

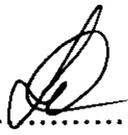
**SAGASCO RESOURCES LIMITED**

**DRILLING PROGRAM  
FLINDERS 1  
T/25P, BASS BASIN,  
TASMANIA**

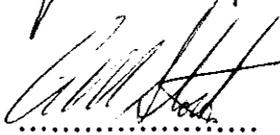
by PM Dwyer & MJ Renison  
July 1992

**AUTHORISATIONS**

Approved by:

Ted Everett  
Offshore Drilling Project Manager .....  17/8/1992

Rob Willink  
Exploration Manager .....  17/8/1992

Andrew Stock  
Operations Manager .....  17/8/1992

CONTENTS

		<b>PAGE</b>
1.0	SUMMARY	3
2.0	HOLE SIZE AND CASING PROGRAM	4
3.0	PRESSURE INFORMATION	5
4.0	CEMENTING PROGRAM	7
5.0	MUD PROGRAM	10
6.0	FORMATION EVALUATION PROGRAM	12
7.0	DRILLING PROCEDURE	14
APPENDIX A	Location Map	
APPENDIX B	Prognosed Sequence - <i>missing</i>	
APPENDIX C	Drilling Rate Curve	
APPENDIX D	Pressure and Casing Design Plot	
APPENDIX E	Bit and Hydraulics Program	
APPENDIX F	Bottom Hole Assemblies	
APPENDIX G	Mud Program	
APPENDIX H	Cement Program	
APPENDIX I	List of Subcontractors	

**1.0 SUMMARY**

- 1.1 Well Name : Flinders 1
- 1.2 Objective of Well : Eastern View Coal Measures
- 1.3 Surface Location : Latitude : 40° 22'51.83"S  
Longitude : 145°40'18.70E  
Line : TNK4-79  
Shot Point : 900
- 1.4 Location Tolerance : Within 30m radius of called location.
- 1.5 Permit/Basin : T/25P - Bass
- 1.6 Elevations:  
Rotary Table to M S L : 22.3 m  
Water Depth : 68.5 m (measured)
- 1.7 Rig:  
Name : Ocean Epoch  
Type : Semisubmersible  
Contractor : Diamond M General Co
- 1.8 Proposed TD : 2723 m RT
- 1.9 Rig Days:  
Dry Hole Basis : 31

## 2.0 HOLE SIZE AND CASING PROGRAM

### 2.1 Casing Program

HOLE SIZE		CASING SIZE		DEPTH m	CASING SPECIFICATIONS					
mm	(in)	mm	(in)		Weight kpm	Grade	Conn	Yield KPa	Collapse KPA	Tensile kg x 000's
914	36	762	30	140	461	B	ST-2	-	-	-
445	17-1/2	340	13-3/8	400	101	K-55	BTC	23,770	13,340	485
311	12-1/4	244	9-5/8	1520	70	N-80	New Vam	47,334	32,728	493
216	8-1/2	178	7	2723	43	N-80	New Vam	56,222	48,368	307

### 2.2 Casing Design Safety Factors

HOLE SIZE		CASING SIZE		DEPTH m	MUD WEIGHT		SAFETY FACTORS		
mm	(in)	mm	(in)		sg	KPa/m	Yield	Collapse	Tensile
914	36	762	30	140	1.05	10.3	-	-	-
445	17-1/2	340	13-3/8	400	1.07	10.5	2.03	3.32	14.97
311	12-1/4	244	9-5/8	1520	1.22	12.0	1.78	2.20	4.96
216	8-1/2	178	7	2723	1.22	12.0	2.12	1.58	2.71

- Notes:**
1. The 178mm (7") casing or liner will only be required to counter pressure or hole conditions, or if the 216mm (8-1/2") hole is to be production tested.
  2. Mud weights are the maximum expected in that section of hole.
  3. Yield safety factors assume maximum anticipated bottomhole formation pressures (ref 3.2) less a 2.26 KPa/m gas gradient.
  4. Collapse safety factors assume total fluid evacuation of the casing string.
  5. Tensile safety factors are calculated without allowance for drilling fluid buoyancy.
  6. All depths refer to RT.

### 3.0 PRESSURE INFORMATION

#### 3.1 BOP Equipment

HOLE SIZE		DEPTH	CASING IN PLACE		BOP EQUIPMENT
(mm)	(in)	(m)	(mm)	(in)	
914	36	140	-		No Riser
445	17½	400	762	30	No Riser
311	12¼	1520	340	13¾	18¾" 10,000 psi Cameron BOP Stack & 20" OD marine riser with:-
					- Cameron Flex/Ball joint, 18¾" 5,000 psi 10 degree.
					- Cameron Type 'DL' 18¾" 5,000 psi upper annular preventor.
					- Cameron Type 'DL' 18¾" 5,000 psi lower annular preventor.
					- Cameron Double "UII" rams upper - 5" Pipe ram lower - Blind/Shear ram
					- Cameron Double "UII" rams upper - variable 3½ to 7¾" ram lower - 5" Pipe ram
					- Cameron 18¾" 10,000psi hydraulic collet connector
					- 3" 10,000 psi Choke & Kill lines.
216	8½	2723	244	9¾	as above

#### 3.2 Anticipated Formation Pressures

HOLE SIZE		DEPTH	CASING SET		BHP		MASP	
(mm)	(in)	(m)	(mm)	(in)	(KPa)	(KPa/m)	(KPa)	(KPa/m)
914	36	140	N/A	N/A	-	-	-	-
445	17½	400	762	30	-	-	-	-
311	12¼	1520	340	13¾	13,750	11.0	1,680	15.3
216	8½	2723	244	9¾	24,400	12.0	5,000	16.0

### **3.3 Seabed Condition and Drilling Hazards**

Based on offset well data and interpretation of reprocessed seismic data no shallow gas is likely to be encountered in the 914mm (36") or 445mm (17.5") holes. A site survey completed on 15 June 1992 recorded an essentially flat and smooth seabed devoid of obstructions to anchoring systems and characterised by surficial deposits to 2.6 metres thick comprising predominantly slight to moderately cohesive silty clays.

### **3.4 Formation Integrity Tests**

#### **3.4.1 Procedure**

On drilling out the 340mm (13<sup>3</sup>/<sub>8</sub>" ) and 244mm (9<sup>5</sup>/<sub>8</sub>" ) casing shoes a Formation Integrity Test (F.I.T) will be performed according to the following procedures.

- (i) Perform phase 1 casing test to obtain pressure/volume profile
- (ii) Drill out shoe and rathole
- (iii) Drill 2m of new hole
- (iii) Circulate and condition mud to ensure uniform mud weight
- (iv) Pull back into casing shoe
- (v) Close BOP's and pressure up with constant pump rate recording barrels of fluid pumped and pressures reached.
- (vi) With reference to the phase 1 casing pressure profile, stop pumping when pressure profile variation indicates when formation first starts to take fluid.
- (vii) Monitor and record pressure until a stable pressure is obtained.
- (viii) Calculate equivalent mud weight using the stabilised pressure and the initial breakover pressure.
- (ix) Report both calculated values as well as the amount of fluid pumped and amount of fluid recovered during pressure bleed off.

Note: It is vitally important to discontinue pumping once the formation yield point has been established so as to prevent formation integrity collapse.

### 3.4.2 Required Equivalent Mud Weights

HOLE SIZE		EMW	
(mm)	(in)	SG	KPa/m
311	12¼	1.56	15.3
216	8½	1.63	16.0

Note: The above are EMWs expected and are used in casing calculations.

## 4.0 CEMENTING PROGRAM

A detailed cement program addressing slurry compositions and properties is attached as Appendix H.

### 4.1 762mm (30") Casing

Set shoe at 140m, pump 5m<sup>3</sup> seawater spacer and cement back to seabed with the following slurry. The inner string cementing method will be used.

#### Slurry

Cement	:	Class G
Mixwater	:	5.0 gal seawater / sack
Additives	:	2.0% BWOC Calcium Chloride
Slurry Weight	:	1.90 SG (15.8 ppg)
Yield	:	1.15 cu.ft. per sack
Excess	:	until returns are seen at seabed

### 4.2 340mm (13-3/8") Casing

Set shoe at 400m, pump seawater spacer and cement with the following slurries. Displace top cement plug with seawater and bump with 14,000 KPa. Caution is to be exercised not to over displace as cement must be present above the shoe so as to obtain a casing test.

**4.2.1 Lead Slurry**

Cement from 100m above shoe to the seabed with the following slurry.

Slurry Details:

Cement	:	Class G
Mixwater	:	9.3 gal water / sack
Additives	:	2.2% BWOC Prehydrated Gel
Slurry Weight	:	1.60 SG (13.2 ppg)
Yield	:	1.76 cu.ft. per sack
Excess	:	100% over calculated volume.

**4.2.2 Tail Slurry**

Cement to 100m above shoe with the following slurry.

Slurry Details:

Cement	:	Class G
Mixwater	:	5.0 gal seawater / sack
Additives	:	None
Slurry Weight	:	1.90 SG (15.8 ppg)
Yield	:	1.15 cu.ft. per sack
Excess	:	100% over calculated volume.

**4.3 244mm (9-5/8") Casing**

Set shoe at 1520m, pump seawater spacer and cement with the following slurries. Displace cement with mud and bump plug. Caution is to be exercised not to over displace.

**4.3.1 Lead Slurry**

Cement from 200m above shoe to the 100m above the 340mm (13<sup>3/8</sup>") casing shoe with the following slurry.

Slurry Details:

Cement	:	Class G
Mixwater	:	9.3 gal water / sack
Additives	:	2.2% BWOC Prehydrated Gel
Slurry Weight	:	1.60 SG (13.2 ppg)
Yield	:	1.76 cu.ft. per sack
Excess	:	10% over calculated volume.

#### 4.3.2 Tail Slurry

Cement from 1520m to 1370m with the following slurry.

Cement	:	Class G
Mixwater	:	5.0 gal seawater / sack
Additives	:	1.0 gal / 10 Bbl mixwater SCR-100L Retarder
Slurry Weight	:	1.90 SG (15.8 ppg)
Yield	:	1.15 cu.ft. per sack
Excess	:	10% over caliper volume.

#### 4.4 Notes:

- (1) Additive quantities are determined by Laboratory testing using parameters based on proposed drilling program. Any changes in program or well parameters may necessitate changing cement program.
- (2) Any chemical washes and spacers to be pumped ahead of cement slurries, will be advised prior to the cementing operation.

#### 4.5 178mm (7") Production Testing Casing/Liner

If hydrocarbon shows are present and the decision is made to run a DST, the 178mm (7") will be run and a cement program forwarded at that time.

## **5.0 MUD PROGRAM**

A detailed mud program addressing make-up quantities and anticipated problems is attached as Appendix G.

### **5.1 914mm (36") Hole (97m - 140m)**

Drill with seawater and sweep with 5m<sup>3</sup> slugs of Hi Vis mud or as necessary to keep the hole clean. Prior to running casing flush the hole by pumping a 15m<sup>3</sup> slug of Hi Vis mud and circulating out. Following this operation, circulate the hole with 200% hole volume of Hi Vis mud.

### **5.2 445mm (17½") Hole (140m - 400m)**

Drill with seawater and sweep with 5m<sup>3</sup> slugs of Hi Vis mud or as necessary to keep the hole clean. Prior to running casing flush the hole by pumping a 15m<sup>3</sup> slug of Hi Vis mud and circulating out. Following this operation circulate the hole with 200% hole volume of Hi Vis mud.

### **5.3 311mm (12¼") Hole (400m - 1520m)**

Drill this section with a lightly treated seawater bentonite/starch system. Additions of PHPA may be used to minimise cuttings dispersion and for wellbore stabilisation. As this section will penetrate some sensitive and dispersible clays, a low-solids, controlled water loss system will be required.

