RV FRANKLIN

National Facility

Oceanographic Research Vessel

Cruise Plan

FR15/98

Itinerary

Depart Sydney 1000 hrs, November 28, 1998

Arrive Brisbane 1000 hrs, December 16, 1998

Title

Marine stratigraphy and sedimentology of the central NSW & SE Queensland margin.

Chief Scientist

Dr Ron Boyd, Dept of Geology, University of Newcastle, NSW 2308.

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Co-Chief Investigators

Dr Peter Roy, University of Sydney

Dr Simon Lang, Queensland University of Technology

Dr Gary Huftile, Queensland University of Technology

This program consists of a NSW segment (13 days) and a SE Queensland segment (6 days), but with a common objective of investigating the stratigraphy and sedimentology of shelf sediments and incised valleys in particular (Hunter, Wallamba/Manning, Macleay, Clarence, Richmond, Tweed, Logan and Brisbane Rivers). Part I of the area of operation ranges from Sydney to Port Stephens, Forster-Tuncurry, Macleay River Valley, and Clarence River to Tweed River, and will be managed by Assoc. Professor Ron Boyd in conjunction with Dr Peter Roy. Part II is concerned with the area offshore from the Tweed River, Nerang, Coomera, Pimpama and Logan Rivers, and the offshore Brisbane River canyon north of Moreton Island, and will be managed by Dr Simon Lang and Dr Gary Huftile under overall supervision by the Chief Scientist.

Part I NSW Sector

Background: This cruise sector is concerned with the evolution, geology and paleoclimate of NSW coastal valleys. On Franklin 15/98 it will be concentrating on the distal sea level lowstand end of the valleys through the use of marine seismic surveys and vibrocore sampling.

Aim: The objective of this project is to study the sedimentary record in the coastal valleys of NSW as these are the only regions where any significant geological history has accumulated since the formation of the east coast of Australia around 60 million years ago. Previous work on the NSW coast has concentrated on the sea level highstand stage of the sea level cycle, primarily located in the onshore valleys (eg the Hunter Valley between Newcastle and Maitland). In 1998 we plan to investigate the logistically more difficult lowstand stage of the cycle, located seaward on the continental shelf.

Research Plan. The research plan consists of conducting a regional marine geological survey of the continental shelf between Sydney and the Queensland border, concentrating on the offshore extension of three valley systems we have already investigated on land -the Hunter, the Wallambah (Forster-Tuncurry) and the Clarence, and two additional valleys, the Macleay and the Tweed. In addition we will integrate these regional data with a number of local surveys, one conducted by the University in a fishing trawler off the Hunter Valley, and the other three conducted for heavy mineral exploration by RZM and provided to our project as in-kind support. On the cruise we will operate 24 hours per day collecting high resolution seismic data to identify the geometry of the valley fills, their stratigraphic relationships and facies, and also collecting vibrocores of the sediment fill to determine composition and to derive dating materials. On the cruise we will concentrate on the bathymetric zone between 60-120 m which we have already identified from previous data as the position of the lowstand shorelines. Our previous data have also indicated considerable along-coast variability in valley properties, so we intend to survey at least four valleys of different size and character in order to derive results with general applicability, suitable for testing and extending our current sequence stratigraphic valley models.

Methods and Techniques. We will use two major techniques on this cruise -high resolution seismic reflection profiling, and marine vibrocoring. For our seismic data collection we will use the University of Sydney seismic instruments and the University of Sydney seismic technician David Mitchell. We will sail with the QUT seismic instruments and recorders as backup. We plan to record all seismic data digitally. For vibrocore acquisition we will use the commercial system of the Coastal and Marine Geosciences company from Sydney and John Hudson will operate the corer. We will sail with the NSW Geological Survey vibrocore as backup (in-kind contribution from the NSW Government).

Expected outcomes. From the research project outlined above we expect the following outcomes:

1) An understanding of the sedimentation style in the lower half of the sea level curve for valley systems on the NSW coast.

