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FINAL REPORT

OFFSHORE NAVIGATION (AUSTRALIA) PTY. LTD.

PROJECT 1419

W783

WELL LOCATION DISCOVERY BAY-1 W.C.R.

AUGUST - SEPTEMBER 1982

FINAL REPORT OFFSHORE NAVIGATION (AUSTRALIA) PTY. LTD. PROJECT 1419

FOR

PHILLIPS AUSTRALIAN OIL COMPANY

VICTORIA, AUSTRALIA
WELL LOCATION DISCOVERY BAY #1

AUGUST - SEPTEMBER 1982

OFFSHORE MAVIGATION USERALIAN PTY, LTD.

TABLE OF CONTENTS

| | Page |
|--|------|
| Introduction | 1 |
| Field Operations Recap | 2 |
| General Information | 5. |
| Maxiran Calibration | 7 |
| Well Location Information | 15 |
| Basic Control | 17 |
| Personnel | 18 |
| Distribution | 18 |
| Base Station Descriptions and Plats | 19 |
| Area of Operations Plat | 29 |
| APPENDIX A - Daily Operations Logs | |
| APPENDIX B - The Maxiran Radiopositioning System | 1 |

I. INTRODUCTION

Offshore Navigation (Australia) Pty. Ltd.(ONA), under contract to Phillips Australia Oil Company (PHILLIPS), employed a Maxiran Radiopositioning System to position the Drilling Vessel (D/V) DIAMOND M EPOCH on a location that was designated by PHILLIPS as:

WELL LOCATION DISCOVERY BAY #1

The survey was conducted in the Great Australian Bight, off the coast of Victoria, Australia. The well was located approximately 29 kilometers west of Cape Bridgewater.

The ONA base of operation was initially established at Portland, Victoria on 20 August 1982.

II. FIELD OPERATIONS RECAP

The Maxiran equipment necessary for this survey was air freighted from Perth, W.A. to Melbourne, Victoria, and arrived on 19 August 1982. ONA personnel necessary for the survey travelled from Perth to Melbourne on 19 August. The Maxiran equipment was loaded onto Land Rovers. The vehicles transported ONA personnel and the Maxiran equipment to Portland, Victoria on 20 August. The Maxiran system was transported to Station Crows Hill on 21 August, and the system calibrated between two known points at this site on 22 August 1982. See "Maxiran Calibration" of this report for details.

ONA personnel were advised on 23 August 1982 that the rig move was cancelled. The Maxiran base station equipment was transported to Portland and stored on 24 August. The Maxiran mobile equipment and ONA mobile operator travelled to Hobart, Tasmania on 24 August. The ONA mobile operator transported the equipment from Hobart to Strahan, where it was stored on 25 August 1982.

II. FIELD OPERATIONS RECAP (continued)

Two ONA base operators were released on 25 August 1982. The ONA party chief and the third base operator was released on 26 August, and the ONA mobile operator was released on 27 August 1982.

ONA personnel returned to Portland on 5 September 1982, and the ONA base of operation was again established that date. The Maxiran base station equipment was removed from storage and transported to their respective site. Installation of the Maxiran base station equipment on the three sites occupied to control the survey began 6 September and was completed 7 September 1982.

The ONA mobile operator arrived in Strahan on 13 September 1982. He and the Maxiran mobile equipment was transported, via helicopter, to the D/V DIAMOND M EPOCH that same date. Installation of the Maxiran mobile equipment on board the rig was completed on 14 September 1982.

II. FIELD OPERATIONS RECAP (continued)

The D/V DIAMOND M EPOCH arrived at Well Location DISCOVERY BAY #1 on 16 September 1982. Anchor operations began at 0922 hours that date, and were completed at 1700 hours 21 September. Some difficulties were experienced during this time period with anchors holding. The rig base plate was cemented in at 2130 hours 22 September 1982, and the final Maxiran position was recorded. See Appendix A of this report for details of operations.

Dismantling of the Maxiran system began 23 September 1982 and was completed 24 September. The Maxiran system was packaged and shipped to the ONA office in Perth by surface freight on 25 September 1982.

All ONA personnel were released from this survey on 24 September 1982.

III. GENERAL INFORMATION

A. Maxiran frequencies used were:

Mobile Transmitter

441 MHz

Base Transmitter

429 MHz

- B. Satisfactory radiotelephone communications were maintained between the Maxiran stations on the frequencies of 4637.5 and 7840.0 (SSB) kilocycles.
- C. The Maxiran field data was retained by ONA on completion of the survey. The final Maxiran position of the drill stem was computed by the ONA office in Perth.
- D. Three Maxiran base station installations were provided by ONA for this survey.
- E. Three Maxiran base station sites were occupied during this operation. They were:

STATION CAPE BRIDGEWATER
STATION JONES RIDGE
STATION MOUNT RUSKIN

III. GENERAL INFORMATION (continued)

- F. The maximum range observed by the Maxiran system during this survey was 45 kilometers.
- G. The Maxiran mobile equipment was checked daily for proper delay setting. The delay setting was determined by a Maxiran Calibration conducted on 22 August 1982.

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IV. MAXIRAN CALIBRATION

The Maxiran system was calibrated on 22 August 1982, prior to the commencement of the Well Location DISCOVERY BAY #1 survey. For this calibration, the Maxiran system was transported to Station Crows Hill, and the equipment installed at two markers at this site. The computed slope range of 1004.518 meters was derived from a survey made by Kevin W. Porter and Associates.

The following pages consist of the field report of this calibration.

MAXIRAN CALIBRATION REPORT

| | | | | | | DATE: AL | 14 22 1982 | |
|--------------------|--------|---------|------------|------------------|---------|----------|----------------|--|
| | MOBILE | STATION | | BASE STATION | | | | |
| LOCATION: C | Rows | 1+16 | | LOCATION: | Row | S 141 | | |
| OPE ATOR: A. | HOS | GART | | OPERATOR: H. | | | | |
| UNIT | | DEL | SERIAL No. | UNIT | 2 | DEL | SERIAL No. | |
| MOT TOR | NMA | 1-013 | 041 | BEACON | NIZ | - 01 | 036 CODE 5 | |
| NTERROGATOR | NTM | 1-01 | 050 | CONTROL BOX | NCL | -01 | 109 | |
| AM | NTL | 1-02 | 073 | AMPLIFIER | NT | 1-01 | 016 | |
| AMPLIFIER P/S | NCL | 10-01 | 038 | AMPLIFIER P/S | ì | 1-01 | 018 | |
| PREMP | SA | 1-12 | 056 | PREAMP | 1 | -12 | 145 | |
| COAX TY | Ţ | YPE | LENGTH | COAX T | | /PE | LENGTH | |
| R× | ANDREL | 05/RG-8 | 74 / 29 / | | ANDREW | 5/RG-8 | 74 / 29 | |
| - NITENINA | T | YPE · | HEIGHT | ANTENNA | T | /PE | HEIGHT | |
| ANTENNA | QUAD | L.P.L. | 20' | ANTENIA | VERTICA | L L.P.Ls | 10' | |
| NP VOLTAGE | | 113 | IU AC | 1919177177777 | | | 1170 AC 120 DC | |
| TX. FREQUENCY | | 441 | MHZ | TX. FREQUENCY | | 429 MHZ | | |
| REQUENCY 42 | | 429 | MITZ | RX. FREQUENCY | | | M11 Z | |
| | | AGC | | RX. GAIN SETTING | | AGC | | |
| TEA HER CONDITIONS | | COOL | SCATTERED | WEATHER CONDIT | IONS | | 103115 | |
| | | ور | DUC | | | | • | |
| | | _ | | | | | | |
| | | | ··· | | | | | |

| DBSERVED RANGE IN CALIBRATE: | 6.∞3 KM | |
|------------------------------|---------------|------------|
| COMPUTED SLANT RANGE: | 1.004 KM | |
| . MOBILE ZERO SETTING IS: | | |
| DBSERVED RANGE IN OPERATE: | 1.004 км | TIME: 1811 |
| | 1 / | |
| | SIGNED: CHOQQ | \prec |