Losses in this section are possible. Overloading the annulus is to be avoided. An adequate supply of LCM is to be kept on hand.

### **5.4 216mm (8½") Hole (1520 - 2723m)**

Drill this section with a freshwater PHPA/Pac system. Geological evaluation dictates that total chlorides be kept below 5,000 ppm throughout the entire interval. Carbon dioxide is expected and will be countered by the maintenance of free lime in the filtrate, and the optimum use of solids control equipment to reduce the low gravity reactive solids content. A low solids, low water loss system will be used to control sensitive and dispersible clays.

Losses in this section are possible. Overloading the annulus is to be avoided. An adequate supply of LCM is to be kept on hand.

### 5.5 Mud Properties Table

Property	Units	914mm (36")	445mm (17½")	311mm (12¼")	216mm (8½")
Mud System		Seawater/ Gel/Guar	Seawater/ Gel/Guar	Seawater/ Gel/Starch	Freshwater/ PHPA/Polymer
Mud Density Min	SG	1.00	1.00	1.05	1.08
Mud Density Max	SG	1.05	1.05	1.10	1.17
Viscosity Range	sec/qt	> 100	> 100	45-55	40-45
PV	cps	-	-	15-30	10-20
YP	lb/100 sq. ft.	-	-	15-30	15-25
Gels	lb/100 sq. ft.	-	-	10/20	5/10
pH		9.0	9.0	9.5	9.5
WL(API)	cc/30 min	-	-	20-10	8-5
Chlorides	ppm x 000's	20	20	20	<5
MBT	ppb	20	20	15	<8
Solids	%	-	-	min	min
PHPA (excess)	ppb	-	-	-	1-2
Gypsum (excess)	ppb	-	-	-	1-2

- Notes:
- (i) To minimise formation damage, minimum mud weights are to be used.
  - (ii) Occasional viscous slugs may be required to be pumped to aid cuttings removal from the hole in the upper sections.
  - (iii) Use of barite is to be minimised.
  - (iv) Optimum use of the solids control equipment is to be maintained throughout the entire drilling phases. Minimum low gravity solids accumulation will aid in wall cake condition as well as reduce chemical consumption and subsequent dilution requirements.

## **6.0 FORMATION EVALUATION PROGRAM**

### **6.1 Mud Logging**

#### **6.1.1 Services**

Mud logging services will be operational from the time of first returns after setting the 340mm (13 $\frac{3}{8}$ " ) casing. The following services are to be provided: Geological Formation Evaluation, Formation Pressure Evaluation, Drilling Engineering Services and Data Transmission Services.

Shale densities to be measured and recorded at each cutting sample point from the onset of firm shale to total depth.

#### **6.1.2 Sampling**

Samples shall be taken at 10m intervals from  $\pm$  400m RT to  $\pm$  1520m or more frequently if specified by the Wellsite Geologist.

Samples will be taken at 3m intervals from  $\pm$  1520m to TD, dependant upon rate of penetration as specified by the Wellsite Geologist.

##### **(i) Washed**

3 Sets washed and dried in plastic 'clip lock' bags (at least 100g per sample).

1 set washed and dried in Samplex trays.

1 Set washed and wet cuttings in cloth bags (at least 500g per sample).

##### **(ii) Unwashed**

1 Set unwashed cuttings in cloth bags composited over 30m from 340mm (13 $\frac{3}{8}$ ) casing shoe to TD (at least 500g per sample).

##### **(iii) Fission Track**

Up to 5 sand samples in cloth bags equally spaced throughout the EVCM (1 kg per sample).

### **6.2 Nitrate Tracer**

Sodium Nitrate will be added to the mud system while drilling the 216mm (8 $\frac{1}{2}$ " ) hole section. Nitrate levels will be maintained between 150 and 200 ppm.

### 6.3 Electric Logging

	LOGGING PROGRAM	
	311mm (12 1/4") 400 - 1520M RUN 1 Sea water base	216mm (8 1/2") 1520-2723M RUN 2 Fresh water base
DLL	Yes	-
MSFL	Yes	Yes
HRI	-	Yes
Digitally Focused Log	-	Yes
GR	Yes*	-
Sonic Logs:		
LSS	Yes	-
BCS	-	Yes
SLD	-	Yes**
CDL	-	Yes**
SGR	-	Yes**
SED	-	Yes
HFDT	-	Yes
SFT	-	Yes
SWC (2 guns per run)	-	Yes
VSP	-	Yes
DTD	Yes***	Yes***

Notes:

\* run to surface

\*\* high resolution data will be collected over thinly bedded zones.

\*\*\* run with combination string and formation tester

#### **6.4 Coring**

Conventional cores will be cut as directed by the Wellsite Geologist through consultation with SAGASCO Exploration Department. A 6¾" x 4" barrel together with fibreglass inner sleeves will be available for coring in both the 311mm (12¼") and 216mm (8½") sections.

It is anticipated that an 18m core will be cut over the approximate interval from 2400 to 2418m. Additional cores will be dependent on shows in the base of the above core.

#### **6.5 Cased Hole Testing**

If open hole evaluation indicates the presence of significant hydrocarbons, a cased hole drill stem test program may be run to obtain reservoir and production data. Conventional drill stem test tools will be used in conjunction with surface separation and measuring equipment. Any hydrocarbons produced will be flared. Detailed programs will be issued prior to any cased hole testing program.

### **7.0 DRILLING PROCEDURE**

#### **7.1 Anchoring**

- (i) Run anchors and orientate rig on location per mooring procedures in Section 17 of the Ocean Epoch Operating Manual.
- (ii) Take pretension test 113 tonne (250 KIPS) on anchors. Hold pretension for a minimum of 15 minutes.
- (iii) Slack off to initial tension, as per Table XI Section 17.2.4 of the Operating Manual.

Note: Piggy back anchors (7 x 14,000kg Baldt Moorfast) will be available to be used as required.

#### **7.2 Pre-Spud**

- (i) Fill mud tanks with water and build volume of Hi Vis pills.
- (ii) Function test all solids control equipment.
- (iii) Pressure test surface equipment from mud pumps to kelly cock to 34,500 KPa.
- (iv) Make-up four stands of 127mm (5") HWDP landing string for Cementing 762mm (30") Conductor pipe and set back in the derrick.

- (vi) Make-up 762mm (30") housing joint and running tool and set back in derrick. Pressure test BOP stack on the test stump to 50,000 KPa.
- (vii) Establish direction of current and 'rig move' procedures in the event of encountering shallow gas in the surface hole.
- (viii) Run Vetco Temporary Guide Base to seabed.
- (ix) Jump underwater camera.

### 7.3 914mm (36") Hole

- (i) Make up 660/914mm (26"/36") drilling assembly as per Bottom Hole Assembly table Appendix F:
- (ii) Open hole to 762mm (30") casing depth. Drill with seawater, flush and clean with Hi Vis mud at each connection.
- (iii) At casing depth, flush hole with 15m<sup>3</sup> of Hi Vis mud and make a check trip across the open hole (leave tools about 5 metres below the mud line). Run back to bottom, check for fill. Displace hole with 200% hole volume of Hi Vis mud. Take Totco survey prior to POOH for running casing.
- (iv) Set Permanent Guidebase in moonpool, stab 762mm (30") casing through and latch.

Note: The wellhead system is the Vetco SG-5

- (v) Run 762mm (30") casing as follows:
  - shoe joint with Halliburton stab in float shoe on bottom and Vetco ST-2 pin connector on top
  - intermediate joint with Vetco ST-2 connectors
  - housing joint with extension and Vetco ST-2 box connector
  - Vetco running tool with a two joints of DP tail below
  - 127mm (5") HWDP landing string

Check slope indicator in PGB.

- (vi) Cement 762mm (30") casing as per programme. Check that the running tool seals are not leaking and observe that good cement returns are established at the seabed using the underwater TV.
- (vii) Check that float is holding. If float does not hold, maintain back pressure until cement sets.

#### 7.4 445mm (17½") Hole

It is planned to drill out the 762mm (30") casing shoe and cement with the 445mm (17½") drilling assembly within twelve hours of completion of the cement operation. However if there are any time delays beyond this period which will see the cement inside the casing build up high compressive strengths, then the decision to run a 660mm (26") bit cleanout run may be made.

- (i) Make up a pendulum 445mm (17½") drilling assembly as per Bottom Hole Assembly table Appendix F:

Open hole to 340mm (13⅜") casing depth using seawater. Hi Vis pills shall be pumped at each connection to clean hole. Wiper trip and check for fill. Take Totco survey and displace hole with 200% hole volume of Hi Vis mud prior to POOH for running casing.

- (ii) Run 340mm (13⅜") casing as follows:
- float shoe
  - 2 joints casing
  - float collar
  - 101 kpm, K55, BTC, R3 casing
  - pup joint, 2m long
  - Crossover swage, 340mm (13⅜") BTC box connector to Vetco 508mm (20") ALT-2 pin connector
  - 18¾" wellhead and extension joint with a Vetco 508mm (20") ALT-2 box connector down
  - Vetco 18¾" wellhead running tool with a DP pup joint and a top plug SSR set into the 340mm (13⅜") pup joint below the swage.
  - HWDP landing string

Note: Fill up each joint with seawater.  
Centralisers will be run 4 metres above the shoe and over the next 3 connections.  
Thread lock the shoe track connections.

Land into 762mm (30") housing while observing via underwater TV. Perform pick up test on 18¾" housing.

- (iii) Circulate a minimum of 150% casing volume with Hivis mud.
- (iv) Cement 340mm (13⅜") casing as per program. Observe for returns via underwater TV throughout the job. Release dart and displace top cement plug with seawater.
- (v) Bump plug with 10,000 KPa and hold for 5 minutes, release pressure and check that float is holding. If float does not hold maintain back pressure until cement sets.

- (vi) Disconnect and retrieve running tool. Run jetting tool and clean top of wellhead. Check top of wellhead via underwater TV.
- (vii) Run 18¾" 10,000 psi BOP stack and riser and latch on. Perform pick up test on BOP. Pressure test rams to 21,000 KPa and annular to 14,000 KPa. Pressure test 340mm (13⅝") casing against the shear rams to 10,000 KPa (maximum casing pressure 23,770 KPa).
- (viii) Run and install 18¾" nominal bore protector.

## 7.5 12¼" Hole

- (i) Make up 311mm (12¼") pendulum drilling assembly as per Bottom Hole Assembly table Appendix F:  
  
RIH and clean out cement and shoe and drill 2m of new hole with seawater. Displace casing with seawater mud system. Condition mud to uniform weight and conduct leakoff test as per program (3.4.1).
- (ii) Drill ahead to approximately 1520m. Take single shot surveys every 150m or on wiper trips and at casing depth or as dictated by hole conditions to ensure that a straight hole is drilled. Increase mud weight only as hole conditions dictate. Wiper trip for logs. POOH.
- (iii) Run electric logs as per program.
- (iv) Condition hole to run casing. POOH.
- (v) Retrieve nominal bore protector.
- (vi) Run 244mm (9⅝") casing as follows:
  - float shoe
  - 2 joints casing
  - float collar
  - 70 kpm, N80, New Vam, R3 casing (approx 120 joints)
  - casing hanger and running tool with SSR cement dual plug set
  - HWDP landing string to surface.

Note: Fill up each joint with seawater.

Centralisers will be run 4 metres above the shoe and over the next 5 connections.

Thread lock the shoe track connections.

