

CAMERON HILLS

OIL DEVELOPMENT PLAN

Paramount Resources Ltd.

October 18, 1991

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OIL DEVELOPMENT PLAN

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## INTRODUCTION

Paramount Resources Ltd. herein proposes a development plan to evaluate, delineate, develop and produce the oil reserves trapped within the Middle Devonian reservoirs in the Cameron Hills Area, Northwest Territories.

This document is intended to:

- a) describe our proposed approach to developing these reserves;
- b) provide reservoir evaluations and production performance estimates;
- c) describe the anticipated drilling, completions and production operations;  
and
- d) discuss the costs and environmental factors associated with the proposed development.

The development plan is presented in two parts: Part I is intended as a detailed synopsis of all aspects of the proposed operation; Part II consists of the studies and evaluations which provide the supporting data and detailed analyses for Part I of the development plan.

PART I

PROJECT OVERVIEW

Significant hydrocarbon reserves have been identified within the Middle Devonian reservoirs in the Cameron Hills Area, N.W.T. A plan pursuing oil development through a phased approach is herein proposed, targeting commercial oil production in 1995. Extended flow testing and a pilot project are scheduled for the first two years. If these preliminary stages prove successful, full scale production, utilizing common facilities and a centralized trucking operation, is forecast for 1994. The scope of the proposed development plan is limited to a small scale oil development, employing conventional drilling, completion and oilfield operation techniques. As governed by technical considerations and economics, the project could eventually expand to incorporate lands within the entire Cameron Hills Significant Discovery Area.

The lands subject to this development plan were initially part of a three grid Exploration Permit issued in 1960 to Hudson's Bay Oil & Gas Limited under the Canadian Oil & Gas Land regulations. This permit was converted to Petroleum and Natural Gas Leases in 1971. During the permit stage, Hudson's Bay conducted seismic and drilled four wells on the lands.

In 1978 Paramount became a participant and the operator for a group of small Canadian companies who entered into a farmout agreement with Hudson's Bay and earned an interest in a large portion of the lands by drilling four earning wells. Table No. 1 summarizes the exploratory activities and expenditures made to date on the three grid areas plus one grid area held by Petro Canada since Paramount became involved in these lands. Table No. 2

WELL DRILLING SUMMARY  
SINCE 1979  
CAMERON HILLS AREA, N.W.T.

OPERATOR	TITLE DOCUMENT	WELL NAME	SPUD DATE	R.R. DATE	WELL COST DRILLING	WELL COST COMPLETING	WELL TYPE
PARAMOUNT	DRILLING LEASE	Para et Cam. H. M-31	Mar. 8/79	Apr. 2/79	\$ 928,653.10		EARNING
PARAMOUNT	P&NG LEASE	Para et al Cam. H. B-13	Mar. 14/80	Apr. 4/80 (D&A)	\$ 668,257.22		EARNING
PARAMOUNT	P&NG LEASE	Para et al Cam. H. J-62	Feb. 7/80	Mar. 11/80	\$ 898,154.75	\$ 13,895.00	EARNING
PARAMOUNT	P&NG LEASE	Para et al Cam H. J-76	Feb. 8/81	Mar. 12/81 (D&A)	\$ 893,320.02		EARNING
PARAMOUNT	EA 213	Para et al Cam H. J-11	Feb. 10/83	Mar. 4/83 (D&A)	\$ 593,981.61		EARNING
Exco(Forward)	EA 213	Exco Cam H. L-11	Dec. 24/84	Jan. 18/85 (D&A)	\$2,797,887.00		EARNING
Exco(Forward)	EA 213	Exco Cam H. I-16	Jan. 21/85	Feb. 16/85	\$3,146,872.00	\$195,862.00	EARNING
Exco(Forward)	EA 213	Exco Cam H. I-10	Feb. 19/85	Apr. 2/85 (J&A)	\$3,299,602.00		EARNING
PARAMOUNT	EA 213	Para et al Cam H. I-10	Jan. 31/86	Mar. 7/86	\$2,751,672.63	\$ 290,948.00	EARNING
PARAMOUNT	EA 213	Para et al Cam H. C-50	Mar. 9/86	Mar. 26/86	\$1,402,375.00	\$ 435,834.00	EARNING
PARAMOUNT	EL 312	Para et Cam H. B-08	Jan. 19/89	Feb. 9/89	\$1,243,193.00	\$ 153,563.00	JOINT/EARN
PARAMOUNT	EL 312	Para et al Cam H. L-77	Feb. 11/89	Mar. 3/89	\$1,296,868.00	\$ 220,081.00	JOINT/EARN
		Sub Total			\$20,000,036.33	\$1,310,103.00	

In addition Exco spent in excess of 6.8 million dollars during 1984 on new geophysical programs conducted on EA-213.

Exploration Sub Total \$26,800,836.33

WELL DRILLING SUMMARY  
SINCE 1979  
CAMERON HILLS AREA, N.W.T.

OPERATOR	TITLE DOCUMENT	WELL NAME	SPUD DATE	R.R. DATE	WELL COST DRILLING	WELL COST COMPLETING	WELL TYPE
PARAMOUNT	E.L. 312	Para et al Cam H. L-44	Dec. 29/89	Jan. 20/90	\$1,284,691.00	\$140,169.00	JOINT/EARN
PARAMOUNT	E.L. 312	Para et al Cam H. N-28	Feb. 26/90	Mar. 19/90	\$1,061,177.00	\$254,955.00	JOINT/EARN
PARAMOUNT	E.L. 312	Para et al Cam H. J-37	Feb. 13/90	Mar. 10/90	\$1,085,057.00	\$419,458.00	JOINT/EARN
PARAMOUNT	E.L. 312	Para et al Cam H. A-68	Jan. 21/90	Feb. 12/90	\$1,086,390.00	\$482,065.00	JOINT/OPER
PARAMOUNT	E.L. 312	Para et al Cam H. B-25	Mar. 20/90	Feb. 10/91	\$1,061,608.00	\$255,470.00	JOINT/OPER
PARAMOUNT	SDL 103	Para et al Cam H. M-73	Jan. 28/91	Feb. 21/91	\$1,090,563.00	\$277,872.00	JOINT/OPER
PARAMOUNT	SDL 103	Para et al Cam H. C-19	Feb. 11/91	Mar. 5/91	\$1,012,764.00	\$299,545.00	JOINT/OPER
		Sub Total			<u>\$7,682,250.00</u>	<u>\$2,129,534.00</u>	
PARAMOUNT	E.L. 327	Para et al Swede A-73	Jan. 31/90	Feb. 25/90	\$1,117,812.00	\$145,927.00	EARNING
PARAMOUNT	SDL 107	Para et al Swede G-21	Jan. 20/91	Feb. 09/90	\$1,059,656.00	\$238,147.00	EARNING
PARAMOUNT	SDL 109	Para et al Swede A-52	Feb. 10/91	Feb. 20/91 (ABAND)	<u>\$1,006,019.00</u>	\$	JOINT/OPER
		Sub Total			<u>\$3,184,287.00</u>	<u>\$384,074.00</u>	
		Total			<u>\$37,667,373.33</u>	<u>\$3,023,791.00</u>	
		GRAND TOTAL				<u>\$41,491,164.33</u>	

SUMMARY OF AGREEMENTS AND DISPOSITION OF INTEREST  
CAMERON HILLS AREA, N.M.T.