- 1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
- 2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
- 3. Each report will be complete in itself. Do not refer to other reports for information.
- 4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

MAXIRAN CALIBRATION REPORT

| | | | T | | DATE: A | UG 22 1982 | |
|--------------------|---|---|--|--|---|--|--|
| MOBILE | STATION | | BASE STATION | | | | |
| CROW | s Hi | LL | LOCATION: | CROW | s H | 4 | |
| HOU | GART | | 11 | | | · | |
| | | SERIAL No. | UNIT | 1 | | SERIAL No. | |
| NM | 1-01B | 041 | BEACON | NTL. | -01 | 036 CODE 5 | |
| NIM | -01 | 009 | CONTROL BOX | NCL | -01 | 109 | |
| | | | AMPLIFIER | | | 016 | |
| | | | AMPLIFIER P/S | | | 018 | |
| ···· | | | PREAMP | | | 145 | |
| TYPE | | LENGTH | COAY | TYPE | | LENGTH | |
| ANDREWS RG-8 | | 74, | 11 · · · · · · · · · · · · · · · · · | ANDREWS/RG8 | | 74 / 24 | |
| TYPE | | HEIGHT | 1 | | | HEIGHT | |
| WHIP | | 20' | ANTENNA | VERTICA | L L.P.Ls | 10' | |
| | 117U AC | | INPUT VOLTAGE | T VOLTAGE | | 12V DC | |
| | 441 | MHZ | TX. FREQUENCY | | 429 | ヘゖて | |
| RX. FREQUENCY | | MHZ | RX. FREQUENCY | | 441 | MITE | |
| RX. AIN SETTING | | | RX. GAIN SETTING | ; | AGC | | |
| ∴EATHER CONDITIONS | | SCATTERED | WEATHER CONDIT | TIONS | As r | NOBILE | |
| | | | | | | | |
| | | | | | | | |
| | HOG MO NMM NTM T ANG RG | HOGGART MODEL NMM-OIB NTM-OI TYPE ANDREWS RG-8 TYPE WHIP 117 441 429 AGC ONS COOL | TYPE LENGTH HOGENS TYPE LENGTH ANDREWS TYPE HEIGHT WHIP 20' 117U AC 441 MHZ 429 MHZ AGC | LOCATION: HOGGART MODEL SERIAL No. UNIT NMM-OIB OUI BEACON CONTROL BOX AMPLIFIER AMPLIFIER AMPLIFIER AMPLIFIER COAX TYPE LENGTH COAX TYPE HEIGHT WHIP LOCATION: UNIT BEACON CONTROL BOX AMPLIFIER AMPLIFIER AMPLIFIER COAX TY RG-8 TYPE HEIGHT WHIP LOCATION: UNIT BEACON AMPLIFIER AMPLIFIER COAX TY RX TYPE HEIGHT ANTENNA INPUT VOLTAGE TX. FREQUENCY RX. FREQUENCY RX. GAIN SETTING ONS COOL SCATTERED WEATHER CONDIT | HOLGART MODEL SERIAL NO. MODEL SERIAL NO. MIT MODEL NMM - OIB OUJ BEACON AMPLIFIER ATU AMPLIFIER P/S AMPLIFIER P/S PREAMP SAU TYPE LENGTH COAX TYPE HEIGHT WHIP 20' INPUT VOLTAGE TX. FREQUENCY AX. FREQUENCY RX. FREQUENCY RX. GAIN SETTING ONS COOL SCATTERED WEATHER CONDITIONS | MOBILE STATION CROWS HILL HOGGART OPERATOR: H. BRIDGES MODEL SERIAL NO. UNIT MODEL NMM—OIB OUJ BEACON NTL-OI AMPLIFIER ATU-OI AMPLIFIER AMPLIFIER FREAMP TYPE LENGTH COAX TYPE HEIGHT WHIP 20' INPUT VOLTAGE ITYPE LYPE LYPE LYPE LYPE LYPE HEIGHT ANTENNA TYPE VERTICAL L.P.LS TX. FREQUENCY LYPE RX. GAIN SETTING AGC ONS COOL SCATTERED WEATHER CONDITIONS AS MODEL LOCATION: CROWS HI MODEL NTL-OI AMPLIFIER NTU-OI AMPLIFIER NTYPE VERTICAL L.P.LS VERTICAL L.P.LS NTYPE LYPE VERTICAL LYPE NTYPE VERTICAL LYPE NTYPE VERTICAL L.P.LS NTYPE NTYPE VERTICAL L.P.LS NTYPE VERTICAL L.P.LS NTYPE VERTICAL NTYPE NTYPE | |

| DBS RVED RANGE IN CALIBRATE: | 6.000 KM | |
|------------------------------|----------|------------|
| COMPUTED SLANT RANGE: | 1.004 KM | |
| . Ma BILE ZERO SETTING IS: | 4.996 KM | • |
| DBSERVED RANGE IN OPERATE: | | TIME: 1753 |
| | 1 | |

signed: aptlaggast

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MAXIRAN CALIBRATION REPORT

| | | | | | | | DATE: A | JG 22 1982 |
|--------------------|--------------|------------|------------|---------------|---------|---------|-----------|------------|
| MOBILE STATION | | | | BASE STATION | | | | |
| LOCATION: CA | Lows | HILL | - | LOCATION | c | Rows | 1414 | ر |
| O ERATOR: A. | HOGG | YART | | OPERATOR | | BRIDG | | |
| UNIT | МО | DEL | SERIAL No. | UNIT | | МО | DEL | SERIAL No. |
| NITOR | NMM | 7-018 | 041 | BEACON | | NTL | - 01 | 036 CODE 5 |
| INTERROGATOR | NTK | 1 - 01 | 050 | CONTROL | зох | NCL | -01 | 109 |
| APPLIFIER | | | | AMPLIFIER | } | NFU | -01 | 016 |
| AMPLIFIER P/S | | | | AMPLIFIER | P/S | Neu | -01 | 018 |
| PREAMP | | | | PREAMP | | SAU. | -12 | 145 |
| COAX | | YPE | LENGTH | COAY | COAX TY | TYPE | | LENGTH |
| COAX | and Ro | RGWS -X | 74', | COAX | | ANDREW | s/R4-8 | 74 / 99, |
| | TY | YPE ' | HEIGHT | ANTENNA | TYPE | | HEIGHT | |
| ANTENNA | W. | HP | 20' | ANTENNA | | VERTIC | AL L.P.L. | 10' |
| IN UT VOLTAGE | | 1170 1 | AC | INPUT VOLTAGE | | | 11746 | |
| TX. FREQUENCY | TV FREQUENCY | | MZ | TX. FREQUENCY | | 429 MMZ | | MHZ |
| | | 429 M | (H Z | RX. FREQU | ENCY | | 441 MHZ | |
| | | AGe | | RX. GAIN S | ETTING | | AGC | |
| WEATHER CONDITIONS | | COOL | SCATTERED | WEATHER | CONDIT | IONS | AS | MOBILE |
| | | و | LOUD | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| O SERVED RANGE IN CALIBRATE: | 6.∞o k | M |
|------------------------------|----------|---|
| COMPUTED SLANT RANGE: | 1.004 K | M |
| .: MOBILE ZERO SETTING IS: | 4.99 6 K | M |
| OBSERVED RANGE IN OPERATE: | | |
| | 1 | • |

