



FIELD OPERATIONS REPORT

on the

ESSO OTWAY EP - 67

MARINE SEISMIC SURVEY

for

ESSO STANDARD OIL (AUSTRALIA) LTD.

Sydney, N.S.W., Australia

Client Representative : J. Barker

by

GEOPHYSICAL SERVICE INTERNATIONAL (G.S.I.)

A Division of Texas Instruments Australia Limited
Sydney, New South Wales, Australia.

Party 942 M/V Gulf Seal

September 23, 1967 to January 9, 1968

OR-063A



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ABSTRACT

A marine seismic reflection survey was conducted for Esso Standard Oil (Australia) Limited in the Otway Basin of the Western Bass Strait between Cape Jaffa, South Australia, and Cape Grim, Tasmania.

Approximately 917 miles were shot for six fold coverage with a 2,400 meter, neutrally buoyant, streamer cable under continuous tow. Recordings were made in TIAC digital format with a sample period of 2 milliseconds. A separate shooting boat was used and normal charge size was 50 pounds.

The ship's position at each shotpoint was determined by two range Decca Hi-Fix. Continuous recordings were made with a Varian proton magnetometer on all seismic lines.

Lost time totalling 71 days was mainly due to loss and failure of streamer cables.



INTRODUCTION

A marine seismic reflection survey was conducted for Esso Standard Oil (Australia) Limited by Geophysical Service International in the Otway Basin between Cape Jaffa, South Australia, and Cape Grim, Tasmania. The area lies on the continental shelf with water depths generally less than 100 fathoms. 917 miles of 600% reflection coverage were shot during 38 production days between September 23rd, 1967 and January 9th, 1968. A location map is submitted as Plate 1. The survey extended 2,327 miles of 600% reflection coverage shot by G.S.I. with the M/V Merino between October 26th, 1966 and May 6th, 1967.

The base port and crew office was at Portland, Victoria. Explosives were loaded at Launceston, Tasmania. A total of 71 days were lost during the project, 16 for weather and the rest mainly due to streamer cable failure. The first cable parted off Portland, Victoria, on September 24th and was never adequately repaired. It was replaced on October 15th by a cable from Western Australia. On October 22nd the second cable was destroyed by a large cargo vessel which passed close astern of the Gulf Seal off Beachport, South Australia. A new cable was supplied by G.S.I. Party 973 at Kent Islands on October 24th. This was used until December 22nd when it parted and was lost about 25 miles south of Port Campbell, Victoria. An air and sea search failed to find it and the Gulf Seal returned to Portland to await the air delivery of another cable from New Zealand on December 31st, 1967.

The assignment off South Australia was not completed before the crayfishing season opened on November 1st. The M/V Warreen, an 80 foot steel vessel, was chartered from H. Stanke and Sons of Carpenters Rocks, South Australia, and manned by experienced fishermen. This crew moved craypots from programmed lines and shooting was continued without damage to gear.



OPERATING PROCEDURES

Horizontal Survey

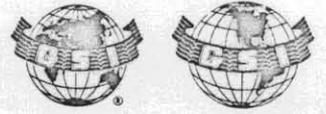
The ship's position was determined by two range Decca Hi-Fix, owned and operated by Amalgamated Decca Surveys of 96 Reserve Road, Artarmon, New South Wales. Shipboard equipment included a trackplotter, sawtooth lane count recorder, digital decometer printout unit and 35 millimeter camera for photographing decometer dials. In addition to automatic recording all shotpoint readings were logged manually. Trackplot charts were prepared on board from predetermined, I. B. M. computed, shotpoint positions.

Equipment was operated on two radio frequencies.

	Frequency (kHz)	Lane Width (yards)
Low Frequency (LF)	1744.77	93.910
High Frequency (HF)	1915.05	85.560

Slave stations sites, surveyed for G.S.I. Party 921, M/V. Merino, during 1966, were reoccupied. Frequency allocations were:

Slave	Location	Frequency
D2	Nora Creina Bay	HF
D3	Cape Buffon	LF
D4	Cape Banks	LF
D5	Mount Ruskin	HF
D6	Cape Nelson	HF
D7	Port Fairy	LF
D8	Flaxmans	LF
D9	Cape Otway	HF
D11	Point Cataraque	HF
D13	Cape Grim	LF



Station locations, grid co-ordinates and access diagrams appear in Plates 2 through 11. Ship to shore radiotelephone communications were made on 3216 kHz with A. W. A. Teleradio 75 equipment.

Decometer corrections and locking constants were determined by baseline and baseline extension crossings. Integral lane counts for Slaves D6, D7 and D8 were recorded at the Portland tanker berth and used for recalibration after port calls. Calibration checks were made by observing simultaneous readings from three slaves.

Signal strength of Decca navigation transmissions was usually adequate to maintain calibration 24 hours of each operating day. Loss of calibration at night occurred on January 5th and 6th when sky-wave interference from another Decca chain in the Adelaide area made the HF pattern unstable.

Fathometer Survey

Continued paper drive failure of the instrument room Ross fathometer occurred. Water depths were therefore recorded by the Simrad fathometer on the bridge of the Gulf Seal. Shotpoint marks were logged manually. A scale template was constructed and submitted with the first data shipment. Periodic depth checks were made by lead line. The fathometer transducer was 9 feet below the waterline and 10 feet aft of the ship's Decca antenna. Record quality was generally good.



Shooting

A tracking buoy was towed by the Gulf Seal to position the shooting vessel. Normal shotpoint position, relative to the streamer cable, was between groups 18 and 19. Assignment in the block off Cape Grim, Tasmania, was shot between groups 12 and 13 at the center of the cable. Shotpoint position was checked while shooting by observing playbacks of recorded waterbreak times.

Three shooting boats were used during the project :

Espirito Santo

September 23rd, 1967 to November 7th, 1967

This charter was terminated due to repeated main engine failure.

Paul Markson

November 8th, 1967 to December 12th, 1967

Vessel was released for another assignment in New Zealand

Imlay

December 13th, 1967 to January 9th, 1968.

Specifications of each vessel are tabulated in Appendix D.

Charges were attached to balloons with a six foot rope and dropped astern of the shooting vessel. Normal charge size was 50 pounds of nitro-carbo-nitrate. Some experimental shots using 100 pound charges were made on December 9th while shooting lines EP-48 and EP-24.

The shooting cycle was controlled by the master clock of the recording vessel. Communications and time break transmission were made with Motorola Motrac FM radio transceivers.



Recording

All shots were recorded with a neutrally buoyant streamer cable under continuous tow. Specifications of the first three streamers were identical. Each live section contained 20 pressure sensitive PZT4C4 crystal seismometers connected in parallel and spaced at equal intervals of 8.2 feet. Group centers were 328 feet apart. The fourth streamer used after January 1st, 1968 had group centers spaced 300 feet apart. Cable dimensions and spread arrangements appear in Plates 12, 13 and 14.

Streamer depth was monitored continuously by 6 pressure sensitive depth transducers connected to a meter display in the instrument room. Transducer outputs were also sampled after each shot and recorded on a strip chart. Depth transducer locations in the cable were :

Transducer Number	Location
1	Forward of Group 1 live
2	6 live
3	11 live
4	16 live
5	21 live
6	24 dead

Normal streamer depth was 40 feet.

Recordings were made in TIAC digital format with a sample period of 2 milliseconds using a Texas Instruments 10,000 Series Digital Field System. A paper playback was made immediately after each shot. Variable area cross section film playbacks of each line were made on board. Instrument settings for recording and playback are tabulated in Appendix B.



Instrument arrangement originally recorded first break
polarity as :

Signal	Recorded Tape Voltage	Galvanometer Deflection
Seismic 1 - 24	Positive	Up
Water Breaks	Negative	Up

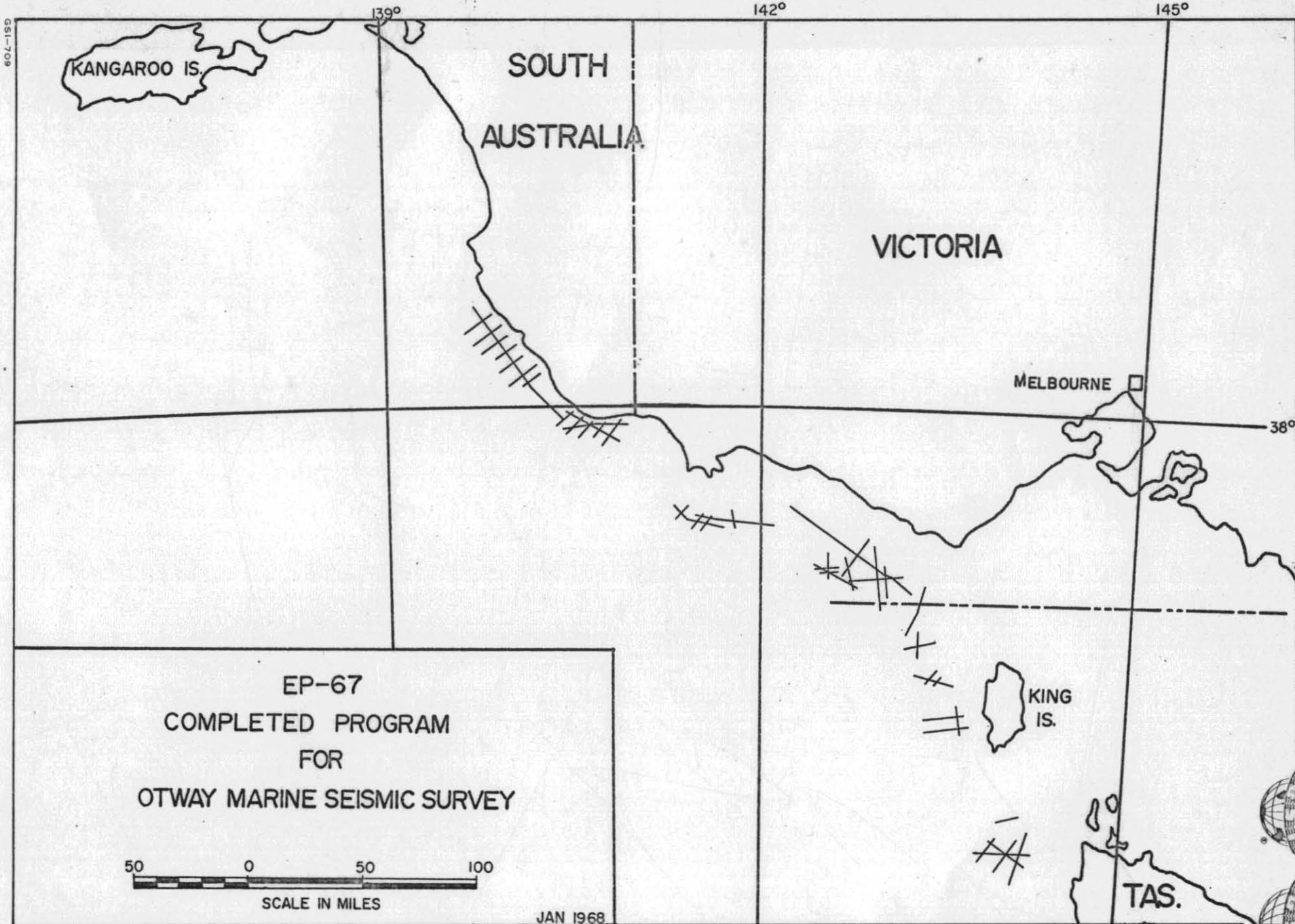
Connections were changed on October 12th, 1967 to Esso's
format :

Seismic 1 - 24	Negative	Down
Water Breaks	Positive	Up

Instrument tests were conducted daily prior to shooting and
included dynamic range determination of the recording system and
streamer noise. Reflection quality was generally fair to good.

Respectfully submitted,

E. R. Denton
Operations Supervisor.



GS1-708

7-A

KANGAROO IS.

SOUTH AUSTRALIA

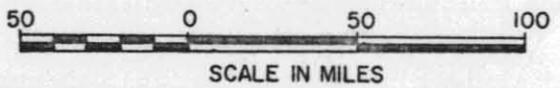
VICTORIA

MELBOURNE

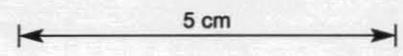
KING IS.

TAS.

EP-67
 COMPLETED PROGRAM
 FOR
 OTWAY MARINE SEISMIC SURVEY

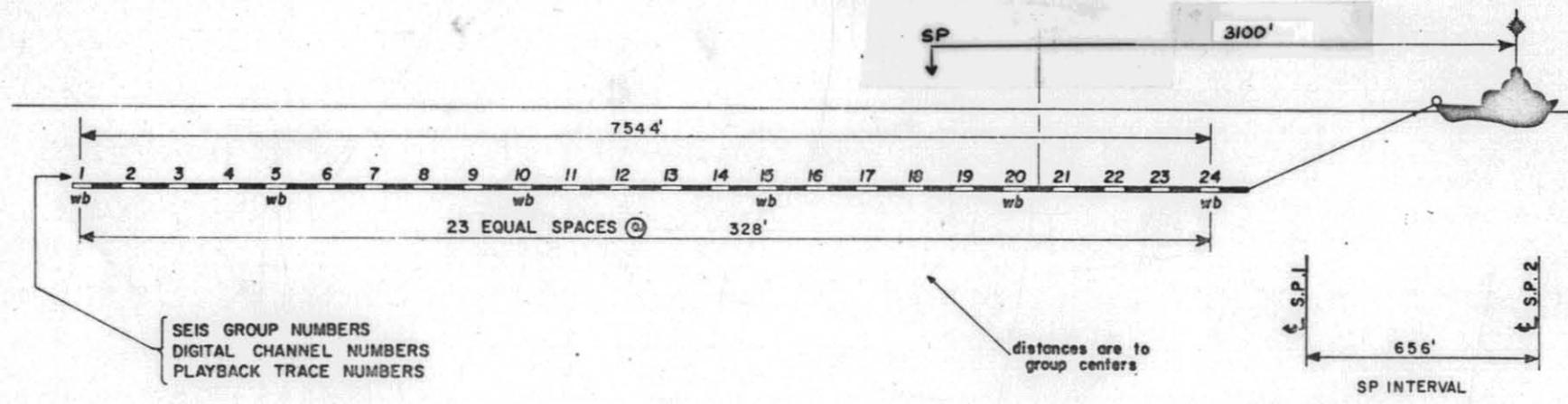


JAN 1968



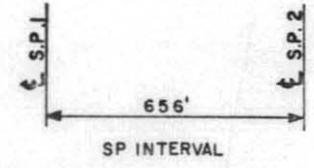
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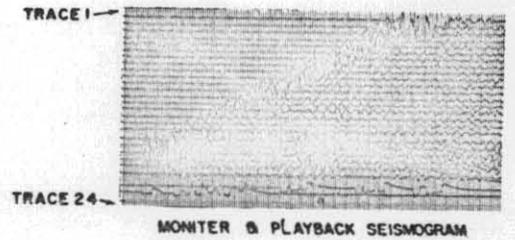


SEIS GROUP NUMBERS
DIGITAL CHANNEL NUMBERS
PLAYBACK TRACE NUMBERS

distances are to group centers



WATER BREAKS FROM SEIS GROUPS	RECORDED IN DIGITAL CHANNELS	DISPLAYED ON SEISMOGRAM TRACES
1	31	27
5	26	27
10	29	5
15	31	3
20	27	1
24	28	2

