



GUYANA

MINISTRY OF MINES AND FORESTS

---

**REPORT ON THE GEOLOGICAL  
SURVEY DEPARTMENT FOR  
THE YEAR 1971**

---

Geological Surveys And Mines Department  
P. O. Box 1028  
Georgetown, Guyana

---

1972

GEOLOGICAL SURVEYS & MINES DEPARTMENT  
ANNUAL REPORT FOR 1971

	<u>Page</u>
CONTENTS	
1. INTRODUCTION	1
2. GENERAL REVIEW OF THE YEAR	1
2.1 Professional Staffing	1
2.2 Training of Professional Staff	1
2.3 Nationalisation of the Demerara Bauxite Company a Subsidiary of Alcan	2
3. HEADQUARTERS WORK	2
3.1 The Analytical Laboratory	2
3.2 The Petrological Laboratory	5
3.3 Drawing Office	6
3.4 Library and Publications	8
3.5 Radio and Geophysical Workshop	10
3.6 Mechanical Workshop	11
4. CONFERENCES AND VISITS	11
5. COLLABORATION PROJECTS WITH OVERSEAS GOVERNMENTS AND INSTITUTIONS	12
5.1 United Nations-Guyana Mineral Survey Phase II	12
5.2 The Canada-Guyana Aerial Geophysical Survey	12
5.3 Photogeological Survey of Southern Guyana	13
6. SUMMARY OF FIELD WORK	14
6.1 GEOCHEMICAL-GEOLOGICAL INVESTIGATIONS	
6.11 <u>Potaro-Mazaruni Project: Omai-Eldorado-Tikwah Section</u> Geological-geochemical Survey by A.K. Gibbs, D. Dublin, B. Stephenson, C. Pollydore and A. Olukoya. First and Second Seasons 1971	14
6.12 <u>White and Fall Creeks, Groete Creek Goldfield Lower</u> <u>Essequibo.</u> Geological-geochemical reconnaissance by S. Mabbula. First Season 1971	15
6.13 <u>Baboon Creek Tungsten Prospect, Eagle Mt. Potaro</u> <u>District.</u> Geological-geochemical survey by K. Narine. Three weeks of Second Season 1971	16
6.14 <u>Sardine Hill and the Upper Tupuru and Mutosse</u> Geological-geochemical survey by M.W. Milner, First Season 1971.	17

	<u>Page</u>
6.2	19
GEOPHYSICAL-GEOLOGICAL INVESTIGATIONS	
6.21	19
<u>Bartica Triangle: Search for deep seated structures by geophysical methods by R. Chakraborti, Second Season 1971</u>	
6.22	20
<u>Small Konawak Molybdenum Prospect, Potaro District Ground Magnetic Traverses and Interpretation by N. Chakraborti</u>	
6.3	21
DIAMOND DRILLING OPERATIONS	
6.31	21
<u>Eagle Mountain Molybdenum Prospect, Potaro District Exploration drilling project planned by Dr. A.K. Banerjee and supervised by J. Inasi (1st Season) and A. Fawcett (2nd Season)</u>	
6.32	23
<u>Small Konawak Molybdenum Prospect, Potaro District Overburden drilling by J.C. Inasi. First Season 1971</u>	
6.33	24
<u>Groete Creek Gold-Copper Prospect Lower Essequibo: Blocks B &amp; C Drill Holes 65-70 Geochemical and exploration drilling project planned by Dr. A.K. Banerjee and carried out by J. Ghansam. First Season 1971</u>	
6.34	25
<u>Dickman's Hill Molybdenum-gold prospect, Potaro District Exploration drilling planned by A.K. Banerjee and supervised by A. Fawcett, Second Season 1971</u>	
6.4	26
CLAY INVESTIGATIONS AND ALLIED PROJECTS	
6.41	26
<u>Tumatumari Ball Clay Deposits: Exploration and evaluation based on surface exploration and drilling by J. Treacy and D.A. Dublin. First and Second Seasons 1971.</u>	
6.42	28
<u>Supenaam Clay Deposits: Preliminary reconnaissance by D.A. Dublin. Second Season 1971.</u>	
6.43	28
<u>Demerara Brick Clay: (opposite Soesdyke) Preliminary evaluation by J. Treacy. First Season 1971.</u>	
6.44	28
<u>Kauranambu Soapstone Deposits, Barama River: Preliminary evaluation by S. Mabbula. Second Season 1971.</u>	

	Page
6.45 <u>Bartica Area Pegmatite Resources:</u> Preliminary evaluation by A. Choudhuri and S. Narine Second Season 1971.	30
6.5 RESEARCH AND APPLIED GEOLOGICAL TOPICS	
6.51 <u>Hariwa and Kuruaparu Laterite bodies, Ituni Area:</u> A Study of their disposition and variation, and of the diagenetic processes responsible for the latter by N. Cameron. First Season 1971.	31
6.52 <u>Paleomagnetic survey of dolerite dykes in the North and South Rupununi Savannas.</u> Collection of samples and training in associated techniques by Prof. W. Hargraves (Princeton Univ- ersity) accompanied by A. Choudhuri, C.N. Barron and S. Narine. Second Season 1971.	32
6.6 APPRAISAL OF ELUVIAL-COLLUVIAL GOLD PROSPECTS	
6.61 <u>Tiger River Gold Prospect, Potaro District:</u> Survey and evaluation of the quartz lodes and mineralised structure in the oxidised zone, by J.C. Inasi and C. Gibson. Second Season 1971.	33
6.62 <u>Honey Camp Gold Prospect, Issano Road, Lower Mazaruni.</u> Evaluation of the colluvial (hillside) deposits, and description of their geological setting by B. Stephenson and M. Patterson. Second Season 1971.	34
7. MINES DIVISION	
7.1 Mineral Production and Development	35
7.11 Bauxite	35
7.12 Gold and Diamonds	37
7.2 Exploration and Prospecting	39
7.21 Licences	39
7.22 Prospecting Licences	39
7.23 Trading Licences	39
7.24 Oil	39
7.25 Gold, valuable minerals, precious stones and silver.	39
7.26 Other minerals	39

	<u>Page</u>
7.261 Radio-active minerals	
7.3 Revenue	39
7.4 General comments and conclusions	39
8. Technical Assistance to West Indian Islands	40
Appendix I, Staff Availability	40
Appendix II, Summary of Expenditure 1971.	

7.2 Exploration and Prospecting

7.21 Licences: 1611 Claims Licences and 431 River Location Licences were in existence during 1971 as compared with 2,099 Claim and 395 River Location Licences for 1970.

