would constitue a worth-while effort, providing prospective investors with full details at close to cost of reproduction. If this amounts to several thousand dollars per package, it will limit sales to serious investors.

There are several media available for advertising the gold prospects of Egypt. The lowest level of effort would be represented by a page-long summary to be offered to any and all magazines having mining and investment audiences. The next level is by local publication of our bi-monthly newsletter, signalling new results of explorations and recounting pertinent older works. These can be mailed to an extensive list of mining, marketing and investment interests in all countries. A mailing list is being compiled presently by Bendix Field Engineering Co. Lastly, oral presentations will be made at the semi-annual symposia of the Minerals, Petroleum and Groundwater Assessment Program, providing greater detail for selected mines under study. These meetings will be advertised in the magazine and newsletter outlets mentioned above, and attendance will include as many foreign investors as can be attracted to Cairo as well as to the public and private sector of Egypt. Proceedings will be published.

The information package will be offered for sale at those meetings and at other times. The Staff of the Geological Survey will be available for consultations, and for package customers, field inspections can be arranged. The services of the Egyptian Investment Authority and such entities as the Economic and Commercial Sections of the U.S. Embassy will also cooperate in acquainting investors with the procedures, terms of agreement and experience with investment climate.

A detailed plan of field operations in support of the marketing scheme is being developed, but cannot be completed until inspection of at least one group of mines has been made during a trip August 1-4, 1983. Umm Rus, Atud, and Sukari are scheduled for inspection, during which the state of knowledge will be reviewed and plans for work parties will be laid.

Since some of these mines have not been explored underground since about 1975, one necessary task will be to rehabilitate each one by replacing timbers, ladders and essential ventillation facilities to make them ready for inspection by potential investors. Package purchasers, perhaps as early as January 1984 would be guided to these selected mines. The desert pass security clearance process will have to be streamlined by then.

Long-range prospects of developing the gold mines will require additional exploration work. In some cases, extentions of known veins or wall-rock alteration zones will be core-drilled. The underground workings have never been used to gain access to wall-rock ores by short drill-holes. The secondary enrichment hypotheses need to be tested, both for unexplored quartz lodes barren at the surface, and for wall rock ores that are weak at the surface. Some of these tasks will be begun in 1983-1984.

Package preparation can begin immediately.

Exploration of Potash Resources of Egypt

The geological surveys of Egypt and the United States have collaborated on a study of geophysical logs of wells penetrating evaporite formations of the Gulf of Suez, with the object of locating mineral deposits of commercial interest. Several correlatable radioactive beds suggestive of potash occurrence will be announced soon in publications by both agencies. Presentation of the data will also be made in January, 1964 at the Semi-Annual Review of MPGAP, the Minerals, Petroleum and Groundwater Assessment Program. This is an investor-oriented development program of the Egyptian Geological Survey and Mining Authority, the Egyptian General Petroleum Corporation, the Desert Research Institute and the Remote Sensing Center, sponsored by USAID, Cairo.

Numerous oil wells and dry holes penetrate the thick, extensive Miocene evaporites of the Zeit and South Gharib Formations along the west shore of the Gulf of Suez. Whereas there are outcrops of these formations, there are no outcrops of potash, by reason of its high solubility and because of the deep structural configuration of the basins in which they were deposited. The salt beds of the South Gharib Formation are the sealing layers over most of the petroleum reservoirs. Out of several hundred holes studied, more than 40 have been logged geophysically in sufficient detail to permit tentative identification of sylvite (KCl) and other minerals of interest. In addition to high resistivity, criteria include:

1. High gamma ray intensity, caused by K_{40} concentrations in thick halite (NaCl) beds, characterized by contrasting:
2. lower sonic velocity ($\Delta t \simeq 74$ if pure KCl vs. 67 for NaCl) and
3. lower density ($\rho_B \simeq 1.86$ vs. 2.03), but an

4. absence of water of crystallization ($\phi N \simeq 0$ vs. $\phi N \simeq 15$ for polyhalite, 45 for kainite, or 65 for carnallite with $\rho_B \simeq 1.57$).