<u>AGREEMENT TYPE</u>	<u>AGREEMENT DATE</u>	<u>FARMOR VENDOR</u>	<u>FARMEE PURCHASER</u>	<u>RETAINED INTEREST</u>
FARMOUT AGREEMENT	NOVEMBER 20, 1978	HUDSON'S BAY O&G	BOWMAN DEVELOPMENT	HGOB - GORR
ASSIGNMENT AND ORR AGREE.	NOVEMBER 20, 1978	BOWMAN DEVELOPMENT	SEDGER EXPLORATION PETROLEUM ROYALTIES	BOWMAN - GORR BOWMAN W.I.
PARTICIPATION AGREEMENT	DECEMBER 19, 1978	SEDGER EXPLORATION	PARAMOUNT RESOURCES	SEDGER - GORR SEDGER W.I.
PARTICIPATION AGREEMENTS	VARIOUS DATES	PARAMOUNT	ALDONA MINES BOW RIO RESOURCES D'ELDONA GOLD MINES GROSMONT RES. (TTY) HARTOG RESOURCES PROTO RESOURCES QUINTAINE RESOURCES SIDEWINDER EXPL. TECK CORPORATION	REDUCED W.I.
ASSIGNMENT AND TRANSFER	JUNE 2, 1980	SEDGER EXPLORATION	PARAMOUNT	NIL
SALE AGREEMENT	MARCH 10, 1982	HUDSON'S BAY O&G	DOME PETROLEUM	NIL
ASSIGNMENT & TRANSFER	MARCH 10, 1982	DOME PETROLEUM	MT PARTNERSHIP DOME CAN.	REDUCED W.I.
FARMOUT AGREEMENTS	SEPTEMBER 1, 1982 VARIOUS DATES	DOME ET AL ALDONA BOW RIO D'ELDONA QUINTAINE TECK CORP.	PARAMOUNT ET AL (GROSMONT, HARTOG PROTO, SIDEWINDER)	HROG - GORR CONVERTED TO REDUCED W.I. REDUCED W.I. FOR OTHERS



SUMMARY OF AGREEMENTS AND DISPOSITION OF INTEREST  
CAMERON HILLS AREA, N.W.T.

<u>AGREEMENT TYPE</u>	<u>AGREEMENT DATE</u>	<u>FARMOR VENDOR</u>	<u>FARMEE PURCHASER</u>	<u>RETAINED INTEREST</u>
FARMOUT AGREEMENT	OCTOBER 20, 1983	DOME ET AL	FORWARD RESOURCES (EXCO)	REDUCED W.I.
FARMOUT AGREEMENT	JANUARY 23, 1986	EXCO (RECEIVER)	PARAMOUNT	REDUCED W.I.
SALE AGREEMENT	AUGUST 1, 1987	BOWMAN DEVEL.	PARAMOUNT	NIL
ASSIGNMENT & NOVATION	OCTOBER 5, 1987	EXCO (RECEIVER)	PARAMOUNT	NIL
SALE AGREEMENT	APRIL 30, 1988	GROSMONT	PARAMOUNT	NIL
SALE AGREEMENT	APRIL 30, 1988	D'ELDONA (INCL. HARTOG, SIDEWINDER)	PARAMOUNT	NIL
FARMOUT & JOINT VENTURE	DECEMBER 20, 1988	PARAMOUNT	TARRAGON OIL & GAS	REDUCED W.I.
SALE AGREEMENT	MARCH 10, 1989	DOME PET.	PARAMOUNT	NIL
SALE AGREEMENT	JUNE 5, 1989	MT. PARTNERSHIP DOME CAN.	PARAMOUNT	NIL
SALE AGREEMENT	MAY 17, 1990	ALDONA	PARAMOUNT	NIL

GRATE RESOURCES OF PARTIES RETAINING INTEREST

10-TO-OILCO-TO-CANADIAN HYDRO

0-TO-BAXTER-TO-CAMRECO

OLEUMS ROYALTIES-TO-RING RESOURCES-TO-LITE RESOURCES

ITAINE-TO-QUINTERRA RESOURCES

1-TO-TRILOGY RESOURCES

summarizes various agreements and evolution of interest owners in the lands since the original 1978 farmout agreement was made with Hudson's Bay.

The results of this exploration effort have initiated the proposed development plan in pursuit of commercial oil production from the Sulphur Point, Muskeg Equivalent Dolomite and Keg River reservoirs. Paramount intends to delineate and develop the oil in two phases. The first phase, to which this development plan directly applies, addresses full scale production in the southern portion of our Significant Discovery Area (SDA), where low water cut oil within the Sulphur Point is anticipated. The second phase, utilizing the infrastructure constructed during Phase I, will expand operations to the north and west, incorporating the area where higher water cut Sulphur Point oil is expected. A location map depicting the Cameron Hills field is presented in Figure No. 1.

The development plan, pertaining specifically to Phase I of the overall Cameron Hills oil operation, can be subdivided into three major components;

1. Extended Production Testing,
2. Pilot Project, and
3. Full Scale Commercial Production.

Each component represents a stage of development whose commencement is contingent upon the results and success of the preceding period. The purpose of each stage is outlined below, together with details of the operation, the predicted timing of activity, and the forecast capital expenditures. Key decision points have been highlighted to emphasize the conditional nature of the project. A schedule summarizing the activity planned for 1992 through to 1995 is included in Figure No. 2. The time frame proposed for the evolution of the project is tentative,

