

219001

OCTOPUS SEISMIC SURVEY
BASS STRAIT
TASMANIA

MARINE SEISMIC SURVEY
1982

OR-204

219002

FINAL REPORT

OCTOPUS

MARINE SEISMIC SURVEY

1982

TASMANIA

PERMIT T-19/P

for

PERTSHIRE PETROLEUM, LTD.
16TH FLOOR, 109 ST. GEORGE'S TERRACE
PERTH, (W.A.) AUSTRALIA 6000

by

WESTERN GEOPHYSICAL COMPANY OF AMERICA
10001 RICHMOND AVENUE
HOUSTON, TEXAS

PARTY 86

M/V WESTERN ODYSSEY

Submitted by
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ABSTRACT

The Octopus Seismic Survey comprises 521.875 kilometers of new seismic lines on the continental shelf of Tasmania: The survey took place on Perthshire Petroleum, Ltd., Australia Permit T-19/P between February 21 and February 25, 1982.

Most of the new lines surveyed were designed to further evaluate structural anomalies disclosed by earlier surveys, with the remainder devoted to gaining stratigraphic and regional control.

The report contains:

- SECTION: I) General Information
II) Data Acquisition
III) Navigation
IV) Data Processing
V) Gravity/Magnetic Survey
VI) Interpretation
VII) List of Plates
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GENERAL INFORMATION

GENERAL INFORMATION

Introduction

The 1982 Octopus Seismic Survey was conducted on Exploration Permit T-19/P which was awarded on March 27, 1981 to Perthshire Petroleum, Ltd., Perth, Western Australia.

The M/V Western ODYSSEY, a fully equipped seismic vessel operated by Western Geophysical Company of America, was used to conduct the survey. Some 521.875 kilometers (324.347 miles) of new seismic, gravity and magnetic data were recorded.

The navigation system consisted of Western Geophysical's Integrated Navigation System which comprises four main subsystems; a doppler-sonar system to determine the ship's velocity continuously; a satellite system to provide the ship's position at intervals averaging two to four hours, a digital computer and a recording system to record computer data. Calculations, for all subsystems and data integration were handled by the on-board general purpose digital computer. The ship's position was continuously calculated by integrating the sonar velocity and updating with satellite fixes. The navigation data was shipped to Western Geophysical's Navigation Department in Singapore for processing.

Seismic recordings were made with a DFS "V" seismic acquisition system - manufactured by Texas Instruments - consisting of two analog modules, a controller module and four tape transports.

The digital recorded magnetic tapes were shipped to GeoCenter, Inc. in Houston, Texas for processing.

The energy source consisted of twenty high pressure Western airguns. In normal operating circumstances, ten of the airguns were combined to form a 760 cubic inches tuned array. The airguns are operated at a pressure of 4,500 pounds per square inch.

The streamer cable used by the Western ODYSSEY was composed of 48 detachable and interchangeable LRS Marine Active Cable sections. Each section is 50 meters in length and contains two 25 meter groups of twenty WM2-036 geophones.

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Gravity data was acquired with a La Coste Romberg meter while magnetic data was acquired with a Geometrics G801/3 meter.

Interpretations of the seismic data were made at Perthshire Petroleum, Ltd. offices in Houston, Texas.

Field tapes and processing tapes are presently at GeoCenter, Inc.'s processing center in Houston, Texas and will later be stored at Geodata Services, Inc. in Houston, Texas.

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DAILY OPERATIONS

Field supervision was provided by Mr. Jack Downing, Vice President - Geophysics, Weaver Oil and Gas Corporation, Australia, and Mr. David C. Lowry, Consulting Petroleum Geologist and Manager of Weaver Oil and Gas Corporation, Australia in Perth. Perthshire Petroleum, Ltd. is a wholly owned subsidiary of Weaver Oil and Gas Corporation.

GEOLOGICAL SUMMARY

The Octopus Seismic Survey took place in the northwest area of the Bass Basin.

The Bass Basin is located offshore between the southern coast of Victoria and the northern coast of Tasmania. It is bounded to the west by King Island and to the east by Flinders Island and the Bassian Rise. Water depth throughout the basin rarely exceeds 270 feet (82 meters). The area has been actively explored for hydrocarbons since 1963.

The oldest sedimentary rocks encountered while drilling are Early Cretaceous. However, the greatest volume of sediments accumulated during the Tertiary. Lithologies vary from continental sandstone, siltstone, shale and coal in the nonmarine Cretaceous to Middle Eocene section, while the Upper Eocene to recent section consists of shale, sandstone, marl, mudstone and limestone. Drilling and seismic data indicate that there was a considerable amount of volcanic activity in the basin throughout its history.

The southeastern area of the basin exhibits the earliest structural growth whereas the structural growth in the central and northwestern areas occurred later. Structural style also varies from tilted fault blocks with thousands of feet of vertical displacement in the southeastern area, to low relief small anticlinal folds and minor faults in the northwestern area. Most of the prominent structural trends are oriented in a northwestern-southeastern direction which is parallel or subparallel to the present basin axis.

Stratigraphic control for the project area is provided by seven wells, namely:

Konkon #1
Toolka #1
Cormorant #1
Bass #1
Aroo #1
Tarook #1A
Bass #3

In addition, two wells drilled in the vicinity are considered relevant and are included in this report. These are:

Durroon #1

Narimba #1

The Konkon #1 well was drilled in 1973 to a measured depth of 5,043 feet (1,537.1 meters) penetrating a section ranging in age from Recent to Lower Cretaceous. The well encountered the predicted sequence with no show of oil or gas and was abandoned in highly altered volcanics.

The Toolka #1 well was drilled in 1974 to a measured depth of 8,907 feet (2,714.85 meters) penetrating a section ranging in age from Recent to Eocene. Minor oil and gas shows were encountered in the Middle Eocene while drilling; however, formation interval test results were negative.

The Cormorant #1 well was drilled in 1970 to a measured depth of 9,846 feet (3,001 meters) penetrating a section ranging in age from Recent to Eocene. Significant indications of oil have been recorded in the Eocene.

The Bass #1 well was drilled in 1965 to a measured depth of 7,717 feet (2,352.14 meters) penetrating a section ranging in age from Recent to Upper Cretaceous. No commercial hydrocarbons were logged.

The Aroo #1 well was drilled in 1974 to a measured depth of 12,112 feet (3,691.74 meters) penetrating a section ranging in age from Recent to Paleocene or pre-Paleocene volcanics. Indications of hydrocarbons were observed at several levels including the top of a sand within the volcanic sequence. Formation tests recovered small amounts of gas.

The Tarook #1A well was drilled in 1972 to a measured depth of 9,100 feet (2,773.68 meters) penetrating a section ranging in age from Recent to Eocene. The well was entirely devoid of hydrocarbon indications.

The Bass #3 well was drilled in 1967 to a measured depth of 7,978 feet (2,431.7 meters) penetrating a section ranging in age from Recent to basement. Hydrocarbon indications were recorded while drilling and a formation interval test recovered gas-condensate and water.

The Durroon #1 was drilled in 1972 to a measured depth of 9,922 feet (3,024.22 meters) penetrating a section ranging in age from Recent to Lower Cretaceous. There were no indications of hydrocarbons nor abnormal formation pressures recorded in the well.

The Narimba #1 well drilled in 1973 to a measured depth of 11,003 feet (3,353.7 meters) penetrating a section ranging in age from Recent to Eocene. There were no hydrocarbon shows reported nor was there abnormally pressured sections penetrated.

GEOPHYSICAL SUMMARY

Design and location of the Octopus Seismic Survey was based on the interpretation of seismic lines as well as magnetic and gravity data previously acquired by the State, the Commonwealth, as well as by the permit holders of the area. These surveys are:

Bass Strait and Encounter Bay aeromagnetic survey
for Hematite Exploration by Aero Services Limited
1960-1961

Anderson's Inlet aeromagnetic survey for Oil Develop-
ment by Aero Services Limited 1961

Flinders Island - Kingston seismic survey for Hematite
Exploration by Western Geophysical 1962-1963

Bass Basin seismic for Esso Australia by Western
Geophysical 1965

King Island East seismic survey for Esso Australia
by Geophysical Services International 1965

Tasmania aeromagnetic survey for the Bureau of Mineral
Resources by Aero Services Limited 1966

Eastern Bass Strait seismic survey for Esso Australia
by Geophysical Services International 1966

Bass ED-67 seismic survey for Esso Australia by Geo-
physical Services International 1967

Bass EF-68 seismic survey for Esso Australia by Western
Geophysical 1968

Bass B69A seismic and magnetic survey for Esso
Australia by Western Geophysical 1968-1969

Bass B69B seismic and magnetic survey for Esso Australia
by Western Geophysical 1969

Bass B70A seismic and magnetic survey for Esso Australia
by Geophysical Services International 1970-1971

Bass B71A seismic and magnetic survey for Esso Australia
by Geophysical Services International 1971-1972

Continental Margins Geophysical - seismic, magnetic and
gravity survey - for the Bureau of Mineral Resources
by GG 1971-1972

Bass B72A seismic survey for Esso Australia by Geophysical
Services International 1972

Bass HB75A seismic survey for Hematite Petroleum by Geo-
physical Services International 1975

Crocodile Rock Seismic Survey for Perthshire Petroleum,
Ltd. by Western Geophysical Company 1981

DESCRIPTION OF SURVEY AREA

The prospect was designated as permit area T-19/P by the Tasmanian Department of Mines. The approximate geodetic centre of the prospect for T-19/P was $39^{\circ} 45'$ South latitude by 145° East longitude.

There were no major shipping lanes passing through the prospect. Fishing activity in the area was sparse at the time of the survey as not to have an adverse effect on the operation. There were no oil rigs in the area and water depth exceeded twenty meters for the duration of the survey.

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DATA ACQUISITION

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INTRODUCTION

Between February 21 and February 25, 1982, Western Geophysical Company shot ten marine seismic lines offshore Australia, Bass Basin for Perthshire Petroleum, Ltd. This survey was recorded by Party 86 aboard the "Western Odyssey" and covered 521.875 miles. The digital processing for this survey was performed at GeoCenter, Inc. in Houston, Texas from February 1982 to April 1982.

The navigation system was by navigation satellite. Antenna positions were located by 16/WINS PHASE IV equipment. Mapping was performed by Western Geophysical Company in Singapore at a scale of 1 to 100,000.

The seismic recording was done on a DFS V system. The DFS V recorded 124 channels in SEG-B format at a 4 ms. sampling interval for 6 seconds. The field filter settings were a low cut out and a high cut of 64 hz with a slope of 70 db/octave.

The cable used was a 96 group streamer which was pulled at an average depth of 14 meters. Each group consisted of 20 phones with a 25 meter spacing between group centers. (Hydrophone configuration diagram included.)

The energy source consisted of an array of 10 air guns. The array had a volume of 760 cubic inches with 4500 psi. A shot was made every 25 meters at a depth of 6 meters. (Air gun array diagram included.)

Test pops were taken at the start of each line, and noise file strips were made at the beginning and end of each line. Monitor records were produced every 29th shotpoint.

Contractors

The survey was conducted on behalf of Perthshire Petroleum, Ltd. who contracted Western Geophysical Company of America, a Delaware Corporation and a division of Litton Industries to conduct the above mentioned seismic survey.

Location of Headquarters

The main office of Perthshire Petroleum, Ltd. is located at 14141 Southwest Freeway, Sugarland, Texas 77478 - mailing address P.O. Box 4562, Houston, Texas 77210. The office in charge of Australian operations is located in Perth, Western Australia. It was to this office that all correspondence pertaining to the operation were directed.

The head office of Western Geophysical is located 10001 Richmond Avenue, Houston, Texas, U.S.A. The survey detailed in this text was conducted under the supervision of Western Geophysical's Singapore office located at Unit 301, Union Building, 37 Jalan Pemimpin, Singapore 2057, Republic of Singapore.

A temporary field office was established and maintained by Western Geophysical at Town Central Motel, 164-166 Nicholson Street, Bairnsdale, Victoria 3875, Australia in order to facilitate communications and logistics involved in the operation.

Communications

Daily production reports were issued to Perthshire Petroleum, Ltd. via telex from Western ODYSSEY and Western's field office in Bairnsdale. Production updates and vessel status were periodically issued to Western Geophysical's offices in both Singapore and Houston from the same field office.

Weather

The weather for the survey was fine with slight seas and force 2 winds.

Key Field Personnel

David Lowry: Perthshire Petroleum, Ltd. Exploration Manager based at Perth office, responsible for liaison between Western Geophysical and Perthshire's principal office. Also onboard, client supervisor.

Western Geophysical Company:

Boyd Kolozs	Marine Operations Supervisor based in Singapore
Terry Leighton	Operations Manager
Peter Rock	Marine Operations Coordinator
Vinay Sharma	Instrument Technician
Mike Clark	Assistant Operations Coordinator
Dicky Chow	Observer
Mike Casey	Observer
Glen Batten	Airgun Mechanic
Mal Weatherspoon	Airgun Mechanic
Peter Durran	Mobile Navigator
Ken Furphy	Mobile Navigator

Disposition of Data

The recorded seismic data tapes, camera monitor records and fathometer charts were sent to GeoCenter Inc. in Houston, Texas.

The primary navigation data along with the gravity still readings results, magnetic data and gravity data were sent to Western Geophysical's Singapore office.

Data Processing

Data to be processed by:

Marine Seismic -	GeoCenter Inc. - Houston, Texas
Magnetic Data -	Aero Service - Houston, Texas
Gravity Data -	Aero Service - Houston, Texas
Primary Navigation Data -	Western Geophysical - Singapore

Instrument Test

Semi-monthly and monthly instrument test were conducted on the DFS V recording system as per the instrument manual's instructions. The results of these test were sent to Western Geophysical's processing center in Singapore for processing and initial interpretation, then forwarded to Western Geophysical's Houston office for final analysis.

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EQUIPMENT & INSTRUMENTATION

EQUIPMENT AND INSTRUMENTATIONA. Survey Vessel

Name : M/V WESTERN ODYSSEY

Length : 185 feet

Beam : 40 feet

Draft : 10 feet

Tonnage; gross/net : 830/250

Engines : 2 x Caterpillar D-399 TA 1090 HP each

Propulsion : 2 x Kamewa 50 x F/4 Control Pitch Propellors

Generators : 2 x 550 kw - for air compressors
2 x 175 kw - for ship's power
2 x 30 kw - for instruments

Radar : 2 x Decca Model 926, 48 mile range

Gyro Compass : Sperry model 227 with auto pilot

Bow Thruster : Kamewa SP 1300 with 350 HP Electric Motor

Stabilization : Flume Type with Anti-Roll Blige Keel

Accommodation : 36 persons

Endurance : 35 days minimum

219027

Official Number : 8775
Call Letters : HO - 3498
Port of Registry : Panama
Helideck : 40 feet x 50 feet

B. Seismic Equipment and Instrumentation

Instruments : DFS V 120 Channel

Main Cable : 2400 m Streamer, 96 groups
25 m group spacing - 96 ch. mode

Energy Source : Western Geophysical High Pressure 4500 psi Array Airgun

Compressors : 6 x Price 5000 psi Compressors electrically driven

Primary Navigation : LRS WINS Phase IV Integrated Satellite Navigation System with Doppler Sonar

Communications : INMARSAT Satellite Terminal with telex and telephone facilities
Sailor 800 Watt Programmable SSB Ship/Shore Radio
Sailor VHF Radio

Gravity Meter : La Coste Romberg S 88

Magnetometer : Geometrics G801/3

Ancillary Equipment : Litton Resources System Geoscience Data Acquisition System (Data Logger)
EPC Single Trace Plotter
SIE ERC 10C Monitor Camera
LRS-100 Energy Source Synchronizer
LRS Airgun Solenoid Controller
Kalamos M4 Cable Fault Locator
Krupp-Altas Model 640 Fathometer - 2000 fathom range
Simrad model EX38D Fathometer - 600 fathom range

C. Instrument Description

The WESTERN ODYSSEY is equipped with a DFS V seismic acquisition system consisting of two analog modules, a controller module and four tape transports. The system accepts analog inputs signals from the streamer cable and converts these to digital form for recording on magnetic tape.

Each analog module contains 60 pairs of wires available for data acquisition. These wires come directly from the streamer cable (through a deck cable leading from the cable reel to the instrument room). Each individual channel is passed through a line filter to mitigate the effects of ambient static picked up from the seismic lines. From this filter the signal is applied to a differential pre-amplifier, then an optional lowcut filter, an alias filter and finally through an optional 50 or 60 Hz notch filter.

After the filtration process the signals are time division multiplexed to a floating point amplifier to allow for scanning of all data channels within the specified sample interval. The particular channel which is to be connected to the amplifier in any time slot is determined by an address from the controller module. The floating point amplifier adjust its gain in steps of 4:1 to bring the amplified signal to the optimum level for application to the Analog-to-Digital Converter.