K_2O content varies from 0 to 63% as gamma ray intensity increases from 0 to 500 API units.

One of the most attractive potash prospects is to be found in the uppermost salt of the Zeit Formation, which is otherwise mostly composed of alternating anhydrite and shale. From geophysical logs of onshore or nearshore wells, it is found as follows:

	Gebel El Zeit 2	Zeit Bay 1	Zeit Bay 2	Ramadan 1	Ras El Behar NE 1	N. Ras El Behar 2
Depth (m)	399	519	211	438	352	385
Thickness	4	4	3.5	7	3.5	3
Depth	405.5	525	217	446	256	390
Thickness	4.5	4.5	4	3	2	4

The average total thickness of these two beds is 7.6m. They extend about 30 km in the NNW-SSE direction, more than 10 km E-W.

In the 5th salt bed (from the top) of the South Gharib Formation is another correlatable radioactive unit:

	Wadi Mellaha 1	Gebel El Zeit 2	RR-89-3	Ras El Behar 6	Um Agawish 1	Ras El Behar NE 1	Ramadan 1
Depth (m)	1825	1306	276	664	657	925	1280
Thickness	45	25	6.7	18	56.5	20	25
Depth			417	823			
Thickness			12.8	17			
Depth			619	995			
Thickness			23.5	10			

In 14 holes, the average thickness of this potash bed is 23m. It extends about 60 by 15 km.

One side-wall core has been obtained from a potash bed in an offshore well, composed of about 45% sylvite and 55% halite, (K_2O 24%). All of the logs indicate sylvite mixed with halite, as usual. Carnallite (KCl, $MgCl_2.6H_2O$) and polynalite ($2CaSO_4$, $MgSO_4$, $K_2SO_4.2H_2O$) are also suggested by the data.

To verify the resource, a coring program aims for preliminary results before the 1964 MPGAP meeting. The first drill site is near Ras El Behar North East 1, to sample and test the shallow layer at 352-358 m, and the layer at 925-945m. Mineral identification and chemical analysis will be conducted, along with detailed geophysical logging. A second site near Ras El Behar 6 may test the ability to project existing data some distance, seeking the same beds shown at 664, 823 and 995 m, totalling about 45m of apparent potash. A third borehole could be drilled near well Gebel El Zeit 2. This is to investigate potash at 425 m in the upper salt bed of the Zeit Formation and the very thick unit at 1306-1336 m in the fifth salt bed of the South Gharib Formation. A fourth hole could be drilled near Um Agawish 1, where 56.5 m of lower-grade ore occurs at 657m. Total estimated drilling needs are 3950 m.

Market considerations may be overshadowed by favorable factors: the potash beds are in excess of 3m thick at depths of less than 400m; they have such geographical distribution that an ideal seaport mine site can be selected for economic processing, materials handling and marketing. The deposits underlie Zeit Bay and Jemsa Bay. Thus a conventional room and pillar or longwall mine could be accessed by a shaft, and processed or raw minerals could be loaded directly on board ship. Alternatively, there are outstanding deposits at reasonable depths for solution mining. For example, at 664m at Ras El Behar 6 is an 18 m bed, possibly suitable for either conventional or solution mining. Elsewhere, there are several thick units, so multiple mine or well completions are possible. Labor and energy are cheap in Egypt. The product of a well-designed operation may compete favorably with most of the world's sources not so favored. Egypt's potash import requirements have been increasing, and use will grow faster than other fertilizers.