- (v) Condition mud as necessary (minimum 150% casing volume). Cement as per program. Displace cement with mud.
- (vi) Bump plug with 14,000 KPa and hold for 5 minutes, release pressure and check that floats are holding. If floats do not hold maintain back pressure until cement sets.
- (vi) Set pack-off assembly and test to 34,500 KPa. Test BOP's to 34,500 KPa on rams and 21,000 KPa on annular (maximum casing pressure 47,334 KPa). Retrieve running tool.
- (vii) Run and set extended length wear bushing.

#### **7.6 216mm (8½") Hole**

- (i) Make up 216mm (8½") pendulum drilling assembly as per Bottom Hole Assembly table Appendix F:
- (ii) RIH and clean out cement and shoe and drill 2m of new hole with seawater. Displace with fresh water mud. Condition mud to uniform weight and conduct leak-off test as per program (3.4.1).
- (iii) Drill ahead to TD at approximately 2723m. Cut cores as required. Single shot surveys to be taken every 250m, during bit changes or on wiper trips and at TD. Raise mud weight only as hole conditions dictate and with consultation with SAGASCO Adelaide office.
- (iv) Wiper trip for logs. POOH.
- (v) Run electric logs as per program.

If significant hydrocarbons are encountered, 178mm (7") casing will be run and the well tested. Continue with step 7.8.

If no significant hydrocarbons are encountered, the well will be plugged and abandoned. Continue with step 7.9.

#### **7.7 Testing**

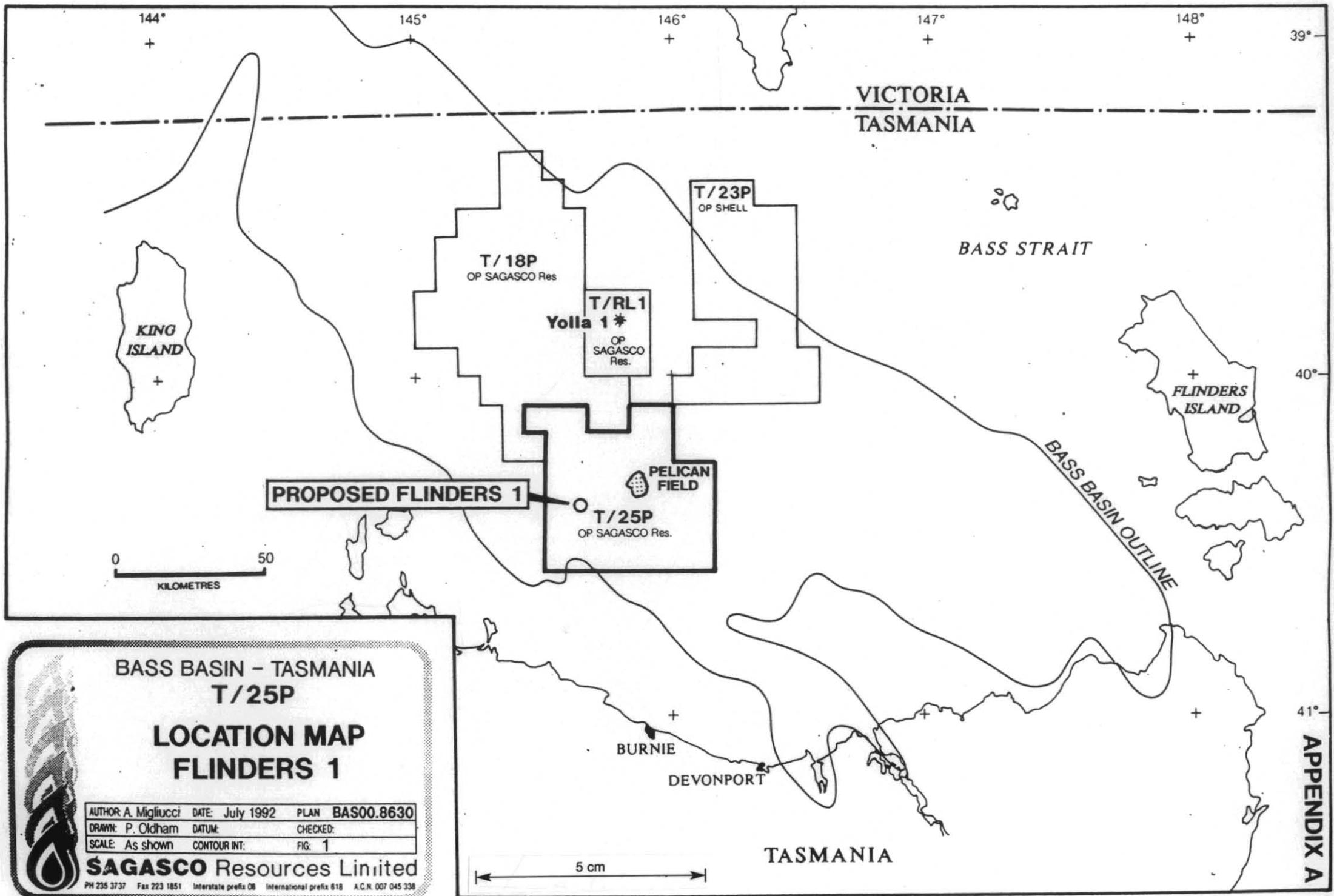
- (i) A separate testing and abandonment program will be issued prior to commencement of these operations.

## **7.8 Plug & Abandonment**

- (i) A separate plug and abandonment program will be issued prior to commencement of P&A.

## **7.9 Operational Limits**

- (i) Rig to be positioned within a 30m radius of called location.
- (ii) Maximum inclination shall be 1 degree from seabed to TD or as directed by SAGASCO Adelaide office, with a maximum displacement of 30m radius at TD from the surface location.



VICTORIA  
TASMANIA

BASS STRAIT

BASS BASIN OUTLINE

KING ISLAND

FLINDERS ISLAND

T/18P  
OP SAGASCO Res

T/23P  
OP SHELL

T/RL1  
Yolla 1 \*  
OP SAGASCO Res.

PELICAN FIELD

PROPOSED FLINDERS 1

T/25P  
OP SAGASCO Res.

BURNIE

DEVONPORT

TASMANIA

APPENDIX A

BASS BASIN - TASMANIA  
T/25P  
LOCATION MAP  
FLINDERS 1

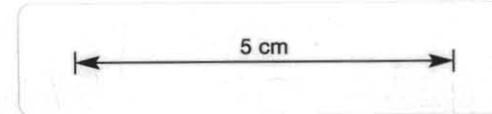
AUTHOR: A. Migliucci	DATE: July 1992	PLAN: BAS00.8630
DRAWN: P. Oldham	DATUM:	CHECKED:
SCALE: As shown	CONTOUR INT:	FIG: 1

**SAGASCO Resources Limited**

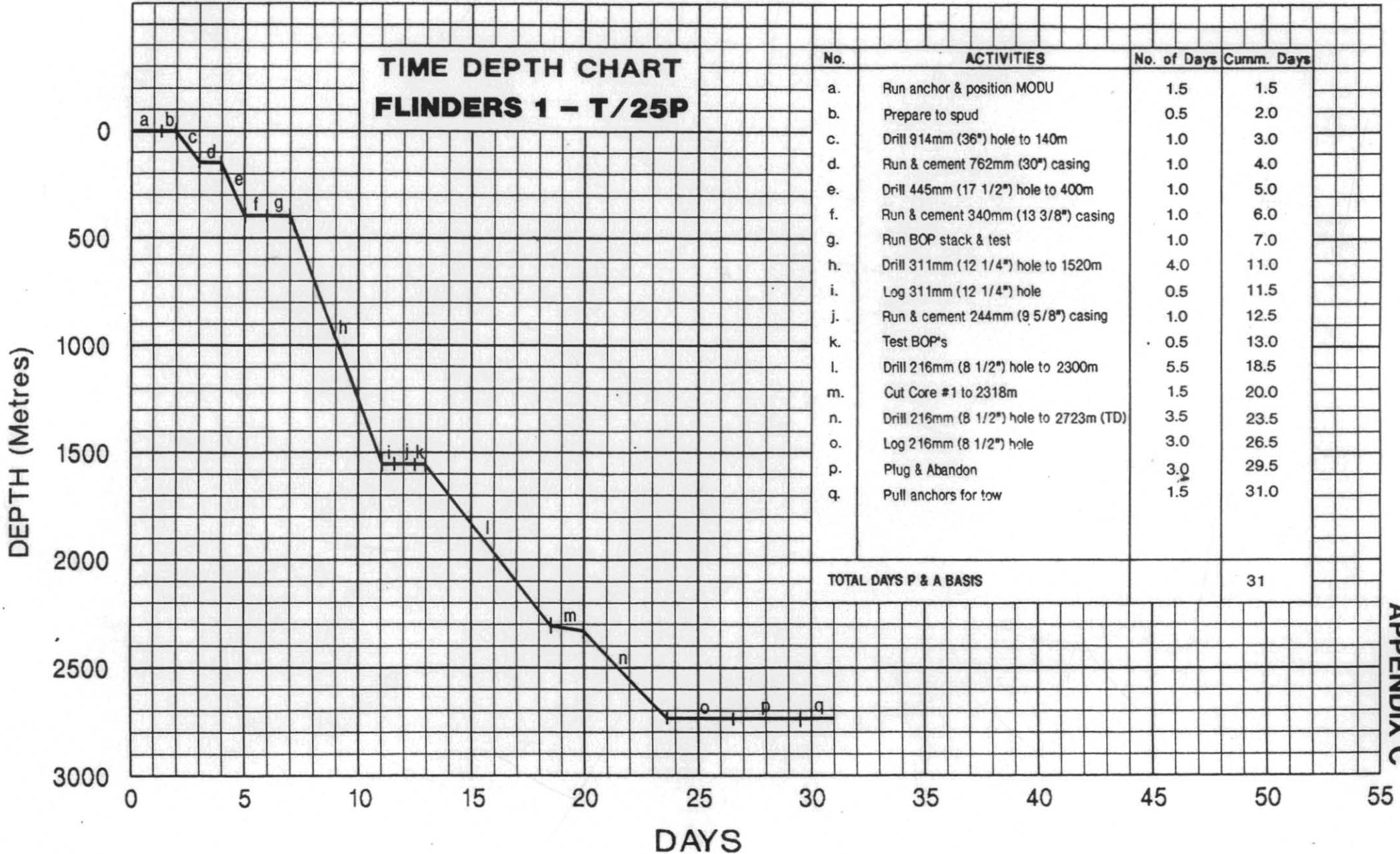
PH 235 3737 Fax 223 1851 Interstate prefix 08 International prefix 618 A.C.N. 007 045 338