2) A comparison of a range of valleys along the NSW coast (and southeast Queensland coast from QUT results) to derive more general models of variability in valley response to climate, sea level and sediment supply parameters. These results will also be compared to my earlier research on valleys in Texas, Louisiana, Nova Scotia and Australia.

3) A collection of specialised core sites along the NSW coast to characterise the sediments in each seismic unit and to provide samples for dating each deposit.

PERSONNEL

Dr Ron Boyd (University of Newcastle)

Dr Peter Roy (University of Sydney)

Mr David Mitchell (Marine Technician, University of Sydney)

Mr John Hudson (Coastal and Marine Geosciences)

Dr Simon C. Lang (Sedimentologist/Stratigrapher, QUT)

Dr Gary Huftile (Geophysicist, QUT)

Mr Vern Beecham (Electrical Technician, QUT)

Ms Sherilea Ramsay (Student, QUT)

Mr Tony Grimison (Student, QUT)

Mr Bob Beattie (CMR cruise manager & computing)

Mr Phil Adams (CMR electronics)

FRANKLIN EQUIPMENT

Pinger

Smith MacIntyre Grab and stand

Main winch and tensiometer

Hydro Winch

Differential GPS Navigation

Precision Depth Sounder with hard copy print out

Shipboard Communications (Bridge-Ops-Winch-Afterdeck)

Container Laboratory (core cutting, sampling)

Weak Links for dredging

Photocopier and toner

Ships Generator wired and fused for University of Sydney seismic system

* We will not require the chemistry lab and request that it be cleared as far as possible to use for computer and storage space.

USER EQUIPMENT

<u>Sydney University and QUT</u>

Sparker and boomer seismic profiling system (sources plus receiving hydrophones plus capacitor banks)

EPC recorder, AGSO Digital Acquisition Seismic System

CMG Vibrocorer and Frame, Dept. Of Mineral Resources Vibrocorer and Frame

Aluminium core barrels (40x6m length, plus core catchers)

Assorted dredges

Corebarrel Cutting Equipment (Circular Saw)

Photographic equipment (cameras plus lights)

SUN Sparcstation plus two IBM PC computers plus Landmark interpretation software, A3 scanner, HP Plotter, HP Printer, Canon bubblejet printer.

CRUISE TRACK

The cruise track will take in a general route from Sydney to Brisbane along the continental shelf. There will be a series of seismic and coring studies conducted at selected regions along the shelf, mainly offshore from major river systems. The areas for these studies will be: 1) NSW Central Coast (1 line and 1 core only), 2) Offshore Newcastle (Fault Survey), 3) Offshore Newcastle (Shelf Survey), 4) Offshore Forster, 5) Offshore Macleay River, 6) Offshore Clarence River, 7) Offshore Tweed River and 8) Queensland Survey (see separate section below).

The general approach will be to run a seismic survey at each location first and then to select coring sites based on the seismic data. Hence the seismic survey locations are generally known in advance but the coring locations will be determined on site. In addition, it is acknowledged that the coring operations will be weather and current dependant, hence coring will take place whenever an appropriate weather window occurs. Consequently, the schedule and exact cruise track will finally depend on ambient conditions and be determined while underway. In the following sections, the study locations for seismic surveys are given, as is a table of way points and a map for each study area.

Study Region 1 NSW Central Coast Adjacent to Terrigal. (Figure 1)

In this location we will conduct a shore normal seismic traverse to link up with an earlier line shot in the same location by John Hudson. After completion of the line we will select a site to conduct a vibrocore and test our coring techniques.

Seismic Line	**Lat S**	**Long E**
1 Start	33 28.1	151 30.083
2 Stop	33 33.2	151 41
Then conduct coring on this line for VC T1		

Study Region 2 Offshore Newcastle and Lake Macquarie.

In this location we will first conduct an optional seismic traverse to locate core sites and then core in three locations previously sampled by RZM for heavy minerals.