Several products could be made at a single locality. Egypt used to export salt produced from Mediterranean evaporation pans, but now barely satisfies its own needs. Rock salt deposits of the Gulf of Suez include pure white translucent crystalline halite ready for market or refining. Salt and potash could be mined through the same shaft. There is abundant solar energy for evaporation and ideal topographic settings can be included in site selection criteria. Phosphates are being mined on the Red Sea coast. There are vast deposits of gypsum and limestone available nearby. Sulphur is present in some oil wells and a mine in the area, and if encountered in any exploration, it could be produced for acid-making or direct marketing. Magnesium salts are also likely to be found in the evaporites. Cost-sharing among complementary mining operations can make them all more competitive. The Red Sea coastal area has great potential for developing chemical and fertilizer industries.

Although apparent reserves are about 40 billion tons, no proven nor probable reserves have been demonstrated. One consultant doubts that sylvite (KCl) will be found, predicting sulphates, but the one sidewall core substantiates the interpretation of geophysical logs. It is considered vital to a speedy promotional activity in this commodity area to get some samples of deposits before the first MPGAP Semi-Annual meeting, to prove both the quality and quantity of the reserves.

GPC is drilling production wells in the Ras El Behar Northeast area. They have completed Nos. 3 and 4 recently, and will drill No. 5 shortly. The new logs substantiate our first potash target, while hole 5 presents an opportunity for early sampling by sidewall coring. A cost estimate has been requested, with EGSMA paying in dollars. Geophysical logs cost $2.56/m., while cores cost $175 each with a $1.20/m depth charge. Cores are obtained in strings of 24, with a run taking about 4 hours. If conducted at about 1000 m., logging would cost $2560. Upon immediate interpretation, one or two intervals may be picked, totalling about 25 m. Four sidewall coring runs would recover 96 cores at 25 m spacing for $1200 plus $16,800. Rig time for a day is about $22,000, thus total sampling costs may be $40,000 for Ras El Behar NE 5.

Continuous core samples are an eventual necessity to prove mining thicknesses, to get average chemical compositions, roof and floor lithology, mechanical properties and the compositions of possible salt-mining horizons. GPC cost estimates have been requested. Tentatively, they believe it may cost $150,000-200,000 to core 65% of the rock to 800 m ($250-300/m). If let to bid, I believe wire-line coring techniques would lower this rate. Since U.S. equipment is used by contractors, payment is in dollars.

In the meantime, EGSMA drilling capabilities are going to be pushed to their limit, with the objective of sampling one or more prospects at less than 500 m depth with the Zif 500 mobile drill. Oil-based mud has been rejected as infeasible, but we will learn how to use concentrated brine as circulant, thus avoiding core and hole erosion. The staff will visit the Ras El Behar area to select sites and depths suggested by the oil well data.

We will also examine the Miocene evaporites exposed on Gebel Zeit and Gemsa anticline, with a view to establishing drillable targets at shallow depths on the flanks of those folds. No one has previously correlated the surface (much dissolved) with the subsurface, but this is believed to be the best way to find deposits at minimum depth, projecting them up-dip from levels detected in wells.

After the cost-saving measures have been fully exploited, it still may prove necessary to either contract some deep (1000m-range) coring, or to acquire a drilling-rig capable of the job of blocking out ore. This work could be a negotiable part of any concession contract.

An information package may also be prepared for the potash deposits, to be sold at near cost to interested parties.

Exploration of Gypsum Resources of Egypt

There are several deposits of gypsum that have potential, either for use internal to the country, or for export. I propose to augment the sparce written record of these deposits by examining them during field trips to be held during 1983. Appropriate drilling and sampling programs will be developed according to the findings.

Of highest priority are massive gypsum deposits of Miocene age exposed at or near the Red Sea coast of Eastern Egypt. The proximity to excellent harbors that can be developed into mineral-handling facilities is the main criterion for priority of these deposits. The site advantage will be enhanced if potash and salt deposits are exploited in the same area. During July 27-30, the Egyptian Geological Survey and Mining Authority will conduct a field trip to investigate surface occurrences at Ras Gemssa and Gebel Zeit, where hydrated Zeit formation beds are exposed. Massive deposits will be scrutinized for the occurrence of limestone and shale interbeds, which could influence the economics of ore handling, and may determine whether or not a shippable product can be made without beneficiation. A core-drilling program will be laid out, to test uniformity, to determine necessary depths of stripping and the down-dip extent of hydration, whereupon the resources can be assessed. During July 31-August 4, similar work will be done at Wadi El Gamal, south of Marsa Alam.