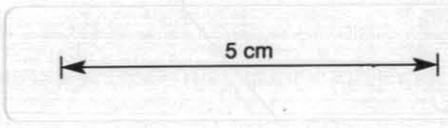


DIRECTION OF BOAT

MARINE CABLE DIAGRAM

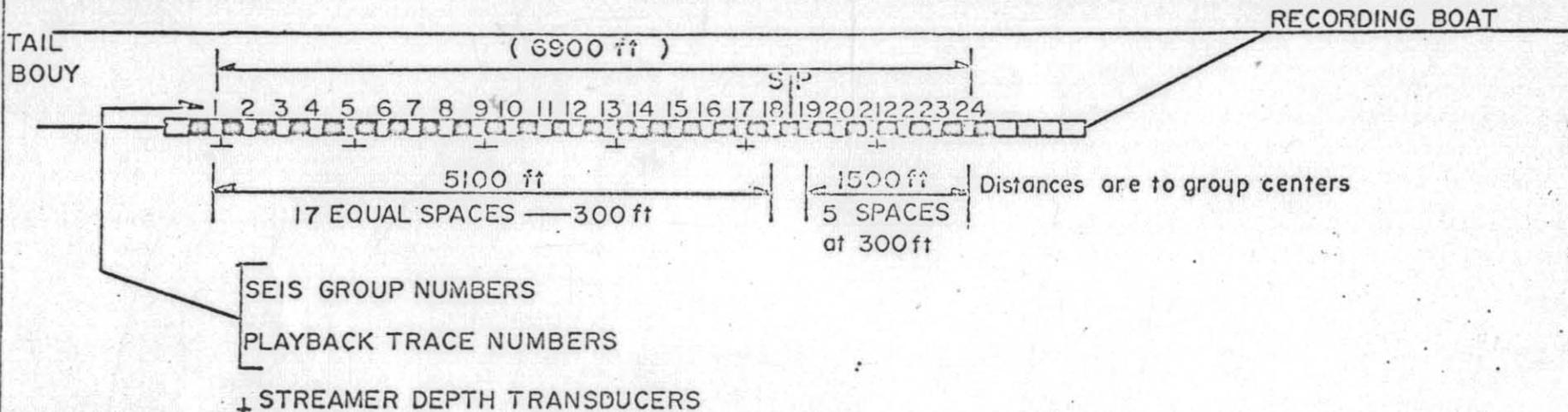
GSI Party 942
Ship M/V GULF SEAL
Client ESSO
Area OTWAY
Date JAN '68

SR 1-6294



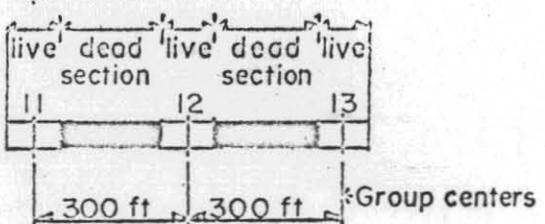
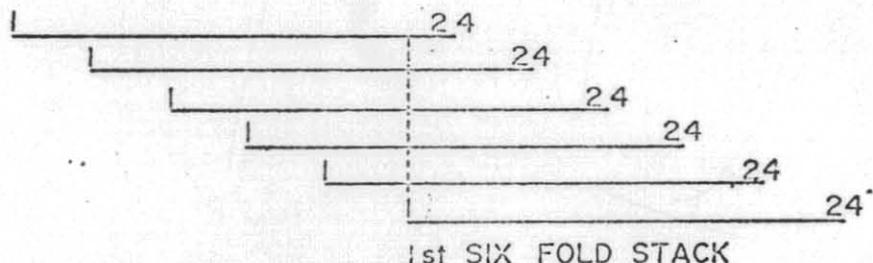
078010





SUBSURFACE

- 1st SHOT
- 2nd SHOT
- 3rd SHOT
- 4th SHOT
- 5th SHOT
- 6th SHOT



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM
 SP 6295-7284
 (S.P. BETWEEN GROUPS 18 and 19)

GSI Party 942

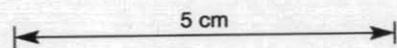
Ship M/V Gulf Seal

Client ESSO

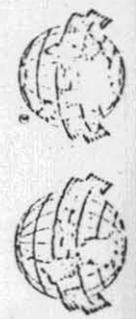
Area OTWAY EP-67

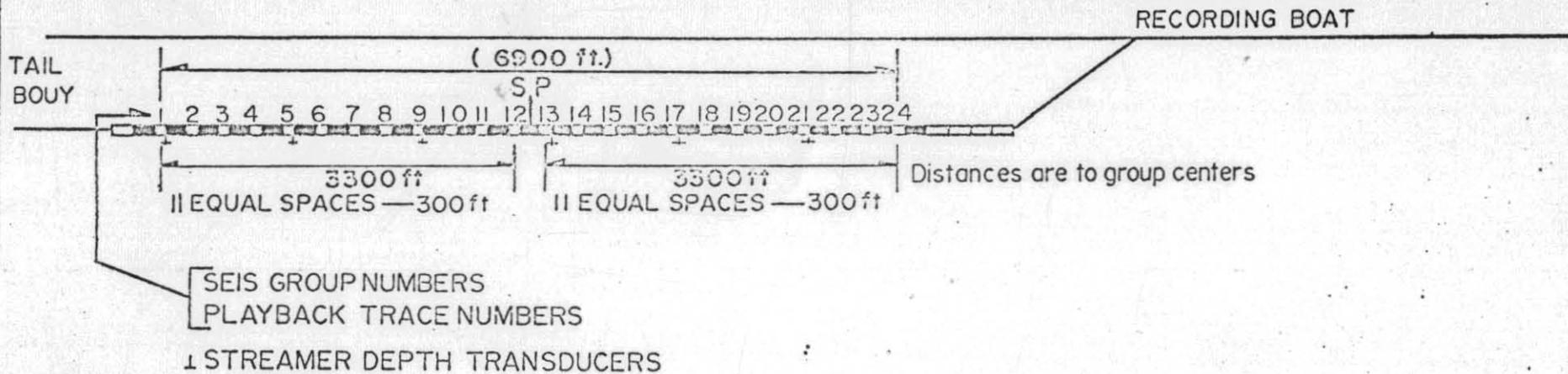
Date JAN'68

PLATE 13



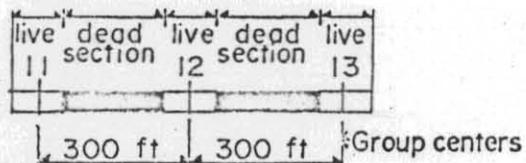
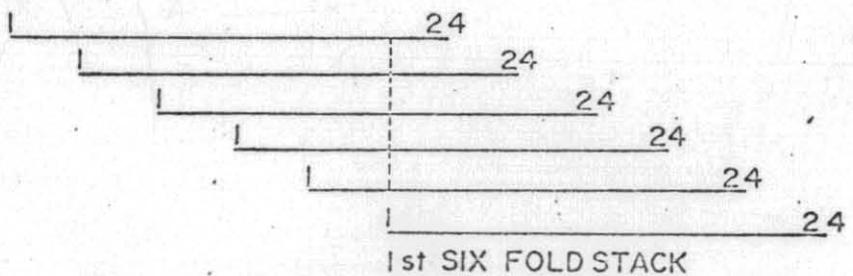
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SUBSURFACE

- 1st SHOT
- 2nd SHOT
- 3rd SHOT
- 4th SHOT
- 5th SHOT
- 6th SHOT



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	29
10	30
5	31
	30

MARINE CABLE DIAGRAM
 SP 7285-8393
 (SPLIT SPREAD — 24 GROUPS)

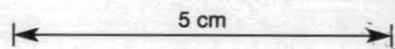
GS1 Party 942

Ship M/V Gulf Seal

Client ESSO

Area OTWAY EP-67

Date JAN' 68





APPENDIX A
OPERATIONS STATISTICS

Start Project	September 23rd, 1967
Finish Project	January 9th, 1968
Production Days	38

Lost Days

Cable and Equipment	28
Weather	16
Port Calls	27

Total Lost Days	71
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Total Days on Project	109
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Type Coverage	600% Reflection
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Total Profiles	8,513
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Chargeable Profiles	7,568
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Misfire Rate of Chargeable Profiles	3.0%
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Miles Traversed	917.5
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Normal Charge Size	50 pounds
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Explosives Consumed

Powder

Manufacturer and Type	Container Size	Pounds
Dupont WW	50 pounds	280,650
ICI A1	50 pounds	249,250
	Total Powder :	<u>529,900</u>

Caps

Dupont	8,201
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ICI	550
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Total Caps :	<u>8,751</u>
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Boosters

Dupont 7,127

ICI 1,605

Total Boosters: 8,732



APPENDIX B
RECORDING PARAMETERS AND INSTRUMENT SETTINGS

Texas Instruments Series 10, 000 Amplifiers and Digital Field System

Dynamic Range	78db
Amplifier Settings	
Filters	
High-Cut	70 Hz at 12db per octave
Low-Cut	8 Hz at 12db per octave
Gain Control	
Mode	Ganged AGC
Control Channels	4, 8, 17 and 22
Expansion Rate	80db per second
Initial Gain	33db
Final Gain	90db
Trip Delay	0.35 seconds
Camera HTL RS8U	
Paper Speed	5 inches per second
Paper Width	6 inches
Paper Type	Dupont Drywrit
Galvanometer Allocation	
Signal	Galvanometer
Seismic 1 through 24	1 - 12
	14 - 25
Water Breaks	
Group 1	31
5	26
10	29
15	31



Water Breaks

Group 20	27
24	28
Gain Display Channel 30	13
100 Hz Timing	36

Digital Field System

Sample Period	2 milliseconds
Tape Speed	45 inches per second
AGC Level	10db to 1 volt

Channel Allocation

Signal	Channel
Seismic 1 through 24	1 - 24

Water Breaks

Group 1	31
5	26
10	29
15	31
20	27
24	28

Gain Recovery 30

Timing 0

VAX Camera

Traces Displayed

Shotpoint between Groups 18 and 19 15 through 22

Shotpoint between Groups 12 and 13 9 through 16

Playback Filters

High-Cut 70 Hz at 12db per octave

Low-Cut 8 Hz at 12db per octave



APPENDIX C
KEY PERSONNEL

Operations Supervisor	E. R. DENTON
Party Manager	G. PIERCE
Administrator	P. J. O'BRIEN
Seismologists	E. O. McCUTCHEN
	E. KEMP
	J. GUENTHER
	T. KERLAN
Instrument Engineers	R. BLAKELY
	R. VAN HOUTEN
	R. WALKER
Cablemen	P. STAINTHORPE
	J. STOKELY
	D. CHURCHILL
Mechanic	G. BRIDGE
Shooters	L. HATFIELD
	C. SMITH
	A. MORGAN
Ship's Captain	G. TAYLOR
<u>Decca Personnel</u>	
Ship Operators	M. AUSTIN
	M. BAYLEY
	J. FLETCHER
Shore Chain Commander	G. THIRSK



APPENDIX D
VESSEL SPECIFICATIONS

Recording Boat

M/V Gulf Seal

Length	154'
Tonnage	199 tons
Owners	Seal Fleet, Inc., Galveston, Texas

Shooting Boat

M/V Espirito Santo

Length	138'
Tonnage	469 tons
Owners	South Australian Fisherman's Co-operative Ltd.

M/V Paul Markson

Length	150'
Tonnage	397 tons
Owners	Athol Rusden

M/V Imlay

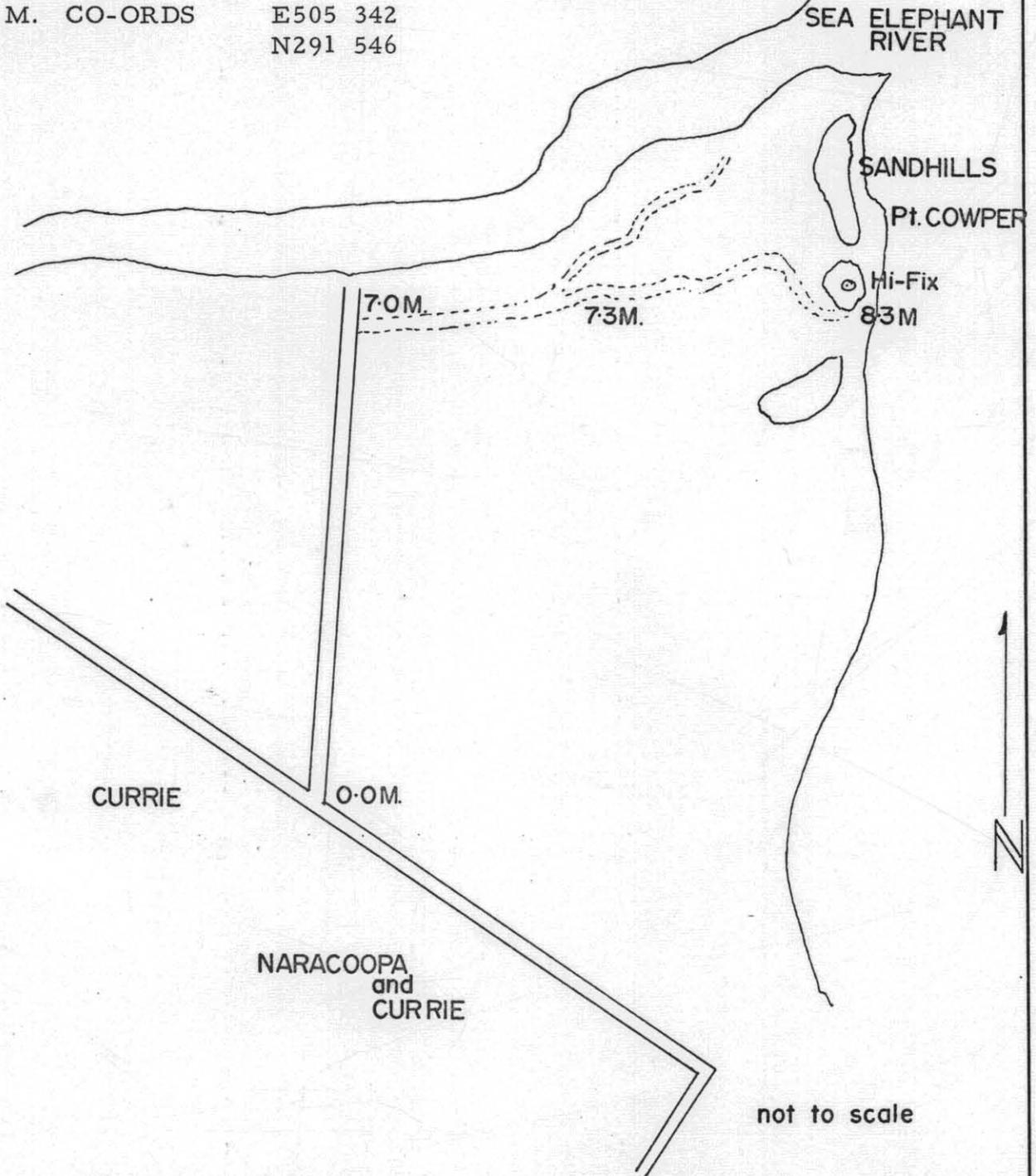
Length	69'
Tonnage	72 tons
Owners	Warren Bros.

078019



ACCESS DIAGRAM TO HI-FIX STATION D₁₂ (BASS STRAIT, TASMANIA, PROSPECT) At Pt. Cowper, King Island

T.M. CO-ORDS E505 342
N291 546



Station situated on highest sandhill at Pt. Cowper 100 ft. high and covered with green bushes. Access from Currie via Naracooper Road, or direct, then by road to Sea Elephant R. Track then winds over sandhills to site. Hi-Fix marked by 18" high wooden peg. 4 Wheel Drive Access.

