



DATA PROCESSING REPORT
FOR
1985A TP05 BASS BASIN SURVEY

FOR
AMOCO AUSTRALIA PETROLEUM COMPANY

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I. INTRODUCTION

The 1985A Amoco Bass Basin survey was recorded by G.S.I. vessel M/V Eugene McDermott II during May 1985. This survey covered 360 kms of Bass Basin permit T-18P and consisted of 15 lines.

Data quality was good apart from very strong direct arrival energy which has not been totally attenuated on the stacked sections but has been during the migration process and is not evident on the migrated sections.

Further processing techniques could be used prior to stack to reduce the coherent and random noise on the shot and CDP gather records. This could give more reliable velocity information to improve data quality on the final stack sections but have not been tested due to the extremely tight turnaround schedule for this project of 12 days to process from field tapes to final migration. Processing followed the same path as the TNK4 survey and is as close as possible to that survey.

Processing was carried out at G.S.I.'s Sydney office on a IBM 3033 computer.



II. RECORDING PARAMETERS

VESSEL - M/V Eugene McDermott II

ENERGY SOURCE

Source - Airguns
 Volume - 4075 cu in.
 Pressure - 2000 psi
 Array - 20 guns
 Array Depth - 10 metres
 Firing Interval - 30 metres

STREAMER

Length - 3600 metres
 Depth - 13 metres
 Number of groups - 240
 Hydrophones per group - 40
 Group interval - 15 metres

RECORDING INSTRUMENTS

Instruments - Trace Sequential Recorder
 Tape format - 1/2" 6250 bpi SEG D
 Record length - 6 seconds
 Sample rate - 2 milliseconds
 Lo cut filter and slope - 8 hz / 18db/oct
 Hi cut filter and slope - 128 hz / 72 db/oct
 Recording polarity - A positive pressure at the hydrophone produces a positive number on tape.



III. TEST SEQUENCE

Very few tests were carried out on the data due to tight turnaround schedules the only tests run were:

1. True amplitude recovery test
2. Post stack time variant scaling test

1. True Amplitude Recovery Test

This test was done on field records from the 1984 TNK4 survey line TNK4-15 records 246-247 so that production processing could go ahead on the 1985A survey with minimum delay.

Spherical divergence corrections were applied to the shot records during this test.

<u>Alpha Tested (db/sec)</u>	<u>Start time (msec)</u>	<u>End time (msec)</u>
3	0	6000
4	0	6000
5	0	6000
6	0	6000
7	0	6000

Decision was to use a alpha of 4 db/sec from 0 to 4000 msec.

2. Post Stack Time Variant Scaling Test

A scaling test was run to balance the amplitudes of the final stack and migrations in a similar manner to the final stack and migrations of the TNK4 survey. The following 6 comparisons were made on line TNK4-15A S.P.400-500.



	<u>Scaling Type</u>	<u>Gate Length (msec)</u>	<u>Start Time (msec)</u>
1.	Flat TVS	Variable using: 3 x 250, 1 x 500, 5 x 1000.	100
2.	Flat TVS	500	100
3.	Log TVS	250	100
4.	Log TVS	500	100
5.	DGCS *	500	100
6.	DGCS *	1000	100

* DGCS stands for Digital Gain Control Scaling



IV. PRODUCTION PROCESSING PARAMETERS

All data was processed to 6.0 seconds at 4 milliseconds but was reduced from 240 trace 60 fold to 120 trace 60 fold by a 2 on 1 mix near the beginning of the processing sequence. This mix also increased the common depthpoint interval from 7.5 metres to 15 metres.

The following processes were applied to the data in the order as they appear below:

1. Resample : The data was minimum phase resampled from 2 to 4 milliseconds.
2. Shot Static : A -51.2 millisecond shift was applied to the data to compensate the airgun delay.
3. 2 on 1 Mix : A simple 2 on 1 smash was used to reduce coherent and random noise and the data volume from 240 trace to 120 trace.
4. True Amplitude Recovery : To amplitude balance the shot records a approximate amplitude recovery scalar was applied of 4 db/second. Spherical divergence corrections were applied at this point.
5. Predeconvolution Mute : To remove excessive direct arrival noise from entering the deconvolution filter design a 96 millisecond ramp was applied from start times (msec):
0,850,2900
at offsets (metres):
390,600,3970.



6. Deconvolution : Whitening deconvolution used.
 1 x 240 msec active filter.
 Design Gates:
 Offset 386, 3971 M
 Start 200, 3500 MSEC
 End 4000, 6000 MSEC
7. Velocity Analysis : 9 depthpoint 5 function velscans were
 run at 4 km intervals to determine
 demultiple velocity function.
8. Demultiple : Frequency wavenumber domain multiple suppression was used
 with a negative F-K quadrant cutoff velocity of 67056
 m/s.
9. Velocity analysis : 9 depthpoint 5 function velscans were
 run at 2 km intervals to determine
 stacking velocity functions.
10. Normal moveout corrections : Velocities picked from Velscans
 were applied at the Velscan
 CDP location with linear inter-
 polation between these locations.
 Shot and streamer corrections of
 approximately 11 msec applied at
 this point.
11. Inside trace mute : 96 msec ramp applied.
 Offsets: 386, 626, 3971 metres
 Start times: -100, -100, -100 msec
 End times : 1200, 2800, 6000 msec



12. First break suppression ramp : 96 msec ramp applied at
 Offsets: 386, 626, 3971 M
 Start times:0, 800, 3100 MSEC
13. CDP Stack : 48 fold depthpoint stack was done using $1/N$ (square root N) recovery scalars where N is the CDP fold defined by the first break suppression ramp.
14. Migration-V7 : Kirchhoff F-K wave equation migration with a 40 degree dip limitation to reduce wavefront noise.
15. Time Variant Filtering : The following zero phase band pass filters were used, the filter points listed below are the 6 db down points
- | Frequency (Hz) | Time (Msec) |
|----------------|-------------|
| 10 - 55 | 0 |
| 8 - 40 | 2000 |
| 6 - 25 | 4000 |
| 5 - 20 | 6000 |
16. Time Variant Scaling : 1000 msec gate length digital control scalars were computed and applied to the data.
17. Final Displays :
- Trace spacing - 42.67 t/in
 - Vertical scale- 3.75 in/sec
 - Polarity - Maintained from field
 - Bias - 5 %



Respectfully submitted:

PETER CARVER
(PROCESSING PARTY CHIEF)

LOCATION MAP OF 1985A SURVEY

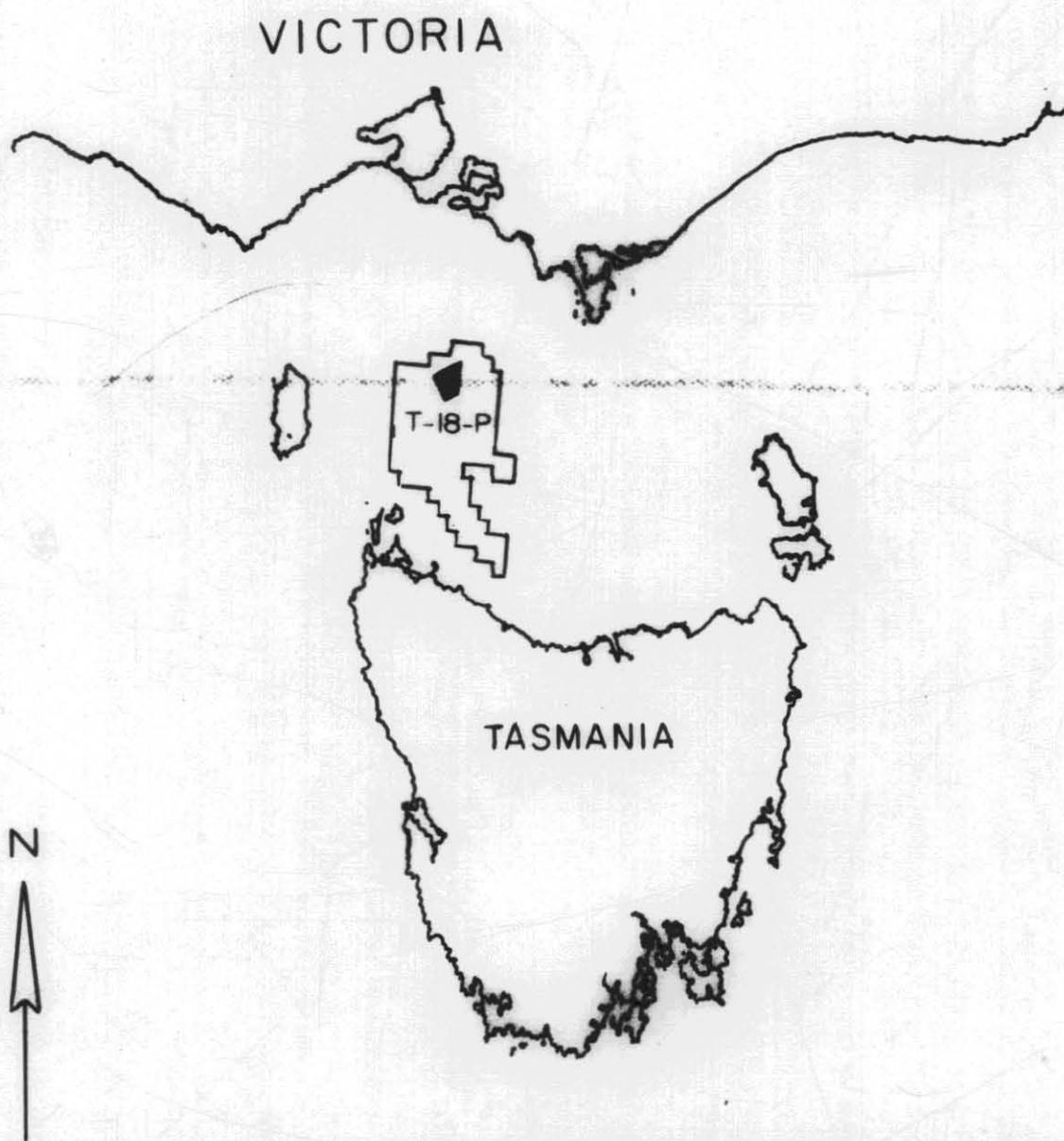


FIGURE 1



PROCESSING FLOW DIAGRAM

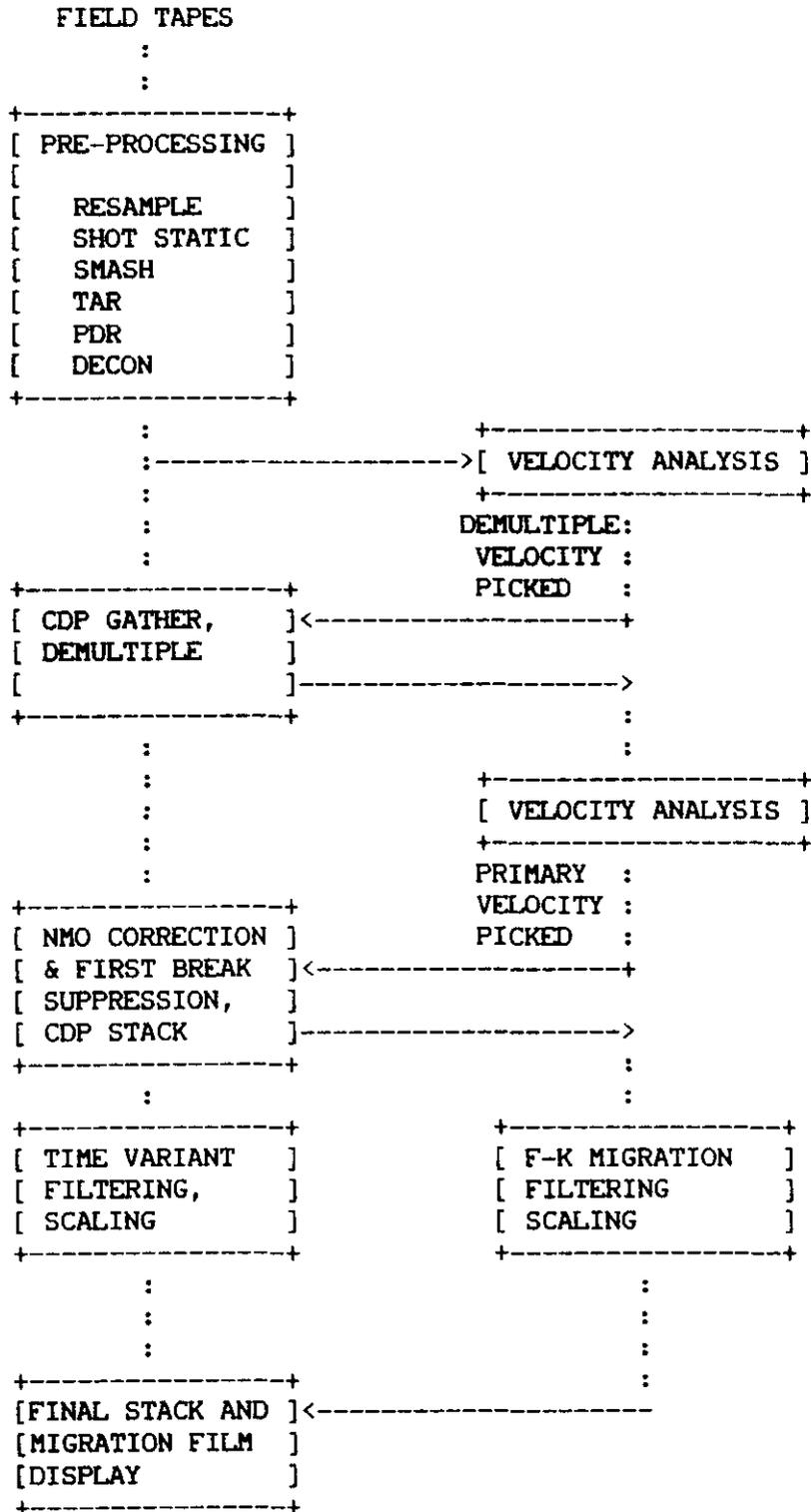


FIGURE 2

A. SEG-Y TRANSCRIPTION INVENTORY

Raw stack data for the following lines was transcribed to 32 bit,
in SEG-Y format at 6250 BPI.

<u>LINE</u>	<u>SHOTPOINT RANGE</u>	<u>CDP RANGE</u>	<u>TAPE NUMBER</u>
TP05-1	1 TO 826	1001 TO 2770	520104
TP05-2	1 TO 830	1001 TO 2778	520104
TP05-3	1 TO 1128	1001 TO 3374	520104
TP05-4	1 TO 724	1001 TO 2566	520104
TP05-5	1 TO 1102	1001 TO 3322	520104
TP05-6	1 TO 643	1001 TO 2404	520104
TP05-7	1 TO 874	1001 TO 2866	520104
TP05-8	1 TO 593	1001 TO 2304	520104
TP05-9	1 to 844	1001 TO 2806	520508
TP05-10	1 TO 593	1001 TO 2304	520508
TP05-11	1 TO 844	1001 TO 2806	520508
TP05-13	1 TO 814	1001 TO 2746	520508
TNK4-15A	300 TO 632	1001 TO 1784	520508
TP05-15	1 TO 696	1001 TO 2510	520508
TP05-17A	1 TO 583	1001 TO 2284	520508
TP05-51C	1 TO 554	1001 TO 2226	520508



B. PROCESS DESCRIPTION

TRUE AMPLITUDE RECOVERY (TAR)

The TAR process is applied to digital field records to produce output records on which relative amplitudes of reflections on each trace are approximately true and traces evenly modulated. This consists of correcting for inelastic attenuation and spherical divergence losses.

VELOCITY FILTERING (VEF)

Velocity filtering is a multichannel process. Multichannel filtering is a two-dimensional frequency-wavenumber filtering operation that can be used to discriminate against specified velocities on pre-stacked data or against specified dips on stacked data.

Velocity filtering processes transform the data from the space time (X-T) domain to the frequency-wavenumber (F-K, where K = reciprocal of wavelength) domain where the filter is applied. After filter application the process transforms back to the X-T domain for further conventional process applications.

The apparent velocity of noise must be adequately separated from the primary signal for the process to be effective. Examples of noise alignment that can be removed are hard bottom refraction, mud roll and cable jerk. These types of noise alignments have a velocity slower than primary signal or have a dip opposite from the primary.

A window of primary dip zones to keep is specified and dips outside this window are rejected.



A linear event in the X-T domain (implying constant velocity) appear as a linear event in the F-K domain where lines of constant velocity pass through the origin. Thus, a multitude of noise events, with the same velocity, at various times on the input record join on the F-K plane into a single event. In general seismic reflections (signal) have higher apparent velocities than noise propating horizontally in a direct path from source to receiver; therefore, recorded signal appears in a different region of the F-K plane from the noise.

This provides the basis for signal-to-noise enhancement used in velocity filtering. The process is analogous to muting in X-T.

Aliasing both in the frequency and wavenumber axes can be predicted from the time sampling period and the spatial sampling (or group interval) of the input data. Spatial sampling determines, to a large extent, the effectiveness of the process. Velocity filtering attenuates some portions of alaised events. However, when aliased noise overlays signal, velocity filtering loses its discriminating power.

DEMULATE PROCESSES

These processes are carried out in the frequency domain using multi-channel filtering technique to attentuate water-layer multiples and other multiples.

DEMULT (DMT)

Demult is a multiple attenuation process designed to be used in cases of severe pegleg or interbed multiple situations.

It is used where the simpler routines designed to automatically attentuate pegleg multiples, based on the water bottom, are considered inadequate. A multiple velocity function, derived from a preliminary velocity analysis of the primary events, must be supplied in each case.



DEPEG (DEP)

The program computes the first order pegleg function as the multiple function based on the users' supplied primary velocity.

Demult operates by using the multiple velocity function to apply NMO corrections to the CDP record. Velocity filtering is then applied to the data, and since the multiples should now all be horizontal and have the same apparent velocity these can be discriminated against.

Depeg uses the primary function to apply NMO corrections. Velocity filtering is then applied to the data to discriminate against the multiples that are undercorrected by the primary velocity function.

The multiple-free output from velocity filtering then only requires the removal of the multiple NMO corrections to restore it to its original state, minus the multiples, before processing continues.

DESIGNATURE (DESIG V4)

Designature is a generic name for processes which attempt to replace an arbitrary source wavelet convolved with the reflection sequence with a shorter wavelet of improved resolving capability.

DESIG V4 is the particular designature process in the current VELFILT program and provides an alternative to conventional pre-CDP stack deconvolution (TVD). DESIG V4 is a multichannel process, like VELFILT that can use the entire record to estimate the wavelet, whereas TVD is a single channel process that only uses a portion of a trace to design an operator. While TVD is time and offset-variant DESIG V4 is not time-variant.



DESIG V4 can better account for the source and receiver ghosts found in marine data than TVD can.

Once the signal-to-noise ratio of the primary events is improved by velocity filtering, designature is applied in the common source point domain. Designature estimates the source wavelet from the seismic traces and attempts to collapse it to a zero phase pulse.

PREDECONVOLUTION RAMP (PDR)

PDR is the process whereby first arrival unwanted noise at the front end of seismic records is removed. This is applied prior to deconvolution/Designature design.

TIME VARIANT DECONVOLUTION (TVD)

The purpose of TVD is to take reverberating series of wavelets and reduce them to the time domain spike and this implies normalising the frequency spectrum. At the same time TVD is desirable to collapse and stabilise wavelet shapes from broad or variable input wavelets.

TVD is accomplished by the application of one or more filters designed from individual data trace autocorrelation functions.

Gapped TVD is the process of deconvolution without total spectral whitening. This is opposed to Spike TVD which gives total spectral whitening. This means the frequency spectrum in Gapped deconvolution will show that the high frequency noise area is not amplified.

VELOCITY ANALYSIS

As part of any velocity analysis routine, static corrections to compensate for shot and cable depth, and multiplexor delays are applied.



CONTINUOUS (SUPASCAT)

Every depth point is utilised in this process. The program reads every CDP gather record and performs the following:-

- 0 Time Variant Filtering
- 0 Equalisation
- 0 Moveout and dip-scan building
- 0 Interpolation of moveout/dip scans to detect valid events with time, amplitude, moveout and dip information.
- 0 Outputs to magnetic tape the Pick/Event files for each space/time gate.

Consolidation of consecutive pick/event files comes after moveout and dip-scan building and this is accomplished via event correlation based on time, moveout and dip. A length attribute is calculated based on the smash rate and number of events that are correlated to produce the pick in the consolidated pick file. Outputs of consolidated pick files contain attributes of time, moveout, dip and length. To produce the consolidated file, 5 Pick/Event files are smashed, giving an effective spatial coverage of 25 depth points per Supascats output. This output was displayed in scattergram form only, with no associated seismic data display.

DISCRETE (VELSCAN)

GSI's VELSCAN Velocity Module is a discrete Velocity Analysis mode making use of advanced picking logic to generate events as functions of time, amplitude, moveout and dip. The event picking proceeds in the following manner:

- . NMO corrections corresponding to a series of moveout functions are applied to a set of depth point traces. For each moveout function, the NMO-corrected traces are stacked. The resulting traces consist of amplitudes as functions of time and moveout.



- . Identical operations are applied to adjacent depth points, adding the dimension of space.
- . Dip is applied and for each value of dip, the traces are stacked across depth points. The result is a set of amplitudes as functions of time, moveout and dip.
- . An event is located by searching for an amplitude extremum in the time, moveout and dip domains. An extremum may be either a maximum or minimum; that is, both peaks and troughs are picked. The event attributes of time, amplitude, moveout and dip are assigned to the centre depth point.

NORMAL MOVEOUT CORRECTIONS (NMO)

Reflection arrival times at the surface, from a horizontal reflecting interface, increase with offset from seismic source in a predictable manner known as the normal moveout effect. NMO at a given location is a function of offset, depth to the reflector and the velocity of the medium between the reflector and the surface.

NMO corrections remove the NMO increase in reflection times with offset (or spread geometry) and reduce all reflection times to the value they would have if source and receiver were coincident.

NMO corrections involve some stretching of the data. This is greatest at early record times but decreases with increasing record time. In order to avoid gross distortion at early record time, ramps are applied to zero out the early part of the traces where NMO is excessive and to phase in the NMO corrections gradually.



COMMON DEPTH POINT STACK (CDP STACK)

The common depth-point stack is the summation of all the traces of a common depth point into one stacked output trace for each depth point. This summation is performed after the application of NMO and static corrections to each of the individual traces. If these corrections are appropriate then trace signals will reinforce whilst random noise will fail to reinforce. The improvement in signal-to-noise (S/N) ratio of a stacked trace compared to the input traces is theoretically equal to the square root of N, where N is the number of traces summed together. Thus, if the fold of stack is 48 fold, then the improvement is approximately 7.

In addition to improving the S/N ratio, stacking can also attenuate or suppress undesired reflection events such as multiple reflections. This is because an appropriately applied MO correction will only partially correct multiple reflections so that they will not reinforce when summed but will suffer destructive interference to some degree.

In practice, the early live portion of the NMO output traces have more distortion than is acceptable. For this and possibly other reasons, a ramp function is applied to the input traces before summation. Each trace may have up to three ramps applied to it to accept or reject portions of the input trace as desired. Quite commonly short offset traces are rejected at depth to improve multiple attenuation.

To accommodate the varying summation, or fold, implicit in this ramping a recovery scaler is applied to normalise the energy output level to that of the full fold stack.



TIME VARIANT FILTERING (TVF)

Filtering is commonly applied in a time variant manner to take account of the higher frequency content of the shallow seismic signal and the lower frequency content at depth when rejecting unwanted frequencies, or noise.

By appropriate filter design, unwanted frequencies may be attenuated, or removed, the most common application is the band-pass filter which discriminates against the high and low frequency spectrum of the input trace where no significant signal energy is present.

TIME VARIANT SCALING (TVS)

Time Variant Scaling (TVS) produces amplitude equalisation in a time variant manner down the seismic trace as well as from trace to trace. Up to 100 time gates can be used to compute time variant scalers for each gate to raise all gates to the same energy level. Design gates for the scalers may not overlap.

Scalers computed for each gate are applied at the gate centre, with linear interpolation between gate centres.

Gate amplitudes are measured for a set of continuous gates on each trace and scalers are computed for each gate to make the amplitude constant or proportional to the amplitudes. The scalers are applied in a continuously time-varying manner.



Following is a brief description of post stack Wavelet Processes:

QCOMP

This process is designed as a complement to the Designature process which is not time variant. It compensates for the frequency dependent energy attenuation caused by absorption in rocks.

TRANSCOMP

This term covers a suite of 3 separate post stack processes which may be applied individually or in combination with each other. The 3 processes are *GAP, TCOMP, and NMP and are described below.

*GAP

This process is designed to deconvolve medium period multiples, with periods between about 100 milliseconds and 1 second. The trace data in user selected space variant time gates is transformed into the cepstral domain, where the multiple energy for a specified multiple period can be isolated by a simple subtraction process. This multiple data is then inverse transformed back to the frequency domain, where it gives the power spectrum of the multiple sequence. Since the multiples are a minimum phase effect, their phase spectrum can be computed from their power spectrum, and an inverse filter designed to attenuate the multiples. Filters are designed in this way for each time gate on each trace, and then applied in a time and space variant manner. This process is designed to attenuate only one multiple period, which is supplied by the user, and can be space variant.



TCOMP

This is a post-stack time-variant deconvolution process designed to correct for the minimum phase transmission effects that result from interbed and short period multiples. Ideally, the input data has been processed through DESIG which has collapsed the time-invariant, geology-independent shot wavelet to a zero phase band-limited pulse. Shallow data, where transmission effects are minimal, should have a relatively flat spectrum, while deeper data will show increasing transmission effects, resulting in increased high frequency attenuation. The transmission effect is isolated by using power spectral ratios for user specified time gates to define spectra from which the filters are designed. Since the first gate spectrum is used as a reference spectrum to which subsequent gate spectra are corrected, at least two gates must be supplied.

NMP

This is a deconvolution technique designed to take advantage of the improved signal-to-noise ratio provided by stack to make the final wavelet zero phase. NMP assumes that the input wavelet is near zero phase and estimates from data within user-specified, optionally space-variant, time windows the residual wavelet. Each estimate incorporates a large number of adjacent traces. The method consists of an assessment of the reflection series being made from the input trace. The location and strength of the reflectors come from an examination of the local maxima on the envelope of the associated complex trace. The polarity of each reflection coefficient comes from an examination of the polarity of the input trace at the relevant time. By correlating this estimated reflection series with the trace, the residual wavelet is determined and spatially averaged. It is then inverted to give a filter which is applied to the data (time and spatially variant, if so designed), to make a final adjustment to the wavelet phase.