7.22 Prospecting Licences: 191 Prospecting Licences were issued during 1971 in Georgetown.

7.23 Trading Licences: 90 Licences to trade in gold and/or precious stones and 97 Licences to purchase gold for manufacture of jewellery were issued for 1971.

7.24 Oil:

Continental Oil Co. and Tenneco (Guyana) Inc. and Guyana Shell Ltd.

Shell, and a consortium headed by Continental, jointly drilled a structure situated at the boundary of O.P.L. 209 and O.P.L. 211. The hole was drilled in 450 feet of water to a depth of 12,500 feet. Traces of oil and gas were encountered but not in commercial quantities.

The consortium headed by Continental relinquished the remaining 1,000 sq. miles held under O.P.L. 209.

Oil Prospecting Licences 221 and 223 were issued to Cominco Exploration (Guyana) Ltd over areas of 2,225 sq. miles and 1,660 sq. miles respectively of the Continental Shelf.

Oil Prospecting Licence 222 was issued to Oxoco Guyana Ltd over an area of 834 sq. miles of the Continental Shelf.

7.25 Gold valuable minerals, precious stones and silver

One Exclusive Permission No. 631 was granted to Terra Developments International Ltd over an area of 9.416 acres on left bank Irang River to explore for gold, precious stones and valuable minerals.

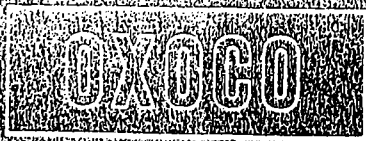
7.26 Other minerals

7.261 Radio-active minerals:

Exclusive Prospecting Licence 630 granted to International Nickel Southern Exploration Ltd over 1,022 sq. miles of land in the South Savannas was abandoned during 1971.

7.3 Revenue

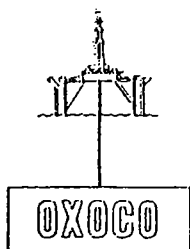
Revenue collected in Georgetown amounted to \$799,345.87. This includes the following royalties:-



OFFSHORE GUYANA  
SEISMIC PROGRAM  
1972

OFFSHORE EXPLORATION OIL COMPANY  
P.O. BOX 11689 PHILADELPHIA, PENNSYLVANIA 19106  
(215) 762-7000 CABLE OXOCO

Oil Concessions  
(Guyana)



OFFSHORE  
EXPLORATION  
OIL  
COMPANY

October 17, 1972

Dr. Sobharam Singh  
Director  
Geological Surveys  
Mines Department  
P. O. Box 1028  
Georgetown, Guyana

Dear Dr. Singh:

In compliance with your letter of October 3, 1972, addressed to Miss L. Ferdinand, we are submitting the details of our work program for Areas A and B, as well as OEL 222.

As you requested, the details of the program are given separately for Area A and Area B, as well as the tentative plans we have for detailing parts of OEL 222. However, the survey specifications as given will pertain to all of the work being planned, as our contract with Delta covers our entire program. Therefore, the time estimates for completion of this program also pertain to the entire project. Since the end result of this work will be to evaluate the entire area and the interpretation is directed toward that end, it is not practical to estimate the time required to evaluate data in Area A and in Area B as separate entities.

If we can be of further service, please do not hesitate to ask.

Sincerely yours,

Lloyd S. Grearson  
Chief Geophysicist

LSG:mgs

enclosure

cc: Miss L. Ferdinand

Oil Concessions  
(Guyana)



Guyana Seismic Program

Area A : 460 Sq. Mi.

4 lines tied into grid coverage on OEL 222

Total line miles: Approx. 88 miles

Spacing varies to conform with existing grid,  
averaging 6x10 mi.

Area B : 750 Sq. Mi.

7 lines tied into grid coverage on OEL 222

Total line miles: Approx. 172 miles

Spacing varies to conform with existing grid,  
averaging 6x10 miles.

Additional Detail Lines:

3 Lines are shown, spaced equally between existing NE-SW in NE sector of Area B and OEL 222. Line miles shown amount to approx. 45 miles, but actual position and total miles involved are contingent on results of Velocity/Lithologic study being conducted by Geophysical Services Inc.

Survey Specifications:

Total Line Miles: 305 mi. (tentative)

I. Acquisition Parameters:

A. Survey Commencement: On or about November 15, 1972

Duration: Approximately 1 week

Contractor: Delta Exploration Company

Vessel: M/V Mediterranean Seal

B. Source: Vibroseis System

4 WABCO Mark IV Vibrators

40' x 40' array

Depth 35'

C. Recording Configuration: 24 groups

group interval 328 ft.

Offset: 984 Ft. off #24

2400% CDP

Cable depth 40 ft. ± 5 ft.

D. Recording System: Texas Instruments DFS III

24 Data channels, 6 auxiliary channels

SEG "A" Format, ½ inch tape, 800 BPI

Sampling rate 4 ms, 6 second recording

Onboard correlator (RTG Model MW-10)

Display Units 1. ETL analog single trace plotter

2. ETL SDW 300 24-trace  
electrostatic camera for 24  
trace monitor record.

Guyana Seismic Program, Page 2

- E. Navigation System: Satellite receiver  
doppler sonar  
gyro compass  
high speed digital computer  
digital tape recorder  
also included: Long range radar systems  
gyrocontrolled autopilot  
Loran A, C, receivers  
dual Simrad fathometers w/strip  
chart recorders  
Marine ship-to-shore radio  
Long range SSB radio

II. Processing Parameters: May be varied depending on results of Velocity/lithologic study being conducted by GSI. Processing generally will include the following:

A. Processing Contractor: Seismic Computing Corporation  
Anticipated completion date: January 1, 1973

- B. 1. 1200% CDP stack, 6 second record length  
2. Velocity determinations at 3 mile intervals, or as dictated by changing geological conditions. Includes Velocity Spectrum, Veri-Vel display of interval velocities, and RMS Velocity profiles.  
3. Bandpass filtering - space and time varying frequency filters  
4. General procedure:  
Edit, Conversion to demultiplexed format, vertical sum 2 on 1  
Time Varying Adaptive Correlation of Vibroseis data  
Cross-section display of near trace from each file (quality control, velocity placement)  
Velocity spectrum analysis  
Normal moveout, Static corrections  
CDP stack  
Bandpass filtering  
Remultiplex for display on film section

III. Interpretation - Lloyd Grearson, OXOCO  
Duration: 1 month after receipt of final processed data plus  
2 weeks for Final Interpretation Report preparation.