Figure No. 1  
CAMERON HILLS  
LOCATION MAP

Cameron Hills  
Significant  
Discovery Area

PHASE II  
DEVELOPMENT

PHASE I  
DEVELOPMENT

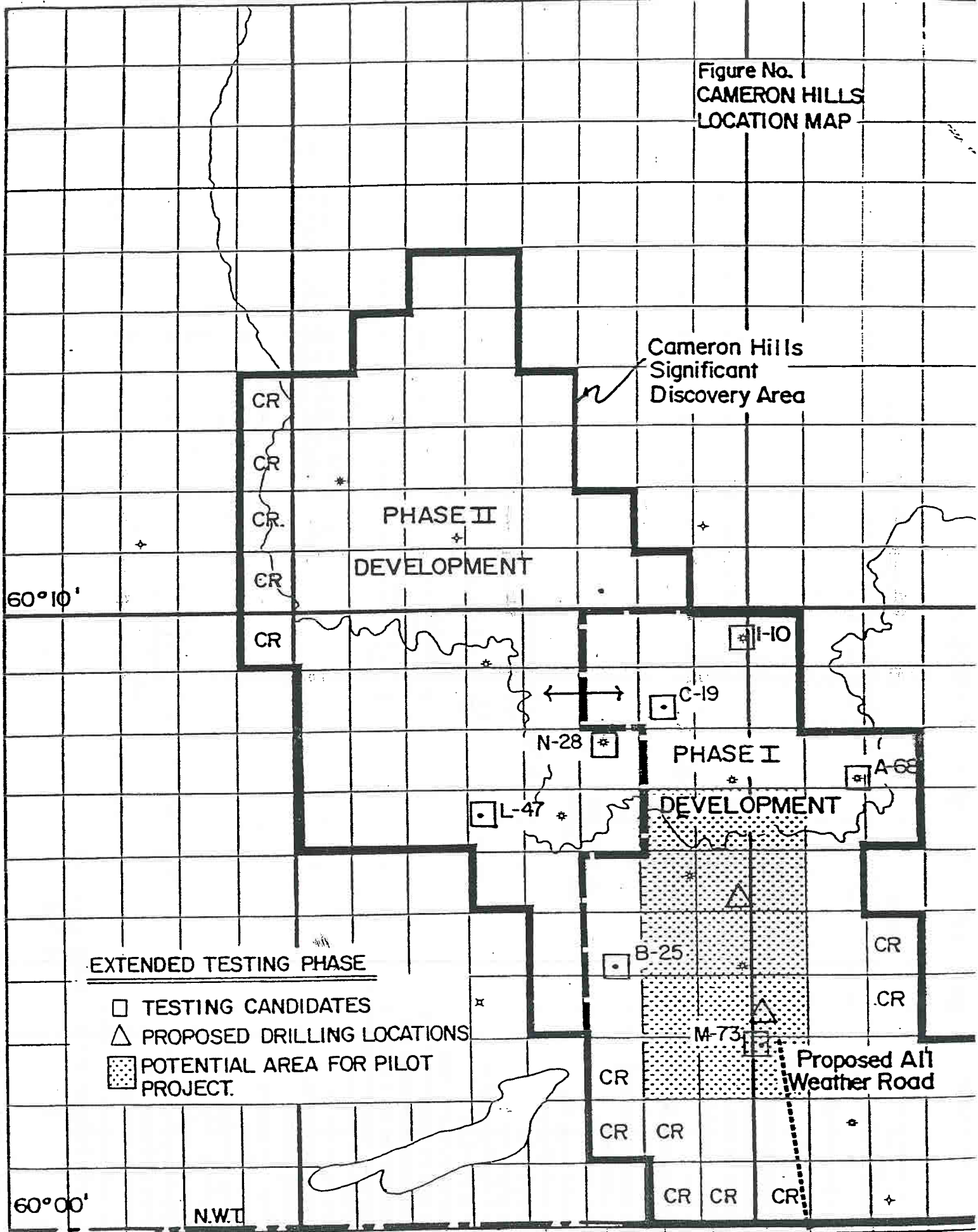
EXTENDED TESTING PHASE

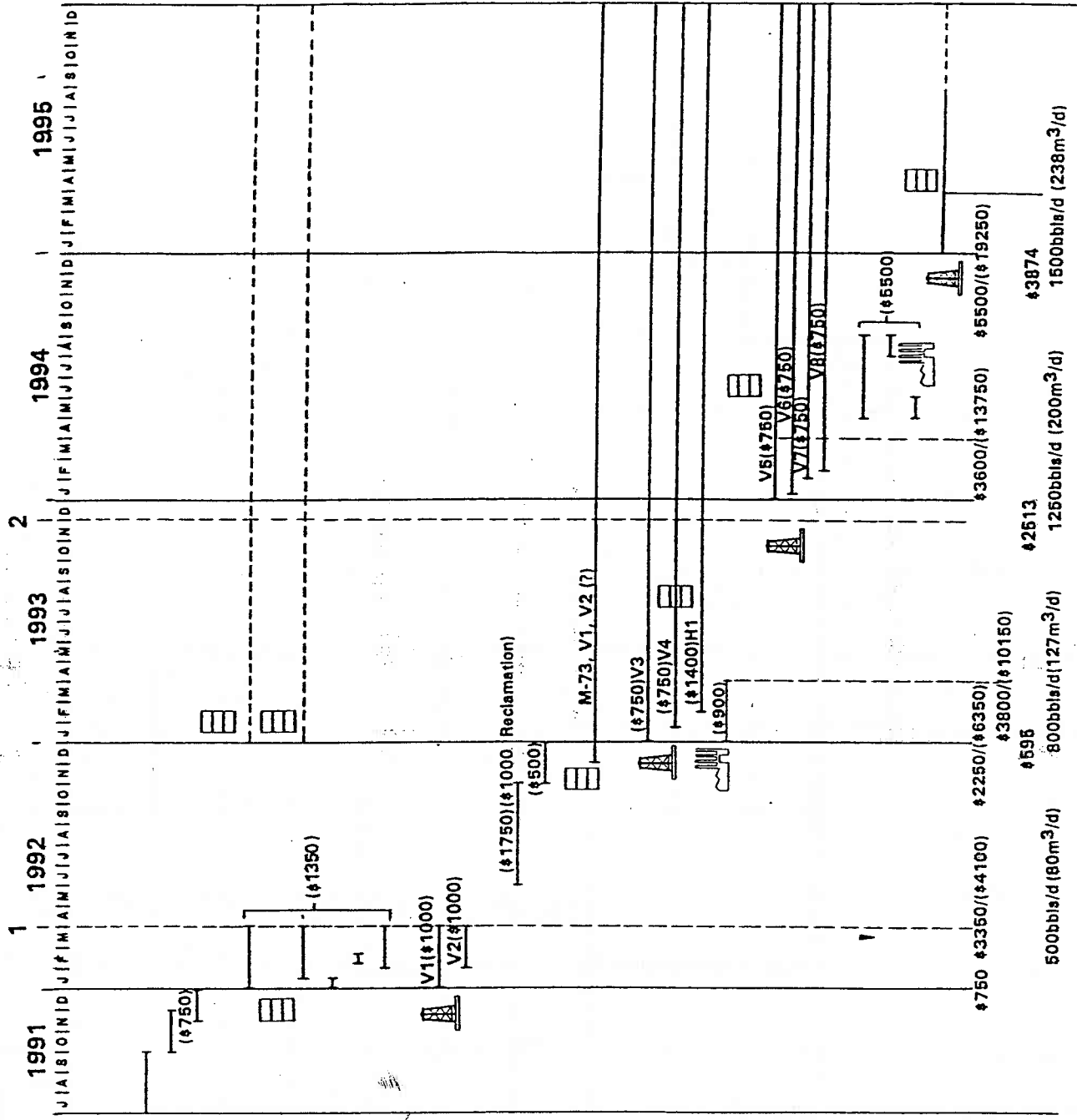
- TESTING CANDIDATES
- △ PROPOSED DRILLING LOCATIONS
- ▨ POTENTIAL AREA FOR PILOT PROJECT.

60° 10'

60° 00'

N.W.T.





KEY DECISION POINT RISKED CAPITAL  
 1 \$4100  
 2 \$11735

\*\*ALL DOLLAR AMOUNTS ARE IN THOUSANDS

depending on the technical success of each phase, the risk - discounted economics of the day, and the evolving regulatory regime governing operations.

Extended Production Testing Phase: December 1991 to April 1992

Due to the limited reservoir performance history of the Sulphur Point both at Cameron Hills and in analog fields, a period of evaluation and testing is initially proposed. This initial stage is characterized by extended production tests on at least six potential oilwells, the drilling of two new wells, and the evaluation of experimental stimulation techniques at one or more locations. This program should serve to monitor the behavioral characteristics of pressure and production trends in the existing wells, and establish the longer term productive capabilities of the Middle Devonian reservoirs. In addition, the success of the new drilling locations will set a confidence level for predictability of oil in the Cameron Hills Area.

Extended production tests are initially planned for six wells:

- a. the M-73 flowing Sulphur Point oilwell,
- b. the L-47 flowing Keg River oilwell,
- c. the C-19 and B-25 Sulphur Point transitional oil/water wells, and
- d. the A-68 and I-10 Muskeg Equivalent Dolomite transitional oil/water wells.

Depending on the operational constraints encountered, the test period for the above wells has been designed for 75 to 90 days within the window of winter operations in the 1991-1992 drilling season.

During the upcoming winter, each well will be equipped with a single well battery and the four transitional oil/water wells will also require artificial lift. Depending on costs, well effluent will either be treated on

site or trucked to a central location for water knockout and treatment. We propose to complete and equip the Paramount et al Cameron L-44 well for water disposal into the Sulphur Point or Keg River Formations. The clean oil will be trucked to the Rainbow pipeline terminal at Zama, Alberta, for pipeline transport to market.