Seismic Line	**Lat S**	**Long E**
Start	33 08.4	151 39

Stop	33 08.2	151 45.6
And connecting through	each of the following core	sites:
Coring Location	**Lat S**	**Long E**
LM 1	33 08.476	151 40.116
LM 2	33 08.480	151 41.280
LM 3	33 08.361	151 43.804
Plus additional cores at the following sites LM3	33 05.398	151 41.376
LM4	33 04.187	151 42.666

In the second part of this study we will conduct a seismic survey of a fault trace located seaward of Newcastle and possibly associated with the Newcastle Earthquake of 1989.

Seismic Line NF	**Lat S**	**Long E**
Start Survey NF	**33.06633**	**151.7590**
WP1	**33.11361**	**151.9850**
WP2	**33.16431**	**151.9366**
WP3	**33.18303**	**152.0280**
WP4	**33.28449**	**152.0154**
WP5	**33.28829**	**152.1209**
End Survey NF	**33.36133**	**152.0817**

In the third part of this study we will conduct a seismic survey in the area offshore from the Hunter River Valley from the 120 m lowstand shoreline position in to near the shore. After finishing the seismic survey we will choose 6 core sites and collect a vibrocore in each location.

Seismic Line HR	**Lat S**	**Long E**

Start Survey HR WP1	**32.98978**	**152.1175**
WP2	**32.95553**	**152.0872**
WP3	**32.91988**	**152.0721**
WP4	**32.89216**	**152.0579**
WP5	**32.87059**	**152.0538**
WP6	**32.84078**	**152.0348**
WP7	**32.88004**	**151.9445**
WP8	**32.90232**	**151.9536**
WP9	**32.96430**	**151.9709**
WP10	**33.00611**	**152.0282**

WP11	**33.01562**	**152.0341**
WP12	**33.00940**	**152.0060**
WP13	**32.94146**	**152.1251**
WP14	**32.92062**	**152.1177**
WP15	**33.01478**	**151.9751**
WP16	**32.97802**	**151.9385**
WP17	**32.88170**	**152.0842**
WP18	**32.82312**	**152.0415**
END SURVEY WP19	**32.89640**	**151.8464**

Study Region 3 Offshore Forster-Tuncurry (Figure 2)

In this location we will conduct a seismic survey to collect information from the previously unexplored deeper shelf region off Forster-Tuncurry where we have previously collected extensive inner shelf data. After completing the seismic survey we will choose 6 sites for vibrocoring and collect a core at each site.

Seismic Line FT	Lat S	Long E
Start Survey FT WP1	32.48669	152.5635
WP2	32.60622	152.8154
WP3	32.51802	152.8155
WP4	32.40180	152.5614
WP5	32.34156	152.5605
WP6	32.44902	152.8913
WP7	32.44002	152.7739
WP8	32.35838	152.8056

WP9	**32.27539**	**152.5423**
WP10	**32.21887**	**152.5856**
WP11	**32.31189**	**152.9362**
WP12	**32.22655**	**152.9324**
WP13	**32.16808**	**152.7058**
WP14	**32.14317**	**152.5168**
WP15	**32.09890**	**152.5359**
WP16	**32.13029**	**152.8490**
WP17	**32.17566**	**153.0163**
WP18	**32.18217**	**152.9859**
WP19	**32.08291**	**153.0221**

WP20	**32.09825**	**153.0575**
WP21	**32.04648**	**152.8554**
WP22	**32.13067**	**152.8488**
WP23	**31.98561**	**152.6574**
END SURVEY WP24	**31.84915**	**152.7786**

Study Region 4 Offshore Macleay River (Figure 3)

In this location we will conduct a seismic survey to collect information from the previously unexplored shelf region off the entrance to the Macleay River. After completing the seismic survey we will choose 6 sites for vibrocoring and collect a core at each site.