0 50  
KILOMETRES

5 cm



**TIME DEPTH CHART  
FLINDERS 1 - T/25P**

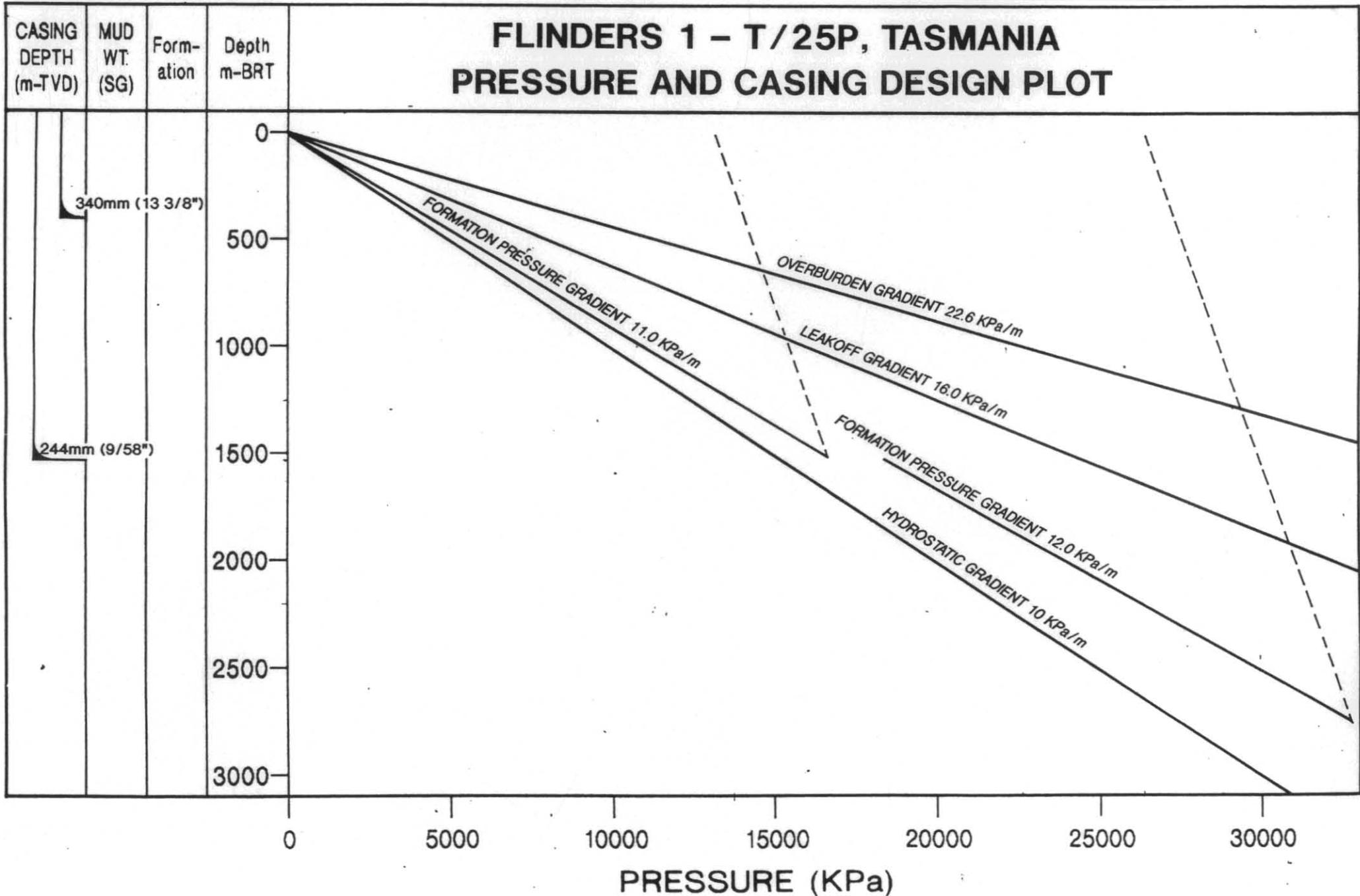


APPENDIX C  
289022

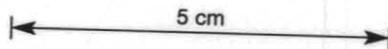


5 cm

### FLINDERS 1 – T/25P, TASMANIA PRESSURE AND CASING DESIGN PLOT



APPENDIX D  
289023



BIT & HYDRAULICS PROGRAM

Interval (m)	Hole Size (mm)	Bit Type (IADC)	Bit Type (Brand)	Nozzles (32nd)	JV (mps)	AV (mpm)	Circ Rate (lpm)	Bit Loss (KPa)	BHA Type	WOB (dN)	RPM	Mud Wt (SG)
Seabed to 140	660 bit 914 HO	1.1.1 1.1.1	DSJ	24,24,24 4 x 18	47	7	4,200	1,262	Slick	0 - 5	30 - 50	1.05
140 to 400	445	1.1.1	DSJ	24,24,24	62	24/26/29	3,200	2,247	Pendulum	5 - 15	80 - 100	1.05
400 to 1000 1520	311	1.1.6 5.1.9	FDS A1	16,16,16 16,16,16	105 105	38/44/55 38/44/55	2,400 2,400	6,582 6,582	Pendulum Pendulum	5 - 15 5 - 15	80 - 110 80 - 110	1.08 1.08
1520 to 1900 2250 2400	216	1.3.7 4.3.7 4.3.7	FDGH F1 F1	11,11,10 11,10,10 11,10,10	108 115 115	46/72 46/72 46/72	1,100 1,100 1,100	7,101 8,056 8,056	Pendulum Packed Packed	5 - 15 10 - 20 10 - 20	80 - 110 60 - 90 60 - 90	1.10 1.15 1.15
2400 to 2418 (Core)	216	9.5.6	CD 93	TBA	TBA	TBA	750-1,500	TBA	Stabilised	2 - 10	80 - 100	1.15
2418 to 2723	216	5.1.7	F2	10,10,10	117	44/69	1,050	9,171	Packed	10 - 20	60 - 90	1.20

BOTTOM HOLE ASSEMBLIES

5 cm

36"	9-7/8"	17-1/2"	17-1/2"	12-1/4"	12-1/4"	8-1/2"	8-1/2"	6"	6"
Slick	Slick	Pendulum	Packed	Pendulum	Packed	Pendulum	Packed	Pendulum	Packed
26" Bit 7-5/8" Reg pin up	Bit 6-5/8" Reg pin up	Bit 7-5/8" Reg pin up	Bit 7-5/8" Reg pin up	Bit 6-5/8" Reg pin up	Bit 6-5/8" Reg pin up	Bit 4-1/2" Reg pin up	Bit 4-1/2" Reg pin up	Bit 3-1/2" Reg pin up	Bit 3-1/2" Reg pin up
36" Hole opener 7-5/8" Reg box down x 7-5/8" Reg pin up	Bit sub with float 6-5/8" Reg box down x 6-5/8" Reg box up	Bit sub with float 7-5/8" Reg box down x 7-5/8" Reg box up	NB stabiliser with float 7-5/8" Reg box down x 7-5/8" Reg box up	Bit sub with float 6-5/8" Reg box down x 6-5/8" Reg box up	NB stabiliser with float 6-5/8" Reg box down x 6-5/8" Reg box up	Bit sub with float 4-1/2" Reg box down x 4-1/2" IF box up	NB Stabiliser with float 4-1/2" Reg box down x 4-1/2" IF box up	Bit sub with float 3-1/2" Reg box down x 3-1/2" IF box up	NB Stabiliser with float 3-1/2" Reg box down x 3-1/2" IF box up
Bit sub with float 7-5/8" Reg box down x 7-5/8" Reg box up	12 x 8" DC's 6-5/8" conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up	2 x 9" DC's 7-5/8" Reg conn  1 x 17-1/2" stabiliser 7-5/8" conn  4 x 8" DC's 7-5/8" Reg conn	1 x 9" Pony DC 7-5/8" Reg conn  1 x 17-1/2" stabiliser 7-5/8" conn  1 x 9" DC's 7-5/8" Reg conn	1 x 8" Monel DC 6-5/8" Reg conn  1 x 8" DC's 6-5/8" Reg conn  1 x 12-1/4" stabiliser 6-5/8" conn	1 x 8" Pony DC 6-5/8" Reg conn  1 x 12-1/4" stabiliser 6-5/8" conn  1 x 8" Monel DC 6-5/8" Reg conn	1 x 6-1/2" Monel DC 4-1/2" IF conn  1 x 8-1/2" stabiliser 4-1/2" IF conn  11 x 6-1/2" DC's 4-1/2" IF conn	1 x Pony 6-1/2" DC 4-1/2" IF conn  1 x 6-1/2" stabiliser 4-1/2" IF conn  1 x 6-1/2" Monel DC 4-1/2" IF conn	1 x 4-3/4" Monel DC 3-1/2" IF conn  1 x 5-7/8" stabiliser 3-1/2" IF conn  14 x 4-3/4" DC's 3-1/2" IF conn	1 x Pony 4-3/4" DC 3-1/2" IF conn  1 x 5-7/8" stabiliser 3-1/2" IF conn  1 x 4-3/4" Monel DC 3-1/2" IF conn
Crossover 7-5/8" Reg pin down x 6-5/8" Reg box up	15 x 5" HWDP 4-1/2" IF conn	Crossover 7-5/8" Reg Reg down x 6-5/8" Reg box up	1 x 17-1/2" stabiliser 7-5/8" conn  5 x 9" DC's 7-5/8" Reg conn	7 x 8" DC's 6-5/8" Reg conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up	1 x 12-1/4" stabiliser 6-5/8" conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up	1 x 6-1/2" Drilling Jars 4-1/2" IF conn  3 x 6-1/2" DC's 4-1/2" IF conn  15 x 5" HWDP 4-1/2" IF conn	1 x 6-1/2" stabiliser 4-1/2" IF conn  12 x 6-1/2" DC's 4-1/2" IF conn  1 x 6-1/2" Drilling Jars 4-1/2" IF conn	1 x 4-3/4" Drilling Jars 3-1/2" IF conn  3 x 4-3/4" DC's 3-1/2" IF conn  12 x 3-1/2" HWDP 3-1/2" IF conn	1 x 5-7/8" stabiliser 3-1/2" IF conn  12 x 4-3/4" DC's 3-1/2" IF conn  1 x 4-3/4" Drilling Jars 3-1/2" IF conn
6 x 8" DC's 6-5/8" conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up		12 x 8" DC's 6-5/8" conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up  15 x 5" HWDP 4-1/2" IF conn	Crossover 7-5/8" Reg Reg down x 6-5/8" Reg box up  3 x 8" DC's 6-5/8" Reg conn  1 x 8" Drilling Jars 6-5/8" Reg conn  3 x 8" DC's 6-5/8" Reg conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up  15 x 5" HWDP 4-1/2" IF conn	10 x 8" DC's 6-5/8" conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up  6 x 6-1/2" DC's 4-1/2" IF conn  1 x 6-1/2" Drilling Jars 4-1/2" IF conn  6 x 6-1/2" DC's 4-1/2" IF conn  15 x 5" HWDP 4-1/2" IF conn	6 x 6-1/2" DC's 4-1/2" IF conn  Crossover 6-5/8" Reg pin down x 4-1/2" IF box up  6 x 6-1/2" DC's 4-1/2" IF conn  15 x 5" HWDP 4-1/2" IF conn	3 x 6-1/2" DC's 4-1/2" IF conn  15 x 5" HWDP 4-1/2" IF conn	1 x 6-1/2" Drilling Jars 4-1/2" IF conn  3 x 6-1/2" DC's 4-1/2" IF conn  15 x 5" HWDP 4-1/2" IF conn	3 x 4-3/4" DC's 3-1/2" IF conn  3 x 4-3/4" DC's 3-1/2" IF conn  12 x 3-1/2" HWDP 3-1/2" IF conn	12 x 4-3/4" DC's 3-1/2" IF conn  3 x 4-3/4" DC's 3-1/2" IF conn  12 x 3-1/2" HWDP 3-1/2" IF conn
Float 5F-6G 'G'	Float 5F-6R 'G'	Float 5F-6R 'G'	Float 5F-6R 'G'	Float 5F-6R 'G'	Float 5F-6R 'G'	Float 4R 'G'	Float 4R 'G'	Float 2F-3R 'G'	Float 2F-3R 'G'



SAGASCO RESOURCES LIMITED

**DRILLING FLUID PROGRAMME**

**FLINDERS #1  
T/25P  
BASS BASIN AUSTRALIA**

**PRESPUD**

1. While moving the rig to the new location the mud system should be thoroughly serviced and inspected. Make sure all valves are holding and there are no evident leaks in the surface equipment. Make sure a detailed schematic of the mud system is prepared.
2. Inspect all solids control equipment. Ensure that the equipment is in good working order prior to spud.
3. Check and clean the high pressure shearing device. Make sure the nozzles are in good condition and that the system will be adequate for the well.
4. Since a large volume of fluid will be required for the top hole sections, as much volume as possible should be mixed prior to spud.