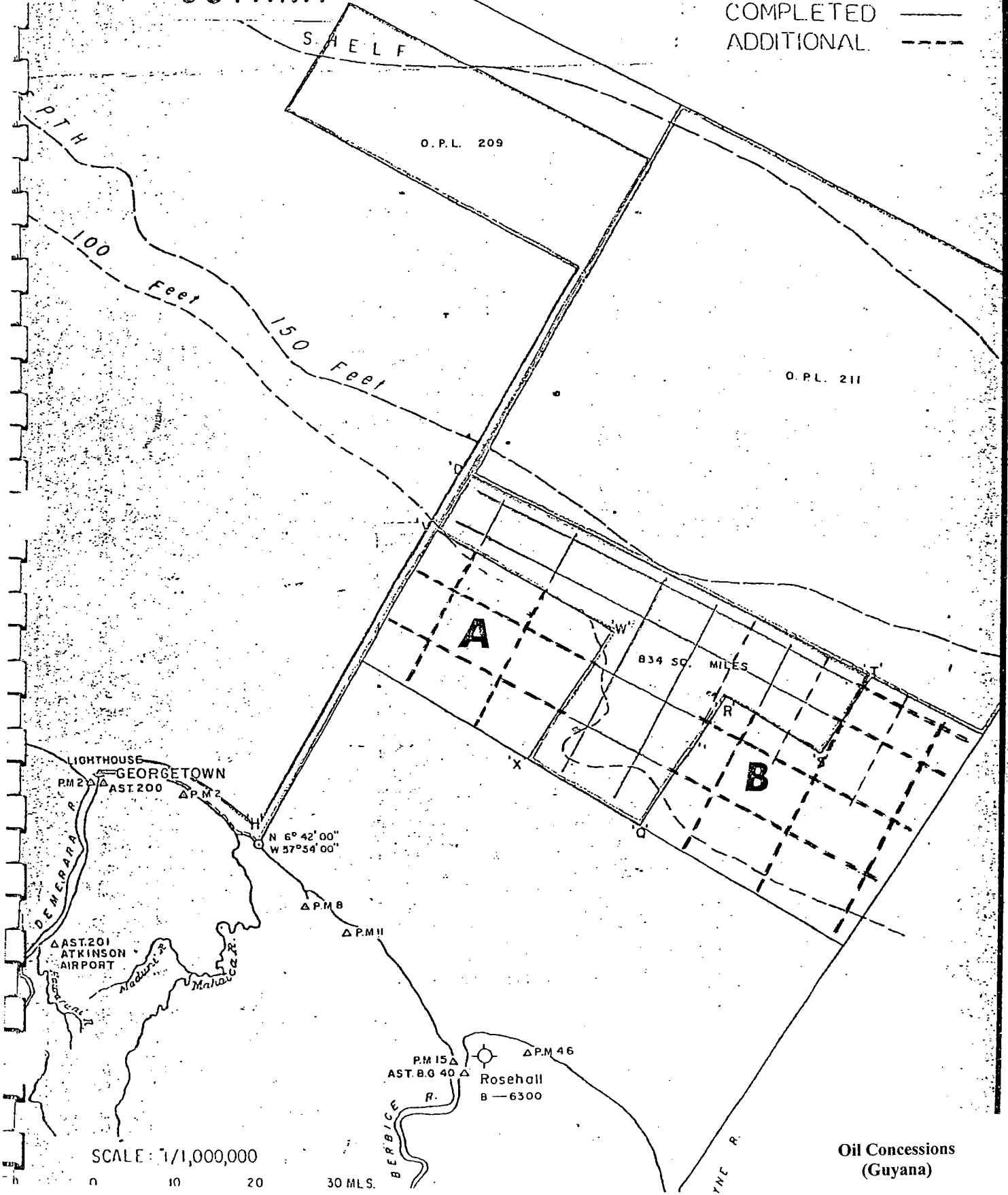
GEOLOGICAL SURVEY OF GUYANA

Area applied for  
OFFSHORE EXPLORATION Oil Co.

# MAP OF THE COASTAL AREA OF GUYANA

SEISMIC PROGRAM

COMPLETED ———  
ADDITIONAL - - - -



SCALE: 1/1,000,000

0 10 20 30 MLS.

Oil Concessions  
(Guyana)

No. 226

OIL EXPLORATION LICENCE

THIS DEED made the 15<sup>th</sup>  
day of November, 1972 between  
the President and Commander-in-Chief of Guyana and  
O X O C O GUYANA LIMITED (hereinafter referred  
to as the "Licensee") of the other part.

WHEREAS the Licensee in accordance with the  
conditions laid down in the Regulations for the time  
being in force for the granting of oil exploration  
licences has applied to the President for an oil  
exploration licence in respect of the Lands specified  
in the Annex marked "A" hereunder (hereinafter referred  
to as "the said lands") and has entered into a Bond in  
the form set out in the Annex marked "B" hereunder with  
the Commissioner in the sum of Ten Thousand Dollars (\$10,000)  
conditioned for the due and faithful carrying out of the  
provisions contained in this Deed:

NOW THIS DEED WITNESSETH AS FOLLOWS:

1. In consideration of the sum of Two Thousand, Six  
Hundred dollars, which has before the execution  
hereof been paid by the Licensee to the Commissioner on  
behalf of the President, the sole right and licence is  
hereby granted by the President to the Licensee, for  
the term of one year from the date hereof, subject to  
the rights of any holder of any right, title or interest,  
in or over the said lands or any part thereof and subject  
to the restrictions, conditions, and provisions, hereinafter  
contained, to explore and search the surface of the  
lands described in the Annex marked "A" hereunder for  
petroleum, and for that purpose to make geological and  
geophysical and topographic examinations on the ground

"A"

DESCRIPTION OF AN AREA APPLIED FOR BY

OXOCO GUYANA LIMITED

FOR AN OIL EXPLORATION LICENCE.