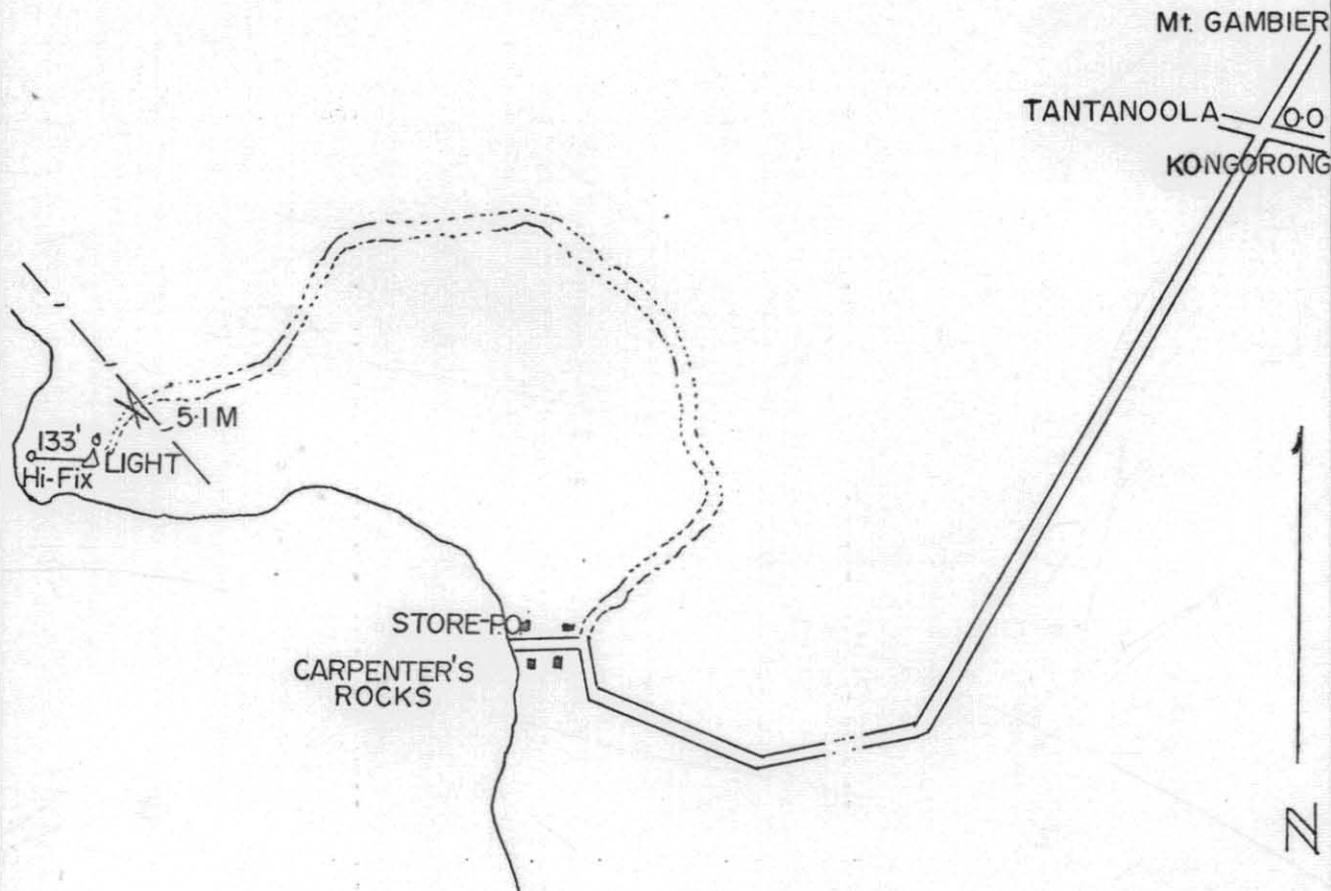
REFER TO -
KING IS. 4M MAP

078020



ACCESS DIAGRAM TO HI-FIX STATION D₄ (OTWAY BASIN
S.A. PROSPECT)
AT CAPE BANKS, STH. AUST.

T.M. CO-ORDS E. 340 074
 N. 326 595



Access by bitumen and gravel roads approximately 25m. from Mt. Gambier.
From Carpenter Rocks, road proceeds behind sawmill garage for 2 m.
Gate across track 3m. from light always locked. Hi-fix marked by 6" x 1"
post set in stone cairn 133' from light. Bearing L/H Hi-Fix 270° 30'.
2 Wheel Drive Access.

REFER TO - PENOLA J54/6

5 cm

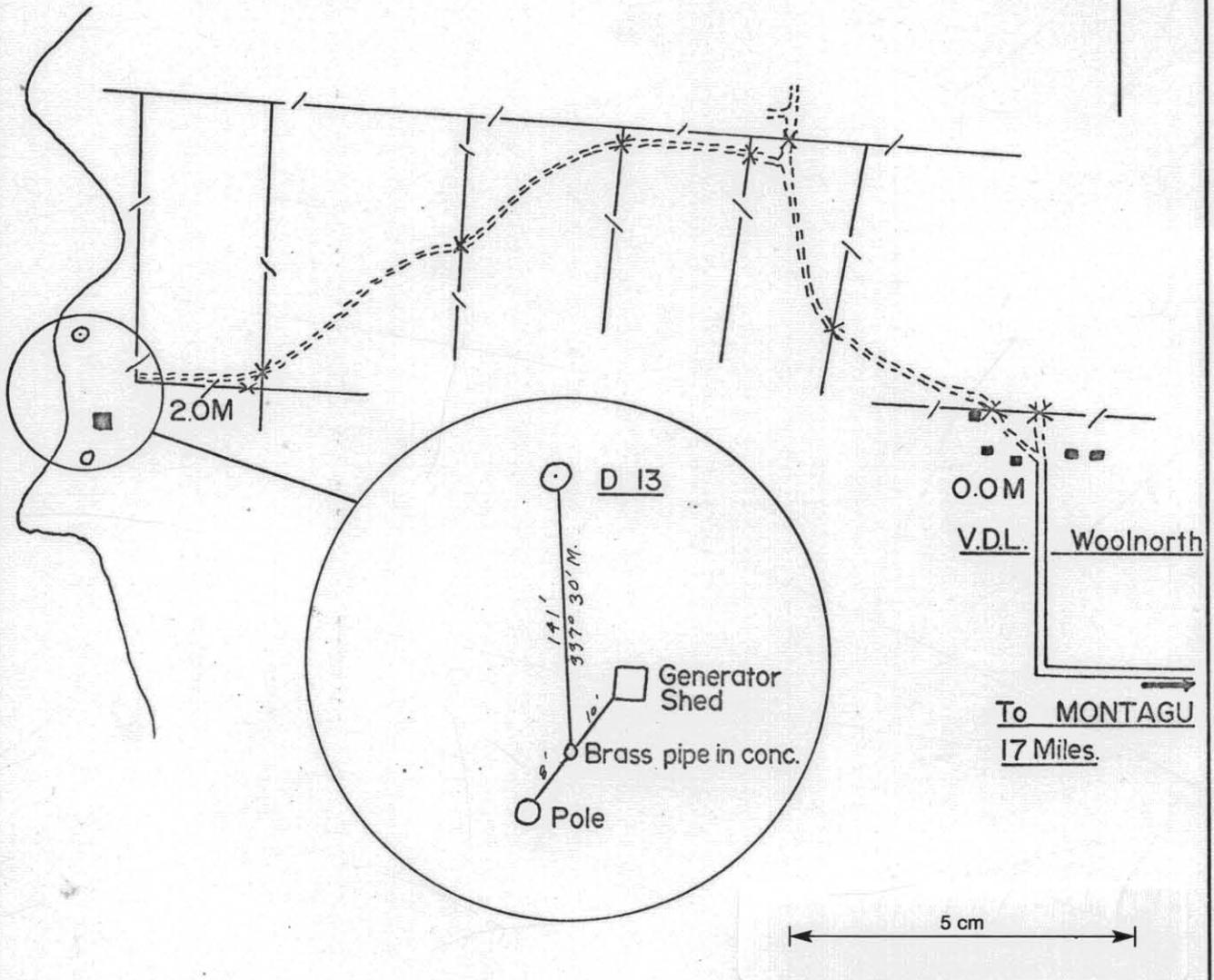
078021



ACCESS DIAGRAM TO HI-FIX STATION D13
(OTWAY BASIN - TASMANIA) AT CAPE GRIM, N-W TASMANIA

CO-ORDS E556 132
N187 148

N



Station situated adjacent to P. M. G. Micro-Wave testing station (not operational) on V. D. L. "Woolnorth" property.

Property Manager: Mr. B. Ritchie, V. D. L. "Woolnorth", Montagu N-W Tasmania. Phone Stanley 199.

Access by gravel road from Montagu, thence by track from homestead to site. There are two tracks - ask local advice - 4 wheel drive necessary.

Station marked by 3' high star iron piquet.

Note: Personnel should 'phone Mr. Ritchie before entering V. D. L. property

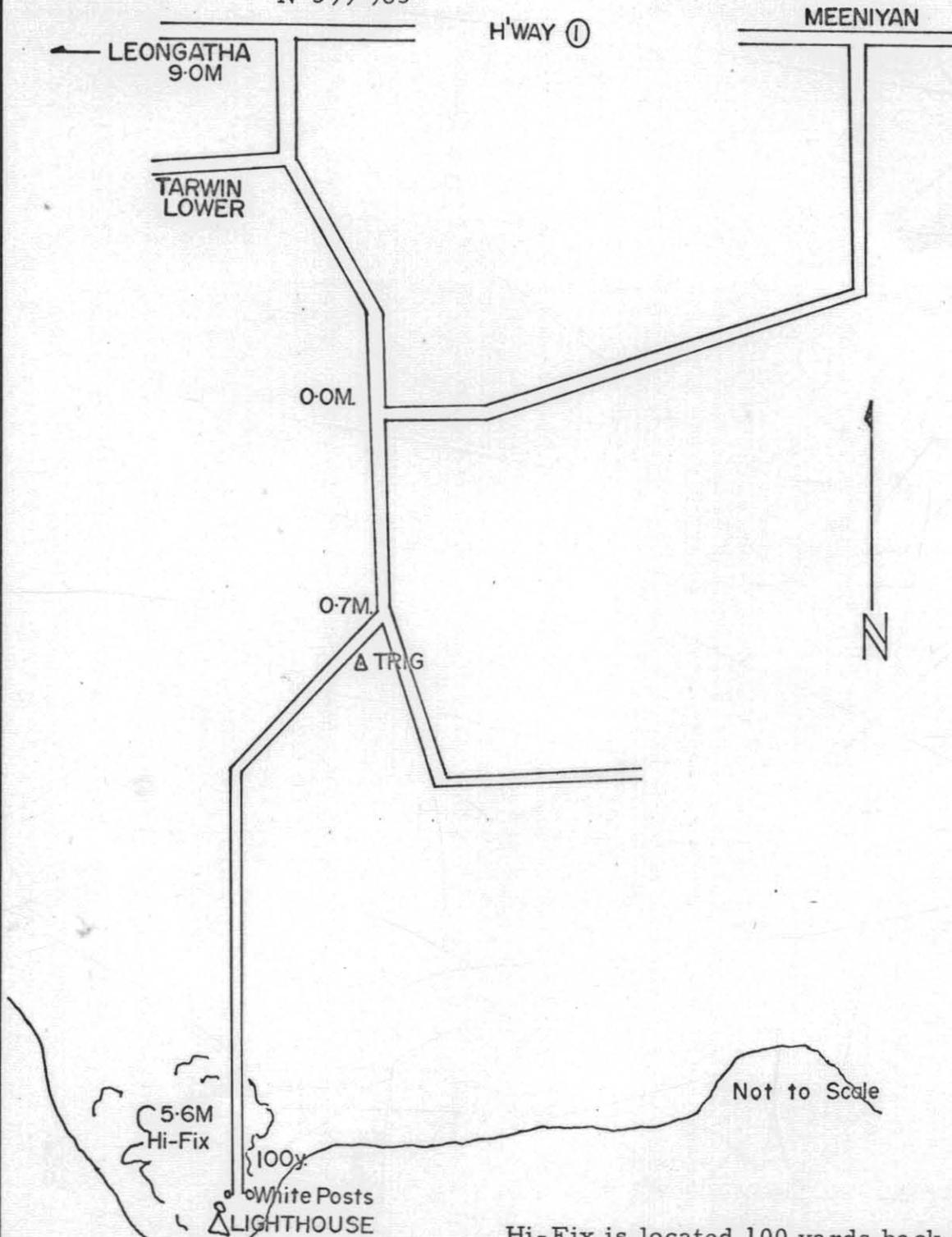
078022



ACCESS DIAGRAM TO HI-FIX STATION D₁₀ (OTWAY BASIN, VICTORIA, BASS STRAIT)

At Cape Liptrap, Victoria

T.M. CO-ORDS E 677 278
N 399 983



CAPE LIPTRAP

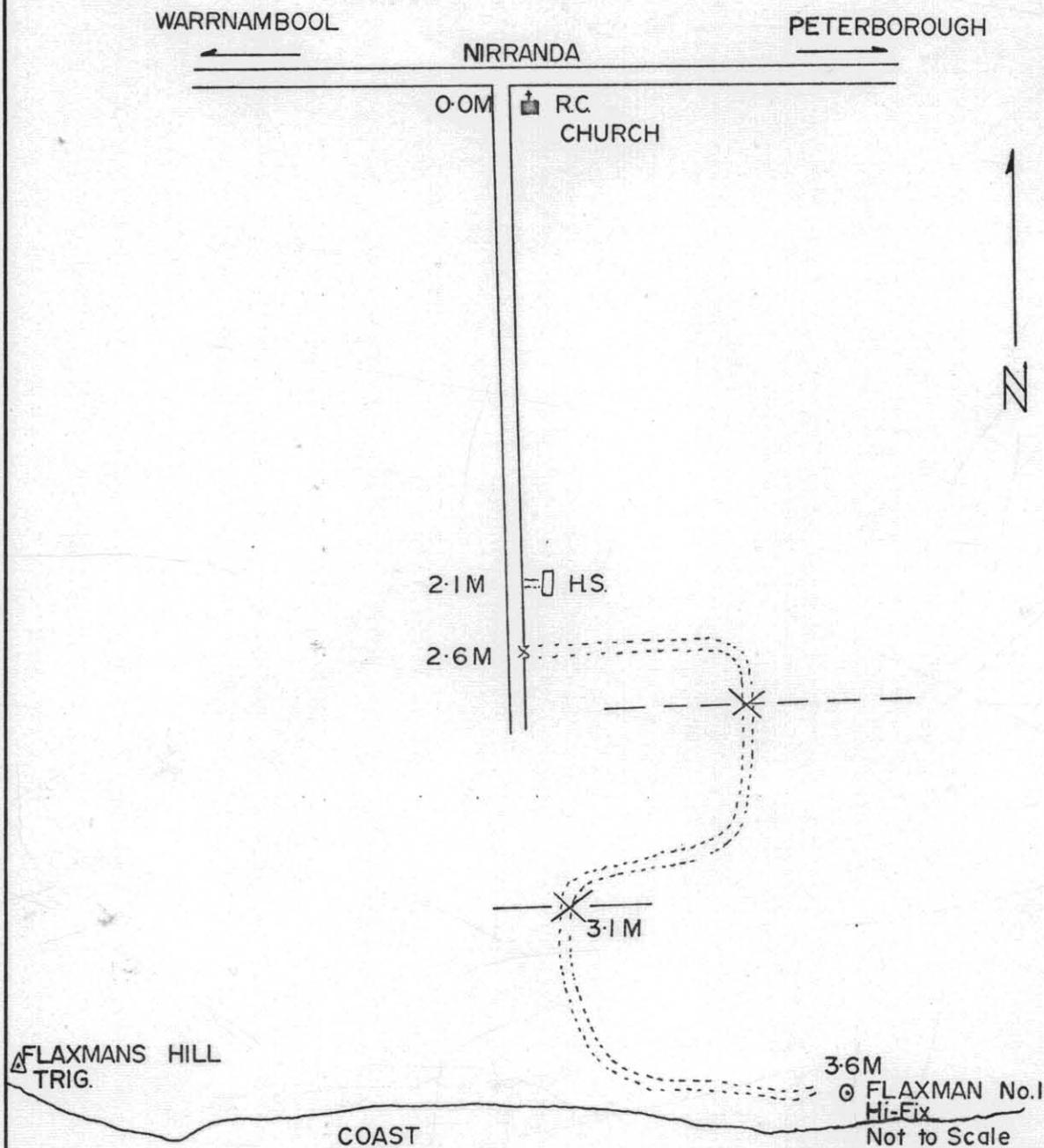
Hi-Fix is located 100 yards back from white post in front of lighthouse and 15 yds from the road on the western side. It is marked by a 15" high wooden peg, top 6" being yellow. Notification of intent to occupy site is required by Dept. of Shipping & Transport. Two Wheel Drive Access. Refer to Warragul 4M Map. Regional Director, Cwlth. Dept. of Shipping & Transport, Box 4317 G..P. O. , Spencer Street, Melbourne, Vic.