**SAGASCO RESOURCES LIMITED**

**MUD VOLUMES & MATERIAL AND COST ESTIMATES: FLINDERS 1**

**WELL CONFIGURATION**

	<b><u>DEPTH</u></b> <b><u>(METRE)</u></b>	<b><u>INTERVAL</u></b> <b><u>LENGTH</u></b>	<b><u>MUD</u></b> <b><u>SYSTEM</u></b>
WATER DEPTH (estimated)	82		
RKB - SEA BED (estimated)	97		
36" HOLE\30" CASING	140	43	SEAWATER/SM(X) SWEEPS GEL SPUD MUD
17.5" HOLE\13 3/8" CASING	400	260	SEAWATER/SM(X) SWEEPS GEL SPUD MUD
12.25" HOLE\9 5/8" CASING	1520	1120	SEA WATER/GEL/POLYMER
8.5" HOLE\7" CASING	2723	1203	PHPA/FRESH WATER



SAGASCO RESOURCES LIMITED

DRILLING FLUID PROGRAMME FLINDERS #1

**HOLE SIZE:** 914mm (36") HOLE / 762mm (30") CONDUCTOR

**SECTION:** 97m - 140m RKB

**MUD TYPE:** **SM(X) VISCOUS SWEEPS/PREHYDRATED BENTONITE DISPLACEMENT FLUID**

The primary requirements of the drilling fluid to be used during this section are to provide adequate carrying capacity to transport the cuttings out of the large diameter hole, and to provide sufficient suspension to maintain borehole stability whilst the fluid is in a static state. It is proposed that the 914mm (36") hole is drilled with seawater, with 5m<sup>3</sup> SM(X) viscous pills pumped every 10 metres. A 15m<sup>3</sup> sweep should also be pumped when at TD to ensure the hole is clean prior to bentonite displacement.

SM(X) is a modified guar gum derivative, which provides excellent hole cleaning properties at low concentrations. The advantages of SM(X) fluids in comparison to conventional Bentonite muds are both economic and logistical. Logistically, the storage area required for SM(X) is less than 10% of the area required for bentonite to make comparable fluids, and SM(X) muds are faster to prepare and do not require fresh water or hydration time.

As with all natural polymers SM(X) is subject to bacterial degradation. It is therefore necessary to treat the system with IDCIDE, a low toxic bactericide.

Although SM(X) provides for excellent hole cleaning under dynamic conditions, the fluid does not have the suspension properties of bentonite when in a static state. It is therefore recommended to displace the hole to a 20 ppb BENTONITE slurry prior to running casing to provide the required suspension for wellbore stability.

It is not anticipated that additional density will be required during this section.



## SAGASCO RESOURCES LIMITED

### **MIXING & MAINTENANCE PROCEDURES: SM(X) VISCOUS SWEEPS**

1. Treat the rigsite make up water to reduce Total Hardness to below 400 ppm, with additions of **SODA ASH**.
2. Add 2 ppb **SM (X)** slowly and smoothly through the hopper, at 15 - 20 minutes per sack.
3. Treat the fluid with 0.2 ppb **IDCIDE**. Maintenance dosages of .1 ppb may be necessary if the fluid is to be stored for extended periods, for example due to delays caused by weather or mechanical breakdown.

### **MIXING & MAINTENANCE PROCEDURES: BENTONITE DISPLACEMENT FLUID**

1. The rig's drill water should be tested to ascertain the chloride and total hardness levels. Salinity should ideally be below 1000 ppm for optimum **BENTONITE** hydration and yield, and calcium and magnesium should be treated with **SODA ASH** and **CAUSTIC** respectively to reduce the total hardness level to below 200 ppm. Water with chlorides in excess of 3000 ppm is unsuitable for hydrating **BENTONITE**.
2. 25 ppb of **BENTONITE** should be added to the treated drill water, and allowed to hydrate for around 6 hours.
3. Dilute the prehydrated **BENTONITE** with seawater at ratio 75/25 (Drillwater/Seawater) just prior to use.
4. Add 1 ppb **LIME**.
5. Displace the hole with 100% excess volume **BENTONITE** spud mud before running casing.



SAGASCO RESOURCES LIMITED

**PRODUCT FUNCTIONS**

<b>BENTONITE</b>	Superior suspending properties in a static state.
<b>CAUSTIC SODA</b>	To provide correct pH if required.
<b>SODA ASH</b>	To control soluble calcium levels.
<b>SM (X)</b>	A modified guar gum derivative providing excellent hole cleaning properties.
<b>IDCIDE L</b>	Low toxic Bactericide.
<b>LIME</b>	A flocculant for Bentonite slurries.



**SAGASCO RESOURCES AUSTRALIA LIMITED**

**MUD VOLUMES & MATERIAL AND COST ESTIMATES: FLINDERS 1**

**914 mm (36") HOLE SECTION TO 140 M (RKB - SEABED 97 M)**

**SEA WATER/SM(X)/GEL SPUD MUD**

**VOLUME ESTIMATES**

High Viscosity Sweeps	64 m <sup>3</sup>
Open Hole Displacement (+200% excess)	85 m <sup>3</sup>
<b>TOTAL ESTIMATED VOLUME</b>	<b>149 m<sup>3</sup></b>

**MATERIALS AND COST ESTIMATES**

PRODUCT	kg/m <sup>3</sup>	QUANTITY SX/DR	UNIT SIZE	UNIT PRICE	TOTAL PRICE
WYOMING BENTONITE	86	160	100 LB	22.18	3,548.80
CAUSTIC SODA	1.4	5	25 KG	46.35	231.75
SODA ASH	1.4	5	25 KG	18.54	92.70
LIME	2.9	10	25 KG	11.15	111.50
SM(X)	5.7	15	25 KG	112.55	1,688.25
IDCIDE L	0.6	1	25 KG	158.90	158.90

<b>SECTION TOTAL</b>	<b>5,831.90</b>
<b>COST/m<sup>3</sup> AUSS)</b>	<b>39.23</b>

**BENTONITE & LIME ESTIMATES FOR 85m<sup>3</sup> FOR HOLE  
DISPLACEMENT (+EXCESS) PRIOR TO RUNNING CASING**

**SM(X) AND IDCIDE L FOR 64 m<sup>3</sup> VISCOUS SWEEPS**



SAGASCO RESOURCES LIMITED

**MIXING & MAINTENANCE PROCEDURES**

1. Treat the rigsite make up water to reduce Total Hardness to below 400 ppm, with additions of **SODA ASH**.
2. Add 1.25 ppb **SM (X)** slowly and smoothly through the hopper, at 15 - 20 minutes per sack.
3. Treat the fluid with 0.15 ppb **IDCIDE**, increasing the dosage slightly if required.
4. Concentrations of **SM (X)** in the sweeps can be varied as required for optimum hole cleaning and may require increasing. The incorporation of native clays into the circulating system may reduce the concentration of **SM (X)** required.



## SAGASCO RESOURCES LIMITED

### **BENTONITE DISPLACEMENT FLUID**

#### **MIXING PROCEDURE**

1. The rigsite make up water should be tested to ascertain the chloride and total hardness levels. Salinity should ideally be below 1000 ppm for optimum Bentonite hydration and yield, and calcium and magnesium should be treated with soda ash and caustic respectively to reduce the total hardness level to below 200 ppm. Water with chlorides in excess of 3000 ppm is unsuitable for hydrating **BENTONITE**.
2. 25 ppb of **BENTONITE** should be added to the treated mix water, and allowed to hydrate for around 6 hours.
3. Dilute the prehydrated **BENTONITE** in the ratio 75/25 (Drillwater to seawater) just prior to use.
4. 1ppb of **LIME** should be added as a flocculent immediately prior to displacing the fluid to the hole.
5. When casing is run, the hole should be left standing full with the fresh bentonite slurry after circulating out one full hole volume.

#### **PRODUCT FUNCTIONS**

<b>BENTONITE</b>	Agent to suspend solids in the displacement fluid.
<b>CAUSTIC SODA</b>	To provide correct pH, in gel system.
<b>SODA ASH</b>	To control soluble calcium levels.
<b>SM (X)</b>	A modified guar gum derivative providing excellent hole cleaning properties.
<b>IDCIDE</b>	Low toxic Bactericide.



**SAGASCO RESOURCES LIMITED**

**MUD VOLUMES & MATERIAL AND COST ESTIMATES: FLINDERS 1**

**445mm (17 1/2") HOLE SECTION TO 400 M**

**SEA WATER/SM(X)/GEL SPUD MUD**

**VOLUME ESTIMATES**

High Viscosity Sweeps	130 m3
Open Hole Displacement (+200% excess)	121 m3
<b>TOTAL ESTIMATED VOLUME</b>	<b>251 m3</b>

**MATERIALS AND COST ESTIMATES:**

PRODUCT	kg/m3	QUANTITY SX/DR	UNIT SIZE	UNIT PRICE	TOTAL PRICE
WYOMING BENTONITE	57	152	100 LB	22.18	3,371.36
CAUSTIC SODA	1.4	7	25 KG	46.35	324.45
SODA ASH	0.7	3	25 KG	18.54	55.62
LIME	2.9	14	25 KG	11.15	156.10
SM(X)	5.7	30	25 KG	112.55	3,376.50
IDCIDE L	0.6	3	25 KG	158.90	476.70

<b>SECTION TOTAL</b>	<b>7,760.73</b>
<b>COST/m3 AUSS)</b>	<b>30.91</b>

**BENTONITE & LIME ESTIMATES FOR 62m3 FOR HOLE  
DISPLACEMENT (+EXCESS) PRIOR TO RUNNING CASING**



SAGASCO RESOURCES LIMITED

DRILLING FLUID PROGRAMME FLINDERS #1

**HOLE SIZE:** 311mm (12½") HOLE / 224mm (9<sup>5</sup>/<sub>8</sub>") CASING

**SECTION:** 400m - 1520m RKB

**MUD TYPE:** SEA WATER / BENTONITE / POLYMER

**SYSTEM DISCUSSION:**

It is proposed that the 12½" section will be drilled with a basic **BENTONITE** based drilling fluid, utilising special additives for rheological and filter cake properties. This traditional mud system will allow cost effective drilling in the upper hole sections where inhibition may not be the prime consideration. Similar mud type systems have been used with varying degrees of success on previous Bass Basin wells.

The fine grained sediments of the Torquay and Demons Bluff group will be encountered in this hole section. The Torquay lithologies have been shown to be highly dispersive. As hole conditions dictate while drilling through these reactive formations, partially hydrolised polyacrylamide (PHPA) may be utilised to minimise cuttings dispersion and for well-bore stabilisation. **IDBOND**, possessing a very high molecular weight, adsorbs strongly to and lends mechanical stability to clay platelets.

Maintaining high yield points are essential to minimise the problems and can be accomplished by the additions of the **BENTONITE** pre-mix. If **IDBOND** additions have been implemented, then the bentonite content should be maintained at minimum values. If further viscosity and yeild point adjustments are necessary, **IDVIS** is recommended and should be available on a standby basis. The modified starch type polymer **IDFLO** will achieve an economical reduction in fluid loss and minimise effects on viscosity and gel strengths. **IDPAC** can be utilised to further reduce filtrate and aid viscosity and yield.