The Controller Module provides a stream of commands to the Analog Module that perform the following functions:

1. Address the channels to be sampled.
2. Command the sending of status and zero offset data.
3. Control whether the gain ranging amplifier automatically selects its gain (AGC) or operates at a gain specified by the operator.
4. Control the source of input to the A/D converter.

In the normal data acquisition mode the floating point amplifier is commanded to be in its automatic gain ranging mode, however the amplifier may be commanded to be in any of eight possible settings (particularly for test and calibration purposes). When in the normal data acquisition mode the A/D converter is commanded to derive its input from the floating point amplifier but for various test and calibration procedures the A/D converter can derive its input from the internal test oscillator in the Analog Module, an external voltage source or ground.

The sequence of address sent out by the Controller to the Analog Module causes each individual analog channel to be sampled in sequence. Before commencement of a new sequence of addresses two time intervals occur that are reserved for specific purposes. During the first time interval, called First Start of Scan (SOS1), a special address is sent which causes the Analog Module to send back status information about the filter settings and gain constants of the Analog Module and to reset stabilize the floating point amplifier. During ensuing second interval, labeled Second Start of Scan (SOS2), the input to the amplifier in the Analog Module is commanded to be short to ground. Thus the information returned to the Controller Module as a result of this command contains zero offset information. The sequence of addresses is generated continuously whenever the power is on. However when a time break (start of energy source discharge) is received the sequence is interrupted and command for a Data Start and SOS1 are transmitted to commence a new sequence.

The digital data from the Analog Module comes to the Controller Module in bit serial format. After conversion to parallel format, a number which represents the dc offset of the amplifier and A/D converter in the Analog Module is subtracted from each data word (each word represents the instantaneous voltage at the moment of sampling of a channel).

The number to be subtracted is derived from the information obtained during SOS2. Since the dc offset of the amplifier may be somewhat dependent on amplifier gain, the gain is set to a different value during the successive SOS2. A separate value of dc offset is stored in a memory for each of the gain settings of the amplifier. In normal operation, the amplifier sets its own gain and the gain value that it determines is received by the controller in three bits of the data word. These bits are an address in memory from which to obtain the proper number to subtract. It is not appropriate to completely update the memory every time a new sample of the zero offset is obtained because the new value received is exaggerated by the effect of noise and thus would cause values placed in memory to be erratic. Therefore, when a new offset sample is obtained, only a fraction of the difference between the new value and the old value is added to the memory. Thus, the quantity stored in memory is a long-term average of zero offset.

The first filter removes those components of dc offset which are common to all channels but does not help the offset caused by the multiplexes of the individual channels. In order to remove the dc offset of the individual channels, it is necessary to have a memory location for each channel where a number can be stored which is to be subtracted from the data on that channel. The offset information for each channel can only be obtained from the data received from that particular channel. Thus, the number stored in memory for a particular channel is built up by adding (to the number in memory) a fraction of the difference between each new sample and the number stored in memory. Hence, the number to be subtracted is constantly changing. The net effect is the digital equivalent to a capacitor/resistor lowcut filter where the number stored in memory (which is subtracted) is analogous to the voltage across the capacitor in the analog realm. To perform this function in the analog realm would require a capacitor for each channel and switches for selecting the proper capacitors for each channel. Therefore, the digital method is much simpler. The filter time constant is 128 milliseconds.

The standard recording formats of the system are SEG-B and SEG-C. In both formats, each seismic event is recorded in a file consisting of a header block containing record constants and a data block containing seismic data values. The principal difference between the formats is the method of recording data values. Despite this difference, both header block tape formats are similar. The first 24 bytes of the header consist of record constants and processing information. The seismic channel fixed and early gain is recorded next for each channel. After this strip, the auxiliary channel identifier code is recorded for each auxiliary channel, then any external data may be recorded at the operator's discretion.

In the SEG-B format, data is organized in 2 byte words with each byte consisting of 8 bits of information. The first of the data block comprise the sync group. Bits 0 through 5 of the sync group are recorded as "ones" for a normal time break and as "zeros" if the system is operated from an internal time break. Bit 6 indicates the number of seismic channels as designated in the following chart :

<u>CHANNELS</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
24	0	0	0	0
36	0	1	0	0
48	0	0	0	1
others	1	1	1	1

The next five words after the sync group are the auxiliary channels. The first auxiliary channel is timing word. During the remainder of the scan, seismic channels are recorded. The gain for 4 seismic channels is combined in one data word by 4 data words containing the mantissa of each of the seismic channels. The magnitude representing the channel output is expressed as a binary number with negative values in one's or two's complement code.

In the SEG-C format, data is organized in four 32 bit words, each word containing the data value for one channel. The recorded data value is the actual channel input in millivolts expressed in IBM-compatible floating point notation. In this notation, a data value is represented by a sign bit, a 7 bit characteristic of exponent and a 24 bit fraction. The characteristic signifies a power of 16 in binary excess 64 code. The fraction is normalized to put the significant digit of the data within the uppermost 4 digits of the fraction.

The data coming from the offset filter (data in the form of a 16 bit two's complement number and a three bit gain for each sample) must be rearranged to be placed on the half inch 9 track (8 bits plus parity) tape. The logic which performs this function is called Format Logic. Only 15 of the 16 bits are actually used. The most significant bit is used to indicate overflow. The output of the Format Logic is a progression of 8 bit words arranged in accordance with either the SEG-B or SEG-C standard formats as chosen by the plug-in Format Logic board in the Controller Module. But after the words are generated, it is further necessary to encode the bits according to either the NRZI or the Phase Encoded modes of writing on the tape. The logic that performs this is called the Write Logic. The Write Logic is on the NZ board for NRZI and on the PE board for Phase Encoded. There must be a timing buffer between the Format Logic and the Write Logic. That is, the data may not be available from the Format Logic at exactly the time when it is desired to feed information to the Write Logic. The average data rate will have to be equal. The required flexibility is provided by a first in/first out memory (FIFO). This device can load a number of words into its input and later read them out of the output in the same order as they were entered. This reading out can occur at different times. The controller Write Logic translates the "ones" and "zeros" of each word into appropriate flux direction signals to be sent to the Tape Transport for writing on tape. In the case of phase encoded signals, this requires two flux direction bits sent for each signal bit. The data is rearranged into 8-bit-plus parity bit parallel words, and these are encoded into 8-bit-plus parity flux direction words. After this 4 command bits are added to each data word and the resulting data command words are converted to bit serial form and sent to Tape Transport. Clock and sync signals are also sent to the Tape Transport. The communication from the Tape Transport to the Controller Module is divided into 2 parts :

1. The data read from the tape is communicated to the controller by 10 wire pairs which carry all 9 tracks from the tape and a read clock for NRZI to the controller in parallel.
2. The status information (tape rewind, end of tape, etc.) is carried over a serial interface.

The Tape Transport motion control commands are sent over the serial interface with the write data. The commands are issued by the Controller Module, but the means of executing the commands are in the Tape Transport Module. Before a record is written on tape, a header is written which contains file identification and a number of constants which are introduced from the controller. Also, there are pieces of information such as gain constants and filter settings which are received from the Analog Module. All this information is arranged into a procession of 8-bit-plus parity (the same as the data) and is arranged in a specified sequence by the header logic according to SEG-B or SEG-C format. The header information or the data information is selected at the appropriate time for feeding the FIFO. The Tape Transport Module is the means by which the digital data from the Controller Module is recorded on magnetic tape. Four transports are used in the system to facilitate dual recording where and when requested by clientele. Each of the 10 inch transports record the data on 1/2 inch tape using IBM-compatible 9-track dual gap heads. The recording can be either 800 bits per inch NRZI or 1600 BPI PE. The transports consists of the capstan drive, mechanical drives, power supply and take up reel servo systems, record/reproduce head data electronics and tape position sensors.

Single Trace Plotter

The plotter used was an EPC Labs Inc. Model 4600 Graphic Recorder. Cable trace 95 was recorded to a time of five seconds from time zero, the recorder being triggered by a signal from the Energy Source Synchronizer.

Magnetometer

A Geometrics Model G801/3 direct reading proton magnetometer with an associated geometrics cable and sensor was used to acquire data in analog form on a HP 7130A strip chart recorder, and in digital form on a magnetic tape through a Litton Resources System Geoscience Data Unit.

Gravity Meter

A standard La Coste and Romberg air-sea gravity meter, system number S88 was used to acquire gravity data. Data was recorded both in analog and digital forms. Analog form was recorded on a Texas Instruments Stripchart Recorder. The digital form was recorded on magnetic tape through the G.D.U.

Data Acquisition System

To digitize the magnetic and gravity data, a Litton Resources Systems Geoscience Data Unit was used. This system scanned the date, time, gravity value, magnetic value, navigation data and water depth on a continuous basis and recorded the value on magnetic tape every 20 seconds.

Depth Recorder

A Krupp-Atlas Model 640 with a 0 - 2000 fathom range was used as the primary depth recorder for the survey. A Simrad Model EX38D with a 0 - 600 fathom range was used as a back-up depth recorder. Both of these fathometers were calibrated against a known depth prior to the start of the survey.

D. Energy Source

The M/V WESTERN ODYSSEY's high pressure energy source system consists of twenty high pressure WESTERN airguns with reservoir capacities ranging from 20 to 200 cubic inches. In normal operating circumstances, 10 of the airguns are combined to form a 760 cubic inches tuned array. The airguns are operated at a pressure of 4,500 psi supplied from 4 of 6 available Price Air Gun Master Compressors.

For various reasons, most airguns have some inherent firing delay and do not fire immediately upon receipt of a "fire" command pulse. The amount of this delay tends to drift with time and naturally varies from unit to unit. To overcome this problem and to assure all airguns fire within specs required for an optimum energy pulse, the system is controlled by the LRS-100 Energy Source Synchronizer. The LRS-100 is a modular microprocessor based system designed specifically to control the firing of a seismic energy source array so that all guns fire concurrently or in a pre-designated staggered time sequence. The system accomplished this by electronically sensing the individual gun delays and automatically establishing a firing sequence to compensate for the variations in delay. The basic sequence of operation is as follows :

1. The Controller Module receives a fire command which signals the start of the firing cycle. The fire command signal may be issued by the seismic system, navigation system or the LRS-100 Cycle Controller.
2. At some pre-calculated point after receiving the fire command, the controller will issue a fire pulse to the solenoid power supply for each gun. The solenoid in turn triggers the release of the control pressure air. As this occurs, an imbalance is created between the control pressure reservoir and the high pressure reservoir that allows the high pressure air to force the seat and shuttle upward and expose the exhaust ports, thus releasing the pressure air.

3. Upon firing, a sensor on the guns produces a return signal which is detected by the controller. Ideally, this fire detect signal should occur at a pre-selected time referred to as the Aiming Point.
4. If the fire detect for any guns does not occur at the Aiming Point, the controller will correct the error by adjusting the time at which the next fire pulse is issued to the gun. These adjustments are computed from a filter applied to the previous error values.
5. Time break for the recording system is generated by the synchronizer when 62.5% of the total enabled gun array volume has returned fire detect signals. The time break is thus a true representation of the release of air. There are no delays to be compensated for in processing of the data.

Through this method of constant electronic adjustment, the energy source system delivers its optimal seismic signals.

E. Streamer Cable

Modern seismic marine streamer cables originated from WW II anti-torpedo technology. The modern cables are 2.5 to 3 inches in diameter and, when filled with a special kerosene based fluid, are neutrally buoyant in the water column. As water density changes, the overall buoyancy of the streamer is adjusted by the addition or removal of thin lead weights taped onto the streamer at various intervals.

The streamer cable used by the WESTERN ODYSSEY is composed of 48 detachable and interchangeable LRS Marine Active Cable sections. Each section is 50 meters in length and contains two 25 meter groups of twenty WM2-036 hydrophones. This gives the streamer an overall active length of 2400 meters excluding the lead-in and elastic sections.

The 500 foot nylon reinforced neoprene lead-in is heavily weighted in order to depress the front end of the streamer cable to the desired operating depth. It is also outfitted with neoprene flarings for noise reduction. In normal operation, two 75 meter elastic sections are attached at the tail of the lead-in for additional noise reduction.

To maintain the streamer cable at the specified depth in the water column, a series of Syntron Depth Controller are employed at equal intervals along the cable. An electronic pulse controls the angle of the wings and thus controls their influence on the cable's depth. The cable depth is monitored from the readouts of pressure sensitive transducers located at regular intervals along the streamer.

A tail buoy is connected at the far end of the cable and is tracked by the vessel's radar, making it possible to observe how closely the cable is trailing the vessel along its line of motion.

219039

RECORDING PARAMETERS

RECORDING PARAMETERSA. Instrument Settings and Specifications

Model : DFS V

System No. : 408

Pre-Amp Gain : 36 dB

Total Gain : 120 dB

Lo Cut Filter : OUT 3 Hz, Slope 18 dB/OCT

Hi Cut Filter : 128 Hz, Slope 70 dB/OCT

Sample Rate : 2 ms

Record Length : 5 secs

Tape Format : SEG GAP B

BPI Density : 1600

Number of Channels : 124

Seismic Channels : 96

Auxiliary Channels : Timebreak - Aux 1
Waterbreak - Aux 2
100 Hz - Aux 4

Analog Module Specs

Frequency Response : 3 to 256 Hz

Maximum Gain : 132 dB

Minimum Gain : 24 dB

219041

Input Impedence

Difference Mode : 20,000 ohm resistive in parallel with 0.035 microfarads

Max. Input Signal

	<u>Gain Constant</u>	<u>Voltage(mV RMS)</u>
Difference Mode :	24	327.68
	36	81.92
	48	20.48

Distortion : 0.05% 3 to 256 Hz

Crossfeed Isolation : 80 dB between any 2 channels, feeding 1 channel only

Control Module Specs

Timing Accuracy : -0.005%

Data Word Rate : 64 kHz maximum

B. Cable Parameters**I. Streamer:**

Percent Coverage	:	4800%
Shot Point Interval	:	25 meters
Pops per km	:	40
Number of Groups	:	96
Center Eney Source to Center Near Group	:	194.45 meters
Center Near Group to Center Far Group	:	2,375 meters
Group Center to Group Center	:	25 meters
Number of Phones Per Group	:	20
Depth Detectors at Head of Groups	:	Tail stretch, 14, 28, 42, 56, 70, 84, 96
Depth Controllers on Groups	:	Tail stretch, 12, 26, 40, 54, 68, 82, head stretch
Water Break Detectors at Head of Groups	:	94
Center Near Group to Sat-Nav Antenna	:	271.4 meters

219043

2. Magnetometer:

Sensitivity : 1 gamma

Chart Scale : 0 - 99 gammas

Recorder marked every 50 shotpoints with total magnetic value and time.

Magnetometer Reel to Sensor : 193 meters

3. Gravity Meter:

The only selectable control on the gravity meter which was used is the 2/3 minutes averaging control. During production recording, all readings were 3 minutes averaged while the still readings in port were 2 minutes averaged.

The chart pen assignments by colour are:

Green	:	Gravity
Black	:	Total Correction
Red	:	Cross Coupling
Orange	:	Spring Tension

219044

C. Energy Source Configuration

Array Volume : 760 cubic inches

Number of Guns : 10

Array Pressure : 4500 psi

Shot Depth : 6 meters

Shot Interval : 25 meters

219045

OPERATIONS CHRONOLOGY

OPERATIONS CHRONOLOGY

<u>Date</u>	<u>Time</u>	<u>Events and Remarks</u>
February 20	1300	Heading for WEAVER prospect.
	2400	Enroute to WEAVER prospect.
February 21	0001	Enroute to WEAVER prospect.
	1500	Start laying cable.
	2400	Working on cable.
February 22	0001	Working on cable.
	0115	Cable out, running for line PB82-30.
	0332	Start of line PB82-30.
	0733	End of line.
	0900	Start of line PB82-31.
	1421	End of line.
	1655	Start of line PB82-36.
	1932	End of line.
	2021	Start of line PB82-34.
	2259	End of line.
	2400	On line change. Production for the day: 147.300 kms.
February 23	0001	On line change.
	0020	Start of line BP82-33.
	0356	End of line.
	0505	Start of line PB82-32.
	0807	End of line.
	1404	Start of line PB82-28.
	1620	End of line.
	1904	Start of line PB82-25.
	2029	End of line.
	2239	Start of line PB82-26.
	2400	Last shotpoint of day recorded, end of line. Production for the day: 122.900 kms.