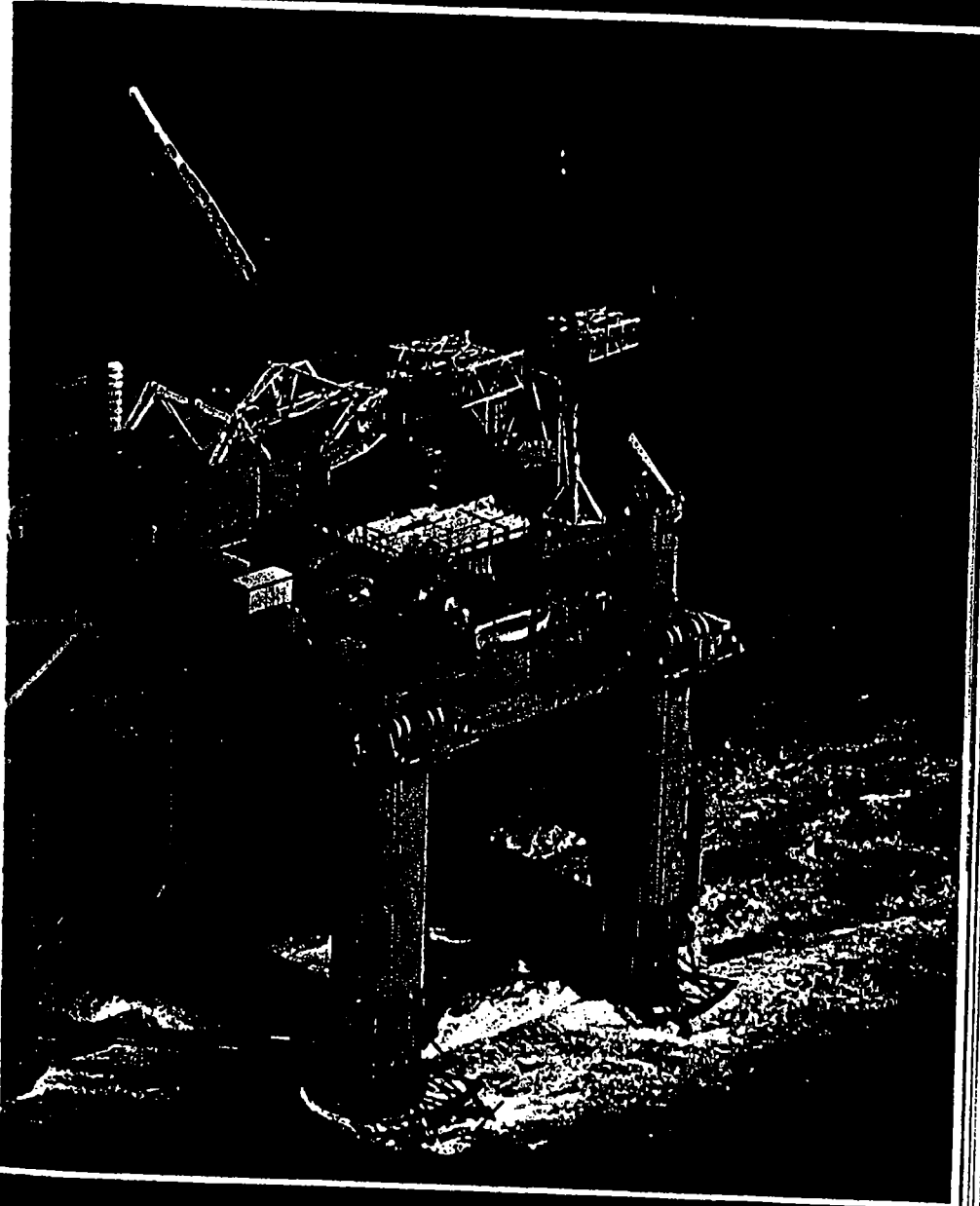
An area of approximately 750 square miles being contiguous with OPL 222 held by OXOCO and commencing at a common point Q having latitude  $6^{\circ}44'00''N$  and longitude  $57^{\circ}13'00''W$ ; thence along the common boundary with OPL 222 for a distance of about 19.5 miles along the common boundary to a point R having latitude  $6^{\circ}57'00''N$  and longitude  $57^{\circ}03'30''W$ ; thence along the common boundary with OPL 222 for a distance of about 14 miles to a point S bearing latitude  $6^{\circ}51'30''N$  and longitude  $56^{\circ}53'00''W$ ; thence in a north-easterly direction for a distance of about 11.5 miles to a point T on the southern boundary of OPL 211 and having latitude  $6^{\circ}59'00''N$  and longitude  $56^{\circ}47'30''W$ ; thence in a north-easterly direction along the southern boundary of OPL 211 for a distance of about 15 miles to a common point AA bearing latitude  $6^{\circ}52'22.29''N$  and longitude  $56^{\circ}35'50.70''W$ ; thence in a south-westerly direction for a distance of about 32 miles to a point Z bearing latitude  $6^{\circ}30'40''N$  and longitude  $57^{\circ}08'45''W$ ; thence in a north-westerly direction for about 29 miles to point of commencement, save and except all areas already lawfully held or occupied.



December 11, 1972

# OIL & GAS JOURNAL

PUBLISHED WEEKLY



... itself toward confrontation with North Sea winter . . . . . 86

... at the upcoming big lease sale off Louisiana . . . . . 49

... seismic activity jumps 18%, U.S. halts its slide . . . . . 54

... banking recycle rates mean to U.S. refiners . . . . . 81

Oil Concessions  
(Guyana)

## INTERNATIONAL BRIEFS

### Third Guatemalan salt-dome well spudded

BASIC Resources International S.A. has spudded its third hole on the Tortugas salt dome 125 miles north of Guatemala City, Guatemala, where it has two completions (OGJ, Oct. 9, p. 37).

Oil was tested at rates of 1,296 b/d and 1,800 b/d, respectively, in the first two wells at depths near 2,500 ft. The new hole is on the opposite side of the dome about a mile from the first two finds.

**Other drilling and exploration news:** Gulf Oil has spudded the 9-466/IX wildcat 28 miles southeast of Chumphon, Thailand, in Block 9 of its 11,272-sq-mile Gulf of Thailand concession. The recent 8-320-IX wildcat was plugged at 6,405 in Block 8. The 9-466/IX is the last of four wells slated by Gulf. . . . France's Elf-Spafe and partners have oil and gas shows in a test in the Ikando Marine permit area offshore Gabon, West Africa. Elf-Spafe has a 60% interest, and the other 40% is divided among Ocean Drilling & Exploration (Odeco), Murphy Oil, and Ocean Oil & Gas. . . . Broken Hill Proprietary Co. Ltd. (BHP) will go it alone to drill the 1 Snail wildcat in Australia's Otway basin, 80 miles southwest of Melbourne in Bass Strait. . . . Esso-BHP, meanwhile, has abandoned as dry its 1 Durcon at 9,922 ft off the coast of Tasmania. . . . France's Aquitaine, 49% interest holder and operator for itself and partners, has had shows of hydrocarbons at 13,120 ft in the 1 Linden wildcat east of the canton of Berne, Switzerland. Bernischer Erdoel A.G. has 51% of the drilling permit area. . . . Colorado Greece Oil Corp. is sidetracking its 1 Kavala in the North Aegean Sea at 4,025 feet and will drill to 5,800 ft to test gaseous hydrocarbon zones previously encountered. Production testing of the well, which had been drilled to 6,675 ft, was prevented by cementing tools lodged in the hole.