SIGNED:

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MAXIRAN CALIBRATION REPORT

| | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | | DATE: A | 16 22 1982 | |
|--------------------|--------|--|------------|--------------------|---------------|---------|---------------|--|
| _ | MOBILE | STATION | | BASE STATION | | | | |
| OCA ION: | Rows | S HILL | • | LOCATION: C | २०७३ | HILL | | |
| | · Hoge | | | OPERATOR: H. | | | | |
| TINE | 1 | DEL | SERIAL No. | UNIT | 1 | DEL | SERIAL No. | |
| CONTTOR | NAN | 1-01B | 041 | BEACON | NTL- | 01 | 032 CODE 3 | |
| JTERROGATOR | NTM | -01 | 050 | CONTROL BOX | NCL - | . 01 | 109 | |
| MEIFIER | | | | AMPLIFIER · | NT | 0-01 | 016 | |
| AMPLIFIER P/S | | | | AMPLIFIER P/S | NCL |) -01 | 018 | |
| PRE MP | | | | PREAMP | 890 | - 12 | 145 | |
| 20 4 X | L | YPE | LENGTH | COAX | TYPE | | LENGTH | |
| | | eeus -8 | 74' | TX R× | ANDREWS/ RG-8 | | 74' / 29' | |
| | T | YPE | HEIGHT | ANTENNA | T | /PE | HEIGHT | |
| ANTENNA | WH | P | 20' | | VERTICAL LPL. | | 10' | |
| INPUT VOLTAGE | | 1170 | AC | INPUT VOLTAGE | INPUT VOLTAGE | | c 120 Dc | |
| TX | | 441 - | 1H 2_ | TX. FREQUENCY | | 419 MHZ | | |
| 555011511014 | | 429 | MIHZ | RX. FREQUENCY | | 441 | パリス | |
| | | Ace | | RX. GAIN SETTING | | | L BEST SIGNAL | |
| WEATHER CONDITIONS | | COOL SCATTGRED | | WEATHER CONDITIONS | | | MOBILE | |
| | | CL | | | | | • | |
| | | | | | | | | |

| OBSERVED RANGE IN CALIBRATE: | 6.000 KM | |
|------------------------------|----------|------------|
| C MPUTED SLANT RANGE: | | |
| MOBILE ZERO SETTING IS: | _ | |
| SERVED RANGE IN OPERATE: | 1.004 KM | TIME: 1736 |

SIGNED:

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MAXIRAN CALIBRATION REPORT

| | tara tara | | | | | | DATE: AU | G 22 1982 |
|-----------------------------------|-----------|--------------------|------------|-----------------------|----------|---------|----------|------------|
| | MOBILE | STATION | | BASE STATION | | | | |
| LOCATION: | CROL | JS F | 116 | LOCATION: | CI | zows | HIL | |
| OFFRATOR: | _ | GART |] | OPERATOR: | H | BRID | GES | |
| UNIT | | DEL | SERIAL No. | UNIT | | 1 | DEL | SERIAL No. |
| MONITOR | NM | M-01B | 041 | BEACON | | NTL | -01 | 067 CODE 3 |
| IN ERROGATOR | NTA | 1-01 | 050 | CONTROL B | ΟX | NCL | -01 | 109 |
| AMPLIFIER | | | | AMPLIFIER | | NTL |) -01 | 016 |
| A PLIFIER P/S | | | | AMPLIFIER I | P/S | NCI | اه-د | 018 |
| PREAMP | | | · | PREAMP | | SAL | ر 12 | 145 |
| | T' | YPE | LENGTH | COAX 7 | | 1 | /PE | LENGTH |
| CAX | | r-8 | 13, | COAX | T¥ R× | ANDREW | s/R4-8 | 74' / 29' |
| | TY | YPE . | HEIGHT | ANTENNA | | TY | /PE | HEIGHT |
| ATENNA | WH | 10 | 20' | | | VERTICA | L L.P.Ls | 10' |
| INDUT VOLTAGE | | 117v | AC | INPUT VOLTAGE 117 U A | | 117 u A | | |
| T FREQUENCY | | 441 | MHZ | TX. FREQUENCY | | 429 MHZ | | |
| | | 429 | MHZ | RX. FREQUENCY | | | 441 MHZ | |
| REGAIN SETTING PC | | RX. GAIN SETTING | | , | AGC | | | |
| WEATHER CONDITIONS COOL SCATTERED | | WEATHER CONDITIONS | | IONS | AS | MOBILE | | |
| | ! | CLOU | 1 | | | | | |
| | | | | | | | | |
| | | | | 1 | | | | |

| OFERVED RANGE IN CALIBRATE: | 6.000 KM | |
|-----------------------------|----------|------------|
| COMPUTED SLANT RANGE: | | |
| OBILE ZERO SETTING IS: | 4.996 KM | |
| OBSERVED RANGE IN OPERATE: | | TIME: 1730 |

SIGNED: attogg -

- 1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
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- 4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