078023



ACCESS DIAGRAM TO HI-FIX STATION D₈ (OTWAY BASIN, VICTORIA
BAS STRAIT, TASMANIA
PROSPECT)

T.M. CO-ORDS E 376 828
N 447 963



Station located on property of Mr. L. J.
Cannon of Nirranda. Hi-Fix sited at Flaxman No. 1 Drill site and marked by
5 ft. high iron post near cliff. 2 Wheel Drive Access.

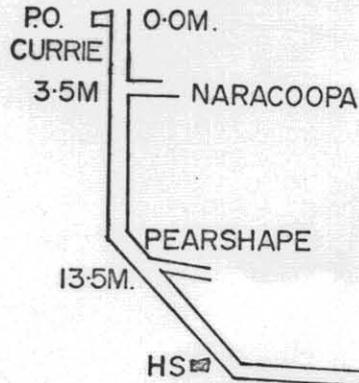
Refer to - COLAC 4M MAP J54 -12



ACCESS DIAGRAM TO HI-FIX STATION D₁₁ (OTWAY BASIN -
BASS STRAIT - TASMANIA - PROSPECT)

T. M. CO-ORDS E480 451
 N263 495

On King Island, Tasmania



OLD HS. □

CREEK

SCRUB

Pt CATARAQUE

Hi-Fix 18.1M

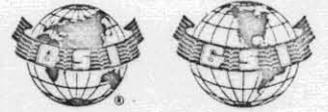


NOT TO SCALE

PLOUGHED FIELD

Station located on Cataraque Pt. on property of Mr. G. Atrill. Access by gravel road south from Currie then by farm tracks to site. Hi-Fix marked by solitary wooden fence post 5' high. 4 Wheel Drive Access.

REFER TO - KING ISLAND 4M MAP



ACCESS DIAGRAM TO HI-FIX STATION D₉ (OTWAY BASIN, VICTORIA, PROSPECT)

Near Cape Otway Lighthouse, Victoria

T.M. CO-ORDS E 448 718.9
 N 410 339.8

↑
COLAC via BEECH FOREST
LORNE →

← PETERBOROUGH

GREAT OCEAN ROAD



HEAD KEEPER'S HOUSE

PATH

NOT TO SCALE

21' Hi-Fix

339'3

LIGHTHOUSE

CAPE OTWAY

Access from west along Great Ocean Road via Peterborough. Access from Melb. via Colac and Beech Forest Rd. Hi-Fix located on Lighthouse Reserve. Notification of intent to occupy site is required by Dept. Shipping & Transport. Hi-Fix marked by 18" high white peg.

2 Wheel Drive Access.

Refer to -

Colac 4 M Map J 54-12

Regional Director,
Commonwealth Dept. Shipping &
Transport

Box 4317 P.O.,
Spencer St.,
MELBOURNE. VICTORIA.

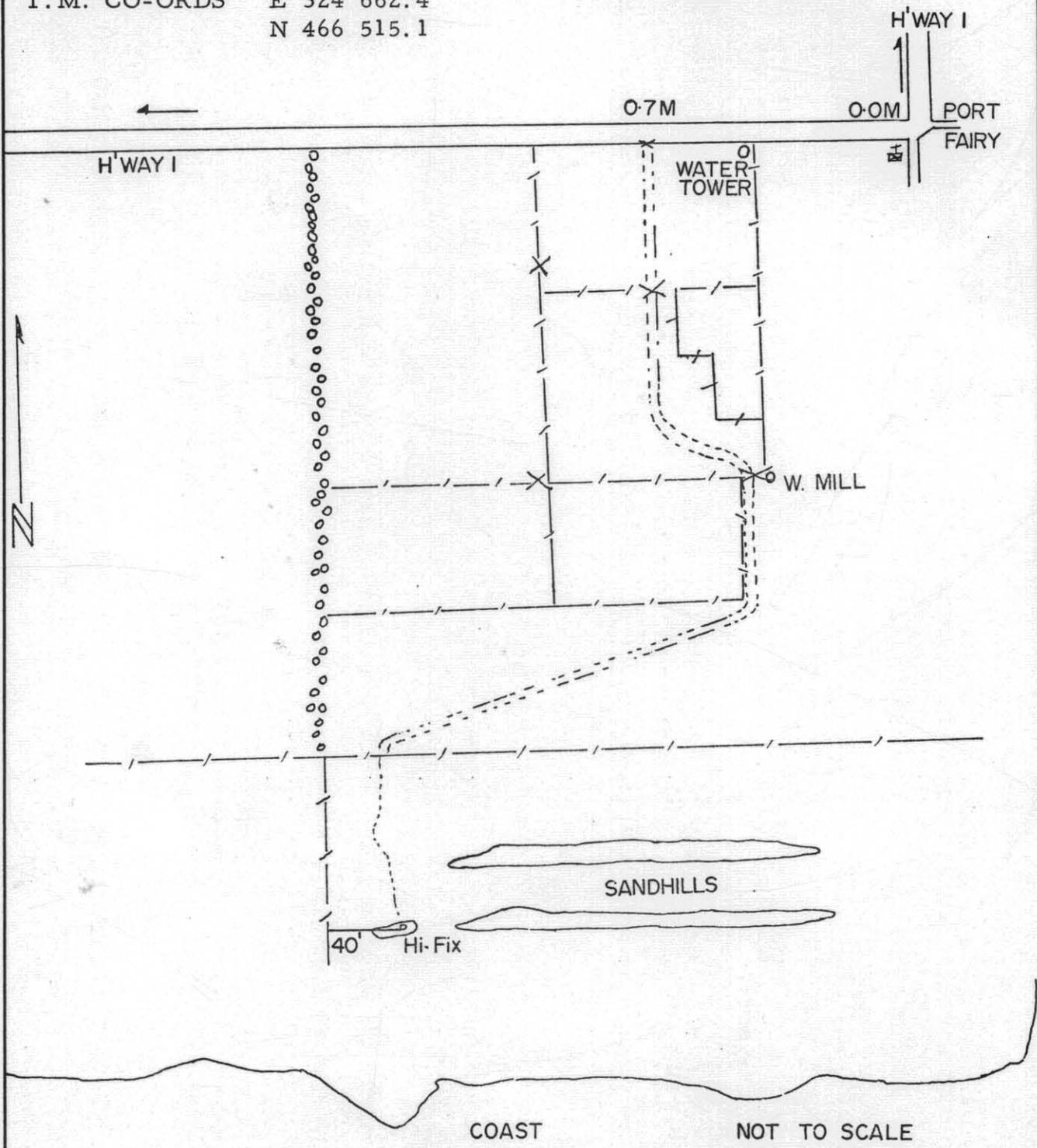
078026



ACCESS DIAGRAM TO PORT FAIRY HI-FIX STATION D₇
(OTWAY BASIN VICTORIA, PROSPECT)

Near Port Fairy

T.M. CO-ORDS E 324 662.4
 N 466 515.1



Access via Highway 1 and farm track through property of Mr. C. Matthews.
Hi-Fix located on sandhill ridge seawards of flat sandy area 40 ft. from fence
and marked by 2ft. high fencing batten. 2 Wheel Drive Access.

Refer to - PORTLAND 4 M MAP J54 - 11

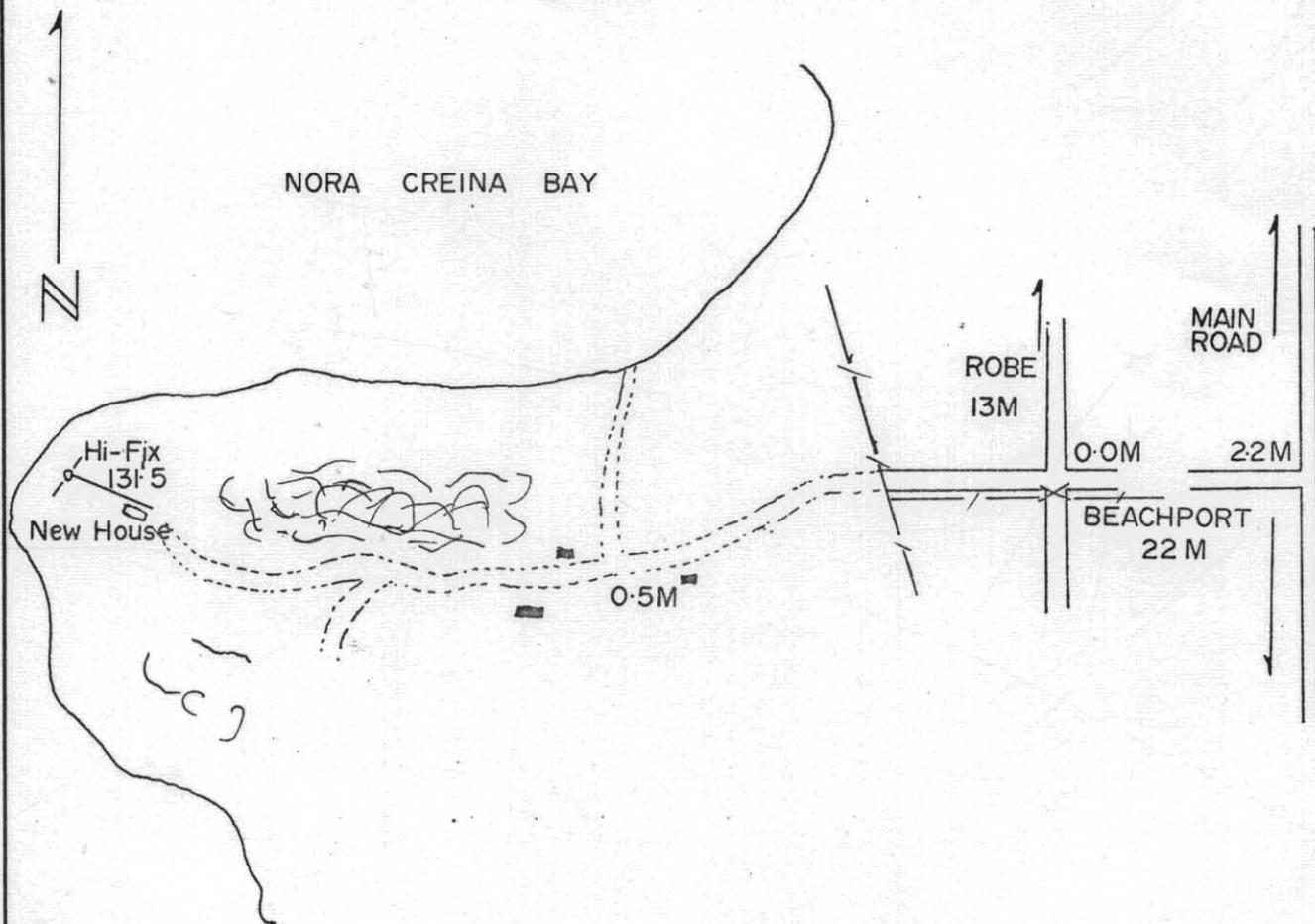
078027



ACCESS DIAGRAM TO HI-FIX STATION D₂ (OTWAY BASIN S. A. PROSPECT)

AT NORA CREINA BAY, STH. AUST.

T.M. CO-ORDS E288 485
 N395 184



NOT TO SCALE

Access from Highway 1 along Beachport Road turn north at Robe turnoff. 10 m. along gravel road to Nora Creina Bay Road. Hi-fix situated on property of Mr. D. Cullen of Robe. Proceed to end of road. Station marked by fencing post 131'5 behind front of new house. 2 Wheel Drive Access.

REFER TO

PENOLA 4M MAP J54/6

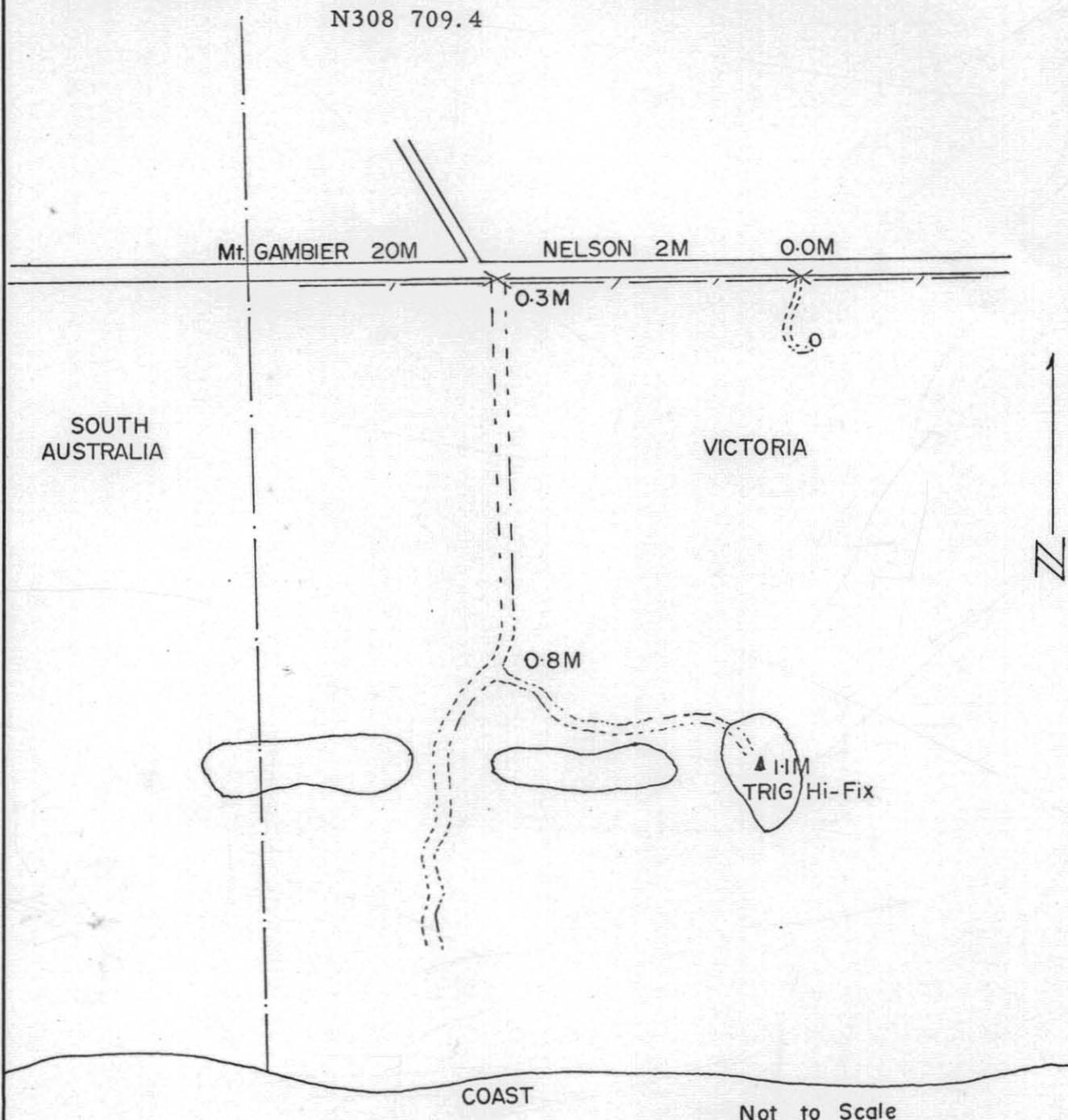
078028



ACCESS DIAGRAM TO HI-FIX STATION D₅ (OTWAY BASIN, VICTORIA, PROSPECT)

At Mt. Ruskin Trig., Victoria.