Assuming operations run according to plan, production rates for gas, oil and water will be monitored and downhole pressure surveys will be recorded for final flow and shut in periods to assess reservoir performance during the extended flow periods. This data is critical to the design of production facilities for the pilot project stage of the development plan. Specifications for artificial lift; fluid separation, treatment and storage; the handling and disposal of produced water and gas; and the transportation of fluids both in the field and to market must be confirmed to optimize the experimental small scale production operation scheduled for 1993.

Further to the extended flow tests outlined above, activity has also been planned to;

- a.) prove up additional reserves,
- b.) increase oil deliverability and recovery,
- c.) evaluate the performance of various stimulation techniques, and
- d.) finalize the location for central facilities for the pilot project.

Two new drilling locations have been identified for early 1992, targeting Sulphur Point oil as the primary objective. The first well will be a step out well to the M-73 flowing oilwell. The second location, while still in the vicinity of M-73, will be along strike and to the north to delineate the areal distribution of the free oil zone. In addition, stimulation alternatives for the B-25 well are being researched in an attempt to increase productivity from the transitional oil/water wells. Finally, the N-28 well is scheduled for completion and testing

to evaluate the oil potential of the Keg River zone at this location. This additional activity, coupled with the extended production tests, should provide significant information to substantiate the risks associated with the recoverable oil reserves at Cameron Hills.

The 'extended flow test' stage of the development plan requires a gross capital investment in excess of \$4 million. With the cessation of operations in April 1992, a key decision point will be reached at which time the direction of future investment and development will have to be determined. Success in the 'extended flow test' phase of the development plan will be defined by:

- a.) establishing economic oil rates for the flowing oilwells and the pumping oil/water transition wells;
- b.) indications that manageable quantities of gas and/or water production can be expected;
- c.) reservoir and hydrocarbon predictability as discerned by the success of the 1991-1992 drilling locations; and
- d.) pressure behavior predicting recoverable reserves higher than the threshold for economic development.

Upon evaluating the data and establishing success in this initial stage, the pilot project will commence with the preparation for year-round operations.

Pilot Project Phase: April 1992 to October 1993

Upon the successful completion of the extended production tests, a pilot project targeting year round production is planned as a prototype for the full scale commercial operation. The 'pilot project' stage is characterized by the construction of an all weather road, continued production of the existing

wells, the drilling of three or four new wells, and the installation of the first facilities. The purpose of this stage is to focus on one small corridor of the Sulphur Point reservoir and develop it to the level that is anticipated as necessary for economic production. The pilot project will essentially act as an analog for the commercial operation, providing the opportunity to observe reservoir behavior and field operations prior to engaging in a full scale, capital intensive project. Success in the pilot project will reduce the risk associated with the full scale operation and dictate the infrastructure required for optimal field development.

The key capital investment for the pilot project stems from the construction of an all weather road. With the exception of the last four to six miles, the access route for the proposed high grade road, as dictated by topography, is almost entirely within the Province of Alberta, mirroring the winter road of the past two drilling seasons. The Northwest Territories portion of the all weather road is intended to extend due north from the Alberta/N.W.T. border, serving the M-73 well, the other existing wells which prove economic after the extended flow test period, and the new locations proposed for the pilot project. Road construction is scheduled for the summer of 1992 and is anticipated to extend over a three to four month period.

New wells will also be required to adequately produce and assess the reservoir during the 'pilot project' phase. Either four conventional wells or two conventional plus one horizontal well will be drilled in January and February 1993. The locations of these wells will likely be in the vicinity of the M-73 well, targeting Sulphur Point oil as the primary objective. Knowledge of the reservoir and pool distribution gained from drilling and production during the extended flow test stage will be employed to assess the technical merits of horizontal drilling within the Sulphur Point reservoir. If a horizontal well is



to maximize oil recovery while minimizing capital expenditures and operating costs. The commercial operation stage includes the continuation of all aspects of the pilot project plus additional drilling, the construction of associated central facilities and increased production, transportation, and marketing of oil.

Beginning in January 1994, two delineation wells to step out the limits of proven reserves and two infill locations to maintain and/or increase productivity will be drilled. April 1994 is our current target date to reach a threshold level of economic production of approximately 1500 barrels per day. A constant level of annual drilling will follow to maintain production levels at 1,500 to 3,000 barrels per day. Wells will be strategically located in a regular pattern for efficient primary reservoir drainage and ready conversion to a secondary recovery operation if technically and economically desirable.

Additional seismic may be required to unravel the detailed pool configuration and pinpoint future drilling sites. Most of the drilling and seismic acquisition especially in the short term, will be scheduled during the winter months, unless located on suitable terrain for year round access.

Facility construction and modifications to the pilot project operations will commence after the 1994 winter drilling season. Interfield pipelines transporting produced fluids to a central site for separation, cleaning, treating and storage is envisaged. An expanded infrastructure, incorporating a system for a future secondary or enhanced recovery scheme may need to be designed for both disposal purposes and pressure maintenance. Although truck transportation to the Zama pipeline terminal is expected to be adequate, if productivity exceeds our current expectations, other options such as rail or pipeline alternatives will have to be investigated.

This final stage of the development plan to upgrade the pilot project to a full scale operation will entail capital expenditures in the order of \$10 million in 1994. The scope and timing of activity, as well as the prediction of investment levels beyond this point is at best speculative. Additional wells and facilities pursuing incremental reserves and accelerated production will be evaluated annually for technical and commercial viability.

In the event that we reach this stage of the development plan, the commercial production of oil will likely be ongoing for a minimum of ten years, notwithstanding any unforeseen reservoir problems. Our current outlook foresees the gradual development of the low water cut oil zones within the Sulphur Point for several years. The second phase of development will mark the integration of higher water cut wells into the project. In addition, gas production will eventually commence in those areas where the ultimate recovery from the oil pools will not be adversely affected. Economics will ultimately govern the pace and degree of development of the Cameron Hills hydrocarbon reserves.

## GEOLOGY AND GEOPHYSICS

### Middle Devonian Stratigraphic, Sedimentologic and Structural Review

Substantial volumes of hydrocarbons have been recognized in four Middle Devonian reservoirs at Cameron Hills including the Slave Point, Sulphur Point, Muskeg and Keg River Formations. A complex geological and diagenetic history led to the assemblage of facies preserved in these Middle Devonian sediments. The following discussion summarizes the geological history and stratigraphy of the Middle Devonian sediments in northern Alberta and the

full scale operation commences, a review of spacing requirements will be incorporated into the optimum depletion scheme (i.e. reduced spacing, horizontal well drainage, geological and/or topographical reasons). Prior to full scale development it is anticipated that pooling or unitization will be negotiated in order to eliminate any equity concerns.

The conservation of associated gas will likely be implemented on an 'as needed' basis prior to the full scale development. At that time pressure maintenance via water injection and/or gas re-injection will be implemented if necessary. The flaring and fuel usage of the associated gas will likely have minimal impact on the ultimate recovery of reserves. Once a depletion scheme has been decided upon, these concerns will be addressed. It is Paramount's intention that the recovery of this resource be governed by good engineering and production practices.

A production forecast is tabulated in Table No. 6 for the pilot and development phases of a 30 well project with recoverable oil reserves of 10 MMSB or  $1590 \text{ E}^3 \text{ m}^3$ . Figure No. 4 illustrates this production forecast which serves as a base model for oil development at Cameron Hills.

#### DEVELOPMENT DRILLING AND COMPLETIONS

Conventional land based drilling activities have been carried out in the Cameron Hills Area of the N.W.T. since the late 1960's. In most recent years, Paramount Resources Ltd. has been the only active operator.