MAXIRAN CALIBRATION REPORT

| MOBILE STATION LOCATION: CROWS HILL OPERATOR: A. HOGGART UNIT MODEL SERIAL NO. MINITOR NMM-013 O41 BEACON NTZ-01 010 CODE IMPERROGATOR NTM-01 050 CONTROL BOX NCL-01 109 APPLIFIER APPLIFIER AMPLIFIER NTU-01 016 PREAMP PREAMP PREAMP PREAMP PREAMP COAX TYPE LENGTH COAX TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT TX. FREQUENCY REFREQUENCY REATHER CONDITIONS COOL SERTIFIED CLOUD CODE SERTIAL NO. DODE CROWD CODE SERTIAL NO. DIVITIONS ROBBES STATION PREADLESS HILL CROWD CODE SERTIAL NO. UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. CODE CODE CODE SERIAL NO. CODE COD COD | | | | | | | DATE: AU | 6 22 1982 |
|--|--------------------|--------|---------|------------------|----------------|--------|----------|------------|
| OPERATOR: A. HOCGART UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. MINITOR NAMA-OIB O41 BEACON NTL-OI OIO CODE IMERROGATOR NTM-OI O50 CONTROL BOX NCL-OI 109 AMPLIFIER AMPLIFIER NTU-OI OIG PREAMP PREAMP PREAMP TYPE LENGTH COAX TYPE LENGTH COAX TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE HEIGHT TXPE HEIGHT | | MOBILE | STATION | | | BASE | STATION | |
| OPERATOR: A. HOGGART UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. UNIT MODEL SERIAL NO. OPERATOR: H. BRIDGES CODE CODE CODE CODE CODE CODE CODE INTERROGATOR NTM - 01 OSO CONTROL BOX NCL - 01 IO9 AMPLIFIER AMPLIFIER AMPLIFIER P/S PREAMP PREAMP PREAMP TYPE LENGTH COAX RA-B TYPE LENGTH COAX RA-B TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE HEIGHT TYPE TYPE TYPE HEIGHT NTU- 01 O1G AMPLIFIER P/S NCU- 01 O18 TYPE LENGTH COAX RA-B TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE HEIGHT TYPE HEIGHT TYPE TYPE HEIGHT TYPE TYPE HEIGHT TYPE HEIGHT TYPE TYPE HEIGHT TYPE TYPE HEIGHT TYPE HEIGHT TYPE TYPE HEIGHT TYPE | LOCATION: C | Rows | HILL | | LOCATION: | CROW | 5 HIL | _ |
| UNIT MODEL SERIAL No. UNIT MODEL SERIAL No. MINITOR NMM-OIB O41 BEACON NTZ-OI OIO CODE INTERROGATOR NTM-OI O50 CONTROL BOX NCL-OI 109 AMPLIFIER AMPLIFIER NTU-OI OIG APPLIFIER P/S AMPLIFIER NTU-OI OIG PREAMP PREAMP SAU-I2 145 PREAMP COAX TYPE LENGTH COAX TYPE LENGTH COAX TYPE LENGTH COAX TYPE LENGTH TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT INPUT VOLTAGE 117 AC INPUT VOLTAGE 117 AC 12 D TX. FREQUENCY 441 MHZ REFREQUENCY 441 MHZ REFREQUENCY 429 MHZ RESENTATION RECORDITIONS COOL SCATTER WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTER WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTERED COAX TYPE LENGTH TYPE LENGTH TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT FREQUENCY 429 MHZ RX. FREQUENCY 429 MHZ RX. GAIN SETTING AGC WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTERED | | | | | | | | |
| INTERROGATOR NTM-01 050 CONTROL BOX NCL-01 109 AMPLIFIER AMPLIFIER NTU-01 016 APPLIFIER P/S NCU-01 018 PREAMP PREAMP SAU-12 145 COAX TX ANDREWS RG-8 74 / 83 / 74 | 1 | 1 | | SERIAL No. | • | 1 | | SERIAL No. |
| AMPLIFIER AMPLIFIER AMPLIFIER P/S AMPLIFIER P/S AMPLIFIER P/S AMPLIFIER P/S NCU-OI OIS PREAMP PREAMP SAU-12 ILENGTH COAX TYPE LENGTH COAX TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA INPUT VOLTAGE TYPE TYPE HEIGHT TYPE HEIGHT | MINITOR | NMM | 1-013 | 041 | BEACON | NTL | -01 | OIO CODE 1 |
| A PLIFIER P/S PREAMP PREAMP PREAMP SAU-12 LENGTH COAX TYPE LENGTH COAX TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE HEIGHT TYPE HEIGHT ANTENNA TYPE TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE HEIG | INTERROGATOR | NTI | 1-01 | 050 | CONTROL BOX | NCL | -01 | 109 |
| PREAMP TYPE LENGTH COAX TYPE ANDREWS Ref-8 TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT INPUT VOLTAGE TX. FREQUENCY TX. FREQUENCY RM FREQUENCY RM FREQUENCY RM GAIN SETTING REATHER CONDITIONS PREAMP SAU-12 ILS TYPE LENGTH COAX TX. RANDREWS | AMPLIFIER | | | | AMPLIFIER | NTL | 1-01 | OIG |
| TYPE LENGTH COAX RA-8 TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT TYPE TYPE HEIGHT TYPE TYPE TYPE TYPE HEIGHT TYPE HEIGHT TYPE TYPE TYPE HEIGHT TYPE T | A PLIFIER P/S | | | | AMPLIFIER P/S | NCL | 0-01 | 018 |
| TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT FREQUENCY TX. FREQUENCY | PREAMP | | | | PREAMP | SAL | 1-12 | 145 |
| TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA INDUT VOLTAGE TX. FREQUENCY TX. FRE | C | | | 1 | COAX TX | T | YPE | |
| TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT ANTENNA TYPE HEIGHT JERTICAL APLS 10' INPUT VOLTAGE IITU AC INPUT VOLTAGE TX. FREQUENCY TX. FR | C OA A | | | 74, | | ANDRE | us/RG-8 | |
| WHIP 20' VERTICAL APLS 10' INDUT VOLTAGE 117 J AC INPUT VOLTAGE 117 J AC 12 J D TX. FREQUENCY 441 MHZ TX. FREQUENCY 429 MHZ RY FREQUENCY 429 MHZ RX. FREQUENCY 441 MHZ RY GAIN SETTING AGC RX. GAIN SETTING AGC WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTER | | T | YPE | HEIGHT | | T | /PE | |
| INDUT VOLTAGE II TO AC INPUT VOLTAGE II TO AC IZO D TX. FREQUENCY RY FREQUENCY LAG MAZ RX. FREQUENCY RX. FREQUENCY RX. GAIN SETTING WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS INPUT VOLTAGE II TO AC IZO D TX. FREQUENCY LAG MIN SETTING RX. GAIN SETTING AGC WEATHER CONDITIONS COOL SCATTERED | A TENNA | WI | +16 | 20' | ANTENNA | VERTIC | AL LPLS | 10' |
| REFREQUENCY L29 MHZ RX. FREQUENCY L41 MHZ RX. GAIN SETTING WEATHER CONDITIONS COOL SEATTERED WEATHER CONDITIONS COOL SEATTERED | IN UT VOLTAGE | | 1170 | AC | INPUT VOLTAGE | リマン | | |
| REGAIN SETTING ALC WEATHER CONDITIONS COOL SEATTERED WEATHER CONDITIONS COOL SCATTERED | T. FREQUENCY | | 441 | MHZ | TX. FREQUENCY | | | |
| WEATHER CONDITIONS COOL SCATTERED WEATHER CONDITIONS COOL SCATTER | | | 429 | MHZ | RX. FREQUENCY | | 441 | MHZ |
| COOL SEATION | RAGAIN SETTING AGC | | ٩ | RX. GAIN SETTING | | | | |
| | WEATHER CONDITIONS | | COOL | SCATTERED | WEATHER CONDIT | TIONS | COOL | SCATTERD |
| 1 | | | -CL | 000 | | | l . | |
| | | | | | | | | |

| O SERVED RANGE IN CALIBRATE: | 5.999 KM | |
|------------------------------|----------|---|
| COMPUTED SLANT RANGE: | | |
| : OBILE ZERO SETTING IS: | 4.995 KM | |
| OBSERVED RANGE IN OPERATE: | 1.004 KM | TIME: 1722 |
| | | • |

- 1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
- 2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
- 3. Each report will be complete in itself. Do not refer to other reports for information.
- 4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

MAXIRAN CALIBRATION REPORT

| | MOBILE | STATION | | BASE STATION | | | | |
|-----------------|--------|---------------|------------|----------------------|--------|--------------------|---------------|--|
| LC ATION: | CROL | 25 H | الــــ | LOCATION: CROWS HILL | | | | |
| OPERATOR: A | | GART | | | BRID | | | |
| UNIT | | DEL | SERIAL No. | UNIT | 1 | DEL | SERIAL No. | |
| MONITOR | NM | M-018 | 041 | BEACON | NTL. | 01 | OO 6 CODE 1 | |
| INERROGATOR | | 1 -01 | 050 | CONTROL BOX | NICL | -01 | 109 | |
| AMPLIFIER | | | | AMPLIFIER | NTO | 1-01 | 016 | |
| APPLIFIER P/S | | | | AMPLIFIER P/S | NCL | 1-01 | 018 | |
| PREAMP | | | | PREAMP | SAU- | -12 | 145 | |
| c/= v | | YPE | LENGTH | COAX TX | 1 | YPE | LENGTH | |
| cdx | | Drews Rg-8 | 74, | | | 1 /R4-8 US /R48 | 74 / 29 / | |
| | Τ | YPE . | HEIGHT | ANTENNA | T | /PE | HEIGHT | |
| AITENNA | · W | H . P | 20' | ANTENNA | VERTIC | AL LP.LG | 10' | |
| INPUT VOLTAGE | | 117 | I U AC | INPUT VOLTAGE | | 1170 | AC 12UDG | |
| TREQUENCY | | 44 | 1 MHZ | TX. FREQUENCY | | 429 | MHZ | |
| RX. FREQUENCY | | 42 | 9 MHZ | RX. FREQUENCY | | 441 | MHZ | |
| RZ GAIN SETTING | | | <i>۽</i> و | RX. GAIN SETTING | | MIN FO | R BEST SIGNAL | |
| WEATHER CONDIT | IONS | COOL | SCATTERED | WEATHER CONDIT | TIONS | AS | | |
| | | CLOU | D | | | | | |
| | | | | | | | • | |