T.M. CO-ORDS E396 726.4
N308 709.4



SOUTH AUSTRALIA

VICTORIA

COAST

Not to Scale

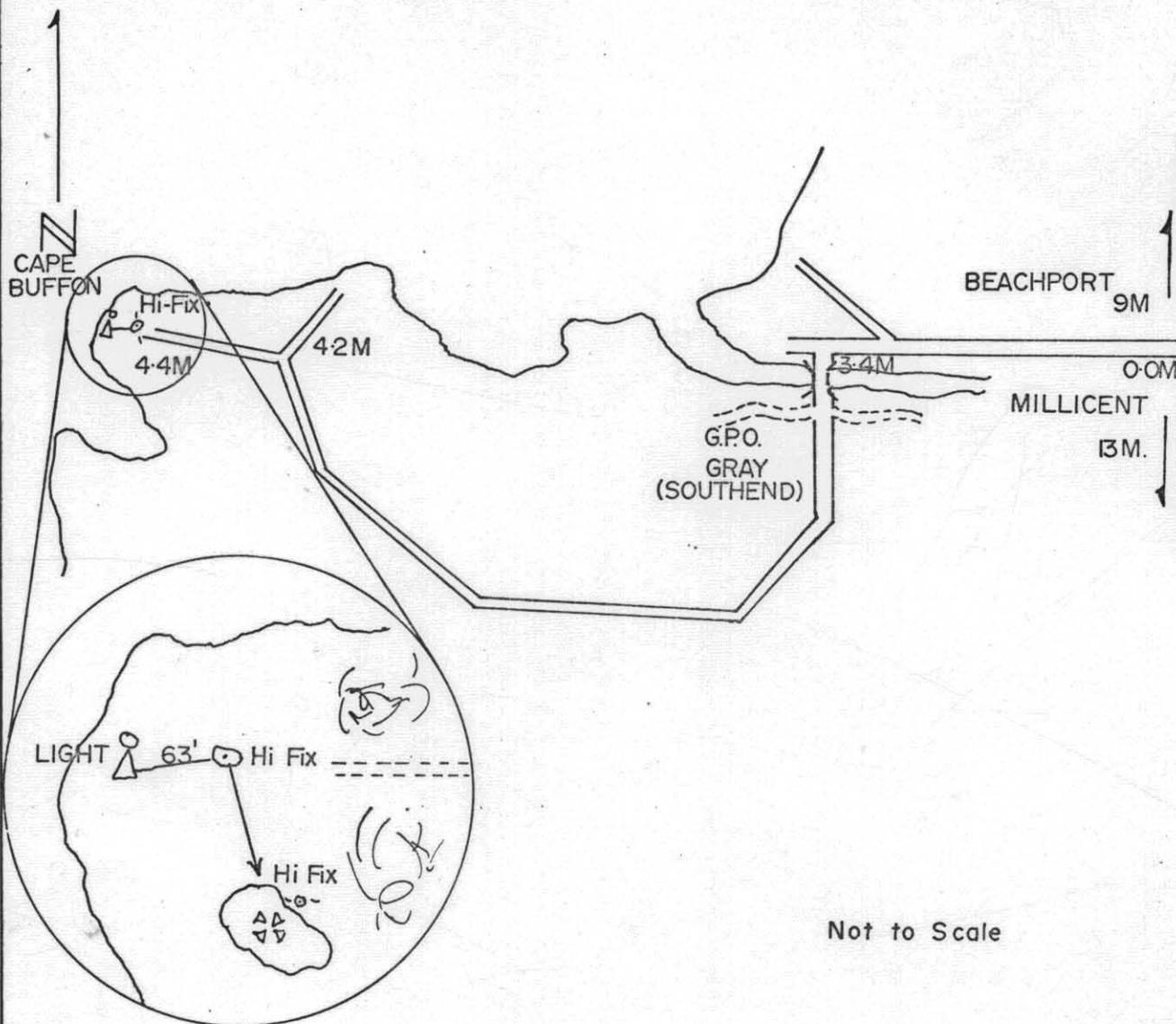
Access along Mr. Gambier-Nelson Road. Hi-Fix located at Trig Point (Mt. Ruskin) on property of Mr. M. Hollaway. 2 Wheel Drive Access by farm track from road. Trig visible from Vic.-S.A. border sign.

REFER TO -
PORTLAND 4M MAP J54-11



ACCESS DIAGRAM TO HI-FIX STATION D₃ (OTWAY BASIN S. A.
PROSPECT)
AT CAPE BUFFON, STH. AUST.

T.M. CO-ORDS E313 895
 N366 672



Access by bitumen road to Gray (also called Southend) then by gravel road over bridge to station. Hi-fix marked by wooden peg 3" out of ground beside flat rock marked with Maltese Cross, 63 ft. back from light in line with road. Crown Reserve. 2 Wheel Drive Access.

REFER TO - PENOLA 4M MAP J54/6

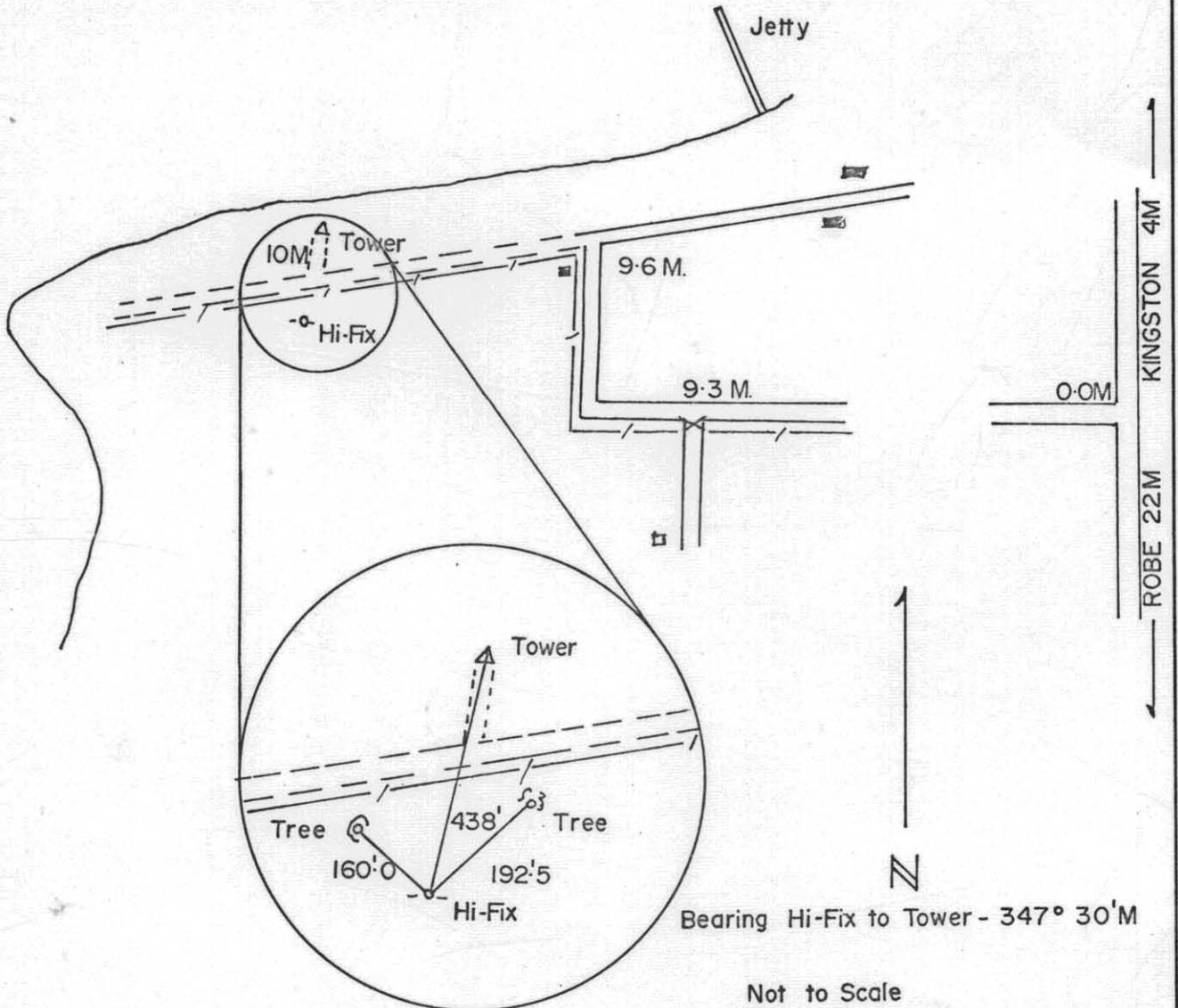
078030



ACCESS DIAGRAM TO HI-FIX STATION D₁ (OTWAY BASIN S. A. PROSPECT)

NEAR CAPE JAFFA STH. AUST.

T.M. CO-ORDS E271 154E
N441 646N



Bearing Hi-Fix to Tower - 347° 30'M

Not to Scale

Access by gravel road starting 4m. south of Kingston on Kingston-Robe Road. Hi-Fix situated on property of Mr. Rothall 10m. along road on Scubby Ridge and marked by 3 ft. high start iron picket. 2 wheel drive access.

REFER TO - NARACOORTE 4M MAP J5412

078031



ACCESS DIAGRAM TO HI-FIX STATION D₆ (OTWAY BASIN, VICTORIA, PROSPECT)

AT CAPE NELSON

T.M. CO-ORDS E 259 865.8
N 461 692.5

0.0M

Portland P.O.

CEMETERY

TELEPHONE POLE

Ploughed Field

Hi-Fix

12.2M.

CAPE NELSON H.S. 6.2M



7.0M

8.0M

Hi-Fix

LIGHTHOUSE

CAPE NELSON

Not to Scale

Access by Cape Nelson Road 7.0m. from Portland P.O. Turn off into scrub and proceed along track 0.8m. to far edge of ploughed land. Hi-Fix marked by 4" x 4" post set in stone cairn on clear rocky cliff top. Two wheel drive access to ploughed field - 4 wheel drive access to Hi-fix site.

REFER TO -



OTWAY/KING PART-IV*

FIELD OPERATIONS REPORT
MARINE SEISMIC SURVEY
OTWAY AND BASS BASINS (AUSTRALIA)
27 November 1967 to 2 December 1967

for
ESSO EXPLORATION AUSTRALIA INC.

by
GEOPHYSICAL SERVICE INTERNATIONAL (GSI)
A division of Texas Instruments Australia Limited
Sydney, New South Wales, Australia

GSI Party 973

D. R. Bealer, Operations Supervisor
Art Martens, Client Representative

January 1968



ABSTRACT

A marine seismic survey was conducted by Geophysical Service International (GSI) Party 973 (M/V CARIBBEAN SEAL) for Esso Exploration Australia Inc. from 27 November 1967 to 2 December 1967 in Otway and Bass basins, Australia. Predetermined shotpoint positions were IBM-computed.

Navigation was by Hifix operated by Amalgamated Decca Surveys Pty. Ltd. (DECCA) under contrast to GSI. The shipboard survey equipment and the shore stations were operated by DECCA personnel.

Logs were maintained on all instrument settings, streamer depths, water depths, ship positions and shotpoint and streamer locations.

Field headquarters were established in St. Kilda, Victoria, Australia.

The seismic program, survey method, instrumentation operating techniques and operational results are presented in this report.



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APPENDIXES

Appendix	Title
A	INITIAL AND FINAL DECCA CALIBRATION
B	MAPS SHOWING DECCA SHORE STATION POSITIONS
C	GENERAL OPERATIONAL INFORMATION
D	TYPICAL SPREAD DETAILS
E	TYPICAL INSTRUMENT DETAILS
F	KEY PERSONNEL



PLATES

Plate	Description
A	THE SEISMIC PROGRAM
B	SPREAD DETAILS
	1. SHOT BETWEEN 12 AND 13
	2. SHOT BETWEEN 18 AND 19
	3. SHOT OFF NO. 24
	4. SHOT OFF NO. 1
C	CABLE DIAGRAM



SECTION I
AREA OF SURVEY

A. SEISMIC PROGRAM

The seismic program (Plate A) was in the Otway and Bass basins. Lines were shot for sixfold common depth point (CDP) coverage. Shotpoints were numbered consecutively, beginning with SP 1 in each area.

B. PHYSICAL CONDITIONS

The survey was located in areas of relatively flat seabed. Average water depth was about 36 ftn. Recorded water depths ranged from approximately 29 to 42 ftn.

The weather conditions were good throughout the project.



SECTION II STREAMER

The neutrally-buoyant 6900-ft streamer (Plate C) employed throughout the prospect has 24 equally-spaced 100-ft long-live sections. Each live section has 20 crystal detectors spaced at 4 ft 10.5 in. intervals, the outputs of which yield one trace. Adjacent live sections, including groups 12 and 13 were separated by two dead sections each 100 ft long.

There were four stretch sections and one dead section preceding group 24. The stretch sections contained nylon stress members to attenuate noise generated by the towing vessel. One dead section and one stretch section followed the last live section (group 1) and a tail buoy was attached to the end of the streamer by a nylon rope.

The streamer was ballasted to ride horizontally below wave action. A variable length of nonbuoyant lead-in cable connected the streamer to the towing vessel. Streamlined weights were attached to the end of the lead-in cable. Under continuous tow, the streamer became hydrodynamically stable at a depth which is a function of its speed through the water, the length of the lead-in cable and the relative buoyancy along the streamer's length.

Six pressure-sensitive depth transducers, spaced along the streamer's length, displayed streamer-depth readings in the range of 0 to 100 ft. Readings were taken from meters in the instrument room. Average streamer depth was 50 ft.



Digital recording was done with group 24 at the head end of the streamer.

Reverse polarity was discovered in one trace after the initial polarity tests had been evaluated. This was corrected and noted on the quality-control daily report.



SECTION III SYSTEMS

A. RECORDING AND AMPLIFICATION SYSTEM

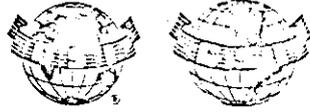
The output of each live-streamer section was amplified by a Texas Instruments Model 10,000 Amplifier System, recorded by a Texas Instruments 10,000 Seismic Digital Field System (DFS), and a direct playback made on a SIE-VR06 photo-oscillograph, simultaneously. A monitor record was made periodically.

Non-filter recordings, amplifier parallel tests, dynamic-range tests, and other periodic, quality-control instrument tests were performed prior to production work. Ambient noise level and straight-gain recordings were taken daily to determine signal-to-noise ratios. Dynamic range determination tests of the DFS, Programmed Gain Control (PGC) calibration check, instrument noise tests, and Ganged Automatic Gain Control (GAGC) oscillator tests were performed daily.

Instrument settings for production work were established initially after consultation with the client representative.

B. WATERBREAK SYSTEM

Direct path, shot-to-detector energy provided data for locating the shot relative to the streamer. First-arrival signal was taken from selected streamer groups and fed to waterbreak amplifiers which respond to the frequency of water-borne acoustic energy. Waterbreaks appeared on traces 26, 27, 28, 29, and 30 on monitors and playbacks. Waterbreaks were recorded in the appropriate tape channels by the DFS.