MSTACK

GSI F-K domain migration routine uses the Kirchoff integral solution to the scalar wave equation and equates to the final solution of the downward continuation finite difference method. This method will migrate data correctly in the presence of a lateral velocity field. In the 'wide' angle mode it has a practical dip limit, approaching 90 degrees. On sections with events with 'true' structural dip of less than 20 degrees it is recommended to use the 'dip' limited option. This option helps to prevent excessive wave front noise on low S/N ratio data. The 'dip' limited option emulates finite difference migration in F-K space without the dispersive effect associated with the Z^* term.



FINAL OPERATIONS REPORT

MARINE SEISMIC SURVEY

CLIENT : AMOCO AUSTRALIA PETROLEUM CO.

CONTRACTOR : GEOPHYSICAL SERVICE INC

VESSEL : M/V EUGENE MCDERMOTT II

LOCATION : BASS BASIN

PROJECT NAME : 1985 A

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7	4075 cu in Airgun Array
8	Fathometer Scale
9	192 Trace Mux Streamer
10 a-b	Location of prospect



SECTION I

INTRODUCTION



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SECTION I

INTRODUCTION

A 2D marine seismic survey was conducted for Amoco Australia between 12th May 1985 and 16th May 1985. The data was collected in the Bass Basin area of the Bass Strait, on the south east coast of Victoria.

The purpose of the following report is to provide the reader with an insight into methods and equipment used by G.S.I. to collect the data and also to highlight any problems that were encountered during the survey period.

Section I(i) consists of statistics of the Motor Vessel Eugene McDermott II.

Section I(ii) contains a list of key personnel involved with operation and maintenance of instruments and equipment employed in collection of the data and also those responsible for the assurance of quality and integrity of data recorded.

An overview of the instrumentation is detailed in section II, with section II(1) containing a brief description of the theory of operation of G.S.I.'s unique equipment. Section II(2) involves both details and discussions of the instrumentation and equipment incorporated in onboard operation.

Information regarding positional systems in use during the survey, including base station data, system calibration and navigation tape summaries are outlined in section III.

In the final section (IV) all aspects of operational procedures are provided and include shipment details and survey statistics.

A number of plates are attached with this report which illustrate various supplementary details involved with data collection and processing techniques and equipment.



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1. SURVEY VESSEL - M/V EUGENE MCDERMOTT II

Flag	Republic of Panama
Homeport	Panama
Trade	Foreign-going
Owners	Geophysical Service Inc.
Call Sign	HO 9376 (Telex: HOMC 1330706)
Length	52.73 metres L.O.A.
Breadth	12.19 metres B.O.A.
Depth	4.27 metres
Draft	3.05 - 3.24 metres
Official No.	7062-PEXT-1, 7685/77
Gross Tonnage	911.66 Tonnes
Nett Tonnage	244.21 Tonnes
Main Engines	2 x 1125 HP (D399 Cat.)
Elec. Power	2 x 250 KVA Cat D
Load Line	LLoyds Register



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ii. KEY PERSONNEL

Party Manager	A. Welfare	
Systems Engineers	K. Webber	T. Rogers
System Operators	S. Woods	R. Luff
	S. Dowling	L. Beal
Quality Control	W. Lloyd	
	I. Slattery	
Nav Personnel	B. Robinson (Geomex)	
	G. Harries (Geomex)	
Compressor Mechanic	R. Barnes	
Airgun Mechanics	S. Fewtrell	M. Goldsmith
	A. Davies	J. Vickery
Master	M. Gusterson	
Vessel Supervisor	L. Williams	
Client Representative	T. Leighton	



SECTION II

INSTRUMENTS

SECTION II (1)(i) THEORY OF OPERATION :- MULTIPLEX STREAMER

The Texas Instruments multiplex streamer consists of four major in water elements, Live Section I's, Live Section II's, Streamer Electronic Modules and Repeater Modules. Configured for 192 traces, the cable comprises of 16 separate "clusters" each handling a group of twelve traces. The three components making up each cluster are a SEM placed between a live I and a live II, with each live section containing 6 separate 15 metre groups. Each group or trace contains 40 acceleration cancelling "dish" type hydrophones, wired in parallel.

Data from the six traces in a live section is passed to their associated SEM where preamplifier gain is applied before the signal is low cut filtered if required. The analog signal is then digitized before being time multiplexed and passed in serial phase encoded format to the head of the live I section where it is converted to a fibre optic signal. Along with the data from the twelve traces, each SEM data block contains a Configuration Status and a Q.C. Status word. These two 16 bit words are used in the onboard Supervisors Terminal to monitor the integrity of the data being received.

The sequence of data flow in the streamer begins at SEM #1 which is programmed as the Last Active Module. Each subsequent SEM places its 18 word data block behind the previous SEM's information. Therefore SEM #16 data is the last to arrive at the Data Acquisition Unit.

A repeater module is placed between each lead in section (including the stretches) for the purpose of resynchronising and retiming of the fibre optic data stream as it travels between the last active cluster and the onboard electronics. This is a function which is also performed in each SEM, thereby negating the need for repeater modules in the active section of the streamer.

Synchronization between SEMs is maintained via the Command Bus. This bus operating at a 12 kHz rate is also the means in which commands are conveyed from the supervisor terminal and each SEM. Typical commands include the switching of low cut filters, the setting of preamplifier gain constant and the driving of the SEM's impulse and leakage test circuit.

SEM seismic data is supplied to the recording equipment at a 1ms sample rate and subsequent resampling is performed in the Data Acquisition Unit.



ii. THEORY OF OPERATION :- TRACE SEQUENTIAL RECORDER

The G.S.I. Trace Sequential Recording system is comprised of three main units, the Data Acquisition Unit, the Supervisory Terminal and the Data Recording Unit. Each unit serves a complete and separate function but all are integrated to form the data recording system.

The Data Acquisition Unit provides all interface requirements of the multiplex streamer. The data reception logic in the DAU converts the phase encoded optical data from the streamer into an electrical signal in NRZI format. The serial data is then converted to parallel and any resampling or trace mixing is performed prior to anti-alias filtering, which is achieved with the use of digital filters. D.C. offset removal is also a function performed in the Data Acquisition Unit.

The Supervisor Terminal is the means of communication between the operator and the recording and acquisition units. All configuration of streamer and recording parameters are set through software by the operator. The ST also performs quality control checks of both SEM data received and data recorded to magnetic tape. Any errors which may occur within the system during recording appear on the error log screen and are also printed to a T.I. 810 printer interfaced to the S.T. 990 computer. The Supervisor Terminal also provides a communications link between the CMS III and the recording instruments. This enables header information such as shotpoint number, Julian time and line number and ID to be transferred to tape. Inversely, the ST passes record and tape reel numbers as well as error information to the CMS III for use in the Automatic Data Logging facility, discussed later in this report.

ii. THEORY OF OPERATION :- TRACE SEQUENTIAL RECORDER (cont.)

The Data Recording Unit, controlled by its own microprocessor, is responsible for accepting the filtered multiplexed data from the Data Acquisition Unit and reformatting it into a Trace Sequential format. This is achieved by reading all of the sampled data for one complete seismic record into mass memory and then "picking" the data out from memory in a fashion which places individual trace data in blocks of complete record samples in a sequential order. This sequential data is then formatted into SEG D with the addition of general, extended and trace headers. Conversion to the Group Coded Recording system is performed by a Telex brand tape formatter which is interfaced to one of three Telex 6253, tri-density tape transports. Reproduce display is a function also handled in the DRU, with oscillograph, oscilloscope and servo-profiler displays being controlled by the Multiplex Display Board in the DRU. Reproduce gain levels are set through the S.T. software.

System flow charts and SEG D tape format plates are attached with this report. (See index)



iii. THEORY OF OPERATION :- CONFIGURABLE MARINE SYSTEM

The Configurable Marine System's (CMS) primary roles are to maintain survey control and to record navigation and quality control data to magnetic tape, although a large number of other functions can be performed dependant on survey requirements. The heart of the CMS system is a Texas Instruments 980B mini computer. The 980 controls the flow of data between all peripheral devices. A Texas Instruments 990 mini computer and video display terminal dedicated to quality control functions (990 QC) provides the means of operator interface to the 980 system. Through the 990 QC terminal all relevant job parameters for line control are initiated to the 980B.

Another 990 mini computer dedicated to navigation control provides the 980 with position fixing information at a pre-determined time interval. The 990 NAV system is capable of interfacing with a wide variety of radio positioning systems with a maximum of twelve individual range data inputs. Using combinations of these range inputs a geodetic fix position, vessel speed and heading are calculated. This fix position is passed to the 980 which, using speed and azimuth supplied by either doppler sonar and ships gyro or RPS data, dead reckons between fixes. Shotpoint positioning during a survey line is achieved in the distance mode with the CMS issuing the airgun controller and recording systems with a shot request after every 30 metres of travel. Generally real time navigation is accomplished using a three way fix routine for fix information to the 980. Occasionally, however, due to either station geometry or signal stability, it may become necessary to remove a particular station's data from the fix routine. In this instance, although data from the "dropped" station is no longer being used, it is still recorded to magnetic tape (as is data from any alternate navigation systems interfaced to the 990 NAV) and may be used in post processing if required.

As well as navigation control with the 990 NAV system the 980 is interfaced to the Texas Instruments TIGER II airgun controller, another 990 mini computer based unit. This system controls all gun firing times by calculating delays from a true firing time history table. This ensures the tuned gun array is always performing at maximum energy efficiency. A video display terminal allows operator monitoring of gun statistics and performance details. Any gun related errors are transferred to the 980B for use by the Automatic Data Logging system (ADL). The ADL is a quality control system which logs to navigation tape any survey related data, whilst providing a hard copy of this data to the operator via the 990 QC 810 printer.



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iv. THEORY OF OPERATION :- ENERGY SOURCE

An electro-pneumatic acoustic energy source known as airguns was used for reflection work. An airgun has only two moving parts. A shuttle and a solenoid. The airgun consists of an upper and lower air chamber connected by an air passage through a moveable shuttle. Another air passage links the upper chamber with the underside of the upper flange of the shuttle and this air passage is controlled by a solenoid valve. Air, at a pressure of 2000 psi (13.8 Mpa), enters the upper chamber through its inlet forcing the shuttle closed. The shuttle is held firmly closed because the area of its upper flange is greater than the area of its lower flange. The main volume of air passes through the channel in the shuttle into the lower chamber. To fire the airgun a command from the Texas Instruments airgun controller unit (Tiger II) activates the solenoids and retracts a plunger, this permits air to pass through a porthole to the underside on the lower shuttle. This neutralises the downward pressure of the shuttle leaving only the upward pressure on the lower flange from the lower air chamber. The rapid expulsion of air creates the bubble and resultant pulse. The air bubble collapses in a manner similiar to that caused by explosives except that its period is controlled and is placed in the desired seismic frequency band.

The energy source used by the M/V Eugene McDermott II was a tuned array of 4075 cu. ins. total capacity. The array was designed for deep penetration and good resolution, having a broadband frequency output that extends below the normal low frequency band for seismic energy sources.

The array includes three low pressure ended air lines each side of the array so that the depth can be monitored by means of static air pressure at all times. The array was ballasted with the use of plastic Norwegian buoys to ride at the contract specified depth.

The Texas Instruments airgun controller (Tiger II) monitored the firing of each airgun in the array. Individual gun firing times were continuously controlled to give phasing within +/- 1 ms for maximum pulse amplitude and front to back ratio.

The Tiger II also performed a quality control function by indicating, with individual gun LED displays, the status of a gun if it was not operating correctly, either self fire or no fire. The airgun performances were logged on both the CMS navigation tape and printer log.



SECTION II (2)

INSTRUMENT DETAILS AND DISCUSSIONS



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SECTION II (2)i. MULTIPLEX STREAMER DETAILS

Length (centre to centre)	3585 m
Group Interval	15 m
Live Section Length	89.77 m
Stretch Section Length	100 m
SEM Module Length	0.46 m
Repeater Module Length	0.3 m
No. of Hydrophones per Group	40
Hydrophone Interval	0.375m
Hydrophone Type	TI - ACR
No. of Stretch Sections	4 Front, 1 Tail
Skin Type	PVC Tropical
Location of Depth Transducers on Sections	In all live I sections
Location of Depth Controllers (on groups)	12/13 36/37 60/61 84/85 108/109 132/133 156/157 180/181 204/205 228/229 240
Near Group	240
Streamer Sensitivity	8.20 uv/ubar



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i(a) MULTIPLEX STREAMER DISCUSSION

The streamer depth control was maintained by proper ballasting and the use of individually addressable remote controlled "Syntron" depth levellers (birds). Streamer depth was continuously monitored using the depth transducers available in each of the streamer's Live I sections. Readings were annotated on the TSR field logs at a 50 shotpoint interval. Where individual depths varied from specifications minor adjustments were made to the depth leveller associated with that section.

Four stretch sections were incorporated between the vessel and the last active section to attenuate any front end jerk and propellor oriented noise bursts. The stretch sections were weighted with lead to aid in front end ballast. A bird was placed at the head of the stretches for fine adjustment of front end depth which tends to alter with vessel speed and tidal conditions. Another stretch section, along with approximately 200m of nylon rope, was placed between the tailbuoy and the first active section to reduce tailbuoy induced noise bursts.



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ii. RECORDING SYSTEM DETAILS

Recording System	Trace Sequential Recorder Serial Number 001
Tape Format	SEG D. Group Coded Recording 6250 bpi
Tape Speed	125 ips
Data Channels on Tape	03 - 242
Gain Control Mode	I.F.P.
Sample Interval	2ms
Record Length	6 secs
Recording Delay	0 secs
Preamplifier Gain	12 dB
Final Gain	96 dB
Dynamic Range	115 dB (referred to input noise)
Filters	Lowcut 8 Hz @ 18 dB/8ve High cut 128 Hz @ 72 dB/8ve
Polarity	Positive Pressure Gives Positive Number on Tape



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ii. RECORDING SYSTEM DETAILS (cont.)

SEG D FORMAT

Each shot consists of;

A 576 byte record plus 195 x 6164 byte data trace records.

576 byte record :-

general header	32 bytes
6 channel set descriptors	192 bytes (6 x 32)
8 sample skew headers	256 bytes (8 x 32)
3 extended headers	96 bytes (3 x 32)

	576 bytes

Data trace record :-

of bytes = $20 + T_{max} \times 1024 \times 2/DT$

where : T = max recording time in seconds

DT = sample period in milliseconds

20 = # of bytes/trace header

of bytes = $20 + 4 \times 1024 \times 2 / 4$

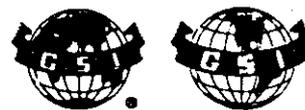
of bytes = 2068 bytes

For a more detailed description see attached plates with this report.

ii. RECORDING SYSTEM DISCUSSION

On completion of recording of a seismic line the magnetic tapes were replayed on an alternate transport to ensure readability and data integrity. A record header was also decoded and analysed after every line as a confirmation of correct system setup and Q.C. data transfer to tape.

On certain lines a hard copy of the depth printout was not available. This was a result of either a non fatal error in the TSR or erasure of the depth file on disc. The observers logs however, were annotated with streamer depths at a 50 shotpoint interval.



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iii. SERVO PROFILER DETAILS

Manufacturer	EPC Labs
Model	4600
Serial Number	371
Source	Trace Number 240
Record Length	4 secs
Gain Mode	PGC
Filters	Production Filters

iii(a) SERVO PROFILER DISCUSSION

An event mark appeared on the profiler charts at a 50 shotpoint interval with the relevant shotpoint number annotated on that mark. This was done to aid in interpretation.



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iv. FATHOMETER DETAILS

Manufacturer	Simrad
Model	EA
Water Velocity Value	1484 m/sec
Transducer Position with respect to CNP	16.7 m forward
Draft Correction	3.5 m
Calibrated	30th July, 1984

iv(a) FATHOMETER DISCUSSION

At a 50 shotpoint interval an event mark was logged to the fathometer strip chart with the relevant shotpoint number and water depth annotated alongside the mark. On any occasion where it became necessary to change fathometer scale, the shotpoint number and new scale was also logged on the chart.

The fathometer was operational for all recorded seismic lines and proved trouble free for the entire duration of the survey.



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v. OSCILLOGRAPH (CAMERA) DETAILS

Manufacturer SIE

Model ERC-10C

Number of Channels 64, with 62 being used

Polarity Positive pressure at the hydrophones gives positive numbers on tape and a upbreak on the camera records

Camera records display 60 data channels and a record number with identification code as listed below.

<u>Display Code</u>	<u>Camera Display</u>
0	Traces 1, 2, 3, 4, 58, 59, 60
1	Traces 61, 62, 63, 119, 120
2	Traces 121, 122, 123, 179, 180
3	Traces 181, 182, 183, 239, 240
4	Traces 1, 5, 9, 233, 237
5	Traces 2, 5, 10, 234, 238
6	Traces 3, 7, 11, 235, 239
7	Traces 4, 8, 12, 236, 240
8	Traces 1, 3, 5, 117, 119
9	Traces 121, 123, 125, 237, 239
10	Traces 2, 4, 6, 118, 120

v(a) OSCILLOGRAPH DISCUSSION

Five separate camera records were produced at a fifty shotpoint interval whilst recording a seismic line. This provided a hard copy of every individual trace available in the streamer for the purpose of Q.C. analysis. A "noise strip" was recorded prior to commencement and on completion of each line, then replayed to the camera to visually display the ambient streamer noise levels for each line.



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vi. ENERGY SOURCE DETAILS

4075 cu in Airgun Array

Operating Volume	4075 cu. ins.
Total Spare Volume	770 cu. ins.
Operating Pressure	2000 psi
Operating Depth	10 m +/- 1.0 m
Timing Control	Tiger II
Firing Delay	51.2 ms
Compressors	3 Norwalk C600 3 Le Roi 750

Setback:

Distance from CNP To Centre of Gun Array	53.70 m
---	---------

Distance from Stern To Centre of Gun Array	38.50 m
---	---------

vi(a) ENERGY SOURCE DISCUSSION

The airguns were maintained by GSI personnel on line changes so that throughout the survey the airgun array was operating within specifications. Whilst recording 30m shotpoint interval two Le Roi and two Norwalk compressors were used to maintain specified operating pressure.

Prior to survey commencement the gun array was lengthened to allow the strings to ride at the client requested depth of 10 metres.



SECTION III

NAVIGATION



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SECTION IIIi. SYSTEM DETAILSPrimary SystemMaxiran

Type	Range / Range, Pulsed
Survey Company	Geomex
Operating Frequency	425 Mhz.
Ships Antenna Height (Above Sea Level)	7 m
Antenna Location from Stern	24.12 m
Antenna Location from Centre Line	3 m (either side of centre)

Secondary System

Type	Sat / Sonar.
Survey Company	GSI
Operating Frequency	150 & 400 MHz
Antenna Height (ASL)	10 m
Antenna Location from Stern	15.2 m
Antenna Location from Centre Line	0 m



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ii. BASE STATION LOCATIONS

<u>Station</u>	<u>Position</u>	<u>Slot (CMS)</u>
Pt. Sorell	041 07 24.75 S 146 31 41.90 E	2
The Nut	040 45 50.24 S 145 18 13.42 E	3
Naracoopa	039 55 29.05 S 144 07 39.04 E	4
Liptrap	038 51 05.52 S 145 57 54.91 E	5



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iii. BASELINE CROSSINGS/SYSTEM CALIBRATION

11th May 1985

<u>STATIONS</u>	<u>PASS</u>	<u>COMPUTED</u>	<u>OBSERVED</u>	<u>DELTA</u>
Sorell/The Nut	1	110578.91 m	110579.50 m	+0.61m
Sorell/Naracoopa	1	243106.00 m	243126.00 m	+20.0m
			(Signals erratic during pass)	
Liptrap/The Nut	1	219763.26 m	219773.00 m	+10.0m
			(Signals noisy during pass)	

16th May 1985

<u>STATIONS</u>	<u>PASS</u>	<u>COMPUTED</u>	<u>OBSERVED</u>	<u>DELTA</u>
Liptrap/The Nut	1	219763.26 m	219774.00 m	+11.0m
	2	219763.26 m	219772.00 m	+9.0 m



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iv. NAVIGATION DISCUSSION

On the 11th May 1985, prior to survey commencement, Maxiran baseline crossings were performed. A crossing was also effected on completion of the survey to confirm integrity throughout the survey period.

Maxiran signal stability during survey execution was generally poor. Consensus of opinion states that atmospheric conditions and operating distances were the major contributing factors to the poor signal quality. Doppler sonar velocity source was used on several occasions due to the erratic nature of velocity data obtained from the RPS.

The major portion of the survey was shot using stations Liptrap, Naracoopa and The Nut. The deltas between filtered and computer predicted ranges for these stations were low.

For lines TP05-10 and TP05-51C, where stations Naracoopa, The Nut and Pt. Sorell were in use it was noticed delta values for ranges obtained from station Pt. Sorell were in the order of 20 to 30 metres. With this combination of stations two way real time position fixing was implemented using Naracoopa and The Nut whilst all three ranges were recorded to navigation tape.

v. NAVIGATION TAPE SUMMARY

For full details of Line number/Nav. tape number correlation, See Production Details (Section IV iv.)



SECTION IV

OPERATIONS



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SECTION IVi. OPERATIONS DISCUSSIONEVENT SUMMARY10th May 1985

Vessel departed Launceston for the prospect area.

11th May 1985

Maxiran baseline crossings performed enroute to prospect area. Commenced streamer ballasting.

12th May 1985

Streamer parted and was recovered, repaired and redeployed. SEM# 20 and its live 2 replaced. Live 2 of SEM# 13 replaced due to water contamination. Stretch section #1 replaced. Streamer ballasting completed and gun strings deployed. Commenced shooting line # TP05-51. Lines TP05-51 and TP05-51A were terminated due to poor navigation signals.

13th May 1985

Run in to line# TP05-17A was extended to allow source mechanics to work on a compressor oil leak.

15th May 1985

Replaced the Live 1 of SEM# 11 due to a shark bite. Replaced SEM# 20 again.

16th May 1985

New Live 1 of SEM# 11 replaced after the fibre optic failed under tension.

Line TP05-51B was terminated due to poor nav signals.

Crossed Maxiran baseline.

Travel to Devonport for client representative and data shipment removal.



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iii. STATISTICS

First Recording Day	:	12th May, 1985.
Last Recording Day	:	16th May, 1985.
Number of Lines	:	16
Number of Kilometres	:	370.53
Number of Shotpoints	:	12351
Percentage of Misfires	:	1.29%
Average Kilometres per Recording Day	:	74.11
Number of Magnetic Kilometres	:	0.00
Number of Gravity Kilometres	:	0.00



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iv. PRODUCTION DETAILS

<u>DATE</u>	<u>LINE</u>	<u>SP. RANGE</u>	<u>KMS</u>	<u>NAV TAPE</u>	<u>STATUS</u>
12/05/85	TP05-51	001- 094	2.82	20174	D.N.P.
	TP05-51A	001- 498	16.43	20174	D.N.P.
13/05/85	TP05-17	001- 480	14.40	20175	T.B.R.
	TP05-15	001- 696	20.88	20175	COMPLETE
	TP05-17A	001- 583	17.49	20175	COMPLETE
	TP05-13	001- 814	24.42	20175	COMPLETE
14/05/85	TP05-11	001- 844	25.32	20175	COMPLETE
	TP05- 9	001- 874	26.22	20175	COMPLETE
	TP05- 7	001-1102	33.06	20175	COMPLETE
	TP05- 5	001-1115	33.45	20175	COMPLETE
	TP05- 3	001-1128	33.84	20175	COMPLETE
	TP05- 1	001- 826	24.78	20175	COMPLETE
	15/05/85	TP05- 2	001- 830	24.90	20175
	TP05- 4	001- 692	20.76	20175	COMPLETE
	TP05- 6	001- 724	21.72	20175	COMPLETE
	TP05- 8	001- 643	19.29	20175	COMPLETE
	TNK4-15A	300- 632	9.99	20175	COMPLETE
	TP05-10	001- 593	17.79	20175	COMPLETE
16/05/85	TP05-51B	001- 220	6.60	20175	T.B.R.
	TP05-51C	001- 554	16.62	20175	COMPLETE

LEGEND: D.N.P. - DO NOT PROCESS

T.B.R. - TO BE RESHOT



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v. FIELD TAPE INVENTORY

<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SP RANGE</u>	<u>RECORD NO.</u>
12/05/85	810471	TP05-51	001- 094	001- 094
	810472	TP05-51A	001- 123	001- 123
	810473	TP05-51A	124- 246	124- 246
	810474	TP05-51A	247- 369	247- 369
	810475	TP05-51A	370- 492	370- 492
	810476	TP05-51A	493- 498	493- 498
13/05/85	810477	TP05-17	001- 123	001- 123
	810478	TP05-17	124- 246	124- 246
	810479	TP05-17	247- 369	247- 369
	810480	TP05-17	370- 480	370- 480
	810481	TP05-15	001- 123	001- 123
	810482	TP05-15	124- 246	124- 246
	810483	TP05-15	247- 369	247- 369
	810484	TP05-15	370- 492	370- 492
	810485	TP05-15	493- 615	493- 615
	810486	TP05-15	616- 696	616- 696
	810487	TP05-17A	001- 125	001- 125
	810488	TP05-17A	126- 250	126- 250
	810489	TP04-17A	251- 375	251- 375
	810490	TP05-17A	376- 500	376- 500
	810491	TP05-17A	501- 583	501- 583
	810492	TP05-13	001- 125	001- 125
	810493	TP05-13	126- 250	126- 250
	810494	TP05-13	251- 375	251- 375
	810495	TP05-13	376- 500	376- 500
	810496	TP05-13	501- 625	501- 625
	810497	TP05-13	626- 750	626- 750
	810498	TP05-13	751- 814	751- 814
	810499	TP05-11	001- 115	001- 115
	810500	TP05-11	116- 240	116- 240
	810501	TP05-11	241- 365	241- 365
	810502	TP05-11	366- 490	366- 490
	810503	TP05-11	491- 615	491- 615
810504	TP05-11	616- 741	616- 740	
810505	TP05-11	742- 844	741- 843	
14/05/85	810506	TP05-09	001- 125	001- 125
	810507	TP05-09	126- 250	126- 250
	810508	TP05-09	251- 375	251- 375
	810509	TP05-09	376- 500	376- 500
	810510	TP05-09	501- 625	501- 625
	810511	TP05-09	626- 750	626- 750
	810512	TP05-09	751- 874	751- 874



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v. FIELD TAPE INVENTORY (cont.)