On a subsequent field trip, to be completed in August, we will visit several Miocene gypsum occurrences on the east side of the Gulf of Suez, including the dormant mines at Ras Malaab, Wadi Garantal, El Shaat and Dhabab. In the event that port facilities are not built on the west coast, there may be potential for expanded production or new mines in this area of the Sinai, in order to take advantage of foreign marketing opportunities.

A two-day trip will be made to the gypsum deposits lying between Pleistocene beaches of the El Hammam area, west of Alexandria, and at Mersa Matruh. These have been mined to some degree, exposing impure gypsum beds of about 1 m thickness. Reserves are sufficient to support an export operation

if handling could be arranged in this port-less stretch of coast. I would have arrangements made to visit the El Alamein oil shipment facility, whereat tankers tie to a buoy in mid-sea, and receive petroleum via pipeline delivered to the buoy. Similar handling of slurried gypsum could be contrived, following coal loading procedures. This new technology could make the remote El Hamman deposits suddenly competitive, althouth it is largely of agricultural or cement grade.

Another prospect that can be examined is the thin gypsum crust found in Northern Beguirat in the Fayoum Governorate. The strippable nature of this crust makes it potentially useful for agriculture in the Nile Valley. I will research the fertilizer industry. Depending on the local needs and the physical problems entailed in excavation, processing and transport, the deposit may be worth advertising as a feasible enterprise. In similar fashion, deposits being exploited at Beni Suef and Girsa, in the Upper Nile Valley, will be visited at the first opportunity.

Gypsum Reserves

Name of Deposit	Proven	Probable	Thickness	Lower	Grade
	(metric tons)		(m)	(m)	(% $CaSo_4nH_2O$)
Fayoum area:					
Qarret El Farass	4.2	2.9			
Buquirat	2.1	2.0	.20-2.3	.20	62
W. of Alexandria:					
Qrayia, 88-98 km	2.5	1.5	.20-4.85	.7-5.5	79
Hagiff, 100 km	(extensive)		1.5-10.0	1.5	92
Sinai near Suez:					
Ras Malaab	21	40 (200 possible)			high grade
Ballah	11				
Gharbanyiat	6.6	5.6			

Detailed surface geologic mapping is to follow promptly upon completing a reconaissance of the Red Sea coast areas. The most attractive areas will be mapped at about 1:1,000 scale, preferably on blown-up aereal photographs, with particular attention paid to beds that would contaminate the gypsum, or that may serve as markers to be found in drill-cores. Nearby plant-site conditions will be mapped in similar detail, and drill-hole locations may be altered to suit conditions found. This work needs to preceed drilling by some weeks, so should be scheduled for late September, 1983. Trenches may have be cut to expose the rock adequately. The purity of the deposit and ease of excavation will be determined, largely by this work.

A core drilling program will be executed at at least one prospective site during the 1983-1984 field season, such as Gemsa or Gebel Zeit. Drill sites will be arranged at about 100 m spacing along profiles in the dip direction, with shallowest holes exploring the outcrop to the base of gypsum (annydrite or some other lithology), and deeper holes in the flank area where shale or limestone may cover the gypsum. The extent of gypsum with depth and downdip, where hydration is always incomplete, must be determined to verify resources and to plan the mining. Such a program may be extended to subsequent years and to other deposits. Whereas gypsum is easily drilled with water, core recovery may be incomplete in weak materials if ordinary tools are used. The triple-tube core barrel may be cost-effective, because 100% recovery would eliminate need for geophysical logging. If halides occur with the gypsum, saturated brine may serve as circulant.