Seismic Line M	**Lat S**	**Long E**
Start Survey M WP1	**30.90812**	**153.0977**

WP2	**30.90156**	**153.2794**
WP3	**30.83486**	**153.2823**
WP4	**30.84321**	**153.0314**
WP5	**30.78408**	**153.0296**
WP6	**30.78811**	**153.3067**
WP7	**30.70956**	**153.3116**
WP8	**30.69699**	**153.0025**
WP9	**30.64785**	**153.0943**
WP10	**30.86785**	**153.0767**
WP11	**30.91937**	**153.2066**
WP12	**30.65798**	**153.2597**

Study Region 5 Offshore Clarence River (Figure 4)

In this location we will conduct a seismic survey to collect information from the previously unexplored deeper shelf region off the Clarence River where we have previously collected extensive estuarine data. After completing the seismic survey we will choose 6 sites for vibrocoring and collect a core at each site.

Seismic Line C	Lat S	Long E
Start Survey C WP1	29.52312	153.7528
WP2	29.48961	153.3788
WP3	29.43210	153.3850
WP4	29.46592	153.7685
WP5	29.41044	153.7822
WP6	29.36623	153.3898

WP7	**29.28040**	**153.3742**
WP8	**29.35421**	**153.7863**
WP9	**29.46606**	**153.7686**
WP10	**29.47497**	**153.7281**
WP11	**29.33112**	**153.7548**
WP12	**29.10408**	**153.7913**
WP13	**29.12327**	**153.5259**
WP14	**28.87895**	**153.6221**
WP15	**28.91408**	**153.8460**
WP16	**29.00251**	**153.8373**
WP17	**29.00029**	**153.6507**

WP18	**28.99648**	**153.5753**

Study Region 6 Offshore Tweed River (Figure 4)

In this location we will conduct a seismic survey to collect information from the previously unexplored deeper shelf region off Forster-Tuncurry where RZM have previously collected extensive inner shelf data. After completing the seismic survey we will choose 6 sites for vibrocoring and collect a core at each site.

Seismic Line T	**Lat S**	**Long E**
Start Survey T WP1	**28.35913**	**153.9061**
WP2	**28.35797**	**153.5941**
WP3	**28.30351**	**153.5876**
WP4	**28.30169**	**153.8896**
WP5	**28.25044**	**153.8723**

WP6	**28.25263**	**153.6033**
WP7	**28.21744**	**153.6002**
WP8	**28.21495**	**153.8608**
WP9	**28.20502**	**153.8149**
WP10	**28.36543**	**153.8151**
WP11	**28.36472**	**153.7056**
WP12	**28.18287**	**153.6764**
WP13	**28.14139**	**153.5265**
WP14	**28.14058**	**153.8233**
WP15	**28.18298**	**153.6765**

TIME ESTIMATES

Depart 10 am 28 November

Transit to Terrigal Study Site 4 hours

Terrigal Seismic Survey 1 hour

Terrigal Core T1 2 hours

Transit to Lake Macquarie Seismic Line 2 hours

Lake Macquarie Seismic Line 1 hour

Collect Cores LM 1-3 4 hours

Transit to LM 4 0.5 hours

Core LM4 1 hour

Core LM5 1 hour

Transit to NF Survey 2 hours

NF Seismic Survey 37.5 nm 7.5 hours

Transit to HV Survey 2 hours

HV Seismic Survey 64 nm 13 hours

Collect Cores HV 1-6 10 hours

Transit to FT Survey 6 hours

FT Seismic Survey 210 nm 42 hours

Collect Cores FT 1-6 10 hours

Transit to MR Survey 8 hours

MR Seismic Survey 104 nm 21 hours

Collect Cores MR 1-6 10 hours

Transit to Clarence River 8 hours

C Seismic Survey 189 nm 38 hours

Collect Cores C 1-6 10 hours

Transit to Tweed Survey 6 hours

T Seismic Survey 131 nm 27 hours

Collect Cores T 1-6 10 hours

Total Time 247 hours or 10.3 days until Tues Dec 8th @ 8 am. Remaining 2 days kept for bad weather contingency and coring conditions.