### Guyana awards two offshore concessions

THE Government of Guyana, South America, has granted two offshore exploration licenses—one to Offshore Exploration Oil Co (Oxoco), Philadelphia, and another to West Germany's Deminex.

Oxoco, which has completed a seismic survey

indicating favorable oil prospects, was awarded a 2,000-sq-mile offshore area. Deminex was awarded an offshore area of 3,789 sq miles. Deminex is reported also to be negotiating exploration acreage off Venezuela.

**Other concession news:** The Government of Malta is offering for \$100,000 nonexclusive seismic data on 1,240 miles of the coast bank and areas south of Malta as a "pre-condition" for consideration of applications for production licenses in the area." The government's details of production licenses will be disclosed in early March. . . . Texas Gas Exploration (Texas Gas Transmission subsidiary) and physical Exploration Corp., both of which have applied for a 376-sq-mile exploration license offshore Belgium. Located northwest of Brugge, the license on the so-called "Marin" area, is for 5 years.

### New company to explore off Japan

TAO Nenryo Kogy Co. and General Oil Development Co. have formed East Japan Oil Development Co. (EJOD) to participate in exploration and development of oil and gas off the eastern coast of mainland Japan.

Esso is to transfer 30% of its 50% interest in what has been a joint venture with Teikoku. The offshore concession covers 38,600 sq miles. Esso-Teikoku conducted a geophysical survey last year. In event of commercial discovery, Esso is entitled to a 15% offtake of production.

### Italian-Egyptian firm to develop Abu Madi

A JOINT Italian-Egyptian company has been created by Egyptian presidential decree to develop Abu Madi gas field reserves in the Nile Delta.

International Egyptian Oil Co., a subsidiary of Italy's state-owned ENI discovered the field in 1968. The joint operating company will be known as Deltaco.

Abu Madi gas will be used for the manufacture of nitrogen fertilizers at the Talkha plant under construction and to replace fossil fuel for electrical power and industrial plants in the central part of the Nile Delta area.



GUYANA SHELL LIMITEDDRILLING PROGRAM - LOCATION ABARY 1(CRETACEOUS TEST ON "D" STRUCTURE)A. GENERAL

- 1) Location:
- |    |                             |   |  |
|----|-----------------------------|---|--|
| a. | Licence                     | : | OPL 211  |
| b. | Co-ordinates                | : | Latitude 7 <sup>o</sup> 19' 14.8"<br>Longitude 56 <sup>o</sup> 42' 46.4" |
| c. | Shot point                  | : | 5736 on line G89   |
| d. | Tolerance                   | : | Radius of 100 metres (328')  |
| e. | Distance from<br>Georgetown | : | 170 KM (92 NM)   |
|    | Distance from Shore         | : | 140 KM (76 NM)   |
- 2) Type of Well:  
Exploration
- 3) Rig:  
Semi-Submersible Drilling Vessel. SEDCO-H.
- 4) Objective:  
To investigate a potential hydrocarbon bearing structural turnover at Cretaceous level to about 15,000'.
- 5) Depth references:
- |                                       |   |      |
|---------------------------------------|---|------|
| Expected water depth below MSL        | : | 200' |
| Approx. distance Derrick floor to MSL | : | 98'  |
| Approx. drilling draught              | : | 80'  |
- 6) Estimated total depth:  
± 15,000'
- 7) Prognosis:
- |             |   |
|-------------|---|
| - 8400' MSL | Seismic marker "A", approx. top Upper Miocene. Same lithology as drilled in Berbice-1 to 12,000'. |
|-------------|---|

- 10,500' MSL Seismic marker "B" approx. top Paleocene.  
Mainly shales with intercalations of dense lime - mud stones.
- 12,300' MSL Seismic marker "C" approx. top Cretaceous,  
first structural closure. Mainly shales with sandstone intercalations and occasional limy intervals.
- 13,000' MSL Seismic marker "C<sub>2</sub>" intra Upper Cretaceous, alternating sandstone shale sequence.
- 14,750' MSL Approx. top of deeper marine Senonian shales.
- TD approx. 15,000'

8) Pressures:

Over pressured shale gas, as experienced in Berbice-1 and Berbice-2, are anticipated from about 4,000' to about 10,000' necessitating to increase the mud weight gradually to app. 12.- ppg at 5500', 13.- ppg at 7,000' and possibly to 15.- ppg at 8,000'.

No over pressures are anticipated in the Cretaceous.

9) Mud Losses:

No mud losses are anticipated.

10) Casing Summary:

<u>Size</u>	<u>Depth below Derrick Floor</u>	<u>Depth below Seabed</u>
30"	± 380'	80'
16"	± 1300'	1,000'
13-3/8"	± 4800'	4,500'
9-5/8"	Approx. 12,000'	
7"	At TD if required.	

B. SUMMARY OF OPERATIONS:

Oil Concessions  
(Guyana)

1. Depending on test jetting, jet maximum of 80' of 30" drive pipe-index pad-guide base combination in to seabed. ....3

2. Drill with 15" bit and 24" hole opener to 1350' with seawater, spotting viscous mud when necessary.
3. Run 16" casing with 20" foundation pile joint and 20-3/4" casing head and cement same to surface.
4. Install 20-3/4" stack and 16" riser. Test stack as per Shell Manual.
5. Drill 12 1/4" hole (Formation intake test 30' below casing shoe) to 4850' with seawater, gradually changing to sea water mud.  
Log. Open hole to 18" with AZ-U13M.
6. Run Caliper, if O.K. run and land 13-3/8" casing. Cement to seabed.
7. Retrieve 20-3/4" stack and riser. Pull 20-3/4" wear bushing and jet - wash inside of well head with sea water. Run and test 13-5/8" well head. Run 13-5/8" stack and riser. Pressure test stack as per Shell Manual.
8. Drill 12 1/4" hole (Formation intake pressure test 30 ft. below casing shoe) to app. 12,000'. Log at  $\pm 8,000'$ ,  $\pm 10,000'$  and before running 9-5/8" casing.
9. Run and land 9-5/8" casing. Cement 1000' into 13-3/8" casing.
10. Drill 8 1/2" hole (Formation intake pressure test 30' below 9-5/8" shoe) to TD.