219047

<u>Date</u>	<u>Time</u>	<u>Events and Remarks</u>
February 24	0001	On line change.
	0126	Start of line PB82-18.
	0323	End of line.
	0520	Start of line PB82-17.
	0646	End of line.
	0839	Start of line PB82-21.
	0947	End of line.
	1100	Start of line PB82-20.
	1348	End of line.
	1509	Start of line PB82-19.
	1820	End of line.
	1856	Start of line PB82-22.
	2040	End of line.
	2249	Start of line PB82-24.
	2400	Last shotpoint of day recorded. Production for the day: 146.125 kms.
February 25	0001	First shotpoint of day recorded.
	0105	End of line PB82-24.
	0309	Start of line PB82-23.
	0534	End of line.
	0648	Start of line PB82-10 EXT.
	0759	End of line.
	0916	Start of line PB82-9 EXT.
	1012	End of line.
	1402	Start of line PB82-38.
	1517	End of line.
	1633	Start of line PB82-39.
	1746	End of line.
	2017	Start of line PB82-37.
	2154	End of line.
	2400	Heading for T-15P prospect. Production for the day: 105.550 kms.

219048

STATISTICAL SUMMARY

219049

STATISTICAL SUMMARY

<u>DATE</u>	<u>LINE</u>	<u>SP - SP</u>	<u>PROFILES</u>	<u>KMS</u>
February 22	PB82-30	061 - 1660	1600	40.000
	PB82-31	061 - 2133	2073	51.825
	PB82-36	061 - 1102	1042	26.050
	PB82-34	061 - 1237	1177	29.425
February 23	PB82-33	061 - 1615	1555	38.875
	PB82-32	061 - 1323	1263	31.575
	PB82-28	061 - 1016	956	23.900
	PB82-25	061 - 617	557	13.925
	PB82-26	061 - 645	585	14.625
February 24	PB82-18	061 - 878	818	20.450
	PB82-17	061 - 688	628	15.700
	PB82-21	001 - 485	485	12.125
	PB82-20	001 - 1254	1254	31.350
	PB82-19	001 - 1385	1385	34.625
	PB82-22	001 - 755	755	18.875
	PB82-24	001 - 520	520	13.000
February 25	PB82-24	521 - 988	468	11.700
	PB82-23	001 - 1037	1037	25.925
	PB82-10 EXT	001 - 504	504	12.600
	PB82-9 EXT	001 - 422	422	10.550
	PB82-38	001 - 546	546	13.650
	PB82-39	001 - 523	523	13.075
	PB82-37	001 - 722	722	18.050

TOTAL KILOMETERS: 521.875

219050

LINE SUMMARY

LINE SUMMARY

<u>Date</u>	<u>Line No.</u>	<u>Description</u>
February 22	PB82-30	Direction 216 ⁰ . Start of line SP 061. Reel number 034932 to 034957. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. At SP 419 gun 13 off, gun 17 on, capacity 760 cubic inches. At SP 500 gun 17 off, gun 18 on, capacity 740 cubic inches. At SP 519 gun 20 on, capacity 760 cubic inches. Parity errors on SPs 300, 360, 577, 578 and 1493. Completed line at SP 1660.
February 22	PB82-31	Direction 041 ⁰ . Start of line SP 061. Reel number 034958 to 034990. Guns 1, 2, 4, 5, 6, 7, 8, 9 and 10 on, capacity 760 cubic inches. 5 second records. Completed line at SP 2133.
February 22	PB82-36	Direction 233 ⁰ . Start of line SP 061. Reel number 034991 to 060007. Guns 9, 10, 11, 12, 13, 14, 16, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Parity errors on SPs 489 and 610. Change in tape header series from 034999 to 060000. Completed line at SP 1102.
February 22	PB82-34	Direction 123 ⁰ . Start of line SP 061. Reel number 060008 to 060026. Guns 1, 3, 4, 5, 6, 7, 8, 9, 10 and 14 on, capacity 760 cubic inches. 5 second records. Missed SPs 435 and 436 on tape deck changes. At SP 229 gun 14 off, gun 19 on, capacity 770 cubic inches. Parity errors on SPs 563 and 711. Completed line at SP 1237.

219052

<u>Date</u>	<u>Line No.</u>	<u>Description</u>
February 23	PB82-33	Direction 332 ⁰ . Start of line SP 061. Reel number 060027 to 060051. Guns 9, 10, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Lost SP 988 due to navigation jump - Sat-Nav update. Parity errors on SP 552. Completed line at SP 1615.
February 23	PB82-32	Direction 152 ⁰ . Start of line SP 061. Reel number 060052 to 060073. Guns 1, 2, 4, 5, 6, 7, 8, 9 and 10 on, capacity 760 cubic inches. 5 second records. Missed SPs 1130 to 1142 on tape deck changes. Lost SPs 1130 to 1142 due to tape malfunction. Parity errors on SP 509. Completed line at SP 1323.
February 23	PB82-28	Direction 006 ⁰ . Start of line SP 061. Reel number 060074 to 060089. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Parity errors on SP 560. Completed line at SP 1016.
February 23	PB82-25	Direction 274 ⁰ . Start of line SP 061. Reel number 060090 to 060098. Guns 9, 10, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Tailbuoy not detectable from start of line to end of line due to rough seas. Completed line at SP 617.
February 23	PB82-26	Direction 095 ⁰ . Start of line SP 061. Reel number 060099 to 060108. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Completed line at SP 645.

219053

<u>Date</u>	<u>Line No.</u>	<u>Description</u>
February 24	PB82-18	Direction 022°. Start of line SP 061. Reel number 060109 to 060122. Guns 5, 9, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Missed SP 547 on tape deck changes. Parity errors on SPs 295, 534, 538, 539, 540, 543 and 629. Completed line at SP 878.
February 24	PB82-17	Direction 202°. Start of line SP 061. Reel number 060123 to 060134. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Completed line at SP 688.
February 24	PB82-21	Direction 127°. Start of line SP 061. Reel number 060135 to 060142. Guns 5, 9, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. At SP 45 gun 5 off, gun 10 on, capacity 760 cubic inches. At SP 92 gun 10 off, capacity 740 cubic inches. Completed line at SP 485.
February 24	PB82-20	Direction 301°. Start of line SP 001. Reel number 060143 to 060163. Guns 1, 2, 3, 4, 11, 13, 15, 18 and 20 on, capacity 760 cubic inches. 5 second records. Completed line at SP 1254.
February 24	PB82-19	Direction 120°. Start of line SP 001. Reel number 060164 to 060185. Guns 1, 2, 3, 4, 11, 13, 15, 18 and 20 on, capacity 760 cubic inches. 5 second records. Parity errors on SP 61. Completed line at SP 1385.

219054

<u>Date</u>	<u>Line No.</u>	<u>Description</u>
February 24	PB82-22	Direction 061 ^o . Start of line SP 001. Reel number 060186 to 060198. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Noise on cable caused by passing ship between SP 600 to SP 660. Completed line at SP 755.
February 24	PB82-24	Direction 155 ^o . Start of line SP 001. Reel number begin from 060199. Guns 9, 10, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Parity errors on SP 115. Completed line at SP 988.
February 25	PB82-23	Direction 062 ^o . Start of line SP 001. Reel number 060215 to 060232. Guns 1, 3, 4, 6, 7, 8, 14, 15, 20 and 10 on, capacity 760 cubic inches. 5 second records. Lost SPs 676 to 679 and 688 to 691 due to tape deck malfunction. Parity errors on SP 320. Completed line at SP 1037.
February 25	PB82-10 EXT	Direction 270 ^o . Start of line SP 001. Guns 9, 10, 11, 12, 14, 16, 17, 18; 19 and 20 on, capacity 760 cubic inches. 5 second records. Completed line at SP 504.
February 25	PB82-9 EXT	Direction 270 ^o . Start of line SP 001. Reel number being from 060242. Guns 9, 10, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Completed line at SP 422.

219055

<u>Date</u>	<u>Line No.</u>	<u>Description</u>
February 25	PB82-38	Direction 092 ⁰ . Start of line SP 001. Reel number 060249 to 060257. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Completed line at SP 546.
February 25	PB82-39	Direction 215 ⁰ . Start of line SP 001. Reel number 060258 to 060266. Guns 9, 10, 11, 12, 14, 16, 17, 18, 19 and 20 on, capacity 760 cubic inches. 5 second records. Parity errors on SPs 283, 284 and 285. Completed line at SP 523.
February 25	PB82-37	Direction 155 ⁰ . Start of line SP 001. Reel number 060267 to 060278. Guns 1, 3, 4, 5, 6, 7, 8, 10, 14 and 15 on, capacity 760 cubic inches. 5 second records. Lost SP 455 due to speed fluctuation. Completed line at SP 722.

219056

NAVIGATION

219057

SECTION III

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1. NAVIGATION SYSTEM DESCRIPTION

The WINS Phase IV

Western Geophysical's WINS^(R) (Western Integrated Navigation System) is comprised of four main sub-systems; a doppler-sonar system to determine ship's velocity continuously, a satellite system to provide ship's position at intervals averaging two to four hours, a digital computer and a recording system to record computed data. Calculations for all sub-systems and data integration, are handled by the on-board general purpose digital computer. The ship's position is continuously calculated by integrating the sonar velocity and updating with acceptable satellite fixes.

DOPPLER SONAR SUBSYSTEM

Doppler Sonar

The main unit is a Marquardt 2020A doppler sonar system. This system uses a 4-element transducer, in a single assembly, to transmit and receive pulses of 300 KHz sonic energy reflected from the sea floor.

The four elements transmit and receive energy at an angle of 30° to the vertical in the fore, aft, port and starboard directions. The associated electronics control both the pulse transmission pattern and provide independent phase-locked-loop tracking of each of the four received signals. The output from the tracker circuits are demodulated to determine the frequency shift present in the received signals. The frequency shift of each channel is pulse shaped to provide a digital pulse rate proportional to ship's velocity in that channel. Vertical velocity, heave, is derived in the computer. Pulse rates proportional to velocities in the 2 horizontal ship axes are provided to the computer.

The sonar will normally maintain lock on the sea bottom to depths greater than 600 feet. When "bottom lock" is lost the sonar will automatically track the sonar return from the water mass. The velocities in this mode are relative to the water mass and therefore in error in the presence of ocean currents. The change in sonar mode may be controlled manually as well as automatically. The sonar mode is indicated to the computer and data logger and also visually displayed.

Velocity Resolution and Compensation

The horizontal ship-referenced velocities are resolved into North and East velocities by the computer. The necessary heading reference is provided by a gyro-compass (Sperry MK227) with electronic readout provided by a resolver. A resolver-digital converter provides a digital heading to the computer. The gyro-compass is corrected internally for latitude error. Dynamic gyro-compass errors are corrected in the computer.

Other corrections to the sonar velocities are for sound velocity in water and ship attitude.

Sound velocity in water is measured by a velocimeter (N.U.S. 1020) which provides an output frequency proportional to sonic velocity. This signal is used by the computer for sonar scale factor correction.

Ship attitude data are provided by pendulous resolver inclinometers (G.A.P. S2000) in the pitch and roll axes. The outputs of these devices are converted to digital form and passed to the computer. The computer applies corrections for pitch and roll and pitch-heave and roll-heave interaction.

SATELLITE SUBSYSTEM

The satellite receiver, Magnavox 702A-3, automatically acquires and tracks the signal from each satellite as they become available. Each satellite transmits a message on two frequencies, 400 MHz and 150 MHz, which are independently tracked by two phase-lock-loop receivers. The doppler shift on each frequency is measured. Digital data representing the high channel doppler-shift cycle count, low channel doppler-shift cycle count and satellite message are passed to the computer.

The satellite fix program is a "short doppler" program which employs the accumulated doppler data in 23-second intervals instead of the 2 minute interval used in the earlier programs. Use of the 23-second interval allows accurate fix computation under reception and pass length conditions which would prevent a 2 minute interval program from computing a fix.

Fix accuracy is very much a function of the accuracy of the measurement of the ship's velocity during the past. In particular one knot error in measurement of the north velocity can induce a position error of up to 1500 ft. in the satellite fix. Accurate knowledge of velocity from the sonar subsystem reduces this error to negligible proportions.

COMPUTER AND PERIPHERAL EQUIPMENT

The computer (HP 2100A) is a general purpose digital computer. The computer accepts data from all the sensor units and a manual entry keyboard. A CRT display unit is fed by the computer to provide a display of present latitude, longitude, heading, cross-course velocity and distance, and along-course velocity and distance. Several other parameters are also displayed. Initialization parameters, such as G.M.T., satellite antenna height, shotpoint interval, etc. are entered by the operator via a keyboard.

A digital line printer is used to provide a visual history by printing time and position at 10-minute intervals. The printer is also used to provide a printout of the satellite fix parameters.

The computer program is loaded from magnetic tape. Program may also be loaded with paper-mylar punched tape.

All computed navigation data, are sampled in digital form every twenty seconds. The resulting data scan is accumulated in a core memory and written onto IBM-compatible, 9-track magnetic tape at 10-minute intervals. Satellite data is accumulated for the entire satellite pass and written onto tape at the end of each pass.

The seismic system is interfaced to the computer in order to record the seismic file and reel number on the navigation tape, to allow the positive positioning of each seismic record. This interface also allows the navigation system to control the seismic recording interval on the basis of elapsed distance, instead of the more normal elapsed time method. The required distance is part of the computer initialization data.

To ensure recorded data validity, data recorded on magnetic tape is read back to the computer and compared with the data written to the tape. This data may also be printed for visual verification.

SURVEY OPERATION

The system is initialized with the latitude/longitude end points of the line and shotpoint control parameters; pop and shotpoint interval, initial shotpoint number and direction of count.

The system displays along-course and cross-course distance and velocity relative to the great circle line passing through the specified line end points. These displays are also available in the wheel house. The problems of bringing the vessel on line and keeping it there are thus simplified and do not require voluminous preplot tabulations or track plotter charts.

The system described above provides a reliable means of navigation to the accuracy required for geophysical survey work on the continental shelf independent of any shore base support.

219062

DATA PROCESSING

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Testing/Deconvolution	46
Velocity Analysis	47
Normal Moveout Application and CDP Stacking	48
Time Variant Filtering	49
Conclusion	50

Introduction

219064

In February 1982, Western Geophysical Company shot 22 lines, approximately 521 km of marine data offshore Australia, Permit T - 19 (Octopus) for Weaver Oil And Gas Corporation. The digital processing for this survey was performed by GeoCenter, Inc. of Houston, Texas from February 1982 to April 1982.

The primary navigation system used was WINS PHASE. The secondary navigation system was SAT - NAV.

The seismic recording was done on a DFS V system. The DFS V recorded 96 channels in SEG-B format at a 2 ms sampling interval for 5 seconds. The field filter settings were a low cut out and a high cut of 128HZ with a slope of 70 db/octave.

The cable used was a 96 group streamer which was pulled at an average depth of 12 meters. Each group consisted of 20 phones evenly spaced with a 25 meter spacing between group centers.

The energy source consisted of an array of 10 air guns with a capacity of 760 cubic inches and 4500 PSI. A shot was made every 25 meters at a depth of 6 meters.

Demultiplex

219065

The data was demultiplexed into trace sequential SEG-Y 32-bit floating point format using our PREP program. During the demultiplex run the near trace was edited to a secondary tape and displayed to check the results of the demultiplex program and to determine velocity analysis locations. Also at this time the data was resampled from 2 ms to 4 ms. An anti-alias filter before re-sampling was not deemed necessary since the field filter had eliminated the problem.

Testing was done on various lines. The geometry tests conducted were adjacent-trace and two-pop sum and also a combination of both. These tests revealed after client review that summing should be performed. The summing improved the signal to noise ratio. Various deconvolution before stack tests were performed. After reviewing the tests with the client, it was decided that a 32 ms predictive distance and a 160 ms operator length was the optimum prestack decon for this data. Post stack deconvolution tests were also performed and after client review it was decided that no post stack decon was necessary.

Our IGEM program then generated common depth point ordered tapes in SEG-Y format incorporating in the trace headers all the basic information regarding field parameter such as spread distances and line geometry. A 2:1 adjacent trace sum was performed at this time prior to CDP sort.

Prior to deconvolution a geometric spreading correction was applied to compensate for spherical divergence. Deconvolution was then performed using the Wiener - Levinson least squares minimum phase algorithm. The design gates for the deconvolution operators varied as a function of the distance of the trace from the source. A new operator was calculated for each trace. Auto correlations were computed before and after deconvolution, providing a check on the effectiveness of the decon.

Velocity analyses were performed using the constant velocity stack method. Six adjacent deconvolved CDP gathers were used. These analyses were performed at the rate of 1 per 2 km. The results were displayed in a variable area, wiggle trace mode using a versatec electrostatic plotter. The stacking velocity functions were determined from these analyses.

Normal moveout corrections were applied to each trace on a fractional millisecond basis. The program used a 16 point Lagrangian operator for interpolation. The velocity functions were input at specified CDP locations along the line. Velocities were then interpolated between input points on a CDP basis. Within each velocity function, RMS velocities were linearly interpolated between control points. Traces were muted individually after normal moveout application. The members of each CDP family were summed together to produce a stacked output trace. Each sample of time of the stacked output trace was then divided by the number of "live" samples at that time which were summed to produce that stacked sample. Effectively, this retains the relative recorded time-varying amplitude of the trace.