PART II QUEENSLAND SECTOR

CRUISE PLAN

Itinerary

In transit Thursday 10th December offshore Tweed River to offshore Southport Seaway

Arrive Brisbane, Wed 16th December, 1998.

Title

Marine stratigraphy and sedimentology of the incised valleys and associated shelf and canyon sediments of the Logan and Brisbane River systems of the Cainozoic SE Queensland margin, Eastern Australia.

Principal Investigator

Dr Simon C. Lang* s.lang@qut.edu.au, 0738641395ph, 0738641535 fax

Associate Investigators

Dr George P. Allen*, and Dr Gary Huftile*

* Earth Sciences, School of Natural Resource Sciences,

Queensland University of Technology, Brisbane

SCIENTIFIC OBJECTIVES

The incised valley fill of the ancient Brisbane and Logan Rivers lying between the coast and the shelf edge offshore from Moreton Bay, provide an excellent opportunity to study coastal evolution during changes in relative sea level in the Cainozoic. This project will support the use of the ***RV Franklin*** research vessel to acquire high resolution seismic and vibrocores that will trace the path of these former river valleys across the continental shelf to their shelf-edge canyons. We aim to determine the character of the sediments, stratal geometries and key surfaces that will result in an evolutionary model and palaeo-climatic record. Results will improve stratigraphic models useful for hydrocarbon exploration in ancient incised valley fill successions.

AIMS

General: To determine the geological evolution of the Cainozoic SE Qld continental margin

Specifically:

1) To document the sedimentary response to Quaternary sea-level and climate change across the continental margin from the upper slope and canyons, continental shelf through to the coastal zone

2) To determine the sedimentary architecture (facies, geometry, stacking patterns) and sequence stratigraphy of incised valley fill developed by the palaeo-Brisbane and -Logan Rivers during successive Quaternary lowstands, transgressions and highstands of relative sea-level

3) To further develop predictive hydrocarbon exploration models for incised valley and associated shelf sediments on wave, and mixed wave-tide-fluvial coastal settings

EXPECTED OUTCOMES

- Documentation of the stratigraphic architecture of the Cainozoic SE Qld continental margin
- Documentation of the Quaternary relative sea-level changes and therefore climatic/tectonic change
- Documentation of the stratigraphic response to changes to the equilibrium profiles of the Brisbane & Logan Pimpama Coomera River systems through changes in relative sea-level

- Improved models for incised valley fill and their relationship to shelf and slope sedimentation that can be used to enhance hydrocarbon exploration through identification of reservoirs, seals & migration pathways.

BACKGROUND

During the late Cainozoic, and in particular the Quaternary, changes in relative sea-level induced mainly by climatic change resulted in the periodic drowning and exposure of the SE Queensland continental margin. This area presents a good opportunity to examine the nature of sedimentation and stratigraphic packaging developed across a passive margin shelf as a result of eustatic sea-level rise and fall. As relative sea level falls, coastal rivers start to erode the shelf to match the new positions of lowstand shorelines assuming that sediment supply and subsidence rates to not keep up with the rate of sea-level fall (Posamentier et al., 1992). If the relative fall in sea level is large enough (eg. 150m of fall during the late Quaternary), the rivers may cut canyons at the shelf edge before delivering their sediment load to the sea.

The shoreline deposits ultimately developed across the shelf or perched on the shelf edge are referred to as "forced regressive shorelines" and this concept is of considerable importance to the hydrocarbon exploration industry because of the significant potential for good reservoir development. These potential reservoirs are controlled by the position of the incised valley, and the degree to which the fluvial sediment outflow is modified by waves and tides. The nature of incised river valleys is vital to understanding the shoreline deposits. Furthermore, as relative sea-level begins to rise, the incised rivers may become filled by transgressive estuarine and shelf sediments, starving the retreating shoreline of sand, and sealing any sandy deposits along the base of the incised valleys. Depending on the slope of the shelf, the relative importance of waves, tides and fluvial outflow, the lowstand shorelines may be completely reworked into the transgressive shorelines, but if the rate of relative sea-level rise is rapid, they may be overstepped, thus becoming sealed by shelf sediments.