At the present time, access to the wellsites is by winter only roads constructed of compacted snow. Land Use Permits are applied for and obtained from DIAND according to the Territorial Land Use Regulations. Operating

conditions are attached to the Land Use Permit to minimize the surface impact. Surface well sites and other land uses are handled by the same process.

Most of the existing oilwells will be used for extended flow testing and will probably be included in the pilot scheme or full scale production to some extent. These wells were all drilled and completed according to the existing Canada Oil and Gas Drilling Regulations.

A schedule for drilling wells is provided in Figure No. 2. Weather is the main determining factor. Until all weather access is constructed, drilling and production operations can only occur in the three winter months.

The basic design of development wells will not differ from that of the previously drilled exploration wells. These designs comply with the requirements of the Canada Oil and Gas Drilling Regulations and Production and Conservation Regulations. Figure Nos. 5 and 6 show the basic designs for both flowing and pumping type well completions. Design details are handled in the applications for Authority to Drill a Well and the Drilling Program Authorization if required. Figure Nos. 7 and 8 show typical wellhead configurations and equipment.

Most, if not all wells, will require artificial lift at some time in their production life. Some wells are not capable of flowing at initial completion and will require artificial lift immediately. Conventional pull type bottom hole pumps will be run with rod strings and surface pump jacks installed when required. Portable strapjack beamless units will be used during initial testing. These are rigged up to be self contained on skids for easy movement and installation. When pump jacks are installed on a more permanent basis, conventional walking beam units may be used. These will be placed on gravel pads or piled bases depending on ground conditions. The engines will be run on solution gas or propane if insufficient solution gas is available.



## PARAMOUNT et al CAMERON

1991-09-17

Rev. 0.0

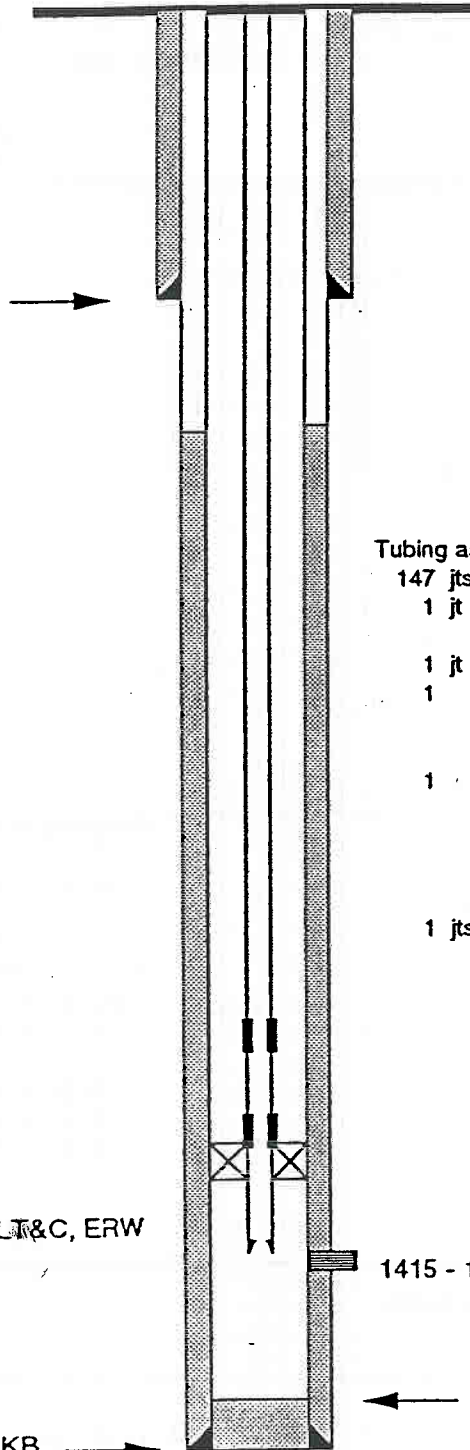
### TYPICAL WELL COMPLETION SCHEMATIC FOR FLOWING OIL/GAS

KBE : 775.15 m  
GLE : 771.45 m

Tbg. "h" : 2.98 m    TFE : 772.17 m  
Csg. "H" : 3.60 m    CFE : 771.55 m

311.2 mm hole to 390 mKB.

Set 244.5 mm, 53.6 kg/m,  
J-55, LT&C ERW casing  
@ 390 mKB.  
Cemented to surface.



Tubing as follows from top:

- 147 jts - 73.0 mm, 9.67 kg/m, J-55, EUE tbg
- 1 jt - 73.0 mm 'VF' nipple w/ 58.7 mm profile,  
set @ 1392mKB
- 1 jt - 73.0 mm, 9.67 kg/m, J-55, EUE tbg
- 1 - 73.0 mm On-Off Seal Unit  
w/ 57.1 mm 'VR' profile & 55.8 mm NoGo  
@ 1401.77 mKB
- 1 - 139.7 x 73.0 mm Dbl. Grip Retrieveable  
Packer. Set in 5000 daN  
compression.  
@ 1402.35 mKB to top  
@ 1402.76 mKB to center element
- 1 jts - 73.0 mm tubing w/reentry guide,  
bottom @ 1413 mKB.

Set 139.7 mm, 23.1 kg/m, IK-55, LT&C, ERW  
casing @ 1658 mKB.  
Cemented from 1658 to 390 m.

1415 - 1420 mKB

Sulphur Point  
perforations

PBDT 1566 mKB

222.2 mm hole to 1658 mKB.

Figure No. 5



PARAMOUNT et al CAMERON

1991-09-17  
Rev. 0.0

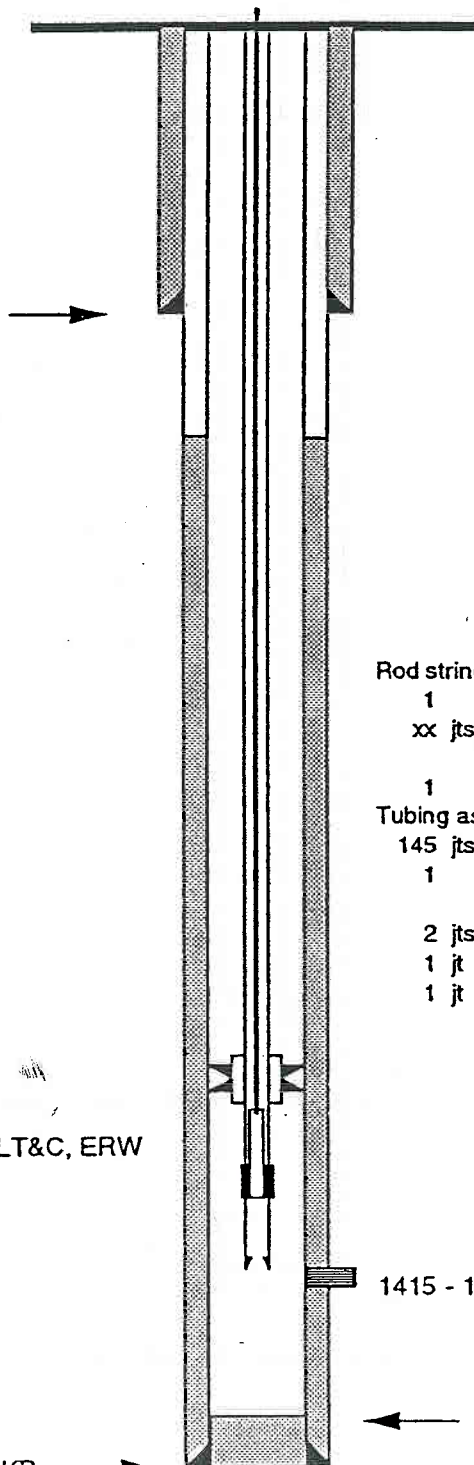
TYPICAL WELL COMPLETION SCHEMATIC  
FOR PUMPING OIL

KBE : 775.15 m  
GLE : 771.45 m

Tbg. "h" : 2.98 m    TFE : 772.17 m  
Csg. "H" : 3.60 m    CFE : 771.55 m

311.2 mm hole to 390 mKB.