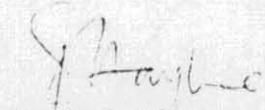
Quality control of the applied velocity functions was performed by generating an ISO-VELOCITY plot. Where deemed necessary revised velocity functions were used to compute the normal moveout corrections.

Time variant zero phase digital filter tests were run to determine the optimum filter pass-bands and times of application. Filter pass-bands were chosen after client review and the filters and times of application are noted in the section headers for each line. These filters were both space and time-variant in order to follow structural trends. Filter slopes are also noted in the side label.

Conclusion

219070

All final sections were checked for quality and approved prior to release. All questionable data was investigated and revised where necessary. The sections were displayed at a vertical scale of 2.5 in/sec and a horizontal scale of 24 tr/in. All velocity information i.e. "knee points", line ties, and water depth were noted at the top of the section.



J. S. Hayhre

Data Processing Manager

219071

GRAVITY/MAGNETIC DATA

SECTION V

GRAVITY/MAGNETIC DATA PROCESSING

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219073

GRAVITY/MAGNETIC DATA PROCESSING

IN

BASS BASIN

OCTOPUS AREA

OFFSHORE AUSTRALIA

1982 SURVEY

for

WEAVER OIL AND GAS

by

AERO SERVICE DIVISION
WESTERN GEOPHYSICAL COMPANY
OF AMERICA

AUGUST, 1982

THE GRAVITY AND MAGNETIC SURVEY

The Gravity and Magnetic field survey was performed on Weaver Oil and Gas permits T-15/P, T-16/P and T-19/P between February 22, 1982 and March 4, 1982 by Western Geophysical Company of America, Party 86 on board the M/V Western ODYSSEY. The gravity meter used was LaCoste and Romberg S-88, which has a constant of 0.09961 milligals per counter division. All data was simultaneously recorded on analog strip charts and magnetic tape.

The in port reading for the survey was made at Port Victoria, Australia and a base value of 980,038.85 milligals was used.

The sea bottom density used on this survey was 2.2 grams per cubic centimeter.

Latitude correction was applied as computed by the gravity formula for the geodetic reference system, 1967 (GFGRS, 1967).

Navigation coordinates were provided by Western Geophysical Company of America using the ARGO navigation system. There were approximately 1,140 kilometers of gravity and 1,354 kilometers of magnetics recorded with 55 line segments. All gravity and magnetic data was directly tied to the previous bass basin survey shot in April, 1981.

The portion of the survey that can be attributed to T-19/P is 514.5 km of gravity recorded and 514.5 km of magnetics recorded with 22 line segments.

PROCESSING FLOW

Plate 10 shows the data processing flow for the gravity and magnetics processing. The following paragraphs discuss each of the steps involved in the data processing flow:

A. Edit - This program processes the field tapes data at 20 second intervals and outputs a gravity and magnetic sample at every minute by averaging the current sample with the samples occurring 20 seconds earlier and 20 seconds later. Before averaging, each sample is checked to see if the value falls within a reasonable accepted range for such data. If a value falls outside the acceptable range, it is not used in the average. A delta value check is made also. The values used were:

	<u>DELTA</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>	
Gravity	333	55,000	70,000	Counter Units
Magnetics	666	25,000	60,000	Gammas

These numbers were based on empirical information gathered during previous data processing.

B. Gravity/Magnetics Update - This program is used to make changes to line numbers, water depths, or to manually update sensor information when obvious errors such as one point spikes not trapped by the edit program appear on the quality control profiles.

C. Navigation Reformat - This program changes the format of the navigation tapes to Aero's standard gravity/magnetics tape format to facilitate further processing.

D. Navigation Resequenece - This program records all navigation data to coincide with the gravity and magnetics data.

E. Navigation Merge - After the reformatting and resequencing operations have been performed, this program merges the navigation data with the gravity and magnetics data, scales gravity counter units to milligals using the gravity meter constant, scales gravity counter units to milligals using the gravity meter constant, and computes latitude corrections. Latitude corrections are computed using the algorithm for the Geodetic Reference System, 1967 (GFGRS, 1967). If any discontinuities (large distance jumps) or missing data exist, the affected samples are flagged. All subsequent processes are performed using the merged gravity magnetics formatted (GMI) tape.

F. Eotvos Effect Removal - This program reads the GMI tape and computes a raw Eotvos correction for each sample using the following formula:

$$E = 7.5 * S * \text{COS} (\text{LAT}) * \text{SIN} (\text{HEAD})$$

where

E = Eotvos correction

S = Ship's speed in knots

LAT = Ship's latitude

HEAD = Ship's heading

Speed and heading are computed from the time, latitude, and longitude of the tape record. These raw Eotvos numbers are smoothed in a three (3) point running average synthetic operation and then filtered using a parabolic recursive filter passing frequencies below 0.0007 Hz. This filter setting has proven to be effective in reducing high frequency noise jitter associated with ship motion and navigation resolution. The final filtered Eotvos correction is applied to each free air gravity sample and all values are written onto the output tape.

G. Magnetic Regional Removal and Horizontal Gradient Calculation -

This program reads the GMI tape and computes the earth's normal magnetic field using the International Geomagnetic Reference, 1975 updated to 1981. Each sample's latitude, longitude, and time is used to develop a unique value for that sample. This program also calculates the magnetic horizontal gradient from the gradiometer system's master and slave sensors by subtraction and division by the distance between sensors where applicable.

H. Filtering - Low pass filtering operations are performed on both the gravity and magnetics data. The magnetics filtering is used to smooth high frequency instrument noise and the gravity filter is used to smooth the effects of the sea state and wave action. Each preliminary profile is examined and a particular filter length is chosen manually to compensate for the observed "noise". A filter length of 0.0003 Hz. was used for the gravity data and 0.0008 Hz. was used for the magnetic data. After the filtering process, each line is checked by plotting profiles displaying water depth, Eotvos, free air gravity without Eotvos correction, unfiltered free air gravity with Eotvos correction, filtered free air gravity with Eotvos, and unfiltered magnetics. Any error conditions (such as direct or inverse correlation of Eotvos correction and Bouguer gravity, improper filtering, or errors in water depths) are spotted and corrected before further processing.

I. Intersection Picker - Latitude and longitude coordinates from the GMI tape are input to this program and an intersection algorithm calculates sample times at which lines cross one another. Subsequent processing programs use this intersection information to compute statistics for applying systematic corrections.

J. Intersection Mistie - By using the intersections determined in the Intersection Picker Program and the sensor data tape output by the Filter Program, this program calculates the filtered free air gravity and filtered magnetics misties at intersections. The average free air mistie is 7.67 milligals, and the average magnetics mistie is 14.18 gammas.

K. Free Air Sysfix - The sensor data output from the Filter Program and the mistie data are used to compute a systematic adjustment bias for each line by the method of least squares. The data is then corrected by adding the applicable bias to each line. The average filtered adjusted free air gravity mistie for the survey after this process is 2.36 milligals.

L. Magnetism Sysfix - Next the same procedure as above is used to systematically adjust the magnetism data. The average magnetism mistie for the survey for the adjusted filtered magnetism is 8.36 gammas.

M. Bouguer and Terrain Correction - The water depths values at each sample are used to compute Bouguer and terrain corrections for application to the adjusted free air gravity. The terrain corrections are two (2) dimensional and are computed by the Talwani et al method referenced in the Journal of Geophysical Research, Vol. 64, No. 1 January, 1959, page 49. The first and last depth for each line is extended to infinity for purposes of this calculation.

N. Intersection Mistie - This program is run next to compute mistie in the unadjusted Bouguer gravity after the above correction have been applied. The average mistie for the unadjusted Bouguer gravity is 12.11 milligals.

O. Bouguer Gravity Sysfix - Using the sensor data output by the Bouguer and terrain correction program and the mistie information listed above, a systematic error correction is computed and applied using least squares to minimize the average errors across the entire survey. After applying this correction for the survey, the average mistie is 2.32 milligals.

P. Final Gravity/Magnetism Profile - This program creates a Calcomp drum plot tape from the sensor data contained on a GMI tape. This tape is fed to a Calcomp 1052 drum plotter and the final gravity and magnetism profiles are plotted on 10" gridded paper. The horizontal scale of the profiles for the survey is 1 inch = 2,450 meters. Vertical scales of the plotted curves are listed below:

Gravity:

- a) Final Bouguer Gravity @ 5 milligals/inch
- b) Adjusted Free Air Gravity @ 5 milligals/inch
- c) Adjusted Bouguer Gravity @ 5 milligals/inch
- d) Eotvos Correction @ 5 milligals/inch
- e) Water Depths @ 20 meters/inch

Magnetics:

- f) Adjusted Raw Magnetics @ 20 gammas/inch
- g) Total Magnetic Intensity @ 20 gammas/inch

In addition to the above presentation, a set of gravity and magnetic profiles were produced on 10" gridded mylar with the horizontal scale of 1" = 575 meters matching the seismic sections scale. Vertical scales of the two plotted curves are as follows:

- h) Final Bouguer Gravity @ 5 milligals/inch
- i) Total Magnetic Intensity @ 20 gammas/inch

Q. Gravity/Magnetics Mapmaker - This program creates a Flatbed plot tape from the sensor data contained on a GMI tape, this data is fed to a 748 Flatbed plotter and the final mylar maps on which the contours are drafted are made. The maps are at a scale of 1:100,000. The projection used was Universal Transverse Mercator with the spheroid being Australian National. The central meridian is 147⁰E. The maps are bounded on the south by latitude 41⁰⁰'S, on the north by latitude 148⁰⁰'E and extend eastward from longitude 144⁰⁰'E to longitude 146⁰⁰'E. The maps covering the entire survey area are as follows:

- a) Six (6) Total Magnetic Anomaly Map @ contour interval =
10 gammas (MAPS 1-5) and 20 gammas (MAP 6)
- b) Six (6) Bouguer Gravity Map @ contour interval = 1 milligal

GRAVITY-MAGNETICS GMI INTERMEDIATE RECORD FORMAT

WORD	FORMAT	DESCRIPTION
1	I#L	Line Number
2	I#L	Julian Date
3	I#L	Greenwich Mean Time (HHMMSS)
4	I#L	Accumulated Time (seconds)
5	R#L	Shotpoint Number
6	A#L	Re-Shot Characters or 'INT'
7	R#L	Accumulated Distance (meters)
8	R#L	Water Depth (meters) or elevation
9	R#L	Latitude (degrees)
10	R#L	Longitude (degrees)
11	R#L	Northing - Y (meters)
12	R#L	Easting - X (meters)
13	A#L	Line Name (1st 4 characters)
14	A#L	Line Name (2nd 4 characters)
15	A#L	Area Name (4 characters)
16	R#L	Magnetics, Field Master
17	R#L	Magnetics, Field Slave
18	R#L	Magnetics, Gradient
19	R#L	Magnetics, Accumulated Gradient Field
20	R#L	
21	R#L	
22	R#L	
23	I#L	
24	R#L	Instrument-Corrected Gravity (Mgals)
25	I#L	Gravity Counter Units
26	R#L	Gravity Corrected for Monitors (Mgals)
27	R#L	Eotvos Correction (Mgals)
28	R#L	Slab Bouguer Gravity (Unfiltered) (Mgals)
29	R#L	Free Air Gravity before Eotvos (Mgals)
30	R#L	System Adj. Bouguer (Mgals)
31	R#L	Final Random Adj. Bouguer (Mgals)
32	R#L	Free Air Gravity (Mgals)
33	R#L	2-D Terrain Correction (Mgals)
34	R#L	Tide Correction (Mgals)
35	I#L	Magnetics, Field Master (gammas)
36	R#L	Magnetics, Diurnal & Regional Removed (gammas)
37	R#L	Magnetics, Regional Correction (gammas)
38	R#L	Magnetics, Diurnal Correction (gammas)
39	R#L	Magnetics, Filtered (gammas)
40	R#L	Magnetics, Systematic Adjusted (gammas)
41	R#L	Magnetics, Random Adjusted (gammas)
42	R#L	Tide (meters)
43	I#L	
44	I#L	
45	R#L	Slab Bouguer Correction (Mgals)
46	R#L	2-D Bouguer Gravity (Filtered)
47	R#L	
48	R#L	
49	R#L	Adjusted Water Depths (Meters)
50	R#L	Filtered Free Air Gravity (Mgals)
51	R#L	3-D Bouguer Correction (Mgals)
52	R#L	3-D Bouguer Gravity (Unfiltered)
53	R#L	Sysfixed Free Air Gravity (Mgals)
54	R#L	3-D Bouguer Gravity (Filtered)
55	R#L	Free Air Gravity, Random Adjusted (Mgals)
56	R#L	Magnetics, Hilbert Transform
57	R#L	Magnetics, Horizontal Derivative (Gammas)
58	R#L	Magnetics, Vertical Derivative (Gammas)
59	R#L	Magnetics, Reduced to Pole (Gammas)
60	I#L	Sequence Number

219080

INTERPRETATION

SECTION VI

	<u>Page</u>
<u>Interpretation:</u>	
General	57
Map Horizon	57
Structural Features of Interest	57-58

General

The Octopus Seismic Survey was designed to better delineate leads and tie down critical fault cuts in hopes of defining one or more drillable prospects.

Map Horizon

Because of sparse well control which often encountered igneous material in the Lower Eocene or Paleocene, numerous faults of varying throw, and the general poor quality of data at and beneath the Eocene, continuous correlations of the M. diversus reflector was difficult, and the stratigraphic age of lower reflectors were postulated.

Structural Features of Interest

Sea Elephant - Plate 6a & 6b

This feature is located in the S.W. portion of the permit area where it was just identified on a single seismic line of 1966-67 vintage. Six additional lines were acquired to determine if the large anticlinal feature could be closed. Although it is not as large as originally anticipated, 2 separate leads exist as mapped on the M. diversus, one of which depends on fault closure. Closure to the southwest is furnished by a sizeable depositional trough. Regional dip is down to the northeast of northwest. Critical closure is to the southeast. The area of closure for both leads totals approximately 19,760 acres. Additional seismic would be required to completely confirm the southeast closure.

Coraline Lead - Plate 7

This lead was mapped on the M. diversus reflector and is an intensely faulted, low profile structure with questionable prospectivity. Due to its low profile nature, production in the area would have to be confirmed before proceeding with a test on this feature. Its areal closure is approximately 14,750 acres with 240' of vertical closure.

Morwong Lead - Plate 8

As mapped on the M. diversus, this lead is a low profile anticlinal structure with questionable prospectivity. As with the aforementioned lead, production in the area would enhance this potential prospect, but it would not stand alone on its own merit. The areal closure is approximately 9,280 acres with 260' of vertical closure.

Manatee Lead - Plate 9

This feature is similar in structural style to the Gippsland type anomalies, in that it is a combination of a structural and erosional remnant. Stratigraphically, it is in the Lower Eocene/Paleocene. As presently mapped (with much difficulty) it encompasses approximately 11,150 acres with a vertical closure of 1,550'. It would require additional seismic to bring this interesting lead to a drillable prospect status.

Octopus Lead - Plate 10

This feature is a tilted fault block in the northeast portion of the permit.

Three lines were shot across the Octopus lead in an attempt to close off the critical dip to the northwest, however, the closure has eluded our attempts to verify its existence. Additional seismic will be required to confirm the critical closure. As optimistically mapped, it may have 9,300 acres closure with 210' of vertical closure.