C. DEVIATION, MUD AND CASING PROGRAMME

1. Deviation:

- a) To be kept to a minimum to the 13-3/8" casing depth.
- b) Totco readings to be taken every 500 ft. or nearest bit change.
- c) Dogleg severity should be limited to 1° per 100 ft.

2. Mud:

- a) 24" hole to 1350', sea water.
- b) 12 1/4" hole to 4850', sea water gradually building up to sea water mud:

-"-

Weight : 9 to 10.5 ppg.  
Viscosity : 50 secs MF.  
WL : 15 cc API  
pH approx. : 9.5

c) 12½" hole to 12,000 ft., sea water mud.

Weight : 10.5 ppg. to be increased when  
necessary to control shale gas  
inflow (highest expected necessary  
weight is 15. ppg.)  
Viscosity : 45 sec. MF.  
WL approx. : 5 cc API  
pH approx. : 9.5

d) 8½" hole to TD, sea water mud.

Weight : 10.5 (after cementing the 9-5/8"  
casing no geopressures are anticipate  
in the cretaceous).  
Viscosity : 45 sec. MF.  
WL approx : 5 cc API  
pH approx : 9.5.

e) A Magcobar mud engineer will be on board during all drilling  
operations.

3. CASING AND CEMENTING PROGRAMME

a) Set 1,000 of 16", 65 lbs/ft, H-40 casing below seabed.

The string should include one joint of 84 lbs/ft K-55 to be made  
up to the EC-4 connector, cement to sea bed with 2,000 sacks  
class B cement mixed with 2% prehydrated bentonite (14.- ppg.)  
and 500 sacks neat cement (15.4 ppg.)  
(Theoretical fill to seabed + 100 % excess).

-5-

- b) Set 4,500' of 13-3/8", 61 lbs/ft., K-55 Hydril flush joint casing below seabed. Cement with 1500 sacks class B cement mixed with 2% prehydrated bentonite 13 ppg.) followed by 300 sacks neat cement (15.4 ppg.)
- c) Set 9-5/8" 47/40 lbs, N-80 bu gress combination string at approx. 12,000 ft.  
Cement according to separate programme, possibly using dual stage collar.
- d) Set 7" combination string after reaching TD for production testing or as deep as possible if necessary for hole conditions. (separate programme).
- e) Set 4½" liner if necessary. (separate programme).

D. EVALUATION

1) General:

Depth will be recorded in feet below derrick floor. Schlumberger log scales will be 1:500 and 1:200. Geoservices mud log scales 1:500.

2) Mud Logging:

Geoservices will provide a continuous mud logging record below 1500'. Maximum information will be incorporated on the composite log.

3) Ditch Cuttings:

Samples will be collected at 30 ft. intervals from 16" shoe to 13-3/8" casing setting depth and at 10 ft. intervals from 13-3/8" shoe to TD.

One set of unwashed samples and 7 sets of small rinsed and dried samples will be required.

4) Coring:

Conventional cores will be taken when required.

5) Schlumberger logging:

- a) At 4850' (13-3/8" setting depth) in 12¼" hole.
- b) At approx. 8,000', 10,000' and 9-5/8" setting depth.
- c) At approx. 1,500' intervals in the 8½" hole.

-----  
All logging jobs will consist of:

DLL/SP, FDC/GR/CAL, BHC/GR/TT1, SNP/CAL, and MPT.

At 9-5/8" setting depth and TD, the HDT and CST will be run  
and the Formation Tester will be standby.

6) Velocity Survey:

To be run at TD.

7) Testing:

Production testing will be done through a permanent production packer,  
3½" Hydril tubing and SSTT. (In case testing has to be done in 4½"  
liner, a 2½" tail end will be used below the 3½" tubing).

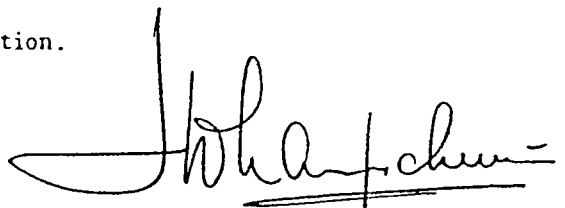
E. RESPONSIBILITY

1) Company Representative:

The Shell representative on the Sedco-H will supervise all operations  
to ensure that they are carried out in accordance with the drilling  
programme and accepted company practice.

2) Secrecy:

The well is a tight hole and all personnel will adhere to the  
procedure of passing information.



H. O. Kampschuur,  
Chief Petroleum Engineer.

(6)

Shell Daily Report - 28/12/74.

---

38' casing jetted in to 38' below sea bed instead of 80'  
drilling of 24" hole in progress.

Water depth 227'

Derrick floor - 100' above sea level.

# Guyana Shell Limited



Memorial of Guyana  
Annex 117

(Incorporated in Guyana)

69 Main Street  
P.O. Box 142  
Georgetown  
Guyana

Telephone: 67231  
Cables : "GUYSHELL"  
Telex : 271 GUYSELL GY

8

The Commissioner,  
Geological Surveys & Mines Department,  
P.O. Box 1028,  
Brickdam, Stabroek,  
GEORGETOWN.

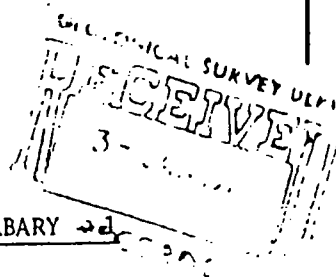
Your

Our Ref. 2105

Date 2nd January, 1975

Dear Sir,

OPL 211 - ABARY



Further to our letter of 19th December, 1974 our exploration well  
Abary - 1 was spudded on 26th December, 1974.

The final co-ordinates of the location are:-

Latitude 7° 19' 16.5" N  
Longitude 56° 42' 48.6" W

The water depth is 227 feet.

The derrick floor elevation is 98 feet above sealevel.

All depth's in the well will be measured from derrick floor which  
is 325 feet above sea bed.