| OBSERVED RANGE IN CALIBRATE: | 6.001 KI | vi - |
|------------------------------|----------|---------------|
| COMPUTED SLANT RANGE: | | |
| MOBILE ZERO SETTING IS: | , 007 | |
| OF FRYED RANGE IN OPERATE: | _ | N TIME: 17.11 |

signed: applying -

- 1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
- 2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
- 3. Each report will be complete in itself. Do not refer to other reports for information.
- 4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

V. WELL LOCATION INFORMATION

The following information pertains to the positioning of the D/V DIAMOND M EPOCH on Well Location DISCOVERY BAY #1.

Coordinates of the desired location were obtained from PHILLIPS as:

(Line op 80-17, Shotpoint 1080)
Latitude 38°24'37".97 S N = 5,748,615 meters
Longitude 141°04'23".12 E E = 506,381 meters

The D/V DIAMOND M EPOCH was secured on location, and the following final Maxiran ranges were recorded at 2130 hours 22 September 1982, with the Maxiran mobile equipment installed on board the rig:

Sta. C. Bridgewater to mobile antenna 29.307 kilometers Sta. Jones Ridge to mobile antenna 44.976 kilometers Sta. Mount Ruskin to mobile antenna 41.422 kilometers

At the time these final Maxiran ranges were recorded, the drill stem was 36 meters, at a bearing of 125° True, from the Maxiran mobile antenna.

V. WELL LOCATION INFORMATION (continued)

FINAL COMPUTED COORDINATES - WELL DISCOVERY BAY #1: (Drill stem)

Latitude $38^{\circ}24'42".90 \text{ S}$ N = 5,748,463 meters Longitude $141^{\circ}04'21".10 \text{ E}$ E = 506,332 meters Least square adjusted tie = 0.5 meter From desired to final position = 160 meters @ 198°

Coordinates of the desired and final position are expressed in the Universal Transverse Mercator Projection,
Australian National Spheroid of Reference, Zone 54,
Central Meridian 141° East, AUSTRALIAN GEODETIC DATUM.

VI. BASIC CONTROL

Coordinates of the two Maxiran base stations, occupied to control this survey, were obtained from the ONA Basic Control files.

Universal Transverse Mercator Projection Australian National Spheroid Zone 54 Central Meridian 141° East AUSTRALIAN GEODETIC DATUM

STATION CAPE BRIDGEWATER:

Latitude $38^{\circ}23^{\circ}17^{\circ}21^{\circ}8$

STATION JONES RIDGE:

Latitude $38^{\circ}02'37".35$ S N = 5,789,282 meters Longitude $141^{\circ}17'13".40$ E E = 525,188 meters Elevation 140 meters

STATION MOUNT RUSKIN:

Latitude $38^{\circ}02'54"56 \text{ S}$ N = 5,788,789 metersLongitude $140^{\circ}57'49"58 \text{ E}$ E = 496,821 metersElevation 38 meters

VII. PERSONNEL

NAME

POSITION

Bridges, H.

Party Chief

Hoggart, A.

Mobile Operator

Thieman, C.

Base Operator

Walsh, S.

Base Operator

Wells, G.

Base Operator

VIII. DISTRIBUTION

Phillips Australian Oil Company 23rd Floor, City Centre Tower 48 St. Georges Terrace Perth, W.A. 6000 AUSTRALIA

Four copies

Offshore Navigation, Inc. Post Office Box 23504 Harahan, Louisiana 70183 U.S.A.

Two copies

Offshore Navigation (Australia) Pty. Ltd. Post Office Box 291 Cloverdale, W.A. 6105 AUSTRALIA

One copy

OFFSHORE NAVIGATION (AUSTRALIA) PTY. LTD.

STATION: CAPE BRIDGEWATER

LOCATED: The station is located near the township of Cape Bridgewater, approximately 19 kilometers west of Portland, Victoria, Australia.

ACCESS: From Portland, drive 19 kilometers west towards Cape Bridgewater. On entering the town, turn left at the first intersection past the school. Drive on this road, and make a hard turn to the right. Just after making this hard right turn, a house will be seen to your left. Follow the track, as indicated in the sketch, to the station.

MARKER: The physical description of the marker was not submitted from the field operations. The station is on the property of Mr. J. Boyle, who lives in the house at the junction of the road and track. He should be able to point out the marker. The Maxiran tower was erected 2 meters, at a bearing of 090° Magnetic, from the marker.

GENERAL: A 40-foot tower was erected at this station. A minimum tower height of 20 feet is required to clear surrounding obstructions. Clear vista has not been reported. Star stakes were used to secure the tower.

Mr. J. Boyle can be contacted at telephone number 055-26-7213. Permission must be obtained from Mr. Boyle to set a station on his property. No rent was paid for the use of the property.

ELEVATION: 135 meters

SKETCH: See next page.

Coordinates of the trig marker were obtained from the Lands & Surveys Department, Victoria.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID ZONE 54, C.M. 141° EAST ---- A.G.D.

Lat. $38^{\circ}23'17".21 \text{ S}$ N = 5,751,029 meters Long. $141^{\circ}24'22".81 \text{ E}$ = 535,487 meters

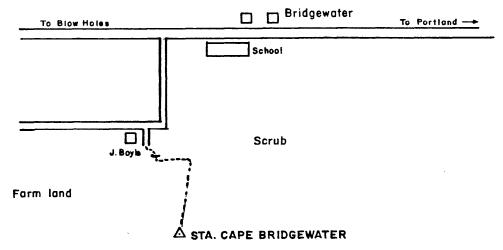
STA. CAPE BRIDGEWATER ------ AUSTRALIA

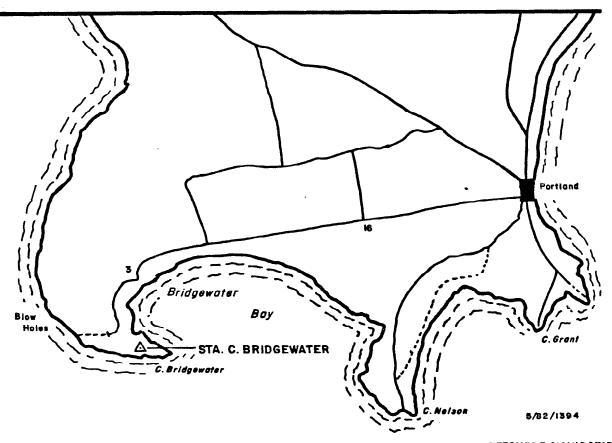
LAT. 38°23' 17"21 S LONG. 141924 22 81 E N 5,751,029 meters 535,487 meters E

ELEV. 135 meters

UTM PROJECTION, ZONE 54

AUST. NAT. SPHEROID C. M. 141° E AUSTRALIAN GEODETIC DATUM





OFFSHORE HAVIGATION (AUSTRALIA) PTY. LTD. STATION: JONES RIDGE

LOCATED:

Station Jones Ridge is located 45.2 kilometers by road from Portland, Victoria, Australia, and 11.5 kilometers from Winnap. The station marker is on a grassy ridge on the east of the Winnap - Nelson Road. A forestry tower is also on the ridge, and the station marker is some 160 meters to the south-southeast of the tower. The tower can be seen from the road. The ground at the station is very rocky.