219084

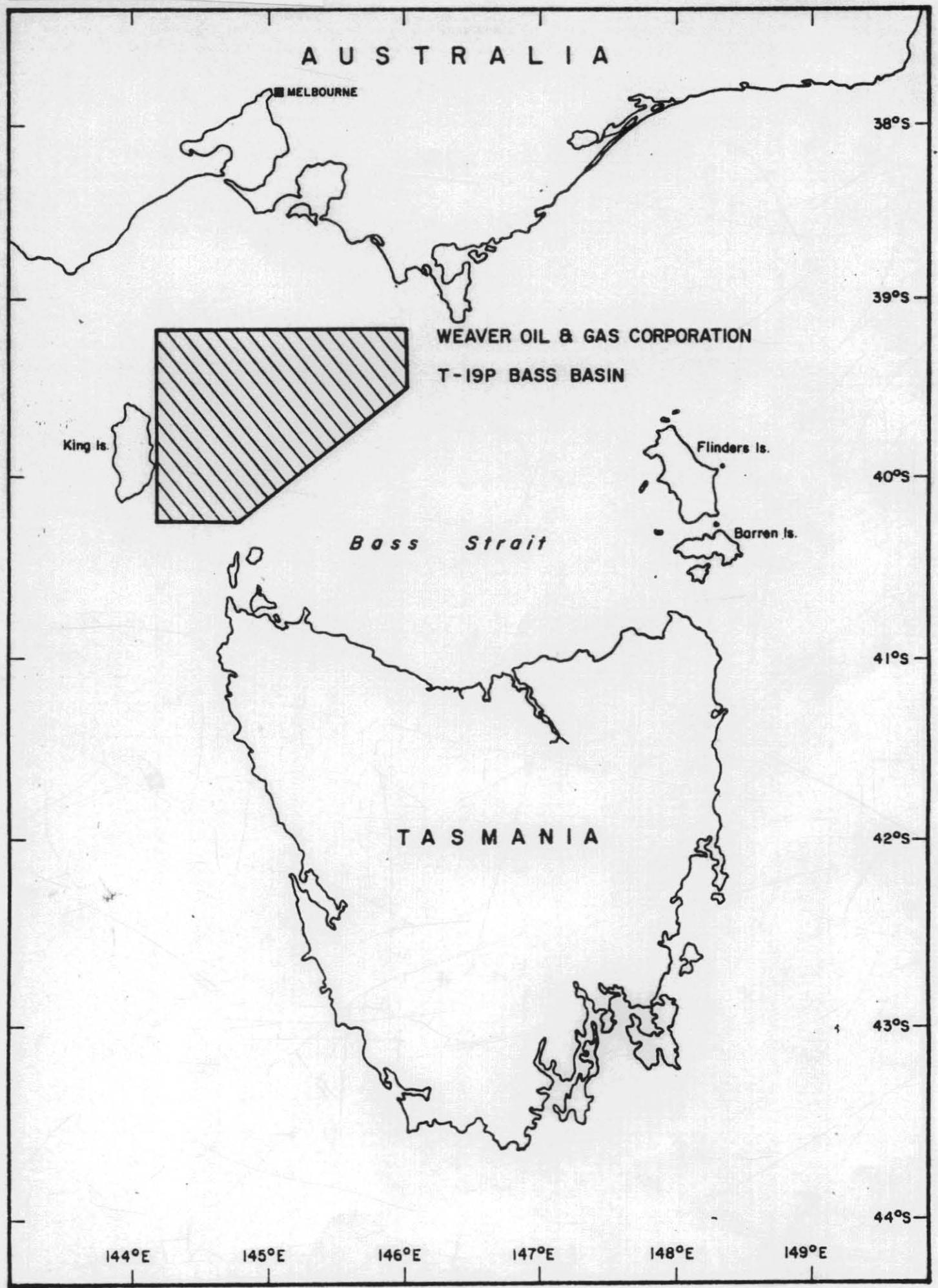
LIST OF PLATES

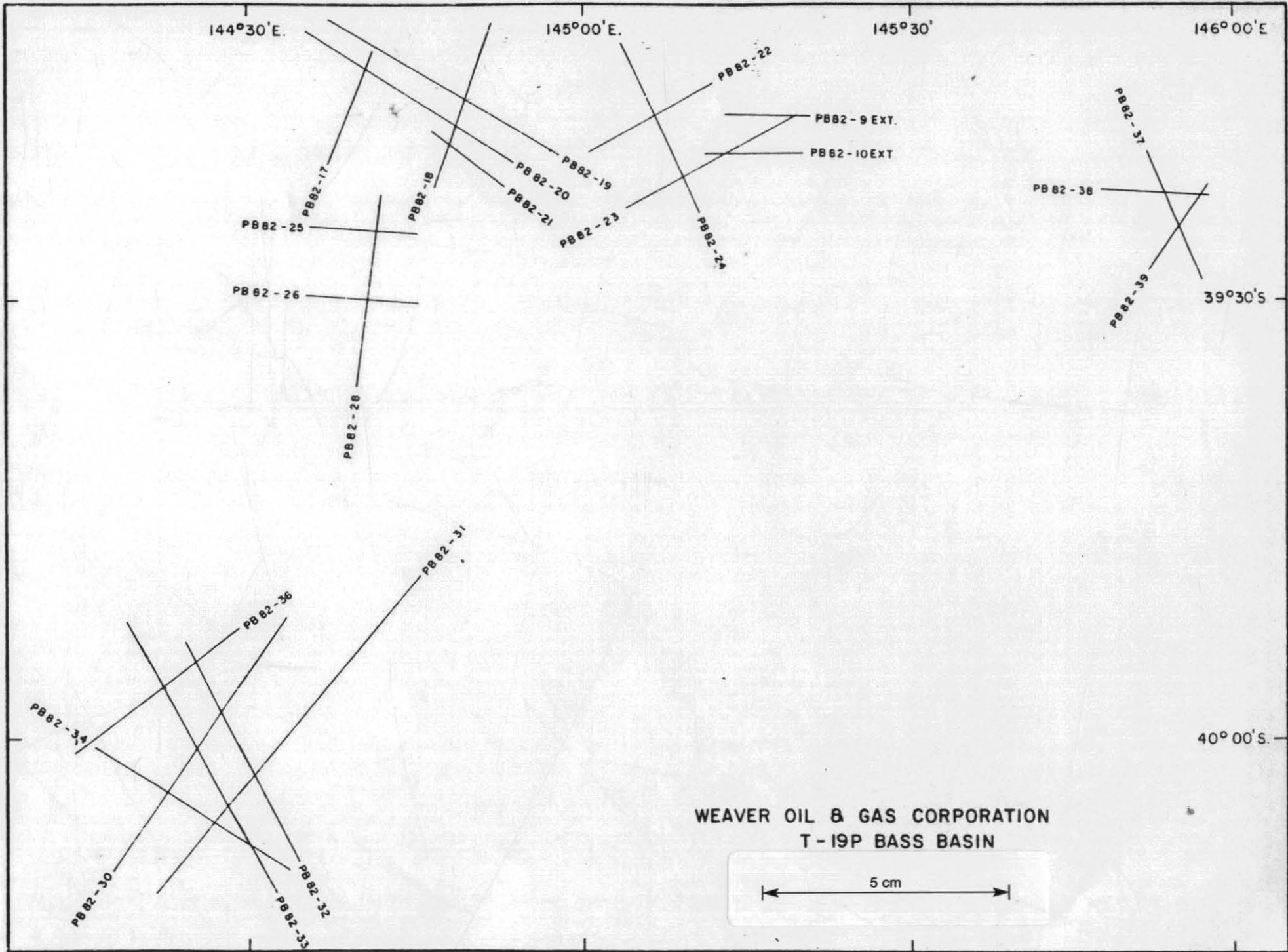
SECTION VII

List of Plates:

- 1) Location Map
- 2) Lines Location
- 3) Vessel and Cable Layout
- 4) Cable Configuration
- 5) Gun Array Configuration
- 6) Hydrophone Configuration
- 7) Main Streamer Frequency Curve
- 8) Block Diagram
- 9) Fathometer Scale
- 10) Processing Flow Chart - Gravity & Magnetics

5 cm





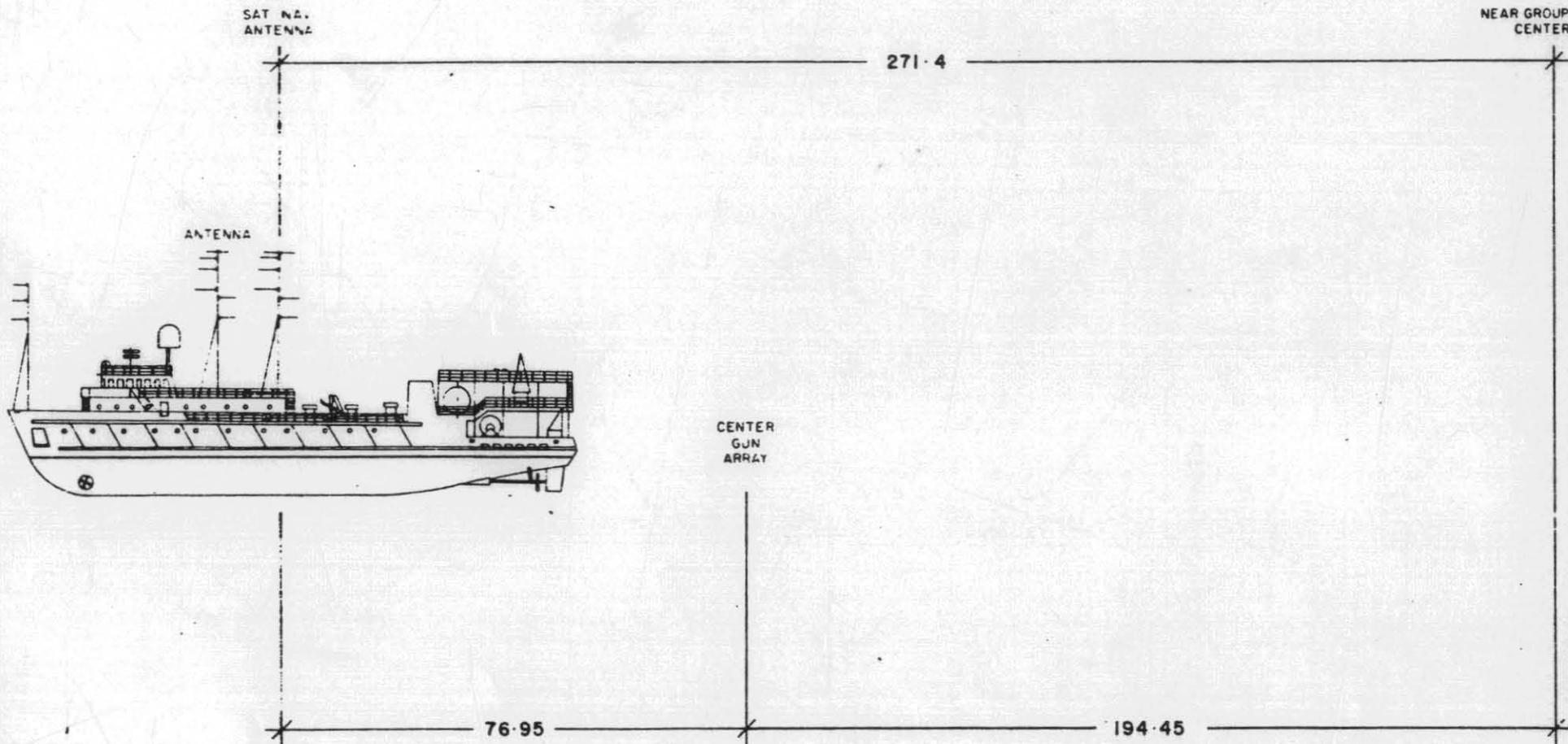
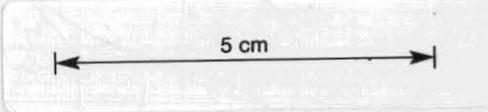


PLATE 3

WESTERN ODYSSEY PARTY 86

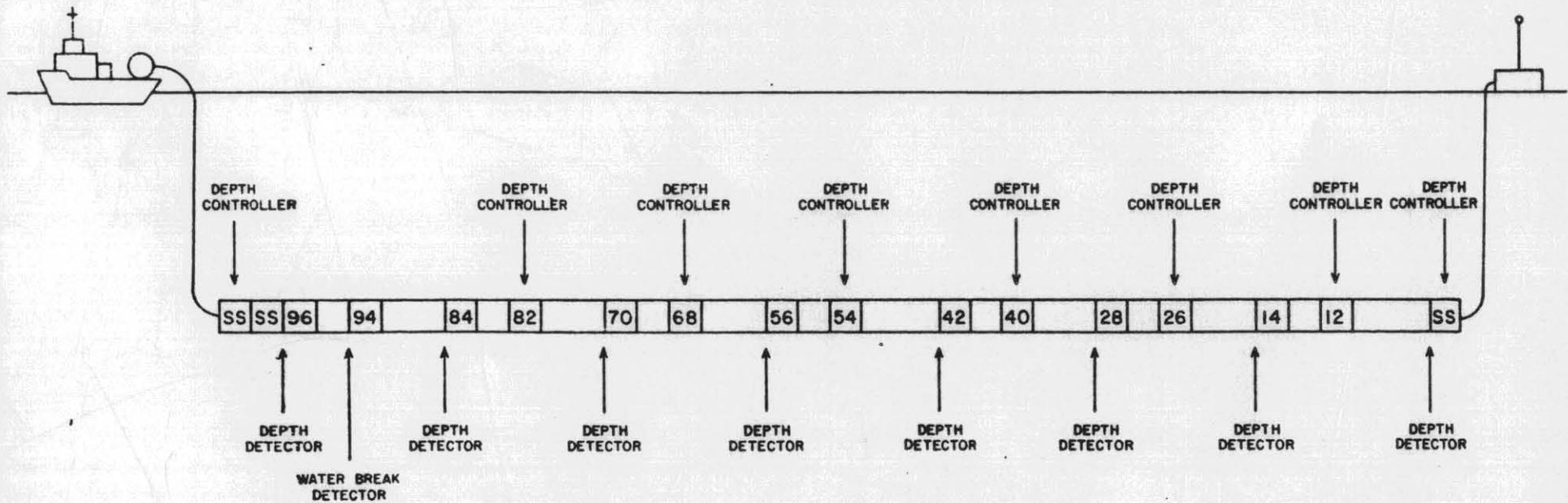
(DISTANCES IN METERS)