Yours truly,  
For GUYANA SHELL LIMITED,

E. van der Meulen,  
General Manager.

HOK:gp

Oil Concessions  
(Guyana)



HEADS OF AGREEMENT

between

THE GOVERNMENT OF GUYANA

(hereinafter referred to as "GUYANA"),

DENMISON MINES LIMITED

and

SEAGULL PETROLEUM LIMITED collectively

(hereinafter referred to as "S.P.L.")

OBJECT

TO DEFINE THE RELATIONSHIP BETWEEN GUYANA AND S.P.L.  
for prospecting and exploring, and possible mining of  
petroleum (crude oil or natural gas) in Guyana.

AREAS OF INTEREST

An area of approximately 4,390 sq. miles commencing from  
Point "A" Latitude N-6° 20'00" and Longitude W-57° 09'00",  
thence North to Point "B" Latitude N-7° 17'00" and Longitude  
W-57° 09'00" thence Northwest to Point "C" Latitude N-8°  
00'00" and Longitude W-58° 10'00" thence South to Point "D"  
Latitude N-7° 08'00" Longitude W-58° 10'00", thence Southeast  
to Point "A".

DURATION

GUYANA shall grant an oil prospecting licence (O.P.L.) to  
S.P.L. for an initial period of 5 years to prospect for  
petroleum in the area described in Appendix "A" to this  
Agreement. Such period may be extended for two additional  
periods of 5 years each at the discretion of GUYANA, and  
approval for such extension shall not be unreasonably  
withheld.

RENTALS

The annual rentals shall be paid in advance as follows:

	US\$5.00	per square mile
1st year		
2nd year	5.00	-do-
3rd year	7.50	-do-
4th year	7.50	-do-
5th year	10.00	-do-
6th-10th year	20.00	-do-
11th-15th year	30.00	-do-

RELINQUISHMENT OF AREAS

S.P.L. shall relinquish portions of the area described in Appendix "A" as follows -

- 25% of the said area not later than 36 months after the grant of an O.P.L.
- 25% of the remaining area not later than the end of the original 5-year period.

It is agreed however, that at the expiry of the O.P.L. for the second 5-year period, S.P.L. shall hold an area not exceeding 33 1/3% of the original area as described in Appendix "A".

EXPENDITURE FOR SECOND AND THIRD FIVE YEAR PERIODS

In lieu of S.P.L. providing a Work Programme for the second and third 5-year periods, S.P.L. agrees to expend a minimum of US\$100.00 per sq. mile for the area covered by the O.P.L.

*[Handwritten signature]*  
*[Handwritten initials]*

-3-

WORK PROGRAMME

(A) S.P.L. agrees to do the following within 5 years of the grant of an O.P.L. -

1st year - gather, review and re-interpret all available geological and geophysical data pertinent to the area.

- reprocessing of all existing tapes and seismic data that can be acquired from previous licence holders of the area.

In connection with the above, GUYANA shall agree to grant S.P.L. access to technical data in its possession relating to the said area.

GUYANA shall agree further to use its best efforts in assisting S.P.L. to obtain technical data from previous licence holders.

2nd year - not less than 750 line kilometres of reconnaissance seismic surveying; or drilling of at least one well at S.P.L.'s option.

3rd year - not less than 300 line kilometres of detailed seismic surveying; or drilling of at least one well at S.P.L.'s option.

4th year - drilling of at least one well.

5th year - re-evaluation of geological and geophysical works performed, to be followed by either

-4-

further detailed seismic surveying  
or drilling.

(B) Not later than 45 days before completion of its  
1st year's operations it is agreed that S.P.L.  
shall give either -

- (i) a firm commitment to undertake its 2nd year's  
work programme and provide a bond; or
- (ii) relinquish the entire area. ✓

For all subsequent years S.P.L. shall notify GUYANA  
not later than 90 days before the end of each year  
of its intention of either -

- (a) continuing its Work Programme for the next year;  
or
- (b) relinquishing the entire area.

#### PERFORMANCE BOND

In the event of S.P.L. continuing its operation in any  
subsequent year it is agreed that a Performance Bond  
shall be furnished by S.P.L. at the beginning of each  
year based on the estimated cost of the yearly Work  
Programme as provided above.

The value of the said Bond shall be calculated as  
follows:

- 100% for the first US\$50,000
- 50% for the next US\$50,000
- 25% for the next US\$400,000
- 10% for any amount in excess of US\$500,000.

ROYALTY

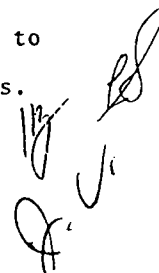
Upon commencement of Commercial Production of Crude Oil, S.P.L. shall pay GUYANA in cash or in kind at GUYANA's option and in the manner hereinafter provided, royalty calculated on the Crude Oil value on that portion of Crude Oil produced saved and sold as follows:-

For average daily production up to 25,000 barrels per day 12½%;  
from 25,000 barrels per day up to 75,000 barrels per day 15% on the incremental volume in excess of 25,000 barrels per day;  
from 75,000 barrels per day up to 125,000 barrels per day 17½% on the incremental volume in excess of 75,000 barrels per day;  
from 125,000 barrels per day up to 175,000 barrels per day, 20% on the incremental volume in excess of 125,000 barrels per day; and  
above 175,000 barrels per day, 25% on the incremental volume in excess of 175,000 barrels per day.

The said royalty shall be calculated on the average posted prices of namely - Trinidad, Vepuzuela and Mexico.

Oil or gas used in its operations such as repressurization shall be excluded.

Royalties in respect of any year shall be payable only to the extent to which the amount exceeds the yearly rents.



-6-

GUYANA shall have the option of taking its Royalty in cash or kind and in the event that GUYANA elects to take its Royalty in kind, cognisance will be taken of S.P.L.'s long-term marketing arrangements.

MINING LEASE

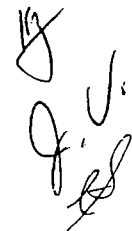
In the event of S.P.L.'s discovery of crude oil or natural gas in commercial quantities, GUYANA shall grant S.P.L. a mining lease for a period of 30 years with periodic extensions thereafter of 5 years until the cessation of commercial production.

MINIMUM SIZE OF MINING LEASE

The size and boundaries of the area to be covered by the Mining Lease shall be determined by the seismic data and drilling results. However, the minimum size of the said area to be covered by the Mining Lease shall not be less than 25 sq. miles provided that the length of the boundary of the said area shall not exceed 4 times its width.