<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SP RANGE</u>	<u>RECORD NO.</u>	
14/05/85	810513	TP05-07	001- 123	001- 123	
	810514	TP05-07	124- 246	124- 246	
	810515	TP05-07	247- 369	247- 369	
	810516	TP05-07	370- 492	370- 492	
	810517	TP05-07	493- 615	493- 615	
	810518	TP05-07	616- 738	616- 738	
	810519	TP05-07	739- 861	739- 861	
	810520	TP05-07	862- 984	862- 984	
	810521	TP05-07	985-1102	985-1102	
	810522	TP05-05	001- 125	001- 125	
	810523	TP05-05	126- 250	126- 250	
	810524	TP05-05	251- 375	251- 375	
	810525	TP05-05	376- 500	376- 500	
	810526	TP05-05	501- 625	501- 625	
	810527	TP05-05	626- 750	626- 750	
	810528	TP05-05	751- 875	751- 875	
	810529	TP05-05	876-1000	876-1000	
	810530	TP05-05	1001-1115	1001-1101	
	810531	TP05-03	001- 125	001- 125	
	810532	TP05-03	126- 250	126- 250	
	810533	TP05-03	251- 375	251- 375	
	810534	TP05-03	376- 500	376- 500	
	810535	TP05-03	501- 625	501- 625	
	810536	TP05-03	626- 750	626- 750	
	810537	TP05-03	751- 875	751- 875	
	810538	TP05-03	876-1000	876-1000	
	810539	TP05-03	1001-1125	1001-1125	
	810540	TP05-03	1126-1128	1126-1128	
	810541	TP05-01	001- 125	001- 125	
	810542	TP05-01	126- 250	126- 250	
	810543	TP05-01	251- 375	251- 375	
	810544	TP05-01	376- 500	376- 500	
	810545	TP05-01	501- 625	501- 625	
	810546	TP05-01	626- 750	626- 750	
	810547	TP05-01	751- 826	751- 826	
	810548	TP05-02	001- 125	001- 125	
	810549	TP05-02	126- 250	126- 250	
	810550	TP05-02	251- 375	251- 375	
	15/05/85	810551	TP05-02	376- 500	376- 500
		810552	TP05-02	501- 625	501- 625
		810553	TP05-02	626- 750	626- 750
		810554	TP05-02	751- 830	751- 830



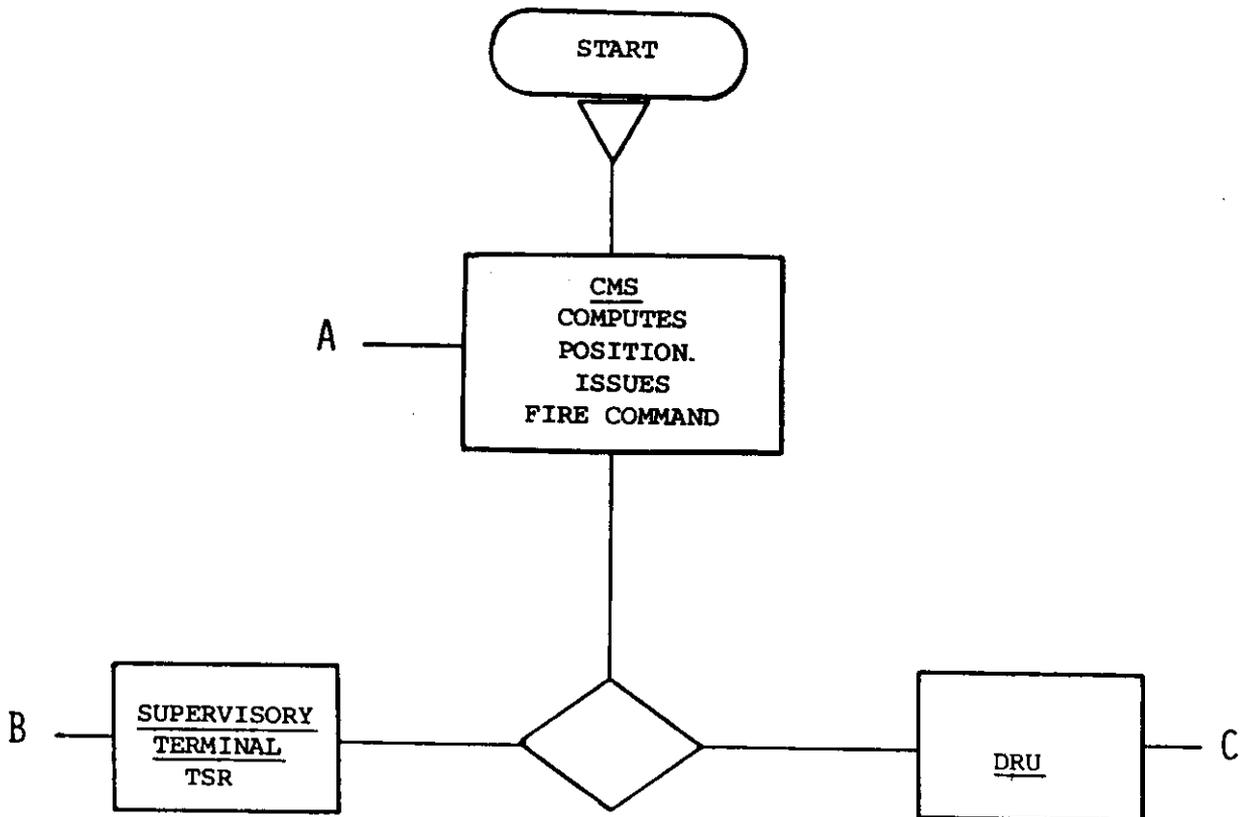
- 32 -

v. FIELD TAPE INVENTORY (cont.)

<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SP RANGE</u>	<u>RECORD NO.</u>
15/05/85	810555	TP05-10	001- 125	001- 125
	810556	TP05-10	126- 250	126- 250
	810557	TP05-10	251- 375	251- 375
	810558	TP05-10	376- 500	376- 500
	810559	TP05-10	501- 625	501- 625
	810560	TP05-10	626- 692	626- 692
	810561	TP05-06	001- 125	001- 125
	810562	TP05-06	126- 250	126- 250
	810563	TP05-06	251- 375	251- 375
	810564	TP05-06	376- 500	376- 500
	810565	TP05-06	501- 625	501- 625
	810566	TP05-06	626- 724	626- 724
	810567	TP05-08	001- 125	001- 125
	810568	TP05-08	126- 250	126- 250
	810569	TP05-08	251- 375	251- 375
	810570	TP05-08	376- 500	376- 500

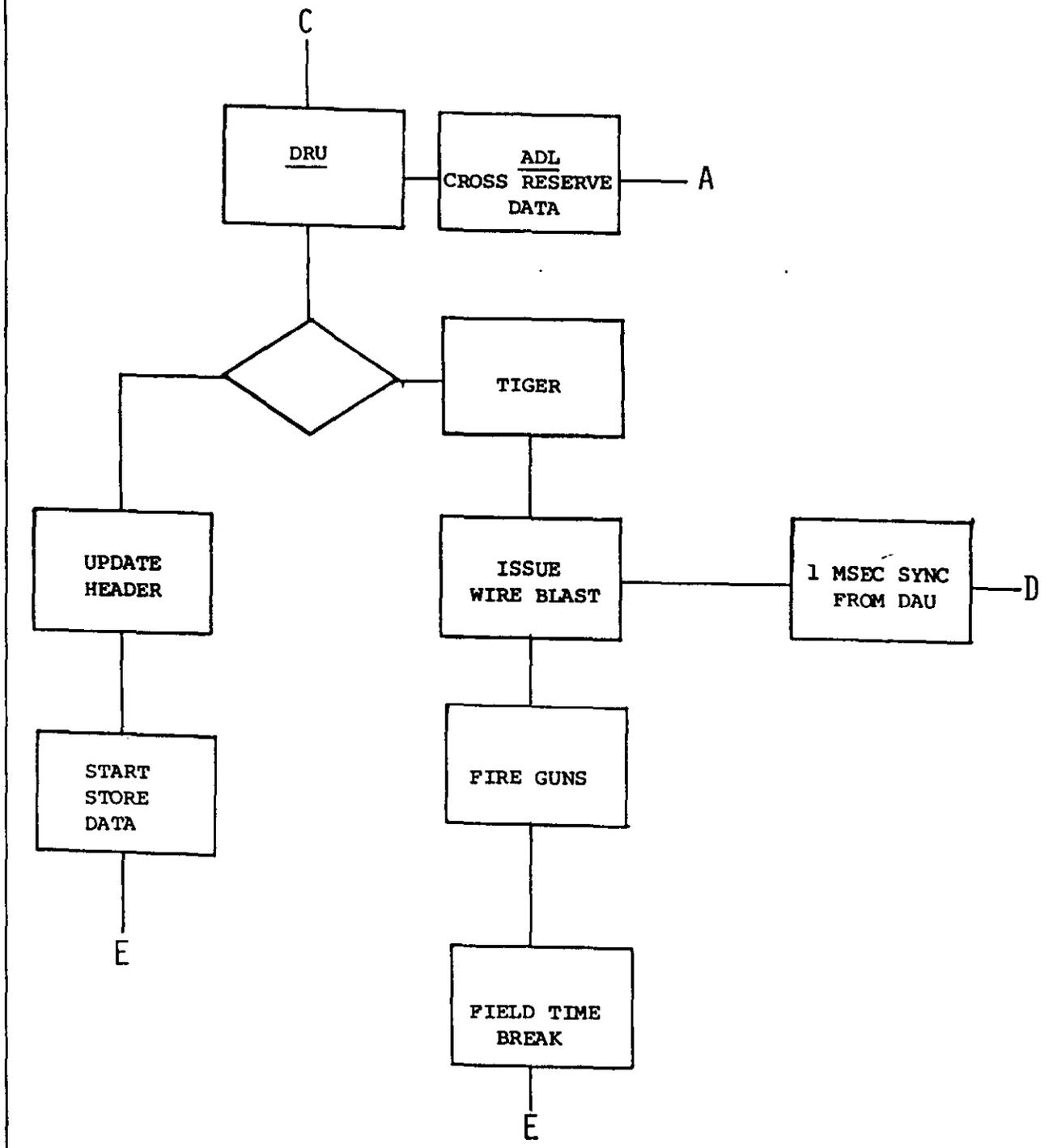


TSR RECORDING SEQUENCE



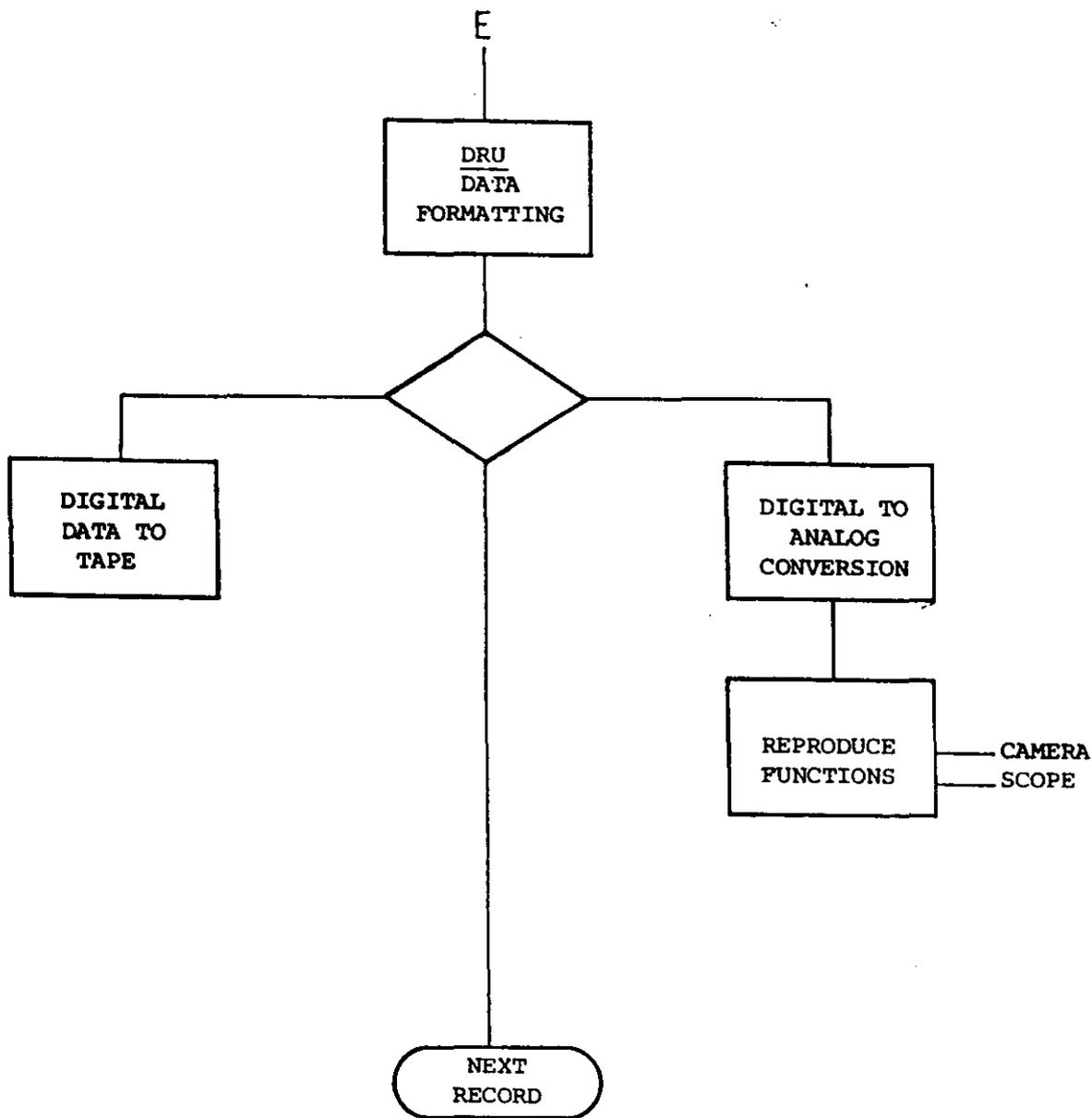


TSR RECORDING SEQUENCE





TSR RECORDING SEQUENCE



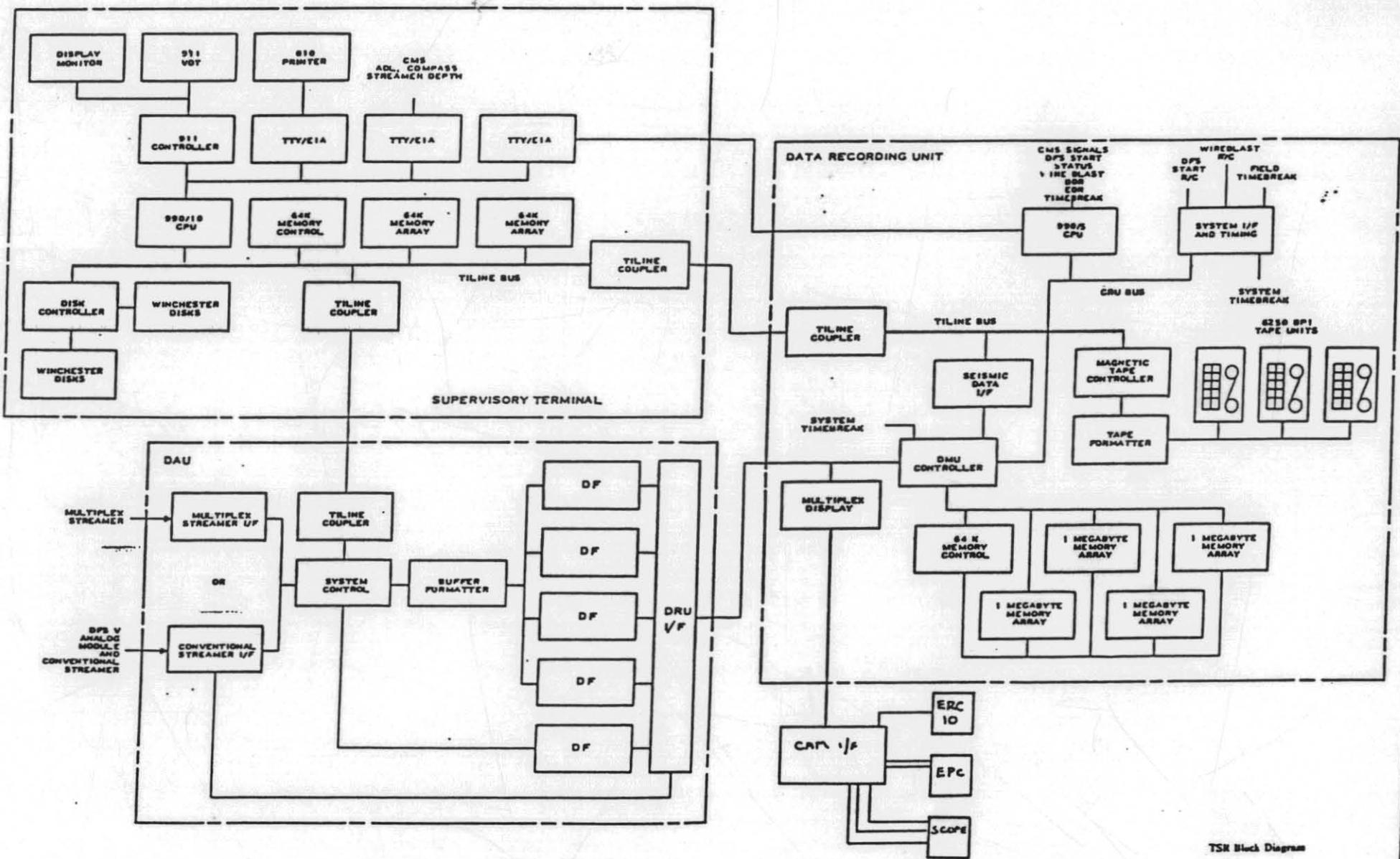
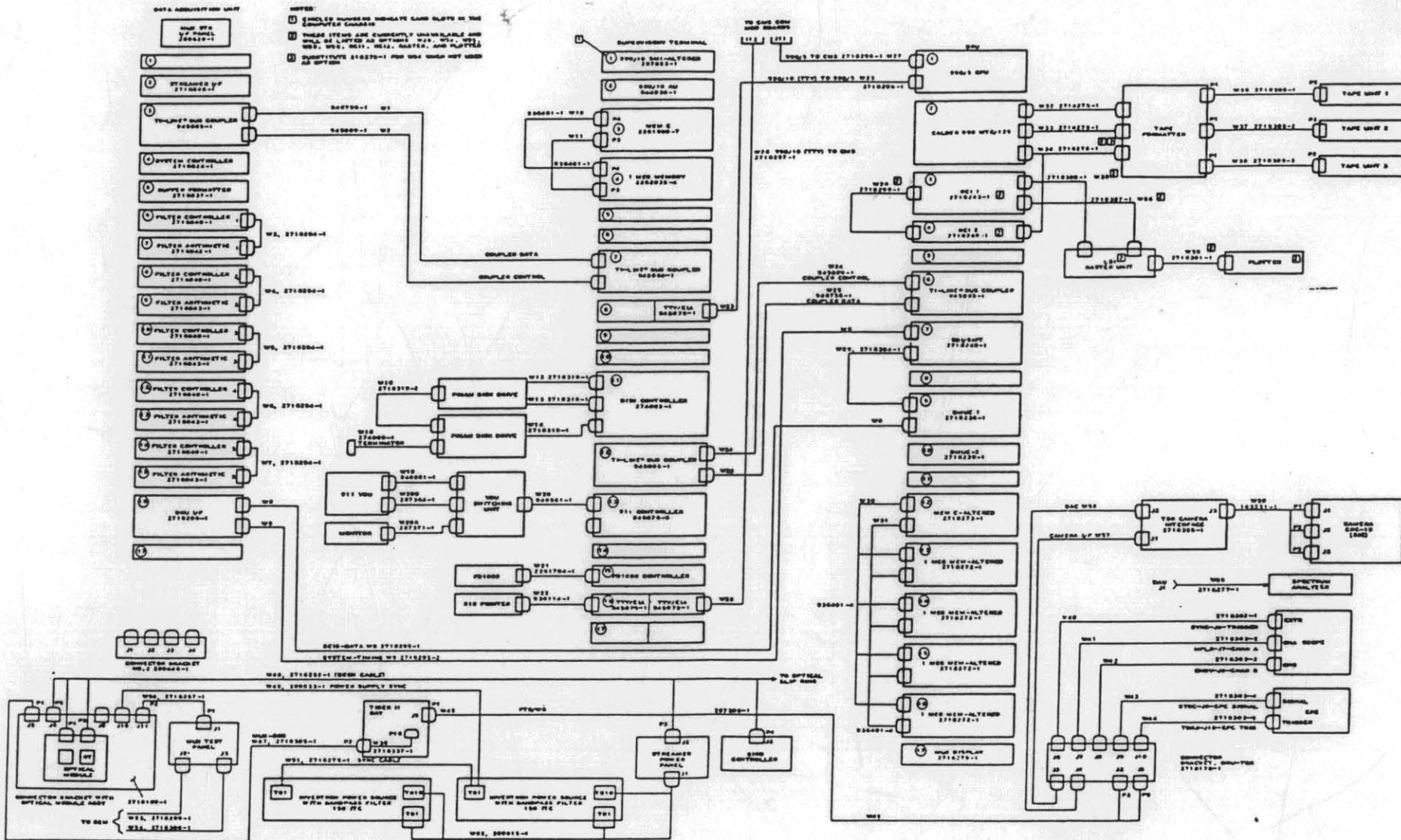


PLATE 2

185064

TSN Block Diagram



*TRADEMARK OF TEGAS INSTRUMENTS

TSR With Multiplex Streamer



HEADER DESCRIPTORS

ABBREVIATION	HEADER	BYTE NO.	DESCRIPTION
S/C	S	12	EXPONENT OF SAMPLES PER CHANNEL IN THE BASE SCAN
SE	G	16	SECOND OF MINUTE
SK	G	30	NUMBER OF 32 BYTE SKEW FIELDS
SOS	—		START OF SCAN (MULTIPLEXED DATA BLOCK)
SS	—		SAMPLE SKEW
S/S	—		SAMPLES/SCAN
ST	S	1	SCAN TYPE NUMBER
ST/R	G	28	SCAN TYPES PER RECORD
T	—		TIMING WORD (MULTIPLEXED DATA BLOCK)
TF	S	3, 4	FIRST TIMING WORD IN THIS CHANNEL SET
TE	S	5, 6	END TIME OF THIS CHANNEL SET
TN	—		DEMULPLEXED TRACE NO. (SEE TRACE HEADER)
TW	—		TIME BREAK WINDOW (SEE DEMULTI- PLEXED DATA BLOCK, TRACE HEADER BYTES 13, 14 AND 15)
TWI	—		TIME BREAK WINDOW INDICATOR (SEE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
Y	G	3, 4	FORMAT CODE (DATA RECORDING METHOD)
YR	G	11	YEAR (LAST TWO DIGITS)
Z	G	26	RECORD TYPE

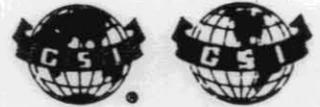


HEADER DESCRIPTORS

G = general header

S = scan type header (channel set descriptor)

ABBREVIATION	HEADER	BYTE NO.	DESCRIPTION
AF	S	13, 14	ALIAS FILTER FREQUENCY
AS	S	15, 16	ALIAS FILTER SLOPE
B	G	20, 21, 22	BYTES PER SCAN (MULTIPLEXED ONLY)
BCD	—		BINARY CODED DECIMAL
BOT	—		BEGINNING OF TAPE MARK
C	S	11	CHANNEL TYPE IDENTIFICATION
CN	S	2	CHANNEL SET NUMBER
CS	G	29	CHANNEL SETS PER SCAN TYPE
C/S	S	9, 10	CHANNELS IN THIS CHANNEL SET
DP	—		DYNAMIC PARAMETER CHANGE BIT (SEE THE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
DY	G	12, 13	DAY OF YEAR
EC	G	31	EXTENDED HEADER LENGTH
EOF	—		END OF FILE MARK
EOT	—		END OF TAPE MARK
EX	G	32	EXTERNAL HEADER LENGTH
F	G	1, 2	FILE NUMBER
H	G	14	HOUR OF DAY
HDR	—		HEADER FOR DEMULTIPLEXED TRACE
HL	—		HEADER LENGTH (SEE APPENDIX E4)
I	G	23	BASE SCAN INTERVAL
IBG	—		INTERBLOCK GAP (ALSO GAP)
ITB	—		INTERNAL TIME BREAK (SEE THE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
J	S	12	GAIN CONTROL METHOD
K	G	5 THRU 10	GENERAL CONSTANTS
LC	S	17, 18	LOW CUT FILTER FREQUENCY
LS	S	19, 20	LOW CUT FILTER SLOPE
LSB	—		LEAST SIGNIFICANT BIT
LSD	—		LEAST SIGNIFICANT DIGIT
M	G	17 THRU 19	MANUFACTURER'S CODE AND SERIAL NUMBER
MI	G	15	MINUTE OF HOUR
MP	S	8	DESCALING EXPONENT
MSB	—		MOST SIGNIFICANT BIT
MSD	—		MOST SIGNIFICANT DIGIT
NT	S	21 THRU 26	NOTCH FILTER FREQUENCY
P	G	24	POLARITY
R	G	26, 27	RECORD LENGTH
S	—		SIGN BIT
S/B, S/BX	G	24, 25	NUMBER OF SCANS PER BLOCK



APPENDIX C—GLOSSARY

- Base scan interval** The time between timing words. A base scan interval usually contains one scan but under some conditions may contain multiple subscans.
- Block** The data between gaps on tape.
- Channel set** One or more channels sampled at the same sampling interval and containing the same filter, fixed gain, and other fixed parameter information.
- Channel set descriptor** A unit of the scan type header describing the parameters of a channel set.
- Data recording method** The arrangement of bits to represent samples on tape.
- File** All data recorded from a single energy impulse or sweep. It may also be the sum of a number of energy impulses or sweeps. Literally, it is all of the blocks between file marks.
- Format Data** recording method combined with a multiplexed/demultiplexed indicator (see general header Bytes 3 and 4).
- General header** The first header in the header block. It contains information common to the entire record.
- Index byte** The byte number of some particular parameter within the general or scan type header.
- Packed BCD** Binary coded decimal digits represented by four data bits.
- Sample skew** The fraction of the base scan interval between the timing word and the actual time the sample was taken in a base scan interval (not related to position on tape).
- Sampling interval** The interval between readings such as the time between successive samples of a digital seismic trace.
- Scan** One complete sequence of events, such as sampling all channels. Data recorded during a base scan interval.
- Scan interval** The interval between readings of all samples contained in a scan type.
- Scan type** One complete set of channel sets which make up a scan. A seismic record contains multiple scans, and may or may not contain more than one scan type.
- Scan type header** A header containing one or more channel set descriptors and the skew information.
- Subscan** A set of samples containing one sample for each channel in a channel set.
- Time break window** Time interval in which time break is expected. If time break does not occur by the end of the window, internal time break is generated.
- Trace** A record of one seismic channel within a scan type. A collection of a sequential set of points from one seismic channel.
- Trace block** A block containing the data of one trace or a part of a trace with constant parameters.



CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION
---------------	--------------	-------------

The following notch filters are coded in a similar manner:

23	NT ₁ , NT ₂	Second notch frequency
24	NT ₃ , NT ₄	
25	NT ₁ , NT ₂	Third notch frequency
26	NT ₃ , NT ₄	
27		
28		
29	Unused. Written as zeros.	
30		
31		
32		



CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION																																																																		
11	C ₁ , 0	Channel type identification: <table border="1"> <thead> <tr> <th>Bit</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>Other</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>External data</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>Time counter^d</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>Water break</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> <td>Up hole</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>Time break</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>Seis</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>Unused</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>Signature, unfiltered</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>Signature, filtered</td> </tr> </tbody> </table>	Bit	0	1	2	3		0	1	1	1	1	Other	0	1	1	0	0	External data	0	1	0	1	1	Time counter ^d	0	1	0	0	0	Water break	0	0	1	1	1	Up hole	0	0	1	0	0	Time break	0	0	0	1	1	Seis	0	0	0	0	0	Unused	1	0	0	0	0	Signature, unfiltered	1	0	0	0	1	Signature, filtered
Bit	0	1	2	3																																																																
0	1	1	1	1	Other																																																															
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0	0	0	1	1	Seis																																																															
0	0	0	0	0	Unused																																																															
1	0	0	0	0	Signature, unfiltered																																																															
1	0	0	0	1	Signature, filtered																																																															
12	S/C,	This packed BCD number is an exponent of 2. The number (2 ^{S/C}) represents the number of subscans of this channel set in the base scan. Possible values for this parameter (2 ^{S/C}) are 1 to 512 (2 ⁰ to 2 ⁹). Reference Byte 23 of the general header.)																																																																		
12	, J	Channel gain control method. <table border="1"> <thead> <tr> <th>Bits</th> <th>Gain mode</th> </tr> </thead> <tbody> <tr> <td>4 5 6 7</td> <td></td> </tr> <tr> <td>0 0 0 1</td> <td>- (1) Individual AGC</td> </tr> <tr> <td>0 0 1 0</td> <td>- (2) Ganged AGC</td> </tr> <tr> <td>0 0 1 1</td> <td>- (3) Fixed gain</td> </tr> <tr> <td>0 1 0 0</td> <td>- (4) Programmed gain</td> </tr> <tr> <td>1 0 0 0</td> <td>- (8) Binary gain control</td> </tr> <tr> <td>1 0 0 1</td> <td>- (9) IFP gain control</td> </tr> </tbody> </table>	Bits	Gain mode	4 5 6 7		0 0 0 1	- (1) Individual AGC	0 0 1 0	- (2) Ganged AGC	0 0 1 1	- (3) Fixed gain	0 1 0 0	- (4) Programmed gain	1 0 0 0	- (8) Binary gain control	1 0 0 1	- (9) IFP gain control																																																		
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13	AF ₁ , AF ₂	Alias filter frequency. It can be coded for any frequency from 0 to 9999 Hz.																																																																		
14	AF ₃ , AF ₄																																																																			
15	0, AS ₁	Alias filter slope in dB per octave. It can be coded from 0 to 999 dB in 1-dB steps. A zero indicates the filter is out (see Appendix E5 for definition).																																																																		
16	AS ₂ , AS ₃																																																																			
17	LC ₁ , LC ₂	Low-cut filter setting. It can be coded for any frequency from 0 to 9999 Hz.																																																																		
18	LC ₃ , LC ₄																																																																			
19	0, LS ₁	Low-cut filter slope. It can be coded for any slope from 0 to 999 dB per octave. A zero slope indicates the filter is out. (See Appendix E5 for definition.)																																																																		
20	LS ₂ , LS ₃																																																																			
21	NT ₁ , NT ₂	Notch frequency setting. It can be coded for any frequency from 0 to 999.9 Hz. The out filter is written as 000.0 Hz.																																																																		
22	NT ₃ , NT ₄																																																																			

^dIllegal code for this format because the timing counter is part of the start of scan and cannot be identified as part of a channel.



CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION
1	ST ₁ , ST ₂	These two digits (1-99) identify the number of the scan type header to be described by the subsequent bytes. The first scan type header is 1 and the last scan type header number is the same value as Byte 28 (ST/R) of the general header. If a scan type header contains more than one channel set descriptor, the scan type header number will be repeated in each of its channel set descriptors. If the system does not have dynamic parameter changes during the record, such as switched sampling intervals, there will only be one scan type header required.
2	CN ₁ , CN ₂	These two digits (1-99) identify the channel set to be described in the next 30 bytes within this scan type header. The first channel set is "1" and the last channel set number is the same number as Byte 29 (CS) of the general header. If the scan actually contains fewer channel sets than CS, then dummy channel set descriptors are included as specified in Byte 29 of general header.
3 4	TF ₁₈ thru TF ₉ TF ₈ thru TF ₁	Channel set starting time. This is a binary number where TF ₁ = 2 ¹ msec (2-msec increments). This number identifies the timing word of the first scan of data in this channel set. In a single scan type record, this would typically be recorded as a zero (an exception might be deep water recording). In multiple scan type records, this number represents the starting time, in milliseconds, of the channel set. Start times from 0 to 131,070 msec (in 2-msec increments) can be recorded.
5 6	TE ₁₈ thru TE ₉ TE ₈ thru TE ₁	Channel set end time. This is a binary number where TE ₁ = 2 ¹ milliseconds (2 millisecond increments). These two bytes represent the record end time of the channel set in milliseconds. In a multiplexed record, all channels of a channel set must be of the same length. TE may be used in a demultiplexed record to allow the termination of a particular channel set shorter than other channel sets within its scan type. In a single scan type record, Bytes 5 and 6 would be the length of the record. End times up to 131,070 msec (in 2-msec increments) can be recorded.
7 8	0, 0 MP ₅ , MP ₄ thru MP ₋₂	This sign magnitude binary number is the exponent of the base 2 multiplier to be used to descale the data on tape to obtain input voltage in millivolts. The radix point is between MP ₀ and MP ₋₁ . This multiplier has a range of 2 ^{31.75} to 2 ^{-31.75} . (See Appendix E7.)
9 10	C/S ₁ , C/S ₂ C/S ₃ , C/S ₄	This is the number of channels in this channel set. It can assume a number from 0-9999.



GENERAL HEADER

INDEX BYTE	ABBREVIATION	DESCRIPTION
28	ST/R ₁ , ST/R ₂	Scan types per record. This 2 digit code is the number of scan types per record (1-99). (Zero is invalid.)
29	CS ₁ , CS ₂	Number of channel sets per scan type (1-99). (Zero is invalid.) This 2 digit code is the number of channel sets per scan. If multiple scan types are used (such as in a switching sampling interval environment), this number is equal to the number of channel sets contained in the scan type with the largest number of channel sets. If scan types also exist with less than this maximum number of channel sets per scan type, dummy channel set descriptors will have to be recorded in the scan type header. This can be done by setting the number of channels in the dummy channel set descriptor to zero (reference Bytes 9 and 10 of the scan type header description). Example 6 illustrates this requirement.
30	SK ₁ , SK ₂	Number of 32 byte fields added to the end of each scan type header in order to record the sample skew of all channels (0-99). (See Appendix E3). Zero indicates that skew is not recorded.
31	EC ₁ , EC ₂	Extended header length. The extended header is used to record additional equipment parameters. An example of this would be parameters generated by the addition of a field stacker to the system. The two digits (0-99) in this field specify the number of 32 byte extensions.
32	EX ₁ , EX ₂	External header length. The external header is used to record additional user supplied information in the header. The two digits (0-99) in this field specify the number of 32 byte extensions.

Scan type header (channel set descriptor)

The scan type header is determined by the system configuration and consists of one or more channel set descriptors each of 32 bytes followed by a series of 32 byte sample skew fields. A channel set is defined as a group of channels operating with the same set of parameters and being sampled as part of a scan of data. A scan type header can be composed of from 1 to 99 channel set descriptors. If dynamic parameter changes are required during the recording, additional scan type headers must be added, each containing the channel set descriptors necessary to define the new parameters. Each scan type header must have the same number of channel set descriptors (see Appendix E4 for header length calculation).



GENERAL HEADER

INDEX BYTE	ABBREVIATION	DESCRIPTION																																				
24	P,	<p>in binary steps. Thus, the allowable base scan intervals are $1/16$, $1/8$, $1/4$, $1/2$, 1, 2, 4, and 8 msec. The base scan interval is always the difference between successive timing words. Each channel used will be sampled one or more times per base scan interval.</p> <p>Polarity.—These 4 binary bits are measured on the sensors, cables, instrument, and source combination and are set into the system manually. The codes are:</p> <ul style="list-style-type: none"> 0000 Untested 0001 Zero 0010 45 degrees 0011 90 degrees 0100 135 degrees 0101 180 degrees 0110 225 degrees 0111 270 degrees 1000 315 degrees 1001 1010 1011 1100 unassigned 1101 1110 1111^c 																																				
25	, S/BX ₃ thru S/BX ₀ S/B ₇ thru S/B ₀	<p>This binary number (range 0 to 15) is an exponent of 2 and is used in conjunction with S/B (Byte 25). This binary number (range 0 to 255) is used in conjunction with S/BX (see Byte 24) to indicate the number of scans in a block. If it is 0, the data body is one continuous block. Otherwise, the data body is composed of multiple blocks, each block containing $S/B \times 2^{S/BX}$ scans. It is valid only for multiplexed data.</p>																																				
26	Z,	<p>Record type</p> <table border="1"> <thead> <tr> <th>Bits</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>Test record</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>Parallel channel test</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>Direct channel test</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>Normal record</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>Other</td> </tr> </tbody> </table>	Bits	0	1	2	3		0	0	1	0	0	Test record	0	1	0	0	0	Parallel channel test	0	1	1	0	0	Direct channel test	1	0	0	0	0	Normal record	0	0	0	1	0	Other
Bits	0	1	2	3																																		
0	0	1	0	0	Test record																																	
0	1	0	0	0	Parallel channel test																																	
0	1	1	0	0	Direct channel test																																	
1	0	0	0	0	Normal record																																	
0	0	0	1	0	Other																																	
27	, R ₁ R ₂ , R ₃	<p>Record length from time zero (in increments of 0.5 times 1.024 sec). This value can be set from 00.5 to 99.5 representing times from 0.512 sec. to 101.888 sec. A setting of 00.0 indicates the record length is indeterminate.</p>																																				

^cDetails of polarity codes and test methods are listed in the following reference: Thigpen, B. B., Dalby, A. E., Landrum, R., 1975, Special report of the subcommittee on polarity standards: Geophysics, v. 40, p. 694.



HEADER BLOCK PARAMETERS

General header

All values are in packed BCD unless otherwise specified.

INDEX BYTE	ABBREVIATION	DESCRIPTION
1	F ₁ , F ₂	File number of four
2	F ₃ , F ₄	digits (0-9999)
3	Y ₁ , Y ₂	Format code:
4	Y ₃ , Y ₄	0015 20 bit binary multiplexed 0022 8 bit quaternary multiplexed 0024 16 bit quaternary multiplexed 0042 8 bit hexadecimal multiplexed 0044 16 bit hexadecimal multiplexed 0048 32 bit hexadecimal multiplexed 8015 20 bit binary demultiplexed 8022 8 bit quaternary demultiplexed <u>8024 16 bit quaternary demultiplexed</u> 8042 8 bit hexadecimal demultiplexed 8044 16 bit hexadecimal demultiplexed 8048 32 bit hexadecimal demultiplexed 0200 Illegal, do not use 0000 Illegal, do not use
5	K ₁ , K ₂	General constants, 12 digits
6	K ₃ , K ₄	
7	K ₅ , K ₆	
8	K ₇ , K ₈	
9	K ₉ , K ₁₀	
10	K ₁₁ , K ₁₂	
11	YR ₁ , YR ₂	Last two digits of year (0-99)
12	0, DY ₁	Julian day 3 digits (1-366)
13	DY ₂ , DY ₃	
14	H ₁ , H ₂	Hour of day 2 digits (0-23) (Greenwich Mean Time)
15	MI ₁ , MI ₂	Minute of hour 2 digits (0-59)
16	SE ₁ , SE ₂	Second of minute 2 digits (0-59)
17	M ₁ , M ₂	Manufacturer's code 2 digits Note: See Appendix B for the current assignments
18	M ₃ , M ₄	Manufacturer's serial number, 4 digits
19	M ₅ , M ₆	
20	B ₁ , B ₂	Bytes per scan 6 digits (1-999,999) are utilized in the multiplexed formats to identify the number of bytes (including data, auxiliary, sync, and timing bytes, etc.) required to make up a complete scan.
21	B ₃ , B ₄	In a demultiplexed record, this field is not used and is recorded as zeros. (See Appendix E2)
22	B ₅ , B ₆	
23	I ₃ thru I ₄	Base scan interval. —This is coded as a binary number with the LSB equal to 1/16 msec. This will allow sampling intervals from 1/16 through 8 msec



FILE NUMBER	F ₁	F ₁	F ₁	F ₁	F ₂	F ₂	F ₂	F ₂	1
	F ₃	F ₃	F ₃	F ₃	F ₄	F ₄	F ₄	F ₄	2
SCAN TYPE NUMBER	ST ₁	ST ₁	ST ₁	ST ₁	ST ₂	ST ₂	ST ₂	ST ₂	3
CHANNEL SET NUMBER	CN ₁	CN ₁	CN ₁	CN ₁	CN ₂	CN ₂	CN ₂	CN ₂	4
TRACE NUMBER	TN ₁	TN ₁	TN ₁	TN ₁	TN ₂	TN ₂	TN ₂	TN ₂	5
	TN ₃	TN ₃	TN ₃	TN ₃	TN ₄	TN ₄	TN ₄	TN ₄	6
FIRST TIMING WORD	T ₁₅	T ₁₄	T ₁₃	T ₁₂	T ₁₁	T ₁₀	T ₉	T ₈	7
	T ₇	T ₆	T ₅	T ₄	T ₃	T ₂	T ₁	T ₀	8
	T ₋₁	T ₋₂	T ₋₃	T ₋₄	T ₋₅	T ₋₆	T ₋₇	T ₋₈	9
SAMPLE SKEW	0	0	0	0	0	0	0	0	10
	SS ₋₁	SS ₋₂	SS ₋₃	SS ₋₄	SS ₋₅	SS ₋₆	SS ₋₇	SS ₋₈	11
	0	0	0	0	0	0	0	0	12
TIME BREAK WINDOW	TW ₁₅	TW ₁₄	TW ₁₃	TW ₁₂	TW ₁₁	TW ₁₀	TW ₉	TW ₈	13
	TW ₇	TW ₆	TW ₅	TW ₄	TW ₃	TW ₂	TW ₁	TW ₀	14
	TW ₋₁	TW ₋₂	TW ₋₃	TW ₋₄	TW ₋₅	TW ₋₆	TW ₋₇	TW ₋₈	15
	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	17
	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	19	
0	0	0	0	0	0	0	0	20	

Demultiplexed trace header



TRACK NO.	4	7	6	5	3	9	1	8	2
-----------	---	---	---	---	---	---	---	---	---

BIT NO.	P	0	1	2	3	4	5	6	7
---------	---	---	---	---	---	---	---	---	---

BCD VALUE MSD	8	4	2	1	8	4	2	1	LSD
BINARY VALUE MSB	128	64	32	16	8	4	2	1	LSB

SCAN TYPE NUMBER	ST ₁	ST ₁	ST ₁	ST ₁	ST ₂	ST ₂	ST ₂	ST ₂	1
CHANNEL SET NUMBER	CN ₁	CN ₁	CN ₁	CN ₁	CN ₂	CN ₂	CN ₂	CN ₂	2
CHANNEL SET START TIME	TF ₁₆	TF ₁₅	TF ₁₄	TF ₁₃	TF ₁₂	TF ₁₁	TF ₁₀	TF ₉	3
	TF ₈	TF ₇	TF ₆	TF ₅	TF ₄	TF ₃	TF ₂	TF ₁	4
CHANNEL SET END TIME	TE ₁₆	TE ₁₅	TE ₁₄	TE ₁₃	TE ₁₂	TE ₁₁	TE ₁₀	TE ₉	5
	TE ₈	TE ₇	TE ₆	TE ₅	TE ₄	TE ₃	TE ₂	TE ₁	6
	0	0	0	0	0	0	0	0	7
DESCALE MULTIPLIER	MP ₅	MP ₄	MP ₃	MP ₂	MP ₁	MP ₀	MP ₋₁	MP ₋₂	8
NUMBER OF CHANNELS	C/S ₁	C/S ₁	C/S ₁	C/S ₁	C/S ₂	C/S ₂	C/S ₂	C/S ₂	9
	C/S ₃	C/S ₃	C/S ₃	C/S ₃	C/S ₄	C/S ₄	C/S ₄	C/S ₄	10
CHANNEL TYPE (C)	C ₁	C ₁	C ₁	C ₁	0	0	0	0	11
SAMPLES/CHANNEL (S/C) CHANNEL GAIN (J)	S/C	S/C	S/C	S/C	J	J	J	J	12
ALIAS FILTER FREQUENCY	AF ₁	AF ₁	AF ₁	AF ₁	AF ₂	AF ₂	AF ₂	AF ₂	13
	AF ₃	AF ₃	AF ₃	AF ₃	AF ₄	AF ₄	AF ₄	AF ₄	14
ALIAS FILTER SLOPE (AS)	0	0	0	0	AS ₁	AS ₁	AS ₁	AS ₁	15
	AS ₂	AS ₂	AS ₂	AS ₂	AS ₃	AS ₃	AS ₃	AS ₃	16
LOW CUT FILTER	LC ₁	LC ₁	LC ₁	LC ₁	LC ₂	LC ₂	LC ₂	LC ₂	17
	LC ₃	LC ₃	LC ₃	LC ₃	LC ₄	LC ₄	LC ₄	LC ₄	18
LOW CUT FILTER SLOPE (LS)	0	0	0	0	LS ₁	LS ₁	LS ₁	LS ₁	19
	LS ₂	LS ₂	LS ₂	LS ₂	LS ₃	LS ₃	LS ₃	LS ₃	20
FIRST NOTCH FILTER	NT ₁	NT ₁	NT ₁	NT ₁	NT ₂	NT ₂	NT ₂	NT ₂	21
	NT ₃	NT ₃	NT ₃	NT ₃	NT ₄	NT ₄	NT ₄	NT ₄	22
SECOND NOTCH FILTER	NT ₁	NT ₁	NT ₁	NT ₁	NT ₂	NT ₂	NT ₂	NT ₂	23
	NT ₃	NT ₃	NT ₃	NT ₃	NT ₄	NT ₄	NT ₄	NT ₄	24
THIRD NOTCH FILTER	NT ₁	NT ₁	NT ₁	NT ₁	NT ₂	NT ₂	NT ₂	NT ₂	25
	NT ₃	NT ₃	NT ₃	NT ₃	NT ₄	NT ₄	NT ₄	NT ₄	26
	0	0	0	0	0	0	0	Q	27
	0	0	0	0	0	0	0	0	28
	0	0	0	0	0	0	0	0	29
	0	0	0	0	0	0	0	0	30
	0	0	0	0	0	0	0	0	31
	0	0	0	0	0	0	0	0	32

Channel set descriptor

PLATE 4L



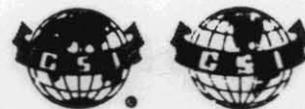
TRACK NO.	4	7	6	5	3	9	1	8	2
-----------	---	---	---	---	---	---	---	---	---

BIT NO.	P	0	1	2	3	4	5	6	7
---------	---	---	---	---	---	---	---	---	---

BCD VALUE MSD	8	4	2	1	8	4	2	1	LSD
BINARY VALUE MSB	128	64	32	16	8	4	2	1	LSB

FILE NUMBER	F ₁	F ₁	F ₁	F ₁	F ₂	F ₂	F ₂	F ₂	1
	F ₃	F ₃	F ₃	F ₃	F ₄	F ₄	F ₄	F ₄	2
FORMAT CODE	Y ₁	Y ₁	Y ₁	Y ₁	Y ₂	Y ₂	Y ₂	Y ₂	3
	Y ₃	Y ₃	Y ₃	Y ₃	Y ₄	Y ₄	Y ₄	Y ₄	4
GENERAL CONSTANTS	K ₁	K ₁	K ₁	K ₁	K ₂	K ₂	K ₂	K ₂	5
	K ₃	K ₃	K ₃	K ₃	K ₄	K ₄	K ₄	K ₄	6
	K ₅	K ₅	K ₅	K ₅	K ₆	K ₆	K ₆	K ₆	7
	K ₇	K ₇	K ₇	K ₇	K ₈	K ₈	K ₈	K ₈	8
	K ₉	K ₉	K ₉	K ₉	K ₁₀	K ₁₀	K ₁₀	K ₁₀	9
YEAR	K ₁₁	K ₁₁	K ₁₁	K ₁₁	K ₁₂	K ₁₂	K ₁₂	K ₁₂	10
	YR ₁	YR ₁	YR ₁	YR ₁	YR ₂	YR ₂	YR ₂	YR ₂	11
DAY (DY)	0	0	0	0	DY ₁	DY ₁	DY ₁	DY ₁	12
	DY ₂	DY ₂	DY ₂	DY ₂	DY ₃	DY ₃	DY ₃	DY ₃	13
HOUR	H ₁	H ₁	H ₁	H ₁	H ₂	H ₂	H ₂	H ₂	14
MINUTE	MI ₁	MI ₁	MI ₁	MI ₁	MI ₂	MI ₂	MI ₂	MI ₂	15
SECOND	SE ₁	SE ₁	SE ₁	SE ₁	SE ₂	SE ₂	SE ₂	SE ₂	16
MANUFACTURER'S CODE	M ₁	M ₁	M ₁	M ₁	M ₂	M ₂	M ₂	M ₂	17
MANUFACTURER'S SERIAL NUMBER	M ₃	M ₃	M ₃	M ₃	M ₄	M ₄	M ₄	M ₄	18
	M ₅	M ₅	M ₅	M ₅	M ₆	M ₆	M ₆	M ₆	19
	B ₁	B ₁	B ₁	B ₁	B ₂	B ₂	B ₂	B ₂	20
BYTES PER SCAN	B ₃	B ₃	B ₃	B ₃	B ₄	B ₄	B ₄	B ₄	21
	B ₅	B ₅	B ₅	B ₅	B ₆	B ₆	B ₆	B ₆	22
	I ₃	I ₂	I ₁	I ₀	I ₋₁	I ₋₂	I ₋₃	I ₋₄	23
BASE SCAN INTERVAL	P	P	P	P	S/B ₁₃	S/B ₁₂	S/B ₁₁	S/B ₁₀	24
POLARITY (P)	S/B ₇	S/B ₆	S/B ₅	S/B ₄	S/B ₃	S/B ₂	S/B ₁	S/B ₀	25
SCANS/BLOCK EXPONENT (S/B _n)	Z	Z	Z	Z	R ₁	R ₁	R ₁	R ₁	26
SCANS/BLOCK	R ₂	R ₂	R ₂	R ₂	R ₃	R ₃	R ₃	R ₃	27
RECORD TYPE (Z)	ST/R ₁	ST/R ₁	ST/R ₁	ST/R ₁	ST/R ₂	ST/R ₂	ST/R ₂	ST/R ₂	28
RECORD LENGTH (R)	CS ₁	CS ₁	CS ₁	CS ₁	CS ₂	CS ₂	CS ₂	CS ₂	29
SCAN TYPES/RECORD	SK ₁	SK ₁	SK ₁	SK ₁	SK ₂	SK ₂	SK ₂	SK ₂	30
CHANNEL SETS /SCAN TYPE	EC ₁	EC ₁	EC ₁	EC ₁	EC ₂	EC ₂	EC ₂	EC ₂	31
SKEW BLOCKS	EX ₁	EX ₁	EX ₁	EX ₁	EX ₂	EX ₂	EX ₂	EX ₂	32
EXTENDED HEADER BLOCKS									
EXTERNAL HEADER BLOCKS									

General header



2 byte quaternary exponent data recording method

The following illustrated the 16-bit word and the corresponding bit weights:

Bit	0	1	2	3	4	5	6	7
Byte 1	S	C ₂	C ₁	C ₀	Q ₋₁	Q ₋₂	Q ₋₃	Q ₋₄
Byte 2	Q ₋₅	Q ₋₆	Q ₋₇	Q ₋₈	Q ₋₉	Q ₋₁₀	Q ₋₁₁	Q ₋₁₂

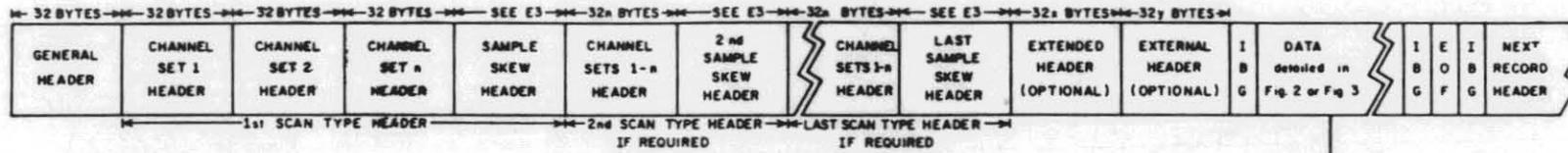
S = sign bit. — (One = negative number).

C = quaternary exponent. — This is a three bit positive binary exponent of 4 written as 4^{CCC} where CCC can assume values from 0-7.

*Q*₁₋₁₂ = fraction. — This is a 12 bit one's complement binary fraction. The radix point is to the left of the most significant bit (*Q*₋₁) with the MSB being defined as 2^{-1} . The fraction can have values from

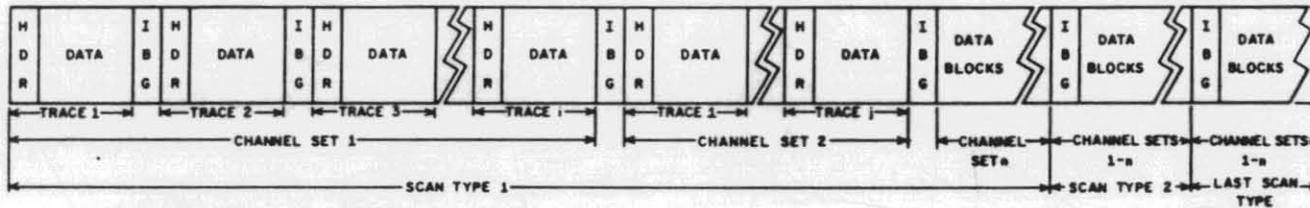
$-1 + 2^{-12}$ to $1 - 2^{-12}$. In order to guarantee the uniqueness of the start of scan, negative zero is invalid and must be converted to positive zero.

Input signal = $S.QQQQ.QQQQ.QQQQ \times 4^{CCC} \times 2^{MP}$ millivolts where 2^{MP} is the value required to de-scale the data sample to the recording system input level. MP is defined in Byte 8 of each channel set descriptor in the scan type header.