219088

WESTERN ODYSSEY

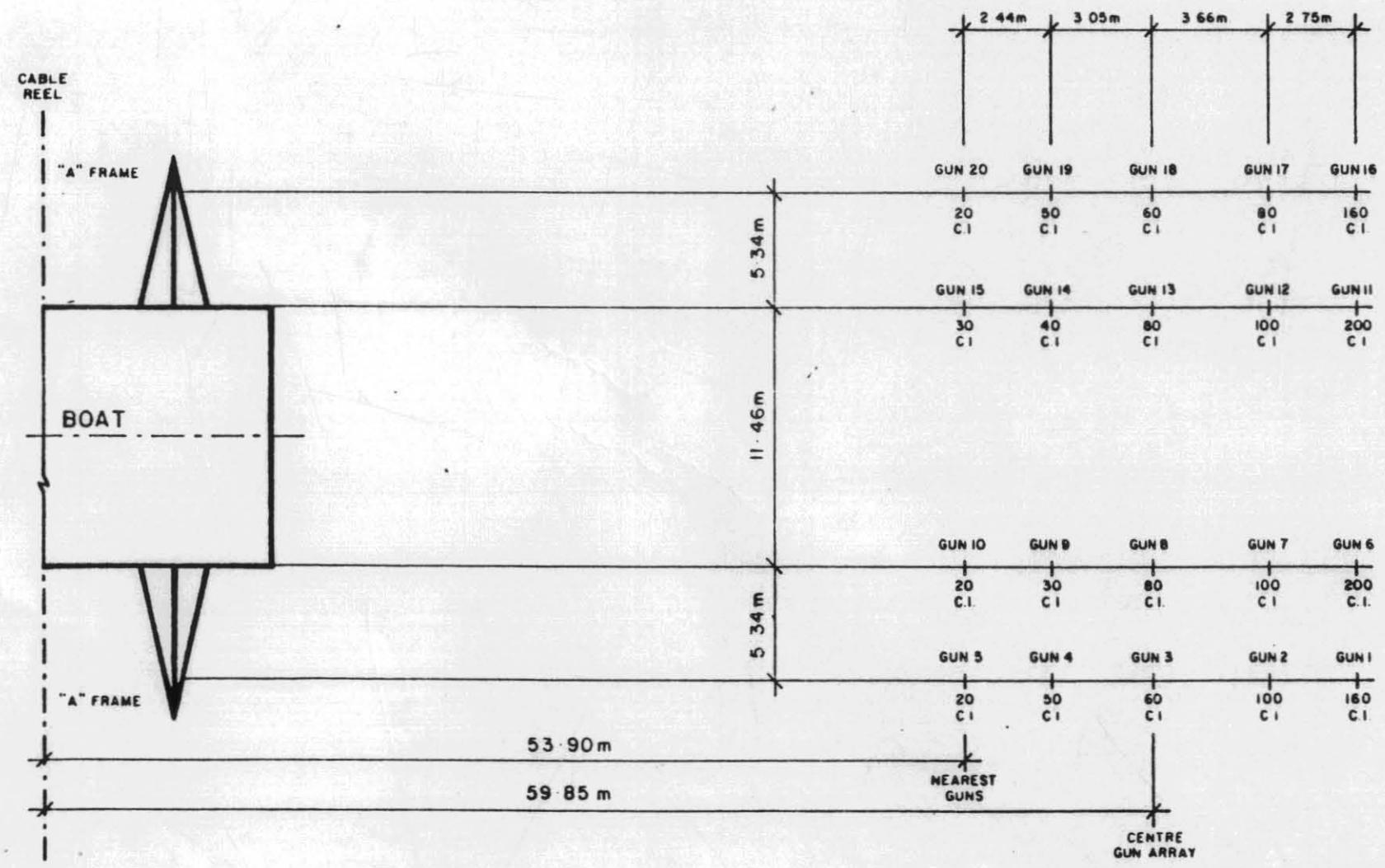
.96 GROUP CABLE CONFIGURATION



5 cm

5 cm

WESTERN ODYSSEY PARTY 86 GUN ARRAY CONFIGURATION

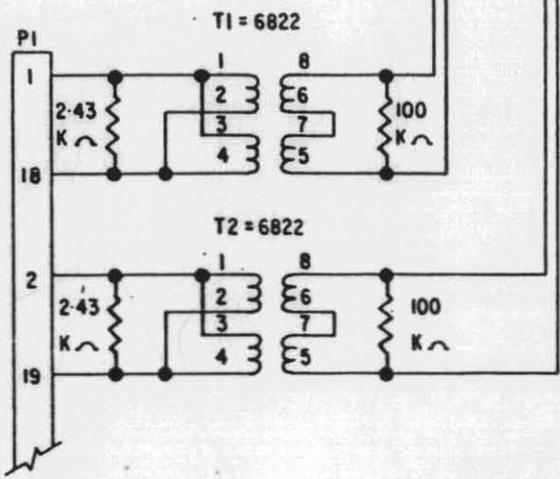
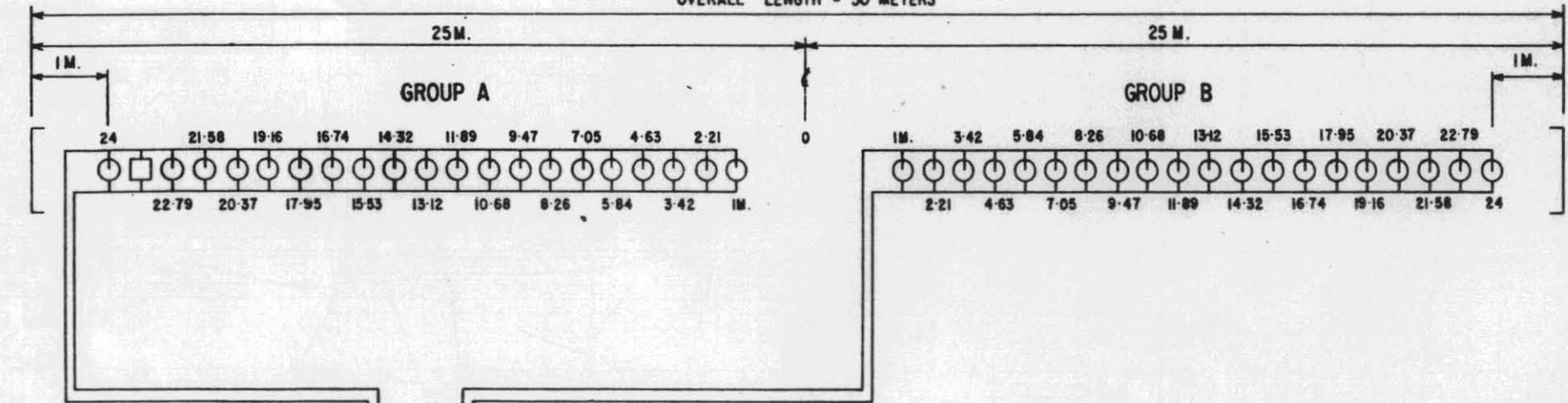


LEGEND : C.I. - CUBE INCH

PLATE 5

219090

OVERALL LENGTH - 50 METERS



HYDROPHONE CONFIGURATION WESTERN ODYSSEY 96 CHANNEL

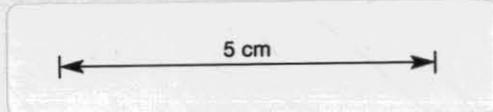
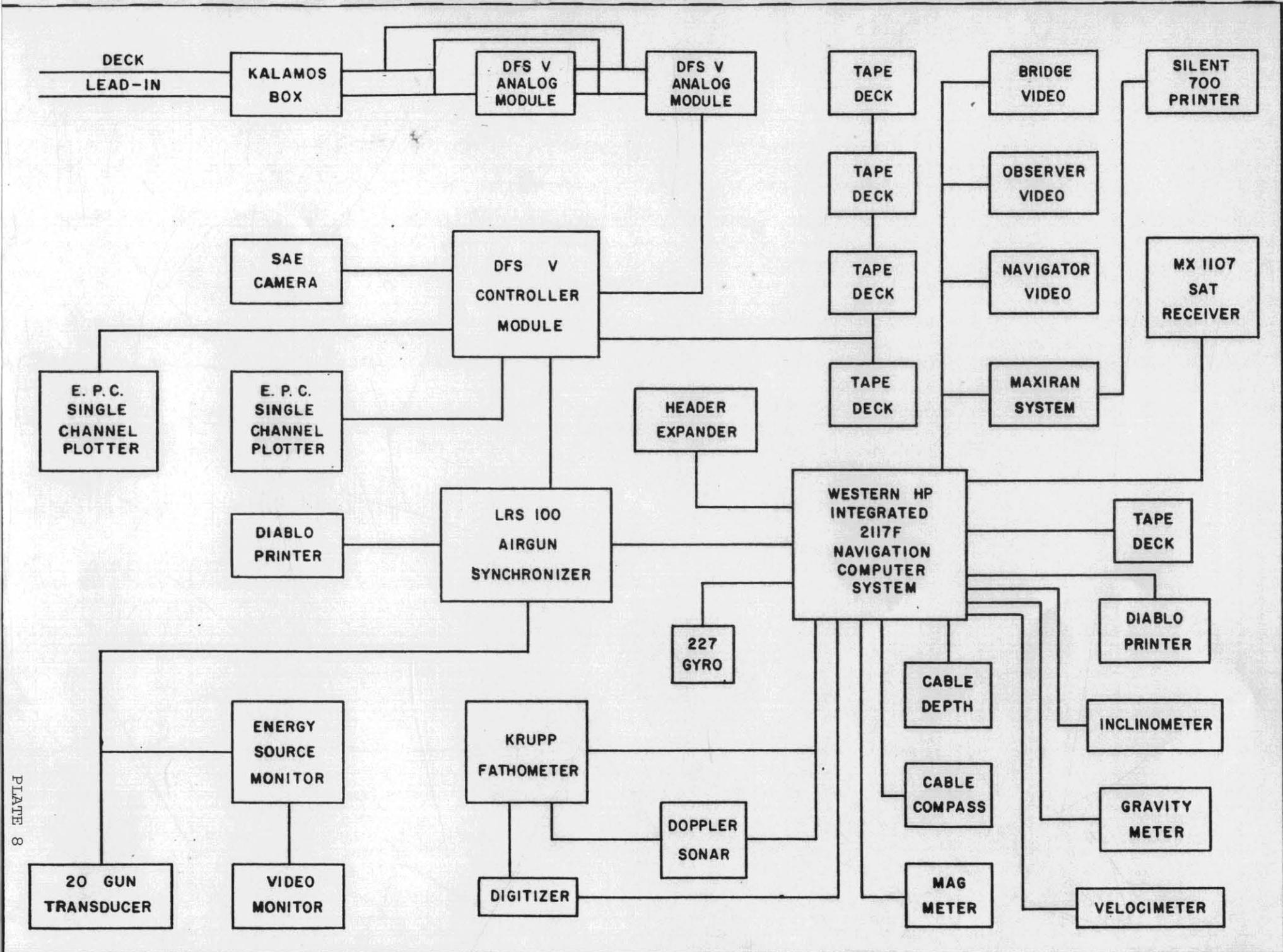


DIAGRAM
PLATE 6

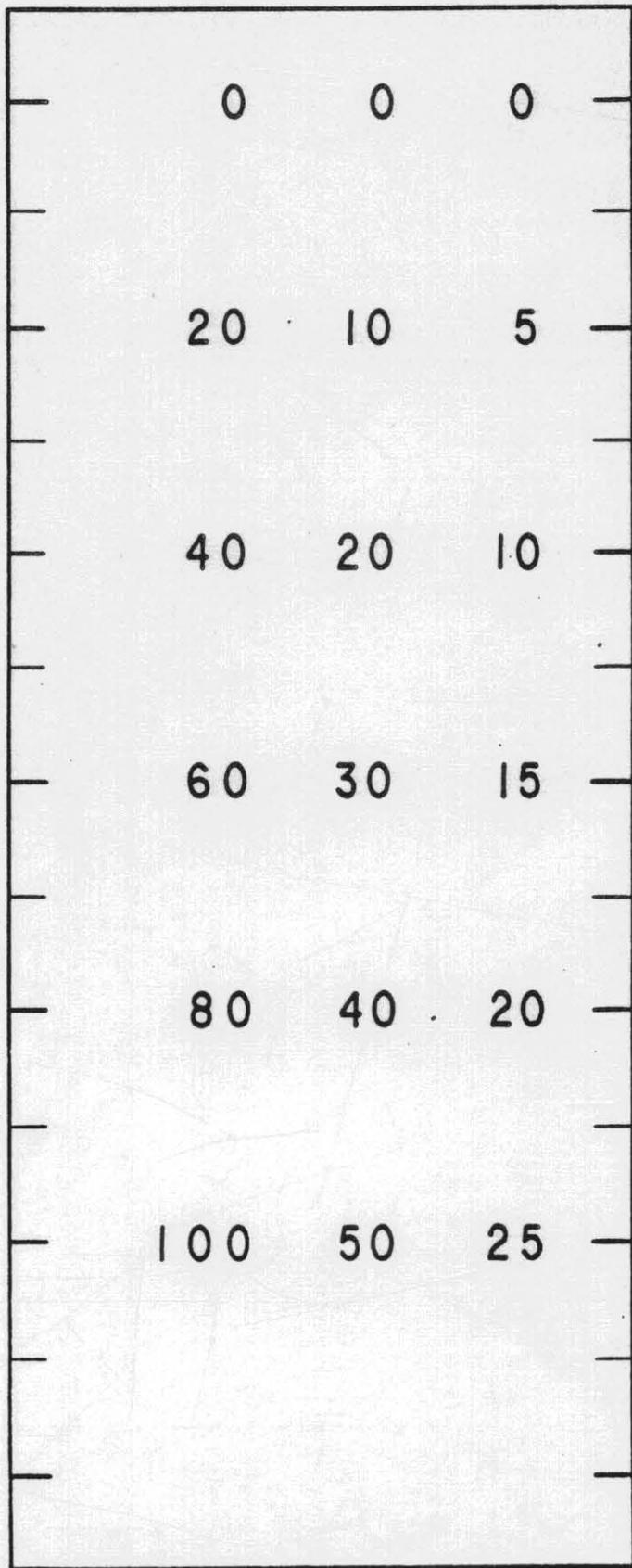
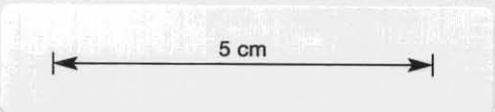
219091



BLOCK DIAGRAM

PLATE 8

219093



FATHOMETER SCALE

SECTION VIII

Basic Data Submitted

Water Depth (Fathoms)

Bouguer Gravity Profiles Showing:

Adjusted Bouguer Gravity (MGALS)

Bouguer Gravity (MGALS)

Adj. Free Air Gravity (MGALS)

Filtered Eotvos Gravity (MGALS)

Water Depth (Meters)

Magnetics Profile Showing:

Total Magnetics Intensity (GAMMAS)

Raw Magnetics (GAMMAS)

Bouguer Gravity Map - C.I. = 1MGAL - Density = 2.2

Shot Point Location with Water Depth in Feet Map

Shot Point Location Map

Total Magnetics Intensity Map - C.I. = 10 GAMMAS

Total Magnetics Intensity Map - C.I. = 20 GAMMAS

Final Bouguer Gravity/Total Magnetic Intensity Profiles Showing:

Final Bouguer Gravity - 5 MGALS/IN.

Final Total Magnetics Intensity - 20 GAMMAS/IN.

Navigation Data - Computer Printouts - Postplots

Seismic Lines

PB82-9 ext	SP 1-422
PB82-10 ext	SP 1-504
PB82-17	SP 61-688
PB82-18	SP 61-878
PB82-19	SP 1-1385
PB82-20	SP 1-1254
PB82-21	SP 1-485
PB82-22	SP 1-755
PB82-23	SP 1-1037
PB82-24	SP 1-988
PB82-25	SP 61-617
PB82-26	SP 61-645
PB82-28	SP 61-1016
PB82-30	SP 61-1660
PB82-31	SP 61-2133
PB82-32	SP 61-1323
PB82-33	SP 61-1615
PB82-34	SP 61-1237
PB82-36	SP 61-1102
PB82-37	SP 1-722
PB82-38	SP 1-546
PB82-39	SP 1-523