SAGASCO RESOURCES LIMITED

The formations that will be encountered are expected to be very soft with penetration rates being correspondingly high, and thus the potential accumulation of drilled solids could result in high viscosities and mud weights. Therefore the use of all mechanical solids control equipment should be optimised to keep maintenance and dilution to a minimum. A pre-planned solids control and dilution programme should be implemented, with special care taken not to overload the annulus with cuttings, minimising the potential for lost circulation. The finest shaker screens possible should be utilised, and the regular dumping of shaker boxes and sandtraps will assist in avoiding recirculation of drilled solids and help prevent overloading the downstream solids control equipment. It is expected that dilution requirements will be in the range of 2 - 2.5 bbls per bbl of cuttings generated, if the mud system does not have inhibitive characteristics.

The claystones in the Demons Bluff have shown to be less reactive but produce blocky cuttings, indicative of sloughing and have a tendency to cave. Mud weight adjustments with **BARITE** may be required to increase hole stability.

As high pH fluids are known to promote dispersion of the clay matrix, the mud system should be run with a pH below 9.5 if possible. This will be beneficial to the well-bore stability through these lithologies.

The system can be used at temperatures up to 260 deg F. It is compatible with most water based drilling fluid additives and can easily be converted to a more inhibitive system such as **SALT, GYPSUM** or **LIME** based mud.

Carbonate/Bicarbonate alkalinities from CO<sub>2</sub> influx or the nature of the rock matrix has caused excessively high progressive gel strengths and viscosities on offset wells. Excess calcium (as distinct from Ca & Mg) in the filtrate, up to 1000ppm, should prevent this contamination from becoming a problem.



SAGASCO RESOURCES LIMITED

**PRODUCT FUNCTIONS:**

<b>BENTONITE</b>	In PHPA systems, small quantities provides hole and system stability and enhances well-bore lubricity.
<b>CAUSTIC SODA</b>	To provide correct pH.
<b>SODA ASH</b>	To control soluble calcium levels.
<b>IDFLO</b>	Low viscosity fluid-loss reducer.
<b>IDPAC</b>	Fluid Loss reducer and viscosifier.
<b>IDBOND</b>	A PHPA used as an encapsulating polymer to provide shale inhibition (contingency).
<b>CFL</b>	Used to control viscosity and gel strengths and provides some fluid loss control (contingency).
<b>IDVIS</b>	A xanthan type polymer for pseudoplastic viscosity and gel strength (contingency only).
<b>DRILLING DETERGENT</b>	To reduce surface tension, to aid dropping sand and minimise bit balling. It also has a secondary lubrication effect and will reduce torque and drag.

**MUD FORMULATION**

BENTONITE (no PHPA)	15 ppb
BENTONITE (with PHPA)	< 5 ppb
CAUSTIC SODA	.3 - .5 ppb
SODA ASH	.25 ppb
IDFLO	2 - 4 ppb
IDPAC	1 ppb
IDBOND	1 - 1.5 ppb*
IDVIS	.25 ppb*
DRILLING DETERGENT	as required

\* contingency



SAGASCO RESOURCES LIMITED

**ENGINEERING COMMENTS:**

1. If possible, drill out the casing shoe with seawater to avoid cement contamination of the mud, otherwise pre treat the fluid with 0.5 ppb **SODIUM BICARBONATE**. As with the previous interval, prehydrate **BENTONITE** in drill water and add to active volume as needed and dilute with seawater. Maintain sufficient concentration for adequate hole cleaning viscosity, fluid loss control and filter cake quality.
2. Dilution will be required, and this is best achieved by making whole mud additions; product concentrations in the premix should be adjusted as required to maintain the active properties within the desired parameters. A pre-planned solids control and dilution programme should be implemented, with special care taken not to overload the annulus with cuttings. The finest shaker screens possible should be utilised, and the regular dumping of shaker boxes and sandtraps should assist in avoiding recirculation of drilled solids and help prevent overloading the downstream solids control equipment.
3. Control filter cake quality and filtrate reductions with **IDPAC**, **IDFLO** and bentonite. If sand or silt stringers occur it may be necessary to introduce tighter control to avoid build up of wallcake by increased concentrations.
4. Yield point can be increased if required while keeping solids to a minimum with small additions of **IDVIS** or **IDPAC**.
5. **IDF DRILLING DETERGENT** should be added to the system at a concentration of around 0.5 pb to reduce the tendency of the clay to ball up the BHA, and hence assist in reducing torque and drag.
6. As a precautionary measure, it is suggested that a concentration of around 0.2 ppb **IDCIDE L** is maintained in the system.
7. There is a potential for lost circulation in these friable lithologies. If losses do occur, initial attempts to cure these should be made by spotting LCM pills, made from a mixture of **MICA**, **NUTPLUG** and **KWIKSEAL**. An adequate supply of LCM is to be kept on board at all times.
8. Kicks. Pit levels should be closely monitored, and drilling breaks observed for evidence of gas/fluid invasion.



**SAGASCO RESOURCES LIMITED**

**MUD VOLUMES & MATERIAL AND COST ESTIMATES: FLINDERS 1**

**311mm (12 1/4") HOLE SECTION TO 1520 M**

**SEAWATER/BENTONITE/POLYMER**

**VOLUME ESTIMATES**

Surface	95 m3
Riser (Assumed 20" ID)	20 m3
13 3/8" Casing	23 m3
12 1/4" Open Hole (+ 20% excess)	102 m3
Circulating Volume	241 m3
Solids control efficiency	85%
Max drilled solids	6.00%
Calculated dilution to control LGS content	240 m3
Recovered from previous section	0 m3
<b>TOTAL ESTIMATED VOLUME</b>	<b>481 m3</b>

**MATERIALS AND COST ESTIMATES: (1.10 SG)**

PRODUCT	kg/m3	QUANTITY SX/DR	UNIT SIZE	UNIT PRICE	TOTAL PRICE
BARITE	71	755	100 LB	13.84	10,452.74
WYOMING BENTONITE	36	377	100 LB	22.18	8,361.86
CAUSTIC SODA	1.4	27	25 KG	46.35	1,251.45
SODA ASH	1.4	27	25 KG	18.54	500.58
IDFLO	8.6	164	25 KG	50.32	8,252.48
IDBOND	4.3	82	25 KG	185.38	15,201.16
DRILLING DETERGENT	1.4	3	200 LT	271.45	814.35
IDVIS	0.7	14	25 KG	387.98	5,431.72

<b>SECTION TOTAL</b>	<b>50266.34</b>
<b>COST/m3 AUSS)</b>	<b>104.51</b>



SAGASCO RESOURCES LIMITED

DRILLING FLUID PROGRAMME FLINDERS #1

**HOLE SIZE:** 216mm (8½") / 178mm (7") LINER  
**SECTION:** 1520m - 2723m RKB  
**MUD TYPE:** FRESHWATER / IDBOND / IDPAC

**SYSTEM DISCUSSION:**

Geological evaluation requires that the total chlorides be kept below 5000 ppm throughout the entire 8½ hole section. The Eastern View Coal Measures are micro laminated, friable and are shown to have migrating fines in the pore space of potential producing sands. A PHPA mud will provide sufficient inhibition to minimise problems associated with these lithologies. therefore in order to provide a high degree of inhibition to the rock matrix and reduce its dispersion in to the drilling fluid, a **FRESH WATER/IDBOND/IDPAC** system is recommended for drilling through this interval.

The **IDBOND** system has been run extensively by IDF for over 20 years. It provides all the advantages that a non dispersed polymer system has over more traditional dispersed bentonite fluids. In particular, it allows faster penetration rates due to the pseudoplastic rheological properties, as well as providing a high degree of inhibition in a fresh water system.

The **IDBOND** polymer, which has a very high molecular weight, absorbs strongly onto the clay platelets, producing a viscous surface layer which slows down water penetration into the shale structure and lends mechanical stability to clay platelets. Polyacrylamides such as **IDBOND** are sacrificial polymers in the sense that they can be added solely for the purpose of absorbing onto the cuttings and formations. **IDBOND** is not added as a primary viscosifier or filtration control additive. These functions are achieved with **IDPAC** polymers which provide both viscosity and fluid loss control. **IDVIS** additions should be made if additional rheological and suspension properties are required, however this is not an expected requirement with the formations anticipated.

Small additions of Bentonite (<5ppb) have proved to be beneficial to this sytem under certain circumstances, providing a filtercake base and stabilising the rheological properties of the fluid. In addition, the coefficient of friction within the wellbore has been shown to be significantly reduced with a low concentration of commercial bentonite.



SAGASCO RESOURCES LIMITED

Coal seams with the Eastern View Group are very susceptible to washouts, resulting in unstable ledges of siltstone and shale on either side of the seam. Borehole instability has caused tight hole and required reaming on offset wells. If conditions dictate, the addition of **GILSONITE** could slow down the entry of water into these fractured formations. However, density increases may be necessary to control severe caving and hole instability, and the system proposed will perform effectively within the density requirements anticipated.

Since a high pH environment can cause the precipitation of PHPA polymer, the **IDBOND** system is run most effectively with a pH below 9.5. This will also be beneficial to the wellbore and lithologies, as high pH fluids are known to promote dispersion of the clay matrix.

Carbonate contamination due to CO<sub>2</sub> influxes as evidenced on many Bass Basin wells should be anticipated. The **IDBOND** system should not be susceptible to this intrusion, due to the minimal quantities of bentonite utilised in this polymer system. However, as the pH drops and the carbonate/bicarbonate alkalinity increases, rheological properties may be affected.

This condition can be countered by the maintenance of free **LIME** in the filtrate. The addition of **LIME** or **GYPSUM** is used to precipitate the CO<sub>2</sub> as CaCO<sub>3</sub>. Treatments should be initiated on first signs of contamination and may reach 2 ppb. Of primary importance is the maintenance of the pH in the 9 - 9.5 range and the control of low gravity solids at a maximum value of 5%.

Should the system prove to be adversely effected by contaminants, or become uneconomical due to excessive dilution requirements, discontinue treatment with **IDBOND** and increase **IDPAC** concentrations. No instability or special treatment should result from the approach of contaminants being treated as required and viscosity increases being made as necessary with additions of **IDVIS**.

Excessive viscosities and gel strengths due to the incorporation of native clays would be deflocculated with additions of **CHROME FREE LIGNOSULPHONATE (FCL)**, which also provides supplementary fluid loss control.



SAGASCO RESOURCES LIMITED

**PRODUCT FUNCTIONS:**

<b>IDBOND</b>	A partially hydrolysed polyacrylamide used as an encapsulating polymer to provide shale inhibition.
<b>IDPAC or XL</b>	A polyanionic cellulose used to provide both viscosity and fluid loss control
<b>IDVIS</b>	A xanthan type polymer used to achieve pseudoplastic viscosity. The product will also provide progressive gel strengths (contingency only).
<b>IDFLO</b>	A non dispersing polymeric fluid loss reducer which is effective in both fresh and brine based fluid (contingency only).
<b>CAUSTIC SODA</b>	To provide correct pH, not to exceed 9.0.
<b>BARITE</b>	Weighing agent to stabilise well bore up to 10 ppg.
<b>BENTONITE</b>	Provides hole and system stability in PHPA muds and can substantially reduce the lubricity coefficient in the well bore.

**MIXING AND MAINTENANCE PROCEDURES:**

1. Clean out tanks and fill with drill water. Treat out total hardness with **SODA ASH**.
2. Add **BENTONITE** to achieve a maximum concentration of 5 ppb.
3. Mix the **IDPAC** polymer slowly and smoothly through the hopper at approximately 15 minutes per sack.
4. Add 0.5 ppb **CAUSTIC SODA** to raise the pH to 9.5.
5. Add Barite as required.