Record format

- SOS = START OF SCAN (4 BYTES)
- T = TIMING WORD (4 BYTES)
- HDR = TRACE HEADER (20 BYTES)
- IBG = INTER BLOCK GAP
- E3 = REFERENCE APPENDIX E3
- x AND y ARE GENERAL HEADER ENTRIES

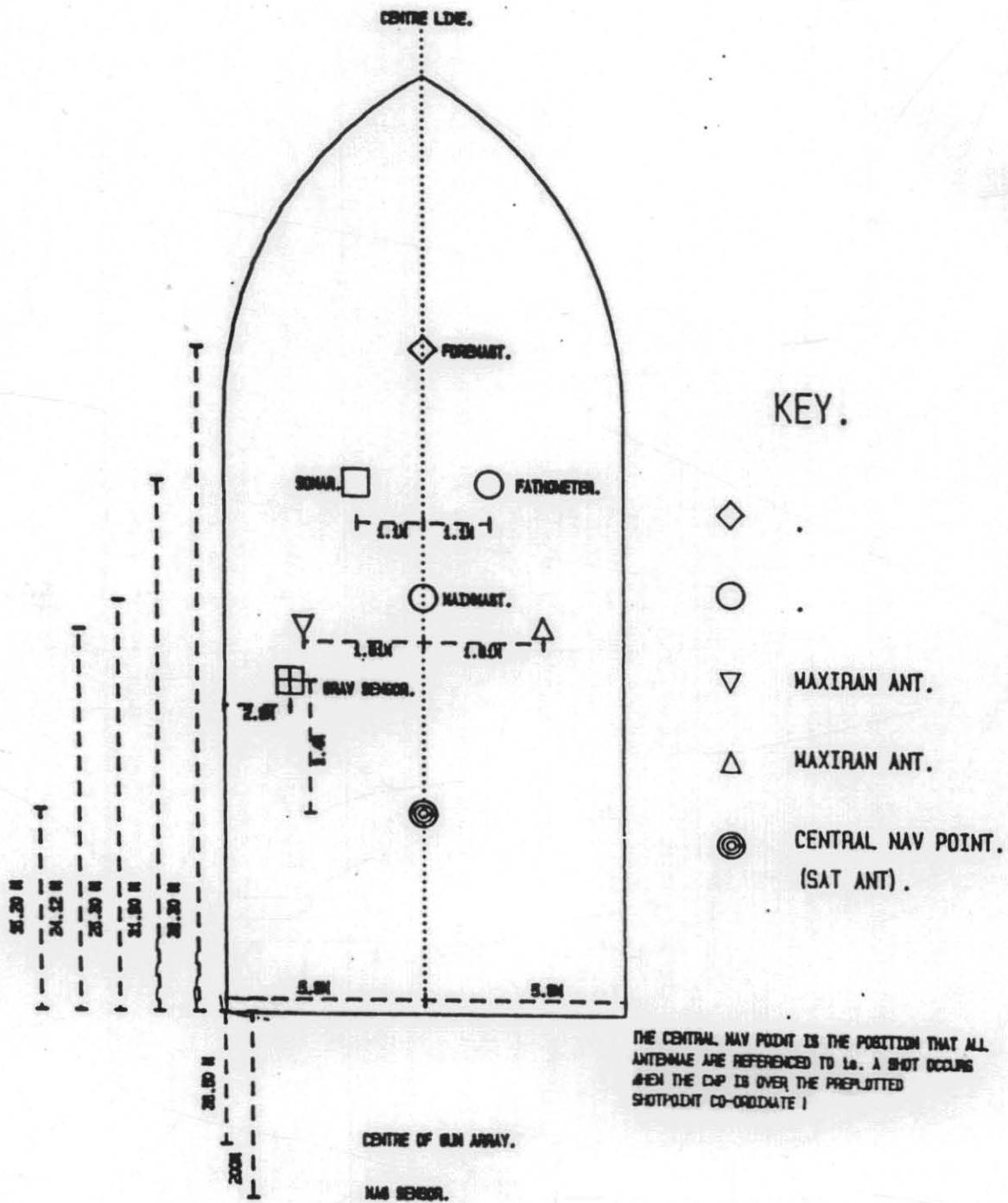


Demultiplexed data blocks





M/V EUGENE McDERMOTT II



THE CENTRAL NAV POINT IS THE POSITION THAT ALL ANTENNAE ARE REFERENCED TO IS. A SHOT OCCURS WHEN THE CAP IS OVER THE PREPLOTTED SHOTPOINT CO-ORDINATE I

5 cm

PLATE 6OFFSET CALCULATION

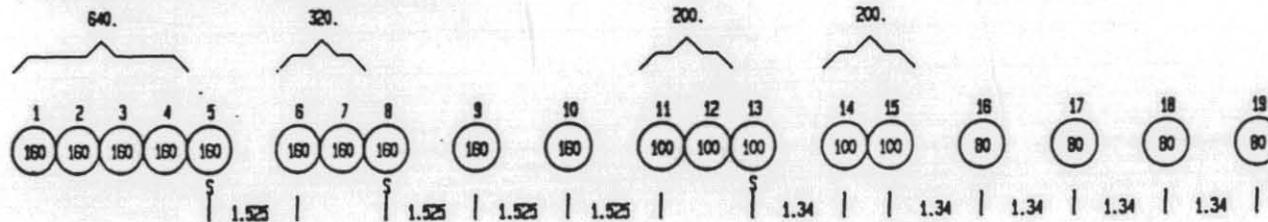
The offset was calculated by firing a single gun at, or close to the array centre and measuring the time (t) to peak of the first break from the near group on the camera display. The formula used was:

$$\begin{aligned}\text{OFFSET} &= (t - \text{gun delay} - \text{filter delay}) \times \text{water sound vel.} \\ &\quad \text{plus } 1/2 \text{ group length} \\ &= ((316 - 51.0 - 5.0) \times 1.48) + 7.5\text{m} \\ &= 384.8 + 7.5\text{m} \\ &= 392.3 \text{ metres}\end{aligned}$$

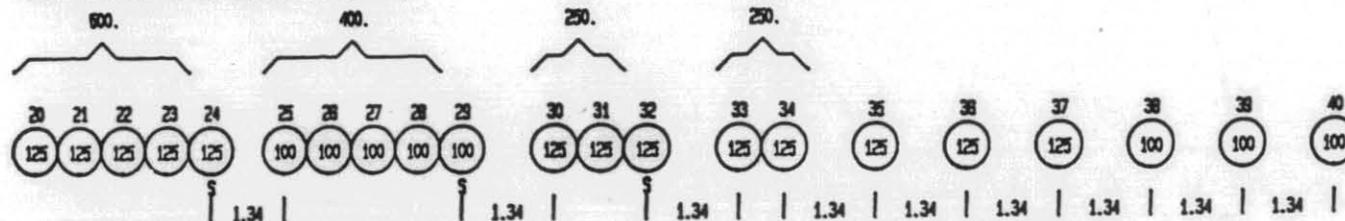


4075 CUBIC-INCH MOD II/III AIRGUN ARRAY

STARBOARD STRING (19 GUNS, 18.25 M)



PORT STRING (21 GUNS, 18.6 M)



NOTES-

1. GUN SIZE IN CUBIC INCHES
2. CENTRELINE TO CENTRELINE SPACING OF ALL COALESCED GUNS IS 0.545 METRES
3. SPARE GUNS DENOTED BY "S"
4. GUNS 1 - 10 ARE MOD III PC, GUNS 11 - 40 ARE MOD II PC
5. PREDICTED AVERAGE PERFORMANCE-
 $P_a=80$ BAR-M (P-P, 0-125 Hz)
 $P_a/P_b=10$:

ARRAY COMPOSITION

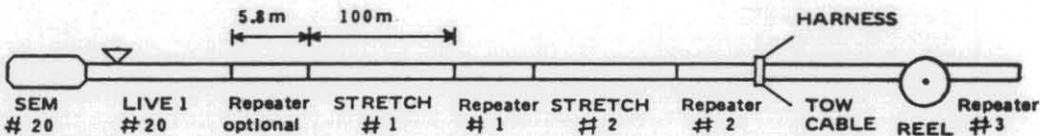
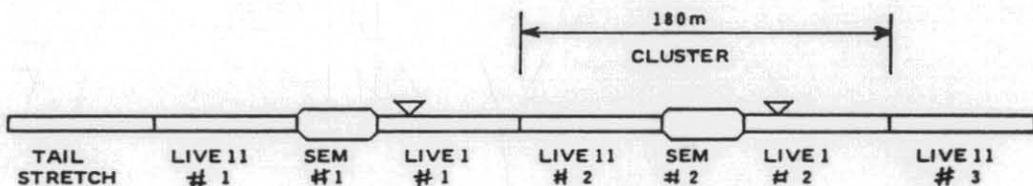
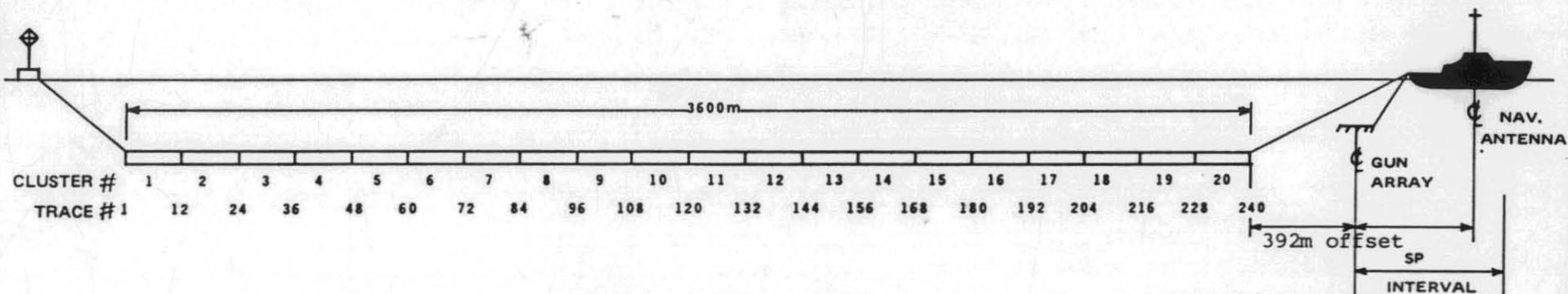
1 X 640	} 4075 ACTIVE	} 770 SPARE
1 X 500		
1 X 400		
1 X 320		
2 X 250		
2 X 200		
2 X 160		
3 X 125		
3 X 100		
4 X 80.		
2 X 160	} 770 SPARE	
1 X 125		
1 X 100.		

PLATE 7

5 cm

5 cm

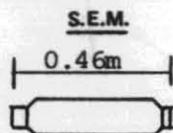
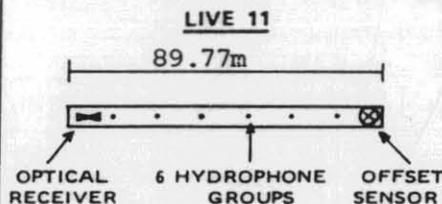
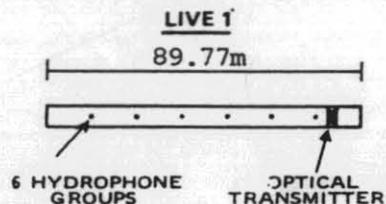
081-708



DEPTH CONTROLLER AT (Marked ▽)
LIVE 1 NUMBERS

12	36	60	84	108	132	156	180	204	228	240
13	37	61	85	109	133	157	181	205	229	

EACH 180m LONG CLUSTER
CONTAINS 12 x 15m LONG GROUPS



G.S.I. MARINE MULTIPLEX STREAMER DIAGRAM

G.S.I. PARTY 2931

SHIP M/V "EUGENE McDERMOTT II"

CLIENT AMOCO

CHANNELS 240

LENGTH 3600m

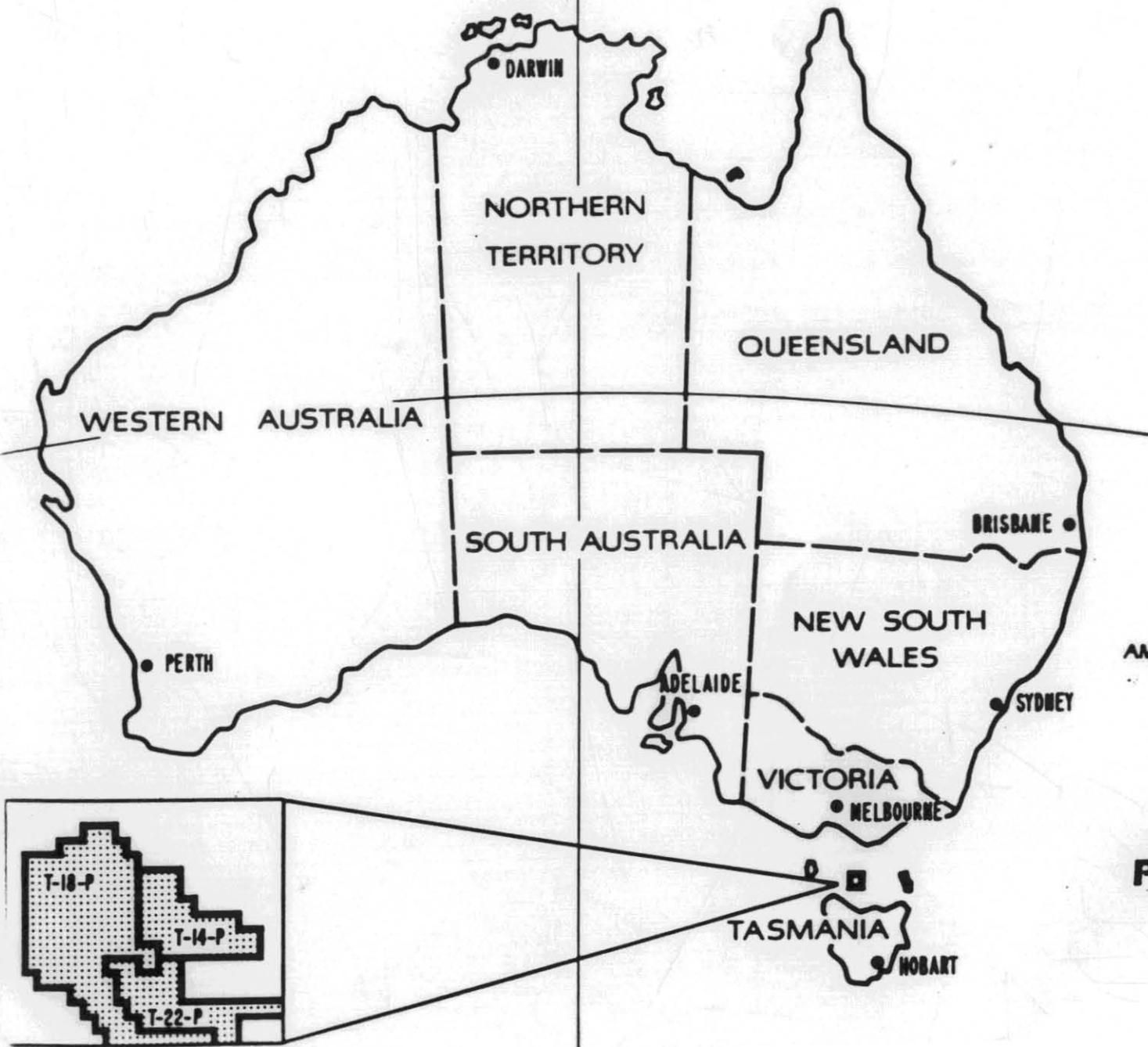
DATE 12th - 16th May, 1985

PLATE 9



185084

134° E



NORTHERN
TERRITORY

QUEENSLAND

WESTERN AUSTRALIA

SOUTH AUSTRALIA

NEW SOUTH
WALES

VICTORIA

TASMANIA

1:22,000,000 Approx

5 cm



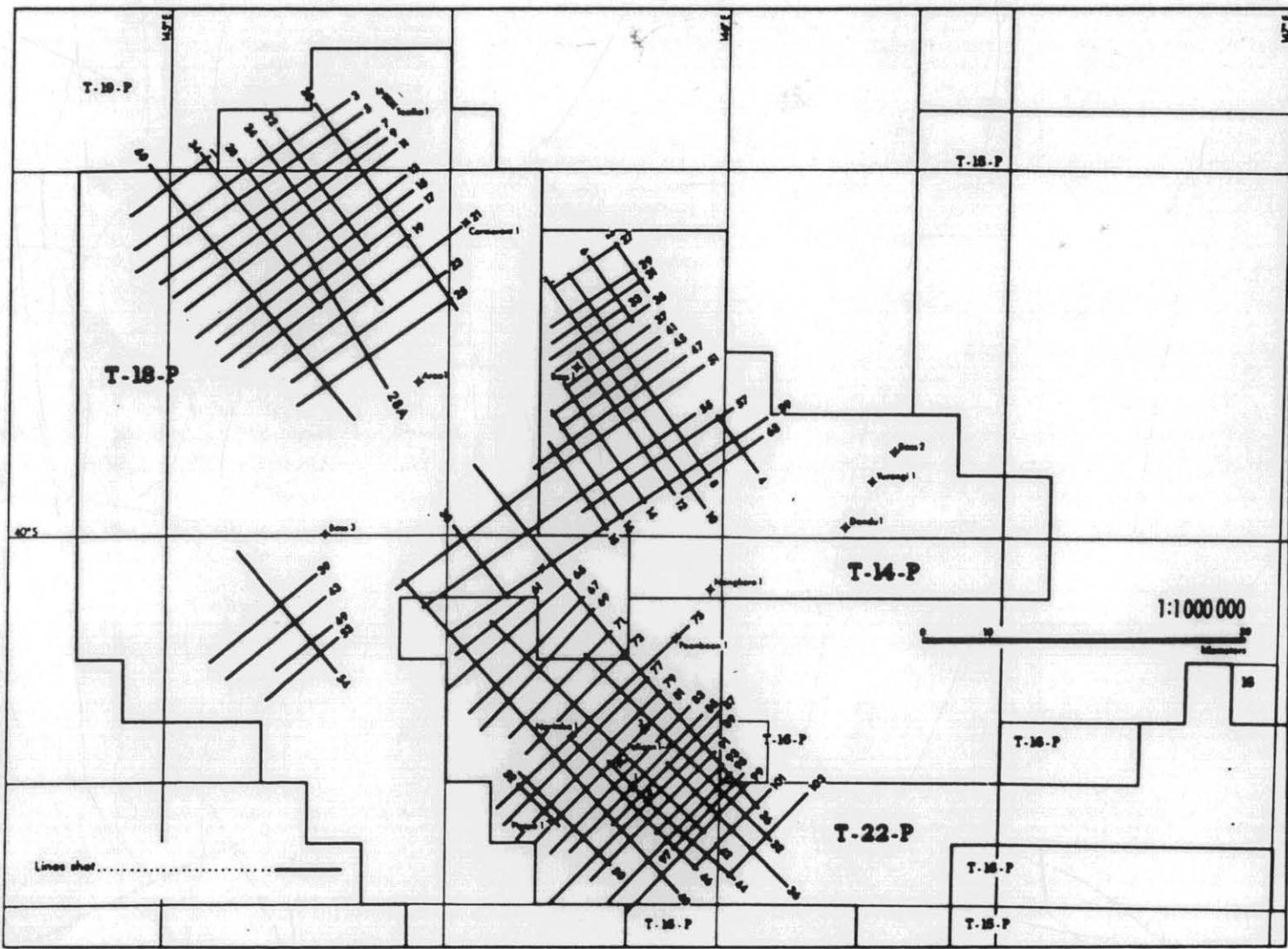
AMOCO AUSTRALIA PETROLEUM COMPANY

LOCATION MAP
Offshore Tasmania

BASS BASIN
PERMITS T-14,18,22-P

PLATE 10a.

185085



NOTE : All lines prefixed by -TNK4-
e.g. TNK4-28

SCALE 1:1,000,000

1:1000000



AMOCO AUSTRALIA PETROLEUM COMPANY
1984 AMOCO BASS BASIN SURVEY

LINE LOCATION MAP

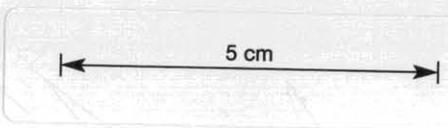


PLATE 10b.

00001

AMOCO AUSTRALIA PETROLEUM COMPANY

REPORT

ON

MAXIRAN POSITIONING

FOR

1985A AMOCO BASS BASIN SEISMIC SURVEY

IN

BLOCK T/18P

BASS STRAIT

AUSTRALIA

TABLE OF CONTENTS

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAGE NO</u>
1	INTRODUCTION	1
2	PERSONNEL AND EQUIPMENT	
	2.1 Personnel	2
	2.2 Equipment	3
3	CHRONOLOGICAL RECORD OF EVENTS	4
4	SURVEY METHODS AND PROCEDURES	
	4.1 Maxiran Positioning System and Calibration	7
5	SEISMIC DATA	15

APPENDICES

- 1 - Maxiran Calibration Information
- 2 - Navigation Log Sheets
- 3 - Station Descriptions

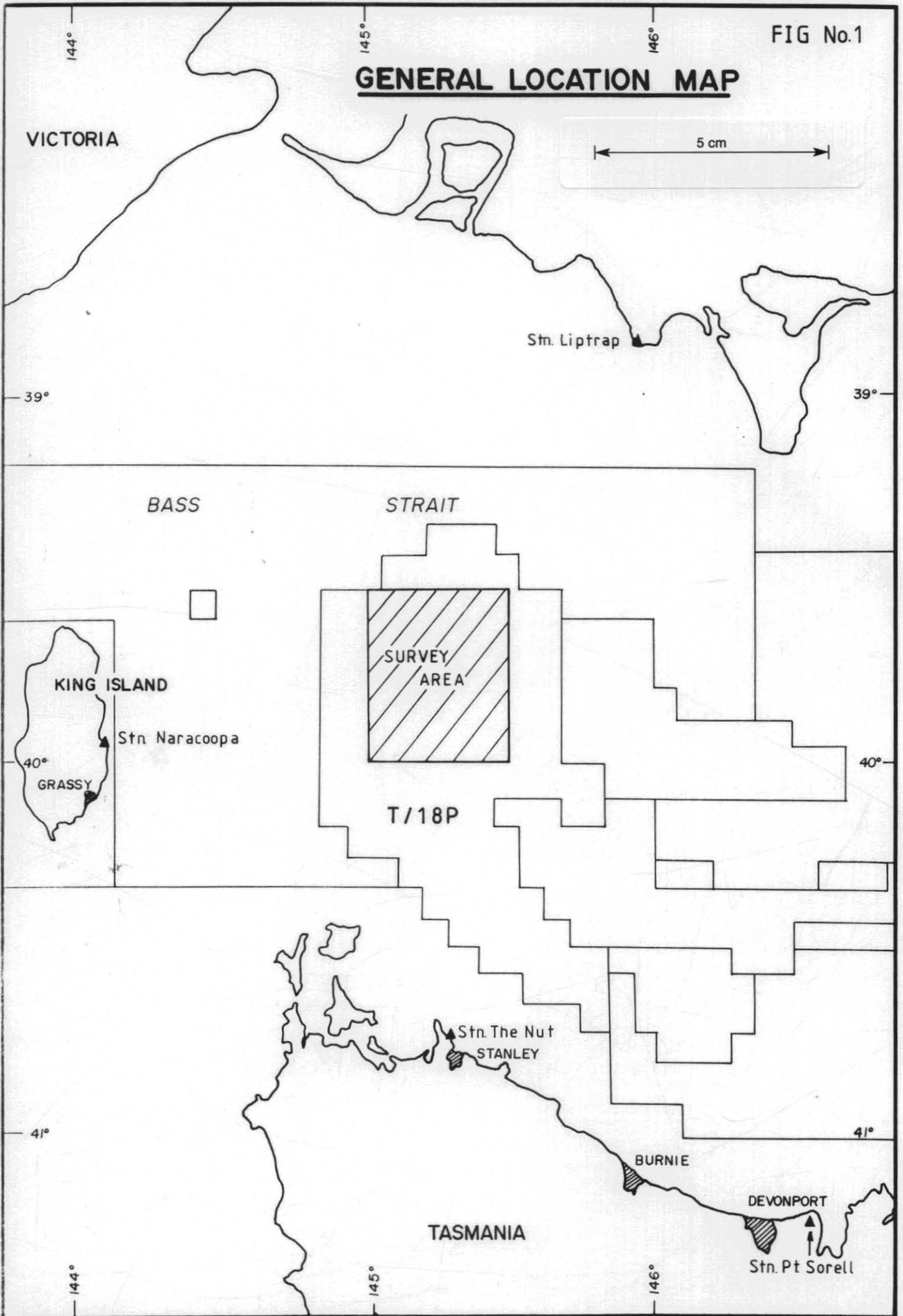
LIST OF FIGURESFIG. NO.TITLEPAGE NO.

1

GENERAL LOCATION MAP

FRONTISPIECE

GENERAL LOCATION MAP



1 INTRODUCTION

GEOMEX SURVEYS (AUSTRALIA) PTY. LTD., was contracted by AMOCO AUSTRALIA PETROLEUM COMPANY to provide positioning for the vessel "EUGENE McDERMOTT 11" while carrying out "1985A Amoco Bass Basin Survey" in T-18-P during May 1985.

The positioning system supplied for this task was Maxiran, as it was already set-up and operating in the area. The mobiles were installed onboard the vessel upon completion of her dry-docking in Launceston on 9th May, and were interfaced to the onboard C.M.S. system to act as the primary navigation system throughout the survey. The secondary navigation system was supplied by G.S.I. with their Satellite and Doppler Sonar System.

The Seismic survey comprised approximately 350 line kilometres and was carried out between 10th and 16th May over an area situated 100km east of King Island and 130km north of the Tasmanian Coast.

The four Maxiran base stations used for the survey are shown in Figure 1 at:

1. Point Sorell (Tasmania)
2. The Nut (Tasmania)
3. Naracoopa (King Island)
4. Cape Liptrap (Victoria)

Upon completion of the survey the positioning equipment was removed from the vessel on 17th May and stored locally for the forthcoming work in the area.

PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT2.1 Personnel

The survey personnel engaged on this project were as follows:

G.J. Harries	:	Surveyor/Party Chief
B. Robinson	:	Technician/Navigator
B. Maluish	:	Base Station Operator (Liptrap)
T. Moore	:	Base Station Operator (The Nut)
W. Gray	:	Base Station Operator (Naracoopa)
G. Dobson	:	Base Station Operator (Point Sorell)

2 PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT (Cont'd)2.2 Equipment

The following survey equipment was employed on this project:

2.2.1 Navigation- The Maxiran Positioning System comprising:

A. Complete Mobile System plus backup

- Two - Monitors
S/Nos. 74, 78
- Two - Interrogators
S/Nos. 151, 114
Complete set of cables, connections
and interfacing
- Two - sets of L.P.L's and Omni Directional
Antennas
- Two - Linear Amplifiers/Power Supply
- One - S.S.B. Radio

B. Four sets of Base Stations equipment
plus backup

- Seven - Base Beacons/Beacon Control Box
Complete set of cables, connections
- Four - Complete Base Stations comprising
of Generator, Radio (S.S.B) Tower
Sections, and Auxillary Equipment

CHRONOLOGICAL RECORD OF EVENTSSunday 5th May, 1985

07.30 Commenced preparation for short baseline calibration.
Unable to perform calibration due to severe weather conditions.

Monday 6th May, 1985.

08.00 Commenced short baseline calibration.
Weather conditions again delay calibration.

Tuesday 7th May, 1985.

10.15-15.30 Performed short baseline calibration, without linear amplifiers.

Wednesday 8th May, 1985.

10.00-14.00 Performed short baseline calibration, with linear amplifiers.
15.30 Commenced long baseline calibration.

Thursday 9th May, 1985.

11.00 Completed long baseline calibration.
13.00 Surveyor's depart Devonport for Launceston.
15.00 Arrive Launceston.
16.00 Commenced installing equipment on "Eugene McDermott 11".

Friday 10th May, 1985.

12.00 Completed installing equipment and testing.
17.00 Vessel departed Launceston for survey area.

Saturday 11th May, 1985.

05.00 Crossed baseline Pt Sorell - The Nut.
10.40 Crossed baseline Naracoopa - Pt Sorell.
15.30 Crossed baseline The Nut - Pt Liptrap.
Vessel proceeding to survey area.

3 CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Sunday 12th May, 1985.

16.30 Commenced survey of line TP505-51.

Monday 13th May, 1985.

03.27 Commenced survey of line TP505-17.

09.04 Commenced survey of line TP505-15.

13.43 Commenced survey of line TP505-17A.

17.25 Commenced survey of line TP505-13.

21.42 Commenced survey of line TP505-11.

Tuesday 14th May, 1985.

01.59 Commenced survey of line TP505-9.

05.49 Commenced survey of line TP505-7.

10.41 Commenced survey of line TP505-5.

15.28 Commenced survey of line TP505-3.

19.52 Commenced survey of line TP505-1.

23.50 Commenced survey of line TP505-2.

Wednesday 15th May, 1985.

03.24 Commenced survey of line TP505-4.

06.56 Commenced survey of line TP505-6.

10.31 Commenced survey of line TP505-8.

18.15 Commenced survey of line TNK4-15A.

20.57 Commenced survey of line TP505-10.

Thursday 16th May, 1985.

05.51 Commenced survey of line TP505-51B.

09.01 Commenced survey of line TP505-51C.

13.35 Crossed baseline Liptrap - The Nut.

22.00 Vessel returned to Devonport.

Friday 17th May, 1985.

04.00 Mobile equipment de-rigged from vessel.

18.00 Base station equipment de-rigged.

CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Saturday 18th May, 1985.

12.00 All survey equipment packed and stored
on site.

16.00 Survey personnel demobilized for Devonport.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration4.1.1 Mode of Operation

MAXIRAN POSITIONING SYSTEM - This is a medium range positioning system operating between the frequencies of 420 to 450 MHz with a bandwidth of ± 1.8 MHz. A series of phase coded pulses emitted from the mobile unit installed onboard the vessel interrogates the beacons at co-ordinated points ashore, each replying to the mobile after synchronising code generators with an unique coded pulse. The transmission cycle repeating once every 200 milliseconds. The mobile unit measures the time elapse allowing for propagation corrections and component delays to output the range to each beacon to a high standard of accuracy.

This system operating in its range/range mode will provide position accuracies of better than ± 10 m., in excess of 200 km. offshore.

The compact units and low power requirements of this system facilitates transportation and deployment in the field. The shore stations are each manned by one experienced operator who is responsible for the installation and 24 hour operation of his equipment. All units are in contact by SSB radio.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.2 Installation

Three (3) base stations already installed for previous work in the area were re-activated, and a fourth station set-up to improve the navigation coverage for this survey. The three original stations comprised two on the mainland (Point Sorell - The Nut) and one on King Island (Naracoopa), the fourth station was set-up at Cape Liptrap. Details of the offsets and coordinates can be found in section 4.3 and in the station description, see appendix 3.

L.P.L. antennas were used for both the mobile and base station installations OMNI-directional whips were also worked ontop of the mobile antennas, but were not used during this survey.

The mobile antennas installed on either end of gantry on the "Eugene McDermott 11" with mast and linked to the monitor, interrogater and linear amplifier in the vessels control room, which then supplied range data to the onboard C.M.S (Configurable Marine System) to provide navigation for the vessel during the seismic survey.

The Maxiran Monitor S/N 74 was used without a linear amplifier for the majority of the period of the survey, and was monitored on a 24 hour basis by the Geomex personnel.

SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.3 Base Station Data

The four maxiran stations were installed at the following co-ordinated points:

(a) Point Sorell

Latitude: 41° 07' 24.749" South
Longitude: 146° 31' 41.905" East
Eastings: 460 403.85m.
Northings: 5 447 405.45m.
Antenna Height: 42m.

Established with a 12 m. tower, offset 1.85 metres bearing 162° from marker ST 517.

(b) The Nut

Latitude: 40° 45' 50.244" South
Longitude: 145° 18' 13.416" East
Eastings: 356 829.45m.
Northings: 5 486 045.74m.
Antenna Height: 155m.

Established with a 12m. tower, offset 1.0 metres bearing 239° from marker ST 674.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.3 Base Station Data (Cont'd)(c) Naracoopa

Latitude: 39° 55' 29.05" South

Longitude: 144° 07' 39.03" East

Easting: 254 516.76m.

Northing: 5 576 629.84m.

Antenna Height: 53m.

Erected with a 18m. tower, offset
307.95 metres, bearing 98° 7' 14"
from marker 281/150.

(d) Liptrap

Latitude: 38° 51' 05.64" South

Longitude: 145° 57' 54.98" East

Easting: 410 212.82m.

Northing: 5 699 171.44m.

Antenna Height: 183m.

Erected with a 13m. tower, offset
4.0 metres bearing 140° magnetic
from Trig marker.

All co-ordinates refer to:

Datum	:	Australian Geodetic
Spheroid	:	Australian National
Projection	:	UTM Zone 55
C. Meridian	:	147° East

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.4 Short Baseline Calibration

On 7th May, 1985 the Maxiran system was calibrated over a short baseline distance of 15,168 m. between "Point Sorell" station and the trig marker at "Mersey Bluff", Devonport. Land pass was negligible and conditions were clear and stable.

Both mobiles were calibrated against all seven (7) beacons, with and without linear amplifiers and using both OMNI and L.P.L. antennas. The monitors and beacons were connected for zero set, and the interrogators adjusted with calibration screws to set for equal delays, before recording observed ranges for each mobile using all combinations of primary and back-up equipment.

The mobiles were set-up at "Point Sorell" using two towers off-set from the trig marker, while the beacons were operated from the tower set-up at "Mersey Bluff". The calibration distances calculated as follows:

Calibration Distance 1

North Tower of Pt Sorell - "Mersey Bluff"-15158.9 m.

Calibration Distance 2

South Tower of Pt Sorell - "Mersey Bluff"-15158.3 m.

See appendix 1 for Results of Short Baseline Calibration.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.5 Long Baseline Calibration

On 8th May, 1985 a long baseline calibration was carried out between the stations at "Point Sorell" and "The Nut". The equipment configuration and the weather remaining the same as for the short baseline calibration.

The two towers with the mobile equipment at "Point Sorell" were left standing and the different spheroidal distances over which the calibration was carried out were calculated as follows:

Calibration Distance 1

North Tower of Point Sorell - The Nut = 110569.8m.

Calibration Distance 2

South Tower of Point Sorell - The Nut = 110572.2m.

See appendix 1 for results of long baseline calibration.

As part of the long baseline calibration the mobiles were left interrogating one beacon over this long baseline distance from 15.30 hours on 8th May to 08.30 hours on 9th May 1985 to monitor any directional variation in the propagation of the signal.

The result of this was that very little variation was seen throughout the period.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.6 Baseline Crossings

On the 11th May 1985 whilst enroute to the prospect area, three baseline crossings were cut, and on the vessels return to Devonport one of these baselines was again cut on 16th May 1985.

On all baseline crossings the observed ranges were recorded directly from the monitor, with the delays set in the unit.

Point Sorell - The Nut (Beacon 2-Beacon 3)

Total Delay = 9 576 m.

(OMNI Antenna/Linear Amplifier)

11-05-1985 0500 hrs Heading 018°

Observed Distance 110 579.5 m.

Calculated Distance 110 579 m.

C - O -0.5 M.

Naracoopa - Point Sorell (Beacon 5 - Beacon 2)

Total Delay = 9 575 m.

(L.P.L. Antenna/Linear Amplifier)

11-05-1985 1040 hrs Heading 217°

Observed Distance 243 126 m.

Calculated Distance 243 107 m.

C - O -19 m.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.6 The Nut - Liptrap (Beacon 3- Beacon 4)

Total Delay = 9 568 m.

(L.P.L. Antennas/Linear Amplifiers)

11-05-1985 1530 hrs Heading 110°

Observed Distance 219 773 m.

Calculated Distance 219 760 m.C - O -13 m.The Nut - Liptrap (Beacon 3- Beacon 4)

Total Delay = 9 541 m.

(L.P.L. Antennas/No Linear Amplifier)

16-05-1985 1335-1423 hrs Heading 290°/110°

Observed Distance 219 774 m.

Calculated Distance 219 772 m.

Mean 219 773 m.

Calculated 219 760 m.C - O -13 m.

Taking the readings from Naracoopa-Point Sorell and The Nut-Lip Trap baseline crossings, propagation factors of 0.999 921 851 and 0.999 940 848 are obtained respectively and closely approximate the factor used throughout the survey.

5

SEISMIC LINE DATA

The proposed seismic lines, with start and end co-ordinates are herewith listed below, and were shot by the M/V "Eugene McDermott 11" between 12th and 16th May, 1985.

LINE GEOGRAPHICAL CO-ORDS/LENGTH/BEARING (PROPOSED)				
LINE	END POINT LATITUDE LONGITUDE	END POINT LATITUDE LONGITUDE	LENGTH	BEARING
TP05-1	39° 36 25".5 S 145° 01 48".0 E	39° 29' 24".5 S 145° 14' 27 .0 E	22500	54.4
TP05-3	39° 38 46".5 145° 01 30".0 E	39° 28' 44".6 S 145° 19' 47".0 E	32100	54.8
TP05-5	39° 39 43".5 S 145° 03 07".2 E	39° 29' 36".0 S 145° 20' 32".5 E	31200	53.2
TP505-7	39° 40 42".0 S 145° 04 25".5 E	39° 30' 36".9 S 145° 21' 37".7 E	30900	52.9
TP505-9	39° 41 09".0 S 145° 05 16".5 E	39° 33' 19".3 S 145° 18' 38".8 E	24000	52.9
TP505-11	39° 42 0".0 S 145° 06 57".0 E	39° 34' 29".5 S 145° 19' 50".9 E	23100	53.1
TP505-13	39° 42 52".5 S 145° 08 27".7 E	39° 35' 37".4 S 145° 20' 49".6 E	22200	52.9
TP505-15	39° 43 57".0 S 145° 09 36".0 E	39° 37' 47".0 S 145° 20' 08".2 E	18900	52.9

5 SEISMIC LINE DATA (Cont'd)

LINE GEOGRAPHICAL CO-ORDS/LENGTH/BEARING (PROPOSED)

LINE	END POINT LATITUDE LONGITUDE	END POINT LATITUDE LONGITUDE	LENGTH	BEARING
TP505-17	39° 44 02".3 145° 12 49'.5	39° 39' 04".5 145° 21' 23".1	15300	53.2
TP505-2	39° 34 02".4 145° 05 33".4	39° 43' 38".0 145° 15' 33".5	22800	141.2
TP505-4	39° 32 03".2 145° 09 02".2	39° 40' 23".4 145° 16' 17".8	18600	146.1
TP505-6	39° 41 52".5 145° 07 06".0	39° 31' 36".3 145° 10' 09".1	19500	13.0
TP505-8	39° 32 57".0 145° 13 10".5	39° 41' 58".1 145° 10' 34 ".2	17100	192.6
TP505-10	39° 45 33".8 145° 20 04".5	39° 48' 32".6 145° 30' 17".7	15600	110.8
TP505-51	39° 57 07".5 145° 37 30".3	40° 01' 39".3 145° 29' 16".7	14400	234.4

See Appendix 2 for Navigation Log Sheets showing the running of these lines.

APPENDIX 1

MAXIRAN CALIBRATION INFORMATION

APPENDIX 1 - CALIBRATION INFORMATION

The two towers "N" and "S" with the mobile equipment installed on POINT SORRELL (ST 517) have the following co-ordinates:

POINT SORRELL (ST 517)

Latitude: 41° 07' 24.6921" South
Longitude: 146° 31' 41.8809" East
Northing: 5 447 407.233 metres
Easting: 460 403.278 metres

MOBILE TOWER 'N'

9.35 m. at 248° (Magnetic) from ST 517

Latitude: 41° 07' 24.7380" South
Longitude: 146° 31' 41.485" East
Northing: 5 447 405.770 metres
Easting: 460 394.043 metres

MOBILE TOWER 'S'

9.71 m. at 224° (Magnetic) from ST 517

Latitude: 41° 07' 24.8622" South
Longitude: 146° 31' 41.530 " East
Northing: 5 447 401.945 metres
Easting: 460 395.135 metres

The beacons were positioned at the MERSEY BLUFF at an offset from S.P.M. 200 (Please see station description - Appendix 3).

MERSEY BLUFF (S.P.M. 200)

Latitude: 41° 09' 37.3178" South
Longitude: 146° 21' 15.1429" East
Northing: 5 443 223.704 metres
Easting: 445 819.267 metres

Appendix 1 - Calibration Information (Cont'd)S.P.M. 200 (Offset)

10 m. at 61° (Magnetic) from S.P.M. 200

Latitude: 41° 09' 37.2331" South

Longitude: 146° 21' 15.557 " East

Northing: 5 443 226.39 metres

Easting: 445 828.90 metres

BASELINE CALIBRATION DISTANCES

Mobile Tower 'N' - 200 (Offset) = 15158.9 metres

Mobile Tower 'S' - S.P.M. 200 (Offset) = 15158.3 metres

Mobile Tower 'N' - The Nut (Maxiran Tower) = 110569.8 metres

Mobile Tower 'S' - The Nut (Maxiran Tower) = 110572.2 metres

Appendix 1 - Calibration Information (Cont'd)EQUIPMENT CONFIGURATION DURING CALIBRATIONS

Beacon No.	S/No.	Cable S/N	Control Box S/N
1	281	112	281
2	287	204	279
3	223	213	282
4A	284	207	232
4B	59	-	311
5	85	-	62
6	286	104	-

N.B. Gain Control on Beacon 6 sensitive.

<u>Tower 'N'</u>	<u>S/N</u>
Antennae (Loops)	
(omni)	411
Interrogator	151
Linear Amplifier	1450
Duplexer	3
Cable	105
Power Box	1450
Power Cable	1459

Appendix 1 - Calibration Information (Cont'd)Tower 'S'

	<u>S/N</u>
Antennae (Loops)	
(Omni)	402
Interrogator	114
Linear Amplifier	1193A
Duplexer	50
Cable	118
Power Box	1193A
Power Cable	

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 78

(No Linear Amplifier)

Antenna Loops

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19932/33	4774	15158.5
	S	19932/33	4774	15158.5
2	N	19929/30	4771	15158.5
	S	19929	4771	15158.0
3	N	19934/35	4775	15159.0
	S	19933/34	4775	15158.0
4A	N	19929	4770	15159.0
	S	19928	4770	15158.0
4B	N	19923/24	4765	15159.0
	S	19923/22	4764(4765)	15158.0
5	N	19923/24	4765	15159.0
	S	19923	4765	15158.0
6	N	19937	4778	15159.0
	S	19936/37	4778	15158.0

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 78

(No Linear Amplifier)

Antenna - Omni - S/N 411 & 402

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19931	4772	15159
	S	19932	4774	15158
2	N	19931/30	4773	15159
	S	19931/32	4773	15159
3	N	19936	4777	15159
	S	19935	4777	15158
4A	N	19929/30	4771	15159
	S	19930/29	4771	15159
4B	N	19924/25	4766	15159
	S	19924/25	4766	15158
5	N	19924/25	4766	15159
	S	19924/25	4766	15158
6	N	19929/30	4771	19159
	S	19929	4771	19158

Appendix 1 - Calibration InformationSHORT BASELINE MOBILE S/N 78

(Linear Amplifier)

Antenna - Loops

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19948/49	4790	15159
	S	19947	4789	15158
2	N	19947/46	4787	15160
	S	19945/46	4787	15158
3	N	19946	4787	15159
	S	19945	4787	15158
4A	N	19945	4786	15159
	S	19943/44	4785	15158
4B	N	19941	4782	15159
	S	19940	4782	15158
5	N	19937/38	4778	15159
	S	19936/37	4778	15158
6	N	19945	4786	15159
	S	19943	4785	15158

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 78

(Linear Amplifier)

Antenna : Omni

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19949/50	4791	15159
	S	19949	4791	15158
2	N	19948	4789/90	15159
	S	19948	4790	15158
3	N	19947	4788	15159
	S	19946/47	4788	15158
4A	N	19946/47	4788/89	15159
	S	19946/45	4787	15158
4B	N	19941/42	4783	15159
	S	19941	4783	15158
5	N	19939/38	4780	15159
		19938	4780	15158
6	N	19946/45	4787	15159
	S	19945	4787	15158

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 74

(No linear amplifier)

Antenna : Loops

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19930/31	4772	15159
	S	19930/31	4772	15158
2	N	19929	4770	15159
	S	19928/29	4770	15158
3	N	19933/34	4776	15158
	S	19934/35	4776	15159
4A	N	19929	4770	15159
	S	19928	4770	15158
4B	N	19923/24	4765	15159
	S	19923/24	4765	15158
5	N	19923/24	4765	15159
	S	19923	4765	15158
6	N	19937	4778	15159
	S	19936/37	4778	15158

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 74

(No linear amplifier)

Antenna : Omni

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19933/34	4775	15159
	S	19934/35	4776	15158
2	N	19930/31	4772	15159
	S	19931/32	4773	15159
3	N	19935/36	4777	15159
	S	19934/35	4776	15158
4A	N	19930	4771	15159
	S	19930	4772	15158
4B	N	19924/25	4766	15159
	S	19925	4767	15158
5	N	19924	4765	15159
	S	19924	4766	15158
6	N	19929/30	4771	15159
	S	19929	4771	15158

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 74

Antenna : Loops

Beacon	Tower	Raw Range	Zero Set	Calibrated Dist.
1	N	19947/48	4789	15159
	S	19945/46	4787	15158
2	N	19945/46	4787	15159
	S	19944/45	4786	15158
3	N	19946/45	4787	15159
	S	19945	4787	15158
4A	N	19945	4786	15159
	S	19944	4786	15158
4B	N	19940	4781	15159
	S	19939	4781	15158
5	N	19938	4779	15159
	S	19936/37	4778	15158
6	N	19945	4786	15159
	S	19944	4786	15158

Appendix 1 - Calibration Information (Cont'd)SHORT BASELINE MOBILE S/N 74

(Linear Amplifier)

Antenna : Omni

Beacon	Tower	Raw Ranges	Zero Set	Calibrated Dist.
1	N	19948	4789/90	15159
	S	19948	4790	15158
2	N	19947	4788	15159
	S	19947/48	4789	15158
3	N	19947	4788	15159
	S	19947	4789	15158
4A	N	19945	4786	15159
	S	19945/46	4787	15158
4B	N	19940/41	4782	15159
	S	19939/40	4781	15158
5	N	19939	4780	15159
	S	19939	4781	15158
6	N	19945/46	4787	15159
	S	19945	4787	15158

Appendix 1 - Calibration Information (Cont'd)

17 HOUR LONG BASELINE CALIBRATION DATE: 08/09-05-85

MOBILE S/N 78 BEACON 3 S/N 223

Tower (North) - No linear amplifier

Tower (South) - Linear Amplifier

N.B. "Raw Ranges"

Time	North Tower		South Tower	
	Loop	Omni	Loop	Omni
15.30	115346	115347	115362	115363
16.30	115348	115348	115364	115365
17.30	115347	115347	115363	115365
18.30	115347	115348	115364	115365
19.30	115346	115347	115362	115364
20.30	115347	115348	115362	115363
21.30	115346	115346	115362	115362
22.30	115346	115346	115365	115362
23.30	115348	115346	115367	115364
00.30	115347	115347	115365	115365
01.30	115347	115347	115362	115364
02.30	115348	115346	115363	115363
03.30	115346	115348	115364	115364
04.30	115346	115348	115362	115365
05.30	115346	115348	115362	115365
06.30	115347	115348	115364	115365
07.30	115348	115348	115364	115365
08.30	115347	115347	115363	115366
Mean	115347	115347	115363	115364
Z/Set	4775	4777	4787	4788
	110572	110570	110576	110576
Δ S-O	-2	0	-4	-4

Appendix 1 - Calibration Information (Cont'd)17 HOUR LONG BASELINE CALIBRATIONDATE: 08-09/05/85MOBILE S/N 74 BEACON 3 S/N 223

Tower (North) - No linear Amplifier

Tower (South) - Linear Amplifier

Time	North Tower		South Tower	
	Loop	Omni	Loop	Omni
15.30	115346	115347	115362	115363
16.30	115347	115348	115363	115364
17.30	115346	115348	115363	115364
18.30	115347	115347	115362	115363
19.30	115347	115347	115362	115363
20.30	115347	115347	115363	115364
21.30	115348	115346	115363	115365
22.30	115345	115347	115362	115365
23.30	115348	115348	115361	115364
00.30	115347	115347	115363	115363
01.30	115347	115348	115362	115363
02.30	115347	115347	115362	115364
03.30	115346	115348	115362	115363
04.30	115347	115348	115361	115363
05.30	115346	115347	115362	115364
06.30	115348	115348	115364	115363
07.30	115347	115348	115362	115363
08.30	115348	115347	115362	115364
Mean	115347	115347	115362	115364
Z/Set	4776	4777	4787	4789
	110571	110570	110575	110575
C-0	-1	-	-3	-3

APPENDIX 2

NAVIGATION LOG SHEETS

JOB NO: K 076

NAVIGATION LOG

Page: 1 OF 10SPHEROID: H.N.S.; a: 6378160; b:Date: SUNDAY 12th MAY 1985PROJECTION: UTM; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500 000 m; False N: 10 000 000 m; False Lat.: N/S; False Long.: E;

Velocity Factor:; Fix Interval:; Fix Increment:; Mobile Height:

185123

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 403.8	5 447 405.5	2	287							
THE NUT	356 829.4	5 486 045.7	3	223							
NARACOOPA	254 517.0	5 576 630.0	5	51							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config. (BEACON)	Remarks
SOL TP 505-51				16:30	54.4				3,5	RUN ON TWO RANGES
EOL				17:00						NUT / NARACOOPA
SOL										ATTEMPT TO FIND THIRD
EOL										STN - UNSUCCESSFUL
SOL										DELAYS
EOL										BEACON 3 4787
SOL										" 5 4718
EOL										CANCEL LINE
SOL										NAVIGATION POOR SIGNALS
EOL										
SOL TS05-51				21:27	54.4					CANCEL
EOL										MAXIMUM DOWN: LINEAR AMP ON PORT SIDE ON START OF FIRING OF GUNS
SOL										STOPPED WORKING
EOL										: REPAIR - SIGNALS GOOD AT 23:30
SOL										
EOL										NB: LINE TP 505-51 WAS RUN WITH LINEAR-AMP
SOL										AS OF 22:30 LINEAR AMP WERE NOT USED - SIGNALS IMPROVED.
EOL										
SOL										NB: PRECALCULATION FACTOR NOT APPLIED TO RANGES
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K 076

NAVIGATION LOG

Page: 2/10

SPHEROID: HNS ; a: 6378160 ; b:

Date: MONDAY 13th MAY 1985

PROJECTION: UTM ; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500 000 m; False N: 10 000 000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

185124

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 403.8	5 447 4055	2	287							
THE NUT	356 829.4	5 486 0457	3	223							
NARACOOPA	254 517.0	5 576 630.0	5	54							
LIPTRAP	410 212.8	5 649 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config. (BEACON)	Remarks
SOL TP 505-17			1	0327	52°				3, 5, 4B	04:30; LOSS OF SIGNAL FROM
EOL			480	0521						NARACOOPA SP 241
SOL										04:23; 2 RANGE FIXING
EOL										NUT / LIPTRAP
SOL										(SIGNALS FAIR)
EOL										(POSSIBLE RE-RUN)
SOL										BEACON DELAY
EOL									3	4776
SOL									5	4765
EOL									4B	4765
SOL										
EOL TP 505-15			1	0904	232°				3, 2, 4	SP 611 DROP SIN POINT
SOL			696	1106						SORELL
EOL										2 RANGE FIXING
SOL										(SIGNAL FAIR/GOOD)
EOL										NUT / LIPTRAP
SOL										BEACON DELAY
EOL									3	4776
SOL									2	4770
EOL									4	4765

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K076

NAVIGATION LOG

Page: 3/10
 Date: MONDAY 12th MAY 1985
 Local Time/GMT

SPHEROID: A.N.S. ; a: 6378160 ; b:
 PROJECTION: U.T.M. ; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996
 False E: 500,000 m; False N: 10,000,000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

185125

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
POINT SORELL	460 403.8	5447 405.5	2	287							
THE NUT	356 824.4	5486 045.7	3	223							
NARACORPA	254 517.0	5576 630.0	5	54							
LIPTRAP	410 212.8	5699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config. (BEACON)	Remarks
SOL TP 505 - 17A			1	13:43	53°				3, 5, 4B	BEACON DELAY
EOL			583	15:42					3	4776
SOL									5	4765
EOL									4B	4765
SOL										SIGNALS FAIR - "GOOD"
EOL										
SOL TP 505 - 13			1	17:25	233°				3, 5, 4B	BEACON DELAY
EOL			813	19:48					3	4776
SOL									5	4765
EOL									4B	4765
SOL										LIPTRAP SIGNALS AFTER
EOL										SP 513 BECOMING POOR
SOL										TO FAIR.
EOL										
SOL TP 505 - 11			1	21:12	53°				3, 5, 4B	BEACON DELAY
EOL			344	00:36	(NB 14/05/85)				3	4776
SOL									5	4765
EOL									4B	4765
SOL										SIGNALS GOOD
EOL										