Set 244.5 mm, 53.6 kg/m,  
J-55, LT&C ERW casing  
@ 390 mKB.  
Cemented to surface.



Rod string as follows:

- 1 - 31.75 mm x 6.7 m polish rod
- xx jts - 19.0 mm Gr. 78 Sucker Rods, plain & scraped
- 1 - 25 x 15 RWBC 12 x 4 bottom hole pump

Tubing as follows from top:

- 145 jts - 73.0 mm, 9.67 kg/m, J-55, EUE tbg
- 1 - 139.7 x 73.0 mm Tubing Anchor/Catcher  
Set in 5000 daN tension.
- 2 jts - 73.0 mm, 9.67 kg/m, J-55, EUE tbg
- 1 jt - 73.0 mm API PSN
- 1 jt - 73.0 mm tubing w/reentry guide,  
bottom @ 1425 mKB.

Set 139.7 mm, 23.1 kg/m, IK-55, LT&C, ERW  
casing @ 1658 mKB.  
Cemented from 1658 to 390 m.

1415 - 1420 mKB

Sulphur Point  
perforations

PBDT 1566 mKB

222.2 mm hole to 1658 mKB.

Figure No. 6



PARAMOUNT et al CAMERON  
TYPICAL WELLHEAD FOR FLOWING OIL

NOTE: All wellhead components to meet API specifications (PSL-1) and NACE Specification MR-01-75.

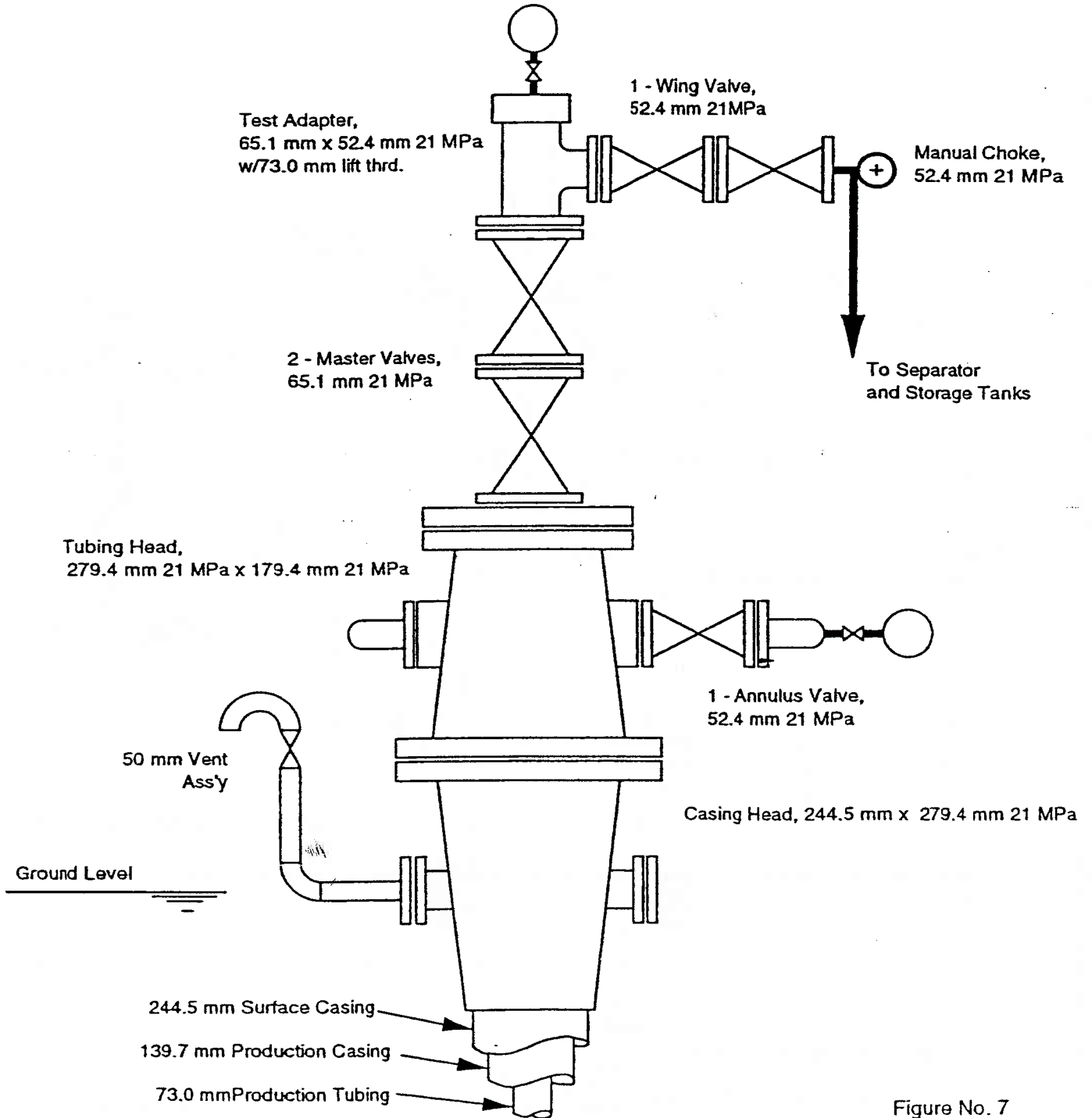


Figure No. 7



PARAMOUNT et al CAMERON  
TYPICAL WELLHEAD FOR PUMPING OIL

NOTE: All wellhead components to meet API specifications (PSL-1) and NACE Specification MR-01-75.