ACCESS:

Two access routes are given for this station, one access from Winnap, and another from Portland.

FROM WINNAP, set the odometer at 0.00 kilometer at the Winnap Store, and proceed towards Heywood. Turn right onto the Drik Drik Road at 0.1 kilometer, and cross a narrow bridge at 0.3 kilometer. Continue straight at 0.4 kilometer, where a road on the left will be encountered. Continue on Drik Drik Road, passing Liddles Lane (3.0 kilometer), Clarkes Road (4.8 kilometers), Drik Drik Cemetery (5.4 kilometers), and a scenic lookout on the righthand side of the road at 11.0 kilometers. At 11.5 kilometers, turn left into a gateway. Take the righthand gate, and proceed along a track to the next gate. Go through this gate and pass the remains of a bluestone cottage on the left, through another gate, and up the ridge to the station site.

FROM PORTLAND, set the odometer at 0.00 kilometer at the Portland Post Office, and proceed north on the Henry Highway, turning left onto the signposted Nelson Road at 2.65 kilometers. Drive on Nelson Road, crossing a railroad track at 3.85 kilometers, the junction with Gorea West Road at 16.4 kilometers, a scenic lookout on the left at 32.7 kilometers, to a junction at 58.8 kilometers. Take the right fork at this junction, and drive on Drik Drik Road to 69.1 kilometers, and the gate. Turn right into this gate and follow the route described in the Winnap Access.

STATION: JONES RIDGE (continued)

MARKER: The trig marker consists of a block concrete ground marker (No. 80502), with a 4.34-meter quadruped beacon sitting above the marker.

GENERAL: All supplies, including water and labor, can be obtained in Portland.

> The station site is on property owned by Mr. Phil Jones, 1164 Princess Highway, Mumbannar. Mr. Jones' phone number is Dartmoor 286264. Permission to occupy the station must be obtained from Mr. Jones. No rent was paid for the use of the property.

> A 40-foot tower was erected at this station, the minimum height required to clear surrounding obstructions. Star stakes were used to secure the tower.

ELEVATION: 140 meters

SKETCH: See next page.

> Coordinates of the trig marker were obtained from the Lands & Surveys Department, Victoria.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID ZONE 54, C.M. 141° EAST ----- A.G.D.

38°02'37"35 S N = 5,789,282 metersLong. 141°17'13"40 E E = 525,188 meters

> OFFSHORE NAVIGATION (AUSTRALIA) PTY, LTD.

STA. JONES RIDGE-

-AUSTRALIA

PHILLIPS COORDINATES

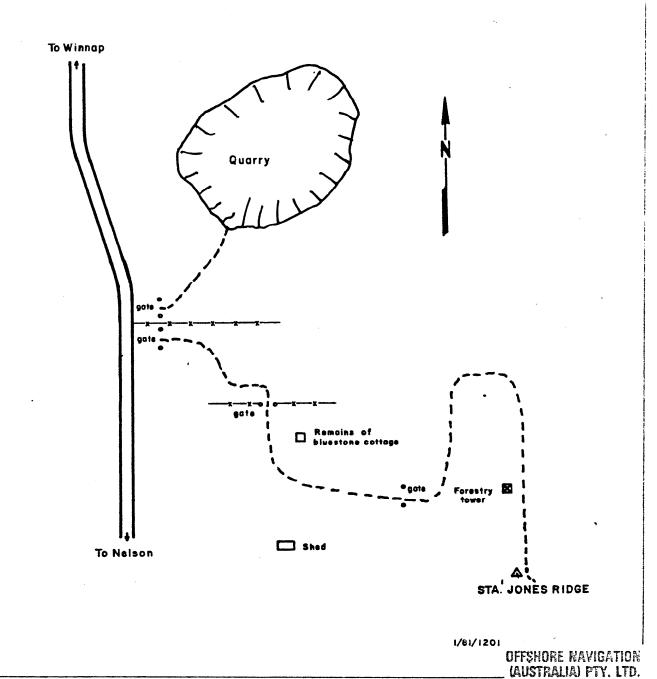
LAT. 38°02' 37"35 S LONG. 141º 17' 13"40 E

5,789,282 meters 525, 188 meters

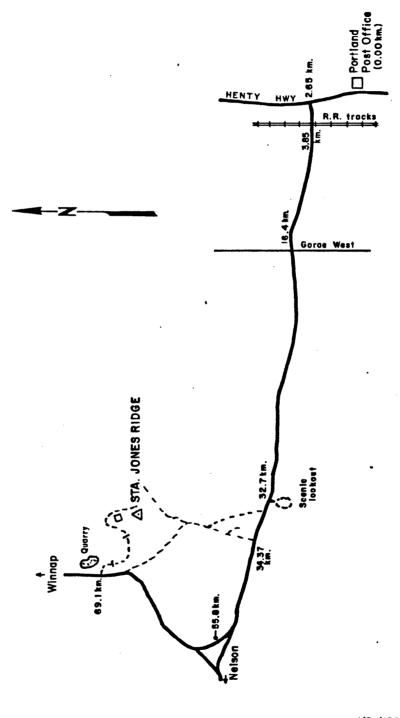
ELEV. 140 meters

UTM PROJECTION, ZONE 54

AUST. NAT. SPHEROID C. M. 141° E AUSTRALIAN GEODETIC DATUM



STA. JONES RIDGE————AUSTRALIA <u>ACCESS—FROM PORTLAND</u>



OFFSHORE MAYIGATION
(AUSTRALIA) PTV. LTD

STA. JONES RIDGE -----AUSTRALIA ACCESS --- FROM WINNAP innap ore (00.00 km) △ STA. JONES RIDGE 1/81/1201 OFFSHORE NAVIGATION (AUSTRALIA) PTY. LTD.

STATION: MOUNT RUSKIN

LOCATED:

Station Mount Ruskin is located on the Victoria-South Australia border, about 4 miles west of the township of Nelson, Victoria. The station is on a prominent hill, which can be seen from the Port Nelson - Mount Gambier Highway at the border sign. The station is in a large paddock on the farm of Mr. Max Holaway.

ACCESS:

From the Portland, Victoria General Post Office building, set the vehicle's odometer to 0.00 kilometer, and travel on the North Princess Highway for 2.7 kilometers to a Shell garage. Turn left at this point, remaining on the Princess Highway, and drive to Nelson. At 65.2 kilometers, and in the township of Nelson, a Mobil garage will be passed. Continue on the Princess Highway, crossing a bridge that is over the Elenee River at 65.5 kilometers, pass the entrance to Mr. Holaway's house at 68.5 kilometers, and drive to a gate on the lefthand side of the road at 69.3 kilometers, just past the Victoria - South Australia border. Turn left and go through the gate. Follow the track from the gate to the station, a distance of 1.4 kilometers. A four-wheel drive vehicle is required to negotiate the track during periods of wet weather.