FOI

JOB NO: K076

NAVIGATION LOG

Page: 4/10

SPHEROID: H.N.S.; a: 6378160; b:

Date: Tuesday 14th MAY 1985

PROJECTION: U.T.M.; C.M.: 147°E; Scale Factor @ C.M.: 0.9996

Local Time/GMT:

False E: 500 000 m; False N: 10 000 000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

STATIONS (8):

185126

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht. (m)	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 403.8	5 447 405.5	2	287							
THE NUT	356 829.4	5 486 045.7	3	223							
NARACOOPA	254 517.0	5 576 630.0	5	59							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config. BEACONS	Remarks
SOL TP 505-9			1	01:59	232				3,5,4	BEACON DELAY
EOL			874	04:23						3 4776
SOL										5 4765
EOL										4 4765
SOL										02:30; SP234 NARACOOPA LOST
EOL										2WAY FIX
SOL										02:35; SP267 - 3WAY FIX
EOL										04:20 SP865 NUT LOST
SOL										2WAY FIX
EOL										
SOL TP 505-7			1	05:49	53°				3,5,4B	BEACON DELAY
EOL			1102	09:15						3 4776
SOL										5 4765
EOL										4 4765
SOL										09:12 SP 1086 - NUT LOST
EOL										1088 - 2WAY FIX
SOL										09:14. REC SIG FROM NUT
EOL										SIGNAL - GOOD
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: R 076

NAVIGATION LOG

Page: 5/10

SPHEROID: A.N.S.; a: 6378160; b:

Date: TUESDAY 14-05-83

PROJECTION: U.T.M.; C.M.: 147; E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500000 m; False N: 10000000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

STATIONS (8):

185127

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 403.8	5 447 405.5	2	287							
THE NUT	356 829.4	5 486 045.7	3	223							
NARACOOPA	254 517.0	5 576 630.0	5	54							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL TP505-5			1	10:41	232				3,5,4B	BEACON DELAY
EOL			1115	14:03						3 4776
SOL										5 4765
EOL										4B 4765
SOL										SP 525 LOST NUT
EOL										PROBLEM WITH SIGNALS
SOL										DROP LIPTRAP AND GO ON
EOL										2WAY FIX SP695 (12'45)
SOL										TOWARDS THE END SIGNALS
EOL										WERE POOR. FROM NUT
SOL										VERY ERATIC
EOL										
SOL TP505-3			1	15:28	54°				3,5,4B	BEACON DELAY
EOL				18:42						3 4776
SOL										5 4765
EOL										4B 4765
SOL										2WAY FIX AT SP631 ONWARDS
EOL										ATTEMPT TO HAVE 3WAY FIX
SOL										SIGNALS POOR QUALITY
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K 076

NAVIGATION LOG

Page: 6/10

SPHEROID: A.N.S; a: 6378160; b:

Date: TUESDAY 14-05-85

PROJECTION: U.T.M; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500 000 m; False N: 10 000 000 m; False Lat: N/S; False Long: E;

Velocity Factor:; Fix Interval:; Fix Increment:; Mobile Height:

185128

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PI SORELL	460 403.8	5 447 405.5	2	287							
THE NUT	256 829.4	5 486 045.7	3	223							
NARACOOPA	254 517.0	5 576 630.0	5	54							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL TP505 - 1			1	19.52	233				3, 2, 4B	BEACON DELAY
EOL			826	22 01					3	4776
SOL									2	4770
EOL									4B	4765
SOL										SIGNALS POOR - RUN ON
EOL										TWO WAY FIX
SOL										AT APPROX 17:00 WEATHER
EOL										FRONT PAST THRU THE
SOL										AREA - POSSIBLE EXPLANATION
EOL										TO POOR SIGNALS "?"
SOL										SIGNALS ARE GENERALLY
EOL										IMPROVING ALONG LINE
SOL										
EOL										
SOL										
EOL										
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K976

NAVIGATION LOG

Page: 7/10

SPHEROID: A.N.S.; a: 6378160; b:

Date: 15-05-1985 WEDNESDAY

PROJECTION: U.T.M.; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500 000 m; False N: 10 000 000 m; False Lat: N/S: False Long: E;

Velocity Factor:; Fix Interval:; Fix Increment:; Mobile Height:

185129

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SRELL	460 403.8	5 447 405.5	2	287							
THE NUT	356 829.4	5 486 045.7	3	223							
NANACOOPA	254 517.0	5 576 630.0	5	57							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL TP 505-2			1	23:50	141°				3, 5, 4B	BEACON DELAY
EOL			830	02 08						3 4776
SOL										5 4765
EOL										4B 4765
SOL										N.P. START TIME 23:50, 14/05
EOL										TWO WAY FIX - NUT/
SOL										SP 38 - SP 49 - ATTEMPT 3WAY
EOL										FIX
SOL										00:56 SP 394 - 3WAY FIX
EOL										01:54 SP 740 - 2WAY FIX
SOL										01:55 SP 752 - 3 " "
EOL										
SOL TP 505-4			1	03:24	326°				3, 5, 4B	BEACON DELAY
EOL			691	05:29						3 4776
SOL										5 4765
EOL										4B 4765
SOL										NAVIGATION ON 2WAY FIX
EOL										NUT + LIPTRAP
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K 076

NAVIGATION LOG

Page: 8/10

SPHEROID: A.N.S.; a: 6378160; b:

Date: WEDNESDAY 15-05-1985

PROJECTION: U.T.M.; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500 000 m; False N: 10 200 000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

185130

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 402.8	5 447 405.5	2	287							
THE NUT	356 829.4	5 486 046.7	3	223							
NARACOWA	254 517.0	5 576 630.0	5	59							
LIPTRAP	410 212.8	5 699 171.4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL TP 505 - 6			1	06:36	193°				3, 5, 4B	BEACON DELAY
EOL			724	09:06						3 4776
SOL										5 4765
EOL										4B 4765
SOL										2 WAY FIX - BEACON 3, 4B
EOL										08:38 SP668 2WAY FIX
SOL										BEACON 3, 5
EOL										UNABLE TO HOLD TRACEABLE
SOL										SIGNAL FROM LIPTRAP
EOL										THICK FOG ON STN LIPTRAP
SOL										08:55 SP657 STILL 2WAY
EOL										
SOL TP 505 - 8			1	10:31	12°				3, 5, 4B	BEACON DELAY
EOL			643	12:22						3 4776
SOL										5 4765
EOL										4B 4765
SOL										SIGNALS FAIR/GOOD
EOL										
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K076

NAVIGATION LOG

Page: 9/10

SPHEROID: A.N.S.; a: 6378160; b:

Date: WEDNESDAY 18-05-1985

PROJECTION: U.T.M.; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500,000 m; False N: 10,000,000 m; False Lat: N/S; False Long: E;

Velocity Factor:; Fix Interval:; Fix Increment:; Mobile Height:

185131

STATIONS (8):

Name	Easting (m)	Northing (m)	BEACON	Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SCRELL	460 403 8	5 447 405 5	2	287							
THE NUT	356 829 4	5 486 045 7	3	223							
NARACOC PA	254 517 0	5 576 630 0	5	59							
LIPTRAP	410 212 8	5 699 171 4	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL <u>TAK4-15A</u>			300	18:15	52				3, 5, 4B	BEACON DELAY
EOL			632	19:11						3 4776
SOL										5 4765
EOL										4B 4765
SOL										SIGNALS GOOD
EOL										
SOL <u>TP505-10</u>			1	20:57	111				2, 3, 5	BEACON DELAY
EOL			593	22:38						2 4770
SOL										3 4776
EOL										5 4765
SOL										SIGNALS FAIR/GOOD
EOL										2 WAY FIX ONLY AS
SOL										BEACON 2 WAS SLIGHTLY
EOL										JUMPY
SOL										N.B BEACON 2 RANGES REC.
EOL										
SOL										
EOL										
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

JOB NO: K076

NAVIGATION LOG

Page: 10/10

SPHEROID: A N S ; a: 6378160 ; b:

Date: 16/05/85 THURSDAY

PROJECTION: UTM ; C.M.: 147 °E; Scale Factor @ C.M.: 0.9996

Local Time/GMT

False E: 500000 m; False N: 10000000 m; False Lat.: N/S; False Long.: E;

Velocity Factor: ; Fix Interval: ; Fix Increment: ; Mobile Height:

STATIONS (8):

185132

Name	Easting (m)	Northing (m)		Serial No.	Ht.	Name	Easting (m)	Northing (m)	Delay	Serial No.	Ht.
PT SORELL	460 403.8	5 447 4055	2	287							
THE NUT	356 824.4	5 486 0457	3	223							
NARACOUNA	354 517.0	5 576 6300	5	54							
LIP TRAP	410 212.8	5 699 1714	4B	85							

LINE	Easting	Northing	Fix No.	Time	Gyro	Track	File	Tape No.	Config.	Remarks
SOL TP 505-51B			1	0551	248				2,3,4	BEACON DELAY
EOL			220	0632						2 4770
SOL										3 4776
EOL										4 4765
SOL										CANCEL LINE DUE TO
EOL										BAD NAV SIGNALS?
SOL										(SEE DAILY LOGS)
EOL										
SOL TP 505-51C			1	0901	248					BEACON DELAY
EOL			554	1046					2,3,5	2 4770
SOL										3 4776
EOL										5 4765
SOL										2WAY FIXING AT S.O.L
EOL										BEACON 3 AND 5
SOL										SURROUNDED BY RAIN.
EOL										STORMS
SOL										
EOL										
SOL										
EOL										

NOTE: SUBMIT PLAN VIEW OF VESSEL SHOWING OFFSETS

APPENDIX 3

STATION DESCRIPTIONS

STATION: LIPTRAP

LOCATED: Station Liptrap is located approximately 15 miles from the township of Tarwin Lower, Victoria, Australia, and 5 miles north of the Cape Liptrap Lighthouse. The station site is 170 metres above sea level, and surrounded on three sides by the sea. The land around the base station is undulating sand hills, covered by low mallee scrub with areas of secondary growth consisting of ferns and prickly bush. Also, some livestock grazing areas are within a mile radius of the site.

The station is located within a triangle of dirt roads, the northern side being the apex leading to the township of Tarwin Lower. The two southern apexes lead to beaches, one at Cape Liptrap, and the other at Walker Ville. The immediate area at the trig marker is covered by scrub 1 to 2 feet high, growing on white and yellow sand. The trig marker is approximately 200 feet east of the dirt road. The area, for approximately 200 feet around the marker, is reasonably flat.

This station is accessible by any type of vehicle.

MARKER: The original marker, placed in 1863, was about 3/4 mile south-southwest from the present marker, but could not be recovered. A second marker, about 1 mile north-northeast of the present marker, was placed in 1920. The beacon on this marker disappeared during the 1950's.

The present marker consists on a 3-foot square slab of concrete, that is flush with ground level. A brass plaque, inscribed "AUST. TRIANGLULATION STN., SURVEY CORPS.", is imbeded in the concrete.

STATION: LIPTRAP (Cont'd)

MARKER: A 15-foot steel quadripod, with 2-foot vanes on
(Cont'd) top, has been constructed over the marker. The
quadripod and vanes are painted black.

There are no prominent features in the immediate vicinity of the marker that could be used as reference, with the exception of the roads, (see sketch).

GENERAL: Local labour, food, fuel, oil and drinking water can be obtained from the towns of Fish Creek (15 miles) or Tarwin Lowers (14 miles). If the operator has no transportation, the local Lands Department will be only too willing to get water and/or supplies for the operator.

Permission to occupy the site should be obtained from the Victorian Crown Lands and Surveys. Permission can be obtained from Mr. Ken McMahon, P.O. Box 349, Traralgon, 3844, Victoria. Telephone: (051) 745 244. No rental fee is charged. However, conditions of occupancy are on a "LEFT AS FOUND" basis.

Rain and wind, mainly from the west and east, will be the main discomfort experienced on this station. It would be advisable to double-tie the tents down. The station should never be left unmanned, due to the heavy tourist traffic in the area.

A minimum tower height of 40 feet is required to clear surrounding obstructions. Clear vista is from 120° to 290°. Six-foot steel star stakes are used to secure the tower.

ELEVATION: 170 metres.

SKETCH: See next page

STATION: LIPTRAP (Cont'd)

Co-ordinates of the station markers were obtained from a Department of Crown Lands and Survey, Victoria summary sheet.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

Latitude: 38° 51' 05.51" South
Longitude: 145° 57' 54.92" East
Northing: 5 699 175 metres
Easting: 410 211 metres

The Maxiran tower was erected 4.0 metres on a bearing of 140° magnetic from the station marker.

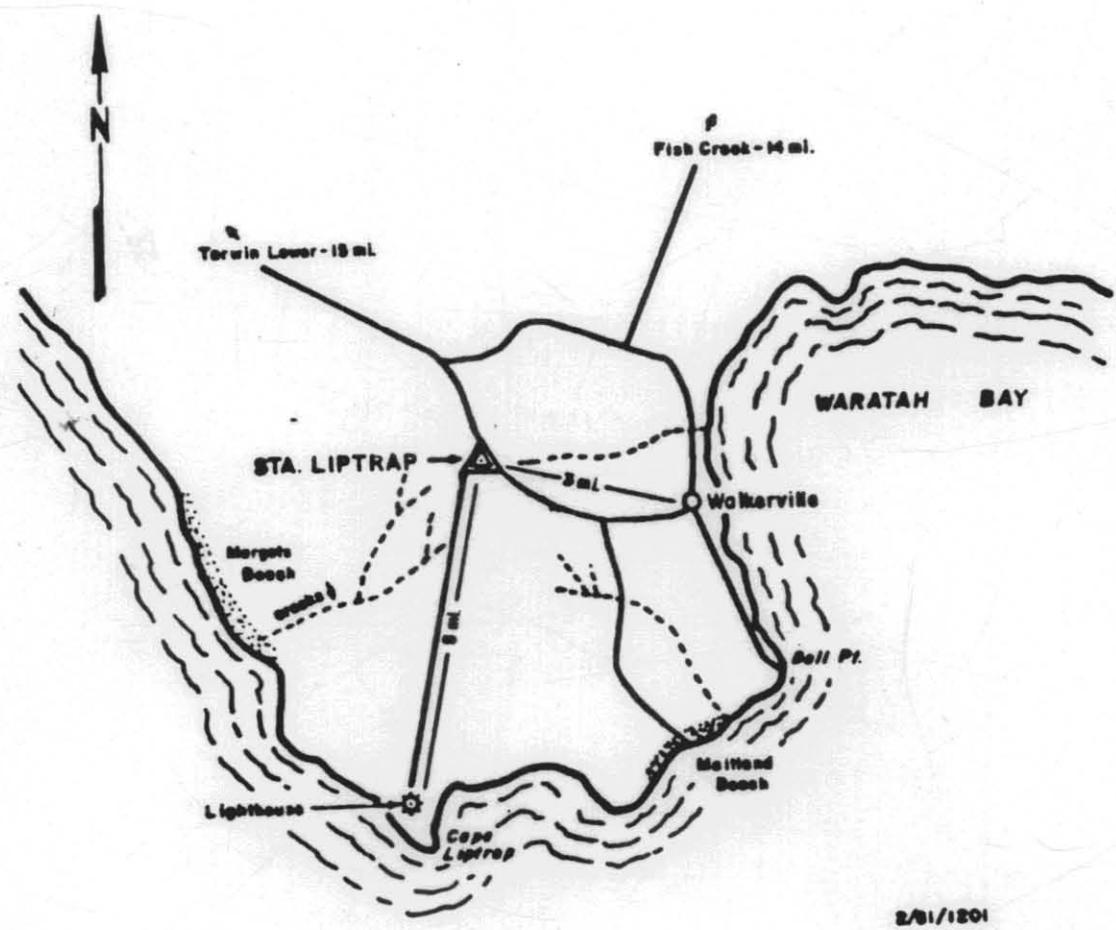
MAXIRAN TOWER OFFSET CO-ORDINATES:

Latitude: 38° 51' 05.64" South
Longitude: 145° 57' 54.98" East
Northing: 5 699 171 metres
Easting: 410 213 metres

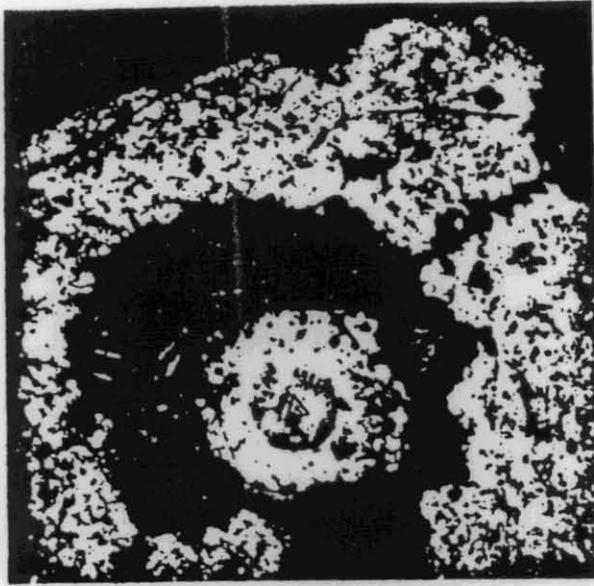
STA. LIPTRAP — AUSTRALIA

LAT. 38°51'05".51 S N 5,699,175 meters
LONG. 145°57'54".92 E E 410,211 meters
ELEV. 170 meters

UTM PROJECTION, AUST. NATIONAL SPHEROID
ZONE 55 C.M. 147° E
AUSTRALIAN GEODETIC DATUM



185139



STATION LIPTRAP
MARKER

OFFSHORE NAVIGATION
(AUSTRALIA) PTY. LTD.

STATION: POINT SORELL (ST 517)

LOCATED: This station is located on the highest point of Point Sorell, Tasmania, Australia, which is 4.8 kilometres from Hawley Beach, 1 kilometre from Port Sorell, and approximately 26 kilometres by road east of the city of Devonport. On a clear day, Badger Head, on the eastern entrance of Port Sorell, is visible from the station.

The station marker is geographically located on a point, 150 metres from the water's edge (Bass Strait). Rocks lay about the station. Some of the rocks extend up to 1 foot above ground level. Vegetation in the area is mainly green grass and patches of tussock up to 1 metre high. On the landward side, the point slopes gradually with black soil pasture riddled with Mutton bird burrows. Once on the flats, which are very wet during winter, vegetation ranges from scattered trees to patches of dense woods.

On a clear day, the city of Devonport can be seen 20 miles away, at a bearing of 260°. Beach areas, seperated by rocks, are located 900 metres from the station, at a bearing of 200°. Small patches of trees are located 500 metres, at a bearing of 080° from the station. A 80-metre by 30-metre island is located offshore, approximately 800 metres, at a bearing of 060°, from the station.

ACCESS: In dry weather a regular two-wheel drive vehicle may be used but the grassy slopes on the approaches to the station site may become very slippery when wet and there are numerous boggy patches after heavy rains and a four-wheel drive vehicle is necessary.

STATION: POINT SORELL (ST 517)

ACCESS:
(Cont'd)

If four-wheel vehicles are unavailable or it turns wet after the station is set, Roger Moncreiff has a tractor which is available to tow the vehicle to and from the station site. The tractor may also be required to tow even a four-wheel drive vehicle if it is heavily laden in extreme wet conditions.

From Devonport, drive on the Bass Highway towards Launceston for 2 kilometres past the East Devonport turnoff, and turn left at the Exeter/Port Sorell turnoff (B19), near the top of the rise. Follow this road towards Port Sorell (the Exeter road turns off to the right), for approximately 12 kilometres to a road intersection, located approximately 2 kilometres before entering Port Sorell. A wooden sign showing "Hawley Caravan Park" is on the left side of this intersection. Turn left at this intersection, and follow the road to Hawley Beach. Turn left at a "T" junction, located 50 metres before the Hawley Beach Store and Post Office. Just after making this left turn, a prominent sign to the right reads "Heavy Vehicles Only" (see sketch). Follow this sealed road to its end at a "T" junction with a chlorine station facing you on the other side of the road. Turn left at this junction. A right turn takes you on a foreshore track. Follow this road (it turns to gravel half-way along) for approximately 700 metres (passing a picnic spot and toilets on the right), to a white wooden gate. Immediately in front of the gate, the road veers to the right. A turn to the left is marked "LMC Private Road". Take this turn to the left (it is 3 kilometres to the station at this point). Follow this road for approximately 100 metres and turn to the right. Straight ahead at this point is the residence of Mr. Roger Moncreiff

STATION: POINT SORELL (ST 517)

ACCESS:
(Cont'd)

the son of the station site landowner. Drive for approximately 300 metres to a locked gate. At this gate, a track leads to the right to the residence of Mr. Don Moncreiff, the station site landowner, located approximately 100 metres from this gate. Obtain a key for this gate, or if opened, follow the road straight ahead to double gates, near the council sewage pond, which are usually opened. The station marker will be visible from the double gates at a distance of approximately 2 kilometres. This is no defined road from this point to the marker. Seek the landowner's advice or follow the tracks shown on the sketch.

MARKER:

The station marker, located on a hill, consists of a brass mushroom S.P.M., which is not numbered. The marker is embedded in concrete at ground level, with stones surrounding the marker.

The maxiran tower was erected 1 metre, at a bearing of 270° Magnetic, from the station marker. This offset was necessary due to a 3-metre high quadropod that is erected over the marker. The quadropod is painted white, and has a black disc, approximately 60 cm in diameter, attached to the top. Rocks covers each leg of the quadropod. Co-ordinates are listed in this description for the station marker and the Maxiran tower offset.

GENERAL:

Labour can be provided by Mr. Roger Moncreiff, Labour can also be obtained in Devonport, approximately 22 km. from the station, or Latrobe, approximately 19 km. away. Fuel, oil, camping equipment and supplies are available in Devonport. Bulk fuel can be obtained from several depots located in Devonport. There is a service station in Port Sorell, and a reasonable selection of goods can be obtained at the Hawley Beach

STATION: POINT SORELL (ST 517)

GENERAL: and Post Office. Drinking water can be obtained
(Cont'd) from the station property landowner or his son.

A caravan with heater is essential at this site. The winter months, June to September, can be very wet, windy and cold. Temperatures can range from several degrees below zero to a daily maximum of as low as 4° C. Extra rope and star stakes should be taken for tying down during this period. Penguins are very frequent visitors to the station site particularly at night.

Caravans are available from Devon Coastavans, 116, Nicholls Street, Devonport, telephone: Ian Finch, 004-242829. Mr. Finch will deliver and pick up the vans to the station sites for a nominal fee (In August 1984, Point Sorell was A\$20.00, Doctors Rocks was A\$40.00. This fee includes delivery and pick-up). The vans are well equipped, gas approximately 60-litre water tank (full on delivery), crockery, cutlery, fridge, etc. Mattresses are supplied, but there is no blankets, pillows or sheets. The vans can be locked. The caravans must be kept clean when vacanting.

Vehicles may be obtained from HERTZ, Oldaker Street, Deconport (tel: 004-241013). HERTZ representatives have been very helpful and can assist regarding fuel supplies from Mobil Devonport if required.

Four wheel drive vehicles may also be obtained from Regent Filling Station, 57, Marine Terrace, South Burnie. This is the Shell Service Station past the paper mill on the Bass Highway, as you approach Burnie from Devonport. The contact at

STATION: POINT SORELL (ST 517)

GENERAL: this palce is Mr. Wayne Cross. The service station telephone no. is 004-312131.
(Cont'd)

A 40 foot tower was erected at this site, although only a height of 20 ft. is required to clear surrounding obstructions. Clear vista is from 200° (through north) to 060°. Star stakes were used to secure the tower.

Permission to occupy the station must be obtained from the landowner, Mr. Don C. Moncreiff, Hawley Beach via Latrobe 7307, Tasmania. His telephone number is 004-286193. Mr. Moncreiff was paid a daily rental fee of A\$25.00 for the use of his land. If Don Moncreiff is absent, permission may be obtained from his son, Roger Moncreiff, tel: 004-286587. Roger lives approximately 1 kilometre from Don Moncreiff (see Sketch).

SKETCH: See next page.

Co-ordinates of the station marker were obtained from a Lands Department, Tasmania, Division of National Mapping summary sheet.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES

Lat.	41° 07' 24.69" S	N = 5 447 407 m.
Long.	146° 31' 41.88" E	E = 460 403 m.
Elev.	30 m.	

STATION: POINT SORELL (ST 517)
(Cont'd)

The Maxiran tower was erected 1.85 m. on a bearing of 162° from the marker.

MAXIRAN CO-ORDINATES

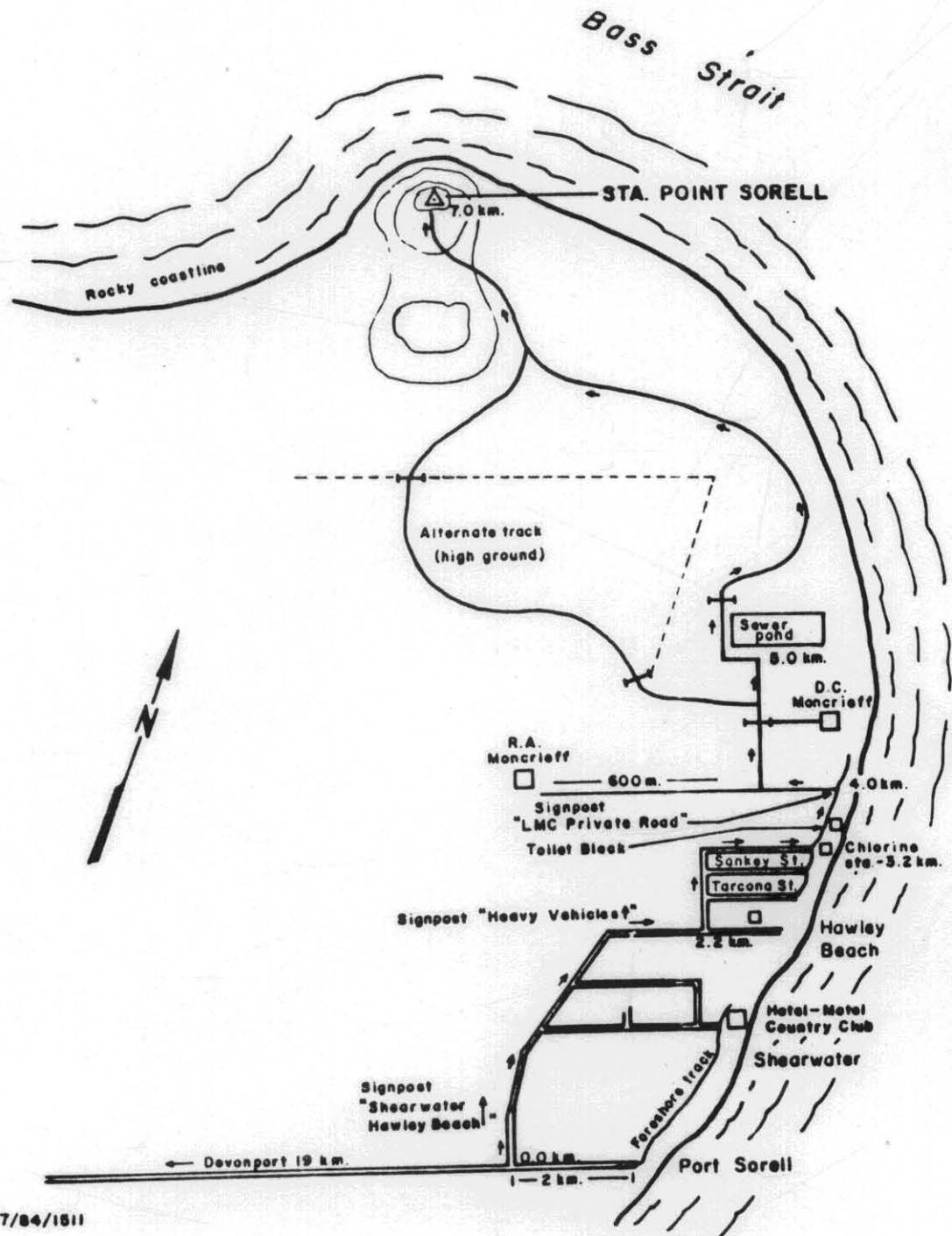
Lat.	41° 07' 24.75" S	N =	5 447 405 m.
Long.	146° 31' 41.91" E	E =	460 404 m.
Elev.	42 m.		