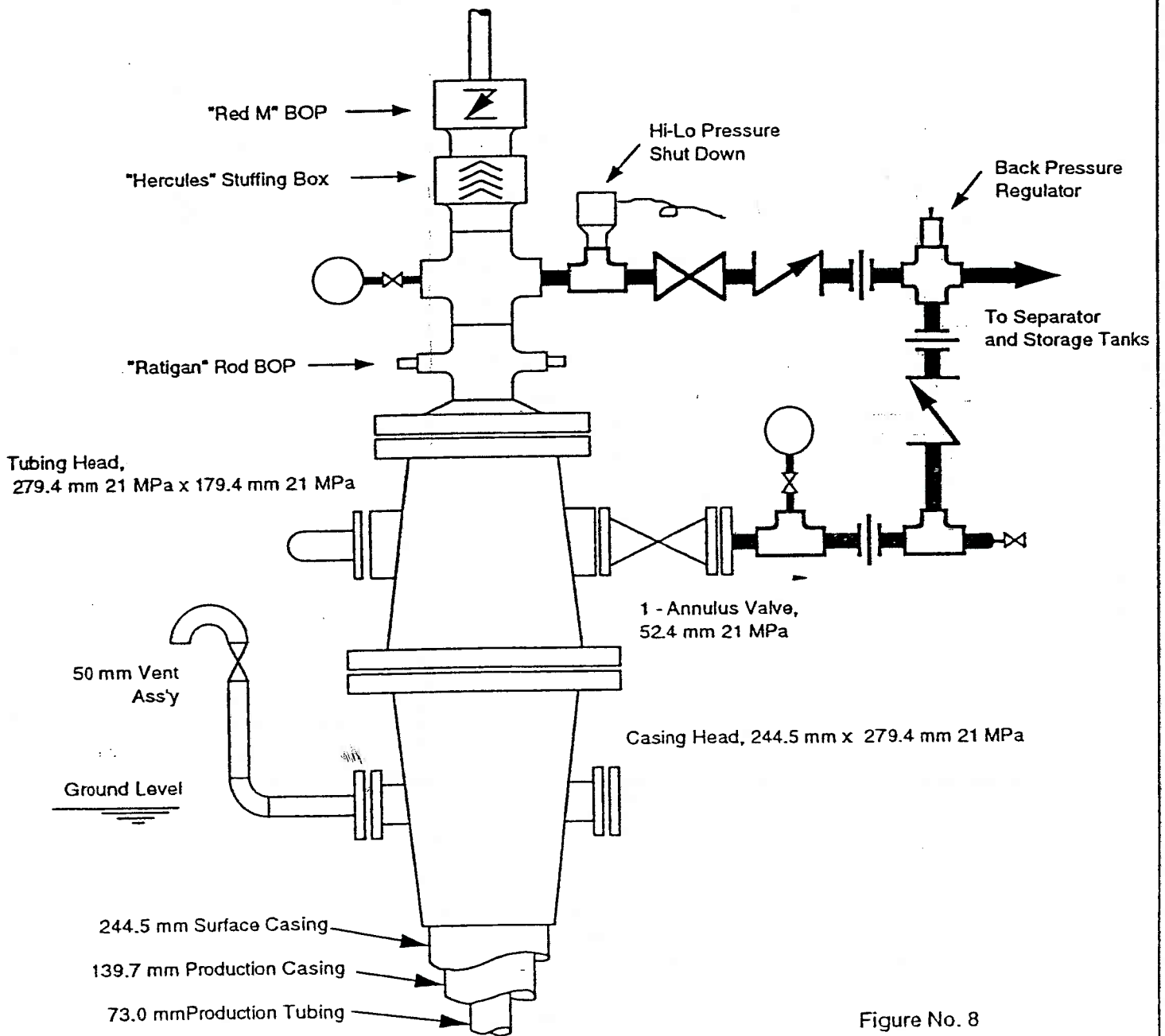


Figure No. 8



Other well designs and completions such as slant wells and horizontal drilling are being investigated. These designs would possibly allow wells to be drilled in cluster arrangements and help minimize surface disturbance by roads, wellsites and pipelines. Production testing, reservoir and economic analyses will help to determine if such alternatives are viable.

It should be clearly pointed out that all materials, equipment and operations proposed are currently proven and accepted technology and practices. Equipment in use and to be used in the future is manufactured to meet or exceed the requirements of current regulations.

#### PRODUCTION SYSTEM

The proposed production system will be a conventional oil operation similar to those currently in operation south of the 60th parallel. The only modifications will be those required to satisfy the Canada Oil and Gas Production and Conservation Regulations where they differ from other jurisdictions.

#### PRODUCTION FACILITIES

The initial 'extended flow testing' and 'pilot project' stages of the proposed development plan will utilize single well oil batteries installed at each wellsite. The equipment being proposed is a portable vapor tight oil battery system. This equipment is manufactured in Alberta by Stettler Oilfield Manufacturing and marketed by Smoky Oilfield Rentals. These self-contained units can be used for both temporary and permanent installations on a rental or purchase basis. They combine both production and testing functions with storage

capabilities. Their portability allows for quick and easy installation with no site fabrication required.

These systems are used in Alberta, Saskatchewan and British Columbia, in particular on critical sour oilwells. Details of the system and equipment are provided in Part II, Attachment No. 5. They exceed the Alberta Energy Resources Conservation Board and other government requirements.

Figure No. 9 shows a typical wellsite schematic of equipment installation. Since most wells will produce oil with varying amounts of water, treater type units will be utilized. Our current plan stipulates that oil and water will be separated on each site. The water will be hauled away for disposal in a salt water disposal well and the oil transported to a pipeline terminal for shipping to market. The solution gas is separated or stripped off and flared on site. This particular production system allows for the collection and flaring of all gas and vapors. Depending on well productivity, battery units will be able to store three to five days of fluid production. On higher capacity wells such as M-73, a second companion tank will be installed for extra storage capacity.

During the testing phase, an existing well (i.e. Paramount et al Cameron L-44) may be converted to a salt water disposal well. The produced water would be re-injected into the Sulphur Point Formation if possible, or the Keg River Formation. Initially, the water will be hauled by tank truck. For long term testing or full scale production, permanent disposal wells will be required in closer proximity to the production facilities so that interfield pipelines could be used.

The battery units are surrounded by containment dykes as required by oil and gas regulations and land use regulations to prevent loss of well fluids. Dykes are constructed of impermeable clay found on site or trucked in from a nearby source. An alternate system consists of prefabricated concrete