MARKER:

The station marker consists of a standard Victorian Department of Lands & Surveys marker, a circular concrete wheel with a metal pin in its center. A 12-foot steel quadruped sits over the marker.

Mr. Holaway's house is located approximately 1 kilometer, at a bearing of 080°, from the marker. A windmill and tank is approximately one-half kilometer away from the marker, at a bearing of 180°.

**

STATION: MOUNT RUSKIN (continued)

GENERAL:

All food, fuel, oil, and water supplies can be purchased in either Nelson or Portland. Water from the bores in the station area is suitable for drinking. Labor is available in Portland at approximately \$40.00 per day.

The station property owner, Mr. Max Holaway, must be notified when this station is to be occupied, and permission obtained. No rent was paid for the use of the property.

A 60-foot tower was erected at this station. A minimum tower height of 40 feet is required to clear surrounding obstructions. Clear vista is from 120° to 250°. Double star stakes are required to secure the tower, due to strong winds that can be experienced in this area. Difficulty can be experienced in trying to keep a tent up in these winds. A caravan, to house the equipment and operator, is required.

ELEVATION: 38 meters

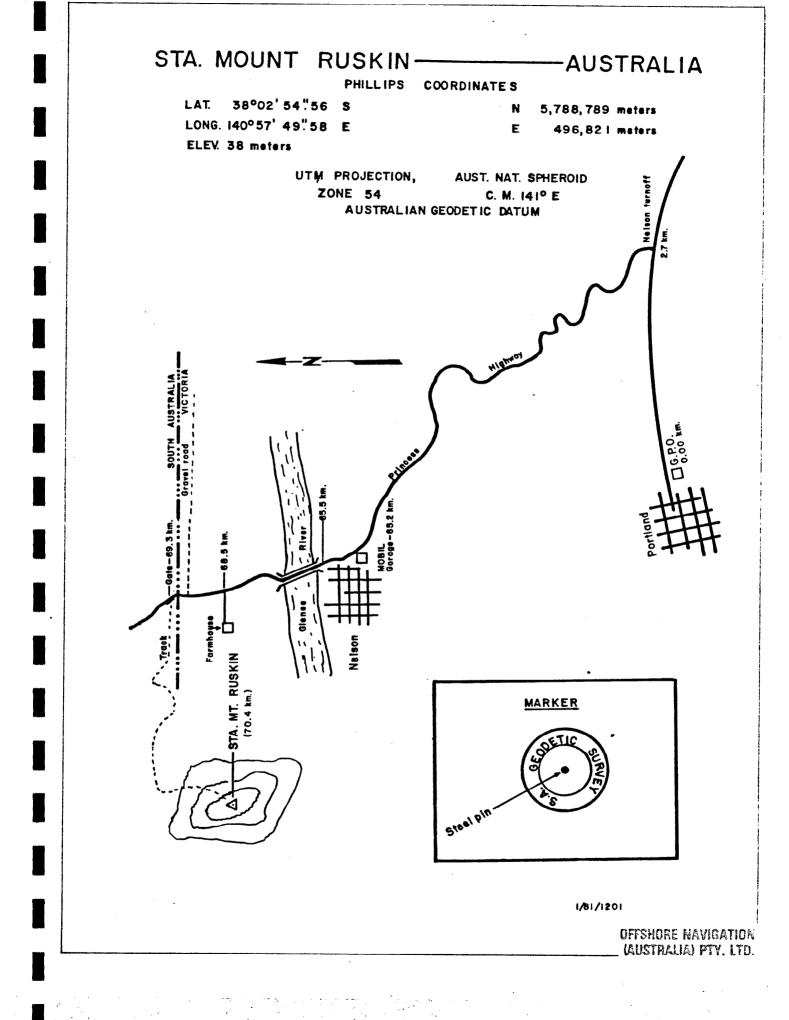
SKETCH: See next page.

Coordinates of the trig marker were obtained from the Lands & Surveys Department, Victoria.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID ZONE 54, C.M. 141° EAST ----- A.G.D.

Lat. $38^{\circ}02'54".56$ S N = 5,788,789 meters Long. $140^{\circ}57'49".58$ E = 496,821 meters

OFFSHORE NAVIGATION (AUSTRALIA) PTY. LTD.



WELL DISCOVERY BAY No.I ------AUSTRALIA

LAT. 38°24' 42"90 S LONG. 141º 04' 21". 10 E

N 5,748,463 meters 506,332 meters

ZONE 52

UTM PROJECTION, AUST. NAT. SPHEROID C. M. 129° E AUSTRALIAN GEODETIC DATUM

143° + 37°

VICTORIA

STA. JONES RIDGE STA. MT. RUSKIN STA CROWS HILL DISCOVERY BAY No.1 Great Australian Bight 9/82/1419

> OFFSHORE RAVIGATION (AUSTRALIA) PTY, LTD.

APPENDIX A

DAILY OPERATIONS LOGS

OFFSHORE NAVIGATION INC. MAXIRAN DAILY OPERATIONS LOG

| physical npany | | Area/ | | Company | PHILLIP | <u> </u> | Radio Frequency 70. | 40 KHZ |
|---------------------------------------|-----------------------|------------------------|---|---|---|---|---------------------------------------|--------------|
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| 00116 | REQUENC' | | INTERROGAT | TOR | MONITOR | AMPLIFI | ER AI | NTENNA SYSTE |
| ation | 141 M4 | ک | 009 | | 041 | | | 7H16 |
| Dioi | | * | 0 | | TATIONS | | 1 . | |
| Position | | | Operator | Frequency | Beacon · | Amplifier | Code | Delay |
| r Rus | KIN | C·T | HEIMAN | 429 MHZ | 036 | 036 | 5 | 4.996 |
| ones Ri | DGE | G. W | ELLS | 429 mHZ | 010 | 032 | | 4.995 |
| RIDGEWA | TER | 5. B | WALS H | 429 442 | 067 | 016 | 3 | 4.996 |
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OFFSHORE NAVIGATION INC. MAXIRAN DAILY OPERATIONS LOG

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| | | | T | TATIONS | | | |
| Position | | Operator | Frequency | Beacon | Amplifier | , Code | Delay |
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| WES RI | DGG G. | WELLS | 429 MHZ | 010 | 032 | 1 | 4.995 |
| RIDGEWA | TER S. | WELLS RAYNE | 429 MHZ | 067 | 016 | 3 | 4.996 |
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OFFSHORE NAVIGATION INC. MAXIRAN DAILY OPERATIONS LOG

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| ophysical mosey | | | Oil Company | PHILLIPS | | Radio Frequency | 7840 KHZ |
| untry AUSTR | ALIAPro | spect VIC/P1 | 4 | Stepback | ••••• | Shot Point | *************************************** |
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| tation 44 | 1 MHZ | 009 | | 041 | | | WHIP |
| | | | | TATIONS | | | |
| Position | | Operator | Frequency | Beacon | Amplifier | , Cod | e Delay |
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| NES RIE | 24E G. | WELLS | 429 MNZ | 010 | 032 | | 4.995 |
| RIDGE UT | TER S. | PHALSH | 429 MHZ | 067 | 016 | 3 | 4.996 |
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| 230 M | NET ON BRIDGE TOPF IET ON JONE IET ON | I RECEIVE RIDGE | IVING LID AT IN & M | MT RUSH 205 KIN T RUSKIN | Y ISR | K AT O Jon IDGGWA | es Ridge |
| 230 M | NET ON BRIDGE TOPF IET ON JONE IET ON | I RECEIVE RIDGE | IVING LID AT IN & M | MT RUSH 205 KIN T RUSKIN | Y ISR | K AT O Jon IDGGWA | es Ridge |
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| | This form is to be filled out completely for each day that the crew, or any member thereof, is in a work status. |
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APPENDIX B