SAGASCO RESOURCES LIMITED

**MUD FORMULATION**

IDBOND	3 ppb
IDPAC or XL	1-2 ppb
IDVIS	.25 ppb
SODA ASH	0.25 ppb
CAUSTIC SODA	.5 ppb
BARITE	± 70 ppb
BENTONITE	5 ppb

N.B. The IDBOND polymer is 35% active, so addition of 3 ppb represent approximately 1 ppb ACTIVE content, required to retain an excess of at least 0.25 ppb in the flowline.

**RECOMMENDED PROPERTIES:**

Density	1.08 - 1.17 sg
Funnel Viscosity (sec/qt)	45
Yield point (lbs/100 sq ft)	15 - 25
Plastic viscosity (cps)	10 - 20
API filtrate (mls)	5 - 8 / 30 min
pH	9.5 maximum
Drilled solids (max %)	<5%
MBT (ppb)	<15
Calcium (ppm)	<200



SAGASCO RESOURCES LIMITED

**ENGINEERING COMMENTS**

1. Drill out cement with mud from the previous section. After the cement has been drilled displace to the new system. Any cement contamination encountered in the new system should be treated with additions of **SODIUM BICARBONATE**.
2. **IDBOND** additions should only be started after the first circulation. Additions must be made slowly at the suction to avoid any viscosity humps which may cause blinding of the shale shaker screens. An excess of 0.25 ppb of **IDBOND** in the mud filtrate, determined by IDF polymer test, should be maintained at all times. Additions of **IDBOND** will be dependent on hole size and drill rate.
3. The appearance of cuttings at the shale shakers should be closely monitored to ensure there is sufficient inhibition, as well as the effects on other drilling parameters such as tight hole, etc.
4. The yield point and gel strength should be raised if required by addition of **IDVIS**. However care should be taken not to over-treat, particularly with regard to additions to premixes.
5. Fluid Loss should be controlled with addition of **IDPAC** or **IDPAC XL**.
6. All available solids control equipment should be utilised to avoid the build up of drilled solids. Whole mud additions (weighted or otherwise) should be used for general maintenance of the system, in preference to dry chemical additions.
7. Sand traps and header boxes should be inspected regularly and dumped as required during connections.
8. Maintenance additions of **IDCIDE L** should be made (if necessary) to prevent bacterial degradation of polymers.
9. Lost circulation. Lost circulation is not anticipated, since losses have not been recorded on offset wells. However, if losses do occur, initial attempts to cure these should be made by spotting LCM pills, made from a mixture of **MICA**, **NUTPLUG** and **KWIKSEAL**. Consideration should also be given to reducing the system density if possible. If massive losses occur soft plugs (gunk squeezes) or cement plugs could be set across the thief zones, or the hole drilled with a mud cap.
10. Kicks. Pit levels should be closely monitored, and drilling breaks observed for evidence of gas/fluid invasion.
11. If Hydrogen Sulphide or Carbon Dioxide are encountered, the mud should be treated with **ZINC CARBONATE** and **GYPSUM** (or **LIME**) respectively. The pH should be maintained at 10.5 minimum.



**SAGASCO RESOURCES LIMITED**

**MUD VOLUMES & MATERIAL AND COST ESTIMATES: FLINDERS 1**

**216mm ( 8 1/2" ) HOLE SECTION TO 2723 M**

**PHPA/IDPAC SYSTEM**

**VOLUME ESTIMATES**

Surface	95 m3
Riser (Assumed 20" ID)	20 m3
9 5/8" Casing	54 m3
8 1/2" Open Hole (+ 15% excess)	51 m3
Circulating Volume	220 m3
Solids control efficiency	85%
Max drilled solids	6.00%
Calculated dilution to control LGS content	119 m3
Recovered from previous section	0 m3
<b>TOTAL ESTIMATED VOLUME</b>	<b>339 m3</b>

**MATERIALS AND COST ESTIMATES (1.20 SG)**

PRODUCT	kg/m3	QUANTITY SX/DR	UNIT SIZE	UNIT PRICE	TOTAL PRICE
BARITE	200	1489	100 LBS	13.84	20,614.74
WYOMING BENTONITE	14	106	100 LBS	22.18	2,351.08
CAUSTIC SODA	0.7	10	25 KG	46.35	463.50
SODA ASH	0.7	10	25 KG	18.54	185.40
IDBOND	8.6	116	25 KG	185.38	21,504.08
IDPAC (OR IDPAC XL)	5.7	77	25 KG	167.51	12,898.27
IDVIS	0.7	10	25 KG	387.98	3,879.80
GYPSUM	4.3	58	25 KG	12.58	729.64

<b>SECTION TOTAL</b>	<b>62626.51</b>
<b>COST/m3 AUSS)</b>	<b>184.88</b>



**SAGASCO RESOURCES LIMITED**

**WELL TOTAL: FLINDERS 1**

**MATERIAL CONSUMPTION & COST ESTIMATE**

<b>PRODUCT</b>	<b>QUANTITY SX/DR</b>	<b>UNIT SIZE</b>	<b>UNIT PRICE</b>	<b>TOTAL PRICE</b>
BARITE	2244	100 LB	13.84	31,067.48
WYOMING BENTONITE	795	100 LB	22.18	17,633.10
CAUSTIC SODA	49	25 KG	46.35	2,271.15
SODA ASH	45	25 KG	18.54	834.30
LIME	24	25 KG	11.15	267.60
DETERGENT	3	200 LT	271.45	814.35
IDBOND	198	25 KG	185.38	36,705.24
IDPAC	77	25 KG	167.51	12,898.27
IDFLO	164	25 KG	50.32	8,252.48
IDVIS	24	25 KG	387.98	9,311.52
GYSUM	58	25 KG	12.58	729.64
IDCIDE L	4	25 KG	158.90	635.60
IDF SM(X)	45	25 KG	112.55	5,064.75

**WELL TOTAL AUSS**

**126485.5**

The above estimate does not include any contingency

chemicals such as LCM, IDFREE etc.



**SAGASCO RESOURCES LIMITED**

**RECOMMENDED CONTINGENCY & SAFETY CHEMICALS**

(Stock recommended over and above estimated well total consumption).

PRODUCT	# of PLTS	QUANTITY SX/DR	UNIT SIZE	UNIT PRICE	TOTAL PRICE
BARITE	BULK	3000	100 LB	13.84	41,534.07
WYOMING BENTONITE	BULK	500	100 LB	22.18	11,090.00
NUTPLUG (M)	3	120	50 LB	33.10	3,972.00
MICA (F,M,C)	3	120	25 KG	19.20	2,304.00
QUIKSEAL	2	80	40 LB	43.03	3,442.40
SODIUM BICARBONATE	1	25	50 KG	40.39	1,009.75
ALUMINIUM STEARATE	2	30	10 KG	185.00	5,550.00
IDCIDE L	1	12	25 LT	158.90	1,906.80
IDFREE UW	1	4	200 LT	503.18	2,012.72
DRILLING DETERGENT	1	4	200 LT	271.45	1,085.80
PTS 200	1	12	25 KG	90.04	1,080.48
CAUSTIC SODA	3	36	25 KG	46.35	1,668.60
SODA ASH	2	40	25 KG	18.54	741.60
LIME	4	80	25 KG	40.39	3,231.20
IDVIS	1	30	25 KG	387.98	11,639.40
IDPAC	2	40	25 KG	167.51	6,700.40
IDPAC XL	2	40	25 KG	167.51	6,700.40
IDFLO	2	40	25 KG	50.32	2,012.80
IDF FCL	2	40	25 KG	37.08	1,483.20
IDF DEFOAMER	1	12	25 LT	98.36	1,180.32
IDBOND	3	96	25 KG	185.38	17,796.48
GYPSUM	4	120	25 KG	12.58	1,509.60

**CONTINGENCY COST, AUSS**

**129652.0**



SAGASCO RESOURCES LIMITED

DRILLING FLUID PROGRAMME FLINDERS #1

**HOLE SIZE:** 445mm (17½") HOLE / 340mm (13¾") CASING

**SECTION:** 140m - 400m RKB

**MUD TYPE:** SEA WATER / SM (X) VISCOUS SWEEPS /  
PREHYDRATED BENTONITE DISPLACEMENT FLUID

**SM (X) SPUD MUD**

**SYSTEM DISCUSSION.**

As in the previous section, the 445mm (17½") hole will be drilled utilising seawater and 5m<sup>3</sup> slugs of SM(X), or as necessary to keep the hole clean. The logistical advantages over BENTONITE are as before, and the system does not have the fresh water and hydration time requirements of conventional Bentonite fluids.

As with all natural polymers SM (X) is subject to bacterial degradation. It is therefore necessary to treat the system with IDCIDE, a low toxic bactericide.

Although SM (X) provides for excellent hole cleaning under dynamic conditions, the fluid does not have the suspension properties of BENTONITE when in a static state. It is therefore recommended to displace the hole to a 20 ppb BENTONITE slurry prior to running casing to provide the required suspension for wellbore stability. This will be accomplished by pumping approximately 150% of the drilled volume leaving the hole full with fresh mud for running 13¾".

It is not anticipated that additional density will be required during this section.

Shale shakers should be dressed with medium - coarse screens to minimize surface losses over the screens: Desanders and desilters should be run continuously when circulating, and the header boxes and sand traps should be inspected regularly and dumped as required during connections.

**APPENDIX H**

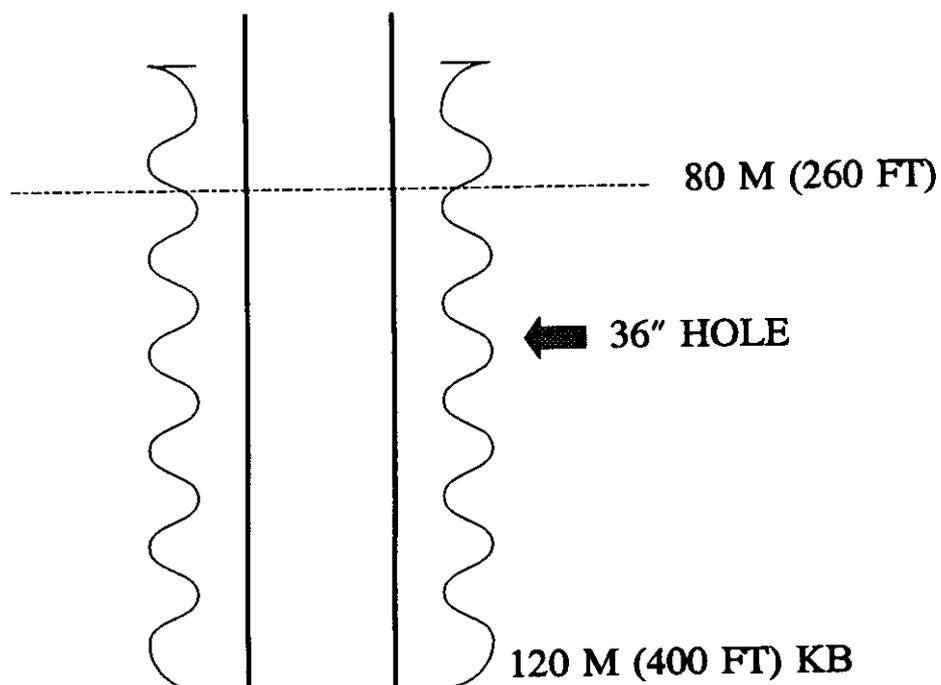
**CEMENT SLURRY DESIGNS**

## SAGASCO - FLINDERS #1

T/25P

CONDUCTOR

30" CASING

**CALCULATIONS: CEMENT TO SEA BED**

Lead Slurry - 150% Excess

BHST 70°F

**SLURRY VOLUME:**

$$199 \text{ ft} \times 0.3847 \text{ bbl/ft} = 76.5 \text{ bbl}$$

$$76.5 \text{ bbl} \times 5.6146 = 429 \text{ cu.ft}$$

$$429 \text{ cu.ft} \times 2.5 = 1074 \text{ cu.ft}$$

$$1074 \text{ cu.ft} \div 1.15 \text{ cu.ft/sk} = \boxed{934 \text{ sk}}$$

**SLURRY DESIGN**

- Cement - Class "G"
- Accelerator - 2% Calcium Chloride (BWOC)
- Defoamer - NF-3 as required