One of the key concepts to understanding the coastal deposits developed near the mouth of rivers during eustatic sea-level change is that of the "equilibrium profile", a plot of the optimum change in gradient of a river between its headwaters and the sea. As sea-level falls, rivers adjust to achieve their equilibrium profile as they grade towards the sea (Allen & Posamentier, 1994), and this means they must incise along a significant portion of their length. As relative sea-level rises, the river may aggrade sediments on the coastal plain in order to maintain the equilibrium profile, and leads to the accumulation of coastal deposits. These concepts form the basis of a series of models for fluvial, coastal, and shelf sedimentation that are embodied in the rapidly growing field of sequence stratigraphy (Van Wagoner et al., 1990) that has revolutionised hydrocarbon exploration strategies over the last two decades. Incised valley systems are of special significance because they form the link between terrestrial and marine sedimentation. Important improvements on incised valley models have been developed by Allen & Posamentier (1993), Posamentier & Allen (1993), Dalrymple, Boyd & Zaitlin (1994), and Dalrymple, Zaitlin, & Boyd, 1992, Zaitlin, Dalrymple & Boyd, 1994), and the SE Queensland continental margin represents a good area to test theses ideas in a wave-dominated, and mixed wave-tide settings.

A research program by Lang & Allen focusing on incised valley fill in Moreton Bay has been underway since 1995. To date it has resulted in 600 line km of high resolution seismic, supported by some drilling, being collected in the relatively protected Moreton Bay (Lang et al., 1995; Lockhart et al., 1995, 1996). This builds or earlier studies (eg. Stephens, 1982) that indicate the ancestral Brisbane and Logan Rivers were incised during periods of sea level lowstand during the late Quaternary. Our seismic work, in addition to work by Searle, Stephens and Jones during the 1970s and early 1980s has shown that 40m+ deep canyons were cut in Moreton Bay by the Logan and Brisbane Rivers, and these must have cut their way across the shelf to the shelf-break offshore from Moreton and Stradbroke Islands respectively. Apart from a few regional transects by the SONNE cruise (Stephens, 1982), the seismic data from outside Moreton Bay is scarce, and does not show any clearly defined incised valleys on the shelf developed by either the Brisbane or the Logan Rivers, unlike the Tweed River to the south. This may be a function of the scarcity of data in the right places, rather than a true lack of incised valleys on the shelf. With this in mind, it was proposed to conduct another seismic reflection survey and drilling program offshore from Moreton and Stradbroke Islands focusing on finding and surveying the incised valley fill using the ***RV Franklin*** as a platform.

CRUISE OBJECTIVES

Two methods of sampling will be used:

1. Seismic reflection profiling using a sparker or boomer system will be conducted over approximately 426 nautical miles (Table 1). Priority will be given to obtaining a series of lines approx. 3 NM apart over A) the shelf, canyon head and slope area of the palaeo-Logan-Pimpima-Coomera river system, and B) the palaeo-Brisbane river system, and drilling program between Sydney and Brisbane. There is already a regional seismic grid offshore from the Tweed Logan river area (SONNE cruise). Therefore the aim will be to complement the existing lines, especially over re-entrants in the 60, 80, 100 and 120m isobaths. Approximately 30 hours of seismic is to be collected (about 181 nautical miles @6 knots). There is no seismic data presently available offshore from the Brisbane River (north of the North Entrance tidal delta), and therefore at least 40 hours of seismic is needed (245 nautical miles @6knots). This is subject to weather conditions (sea state <3), which in addition to the water depth will also determine if the sparker or boomer system is to be deployed. Total seismic cruise time is about 70 hours, with only a few hours cruising without seismic between the two segments.
2. Based on the results of the seismic data collected above, it is expected that approximately 15 x 6m length vibrocore holes will be drilled. Sites 1-5 will be drilled offshore Coomera and Logan in depths between 40m and 80m taking approximately 22 hours. Sites 6-9 offshore Moreton Island will be drilled in depths of between 20 and 60m taking approximately 22 hours. Sites 10-15 offshore northern Moreton Bay will be drilled in depths between 40m and 80m, taking about 22 hours (see Table 2). Total time drilling is expected to take 66 hours, depending on weather conditions.