SECTION IV OPERATING TECHNIQUES

A. SURVEYING

DECCA was subcontracted to GSI to provide positioning throughout the project. Hi-fix was the system used, and all equipment was operated by DECCA personnel.

The initial calibration (Appendix A), was carried out by crossing the base-line extensions at the master station and also at the two slave extensions. The CARIBBEAN SEAL then carried the calibration for the remainder of the short-term project and tied in correctly at the final calibration.

The shooting boat IMLAY carried DECCA recording equipment and recordings of its position were made during production shooting.

The setback distance from antenna to shotpoint varied as did the shotpoint location, and these variations were noted with the post-plot coordinates.

B. SHOOTING

The M/V IMLAY was used as a shooting boat throughout the project. The firing line was attached to the charge which was supported by an inflated plastic bag. The charge was fired about 100 ft. behind the shooting boat and at a depth of approximately 6 ft. The blaster, controlled by the GSI clock system, detonated the charges. At the instant the blaster fired, a signal was received at the DFS which then designated the next clock pulse on tape as timing-word zero. This is seen as a time break on trace 4 of the monitors or playbacks. Charges were fired every 600 ft. for the sixfold CDP coverage. The explosive used was Nitro-Carbo-Nitrate in 50-lb. canisters. Charge size at a shotpoint is noted on the observer's logs.



C. RECORDING AND SHOOTING CYCLE

The recording and shooting cycle was determined by the ship's traverse between predetermined shotpoint intervals. This time interval was set into a master clock (an interval timer which zeros and resets automatically) which controlled the recording and shooting sequence. Changes in ship's speed were compensated for at the master clock. The master clock, set into a Time Co-ordinator Unit, controlled an interval timer in the instrument room, which transmitted a loading and a firing tone to the shooting boat. Hifix readings were taken at the shot instant. A relay controlled by the instrument room counter caused a mark to be placed on the fathogram at the shot instant.

Two continuously recording fathometers were available on the recording boat, one on the bridge and the other in the instrument room. The latter was used during all recordings. A lead-line check was made on 25 November and both fathometers were found to be accurate to the nearest foot. Lines were identified on the fathogram and every tenth shotpoint numbered.



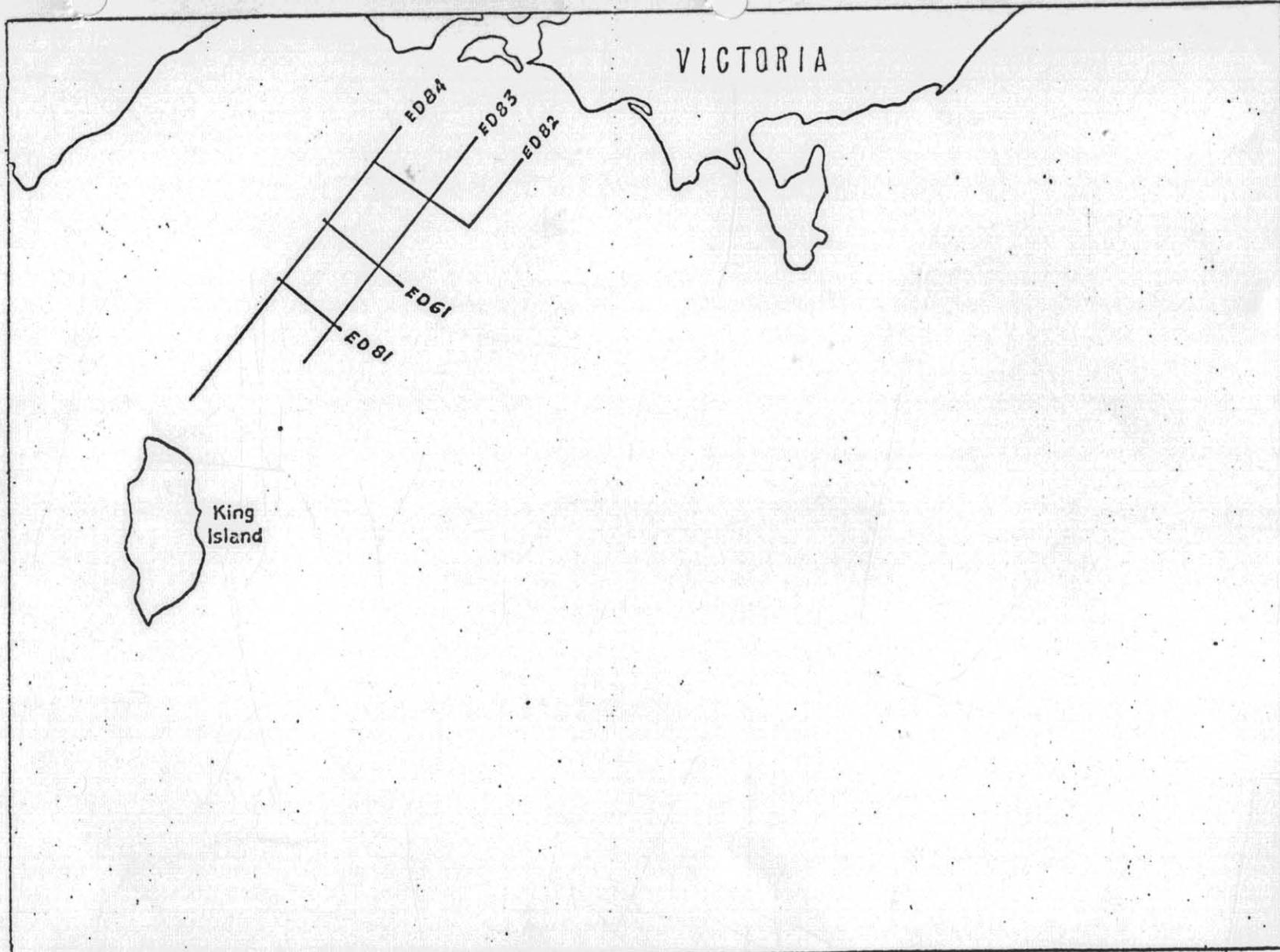
SECTION V
CONCLUSION

Production on this project was successful with over 50-mi shooting/day being average for the five days of shooting. The weather was good throughout, and this, aided by the fact there was no trouble with the equipment, led to high production and good quality data.

The client representative, Mr. Art Martins, was aboard for the duration of the shooting and his co-operation with the crew was appreciated.

Respectfully submitted,

Donald R. Bealer
Operations Supervisor



VICTORIA

King
Island

EDB4

ED83

EDB2

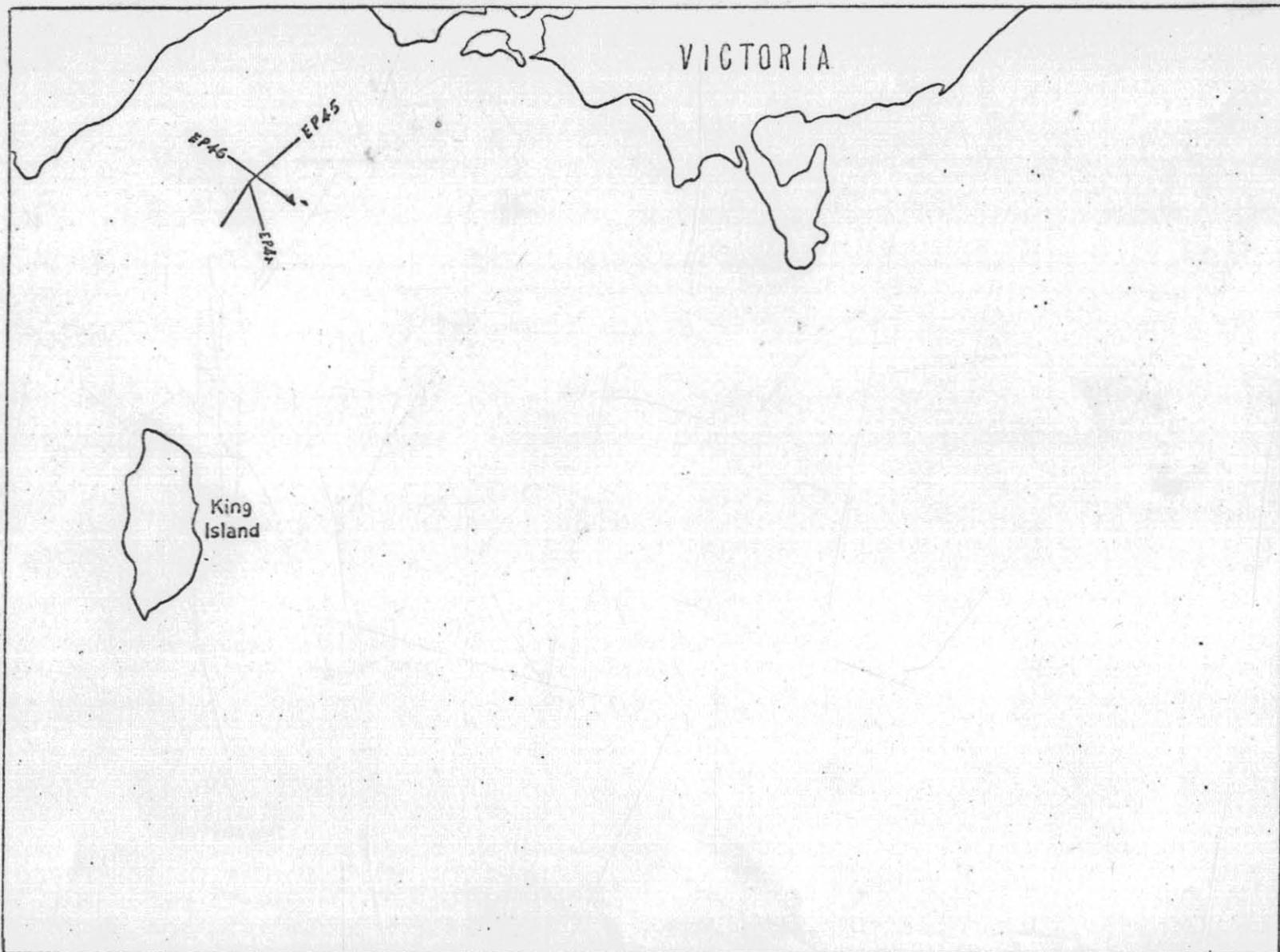
ED61

ED81

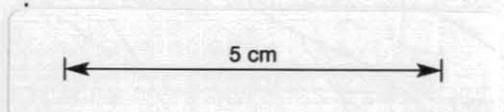
SEISMIC PROGRAM
FOR
ESSO STANDARD OIL
BASS BASIN 1967

5 cm

078043



SEISMIC PROGRAM
FOR
ESSO STANDARD OIL
OTWAY BASIN 1967



078044



APPENDIX A
INITIAL AND FINAL DECCA CALIBRATION



CALIBRATION REPORT

The survey party travelled from Sydney to Bass Basin area on Saturday, 25th November.

The calibration was carried out in conjunction with the recording vessel CARIBBEAN SEAL.

The Hi-Fix antenna on CARIBBEAN SEAL was intersected by simultaneous theodolite observations from two observers ashore at previously surveyed marks. The co-ordinated position of the antenna at each fix was computed and these co-ordinates converted to computed Hi-Fix readings which were then compared to the observed Hi-Fix readings taken at the relevant fix.

The above procedure was followed in the vicinity of Master Station at Cape Schanck and Slave I at Cape Liptrap. These observations were completed by 1845 Monday, 27th November. In order to enable the CARIBBEAN SEAL to proceed with her survey with the minimum of delay, a selection of the fixes in the vicinity of Master were computed in the field. Also during Monday, 27th November, the total number of lanes in Patt I were observed in CARIBBEAN SEAL by obtaining the Hi-Fix readings of the Patt I extension at Master and Patt I extension at Slave I.

The total number of lanes observed in Patt I checked with the computed figures, and the preliminary computations of the calibration observations in the vicinity of Master gave satisfactory results, enabling pattern corrections to be applied to the Slaves at 2100 on Monday, 27th November.

The chain was then effectively operational subject to completion of the computations and further checks if required. Corrected



Hi-Fix co-ordinates of reference points in Westernport Bay and for the Base line extensions were passed to CARIBBEAN SEAL at a rendezvous at Flinders in Westernport Bay at 0100 Tuesday, 28th November, enabling CARIBBEAN SEAL to sail at dawn to commence her programme.

The completed computations showed an anomaly in the readings obtained in the vicinity of Cape Liptrap and these were subsequently disregarded. Although the original settings applied were not seriously in doubt it was decided that the survey party should carry out a further check in the vicinity of Apollo Bay.

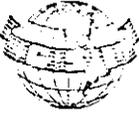
This check was carried out by surveying in the seaward end of the jetty at Apollo Bay. The co-ordinates obtained were converted to Hi-Fix co-ordinates and these compared with observed Hi-Fix readings obtained from a Hi-Fix Ship receiver established at the end of the jetty. These readings checked within 2/100th of a lane for both patterns and confirmed the original pattern settings.

The final pattern settings and opposite slave readings were :

<u>At Slave I</u>		<u>At Slave II</u>	
Patt I	Patt II	Patt I	Patt II
.25	.85	.94	.28

Corrected Hi-Fix Co-ordinates

<u>Reference Point</u>	<u>Patt I</u>	<u>Patt II</u>
Flinders Jetty	106.70	000.20
Flinders Buoy Flashing G.	148.68	000.41
Patt. I - Master Extension	000.08	
Patt. I - Slave Extension	1250.89	
Apollo Bay Jetty	93.99	1428.89

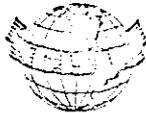


Total number of lanes observed Patt I	1250.89
	<u>000.08</u>
	1250.81
	<u><u>1250.98</u></u>
Total number of lanes computed in Patt I	<u><u>1250.98</u></u>

The results are considered satisfactory.

Diary of events and summary of observations are attached.

N. L. Sanderson.



APPENDIX B
MAPS SHOWING DECCA SHORE STATION POSITIONS



SURVEY REPORT
N. W. BASS BASIN & N. E. OTWAY BASIN
ESSO EXPLORATION AUST.

LAND SURVEY

The DECCA Hi-Fix system was operated in the Hyperbolic mode and the station sites selected were :

SLAVE I	(Cape Liptrap)	392 348.8 E	204 849.0 N
MASTER	(Cape Schanck)	297 223.2 E	253 679.0 N
SLAVE II	(Apollo Bay)	178 175.0 E	216 959.1 N

Co-ordinates on A. T. M. Projection Zone 7.

The station sites were surveyed by tellurometer traverses run from existing geodetic control.

The surveys were carried out by Amalgamated Decca Surveys under contract to G. S. I.

CALIBRATIONS

The Hi-Fix chain was initially calibrated at positions close to the Master and Slave I. Theodolite intersections, from surveyed points, were made of the Hi-Fix antenna on board the CARIBBEAN SEAL. The vessel also checked the lane count of Patt I by crossing both extensions of the base line. A further check was made at Apollo Bay, using an independent Hi-Fix receiver.

The results obtained were considered satisfactory.