THE MAXIRAN RADIOPOSITIONING SYSTEM

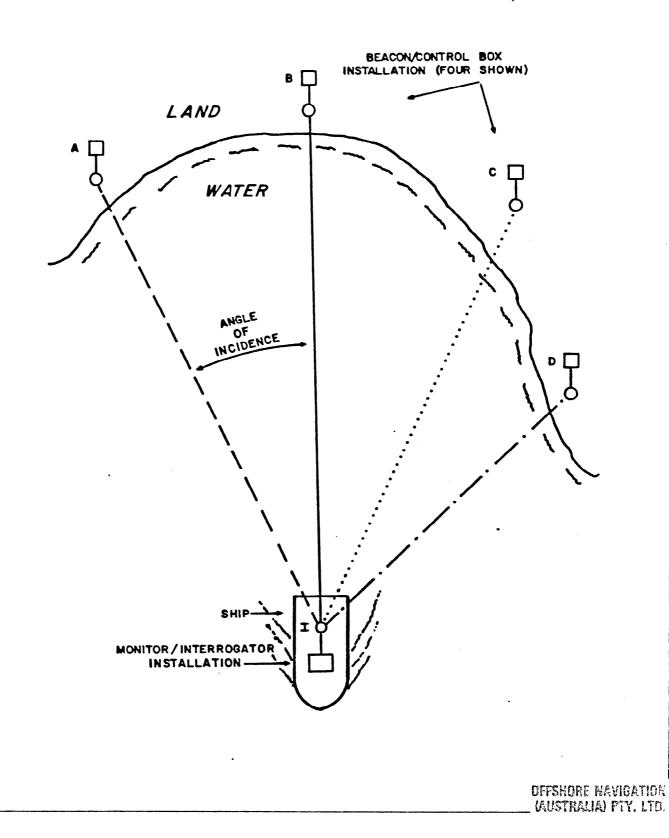
I. THE MAXIRAN RADIOPOSITIONING SYSTEM

The Maxiran Radiopositioning System is a precision electronic ranging system, capable of both manual and automatic tracking of range. It is especially useful for measuring distances across bodies of water.

The use of the Maxiran requires three or more electronic installations. For the purposes of this discussion, one of these installations is assumed to be aboard a ship (see Figure 1). This installation consists of the Maxiran Monitor and Interrogator. The other installations are located onshore. Each of these installations consist of a Maxiran Beacon and a Control Box. There are two or more of the Beacon Control Box installations situated at appropriate locations onshore.

In operation, the Monitor/Interrogator installation transmits a radio signal (containing a Beacon-Select code which addresses a selected Beacon) which is picked up by all of the Beacon/Control Box installations. Each Beacon decodes the received signal and decides whether the Beacon-Select code transmitted corresponds to that Beacon. If the Beacon-Select code is correct for a

FIGURE-I. TYPICAL MAXIRAN SYSTEM

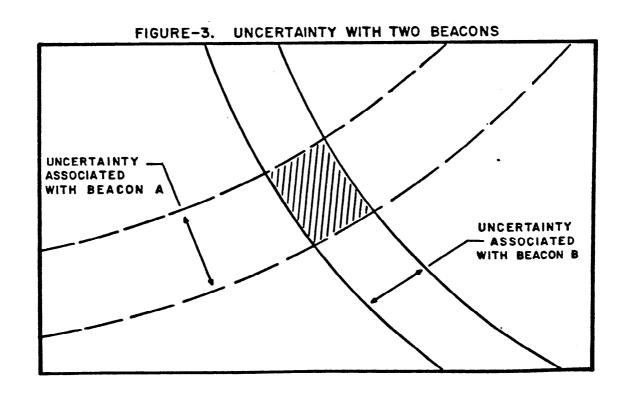


Beacon, it responds by transmitting a radio signal reply. The Monitor measures the amount of time elapsed between the Interrogator's transmission and the received reply sent by the Beacon. Since, for all practical purposes, radio signals travel at a known speed, the time elapsed between transmission and response is a measure of the distance the radio signal travelled. The elapsed time is converted by the Monitor into distance and then displayed. Knowing the location of the land stations and the current distance from the ship to each of them, the position of the ship can be readily calculated.

For the purposes of this discussion, let us first assume that only two Beacons are being utilized. They are the Beacons marked "A" and "B" in Figure 1. Since the distance from Beacon "A" to the Interrogator (call it distance Al), and the distance from Beacon "B" to the Interrogator (call it distance Bl) are now known (these distances are the distances displayed on the Monitor front panel), we can use some geometry to calculate the position of the ship with reference to Beacons "A" and "B".

As illustrated in Figure 2, the distances of Al and Bl define two intersecting circles, one with a radius of length Al centered about Beacon "A", the other with radius of length Bl centered about Beacon "B". The two circles intersect at two points (marked I and I' in Figure 2). Obviously, the ship can only be located at one of the points. Since point I' happens to be located on land, we can safely assume that the ship is located at Point I.

There is always some uncertainty associated with the exact measurements of the Beacons. This is illustrated in Figure 3. Figure 3 illustrates an enlarged view of the intersection of the circles shown in Figure 2. If the tolerance of the measurements of Beacon "B" is plusor-minus 5 meters, then the two solid lines in Figure 3 are 10 meters apart. The tolerance of the measurements of Beacon "A" should be the same as that of Beacon "B", but this is not always the case due to differences in geographical location. Under the above conditions, we only know that the ship is located somewhere in the shaded area of Figure 3.

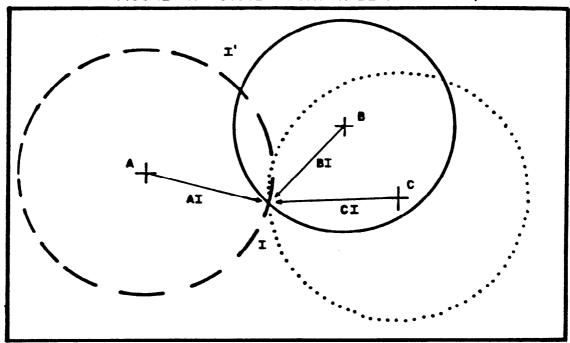


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For the purposes of the following discussion, it is assumed that there are now three Beacons utilized. Now three circles are defined, instead of the two from the discussion above. The third distance, from Beacon "C" to the Interrogator (call it distance Cl), defines a circle of radius length CI centered about Beacon "C". The new situation is illustrated in Figure 4. Notice that with the three circles, there is only one location where all three circles can intersect. This eliminates the ambiguity associated with using only two Beacons. Now there is no I' to worry about. An additional advantage of using three Beacons is illustrated in Figure 5. Now the area of uncertainty has been reduced even though the tolerance of Beacon "C"'s measurement isn't any better than that of the other Beacons.

As the ship moves along, one or more of the Beacons may become unusable for various reasons; out of range, too small or too great an operating angle, etc. If additional Beacons are situated on shore, they may be interrogated, as desired, to greatly expand the range and usability of the system.

FIGURE-4. SYSTEM WITH THREE BEACONS



UNCERTAINTY
ASSOCIATED
WITH BEACON A

UNCERTAINTY
ASSOCIATED
WITH BEACON B

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As many as three different Beacons may be selected at one time by the proper setting of the Monitor's Beacon-Select switches.