CRUISE TRACK

Part II of the cruise is concerned with the area offshore from South and North Stradbroke Island (offshore from Southport Seaway (153 28 27 57 to 153 46) to offshore from Moreton Island (153 25 27 17 out ot 153 43 26 49) in water depths of 300m, returning to shore near Caloundra Head (153 10, 26 45). All of this survey lies in water depths >20m. See Figure 5 for cruise track and line starts/ends.

1. After cruising from the offshore Tweed River, the palaeo-Nerang-Coomera-Pimpama-Logan river system survey will begin offshore from the Southport Seaway and will include 181 NM of seismic consisting of a 10x11 NM survey grid with corners at 153.483E 27.948N and 153.746E 27.6997N. Lines will be approximately 3NM apart, including one line extending to the toe of the shelf (300m), and finishing with a diagonal cross-line.
2. The palaeo-Brisbane river system survey has two parts. The southern part will begin offshore from Moreton Island (153.437E 27.2824N) and will finish immediately offshore from Cape Moreton (153.604E 27.0074N). This survey will form a partial grid approximately 9NM across the shelf, cut by 12NM long cross lines running shore parallel designed to intersect re-entrants in the 80m and 100m isobaths, thought to be possible canyon heads. The survey will comprise about 113NM. The northern part involves 132NM of survey, and begins at the toe of the shelf north east of Cape Moreton where prominent re-entrants occur in the 240m isobaths (153.733E 26.8618N). Two 21NM long, shore-normal seismic lines about 3NM apart will be shot across to Hamilton Patches (153.213E 26.8639N), and return from Caloundra Head back to the toe of the shelf at 153.715E 26.8079N. After returning to the 110m isobath near 153.71E 26.7351N, four 8 to 9NM long shore-parallel seismic lines will be shot approximately 3NM apart, finishing the survey immediately northeast of Caloundra Head (153.164E 26.7498N). See Figure 3 for seismic cruise distances.

EQUIPMENT

Sydney University and QUT

Sparker and boomer seismic profiling system

EPC recorder

CMG Vibrocorer and frame

Aluminium cores (20x6m length, plus core catchers)

Assorted dredges

TIME ESTIMATES

Offshore Tweed River to Southport seaway3hours (if recording seismic)

Offshore Logan River survey30 hours

Drilling Sites 1-522 hours

Transit to next survey2 hours

Offshore Moreton Island18 hours

Drilling Sites 6-922 hours

Transit to next survey1 hours

Offshore Caloundra-Cape Moreton22 hours

Drilling Sites 10-1522 hours

Transit to Brisbane, arrive 5pm4 hours

Subtotal:146 hours (6 days)

QUT PERSONNEL

Dr Simon C. Lang (Sedimentologist/Stratigrapher QUT)

Dr Gary Huftile (Geophysicist, QUT)

Mr Vern Beecham (Electrical Technician, QUT)

in addition to University of Newcastle, Sydney University and CSIRO personnel as in Part 1.

Table 1. Cruise track for seismic program. Lines are connected between station 1 to 57. Sailing order in increasing numerical order (eg. 1-2; 2-3; 3-4.....etc.)