<u>Traverse Point</u>	<u>Unadjusted Angles as Measured</u>	<u>Measured Distance in Yards Corr- ected for : N, Slope Height Scale Factors</u>	<u>Final Eastings</u>	<u>Final Northings</u>
Mount Hoddle Cape Liptrap Trig	166° 57' 18"			
Liptrap I	194° 25' 09"	1656.55	396 037.6	209 777.0
Liptrap II	127° 20' 16"	5460.00	392 201.7	205 891.4
Liptrap III=Hi-Fix)	121° 52' 30"	1052.63	392 348.8	204 849.0
Liptrap IV SI)	119° 10' 05"	372.92	392 689.8	204 698.3
Liptrap V	166° 26' 41"	3002.51	395 088.0	206 504.9
Mount Hoddle Liptrap Trig	003° 48' 19"	29000.03		

Misclosure in traverse 18" Difference E = .83, Difference N = .31

Co-ordinates Liptrap Lighthouse from 3 intersections

E = 392 714.1

N = 204 255.6



MAPS

CAPE LIPTRAP HI-FIX SLAVE I

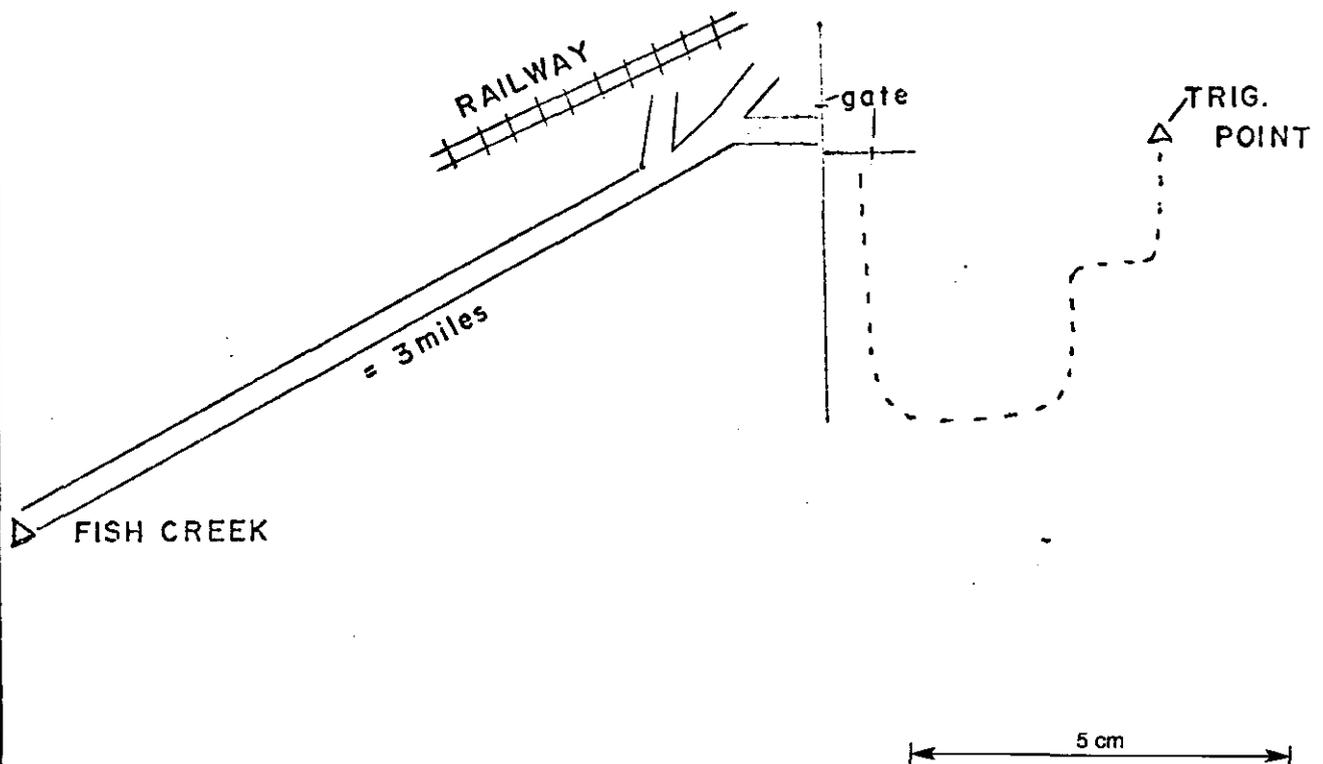
<u>Original Trigdata</u>	<u>Eastings</u>	<u>Northings</u>
Cape Liptrap Trig:	396 871.20	211 208.60
Mount Hoddle Trig:	413 515.20	228 897.00

Access Cape Liptrap

See enclosed access diagram, pages 2A, 2B.

Access Mount Hoddle

Follow the road from Fish Creek to Hoddle (Foster) for about 3 miles. Just before the railway crossing follow the new higher road and turn direct sharp to the right. Upon entering property turn sharp right, proceed through gateway and follow the track along the fence line. Proceed through the next gate at the foot of a small hill. Take the right hand track along the fence and follow the track until the trip is reached (beacon is visible). Access to trig by four wheel drive vehicles only.





Calibration Points:

Liptrap II, Slave I Station, Liptrap IV, Liptrap V.

Access Liptrap II

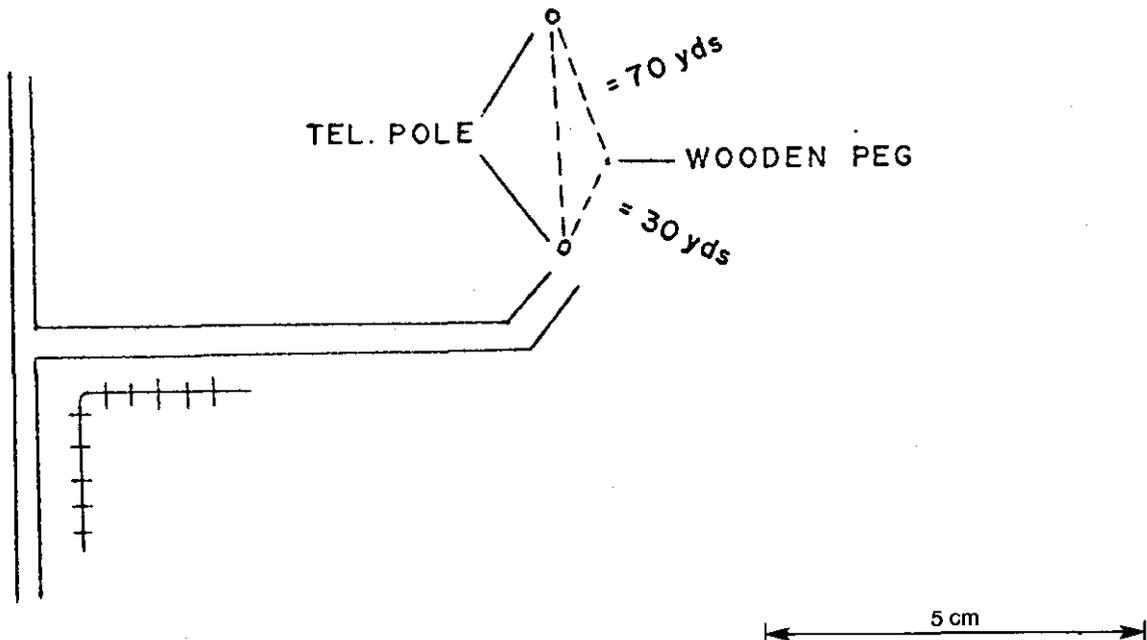
Follow the road from Liptrap lighthouse for approximately 1 mile. Turn left at the point where on the left hand side of the road the land is fenced. Proceed along the fence for about 3/4 mile until another fence is reached and turn 30° to the left for approximately 200 yards. The point is an iron pipe in the open field and could be difficult to find. Access with four wheel drive vehicles only.

Access Liptrap IV

See access diagram Hi-Fix station.

Access Liptrap V

Follow the road from the lighthouse to Liptrap Trig for about 2 miles. On the right hand side of the road you will find an unfenced property with a track leading into it. First follow the track for about 100 yards. It is not advisable to go any further with the landrover. If you walk along the track you will see two telegraph poles on top of a small hill.





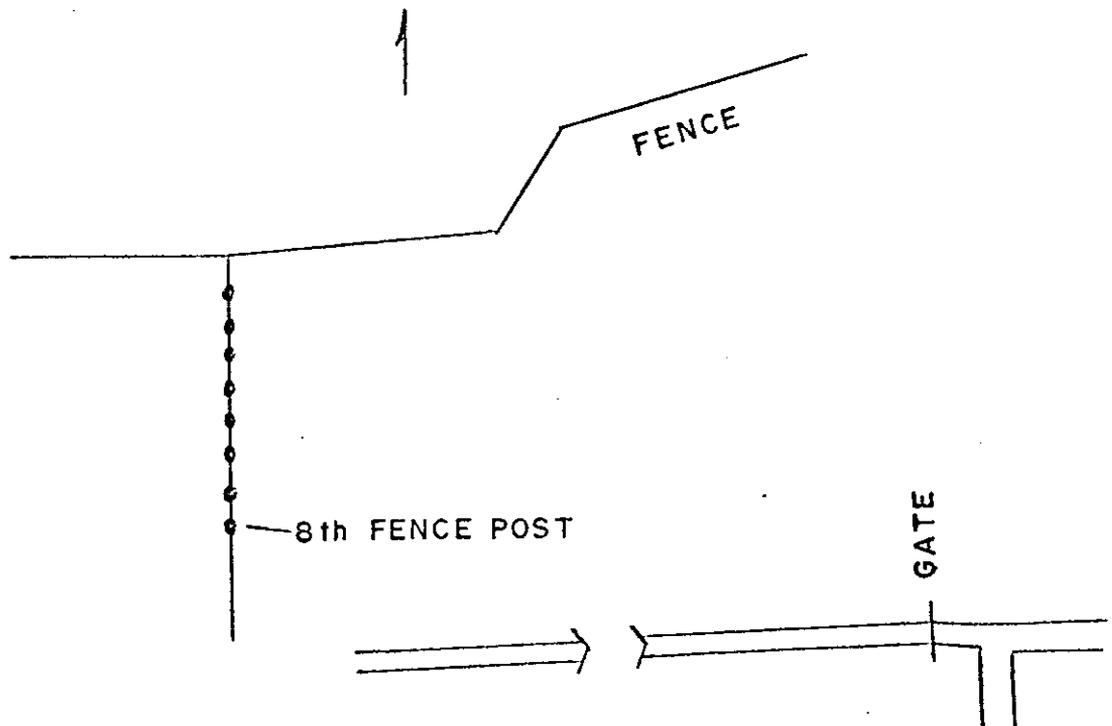
APOLLO BAY SLAVE II

The Hi-Fix site is on a landtongue in Marengo, 1-3/4 miles southwest of Apollo Bay. The land is flat and ideal for a Hi-Fix station. It is Foreshore land (Secretary, Apollo Bay Foreshore Commission).

Calibration Points: Apollo II, Slave 2, Apollo IV.

Access Apollo II

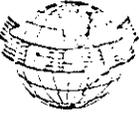
Follow the main road from Apollo Bay Hotel to the east and turn off to the left into Tuxion Road. Follow this road for about 2.5 miles until you reach a sign "High View". Follow the road up the hill for 0.55 miles. Proceed through the gate on the left hand side, follow the track up the first hill and up the second hill. The point is along the fence on top of the second hill (Old Army trig, co-ordinates unknown).



Apollo IV

Follow the road from Shenes Creek to Mount Sabine for about 6 miles. The point is an old Army quadripod on top of a hill on the left hand side of the road, between two telegraph poles just below the telegraph line.

5 cm



CAPE SCHANCK MASTER

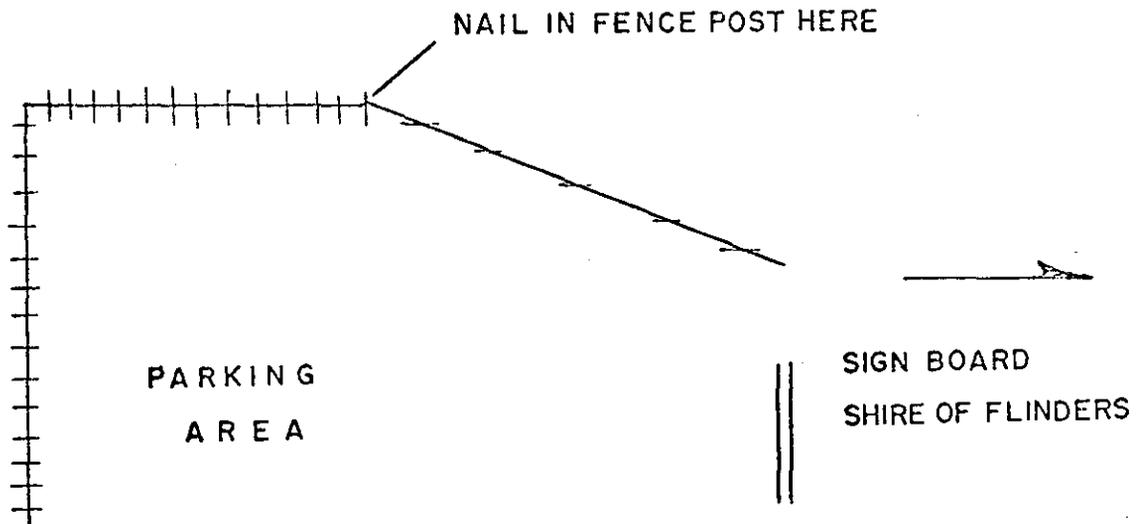
Access Cape Schanck Trig and Wallermyong trig

Take the road from Rosebud to Flinders (via Boneo). After 8 miles you reach the turning to Cape Schanck on the right hand side. Cape Schanck is on the corner. Proceed along the road to Flinders, pass the bridge over the creek and on the right hand side just after the gravel road becomes asphalt you will find the estate "Clondrisse" (about 2.5 miles from Cape Schanck corner). On the road from "Clondrisse" to Main Ridge (leading north) the Wallermyong army trig is on the left hand side of the road on the farm "Wallermyong".

Calibration Points

Calibration I : Access

Follow the road from Cape Schanck trig to Cape Schanck lighthouse. Follow this road to the far end and you will reach the parking area. The point is the fence-post itself, where the fence makes an angle. There is a nail on the top of the fencepost.





Detailed reports by A. D. S. on the station surveys and the calibrations are submitted separate to this report.

MAPPING

Shotpoint location maps were drafted by G. S. I. in their Sydney office from shotpoint co-ordinates supplied by Amalgamated Decca Surveys.