Core-logging procedures will have to be established, as well as sampling, storing and transporting arrangements. Laboratory analysis of the gypsum will be established.

While exploration is progressing, a market study must be undertaken. The Egyptian fertilizer needs have been projected to future years, and many agencies are prepared to advise us on local market potentials. Since local cement manufacture is increasing, so will the gypsum ingredient. World-wide markets for raw or beneficiated gypsum need to be investigated, so as to perceive the profitability of mining ideally-situated high-grade deposits. Agency assistance will be sought for this work. An information package will be prepared.

Exploration and Marketing other Minerals

Egypt has other resources that could attract foreign capital. I list here some that seem promising and worth pursuing further than the Geological Survey has developed them. In rough order of priority, they are:

Mineral	Locality	Comments
Tin-Tantalum-Niobium	Abu Dhabab	$52x10^6$T ore, .11% Sn, .03%Ta_2O_5 .03%Nb_2O_5 under negotiation
Gold-Copper-Nickel	Abu Sewayil	85,000T, 162/T Au, 2.85% Cu
Copper-Nickel-Cobalt	Gabbro Akarem	500,000T ore, 1.52%Cu, 74%Ni, .14% Co
Tantalum-Niobium	Nuweibi	$30x10^6$T ore, .017%Ta_2O_5, .009% Nb_2O_5 N_2O_5
Ilmenite	Abu Ghalaya	$20x10^6$T ore, 36%TiO_2, met. problem
Zinc-Copper-Lead	Umm Samuki E	200,000T ore, 10.3%Zn, 1.1%Cu, 2.3%Pb,
		2900T ore, 21%Zn, 4.5%Cu, 10%Pb
	Umm Samuki W	85,000T ore, 11.8%Zn, 1.1% Cu, 1.6% Pb
		45,000T ore, 21.6%Zn, 2.2%Cu, 0.5%Pb
		27,400T ore, 25.5%Zn, 2.2%Cu, 2.7%Pb
Uranium	Wadi Rusneid	$64x10^6$T ore
	El Erediya	$6x10^6$T ore, .25%U_3O_8
Tin	Wadi Nugrus,	Impressive placers
	El Rusheid	" "
Phosphate	Abu Tartur	10^9T ore, costly infrastructure
Limestone	Numerous sites	Immence reserves of low-Mg rock
Coal	Maghara	$20X10^6$T, sub-bituminous
Glass sand	Zaafarana	Homogeneous dune deposits on coast
Nephyline Syenite	Near Red Sea	Glass manufacture, Al source
Dolomite	Gebel Ataqa	High Purity

The first seven listed are all in ophiolites or strataform volcanics of the Red Sea Hills. Though rich deposits have been found, large deposits have not. Because an economic deposit of massive sulfide could develop into billion-dollar status (as can the non-metallics), long-range exploration efforts should be directed to these in preference to the gold mines, which are in the million-dollar category. It should be understood that the gold mines have proven reserves, whereas the explorations for massive sulfides may require years of investment in exploration efforts, without guarantee of returns. My personal feeling is that major finds will be made if a steady exploration program is instituted.

PC has not contributed significant input to the planning of activities of the other three GOE agencies, believing that priority belonged to the EGSMA needs. Whereas a temporary office was provided for PC at EGSMA, lack of activity at DRI and RSC, in contrast to planning fervor at EGSMA, contributed to the emphasis on the latter's functions. Once Resident Project Director (RPD) is on board, a better distribution of effort will be possible. The vital functions DRI has to fulfill, namely water-finding to make any mineral exploitation feasible, will shortly assume high priority for PC time, while RPD applies his skills to the RSC planning.