Survey Pegs Cruise Track

Point Number (Sailing Order)	Lat S	Long E
2,11	27.9469	153.762

3	27.8857	153.757
4	27.8857	153.480
5	27.8218	153.478
6	27.8233	153.754
7	27.7615	153.921
8	27.7642	153.475
10	27.6997	153.746
12	27.9480	153.709
13	27.7003	153.692
14	27.7003	153.635
15	27.9480	153.645
16	27.9485	153.566
17	27.6997	153.553

20	27.8872	153.541
21	27.8228	153.604
22 end	27.7312	153.694
23 start	27.3033	153.484
24	27.3023	153.557
26	27.2253	153.500
27	27.2258	153.434
28	27.1609	153.436
30	27.0064	153.550
31	27.0074	153.604
32	27.0656	153.622
34	27.0388	153.496

35	27.0378	153.695
36	27.1588	153.732
39	27.2258	153.671
40	27.2813	153.672
41	27.2824	153.437
42	27.2824	153.501
44 start	26.8618	153.733
45	26.8639	153.213
46	26.8126	153.213
47	26.8079	153.715
48	26.7351	153.710
49	26.7388	153.524

50	26.9011	153.526
51	26.9032	153.474
52	26.7383	153.471
53	26.7367	153.409
54	26.9310	153.410
55	26.9362	153.347
56	26.7466	153.345
57 end	26.7498	153.164
1 start,19	27.9480	153.483
25,38	27.2253	153.555
29,37	27.1598	153.554
33,43 end	27.0666	153.498
9,18	27.7003	153.471

intersections	27.8862	153.563
ditto	27.8862	153.643
	27.8862	153.704
	27.8228	153.702
	27.8228	153.641
	27.8223	153.559
	27.7636	153.556
	27.7631	153.638
	27.7626	153.697
	27.7626	153.750
	27.7631	153.663
	27.7872	153.640

	27.8668	153.562
	27.2818	153.557
	27.1603	153.500
	27.0666	153.550
	27.0378	153.614
	27.0388	153.550
	26.8629	153.526
	26.8639	153.474
	26.8105	153.525
	26.8100	153.472
	26.8634	153.410
	26.8105	153.410

	26.8629	153.345
	26.8126	153.346
	26.8650	153.169

Table 2. All coordinates in decimal Latitude and Longitude based on AGD 84.

Drill Holes - Proposed

Hole #	Lat S	Long E
1	27.7634	153.555
3	27.7634	153.638
2	27.7643	153.594
4	27.8869	153.562
5	27.8221	153.640
6	27.2826	153.437
7	27.2820	153.500

8	27.2257	153.500
9	27.1993	153.500
10	27.1614	153.500
11	26.9294	153.410
15	26.8102	153.474
13	26.8107	153.409
14	26.8120	153.347
12	26.8643	153.410
OP1	26.8096	153.524
OP2	26.9029	153.524
OP3	27.0667	153.550
OP4	27.2269	153.555

OP5	27.7622	153.752
OP6	27.7627	153.696

Note that Optional holes OP1-OP6 lie between 80-100m water depth and could be done if drilling in these water depths is possible.

Table 3. Seismic cruise distances Qld sector

South (Logan)		**Km**	**Nmiles**
		27.3193	14.7513
		27.0945	14.6298
		27.2727	14.7261
		13.439	7.25649
		38.7146	20.9042
		26.8985	14.524
		27.3757	14.7817

		27.4513	14.8225
		27.0205	14.5899
		27.0371	14.5988
		26.9375	14.5451
		39.3792	21.263
	Total	335.9399	181.3929
Central (Moreton)		**Km**	**Nmiles**
		7.27428	3.9278
		8.43923	4.55682
		11.2427	6.07059
		5.70655	3.08129
		23.2012	12.5276

		5.46548	2.95112
		6.95599	3.75593
		7.15563	3.86373
		11.3303	6.11786
		6.83178	3.68887
		4.77216	2.57676
		20.3378	10.9815
		19.5258	10.5431
		13.6362	7.36299
		16.9147	9.13322
		16.8839	9.11656
		5.26768	2.84432

		6.46602	3.49137
		11.9065	6.42901
	Total	209.3139	113.0204
GRAND TOTAL		**790.5569**	**426.8664**