STA. POINT SORELL (ST 517) — AUSTRALIA

LAT. 41° 07' 24" 69 S
 LONG. 146° 31' 41" 88 E (MARKER COORDS.)
 ELEV. 30 meters

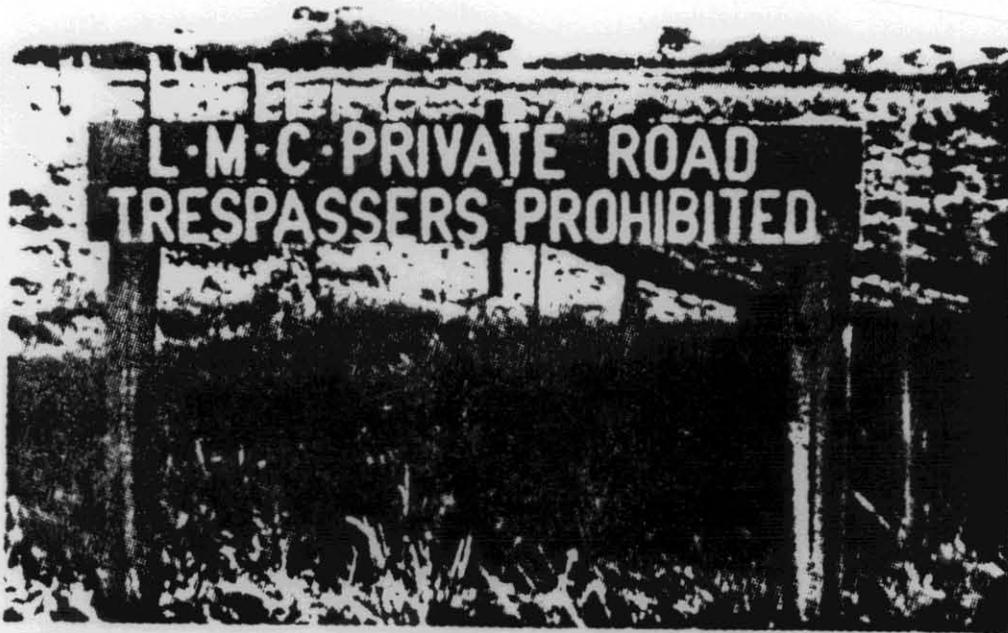
N 5,447,407 meters
 E 460,403 meters

UTM PROJ. — AUST. NAT. SPHEROID
 ZONE 55, C.M. 147° E — A. G. D.

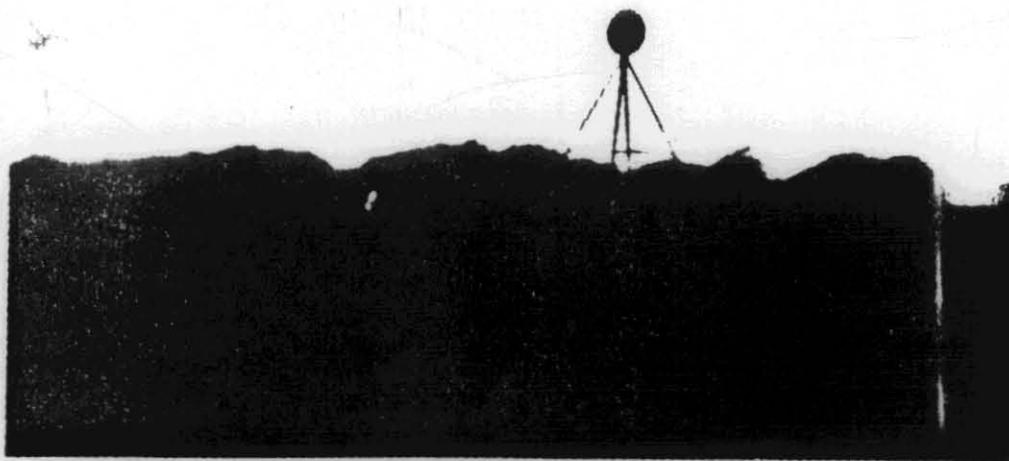


185147

STATION POINT SORELL



SIGN AT TURNOFF TO LEFT ENTERING ROAD TO DON MONCRIEFF PROPERTY. POINT IS ABOUT 3 KILOMETERS FROM STATION.



QUADROPOD OVER MARKER

STATION POINT SORELL

SIGN AT TURNOFF FROM PORT SORELL ROAD. TURN LEFT TO REACH STATION, A DISTANCE OF APPROXIMATELY 7 KILOMETERS FROM THIS POINT.

STATION: THE NUT (ST 674)

LOCATED: This station is located on a hill overlooking the town of Stanley, on the north coast of Tasmania, Australia. The hill is named "The Nut" and its summit is flat to slightly rolling. This hill, as well as the historical town of Stanley, are very popular tourist attractions. The vegetation on this hill consists of grass and low native bushes. There is a tourist walk track around the perimeter of the top which is some 4 km. around. There are many mutton bird burrows along this track. The surrounding district, Circular Head, derives its name from the distinctive shaped "Nut" which juts into Bass Strait. The station marker is on the northern side of The Nut.

ACCESS: Access to the town of Stanley can be made from Burnie or Devonport. It must be noted that minor towns may not appear on road signs. When leaving Devonport, read "Smithton" for "Stanley". At times, only route numbers appear in lieu of town names. It is approximately 120 km. from Devonport to Stanley.

Drive north on the Bass Highway to the intersection with the Stanley Highway (B21). This intersection is 64 km. past Wynyard. Turn onto Stanley Highway and drive 7 km. to the town of Stanley. The Nut will be easily seen to the northeast of Stanley, right beside the town. The road to the hill is signposted "Nut". A vehicle can be taken as far as the car park on the slopes of The Nut. A zig-zag 1 m. wide cement track with centre hand rail leads from the car park to the summit. Take the left hand track at the fork on the top of the hill. The station marker is from 400-500 m. along this track. It is a walk of about 20-30 minutes (unburdened) from the base of the hill to the station.

STATION: THE NUT (ST 674) (Cont'd)

MARKER: The station marker consists of a brass mushroom S.P.M., which is not numbered. The marker is embedded in concrete which is at ground level. A 1.26 m. high stone cairn is built 2.5 m. W.N.W. of the marker.

A 3.86 m. high quadropod has been erected close to the marker. The quadropod has a 60 cm. diameter black disc attached to its top.

The Maxiran tower was erected 1.0 m. at a bearing of 239° Magnetic from the marker. Co-ordinates are listed in this description for the brass mushroom marker, and the Maxiran tower offset.

GENERAL: Food, fuel, oil and water is unavailable in Stanley. Fuel and oil can be obtained from W.T. House, Inc. BP Service Station. Mr. House can also assist in obtaining labour. Labour may also be obtained at the Union Hotel. Emergency water can be obtained from a tank near the old telecom hut, which is located alongside the lookout, approximately 700 m. from the station site.

Although limited camping equipment is available in Stanley, this should be purchased in larger centres, such as Burnie or Devonport.

Hotel accomodation are available at the Union Hotel in Stanley. The nearest airport to this station is in Smithton, approx. 20 miles away.

The station site is completely exposed to weather. This should be taken into consideration when erecting the station. Ample bedding, tent pegs, and spare rope should be taken. During the winter months (June through to September), the site is very cold and damp. A heater is

STATION: THE NUT (ST 674)

GENERAL: essential as temperatures frequently drops below
(Cont'd) zero.

A 40 ft tower was erected at this site. Star stakes were sufficient to secure the tower. Clear vista from 20 ft. up the tower is from 300° (through north) to 090°.

The station site is on land owned by the National Parks and Wildlife Service. Permission to occupy the site was obtained from Mr. P. Murrell, Director, in Sandy Bay, Tasmania 7005. His office address in Sandy Bay is Magnet Court or P.O. Box 210, Sandy Bay, Tasmania 7005. Telegrams addressed "TASPAWS", will be received by the director. No rent was paid for the use of this property. The local inspector is Mr. Rex Gatenby, Launceston tel: 003-415306.

The local ranger in charge is Mr. Brian Carson, tel: 004-581320. His resident is located near the rectory and old school in the old section of Stanley. Mr. Carson was very helpful in all matters. He can arrange for storage of empty equipment boxes at the car park house.

The site is to be kept clean and tidy during occupation. All rubbish is to be removed at the conclusion of a survey.

It will take 2-3 days with a 4 or 5 labourers to carry the equipment to the station site. An average round-trip from the car park to the station site, walking with a load and returning unburdened will take from 60 to 90 minutes, depending on the load. The cement track to the summit is very difficult to negotiate with heavy

STATION: THE NUT (ST 674)

GENERAL:
(Cont'd)

objects with the center hand rail. When possible, a helicopter should be used to mobilise and demobilise this station. The Stanley Football Ground is used as a lift-off and put-down point for the helicopter. Permission can be obtained to use the ground from the Football Club president, Mr. Graham Trenelly, Union Hotel, Stanley, tel: 004-581161. It is approx. a 5 minute flight from the football ground to the station site. It is approx. 50 km. from the Wynyard Airport to The Nut.

SKETCH: See next page.

Co-ordinates of the station marker were obtained from a Lands Department, Tasmania, Division of National Mapping summary sheet.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES

Lat.	40° 45' 50.23" S	N =	5 486 046 m.
Long.	145° 18' 13.45" E	E =	356 830 m.
Elev.	143 m.		

The Maxiran tower was erected 1.0 m. on a bearing of 239° Magnetic, from the station marker.

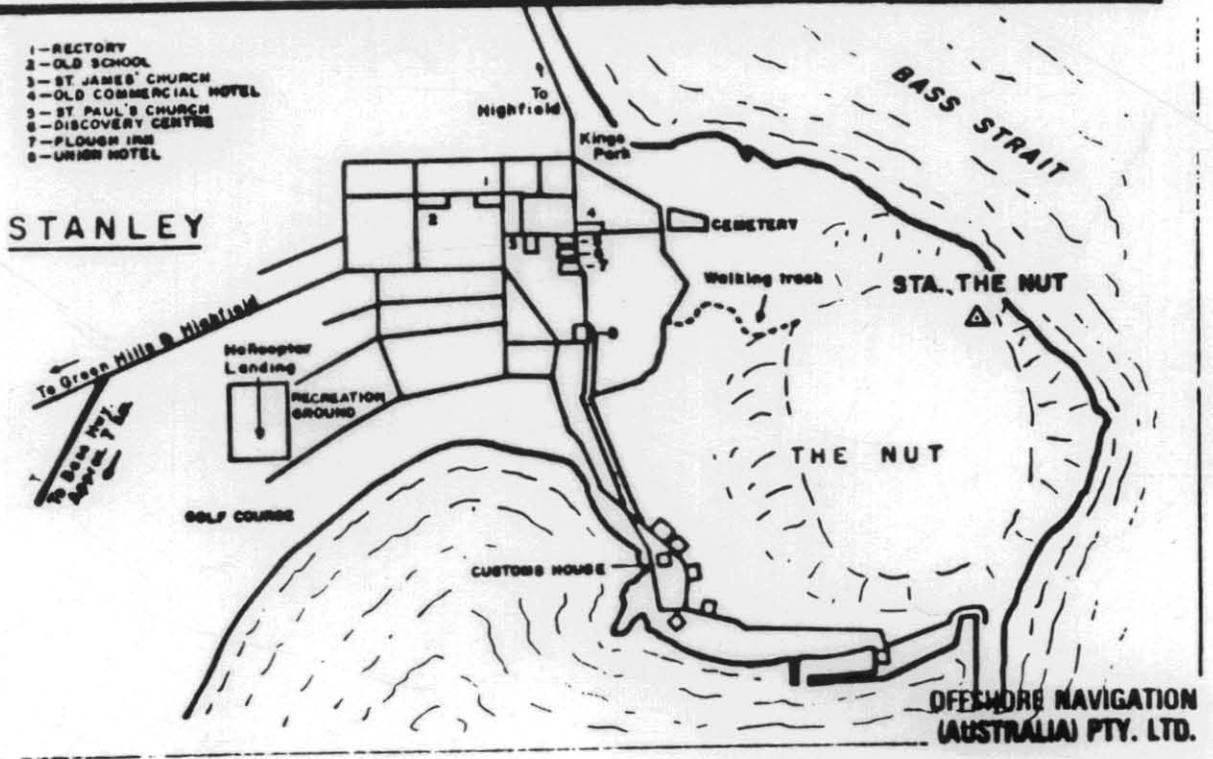
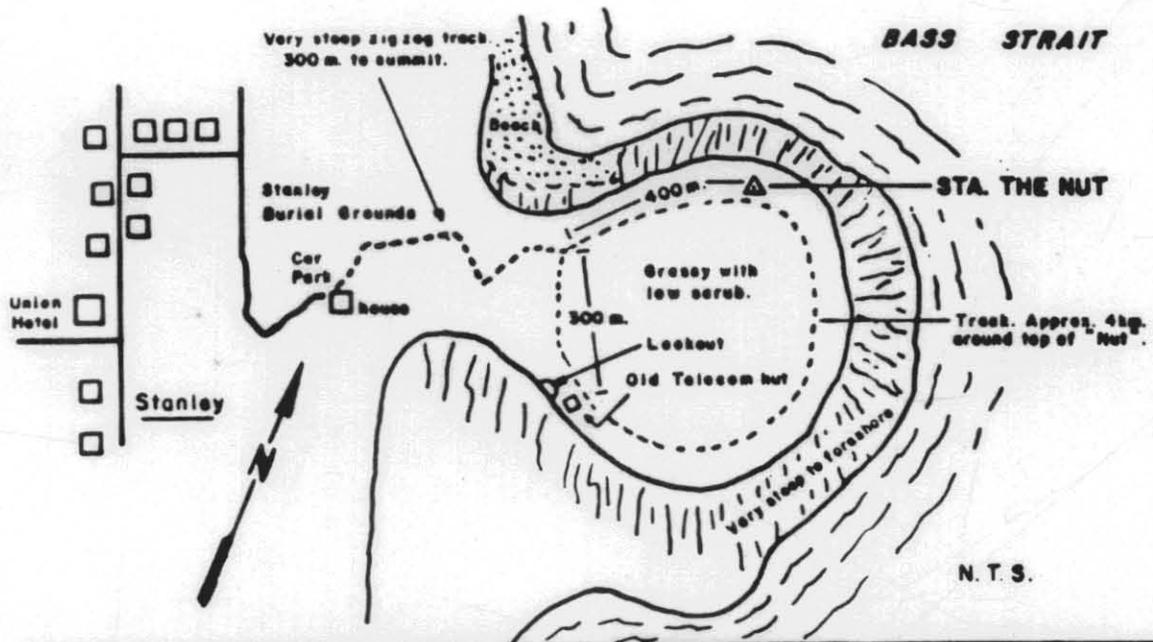
MAXIRAN CO-ORDINATES

Lat.	40° 45' 50.24" S	N =	5 486 046 m.
Long.	145° 18' 13.42" E	E =	356 829 m.
Elev.	143 m.		

STA. THE NUT (ST 674) — AUSTRALIA

LAT. 40°45'50".23 S (MARKER COORDS.) N 5,486,046 meters
 LONG. 145°18'13".48 E E 356,830 meters
 ELEV. 143 meters

UTM PRQJ. — AUST. NAT. SPHEROID
 ZONE 55, C.M. 147° E — A.G.D.



5 cm

STATION: NARACOOPA

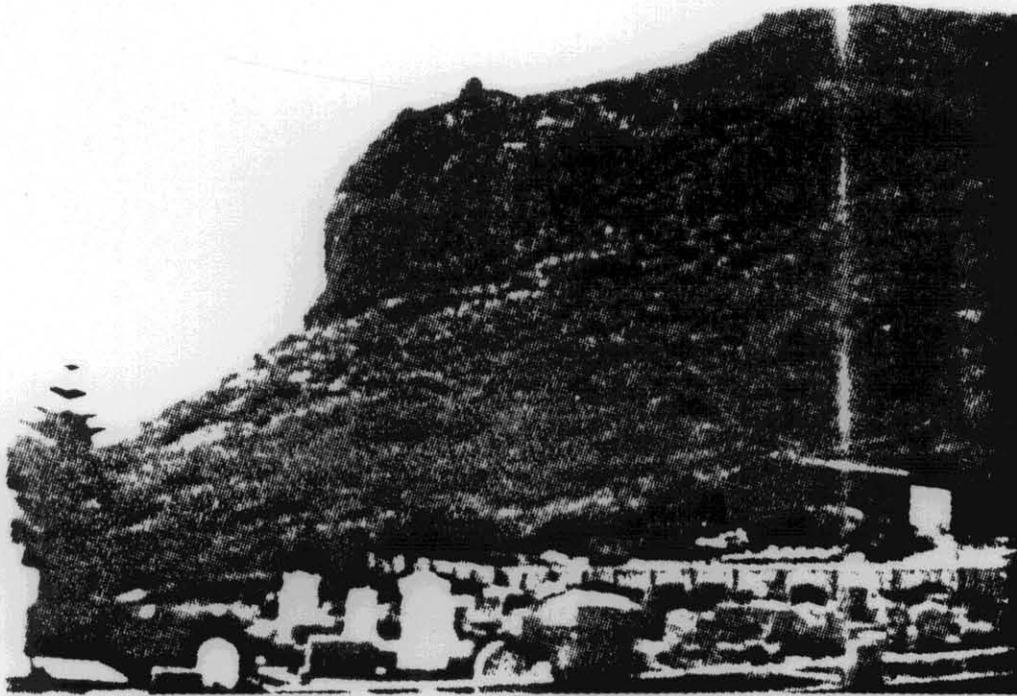
LOCATED: Station Naracoopa is located in a paddock in the village of Naracoopa, King Island, Tasmania, Australia. The station site overlooks the Mobil oil tanks and jetty. The paddock is of grass on top soil with an underfelt of clay. The two markers at this site are located on the north end of the paddock, on the edge of a hill.

ACCESS: Fraser Bluff is in the village of Naracoopa, approximately 20 km. from the main town of Curry on King Island. Just as you enter the village, there is an intersection with a signpost to the right towards "Millbrook". Turn onto Millbrook Road and drive 0.8 km. to a turn-off and gate to the left. Go through this gate and drive to the right around a small dam. Continue on through the scrub to the paddock. Drive through the paddock to the ridge and station site.

Heavy rain fall can be expected during June through September. In the event of a recent rainfall, a four-wheel drive vehicle or tractor will be needed to reach this site as the paddock can become very marshy. Tractors can be obtained from Mr. D. Spittle, whose telephone number is 004-611206. If the ground is marshy and no tractor or 4-wheel drive vehicle is available, it is a distance of approx. 250 yards from the staging area to the site.

MARKER: Two markers exist and consist of two brass plaques embedded in cement 3 inches below ground level. Both positions are marked by star pickets. One plaque is inscribed "ONI ARGO 1984" and the second is inscribed "GSI SYLEDIS 1984".

STATION THE NUT



FROM TURNOFF AT STANLEY BURIAL GROUND



FROM THE OUTSKIRTS OF STANLEY. NOTE ZIG-ZAG TRACK UP MOUNTAIN. THIS IS THE ONLY ACCESS ROUTE BY FOOT.

STATION: NARACOOPA (Cont'd)

GENERAL: Local labour is not available unless prior arrangements are made in the village. Ian Whitehouse, who transported the station to the site in 1984, can make arrangements for Labour from Curry.

All supplies for the site should be purchased in Curry. Websters Store has everything necessary in regard to hardware. Cars and caravans can also be obtained in Curry. A 4-wheel drive vehicle or tractor must be leased from private sources.

There is a cafe in Naracoopa that is owned by Mr. and Mrs. Hoopwood. Limited food supplies can be obtained from there.

During dry season, there is limited water on the island, and water must be purchased in Curry.

There is no electricity in the area. However, power will be available within 2 years.

Heavy winds can be expected at this site from all directions. Winds from the southwest and east are the stronger, and can reach from 40 to 80 knots. A tent at this site would most likely not survive, especially during the winter months.

In the event a tent or caravan cannot be placed at this site, the operator may be able to stay in an empty house 150 to 200 yards from the site. The house and out buildings nearby are owned by Mrs. Gail Henderson, who also owns the property on which the site is located. She lives in Curry.

STATION: NARACOOPA

GENERAL:
(Cont'd)

Everyone on the island is helpful. However, prior arrangements must be made for any assistance that is required.

Permission to occupy the station site must be obtained from Mrs. Gail Henderson.

A 60 ft Maxiran tower was erected over the ARGO marker. A minimum tower height of 40 ft is required to clear surrounding obstructions. Clear Vista is from 120° to 340°. Star pickets were used to secure the towers. The anchors must be doubled and driven into the ground. Also, they must be taken out at the end of an operation as their remaining in the paddock will constitute a hazard for cattle and other livestock.

SKETCH:

See next page.

Co-ordinates of this station were provided by ONA.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES (281/150)

Lat.	39° 55' 27.64" S	N = 5 576 663 m.
Long.	144° 07' 26.23" E	E = 254 211 m.

The Maxiran tower was erected over the Argo marker, on an offset of 307.051 m., at an adjusted azimuth of 98.1204805551° from the (281/150) marker.

MAXIRAN TOWER CO-ORDINATES

Lat.	39° 55' 29.05" S	N = 5 576 630 m.
Long.	144° 07' 39.03" E	E = 254 517 m.
Elev.	53 metres.	

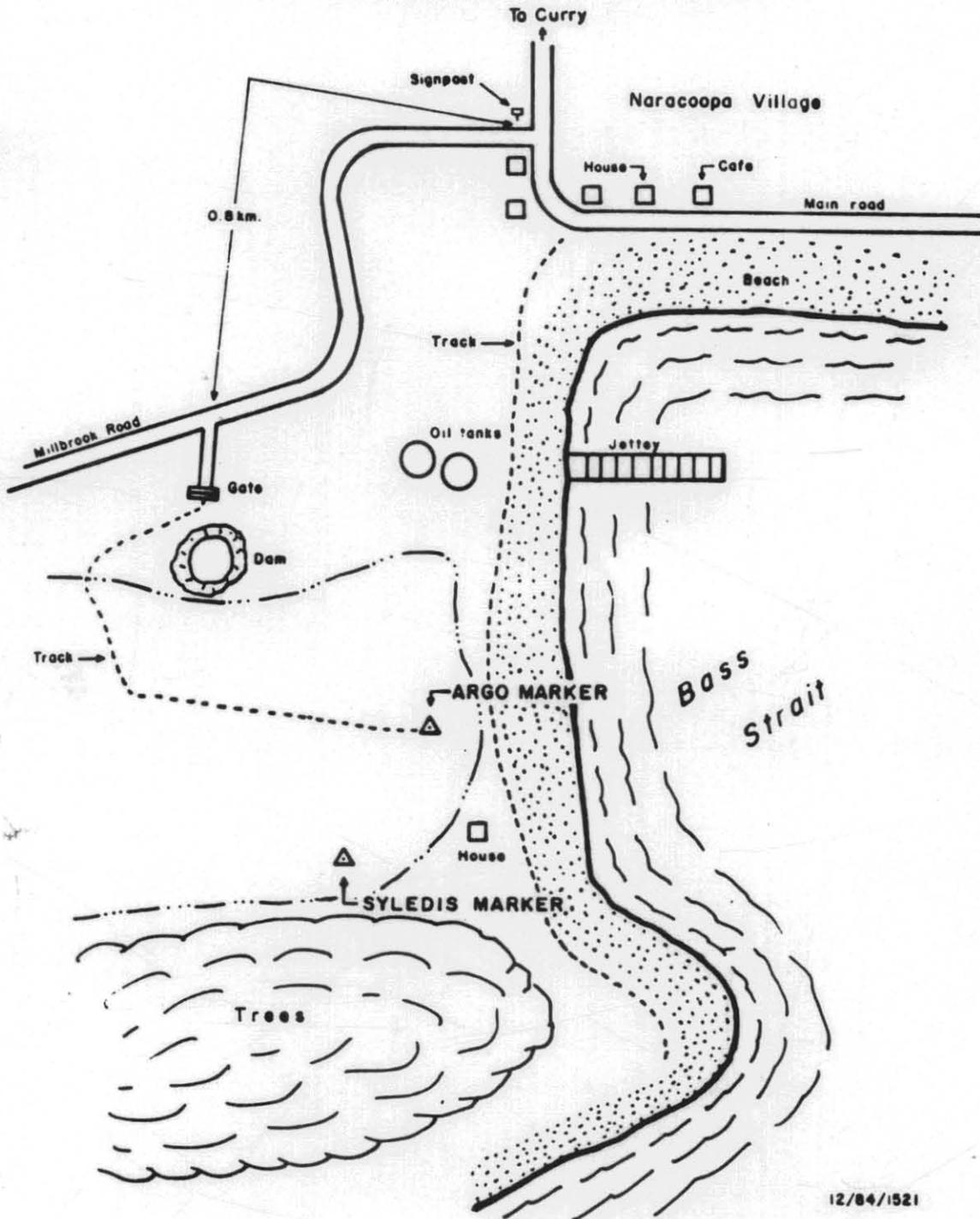
STA. NARACOOPA — AUSTRALIA

MARKER (281/150) COORDINATES

LAT. 39°55'27".64 S
 LONG. 144°07'26".23 E
 ELEV. Not reported

N 5,576,663 meters
 E 254,211 meters

UTM PROJ. — AUST. NAT. SPHEROID
 ZONE 55, C.M.147°E — A.G.D.



12/84/1521