PC has had several meetings with EGPC and its subsidiary GPC for planning their long-term contract work and for collaboration with EGSMA on the potash explorations. PC recognizes he needs to immerse himself in the technical field of petroleum exploration in Egypt, since major expenditures will have to be decided upon their merits, rather than solely on EGPC decisions. For the meantime, PM Hussein Kamel and his staff are content with the Aeroservice Co. performance on their contract - output is expected to be on time, during about December-January. PC intends to push for early data on the basement configuration in the vicinity of the newly-discovered basin SE of Cairo, as it will bear on decisions of alternative contracts, for seismic refraction profiling, or for a stratigraphic test well. The latter has been estimated by Dr. Gamal Hantar to cost $6-10 million, so PC feels he will need to delve into the technology of deep coring, possibly assisted by a U.S. consultant, before such a well is let for competitive

bidding. Appparently, no one has used wire-line coring in Egypt, a method that could shorten the drilling time greatly. On the field trip, PC will be seeing most of the rock units to be expected in such a basin. If costs can be minimized, other exploration efforts could be undertaken with money saved, remaining within the $16.5 million committed to EGPC.

Incidentally, GPC has expressed some proprietary feelings about scientific aspects of the potash discovery, logical because the deposits are in evidence in their own wells. The cooperation atmosphere is being developed further by joint attendance during the July 27-30 part of the trip, when we will also be GPC guests at Ras Gharib Camp.

Three consultations have been held at DRI with Director El Shazly. The general plan of groundwater exploration has been central to discussions, but drill-rig specifications have been the most difficult to finalize. First of all, DRI does not yet share EGSMA's sense of urgency in presenting the world a picture of feasible mineral investments, for their initial efforts of the 1963-1964 field session did not include drilling, without which water resources cannot be proved. If needed, they would contract the drilling.

PC is impatient to get drilling capability into DRI hands. Their little rotary rig is broken down, though their compressor is operable. Just what to specify for rig requisition remains problematical. Dr. El Shazly wants a big new American rig, capable of 1500 ft holes. Practical problems to be surmounted before PC will be comfortable in the belief the rig can and will be properly maintained include: 1) almost total lack of machine-shop facilities at DRI. They can probably not do much beyond simple automotive maintenance, 2) lack of qualified mechanics, trained in heavy equipment and drilling in particular, 4) lack of a designated drilling-department engineer to lead the work of equipping and maintaining a rig, 4) unwillingness to budget sufficient funds annually to keep a big rig running, 5) general lack of experience in Egypt with American rigs, a natural bias towards Russian equipment prevailing still. PC is currently working to establish, within budget, a drillrig of manageable size and complexity, together with machine-shop equipment, possibly truck-mounted, to permit maintenance. Communication has been hampered by the frustrating telephone system, causing failure to meet for discussions or some occasions.

When office facilities at EGSMA and DRI have been installed, better information flow should result. Equipment for the office, less air conditioner, telex and telephone, should be installed by August 15.

Other commodities procurement work has been stalled waiting on two decisions: the drill rig and x-ray fluorescence equipment. Specs are being written for IFB's for all but those items. When Dr. Leo Packer returns to Cairo July 25, his help at NRC will be sought, in order to convince EGSMA's Dr. Gad to do without the X-ray fluorescence gear. Instead, I intend to offer him a new DTA to replace their old inoperable, Hungarian gear. That has been a vital tool for clay identification, and I am confident that a new one would be well used. If it takes some more weeks of negotiations on those two uncertainties, we will have to proceed with the rest.

In the training area, preparations for four U.S.-bound geologists have been made, both independently with the Colorado and Arizona Universities, but also via Bendix. John Burger will visit with the men here before they leave for U.S.A., and will have their tickets written here. Additional designations have been made by EGSMA, DRI and EGPC for training to begin in Spring 1984.

The first TDY appointees are tentatively scheduled for arrival about October 1. These include two in gold mining (an engineer versed in underground and pit operations, plus and explorationist). We have opted to have three for 3 1/2 - 5 months each vs. two for 4 1/2 months. The third is for Spring arrival, a metallurgist-gold processing expert.