5 cm

**MATERIALS REQUIRED**

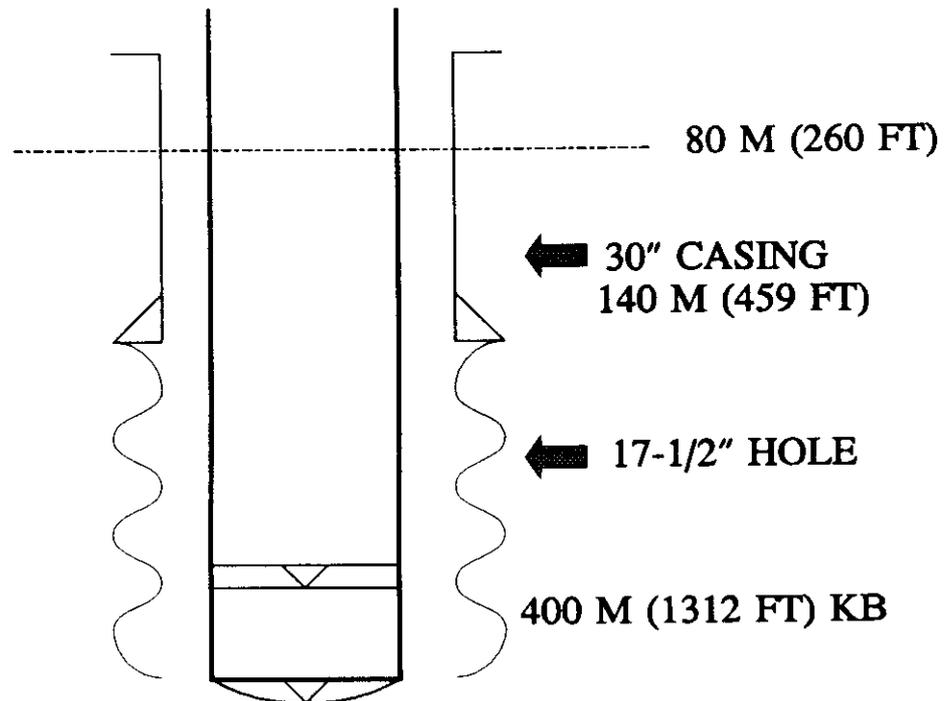
Class "G" Cement	-	934 sx
CaCl <sub>2</sub>	-	1756 lb
NF-3	-	As required

**SLURRY PROPERTIES**

Slurry Density	-	15.9 ppg
Slurry Yield	-	1.15 cu.ft/sk
Water Required	-	5.0 gal/sk (sea water)

SURFACE

13-3/8" CASING

**CALCULATIONS: CEMENT TO SEA BED**

Lead Slurry - 100% Excess in open hole  
 Tail Slurry - 100% Excess in open hole

BHST: 86°F (based on temp gradient of 1.6°F/100 ft  
 below sea bed)

**TAIL-IN SLURRY VOLUME**

Shoe Joint (60 ft)

60 ft x 0.8542 cu.ft/ft = 51 cu.ft

Annulus

328 ft x 0.6946 cu.ft/ft = 228 cu.ft  
 228 cu.ft x 2 = 456 cu.ft

Total Tail Slurry Volume = 507 cu.ft

**LEAD SLURRY VOLUME**

Open Hole

525 ft x 0.6946 cu.ft/ft = 365 cu.ft  
 365 cu.ft x 2 = 730 cu.ft

30" Casing - assume 28.5" ID

199 ft x 3.4544 cu.ft/ft = 687 cu.ft

Total Lead Slurry Volume = 1417 cu.ft

## SACKS CEMENT REQUIRED

Lead Slurry

$$1417 \text{ cu.ft} \div 1.76 \text{ cu.ft/sk} = \boxed{805 \text{ sx}}$$

Tail Slurry

$$507 \text{ cu.ft} \div 1.15 \text{ cu.ft/sk} = \boxed{441 \text{ sx}}$$

**SLURRY DESIGN**

## LEAD SLURRY

- Cement - Class "G"
- Light Weight Additive - 2.2% Prehydrated Gel
- Accelerator - 2% Calcium Chloride
- Defoamer - NF-3 as required

## TAIL SLURRY

- Cement - Class "G"
- Defoamer - NF-3 as required

**SLURRY PROPERTIES**

## LEAD SLURRY

- Slurry Density - 13.2 ppg
- Slurry Yield - 1.76 cu.ft/sk
- Water Required - 9.3 gal/sk (fresh)

## TAIL SLURRY

- Slurry Density - 15.9 ppg
- Slurry Yield - 1.15 cu.ft/sk
- Water Required - 5.0 gal/sk (sea water)

**MATERIALS REQUIRED**

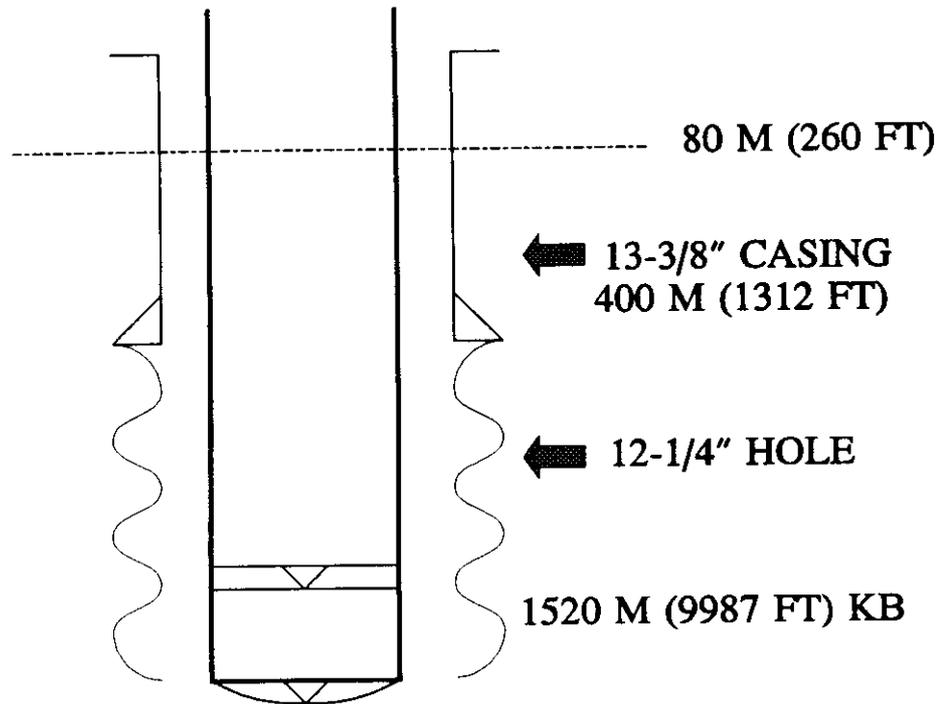
## LEAD SLURRY

Class "G" Cement	-	805 sx
2.2% Prehydrated Gel	-	1372 lb
2% CaCl <sub>2</sub>	-	1513 lb
NF-3	-	As required

## TAIL SLURRY

Class "G" Cement	-	441 sx
NF-3	-	As required

## 9-5/8" CASING



**CALCULATIONS:** LEAD CEMENT TO 100 M ABOVE 13-3/8" CASING SHOE  
TAIL IN CEMENT TO 200 M ABOVE 9-5/8" CASING SHOE

Lead Slurry - 10% Excess  
Tail Slurry - 10% Excess

BHST: 145°F (based on temp gradient of 1.6°F/100 ft below sea bed)

## TAIL-IN SLURRY VOLUME

Shoe Joint (60 ft)

$$60 \text{ ft} \times 0.4257 \text{ cu.ft/ft} = 26 \text{ cu.ft}$$

Casing/Hole Annulus (200 m, 656 ft)

$$656 \text{ ft} \times 0.3132 \text{ cu.ft/ft} = 205 \text{ cu.ft}$$

$$205 \text{ cu.ft} \times 1.10 = 226 \text{ cu.ft}$$

Total Tail Slurry Volume = 252 cu.ft

## LEAD SLURRY VOLUME

Casing/Hole Annulus (920 m, 3018 ft)

$$3018 \text{ ft} \times 0.3132 \text{ cu.ft/ft} = 945 \text{ cu.ft}$$

$$945 \text{ cu.ft} \times 1.10 = 1040 \text{ cu.ft}$$

5 cm

Casing/Casing Annulus

328 ft x .3765 cu.ft/ft = 123 cu.ft

Total Lead Slurry Volume = 1163 cu.ft

## SACKS CEMENT REQUIRED

Lead Slurry

1163 cu.ft ÷ 1.76 cu.ft/sk = 661 sx

Tail Slurry

252 cu.ft ÷ 1.15 cu.ft/sk = 219 sx

**SLURRY DESIGN**

## LEAD SLURRY

Cement - Class "G"  
 Light Weight Additive - 2.2% Prehydrated Gel  
 Defoamer - NF-3 as required

## TAIL SLURRY

Cement - Class "G"  
 Retarder - SCR-100L - 1 gal/10 bbl  
 Defoamer - NF-3 as required

**SLURRY PROPERTIES**

## LEAD SLURRY

Slurry Density - 13.2 ppg  
 Slurry Yield - 1.76 cu.ft/sk  
 Water Required - 9.3 gal/sk (fresh)

## TAIL SLURRY

Slurry Density - 15.8 ppg  
 Slurry Yield - 1.15 cu.ft/sk  
 Water Required - 5.0 gal/sk (fresh)

**MATERIALS REQUIRED****LEAD SLURRY**

Class "G" Cement	-	661 sx
2.2% Prehydrated Gel	-	1126 lb
NF-3	-	As required

**TAIL SLURRY**

Class "G" Cement	-	219 sx
SCR-100L	-	3 gal
NF-3	-	As required

## APPENDIX I

LIST OF CONTRACTORS

## 1 SERVICES

Drilling Unit	:	DIAMOND M GENERAL CO
Supply Vessels	:	TIDEWATER MARINE
Helicopter	:	LLOYDS HELICOPTERS
Marine Base	:	PORT OF LAUNCESTON AUTHORITY
Site Survey	:	ASSOCIATED SURVEYS INTERNATIONAL
Rig Positioning	:	RACAL SURVEYS
Mud Logging	:	HALLIBURTON GEODATA
Electric Logging	:	HALLIBURTON LOGGING SERVICES
Cementing	:	HALLIBURTON
Mud Engineering	:	INTERNATIONAL DRILLING FLUIDS
ROV	:	SUBSEA INTERNATIONAL
Coring	:	DIAMANT BOART
Wellhead	:	ABB VETCO GRAY
Tubular Services	:	WEATHERFORD AUSTRALIA
Drill Tools	:	AUSTOIL
Fishing	:	AUSTOIL
Casing Cutting	:	AUSTOIL
Well Testing	:	TBA

## 2 CONSUMABLES

Tubulars	:	SUMITOMO
Wellhead	:	ABB VETCO GRAY
Cement	:	HALLIBURTON
Mud	:	INTERNATIONAL DRILLING FLUIDS
Floatation	:	WEATHERFORD
Fuel	:	MOBIL
Bits	:	SMITH