SIMPLIFIED SCHEMATIC OF SINGLE WELL BATTERY  
USING VAPOUR TIGHT OIL BATTERY SYSTEM

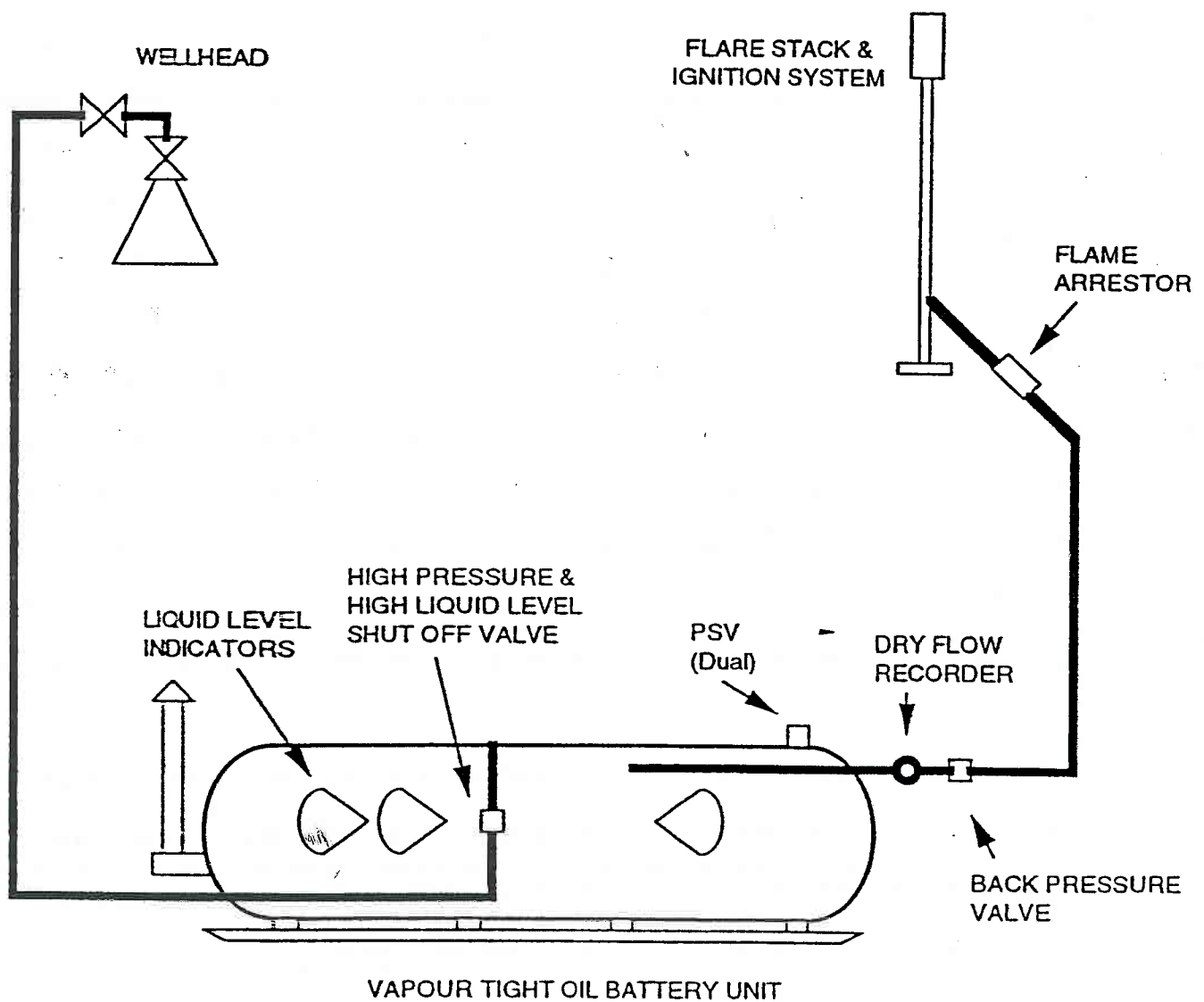


Figure No. 9

wall sections which can be transported to various sites and assembled. These are easily transported and are therefore reusable.

Using this method, no pipelines or permanent facilities will be required during the initial phase of development. Equipment of a more temporary or portable nature will be used until a full scale operation is deemed economic.

When year round production is possible, pipelines and central treating facilities will be planned and located, dependent on such factors as surface conditions, well configuration and spacing, proximity to main reservoir, production volumes, etc.

#### EXPORT SYSTEM

The only method available to transport the produced oil to market prior to full scale production is by truck. This method is used extensively south of the 60th parallel where pipelines are not available or uneconomic. Initially, loads of 28 m<sup>3</sup> per trip will be taken to the Rainbow Pipeline terminal at Zama, Alberta. This is the nearest shipping point. Larger volume tank trucks (up to 47 m<sup>3</sup>) may be used but this will be dependent on access and road conditions.

The amount of fluid stored on any wellsite will be kept to a minimum. Trucks will haul fluids on a continuous schedule. When full scale production is established, alternative shipping methods, including pipeline scenarios, may need to be examined, depending on volumes.

### CONSTRUCTION AND INSTALLATION

During initial testing, very little is required in the way of construction and installation. The wellsite systems are completely portable. No fabrication is required on installation. All equipment can be placed on the presently constructed winter wellsites and use the existing winter access roads.

The first major construction required will be an all weather access road. Wellsites may require upgrading to allow equipment to remain on site year round in some cases. This will be necessary to allow trucking of fluids and servicing of wells, especially those with pumping equipment installed. An all weather airstrip may need to be constructed also at this time. However, its location would be dictated by the location of permanent production facilities.

Should we achieve the full scale production stage of the project, the installation of permanent facilities and associated construction will be dealt with in an amendment to this development plan.

### PRODUCTION OPERATIONS

The recording and reporting of production will be in accordance with the regulations in place and currently accepted oil and gas industry practice. This will require daily or more frequent monitoring of operating wells.

The operating personnel required during testing is minimal. One or two contract operators will monitor the wells and prepare the necessary reports. They will be trained in standard oilfield operating procedures. The production testing will be ongoing while drilling and servicing operations are

conducted in this area. These personnel will be accommodated at camp facilities used during the other operations.

A temporary winter airstrip is constructed in the area and has landing lights and a radio beacon. This is prepared and maintained for safety purposes and changing out personnel. Once a site is selected for permanent facilities, an all weather and year-round airstrip will be constructed. It should be noted that when the access road is constructed, the production area is only a 45 minute drive off Alberta Highway No. 35 and less than three hours travel from High Level, Alberta, or Hay River, N.W.T.

Requirements for personnel, accommodation, etc. for a full scale production operation will be determined during the final planning associated with those operations.

## ENVIRONMENTAL ISSUES

### Drilling and Completions

The handling of drilling fluids and other wastes generated during drilling operations is controlled by land use regulations. Drilling fluids are contained in onsite or offsite sumps. They are generally disposed of by a modified squeeze method where backfill material is added to the sump and mixed with the fluids in the sump before being capped. Solid waste or garbage is collected and hauled to an approved landfill site. Combustible garbage is burnt in an incinerator and any residue taken to the landfill site also.

### Production

Accidental spills of fluids from the production operations pose the greatest environmental threat. On wellsites, all produced gas is collected and flared as required by regulation. Fluids are contained in approved vessels which are in turn surrounded by berms or dykes built to contain any possible spills. These dyked areas are constructed to contain more fluid than the vessels themselves. With daily monitoring of producing wellsites, the chance of a spill escaping a wellsite are remote.

### Transport of Fluids

An accidental spill from a tank truck would result in the worst case situation. Trucks carry emergency spill containment supplies such as shovels, plastic tarps, absorbent materials, etc. for small quantity spills. Large spills would be contained and cleaned up by using construction equipment working in the immediate area. Contract labor, trained and experienced in clean up operations would be brought in from Zama or High Level. As a member of the Prairie Regional Oil Spill Containment and Recovery Action Corporation (PROSCARAC), Paramount has access to the Oil Spill Containment and Recovery (OSCAR) units which are equipped with various containment and recovery equipment and materials. These units are strategically located throughout the prairie provinces and available for immediate response.

All transport drivers are experienced and are required to have certification or training in such areas as First Aid, WHMIS, TDG, and H<sub>2</sub>S.

DECOMMISSIONING AND ABANDONMENT

Abandonment of wells will be dictated by the Canada Oil and Gas Regulations or equivalent, at the time of abandonment.

Decommissioning and abandonment of production facilities will occur once the economic production limit is reached. Approvals will be applied for according to the regulations in place at that time.

Restoration of wellsites and roads will be applied for and carried out according to the Land Use Regulations in place at that time.

DEVELOPMENT AND OPERATING COSTS

Past expenditures are documented in the drilling summary in Table No. 1. An exploration investment in the order of \$41.4 million has been made to date to reach our present-day understanding of the hydrocarbon reserves at Cameron Hills. The development and operating costs associated with our proposed Cameron Hills oil development project are outlined in the development plan presented in Figure No. 2. The costs are detailed according to the various stages of the project, and expenditures to key decision points are highlighted. Assuming success, an estimated \$39.3 million (\$1991) capital investment is forecast to develop the oil reserves at Cameron Hills through the full scale production operation.



PART II

Part II of the Cameron Hills Development Plan consists of technical reports and analyses prepared in support of our Development Application. The following documents are herein enclosed:

1. 'Welltest Analysis in the Cameron Hills Field, Volume I-IV', Fekete Associates Inc., August 1991.
2. 'Paramount Resources Ltd. - Cameron Hills Reserve Evaluation', Status Engineering Associates Ltd., August 1991.
3. 'Cameron Hills Sulphur Point and Muskeg Equivalent Dolomite Oil Development - Application for the Declaration of a Commercial Discovery Area on Significant Discovery Licences 007, 009, 010, 101, 102, 103, 104 and 106 in the Cameron Hills Area, N.W.T.', Paramount Resources Ltd., September 6, 1991.
4. 'Aspects of Reservoir, Trap and Charge in the Keg River Formation - Cameron Hills Area, N.W.T.', Paramount Resources Ltd., September 1991.
5. 'Vapor Tight Oil Battery', Smoky Oilfield Rentals.