List of Interpretive Data Submitted

Seismic Time Structure Map - Sea Elephant Lead

M. diversus Reflector

Intra M. diversus Reflector

Seismic Time Structure Map - Coraline Lead & Area

M. diversus Reflector

Seismic Time Structure Map - Morwong Lead & Area

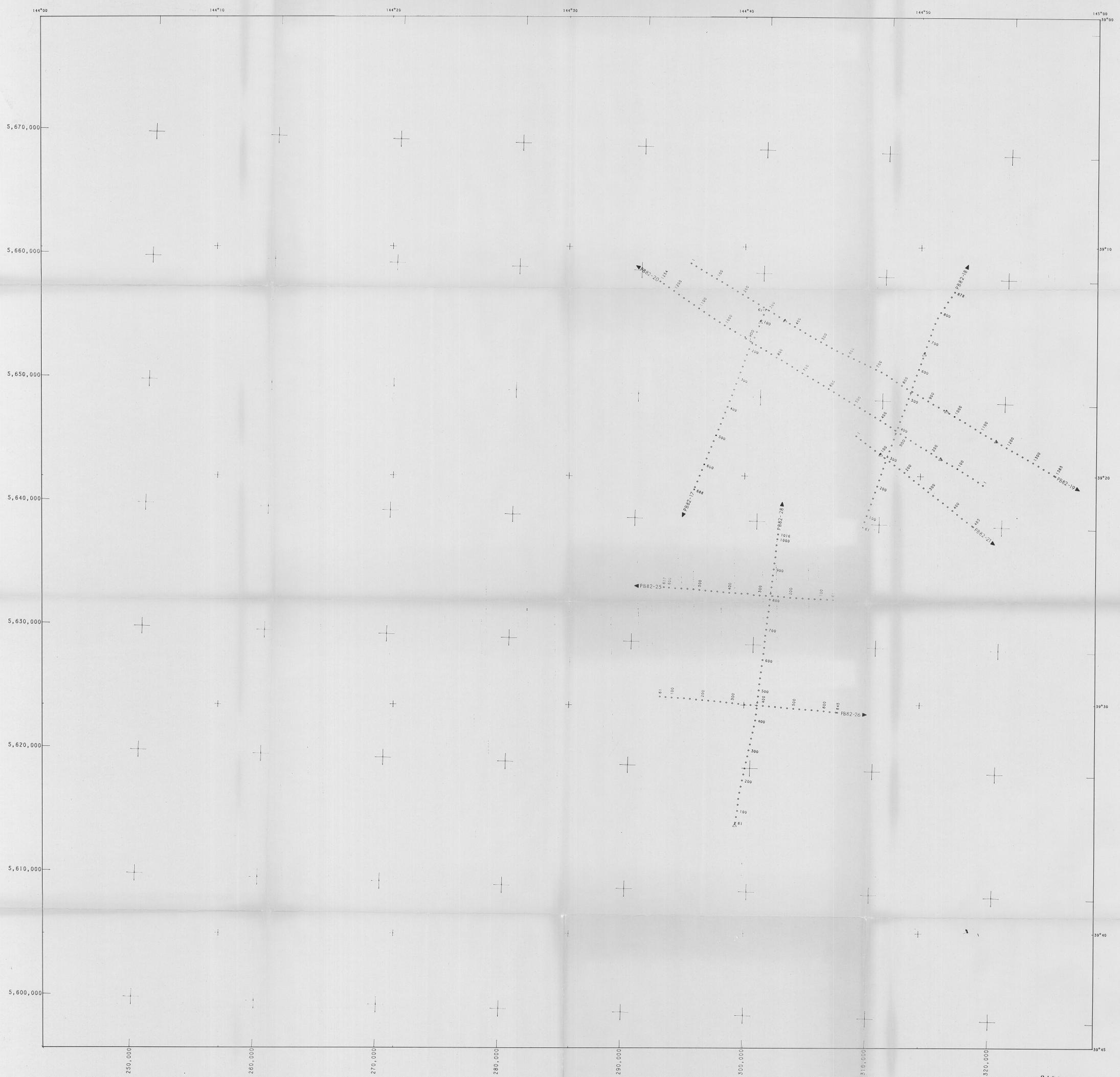
M. diversus Reflector

Seismic Time Structure Map - Manatee Lead

Lower Eocene/Paleocene Reflector

Seismic Time Structure Map - Octopus Lead

M. diversus Reflector



219099



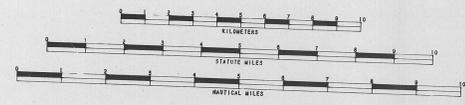
T/19P
PB82
part 1 of 3

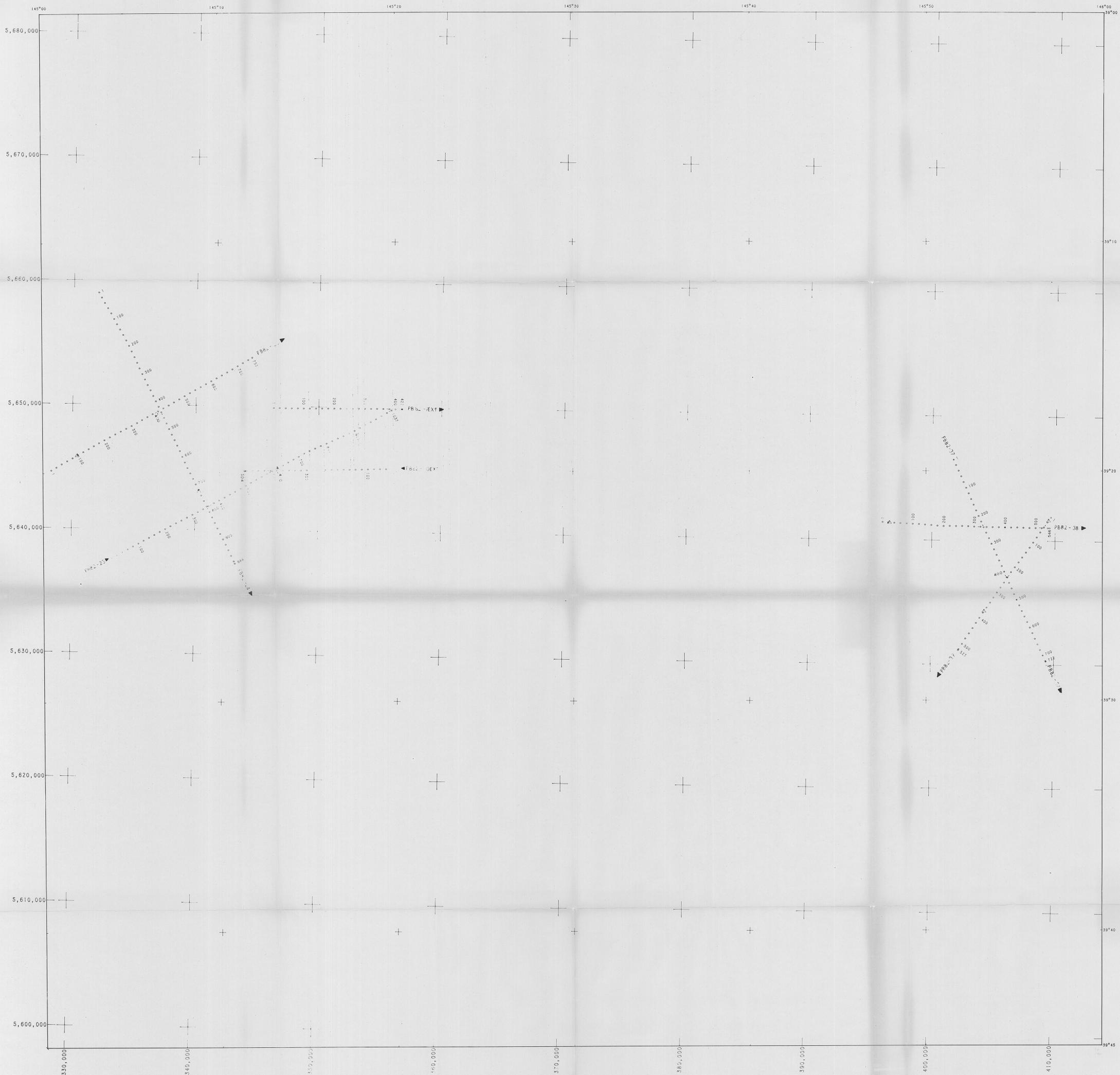
T/19P OCTOPUS SEISMIC SURVEY

REVISIONS		WEAVER OIL AND GAS CORP	
DATE	BY	BASS BASIN	
ANTENNA POSITIONS LOCATED BY WINS®			
SCALE: 1 : 100,000		GRID SYSTEM: UTM ZONE NO. 55	
PROJECTION: TRANSVERSE MERCATOR		GRID UNIT: METER	
SPHEROID: AUSTRALIAN NAT.		FALSE EASTING: 500,000	
CENT. MERIDIAN: 144°00'00" E		FALSE ORIGIN AT C.M. AND LATITUDE	
SCALE FACTOR ON CENTRAL MERIDIAN: 0.99999999		RETRACED APPLIED: 0.0 METERS	
WESTERN GEOPHYSICAL COMPANY OF AMERICA		DATE: APRIL 13, 1982	
		MAP NO.: WEA-1-1	

7.19

ENCLOSURE 1 OR-204





T/19P
PB82
part 2 of 3

T/19P OCTOPUS SEISMIC SURVEY

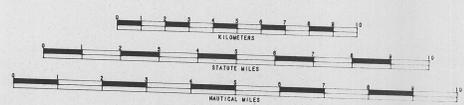
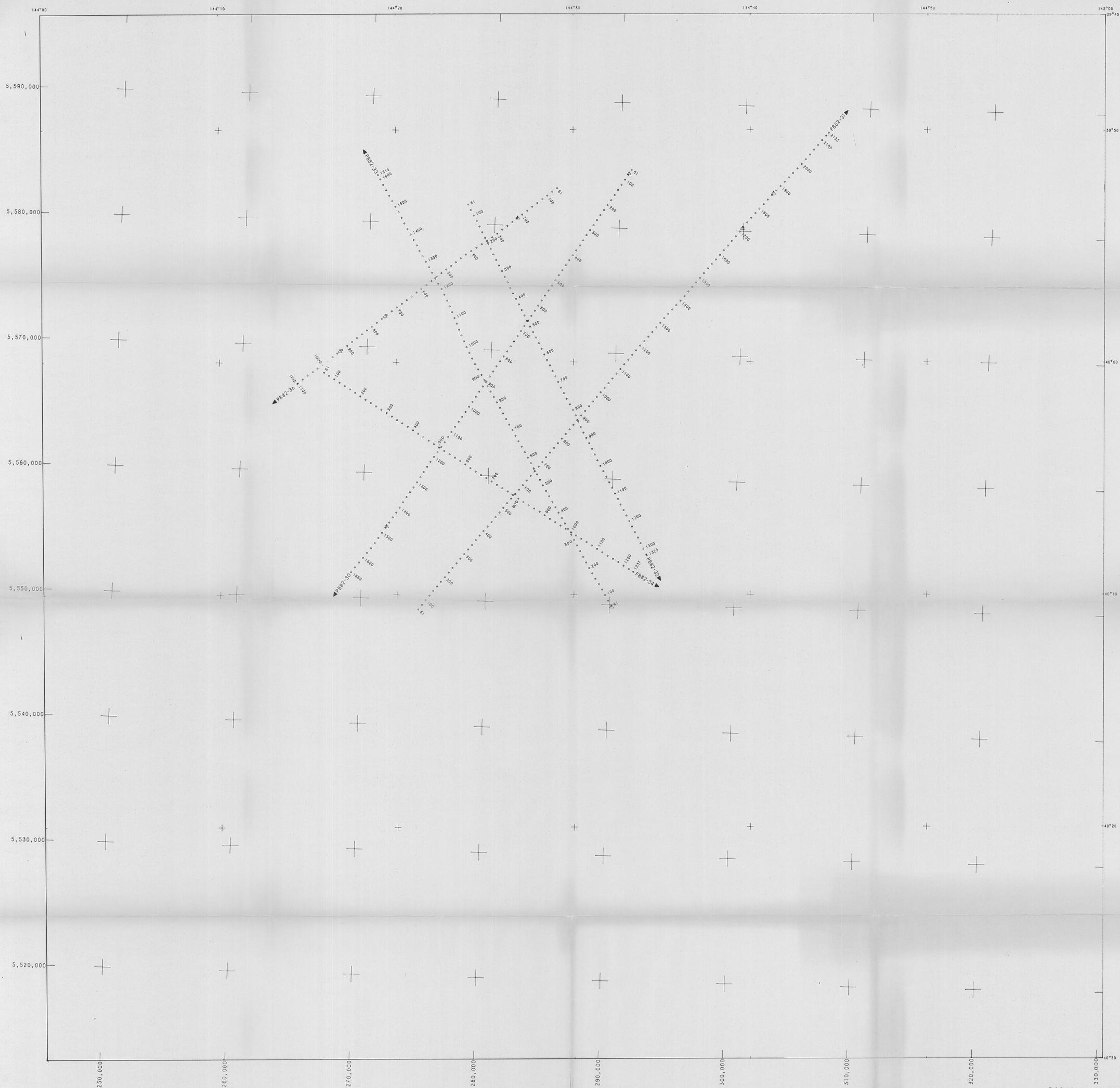
5 cm

219100

REVISIONS		WEAVER OIL AND GAS CORP	
DATE	BY	BASS BASIN	
		ANTENNA POSITIONS LOCATED BY WINS*	
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		PROJECTION: TRANSVERSE MERCATOR	GRID UNIT: METER
		SPHEROID: AUSTRALIAN NAT.	FALSE NORTHING: 19,000,000 S., 0 N.
		CENT. MERIDIAN: 147°00'00.000" E	FALSE EASTING: 500,000
		SCALE FACTOR ON CENTRAL MERIDIAN: 0.9999999	FALSE ORIGIN AT C.M. AND LATITUDE: 0°00'00.000" N
			STRABACK APPLIED: 0.0 METERS
			SEISMIC DATUM: WEST 84
WESTERN GEOPHYSICAL COMPANY OF AMERICA	DATE: APRIL 13, 1982	WAT	WEA-1-2
		ENCLOSURE 2	OR-804

7-19

2



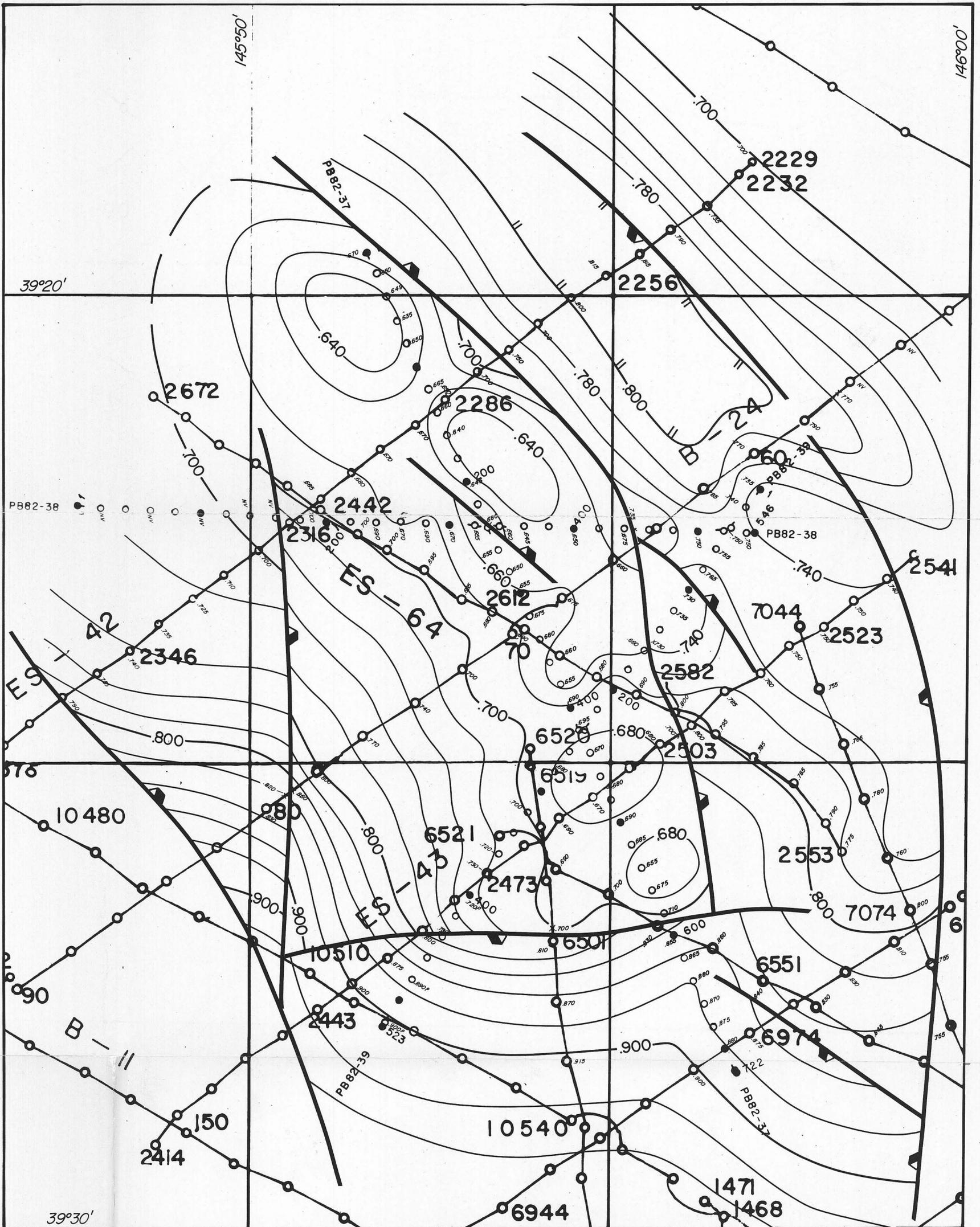
T/19P
PB82
part 3.13

T/19P OCTOPUS SEISMIC SURVEY



REVISIONS		WEAVER OIL AND GAS CORP	
DATE	BY	BASS BASIN	
		ANTENNA POSITIONS LOCATED BY WINS®	
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		PROJECTION: TRANSVERSE MERCATOR	GRID UNIT: METER
		Spheroid: AUSTRALIAN NAT.	FALSE NORTHING: 10,000,000 S., 0 N.
		Cent. Meridian: 147°00' 00" E	FALSE EASTING: 500,000
		SCALE FACTOR ON CENTRAL MERIDIAN: 0.999999	FALSE ORIGIN AT C.M. AND LATITUDE: 0° 00' 00" S
		SETRACK APPLIED: 0.0 METERS	SETRACK APPLIED: 0.0 METERS
		WESTERN GEOPHYSICAL COMPANY OF AMERICA	MAP NO.: WEA-1-3
		DATE: APRIL 13, 1982	ENCLOSURE 3 OR-204

T.19



AREA OF CLOSURE: 9280 acres
 VERTICAL CLOSURE: .045 sec. (210 feet)
 DEPTH TO MAP HORIZON: 635 sec. (2077 feet)
 WATER DEPTH: 246 feet