N. V. Gale.



APPENDIX C
GENERAL OPERATIONAL INFORMATION



APPENDIX C
GENERAL OPERATIONAL INFORMATION

Client	Esso Exploration Australia Inc.
GSI party	973
Area of survey	Otway and Bass basins (Victoria)
Date commenced	27 November 1967
Date finished	2 December 1967
Shotpoint spacing	600 ft (sixfold CDP)
Elapsed days on project	6
Production days	5
Nonproduction days	1

BASS BASIN VICTORIA

Total Mileage	165.14 Miles
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BASS BASIN TASMANIA

Total Mileage	47.73 Miles
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OTWAY BASIN VICTORIA

Total Mileage	53.98 Miles
Surcharge Mileage	7.16 Miles



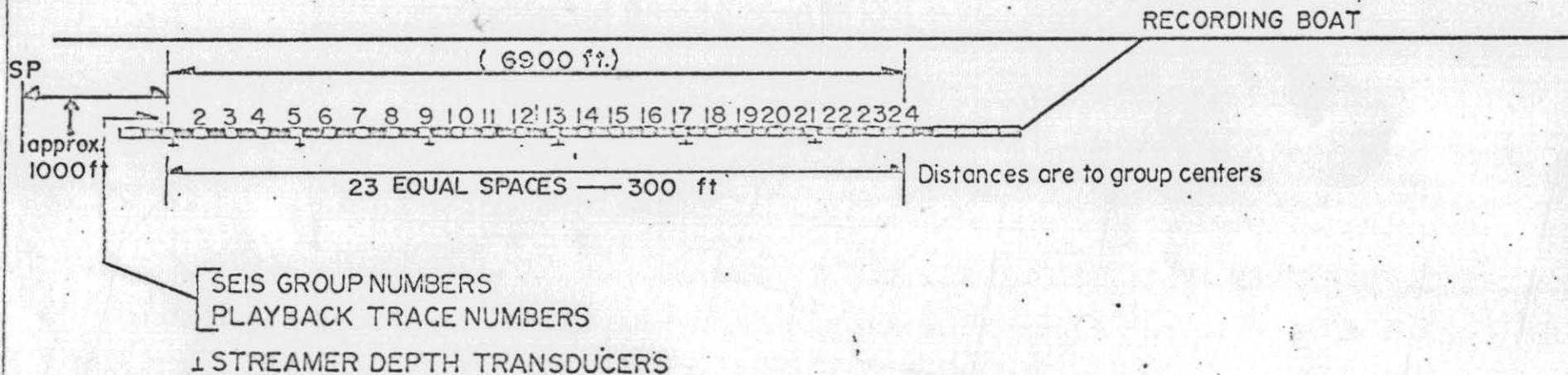
APPENDIX D
TYPICAL SPREAD DETAILS



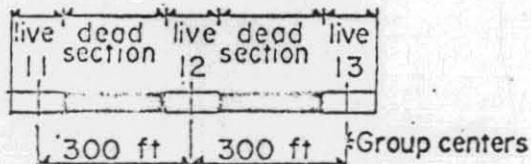
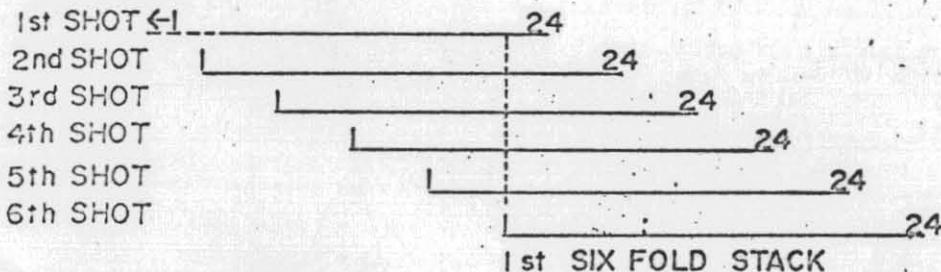
APPENDIX D
TYPICAL SPREAD DETAILS

Type	24-group, neutrally buoyant
Length	Center group 1 to center group 24 6900 ft
Group interval	300 ft
Interval between 12 and 13	300 ft
Length live section	100 ft
Length dead section	100 ft
Type detector	Crystal
Detectors/group	20
Detector interval	4 ft 10-1/2 in.
Charge size	50 lb
Shot depth average	6 ft
Shot offset average	500 ft
Detector depth average	40 ft

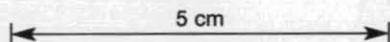
CSI-709



SUBSURFACE



Enlarged section of streamer



WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM

S.P. OFF GROUP NO. 1

GSI Party 973

Ship M/V CARIBBEAN SEAL

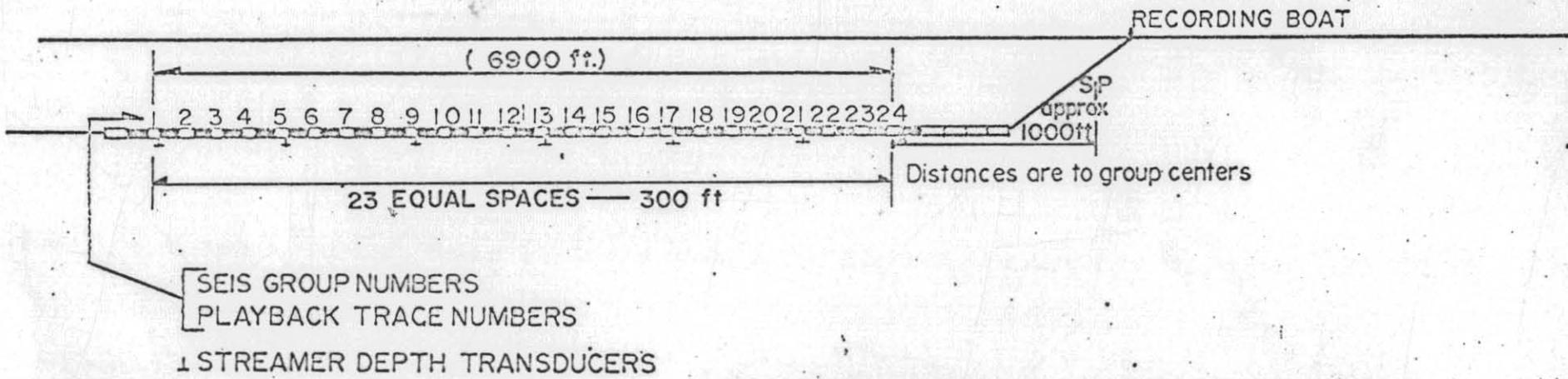
Client ESSO

Area OTWAY and BASS BASINS

Date NOV-DEC 1967

078061

051-709



SUBSURFACE

1st SHOT

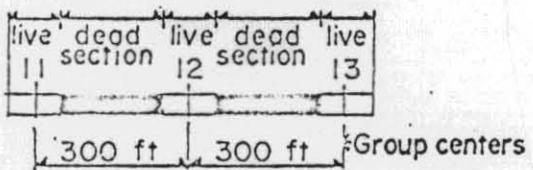
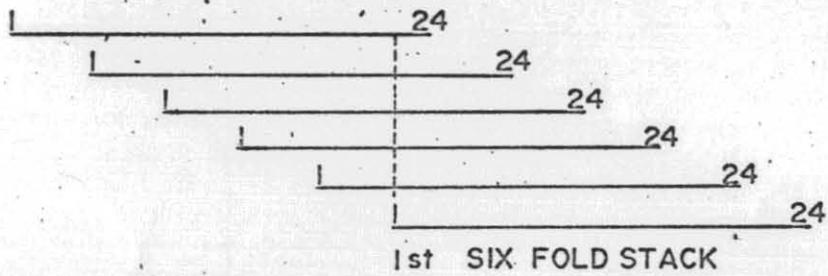
2nd SHOT

3rd SHOT

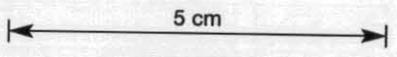
4th SHOT

5th SHOT

6th SHOT



Enlarged section of streamer



WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM

S.P. OFF GROUP NO. 24

GSI Party 973

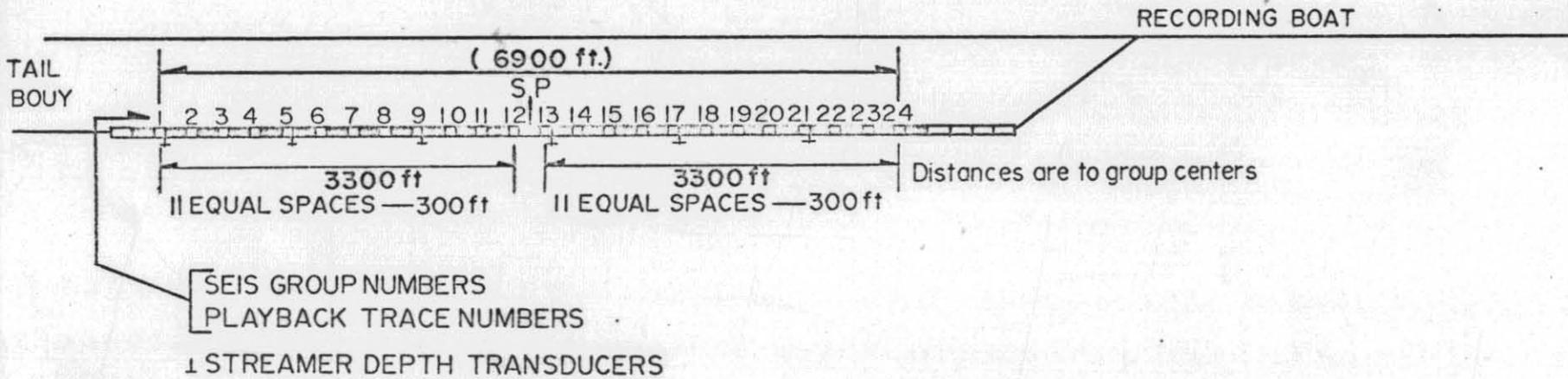
Ship M/V CARIBBEAN SEAL

Client ESSO

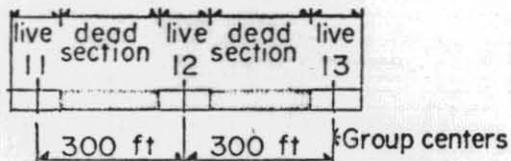
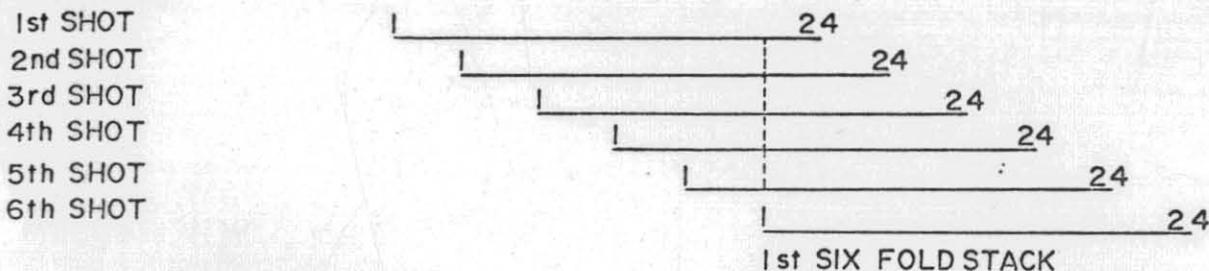
Area OTWAY and BASS BASINS

Date NOV-DEC 1967

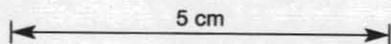
078062



SUBSURFACE



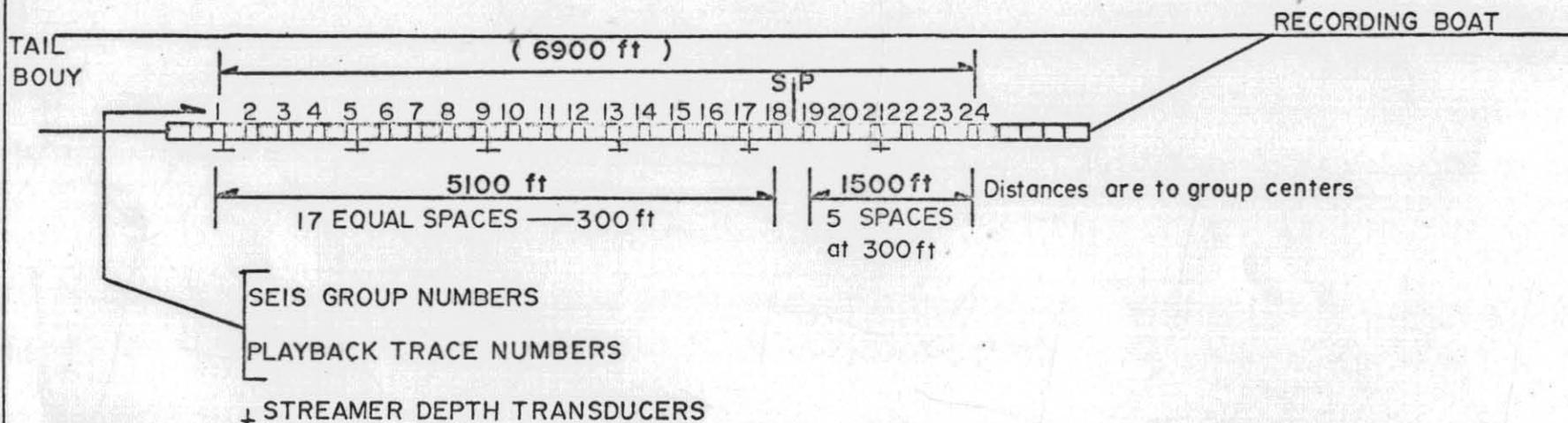
Enlarged section of streamer



WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

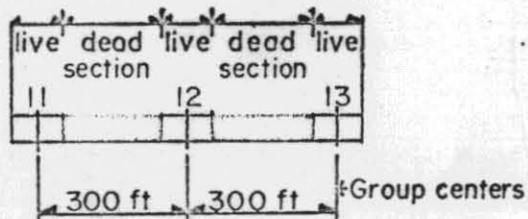
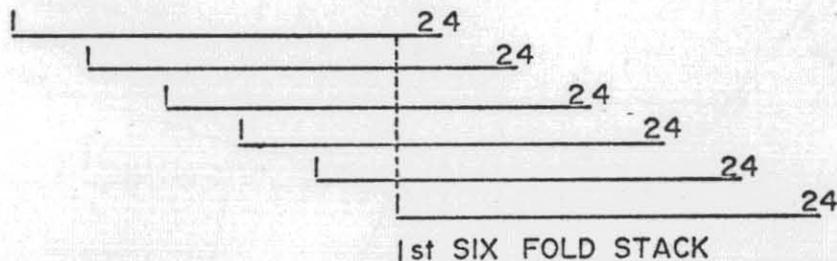
MARINE CABLE DIAGRAM
 (SPLIT SPREAD — 24 GROUPS)
 GSI Party 973
 Ship M/V CARIBBEAN SEAL
 Client ESSO
 Area OTWAY and BASS BASINS
 Date NOV-DEC 1967



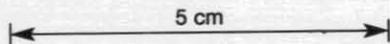


SUBSURFACE

- 1st SHOT
- 2nd SHOT
- 3rd SHOT
- 4th SHOT
- 5th SHOT
- 6th SHOT



Enlarged section of streamer



WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM

(S.P. BETWEEN GROUPS 18 and 19)

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

Area OTWAY and BASS BASINS

Date NOV — DEC 1967





APPENDIX E
TYPICAL INSTRUMENT DETAILS



APPENDIX E
TYPICAL INSTRUMENT DETAILS

Texas Instruments Model 10,000 Amplifier System

Recording Settings

Initial gain	40-43
Final gain	90-95
GAGC expansion	80 db/sec
AGC level	6-10

<u>Filters</u>	<u>Frequency</u>	<u>Slope</u>
High cut	70-92	24
Low cut	8	12

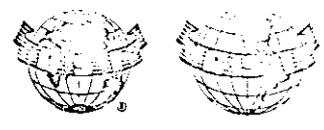
Playbacks - direct

Texas Instruments 10,000 Seismic DFS

Channel 1-24	Seismic Trace 1-24
25	
26	WB 5
27	WB 20
28	WB 24
29	WB 10
30	Gain
31	WB 1, 15
0	Timing word

SIE - VR06 Photo-Oscillograph

Galvo 1-24	Seismic Trace 1-24
25	Channel 30 monitor
26	WB



- Galvo
- 27 WB
 - 28 WB
 - 29 WB
 - 30 WB
 - 31 100 cycles external fork

Paper width 6 in.
 Paper speed 6.401 ips
 Record length 4 and 5 sec
 Timing lines Timing-line generator

Waterbreak Amplifiers

<u>Amplifier</u>	<u>Group No.</u>	<u>Trace</u>
1	24	27
2	20	28
3	15	30
4	10	26
5	5	29
6	1	30

Timebreak Monitor. True TB in trace 4
 Timing-Word Zero (two) trace 8
 Playback - same

SIMRAD Model 515-47 fathometer

- Scale A 0-120 ftm
- B 90-210 ftm
- C 180-300 ftm



APPENDIX F
KEY PERSONNEL



APPENDIX F
KEY PERSONNEL

GSI

Operations supervisor	D. R. Bealer
Quality-control engineer	K. W. Evans
Party manager	L. Helstrom
Administrator	A. Smith
Instrument engineers	L. Willard
	A. Horak
Shooter	L. Gibson

DECCA

Supervisor	C. Rolfe
Operators	N. Dick
	P. Green
	P. McKenna

Captain M/V CARIBBEAN SEAL	R. Hegerburg
Captain M/V IMLAY	P. Warren