REPORTS

S.P.L. shall provide GUYANA free of charge, monthly progress letters and quarterly reports which shall reflect the status and results of the technical investigations, studies and recommendations, and in the event of withdrawal, a final report.



-7-

DATA

S.P.L. shall provide GUYANA free of charge with all raw data, (including magnetic tapes) interpretation of same, reports and records obtained in the performance of their work obligations.

ASSIGNMENT

S.P.L. shall not assign the rights granted by the O.P.L. or Mining Lease to any person or Company without the previous consent in writing of GUYANA and such consent shall not be unreasonably withheld.

DUTY FREE

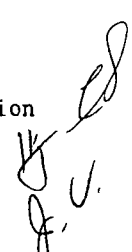
GUYANA agrees that S.P.L. shall be entitled to import and export any materials, data or equipment related to the exploration, development and production of petroleum from the O.P.L. or Mining Lease free of any duty, excise or similar tax.

ARBITRATION

Any matter in dispute shall be referred to arbitration under the Rules of the International Chamber of Commerce and such arbitration shall take place in Georgetown, Guyana.

CONFIDENTIALITY

The parties hereto agree to treat all information relating to the O.P.L., all data, reports and other records, as confidential and they shall not disclose any such information

Handwritten signature and initials, possibly 'J.C.' or similar, written in dark ink.

-8-

to third parties during the subsistence of the O.P.L. and without the prior written consent of the other party which shall not be unreasonably withheld. The parties further agree that during the subsistence of the O.P.L. neither party shall have the right to sell any data acquired and paid for by S.P.L. without the permission of the other party. Any proceeds received by either party for the sale of such data shall be divided equally between the parties.

Press releases shall be approved by both parties.

#### MARKETING

S.P.L. shall have the right to freely dispose of its shares of the petroleum produced under the terms of the Mining Lease at the prevailing world market price subject to the domestic needs of GUYANA.

#### TAX HOLIDAY

Consideration shall be given by GUYANA to S.P.L. for a tax holiday on petroleum production at the production stage, and the parties agree to endeavour to finalize an acceptable formula for the said tax holiday not later than 10½ months (ten and one half months) from the date of the grant of an O.P.L. Such consideration shall be based on one or a combination of the following:-

- (a) commercial viability of each field;
- (b) recoupment formulae of capital investment;
- (c) hydrocarbon reserves; and
- (d) reservoirs and production engineering data.



REMITTANCE AND REPATRIATION OF FUNDS

S.P.L. shall be granted an "approved status" by the Bank of Guyana for the unrestricted remittance of dividends and repatriation of capital.

IN WITNESS WHEREOF the parties hereto have executed this HEADS OF AGREEMENT this 2<sup>nd</sup> day of April, 1979.

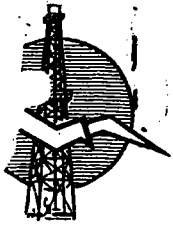
*Joseph Vercellus*  
SEAGULL PETROLEUM LIMITED

*W.O. Paul*  
GOVERNMENT OF GUYANA

*[Signature]*  
DENNISON MINES LIMITED

*[Signature]*  
WITNESSES: (1) *[Signature]*  
(2) *[Signature]*

*[Signature]*  
WITNESSES: (1) *[Signature]*  
(2) *[Signature]*  
7/4/79



143

**SEAGULL PETROLEUM LIMITED**

P. O. BOX N - 10200 - NASSAU, BAHAMAS

July 9, 1979

✓

Please reply to:

Seagull Petroleum (Guyana) Ltd.  
Two Allen Center, Suite 2770  
Houston, Texas 77002

*Handwritten notes:*  
143  
P.O. Box N-10200  
Nassau, Bahamas  
July 26, 1979

The Rt. Hon. H. O. Jack  
Ministry of Energy and Natural Resources  
41 Brickdam and Boyle Place  
Georgetown, Guyana

MINISTRY OF ENERGY  
AND NATURAL RESOURCES  
26 JUL 1979  
*Handwritten signature*  
Minister

Dear Mr. Minister:

SUBJECT: Seagull-Denison's Oil Prospecting  
Licence, Offshore Guyana

As you are no doubt aware, our preliminary evaluation of the geophysical and geological data filed by previous operators with the Petroleum Unit of the Geological Survey and Mines Department of Guyana is almost complete. We are pleased to advise that our studies have revealed a number of seismic reflection leads situated to the east and northeast of the area covered by Seagull-Denison's current concession. It is our considered opinion that the most realistic hopes for the occurrence of commercially significant petroleum deposits in the Guyana offshore basin lie in the triangular area that constitutes the Guyana-Surinam corridor.

Accordingly, following a number of telephone and telex communications with Permanent Secretary H. O. Bovell, the Seagull-Denison Group desire to lodge a formal application to modify their current concession boundaries to include an additional triangular area of approximately 3,800 square miles. The proposed modification will alter the boundaries of the Seagull-Denison concession as follows (please refer to the attached map):

An area of approximately 8,190 square miles offshore commencing at point "X" having latitude 6 degrees 05' 00" N and longitude 57 degrees 09' 00" W, thence for a distance of approximately 110 miles northeast to a point "Y" having latitude 7 degrees 24' 00" N and longitude 56 degrees 16' 00" W, thence for a distance of approximately 77 miles northwest along the 200 m (660 ft.) water depth contour to a point "Z" having latitude 7 degrees 54' 00" N and longitude 57 degrees 09' 00" W, thence for a distance of approximately 42 miles south to a point "B" having latitude 7 degrees

The Rt. Hon. H. O. Jack, Page 2

July 9, 1979

17' 00" N and longitude 57 degrees 09' 00"W, thence for a distance of approximately 86 miles northwest to a point "C" having latitude 8 degrees 00' 00" N and longitude 58 degrees 10' 00"W, thence for a distance of approximately 60 miles south to a point "D" having latitude 7 degrees 08' 00" N and longitude 58 degrees 10' 00" W, thence for a distance of approximately 89 miles southeast to a point "A" having latitude 6 degrees 20' 00" N and longitude 57 degrees 09' 00" W, thence for a distance of approximately 19 miles south to the point of commencement.

We should like the northern boundary of the extension to coincide with the 200 m (660 ft.) water depth contour (i.e. not a straight line).

Since the acquisition of the additional area is vital to the planning of the Seagull-Denison Group's future exploration programme, it would be deeply appreciated if your Ministry would give this application their urgent consideration.

Respectfully yours,

M. Ala

M. Ala (Dr.)  
Guyana Project Co-Ordinator

MA:mm