**WEAVER OIL AND GAS CORPORATION,
 AUSTRALIA**

T-19-P
OCTOPUS PROSPECT
M. diversus

SEISMIC TIME STRUCTURE MAP

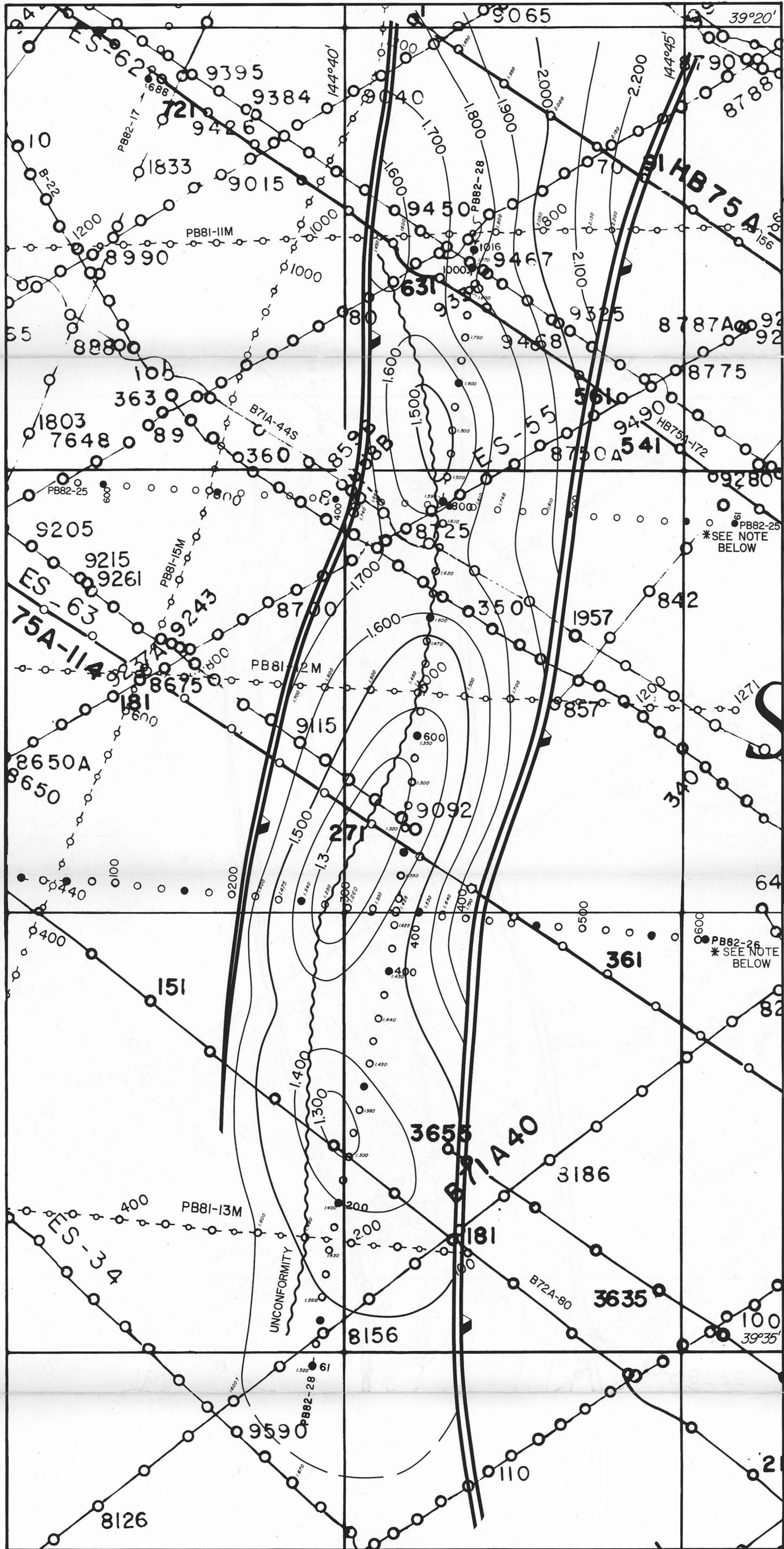
GEOPH: J.D. DOWNING DRFT: Id

0 1 2 3 4 5 mi
 0 1 2 3 4 5 km

C.I.: .020 sec. SCALE 1:50,000 JUNE 1982

219102

Map Part 2 ENCLOSURE 4
 OR-204



* LINE PB82-26 8
 LINE PB82-25: PROBABLE NAV. MISLOCATION.
 BEST FIT SEIS CORRELATION.

AREA OF CLOSURE: 11,150 acres
 VERTICAL CLOSURE: 240 sec. (1550 feet)
 DEPTH TO MAP HORIZON: 5480 feet
 WATER DEPTH: 198 feet

219103



**WEAVER OIL AND GAS CORPORATION,
 AUSTRALIA**

T-19-P

MANATEE LEAD

LOWER EOCENE/PALEOCENE REFLECTOR

SEISMIC TIME STRUCTURE MAP

GEOPH: J.D. DOWNING

DRFT: lal

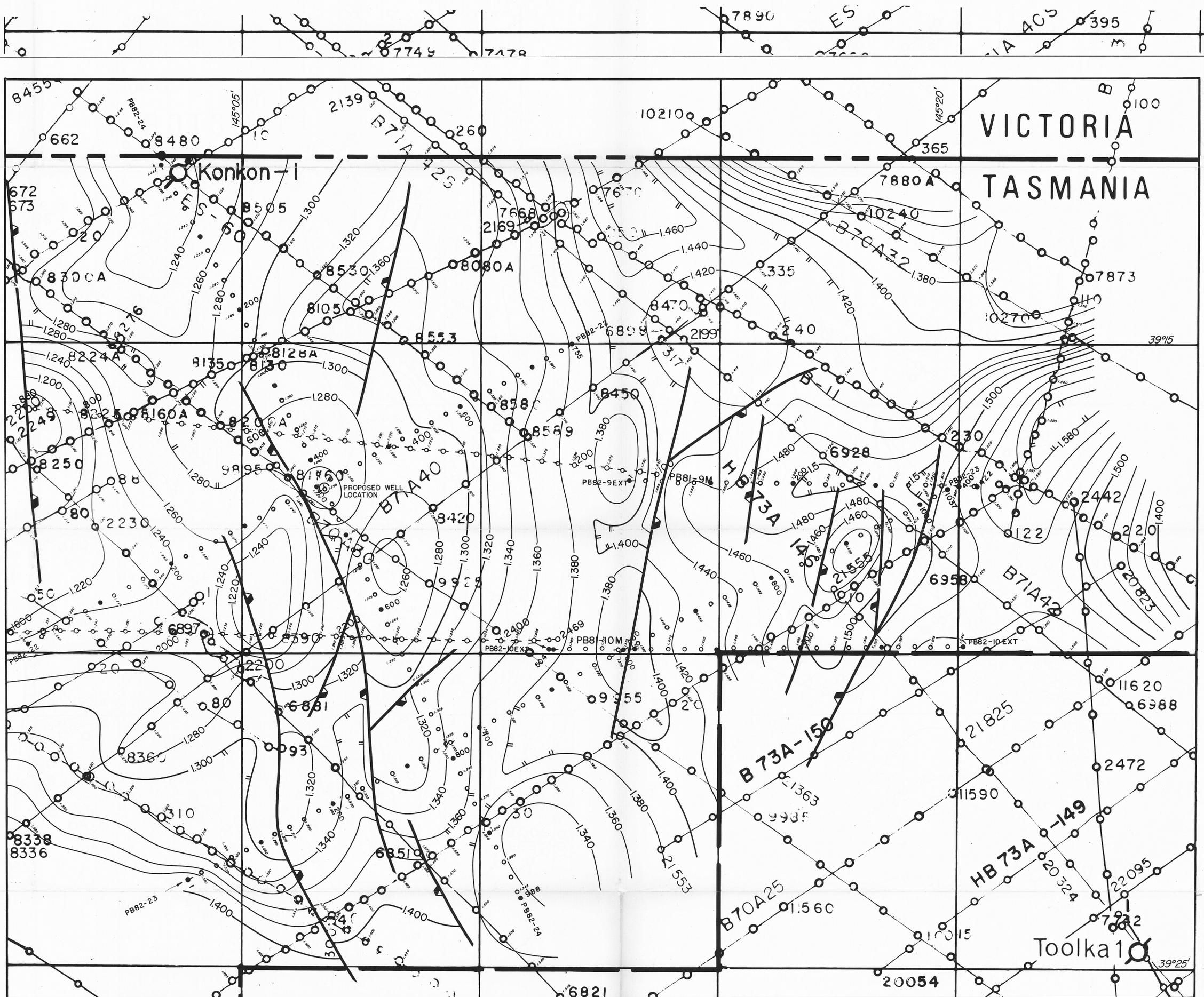


C.I.: .100 sec.

SCALE 1:50,000

JUNE 1982

ENCLOSURE 5
 T/Map Part 2 OR-204



AREA OF CLOSURE: 9280 acres
 VERTICAL CLOSURE: .050 sec. (260 feet)
 DEPTH TO MAP HORIZON: 1.250 sec. (4731 feet)
 WATER DEPTH: 222 feet
 PROPOSED WELL LOCATION: LINE P82-24, S.P. 440

WEAVER OIL AND GAS CORPORATION, AUSTRALIA

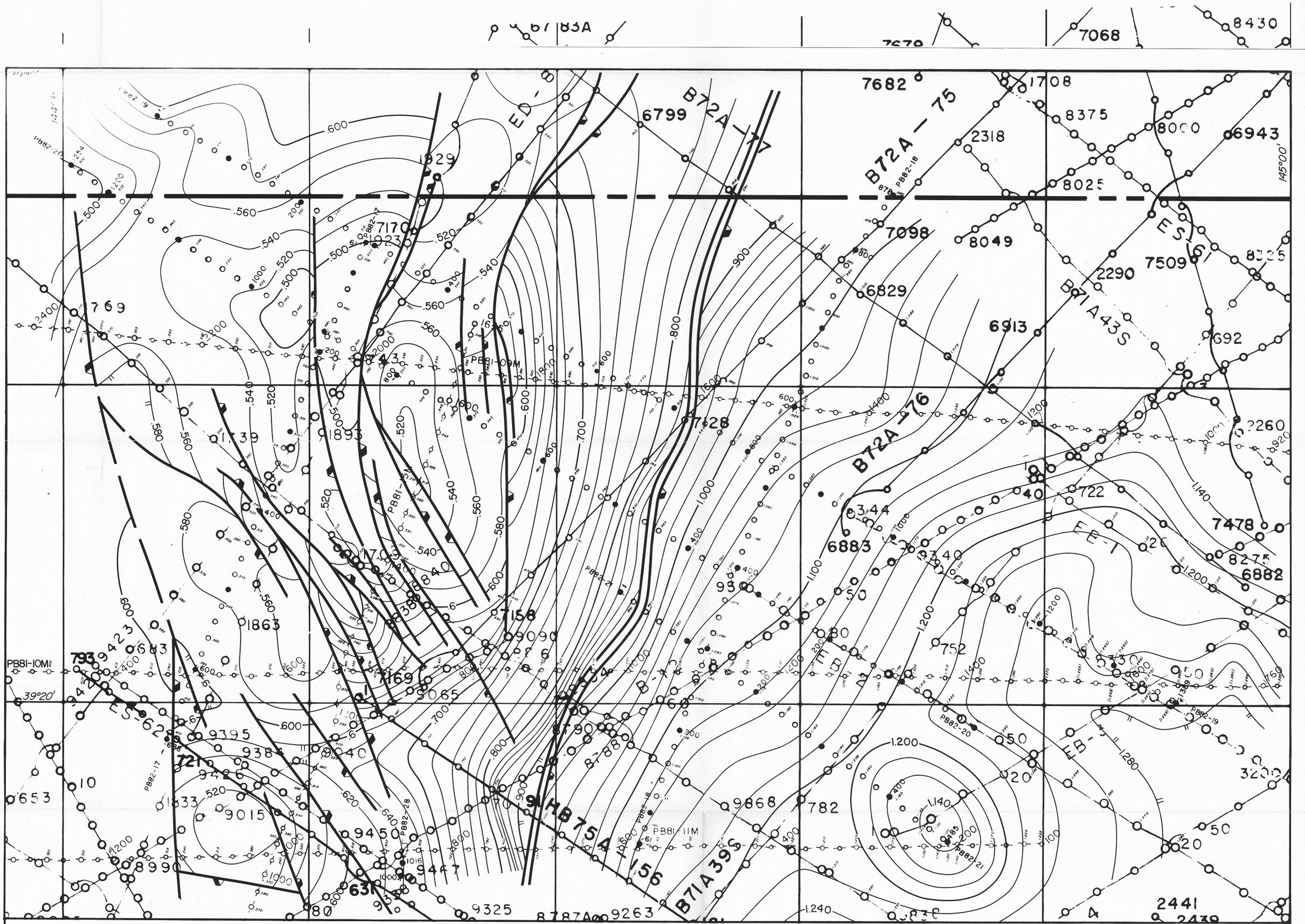
T-19-P
 MORWONG PROSPECT
 M. diversus
 SEISMIC TIME STRUCTURE MAP

GEOPH: J.D. DOWNING DRFT: lal
 C.I.: .025 sec. SCALE 1:50,000 JUNE 1982

219104



ENCLOSURE 6
 T/190 Part 2 OR-204



WEAVER OIL AND GAS CORPORATION,
AUSTRALIA

T-19-P
CORALINE PROSPECT

M. diversus

SEISMIC TIME STRUCTURE MAP
OCTOPUS SEISMIC SURVEY

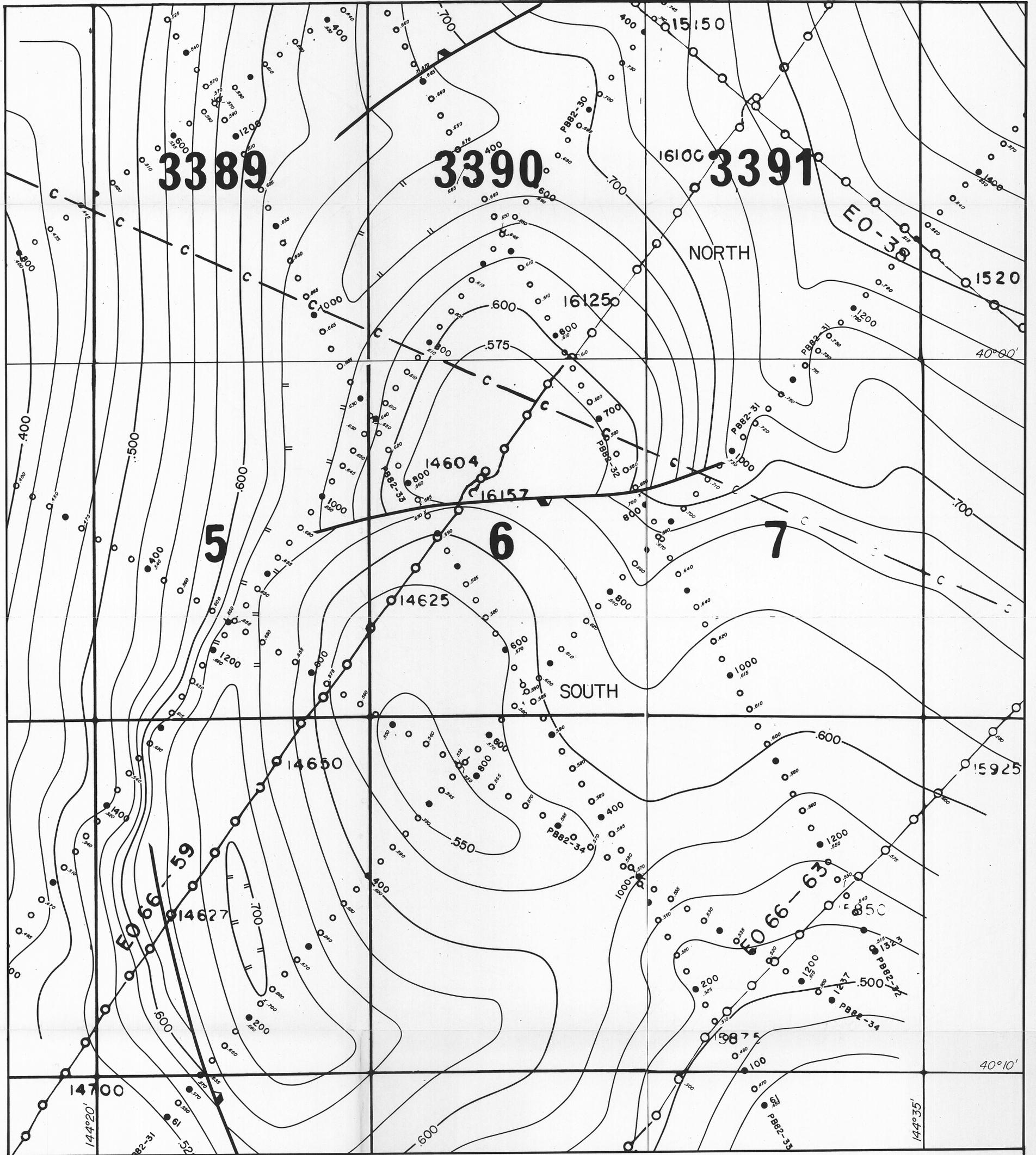
GEOPH: J. D. DOWNING DRFT: lal

C. I.: .020 sec. SCALE 1:50,000 JUNE 1982

219105

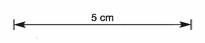
5 cm

ENCLOSURE 7
T-19P Part 2 OR-204



	NORTH	SOUTH
AREA	12,160 ac	7,600 ac
DEPTH to HORIZON	.560 sec. 581 m (1760')	.545 sec. 515 m (1560')
VERTICAL CLOSURE	.090 sec. 122m (370')	.035 sec. 42m (130')
WATER DEPTH	150'	180'

219107



**WEAVER OIL AND GAS CORPORATION,
AUSTRALIA**

T-19-P

SEA ELEPHANT PROSPECT

APPROX. *M. diversus*

SEISMIC TIME STRUCTURE MAP

GEOPH. J. D. DOWNING DRFT: lal

0 1 2 3 4 5 km

C.I.: .025 sec. SCALE 1:50,000 JUNE 1982

T/19P Part 2 ENCLOSURE 9 OR-204